

Aironet 600 Series OfficeExtend Access Point Configuration Guide

Document ID: 113003

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Introduction

This document provides information on the requirements to configure a Cisco Wireless LAN (WLAN) Controller for use with the Cisco Aironet® 600 Series OfficeExtend Access Point (OEAP). The Cisco Aironet 600 Series OEAP supports split mode operation and it has facilities that require configuration through the WLAN Controller and features that can be configured locally by the end user. This document also provides information about the configurations necessary for proper connection and supported feature sets.

Prerequisites

Requirements

There are no specific requirements for this document.

Components Used

The information in this document is based on the Cisco Aironet 600 Series OfficeExtend Access Point (OEAP).

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, make sure that you understand the potential impact of any command.

Conventions

Refer to Cisco Technical Tips Conventions for more information on document conventions.

Background Information

Setup Guidelines

- The Cisco Aironet 600 Series OEAP is supported on these controllers: Cisco 5508, WiSM-2 and the Cisco 2504.
- The first controller release that supports Cisco Aironet 600 Series OEAP is 7.0.116.0
- The controller's Management Interfaces need to be on a routable IP network.
- Corporate Firewall configuration needs to be changed to allow traffic with UDP port numbers **5246** and **5247**.

Office Extend Solution Overview

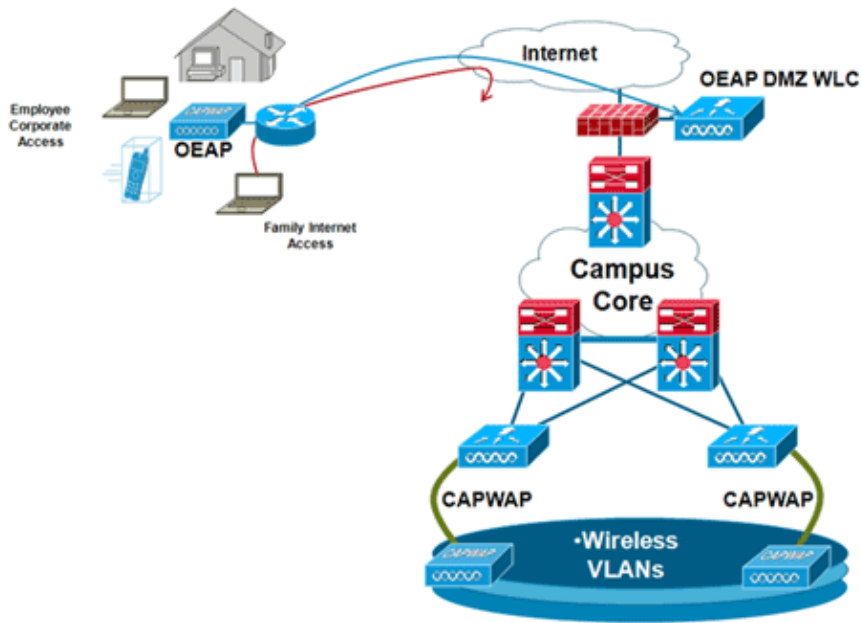
- A user is given an access point (AP) primed with the IP address of the corporate controller, or the user can enter the IP address of the controller from the configuration screen (setup HTML pages).
- The user plugs the AP to their home router.
- The AP gets an IP address from their home router, joins the primed controller and creates a secured tunnel.
- Cisco Aironet 600 Series OEAP then advertises the corporate SSID, which extends the same security methods and services across the WAN to the user's home.
- If the remote LAN is configured, one wired port on the AP is tunneled back to the controller.
- The user can then enable additionally a local SSID for personal use.

Firewall Configuration Guidelines

The general configuration on the firewall is to allow CAPWAP control and CAPWAP management port numbers through the firewall. The Cisco Aironet 600 Series OEAP controller can be placed in the DMZ zone.

Note: The UDP **5246** and **5247** ports need to be opened on the firewall between the WLAN controller and the Cisco Aironet 600 Series OEAP.

This diagram shows an Cisco Aironet 600 Series OEAP controller on the DMZ:



Here is a sample firewall configuration:

```
interface Ethernet0/0
 nameif outside
 security-level 0
 ip address X.X.X.X 255.255.255.224

!--- X.X.X.X represents a public IP address

!
interface Ethernet0/2
 nameif dmz
 security-level 50
 ip address 172.16.1.2 255.255.255.0
!
access-list Outside extended permit udp any host X.X.X.Y eq 5246

!--- Public reachable IP of corporate controller

access-list Outside extended permit udp any host X.X.X.Y eq 5247

!--- Public reachable IP of corporate controller

access-list Outside extended permit icmp any any
!
global (outside) 1 interface
nat (dmz) 1 172.16.1.0 255.255.255.0
static (dmz,outside) X.X.X.Y 172.16.1.25 netmask 255.255.255.255
access-group Outside in interface outside
```

In order to transmit the internal AP-Manager IP address to the OfficeExtend AP as part of the CAPWAP Discovery Response packet, the controller administrator needs to make sure that NAT is enabled in the AP-Manager interface and the correct NATed IP address is sent to the AP.

Note: By default, the WLC will only respond with the NAT IP address during AP Discovery when NAT is enabled. If APs exist on the inside and outside of the NAT gateway, issue this command in order to set the WLC to respond with both the NAT IP address and Non-NAT (inside) Management IP address:

```
config network ap-discovery nat-ip-only disable
```

Note: This is only required if the WLC has a NAT IP address.

This diagram shows NAT is enabled, assuming the WLC has a NAT IP address:

The screenshot shows the Cisco WLC configuration interface for the 'management' interface. The 'NAT Address' section is highlighted with a red circle, showing the 'Enable NAT Address' checkbox checked and the 'NAT IP Address' field set to 'X.X.X.Y'. Other sections include General Information, Configuration, Interface Address, Physical Information, and DHCP Information.

General Information	
Interface Name	management
MAC Address	00:24:97:69:52:8f

Configuration	
Quarantine	<input type="checkbox"/>
Quarantine Vlan Id	0

NAT Address	
Enable NAT Address	<input checked="" type="checkbox"/>
NAT IP Address	X.X.X.Y

Interface Address	
VLAN Identifier	0
IP Address	172.16.1.25
Netmask	255.255.255.0
Gateway	172.16.1.2

Physical Information	
The interface is attached to a LAG.	
Enable Dynamic AP Management	<input checked="" type="checkbox"/>

DHCP Information	
Primary DHCP Server	172.20.225.153
Secondary DHCP Server	0.0.0.0

Note: This configuration is not required in the controller provided it is configured with Internet routable IP address and not behind a firewall.

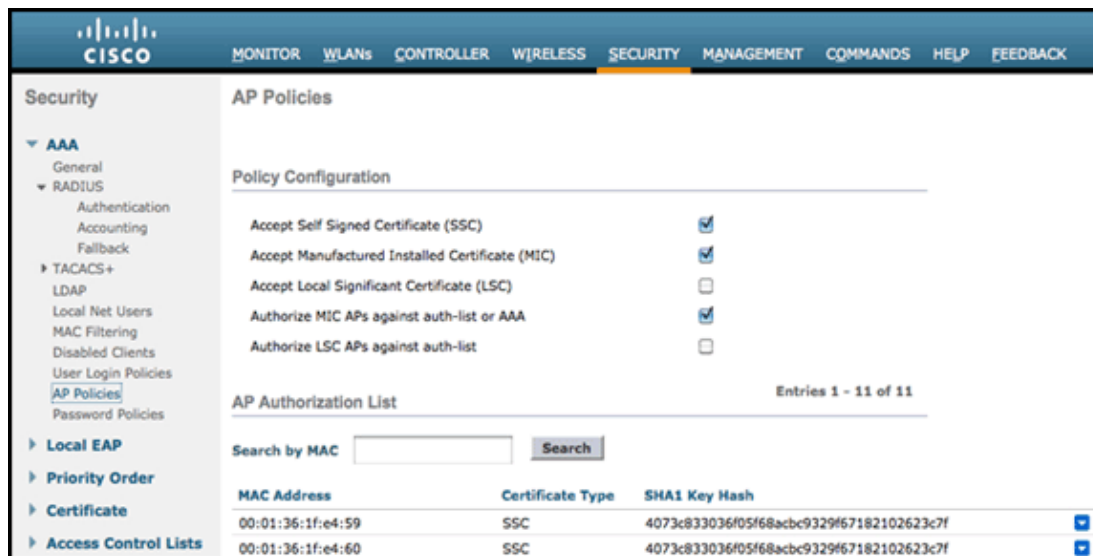
Office Extend AP-600 Configuration Steps

The Cisco Aironet 600 Series OEAP will connect to the WLC as a Local Mode Access Point.

Note: Monitor, H-REAP, Sniffer, Rogue Detection, Bridge and SE-Connect modes are not supported on the 600 Series and are not configurable.

Note: Cisco Aironet 600 Series OEAP functionality in the 1040, 1130, 1140 and 3502i Series Access Points requires configuring the APs for Hybrid REAP (H-REAP) and setting the sub-mode for the AP to Cisco Aironet 600 Series OEAP. This is not done with the 600 Series because it uses local mode and cannot be altered.

MAC filtering can be used in the AP authentication during the initial join process to prevent unauthorized Cisco Aironet 600 Series OEAP units from joining the controller. This image shows where you enable MAC filtering and configure AP security policies:



The Ethernet MAC (not the Radio MAC address) is entered here. Also, if entering the MAC address into a Radius server, lower case must be used. You can examine the AP Event log for information on how to discover the Ethernet MAC address (more on this later).

WLAN and Remote LAN Configuration Settings

There is one physical remote LAN port (yellow port #4) on the Cisco Aironet 600 Series OEAP. It is very similar to a WLAN in how it is configured. However, because it is not wireless and a wired LAN port on the back of the AP, it is called out and managed as a remote LAN port.

While there is only one physical port on the device, up to four wired clients can be connected if a hub or switch is used.

Note: The remote LAN client limit supports connecting a switch or hub to the remote LAN port for multiple devices or connecting directly to a Cisco IP phone that is connected to that port.

Note: Only the first four devices can connect until one of the devices is idle for more than one minute. If using 802.1x authentication, there might be issues attempting to use more than one client on the wired port.

Note: This number does not affect the fifteen limit imposed for the Controller WLANs.

A remote LAN is configured similarly to a WLAN and guest LAN configured on the controller.

WLANs are wireless security profiles. These are the profiles that are used by your corporate network. The Cisco Aironet 600 Series OEAP supports at most two WLANs and one remote LAN.

A remote LAN is similar to a WLAN except it is mapped to the wired port on the back of the access point (port #4 in yellow) as shown in this image:

WLANs > New

Type: WLAN (dropdown menu with options: WLAN, Guest LAN, Remote LAN, WLAN)

Profile Name: _____

SSID: _____

ID: 4 (dropdown menu)

Note: If you have more than two WLANs or more than one remote LAN, all need to be placed into an AP Group.

