JetWave 2450 v2

User's Manual

V1.0

Aug 2017

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About This Manual

This user manual is intended to guide professional installer to install the IEEE 802.11n JetWave 2450v2 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.

 **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

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 EXCEED THE AMOUNT YOU PAID FOR THE PRODUCT.

根據 NCC 低功率電波輻射性電機管理辦法 規定:	
第十二條	經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。
第十四條	低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。 前項合法通信，指依電信法規定作業之無線電通信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

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Content

Chapter 1 Introduction

Introduction

The JetWave 2450v2 is a multi-mode 2x2 Access Point embedded with a software-based virtual access controller (VAC) for centrally managing managed APs that eliminates the need for a separate hardware controller to manage the WLAN. The JetWave 2450v2 operates at 2.4GHz band, this breakthrough innovation provides superior Wi-Fi network solutions at significantly lower cost and easier management.

While operating as access point, the JetWave 2450v2 also provides centralized management and monitoring of all the managed APs on the network. In addition, the easy-to-install JetWave 2450v2 is also a high-performance last-mile broadband solution that provides reliable wireless network coverage for broadband application.

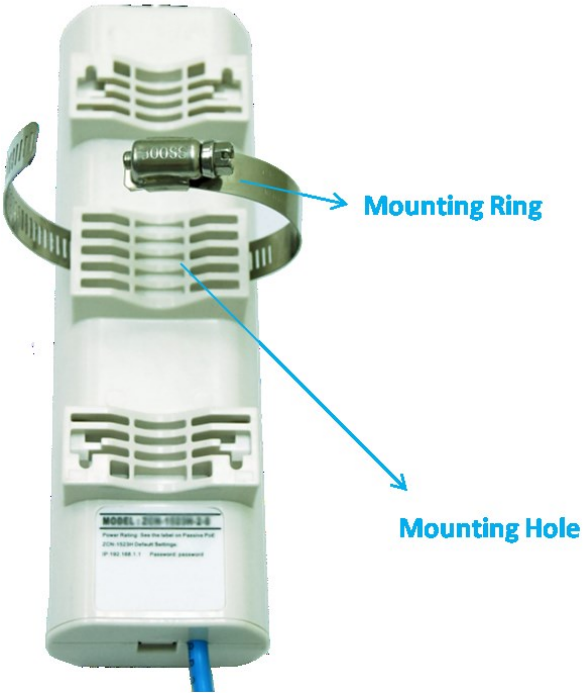
Key Features

- Centralized configuration control for your network
- Compliant with IEEE 802.11n standard
- Support passive PoE supplied with 24V.
- High reliable watertight housing endures almost any harsh environments
- Three management modes including AC, AC+Thin AP, Thin AP and Fat AP.
- Four wireless operation modes in FAT AP mode including AP, Wireless Client, WDS and AP Repeater.
- Up to 8 BSSIDs available for service deployment
- Support encryption: 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

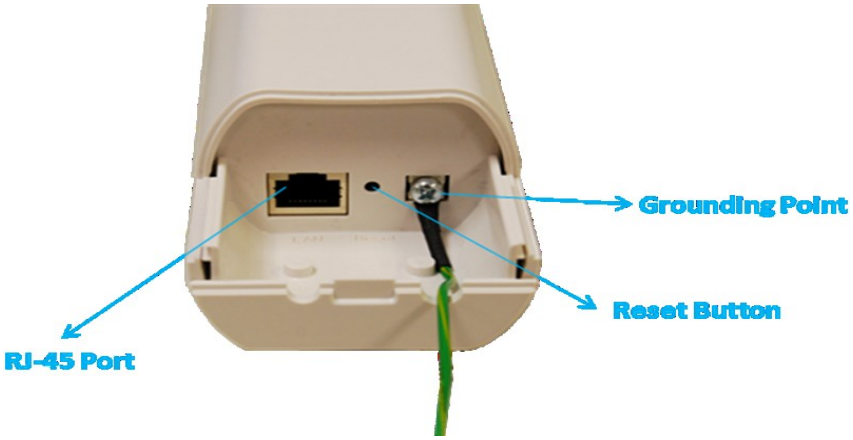
Hardware Overview

Front View

Back View



Inside the Bottom Cover

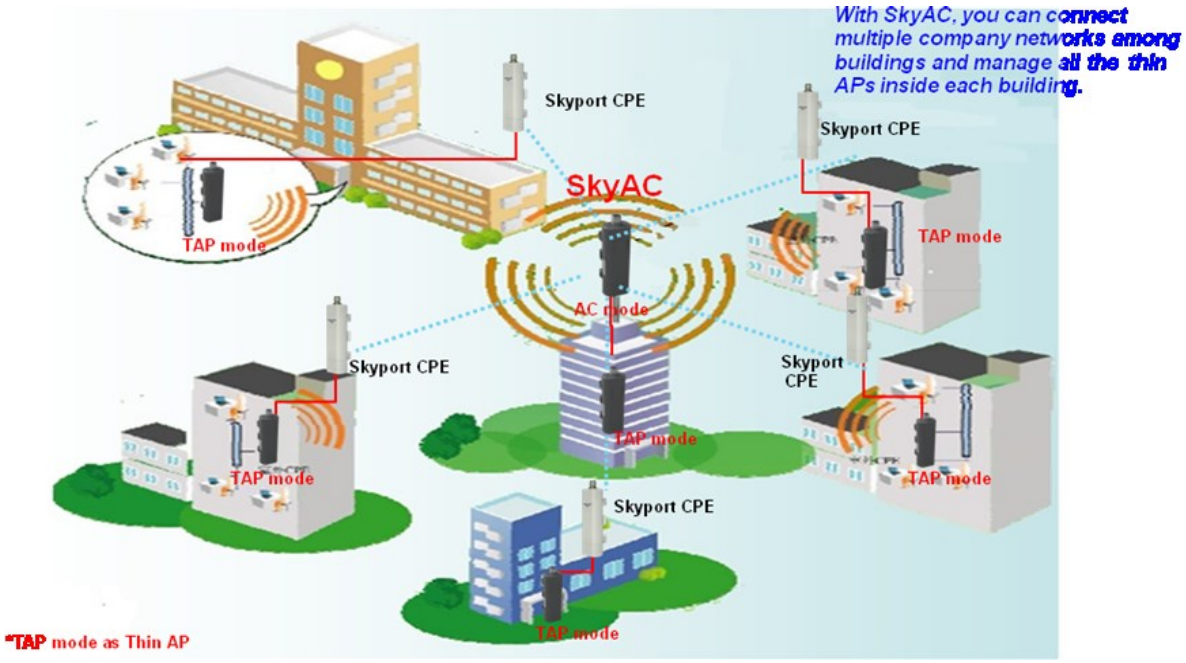


LED Indicators

LED	COLOR	STATUS	DESCRIPTION
PWR	Green	On	The device is powered on
		Off	The device is not receiving power
LAN	Green	On	The device has the Ethernet connection
		Off	The device has no Ethernet connection
		Blinking	Transmitting/receiving Ethernet packets
WLAN	Green	On	The WLAN is active
		Off	The WLAN is inactive
		Blinking	Transmitting/receiving wireless packets
Signal*3	Green	3 LED On	The signal strength is excellent
		2 LED On	The signal strength is good
		1 LED On	The signal strength is weak

Typical Management Scenario

This section describes the typical management of JetWave 2450v2. By default, it is set to thin AP mode (managed AP) which allows it to be managed by the JetWave 2450v2 in AC mode.



When a thin AP mode joins a wired network, it will start to look for a JetWave 2450v2 in AC mode. If the thin AP founds the AP controller on the network, it will send the registration request to the AP controller. Once the registration is successfully made, the AP that acts as the AP controller will add the thin AP to its management list and provides it configuration information.

Hardware Installation

This chapter describes safety precautions and product information you have to know and check before installing the JetWave 2450v2.

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.
2. If you are installing the JetWave 2450v2 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 the JetWave 2450v2, 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 JetWave 2450v2 well while you are installing it, please read and follow these installation precautions.

1. Users MUST use a proper and well-installed grounding and surge arrestor with the JetWave 2450v2; otherwise, a random lightening could easily cause fatal damage to JetWave 2450v2. **EMD (Lightning) DAMAGE IS NOT COVERED UNDER WARRNTY.**
2. Users MUST use the “Power cord & PoE Injector” shipped in the box with the JetWave 2450v2. Use of other options will likely cause damage to the unit.

Product Package

The product package you have received should contain the following items. If any of them are not included or damaged, please contact your local vendor for support.

- IEEE 802.11n JetWave 2450v2 ×1
- Pole Mounting Ring ×1
- 24VDC Power cord & PoE Injector ×1
- Ferrite Suppression Core × 1
- Grounding Wire ×1
- Product CD × 1

Note:

- Product CD contains Quick Installation Guide and User Manual.

Pole Mounting Ring

Ferrite Suppression Core

24VDC Power Cord & PoE Injector

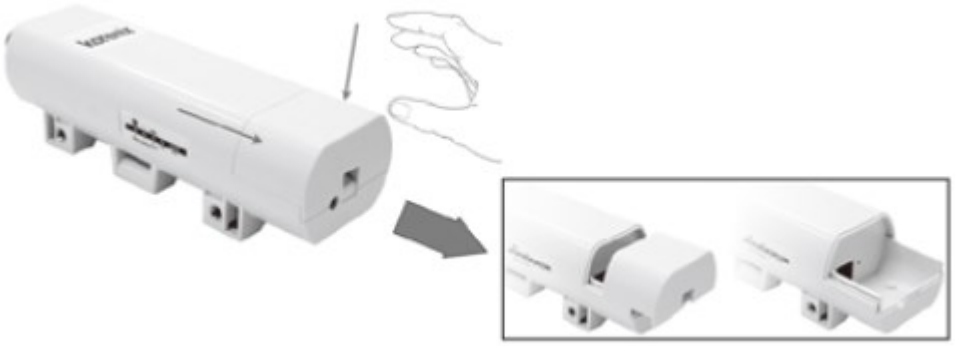
Warning:

- Users MUST use the “Power cord & PoE Injector” shipped in the box with the ZAC Wireless Access Point. Use of other options will likely cause damage to the device.

Hardware Installation

Connect up

1. The bottom of the JetWave 2450v2 is a movable cover. Grab the cover and pull it back harder to take it out as the figure shown below.



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

3. Slide the cover back and press down the lock button to seal the bottom of the JetWave 2450v2.

Using the Grounding Wire

The JetWave 2450v2 is equipped with a grounding wire. It is important that the Access Point, cables, and PoE Injector must be properly connected to earth ground during normal use against surges or ESD.

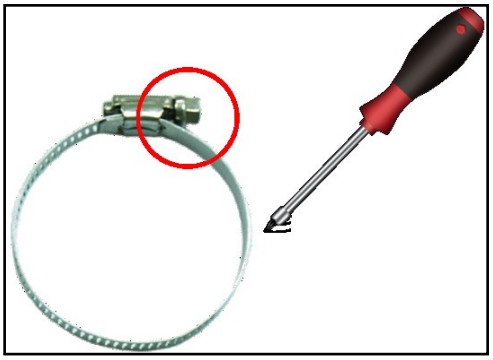
1. Remove the screw on the grounding point at the bottom of the JetWave 2450v2.

2. Put the grounding wire on the grounding point at the bottom of the JetWave 2450v2. Then screw the grounding wire to tighten up.

3. Connect the grounding wire to earth ground.

Mount the AP on a Pole

1. Turn the JetWave 2450v2 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 the device as the following right picture shows.



2. Mount the JetWave 2450v2 steadily to the pole by locking the pole mounting ring tightly.

Power Up

1. Connect power cord to the PoE injector as the following right picture shows.

2. Connect the Ethernet cable that connects the Access Point to the “POE” port of the PoE injector as figured below.

3. Connect the power plug to a power socket. The Access Point will be powered up immediately.

Connect to the Access Point

To be able to configure and manage the Access Point, please do the followings:

1. Open the ferrite core by unsnapping the connector latches. The core will open, revealing a concave surface.

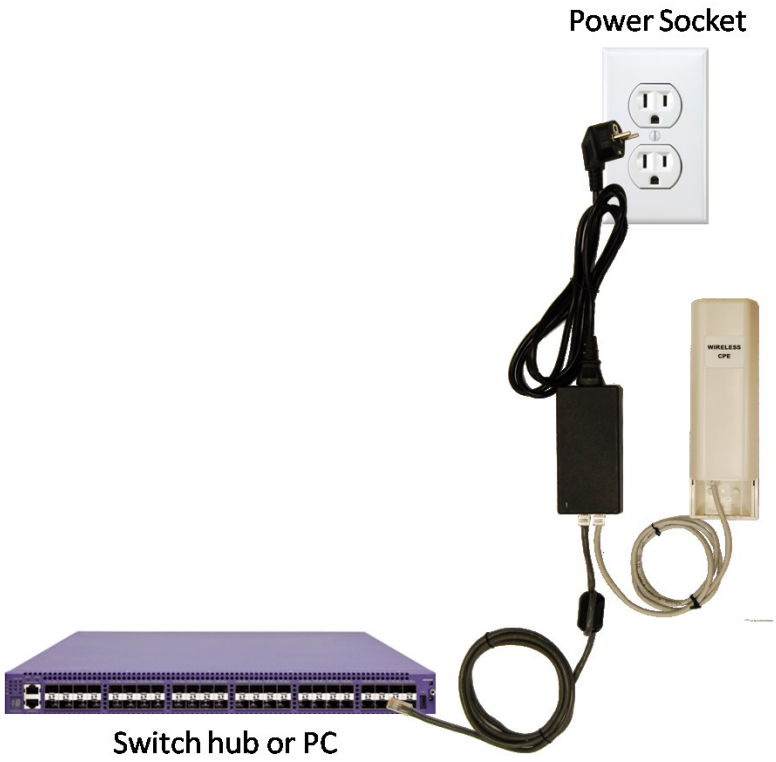
2. Lay the Ethernet cable into the core, usually within 2 to 3 inches of the connector. You may have to experiment with the final location depending on the effectiveness of the high frequency abatement.

