

### Alcatel-Lucent Enterprise OmniAccess Stellar AP User Guide - AWOS 4.0.1

OmniAccess Stellar AP User Guide - AWOS 4.0.1 January 2021 033517-10 Rev.C

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# 1 How to Use This Manual

This manual describes all features supported by the Stellar AP and provides instructions and examples for configuring ALE series OmniAccess Stellar Access Point (AP). It is designed for network administrators who are responsible for configuring and maintaining the Wi-Fi network. It assumes the reader is familiar with Layer2 and Layer3 networks and 802.11 protocols and related technologies. The manual covers an introduction to the Stellar AP and configuration samples. The examples describe the general steps of setting up a Wi-Fi network based on several typical deployment scenarios. It is useful for those new to the ALE Access Point configuration and those already familiar with the software wanting to know more about certain functions.

## Access Stellar AP Through the GUI

This manual is developed for the Stellar AP GUI (Wi-Fi Express mode). Each Stellar AP supports up to three simultaneous GUI connections. The GUI is accessible through a standard web browser from a remote management console or workstation. The GUI includes configuration wizards that guide you to change administrator password and complete basic WLAN configuration. In addition to the wizards, the GUI includes a Dashboard monitoring feature that provides visibility into your wireless network's performance and usage. This allows you to easily locate and diagnose WLAN issues. For details on the GUI Dashboard, see <u>Dashboard Overview</u>.

## **Document Conventions**

The following conventions are used throughout this manual to emphasize important concepts:



It indicates helpful suggestions, pertinent information, and important things to remember.



CAUTION

It indicates a risk of damage to your hardware or loss of data or some incorrect or improper operation that should be avoided.

# 2 Configuration Sample

This chapter describes the general steps to configure the Stellar AP with respect to several deployment topologies. Follow the configuration steps in the guide to configure your Stellar AP. This chapter contains the following topics:

<u>AP Group without ALE OXO server</u> AP Group with ALE OXO server (ZTP)

## Scenario 1: AP Group Without ALE OXO server

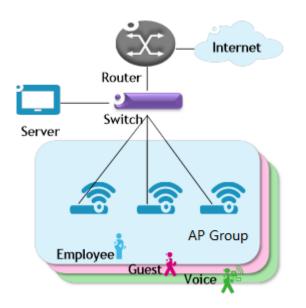


Figure 2-1 AP group without OXO

Following are the requirements for this scenario,

- → There are three APs in this group. All APs connect to a standard PoE switch and the PoE switch connects to the core router. The core router provides DHCP server function to both APs and clients. The Primary Virtual Management (PVM) in the group will be responsible for portal server, AP and client management and monitoring.
- → All three APs broadcast three SSIDs: Employee, Guest and Voice.
- → The Employee WLAN is used for company staff, by which both internal servers and the internet are accessible.

For security, this WLAN will use 802.1x authentication methods. Anyone who tries connecting to this WLAN will be requested to input the user name and password registered in an internal RADIUS server.

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- ➔ The Guest WLAN is designed for guests and can access the internet ONLY. It uses a captive portal authentication and a portal page will pop up when browsing any website. Guest can access the Internet only after inputting the access code or user name and password provided by the network administrator. The splash page can be customized to the customer's style.
- → The Voice WLAN is designed for VoIP application ONLY. It will authorize voice traffic to be highest priority in QoS profile so as to provide a stable voice connection. The SSID will be hidden and inaccessible to both internal and external networks.
- → ALL APs usage and client connections are visible in the UI dashboard.

According to the topology, the clients are separate in three service VLANs (For example: VLAN 100, VLAN 200 and VLAN 300) while APs are in the management VLAN (default VLAN of the switch ports, for example: VLAN 1). The APs and clients will be assigned an IP address from the DHCP server via the router. The router is the default gateway for APs and clients. Following are the detailed configuration steps:

- → Step1: Configure a PoE switch as follows:
  - 1) The ports used to connect the APs have their default (untagged) VLAN as the AP management VLAN;
  - 2) Add tagged VLANs to the ports for all WLANs that will be created on the APs;
  - 3) Tag (trunk) all of the user and AP-Management VLANs on the uplink between the switch and the router.
- → Step2: Connect all APs to the PoE switch and all APs will obtain an IP address from the DHCP server. Login to the AP group, change the administrator password and initially create WLAN 'Employee' using the wizard. Refer to <u>Connect to pre-defined SSID and browse URL</u> and <u>Using the Initializing Wizard for</u> details. Refer to <u>Modify Your WLAN</u> to set the mapping VLAN for WLAN 'Employee'.
- → Step3: Create WLAN 'Guest' as per the steps in '<u>Create New WLAN</u>' and configure the captive portal authentication according to '<u>How to configure captive portal authentication</u>'.
- → Step4: Create WLAN 'Voice' as per the steps in '<u>Create New WLAN</u>'.
- → Step5: Configure ACLs according to <u>Access Control List</u> to restrict the access domain of each WLAN.
- → Step6: Check AP, Client and monitor the performance in the dashboard. Refer to <u>Dashboard Overview</u> for detail.

## Scenario 2: AP Group With ALE OXO Server (ZTP)

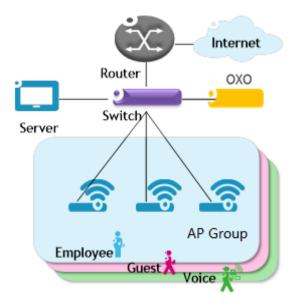


Figure 2-2 AP group with OXO

Following are the requirements for this scenario,

- → There are three APs in this group. All APs connect to a standard PoE switch and the PoE switch connects to the core router and an ALE OXO server.
- → All three APs broadcast three SSIDs: Employee, Guest, and Voice.
- → The Employee WLAN is used for company staff, by which both internal servers and the internet are accessible.

For security, this WLAN will use 802.1x authentication methods. Anyone who tries connecting to this WLAN will be requested to input the user name and password registered in an internal RADIUS server.

- → The Guest WLAN is designed for guests and has access to the internet ONLY. It uses a captive portal page authentication and a portal page will pop up when browsing any website. Guest can access the Internet only after inputting the access code or user name and password provided by the network administrator. The splash page of captive portal authentication can be customized to customer's style.
- → The Voice WLAN is designed for VoIP application ONLY. It will authorize voice traffic to be highest priority in QoS profile so as to provide a stable voice connection. It will be hidden and inaccessible to both internal and external networks.
- → ALL APs usage and client connections are visible in AP UI dashboard.

According to the topology, APs will be assigned an IP address from the OXO server. Router is the DHCP server for the clients. Following is the detailed configuration steps:

→ Step1: Connect all APs to the PoE switch and all APs will obtain an IP address, download firmware (if necessary) and configuration file from the OXO server.

- → Step2: The APs will reboot automatically to setup a group and allow configuration from the OXO server take effect, all three WLANs are created.
- → Step3: Check AP, Client and monitor the performance in the dashboard. Refer to <u>Dashboard Overview</u> for detail.

# 3 Connecting AP Group via Web Browser

## Prerequisites for Setting up and Accessing AP Group

- Connect all APs to switch and power up.
- Ensure that a DHCP server is present and accessible in the network. The AP group uses an external DHCP server for IP address management of the access points and the wireless clients.
- Ensure that a DNS server is available in the network, which helps to parse the web URL used to access the AP. (*Refer to Note 3-1*)
- It is recommended that your configuring terminal should have a compatible operating system and browser.

Recommended OS	Recommended Browser		
<ul> <li>Windows 7</li> <li>Window 8</li> <li>Window 10</li> <li>MAC OS X 10.10</li> <li>MAC OS X 10.11</li> </ul>	<ul> <li>Google Chrome 48 and later</li> <li>Mozilla Firefox 48 and later</li> <li>Internet Explorer 11 and later</li> </ul>		

After above prerequisites are met, proceed to: <u>Connect to pre-defined SSID and browse URL</u>.

Note 3-1: The process of connecting to a single AP through web is same as connecting to AP group. Note 3-2: It is recommended to connect only one AP at a time to the network and complete the configuration, then plug in other APs one by one to synchronize the configurations.

## Connect to Pre-defined SSID and Browse URL

The ALE WLAN solution is based on a cluster architecture. A maximum of 255 APs are supported in one AP cluster/group. All APs have the same cluster ID that uniquely defines the AP group and all APs have to be in the same VLAN because the communication between group members is based on multicast. The group will select the Primary Virtual Manager (PVM) and Secondary Virtual Manager (SVM) based on AP model and MAC address, more details refer to PVM/SVM Election and AP Group Scalability. The PVM is responsible for the group management, such as configuration synchronization, usage data statistics, firmware upgrading, etc. and the SVM is the backup of the PVM. By default, the AP group will advertise the pre-defined SSID 'mywifixxxx' and you can connect to 'mywifi-xxxx' to browse the AP group GUI through http://mywifi.alenterprise.com:8080 to the initializing wizard. After you complete Using the Initializing Wizard, the SSID 'mywifi-xxxx' will be deleted. ('xxxx' is the last two bytes of PVM's MAC address)



Note 3-3: Besides the HTTP login method (port 8080), you can also login to the web manager using HTTPS protocol with the URL https://mywifi.al-enterprise.com, more details please refer to Web management with **HTTPS** 

Note 3-4: If there is no DNS server in the network, you can connect to the AP group directly using the IP address of any AP in the group, accessing "<u>http://a.b.c.d:8080</u>". (a.b.c.d is the AP's IP address) Stellar AP User Guide 12 ALCATEL-LUCENT ENTERPRISE

Note 3-5: If there is no DHCP server in the network, the AP will default to the 192.168.1.254 address. See <u>How to</u> <u>Configure the AP if there is no DHCP server</u>.

Stellar AP1230 series and AP1311 Access Points can be powered with dual uplinks, with both switch ports POE enabled only when connected to a standalone or VC of OmniSwitch 6860/E.

• When using dual links, both switch ports should be of speed 1GE and configured as Linkagg (LACP).

• On the slots used for POE, enable capacitor-detection and then connect the ports to Access Points (lanpower <slot> capacitor-detection enable). Save and certify switch configuration.

• AP1230 series and AP1311 Access Points will always get powered by either uplink, and if the main source goes down, the backup POE link will power up the Access Point.

Stellar AP1230 series and AP1311 when not POE powered using OmniSwitch 6860/E, but other LAN switches, you can still use dual uplinks, but please ensure only one uplink is POE enabled.

## Using the Initializing Wizard

Initializing wizard page is loaded by connecting to the pre-defined SSID accessing the URL <u>http://mywifi.al-enterprise.com:8080</u>. Login with the Administrator account and the default password 'admin', illustrated in Figure 3-1. If you want to manage the AP group with HTTPS protocol, refer to <u>Web management with HTTPS</u>.

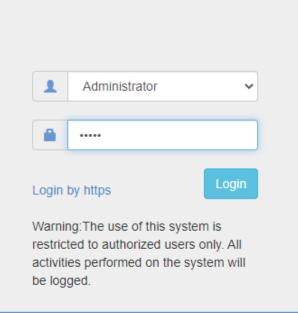


Figure 3-1 AP Group Login Page

The following are the Initialization Wizards:

Step1: Welcome Page



Step2: Change your Administrator password.

Setup Wizard						
Step 1/2 Change your administrator password						
	Password:	•••••				
	Confirm:	•••••				
			Save			

Figure 3-3 Initialization Wizard-Modify Administrator Password



Note 3-6: It is highly recommended and a best security practice to change the default passwords for the predefined login accounts.

Step3: Select your country code and time zone. (Only for -RW models)

Setup Wizard						
Step 2/3 Choose your Country or Region						
Country/Region:	Algeria - DZ	~				
Time Zone:	(UTC-12:00)International-Date-Line	~				
		Save				

Figure 3-4 Initialization Wizard-Select country code and time zone

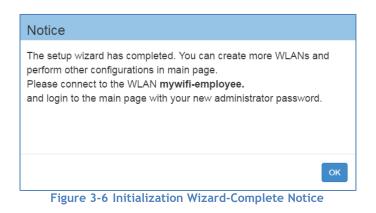
Step4: Create your own WLAN. You can click 'Create New WLAN' for details.

Setup Wizard						
Step 2/2 Create New WLAN						
WLAN Name:	mywifi-employee					
Band:	2.4GHz 5GHz					
Security Level:	Personal ~					
Key Management:	Both(wpa &wpa2) ~					
Password Format:	8-63 chars ~					
Password:	••••••					
Confirm:	•••••••					
	_					
	Save					
Figure 3-5 Init	ialization Wizard-Create New WLAN					



Note 3-7: The VLAN assignment for the WLAN is not available in the initial wizard phase. You can modify the mapping VLAN value after the initial setup is completed, using the steps described in "<u>Modify your WLAN</u>" section which can be used to modify existing WLANs.

#### Step5: Complete Confirmation Page





Note 3-8: While configuring the Initialization Wizards, please make sure your configuring terminal is connected to the pre-defined WLAN 'mywifi-xxxx' to keep the communication operational between AP group (or AP) and web browser. If not, you may encounter the following prompt and fail to complete the wizard configuration

correctly:

Failed to communicate with the backend server



Note 3-9: The pre-defined WLAN 'mywifi-xxxx' is deleted when the wizard is completed. For additional configuration through the wireless connection you need to connect to the new WLAN created in the wizard and then login to the web main page with your new administrator password.

## Connecting to the AP Group via Web

When the initializing wizard has completed and new WLANs have been created, you can connect to each of the WLANs and browse the URL http://mywifi.al-enterprise.com:8080 to manage the AP group.

Another way of connecting to the AP group web management system is through the AP group management IP address. For information on setting of the Management IP address refer to <u>AP Group Management</u>.

The AP group web management system can be accessed through the wired network if the group management IP address is configured and is reachable.

## PVM/SVM Election and AP Group Scalability

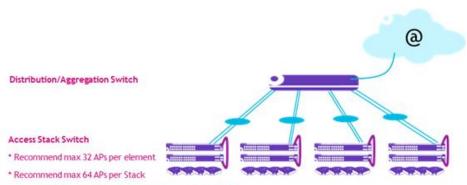
The APs with the same cluster ID will form a group and it will select the Primary Virtual Manager (PVM) and Secondary Virtual Manager (SVM) based on AP model and MAC address. The PVM election rules are as following: Stellar AP User Guide ALCATEL-LUCENT ENTERPRISE

1. PVM/SVM election priority:

AP1320/AP1360 > AP1311 > AP1220/AP1230/AP1251/AP1201 > AP1101/AP1201H/AP1201L/AP1201HL

- 2. Among the APs with same priority, the one with highest MAC address will be selected as PVM, the second highest MAC address AP will be selected as SVM.
- 3. AP1101/AP1201H/AP1201L/AP1201HL as PVM in the cluster, it can scale to 32 APs.
- 4. AP1320/AP1360/AP1311/AP1220/AP1230/AP1251/AP1201 as PVM in the cluster, it can scale to 255 APs.
- 5. The idea in general is to be able to have enough resiliency in the network design, so if there is a cluster size >64 always there is either (AP1220 series, AP1230 series, A1251, AP1320 series or AP1360 series, AP1311) to take up PVM/SVM role. Recommend in network segments of every 64 APs there are at least 4x APs of either AP1220 series, AP1230 series, AP1251, AP1320 series, AP1360 series or AP1311.
- 6. For resiliency deployment, to scale to 64 APs you will need at least 4 AP12XX (AP1220/AP1230/AP1251) or 4 AP13xx (AP1320/AP1360/AP1311) in the cluster.
- 7. For resiliency deployment, to scale even further for 255 APs you will need at least 16 AP12XX (AP1220/AP1230/AP1251) or 16 AP13XX (AP1320/AP1360/AP1311) in the cluster.
- If AP1201 coexists with AP1220/AP1230/AP1251 in the same cluster, and AP1201 is selected as PVM by the system automatically, suggest to manually intervene and turn one of the AP1220/AP1230/AP1251 to be PVM for better management performance consideration. (See "Update to PVM" parameter in Chapter 4 -AP Window)
- 9. If a higher priority AP joins an existed AP group, it will take over the PVM role. For example, an AP1221 will become PVM after it joins an existed pure AP1101 group, and the old PVM will change to SVM or member in the AP group.

Example network design ...



\* Recommend minimum 4x AP12xx or AP13xx in each Stack

# 4 Introduction to the AP Group Web Management System

## Dashboard Overview

The Stellar AP provides a visualized dashboard for AP and client monitoring and configuration. As illustrated in Figure 4-1 Dashboard Overview, the dashboard is split into sub-windows for <u>WLAN Window</u>, <u>AP Window</u>, <u>Client Window</u> and <u>Monitoring Window</u>, <u>System Page</u>, <u>Wireless Page</u> and <u>Access Page</u>. You can briefly check the WLANs, APs or Clients in the dashboard or double click the framework of each window to see the details.

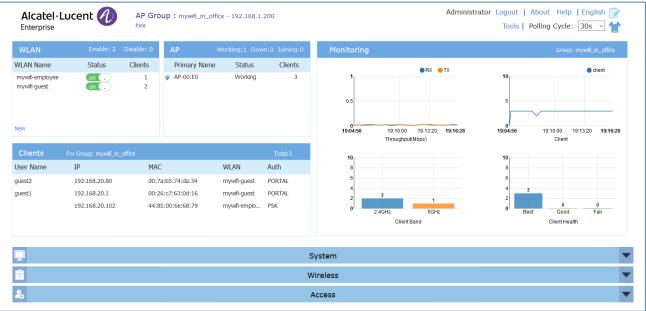


Figure 4-1 Dashboard Overview

### WLAN Window

The WLAN configuration window is integrated with all WLAN related monitoring and operation tasks. There are two modes for the WLAN Window, Simplified Mode illustrated in Figure 4-2 and Advanced Mode illustrated in Figure 4-3. You can easily launch the Advanced Mode from Simplified Mode by clicking the WLAN Window Frame.

Status	Clients
on . on .	1 2

<u>E</u>	Note 4-1: The label be	elow displays the num	ber of enabled	or disabled WLANs.	
Note	WLAN	Enable: 0	Disable: 1		

#### Table 4-1: Key word specification in WLAN Window (Simplified Mode)

WLAN Name	Label or name of WLAN, which is composed by 0-9, a-z or other string.
Status	Indicates the WLAN state, on . indicates that WLAN is in broadcast state, while
	. off indicates WLAN is not in broadcast state.
Clients	The number of users connected to the WLAN.
New	Launch the WLAN creation window.

WLAN Configura	ation			
WLAN Name	Status	Security Level	Captive Portal	Operate
mywifi-1X	Enable	enterprise	No	🖍 🗙 wmm
mywifi-employee	Enable	personal	No	🖍 🗙 wmm
mywifi-guest	Enable	open	Yes	× × wmm
mywifi-portal	Enable	open	Yes	🖍 🗙 wmm
Create				

Figure 4-3 WLAN Window-Advanced Mode

Table 4-2 Key word specification in WLAN Configuration Window (Advanced Mode)

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WLAN Name	Label or name of WLAN.							
Status	Indicates the WLAN state, and indicates that WLAN is in broadcast state, while							
	. off indicates WLAN is not in broadcast state.							
Security Level	Security Level of WLAN, from high to low is Enterprise>Personal>Open.							
Captive Portal	Indicates whether the WLAN is using captive portal authentication. Yes means the WLAN is configured with captive portal authentication, while No means the WLAN is without captive portal authentication.							
Operate	Operation for the WLAN. See <u>Modify Your WLAN</u> , see <u>Delete Your WLAN</u> , wmm see <u>Modify WLAN QoS</u> .							
Create	Link for Creating new WLAN, see Create New WLAN.							

### AP Window

AP Window is integrated with all APs and group related monitoring and configuration functions. Similar to the WLAN Window, there are two modes for AP Window, Simplified Mode illustrated in Figure 4-4 and Advanced Mode illustrated in Figure 4-5. You can easily launch the Advanced Mode from Simplified Mode by clicking the AP Window Frame.

A	Р	Working:	2 Down:0 Joining:0
	Primary Name	Status	Clients
<b>نې</b>	AP-00:E0	Working	2
<b>`</b> \$	AP-00:F0	Working	3
		Figure 4-4 AP Window-Simplified Mode	

#### Table 4-3 Key word specification in AP Window (Simplified Mode)

Primary Name	AP Mac address.
Status	Connection status of AP, there are three indication for AP status, they are Working,
	Down and Joining. See more in Note 4-2.
Clients	The total number of users currently connected to AP.



Note 4-2: AP has three status indications when connecting to group, they are 'working' which indicates that AP has connected to the PVM successfully and is working normally, 'Down' indicates that AP is disconnected from the group, and 'Joining' indicates that AP is requesting to join the group but hasn't completed yet. The Label in AP Window indicates the number of APs in each status.

Select an AP from the AP Configuration Window (Advanced Mode), you can learn the detailed information of the AP, see in Figure 4-5.

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#### Introduction to the AP Group Web Management System

Primary Name	IP	Firmware	Opera	te			Detailed Information
	192.168.20.107(AP)	PVC			<b>^</b>	AP Name:	AP-11:10 Edit
AP-11:10	(M)	3.0.4.1025	©cfg	Oreboot	_	MAC: Location:	34:E7:0B:11:11:10
		SVC			- 1	Status:	Working
	Μ	IEMBER.				Role in Group:	PVC
	I	loining				Serial Number:	11111111
	P	ending				Model:	OAW-AP1101
Neighboring Group						Firmware:	3.0.4.1025
AP-2B:D0	192.168.20.176	3.0.5.5				Upgrade Time:	Wed Aug 29 20:43:24 2018
AP-E6:80	192.168.20.126	3.0.5.6				Upgrade Flag:	successfully
AP-7E:20	192.168.20.59	3.0.4.1027				IP Mode:	DHCP Edit
AD 17-40	100 100 00 70	2 0 4 1027			•	IP:	192.168.20.107
						Netmask:	255.255.254.0
						Default gateway:	192.168.21.254
						DNS:	219.141.136.10
						AP Mode:	Express Edit

Figure 4-5 AP Window-Advanced Mode

### Table 4-4: Key word specification in AP Configuration Window (Advanced Mode)

Primary Name	Name of the AP.
IP	IP address of the AP.
Firmware	Firmware version of the AP.
Operate	There are three optional operations for the AP: Ocfg, Ofirmware and Oreboot
PVM	Primary Virtual Management in the AP group.
SVM	Secondary Virtual Controller in the AP group.
MEMBER	Other member APs in the group except PVM/SVM.
Joining	APs in joining state, needs to be authorized to join the group.
Pending	APs in pending state, needs to upgrade the software to join the group.
Neighboring Group	Neighboring AP groups with different group ID.
©cfg	Checking the detailed configuration on the AP.
Ofirmware	Upgrading firmware for the AP.
<b>O</b> reboot	Execute to reboot the AP.
Reboot All AP	Reboot all the APs in the group.

