



## WAB-6120

150Mbps Wireless Outdoor PoE AP

**User Manual** 

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### **About This Manual**

This user manual is intended to guide professional installer to install the LEVELONE 150MBPS WIRELESS POE AP and how to build the infrastructure centered on it. It includes procedures to assist you in avoiding unforeseen problems.

### Conventions

For your attention on important parts, special characters and patterns are used in this manual:

Note:

• This indicates an important note that you must pay attention to.

### A Warning:

• This indicates a warning or caution that you have to abide.

Bold: Indicates the function, important words, and so on.

### **Federal Communication Commission Interference Statement**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

### FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. To avoid the possibility of exceeding radio frequency exposure limits, you shall beep a distance of at least 100cm between you and the antenna of the installed equipment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

The availability of some specific channels and/or operational frequency bands are country dependent and are firmware programmed at the factory to match the intended destination. The firmware setting is not accessible by the end user.

### Warranty

Standard hardware warranty is for one (1) year from date of shipment from Distributor. Warrants that hardware will conform to the current relevant published specifications and will be free from material defects in material and workmanship under normal use and service.

IN NO EVENT SHALL DISTRIBUTOR BE LIABLE TO YOU OR ANY OTHER PARTY FOR ANY DIRECT, INDIRECT, GENERAL, SPECIAL, INCIDENTAL, CONSEQUENTIAL, EXEMPLARY OR OTHER DAMAGE RISING OUT OF THE USE OR INABILITY TO USE THE PRODUCT (INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF BUSINESS INFORMATION OR ANY OTHER PECUNIARY LOSS, OR FROM ANY BREACH OF WARRANTY, EVEN IF DISTRIBUTOR HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO CASE SHALL DISTRIBUTOR LIABILITY EXCEED THE AMOUNT YOU PAID FOR THE PRODUCT.

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# **Chapter 1 Introduction**

## Introduction

Designed for outdoor environment application, the LEVELONE 150MBPS WIRELESS POE AP is a high-performance last-mile broadband solution that provides reliable wireless network coverage. As an IEEE 802.11b/g compliant wireless device, the LEVELONE 150MBPS WIRELESS POE AP is able to give stable and efficient wireless performance, while designed with IEEE 802.11n standard and high output power makes it possible to deliver several times faster data rate than normal wireless device and higher bandwidth with longer range for outdoor applications.

The LEVELONE 150MBPS WIRELESS POE AP supports four wireless communication connectivity (AP, Wireless Client, WDS and AP Repeater), allowing for various application requirements thus helping to find the key to the "last mile" with least effort.

With high output power and reliable performance, the LEVELONE 150MBPS WIRELESS POE AP is an ideal wireless broadband solution for wireless Internet service providers and system integrators!

## Appearance



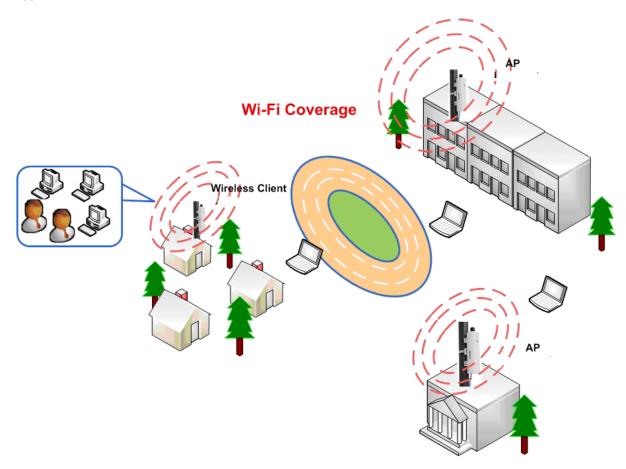
#### Figure 1 LEVELONE 150MBPS WIRELESS POE AP

## **Key Features**

- Compliant with IEEE 802.11b/g and IEEE 802.11n as well
- Support Passive Power over Ethernet which is supplied with 12V or 15V.
- High reliable watertight housing endures almost any harsh environments
- Four operating modes including AP, Wireless Client, WDS and AP Repeater
- Support 64/128/152-bit WEP and 802.1X, WPA, WPA2, WPA&WPA2,WPA-PSK,
   WPA2-PSK, and WPA-PSK&WPA2-PSK
- User-friendly Web and SNMP-based management interface

# **Typical Application**

This section describes the typical applications of LEVELONE 150MBPS WIRELESS POE AP. By default, it is set to AP mode which allows it to establish a wireless coverage; besides, it is also able to join any available wireless network under wireless client mode. The LEVELONE 150MBPS WIRELESS POE AP is able to deliver stable and efficient broadband connectivity for various applications.



**Figure 2 Typical Application** 

Besides, the LEVELONE 150MBPS WIRELESS POE AP can also be applied into the following environments:

- Cost-effectively provide long distance backhaul for remote areas (e.g. village, oil well, island, mountain and etc.)
- Establish local backhaul for campus, farm and factory
- Provide and access for video streaming or surveillance for industrial and mining enterprises

# **Chapter 2 Hardware Installation**

This chapter describes safety precautions and product information you have to know and check before installing LEVELONE 150MBPS WIRELESS POE AP.

## **Preparation before Installation**

### **Professional Installation Required**

Please seek assistance from a professional installer who is well trained in the RF installation and knowledgeable in the local regulations.

### **Safety Precautions**

- 1. To keep you safe and install the hardware properly, please read and follow these safety precautions.
- If you are installing LEVELONE 150MBPS WIRELESS POE AP for the first time, for your safety as well as others', please seek assistance from a professional installer who has received safety training on the hazards involved.
- 3. Keep safety as well as performance in mind when selecting your installation site, especially where there are electric power and phone lines.
- 4. When installing LEVELONE 150MBPS WIRELESS POE AP, please note the following things:
  - Do not use a metal ladder;
  - Do not work on a wet or windy day;
  - Wear shoes with rubber soles and heels, rubber gloves, long sleeved shirt or jacket.
- 5. When the system is operational, avoid standing directly in front of it. Strong RF fields are present when the transmitter is on.

### **Installation Precautions**

To keep the LEVELONE 150MBPS WIRELESS POE AP well while you are installing it, please read and follow these installation precautions.

- Users MUST use a proper and well-installed surge arrestor with the LEVELONE 150MBPS WIRELESS POE AP; otherwise, a random lightening could easily cause fatal damage to LEVELONE 150MBPS WIRELESS POE AP. EMD (Lightning) DAMAGE IS NOT COVERED UNDER WARRNTY.
- Users MUST use the "Power cord & PoE Injector" shipped in the box with the LEVELONE 150MBPS WIRELESS POE AP. Use of other options will cause damage to the LEVELONE 150MBPS WIRELESS POE AP.
- 3. Users MUST power off the LEVELONE 150MBPS WIRELESS POE AP first before connecting the external antenna to it. Do not switch from built-in antenna to the external antenna from WEB management without physically attaching the external antenna onto the LEVELONE 150MBPS WIRELESS POE AP; otherwise, damage might be caused to the LEVELONE 150MBPS WIRELESS POE AP itself.

### **Product Package**

WAB-6120 PoE Injector DC Adapter Clamp RJ-45 Ethernet Cable Quick installation Guide CD Manual

Note:

Product CD contains Quick Installation Guide and User Manual!

### **Pole Mounting Ring**



### Power Cord & PoE Injector





 Users MUST use the "Power cord & PoE Injector" shipped in the box with the LEVELONE 150MBPS WIRELESS POE AP. Use of other options will cause damage to the LEVELONE 150MBPS WIRELESS POE AP.

## **Hardware Installation**

### Connect up

1. The bottom of the LEVELONE 150MBPS WIRELESS POE AP is a movable cover. Grab the cover and pull it back harder to take it out as the figure shown below.

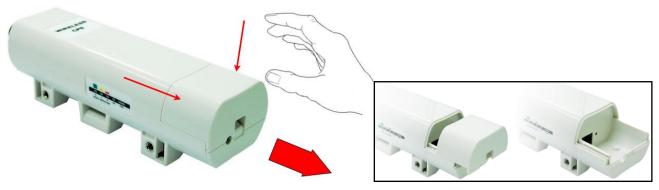


Figure 3 Move the Cover

2. Plug a standard Ethernet cable into the RJ45 port.



Figure 4 Cable Connection

3. Slide the cover back to seal the bottom of the LEVELONE 150MBPS WIRELESS POE AP.



Figure 5 Seal the Bottom

4. Plug the power cord into the DC port of the PoE injector as the following right picture shows.



Figure 6 Connect to PoE Injector

5. Plug the other side of the Ethernet cable as shown in Step 3 into the PoE port of the PoE injector and get the complete set ready.



Figure 7 Complete Set

### **Pole Mounting**

 Turn the LEVELONE 150MBPS WIRELESS POE AP over. Put the pole mounting ring through the middle hole of it. Note that you should unlock the pole mounting ring with a screw driver before putting it through LEVELONE 150MBPS WIRELESS POE AP as the following right picture shows.



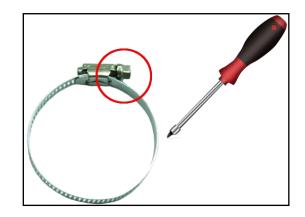


Figure 8 Pole Mounting – Step 1

 Mount LEVELONE 150MBPS WIRELESS POE AP steadily to the pole by locking the pole mounting ring tightly.



Figure 9 Pole Mounting – Step 2

3. Now you have completed the hardware installation of LEVELONE 150MBPS WIRELESS POE

AP.



Figure 10 Pole Mounting – Step 3

### **Using the External Antenna**

If you prefer to use the external antenna with N-type connector for your application instead of the built-in directional antenna, please follow the steps below.

 Grab the black rubber on the top of LEVELONE 150MBPS WIRELESS POE AP, and slightly pull it up. The metal N-type connector will appear.



Figure 11 Move the Rubber

2. Connect your antenna with the N-type connector on the top of LEVELONE 150MBPS WIRELESS POE AP

#### Note:

- If you are going to use an external antenna on LEVELONE 150MBPS WIRELESS POE AP, get some cable in advance.
- Be aware of the force you use while connecting to the N-type connector, inappropriate force may damage the N-type connector!

### **Warning**:

 Users MUST power off the LEVELONE 150MBPS WIRELESS POE AP first before connecting the external antenna to it. Do not switch from built-in antenna to the external antenna from WEB management without physically attaching the external antenna onto the LEVELONE 150MBPS WIRELESS POE AP; otherwise, damage might be caused to the LEVELONE 150MBPS WIRELESS POE AP itself.

# **Chapter 3 Basic Settings**

## **Factory Default Settings**

We'll elaborate the LEVELONE 150MBPS WIRELESS POE AP factory default settings. You can re-acquire these parameters by default. If necessary, please refer to the "Restore Factory Default Settings".

Table 1 LEVELONE 150MBPS WIRELESS POE AP Factory Default Settings

Features	5	Factory Default Settings		
Usernam		admin		
Passwor	d	admin		
Wireless	Device Name	WAB-6120-xxxxx		
		(model name + 6 MAC digits)		
Operatin	g Mode	AP		
Data Rat	е	Auto		
IP Address		192.168.1.1		
	Subnet Mask	255.255.255.0		
LAN	Gateway	0.0.0.0		
Primary DNS	Primary DNS Server	0.0.0.0		
	Secondary DNS Server	0.0.0.0		
Spanning	g Tree	Enable		
802.11 N	lode	802.11b/g/n		
Channel	Number	6		
SSID		LevelOne		
Broadcas	st SSID	Enable		
HT Prote	ct	Disable		
Data Rate		Auto		
Output Power		100% (Full)		
Channel Mode		20MHz		
WMM		Enabled		
RTS Thre	eshold (byte)	2346		
Fragmen	tation Length (byte)	2346		
Beacon I	nterval	100		
DTIM Inte	erval	1		
Space in	Meter	0		
Flow Cor	ntrol by AP	Disable		
Security		Open System		

Encryptic	วท	None		
Wireless	Separation	Disable		
Access C	Control	Disable		
	Enable/Disable	Enable		
SNMP	Read Community Name	Public		
SINIVIE	Write Community Name	Private		
	IP Address	0.0.0.0		

## **System Requirements**

Before configuration, please make sure your system meets the following requirements:

- A computer coupled with 10/ 100 Base-TX adapter;
- Configure the computer with a static IP address of 192.168.1.x, as the default IP address of LEVELONE 150MBPS WIRELESS POE AP is 192.168.1.1. (X cannot be 0, 1, nor 255);
- A Web browser on PC for configuration such as Microsoft Internet Explorer 6.0 or above, Netscape or Firefox. or Google Chrome

## How to Login the Web-based Interface

The LEVELONE 150MBPS WIRELESS POE AP provides you with user-friendly Web-based management tool.