This image shows where WLANs and the remote LAN are configured:

WLANs

Current Filter: None [Change Filter] [Clear Filter] Create New Go

WLAN ID	Type	Profile Name	WLAN SSID	Admin Status	Security Policies
1	WLAN	EvoraData	EvoraData	Enabled	[WPA2][Auth(802.1X)]
2	WLAN	EvoraVoice	Evora_Voice	Enabled	[WPA2][Auth(802.1X)]
3	Remote LAN	EthernetTunnel	---	Enabled	None

This image shows a sample OEAP group name:

AP Groups

AP Group Name	AP Group Description
EvoraOEAP	Group for EvoraOEAPs
default-group	

This image shows a WLAN SSID and RLAN configuration:

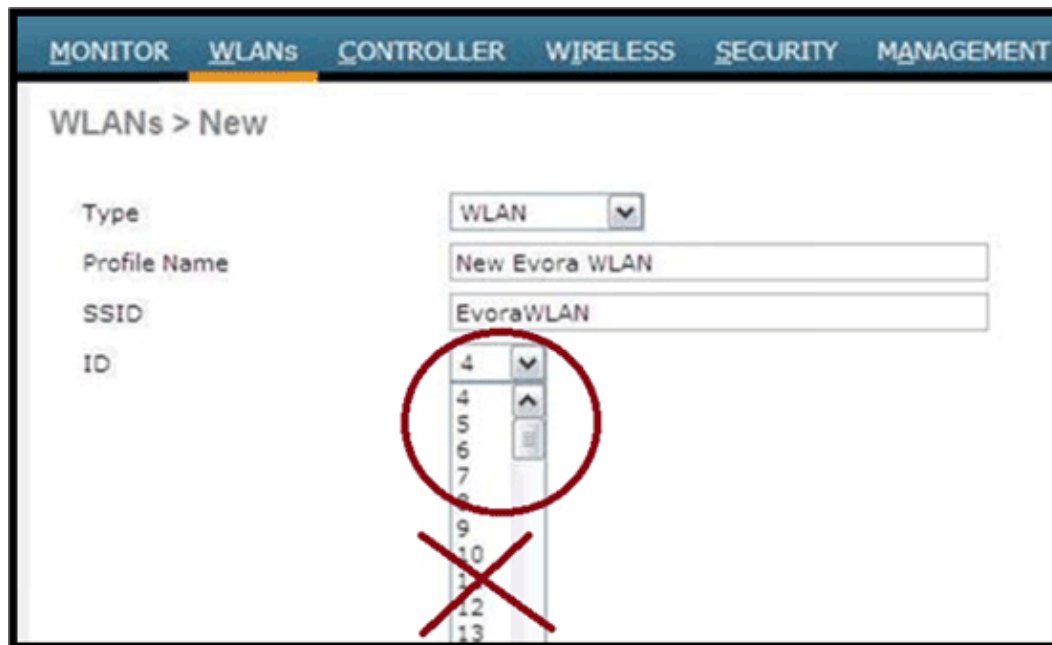
Ap Groups > Edit 'EvoraOEAP'

General WLANs APs

WLAN ID	WLAN SSID	Interface/Interface Group(G)	SNMP NAC State
1	EvoraData	management	Disabled
2	Evora_Voice	management	Disabled
3	EthernetTunnel	management	Disabled

If the Cisco Aironet 600 Series OEAP is entered into an AP group, the same limits of two WLANs and one remote LAN apply for the configuration of the AP group. Also, if the Cisco Aironet 600 Series OEAP is in the default group, which means it is not in a defined AP Group, the WLAN/remote LAN IDs need to be set at less than ID 8 because this product does not support the higher ID sets.

Keep ID sets to less than 8 as shown in this image:



Note: If additional WLANs or remote LANs are created with the intent of changing the WLANs or remote LAN being used by the Cisco Aironet 600 Series OEAP, then disable the current WLANs or remote LAN that you are removing before enabling the new WLANs or remote LAN on the 600 Series. If there is more than one remote LAN enabled for an AP group, disable all remote LANs and then enable only one.

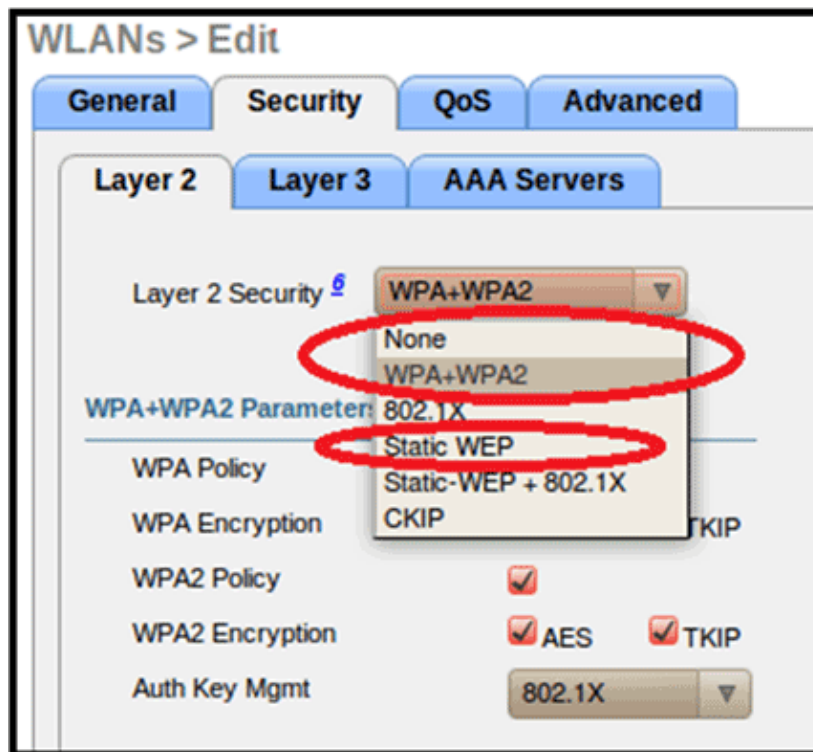
If there are more than two WLANs enabled for an AP group, disable all WLANs and then enable only two.

WLAN Security Settings

When setting the security setting in the WLAN, there are specific elements that are not supported on the 600 series.

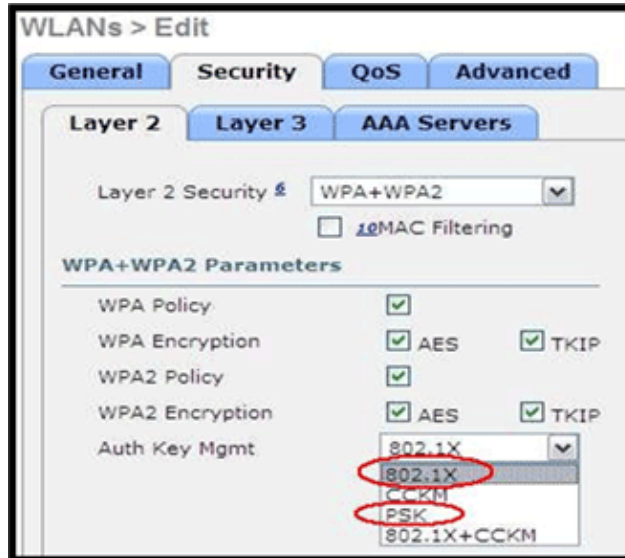
For Layer 2 Security, only these options are supported for the Cisco Aironet 600 Series OEAP:

- None
- WPA+WPA2
- Static WEP can also be used but not for .11n data rates.

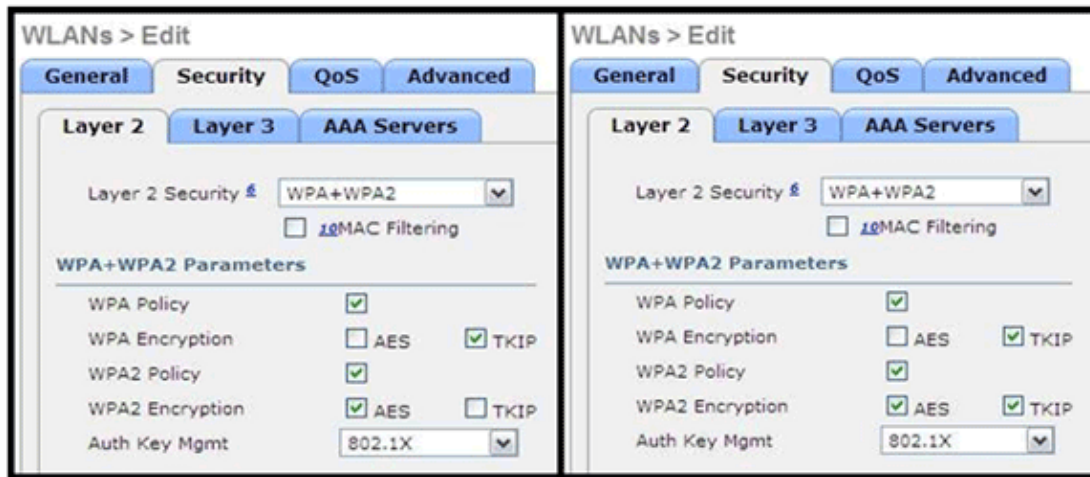


Note: Only 802.1x or PSK should be selected.

Security encryption settings need to be identical for WPA and WPA2 for TKIP and AES as shown in this image:

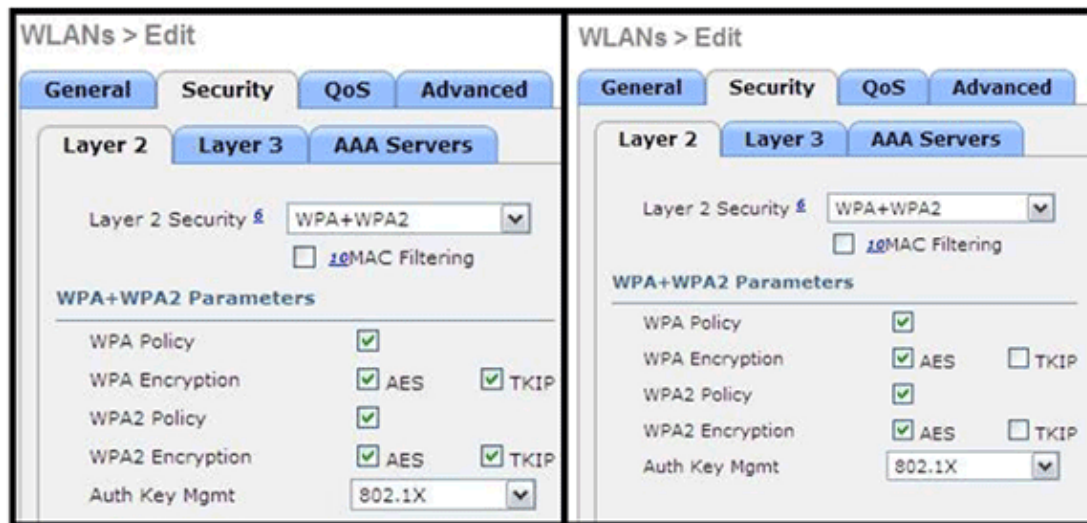


These images provide examples of incompatible settings for TKIP and AES:



Note: Be aware that security settings permit unsupported features.

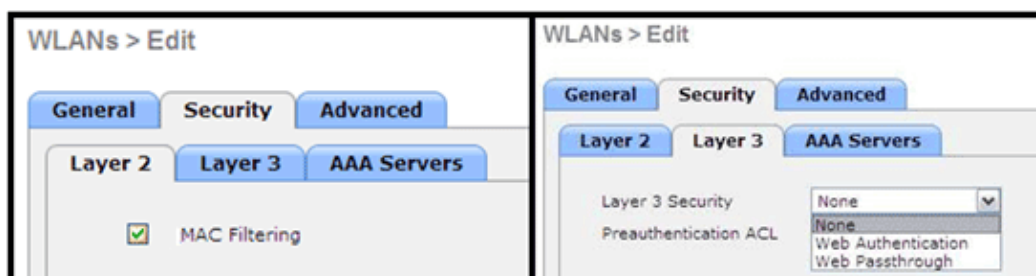
These images provide examples of compatible settings:



MAC Filtering

Security settings can be left open, set for MAC filtering, or set for Web Authentication. The default is to utilize MAC filtering.

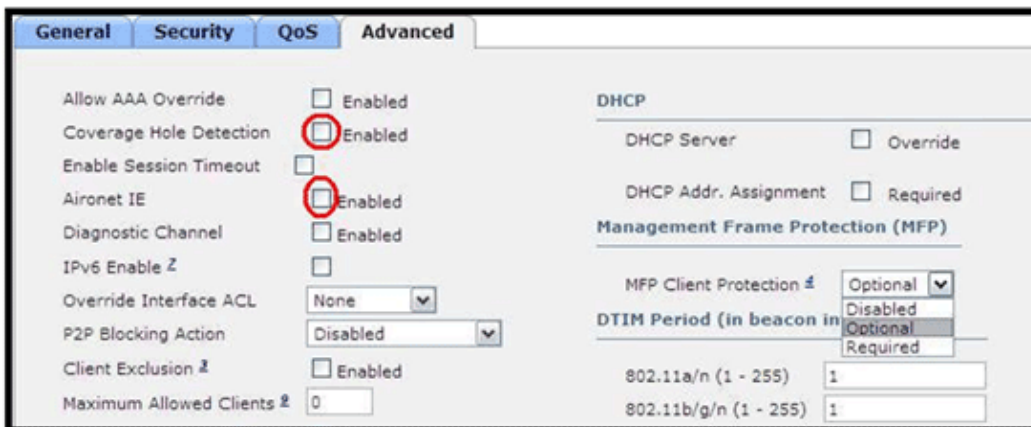
This image shows Layer 2 and Layer 3 MAC filtering:



QoS settings are managed:

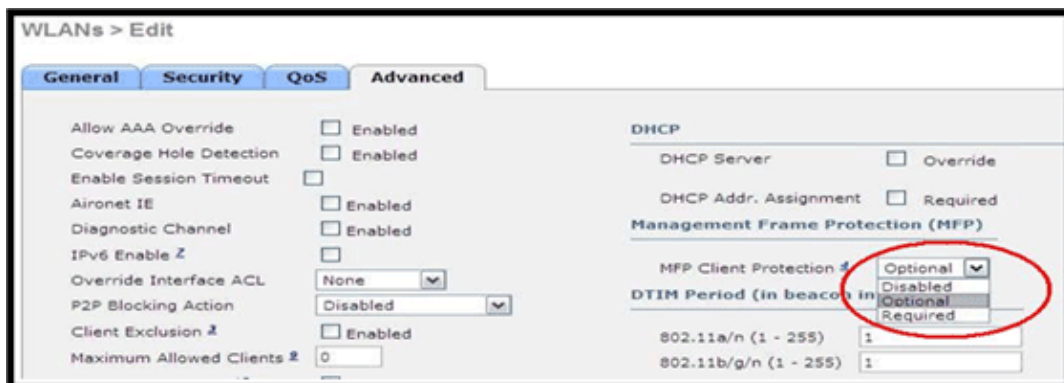


Advanced settings should also be managed:



Notes:

- Coverage Hole Detection should not be enabled.
- Aironet IE (Information Elements) should not be enabled as they are not used.
- Management Frame Protection (MFP) is also not supported, and should be disabled or configured as optional as shown in this image:



- Client Load Balancing and Client Band Select are not supported and should not be enabled:



Supported User Count

Only fifteen users are allowed to connect on the WLAN Controller WLANs provided on the 600 series at any one time. A sixteenth user cannot authenticate until one of the first clients de-authenticates or a timeout occurred on the controller.