3. Loop the cable around and through the core. This helps "lock" the core in place, and may be required in circumstances with severe interference.

4. Close the core and snap the halves back together.

5. Connect the Ethernet cable with suppression core to the “Data In” port of the PoE injector.

6. Connect the other end of Ethernet cable to a PC or a switch hub. The hardware installation is complete.

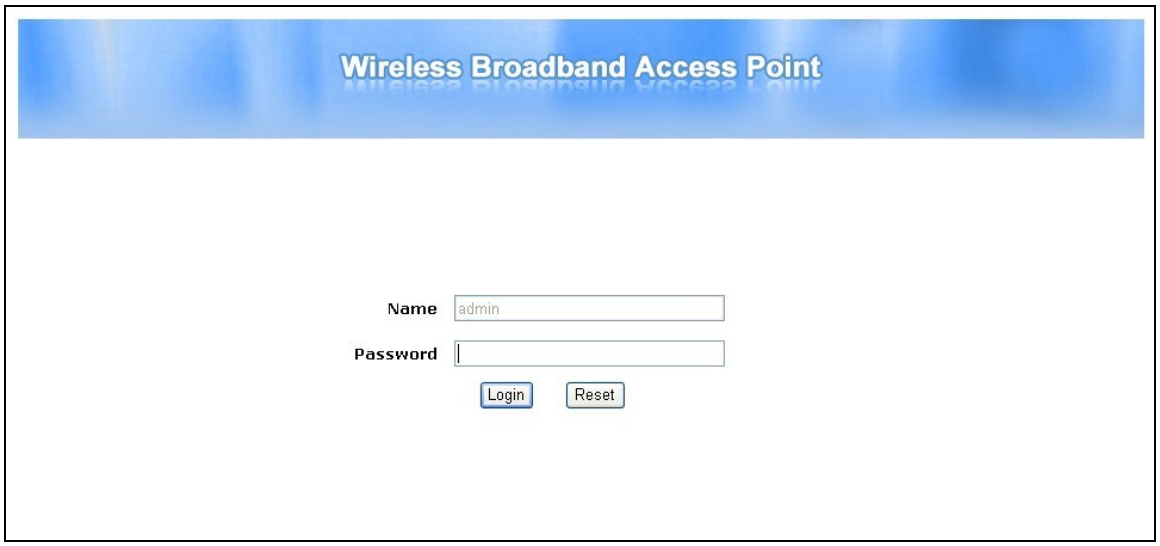


Chapter 2 Quick Setup Tutorial

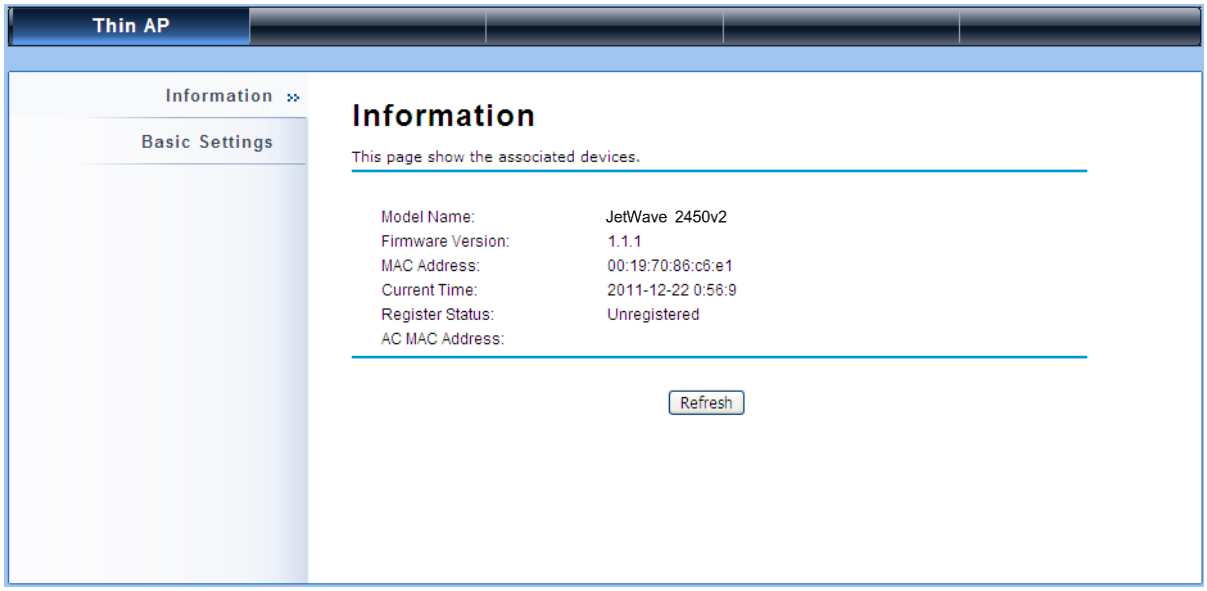
Access the Web Configurator

The JetWave 2450v2 provides you with user-friendly Web-based management interface to easily manage the access point.

- Configure the computer with a static IP address of 192.168.1.x, as the default IP address of the JetWave 2450v2 is 192.168.1.1. (X cannot be 0, 1, nor 255);
- Open Web browser and enter the IP address (Default: **192.168.1.1**) of the JetWave 2450v2 into the address field. You will see the login page as below.



- Enter the username (Default: **admin**) and password (Default: **password**) respectively and click "**Login**" to login the main page of the JetWave 2450v2.



Note:

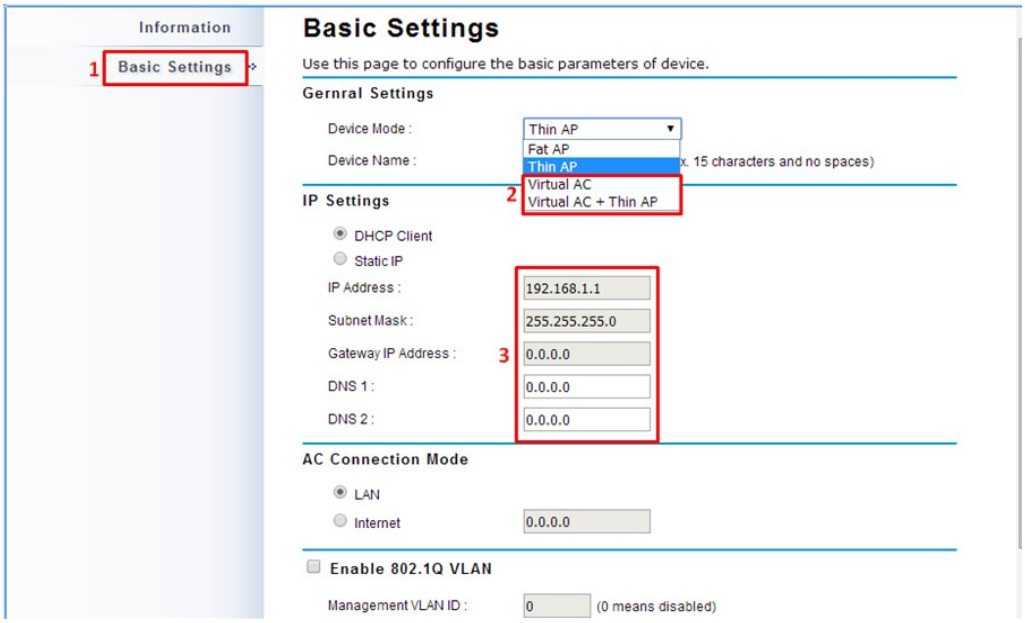
- The username and password are case-sensitive, and the password should be no more than 19 characters!

Configure the AC+Thin AP mode

The JetWave 2450v2 provides 4 operation modes: “**Thin AP**”, “**Virtual AC**”, “V**irtual AC+Thin AP** ”, as well as “**FAT AP**”. The default mode is “Thin AP”. To allow the JetWave 2450v2 to manage the thin APs, you need to switch one of the JetWave 2450v2s to virtual controller mode first. To change the mode, please do the following.

Configure the AC+Thin AP mode

To operate as AC+Thin AP, go to **Basic Settings**. From **Device Mode** drop-down list, select “**Virtual AC**” mode. If you would like the Access Point to perform as a virtual controller and access point concurrently, please select “**Virtual AC + Thin AP**” mode. Then assign an IP address to the JetWave 2450v2 and specify subnet mask, gateway and DNS address respectively. Hit **Apply** and wait for about 50 seconds to take effect.



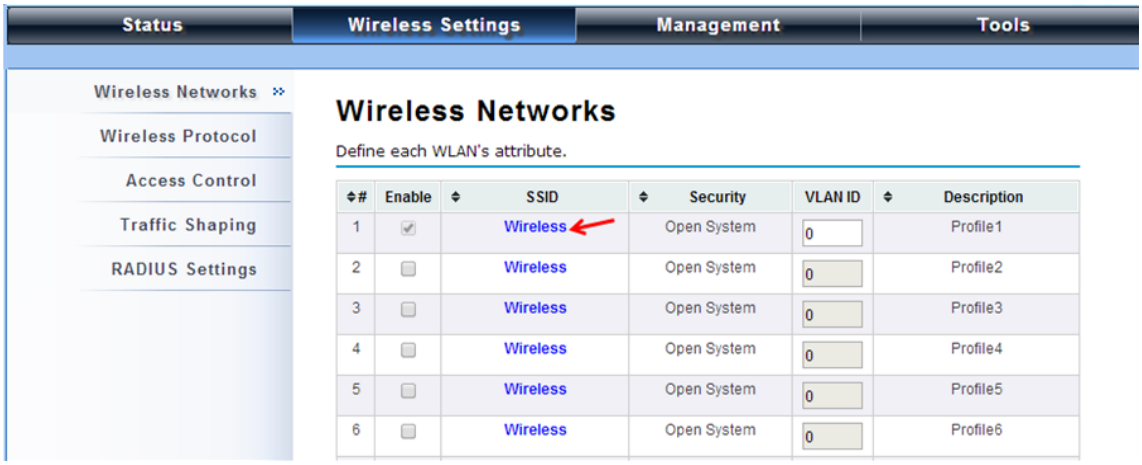
Note:

- AC+ Thin AP mode allows the JetWave 2450v2 to operate as access controller and thin AP concurrently.

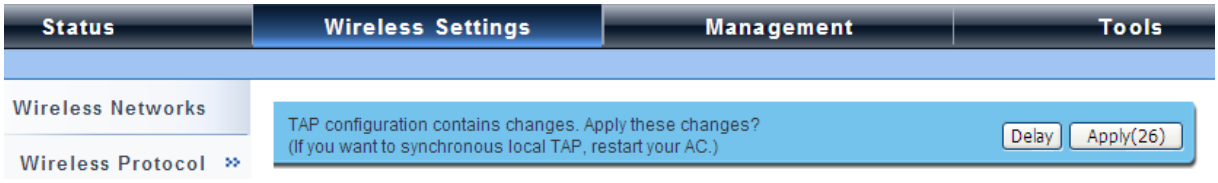
Note:

- To operate as standalone Access Point, wireless client or bridge, please select **FAT AP** from device mode.

For Virtual Controller + Thin AP mode, if you need to configure the wireless settings for the JetWave 2450v2 especially SSID and encryption method, go to **Wireless Settings > Wireless Networks** and click on #1 **Wireless** SSID for configuration. After the configuration is made, click **Save** to save the settings.

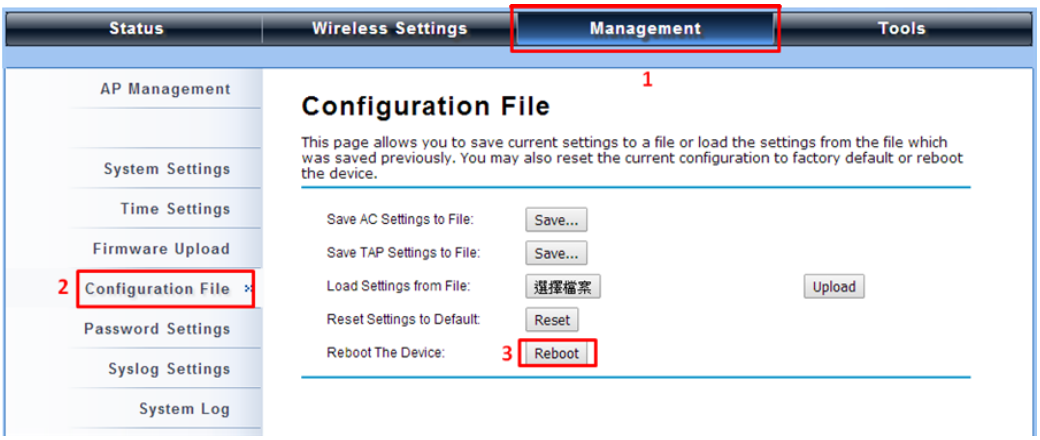


A dialog message will pop up to remind you changes will also apply to other managed Thin APs. Click **Apply** to apply the configuration immediately.