 Open Web browser and enter the IP address (Default: 192.168.1.1) of LEVELONE 150MBPS WIRELESS POE AP into the address field. You will see the login page as below.



Figure 12 Login Page

Enter the username (Default: admin) and password (Default: admin) respectively and click "Login" to login the main page of LEVELONE 150MBPS WIRELESS POE AP. As you can see, this management interface provides five main options in the black bar above, which are Status, System, Wireless, Management and Tools.

one				L
Status	System	Wireless	Management	Tools
Information >>	I			
Connections	Information		sic settings of the device.	
Statistics				
ARP Table	System Information			
Bridge Table	- Device Name MAC Address		20-4e0285 0:4e:02:85	
blidge lable	- Country/Region	United S		
DHCP Clients	Firmware Version	3.0.4(LC	D)3	
Network Activities	LAN Settings			
	IP Address	192.168	3.1.1	
	Subnet Mask	255.255	5.255.0	
	Gateway IP Address	0.0.0.0		
	MAC Address	00:19:7	0:4e:02:85	
	Wireless Settings			
	Operation Mode	AP		
	Operation Mode	AF	210.01	

#### Figure 13 Main Page

# Note:

• The username and password are case-sensitive, and the password should be no

more than 19 characters!

## **Basic System Settings**

For users who use the LEVELONE 150MBPS WIRELESS POE AP for the first time, it is recommended that you begin configuration from "**Basic Settings**" in "**System**" shown below:

Status	System	Wireless	Management	Tools
Basic Settings »	Deele Orthi			
TCP/IP Settings	Basic Settin	<b>195</b> re the basic parameters of	device.	
Time Settings				
RADIUS Settings	Device Settings			
Firewall Settings	Device Name:	The second se	(max. 15 characters and no spaces)	
	- Ethernet DataRate:	Bridge 💌	~	
	Country/Region:	United States		
	Spanning Tree:	Enabled	Disabled	
	STP Forward Delay:	1(1~30 sec	conds)	
	GPS Coordinate Se	ttings		
	Latitude:	N 💌 0 °	0 0	
	Longitude:	E V 0 °	0 0 "	

#### **Figure 14 Basic System Settings**

**Device Name**: Specify the device name, which is composed of no more than 15 characters with (0-9), (A-Z), (a-z) or (-).

**Network Mode**: Specify the network mode, including Bridge and Router. It is easy to configure parameters in Bridge Mode; however, users must pay extra attention to the way they configure the device when it is set to Router Mode. For details, please refer to **TCP/IP Settings**".

Ethernet Data Rate: Specify the transmission rate of data for Ethernet. Default is Auto.

**<u>Country Region</u>**: The availability of some specific channels and/or operational frequency bands is country dependent.

**Spanning Tree**: Spanning Tree Protocol (STP) is a link management protocol for AP which provides path redundancy while preventing loops in a network. STP allows only one active path at a time between the access points but establish the redundant link as a backup if the initial link fails.

STP Forward Delay: STP Forward Delay is the time spent in detecting and learning network tree

topology state before entering the forward state. Default time value is 1 sec.

#### **GPS Coordinate Settings**

The GPS Coordinate Setting helps you mark the latitude and longitude of the Power R2 Extender.

Just enter the coordinates and click the **Apply** button.

#### TCP/IP Settings

Open "**TCP/IP Settings**" in "**System**" as below to configure the parameters for LAN which connects to the LAN port of the CPE. In this page, users may change the settings for IP Address, Subnet Mask, and DHCP Server.

Status	System	Wireless	Management	Tools
Basic Settings				
TCP/IP Settings	TCP/IP Se	ettings		
	Use this page to conf		area network which connects to t ing for IP address, subnet mask,	
Time Settings			-	
RADIUS Settings	IP Address Assig	nment		
Firewall Settings	O Obtain IP Add	Iress Automatically		
r newan settings	Use Fixed IP	Address		
	IP Address :	192.168.1.1		
	Subnet Mask :	255.255.255.0		
	Gateway Ip Addre	ss: 0.0.0.0		
	DNS 1:	0.0.0.0		
	DNS 2 :	0.0.0.0		

Figure 15 IP Settings (Bridge)

**Obtain IP Address Automatically**: If a DHCP server exists in your network, you can check this option, thus the LEVELONE 150MBPS WIRELESS POE AP is able to obtain IP settings automatically from that DHCP server.

#### Note:

• When the IP address of the CPE is changed, the clients on the network often need to wait for a while or even reboot before they can access the new IP address. For an immediate access to the bridge, please flush the netbios cache on the client computer by running the "nbtstat –r" command before using the device name of the CPE to access its Web Management page.

In case the LEVELONE 150MBPS WIRELESS POE AP is unable to obtain an IP

address from a valid DHCP server, it will fall back to default static IP address.

<u>Use Fixed IP Address</u>: Check this option. You have to specify a static IP address, subnet mask, default gateway and DNS server for the CPE manually. Make sure the specified IP address is unique on your network in order to prevent IP conflict.

If the LEVELONE 150MBPS WIRELESS POE AP is configured as Router mode, you need to configure some additional TCP/IP parameters for accessing the Internet.

Status	System	Wireless	Management	Tools
Basic Settings				
	TCP/IP Se	ettings		
TCP/IP Settings	Use this page to con	figure the parameters for local a . Here you may change the setti	rea network which connects to t	he LAN port
Time Settings	or your Access Point	. Here you may change the setui	ng for 1P address, subhet mask,	DHCP, etc.,
RADIUS Settings	IP Address Assig	nment		
	O Obtain IP Add	dress Automatically		
Firewall Settings	Use Fixed IP			
	IP Address :	192.168.1.1		
	Subnet Mask :	255.255.255.0		
	Gateway Ip Addre	ss: 0.0.0.0		
	DNS 1:	0.0.0.0		
	DNS 2 :	0.0.00		

#### Figure 16 IP Settings (Router)

<u>WAN Settings</u>: Specify the Internet access method to Static IP, DHCP or PPPOE. Users must enter WAN IP Address, Subnet Mask, Gateway settings provided by your ISPs.

**LAN Settings**: When DHCP Server is disabled, users can specify IP address and subnet mask for the CPE manually. Make sure the specified IP address is unique on your network in order to prevent IP conflict. When DHCP Server is enabled, users may specify DHCP IP Address Range, DHCP Subnet Mask, DHCP Gateway and Lease Time (15-44640 minutes). A DHCP relay agents is used to forward DHCP requests and replies between clients and servers when they are not on the same physical subnet. To enable the DHCP relay agent, check the **"Enable DHCP Relay**" checkbox and enter the IP address of the DHCP server.



- In AP mode, LEVELONE 150MBPS WIRELESS POE AP must establish connection with another wireless device before it is set to Router mode. To access the unit in Router mode via wired port, please type the WAN IP address to enter the web page for WAN is on wired port and LAN is on wireless port. Or, you can access device through the wireless device connected with the CPE.
- In wireless client mode, users can access the CPE via its wired port, for WAN is on wireless port and LAN is on wired port when device is set to Router mode.
- Bridge mode and AP Repeater mode are similar to AP mode when device is set to Router mode; WAN is on wired port and LAN is on wireless port. Thus users must also connect the CPE with another wireless device before it is set to Router mode and access the CPE via the connected wireless device.

## **Time Settings**

Compliant with NTP, the LEVELONE 150MBPS WIRELESS POE AP is capable of keeping its time in complete accord with the Internet time. Make configuration in "**Time Settings**" from "**System**". To use this feature, check "**Enable NTP Client Update**" in advance.

D 1 0 01				
Basic Settings TCP/IP Settings	Time Settin	-	ith a public time server over the Inter	net.
Time Settings >	Current Time:	Yr 2011 Mon 12	Day 20 Hr 18 Mn 33 Sec 1	6
RADIUS Settings	Time Zone Select:		ean Time: Dublin, Edinburgh, Lisbon, Lo	ndon 💌
Firewall Settings	<ul> <li>Enable NTP clien</li> <li>NTP server:</li> <li>Manual IP:</li> </ul>	nt update 192.5.41.41 - North 0.0.0.0	h America	
		Apply	Cancel	

Figure 17 Time Settings

#### Current Time

Display the present time in Yr, Mon, Day, Hr, Min and Sec.

#### • Time Zone Select

Select the time zone from the dropdown list.

#### • NTP Server

Select the time server from the "**NTP Server**" dropdown list or manually input the IP address of available time server into "**Manual IP**".

Hit "Apply" to save settings.

## **RADIUS Settings**

RADIUS (Remote Authentication Dial-In User Service) is a server for remote user authentication and accounting; playing a central role in the network in providing the capabilities of authenticating, authorizing, accounting, auditing, alarming and etc. It allows an organization to maintain user profiles in a central database that all remote servers can share.

Status	System	Wireless	Management	Tools
Basic Settings	PADILLS	Sottings		
TCP/IP Settings	Use this page to se	et the radius server settings.		
Time Settings				
RADIUS Settings :	>	RADIUS Server		
Firewall Settings	IP Address: Port:	0.0.0.0		
	Shared Secret:			
	Global-Key	Update		
	every 3600 S	econds		
	-			

#### Open "RADIUS Settings" in "System" to make RADIUS configuration.

#### **Figure 18 RADIUS Settings**

#### Authentication RADIUS Server

This is for RADIUS authentication. It can communicate with RADIUS through IP Address, Port and

Shared Secret.

IP Address: Enter the IP address of the Radius Server;

Port: Enter the port number of the Radius Server;

<u>Shared Secret</u>: This secret, which is composed of no more than 31 characters, is shared by the Chapter 3 Basic Settings Page 21 LEVELONE 150MBPS WIRELESS POE AP and RADIUS during authentication.

<u>Global-Key Update</u>: Check this option and specify the time interval between two global-key updates.

## **Firewall Settings**

The firewall is a system or group of systems that enforce an access control policy between two networks. It may also be defined as a mechanism used to protect a trusted network from an un-trusted network. LEVELONE 150MBPS WIRELESS POE AP has capabilities of Source IP Filtering, Destination IP Filtering, Source Port Filtering, Destination Port Filtering, Port Forwarding as well as DMZ. This is available only under Router Mode.

**Source IP Filtering**: The source IP filtering gives users the ability to restrict certain types of data packets from your local network to Internet through LEVELONE 150MBPS WIRELESS POE AP. Use of such filters can be helpful in securing or restricting your local network.

Status	System	Wireless	Managemer	it	Tools
Basic Settings	Course ID	Filferin a			
TCP/IP Settings	Source IP	e used to restrict certain typ	es of data nackets from	your local patwo	ark to
Time Settings		Sateway. Use of such filters of			
RADIUS Settings					
Firewall Settings	Local IP Address:	ce IP Filtering			
Src IP Filtering »	Comment:				
Dst IP Filtering		Apply	Cancel		
Src Port Filtering		(CAPPI)			
Sicrontintering					

**Figure 19 Source IP Filtering** 

**Destination IP Filtering**: The destination IP filtering gives you the ability to restrict the computers in LAN from accessing certain websites in WAN according to specified IP addresses. Check the "**Enable Source IP Filtering**" checkbox and enter the IP address of the clients to be restricted. Hit **Apply** to make the setting take effect.