Clear All Configuration	Restore factory settings for all the APs in the group.
	Backup the configuration of the AP group.
Backup All Configuration	
Restore All Configuration	Restore the configuration for the AP group.
Upgrade All Firmware	Update the firmware for all the APs in the group.
Connect To Cloud	<ul> <li>Contact to Cloud - Enable/Disable contacting to OmniVista Cirrus periodically. If AP in the cluster are authorized to register OV Cirrus, the AP will reboot the register to OV Cirrus, then user can monitor and manage the AP from OV Cirrus. By default, it is enabled.</li> <li>Management Server - OV Cirrus server address to which AP send the register request. User can modify the management server address for the purpose of using other OV Cirrus server than the default one.</li> </ul>
Convert To Enterprise	<ul> <li>Convert all the APs in the cluster to be managed through OmniVista On-Premise. Once configured, AP will reboot and register to On-Premise OV server.</li> <li>Management Server - OV On-Premise server address to which AP register. DHCP Option - Obtain the On-Premise OV server address through DHCP option 138 or option 43 during AP booting up state. Static - Configure a static On-Premise OV server to which AP will register after rebooting.</li> </ul>
Detailed Information	Detailed information for the selected AP.
AP Name	Name of the AP.
Location	Location of the AP.
Status	Connection status of AP, there are three indications for AP status, they
Kick Off	are Working, Down and Joining. See more in Note 4-2. Remove the AP from the group. When an AP is removed from the group, it changes into <b>Joining</b> state until the administrator permits it to join the group again. See more in <u>Allow an AP to Join the Group</u> .
Role in Group	AP role in the group, including PVM, SVM and Member.
Update to PVM	Upgrade the member or SVM to be the PVM of the AP group.
Serial Number	Serial Number of the AP selected.
Model	Product Model of the AP selected.
Upgrade Time	Last firmware upgrade time.
Upgrade Flag	Flag of last time firmware upgrade. Success means the firmware was upgraded successfully on the Upgrade Time, Failed means the firmware wasn't upgraded successfully on the Upgrade Time.
IP Mode	The way by which the AP attains its IP address, dynamically assigned from DCHP server or static IP configured manually. Only IPv4 static address can be configured for AP.
IP	IPv4/IPv6 address of the AP selected.
Netmask	Netmask of the IPv4 address of the AP selected.
Default Gateway	Default Gateway of the AP selected.
DNS	DNS server in the network.
AP Mode	<ul> <li>Express - AP working in cluster mode.</li> <li>Enterprise - Change the AP to be managed and configured through OmniVista On-Premise edition. You need to specify the OmniVista server address when changing to Enterprise mode. DHCP Option - Obtain the On-Premise OV server address through DHCP option 138 or option 43 during AP booting up state. Static - Configure a static On-Premise OV server to which AP will register after rebooting.</li> </ul>

### Client Window

Client Window displays all the connected clients. Similar to the WLAN Window, there are two modes for Client Window, Simplified Mode illustrated in Figure 4-6 and Advanced Mode illustrated in

Jser Name	IP	MAC	WLAN	Access Point				Client Detail	
	192.168.20.17	44:85:00:6e:68:79	2g5gmixed	AP-00:E0	×	Ê	User Name:		
uest1	192.168.20.12	a4:08:ea:02:10:e8	mywifi-g	AP-00:E0	×	Ê	IP:	192.168.20.17	
	192.168.20.210	98:f1:70:2c:52:e5	mywifi-psk	AP-00:E0	×	Ê	MAC:	44:85:00:6e:68:79	
							WLAN:	2g5gmixed	
							Access Point:	34:e7:0b:00:00:e0	
							AP Name:	AP-00:E0	
							Auth:	PSK	
							Attached Band:	5GHz	
							Online Time:	0days 0h 8m 52s	
							Session Time:		
							RSSI:	46	
							Working Mode:	11AC_VHT80	
							PHY Rx rate:	761Mbps	
							PHY Tx rate:	761Mbps	
							Rx rate:	0.01Mbps	

#### Figure 4-7. You can launch the Advanced Mode from Simplified Mode by clicking the Client Window Frame.

Clients	For Group: mywifi_in_office			Total:3
User Name	IP	MAC	WLAN	Auth
guest2	192.168.20.80	d0:7a:b5:74:da:34	mywifi-guest	PORTAL
guest1	192.168.20.1	00:26:c7:63:0d:16	mywifi-guest	PORTAL
	192.168.20.102	44:85:00:6e:68:79	mywifi-empl	PSK

Figure 4-6 Clients Window-Simplified Mode

#### Table 4-5: Key word specification in Client Window (Simplified Mode)

For Group: mywifi_in_office	Clients connected to the group.
For WLAN: mywifi-employee	Clients connected to the specified WLAN in the group.
For AP: 34:e7:0b:00:00:e0	Clients connected to the specified AP in the group.
User Name	User Name of the client, applicable for 802.1X or portal clients.
IPv4	IPv4 address of the client.
IPv6	IPv6 address of the client.
MAC	MAC address of the client.
WLAN	WLAN to which the client connected.
Auth	Authentication type: Open, Portal (Captive portal), PSK (Personal), 802.1X (Enterprise).

#### Introduction to the AP Group Web Management System

User Name	IP	MAC	WLAN	Access Point				Client Detail	
unc ser nume	192.168.20.17	44:85:00:6e:68:79	2g5gmixed		×	â	User Name:	Client Detail	
wort1		a4:08:ea:02:10:e8			×	â	IP:	192.168.20.17	
uest1	192.168.20.12		mywifi-g		x	â	MAC:	44:85:00:6e:68:79	
	192.168.20.210	98:f1:70:2c:52:e5	mywifi-psk	AP-00:E0	<b>^</b>	ш	WLAN:	2g5gmixed	
							Access Point:	34:e7:0b:00:00:e0	
							AP Name:	AP-00:E0	
							Auth:	PSK	
							Attached Band:	5GHz	
							Online Time:	0days 0h 8m 52s	
							Session Time:		
							RSSI:	46	
							Working Mode:	11AC_VHT80	
							PHY Rx rate:	761Mbps	
							PHY Tx rate:	761Mbps	
							Rx rate:	0.01Mbps	

Figure 4-7 Clients Window-Advanced Mode

### Table 4-6: Key word specification in Client Information Window (Advanced Mode)

User Name	User Name of the client.	
IP	IPv4 address of the client.	
MAC	MAC address of the client.	
WLAN	WLAN to which the client connected.	
Access Point	Access point to which the client connected.	
×	Force the client to disconnect the wireless network.	
â	Remove the client from the wireless network and put it within the blacklist. If removed, the client can be displayed and operated in the <u>blacklist window</u> .	
AP Name	Name of access point that the client connected.	
Auth	Authentication type: Open, Portal (Captive Portal), PSK (Personal), 802.1X (Enterprise).	
Attached Band	The radio band through which the client attaching to AP, 2.4GHz or 5GHz.	
Online Time	Time when the client attached to the wireless network.	
Session Time	Time when the client has passed the captive portal authentication, only for captive portal clients.	
RSSI	Received Signal Strength Indication of the client, Value 0~99.	
Working Mode	Wireless working mode of the client.	
PHY Rx rate	Physical receiving rate of the client.	
PHY Tx rate	Physical sending rate of the client.	
Rx rate	Packet receiving rate of the client.	
Tx rate	Packet sending rate of the client.	
Download	Total download data size since the client connected to the wireless network.	
Upload	Total upload data size since the client connected to the wireless network.	
Device type	Device type of the client.	
OS Type	Operating system type of the client.	
Rx Error	The number of error packets received by the client. Interference is the most major cause of packet error. Another cause of packet error is the mismatch of broadcast power levels (Tx Power). If an AP and client device are communicating at much different broadcast strengths, then this can cause packet error.	
Tx Retry	The number of retry packets sent by the client. The Retry indicates packets that h to be re-sent because they were corrupted upon arriving at the proper destination	

Roaming History	<ul> <li>Showing roaming history between SSID/AP/Band for the client, total 32 roaming records can be displayed and will be separated by connection sessions.</li> <li>Connection Session - A session represent a period which starting from associating to the wireless network and ending by disassociating. Roaming records are distributed within sessions.</li> <li>The connection sessions are arranged based to time sequence. The latest session will be positioned on the top of roaming history display.</li> <li>The Offline status represent the connection session has ended. The Online status represent an ongoing session and the client is not disassociated.</li> </ul>

### Monitoring Window

The monitoring window displays the utilization of the wireless network, including statistics of traffic throughput and client working state.

The monitoring window can monitor from four different levels: group level, WLAN level, AP level and client level, illustrated in Figure 4-8, Figure 4-9, Figure 4-10 and Figure 4-11.

The group monitoring is the default display, you can select to monitor certain WLAN/AP/client from the WLAN Window/AP Window/Client Window on left side of the <u>Dashboard</u>.

The monitoring window is automatically refreshed every 30 seconds by default, and the data polling cycle can be set to 30s /60s /120s.



Figure 4-8 Monitoring Window - AP Group

#### Table 4-7: Key word specification in AP group Monitoring Window

RX	Total receiving rate of the AP group.
ТХ	Total sending rate of the AP group.
Client	The number of clients connected to the AP group.

Client Band	The working band distribution of clients connected to the AP group, including number of clients working on 2.4GHz band and number of clients working on 5GHz band.
Client Health	<ul> <li>The wireless connection quality between client and Stellar AP, it is judged by the signals of client, and classified as below:</li> <li>Best— Number of clients whose signal strength is more than 30.</li> </ul>
	<ul> <li>Good— Number of clients whose signal strength is between 15 ~30.</li> </ul>

• Fair—Number of clients whose signal strength is less than 15.



Figure 4-9 Monitoring Window - WLAN

### Table 4-8: Key word specification in WLAN Monitoring Window

RX	Total receiving rate of the WLAN.	
ТХ	Total sending rate of the WLAN.	
Client	The number of clients connected to the WLAN.	
Client Band	The working band distribution of clients connected to the WLAN, including number of clients working on 2.4GHz band and number of clients working on 5GHz band.	
Client Health	<ul> <li>The wireless connection quality between client and Stellar AP, it is judged by the signals of client, and classified as below:</li> <li>Best— Number of clients which signal strength is more than 30.</li> <li>Good— Number of clients which signal strength is between 15 ~30.</li> </ul>	
	• Fair—Number of clients which signal strength is less than 15.	

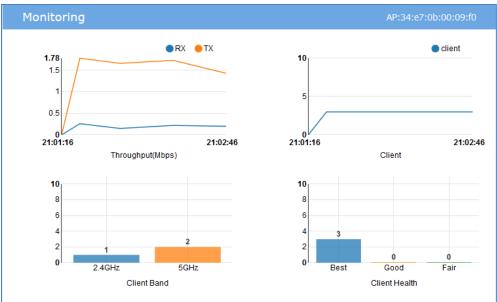


Figure 4-10 Monitoring Window - AP

### Table 4-9: Key word specification in AP monitoring Window

Total receiving rate of the AP.	
Total sending rate of the AP.	
The number of clients connected to the AP.	
The working band distribution of clients connected to the AP, including number of clients working on 2.4GHz band and number of clients working on 5GHz band.	
<ul> <li>The wireless connection quality between client and Stellar AP, it is judged by the signals of client, and classified as below:</li> <li>Best— Number of clients which signal strength is more than 30.</li> <li>Good— Number of clients which signal strength is between 15 ~30.</li> <li>Fair—Number of clients which signal strength is less than 15.</li> </ul>	



Figure 4-11 Monitoring Window - Client

#### Table 4-10: Key word specification in Client Monitoring Window

RX	Receiving rate of the client.
TX	Sending rate of the client.
RSSI	Received Signal Strength Indication of the client
PHY RX	Physical receiving rate of the client.
PHY TX	Physical sending rate of the client.



Note 4-3: The data shown in the monitoring window is collected and displayed while the window is open. The data is not stored and no historical view of the data is available.

## System Page

The System page focus on the basic settings of the AP group, including: AP group attributes, system management accounts, system time and syslog.

It is divided into three windows in System Page: General window, System Time window and Syslog window, illustrated in Figure 4-12 System page.

	Mon Aug 22 2016 16:12:32	1	Syslog		
	Mon Aug 22 2016 16:12:32	1	7741-		
	(UTC+01:00)Brussels,Copenhagen,Mad rid,Paris	1	Title <err> get_ipaddr-501 get ip failed</err>	Level err	Source 192.168.1.254
	14,1013				
pool.ntp.org	+ <b>x</b>	^			
cn.pool.ntp.org	<b>↑↓×</b>	- 11			
tw.pool.ntp.org 0.asia.pool.ntp.org	1+× 1+×	1	Log Level: Notice V	ive	
1.asia.pool.ntp.org	t ↓ × A I ⊷ Add	Ŷ			Run
	NTP Server List: poolntp.org cn.poolntp.org tw.poolntp.org 0.asia.poolntp.org 1.asia.poolntp.org	NTP Server List: poolntp.org + * tw.poolntp.org + + * 0.asa.poolntp.org + + * 1.asa.poolntp.org + + *	NTP Server List: pool.ntp.org	NTP Server List: pool.ntp.org ↓ × cn.pool.ntp.org ↑ ↓ × tw.pool.ntp.org ↑ ↓ × Log.sa.pool.ntp.org ↑ ↓ × Log.sa.pool.ntp.org ↑ ↓ × Log.Remote: . off 192.166 Log Remote: . off 192.166 Log Remote: . off 192.166	NTP Server List: pool.ntp.org



### General Window

General Window displays the basic information of the wireless system. There are two modes for General Window, Simplified Mode illustrated in Figure 4-13 General Window - Simplified Mode and Advanced Mode illustrated in Figure 4-14 General Configuration Window - Advanced Mode. You can launch the Advanced Mode from Simplified Mode by clicking the General Window Frame.

#### Introduction to the AP Group Web Management System

General	
Group ID:	8818
Group Name:	mywifi_in_office
Group Location:	Paris
Group Management IP:	192.168.20.162
Group Management Netmask:	255.225.255.0
User - Viewer:	Enable
User - GuestOperator:	Enable

Figure 4-13 General Window - Simplified Mode

The General Configuration window includes two tabs: Group Info Management and Account management, illustrated in Figure 4-14.

#### Group Info Management

Group Info Management contains the basic information of the AP group, you can edit it with your own group settings to identify a private Wi-Fi network.

General Configuration		×
Group Info Management	Account Management	Certificate Management
Group Name:	mywifi-office	(1-25 chars)
Location:	Paris	(1-32 chars)
Group Management IP:	192.168.24.172	
Group Management Netmask:	255.255.255.0	
Group Management IPv6:		
	Cancel Save	
Group ID:	8848	(1-9999)
	Cancel Save	

Figure 4-14 General Configuration Window -Advanced Mode

#### Table 4-11: Key word specification in Group Info Management Tab

Group Name	Name of the AP group.
Location	Location of the AP group.
Group Management IP	A virtual IP address for AP group management, default is 10.0.0.1, see
	more in Note 4-4.
Group Management	Netmask of Group Management IP.
Netmask	
Group Management IPv6	A virtual IPv6 address for AP group management.
Stellar AP User Guide	
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Group ID	Identification of the AP group, default is 100.		
MQTT Compatibility	Enable to allow AP with lower version firmware (AWOS4.0.0 and before) to join. The lower version firmware is low-level security on MQTT. By default, it is not allowed AWOS4.0.0 and before version AP to join.		



Note 4-4: AP of a group usually obtains its IP address dynamically from a DCHP server, and it is difficult to keep the same assigned IP address for the AP. So managing the AP group by the AP's dynamic IP address can be difficult. The Group Management IP (GMIP) is a static IP address configured for the AP group web management, and you can manage the AP group via accessing the URL: <u>http://GMIP:8080</u> by wired or wireless. The GMIP is configured on the PVM of the AP group, and you have to make sure the GMIP on the PVM is routable from your configuring terminal (browser). A recommended method is to choose an idle IP address from the AP group domain to configure as a GMIP.

#### Account Management

There are three accounts can login to the Web GUI with different privileges: Administrator, Viewer, and GuestOperator. Administrator account allows configuring and viewing the whole system, Viewer account allows checking configuration and monitoring of WLAN operations, while GuestOperator ONLY has the privilege to edit the guest portal users. Each account can be logged in at the same time. By default, only the Administrator account is enabled; Viewer and GuestOperator are disabled.

In the Account Management tab, you can enable/disable the Viewer and GuestOperator account, change the password for Administrator, Viewer and GuestOperator, illustrated in Figure 4-15.

General Configuration					×
	Group Info Management			Account Management	
	Administrator				
	Password:			(4-16 chars)	
	Confirm:				
	Viewer		Enable ODisable		
	Password:	•••••		(4-16 chars)	
	Confirm:	•••••			
	GuestOperator		Enable ODisable		
	Password:	•••••		(4-16 chars)	
	Confirm:	•••••			
	Tip: In order to ensure user	security, please set the di	fferent password!		
			Cancel Save		

Figure 4-15 Account Management Tab

There are security methods to protect AP group management web UI from unsecure usage:

General Configuration						×
Group Info Management	Account M	lanagement	Certificate	Management	Service Managem	ent
	Account - Lockout					*
	Lockout Threshold:			(2-5 invalid logon attempts)		
	Lockout Duration:			(1-15 minutes)		
	Inactivity Time:			(5-60 minutes)		- 1
	Warning Banner:	The use of this system authorized users only. performed on the syst	All activities	(0-128 chars)		
			Cancel Save			

Figure 4-16 Account Lockout

Account Lockout Threshold - Specify how many times a user must fail against a valid account before the user is denied login. By default, the lockout threshold is 3 times of invalid login attempts.

Account Lockout Duration - Specify how long will the user be denied from login after exceeding invalid attempts. Be default, the lockout duration is 1 minute.

Inactivity Time - Specify the inactivity time for automatic lock due to no operation.

Warning Banner - Warning banners are brief messages that are used to inform users of policies and legislation regarding the use of Stellar AP group web management system. User can customize the content for Warning Banner on demand.

There are two accounts can login to the Stellar AP command line interface with different privileges: support and root. Administrator can change the login password for those command line accounts. The root password is a string held by the customer only and is used to generate real root access credential by AP.

General Configuration				×
Group Info Management	Account Managem	ent Certificate	Management	Service Management
		Cancel Save		•
	Support			
F	Password: Please		(4-16 chars)	
c	Confirm:			
		Cancel Save		
Ĩ	Root Account			
F	Password: Please		(4-16 chars)	
c	Confirm:			
		Cancel Save		
				Ŧ

Figure 4-17 Command line Account

#### Certificate Management

AP support 3 types of build-in certificates, user can customize their own certificate on demand:

- (1) Internal Web Server The certificate is utilized to setup the secure connection between web browser and AP web server for https management. By default, there is a build-in CA certificate generated by ALE with the domain 'mywifi.al-enterprise.com'. User can use open SSL to generate his/her own CA certificate and replace the default one (User needs to use domain 'mywifi.alenterprise.com' for your own certificate because the login URL cannot be changed).
- (2) Internal Portal Server The certificate is utilized to setup the secure connection between captive portal page and the AP web server for protecting the user login credentials being stolen. User can define its own captive login URL and replace the certificate accordingly.
- (3) External Portal Server The certificate is utilized to setup the secure connection between captive portal page and the AP web server for protecting the user login credentials being stolen. User can define its own captive login URL and replace the certificate accordingly.

onfiguration					
Group Info Management		Acco	Account Management		Certificate Managen
Certificate					
N	ame:				(4-20 chars)
C	ertificate Type:	Internal Web Serve	r(Domain)	•	
C	ertificate File:	Choose File No fi	le chosen		
Password:					(4-16 chars)
C	onfirm:				
C	ertificate Format:	PEM			
			Cancel	Add	
Certificate Lis	st				
Name	Certificate	Туре	Format	Status	Operate

Figure 4-18 Certificate Management Tab

#### Service Management

Stellar AP support Layer 3 IPv6 traffic forwarding between clients and other network elements if the IPv6 Service is enabled. By default, it is disabled.

#### Introduction to the AP Group Web Management System

Ger	neral Configuration			×
	Group Info Management	Account Management	Certificate Management	Service Management
	IPV6 Service:	. off		

Figure 4-19 Service Management Tab

### System Time Window

It is important to ensure the system time is correct, this is because proper communication between network elements and syslog for troubleshooting are based on the correct time.

NTP (RFC 1305 - Network Time Protocol) is a networking protocol for time synchronization between the elements across the network. If you don't have a private NTP server in your network, it is suggested to add your favorite NTP server and prioritize it to the top of the NTP Server List, or use the default NTP servers in the system, illustrated in Figure 4-20 System Time.

Date and Time:	Wed Nov 23 2016 22:31:29	1		
Daylight-Saving Time:	on			
Time Zone:	(UTC-08:00)Pacific-Time(US and Canada)	1		
NTP Server List:				
pool.ntp.org	<b>↓ ×</b>	^		
cn.pool.ntp.org	<b>↑ ↓ ×</b>			
tw.pool.ntp.org	<b>↑ ↓ ×</b>			
0.asia.pool.ntp.org	<b>↑ ↓ ×</b>			
1.asia.pool.ntp.org	<b>↑ ↓ ×</b>	~		
NTP Server: XXXXX	Add			
Figure 4-20 System Time Window				

If configured, APs in the group synchronize the time with NTP sever in 15-minute intervals.

You can also specify the **Time Zone** and daylight-saving time of the AP group to coordinate with the local time. The daylight-saving time is automatically enabled on supporting time zone.



Note 4-5: In order to ensure time synchronization, it is recommended to check the reachability before adding

an NTP server. If the NTP server is not configured or is unreachable, an AP reboot may lead to variation in time.

### Syslog & SNMP Window

Syslog is a standard for message logging. Syslog is used for system management and security auditing as well as general informational, analysis, and debugging messages.

APs in group generate logs following the standard of Syslog, you can view logs and configure corresponding attributes in the Syslog Window.

Upper part of the Syslog Window displays **error** (and lower, see in Note 4-5) level Syslog generated by APs in the group.

Title is the content of the log message.

Level is the severity of the log message.

Source is the generator's IP address of the log message.

When you move the mouse cursor to certain row of log message, the generating time of the log displays, illustrated in Figure 4-21 Syslog Window.

Syslog				
Title Level Source				
Device IP conflicts with other hosts IP err 192.168.50.216 Device IP conflicts with other Tue Aug 23 16:19:21 2016 68.50.216				
Log Level: Notice   Save				
Log Remote: . off 192.168.100.1				
Log File: wanglili				
Figure 4-21 Syslog Window				

**Log Level:** Setting of Syslog message severity. If certain level is specified, the AP group will generate Syslog messages including all lower levels. That is, if Syslog messages are separated by individual severity,

Stellar AP User Guide ALCATEL-LUCENT ENTERPRISE a Warning level entry will also be included in Notice, Info and Debug processing. Notice is the default level of Syslog setting, and the system generates logs including levels of Notice, Warning, Error, Critical, Alert and Emergency.

Log Remote: Setting of remote log server. If configured and enabled, besides storage in local file, Syslog messages of all APs in group can be sent to and stored in the server once generated.

Log File: Download the log file on a selected AP in the group to your configuring machine. Syslog messages are stored in a local file when generated. For one AP, up to 1MB size of syslog messages can be saved in the local log file. The log file is FIFO, new syslog messages will replace the old ones if the size exceeds 1MB.