Note: This number is cumulative across the controller WLANs on the 600 series.

For example, if two controller WLANs are configured and there are fifteen users on one of the WLANs, no users will be able to join the other WLAN on the 600 series at that time. This limit does not apply to the local private WLANs that the end user configures on the 600 series designed for personal use and clients connected on these private WLANs or on the wired ports do not affect these limits.

Channel Management and Settings

The radios for the 600 series are controlled through the Local GUI on the 600 series and not through the Wireless LAN Controller.

Attempting to control the spectrum channel, power, or disable the radios through the controller will fail to have any effect on the 600 series.

The 600 series will scan and choose channels for 2.4 GHz and 5.0 GHz during startup as long as the default settings on the Local GUI are left as default in both spectrums.

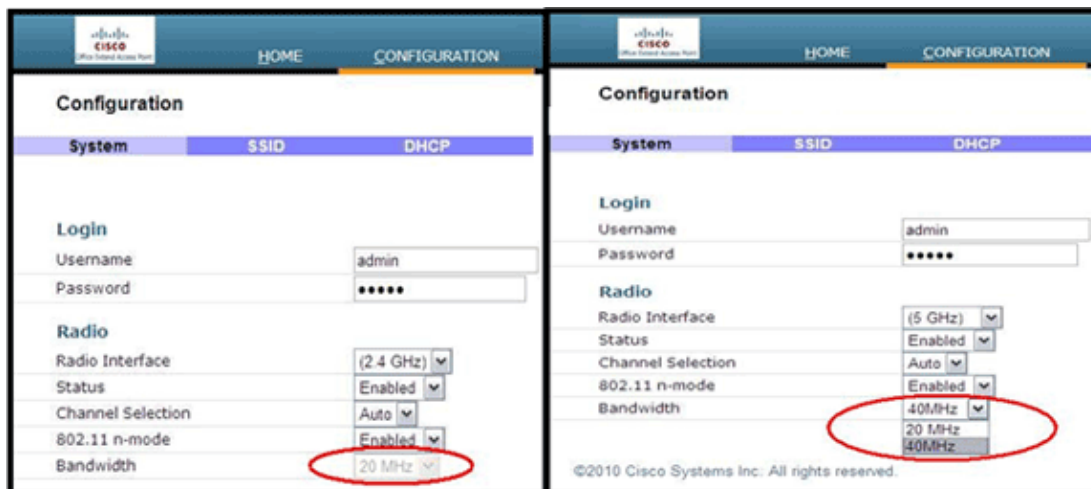
Note: If the user disables one or both radios locally (that radio is also disabled for corporate access), also as previously stated, RRM and advanced features such as monitor, H-REAP, sniffer are beyond the capabilities of the Cisco Aironet 600 Series OEAP which is positioned for home and teleworker usage.

The channel selection and bandwidth for 5.0 GHz are configured here on the local GUI of the Cisco Aironet 600 Series OEAP.

The image displays two side-by-side screenshots of the Cisco Aironet 600 Series OEAP Configuration GUI. Both screenshots show the 'Configuration' tab with a 'Radio' section. In the left screenshot, the 'Radio Interface' is set to '(2.4 GHz)' and 'Channel Selection' is set to 'Auto' (circled in red). In the right screenshot, the 'Radio Interface' is set to '(5 GHz)' and 'Channel Selection' is set to 'Auto' (circled in red). Both screenshots show the 'Status' as 'Enabled' and '802.11 n-mode' as 'Enabled'. The 'Bandwidth' is set to '20 MHz' in the left screenshot and '40MHz' in the right screenshot. The 'Login' section shows 'Username' as 'admin' and 'Password' as '*****'.

Notes:

- 20 and 40 MHz wide settings are available for 5 GHz.
- 2.4 GHz 40 MHz wide is not supported and fixed at 20 MHz.
- 40 MHz wide (channel bonding) is not supported in 2.4 GHz.



Additional Caveats

The Cisco Aironet 600 Series OEAP is designed for single AP deployments. Therefore, client roaming between the 600 series is not supported.

Note: Disabling the 802.11a/n or 802.11b/g/n on the controller might not disable these spectrums on the Cisco Aironet 600 Series OEAP because local SSID might still be working.

The end user has enable/disable control over the radios inside the Cisco Aironet 600 Series OEAP.



802.1x Support on the Wired Port

In this initial release, 802.1x is only supported on Command Line Interface (CLI).

Note: GUI support has not been added yet.

This is the wired port (port #4 in yellow) on the back of the Cisco Aironet 600 Series OEAP and is tied to the remote LAN (see previous section on configuring remote LAN).

At any time, you can use the **show** command to display the current remote LAN configuration:

```
show remote-lan <remote-lan-id>
```

In order to change the remote LAN configuration, you must first disable it:

```
remote-lan disable <remote-lan-id>
```

Enable 802.1X authentication for the remote LAN:

```
config remote-lan security 802.1X enable <remote-lan-id>
```

You can undo it by using this command:

```
config remote-lan security 802.1X disable <remote-lan-id>
```

For the remote LAN, Encryption is always None (as displayed in **show remote-lan**) and not configurable.

If you want to use local EAP (in the controller) as authentication server:

```
config remote-lan local-auth enable <profile-name> <remote-lan-id>
```

Where the profile is defined either through the controller GUI (Security > Local EAP) or CLI (**config local-auth**). Refer to the controller guide for details on this command.

You can undo it bywith this command:

```
config remote-lan local-auth disable <remote-lan-id>
```

Or, if you use an external AAA authentication server:

- **config remote-lan radius_server auth add/delete** <remote-lan-id> <server-id>
- **config remote-lan radius_server auth enable/disable** <remote-lan-id>

Where server is configured through the controller GUI (Security > RADIUS > Authentication) or CLI (**config radius auth**). Refer to the controller guide for more information about this command..

After you are done with the configuration, enable the remote LAN:

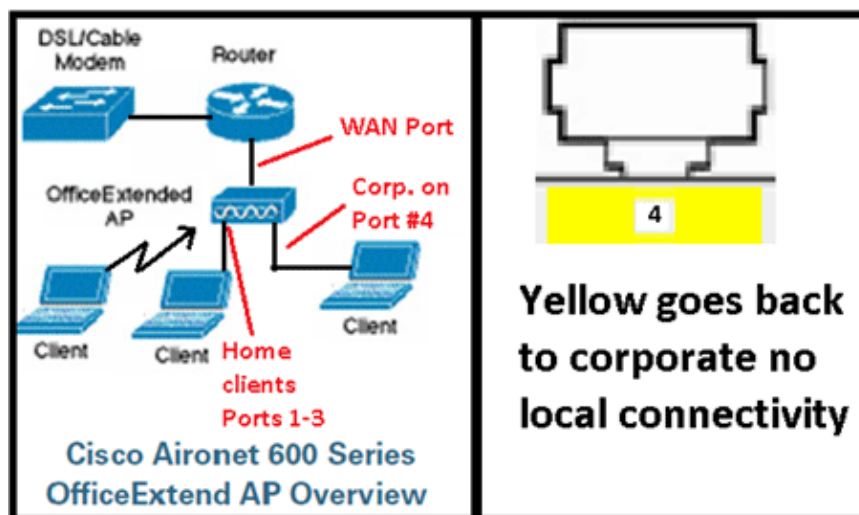
```
config remote-lan enable <remote-lan-id>
```

Use the **show remote-lan** <remote-lan-id> command in order to verify your setting.

For the remote LAN client, you need to enable 802.1X authentication and configure correspondingly. Refer to your device user guide.

OEAP-600 Access Point Configuration

This image shows the wiring diagram for the Cisco Aironet 600 Series OEAP:

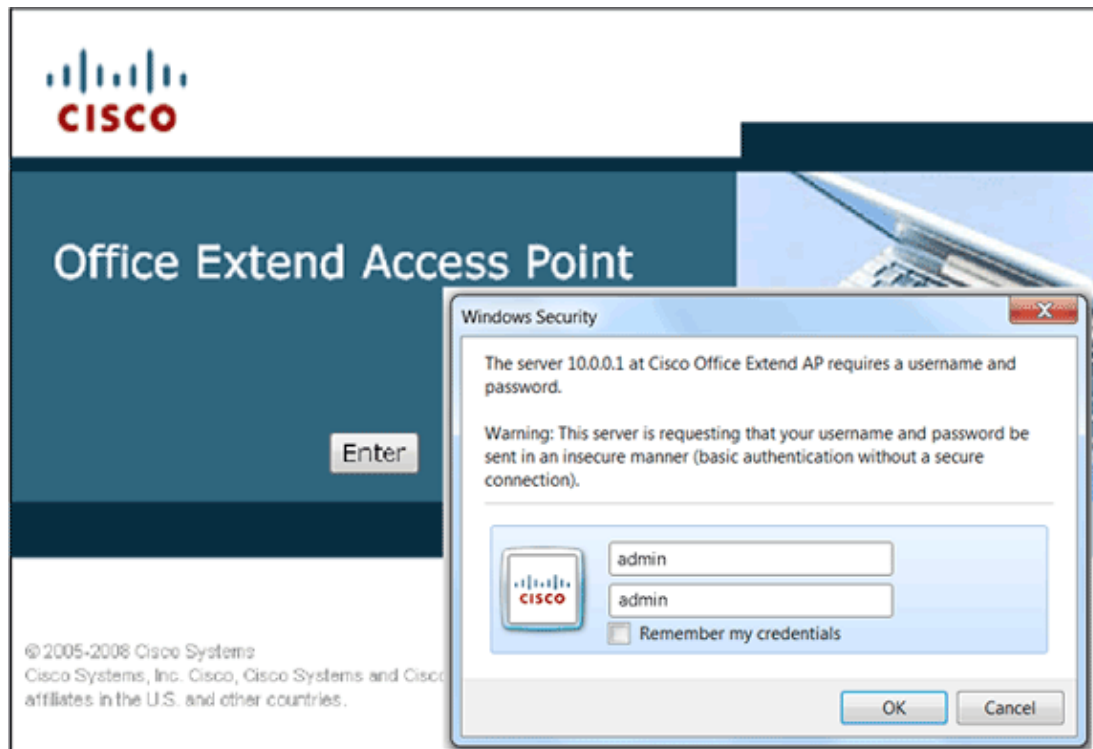


The default DHCP scope of the Cisco Aironet 600 Series OEAP is 10.0.0.x so you can browse to the AP on ports 1–3 using the address of 10.0.0.1. The default username and password are admin.

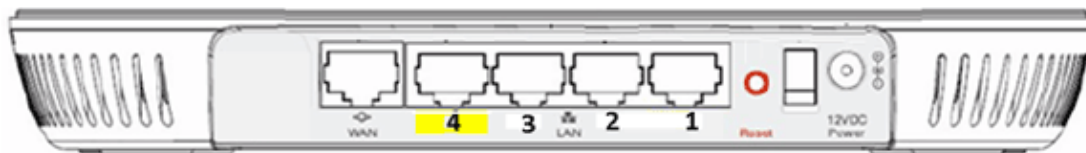
Note: This is different from the AP1040, 1130, 1140 and 3502i which used Cisco as the username and password.