ōnē					L
Status	System	Wireless	Ma	nagement	Tool
Basic Settings	Destinet				
TCP/IP Settings		ion IP Filtering		from accessing certain we	beites in
Time Settings	WAN according to			for accessing certain we	balces in
RADIUS Settings	Enable D	estination IP Filtering			
Firewall Settings	Destination IP Comment :	Address:	1		
Src IP Filtering			_		
Dst IP Filtering »		Apply	Cancel		
Src Port Filtering	Des	tination IP Addrest Com	ment 🗢	Select Edit	
Dst Port Filtering				······································	
Port Forwarding		Delete Selected	Delete All	Refresh	

Figure 20 Destination IP Filtering

**Source Port Filtering**: The source port filtering enable you to restrict certain ports of data packets from your local network to Internet through LEVELONE 150MBPS WIRELESS POE AP. Use of such filters can be helpful in securing or restricting your local network.

Status	System	Wireless	Management	Tool
Basic Settings	Source D	ort Eiltoring		
TCP/IP Settings		ort Filtering are used to restrict certain po	rts of data packets from vo	ur local network to
Time Settings	Internet through th local network.	e Gateway. Use of such filters	can be helpful in securing o	or restricting your
RADIUS Settings	- Fachia Sa	ource Port Filtering		
Firewall Settings	Port Range:			
Src IP Filtering	Protocol: Comment:	Both 💙		
Dst IP Filtering				
Src Port Filtering »	,	Apply	Cancel	
Dst Port Filtering	1	rt Range ♦ Protoco⊭	Comment 🗢 Se	elect Edit

Figure 21 Source Port Filtering

**Destination Port Filtering**: The destination port filtering enables you to restrict certain ports of data packets from your local network to Internet through LEVELONE 150MBPS WIRELESS POE AP. Use of such filters can be helpful in securing or restricting your local network.

Status	System	Wireless	Management	Tools
Basic Settings	Beetleet			
TCP/IP Settings		on Port Filteri	<b>ng</b> rts of data packets from your local n	atwark to
Time Settings	Internet through the local network.	e Gateway. Use of such filters	rts of data packets from your local n can be helpful in securing or restricti	ing your
RADIUS Settings		- Alexandrea - Rock Fillerian		
Firewall Settings	Port Range:	estination Port Filtering		
Src IP Filtering	Protocol:	Both 💙		
Dst IP Filtering	Comment:			
Src Port Filtering		Apply	Cancel	
	Dest Por			

**Figure 22 Destination Port Filtering** 

**Port Forwarding**: The port forwarding allows you to automatically redirect common network services to a specific machine behind the NAT firewall. These settings ne are only necessary if you wish to host some sort of server like a web server or mail server on the private local network behind LEVELONE 150MBPS WIRELESS POE AP's NAT firewall.

Status	System	Wireless	Management	Tools
Basic Settings	Back Field			
TCP/IP Settings	Port For			
Time Settings	machine behind th	ne NAT firewall. These settings a	lirect common network services to a are only necessary if you wish to host private local network behind your Ga	t some sort
RADIUS Settings	NAT firewait.			
Firewall Settings	IP Address:	Port Forwarding		
Src IP Filtering	Protocol:	Both 💙		
Dst IP Filtering	Port Range:		]	
Src Port Filtering	Comment:			
Dst Port Filtering		Apply	Cancel	
	> Lecol ID As			

Figure 23 Port Forwarding

**DMZ**: A Demilitarized Zone is used to provide Internet services without sacrificing unauthorized access to its local private network. Typically, the DMZ host contains devices accessible to the Internet traffic, such as Web (HTTP) servers, FTP servers, SMTP (e-mail) servers and DNS servers.

Status	System	Wireless	Management	Tools
Basic Settings	DM7			
TCP/IP Settings	A Demilitarized Zo	ne is used to provide Internet	services without sacrificing unautho	rized access
Time Settings	to its local private	network. Typically, the DMZ h	ost contains devices accessible to In (e-mail) servers and DNS servers.	ternet traffic,
RADIUS Settings	Enable DM			
Firewall Settings	DMZ Host IP Ac	ddress: 0.0.0.0		
Src IP Filtering		Apply	Cancel	
Dst IP Filtering				
Src Port Filtering				

Figure 24 DMZ

## **Basic Wireless Settings**

Open "Basic Settings" in "Wireless" as below to make basic wireless configuration.



**Figure 25 Basic Wireless Settings** 

#### Disable Wireless LAN Interface

Check this option to disable WLAN interface, then the wireless module of LEVELONE 150MBPS WIRELESS POE AP will stop working and no wireless device can connect to it.

#### Wireless Mode

Four operating modes are available in LEVELONE 150MBPS WIRELESS POE AP.

<u>AP</u>: The LEVELONE 150MBPS WIRELESS POE AP establishes a wireless coverage and receives connectivity from other wireless devices.

<u>Wireless Client</u>: The LEVELONE 150MBPS WIRELESS POE AP is able to connect to the AP and thus join the wireless network around it.

**Bridge**: The LEVELONE 150MBPS WIRELESS POE AP establishes wireless connectivity with other APs by keying in remote MAC address. Please refer to the "WDS Setting" for detailed configuration.

<u>AP Repeater</u>: The LEVELONE 150MBPS WIRELESS POE AP servers as AP and Bridge concurrently. In other words, the LEVELONE 150MBPS WIRELESS POE AP can provide connectivity services for CPEs under Bridge mode.

#### Wireless Network Name (SSID)

This wireless network name is shared among all associated devices in your wireless network. Keep it identical on all those devices. Note that the SSID is case-sensitive and can not exceed 32 characters.

#### Broadcast SSID

Under AP mode, hiding network name is necessary when you are in a wireless environment that may have potential risk. By disabling broadcast SSID, the STA can not scan and find LEVELONE 150MBPS WIRELESS POE AP, so that malicious attack by some illegal STA could be avoided.

#### • 802.11 Mode

The LEVELONE 150MBPS WIRELESS POE AP can communicate with wireless devices of 802.11b/g or 802.11b/g/n.

#### HT Protect

Enable HT (High Throughput) protect to ensure HT transmission with MAC mechanism.
 Under 802.11n mode, wireless client can be divided into HT STA and Non-HT STA, among which the one with HT protect enabled gets higher throughput.

#### • Frequency/Channel

Channel varies much as the available band differs from country to country. Select a proper Chapter 3 Basic Settings Page 26 operating channel in the drop-down list according to your situation.

#### Extension Channel

Only applicable to AP, AP Repeater, and 40MHz channel width) indicates the use of channel bonding that allows the LEVELONE 150MBPS WIRELESS POE AP to use two channels at once. Two options are available: Upper Channel and Lower Channel.

#### Channel Mode

Four levels are available: 5MHz, 10MHz, 20MHz and 40MHz. The last one can enhance data throughput, but it takes more bandwidth, thus it might cause potential interference.

#### Antenna

By default, LEVELONE 150MBPS WIRELESS POE AP uses its built-in antenna for directional transmission; however, if you prefer to use an external antenna for your case-dependent applications, you can switch from "Internal (8 dBi)" to "External (N-Type)".

When **External (N-Type)** is selected, an Antenna Gain bar will appear to allow you specify the gain of the external antenna. The antenna gain calculates the TX power back off needed to remain in compliance with regulations.

#### Note:

- You are able to choose "External (N-Type)" only when you have well done installing the external antenna; otherwise, it might damage LEVELONE 150MBPS WIRELESS POE AP itself.
- The maximum output power will vary depending on the country selected in order to comply with the local regulation.
- The output power here is counted from the RF single chain only not including the 8dBi internal antenna.

#### Maximum Output Power (per chain):

Specify the signal transmission power. The higher the output power is, the wider the signal can cover, but the power consumption will be greater accordingly.

#### Data Rate

Usually "**Auto**" is preferred. Under this rate, the LEVELONE 150MBPS WIRELESS POE AP will automatically select the highest available rate to transmit. In some cases, however, like where there is no great demand for speed, you can have a relatively-low transmit rate for compromise of a long distance.

#### Extension Channel Protection Mode

This is to avoid conflict with other wireless network and boost the ability of your device to catch all 802.11g transmissions. However, it may decrease wireless network performance. Compared to CTS-Self; the transmission amount of CTS-RTS is much lower.

#### Enable MAC Clone

Available only under wireless client mode, it hides the MAC address of the AP while displays the one of associated wireless client or the MAC address designated manually.

### **Site Survey**

Under wireless client mode, the LEVELONE 150MBPS WIRELESS POE AP is able to perform site survey, through which, information on the available access points will be detected.

Open **"Basic Settings**" in **"Wireless**", by clicking the **"Site Survey**" button beside **"Wireless Mode**" option, the wireless site survey window will pop up with a list of available AP in the vicinity. Select the AP you would like to connect and click **"Selected**" to establish connection.

#### Wireless Site Survey

This page provides tool to scan the wireless network. If any Access Point or IBSS is found, you could choose to connect it manually when client mode is enabled.

Select	S SID ≑	Frequency/Channel	MAC Address 🗢	Wireless Mode	Signal Strength	Security
0	LevelOne	2437MHz(6)	00:11:6b:4e:02:86	802.11B/G/N	-90	NONE
0	default-Steven	2437MHz(6)	00:11:6b:62:d4:ac	802.11B/G	-84	NONE
0	Will_wbr-6003	2437MHz(6)	00:11:6b:64:4a:36	802.11B/G/N	-85	NONE
0	Level1_9F	2462MHz(11)	00:11:6b:36:86:db	802.11B/G	-55	WPA2
0	Meetingroom	2462MHz(11)	00:11:6b:3d:ae:df	802.11B/G	-50	WPA2
0	LevelOne	2462MHz(11)	00:11:6b:64:eb:b4	802.11B/G/N	-92	NONE
0	TFN	2462MHz(11)	00:11:6b:00:0f:01	802.11B/G	-94	WPA2
0	6th Floor Wi-Fi	2442MHz(7)	00:11:6b:61:fa:9c	802.11B/G/N	-86	NONE
0		2417MHz(2)	00:11:6b:e9:2e:f9	802.11B/G/N	- <mark>94</mark>	NONE

#### Figure 26 Site Survey

### **VAP Profile Settings**

Available in AP mode, the LEVELONE 150MBPS WIRELESS POE AP allows up to 16 virtual SSIDs on a single BSSID and to configure different profile settings such as security and VLAN ID to each SSID. To create a virtual AP, you may check the **Enable** box of the profile and click on the profile (eg. Profile 2) to configure wireless and security settings. Hit **Apply** to active the profile.