Note 4-5: Syslog is divided into eight levels, and lowest level 0 is Emergency severity while highest level 7 is

Level Value	Severity	Keyword	Description
0	Emergency	emerg	System is unusable
1	Alert	alert	Should be corrected immediately
2	Critical	crit	Critical conditions
3	Error	err	Error conditions
4	Warning	warning	May indicate that an error will occur if action is not taken
5	Notice	notice	Events that are unusual, but not error conditions
6	Informational	info	Normal operational messages that require no action
7	Debug	debug	Information useful to developers for debugging

Debug severity. Definition of Syslog severity as follow:

Syslog & SNMP	
Syslog	SNMP
SNMP Agent:	. off
Community:	public
SNMP Trap:	. off
Trap Server:	127.0.0.1
Community:	public
Trap List:	
	Cancel Save

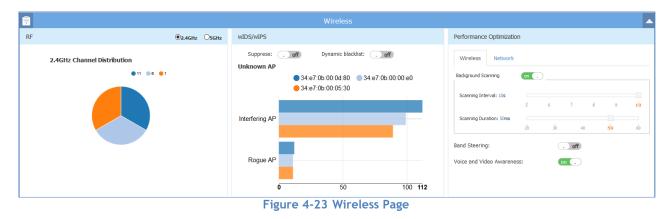
Figure 4-22 SNMP Window

With SNMP user can monitor AP status in the group through traditional network management platform.

- SNMP Agent Enable/Disable the SNMP agent on AP. Network management platform can fetch information from AP through SNMP protocol.
- Community The credential used to communicate between AP and network management platform.
- SNMP Trap Enable/Disable AP to send trap to network management platform.
- Trap Server Network management platform to which AP send SNMP traps.
- Trap List Specify the trap items needs to be sent to network management platform.

## Wireless Page

The Wireless page focuses on advanced wireless functions, including three windows: RF (Radio Frequency), Wireless Intrusion Detection System/Wireless Intrusion Prevention System (wIDS/wIPS), and wireless performance optimization, illustrated in Figure 4-23 Wireless Page.

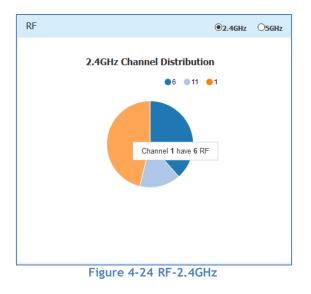


### **RF Window**

Radio Frequency (RF) window is for monitoring the wireless utilization and configuring wireless attributes like channel and transmitting power.

There are two modes for RF Window, Simplified Mode illustrated in Figure 4-24 RF-2.4GHz and Advanced Mode illustrated in Figure 4-26. You can launch the Advanced Mode from Simplified Mode by clicking the RF Window Frame.

Panel of RF displays the monitoring information of channel distribution, can be selected on 2.4G band or 5G band. Channels are separated by different colors, when you move the mouse cursor to the colored section of the pie chart, it displays the clients connected to the AP group through 2.4G band or 5G band, illustrated in Figure 4-24 RF-2.4GHz and Figure 4-25 RF-5GHz.



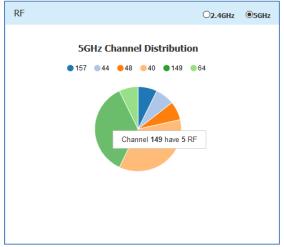


Figure 4-25 RF-5GHz

RF Configu	Iration								×
Global:	5G Channel Width(MHz)	40 •		Save					
AP	2.4GHz Channel	2.4GHz Power(dBm)	5GHz Channel	5GHz Power(dBm)			Edit RF Information		
AP-21:A0	auto(11)	auto(20)	auto(40)	auto(14)	1	AP Name:	AP-21:A0		-
AP-F1:30	auto(11)	auto(17)	auto(40)	auto(5)	1	AP MAC: dc:08:56:12:21:a0			
AP-32:C0	auto(6)	auto(19)	auto(40)	auto(9)	/	2.4GHz Channel ACS: Channel: Channel Width: Power APC	Image: Second	(MHz)	•

Figure 4-26 RF Configuration Window

The left side of the RF Configuration window displays the list of working channels and transmitting power of all APs in the group. When you pick an AP from the list, its detailed RF information is displayed on the right side of the window, illustrated Figure 4-26. The global configuration can be used to change 5GHz channel width for all APs in the cluster for efficiency or you can change the channel width for specific AP by individually editing it. The latter configuration will take effect if both global setting and specific AP configuration both exist.

You can turn OFF specific wireless radios for APs in the cluster to reduce the radio emissions or for other purpose with Radio ON/OFF button.

For AP1222, AP1232, AP1322, AP1362 with external antenna deployment, you can specify the gain of the antenna which you want to use (Note: please subtract cable loss from the gain). AP will coordinate and comply with local law on signal transmitting.

By default, the working channel and transmitting power are automatically managed by Radio Dynamic Adjustment<sup>™</sup> (RDA) technology. You can specify the channels list/power range applicable for auto selection, which can reduce the risk of low power transmitting or DFS channel conflict. If you want to set the channel and power values for an AP manually, you need to disable the ACS/APC function on the AP, illustrated in Figure 4-27.

#### Introduction to the AP Group Web Management System

RF Configuration											×
AP	2.4GHz Channel	2.4GHz Power(dBm)	5GHz Channel	5GHz Power(dBm)					nformation		
AP-D7:50	auto(6)	auto(20)	auto(64)	auto(23)	1		Width(MHz):	20			*
AP-C2:70	auto(11)	auto(20)	auto(60)	auto(23)	1	5GHz					
AP-09:F0	auto(6)	auto(17)	auto(52)	auto(16)	1				0		
AP-06:80	auto(1)	auto(17)	auto(132)	auto(22)	1		ACS:	ON	OFF		
AP-05:90	auto(6)	auto(20)	auto(100)	auto(25)	1		APC:	ON	OFF		
AP-18:40	auto(1)	auto(14)	auto(56)	auto(16)	1		Channel:	64		v	×.
AP-C6:60	auto(1)	auto(17)	auto(116)	auto(25)	1		Power(dBm):	23		(9-23)	
AP-1A:80	auto(11)	auto(17)	auto(100)	auto(22)	1		. ,				
AP-0C:F0	auto(1)	auto(23)	auto(165)	auto(25)	1		Channel Width(MHz):	20		Ŧ	I
							ChannelList:				
							Note : The RF config	36		to take effect on	
							the AP after you clic	40		led to make other	
							RF changes on this <i>i</i>	44			*
								48			
								52			





Note4-6: Radio Dynamic Adjustment<sup>™</sup> (RDA) is a technology that adjusts the radio working channel and transmitting power according to the wireless environment around it. It includes Auto Channel Selection (ACS) and Auto Power Control (APC) functions. By default, RDA is enabled.

RDA relies on the background scanning feature. To ensure the RDA is effective, make sure the background scanning is ON, see "<u>Performance optimization Window</u>".

#### Table 4-12: Key word specification in RF Configuration Window

Parameter	Specification
Client Aware	When enabled, Auto Channel Selection does not change channels for Stellar APs with connected clients, except for high-priority events such as RADAR detected. If "Client Aware" is Disabled, the Stellar AP may change to a more optimal channel, which may temporarily disrupt current client traffic.
Short GI	Enable/Disable Short Guard Interval. In IEEE 802.11 OFDM-based communications, Guard Interval is used to ensure that distinct transmissions occur between the successive data symbols transmitted by a device. The standard symbol Guard Interval used in 802.11 OFDM is 800 nanoseconds in duration. To increase data rates, the 802.11 standard added optional support for a 400 nanoseconds guard interval (Short Guard Interval). This would provide approximately an 11% increase in data rates. However, using the Short Guard Interval will result in higher packet error rates when the delay spread of the RF channel exceeds the Short Guard Interval, or if timing synchronization between the transmitter and receiver is not precise. By Default, Short Guard Interval is enabled on the wireless radio. If the multipath effect is too serious (too many metals or other reflecting materials), disabling Short Guard Interval is recommended.

MU-MIMO	Enable/Disable MU-MIMO (multi-user, multiple-input, multiple-output) feature.
High Efficiency	Enable/Disable 802.11ax high efficiency wireless functionality. When disabled, the HE mode capable AP will downgrade to VHT (Very High Throughput) mode.
Beacon Interval	Specify the Beacon period for the AP in milliseconds. This indicates how often the 802.11 beacon management frames are transmitted by the access point. You can specify a value within the range of 60-500. The default value is 100 milliseconds.

#### wIDS/wIPS Window

wIDS/wIPS window focus on the wireless security of the Stellar AP network.

Wireless is a borderless network and always works in an open environment which can be interfered with and attacked. It is useful to discover the surrounding wireless conditions, and based on that, provide instructions and tools to help administrators improve the quality of the wireless network. Usually there are two types of foreign unknown APs having a negative effect on the wireless network, they are interfering APs and rogue APs.

An **interfering AP** is an AP seen in the wireless environment but not connected to the wired network. The interfering AP can provide RF interference potentially, however, it is not considered a direct security threat, because it is not connected to the wired network.

A **rogue AP** is an unauthorized AP plugged into the wired side of the network or a foreign interfering AP broadcasting the same SSID with the AP group. A rogue AP is considered a security threat to the AP group.

Panel of wIDS/wIPS displays top 5 Stellar APs with interference from surrounding APs, and the top 5 Stellar APs with the most rogue APs surrounding, illustrated in Figure 4-28.

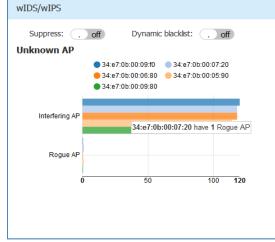


Figure 4-28 Top 5 AP interfered

**AP whitelist:** Both interfering APs and rogue APs are foreign unknown APs which can be found by background scanning and are listed in the unknown AP table, illustrated in Figure 4-29. However, some foreign APs found are trusted APs, those are not suitable for being classified as interfering APs or rogue APs. To avoid trusted foreign APs from being classified as interfering APs or rogue APs, you can add the trusted MAC address or MAC prefix to the AP whitelist, illustrated in Figure 4-30. If a foreign AP MAC address is added to the whitelist, it will not be displayed in the unknown AP list.

**AP blacklist:** Only rogue APs can be added to the blacklist. If a rogue AP is added to the blacklist, it cannot change its role to act as a client and access to the Stellar AP wireless network, illustrated in Figure 4-31.

**Suppress:** Enable/disable the function of rogue AP suppress. If enabled, the detecting Stellar AP will send DEAUTH frames to clients that have associated to the rogue AP, keeping the clients away from the unsafe wireless network. By default, the detecting Stellar AP does not send DEAUTH frames, see in Figure 4-28.

**Dynamic blacklist:** If enabled, all the ad-hoc devices found will be added to the AP blacklist automatically, which prevents the ad-hoc device from changing its role to act as a client and access to Stellar AP wireless network. By default, the ad-hoc device is not added to the blacklist automatically.

Jnknown AP	SSID	Туре	AP	Operate		Unknov	n AP Information
00:02:03:04:05:06	OpenWrt_1_2.4	Interfering	duanmingzhe	Trust	^	Unknown AP: RSSI:	08:57:00:88:10:4b 44
4c:48:da:24:f4:47 4c:48:da:24:e4:88	chenjun_VLAN	Interfering Interfering	duanmingzhe duanmingzhe	Trust		SSID: Channel:	SoftAP 1
00:1f:64:ca:42:a9 08:57:00:88:10:4b	NiuBin-work-2.4 SoftAP	Interfering Rogue	duanmingzhe duanmingzhe	Trust		Type: Already In blacklist: AP Name:	Rogue No duanmingzhe
4c:48:da:24:f1:90 4c:48:da:24:11:10		Interfering Interfering	duanmingzhe duanmingzhe	Trust		AP MAC: AP Location:	34:e7:0b:00:09:f0
4c:48:da:24:cb:b0 00:1f:64:12:13:91	y-2 DMZ-TEST2	Interfering	duanmingzhe duanmingzhe	Trust		Distance: Encryption Type:	far WPA2/RSNA
4c:48:da:24:11:11	fdfsd	Interfering	duanmingzhe	Trust		Attached Clients: 64:cc:2e:0a:49:4d	1
4c:48:da:24:f1:91 00:1f:64:12:13:92	Imm123 DMZ-TEST3	Interfering Interfering	duanmingzhe duanmingzhe	Trust			

Figure 4-29 wIDS/wIPS Configuration Window

#### Table 4-13: Key word specification in wIDS/wIPS Configuration Window

Parameter	Specification
Unknown AP	MAC address of the unknown AP detected in the nearby.
SSID	SSID broadcasting by the unknown AP.
Туре	Classified result of the unknown AP, can be interfering AP or rogue AP.
RSSI	Received Signal Strength Indication of the unknown AP.
Channel	Working channel of the unknown AP.
Already In Blacklist	Flag of ad-hoc device, depends on "the Dynamic blacklist" switch. If on, the ad-hoc devices will be automatically added to the blacklist and the flag is true (Yes); If off or the unknown AP in list is not an ad-hoc device, the flag is false (No).
AP/AP Name	Name of detecting AP in the group.
AP MAC	MAC of detecting AP in the group.
AP Location	Location of detecting AP in the group.
Distance	Distance between unknown AP and the detecting AP in the group, it is measured by RSSI of the unknown AP: Nearest - RSSI>(-20dBm); Near - (-45dBm) <rssi< (-20dbm);<br="">Far - (-70dBm) <rssi<(-45dbm); Farthest - RSSI&lt;(-70dBm);</rssi<(-45dbm); </rssi<>
Encryption Type	The encryption type of the SSID being broadcast by the unknown AP.
Attached Clients	The number of clients attached to the unknown AP, and MAC of each client.
Operate	Operation to trust the foreign AP and delete it from the unknown AP list. If the foreign AP is trusted, its MAC address will be added to the whitelist.

White List	Whitelist of foreign APs. Those not considered as security threat to the Stellar AP network, you can add the trusted MAC address into whitelist manually, see more in Figure 4-30.
Black List	Blacklist of foreign APs. Those classified as rogue APs and pretending to act as a client to access the Stellar AP network. If <sup>Dynamic blacklist:</sup> on on and there are detected ad-hoc devices, all of them will be added to the blacklist automatically. You can remove a foreign AP from the blacklist by the <b>Trust</b> operation, see more in Figure 4-31.

Jnknown AP	SSID	Туре	AP	Operate		Whi	te List	
tC.40.Ua.24.C4.01		Interrening	uuaniningzne	HUSL	^	МАС		
00:02:03:04:05:06	OpenWrt_1_2.4	Interfering	duanmingzhe	Trust		MAC		
4c:48:da:24:f4:47	chenjun_VLAN	Interfering	duanmingzhe	Trust		34:e7:0b:*:*:*	×	
4c:48:da:24:e4:88		Interfering	duanmingzhe	Trust				
00:1f:64:ca:42:a9	NiuBin-work-2.4	Interfering	duanmingzhe	Trust				
08:57:00:88:10:4b	SoftAP	Rogue	duanmingzhe	Trust				
4c:48:da:24:f1:90		Interfering	duanmingzhe	Trust				
4c:48:da:24:11:10		Interfering	duanmingzhe	Trust				
4c:48:da:24:cb:b0	y-2	Interfering	duanmingzhe	Trust				
00:1f:64:12:13:91	DMZ-TEST2	Interfering	duanmingzhe	Trust				
4c:48:da:24:11:11	fdfsd	Interfering	duanmingzhe	Trust				
4c:48:da:24:f1:91	lmm123	Interfering	duanmingzhe	Trust				
00:1f:64:12:13:92	DMZ-TEST3	Interfering	duanmingzhe	Trust			Add	



Jnknown AP	SSID	Туре	AP	Operate		Black List		
01:60:02:00:00:00	OpenWrt-2g	Interfering	AP-00:E0	Trust	^	MAC		
00:11:22:33:44:60		Rogue	AP-00:E0	Trust		00:11:22:33:44:60	Trust	
lc:48:da:27:47:a0		Interfering	AP-00:E0	Trust		4c:48:da:24:f0:e0	Trust	
c:48:da:24:f1:c0		Interfering	AP-00:E0	Trust		00:11:22:33:44:61	Trust	
lc:48:da:24:f4:c0		Interfering	AP-00:E0	Trust		00:1f:64:ca:42:a9	Trust	
lc:48:da:24:f2:00		Interfering	AP-00:E0	Trust		4c:48:da:04:ef:50	Trust	
lc:48:da:24:f0:e0		Rogue	AP-00:E0	Trust		00:11:22:33:44:50	Trust	
lc:48:da:24:f0:e1	chenjun001	Interfering	AP-00:E0	Trust		4c:48:da:28:ef:50	Trust	
4c:48:da:24:f4:c1	test_8021x	Interfering	AP-00:E0	Trust		4c:48:da:24:11:10	Trust	
00:11:22:33:44:61	w33	Rogue	AP-00:E0	Trust		4c:48:da:54:ef:50	Trust	
lc:48:da:27:47:a1	test_8021x	Interfering	AP-00:E0	Trust		4c:48:da:24:f1:90	Trust	
lc:48:da:24:f2:01	lvshuaijiang	Interfering	AP-00:E0	Trust				
lc:48:da:24:f4:a1	fdfsd	Interfering	AP-00:E0	Trust	~			

You can remove a foreign AP from the Unknown AP list or blacklist by the **Trust** operation. If you trust an unknown AP (interfering AP/rogue AP), it is removed from the Unknown AP list and blacklist, and its MAC address will be added to whitelist.

#### Performance Optimization Window

Wireless performance optimization is useful to enhance the quality of wireless service for users. The performance optimization includes Background Scanning, Band Steering, Load Balance, RSSI Threshold, Roaming RSSI, Voice and Video Awareness, and Airtime Fairness, illustrated in Figure 4-32.

Performance Optimizatio	n
Background Scanning	
Scanning Channel:	Working Channel 🗸
Scanning Interval:	0 min 20 sec Save
Scanning Duration: 50ms	20 30 40 <b>50</b> 60 70 80 90 100 110
Band Steering:	
on 🕠	Force 5G: Exclude
Load Balance:	
on 🔒	
RSSI Threshold:	
2.4G: 0	5G: 0 Save
Roaming RSSI: 2.4G: 0	5G: 0 Save
Voice and Video Awareness:	. off
Airtime Fairness:	2.4G: . off 5G: . off

Figure 4-32 Wireless Optimization Tab

**Background Scanning:** Wireless networks operate in environments with electrical and radio frequency devices that can interfere with network communications. Microwave ovens, cordless phones, and even adjacent Wi-Fi networks are all potential sources of continuous or intermittent interference. The background scanning is able to examine the radio frequency (RF) environment in which the Wi-Fi network is operating, identify interference and classify its sources.

Background scanning is the basis for some advanced features such as: wIDS/wIPS, RDA (ACS/APC) etc. When it's turned OFF, the foreign AP detection and rogue suppression will stop and the RDA will drop its precision. By default, background scanning is enabled.

The scanning channel can be defined on demand: For highly sensitive packet delay use case, suggest enabling background scanning only for the working channel. The scanning interval of Background Scanning can be configured from 5 seconds to 3 hours (180 minutes) according to deployment requirement. For highly sensitive packet delay use case, it is recommended to prolong the interval from default 20-second setting. If the interval is longer than 1 minutes, RDA and wIPS feature accuracy will be impacted.

#### Band Steering: Band steering supports Prefer 5GHz and Force 5G.

**Prefer 5GHz** feature assigns the dual band clients to the 5 GHz band prior to the 2.4G band. Thus can reduce co-channel interference and increase available bandwidth for clients, because there are more

Stellar AP User Guide ALCATEL-LUCENT ENTERPRISE channels on 5 GHz band. By default, band steering is enabled. When Band Steering is enabled and Force 5G is NOT selected, AP is working in Prefer 5G mode. The prefer-5GHz-band-steering is based on channel utilization and client density. When the 5G band is busy and connecting too many clients, a new client will be guided to connect to free 2.4G band.

**Force 5G**: AP forces dual band clients to connect to the 5 GHz band. Dual band clients are not allowed to connect 2.4G radio. Those clients only supporting 2.4G band are permitted to connect to 2.4G radio. When Band Steering is enabled and Force 5G is selected, AP is working in Force 5G mode.

**Exclude:** Excludes the clients from Band Steering. For example, user can exclude some dual band voice terminals from Band Steering and AP will let those terminals choose wireless band to connect freely.

Load Balance: The principle of this is to provide fair distribution of clients among neighboring APs. Based on the client density, channel utilization on adjacent APs, and associating clients RSSI value, it is steered from a busy AP to an idle AP. The thresholds for client density is 10, channel utilization is 70% for 2.4G and 70% for 5G. By default, Load Balance is enabled.

**RSSI Threshold**: Wireless access control, client with lower RSSI value than configured setting is forbidden to access. By default, RSSI threshold is disabled (0). RSSI threshold can be applied to 2.4G band or 5G band separately. Recommended 2.4G (5), 5G (10). RSSI threshold is recommended to be deployed in high density scenario.

**Roaming RSSI:** Wireless access control, client with lower RSSI value than setting is forced to roaming. By default, roaming RSSI is disabled (0). Roaming RSSI can be applied to 2.4G band or 5G band separately. Roaming RSSI is used in conjunction with 802.11k and 802.11v. Clients that support these protocols will be informed with sufficient information on which AP to roam to when the threshold is breached. When 802.11k and 802.11k and

**Voice and Video Awareness:** Background scanning needs to be aware of existing traffic on the Stellar AP, if there is an ongoing voice/video service, scanning should not be done to ensure uninterrupted traffic; and allows to resume scanning when there is no active voice/video session. By default, Voice and Video Awareness feature is disabled.

**Airtime Fairness:** All clients share the wireless transition time slice equally, even with traditional low speed clients present. By default, Airtime fairness is disabled.

## Access Page

The Access page focuses on user access management including: user authentication, user blacklist and whitelist and user access control list.

The Access page is divided into three windows: Authentication window, Blacklist & Whitelist window, ACL window, illustrated in Figure 4-33.

♣		Access			4
Authentication  ODevice ODevice	Black List & Whitelist		ACL		
Device type	Black List White List Walled garden		Source 192.168.20.101/24 :4000	Destination 192.168.50.89/24 :4000	Protocol Action TCP REJECT
	MAC Address	Operate			
PC	00:1f:64:ca:42:a9 MAC: MAC Add	×			
	Figure	4-33 Access Pa	age		

#### Authentication Window

Authentication Window displays the user authentication and accessing information.

There are two modes for Authentication Window, Simplified Mode illustrated in Figure 4-34 and Advanced Mode illustrated in Figure 4-35. You can launch the Advanced Mode from Simplified Mode by clicking the Authentication Window Frame.

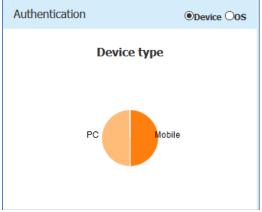


Figure 4-34 Authentication Window - Simplified Mode

The simplified Authentication Window displays the statistics information of the users' device and operating system, illustrated in Figure 4-34.

The advanced Authentication Window is mainly used to configure the captive portal authentication, illustrated in Figure 4-35.