If the radios are up and a personal SSID has already been configured, you can access the configuration screen wirelessly. Otherwise, you need to use local Ethernet ports 1–3.

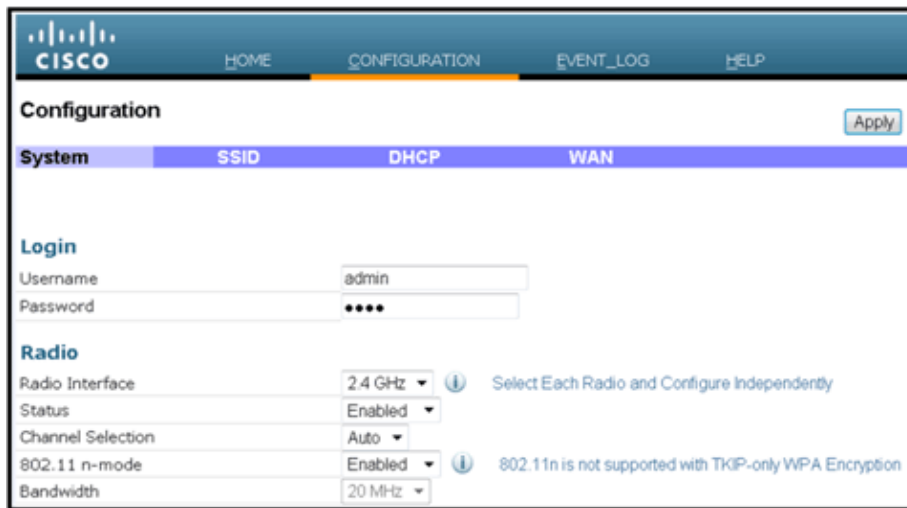
In order to login, the default username and password are admin.



Note: The yellow port #4 is not active for local use. If a remote LAN is configured on the controller, this port tunnels back after the AP successfully joins the controller. In order to browse to the device, locally use ports 1–3:



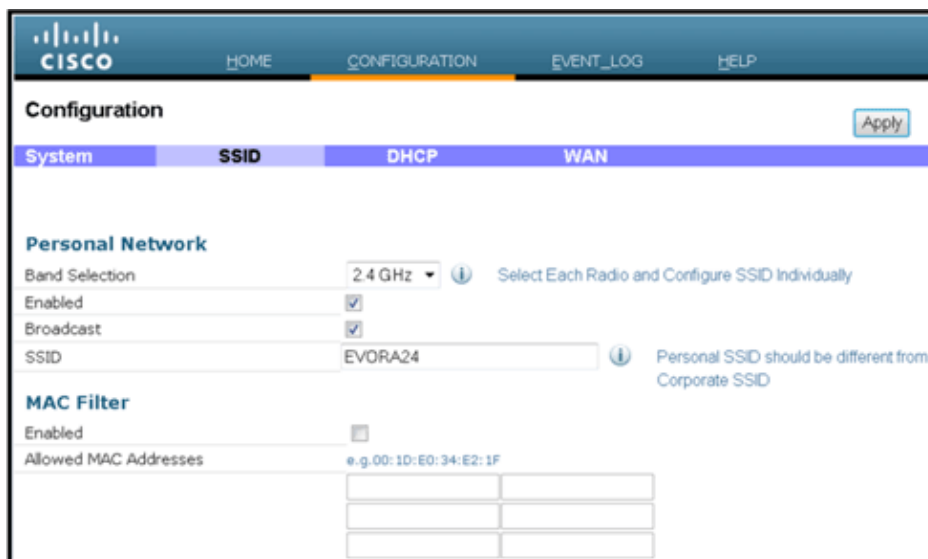
Once you successfully browse to the device, you see the home status screen. This screen provides radio and MAC statistics. If radios have not been configured, the configuration screen permits the user to enable the radios, set channels and modes, configure local SSIDs, and enable the WLAN settings.



The image shows the Cisco Configuration Manager interface for SSID configuration. The top navigation bar includes 'HOME', 'CONFIGURATION', 'EVENT_LOG', and 'HELP'. The 'CONFIGURATION' tab is active. Below the navigation bar, there's a 'Configuration' section with an 'Apply' button. A tabbed interface shows 'System', 'SSID', 'DHCP', and 'WAN' tabs, with 'SSID' currently selected. The 'Login' section has fields for 'Username' (admin) and 'Password' (masked with dots). The 'Radio' section includes settings for 'Radio Interface' (2.4 GHz), 'Status' (Enabled), 'Channel Selection' (Auto), '802.11 n-mode' (Enabled), and 'Bandwidth' (20 MHz). Informational messages are present: 'Select Each Radio and Configure Independently' and '802.11n is not supported with TKIP-only WPA Encryption'.

From the SSID screen is where the user can configure the personal WLAN network. The corporate radio SSID and security parameters are set up and pushed down from the controller (after you configure the WAN with the IP of the controller), and a successful join has occurred.

This image shows an SSID local MAC filtering configuration:



The image shows the Cisco Configuration Manager interface for SSID configuration, specifically the 'Personal Network' section. The top navigation bar is the same as the previous image. The 'SSID' tab is selected. The 'Personal Network' section includes 'Band Selection' (2.4 GHz), 'Enabled' (checked), 'Broadcast' (checked), and 'SSID' (EVORA24). A note states 'Personal SSID should be different from Corporate SSID'. The 'MAC Filter' section has 'Enabled' (unchecked) and 'Allowed MAC Addresses' (e.g. 00:1D:E0:34:E2:1F). There are three empty rows for adding MAC addresses.

After the user configures the personal SSID, the screen below permits the user to set up security on the private home SSID, enable radios, and configure MAC filtering if desired. If the personal network is using 802.11n rates, it is recommended that the user choose an authentication type, encryption type and a passphrase enabling WPA2-PSK and AES.

Note: These SSID settings are different from the corporate settings if the user chooses to disable one or both of the radios (both are also disabled for corporate use as well).

Users who have access locally to the admin control settings have control over core functions such as radio enable/disable unless the device is password protected and configured by the administrator. Therefore, care must be taken not to disable both radios as this can result in a loss of connectivity even if the device successfully joins the controller.

This image shows the system security settings:

Security	
WPA-PSK	Disabled ▾
WPA2-PSK	Enabled ▾
WEP Encryption	Disabled ▾
WPA Encryption	AES ▾
WPA passphrase	••••• Click here to display
Network Key 1	
Network Key 2	
Network Key 3	
Network Key 4	
Current Network Key	2 ▾

It is expected that the home teleworker installs the Cisco Aironet 600 Series OEAP behind a home router as this product is not designed to replace the functionality of a home router. This is because the current version of this product does not have firewall support, PPPoE support or port forwarding. These are features customers expect to find in a home router.

While this product can work without a home router, it is recommended not to position it that way for the reasons stated. Also, there can be compatibility issues connecting directly to some modems.

Given that most home routers have a DHCP scope in the 192.168.x.x range, this device has a default DHCP scope of 10.0.0.x and is configurable.

If the home router happens to be using 10.0.0.x, then you must configure the Cisco Aironet 600 Series OEAP to use a 192.168.1.x or compatible IP address to avoid network conflicts.

This image shows a DHCP scope configuration:

CISCO																																					
HOME	CONFIGURATION																																				
<div>Configuration Apply</div> <table border="1"> <thead> <tr> <th>System</th> <th>SSID</th> <th>DHCP</th> <th>WAN</th> </tr> </thead> <tbody> <tr> <td colspan="4">Local DHCP</td> </tr> <tr> <td>IP Address</td> <td colspan="3">10.0.0.1</td> </tr> <tr> <td>Subnet Mask</td> <td colspan="3">255.255.255.0</td> </tr> <tr> <td>Default Gateway</td> <td colspan="3">10.0.0.1</td> </tr> <tr> <td>DHCP Server</td> <td colspan="3">Enabled ▾</td> </tr> <tr> <td>DHCP Starting IP Address</td> <td colspan="3">10.0.0.100</td> </tr> <tr> <td>DHCP Ending IP Address</td> <td colspan="3">10.0.0.150</td> </tr> <tr> <td>DHCP Lease Time</td> <td colspan="3">86400</td> </tr> </tbody> </table>		System	SSID	DHCP	WAN	Local DHCP				IP Address	10.0.0.1			Subnet Mask	255.255.255.0			Default Gateway	10.0.0.1			DHCP Server	Enabled ▾			DHCP Starting IP Address	10.0.0.100			DHCP Ending IP Address	10.0.0.150			DHCP Lease Time	86400		
System	SSID	DHCP	WAN																																		
Local DHCP																																					
IP Address	10.0.0.1																																				
Subnet Mask	255.255.255.0																																				
Default Gateway	10.0.0.1																																				
DHCP Server	Enabled ▾																																				
DHCP Starting IP Address	10.0.0.100																																				
DHCP Ending IP Address	10.0.0.150																																				
DHCP Lease Time	86400																																				

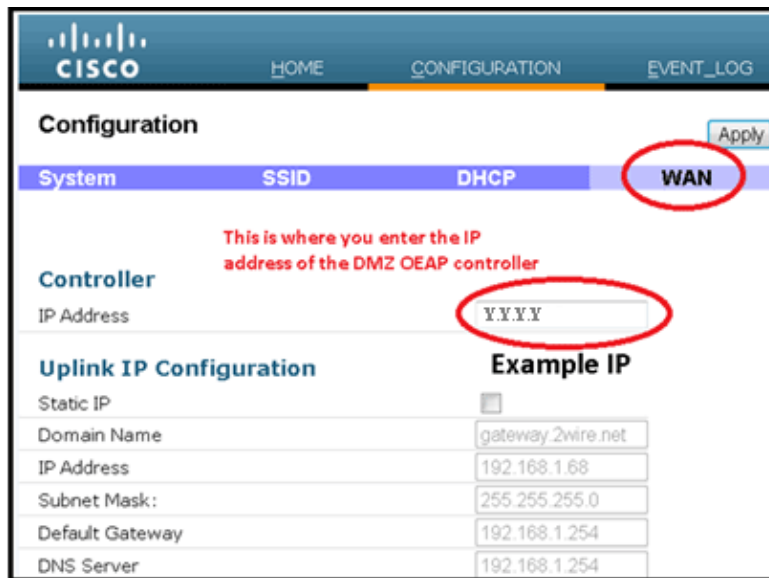


Caution: If the Cisco Aironet 600 Series OEAP is not staged or configured by the IT administrator, the

user needs to enter the IP address of the corporate controller (see below) so the AP can successfully join the controller. After a successful join, the AP should download the latest image from the controller and the configuration parameters such as the corporate WLAN settings. Also, if configured, the remote LAN settings wired port #4 on the back of the Cisco Aironet 600 Series OEAP.

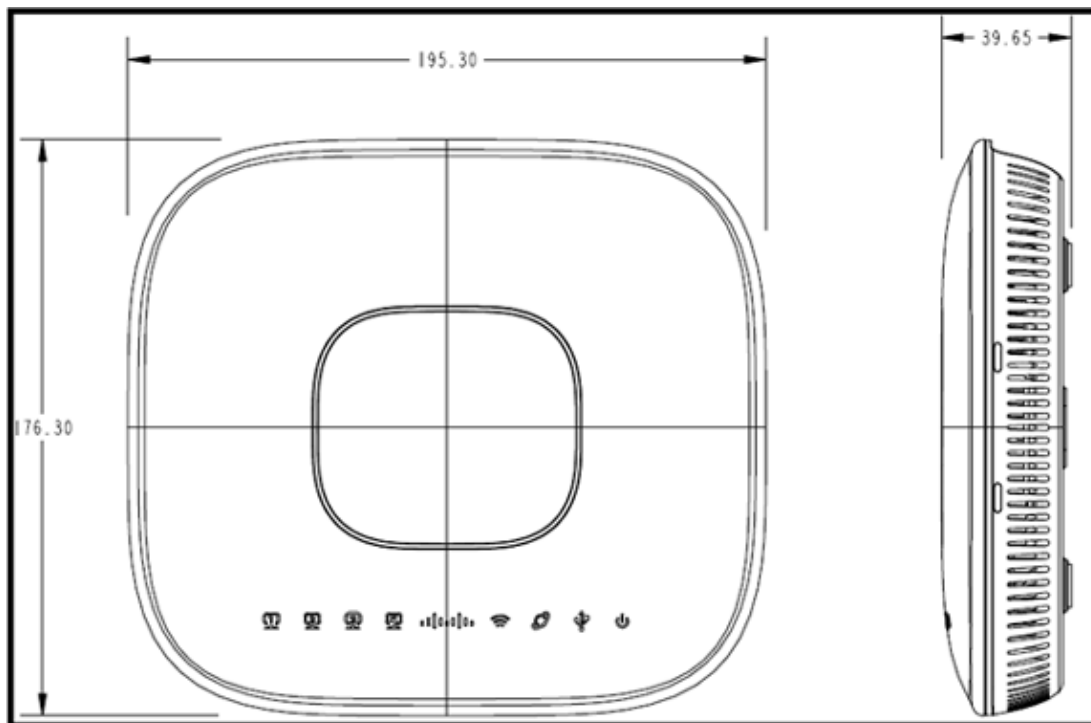
If it does not join, verify that the IP address of the controller is reachable via the Internet. If MAC filtering is enabled, verify that the MAC address is successfully entered into the controller.