Status	System	n	Wireless	Manageme	nt	Tools
Basic Settings	1/0		Cattinara			
Profile Settings »		P Profile	-			
Advanced Settings						
Access Control	#	Profile Name +	SSID	\$ Security \$	Vlan ID	Enable
Access control	1	Profile1	LevelOne	Open System	0	Always Enabled
WDS Settings	2	Profile2	LevelOne	Open System	0	
	3	Profile3	LevelOne	Open System	0	
	4	Profile4	LevelOne	Open System	0	
	5	Profile5	LevelOne	Open System	0	
	6	Profile6	LevelOne	Open System	0	
	7	Profile7	LevelOne	Open System	0	
	8	Profile8	LevelOne	Open System	0	
	9	Profile9	LevelOne	Open System	0	

Figure 15 VAP Profile Settings

Basic Settings       Access Control     Profile Name:       WDS Settings     Profile Name:       Wireless Network Name (SSID):     LevelOne       Broadcast SSID:     © Enabled     Disabled       Wireless Separation:     © Enabled     Disabled       WMM Support:     © Enabled     Disabled	Status	System	Wireless	Management	Tools
Profile Settings       Basic Settings         Access Control       Profile Name:       Profile1         WDS Settings       LevelOne       Enabled         Wireless Network Name       LevelOne       Disabled         Wireless Separation:       © Enabled       Disabled         WMM Support:       © Enabled       Disabled	Basic Setting		Cattings		
Basic Settings       Access Control     Profile Name:       WDS Settings     Profile Name:       Wireless Network Name (SSID):     LevelOne       Broadcast SSID:     © Enabled     Disabled       Wireless Separation:     © Enabled     Disabled       WMM Support:     © Enabled     Disabled	Profile Setting		Settings		
Access Control       Profile Name:       Profile1         WDS Settings       Wireless Network Name (SSID):       LevelOne         Broadcast SSID:       Image: Separation:       Image: Separation:         Wireless Separation:       Image: Separation:       Image: Separation:         WMM Support:       Image: Separation:       Image: Separation:	Advanced Setting	Basic Settings			
WDS Settings     (SSID):     LevelOne       Broadcast SSID:     Image: Constraint of the set of the	Access Contro		Profile1		
Broadcast SSID:   Broadcast SSID:  Wireless Separation:  WMM Support:  Broabled  Disabled  Disabled  Broadcast SSID:  Disabled  Disabled  Broadcast SSID:  Disabled  Disabled Di	WDS Setting		e LevelOne		
WMM Support			⊙ Enabled ○ [	Disabled	
		Wireless Separation:	O Enabled 💿 🛛	Disabled	
		WMM Support:	Enabled	Disabled	
Max. Station Num: 32 (0-32)		Max. Station Num:	32 (0-3	2)	
Security Settings		Security Settings			
		Network Authentication:	Open System	*	
		Data Encryption: Key Type:	None Mex		

Figure 16 VAP Profile Settings

#### Basic Setting

#### Profile Name: Name of the VAP profile

#### Wireless Network Name: Enter the virtual SSID for the VAP

**Broadcast SSID**: In AP mode, hiding network name is necessary when you are in a wireless environment that may have potential risk. By disabling broadcast SSID, the STA cannot scan and find the LEVELONE 150MBPS WIRELESS POE AP, so that malicious attack by some illegal STA could be avoided.

<u>Wireless Separation</u>: Wireless separation is an ideal way to enhance the security of network transmission. Under the mode except wireless client mode, enable "Wireless Separation" can prevent the communication among associated wireless clients.

<u>WMM Support</u>: WMM (Wi-Fi Multimedia) is a subset of 802.11e. It allows wireless communication to define a priority limit on the basis of data type under AP mode only, thus those time-sensitive data, like video/audio data, may own a higher priority than common one. To enable WMM, the wireless client should also support it

<u>Max. Station Number</u>: By checking the "Max. Station Num" the CPE will only allow up to 32 wireless clients to associate with for better bandwidth for each client. By disabling the checkbox the CPE will allow up to 128 clients to connect, but it is likely to cause network congestion or poor performance.

#### • Security Setting:

To prevent unauthorized radios from accessing data transmitting over the connectivity, the LEVELONE 150MBPS WIRELESS POE AP provides you with rock solid security settings. For detailed information please go to **Chapter 4 Wireless Security Setting**.

### **VLAN** Tab

If your network uses VLANs, you can assign one SSID to a VLAN, and client devices using the SSID are grouped in that VLAN.

To allow users on the VLAN to access the WEB page of the LEVELONE 150MBPS WIRELESS POE AP, you need to enable "**Enable 802.1Q VLAN**" and assign a management VLAN ID for your device. Make sure the assigned management VLAN ID is identical to your network VLAN ID to avoid failures Chapter 3 Basic Settings Page 30

Status	System		Wireless	Manageme	ent	Tool
Basic Settings	8	Promes	wireless	Open system	U	
Dasic Settings	9	Profile9	Wireless	Open System	0	
Profile Settings >>	10	Profile10	Wireless	Open System	0	
Advanced Settings	11	Profile11	Wireless	Open System	0	
Access Control	12	Profile12	Wireless	Open System	Q	
	13	Profile13	Wireless	Open System	0	
WDS Settings	14	Profile14	Wireless	Open System	0	
	15	Profile15	Wireless	Open System	0	
	16	Profile16	Wireless	Open System	0	
		ement VLAN ID:	N	2001		

of accessing the Web page of the LEVELONE 150MBPS WIRELESS POE AP.

Figure 17 Management VLAN ID

# **Chapter 4 Advanced Settings**

### **Advanced Wireless Settings**

Open "Advanced Settings" in "Wireless" to make advanced wireless settings.



**Figure 30 Advanced Wireless Settings** 

#### A-MPDU/A-MSDU Aggregation

The data rate of your AP except wireless client mode could be enhanced greatly with this option enabled; however, if your wireless clients don't support A-MPDU/A-MSDU aggregation, it is not recommended to enable it.

#### Short GI

Under 802.11n mode, enable it to obtain better data rate if there is no negative compatibility issue.

#### RTS Threshold

The LEVELONE 150MBPS WIRELESS POE AP sends RTS (Request to Send) frames to certain receiving station and negotiates the sending of a data frame. After receiving an RTS, that STA responds with a CTS (Clear to Send) frame to acknowledge the right to start transmission. The setting range is 0 to 2346 in byte. Setting it too low may result in poor network performance. Leave it at its default of 2346 is recommended.

#### Fragmentation Length

Specify the maximum size in byte for a packet before data is fragmented into multiple packets. Setting it too low may result in poor network performance. Leave it at its default of 2346 is recommended.

#### Beacon Interval

Specify the frequency interval to broadcast packets. Enter a value between 20 and 1024.

#### DTIM Interval

DTIM, which stands for Delivery Traffic Indication Message, is contained in the data packets. It is for enhancing the wireless transmission efficiency. The default is set to 1. Enter a value between 1 and 255.

#### Preamble Type

It defines some details on the 802.11 physical layer. "Long" and "Auto" are available.

#### IGMP Snooping

Available in AP/Router mode, IGMP snooping is the process of listening to IGMP network traffic. By enabling IGMP snooping, the AP will listen to IGMP membership reports, queries and leave messages to identify the ports that are members of multicast groups. Multicast traffic will only be forwarded to ports identified as members of the specific multicast group or groups.

#### RIFS

RIFS (Reduced Interframe Spacing) is a means of reducing overhead and thereby increasing network efficiency.

#### Link Integration

Available under AP/Bridge/AP repeater mode, it monitors the connection on the Ethernet port by checking "**Enabled**". It can inform the associating wireless clients as soon as the disconnection occurs.

#### • TDM Coordination

Stands for "Time-Division Multiplexing Technique", this resource reservation control mechanisms can avoid packet collisions and send the packets much more efficiently allowing for higher effective throughput rates. This function is only available in AP/CPE mode. It is highly recommended to enable TDM coordination when there are multiple CPEs needed to connect to the AP in your application.

#### LAN2LAN CPE

LAN2LAN CPE mode enables packet forwarding at layer 2 level. It is fully transparent for all the Layer2 protocols.

#### • Space in Meter

To decrease the chances of data retransmission at long distance, the LEVELONE 150MBPS WIRELESS POE AP can automatically adjust proper ACK timeout value by specifying distance of the two nodes.

#### Flow Control

It allows the administrator to specify the incoming and outgoing traffic limit by checking "**Enable Traffic Shaping**". This is only available in Router mode.

Note:

 We strongly recommend you leave most advanced settings at their defaults except "Distance in Meters" adjusted the parameter for real distance; any modification on them may negatively impact the performance of your wireless network.

### **Wireless Security Settings**

To prevent unauthorized radios from accessing data transmitting over the connectivity, the LEVELONE 150MBPS WIRELESS POE AP provides you with rock solid security settings.

#### **Security Settings**

Open "Security Settings" in "Wireless" as below:

Status	System	Wireless	Management	Tools
Basic Settings	Wireless Network Name (SSID):	LevelOne		
Profile Settings » Advanced Settings	WMM Support: Security Settings	Enabled O Dis	abled	-
Access Control	Network Authentication:	Open System	<b>*</b>	
WDS Settings	Data Encryption: Key Type: Default Tx Key: WEP Passphrase:	Shared Key Legacy 802.1x WPA with Radius WPA-2 with Radius WPA-PSK WPA2-PSK	Generate Keys	
	Encryption Key 1: Encryption Key 2:			
	Encryption Key 3: Encryption Key 4:			

#### Figure 31 Security Settings

#### Network Authentication

**Open System**: It allows any device to join the network without performing any security check.

**<u>Shared Key</u>**: Data encryption and key are required for wireless authentication (Not available in Bridge/AP Repeater mode).

**Legacy 802.1x**: Available in AP/Wireless Client mode, it provides the rights to access the wireless network and wired Ethernet. With User and PC identity, centralized authentication as well as dynamic key management, it controls the security risk of wireless network to the lowest. To serve the 802.1x, at least one EAP type should be supported by the RADIUS Server, AP and wireless client.

### Note:

 For first time users, if EAP type "TLS" is selected, you need to import valid user certificate given by CA in prior. To import user certificates, please refer to Chapter 5 Management/Certificate Settings for more details.

<u>WPA with RADIUS</u>: Available in AP/Wireless Client mode, with warrant (username, password and etc.) offered by user, this kind of authentication can be realized with specific RADIUS server. This is the common way to be adopted in large enterprise network.

 WPA2 with RADIUS
 Available in AP/Wireless Client mode, as a new version of WPA, only all the

 Chapter 4 Advanced Settings
 Page 35

clients support WPA2, can it be available. If it is selected, AES encryption and RADIUS server is required. It is only available in AP/Wireless Client mode.

<u>WPA&WPA2 with RADIUS</u>: Available in AP mode, it provides options of WPA (TKIP) or WPA2 (AES) for the client. If it is selected, the data encryption type must be TKIP + AES and the RADIUS server must be set.

**WPA-PSK**: It is a simplified WPA mode with no need for specific authentication server. In this so-called WPA Pre-Shared Key, all you have to do is just pre-enter a key in each WLAN node and this is the common way to be adopted in large and middle enterprise as well as residential network.

**WPA2-PSK**: As a new version of WPA, only all the clients support WPA2, can it be available. If it is selected, the data encryption can only be AES and the passphrase is required.

**WPA-PSK&WPA2-PSK**: Available in AP mode, it provides options of WPA (TKIP) or WPA2 (AES) encryption for the client. If it is selected, the data encryption can only be TKIP + AES and the passphrase is required.

#### Data Encryption

If data encryption is enabled, the key is required and only sharing the same key with other wireless devices can the communication be established.

None: Available only when the authentication type is open system.

64 bits WEP: It is made up of 10 hexadecimal numbers.

**<u>128 bits WEP</u>**: It is made up of 26 hexadecimal numbers.

152 bits WEP: It is made up of 32 hexadecimal numbers.

**TKIP**: Temporal Key Integrity Protocol, which is a kind of dynamic encryption, is co-used with WPA-PSK, etc.

AES: Advanced Encryption Standard, it is usually co-used with WPA2-PSK, WPA, WPA2, etc.

**TKIP + AES**: It allows for backwards compatibility with devices using TKIP.

### Note:

- We strongly recommend you enable wireless security on your network!
- Only setting the same Authentication, Data Encryption and Key in the LEVELONE 150MBPS WIRELESS POE AP and other associated wireless devices, can the communication be established!

#### **Access Control**

The Access Control appoints the authority to wireless client on accessing LEVELONE 150MBPS WIRELESS POE AP, thus a further security mechanism is provided. This function is available only under AP mode.

Open "Access Control" in "Wireless" as below.

Status	System	Wireless	Management	Tools
Basic Settings	Wireless	Access Contr	ol	
Profile Settings			whose wireless MAC addresses ar	e in the access
Advanced Settings		able to connect to your Access In the list will not be able to conn	Point. When 'Deny Listed' is select nect the Access Point.	ted, these
Access Control »	Access Contro	Disable	•	
WDS Settings	MAC Address:			
		Apply	Cancel	
	3			
		MAC Address \$	Select Edit	

#### Figure 32 Access Control

#### Access Control Mode

If you select "**Allow Listed**", only those clients whose wireless MAC addresses are in the access control list will be able to connect to your AP. While when "**Deny Listed**" is selected, those wireless clients on the list will not be able to connect the AP.