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Authentication Conf	iguration					×
HTTPS: On .		Cus	tomized Portal Page		Local Auth User	
Internal Captive Port Login by:	al ©External Captive Portal	erms of use		UserName:	guest1	
Redirect URL:	on . http://google.co	m Save		Firstname:	Jordan	
<ul> <li>UserName</li> </ul>	Starting Date	Ending Date	Operate	Lastname:	Michael	
<ul> <li>guest1</li> </ul>	2018.09.07	2018.09.20	/ × -	Mail:		
				Phone:		
				Company:	NBA	
				Starting Date:	2018.09.07	
				Ending Date:	2018.09.20	
Add Import Porta	al Account Download Template	Batch delete account				
Client Behavior Trackin Client Connection	ng: on . ions ☑HTTP/HTTPS ☑ALL					
Log To Server: TFTP Server OSFT	TP Server					

#### Figure 4-35 Authentication Window - Internal Portal Server

Authentication Configuration					×
HTTPS: on .					Edit Client Behavior
Internal Captive Portal     Image: Server     Captive Portal Server	otive Portal			*Server IP:	192.168.10.201
Hostname:	wifi.n2s.es			*Server Port:	22
Redirect URL:	/login/hotspot/ale			Remote Path:	/test
Redirect URL param:	○enable ●disable			*UserName:	root
Authentication Server:				*Password:	
Server IP /Hostname:	80.58.201.230			-rassword.	•••••
Authentication Server Port:	1812	(1-65535)		Cycle: 1h V Save	Upload Now
Secret:	•••••				
Confirm:	••••••		а.		
Radius Accounting					
Accounting Server Port:	1813	(1-65535)	-		
Client Behavior Tracking: on .	_				
✓Logging Client Connections ✓HTTP/HTTP	≥S ⊠ALL				
Log To Server: OTFTP Server   OSFTP Server					

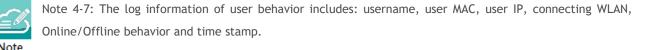
Figure 4-36 Authentication Window - External Portal Server

### Table 4-14: Key word specification in Authentication Window (Advanced Mode)

	Consider the continue newtral leaves whether and better		
HTTPs	Specify the captive portal login protocol, https or http.		
Captive Portal Type	<ul> <li>Internal Captive Portal - Use AP internal captive</li> </ul>		
	portal server for authentication.		
	External Captive Portal - Use external captive portal		
	server for authentication.		
Login by: OAccount OAccess Code O Terms Of use			
	corresponding to different login page and credentials:		
	<ul> <li>Account - Login by user account, you need to add</li> </ul>		
	accounts for portal users, see Create Users or Access		
	<u>Code</u> . The users enter their usernames and passwords to		
	pass the authentication and access the wireless		
	network, see more in <u>Customized Portal Page - Login by</u>		
	Account.		
	<ul> <li>Access Code - Login by access code, you need to add</li> </ul>		
	access code for portal user, see Create Users or Access		
	<u>Code</u> . The users enter the access code to pass the		
	authentication, see more in <u>Customized Portal Page -</u>		
	Login by access code.		
	• Terms of use - Login by terms of use. The users accept		
	the terms of use and pass the authentication, see more		
	in <u>Customized Portal Page - Login by Terms of use</u> .		
Redirect URL: On ( . )	Redirect user to a specific URL defined by administrator. By		
	default, it is disabled.		
UserName	Account of captive portal user.		
Starting Date	Account effective starting date.		
Ending Date	Account effective ending date.		
Operate	Edit or delete captive portal users.		
Add	Add users for captive portal authentication when using login		
	by account.		
Import Portal Account	Import portal user account through excel file. Suggest		
	downloading the excel template, add user accounts into it		
	and then upload to the AP.		
	Maximum 2000 accounts supported in AP local database for		
	internal captive portal authentication.		
Download Template	Download the user account template.		
Batch delete account	Batch delete unnecessary user account from AP.		
	Customized portal web page according to application		
Customized Portal Page	requirement.		
Braviou	Preview the customized portal web page.		
Preview			
Defult	Return the customized portal web page to the system		
Default	default.		
Client Behavior Tracking	Enable logging user behavior to a FTP server or syslog server.		
-	Connection information of all users including online and		
	offline will be recorded. More details can see in Note4-7.		
Logging Client Connections	• HTTP/HTTPS - Record the HTTP/HTTPs web session of		
	wireless clients		
	<ul> <li>ALL - Record the all the session including</li> </ul>		
Log To Server	<ul> <li>ALL - Record the all the session including HTTP(s)/TCP/UDP of wireless clients</li> <li>TFTP Server - Record the client connection information</li> </ul>		

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	<ul> <li>SFTP Server - Record the client connection information to a specific SFTP server by uploading log files</li> <li>Syslog Server - Record the client connection information to a specific server by syslog message</li> </ul>
Cycle: 1h 🗸	Specify the cycle for uploading user behavior logs to FTP server, can be set to 1 hour, 2 hours and 4 hours. Save the FTP setting for uploading user behavior logs.
Upload Now	Upload the user behavior logs to the FTP server manually.
RADIUS Setting	<ul> <li>Setting RADIUS attributes which will be utilized by AP for authentication</li> <li>Called-Station-ID: Specify the value for Called-Station-ID which will be used while AP sending RADIUS access request, max 64 bytes string.</li> </ul>



#### **Customized Portal Page Panel**

You can customize your splash page used in the captive portal authentication by changing the Logo, background and terms of use, illustrated in Figure 4-37.

Authentication Cor	nfiguration				×
Captive Portal: on		Custo	mized Portal Page	Customized Portal Page	
Login by:	Account O Access Code	○ Terms Of use		Preview Default	
Redirect URL:	on . http://www.	google.com Save		Note:Logo file should be in PNG(preferred)/JPEG file format, less than 20KB size, recommended 490 x 190 pixels	
UserName	Starting Date	Ending Date	Operate	Logo:	
guest1	2016.11.21	2016.11.28	× ×	Browse No file selected.	
				Note:Background image file should be in PNG(preferred)/JPEG file format, less than 200KB size, recommended 1200 x 220 pixels Background: Browse No file selected.	
	58.20.161 Cycle: 2h	Save Upload Now		Note:Terms of use file size should be less than 50KB. Terms of use: Browse No file selected.	*

Figure 4-37 Customized Portal Page

There are three splash page templates provided by the system, you can choose your captive portal login method and customize your own splash page accordingly, see more in <u>Customized Portal Page - Login by</u> <u>Account</u>, <u>Customized Portal Page - Login by access code</u> and <u>Customized Portal Page - Login by Terms of</u> <u>use</u>.

### Customized Portal Page - Login by Account

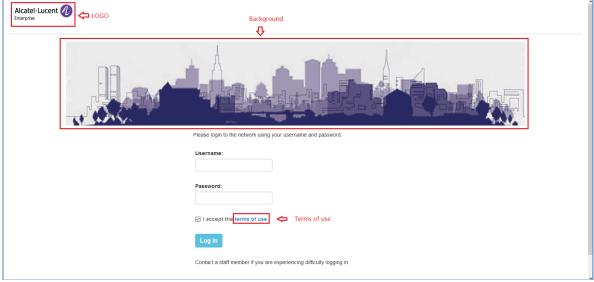


Figure 4-38 Customized Portal Page - Login by account

### Customized Portal Page - Login by Access Code

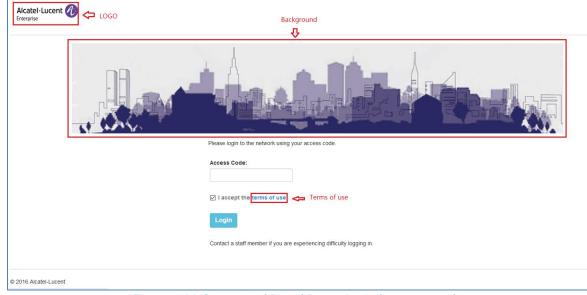


Figure 4-39 Customized Portal Page - Login by access code

Customized Portal Page - Login by Terms of Use

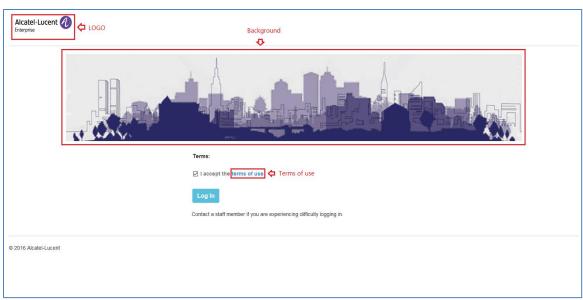


Figure 4-40 Customized Portal Page - Login by Terms of use



Figure 4-41 Customized Portal Page - Terms of use

#### Black List & White List Window

Black List & White List Window focuses on the basic access control mechanism for users connecting to the Stellar WLAN network based on the client level. It includes following tabs: Black List Tab, White List Tab, Wall Garden Tab and Multicast Control Tab.

Those clients on the blacklist are denied associating to the Stellar AP wireless network. Once a client is in the blacklist, it cannot connect to any WLAN of any security level (Enterprise/Personal/Open). You can add/delete the blacklist based on client's MAC address, illustrated in Figure 4-42.

#### Introduction to the AP Group Web Management System

Black List & V	Vhite List						
Black List	White List	Walled Garden	Multicast Control				
MAC Address	MAC Address Operate						
00:1F:64:CA:4	2:A9		×				
MAC: MAC		Add					
		1 10 DL					

Figure 4-42 Black List Tab

The whitelist is applied to captive portal authentication ONLY. Those clients on the whitelist are permitted to access the network resource without passing the captive portal authentication. You can manually add/remove client(s) to/from the whitelist for captive portal authentication by MAC address, illustrated in Figure 4-43. The whitelist does not support Enterprise/Personal WLANs. This means that the clients in the whitelist are not allowed to access Enterprise/Personal WLANs without using correct credentials.

Black List & White List						
Black List White List	Walled Garden	Multicast Control				
MAC Address		Operate				
90:E7:0B:03:D5:D0-90:E7:0B	:03:D5:D0	×				
Starting MAC:	Starting MAC					
Ending MAC:	Ending MAC	Add				

Figure 4-43 White List Tab

The walled garden is a control mechanism over network resources, it restricts access to non-approved applications or content. The walled garden is applied for captive portal authentication ONLY. The client can access the network resource (For example: website of the hotel) before passing the captive portal authentication. You can add/remove allowed domain(s) or IP(s) to/from the walled garden, illustrated in Figure 4-44.

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Bl	ack List & V	/hite List		
	Black List	White List	Walled Garden	Multicast Control
I	р			Operate
1	92.168.1.2-19	92.168.1.100		×
Do	omain:	0	IP:	۲
St	arting IP:	IP	Address (v4   v6)	
En	nding IP:	IP	Address (v4   v6)	Add

Figure 4-44 Walled Garden Tab

Note 4-7: To allow the user to access some network resources (For example: office website or open file server) before passing the captive portal authentication, you must know the IP address or domain name of the network resource and add it into the walled garden.

The Multicast Control targets on the mDNS multicast traffic forwarding from wired network (switch ports) towards AP. When enabled, only traffic from the configured multicast source in the white list can be forwarded by AP to the clients connecting to it. Maximum 8 items of multicast white list are supported. When Multicast White List is disabled, the mDNS multicast traffic is forwarding without conditions.

Black List & White	List		
Black List Wh	ite List Walled Ga	Multicast Control	
Multicast White List:	on .		
Multicast Type	Destination IP	Source MAC	Operate
mDNS	224.0.0.251	90:E7:0B:03:D5:56	×
Multicast Type:	mDNS	•	
Destination IP:	224.0.0		
Desunduon IP:	224.0.0.2	251	
Source MAC:	000000	000000	Add

Figure 4-45 Multicast Control Tab

Note

### Access Control List Window

There are two modes for ACL Window, Simplified Mode illustrated in Figure 4-46 and Advanced Mode illustrated in

Figure 4-47. You can launch the Advanced Mode from Simplified Mode by clicking the ACL Window Frame.

The simplified ACL Window displays the ACLs configured, illustrated in Figure 4-46.

You can create L3 ACLs using wildcard entries for both IP address and TCP/UDP/ICMP ports. See the advanced ACL Window illustrated in

Figure 4-47.

The ACL rules created in the list are applied sequentially, based on the precedence of top-to-bottom.

By default, traffic is allowed to pass if no ACL rules are matched (Default ACL action is 'Accept').

ACL		
Source	Destination	Protocol Action
192.168.20.101/24 :4000	192.168.50.89/24 :4000	TCP REJECT

Figure 4-46 ACL Window - Simplified Mode

ACL Configu	ration							×
Default ACL Act	ion:  Accept	©Reject						
Source IP	Destination IP	Protocol	Action	Apply To	Operate		Add ACL	
						Source IP:	x.x.x.x/x	🖉 Any
						*Destination IP:	64.57.12.218	🔲 Any
						Source Port:	1-65535	🗹 Any
						Destination Port:	1-65535	🗹 Any
						Protocol Type:	ТСР	Ŧ
						Action:	REJECT	¥
						Apply To WLAN:		🗹 Any
						Apply To EthPort:	× Eth3	🔲 Any
							Cancel	Save
Add								

Figure 4-47 ACL Window - Advanced Mode

Table	<b>4-15</b>	ACL	Parameter	Specification
-------	-------------	-----	-----------	---------------

Parameter	Specifications
Source IP	The source IP address.
Destination IP	The destination IP address.
Source Port	Source UDP or TCP port.
Destination Port	Destination UDP or TCP port.
IP Protocol	There are three options for IP Protocol, TCP, UDP or ICMP.
Action	Accept or Reject
Apply To WLAN	Indicate the range which the ACL rule take effect for wireless connection, specific SSID or any SSID.
Apply To EthPort	Indicate the range which the ACL rule take effect for downlink wired connection, dedicated for AP1201H.



Note 4-8: Stellar AP supports L2 ACLs, you can blacklist/white-list certain MACs or a range of MAC addresses, see <u>Blacklist & Whitelist Window</u>. Also, you can setup rules based on 802.1p/DSCP while creating a new SSID, see <u>Modify WLAN QoS</u>.

## Network Page

The Network page is mainly focus on wired network configuration. For example, user can view and configure AP1201H downlink ports in network page.

<b>.</b>				5	System			-
<b></b>	Wireless						-	
2					Access			-
۳				N	letwork			
Wired Network					Wired Network Configura	tion		
AP Model	Ethernet	VLAN ID	Admin Status	Operate	AP Model:	OAW-AP1201H		
OAW-AP1201H	Eth3 Eth2 Eth1		Enable Enable Enable	1	Ethernet: VLAN ID:	Eth1	(0,2-4090)	
					Admin Status:	Con 😱		

Figure 4-48 Network Page

The AP1201H downlink configuration template is always displayed in the Web-UI, even when there is no AP1201H in the cluster. If there isn't any AP1201H in the AP Group, you don't need to change this configuration.

#### Table 4-16 Wired Network

Parameter	Specifications	
AP Model	AP model needs to configure wired link	
Ethernet	Ethernet port of AP	
VLAN ID	VLAN ID assigned to the Ethernet port	

Configuring WLAN should be the first step when setting up your Wi-Fi network. This section contains the following topics:

- → <u>Create NEW WLAN</u>
- Delete Your WLAN
- ➔ Modify Your WLAN
- ➔ Modify WLAN Qos

## Create New WLAN

To create a new WLAN, click on the hyperlink 'New' to launch the WLAN creation window. There are three security levels of WLANs that can be created: Enterprise, Personal and Open (Captive Portal).

**Enterprise:** Also referred to as 802.1X mode, this is designed for enterprise networks and requires a RADIUS authentication server. This requires a more complicated setup, but provides additional security (e.g. protection against dictionary attacks on short passwords). Various kinds of the Extensible Authentication Protocol (EAP) are used for authentication. Enterprise mode is available with both WPA and WPA2.

**Personal:** Also referred to as PSK (pre-shared key) mode, this is designed for home and small office networks and doesn't require an authentication server. Each wireless network device encrypts the network traffic using a 256 bit key. This key may be entered either as a string of 64 hexadecimal digits, or as a passphrase of 8 to 63 printable ASCII characters. Personal mode is available with both WPA and WPA2.

**Open (Captive Portal):** No Authentication or encryption method for the wireless network. User data will be transmitted as plain text transmit mode over the air. Captive portals are mainly used in wireless open networks where the users are shown a welcome message informing them of the conditions of access. Often captive portals are used for marketing and commercial communication purposes and they allow the providers of this service to display or send advertisements to users who connect to the Wi-Fi access points.

#### Create an Enterprise WLAN

Enterprise WLAN creation window has two display modes, simplified mode and advanced mode, respectively illustrated in Figure 5-1and Figure 5-2. You can switch to advanced mode from simplified mode by clicking the hyperlink Advance.

There are six essential parameters needed to be configured in simplified mode, they are WLAN Name, Security Level, Key Management and AuthServer, AuthPort and AuthSecret. Other parameters will be considered as per the default value. To configure other advanced parameters, you must switch to advanced mode. Refer to Table 5-1 for details about each parameter.

▼ ▼
~
×
Cancel Save

WLAN Name:		(1-32 chars)	
Security Level:	Enterprise		
Key Management:			
	Both(wpa &wpa2)		I
AuthServer:	XXXX		
AuthPort:	1812		
AuthSecret:			
Nas Identifier:			
Radius Accounting:	Ø		
AcctServer:	X.X.X.X		
AcctPort:	1813		
AcctSecret:	1813		Ì
needbearer.			
Inactivity Timeout Status:	. off		
Inactivity Timeout Interval:	600	(60-1200)s	
Enable:	• Yes O No		
Hidden:	○ Yes   No		
Multicast:	○ Yes ● No		
Broadcast ARP:	⊖Yes  No		
VLAN ID:	0	(0-4090)	
Band:	✓ 2.4GHz ✓ 5GHz		
WLAN Access Timer:	. off		
MaxClients Per Band:	64	(1-256)	
Upstream Per Client:	0	(0-65536)kbps	1
Downstream Per Client:	0	(0-65536)kbps	
Client Isolate:	. off		
802.11r:	. off		
802.11v:	on 💽		
802.11k:	on 💽		
802.11b:	on .		
802.11g:	on .		
OKC: 2.4G Client Rate Control:	. off		
2.4G Client Rate:	1 *	Mbit/s	
5G Client Rate Control:	. off		l
5G Client Rate:	6 *	Mbit/s	
2.4G MGMT Rate control:	. off		ĺ
2.4G MGMT Rate:	1	Mbit/s	
5G MGMT Rate control:	. off		
5G MGMT Rate:	б *	Mbit/s	l

Figure 5-2 Create Enterprise WLAN - Advanced Mode

WLAN Parameter	Specification
WLAN Name	Label or name of WLAN.
Security Level	Security mode of WLAN, from high to low is Enterprise>Personal>Open. Here
	select the Enterprise mode.
Key Management	WPA3/WPA2/WPA encryption method. It is applicable to Enterprise/Personal
	WLANs only.
	Both(wpa&wpa2): Allowing WPA or WPA2 capable wireless client to
	connect to the WLAN
	<ul> <li>wpa2-enterprise: Allowing WPA2 capable or WPA3 capable wireless client to connect to the WLAN</li> </ul>
	• wpa3-enterprise: Allowing WPA3 capable wireless client to connect to the WLAN. CSNA: Allowing client supporting WPA3 with CNSA (Suite B) to
	connect when checked.
	Note: AP1101 full band does not support WPA3 CNSA encryption, AP1201H and AP1201L 2.4Ghz band does not support WPA3 CSNA encryption. All other APs and radio bands support CSNA encryption. When CSNA encryption is applied to an AP that does not support it, the encryption will automatically fall back to non-CSNA mode (WPA2).
PMF	Stellar supports the IEEE802.11w standard, also known as Protected Management
	Frames (PMF). The PMF function increases the security by providing data confidentiality of management frames. PMF is applicable for WPA2 and WPA3 encryption method.
	Disabled: Disables 802.11w PMF protection for the WLAN.     Optionals Bath 802.11w PMF papels and 802.11w PMF papels
	Optional: Both 802.11w PMF capable clients and 802.11w PMF non- capable clients cap capact the W/I AN
	capable clients can connect the WLAN.
	• Required: Only 802.11w PMF capable clients can associate to the WLAN.
	• For WPA3 Enterprise authentication, if the CNSA is selected, PMF is set to
AuthServer	'required' which means only PMF capable client can connect.
	IPv4/IPv6 address of the authentication server (RADIUS).
AuthPort AuthSecret	Communication port of the authentication server. The default value is 1812.
	Shared secret key used by the authentication server, in ASCII format.
RADIUS Accounting	Select the checkbox if accounting service is needed. By default, it is not selected.
AcctServer	IPv4 address of the accounting server.
AcctPort	Communication port of the accounting server. The default value is 1813.
AcctSecret	Shared secret key used by the accounting server, in ASCII format.
Inactivity Timeout	Enable/Disable inactivity timeout control. If enabled, those clients not
Status	transmitting any packets in the configured period will be disconnected from the wireless network.
Inactivity Timeout	Specify the inactivity timeout internal, default is 600 seconds.
Interval	
Enable	Specify the WLAN state, Yes indicates that WLAN is in broadcast state, while No
Hidden	indicates WLAN is not in broadcast state. Specify visibility of the WLAN, Yes indicates that WLAN is visible to users, while
	No indicates WLAN is invisible.
Multicast	This feature allows APs to convert multicast streams into unicast streams over the
	wireless network based on the IGMP snooping table. Enabling Multicast to Unicast
	(for up to 6 clients) can enhance the quality and reliability of video streams,
	while preserving the bandwidth available to the non-video services.
Broadcast ARP	If enabled, AP will reply to client's ARP request instead of forwarding.
VLAN ID	Identifier of the VLAN to which the WLAN mapping, it is a user VLAN.
Band	Select a value to specify the band at which the network transmits radio signals.
	You can set the band to 2.4 GHz, 5 GHz, or All. The All option is selected by default.

#### Table 5-1: Key word specification in Enterprise WLAN Configuration Window

Scono Tuno	Specify the scope of ADs in the cluster which will create the WI AN
Scope Type	<ul> <li>Specify the scope of APs in the cluster which will create the WLAN.</li> <li>All - All APs in the cluster will create the WLAN.</li> </ul>
	<ul> <li>Group - Select the APs which will create the WLAN. The AP which MAC</li> </ul>
	address is in the group will be valid for the WLAN.
WLAN Access Timer	Specify the WLAN working period, in which only SSID broadcasts. If NOT
	configured (Disabled), SSID will always broadcast if the WLAN is activated.
	• Access Days - Specify the days for broadcasting SSID per week.
	Operational Hours - Specify the time of the day in which broadcasting
	SSID.
Max Clients per	Specify the maximum number of clients that can be configured for each BSSID on
band .	a WLAN. You can specify a value within the range of 1 to 256. The default value is
	64.
Upstream Per	Specify the maximum upstream bandwidth limitation for each user.
Client	
Downstream Per Client	Specify the maximum downstream bandwidth limitation for each user.
Client Isolate	Not permit the clients attached to the same WLAN to communicate with each
	other, they can only communicate with upstream gateway.
802.11r	Select to enable IEEE 802.11r (Fast BSS Transition). The Fast BSS Transition
	mechanism minimizes the delay when a client transitions from one BSS to another
	within the same group.
802.11v	Enables/Disables 802.11v. 802.11v standard defines mechanisms for wireless
	network management enhancements and BSS transition management. It allows
	client devices to exchange information about the network topology and RF
	environment. The BSS transition management mechanism enables an AP to
	request a voice client to transition to a specific AP, or suggest a set of preferred
	APs to a client, due to network load balancing or BSS termination. It also helps
000 441	the client identify the best AP to transition to as they roam.
802.11k	Enables/Disables 802.11k. The 802.11k protocol enables APs and clients to
	dynamically measure the available radio resources. When 802.11k is enabled, APs
	and clients send neighbor reports, beacon reports, and link measurement reports to each other.
802.11b	Enables/Disables allowing 11b legacy clients connect to AP
802.11g	Enables/Disables allowing 11b legacy clients connect to AP
2.4G Client Rate	Enables/Disables 2.4G band access control based on client data rate
Control	Linables/ Disables 2.40 band access control based on client data rate
2.4G Client Rate	2.4G band client with lower data speed will not be allowed to access,
	recommended value 12
5G Client Rate	Enables/Disables 5G band access control based on client data rate
Control	
5G Client Rate	5G band client with lower data speed will not be allowed to access,
	recommended value 24
2.4G MGMT Rate	Enables/Disables 2.4G band wireless management frame rate control
Control	
2.4G MGMT Rate	2.4G band wireless management frame transmit rate, higher value means less
	coverage, lower value means larger coverage. 2.4G Beacon frame does not
	support 9 Mbps or 18 Mbps speed. When 9/18 Mbps is configured for 2.4G MGMT
	Rate, beacon frame will broadcast on 11/24 Mbps rate and other management
	frames (such as probe frame) will broadcast on 9/18 Mbps.
5G MGMT Rate	Enables/Disables 5G band wireless management frame rate control
Control	
5G MGMT Rate	5G band wireless management frame transmit rate, higher value means less
	coverage, lower value means larger coverage. 5G Beacon frame does not support
	9 Mbps speed. When 9 Mbps is configured for 5G MGMT Rate, beacon frame will

	broadcast on 12 Mbps rate and other management frames (such as probe frame) will broadcast on 9 Mbps.
ОКС	If OKC is enabled, a cached pairwise master key (PMK) is used when the client roams to a new AP. This allows faster roaming of clients without the need for a complete 802.1x authentication.
DTIM Interval	The DTIM interval indicates the DTIM period in beacons, which determines how often the AP should deliver the buffered broadcast and multicast frames to associated clients in the power save mode. The default value is 1, which means the client checks for buffered data on the AP at every beacon. User can also configure a higher DTIM value for power saving.
Cancel	The WLAN Creation Window is closed if you click 'Cancel' button.
Save	Click 'Save' to save the configuration and create the WLAN.