To make profile setting on the JetWave 2450v2 itself take effect, you need to reboot the AP in controller mode as well. To reboot the JetWave 2450v2, go to **Management > Configuration File**

and click the **Reboot** button. The reboot process will take about 50 seconds.



Firmware Upgrade for JetWave 2450v2 in AC mode

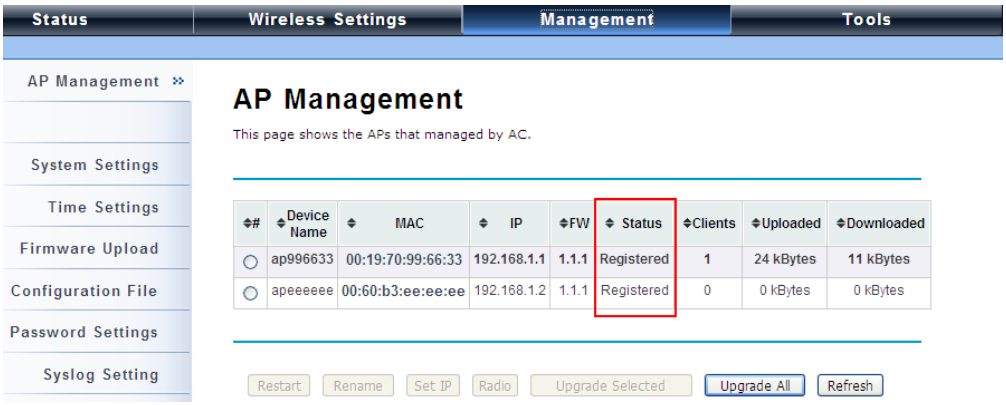
To upgrade the firmware for the JetWave 2450v2 in controller mode when necessary, go to **Management > Firmware Upload** and from **Upgrade AC Firmware**, browse the firmware file where it is placed. Hit **Upload** to start the upgrade process. It will take approximately 2 minutes to complete the update.

Install the Managed Thin AP

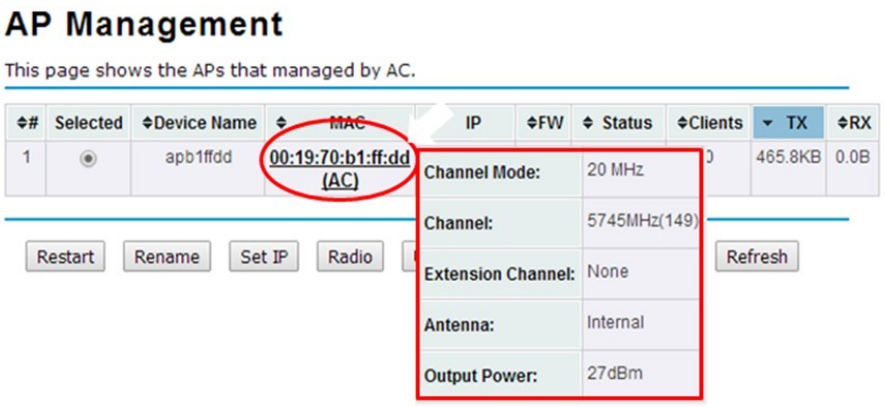
Install and connect the rest of managed Access Points to your network with Ethernet cables. Power them up respectively. They will automatically discover the JetWave 2450v2 in controller mode and register themselves.

To check whether the thin APs are successfully registered or not, enter the web page of the JetWave 2450v2 master access controller and go to **Management > AP Management**. You will see "**Registered**" in **Status** column. Besides registration status, you are able to see other information such as Device Name, MAC address, IP address, FW version, number of clients that associate to each

thin AP as well as upload/download speed.



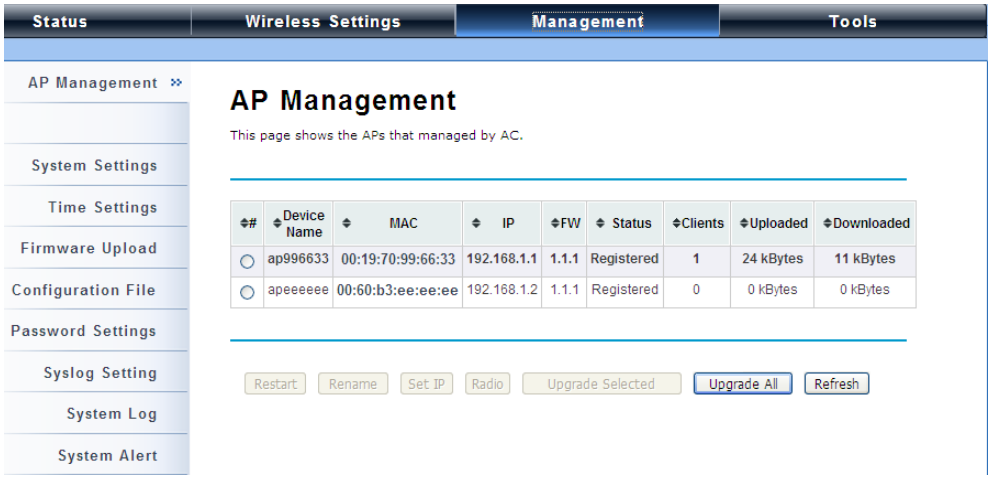
Moving the mouse over MAC address of each managed AP will also display relevant RF information such as channel mode, current channel, antenna being used together with transmit output power.



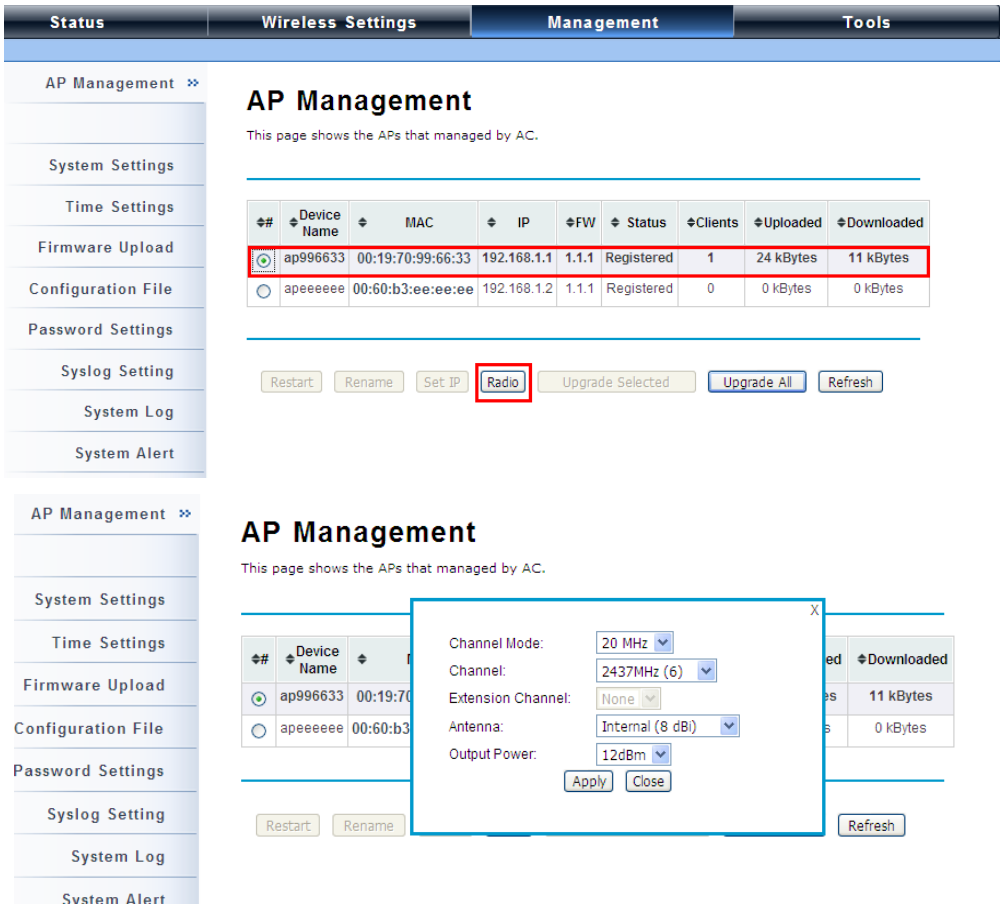
Manage Thin APs

To configure and manage the managed APs:

1. Enter the web page of the JetWave 2450v2 in controller mode and go to **Management > AP Management**, the following screen shows up.



The JetWave 2450v2 AP in Virtual AC+Thin AP mode on the list is highlighted in bold font. By selecting it and hitting **Radio** button, you may configure its radio setting such as **channel bandwidth**, **channel**, **antenna** and **output power**.

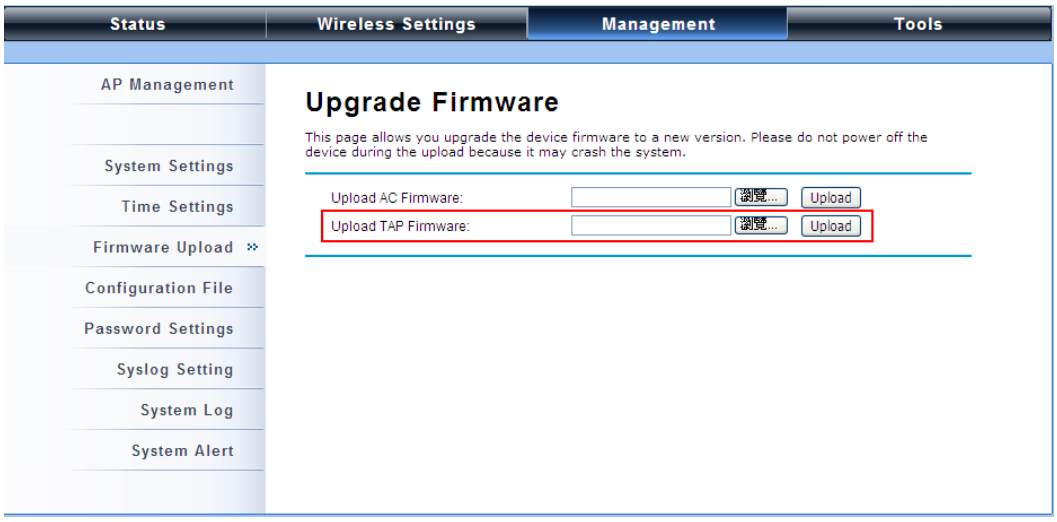


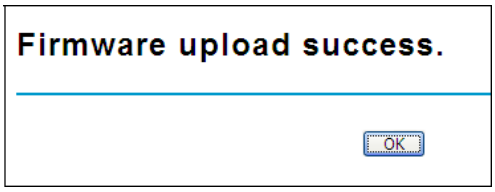
Besides radio setting, you may also reboot the managed AP, change its IP address and perform firmware upgrade for managed AP.

Firmware Upgrade for Managed Thin APs

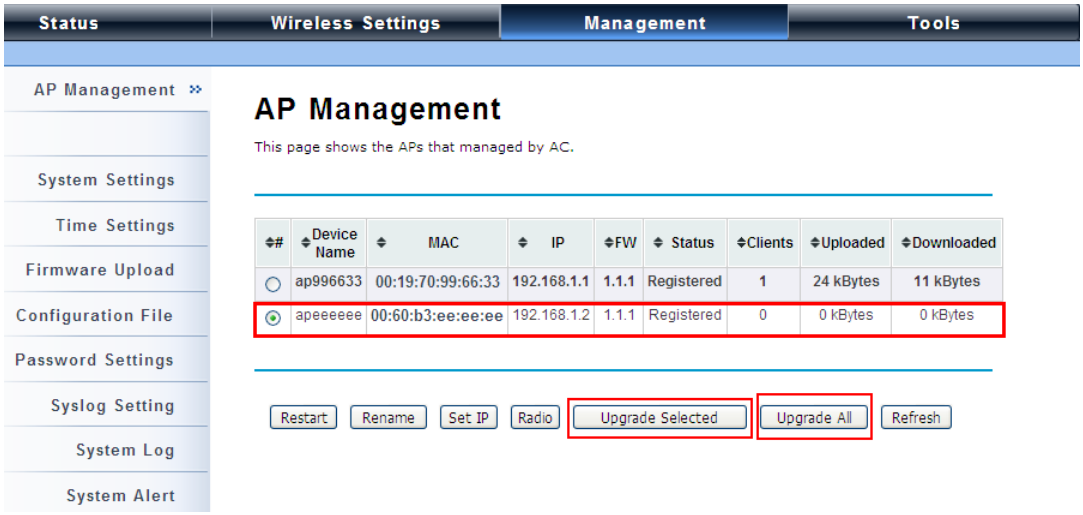
For firmware upgrade, you may choose to upgrade the selected managed AP by hitting **Upgrade Selected**, or do the group upgrade by hitting **Upgrade All**.

Before upgrading the managed AP, you need to locate the new firmware in the JetWave 2450v2. Go to **Management > Firmware Upload**, browse the firmware file where it is located, click **Upload** and Click **OK**.