#### MAC Address

Enter the MAC address of the wireless client that you would like to list into the access control list, click "**Apply**" then it will be added into the table at the bottom.

#### Delete Selected/All

Check the box before one or more MAC addresses of wireless client(s) that you would like to cancel, and click "**Delete Selected**" or "**Delete All**" to cancel that access control rule.

#### **WDS Settings**

Extend the range of your network without having to use cables to link the Access Points by using the Wireless Distribution System (WDS): Simply put, you can link the Access Points wirelessly. Open "WDS Settings" in "Wireless" as below:

Status	System Wi	reless	Management	Tools
Basic Settings				
Profile Settings	WDS Settings			
Advanced Settings	<ul> <li>Wireless Distribution System us</li> <li>Ethernet does. To do this, you n</li> <li>other APs which you want to cor</li> </ul>	nust set these APs in the	e same channel and set MAC	addresses of
Access Control	can work only in Bridge and AP			
	WDS Separation:	O Enabled 💿 Di	sabled	
WDS Settings »	Local MAC Address:	00:19:70:4e:02:85		
	Remote AP MAC Address 1:			
	Remote AP MAC Address 2:			
	Remote AP MAC Address 3:			
	Remote AP MAC Address 4:			

Figure 33 WDS Settings

Enter the MAC address of another AP you wirelessly want to connect to into the appropriate field and click "**Apply**" to save settings.

#### WDS separation

WDS separation can separate the data connection when there are more than 3 WAB-6120 devices connect in WDS mode. Ex, A,B,C connect in WDS mode, A<->B, B<->C, you can enable WDS separation to interrupt the data transfer between A and C.



- WDS Settings is available only under Bridge and AP Repeater Mode.
- Bridge uses the WDS protocol that is not defined as the standard thus compatibility issues between equipment from different vendors may arise. Moreover, Tree or Star shape network topology should be used in all WDS use-cases (i.e. if AP2 and AP3 are specified as the WDS peers of AP1, AP2 should not be specified as the WDS peer of AP3 and AP3 should not be specified as the WDS peer of AP3 and AP3 should not be specified as the WDS peer of AP2 in any case). Mesh and Ring network topologies are not supported by WDS and should be avoided in all the use cases.

# **Chapter 5 Management**

### **Remote Management**

The LEVELONE 150MBPS WIRELESS POE AP provides a variety of remotes managements including Telnet, SNMP, FTP, SSH, HTTPS and exclusive WISE tool, making configuration more convenient and secure.

With **Normal** selected, Telnet, SNMP and FTP are activated as default remote management options. To use secure management tools such as SSH, HTTPS and WISE, please select "**Secure**". You may also choose "**Customized**" to enable any methods as desired.

Remote Settings >>   CoovaChilli Settings   Firmware Upload   Configuration File   Password Settings   Certificate Settings   SNMP   SNMP Settings   Protocol Version:   V3 >   Server Port.   Get Community:   public   Set Community:   protocol Version:   V3 >	Status	System	Wireless	Management	Tools
CoovaChilli Settings         Firmware Upload         Configuration File         Password Settings         Certificate Settings         SNMP Settings         Protocol Version:         Server Port         Get Community:         public	Remote Setting	ā			
Firmware Upload         Configuration File         Password Settings         Certificate Settings         SNMP Settings         Protocol Version:         Server Port:         161         Get Community:		Remote	Settings		
Configuration File       Management Privacy Mode         Password Settings       Imagement Privacy Mode         Certificate Settings       Imagement Privacy Mode         SSH       Force HTTPS         Protocol Version:       V3 V         Server Port:       161         Get Community:       public	CoovaChilli Setting	Use this page to s	witch services of remote console.	<[	
Configuration File       Normal       Secure       Customized         Password Settings       Image: Telnet       Image: SNMP       Image: FTP         Certificate Settings       Image: SNMP Settings       Image: SNMP Settings         Protocol Version:       V3 Image: State Settings         Server Port:       161         Get Community:       public	Firmware Upload				
Password Settings     Image: Telnet     Image: SNMP     Image: FTP       Certificate Settings     Image: SNMP Settings       SNMP Settings       Protocol Version:     V3 Image: V	Configuration File	Management F	Privacy Mode		
Certificate Settings  SNMP Settings  Protocol Version: V3  Server Port: 161 Get Community: public	Reseword Setting				
SNMP Settings Protocol Version: V3 V Server Port: 161 Get Community: public	Fassword Setting	Temer			
Protocol Version: V3 V Server Port: 161 Get Community: public	Certificate Setting	s LISSH	Force HTTPS With	SE	
Server Port: 161 Get Community: public		SNMP Settings			
Get Community: public		Protocol Versio	vs 🗸		
		Server Port:	161		
Set Community: private		Get Communit	y: public		
		Set Communit	private		
		Trap Commun	ity: public		

Figure 18 Remote Settings

### **SNMP** Management

The LEVELONE 150MBPS WIRELESS POE AP supports SNMP for convenient remote management. Open "**Remote Settings**" in "**Management**" shown below. Set the SNMP parameters and obtain MIB file

before remote management.

one WAB-				Log
Status	System	Wireless	Management	Tools
Remote Settings »	Demete C			
CoovaChilli Settings	Remote S Use this page to swit	ch services of remote console.		
Firmware Upload				
Configuration File	Management Pri			
Password Settings	○ Normal ○ ☑ Telnet	Secure  Customized SNMP		
Certificate Settings	SSH	Force HTTPS VIS	E	
	SNMP Settings			
	Protocol Version:	V3 🛩		
	Server Port:	161		
	Get Community:	public		
	Set Community:	private		
	Trap Destination:	0.0.0.0		
	Trap Community:	public		

#### Figure 35 SNMP Configuration

#### Protocol Version

Select the SNMP version, and keep it identical on the LEVELONE 150MBPS WIRELESS POE AP and the SNMP manager. The LEVELONE 150MBPS WIRELESS POE AP supports SNMP v2/v3.

#### • Server Port

Change the server port for a service if needed; however you have to use the same port to use that service for remote management.

#### Get Community

Specify the password for the incoming Get and GetNext requests from the management station. By default, it is set to public and allows all requests.

#### • Set Community

Specify the password for the incoming Set requests from the management station. By default, it is set to private.

#### • Trap Destination

Specify the IP address of the station to send the SNMP traps to.

#### • Trap Community

Specify the password sent with each trap to the manager. By default, it is set to public and allows all requests.

### Configure SNMPv3 User Profile

For SNMP protocol version 3, you can click "**Configure SNMPv3 User Profile**" in blue to set the details of SNMPv3 user. Check "**Enable SNMPv3 Admin/User**" in advance and make further configuration.

Status	System W	ireless	Management	Tools
Remote Settings		ttinge		
CoovaChilli Settings »	CoovaChilli Se			
Firmware Upload	Coovachilli Enable			
Configuration File	RADIUS Settings			100
Password Settings	Primary RADIUS Server:	radius1.coova.net		
Certificate Settings	Secondary RADIUS Server:	radius2.coova.net		
	RADIUS Auth Port: RADIUS Acct Port:	1812		
	RADIUS Shared Secret			
	RADIUS NASID:	your-radius-nasid		

Figure 36 Configure SNMPv3 User Profile

#### User Name

Specify a user name for the SNMPv3 administrator or user. Only the SNMP commands carrying this user name are allowed to access the LEVELONE 150MBPS WIRELESS POE AP.

#### Password

Specify a password for the SNMPv3 administrator or user. Only the SNMP commands carrying this

password are allowed to access the LEVELONE 150MBPS WIRELESS POE AP.

#### Confirm Password

Input that password again to make sure it is your desired one.

• Access Type

Select "Read Only" or "Read and Write" accordingly.

#### Authentication Protocol

Select an authentication algorithm. SHA authentication is stronger than MD5 but is slower.

#### Privacy Protocol

Specify the encryption method for SNMP communication. None and DES are available.

<u>None</u>: No encryption is applied. Chapter 5 Management

### **Coovachilli Settings**

Coovachilli is a captive portal management which allows WLAN users to easily and securely access the Internet. Under Router mode, when Coovachilli is enabled, the LEVELONE 150MBPS WIRELESS POE AP Access Point will force an HTTP client on a network to see a special web page (usually for authentication purposes) before using the Internet normally. At that time the browser is redirected to a web page which may require authentication. Captive portals are used at most Wi-Fi hotspots. Therefore, to use Coovachilli, you need to find Coovachilli service providers that have the additional services needed to make Coovahcilli work.

Status	System Wi	ireless	Management	Tools
Remote Settings	CeaveChilli Se	ttinge		
CoovaChilli Settings »	CoovaChilli Se Use this page to set basic Coov			
Firmware Upload	Coovachilli Enable			
Configuration File	RADIUS Settings			(***
Password Settings	Primary RADIUS Server:	radius1.coova.net		
Certificate Settings	Secondary RADIUS Server:	radius2.coova.net		
	RADIUS Auth Port: RADIUS Acct Port:	1812		
	RADIUS Acci Polt.	1813		
	RADIUS NASID:	your-radius-nasid		

#### Figure 19 Coovachilli Settings

#### **Radius Settings**

#### • Primary Radius Server

Enter the name or IP address of the primary radius server

Secondary Radius Server

Enter the name or IP address of the primary radius server if any.

#### • Radius Auth Port:

Enter the port number for authentication

#### • Radius Acct Port:

Chapter 5 Management

Enter the port number for billing

• Radius Shared Secret:

Enter the secret key of the radius server

• Radius NAS ID:

Enter the name of the radius server if any

#### **Radius Administrative-User**

Radius Admin Username:

Enter the username of the Radius Administrator

• Radius Admin Password:

Enter the password of the Radius Administrator

#### Captive Portal

• UAM Portal URL:

Enter the address of the UAM portal server

• UAM Secret:

Enter the secret password between the redirect URL and the Hotspot.

### **Upgrade Firmware**

Open "**Firmware Upload**" in "**Management**" and follow the steps below to upgrade firmware locally or remotely through LEVELONE 150MBPS WIRELESS POE AP's Web:

		Contraction (Contraction)		
Remote Setting	Upgrad	le Firmware		
CoovaChilli Setting	This page allow	vs you upgrade the device firmwa he upload because it may crash t	are to a new version. Please do not po	ower off the
Firmware Uploa	d »	ne upidad because it may crash t	the system.	
Configuration File	e Select File:		瀏覽	
Password Setting	S	Upload	Cancel	
Certificate Setting	s	Opioau	Cancer	

#### Figure 20 Upgrade Firmware

- Click "Browse" to select the firmware file you would like to load;
- Click "Upload" to start the upload process;
- Wait a moment, the system will reboot after successful upgrade.

#### Note:

• Do NOT cut the power off during upgrade, otherwise the system may crash!

### **Backup/ Retrieve Settings**

It is strongly recommended you back up configuration information in case of something unexpected. If tragedy hits your device, you may have an access to restore the important files by the backup. All these can be done by the local or remote computer.

Open "Configuration File" in "Management" as below:

Remote Settings	Configurati	on File		
CoovaChilli Settings	This page allows you to a	save current settings to a file	e or load the settings from the file	
Firmware Upload	saved previously. Beside the device.	es, you could reset the curre	ent configuration to factory defaul	t or reboot
Configuration File >>	Save Settings to File:	Save		
Password Settings	Load Settings from Fi		瀏覽 Upload	
Certificate Settings	Reset Settings to Def Reboot The Device:	ault: Reset		
	Rebout the Device.	[KEDOOL]		

#### Figure 21 Backup/Retrieve Settings

#### • Save Setting to File

By clicking "**Save**", a dialog box will pop up. Save it, then the configuration file **ap.cfg** will be generated and saved to your local computer.