#### Create a Personal WLAN

Personal WLAN creation window has two display modes, simplified mode and advanced mode, respectively illustrated in Figure 5-3 and Figure 5-4. You can switch to advanced mode from simplified mode by clicking the hyperlink Advance.

There are five essential parameters to be configured for a Personal WLAN in simplified mode, they are WLAN Name, Security Level, Key Management, Password Format and Password. Other parameters will be considered as per the default value. To configure other advanced parameters, you must switch to advanced mode. Refer to Table 5-2 for details about each parameter.

Create New WLAN		×
WLAN Name:		
Security Level:	Personal ~	
Key Management:	Both(wpa &wpa2) V	
Password Format:	8-63 chars v	
Password:		
Confirm:		
Advance	Cancel Save	

Figure 5-3 Create Personal WLAN - Simplified Mode

Create New WL	AN		×
WLAN Name:			(1-32 chars)
Security Level:	Personal	*	
Key Management:	Both(wpa &wpa2)	•	
Password Format:	8-63 chars	•	
Password:			
Confirm:			
Inactivity Timeout Status:	. off		
Inactivity Timeout Interval:	600		(60-1200)s
Enable:	● Yes ◎ No		
Hidden:	○ Yes ● No		
Multicast:	○ Yes ● No		
Broadcast ARP:	©Yes ●No		
VLAN ID:	0		(0-4090)
Band:	🖉 2.4GHz 🗹 5GHz		
WLAN Access Timer:	on		
Access Days:	∎Mon ∎Tue ∎Wed ∎Thu ∎Fri ∎Sat	Sun	
Operational Hours:	on .		
Start Time:	00:00		hr:min
End Time:	23:59		hr:min
MaxClients Per Band:	64		(1-256)
Upstream Per Client:	0		(0-65536)kbps
Downstream Per Client:	0		(0-65536)kbps
Client Isolate:	. off		
802.11r:	. off		
802.11v:	on 🔒		
802.11k:	on		
802.11b:	on 🕠		
802.11g:	on .		
2.4G Client Rate Control:	. off		
2.4G Client Rate:	1	*	Mbit/s
5G Client Rate Control:	. off		
5G Client Rate:	6	¥	Mbit/s
2.4G MGMT Rate control:	. off		
2.4G MGMT Rate:	1	•	Mbit/s
5G MGMT Rate control:	. off		
5G MGMT Rate:	6	•	Mbit/s
Hide	Cancel	Sav	/e 🗸

Figure 5-4 Create Personal WLAN - Advanced Mode

WLAN Parameter	Specification	
WLAN Name	Label or name of WLAN.	
Security Level	Security Level of WLAN, from high to low is Enterprise>Personal>Open. Here	
	select the Personal type.	
Key Management	WPA3/WPA2/WPA encryption method. It is applicable to Enterprise/Personal WLANs only.	
	<ul> <li>Both(wpa&amp;wpa2): Allowing WPA or WPA2 capable wireless client to connect to the WLAN</li> </ul>	
	<ul> <li>wpa2-personal: Only Allowing WPA2 capable wireless client to connect to the WLAN</li> </ul>	
	<ul> <li>Both(wpa2&amp;wpa3): Allowing WPA2 or WPA3 capable wireless client to connect to the WLAN</li> </ul>	
	<ul> <li>wpa3-personal: Only Allowing WPA3 capable wireless client to connect to the WLAN</li> </ul>	
	• Static-wep: Wireless client is authenticated with Static Wired Equivalent Privacy security algorithm, which is specified in 802.11b and is designed to provide a WLAN with a level of security and privacy comparable to what is usually expected of a wired LAN. You can specify up to 4 WEP keys and make one of them effective for authentication. Each WEP key can be 10 or 26 hexadecimal characters. Recommendation is that a static-wep WLAN is ONLY applicable for those 802.11b clients.	
PMF	Stellar supports the IEEE802.11w standard, also known as Protected Management Frames (PMF). The PMF function increases the security by providing data confidentiality of management frames. PMF is applicable for WPA2 and WPA3 encryption method. Disabled: Disables 802.11w PME protection for the WLAN.	
	<ul> <li>Disabled: Disables 802.11w PMF protection for the WLAN.</li> <li>Optional: Both 802.11w PMF capable clients and 802.11w PMF non-capable clients can connect the WLAN.</li> <li>Required: Only 802.11w PMF capable clients can associate to the WLAN.</li> </ul>	
Password Format	Password format of Personal WLAN. There are two password formats to be selected: Either as a string of 64 hexadecimal digits, or as a passphrase of 8 to 63 printable ASCII characters.	
Password	Enter the password for the Personal WLAN.	
Confirm	Reenter the password for the Personal WLAN.	
Inactivity Timeout Status	Enable/Disable inactivity timeout control. If enabled, those clients not transmitting any packets in the configured period will be disconnected from the wireless network.	
Inactivity Timeout Interval	Specify the inactivity timeout internal, default is 600 seconds.	
Enable	Specify the WLAN state, Yes indicates that WLAN is in broadcast state, while No indicates WLAN is not in broadcast state.	
Hidden	Specify visibility of the WLAN, Yes indicates that WLAN is visible to users, while No indicates WLAN is invisible.	
Multicast	This feature allows APs to convert multicast streams into unicast streams over the wireless network based on the IGMP snooping table. Enabling Multicast to Unicast (for up to 6 clients) can enhance the quality and reliability of video streams, while preserving the bandwidth available to the non-video services	
Broadcast ARP	If enabled, AP will reply to client's ARP request instead of forwarding.	
VLAN ID	Identifier of the VLAN to which the WLAN mapping, it is a user VLAN.	

#### Table 5-2: Key word specification in Personal WLAN Configuration Window

Band	Select a value to specify the band at which the network transmits radio signals. You can set the band to 2.4 GHz, 5 GHz, or All. The All option is selected by
	default.
Scope Type	Specify the scope of APs in the cluster which will create the WLAN.
·	All - All APs in the cluster will create the WLAN.
	Group - Select the APs which will create the WLAN. The AP which MAC address is
	in the group will be valid for the WLAN.
WLAN Access Timer	Specify the WLAN working period, in which only SSID broadcasts. If NOT
	configured (Disabled), SSID will always broadcast if the WLAN is activated.
	Access Days - Specify the days for broadcasting SSID per week.
	<ul> <li>Operational Hours - Specify the time of the day in which broadcasting</li> </ul>
	SSID.
Max Clients per	Specify the maximum number of clients that can be configured for each BSSID on
band	a WLAN. You can specify a value within the range of 1 to 256. The default value
	is 64.
Upstream Per Client	Specify the maximum upstream bandwidth limitation for each user.
Downstream Per	Specify the maximum downstream bandwidth limitation for each user.
Client	
Client Isolate	Not permit the clients attached to the same WLAN to communicate with each
	other, they can only communicate with upstream gateway.
802.11r	Select to enable IEEE 802.11r (Fast BSS Transition). The Fast BSS Transition
	mechanism minimizes the delay when a client transitions from one BSS to
	another within the same group.
802.11v	Enables/Disables 802.11v. 802.11v standard defines mechanisms for wireless
	network management enhancements and BSS transition management. It allows
	client devices to exchange information about the network topology and RF
	environment. The BSS transition management mechanism enables an AP to
	request a voice client to transition to a specific AP, or suggest a set of preferred
	APs to a client, due to network load balancing or BSS termination. It also helps
	the client identify the best AP to transition to as they roam.
802.11k	Enables/Disables 802.11k. The 802.11k protocol enables APs and clients to
	dynamically measure the available radio resources. When 802.11k is enabled, APs
	and clients send neighbor reports, beacon reports, and link measurement reports
	to each other.
802.11b	Enables/Disables allowing 11b legacy clients connect to AP
802.11g	Enables/Disables allowing 11g legacy clients connect to AP
2.4G Client Rate	Enables/Disables 2.4G band accessing control based on client data rate
Control	
2.4G Client Rate	2.4G band client with lower data speed will not be allowed to access,
	recommended value 12
5G Client Rate	Enables/Disables 5G band accessing control based on client data rate
Control	
5G Client Rate	5G band client with lower data speed will not be allowed to access,
	recommended value 24
2.4G MGMT Rate	Enables/Disables 2.4G band wireless management frame rate control
Control	
2.4G MGMT Rate	2.4G band wireless management frame transmit rate, higher value means less
	coverage, lower value means larger coverage
5G MGMT Rate	Enables/Disables 5G band wireless management frame rate control
Control	
5G MGMT Rate	5G band wireless management frame transmit rate, higher value means less
	coverage, lower value means larger coverage
DTIM Interval	The DTIM interval indicates the DTIM period in beacons, which determines how
DTIM Interval	

	the client checks for buffered data on the AP at every beacon. User can also configure a higher DTIM value for power saving.
Cancel	The WLAN Creation Window is closed if you click 'Cancel' button.
Save	Click 'Save' to save the configuration and create the WLAN.

#### Create a Captive Portal WLAN

Captive Portal WLAN creation window has two display modes, simplified mode and advanced mode, respectively illustrated in Figure 5-5 Create Captive Portal WLAN - Simplified Mode and Figure 5-6 Create Captive Portal WLAN - Advanced Mode. You can switch to advanced mode from simplified mode by clicking the hyperlink Advance.

There are three essential parameters to be configured for a Captive Portal WLAN in simplified mode, they are WLAN Name, Security Level (Open) and Captive Portal (Yes). Other parameters will be considered as per the default value. To configure other advanced parameters, you must switch to advanced mode. Refer to Table 5-3 for details about each parameter.

Create New WLAN		×
WLAN Name:		
Security Level:	Open	~
Captive Portal:	● Yes ○ No	
Advance		Cancel Save

Figure 5-5 Create Captive Portal WLAN - Simplified Mode

Create New WL4	AN	×	
WLAN Name:		(1-32 chars)	
Security Level:	Open •		
Captive Portal:	○ Yes ● No		
Inactivity Timeout Status:	. off	- 1	
Inactivity Timeout Interval:	600	(60-1200)s	
Enable:	● Yes <sup>O</sup> No		
Hidden:	○ Yes <sup>®</sup> No		
Multicast:	○ Yes <sup>®</sup> No		
Broadcast ARP:	⊖Yes  No		
VLAN ID:	0	(0-4090)	
Band:	🖉 2.4GHz 🗹 5GHz		
WLAN Access Timer:	. off		
MaxClients Per Band:	64	(1-256)	
Upstream Per Client:	0	(0-65536)kbps	
Downstream Per Client:	0	(0-65536)kbps	
Client Isolate:	. off		
802.11v:	on		
802.11k:	on		
802.11b:	on .		
802.11g:	on .		
2.4G Client Rate Control:	. off		
2.4G Client Rate:	1 *	Mbit/s	
5G Client Rate Control:	. off		
5G Client Rate:	б •	Mbit/s	
2.4G MGMT Rate control:	. off		
2.4G MGMT Rate:	1	Mbit/s	
5G MGMT Rate control:	. off		
5G MGMT Rate:	6 •	Mbit/s	
Hide	Cancel	Save	

Figure 5-6 Create Captive Portal WLAN - Advanced Mode

WLAN Parameter	Specification
WLAN Name	Label or name of WLAN.
Security Level	Security Level of WLAN, from high to low is Enterprise>Personal>Open. Here
	select the Open type.
Captive Portal	Specify the captive portal authentication supporting state. Yes indicates the
-	WLAN supports captive portal authentication, while No indicates the WLAN does
	not support captive portal authentication.
Inactivity Timeout	Enable/Disable inactivity timeout control. If enabled, those clients not
Status	transmitting any packets in the configured period will be disconnected from the
	wireless network.
Inactivity Timeout	Specify the inactivity timeout internal, default is 600 seconds.
Interval	
Enable	Specify the WLAN state, Yes indicates that WLAN is in broadcast state, while No
	indicates WLAN is not in broadcast state.
Hidden	Specify visibility of the WLAN, Yes indicates that WLAN is visible to users, while
	No indicates WLAN is invisible.
Multicast	This feature allows APs to convert multicast streams into unicast streams over
	the wireless network based on the IGMP snooping table. Enabling Multicast to
	Unicast (for up to 6 clients) can enhance the quality and reliability of video
	streams, while preserving the bandwidth available to the non-video services
Broadcast ARP	If enabled, AP will reply to client's ARP request instead of forwarding.
VLAN ID	Identifier of the VLAN to which the WLAN mapping, it is a user VLAN.
Band	Select a value to specify the band at which the network transmits radio signals.
Dania	You can set the band to 2.4 GHz, 5 GHz, or All. The All option is selected by
	default.
Scope Type	Specify the scope of APs in the cluster which will create the WLAN.
	• All - All APs in the cluster will create the WLAN.
	Group - Select the APs which will create the WLAN. The AP which MAC address is
	in the group will be valid for the WLAN.
WLAN Access Timer	Specify the WLAN working period, in which only SSID broadcasts. If NOT
	configured (Disabled), SSID will always broadcast if the WLAN is activated.
	Access Days - Specify the days for broadcasting SSID per week.
	<ul> <li>Operational Hours - Specify the time of the day in which broadcasting</li> </ul>
	• Operational roots - specify the time of the day in which broadcasting SSID.
Max Clients per	Specify the maximum number of clients that can be configured for each BSSID on
band	a WLAN. You can specify a value within the range of 1 to 256. The default value
band	is 64.
Upstream Per Client	Specify the maximum upstream bandwidth limitation for each user.
Downstream Per	Specify the maximum downstream bandwidth limitation for each user.
Client	specify the maximum downstream bandwidth timitation for each user.
Client Isolate	Not permit the clients attached to the same WLAN to communicate with each
client isolate	other, they can only communicate with upstream gateway.
802.11r	Select to enable IEEE 802.11r (Fast BSS Transition). The Fast BSS Transition
002.111	mechanism minimizes the delay when a client transitions from one BSS to
802.11v	another within the same group. Enables/Disables 802.11v. 802.11v standard defines mechanisms for wireless
002.119	network management enhancements and BSS transition management. It allows
	client devices to exchange information about the network topology and RF
	environment. The BSS transition management mechanism enables an AP to
	request a voice client to transition to a specific AP, or suggest a set of preferred
	APs to a client, due to network load balancing or BSS termination. It also helps
	the client identify the best AP to transition to as they roam.

#### Table 5-3: Key word specification in Captive Portal WLAN Configuration Window

802.11k	Enables/Disables 802.11k. The 802.11k protocol enables APs and clients to
	dynamically measure the available radio resources. When 802.11k is enabled, APs
	and clients send neighbor reports, beacon reports, and link measurement reports
	to each other.
802.11b	Enables/Disables allowing 11b legacy clients connect to AP
802.11g	Enables/Disables allowing 11g legacy clients connect to AP
2.4G Client Rate	Enables/Disables 2.4G band accessing control based on client data rate
Control	
2.4G Client Rate	2.4G band client with lower data speed will not be allowed to access,
	recommended value 12
5G Client Rate	Enables/Disables 5G band accessing control based on client data rate
Control	
5G Client Rate	5G band client with lower data speed will not be allowed to access,
	recommended value 24
2.4G MGMT Rate	Enables/Disables 2.4G band wireless management frame rate control
Control	
2.4G MGMT Rate	2.4G band wireless management frame transmit rate, higher value means less
	coverage, lower value means larger coverage
5G MGMT Rate	Enables/Disables 5G band wireless management frame rate control
Control	
5G MGMT Rate	5G band wireless management frame transmit rate, higher value means less
	coverage, lower value means larger coverage
DTIM Interval	The DTIM interval indicates the DTIM period in beacons, which determines how
	often the AP should deliver the buffered broadcast and multicast frames to
	associated clients in the power save mode. The default value is 1, which means
	the client checks for buffered data on the AP at every beacon. User can also
	configure a higher DTIM value for power saving.
Cancel	The WLAN Creation Window is closed if you click 'Cancel' button.
Save	Click 'Save' to save the configuration and create the WLAN.

After the WLAN has been created, proceed to: <u>How to Configure Captive Portal Authentication</u> to compete the configuration.

# Delete Your WLAN

In WLAN Window Advanced Mode Figure 4-3 WLAN Window-Advanced Mode, you can delete the WLAN by clicking the '\*' Button, as shown in Figure 5-7.

VLAN Configura	ation			
WLAN Name	Status	Security Level	Captive Portal	Operate
mywifi-1x	Enable	enterprise	No	🖍 🗙 wmm
mywifi-employee	Enable	personal	No	🖍 🗙 wmm
mywifi-guest	Enable	open	Yes	🖍 🗙 wmm
mywifi-portal2	Disable	open	No	🖍 🗙 wmm

Figure 5-7 Delete a WLAN

## Modify Your WLAN

In WLAN Window Advanced Mode Figure 4-3 WLAN Window-Advanced Mode, you can modify the WLAN by clicking the ' A Button, shown in Figure 5-8. All configurable WLAN parameters will be displayed on the right of WLAN Window Advanced Mode, Enterprise WLAN see Table 5-1, Personal WLAN see Table 5-2 and Captive Portal WLAN see Table 5-3. Click Cancel to cancel the modification or click Save to save the configuration.

WLAN Configura	tion							>
WLAN Name	Status	Security Level	Captive Portal	Operate	Edit WLANInfo			
mywifi-1x	Enable	enterprise	No	💉 🗙 wmm	WLAN Name:	mywifi-employee	(1- 32 chars)	^
mywifi-employee	Enable	personal	No	<u>/</u> 🗙 wmm	Security Level:	Personal ~		
mywifi-guest	Enable	open	Yes	💉 🗙 wmm	Key Management: Password Format:	Both(wpa &wpa2) ~ 8-63 chars ~		
mywifi-portal2	Disable	open	No	💉 🗙 wmm	Password:	•••••		
					Confirm:	•••••		1
					Enable:	©Yes ONo		
					Hidden:	⊖ Yes <sup></sup> No		
					MaxClients Per Band:	64	(1-120)	
					RSSIThreshold:	0	(0-100)db	~

Figure 5-8 Modify a WLAN

# Modify WLAN QoS

Wi-Fi Multimedia (WMM) is a Wi-Fi Alliance interoperability certification, based on the IEEE 802.11e standard. It provides basic Quality of service (QoS) features to IEEE 802.11 networks. WMM prioritizes traffic according to four Access Categories (AC): voice (AC\_VO), video (AC\_VI), best effort (AC\_BE), and

Stellar AP User Guide ALCATEL-LUCENT ENTERPRISE background (AC\_BK). It is suitable for well-defined applications that require QoS, such as Voice over IP (VoIP) on Wi-Fi phones.

You can edit the mapping relationship	between DSCP/802.1p va	alues and WMM prioritie	s for a WLAN on
Stellar AP, illustrated in Figure 5-9.			

WLAN Configura	ation							
WLAN Name	Status	Security Level	Captive Portal	Operate	WMM Edit			
mywifi-1x	Enable	enterprise	No	🖍 🗙 wmm	Uplink:WMM->DSCP/8	02.1P	Downlink:D	SCP/802.1P->WMM
mywifi-employee	Enable	personal	No	V X		DSCP		802.1P
mywifi-guest	Enable	open	Yes	× × wmm	Background Best effort	10	]	1
mywifi-portal2	Disable	open	No	🖍 🗙 wmm	Video	40	]	4
					Voice	46	]	6
					Each WMM corresponds to be duplicated. The range of t			/8021.p value of each type of WMI value is 0-7. Reset Save

Figure 5-9 Modify WLAN QoS

# 6 AP Management

This chapter describes how to configure and manage your AP. The ALE Wi-Fi solution is a controller-less based architecture. The APs can establish an autonomous group, in which there are three types of AP roles, Primary Virtual Management (PVM), Secondary Virtual Management (SVM) and member AP. This chapter describes how to manage the group and how to check, backup, restore AP configuration and to upgrade firmware in GUI.

AP Management procedures described in this chapter include:

- → <u>AP Group Management</u>
- → Import and Export AP Configuration
- Upgrade AP Firmware
- → Modify AP Name and IP Address
- → Check AP Configuration Detail
- → Modify AP Transmission Power and Channel
- → <u>AP LED Specification</u>
- → Locate AP or Turn LED Off
- → Kick off an AP from the group
- → Allow an AP to join the group
- → How to add a new AP to the group
- → How to replace an current AP in the group
- → How to Setup Wireless Networks with more than 64 APs
- → How to Configure the AP if there is no DHCP server

### **AP Group Management**

By default, APs will have the group ID 100 and all APs that have the same group ID will align to the same group. The group will select the AP which has the highest MAC address as the PVM and the AP which has the second highest MAC address as the SVM. Each group has a management IP address that is a virtual IP and will be assigned to the PVM. When the PVM fails to respond due to an unexpected error or issue, the SVM will automatically upgrade to act as the PVM. There will be no interruption or service disturbance to member APs or any of the wireless users.

Table 6-1 describes the several group attributes parameters.

To configure or modify the group attributes, launch the window 'System-General Configuration', as shown in Figure 6-1. AP group information will be displayed at the top of the Dashboard, as shown in Figure 6-2.

Parameter	Specification
Group ID	Define a unique AP Group
Group Name	Name of the group
Location	Specify where you will deploy this group of APs. Provide specific name to identify the group location.
Group	It is a virtual IP address and will be dynamically assigned to the PVM. It is
Management IP	used for the group management and can be configured manually.