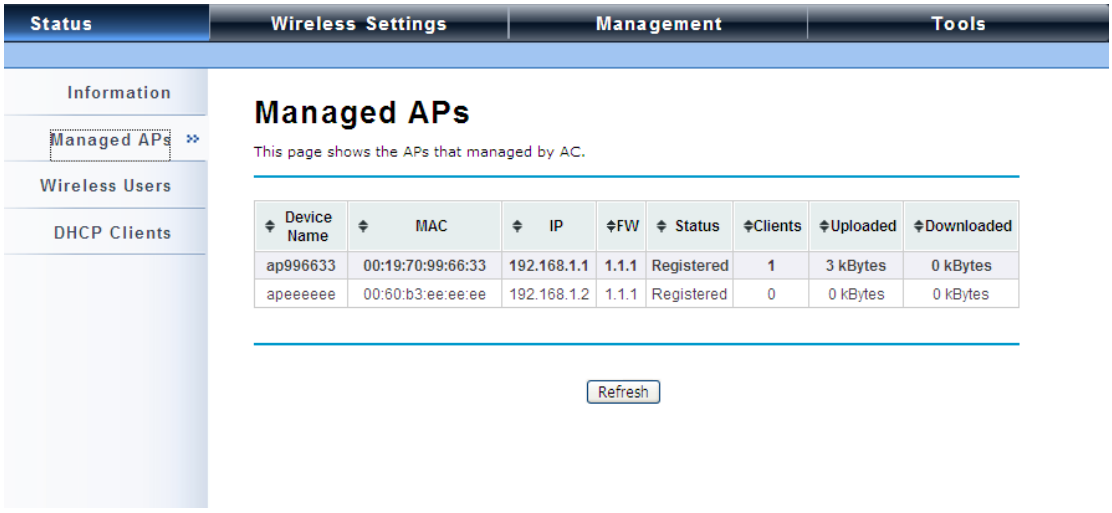


Then go back to **Management > AP Management to** do single or group update.



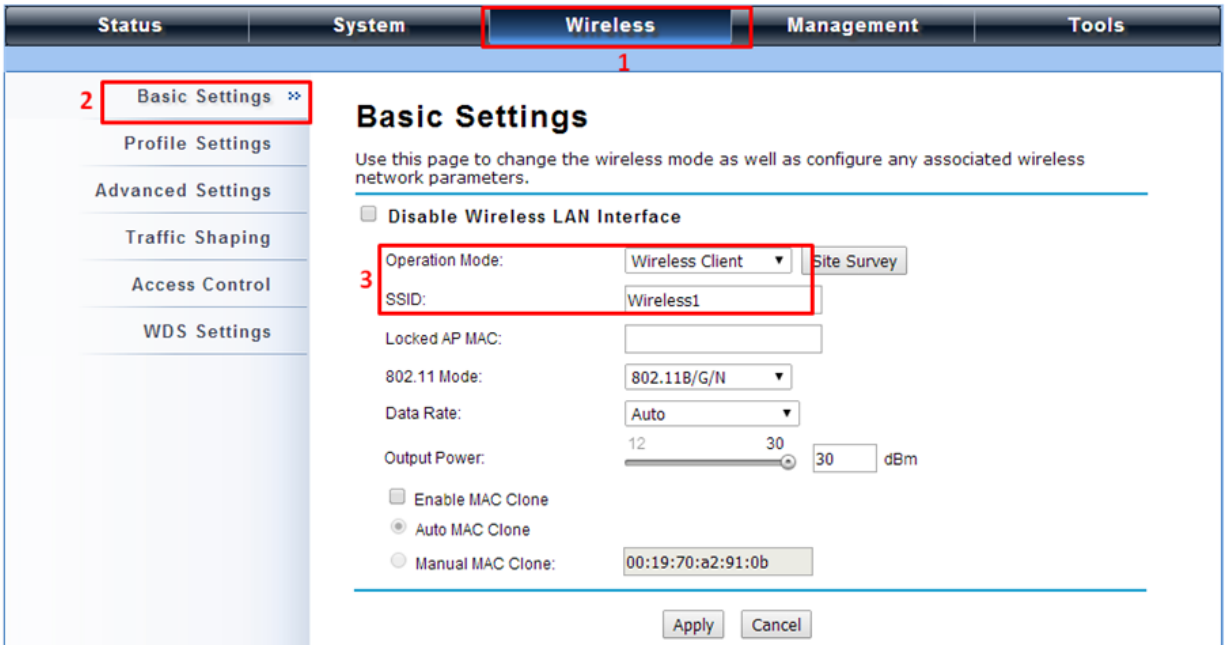
Monitor Managed Thin APs

To view each managed AP's status, please go to **Status > Managed APs**. Besides viewing device information such as device name, MAC address, IP address, and FW version, you may also monitor the wireless clients that are currently associated with the managed APs as well as packets statistics.

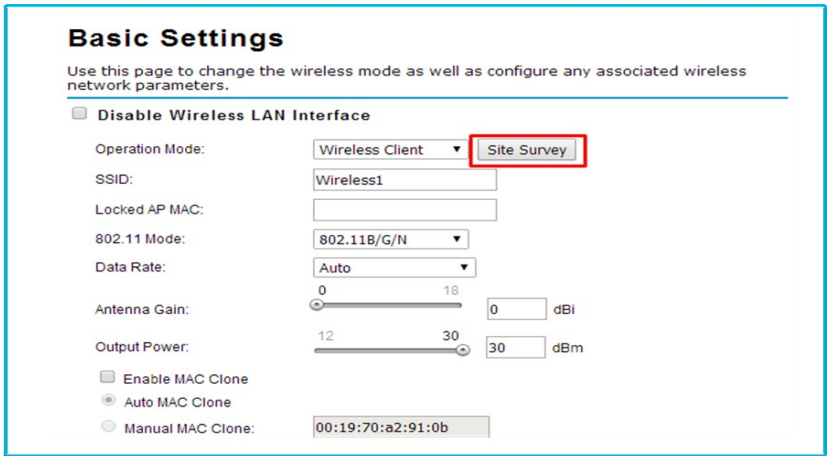


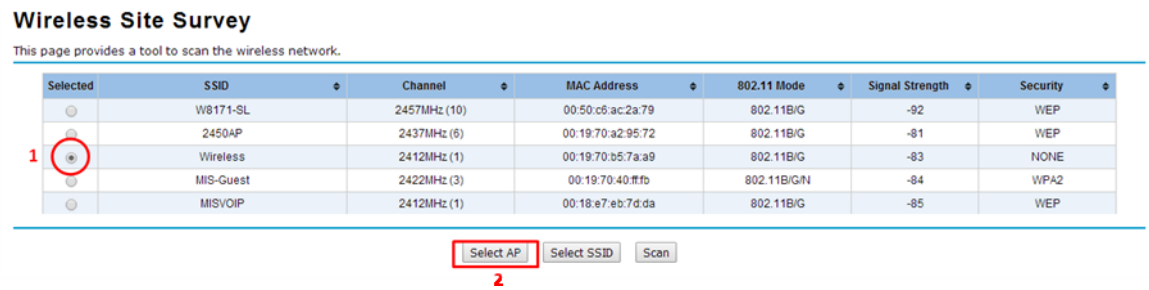
Wireless Client Mode

1. Go to **Wireless > Basic Settings** and choose "**Wireless Client**" from Wireless Mode. Specify the SSID that you would like connect and click **Apply** to save the configuration.



Besides specifying the SSID manually, you may select the preferable Access Point to connect by clicking the "**Site Survey"** button beside **Wireless Mode**. Once the button is pressed, the wireless client will scan all the available access points within coverage. Select the one you prefer to connect, and click **Select AP** to establish the connection.





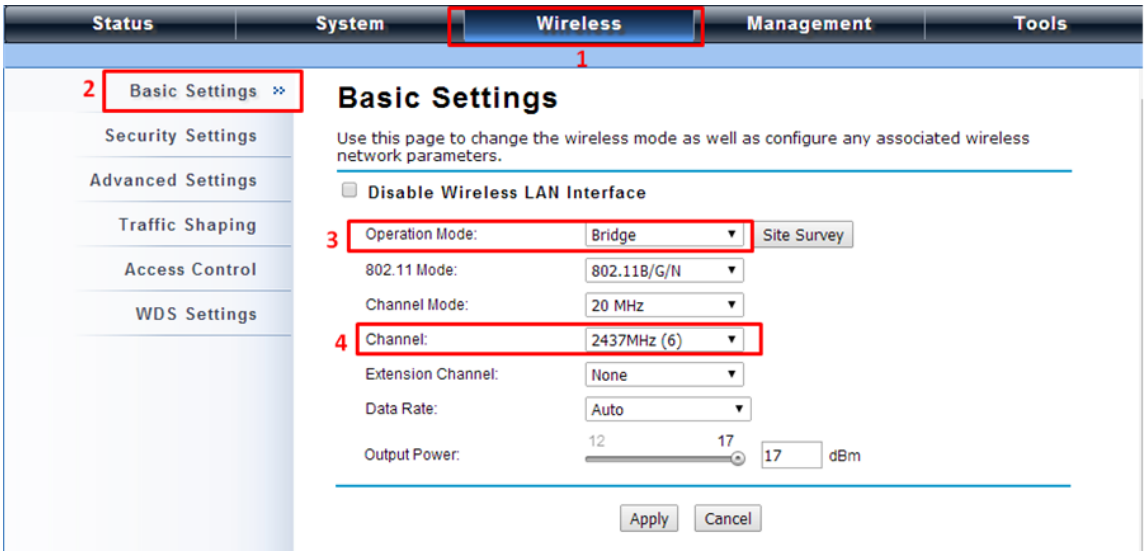
3. If the AP you connect to require authentication or encryption keys, click **Profile Settings** in the left column, select the corresponding authentication and encryption options, and click " **Apply**" to save

configuration.

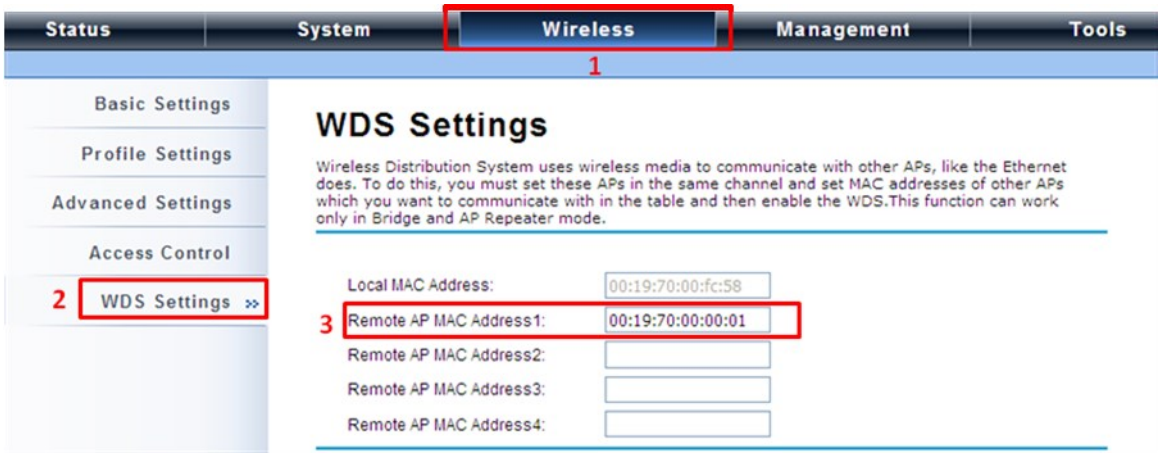
4. To check whether the association with the Access Point has been successfully made, go to **Status > Connections**. If the connection is established, it will display association information of the Access Point including MAC address, wireless mode, signal strength and connection time.

Bridge Mode

1. Go to **Wireless > Basic Settings**. Choose "Bridge" from Wireless Mode, choose a clean channel and click **Apply** to save configuration.



2. Go to "**WDS Settings**" in "**Wireless**", input the MAC address of the remote bridge to "**Remote AP MAC Address 1**" field and click "**Apply**".



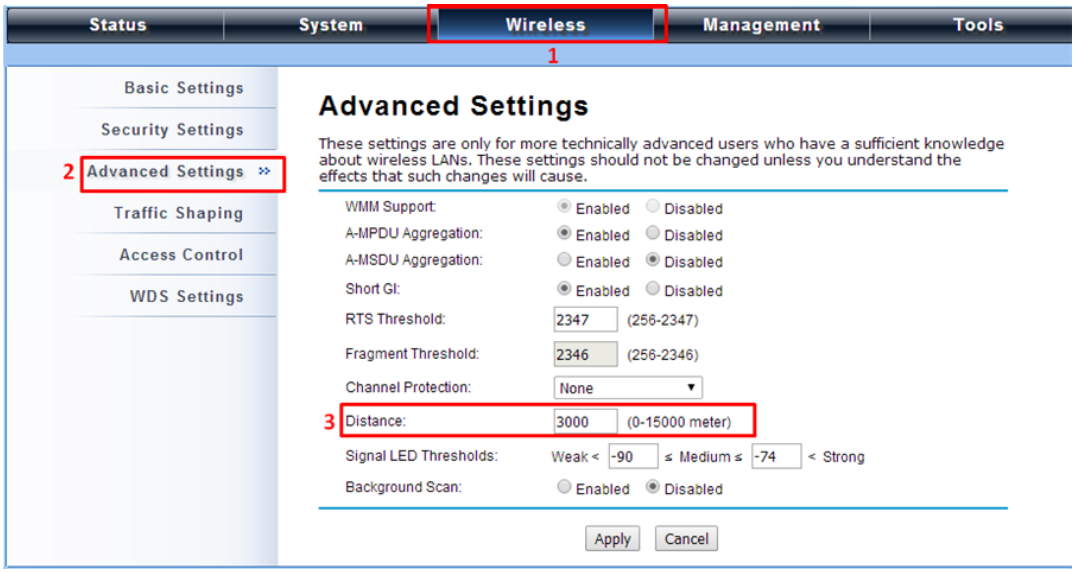
Note:

- 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 AP2 in any case). Mesh and Ring

network topologies are not supported by WDS and should be avoided in all the use cases.