#### Load Settings from File

By clicking "**Browse**", a file selection menu will appear, select the file you want to load, like **ap.cfg**; Click "**Upload**" to load the file. After automatically rebooting, new settings are applied.

### **Restore Factory Default Settings**

The LEVELONE 150MBPS WIRELESS POE AP provides two ways to restore the factory default settings:

#### Restore factory default settings via Web

From "**Configuration File**", clicking "**Reset**" will eliminate all current settings and reboot your device, then default settings are applied.

Status	System	Wireless	Management	Tools
Remote Setting	Configu	ration File		
CoovaChilli Setting		ration File	a file or load the settings from the fil	a which was
Firmware Upload	saved previously.	Besides, you could reset the cu	irrent configuration to factory defaul	t or reboot
Configuration File	Save Settings	to File: Save	ĩ	
Password Setting	678		」 【瀏覽…】 Upload	
Certificate Setting				
	Reboot The D	evice: Reboot		

#### **Figure 22 Restore Settings**

#### Restore factory default settings via Reset Button

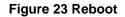
If software in LEVELONE 150MBPS WIRELESS POE AP is unexpectedly crashed and no longer reset the unit via Web, you may do hardware reset via the reset button. Press and hold the button for at least 5 seconds and then release it until the PWR LED gives a blink.

### Reboot

You can reboot your LEVELONE 150MBPS WIRELESS POE AP from "Configuration File" in "Management" as below:

Click "**Reboot**" and hit "**Yes**" upon the appeared prompt to start reboot process. This takes a few minutes.

Remote Settings				
CoovaChilli Settings		ration File		
Firmware Upload	This page allows y saved previously. the device.	ou to save current settings to a Besides, you could reset the cu	a file or load the settings from the file arrent configuration to factory defaul	e which was t or reboot
Configuration File	>> Save Settings 1	a File:	1 C	
Password Settings	Load Settings		」 ②覽… Upload	
Certificate Settings	Reset Settings Reboot The De		7	
	Reboot the De	Nice.		



### Password

From **"Password Settings**" in **"Management**", you can change the password to manage your LEVELONE 150MBPS WIRELESS POE AP.

Enter the new password respectively in "**New Password**" and "**Confirm Password**" fields; click "**Apply**" to save settings.

	System		Management	
Remote Settings	Passwor	d Settings		
CoovaChilli Settings		et the password of this Access	Point.	
Firmware Upload				
Configuration File	New Passwor Confirm Pass			
Password Settings				
Certificate Settings	5	Apply	Cancel	

#### Figure 24 Password

Note:

• The password is case-sensitive and its length cannot exceed 19 characters!

### **Certificate Settings**

Under Client mode, when EAP-TLS is used, the RADIUS server must know which user certificates to trust. The Server can trust all certificates issued by a given CA.

To import a user certificate, from Import User Certificates, click "**Browse**" and specify the location where the user certificate is placed. Click "**Import**".

Remote Settings				
CoovaChilli Settings		te Settings		
Firmware Upload	Delete User C	ertificate:	Delete	
Configuration File	Import User C	ertificates:	瀏覽 Import	
Password Settings				
Certificate Settings	*			

#### Figure 25 Certificate Settings

# **Chapter 6 Monitoring Tools**

### System Log

System log is used for recording events occurred on the LEVELONE 150MBPS WIRELESS POE AP, including station connection, disconnection, system reboot and etc.

Open "System Log" in "Tools" as below.

WAB-						
Status	System	Wire	eless	Management	Tools	
System Log »	0					
Site Survey	the second	em Log age to set remote log se	ever and show the sve	stem log		
Ping Watchdog		ige to set remote log st	a ver and show the sys	icin log.		
Data Rate Test	🗌 Ena	ble Remote Syslog	Server			
Antenna Alignment	IP Add	ress:	0.0.0.0			
Speed Test	Port:		514			
			Apply Cancel	<u>ן</u>		
	# \$	Time 💠	Source +	Message	÷	
	1	2011-12-20 17:46:04	00:19:70:4E:02:85	WLAN service stopped.		
	2	2011-12-20 17:46:04	00:19:70:4E:02:85	WLAN service started.		
	3	2011-12-20 17:46:05	00:19:70:4E:02:85	WLAN service stopped.		
	4	2011-12-20 17:46:05	00:19:70:4E:02:85	WLAN switch antenna from Extern	Sector 1	

#### Figure 26 System Log

#### Remote Syslog Server

Enable Remote Syslog: Enable System log to alert remote server.

**IP Address:** Specify the IP address of the remote server.

**Port**: Specify the port number of the remote server.

### **Site Survey**

Only available under Wireless Client mode, site survey allows you to scan all the APs within coverage.

Sustem Les							
System Log		eless Site	Survey				
Site Survey	This pag	e provides tool to s loose to connect it r	can the wireless netw nanually when client	vork. If any Acc mode is enable	ess Point o J.	r IBSS is f	ound, you
Ping Watchdog							
Data Rate Test		SSID \$	Frequency/Channel	MAC Addrests	Wireless Mode	Signal Strength	Security
Antenna Alignment				· · · · ·		·	-
Speed Test			[c.				
			.5	LdII			

Open "Site Survey" in "Tools" as below and select the desired AP to connect.

Figure 27 Site Survey

## **Ping Watch Dog**

If you mess your connection up and cut off your ability the log in to the unit, the ping watchdog has a chance to reboot due to loss of connectivity.

Status	System	Wireless	Management	Tools
System Log	Ding Watchd	0.0		
Site Survey	Ping Watchd	-	Watchdog. If the failcount of the Ping	reaches to a
Ping Watchdog »	specified value, the watchdo	g will reboot the d	levice.	
Data Rate Test	Enable Ping Watchd	log		
Antenna Alignment	IP Address to Ping:	0.0.0.0		
Speed Test	Ping Interval:	300	seconds	
spood foot	Startup Delay: - Failure Count To Reboot:	120 300	seconds(>120)	
		Lancester		
		Apply	Cancel	

Figure 28 Ping Watchdog

#### Ping Watchdog

**Enable Ping Watchdog**: To activate ping watchdog, check this checkbox.

IP Address to Ping: Specify the IP address of the remote unit to ping.

**Ping Interval:** Specify the interval time to ping the remote unit.

<u>Startup Delay</u>: Specify the startup delay time to prevent reboot before the LEVELONE 150MBPS WIRELESS POE AP is fully initialized.

**Failure Count To Reboot**: If the ping timeout packets reached the value, the LEVELONE 150MBPS WIRELESS POE AP will reboot automatically.

### **Date Rate Test**

The Data Rate Test allows you test the current RSSI at each data rate between your LEVELONE 150MBPS WIRELESS POE APs.

System Lo	Data Rat	e Test		
Site Surve	ey Use this page to t	est the link quality to the re	mote WDS node.	
Ping Watchdo	og	- Index		
Data Rate Te	st »	Index	MAC Address	
Antenna Alignme	nt			
Speed Te	st	Refre	sh Start	

#### Figure 29 Data Rate Test

### **Antenna Alignment**

Under Bridge mode, when the bridges are not easily visible from the location where the dish will be installed, the antenna alignment tool can help you evaluate the position of the unit and adjust the angle of the antenna more precisely. Keep it that in real circumstances a lot of additional factors should be taken into account when your unit is installed. These factors include various obstacles (buildings, trees), the landscape, the altitude, transponder orientation, polarization, etc.

To use the tool, select the desired remote WDS bridge and click "Start", the web page will display the measured signal strength, RSSI and transmit/receive packets. If the signal quality is not quite good, try to adjust the antenna and see if the quality improves or not.

Status	System		eless	Managem		Tools
System Log	Antenna	a Alignm	ent			
Site Survey		align the antenna				
Ping Watchdog						
Data Rate Test			-	MAC Address	*	
Antenna Alignment 🗧	•		2			
Speed Test			Refresh	Start		

Figure 30 Antenna Alignment

### **Speed Test**

The speed test is to monitor the current data transmission (TX) and data reception (RX) rate with the remote LEVELONE 150MBPS WIRELESS POE AP. Enter the IP address of the remote CPE, type in the user name/password and click "**Test**". The result will display in the bottom **STATUS**. You may test single TX/RX or bi-direction.

System Log	Speed To	est		
Site Survey	-		tween this device and another termin	al.
Ping Watchdog	Destination IP:	2		
Data Rate Test	User Name:			
Antenna Alignment				
Speed Test	Direction:	Transmit 🕚		
		T	est	

Figure 31 Speed Test

# **Chapter 7 Status**

### **View Basic Information**

Open "Information" in "Status" to check the basic information of the CPE, which is read only. Information includes system information, LAN settings, wireless setting and interface status. Click "Refresh" at the bottom to have the real-time information.

one		Log		
Status	System	Wireless	Management	Tools
Information »	Information			
Connections	This page shows the curre	ent status and some bas	sic settings of the device.	
Statistics				
ARP Table	System Information	WAR-61	20-4e0285	
Bridge Table	MAC Address		3:4E:02:85	
DHCP Clients	Country/Region Firmware Version	United S 3.0.4(LC		
Network Activities	LAN Settings			
	IP Address	192.168	.1.1	
	Subnet Mask	255.255	.255.0	
	Gateway IP Address	0.0.0.0		
	MAC Address	00:11:68	B:4E:02:85	
	Wireless Settings			
	Operation Mode	AP		

Figure 50 Basic Information

### **View Association List**

Open "**Connections**" in "**Status**" to check the information of associated wireless devices such as MAC address, signal strength, connection time, IP address, etc. All is read only. Click "**Refresh**" at the bottom to update the current association list.

	System				Managemen		
Information	Asso	ciation L	ist				
Connections »	This table :	shows the MAC Add	ress,IP Addres	s and R	SSI for each associate	d device(s).	
Statistics ARP Table	VAP Index	MAC Address \$	Signal I Strength	Noise Floor	Connection Time	Last IP 🜩	Action
Bridge Table							
DHCP Clients				Refresh			
Network Activities							

**Figure 51 Connection** 

By clicking on the MAC address of the selected device on the web you may see more details including device name, connection time, signal strength, noise floor, ACK timeout, link quality, IP information, current data rate, current TX/RX packets.

### Association Node Details

The details information of association node:

MAC Address	00:13:02:71:35:ba
Device Name	
Connect time	2011-1-24 17:59:33
Signal Strength	-85 dBm
Noise Floor	-117 dBm
ACK Timeout	27
Link Quality	0%
Last IP	169.254.17.206
TX/RX Rate	0/24 MBs
TX/RX Packets	2/115
Bytes Transmitted	119
Bytes Received	10002

Negotiated Rate	Last Signal
6M	-86 dBm
24M	-87 dBm
36M	-85 dBm

### **View Network Flow Statistics**

Open "**Statistics**" in "**Status**" to check the data packets received on and transmitted from the wireless and Ethernet ports. Click "**Refresh**" to view current statistics.

WAB					Lo		
Status	System	Wire	less	Management	Tools		
Information	04-44						
Connections		Statistics					
Statistics »	ethernet ne	This page shows the packet counters for transmission and reception regarding to wireles ethernet networks.					
ARP Table	Poli Int	terval: 5	(0-65534) sec S	et Interval Stop			
Bridge Table			Received	Transmitted			
		Wireless					
DHCP Clients		Unicast Packets	0	0			
DHCP Clients	-			0			
DHCP Clients Network Activities		Broadcast Packets	0	0			
		Broadcast Packets Multicast Packets	0	0			
	-			-			
	-	Multicast Packets	0	0			
		Multicast Packets Total Packets	0	0			
		Multicast Packets Total Packets Total Bytes	0	0			

#### Figure 52 Network Flow Statistics

#### Poll Interval

Specify the refresh time interval in the box beside "**Poll Interval**" and click "**Set Interval**" to save settings. "**Stop**" helps to stop the auto refresh of network flow statistics.

### **View ARP Table**

Open "ARP Table" in "Status" as below. Click "Refresh" to view current table.