#### Table 6-1: AP Group Attribution Parameters Specification

Group	Netmask of Group Management IP.
Management	
Netmask	

General Configuration			×
Group Info Management		Account	Management
Group Name:	mywifi_in_office		(1-25 chars)
Location:	Paris		(1-32 chars)
Group Management IP:	192.168.1.200		
Group Management Netmask:	255.225.255.0		
		Cancel Save	
Group ID:	8848	* *	(1-9999)
		Cancel Save	



Alcatel-Lucent	AP Group : mywifi_in_office - 192.168.1.200 Paris	Administrator Logout   About Help   English 📸 Tools   Polling Cycle: 30s 🗸 😭

Figure 6-2 AP Group Information Location

AP Configuration					
Primary Name	IP	Firmware	Operate		
		PVC			
AP-00:E0	192.168.20.162(AP 192.168.1.200(M)		●cfg ●firmware ●reboot		
		SVC			
MEMBER					
		Joining			

Figure 6-3 AP Group Management IP

There are two IP addresses on the PVM of the group, illustrated in Figure 6-3 (Navigate:Dashboard - AP Window - AP Configuration Window).

1. AP IP address [e.g.: 192.168.20.162(AP)] - The IP of the PVM which used to communicate with other Stellar APs in the group and with network entities outside the group. It can be set manually or assigned from a DHCP server in the network.

2. AP Group Management IP address [e.g.: 192.168.1.200(M)] - The virtual IP for the group management. It can be set by the administrator manually and as a static group management entrance through wired or wireless access.

# Import and Export AP Configuration

In the AP Configuration Window (Navigate: Dashboard - AP Window - AP Configuration Window), you can backup, recover or clear the group configuration, illustrated in Figure 6-4 and Figure 6-5.

AP Configuration					
Primary Name	IP	Firm	ware Operate		Detailed Information
AP-00:E0	192.168.20.162(AP) 192.168.1.200(M) 192.168.20.60	PVC 2.1.0 SVC 2.1.0 MEMBER Joining	You have chosen to open: cluster.conf which is: conf File (13.4 KB)	Browse w on. IP Mode: IP: Netmask: Default Gateway:	AP-00:E0 Edit Edit Working PVC 11111111 OAW-AP1101 2.1.0.63 Wed Aug 24 11:54:49 UTC 2016 Success dhcp Edit 192.168.20.162 255.255.25.0 192.168.20.254

Figure 6-4 Export AP Group Configuration

AP Configuration					
Primary Name	IP	Firmware	Opera	ite	Restore All Configuration
		PVC			Browse cluster.conf
AP-00:E0	192.168.20.162(AP) 192.168.1.200(M)	2.1.0.63	©cfg	<b>⊙</b> firmware <b>⊙</b> reboot	Name: cluster.conf Size: 0.01 Mb
		SVC			Remove Upload
AP	192.168.20.60	2.1.0.60	©cfg	<b>⊙</b> firmware <b></b> ©reboot	
	Ν	1EMBER			
		Joining			
	Clear All Configur	ation Backup	All Config	uration Restore Al Configu	ation Upgrade Al Firmware

Figure 6-5 Import AP Group Configuration

#### Table 6-2: AP Group Configuration

Parameter	Specification
Clear All Configuration	Clear all AP configurations, return to factory state.
Backup Al Configuration Download and backup configuration file of AP group, it is recommended to do this when you have completed all configuration.	
Restore All Configuration	Upload configuration file to all APs.

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Jpgrade All Firmware



Note6-1: All configuration settings (clear, backup or restore) will be applied to the entire group. There is no need to select specific APs to apply configuration settings. The entire group of APs have one configuration file.

## Upgrade AP Firmware

Before upgrading the AP you should prepare the firmware file to be upgraded. You can download the firmware file and save it in the local drive of the machine you are using to connect to the Stellar AP or save the firmware file in a remote TFTP server.

In the AP Configuration Window (Navigate: **Dashboard-AP Window-AP Configuration Window**), there are separate entrances for upgrading a single AP or all the APs in a group:

- 1. Upgrade single AP: Select the AP to be upgraded from the AP list, click Ofirmware to upload firmware, illustrated in Figure 6-6 and Figure 6-7. Generally, it takes approximately five minutes to upgrade the AP firmware.
- **2.** Upgrade all APs: Click on Upgrade Al Firmware to open a dedicated upgrade page to upload separate AP firmware for each AP model and upgrade, illustrated in Figure 6-8.

AP Config	juration						×
Primary N	ame IP		Firmware	Operate		Update Firmware	
		I	PVC			Don't turn off the power during the upgrade process!	
AP-00:E0		168.20.162(AP) 168.1.200(M)	2.1.0.63	©cfg <b>①</b> fir	mware <b>O</b> reboot	©Image File OImage File URL	
St	tep1:select the Al	P :	SVC			Browse Jaos-wng-r21-osupgrade.bin     Name: aos-wng-r21-osupgrade.bin	
AP	192.	168.20.60	2.1.0.60	©cfg (⊕fir	mware Oreboot	Size: 13.56 MBi	
		ME	MBER		Step2		
		JC	vining			Remove Upload Step4	
		Clear All Configurat	tion Backup /	NI Configuration	Restore All Configurat	ration Upgrade All Firmware	

Figure 6-6 Update Single AP using Local Image File

You can also upload the AP firmware from a specified URL as shown in Figure 6-7.

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#### **AP** Management

AP Configuration				3
Primary Name AP-00:E0	IP 192.168.20.162(AP) 192.168.1.200(M)	Firmware PVC 2.1.0.63	Operate ©cfg Ofirmware Oreboot	Update Firmware Don't turn off the power during the upgrade process! OImage Fie
		SVC	$\frown$	URL: TFTP://192.168.20.102/aos-wng-r21-osu
AP		2.1.0.60 IEMBER Joining	Org Offrmware Oreboot	(TFTP://p/fie.bin) (FTP://p[:Port]/path/fie.bin:UserName:Password) Upbad
	Clear All Configur	ation Backup	All Configuration Restore All Co	onfiguration Upgrade Al Firmware

Figure 6-7 Update Single AP from Remote TFTP Server

Multi-model Upgrade			
Model	Firmware	AP Quantity	Update Firmware
AP1101 AP1220	3.0.0.70 3.0.0.70	1	Don't turn off the power during the upgrade process! #Image File @Image File URL #Image File #Image File #Image File URL #Image File #Imag





Note 6-2: In order to make sure you're running the latest software, we strongly recommend to clear the browsing data in your browser after the software upgrade, including:

Cookies

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Cache

## Modify AP Name and IP Address

In the AP Configuration Window (Navigate: **Dashboard-AP Window-AP Configuration Window**), you can modify the name and other parameters as needed for the AP in Detailed Information panel.

→ Modify AP Name

	Detailed Information
APName:	AP-05:30 Edit
Location:	Edit
Status:	Working
Role in Group:	PVC
Serial Number:	NI9GG22Y006UC01
Model:	OAW-AP1101
Firmware:	2.1.0.65
Upgrade Time:	Wed Sep 7 02:27:11 UTC 2016
Upgrade Flag:	Success

Figure 6-9 Modify AP Name

Click on "Edit" to modify the AP name. Enter a name to identify the AP. By default, an Stellar AP is named with the last two bytes of its MAC address (e.g. 05:30 is the last-two-byte MAC address of the Stellar AP in Figure 6-9).

#### → Modify AP IP Address

Enter an IP address to modify AP IP address. Stellar AP supports both static and dynamic IP addresses, illustrated in Figure 6-10.

	Detailed Information
APName:	AP Edit
Location:	Edit
Status:	Working Kick Off
Role in Group:	SVC
Serial Number:	NI9GG22Y006UC01
Model:	OAW-AP1101
Firmware:	2.1.0.60
Upgrade Time:	Fri Aug 19 15:18:42 UTC 2016
Upgrade Flag:	Success
IP Mode:	dhcp (Edit
IP MOUE.	192.168.20.60
Netmask:	255.255.255.0
Default Gateway:	
Dendie Odeendy.	15211001201251
0	
ODHCP	Cancel Save
IP:	192.168.20.60
Netmask:	255.255.255.0
Default Gateway:	192.168.20.254

#### Figure 6-10 Modify AP IP Address

## Check AP Configuration Detail

Click to verify AP configuration in the AP Configuration Window (Navigate: Dashboard-AP Window-AP Configuration Window).

AP Configuration				×
Primary Name	IP	Firmware	Operate	Current Configuration
AP-05:30	192.168.20.106(AP) 192.168.20.162(M)	PVC 2.1.0.65	●cfg Ofirmware Ureboot	option scan_interval '10' option foreign_ch_dur '50' option scan_iface0 'athscan0' option scan_iface1 'athscan1'
AP-00:E0	192.168.20.110 N	SVC 2.1.0.65 IEMBER	Treboot	[captive_portal] config captive_portal 'eag' option local_database '1'
34:e7:0b:00:0d:80	192.168.20.135	leinin –	●cfg ④firmware Ůreboot	option idletime '900' option idleflow '10240' option account_interval '900'
		loining		option dns_redir '0' list essid 'mywifi-guest' list essid 'mywifi-portal' option switch '1' list mac_white_rule '4c:48:da:24:f0:20-4c:48:da:24:f0:20' list white_list '192.168.1.200' option auth_mode '0'
	Clear All Config	uration Back	up All Configuration Restore All Co	Upgrade All Firmware

Figure 6-11 Check AP Configuration Detail

## Modify AP Transmission Power and Channel

You can modify the transmission power and working channel for the Stellar AP in the RF Configuration Window. (Navigate: Dashboard-Wireless Page-RF Window-RF Configuration Window)

RF Configu	iration									×
Global:	5G Channel Width(MHz)	uto 🗸		Save						
AP	2.4GHz Ch	2.4GHz Po	5GHz Cha	5GHz Pow			Edit RF Infor	mation		
AP-D9:20	auto(1)	auto(18)	auto(149)	auto(33)	1.	Channel				
AP-D8:70	inactive	inactive	inactive	inactive	1	Channel				
AP-D5:D0	auto(6)	auto(17)	auto(36)	auto(23)	1	ACS:	ON O	OFF		
AP-B2:C0	auto(6)	auto(17)	auto(52)	auto(22)	1	Client Aware:	. off			
						Channel:	149	~		
						Channel Width:	Auto	~	(MHz)	
						Channel List:				
						Power				
						APC:		OFF		
						Power:	33		(3-40)dBm	
						Auto Power Rang	e: Min -		(3-40)dBm	

Automatic Channel Selection (ACS) and Automatic Power Control (APC) are turned ON by default. The AP transmission power and channel are adjusted dynamically by default. If you disable ACS and APC the channel

used by the AP and the transmit power must be set manually. In manual mode the AP transmit power can be adjusted in 1 dB increments. These values must be set for both radio bands.

## AP LED Specification

Table 6-3: Describes the LED status during different stages of Stellar AP.

Red	Blue	Green	Time Line	Status	
ON			Power on	Power on	
ON			Bootloader- OS loading	System start up	
Flas h			System running	Network abnormal (Interface down)	
		Flash	System running	Network normal, without SSID created	
		ON	System running	Network normal, single band working, ether 2.4Ghz or 5Ghz working	
	ON		System running	Network normal, dual bands working, 2.4Ghz and 5Ghz are both working	
Flas h	Flash		System running	Red and Blue LED rotate flash in a specific frequency; OS upgrading	
Flas h	Flash	Flash	System running	3 LED rotate flash in a specific frequency; Used for location an AP	

## Locate AP or Turn LED Off

Step1: Click in AP Window of Dashboard to launch 'LED-Off/Locate' buttons.
Step2: Click 'LED-Off' to turn off the LED light.

AP	Working:2	Down:0	Joining:0
Primary Name	State	JS	Clients
• AP-00:E0	Work	ing	2
<ul> <li>↓ Locate</li> <li>☆ AP</li> </ul>	Work	ing	0

Figure 6-13 Turn LED off

Step3: Click "Locate" to locate AP.

#### **AP** Management

AP	Working:2 Dov	wn:0 Joining:0
Primary Name	Status	Clients
AP-00:E0     LED-On /Cocate	Working	2
Ý AP	Working	0
Fi	gure 6-14 Locate Al	0

Figure 6-14 Locate AP

The Restore window appears. The LED blinks with red, blue and green color.

Step 4: Click "Restore" to return to the normal state.

AP	Working:2 Down:0	Joining:0
Primary Name	Status	Clients
AP-00:E0	Working	2
Restore     AP	Working	0

Figure 6-15 Restore AP state

## Remove an AP from the Group

An AP is removed from the AP group list (PVM/SVM/Member) by selecting "kick off". Then the AP enters a group blacklist, if it is not disconnected from the network it will move to the '**Joining**' state, and without authorization is not permitted to be a member of group again. See in Figure 6-16 and Figure 6-17.

AP Configuration				
Primary Name	IP 192.168.20.162(AP)	Firmware PVC	Operate	Detailed Information APName: AP Edit
AP-00:E0	192.168.1.200(M)	2.1.0.63 SVC	●cfg Ofirmware Oreboot	Location: Edit Status: Working (Cck Off)
AP	192.168.20.60 M	2.1.0.60 IEMBER	●cfg ●firmware ●reboot	Role in Group: SVC Serial Number: NI9GG22Y006UC01
		Joining		Model:OAW-AP1101Frmware:2.1.0.60Upgrade Time:Fri Aug 19 15:18:42 UTC 2016Upgrade Flag:SuccessIP Mode:dhcpEditIP:192.168.20.60Netmask:Default Gateway:192.168.20.254
	Clear All Configur	ation Backup	All Configuration Restore All Configu	ration Upgrade Al Firmware

Figure 6-16 Remove an AP from Group

## Allow an AP to Join the Group

AP Configuration				×
Primary Name	IP	Firmware	Operate	Detailed Information
		PVC		
AP-00:E0	192.168.20.162(AP) 192.168.1.200(M)	2.1.0.63	●cfg <b>①</b> firmware <sup>①</sup> reboot	
		SVC		Status: Joining Accept
	ī	MEMBER		
		Joining		
34:e7:0b:00:05:30	192.168.20.60	2.1.0.60	●cfg ●firmware <sup>●</sup> reboot	
	Clear All Configu	ration Backup	All Configuration Restore All Configural	ration Upgrade All Firmware

Figure 6-17 Allow AP to join group

In the displayed AP Configuration screen, an AP in 'Joining' state is in the group blacklist, the 'Accept' operation lets it join the group and removes it from the group blacklist.

## How to Add a New AP to Group

To add a new AP to the group, ensure that the PVM is not in the 'Down' state. If the PVM is down, upgrade the SVM to be the PVM before plugging in the new AP.

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## How to Replace a Current AP in Group

- 1. To replace the current PVM: Upgrade the SVM to the PVM before disconnecting the old PVM. Then replace the old PVM with a new Stellar AP.
- 2. To replace the SVM or a MEMBER of the group: Disconnect and replace the SVM or member directly with a new Stellar AP, users on other Stellar APs will not be affected.

## How to Setup Wireless Networks With large scale of Stellar ΔPs

If you have more Stellar APs than a group specification, you can setup more than one AP group to provide Wi-Fi service.

There are three methods to setup more than one AP group in the network:

Method one: Divide the Stellar APs into different subnets by changing the default VLAN of the switch ports to which the Stellar APs connect; for example: subnet-A uses default VLAN 100 while subnet-B uses default VLAN 200.

**Method two**: Setup up different group IDs for each AP group respectively. Perform the following steps:

- 1. Select the APs which you want to work in Group-A, plug in to the switch to build the first AP group;
- 2. Browse to the Group-A management interface and change its group ID. (For example: change the group ID from 100 to 8818), see in General Window.
- 3. Repeat the above process to setup Group B/C/etc.

Method three: Deploy Stellar AP with ALE OmniVista and scale up to 4000 AP in one network.



Note 6-3: Without Omni Vista management, each group is managed independently and roaming between groups

is not supported.

## How to Configure the AP if There is No DHCP server

**Case one:** If the APs reboot and the DHCP server is not accessible, all the APs return to the system default IP -192.168.1.254. This means there are duplicate IPs in the broadcast domain. All the APs work separately as the PVM and broadcast the same WLANs. In this case, it is highly recommended to fix the DHCP sever in the network and let the wireless service recover.

**Case two:** If you want to configure a single Stellar AP without a DHCP server, perform the following steps:

- 1. Connect the Stellar AP (default IP address is 192.168.1.254) to your configuring terminal (laptop for example) directly with an Ethernet cable.
- 2. Specify a static IP address and a DNS sever for the network card of your laptop, for example: IP Address - 192.168.1.100; Subnet Mask - 255.255.255.0; Default Gateway - 192.168.1.254; DNS sever -192,168,1,254.

Stellar AP User Guide ALCATEL-LUCENT ENTERPRISE 3. Browse <u>http://mywifi.al-enterprise.com:8080</u> or <u>http://192.168.1.254:8080</u> to configure the Stellar AP.

## 7 Authentication Management

As WLANs evolve from best-effort to mission-critical infrastructure, organizations are finding that the operational aspects of network security take on much greater importance. The ALE Wi-Fi solution supports enhanced security methods to assure your wireless connection is more secure to eliminate any type of potential sniffers and other security threats. The major features of the ALE WLAN are:

- To secure users and network traffic in a WLAN ALE provides a full suite of authentication, encryption, and policy enforcement capabilities in an architecture that allows easy integration of additional security services.
- Wireless Intrusion Prevention System (WIPS) To enforce no-wireless policies or detect attacks against a WLAN, ALE AP provides advanced threat detection and suppressing functions. An AP can scan the wireless environment and detect the potential rogue and restrict it from replying to user connection requests.

AP Security described in this chapter includes:

- Authentication and Encryption Methods
- How to Configure Captive Portal Authentication

### Authentication and Encryption Methods

When creating a WLAN, select the security type as illustrated in Figure 7-3.

- Open: No Authentication or encryption method for this WLAN. User data will be transmitted as Plain text Transmit Mode.
- → Personal: There will be Static-WEP, and several WPA, WPA2, WPA3 combinations available once you select Personal. This does not require an external RADIUS server as illustrated in Figure 7-3.
- Enterprise: Authentication method will be based on WPA Enterprise Architecture. Encryption method
   TKIP or AES is selected. An external RADIUS server is required as illustrated in Figure 7-4.



Note 7-1: WPA uses 802.1X authentication which is one of the Extensible Authentication Protocol (EAP) types available today. 802.1X is a port-based network access control method for wired, as well as wireless, networks. It was adopted as a standard by the IEEE in August of 2001. EAP handles the presentation of users' credentials, in the form of digital certificates (already widely used in Internet security), unique usernames and passwords, smart cards, secure IDs, or any other identity credential that the IT administrator is comfortable deploying. WPA allows flexibility in both the type of credentials that are used and in the selection of an EAP type. Enterprise Authentication is developed for medium and large businesses and requires a RADIUS authentication server that provides automatic key generation and authentication throughout the entire enterprise.

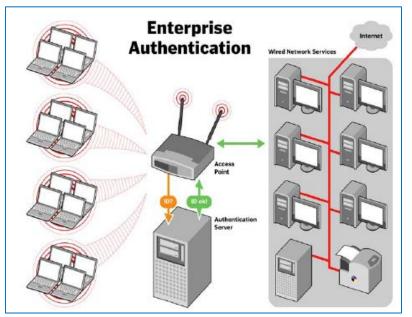


Figure 7-1 Enterprise Authentication

Users in small office and home office (SOHO) wireless LAN environments lack the budget and IT staff to install and maintain RADIUS authentication servers. There are alternatives for this type of wireless LAN authentication and validation: Static-WEP and WPA-Personal. Both protocols use a pre-shared key, but the encryption on WEP is weaker than the encryption on WPA-Personal systems. It's recommended to use WPA-Personal instead of WEP protocol for encryption and authentication.



Figure 7-2 SOHO Authentication

Create New WLAN		×
WLAN Name:	mywifi-employee	•
Security Level:	Personal	L
Key Management:	Both(wpa &wpa2)	
Password Format:	Both(wpa &wpa2) wpa2-personal	
Password:	Both(wpa2&wpa3) wpa3-personal	L
Confirm:	•••••	L
Advanced	Caperal	•

Figure 7-3 Authentication Security Type-Personal

Create New WLAN		×
WLAN Name:	mywifi-employee	A
Security Level:	Enterprise •	
Key Management:	wpa3-enterprise 🔻	
CNSA:	Both(wpa &wpa2) wpa2-enterprise	- 1
AuthServer:	wpa3-enterprise 192.168.1.100	- 1
AuthPort:	1812	- 11
AuthSecret:	•••••	
Nas Identifier:	10	-

Figure 7-4 Authentication Security Type-Enterprise

There are multiple Wi-Fi security protocols for personal and enterprise networks:

- Wired Equivalent Privacy (WEP), introduced as part of the original 802.11 standard ratified in 1997. It uses the RC4 cipher to ensure confidentiality and a CRC-32 Checksum to ensure integrity of the data transmitted.
- Wi-Fi Protected Access (WPA) became available in 2003. It was the replacement to the increasingly apparent vulnerabilities of the WEP encryption standard. The keys used by WPA are 256-bit, a significant increase over the 64-bit and 128-bit keys used in the WEP system. WPA includes message integrity checks and the Temporal Key Integrity Protocol (TKIP). TKIP employs a per-packet key system that was radically more secure than the fixed key system used by WEP. RC4 cipher is still used to ensure confidentiality in WPA.

- WPA2 replaced WPA began in 2004. Most important upgrade is mandatory use of AES algorithms (instead of previous RC4) and the introduction of CCMP (AES CCMP, Counter Cipher Mode with Block Chaining Message Authentication Code Protocol, 128 Bit) as a replacement for TKIP (which is still present in WPA2, as a fallback system and WPA interoperability).
- WPA3 began as a replacement to WPA2 in 2018. It introduces new features to simplify Wi-Fi security, including enabling better authentication, increased cryptographic strength, and requiring the use of Protected Management Frames (PMF) to increase network security. WPA3-Personal uses Simultaneous Authentication of Equals (SAE) which replaces Pre-Shared Key (PSK) in WPA2-Personal. SAE improves security of the initial key exchange and offers better protection against offline dictionary-based attacks. WPA3-Enterprise utilizes 192-bit security while still using the 802.1x standard to provide a secure wireless network for enterprise use. This provides a superior encryption method to better protect any kind of data. The security suite is aligned with the recommendations from the Commercial National Security Algorithm (CNSA) suite and commonly placed in high-security Wi-Fi networks such as in government, defense, finance, and other industries.

## How to Configure Captive Portal Authentication

### Create a Captive Portal WLAN

Navigate: Dashboard-WLAN window->'New' button.

Create New WL	AN	×
WLAN Name:	mywifi-portal	(1- 32 chars) ^
Security Level:	Open ~	1 1
Captive Portal:	● Yes ○ No	
Enable:	● Yes ○ No	- 1
Hidden:	⊖ Yes ● No	
VLAN ID:	0	(0-4094)
Band:	2.4GHz 🗹 5GHz	
MaxClients Per Band:	64	(1-120)
Upstream Per Client:	0	(0-65536)kbps
Downstream Per Client:	0	(0-65536)kbps
		¥

Figure 7-5 Create Captive Portal type WLAN

If you have created the captive portal WLAN, proceed to: Enable Captive Portal Service.

### Enable Captive Portal Service

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Login by:	●Account ○ Access Code ○	) Terms Of use		
UserName	Starting Date	Ending Date	Operate	
guest1	2016.08.25	2016.08.31	/ ×	
guest2 Add	2016.08.25	2016.08.31	/×	

Navigate: Dashboard-Access Page-Authentication Window-Authentication Configuration Window.