This image shows the IP address of the Cisco Aironet 600 Series OEAP controller:



OEAP-600 Access Point Hardware Installation

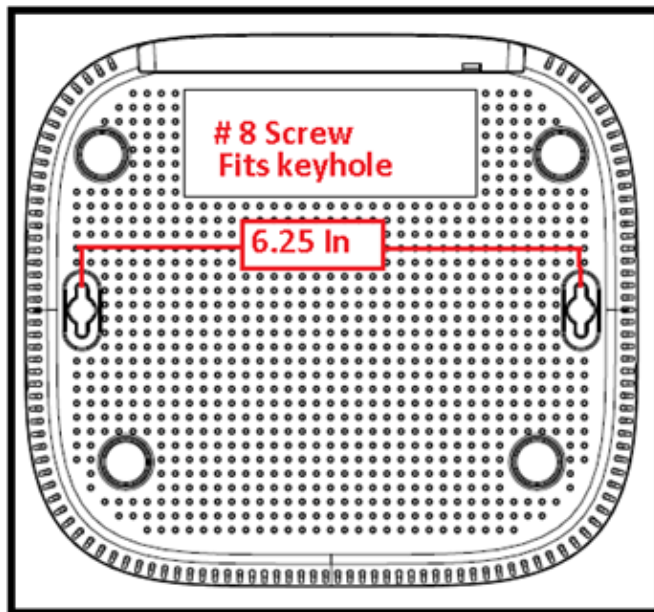
This image shows the physical aspects of the Cisco Aironet 600 Series OEAP:



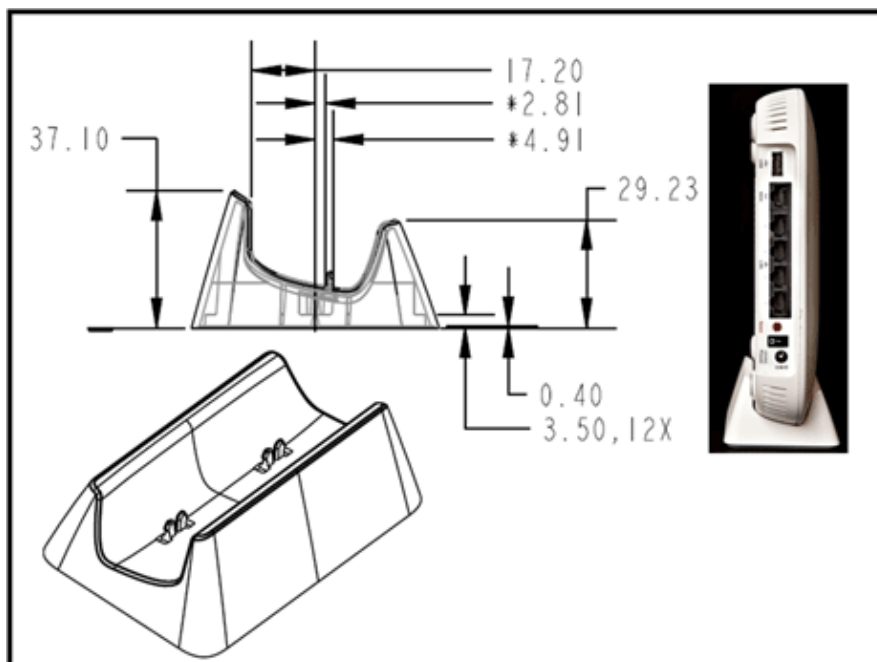
This AP is designed to be mounted on a table and has rubber feet. It can also be wall mounted, or can sit upright using the supplied cradle. Try to locate the AP as close to the intended users as possible. Avoid areas with large metal surfaces, such as sitting the device on a metal desk or near a large mirror. The more walls and objects between the AP and the user result in lower signal strength, and can reduce performance.

Note: This AP utilizes a +12 Volt power supply and does not utilize Power over Ethernet (PoE). Also, the device does not supply PoE. Make sure the right power adapter is used with the AP. Also, make sure not to use other adapters from other devices such as laptops and IP phones as these can damage the AP.

The unit can be mounted on the wall with plastic anchors or wood screws.



The unit can be mounted upright using the supplied cradle.



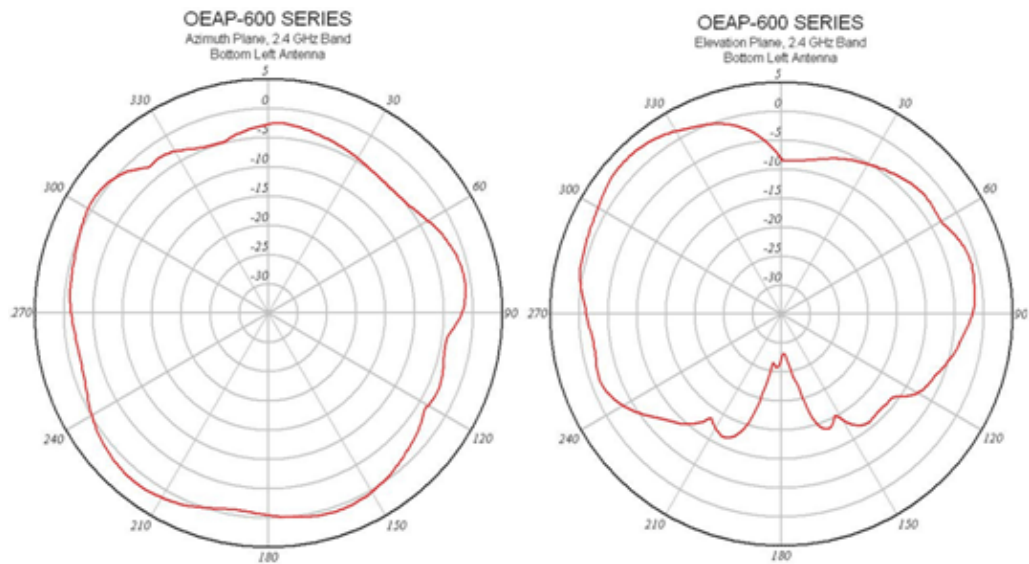
The Cisco Aironet 600 Series OEAP has antennas located on the edges of the AP. The user should take care not to place the AP in areas near metal objects or obstructions which can cause the signal to become directional or diminished. The antenna gain is approximately 2 dBi in both bands and designed to radiate in a 360 degree pattern. Similar to a light bulb (without a lamp shade), the goal is to radiate in all directions. Think of the AP as you would a lamp and try to place it in close proximity to the users.

Metal objects, such as mirrors, obstruct the signal much like the lampshade analogy. You can experience degraded throughput or range if the signal must penetrate or go through solid objects. If you expect connectivity, for example in a three story home, avoid placing the AP in the basement and try to mount the AP in a central location within the home.

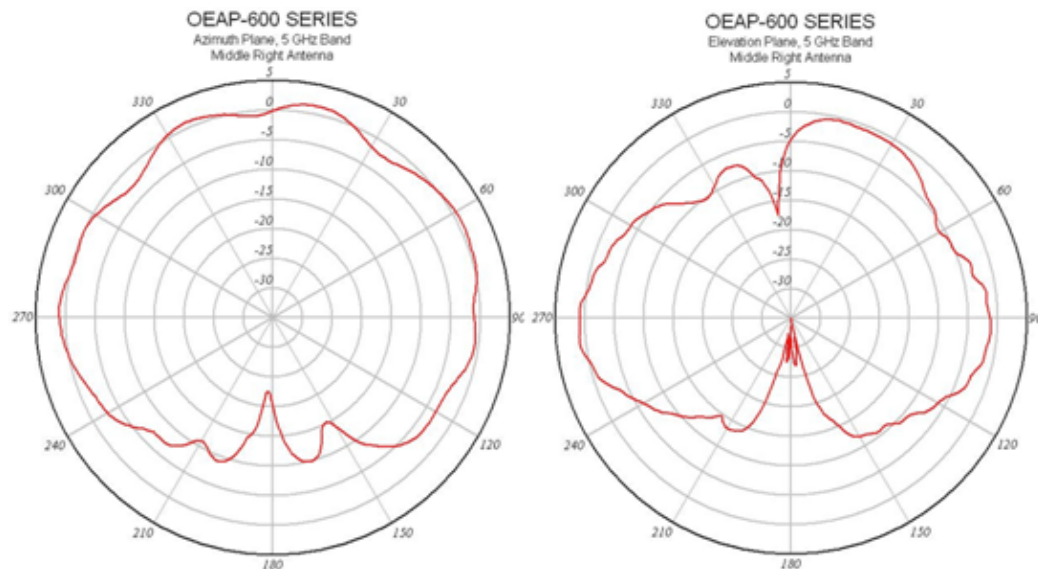
The access point has six antennas (three per band).



This image shows a 2.4 GHz Antenna Radiation Pattern (taken from the bottom left antenna).



This image shows a 5 GHz Antenna Radiation Pattern (taken from the middle right antenna):



Troubleshooting the OEAP-600

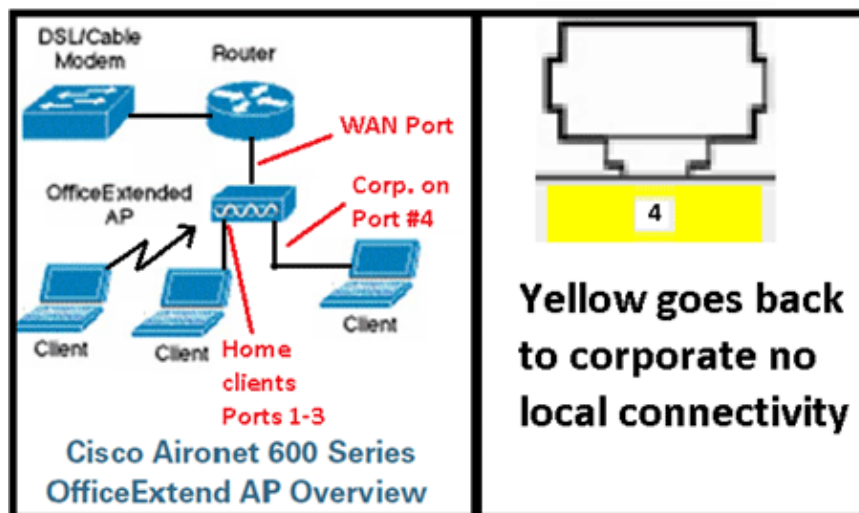
Verify that the initial wiring is correct. This confirms that the WAN port on the Cisco Aironet 600 Series OEAP is connected to the router and can receive an IP address successfully. If the AP does not appear to join the controller, connect a PC to port 1-3 (home client ports) and see if you can browse to the AP using the default IP address of 10.0.0.1. The default username and password is admin.

Verify that the IP address for the corporate controller is set. If not, enter the IP address and reboot the Cisco Aironet 600 Series OEAP so it can try to establish a link to the controller.