Information		-/			
Connections	ARP T	Table			
Statistics	inia cable al				
ARP Table >>		IP Address 🗢	MAC Address	Interface	*
Bridge Table		192.168.1.33	00:1E:8C:3D:28:34	br0	
DHCP Clients			Refresh		
Network Activities					



### **View Bridge Table**

Open "Bridge Table" in "Status" as below. Click "Refresh" to view current connected status..

Information	 				
Connections	 e Table				
Statistics					
ARP Table	MAC Address	\$	Interface	\$ Ageing Timer(s) \$	
Bridge Table »	00:1e:8c:3d:28:34 00:19:70:4e:02:85		LAN Bridge	0.00	
DHCP Clients		ſ	Refresh		
Network Activities			Reliesh		

Figure 54 Bridge

### **View Active DHCP Client Table**

Open "**DHCP Client List**" in "**Status**" as below to check the assigned IP address, MAC address and time expired for each DHCP leased client. Click "**Refresh**" to view current table.

Information		liente				
Connections	DHCP C		ress. MAC address an	nd time e	xpired for each DHCP I	eased
Statistics	client.					
ARP Table		IP Address 🗢	MAC Address	+ 1	Time Expired(s) \$	
Bridge Table		None				
DHCP Clients »			Refresh			
Network Activities						



### **View Network Activities**

The network activities allows you to monitor the current Wireless and Ethernet TX/RX data traffic in graphical and numerical form on the Web of the device. The chart scale and throughput dimension (Bps, Kbps, Mbps) changes dynamically according to the mean throughput value. Throughput statistics can be updated manually using the "**Refresh**" button.

Status	System	Wireless	Management	Tools
Information	Naturaulr			
Connections		Activities	ess and ethernet networks.	
Statistics	1.		• *-3-1*	
ARP Table	100 90 <b>m</b> rx: 0b/	Wirel	less	
Bridge Table	80 70 tx: 0b/s			
DHCP Clients	60 50 40			
Network Activities »	30 20			
	10 b/s 0 *			
	100	Ether	rnet	



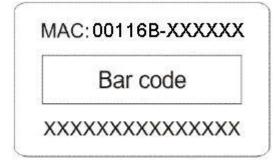
# **Chapter 8 Troubleshooting**

This chapter provides troubleshooting procedures for basic problems with the LEVELONE 150MBPS WIRELESS POE AP. For warranty assistance, contact your service provider or distributor for the process.

#### Q 1. How to know the MAC address of LEVELONE 150MBPS WIRELESS POE AP?

MAC Address distinguishes itself by the unique identity among network devices. There are two ways available to know it.

• Each device has a label posted with the MAC address. Please refer below.



#### Figure 57 MAC Address

On the LEVELONE 150MBPS WIRELESS POE AP Web-based management interface, you can view the MAC Address from "<u>View Basic Information</u>".

#### Q 2. What if I would like to reset the unit to default settings?

You may restore factory default settings in "Configuration File" from "Management".

#### Q 3. What if I would like to backup and retrieve my configuration settings?

You may do the backup by generating a configuration file or retrieve the settings you have backed

up previously in "Configuration File" from "Management".

#### Q 4. What if I can not access the Web-based management interface?

Please check the followings:

- Check whether the power supply is OK; Try to power on the unit again.
- Check whether the IP address of PC is correct (in the same network segment as the unit);

- Login the unit via other browsers such as Firefox.
- Hardware reset the unit.

# Q 5. What if the wireless connection is not stable after associating with an AP under wireless client mode?

- Since the LEVELONE 150MBPS WIRELESS POE AP comes with a built-in directional antenna, it is recommended make the LEVELONE 150MBPS WIRELESS POE AP face to the direction where the AP is to get the best connection quality.
- In addition, you can start "Site Survey" in "Wireless Basic Settings" to check the signal strength. If it is weak or unstable (The smaller the number is, the weaker the signal strength is.), please join other available AP for better connection.

# Appendix A. ASCII

WEP can be configured with a 64-bit, 128-bit or 152-bit Shared Key (hexadecimal number or ACSII).

As defined, hexadecimal number is represented by 0-9, A-F or a-f; ACSII is represented by 0-9, A-F,

a-f or punctuation. Each one consists of two-digit hexadecimal.

ASCII	Hex	ASCII	Hex	ASCII	Hex	ASCII	Hex
Character	Equivalent	Character	Equivalent	Character	Equivalent	Character	Equivalent
!	21	9	39	Q	51	i	69
"	22	•	ЗA	R	52	j	6A
#	23	•	3B	S	53	k	6B
\$	24	<	3C	Т	54	-	6C
%	25	=	3D	U	55	m	6D
&	26	>	3E	V	56	n	6E
ſ	27	?	3F	W	57	0	6F
(	28	@	40	Х	58	р	70
)	29	А	41	Υ	59	q	71
*	2A	В	42	Z	5A	r	72
+	2B	С	43	[	5B	S	73
,	2C	D	44	١	5C	t	74
-	2D	E	45	]	5D	u	75
	2E	F	46	۸	5E	V	76
/	2F	G	47	-	5F	W	77
0	30	Н	48	`	60	х	78
1	31	1	49	а	61	у	79
2	32	J	4A	b	62	z	7A
3	33	К	4B	С	63	{	7B
4	34	L	4C	d	64		7C
5	35	М	4D	е	65	}	7D
6	36	Ν	4E	f	66	2	7E
7	37	0	4F	g	67		
8	38	Р	50	h	68		

#### Table 2 ACSII

# **Appendix B. SSH Settings**

#### Table 3 CLI Commands

get	set	del	Keyword				Descriptions
$\checkmark$	$\checkmark$		time				time setting
$\checkmark$				-now			current system time
$\checkmark$	$\checkmark$			-zone			time zone
$\checkmark$	$\checkmark$			-NTPUpdate			NTP Update
$\checkmark$	$\checkmark$			-servertype			server type
$\checkmark$	$\checkmark$			-IP			-IP
$\checkmark$	$\checkmark$			-Manual IP			-Manual IP
$\checkmark$	$\checkmark$		system				system setting
$\checkmark$				-swversion			system firmware version
$\checkmark$	$\checkmark$			-systemmac			system MAC address
$\checkmark$	$\checkmark$			-devname			system name
$\checkmark$	$\checkmark$			-country			country/region
	$\checkmark$			-ethernet1DataRate			ether port 1 data rate
$\checkmark$	$\checkmark$			-ethernet2DataRate			ether port 2 data rate
$\checkmark$	$\checkmark$			-macclone			mac clone enable
$\checkmark$	$\checkmark$			-clonedmac			cloned mac address
$\checkmark$	$\checkmark$			-poepower			secondary RJ45 power
$\checkmark$	$\checkmark$			-stp			Spanning Tree
$\checkmark$	$\checkmark$			-stpForwardDelay			STP forward delay
$\checkmark$	$\checkmark$			-gpslatitude			gps latitude
$\checkmark$	$\checkmark$			-gpslongitude			gps longitude
$\checkmark$	$\checkmark$		ipset				
$\checkmark$	$\checkmark$			-networkmode			network mode select
v	v			-networkinode			(bridge or router)
$\checkmark$	$\checkmark$			-bridge			bridge mode ip settings
$\checkmark$	$\checkmark$				-iptype		fixed/dynamical ip(dhcp
							client)
$\checkmark$	$\checkmark$				-ipaddr		ip address
$\checkmark$	$\checkmark$				-netmask		subnet mask
$\checkmark$	$\checkmark$				-gateway		gateway ip address
$\checkmark$	$\checkmark$				-dns1		dns1
$\checkmark$	$\checkmark$				-dns2		dns2
$\checkmark$	$\checkmark$			-router			router mode ip settings
$\checkmark$	$\checkmark$				-wan		wan ip settings
$\checkmark$	$\checkmark$					-accesstyp e	router mode access type
$\checkmark$	$\checkmark$					-staticipadd	static ip address

					r	
$\checkmark$	$\checkmark$				-staticnetm ask	static subnet mask
$\checkmark$	$\checkmark$				-staticgate way	static gateway ip address
$\checkmark$	$\checkmark$				-staticdns1	static dns1
$\checkmark$	$\checkmark$				-staticdns2	static dns2
$\checkmark$	$\checkmark$				-dhcpclient hostname	dhcp client hostname
$\checkmark$					-pppoecon nectstatus	pppoe connect status
$\checkmark$					-pppoelocal ip	obtains IP from pppoe server
$\checkmark$	$\checkmark$				-pppoestati cipaddr	pppoe static ip address
$\checkmark$	$\checkmark$				-pppoeuser name	pppoe username
$\checkmark$	$\checkmark$				-pppoepass word	pppoe password
$\checkmark$	$\checkmark$				-pppoeserv ername	pppoe server name
$\checkmark$	$\checkmark$				-pppoecon nectmode	pppoe connect mode
$\checkmark$	$\checkmark$				-pppoeidleti me	pppoe idle time
$\checkmark$	$\checkmark$			-lan		lan ip settings
$\checkmark$	$\checkmark$				-ipaddr	lan ip address
$\checkmark$					-netmask	lan subnet mask
$\checkmark$	$\checkmark$				-dhcpserve renable	dhcp server enable
$\checkmark$	$\checkmark$				-dhcpserve ripstart	dhcp server ip start
$\checkmark$	$\checkmark$				-dhcpserve ripend	dhcp server ip end
$\checkmark$	$\checkmark$				-dhcpserve rleasetime	dhcp server leasetime
$\checkmark$	$\checkmark$				-dhcprelay enable	dhcp relay enable
$\checkmark$	$\checkmark$				-dhcpserve rip	dhcp server ip
	$\checkmark$	wlan				wlan setting
	$\checkmark$		-operationmode			operation mode
$\checkmark$	$\checkmark$		-ssid			wireless network name
$\checkmark$			-ssidhided			wireless SSID broadcast

$\checkmark$	$\checkmark$		-radio	radio switch
$\checkmark$	$\checkmark$		-wirelessmode	wireless mode
$\checkmark$	$\checkmark$			
$\checkmark$	$\checkmark$		-HTprotect	HT protect
				-wireless frequency/channel
$\checkmark$	$\checkmark$		-frequency/channel	(depends on country and
				wireless mode)
$\checkmark$	$\checkmark$		-power	power
$\checkmark$	$\checkmark$		-rate	rate
$\checkmark$	$\checkmark$		-antenna	antenna type
$\checkmark$	$\checkmark$		-antennaGain	antenna gain setings
$\checkmark$	$\checkmark$		-wmm	wmm settings
				wireless isolate
$\checkmark$	$\checkmark$		-Isolation	communication between
				clients
.1	./			max sta connection
$\checkmark$	$\checkmark$		-maxStaNum	number
	$\checkmark$		Sto Numl mt	Whether manually limit the
	N		-StaNumLmt	number of station
	$\checkmark$		opeopleMeter	wireless bwa space in
N		-spaceInMeter	meter setting	
	$\checkmark$		Linklategration	wireless bwa coverage
N	N		-LinkIntegration	class setting
$\checkmark$	$\checkmark$		-channelMode	channel mode
$\checkmark$	$\checkmark$		-channelOffset	channel offset of 40MHz
$\checkmark$	$\checkmark$		-extension	extension
$\checkmark$	$\checkmark$		-A-MPDU	A-MPDU
$\checkmark$	$\checkmark$		-A-MSDU	A-MSDU
$\checkmark$	$\checkmark$		-shortGI	short GI
$\checkmark$	$\checkmark$		-RIFS	rifs
$\checkmark$	$\checkmark$		-RTS	RTS
$\checkmark$	$\checkmark$		-fragment	fragment
$\checkmark$	$\checkmark$		-beacon	beacon
$\checkmark$	$\checkmark$		-DTIM	DTIM
$\checkmark$	$\checkmark$		-preamble	preamble
$\checkmark$	$\checkmark$		-IGMP	IGMP
$\checkmark$	$\checkmark$		-stdm	stdm setting
$\checkmark$	$\checkmark$		-среТуре	CPE Type
			authoritization	wireless authentication
$\checkmark$	N		-authentication	type
$\checkmark$	$\checkmark$		-encryption	wireless data encryption
$\checkmark$	$\checkmark$	$\checkmark$	-key	wireless wep key setting
	$\checkmark$		-type	wireless wep key type