Figure 7-6 Enable Captive Portal Service

After you have enabled the captive portal service, proceed to: Select Your Login Method.

#### Select Your Login Method

Navigate: Dashboard-Access Page-Authentication Window-Authentication Configuration Window.

Authentication Co	onfiguration		
Captive Portal: on	D	Cust	omized Portal Page
Login by:		Terms Of use	
UserName	Starting Date	Ending Date	Operate
guest1	2016.08.25	2016.08.31	/ ×
guest2	2016.08.25	2016.08.31	/×
Add			
User Behavior: 👩			
TFTP Server: 192.168	8.0.1 Cycle: 1h v	Save Upload Now	

Figure 7-7 Select Your Login Method

There are three login methods for the captive portal authentication:

- (1) Login by account and password;
- (2) Login by unified access code for the organization;
- (3) Login by accepting terms of use;

If you have selected the account or access code login method, proceed to: Create Users or Access Code.

#### Create Users or Access Code

Navigate: Dashboard-Access Page-Authentication Window-Authentication Configuration Window.

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Authentication Conf	iguration					×
Captive Portal: on .		Cust	omized Portal Page	(	Add Local Auth User	
Login by:	Account     O Access Code C	) Terms Of use		*UserName:		Â
UserName	Starting Date	Ending Date	Operate	*Password:		
guest1	2016.09.05	2016.09.30	/×	*Confirm:		
guest2	2016.09.05	2016.09.30	/×	Firstname		
				Lastname		
				Mail		
				Phone		
				Company		
Add				*Starting Date	<b></b>	
User Behavior: on		n		*Ending Date		
*TFTP Server: 192.168.0	0.1 Cycle: 1h ~	Save Upload Now			Cancel Save	J.

Figure 7-8 Create Captive Portal Users



Note 7-2: If you have selected login by account method for the captive portal authentication, it ONLY supports users in the local user database. It does not support connecting to an external authentication server. You can add user accounts to the local user database, see in Figure 7-8.

Note 7-3: Single user account can be used by multiple devices simultaneously, there are no limits to the number of devices a captive portal user account can connect to the network.

Authentication Configuration			×
Captive Portal: on . Login by: OAccount OAccess CodeD Te	Customized Portal Page	Access Code:	Add Access Code
Access Code	Operate		Cancel Save
123456	×		
Add User Behavior: on .			
TFTP Server: 192.168.0.1 Cyde: 1h V Sa	Ve Upload Now		

Figure 7-9 Create Access Code

#### Customize Your Splash Page (Optional)

Navigate: Dashboard-Access Page-Authentication Window-Authentication Configuration Window-Customized Portal Page Panel.

Authentication Con	figuration				×
Captive Portal: on .		Cus	tomized Portal Page	Customized Portal Page	
Login by:	Account O Access Code	) Terms Of use		Preview Default	Â
UserName	Starting Date	Ending Date	Operate	Note:logo file as less than 20k.	
guest1	2016.08.25	2016.08.31	/× (	Browse No file selected.	
guest2	2016.08.25	2016.08,31	/*	Note:Background file as less than 40k. Background: Browse	
Add User Behavior: on 1 IFTP Server: 192.168.0		Save Upload Now		Note:Terms of use as less than 50k. Terms of use: Browse o file selected.	~

Figure 7-10 Customize Your Splash Page

#### Log User Behavior (Optional)

Navigate: Dashboard-Access Page-Authentication Window-Authentication Configuration Window

The user behaviors including online and offline are logged and sent to the specified TFTP server. The detailed information of the user behavior can refer to: <u>Authentication Configuration Window</u>.

aptive Portal: on 🤇 .		a	istomized Portal Page	Customized Portal Page	
Login by:	Access Code	) Terms Of use		Preview Default	
UserName	Starting Date	Ending Date	Operate	Note:logo file as less than 20k. Logo:	
guest1	2016.08.25	2016.08.31	/ ×	Browse No file selected.	
guest2	2016.08.25	2016.08.31	/ ×		
				Note:Background file as less than 40k. Background: Browse No file selected.	
Add				Note:Terms of use as less than 50k.	
				Terms of use:	
er Behavior: (on (				Browse No file selected.	

Figure 7-11 Log User Behavior

Specify Your Walled Garden (Optional) Navigate: Dashboard-Access Page-Black List & Whitelist Window-Walled Garden Tab.

Black List &	Whitelist			
Black List	White List	Walled garden	)	
IP Address			Operate	
192.168.1.1	00-192.168.1.1	.00	×	
	_			
Starting IP:	$\sim$	x.x.x.x		
Ending IP:		YOQXX	Add	

#### Figure 7-12 Wall Garden

Specify Your Captive Portal Whitelist (Optional) Navigate: Dashboard-Access Page-Black List & Whitelist Window-White List Tab.

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Black List & Whitelist	
DIACK LIST & WHITEHIST	
Black List White List Walled garden	
MAC Address Operate	
4c:48:da:24:f1:90-4c:48:da:24:f1:90 X	
Starting MAC: Starging MAC Ending MAC: Ending MAC Add	
Figure 7-13 Portal Whitelist	

## 8 Tools

Tools are several commands provided for diagnosing and troubleshooting. The commands are applied to a single AP in the group. You can select an AP from the group and execute a command to discover the running information of the AP, such as system health, wireless health and reboot reason. Illustrated in Figure 8-1, Figure 8-2.

Alcatel • Lu Enterprise	ucent 🕖	AP Gro Paris	oup:mywifi_in_offi	ce - 192.168.1.	200		A	dministrator Logout	About Help   Polling Cycle:	
WLAN	Enable: 3	Disable: 1	AP	Working:2 Dow	n:0 Joining:0	Monitoring			Group: m	/wifi_in_office
/LAN Name	Status	Clients	Primary Name	Status	Clients		●RX ●TX			client
nywifi-1x nywifi-employee nywifi-guest nywifi-portal2 ew	on . on . on . off	0 1 1 0	☆ AP-00:E0 ☆ AP	Working Working	2 0	0.5		10 5 0 1:17:38 10:48:08		11:17:38
Clients	For Group: mywifi_in_	-66			Total:2		Throughput(Mbps)		Client	
ser Name	IP	MA	C	WLAN	Auth	10 8		10 8		
	192.168.20.1 192.168.20.102		26:c7:63:0d:16 35:00:6e:68:79	mywifi-guest mywifi-emplo	open PSK	6 4 2 0	1 1 2.4GHz 5GHz Client Band	6 4 2 0	2 0 Best Good Client Health	0 Fair
						System				
					١	Wireless				
0						Access				

Figure 8-1 Tools in Dashboard

Tools	
Celect Command:       AP:       dc:08:56:8b:d9:20 •       Exec         Show system health show WIFI info show history syslog info traceroute ping show history reset reason AP log collection show channel utilization       Free	2
PMD: . off) TFTP Server: IP Address(v4 v6) Save	

Figure 8-2 Troubleshooting Command

#### Table8-1 describes the commands for troubleshooting.

Command	Purpose
show system heath	Show system CPU and memory usage information of specified AP
show WIFI info	Show wireless interface information of specified AP

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show history syslog info	Show historic Syslog messages generated in last time system running (Before this time system up) of specified AP
traceroute	Traceroute from specified AP to another host in the network
ping	Ping operation from specified AP to another host in the network
show history reset reason	Show historic reboot reason of specified AP
AP log collection	Collect AP log files for troubleshooting and download by TFTP/HTTP
show channel utilization	Display current 2.4G/5G band channel utilization detected by the AP

#### PMD

Tools	
-Select Command- show system health show system health show Nistory syslog info traceroute ping show history reset reason	
PMD: on . TFTP Server: 192.168.1.100 Save	

#### Figure 8-3 PMD

Post Mortem Dump (PMD) is a troubleshooting method helping to identify root cause of a core dump and exception pointers after a fatal crash. If PMD is enabled and configured, the AP will send PMD files to a specific TFTP server immediately when there is key process crashing on the AP. By default, PMD files sending to external TFTP server is disabled.

#### Reset the AP to Factory Default Settings

Press and hold the reset button for approximately 5 seconds then release. The LED will turn off and then turn red as the AP reboots to the factory default settings.

#### SSH Secure shell

Stellar Access Points support secure access via SSHv2

# 9 AP UI

AP UI is a dedicated web interface to monitor and configure single AP in the group, while group web management system is focus on cluster configuration as well as monitoring. In AP UI, you can:

- (1) Learn the WLANs status, connecting clients on the AP;
- (2) Configure DHCP/DNS/NAT services on the AP;
- (3) Configure wireless Mesh/Bridge feature for the AP;
- (4) Maintenance Upgrade/Reset/Reboot the AP.

#### Login to AP UI

When AP is working in the Express mode, you need to login the group web management. In the AP List of group web, you can click the link to open a specific AP UI.

		Primary Name	IP	Firmware	Opera	te			Detailed Information	
				PVC			-			
ame oloyee-test	Status	AP-C2:70	192.168.55.17(AP) 192.168.55.239(M)	3.0.3.28	€cfg	Oreboot		AP Name: MAC:	AP-C2:70 Edit 34:E7:0B:03:C2:70	
est erprise	on C.			SVC			- 1	Location:	Edit	
ployee portal	on C.	AP-D7:50	192.168.55.9	3.0.3.28	€cfg	Oreboot	_	Status:	Working	
st	on (		-	1EMBER				Role in Group:	PVC	
		AP-24:00	192.168.55.1	3.0.3.29	⊙cfg	Oreboot		Serial Number: Model:	SSZ170200040 OAW-AP1221	×
		AP-18:40	192.168.55.10	3.0.3.28	©cfg	Oreboot		Firmware:	3.0.3.28	
ame	IP	AP-0C:F0	192.168.55.19	3.0.3.28	©cfg	Oreboot		Upgrade Time:	Thu May 3 17:40:04 2018	
	192.168.55.30 100.1.1.188	AP-09:F0	192.168.55.13	3.0.3.28	Ocfg	Oreboot		Upgrade Flag:	successfully	
	100.1.1.70	AP-05:90	192.168.55.18	3.0.3.28	©cfg	Oreboot				
	100.1.1.41						*	IP Mode:	DHCP Edit	×
	100.1.1.80							IP: Netmask:	192.168.55.17 255.255.255.0	
								Default gateway:	192.168.55.254	
								DNS:	219.141.136.10	

Figure 9-1 AP List - link to AP UI

G	192.168.55.9:8080/static/apui.html
AI	catel·Lucent 🕖

Alcatel · Luce	ent 🕖							Administrato	r Logout   About   [ Tools   Se	
AP					WLAN					
MAC	IP	Status	Clients		WLAN Name	Status	т	уре	Clients	
34:E7:08:03:D7:50	192.168.55.9	CLUSTER	8		Employee-test Guest Enterprise Employee ex-portal hehe-test	enable enable disable enable disable enable		Personal Open Enterprise Personal Open Open	1 0 7 0 0	
Clients					RF					
IP	MAC	WLAN	Auth			Channel	Status	Power	Clients	
192.168.55.98	7c:b0:c2:bc:a3:db	Employee-test	PSK	*	2.4G 5G_all	6 140	enable enable	20 29	4	
100.1.1.9	30:f7:72:3e:e0:33	Employee	PSK		5/5_all	140	enable	29	4	
100.1.1.54	04:d6:aa:9c:b3:6e	Employee	PSK							
100.1.1.22	9c:f3:87:c2:f8:18	Employee	PSK							
100.1.1.14	10:4a:7d:52:7c:c7	Employee	PSK	•						
				Syst	em					
5				Netv	vork					
				Sen	/ice					

Figure 9-2 AP UI

When AP is working in the OmniVista Enterprise mode, you can open the AP UI through the "AP Web" hyperlink. More information can refer to help information on OmniVista platform.

#### AP Interface Navigate: AP-UI -> Network -> AP Interface -> AP Interface Configuration.

AP Interfac	e Configura	tion			
Name	Speed(MB)	Model	Link Status	Enable	Operate
ENET0	1000	Trunk	Up	Yes	
Backhaul1	0	Trunk	Down	No	1
Connector1	0	Trunk	Down	No	1
					Figure 9-3

- ENET0 Uplink interface of the AP.
- Backhaul1 Downlink interface of the Mesh/Bridge link.
- Connector1 Uplink interface of the Mesh/Bridge link.

For each AP interface

- Speed Link speed of the AP interface.
- Mode VLAN access mode or WLAN trunk mode.

- Link Status Up/down.
- Enable Indicate whether the AP interface is enabled or disabled.
- Operate Can be applied to Backhaul1 or Connector1 interface for wireless mesh/bridge configuring.

Navigate	e: AP-UI	-> Netwo	ork -> AP Ne	tworks.			
AP Netwo	rk Configur	ation					×
AP Netwo Name vlan667 vlan31 wan vlan666	rk Configur Vlan 667 31 666	Protocol Static Static DHCP Static	IP Address 192.168.55.17 100.1.1.1	Operate / / /	Edit NetworkNetwork Name:vlan666Vlan:666Protocol:StaticIP Address:100.1.1.1Netmask:255.255.255.0DNS:192.168.55.17	<b>v</b>	×
					Default Route: . off Canor	el Save	

#### AP Network Navigate: AP-UI -> Network -> AP Networks.

Figure 9-4 AP Network

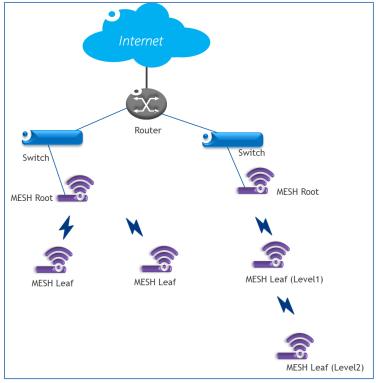
- Network Name Name of the network. There are 2 types of network on AP: VLAN networks mapping to WLAN (SSID); WAN networking mapping to AP uplink port.
- VLAN VLAN ID mapping to specific WLAN (SSID).
- Protocol IP address allocation for the network interface. IP address of a network interface is usually set as the gateway of the devices connecting the network.
  - DHCP Indicates the interface IP address of the network is obtained from an outside DHCP server.
  - Static Indicates the interface IP address of the network is manually set.
- Operate Edit the AP network.
- IP Address Interface IP address of the network.
- Netmask Netmask of the network.
- DNS DNS server for the network.
- Default Route Indicate whether the interface of the network is default route of the AP. By default, WAN interface in the default route of the AP.

### Configure Mesh/Bridge through AP UI

The Alcatel-Lucent mesh solution is an effective way to expand network coverage for outdoor and indoor enterprise environments without any wires. Using mesh, you can bridge multiple Ethernets LANs or you can extend your wireless coverage (Wireless backhauling). As traffic traverses across mesh APs, the mesh network automatically reconfigures around broken or blocked paths. This self-healing feature provides increased reliability and redundancy: the network continues to operate if an AP stops functioning or a connection fails.

To expand your wireless coverage without bridging Ethernet LAN segments, you can use Mesh services configured as wireless backhaul. In this deployment scenario, the AP provides network access for wireless Stellar AP User Guide

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clients and establishes a mesh path to the mesh root, which uses its wired interface to connect to the switch.

Figure 9-5 MESH Topology

#### **MESH Configuration:**

**Out-of-box MESH:** Out-of-box MESH is mainly used to improve the MESH deployment efficiency and administrator only needs to specify the root MESH point, other leaf MESH point can automatically join the MESH network without manual configuration. By default, Stellar AP with factory configuration powered up without wired uplink will try to establish MESH link automatically with build-in configuration (MESH SSID [Stellar-MESH] and password on 2.4G band). The out-of-box will be permanently disabled once the AP ever connected to wired uplink and only reset to factory operation can bring the out-of-box function back. The out-of-box MESH can be manually modified on band (Change from 2.4G to 5G) as well as passphrase (Navigate: AP-UI -> Network -> AP Interface -> AP Interface Configuration), and it will return to factory setting after reset operation.

**Regular MESH:** The MESH is configured on Stellar AP one after one by administrator manually. To configure MESH for the Stellar AP working in EXPRESS mode, administrator needs to login separate AP-UI of APs planned to enable MESH in the network and then perform the MESH configuration: Navigate: AP-UI -> Network -> AP Interface -> AP Interface Configuration.

AP Interfac	e Configura	tion						×
Name ENET0 Backhaul0 Connector0	Speed(MB) 1000 0	Model Trunk Trunk Trunk	Link Status Up Down Down	Enable Yes No No	c Operate	Edit Interface Enable: Model: SSID: Is Root: Band: Passphrase: Confirm:	•Yes ONo         •Mesh OBridge         Stellar-MESH         •Yes ONo         •2.4G OSG         ••••••••         •••••••••	

Figure 9-6 Configure Mesh Root

AP Interfac	e Configura	tion							
Name	Speed(MB)	Model	Link Status		ble Operate	E	Edit Interface		
ENET0	1000	Trunk	Up	Yes			and the second se	<b>e</b> u eu	
Backhaul0	0	Trunk	Down	No	1.	L L	inable:	●Yes ○No	
Connector0	0	Trunk	Down	No	1	M	Iodel:	●Mesh ○Bridge	
						S	SSID:	Stellar-MESH	
						Is	s Root:	⊖Yes .	
						В	Band:	●2.4G ○5G	
						P	Passphrase:	•••••	
						C	Confirm:	•••••	
							Cancel Save		

Figure 9-7 Configure Mesh Leaf

Edit the Backhaul/Connector interface to complete the MESH configuration. Either Backhaul configuration or Connector configuration is sufficient. The last saved configuration will be effective if Backhaul1 and Connector1 are both configured:

- Enable Enable/disable the wireless mesh on the AP.
- Mode AP working mode, mesh mode or bridge mode.
- SSID WLAN used to setup wireless mesh connection (SSID 'Stellar-MESH' is built-in for Out-of-box MESH, it can be modified to become a regular MESH SSID).
- Band Mesh working band. All the mesh connection from root node to leaf shall be in the same band.
- Is Root Specify the root node of the wireless mesh chain.
- Passphrase Password of the WLAN used to setup wireless mesh connection.
- Confirm Re-enter the password to confirm.

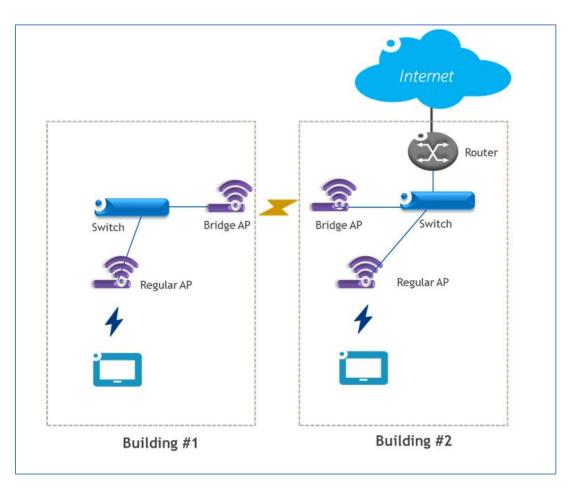
#### Wireless Bridge Configuration:

A point-to-point wireless bridge is used to connect LAN(s), which are often in different buildings, through the wireless interface. The wireless bridges eliminate the need for expensive leased lines and fiber-optic cables.

#### Navigate: AP-UI -> Network -> AP Interface -> AP Interface Configuration.

Edit the Backhaul1/Connector1 interface to complete the wireless bridge configuration. Either Backhaul1 configuration or Connector1 configuration is sufficient. The last saved configuration will be effective if Backhaul1 and Connector1 are configured with different attributes:

- Enable Enable/disable the wireless bridge on the AP.
- Mode AP working mode, mesh mode or bridge mode.
- SSID WLAN used to setup wireless bridge connection.
- Band Wireless bridge working frequency.
- Is Root Specify the root node of the wireless bridge.
- Passphrase Password of the WLAN used to setup wireless bridge connection.
- Confirm Re-enter the password to confirm.



#### Figure 9-8 Configure Wireless Bridge

#### Note:

1. AP1201, AP1201L, AP1201H, AP1201HL is low performance than other mid-end/high-end APs, and those APs do not support bridging the packets with VLAN tags, so not recommend deploying wireless bridge with above AP models. If really needs to deploy wireless bride with AP1201, AP1201L, AP1201HL, please contact ALE support for help. AP1201, AP1201L, AP1201H, AP1201HL is working correctly in MESH deployment.

2. MESH AP can provide service to wireless client accompanied with MESH link. While Wireless Bridge AP can only provide bridge link, not able to connect wireless clients.

#### Configure DHCP through AP UI Navigate: AP-UI -> Service -> DHCP.

For an AP group in the same L2 domain, you can setup DHCP server on a specific AP in the group.

Configur	ation						
nary Nam	ne IP	Firmware	Operat	e			Detailed Information
		PVC			*		
AP-C2:70	192.168.55.17(AP) 192.168.55.239(M)	3.0.3.28	€cfg	Oreboot I™dhcp		AP Name: MAC:	AP-C2:70 Edit 34:E7:0B:03:C2:70
		SVC			_	Location:	Edit
AP-D7:50	192.168.55.9	3.0.3.28	©cfg	Oreboot	_	Status:	Working
	,	4EMBER			- 1	Role in Group:	PVC
AP-18:40	. 192.168.55.10	3.0.3.28	©cfg	Oreboot	-1-	Serial Number: Model:	SSZ170200040 OAW-AP1221
AP-1A:80	192.168.55.15	3.0.3.28	©cfg	Oreboot	-1	Firmware:	3.0.3.28
AP-06:80	192.168.55.11	3.0.3.28	©cfg	Oreboot		Upgrade Time:	Thu May 3 17:40:04 2018
AP-05:90	192.168.55.18	3.0.3.28	Ocfg	Oreboot		Upgrade Flag:	successfully
VP-0C:F0	192.168.55.19	3.0.3.28	€cfg	Oreboot	-	IP Mode:	DHCP Edit
						IP:	192.168.55.17
						Netmask:	255.255.255.0
						Default gateway:	192.168.55.254
						DNS:	219.141.136.10

Figure 9-9 DHCP Server in AP group



Figure 9-10 DHCP Server

- Pool Name Name of the DHCP pool.
- Pool Size Size of the DHCP pool.

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- Assign IP addresses have been allocated.
- Network Network to which the DHCP pool is bound. A Network usually means the VLAN mapping to specific SSID or the AP WAN interface. All the networks are displayed in the window: AP UI -> Network -> AP Networks. You must map the VLAN to a SSID before it can be displayed in the AP UI.
  - Lease Time Period of time that the IP address allocated can be used by the device. By default, lease time is 24 hours.
- Subnet Subnet of the DHCP pool.
- Gateway Specify the gateway for the DHCP pool. •
- Range Start DHCP pool starting IP address.
- Range Stop DHCP pool ending IP address.
- DNS1 Primary DNS server for the DHCP pool.
- DNS2 Secondary DNS server for the DHCP pool.
- Operate

....

- Bind Network Bind the DHCP pool to specific Network. Before binding, you need to configure the Network basic parameters in the 'AP UI -> Network -> AP Networks window'. Only Network with static IP (as gateway) can be bound to a DHCP pool.
- Delete Delete the DHCP pool.
- Leases Display the IP addresses which have been allocated to devices.