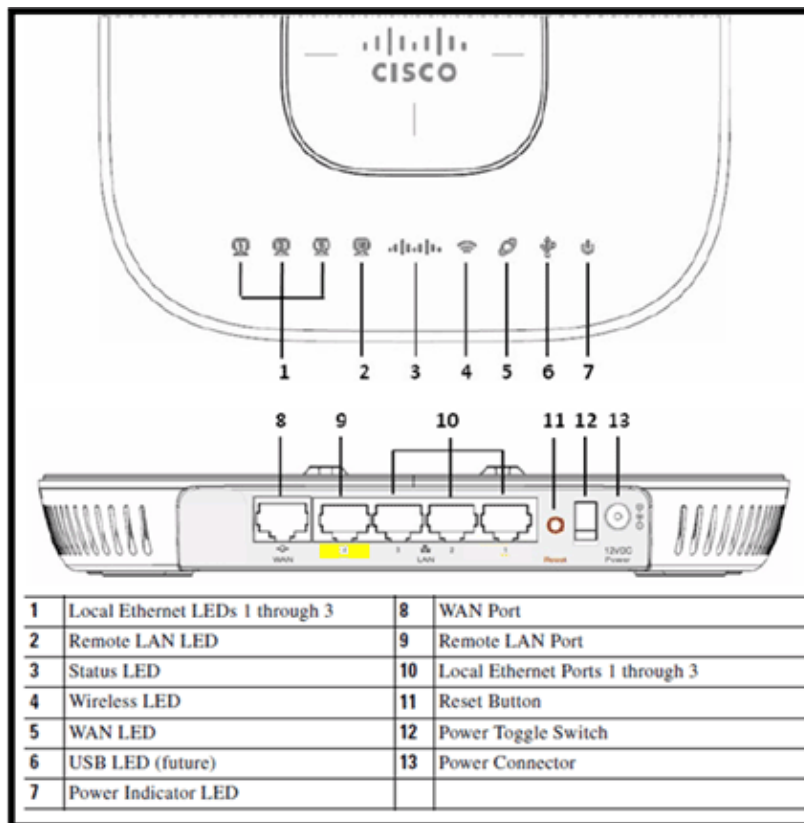
Note: The corporate port #4 (in yellow) cannot be used to browse to the device for configuration purposes. This is essentially a dead port unless a remote LAN is configured. Then, it will tunnel back to corporate (used for wired enterprise connectivity)

Check the event log to see how the association progressed (more on this later).

This image shows the Cisco Aironet 600 Series OEAP wiring diagram:



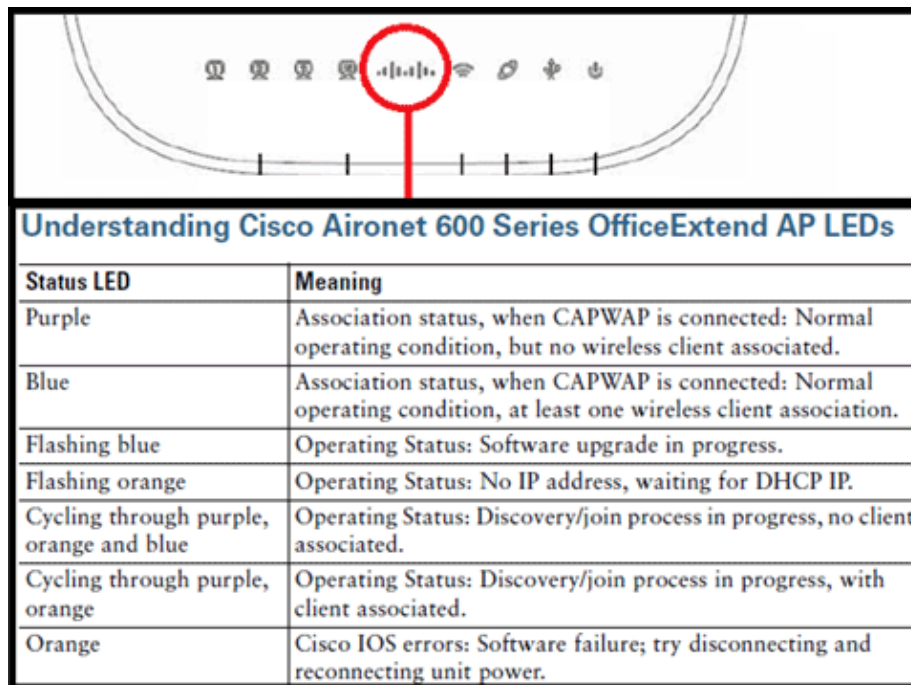
This image shows the Cisco Aironet 600 Series OEAP connectivity ports:



If the Cisco Aironet 600 Series OEAP fails to join the controller, it is recommended that you check these items:

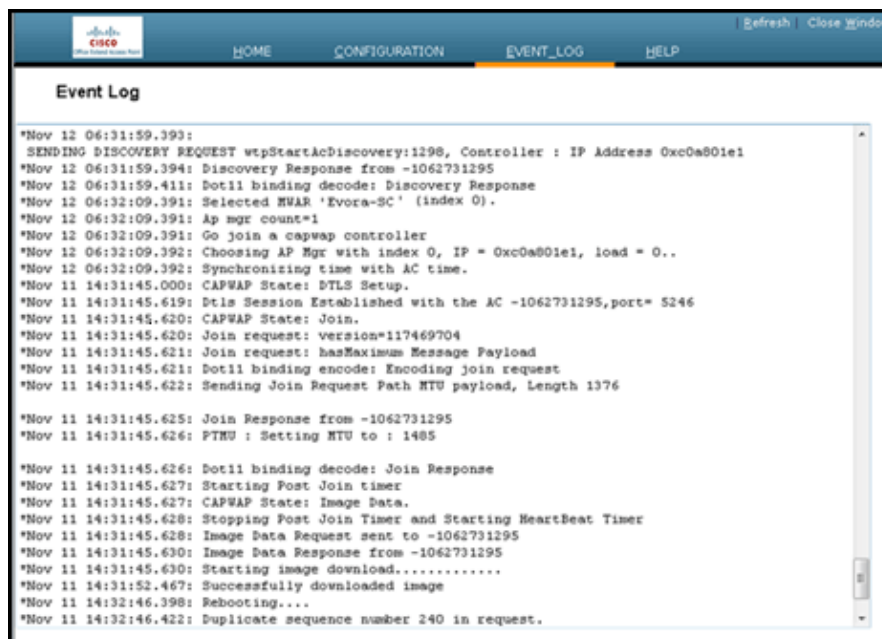
1. Verify that the router is functional and connected to the WAN Port of the Cisco Aironet 600 Series OEAP.
2. Connect a PC to one of the ports 1–3 on the Cisco Aironet 600 Series OEAP. It should see the Internet.
3. Verify that the IP address of corporate controller is in the AP.
4. Confirm that the controller is on DMZ and reachable via the Internet.
5. Verify join and confirm the Cisco logo LED is solid blue or purple.
6. Allow for enough time in case the AP needs to load a new image and restart.
7. If a firewall is in use, verify that UDP 5246 and 5247 ports are not blocked.

This image shows the Cisco Aironet 600 Series OEAP logo LED status:



If the join process fails, the LED cycles though colors or perhaps flashes orange. If this occurs, check the event log for further details. In order to get to the event log, browse to the AP (using personal SSID or wired ports 1–3) and capture this data for the IT administrator to review.

This image shows the Cisco Aironet 600 Series OEAP event log:



If the join process fails and this is the first time the Cisco Aironet 600 Series OEAP has tried to connect to the controller, check the AP join statistics for the Cisco Aironet 600 Series OEAP. In order to do this, you need the Base Radio MAC of the AP. This can be found in the event log. Here is an example of an event log with comments to help you interpret this:

Event log 1

WAN port has not obtained IP address, otherwise it will be shown here.

AP Mac address

Base Radio MAC is 00:22:BD:DA:86:00

```

*Jan 01 08:00:05.420: eth0 Linkencap:Ethernet HWaddr00:C1:C0:05:48:86
*Jan 01 08:00:05.420: UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
*Jan 01 08:00:05.420: RX packets:1 errors:0 dropped:0 overruns:0 frame:0
*Jan 01 08:00:05.420: TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
*Jan 01 08:00:05.420: collisions:0 txqueuelen:100
*Jan 01 08:00:05.421: RX bytes:64 (64.0 b) TX bytes:0 (0.0 b)
*Jan 01 08:00:05.421: Interrupt:4 Base address:0x2000
*Jan 01 08:00:05.421:
*Jan 01 08:00:05.444: eth1 Linkencap:Ethernet HWaddr00:22:BD:DA:86:07
*Jan 01 08:00:05.444: UP BROADCAST RUNNING ALLMULTI MULTICAST MTU:1500 Metric:1
*Jan 01 08:00:05.444: RX packets:0 errors:0 dropped:0 overruns:0 frame:0
*Jan 01 08:00:05.444: TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
*Jan 01 08:00:05.444: collisions:0 txqueuelen:100
*Jan 01 08:00:05.444: RX bytes:0 (0.0 b) TX bytes:0 (0.0 b)
*Jan 01 08:00:05.445: Interrupt:3 Base address:0x1000
*Jan 01 08:00:05.445:
*Jan 01 08:00:05.467: Kernel IP routing table
*Jan 01 08:00:05.467: Destination Gateway Genmask Flags Metric Ref Use Iface
*Jan 01 08:00:05.467: 127.0.0.0 * 255.0.0.0 U 0 0 0 lo
*Jan 01 08:00:05.489: IP address HW type Flags HW address Mask Device
*Jan 01 08:00:05.540: oeap_mwar_ipaddr0= Y.Y.Y.Y
*Jan 01 08:00:07.074: Subject: C=US, ST=California, L=San Jose, O=CISCO, OU=WNBU, CN=OEAP602-C0C1C0054886/emailAd
  
```

Controller IP address configured in local GUI

certificate

Once this is known, you can look in the controller monitor statistics to determine whether the Cisco Aironet 600 Series OEAP has joined the controller or has ever joined the controller. Also, this should provide an indication on why, or if, a failure has occurred.

If AP authentication is required, verify the Cisco Aironet 600 Series OEAP Ethernet MAC address (not the radio MAC address) has been entered into the Radius server in lower case. You can determine the Ethernet MAC address from the event log as well.

Searching on the Controller for the Cisco Aironet 600 Series OEAP

The screenshot shows the Cisco Aironet 600 Series OEAP Monitor page. The 'AP Join Stats' section is active, displaying a table of APs. A red box highlights the 'Search AP' dialog, which has a red arrow pointing to the 'MAC Address' field. The table lists APs with columns for Base Radio MAC, AP Name, Status, Ethernet MAC, IP Address, and Last Join Time.

Base Radio MAC	AP Name	Status	Ethernet MAC	IP Address	Last Join Time
00:22:BD:DA:86:00	cjoly-homeap	Not joined	00:00:00:00:00:00	72.84.14.82	
00:22:BD:DA:86:01	devo-homeap			83	Feb 18 14:30:02.496
00:22:BD:DA:86:02	phil-homeap			1.142	
00:22:BD:DA:86:03	rajeverm-Evora			167	Feb 18 18:33:33.150
00:22:BD:DA:86:04	chang-evora			15	Feb 20 03:18:26.226
00:22:BD:DA:86:05	segunce-evora			17	Feb 17 12:08:19.429
00:22:BD:DA:86:06	nostagn-evora			243	Feb 20 09:01:15.873
00:22:BD:DA:86:07	arismath-evora			128	Feb 17 12:06:32.528
00:22:BD:DA:86:08	pasikena-evora			15	Feb 18 20:00:31.506
00:22:BD:DA:86:09	jakew-THE-evora	Joined	00:c1:c0:05:48:34	216.139.18.67	Feb 18 11:06:12.427
00:22:BD:DA:86:0A	mehulpat-evora	Joined	c0:c1:c0:05:47:c8	96.126.238.245	Feb 20 05:08:17.463
00:22:BD:DA:86:0B	evall-evora	Joined	c0:c1:c0:05:47:c8	74.125.132.106	Feb 19 04:46:18.155

If you have determined that Internet is accessible from a PC connected to the local Ethernet port, but the AP still cannot join the controller, and you have confirmed the controller IP address is configured in the local AP GUI and is reachable, then confirm if the AP has ever joined successfully. Perhaps the AP is not in the AAA server. Or, if DTLS handshaking fails, the AP might have a bad certificate or date/time error on the controller.

If no Cisco Aironet 600 Series OEAP units can join the controller, verify that the controller is on the DMZ is reachable and has UDP ports 5246 and 5247 open.

How to debug client association issues

The AP joins the controller properly, but the wireless client cannot associate with the Corporate SSID. Check the event log to see if an association message reaches the AP.

The next figure shows the normal events for client association with corporate SSID with WPA or WPA2. For SSID with open authentication or static WEP, there is only one ADD_MOBILE event.