3. Repeat the above procedures to configure the remote bridge.

4. Enter the actual distance in **Space In Meter**. For example, if the distance between the two ZAC bridges is 3 kilometers, enter 3000 in the field. Click **Apply** to save configuration.

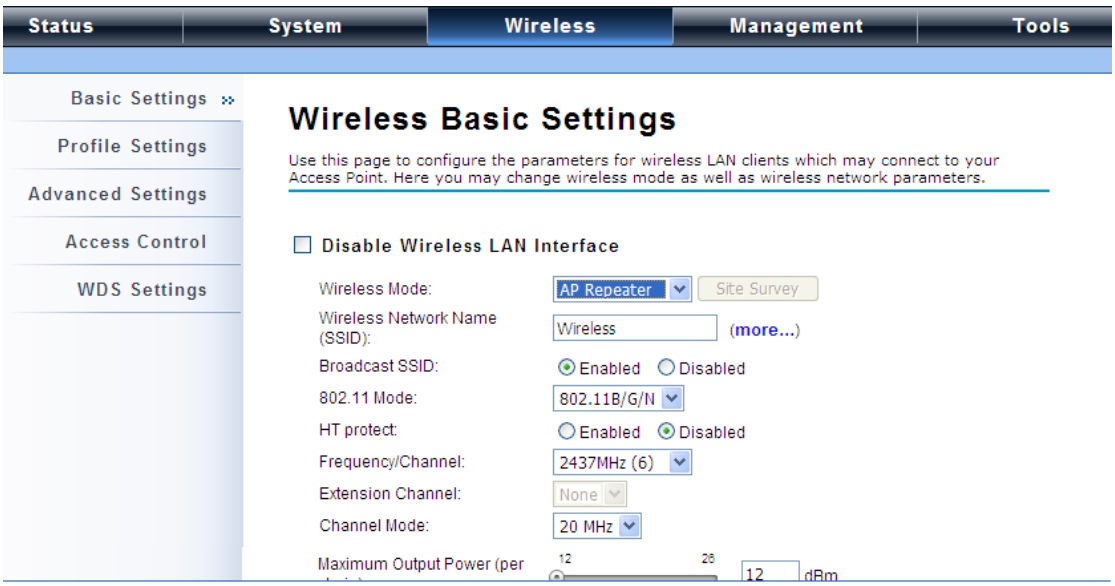


5. Use ping to check whether the link between the two bridges is OK.

6. To check the wireless connectivity, go to **Status > Connections**. If the connection is established, it will display association information of the remote bridge including MAC address, wireless mode, signal strength and connection time.

AP Repeater Mode

1. Go to **Wireless > Basic Settings**. Choose "**AP Repeater**" from Wireless Mode, and click **Apply** to save it.



To establish point-to-point bridge connection, please follow the procedures described in Bridge mode.

To connect the wireless client to the AP, please follow the procedures described in Wireless Client mode.

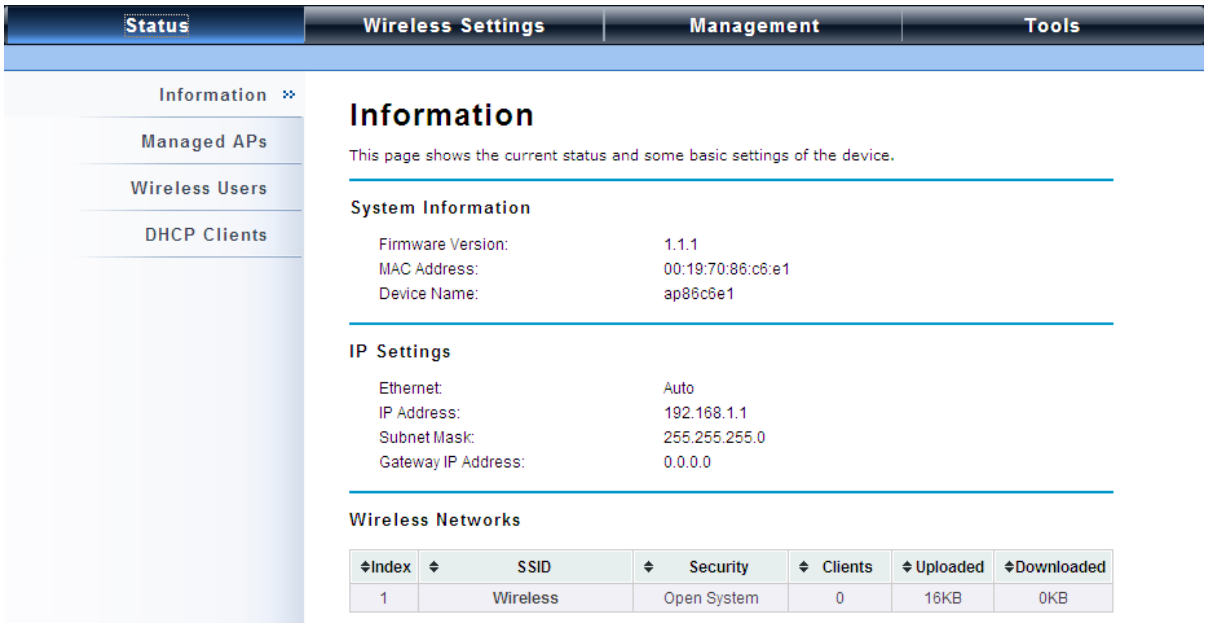
Chapter 3 Navigate the Web Configurator

Virtual AC+Thin AP Mode

Status

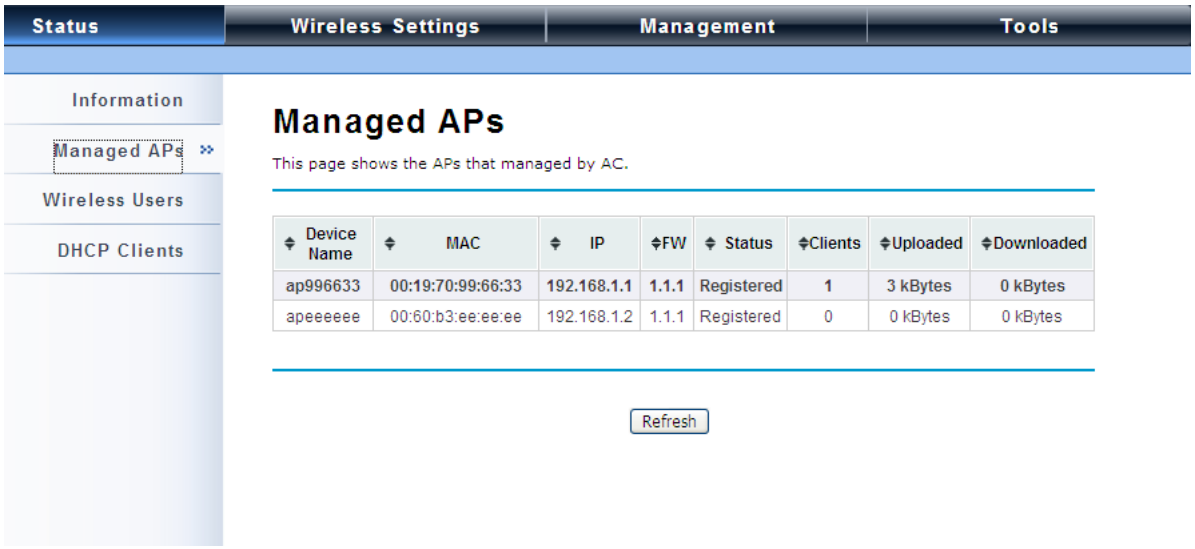
View Basic Information

Open “**Information**” in “**Status**” to check the basic information of the JetWave 2450v2, which is read only. Information includes system information, IP settings, and wireless network setting. Click “**Refresh**” at the bottom to have the real-time information.



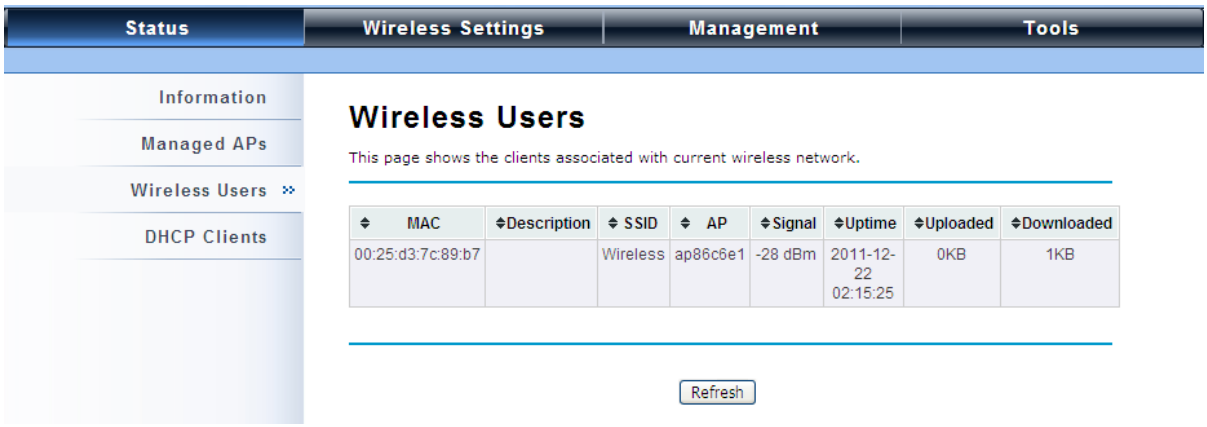
View Managed APs

Open “**Managed APs**” in “**Status**” to check information of managed AP such as device name, MAC address, IP address, numbers of associated clients and uploaded/downloaded packets. All is read only. Click “**Refresh**” at the bottom to update the list.



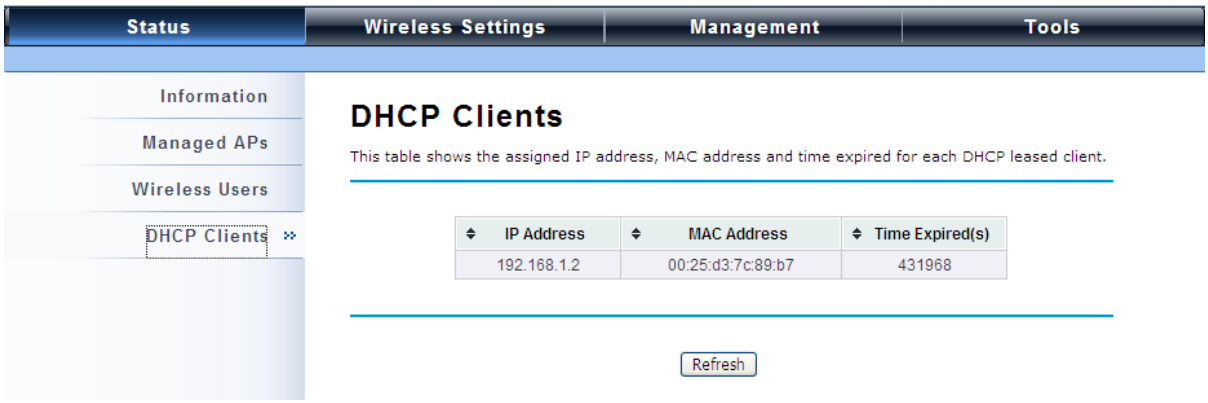
View Wireless Users

Open "**Wireless Users**" in "**Status**" to check the information of all the wireless clients such as MAC address, SSID of the managed APs that are associated with, signal strength, connection up time, and uploaded/downloaded packets. All is read only. Click "**Refresh**" at the bottom to update the list.



View DHCP Client Table

Open "**DHCP Clients**" in "**Status**" as below to check the assigned IP address, MAC address and lease time for each DHCP client. Click "**Refresh**" to update the table.