#### Configure DNS Cache through AP UI Navigate: AP-UI -> Service -> DNS.

• Cache Size - Specify the size for the DNS cache.

#### Configure NAT through AP UI Navigate: AP-UI -> Service -> NAT -> Source NAT.

Name	Source IP	Source Port Destination IP	Destination Port	Translation	Operate		Edit Source NAT
employee	100.1.1.0/24			MASQUERADE to wan	/ ×	Name:	employee
						Source IP:	100.1.1.0/24
						Destination IP:	x.x.x.x/x
						Source Port:	
						Destination Port:	
						Protocol Type:	ALL
						Output Interface:	wan 🔻
						Translation:	●Use Masquerade

Source NAT can be utilized to translate the internal IP addresses to single external IP address while visiting Internet, by saving public IP address.

- Name Name of the Source NAT rule. •
- Source IP Mapping source IP address of the NAT rule, single IP or segment. •

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- Destination IP Mapping destination IP address of the NAT rule, single IP or segment.
- Source Port Mapping source port of the NAT rule.
- Destination Port Mapping destination port of the NAT rule.
- Protocol Type Network protocol to which the NAT rule is applied.
- Output Interface Specify the outbound interface of the NAT rule.
- Translation Use Masquerade, indicates the internal IP addresses will be translated to the interface IP address (gateway) of the network.

#### **Destination NAT**

Destinatio	on NAT Configu	ration					×
Name	Source IP	Source Port Destination IP	Destination Translation Port	Operate	Source IP:	Add Destination NAT 106.78.34.108	•
					Destination IP:	112.52.77.50	ų,
					Source Port:	8090	
					Destination Port:	8090	
					Protocol Type:	Both TCP and UDP	
					Input Interface:	wan	
					*Translation:	Specify Network Addr	
						IP: 192.168.1.100	
						Dorte 0000	*
Add							

Figure 9-12 Destination NAT

Destination NAT can be utilized to realize visiting specific server in the internal network from internet.

- Name Name of the destination NAT rule.
- Source IP Mapping source IP address of the NAT rule, single IP or segment.
- Destination IP Mapping source port of the NAT rule.
- Source Port Mapping source port of the NAT rule.
- Destination Port Mapping destination port of the NAT rule.
- Protocol Type Network protocol to which the NAT rule is applied.
- Input Interface Specify the inbound interface of the NAT rule.
- Translation
  - IP IP address to which the external IP address will be translated
  - Port Port to which the external IP address will be translated

#### Configure Static Neighbor AP through AP UI Navigate: AP-UI -> Neighbor AP.

Neighbor AP is the candidate to which clients connecting to current AP might roam. There two types of neighbor AP - Auto Neighbor AP as well as Static Neighbor AP. Auto Neighbor AP is discovered through wireless scanning automatically, while Static Neighbor AP is manually added.

	Auto AP		
Neighbor AP	List		
Order	MAC Address	IP Address	
1	dc:00:11:22:34:40	192.168.20.138	

Figure 9-13 Auto Neighbor AP

			Static AP		
Neighbor AP List					
Order	MAC Address	IP Address	Operate	Add Neighbor AP	
1	dc:00:11:22:34:60	N/A	×	AP MAC:	dc:00:11:22:34:90
					Cancel Sive
Add Neighbor AP					<b>⋽</b> ⊕ •, © ∳ (

Figure 9-14 Static Neighbor AP

- Order Item number of the neighbor AP.
- MAC Address MAC address of the neighbor AP.
- IP Address IP address of the neighbor AP.
- Operate Remove the neighbor AP, only applicable for static neighbor APs.

#### **RF Environment**

The RF Environment is used to view Scanning Mode data for APs. Wireless networks operate in environments with electrical and radio frequency devices that can interfere with network communications. APs can examine the radio frequency environment in which the Wi-Fi network is operating, identify interference, and classify its sources. An analysis of the results can then be used to quickly isolate issues with packet transmission, channel quality, and traffic congestion caused by contention with other devices operating in the same band or channel.

Note: To view Scanning Mode data for an AP, the AP must be in "Scanning Mode". When an AP is in Scanning Mode, no clients can associate with the AP.

There are two types of AP Scanning Mode:

- One Time The scanning mode will last for 5 minutes duration and then return to normal AP mode in which wireless clients can associate.
- Always The scanning mode is always active and wireless client is not allowed to associate if the AP is powered on.

When the scanning mode is terminated automatically (One Time mode) or manually (Always mode), AP will return to normal AP mode and clients are allowed to connect.

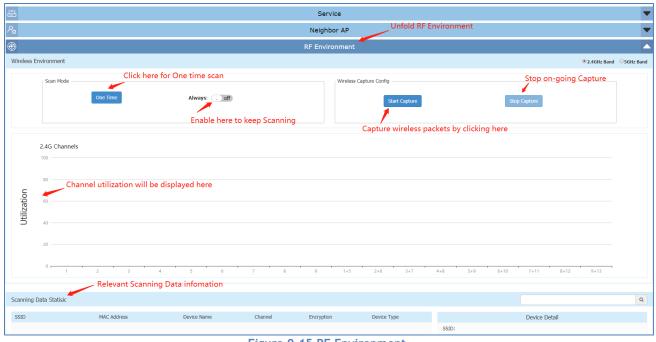


Figure 9-15 RF Environment

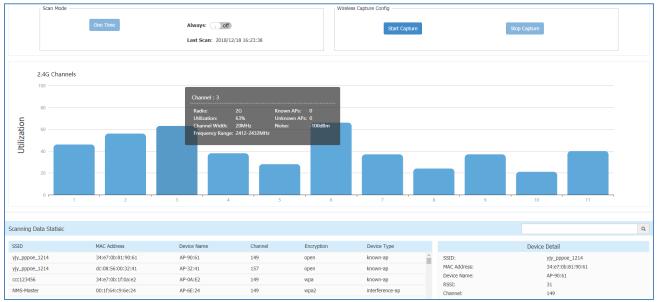


Figure 9-16 RF Scanning Data

The RF scanning data can be viewed by selecting 2.4G/5G radio:

- Channel Wi-Fi channel.
- Radio Radio of the Wi-Fi channel.
- Utilization Utilization of the Wi-Fi channel.
- Channel Width Width of the Wi-Fi channel.
- Frequency Range Frequency range of the Wi-Fi channel.
- Known APs APs which are identified working in the same network with scanning APs on the Wi-Fi channel.
- Unknown APs Foreign APs including interfering APs and Rogue APs on the Wi-Fi channel.
- Noise Noise is the measure of the wireless signal created from the sum of all the noise sources and unwanted signals.

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#### Wireless Packet Capture

Capture Config		×
Channel:	•	
TFTP Server:	192.168.20.42	
Filter :		
MAC1:		
MAC2:	Any Address 🔹	
Frame Type:	802.11 ALL •	
	Reset Start	

Figure 9-17 Wireless Packet Capture

User can use specific AP to capture wireless packets for troubleshooting purpose:

- Channel Specify the Wi-Fi channel for packet capture.
- TFTP Server The file server to which the packets captured will be uploaded.
- Filter A filter used to select the Wi-Fi packets wanted to be captured.
  - MAC1 Target MAC for wireless packet capturing, could be destination MAC or Source MAC. Can be used together with MAC2 to be a combination for specifying the filter condition. For example, to capture the bidirectional packets between client A (MAC1) and client B (MAC2).
  - MAC2 Target MAC for wireless packet capturing, could be destination MAC or Source MAC. Can be used together with MAC2 to be a combination for specifying the filter condition.
  - Frame Type Specify the 802.11 packet type that will be captured:
    - 802.11 ALL All the 802.11 packets mapping MAC address condition on the channel will be captured, including management, data and control packets.
    - 802.11 MGMT The 802.11 management packets mapping MAC address condition on the channel will be captured (Packet type: beacon/ assoc-req/ assoc-resp/ reassocreq/ reassoc-resp/ probe-req/ probe-resp/ disassoc/ auth/ deauth/ atim).
    - 802.11 DATA- The 802.11 data packets mapping MAC address condition on the channel will be captured (Packet type: null/data/ data-cf-ack/ data-cf-poll/ datacf-ack-poll/ cf-ack/ cf-poll/ cf-ack-poll/ qos-data/ qos-data-cf-ack/ qos-data-cfpoll/ qos-data-cf-ack-poll/ qos/ qos-cf-poll/ qos-cf-ack-poll).
    - 802.11 CTRL The 802.11 control packets mapping MAC address condition on the channel will be captured (ps-poll/ rts/ cts/ ack/ cf-end/ cf-end-ack).

## 10 Web Management with HTTPS

There are two methods to login to the AP group web management system: (1) HTTP protocol with URL <u>http://AP-IP:8080</u> (For example: <u>http://172.16.101.34:8080</u>) or <u>http://mywifi.al-enterprise.com:8080</u>, which is simpler and easier for the user without needing to install the digital certificate; (2) HTTPS protocol with URL <u>https://AP-IP</u> (For example: <u>https://172.16.101.34</u>) or <u>https://mywifi.alenterprise.com</u>, which is more secure communication between AP and the browser. User can select his/her preferred managed method accordingly.

User can access the web manager directly with HTTP. If you want to access with HTTPS, a CA root needs to be downloaded from the AP and installed into the trust store of the browser used. The certificate installation procedure varies from operating system and browser combinations. You can follow below illustrated steps to install the root CA accordingly.

## Download the Certificate from AP

In the HTTP login page, you can download the root certificate file "ALE-OmniAccess-WLAN.CRT" from AP, illustrated in Figure 10-1 and Figure 10-2.

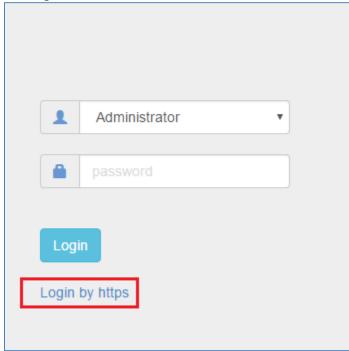


Figure 10-1 HTTP Login Page

Https Setting Window	>
1.Download and Install Certificate	
2.Go to HTTPS page for login	
Note:Please make sure all the APs in the group have being upgraded to 2.0.1.100 or later version before login with https.	
Figure 10-2 Download Certificate from AP	

## Install the Certificate on Different Platform accordingly

You can follow the demonstrated steps to install the certificate based on the operating system and browser combinations.

After you have installed the certificate successfully, you can access <u>https://PVM-IP</u> (For example: <u>https://172.16.101.34</u>) or <u>https://mywifi.al-enterprise.com</u> to manage the AP group.

## Case A: Microsoft Windows + Microsoft IE/Google Chrome

When using Microsoft IE or Google Chrome on Microsoft Windows platform, you can follow the steps illustrated from Figure 10-3 to Figure 10-8 to install the certificate.

> Thi	s PC > Downloads >	Certificate		
	Name	^	Date modified Type Si	ze
* * * *	ALE-OmniAcces		Open Install Certificate Scan with Windows Defender Open with Share with Add to archive Add to "ALE-OmniAccess-WLAN.rar" Compress and email Compress to "ALE-OmniAccess-WLAN.rar" and email	> "B
		F	Figure 10-3 Case A - Step 1	

_		
÷	🚰 Certificate Import Wizard	×
	Welcome to the Certificate Import Wizard	
	This wizard helps you copy certificates, certificate trust lists, and certificate revocation lists from your disk to a certificate store.	
	A certificate, which is issued by a certification authority, is a confirmation of your identity and contains information used to protect data or to establish secure network connections. A certificate store is the system area where certificates are kept.	
	Store Location	
	Current User     Local Machine	
	To continue, click Next.	
	Next Cancel	
	Figure 10-4 Case A - Step 2	
		×
←	🚰 Certificate Import Wizard	
	Certificate Store	
	Certificate stores are system areas where certificates are kept.	
		-
	Windows can automatically select a certificate store, or you can specify a location for the certificate.	
	O Automatically select the certificate store based on the type of certificate	
	Place all certificates in the following store	
	Certificate store: Browse	

Next

Figure 10-5 Case A - Step 3

Cancel

		-	×
Select Certificate Store	Х		
Select the certificate store you want to use.			
Personal	^	tificates are kept.	
Intermediate Certification Authorities     Intermediate Certification Authorities     Intermediate Certificates	~	store, or you can specify a location for	
< >>		e based on the type of certificate	
Show physical stores		re	
OK Cancel		Browse	
		Drowse	
		Next Cance	el

#### Figure 10-6 Case A - Step 4

÷	Certificate Import Wizard	×
	Completing the Certificate Import Wizard	
	The certificate will be imported after you click Finish.	
	You have specified the following settings:	
	Certificate Store Selected by User         Trusted Root Certification Authorities           Content         Certificate	
	Finish	Cancel

#### Figure 10-7 Case A - Step 5

Https Setting Window	×
1.Download and Install Certificate	
2.Go to HTTPS page for login	
Note:Please make sure all the APs in the group have being upgraded to 2.0.1.100 or later version before login with https.	
Figure 10-8 Case A - Step 6	

## Case B: Microsoft Windows + Mozilla Firefox

When using Mozilla Firefox browser on Microsoft Windows, you can follow the steps illustrated from Figure 10-9 to Figure 10-13 to install the certificate.

👗 Cut	Сору	Paste		
-	100%	+		
	8			
New Win- dow	New Private Window	Save Page		
	C	∢⊉►		
Print	History	Full Screen		
۶ Find	<b>O</b> ptions	Add-ons		
Developer	Synced Tabs			
🔇 Sign in to Sync				
E Customize				
Figure 10-9 Case B - Step 1				

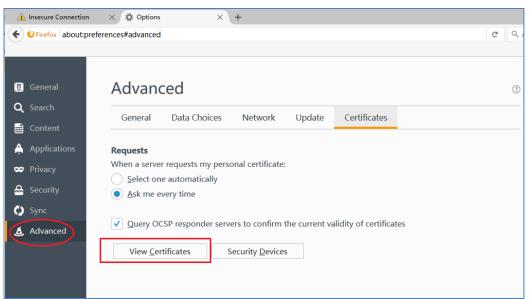


Figure 10-10 Case B - Step 2

Ce	rtificate Manager		×
Ţ	Your Certificates People Servers Authoritie	Others	
	You have certificates on file that identify th	nese certificate authorities:	
	Certificate Name	Security Device	Ţ.
	∨AC Camerfirma S.A.		^
	Chambers of Commerce Root - 2008	Builtin Object Token	
	Global Chambersign Root - 2008	Builtin Object Token	
	∨AC Camerfirma SA CIF A82743287		
	Chambers of Commerce Root	Builtin Object Token	
	Global Chambersign Root	Builtin Object Token	
	~ACCV		
	ACCVRAIZ1	Builtin Object Token	
	View Edit Trust Import	Export <u>D</u> elete or Distrust	
		ок	

Figure 10-11 Case B - Step 3

Select File containing CA certificate(s) to import X					
$\leftarrow$ $\rightarrow$ $\checkmark$ $\uparrow$ $\Box$ > This PC > Downloads > Certificate $\checkmark$ $\circlearrowright$ Search Certificate					م, ۽
Organize 🔻 Nev	w folder				= • 🔟 🕐
🖈 Quick access	^	Name	Da	te modified	Туре
	*	🔄 ALE-OmniAccess-WLAN	1/	13/2017 10:31 AM	Security Certificate
	*				
🚆 Documents 🔅	*				
Pictures 🗧	*				
ARUBA					
ECO					
PM					
WMA					
\land OneDrive					
💻 This PC	~ <	C			>
	File nan	ne: ALE-OmniAccess-WLAN	~	Certificate Files	Cancel

Certificate Manager	×
Downloading Certificate	×
You have been asked to trust a new Certificate Authority (CA).	
Do you want to trust ".OAW-APfor the following purposes?	
✓ Trust this CA to identify websites.	
Trust this CA to identify email users.	
Trust this CA to identify software developers.	
Before trusting this CA for any purpose, you should examine its certificate and its policy and procedures (if available).	
View Examine CA certificate	
OK Cancel	
ОК	
	-

Figure 10-12 Case B - Step 4

Case C: Apple MAC OS X + Google Chrome When using Google Chrome on Apple MAC OS X, you can follow the step illustrated from Figure 10-14 to Figure 10-22 to install the certificate.

🔹 Chrome File Edit View History Bookmarks Window Help 🔶	🕩 📕 Tue 10:54 AM	autelan	् ≔
• • • New Tab			0
$\leftrightarrow \Rightarrow \mathbf{C}$			್ಷ 🔳
Apps For quick access, place your bookmarks here on the bookmarks bar. Import bookmarks now	New Tab New Window New Incognito W Bookmarks Recent Tabs	indow	#T #N ☆#N ►
	Edit Save Page As Find Print	Cut Copy	Y Paste 第S 第F 発P
Google	Zoom History Downloads	- 100%	「 「 「 「 「 」 「 」 一 一 一 一 一 一 一 一 一 一 一 一
Search Google or type URL	Sign in to Chrome Sottings About Google Ch Help Chrome is Out	rome	Þ
	More tools		►

Figure 10-14 Case C - Step 1

Chrome	Settings		
History	On startup		
Extensions			
Settings	Open the New Tab page		
	Continue where you left off		
About	Open a specific page or set of pages. Set pages		
	Appearance		
	Get themes Reset to default theme		
	Show Home button		
	Always show the bookmarks bar		
	Search		
Set which search engine is used when searching from the omnibox.			
	Google ▼ Manage search engines		
	People		
	You are currently the only Google Chrome user.		
	Enable Guest browsing		
	✓ Let anyone add a person to Chrome		
	Add person Delete this person Import bookmarks and settings		
	Default browser		
	Make Google Chrome the default browser		
-	Google Chrome is not currently your default browser.		
	Show advanced settings		
	Figure 10-15 Case C - Step 2		

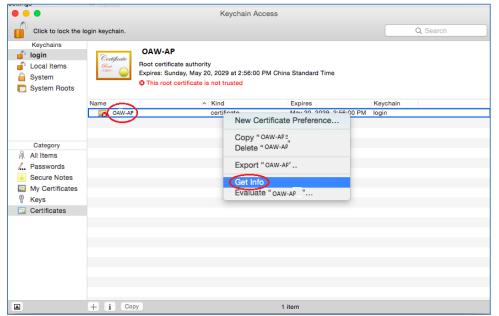
Chrome	File Edit View History Bookmarks Window Help				
🔍 🔍 🔍 🗘	tings ×				
• → C 🗋	hrome://settings				
Chrome	Pattinga				
Chrome	Settings				
History	Languages				
Extensions	Change how Chrome handles and displays languages. Learn more				
Settings	Language and input settings				
	Offer to translate pages that aren't in a language you read. Manage language				
About					
	Downloads				
	Download location: //Users/autelan/Downloads Change				
	Ask where to save each file before downloading				
HTTPS/SSL Manage certificates					
					Google Cloud Print
					Set up or manage printers in Google Cloud Print. Learn more
	Manage				
	Show notifications when new printers are detected on the network				
	Accessibility				
	Add additional accessibility features				
	System				
	Use hardware acceleration when available				
	Reset settings				
	Restore settings to their original defaults.				
	Reset Settings Figure 10-16 Case C - Step 3				

	Settings	×			
) C [			Keychain A	ccess	
G	Click to lock the	lagis keyebais			Q Search
		login keychain.			Q Search
nrome	Keychains				
	Local Items				
tory	System				
tensions	System Roots				
	System Hoots				
ttings		Name	<ul> <li>Kind</li> </ul>	Expires	Keychain
out					
our					
	Category All Items				
	Antenis				
	Secure Notes				
	My Certificates				
	<pre>% Keys</pre>				
	Certificates				
	Gertinicates				
		+ i Copy		0 items	

Figure 10-17 Case C - Step 4

	Keychain Access	
Click to lock the login keychain.		Q Search
Keycha	₩ OAW-AP	Q Search
≧ System       Favorites         ☑ System       ☑ All My Files         ☑ System       ☑ Icloud Drive         ✓ iCloud Drive       ✓ Applications         ☑ Desktop       ☑ Documents	532220.dmg 64_V2015.lso .2661.102.dmg ys6.1-zh-cn.exe mg )	Certificane Root
All Item	▶ p .6.3.dmg	OAW-AP .CET 670 bytes Created 6/11/11, 6:31 PM Modified 6/11/11, 6:31 PM Last opened 6/11/11, 6:31 PM Add Tags
	Destination Keychain: login	
Acce:		Cancel Open

Figure 10-18 Case C - Step 5



#### Figure 10-19 Case C - Step 6

		Keychain Acc	cess		
Click to lock t	the login keychain.			Q Se	arch
Keychains login Local Items System System Roots	Expires: S	P ficate authority unday, May 20, 2029 at 2:56:00 F ot certificate is not trusted	PM China Standard Time		
	Name	Kind	Expires	Keychain	
	GAW-AP	certificate	May 20, 2029, 2	56:00 PM login	
All Items All Items All Items Secure Notes My Certificates Yess Certificates All Certificates		Centification Centification Trust When usin Secure Soc Secure Extensible Auth	is root certificate is not tr ng this certificate: kets Layer (SSL) Alw re Mail (S/MIME) Alw enentication (EAP) Alw i Security (IPsec) Alw i Chat Security Alw	e at 2:56:00 PM China Standard T usted ays Trust © ays Trust © ays Trust © ays Trust © ays Trust © ays Trust © ays Trust ©	īme
Accessibili	ty		Kerberos Server Alw	ays Trust ᅌ	
Add additional accessibility features System			Code Signing Alw	ays Trust 🗘	
			Time Stamping Alw	ays Trust ᅌ	

Figure 10-20 Case C - Step 7

ooning		** // /	12	
			Key	rchain Access
	Click to lock the lo	ogin keychain.		Q Search
	Keychains			
_ 🗗	login	Certificate	OAW-AP	
<b>_</b>	Local Items	S Rod	Root certificate authority	
	System		Expires: Sunday, May 20, 202	
	System Roots		C This root certificate is not	
		Name	~ Kinc	You are making changes to your Certificate Trust Settings. Type your password to allow this.
		🐻 OAW-AP	certi	Settings. Type your password to allow this.
				Username: user
	Category			Descurate
R	All Items			Password: ••••••
<u>/</u>	Passwords			
<b>a</b>	Secure Notes			Cancel Update Settings
22	My Certificates			
ę	Keys			
- 22	Certificates			
		(+) ( <b>i</b> ) (Cop	<u></u>	1 item

#### Figure 10-21 Case C - Step 8

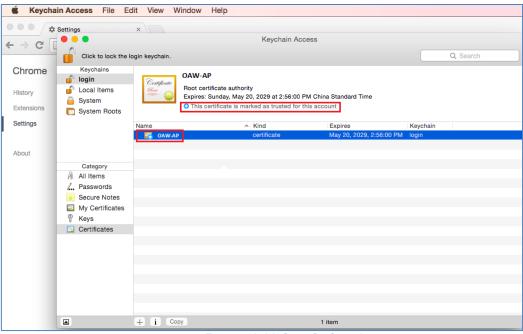
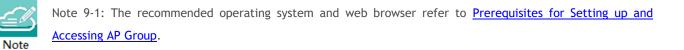


Figure 10-22 Case C - Step 9

# Case D: Apple MAC OS X + Mozilla Firefox

When using Mozilla Firefox browser on Apple MAC OS X platform, go to **Case B: Microsoft Windows + Mozilla Firefox** and follow the steps to install the certificate.



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