Event Log Client Association

```
*Feb 19 20:26:58.876: (Re)Assoc-Req from 00:24:d7:2a:72:c0 forwarded to WLC, wired: no
*Feb 19 20:26:58.941: received assoc-rsp for wireless client, status=0000
*Feb 19 20:26:58.942:
ADD_MOBILE from WLC,wmeEnabled=1,encrptPolicy=1
*Feb 19 20:26:58.942: ADD_MOBILE: client 00:24:d7:2a:72:c0, slot=0,vapid=1
*Feb 19 20:27:00.648:
ADD_MOBILE from WLC,wmeEnabled=1,encrptPolicy=4
*Feb 19 20:27:00.649: ADD_MOBILE: client 00:24:d7:2a:72:c0, slot=0,vapid=1
```

If (Re)Assoc-Req event is not in the log, verify the client has the right security settings.

If (Re)Assoc-Req event shows up in the log but the client cannot associate properly, enable the **debug client <MAC address>** command on the controller for the client and investigate the problem in the same way as a client working with other Cisco non-OEAP access points.

How to interpret the event log

The following event logs with comments can assist you in troubleshooting other Cisco Aironet 600 Series OEAP connection issues.

Here are a few samples collected from the Cisco Aironet 600 Series OEAP event log files with comments to help with interpreting the event log:

Event log 2

*Jan 01 08:00:07.093: Build version 7.0.112.66 (compiled Feb 19 2011 at 16:29:58).
 *Jan 01 08:00:08.975: CAPWAPState: Init.
 *Jan 01 08:00:09.009: CAPWAPState: Discovery.
 *Jan 01 08:00:09.042: Starting Discovery.
 *Jan 01 08:00:09.044: CAPWAPState: Discovery.
 *Jan 01 08:00:09.193: Discovery Request sent to Y.Y.Y.Y with discovery type set to 1
 *Jan 01 08:00:09.194: Discovery Request sent to Y.Y.Y.Y with discovery type set to 1
 *Jan 01 08:00:09.194: SENDING DISCOVERY REQUEST wtpStartAcDiscovery:1338, Controller Cisco_7d:88:00: IP Address: Y.Y.Y.Y
 *Jan 01 08:00:09.195: Discovery Request sent to Y.Y.Y.Y with discovery type set to 0
 *Jan 01 08:00:09.256: Discovery Response from Y.Y.Y.Y
 *Jan 01 08:00:09.272: Dot11 binding decode: Discovery Response
 *Jan 01 08:00:09.272: wtpDecodeDiscoveryResponse Discovery Latency: 0, WLC: IP= Y.Y.Y.Y , name=Cisco_7d:88:00, index
 *Jan 01 08:00:09.272: Discovery Response from Y.Y.Y.Y
 *Jan 01 08:00:09.273: Dot11 binding decode: Discovery Response
 *Jan 01 08:00:09.273: wtpDecodeDiscoveryResponse Discovery Latency: 0, WLC: IP= Y.Y.Y.Y , name=Cisco_7d:88:00, index
 *Jan 01 08:00:09.273: Discovery Response from Y.Y.Y.Y
 *Jan 01 08:00:09.274: Dot11 binding decode: Discovery Response
 *Jan 01 08:00:09.274: wtpDecodeDiscoveryResponse Discovery Latency: 0, WLC: IP= Y.Y.Y.Y , name=Cisco_7d:88:00, index
 *Jan 01 08:00:12.133: Dropping dtls packet since session is not established. ab462383, 147e, c0a80121, 147e, 0
 *Jan 01 08:00:19.182: Selected MWAR 'Cisco_7d:88:00' (index 0).
 *Jan 01 08:00:19.183: Selected MWAR 'Cisco_7d:88:00' (index 0).
 *Jan 01 08:00:19.183: Ap mgr count=1
 *Jan 01 08:00:19.183: Go join a capwap controller
 *Jan 01 08:00:19.183: Choosing AP Mgr with index 0, IP = Y.Y.Y.Y , load=151.
 *Jan 01 08:00:19.183: Synchronizing time with AC time.
 *Feb 19 23:33:56.000: CAPWAPState: DTLS Setup.
 *Feb 19 23:34:16.813: Dtls Session Established with the AC Y.Y.Y.Y , port=5246

Discovery Request sent If AP can not get IP address, then Discovery Req. will not be sent

Discovery resp. received from controller. If no response from controller, then need to check whether controller is accessible

Selected controller to join, timestamp synced to the controller

DTLS handshaking with the controller completed. If certificate has problem, then the failure will happen here

Event log 3

*Feb 19 23:34:16.813: CAPWAPState: Join.
 *Feb 19 23:34:16.814: Join request: version=7.0.114.76
 *Feb 19 23:34:16.815: Join request: hasMaximumMessagePayload
 *Feb 19 23:34:16.815: Dot11 binding encode: Encoding join request
 *Feb 19 23:34:16.815: Sending Join Request Path MTU payload, Length 1376
 *Feb 19 23:34:16.887: Join Response from Y.Y.Y.Y
 *Feb 19 23:34:16.888: PTMU: Setting MTU to: 1485
 *Feb 19 23:34:16.888: Dot11 binding decode: Join Response
 *Feb 19 23:34:16.889: Starting Post Join timer
 *Feb 19 23:34:16.890: CAPWAPState: Image Data.
 *Feb 19 23:34:16.890: Controller Version: 7.0.114.76
 *Feb 19 23:34:16.890: AP Version: 7.0.114.76
 *Feb 19 23:34:16.891: CAPWAPState: Configure.
 *Feb 19 23:34:16.891: Dot11 binding encode: Encoding configuration status request.
 *Feb 19 23:34:16.893: lwapp_encode_ap_reset_button_payload: reset button state off
 *Feb 19 23:34:16.895: Configuration Status sent to Y.Y.Y.Y
 *Feb 19 23:34:17.019: Configuration Status Response from Y.Y.Y.Y
 *Feb 19 23:34:17.022: CAPWAPState: Run.
 *Feb 19 23:34:17.022: Dot11 binding encode: Encoding change state event request.
 *Feb 19 23:34:17.023: CAPWAPState: Run.

Join Resp. from controller If AP is not added to AAA server, this step will fail.

Controller and AP have same version SW, no image download is need. When controller is upgraded to new version SW, image download will happen.

Capwap configuration completes

Event log 4

*Feb 19 23:34:17.023: CAPWAP moved to RUN state stopping post join timer
 *Feb 19 23:34:17.399: capwapWtpDIForwarding() returned 1
 *Feb 19 23:34:17.602: capwapWtpDIForwarding() returned 1
 *Feb 19 23:34:17.762: Change State Event Response from -1421466749
 *Feb 19 23:34:17.853: SSID alpha,WLAN ID 1, added to the slot[0], enabled
 *Feb 19 23:34:18.045: SSID alpha_phone,WLAN ID 2, added to the slot[0], enabled
 *Feb 19 23:34:18.118: Ethernet Backhaul WLAN ID = 3,qos=0
 *Feb 19 23:34:18.281: SSID alpha,WLAN ID 1, added to the slot[1], enabled
 *Feb 19 23:34:18.522: SSID alpha_phone,WLAN ID 2, added to the slot[1], enabled

WLANs are configured for 2.4 GHz Radio

Remote-lan is configured

WLANs are configured for 5 GHz Radio

When the Internet connection appears unreliable

The event log example in this section can occur when the Internet connection fails or ends up being very slow or intermittent. This can be caused by your ISP network, the ISP modem, or your home router. Sometimes connectivity from the ISP drops or becomes unreliable. When this occurs, the CAPWAP link (tunnel back to corporate) can fail or have difficulty.

Here is an example of such a failure in the event log:

```
*Feb 16 07:13:24.918: Re-Tx Count= 0, Max Re-Tx Value=5, NumofPendingMsgs=1
*Feb 16 07:13:36.919: Re-Tx Count= 4, Max Re-Tx Value=5, NumofPendingMsgs=2
*Feb 16 07:13:39.919: Max retransmission count exceeded going back to DISCOVER mode.
*Feb 16 07:13:39.919: Retransmission count for packet exceeded max{UNKNOWN_MESSAGE_TYPE (218103808), 2}
*Feb 16 07:13:39.919: Retransmission count exceeded max, ignoring as the ethernet is overloaded
*Feb 16 07:13:42.918: Re-Tx Count= 6, Max Re-Tx Value=5, NumofPendingMsgs=2
Comment : This Retransmission continues on..... Multiple times..
*Feb 16 07:13:42.919: Max retransmission count exceeded going back to DISCOVER mode.
*Feb 16 07:13:42.919: Retransmission count for packet exceeded max{UNKNOWN_MESSAGE_TYPE (218103808)
*Feb 16 07:14:09.919: GOING BACK TO DISCOVER MODE
*Feb 16 07:14:09.920: CAPWAP State: DTLS Teardown.
*Feb 16 07:14:14.918: DTLS session cleanup completed. Restarting capwap state machine.
*Feb 16 07:14:14.919:
Lost connection to the controller, going to re-start evora...
```

Additional debug Commands

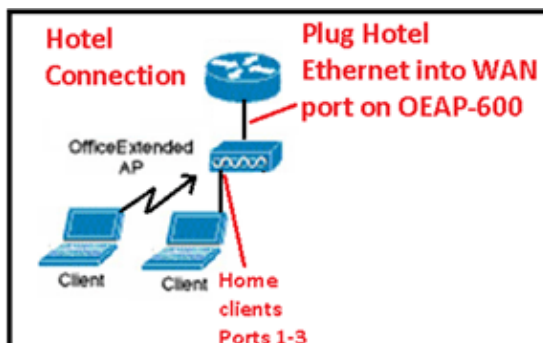
When using the Cisco Aironet 600 Series OEAP in a hotel or other pay for use venue, before the Cisco Aironet 600 Series OEAP can tunnel back to the controller, you need to get through the walled garden. In order to do this, plug a laptop into one of the wired local ports (port 1–3) or use a personal SSID to login to the hotel and satisfy the splash screen.

Once you have Internet connectivity from the home side of the AP, the unit establishes a DTLS tunnel and your corporate SSIDs. Then, wired port #4 (assuming a remote LAN is configured) becomes active.

Note: This might take a few minutes, watch the Cisco logo LED for solid blue or purple to indicate successful join. At this point both personal and corporate connectivity are active.

Note: The tunnel breaks when hotel or another ISP disconnects (usually 24 hours). Then, you have to start same process over. This is by design and is normal.

This image shows Office Extend in pay-for-use configuration:



This image shows additional debug commands (radio interface information):

Below are the new diagnostics commands for the OEAP 600

The WLC CLI of "show tech" is:

debug ap enable <apname>

then:

debug ap command "evoraTechSupport" <apname> → the information about system and radio slot 0/1

debug ap command "evoraTechSupport 2" <apname> → more info about radio slot 0 (2.4G)

debug ap command "evoraTechSupport 3" <apname> → more info about radio slot 1 (5G)

The "show eventlog" is the same as other APs:

show ap eventlog <apname>

Known Issues/Caveat

When you upload the configuration file from a controller to a TFTP/FTP server, Remote-LAN configurations are uploaded as WLAN configurations. Refer to Release Notes for Cisco Wireless LAN Controllers and Lightweight Access Points for Release 7.0.116.0 for more information.

On the OEAP-600, if the CAPWAP connection fails due to an authentication failure on the controller, the Cisco logo LED on the OEAP-600 can turn off for some time before the OEAP-600 tries to restart the CAPWAP attempt. This is normal so you should be aware that the AP did not die should the logo LED momentarily turns off.