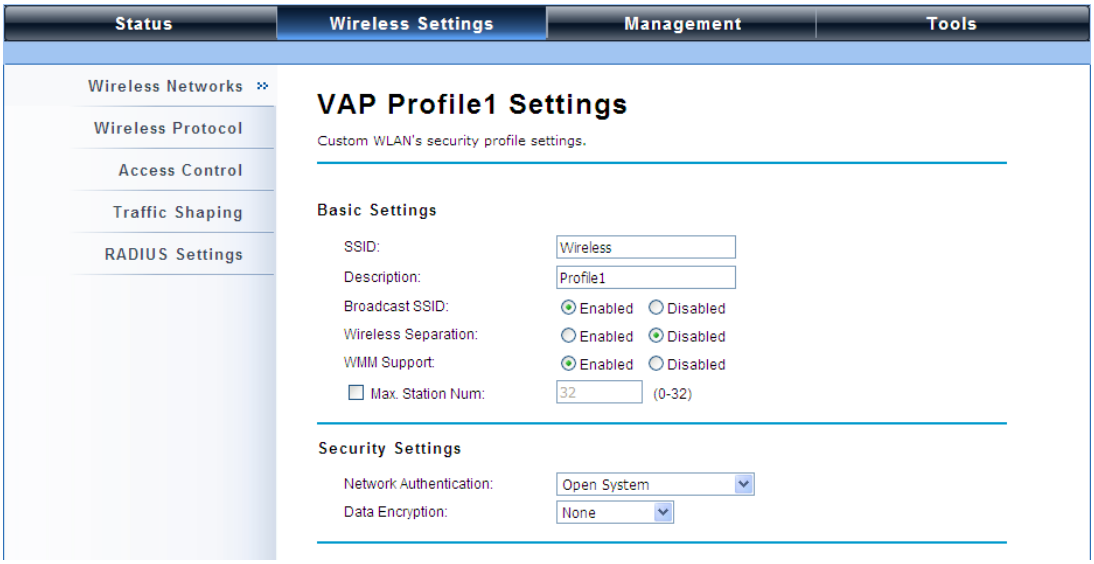


Wireless Settings

Wireless Setting allows you to configure wireless parameters, security method, access control and flow control for your JetWave 2450v2. Note that the configuration will also apply on all the other managed APs.

Wireless Networks (VAP Profiles Settings)

The IEEE 802.11n JetWave 2450v2 allows up to 8 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.



- **Basic Setting**

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 cannot exceed 32 characters.

Description: Name of the VAP profile

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 IEEE 802.11n JetWave 2450v2, so that malicious attack by some illegal STA could be avoided.

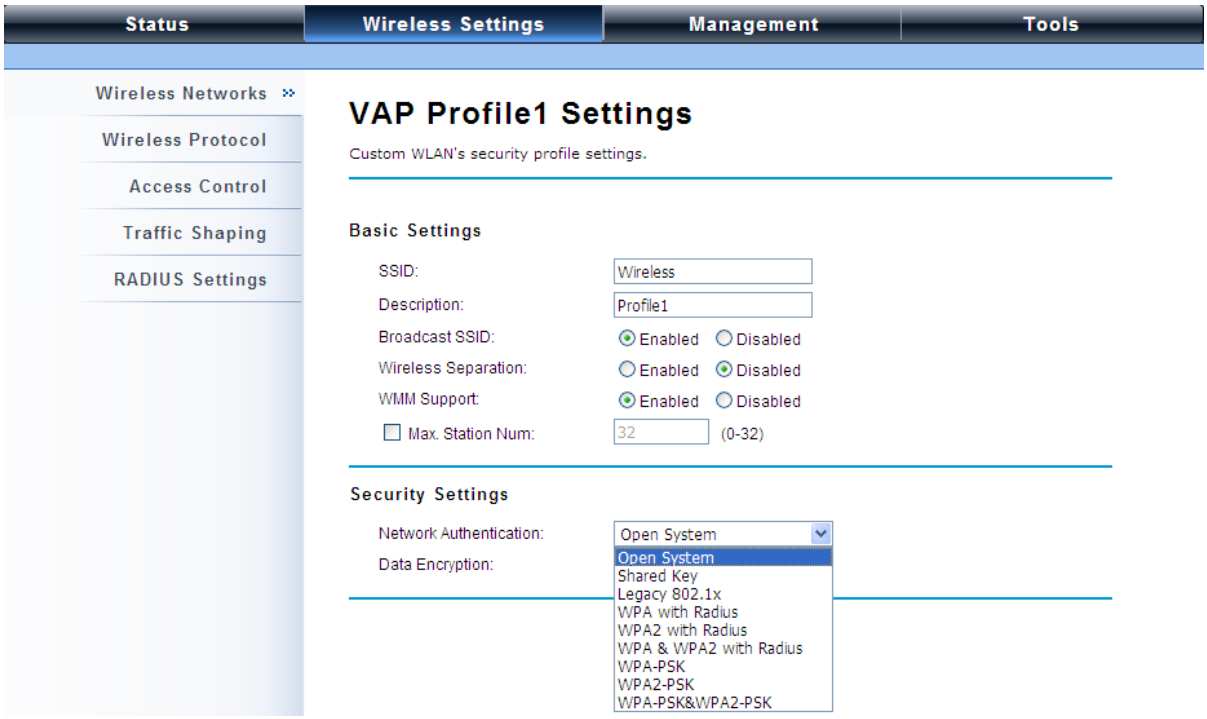
Wireless Separation: Wireless separation is an ideal way to enhance the security of network transmission. By enabling "**Wireless Separation**" can prevent the communication among associated wireless clients.

WMM Support: 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. By default it is enabled and cannot be disabled in b/g/n mode.

Max. Station Number: By default the "**Max. Station Num**" the JetWave 2450v2 will only allow up to 32 wireless clients to associate with for better bandwidth for each client. You may tick the box and enter the preferable limits for maximum client association number.

- **Security Setting:**

  To prevent unauthorized radios from accessing data transmitting over the connectivity, the IEEE 802.11a/n JetWave 2450v2 provides you with rock solid security settings.



- **Network Authentication**

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

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

  Legacy 802.1x: 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.

  WPA with RADIUS: Wi-Fi Protected Access (WPA) is a subset of the IEEE 802.11i standard. 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: WPA2 (IEEE 802.11i) is a wireless security standard that defines stronger encryption, authentication and key management than WPA. If it is selected, AES encryption and RADIUS server are required.

WPA&WPA2 with RADIUS: 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.

Note:

- If Radius relevant authentication type is selected, please go to **Wireless → Radius Settings** for further radius server configuration.

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.

128 bits WEP: 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.

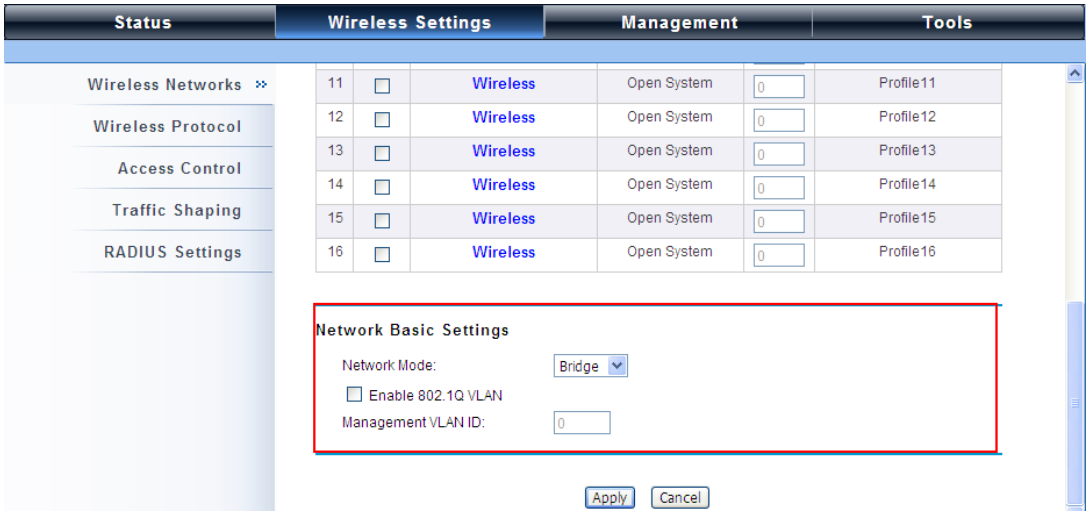
TKIP + AES: It allows for backwards compatibility with devices using TKIP.

Note:

- We strongly recommend you enable wireless security on your network!
- Only the same Authentication, Data Encryption and Key among the IEEE 802.11n

JetWave 2450v2 and wireless clients can the communication be established!

- **Network Basic Setting:**



Network Mode: Specify the network mode. It includes **Bridge** and **Router**. When switch to Router mode, the LAN IP address for web page access will become 192.168.0.99.

Wireless Protocols

Allow the user to change country code, 802.11 mode and other advanced parameters for the JetWave 2450v2.

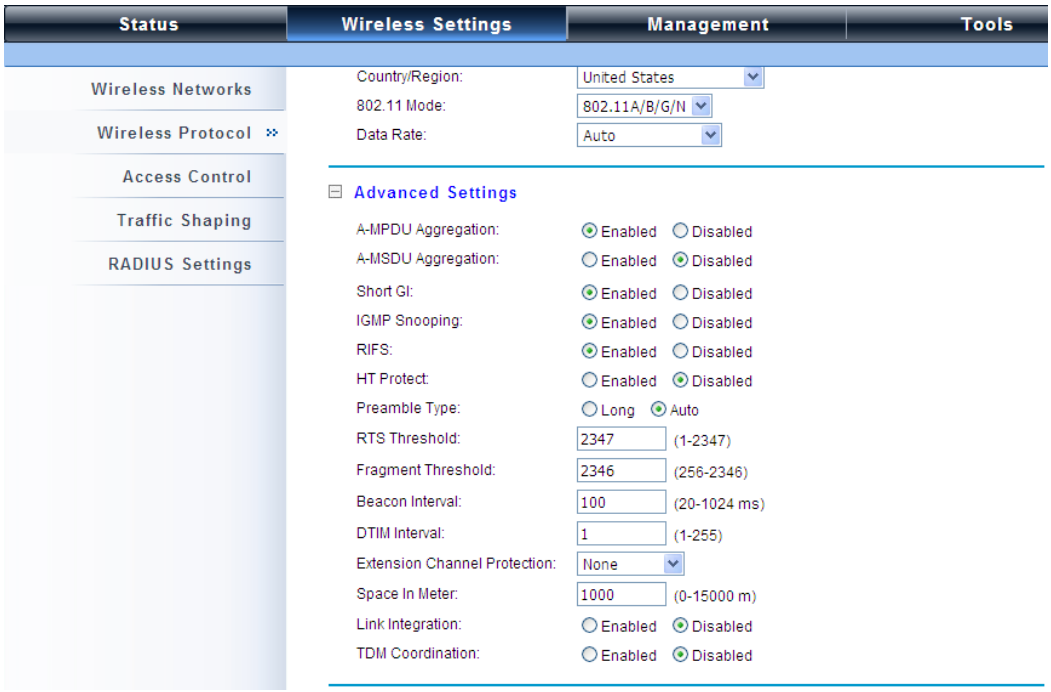
- **Basic Settings**

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

  802.11 Mode: The IEEE 802.11n JetWave 2450v2 can communicate with wireless devices of 802.11b/g or 802.11b/g/n.

  Data Rate: Usually "**Auto**" is preferred. Under this rate, the IEEE 802.11n JetWave 2450v2 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 by fixing the data rate.

- **Advanced 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.

IGMP Snooping: 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.

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.

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

RTS Threshold: The IEEE 802.11n JetWave 2450v2 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 Threshold: 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.

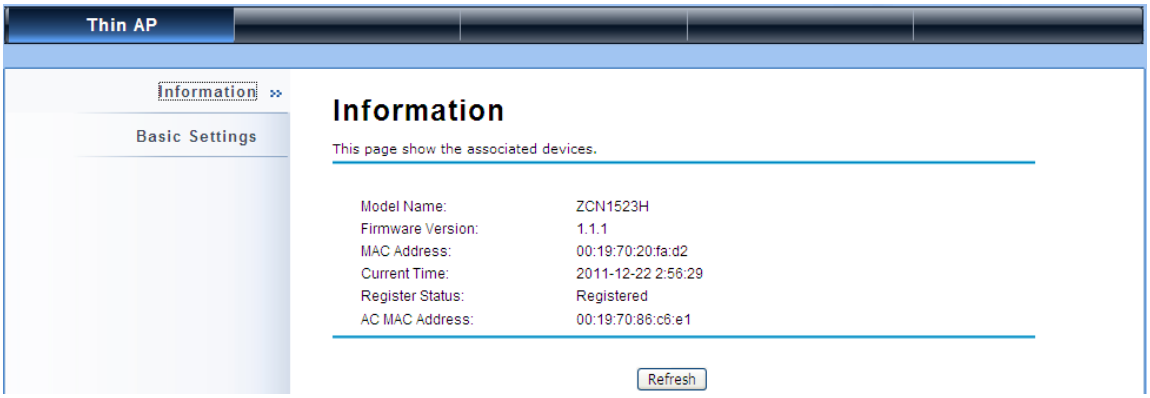
Channel Protection Mode: This is to avoid conflict with other wireless network and boost the ability of your device to catch all 802.11g transmissions. However, it may decrease wireless network performance. Compared to CTS-Self; the transmission amount of CTS-RTS is much lower.

Distance: To decrease the chances of data retransmission at long distance, the IEEE 802.11n JetWave 2450v2 can automatically adjust proper ACK timeout value by specifying distance of the two nodes.