	$\checkmark$				-default	wireless wep default key
•	•				deladit	index
$\checkmark$	$\checkmark$	$\checkmark$			-1	wireless wep key 1
$\checkmark$	$\checkmark$	$\checkmark$			-2	wireless wep key 2
$\checkmark$	$\checkmark$	$\checkmark$			-3	wireless wep key 3
$\checkmark$	$\checkmark$	$\checkmark$			-4	wireless wep key 4
$\checkmark$	$\checkmark$	$\checkmark$		-wpa		wireless WPA setting
$\checkmark$	$\checkmark$				-psk	wireless pre-shared key
N	v	N			-psk	(PSK) for WPA-PSK
$\checkmark$	$\checkmark$				-reauthtime	wireless WPA re-auth
N	N				-reautnume	period (in seconds)
$\checkmark$	$\checkmark$				kovundata	enable wireless WPA
N	N				-keyupdate	global key update
$\checkmark$	$\checkmark$	$\checkmark$		-eap		WPA EAP setting
$\checkmark$	$\checkmark$	$\checkmark$			-eaptype	WPA EAP Type
	./	./			-innereapty	
$\checkmark$	$\checkmark$	$\checkmark$			ре	WPA inner EAP Type
$\checkmark$	$\checkmark$				-username	WPA user name
$\checkmark$	$\checkmark$				-loginname	WPA login name
$\checkmark$	$\checkmark$				-password	WPA password
$\checkmark$	$\checkmark$				-usercert	WPA cert file
		1			-privatekey	
$\checkmark$	$\checkmark$				password	WPA private key password
$\checkmark$	$\checkmark$			-trafficshaping		traffic shaping
$\checkmark$	$\checkmark$				-enable	enable Traffic Shaping
$\checkmark$	$\checkmark$				-downlimit	Incoming Traffic Limit
$\checkmark$	$\checkmark$				-downburst	Incoming Traffic Burst
$\checkmark$	$\checkmark$				-uplimit	Outgoing Traffic Limit
$\checkmark$	$\checkmark$				-upburst	Outgoing Traffic Burst
$\checkmark$	$\checkmark$			-wdsMac		WDS Remote Mac
$\checkmark$					-local	local macAddr
	$\checkmark$				-remote1	remote macAddr1
$\checkmark$	$\checkmark$	1			-remote2	remote macAddr2
$\checkmark$	$\checkmark$	1	1		-remote3	remote macAddr3
$\checkmark$	$\checkmark$		1		-remote4	remote macAddr4
$\checkmark$	$\checkmark$		1	-wdsSeparation		WDS Separation
J	1	1				list of associated wireless
$\checkmark$				-association		clients
1	1	1	vapprofile			
$\checkmark$	$\checkmark$		1(2, 3,etc)			VAP setting
$\checkmark$	$\checkmark$			-active		on/off this vap
$\checkmark$	$\checkmark$		1	-profileName		Name of profile
				-ssid		ssid of this vap

$\checkmark$	$\checkmark$		-ssidhided		Broadcast SSID Enable or Disable
			-vlanID		vlanID of this vap
v √	v √		-Nand -Isolation		wireless separation
v √	v √				
			-wmm		WMM Support
$\checkmark$	$\checkmark$		-MaxStaNum		Max Station Number
$\checkmark$	$\checkmark$		-StaNumLmt		Whether manually limit the
					number of station
$\checkmark$	$\checkmark$		-authentication		wireless authentication
	1				type
$\checkmark$	$\checkmark$		-encryption		wireless data encryption
	$\checkmark$		-default		wireless wep default key
					index
$\checkmark$	$\checkmark$		-wpa		wireless WPA setting
$\checkmark$			-association		list of associated wireless
					clients
$\checkmark$	$\checkmark$	vlan			vlan setting
$\checkmark$	$\checkmark$		-active		enable 802.1Q VLAN
$\checkmark$	$\checkmark$		-manageID		Management VLAN ID
$\checkmark$	$\checkmark$	radius			radius setting
$\checkmark$	$\checkmark$		-IPaddr		IP address
$\checkmark$	$\checkmark$		-port		port
	$\checkmark$		-shared secret		Shared Secret
$\checkmark$	$\checkmark$	firewall			firewall setting
$\checkmark$	$\checkmark$		-srcipfilter		source ip filter settings
$\checkmark$	$\checkmark$			-enable	source ip filter enable
$\checkmark$	$\checkmark$			-addrule	add a source ip filter rule
	$\checkmark$			-delerule	delete source ip filter rule
1					show source ip filter rule
$\checkmark$				-rulelist	lists
$\checkmark$	$\checkmark$		-destipfilter		destination ip filter settings
$\checkmark$	$\checkmark$			-enable	destination ip filter enable
,	,				add a destination ip filter
$\checkmark$	$\checkmark$			-addrule	rule
	,				delete destination ip filter
	$\checkmark$			-delerule	rule
,					show destination ip filter
				-rulelist	rule lists
			-srcportfilter		source port filter settings
				-enable	source port filter enable
					add a source port filter
$\checkmark$	$\checkmark$			-addrule	rule
				delervite	delete source port filter
	$\checkmark$			-delerule	rule

$\checkmark$				-rulelist	show source port filter rule lists
					destination port filter
			-destportfilter		settings
					destination port filter
$\checkmark$	$\checkmark$			-enable	enable
1	,				add a destination port filter
	$\checkmark$			-addrule	rule
	1				delete destination port
	$\checkmark$		-delerule	filter rule	
I					show destination port filter
$\checkmark$				-rulelist	rule lists
	$\checkmark$		-portforward		port forward settings
	$\checkmark$			-enable	port forward enable
$\checkmark$	$\checkmark$			-addrule	add a port forward rule
	$\checkmark$			-delerule	delete port forward rule
				-rulelist	show port forward rule
N				-rulelist	lists
$\checkmark$	$\checkmark$		-dmzenable		dmz enable
$\checkmark$	$\checkmark$		-dmzipaddr		dmz ip address
	$\checkmark$	remote			remote management
N	v	Terriote			setting
$\checkmark$	$\checkmark$		-privacy		radius IP address
$\checkmark$	$\checkmark$		-telnet		enable telnet
$\checkmark$	$\checkmark$		-snmp		enable snmp
	$\checkmark$		-ftp		enable ftp
$\checkmark$	$\checkmark$		-ssh		enable ssh
$\checkmark$	$\checkmark$		-forcehttps		force https
$\checkmark$	$\checkmark$		-wise		enable wise tools
$\checkmark$	$\checkmark$	snmp			SNMP setting
$\checkmark$	$\checkmark$		-version		Protocol Version
$\checkmark$	$\checkmark$		-port		Server Port
$\checkmark$	$\checkmark$		-getCommunity		SNMP Read Community
$\checkmark$	$\checkmark$		-setCommunity		SNMP Write Community
$\checkmark$	$\checkmark$		-trapdestination		Trap Destination
$\checkmark$	$\checkmark$		-trapcommunity		Trap Community
$\checkmark$	$\checkmark$		-v3Admin		v3Admin
$\checkmark$	$\checkmark$			-on	Enable SNMPv3Admin
$\checkmark$	$\checkmark$			-name	name
	$\checkmark$			-password	password
	$\checkmark$			-accessTyp	
N	N			е	access type
$\checkmark$	$\checkmark$			-authentica	Authentication Protocol

					tion		
$\checkmark$	$\checkmark$				-Privacy	privacy protocol	
$\checkmark$	$\checkmark$			-v3User		-v3User	
$\checkmark$	$\checkmark$				-on	Enable SNMPv3User	
$\checkmark$					-name	name	
					-password	password	
I	1				-accessTyp		
$\checkmark$	$\checkmark$				е	access type	
.1	.1				-authentica	Authentication Destand	
	$\checkmark$				tion	Authentication Protocol	
$\checkmark$	$\checkmark$				-Privacy	privacy protocol	
$\checkmark$	$\checkmark$		coovachilli			CoovaChilli setting	
$\checkmark$	$\checkmark$			-coovaChilliEnable		Coovachilli Enable	
.1	./			-primaryRadiusServ			
$\checkmark$	$\checkmark$			er		Primary RADIUS Server	
.1	./			-secondaryRadiusSe		Secondary RADIUS	
$\checkmark$	$\checkmark$			rver		Server	
.1	./					RADIUS Authentication	
$\checkmark$	$\checkmark$			-radiusAuthPort		Port	
$\checkmark$	$\checkmark$			-radiusAcctPort		RADIUS Accounting Port	
$\checkmark$	$\checkmark$			-radiusSharedSecret		RADIUS Shared Secret	
$\checkmark$				-radiusNasid		RADIUS Nasid	
$\checkmark$				-radiusAdminUserna me		RADIUS Admin Username	
				-radiusAdminPassw ord		RADIUS Admin Password	
$\checkmark$				-uamPortalUrl		UAM Portal URL	
				-uamSecret		UAM Secret	
			syslog			syslog	
√			- Joing	-client		enable syslog client	
				-ipaddr		syslog server IP address	
				-port		syslog server port number	
•				-clear		syslog clear	
$\checkmark$			pingwdg			ping watchdog	
			pingwag	-enable		enable	
√		1		-interval		interval	
v √				-startdelay		startup delay	
v √				-failcount		failure count	
v √				-ip		ip address	
v √	v √	$\checkmark$	acl	אי 		access control	
۷	v	v					
$\checkmark$	$\checkmark$			-mode		control (ACL)	
		$\checkmark$		-delete		 delete a local ACL	

						address	
$\checkmark$	$\checkmark$			-list	delete or display all local		
v		v		-1151		ACL address	
			-MacAddr		add mac address to		
	`			-MacAddi		Current Access Control List	
$\checkmark$			statistics			statistics	
$\checkmark$				-Wireless		Wireless LAN	
$\checkmark$				-Ethernet		Ethernet LAN	
$\checkmark$		$\checkmark$	log list			syslog list	
	$\checkmark$		password			system password	
	$\checkmark$		reset			restore factory	
	$\checkmark$		reboot			reboot system	
	$\checkmark$		exit			logout from CLI	

# **Appendix C. GPL Declamation**

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In the software we delivered, there may contains some public software, if it is, please read below carefully:

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			license terms	Reference
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	1999, 2000, 2001, 2002,	s.redhat.c		dhat.com/ecos/e
	2003 Red Hat, Inc.	om/private		cos-license/
		/gnupro-xs		
		cale-03042		
		2/redboot-i		
		ntel-xscale		
		-030630.tar		
		.Z		
Busybox		http://www	GNU GENERAL PUBLIC	http://www.gnu.o
		.busybox.	LICENSE Version 2	rg/licenses/old-li
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		oads/busy		ml
		box-1.01.ta		
		r.bz2		
brctl	Copyright (C) 2000	http://nchc	GNU GENERAL PUBLIC	http://www.gnu.o
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		orge.net/s		censes/gpl-2.0.ht
		ourceforg		ml
		e/bridge/br		
		idge-utils-		
		1.0.6.tar.gz		
dropbear	Copyright (c)	http://matt.	GNU GENERAL PUBLIC	http://www.gnu.o
	2002-2006 Matt	ucc.asn.au	LICENSE Version 2	rg/licenses/old-li
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	Stoenescu	2		
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	<jkmaline@cc.hut.fi></jkmaline@cc.hut.fi>	hostapd-0.		ml
	and	4.8.tar.gz		
	contributors	4.0.141.92		
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	and	icant-0.4.7.		
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		d/cvs/mtd/		
		util/		
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		94.tar.gz		
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				ml
vsftpd	Author: Chris Evans	ftp://vsftpd	GNU GENERAL PUBLIC	http://www.gnu.o

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