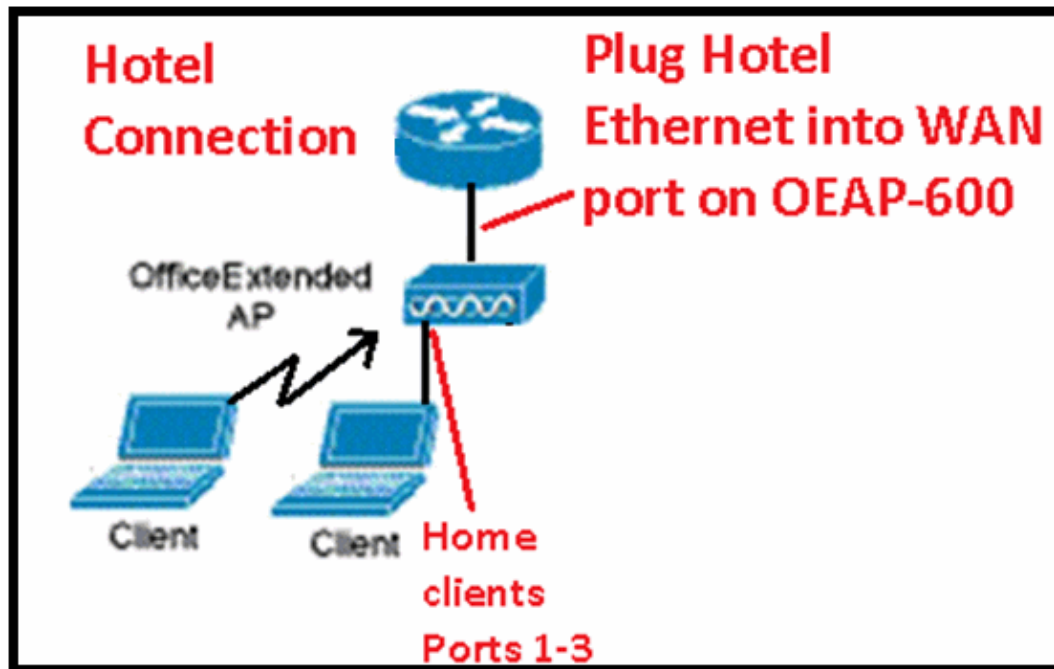
This OEAP-600 product has a different login name than previous OEAP Access Points, to be consistent with home products such as Linksys, the default username is *admin* with a password of *admin* the other Cisco OEAP Access Points such as the AP-1130 and AP-1140 have a default user name of *Cisco* with a password of *Cisco*.

This first release of the OEAP-600 has 802.1x support, but it is only supported on the CLI. Users who try to make changes to the GUI can lose their configurations.

When you use the OEAP-600 in a hotel or other pay for use venue, before the OEAP-600 can tunnel back to the controller, you need to get through the walled garden. Simply plug a laptop into one of the wired local ports (port 1-3) or use a personal SSID log into the hotel and satisfy the splash screen. Once you have internet connectivity from the home side of the AP, the unit then establishes a DTLS tunnel and your corporate SSIDs and wired port #4, which is assumed that Remote-LAN is configured, then becomes active. Note that this may take a few minutes, watch the Cisco logo LED for solid blue or purple to indicate successful join. At this point both personal and corporate connectivity are active.

Note: The tunnel can break when hotel or other ISP disconnects (usually 24 hours) and you would have to restart same process. This is by design and is normal.

Office Extend in pay for use venue

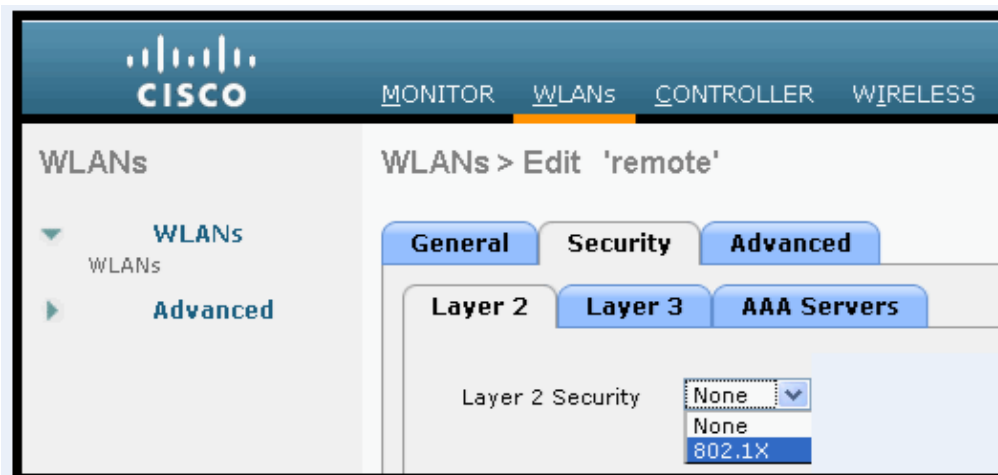


These are some additional enhancements introduced in the Cisco 7.2 release:

- Addition of 802.1x security added in GUI
- Ability to disable local WLAN access on the AP from controller disabling personal SSID allowing only corporate configuration
- Channel assignment selectable options
- Support changed from 2 corporate SSID to 3 SSIDs
- Support for Dual RLAN port feature

Addition of 802.1x security added in GUI

802.1x now added to the GUI



Notes in regards to authentication for remote LAN port.

802.1x authentication for remote-LAN port

WCS shall be provided to enable 802.1x Layer 2 Security and configure AAA server for remote-LAN. WEP encryption shall be always disabled.

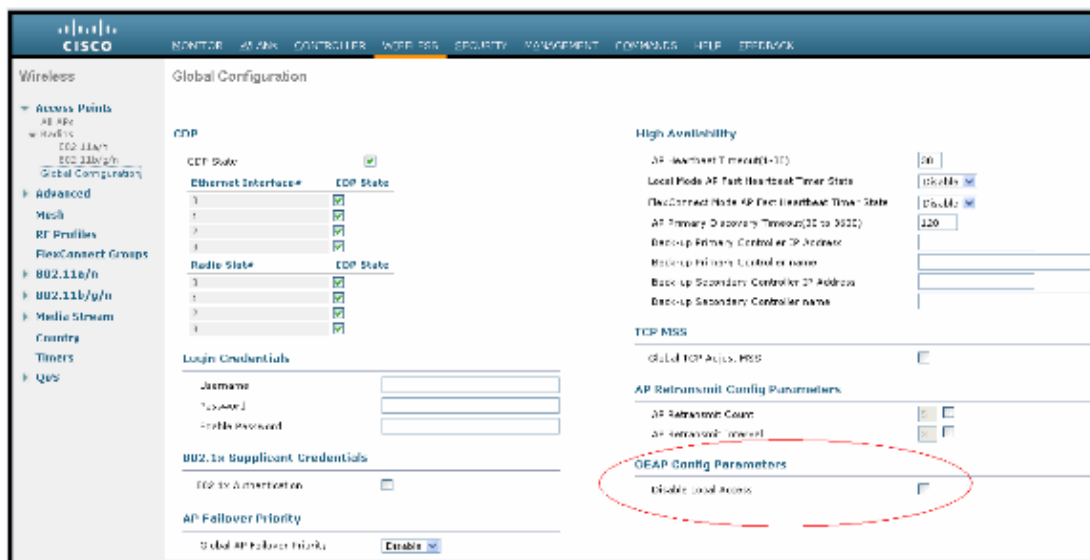
Same as 802.1x authentication for wireless clients, in 802.1x authentication for remote-LAN client, WLC acts as authenticator. Evora AP just forwards the EAPOL packets. AP converts EAPOL Ethernet packet to 802.11 data frame before sending it to WLC. The destination address in the 802.11 data frame shall be set to BSSID for remote-LAN. There is no data encryption for the Ethernet packets transferred on remote-LAN port. So there is no key exchange on EAPOL. The data security is provided by DTLS on CAPWAP data channel.

Following EAP methods are supported:

- EAP-TLS
- PEAP
- EAP-TTLS.

Ability to disable local WLAN access on the AP from controller disabling personal SSID allowing only corporate configuration

Disable local WLAN access

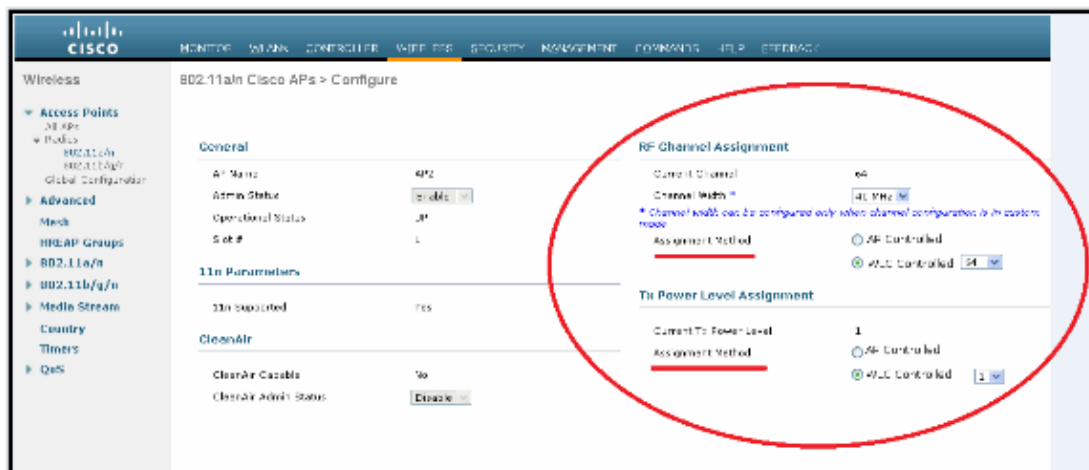


The screenshot displays the Cisco Wireless LAN Controller (WLC) configuration interface. The left sidebar shows the navigation menu with 'Wireless' selected. The main content area is titled 'Global Configuration'. Under the '802.1x Supplicant Credentials' section, the '802.1x Authentication' checkbox is checked, and the 'AP Fallback Priority' dropdown is set to 'Enable'. The 'High Availability' section shows various settings for redundancy. The 'AP Return/Submit Config Parameters' section shows settings for AP configuration. The '802.1x Supplicant Credentials' section is highlighted with a red dashed circle.

The channel assignment selectable options are:

- AP controlled locally
- WLC controlled

RF Channel and Power Assignments now local or WLC controlled



Manually configure channel and power level

In JMR1 release, there is no configuration option for 802.11a/n and 802.11b/g/n radios for the OEAP-600 AP. In 7.2 release, the configuration window is added back with only "General", "RF Channel Assignment" and "Tx Power Level Assignment" portions. The "Admin Status" in "General" shall be display only. The options for "Assign Method" are changed to "Custom Configured" and "AP Controlled". By default "AP Controlled" is selected. Channel and Tx power level can be configured only when they are in "Custom Configured" mode.

OEAP-600 does not support DFS channels so that WLC shall not allow these channels to be configured. [This new assignment method is passed to AP with CAPWAP payload.

In AP, when the channel is "AP Controlled", then the channel is controlled by the setting from local AP GUI. Otherwise the channel set by WCS is used.

The channel assign method and the assigned channel are saved in NVRAM and displayed in local GUI.

In AP, when the power is "AP controlled", then the maximum power level is always used. Otherwise the power level set by WCS is used.

The assign method for TX power level and assigned TX power level shall be saved in flash so that they can take effect after AP reboots.

When "Reset to Default" operation is performed, the assign method is set to "AP controlled".

Support for Dual RLAN port feature (CLI only)

This note applies to OEAP-600 series APs using the Dual RLAN Ports feature, which allows OEAP-600 Ethernet port 3 to operate as a remote LAN. The configuration is only allowed through the CLI, and here is an example:

```
Config network oeap-600 dual-rlan-ports enable|disable
```

In the event that this feature is not configured, the single port 4 remote-lan continues to function. Each port uses a unique remote-lan for each port. The remote-lan mapping is different, which depends on whether the default-group or AP Groups is used.

Default-group

If the default-group is used, a single remote LAN with an even remote-lan ID is mapped to port 4. For instance, the remote-lan with remote-lan-id 2 is mapped to port 4 (on the OEAP-600). The remote-lan with an odd numbered remote-lan ID is mapped to port 3 (on the OEAP-600).

As an example, take these two remote-lans:

```
(Cisco Controller) >show remote-lan summary
```

```
Number of Remote LANS..... 2
```

RLAN ID	RLAN Profile Name	Status	Interface Name
2	rlan2	Enabled	management
3	rlan3	Enabled	management

rlan2 has an even numbered remote-lan ID, 2, and as such maps to port 4. rlan3 has odd remote-lan ID 3, and so maps to port 3.

AP Groups

If you use an AP group, the mapping to the OEAP-600 ports is determined by the AP-Group ordering. In order to use an AP group, you must first delete all remote-lans and WLANs from the AP-group and leave it empty. Then add the two remote-lans to the AP group. First add the port 3 AP remote-LAN first, then add port 4 remote group, and finally add any WLANs.

A remote-lan in the first position in the list maps to port 3, and second in the list maps to port 4, as in this example:

RLAN ID	RLAN Profile Name	Status	Interface Name
2	rlan2	Enabled	management
3	rlan3	Enabled	management

Related Information

- **Cisco Wireless LAN Controller Configuration Guide, Release 7.0**
- **Technical Support & Documentation – Cisco Systems**

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