Thin AP Mode

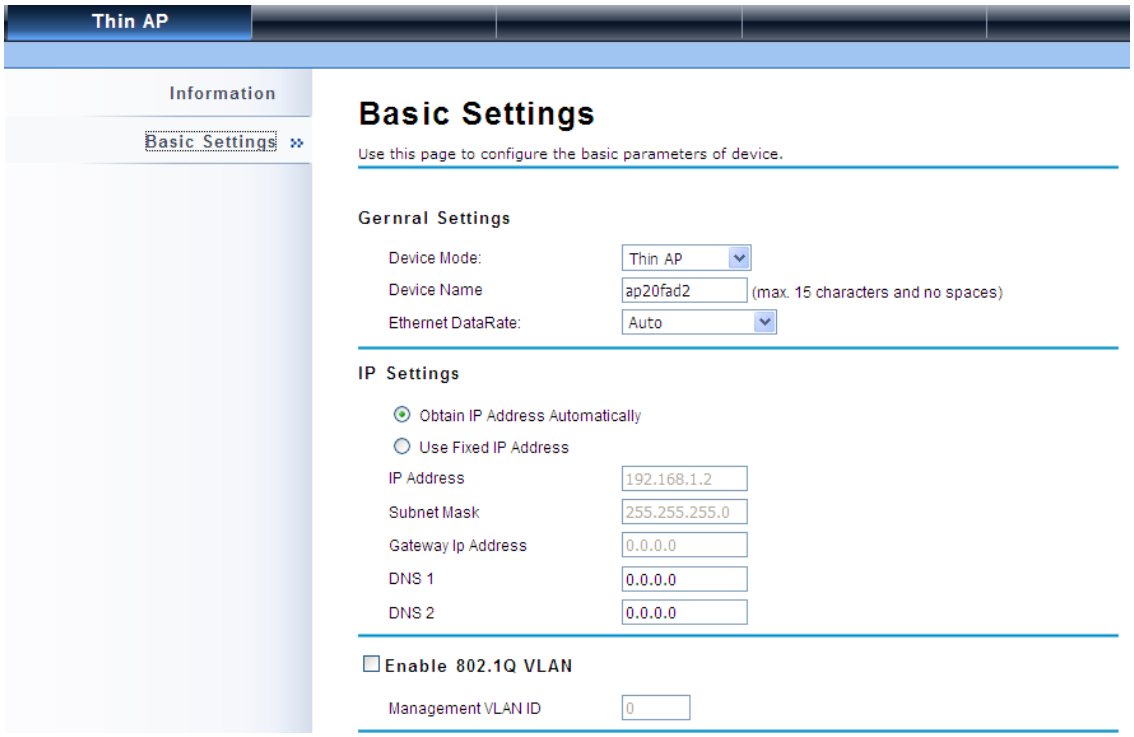
Information

You may see some Managed AP's basic information such as model name, firmware version, MAC address, current up time, registration status as well as MAC address.



Basic Settings

Allows you to configure device and IP settings for the Managed AP.



- **General Settings:**

  Device Mode: Three modes are provided: **AC+Thin AP**, **Thin AP**, **FAT AP**. Select AC+Thin AP to have the device act as virtual access controller to manage other Managed APs on your network. Select “Thin AP” to have the JetWave 2450v2 managed by the ZAC AP in AC mode. Select FAT AP to perform as a standalone AP, neither managing nor managed by other ZAC APs.

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

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

- **IP Address Assignment:**

  Obtain IP Address Automatically: If a DHCP server exists in your network, you can check this option, thus the IEEE 802.11n ZAC Access Pioint is able to obtain IP settings automatically from the DHCP server.

  Use Fixed IP Address: Check this option. You have to specify a static IP address, subnet mask, default gateway and DNS server for the JetWave 2450v2 manually. Make sure the specified IP address is unique on your network in order to prevent IP conflict.

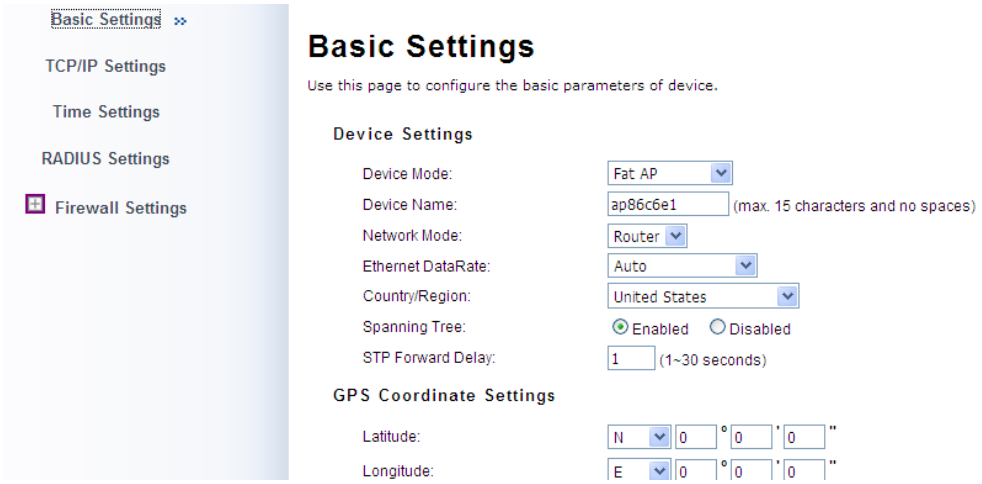
- **Enable 802.1Q VLAN**

  To be able to access the web page of the Managed AP in the VLAN network, you need to assign the VLAN management ID for the Managed AP. Note that the ID on the switch must be identical of the AP’s VLAN ID. Check **Enable 802.1Q VLAN** checkbox to activate it.

  Management VLAN ID: Enter the VLAN ID.

System

Basic System Settings



- **Device Settings**

  Device Mode: Three modes are provided: **AC+Thin AP**, **Thin AP**, **FAT AP**. Select AC+Thin AP to have the device act as virtual access controller to manage other Managed APs on your network. Select "Thin AP" to have the JetWave 2450v2 managed by the ZAC AP in AC mode. Select FAT AP to perform as a standalone AP, neither managing nor managed by other ZAC APs.

  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**.

  Country Region: 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.

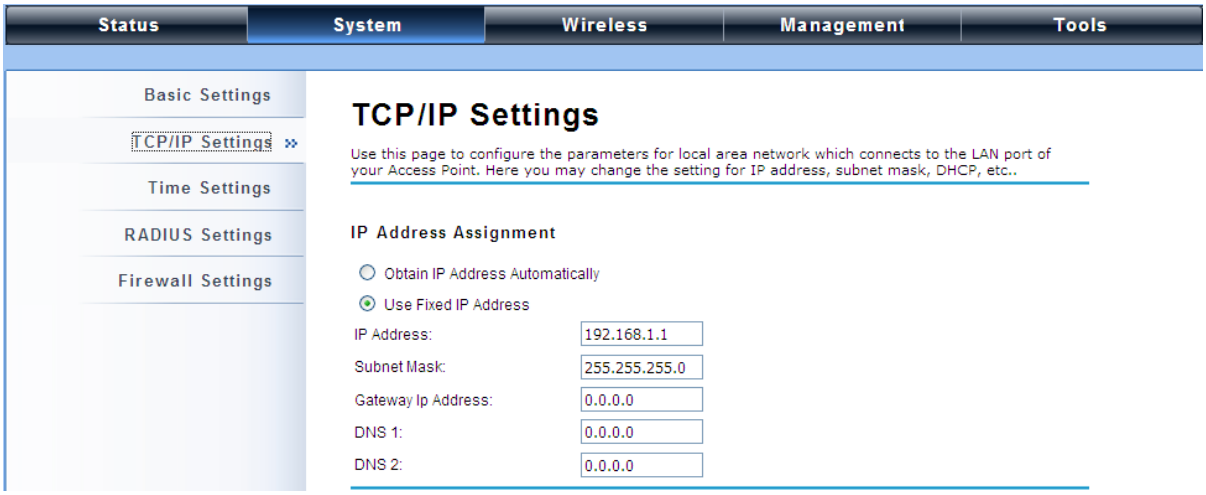
STP Forward Delay: STP Forward Delay is the time spent in detecting and learning network tree topology state before entering the forward state. Default time value is 1 sec.

- **GPS Coordinate Settings**

  The GPS Coordinate Setting helps you mark the latitude and longitude of the JetWave 2450v2. 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 JetWave 2450v2. In this page, users may change the settings for IP Address, Subnet Mask, and DHCP Server.



Obtain IP Address Automatically: If a DHCP server exists in your network, you can check this option, thus the IEEE 802.11n JetWave 2450v2 is able to obtain IP settings automatically from that DHCP server.

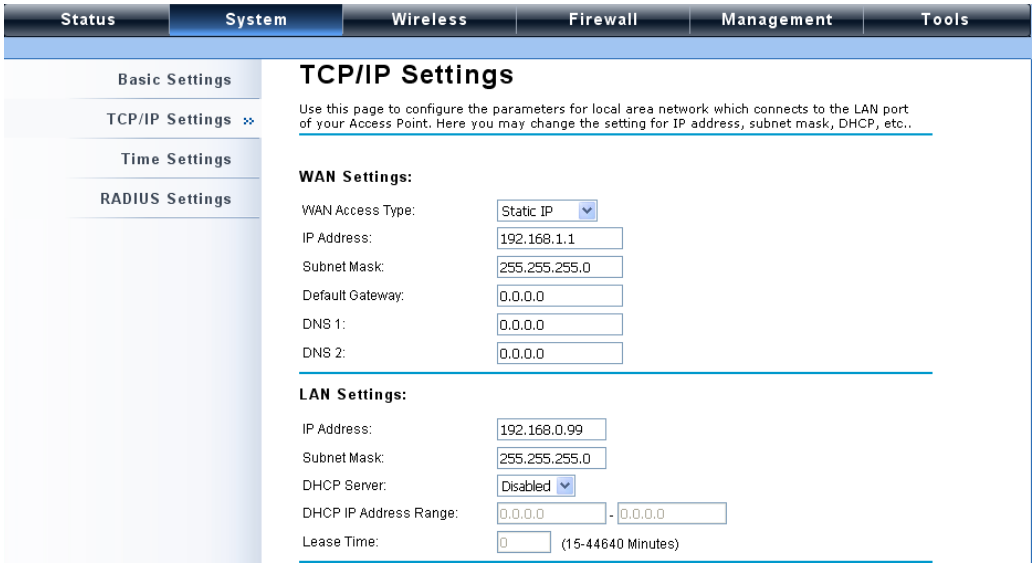
Note:

- When the IP address of the JetWave 2450v2 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 JetWave 2450v2 to access its Web Management page.
- In case the IEEE 802.11n JetWave 2450v2 is unable to obtain an IP address from a

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

Use Fixed IP Address: Check this option. You have to specify a static IP address, subnet mask, default gateway and DNS server for the JETWAVE 2450V2 manually. Make sure the specified IP address is unique on your network in order to prevent IP conflict.

If the IEEE 802.11n JetWave 2450v2 is configured as Router mode, you need to configure some additional TCP/IP parameters for accessing the Internet.



WAN Settings: 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 JETWAVE 2450V2 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.

Warning:

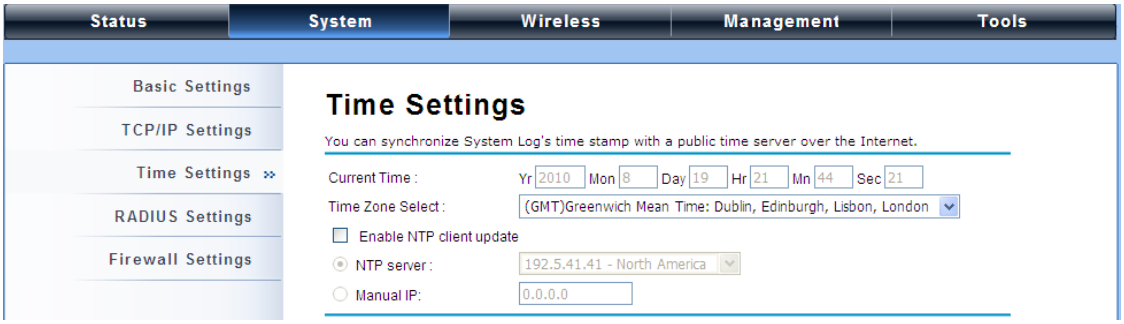
- In AP mode, the IEEE 802.11n JetWave 2450v2 must establish connection with

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 ZAC AP.

- In wireless client mode, users can access the JetWave 2450v2 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 JetWave 2450v2 with another wireless device before it is set to Router mode and access the JetWave 2450v2 via the connected wireless device.

Time Settings

Compliant with NTP, the IEEE 802.11n JetWave 2450v2 is capable of keeping its time in accord with the Internet time. To use this feature, check **Enable NTP Client Update** in advance.



- **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.

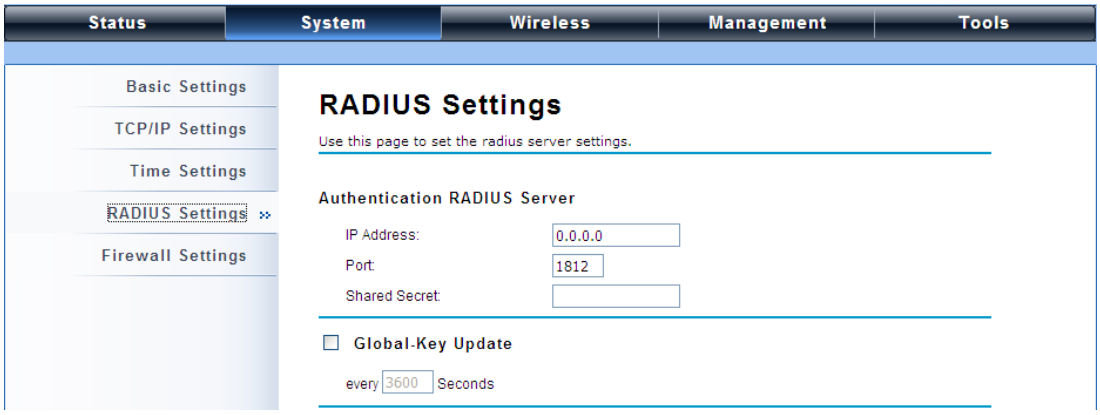
- **NTP Server**

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

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. If 802.1X, WPA(2) is used, you need to configure radius settings.

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



- **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;

  Shared Secret: This secret, which is composed of no more than 31 characters, is shared by the IEEE 802.11n JetWave 2450v2 and RADIUS during authentication.

- **Global-Key Update**

  Check this option and specify the time interval between two global-key updates. Default is 3600 seconds.

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. The IEEE 802.11n JetWave 2450v2 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:**

You may create and activate a rule that filters a packet based on the source IP address from your local network to Internet. Check "Enable Source IP Filtering**" to activate rule.**

Local IP Address: Enter the IP address you would like to restrict.

Comment: Make comments to record your filtering rule.

Click **Apply** and the IP address will be added in the list. To delete the IP address from filtering, click **Select** checkbox of the designated IP address and click the **Delete Selected** button. You may delete all the IP addresses in the list by clicking **Delete All**.

- **Destination IP Filtering:**

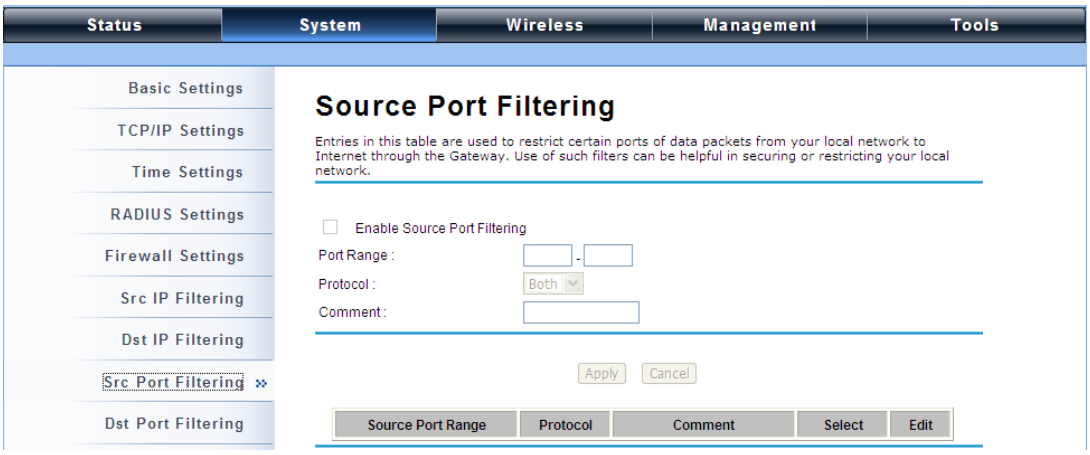
You may create and activate a rule that filters a packet based on the destination IP address to restrict the local computers from accessing certain websites. Check "**Enable Destination IP Filtering**" to activate rule.

Destination IP Address: Enter the IP address to be restricted.

Comment: Make comments to record your filtering rule.

Click **Apply** and the IP address will be added in the list. To delete the IP address from filtering, click **Select** checkbox of the designated destination IP address and click the **Delete Selected** button. You may delete all the IP addresses in the list by clicking **Delete All**.

- **Source Port Filtering:**



You may create and activate a rule that filters a packet based on the source port from your local network to Internet. Check "**Enable Source Port Filtering**" to activate rule.

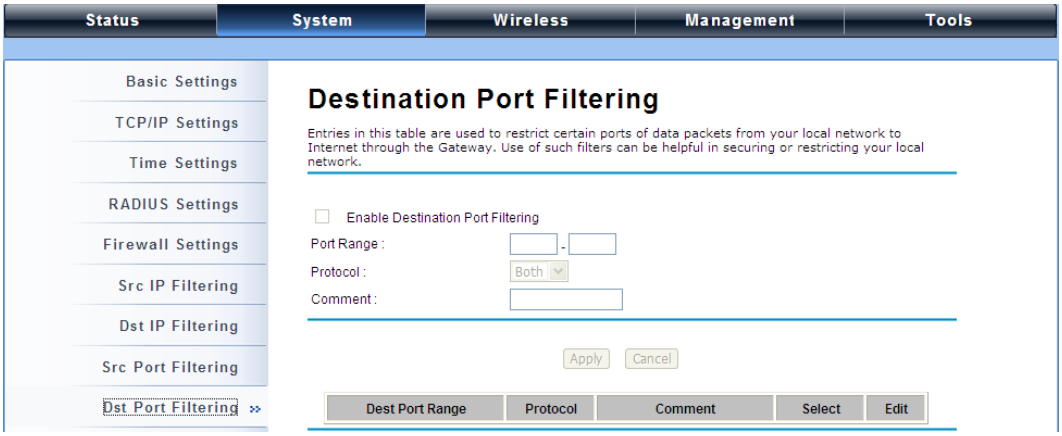
Port Range: Enter the port range you would like to restrict.

Protocol: Select port protocol: **Both**, **TCP**, **UDP**.

Comment: Make comments to record your filtering rule.

Click **Apply** and the IP address will be added in the list. To delete the restricted source ports, click **Select** checkbox of the designated ports and click the **Delete Selected** button. You may delete all the IP addresses in the list by clicking **Delete All**

- **Destination Port Filtering:**



You may create and activate a rule that filters a packet based on the destination port from your local network to Internet. Check "**Enable Destination Port Filtering**" to activate rule.

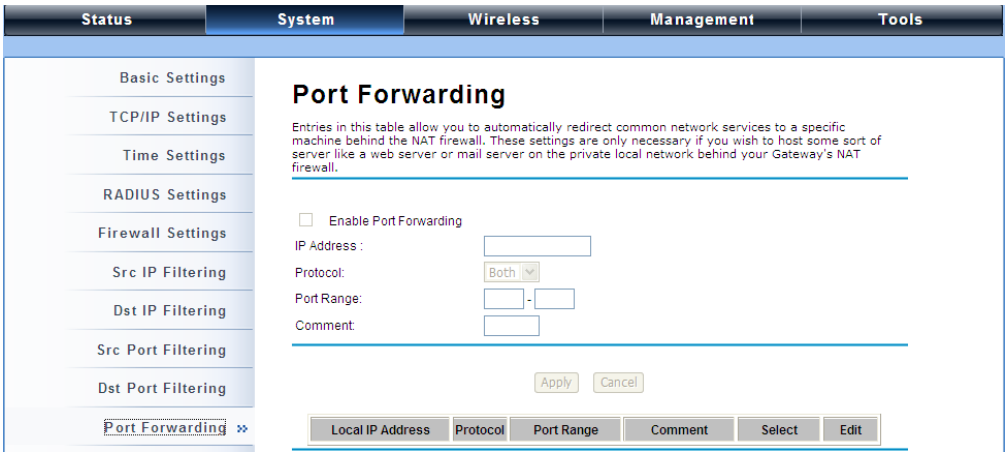
Port Range: Enter the port range you would like to restrict.

Protocol: Select port protocol: **Both**, **TCP**, **UDP**.

Comment: Make comments to record your filtering rule.

Click **Apply** and the IP address will be added in the list. To delete the restricted destination ports, click **Select** checkbox of the designated ports and click the **Delete Selected** button. You may delete all the IP addresses in the list by clicking **Delete All**.

- **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 IEEE 802.11n Wireless JetWave 2450v2's NAT firewall. Check the **Enable Port Forwarding** checkbox to

activate port forwarding.

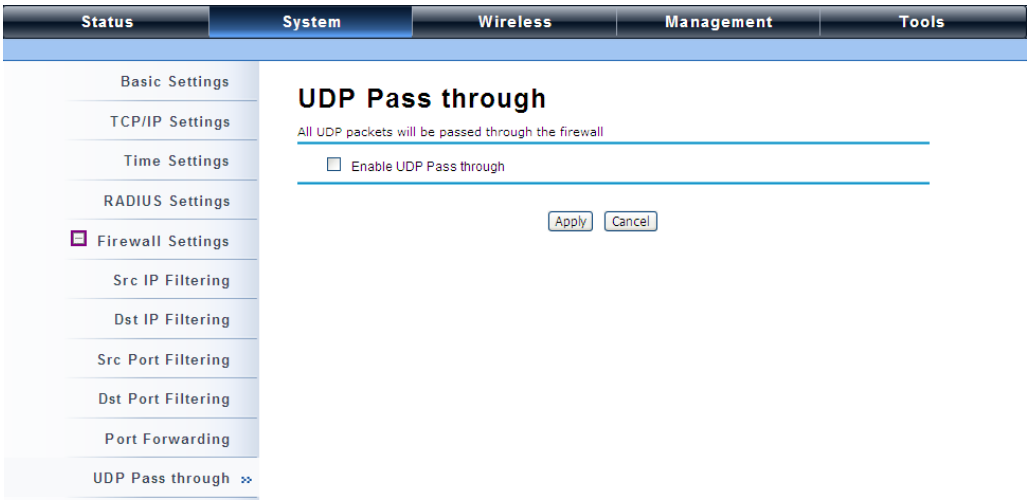
IP Address: Enter the IP address the local server.

Protocol: Select **Both**, **UDP** or **TCP**.

Port Range: Specify the port range.

Comment: Make comments to record the port forwarding rule.

UDP Pass Through

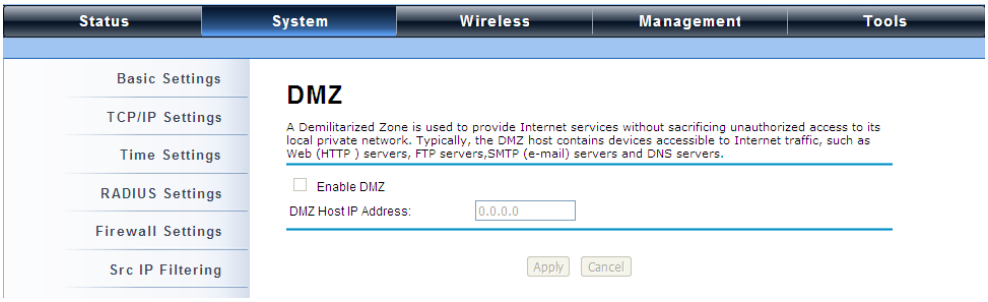


By check **Enable UDP Pass through** will allow all the UDPs packets to pass through the firewall.

Note that opening all the UDP ports will be very likely to expose the network to intruders

DMZ:

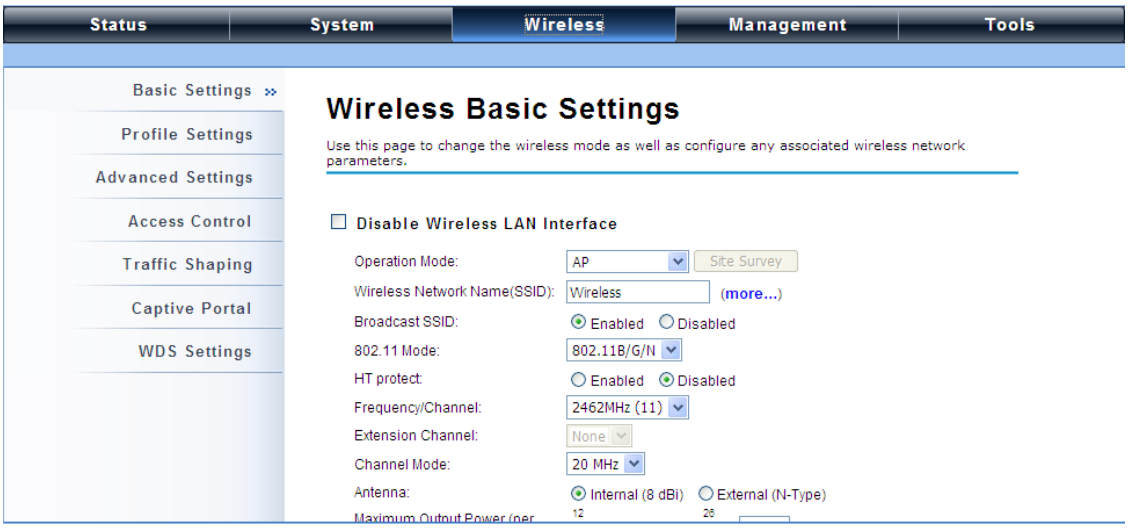
A Demilitarized Zone is used to provide Internet services without sacrificing unauthorized access to its local private network. Typically, the DMZ host contains devices accessible to the Internet traffic, such as Web (HTTP) servers, FTP servers, SMTP (e-mail) servers and DNS servers. To activate DMZ,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



DMZ Host IP Address: Enter the local host IP address.

Wireless

Open “**Basic Settings**” in “**Wireless**” as below to make basic wireless configuration.



- **Disable Wireless LAN Interface**

  Check this option to disable WLAN interface, then the wireless module of IEEE 802.11n JetWave 2450v2 will stop working and no wireless device can connect to it.

- **Operation Mode**

  Four operating modes are available in IEEE 802.11n JetWave 2450v2 when acts as a FAT AP.

  AP: The IEEE 802.11n JetWave 2450v2 establishes a wireless coverage and receives connectivity from other wireless devices.

  Wireless Client: The IEEE 802.11n JetWave 2450v2 is able to connect to the AP and thus join the wireless network around it.

  Bridge: The IEEE 802.11n JetWave 2450v2 establishes wireless connectivity with other APs by keying in remote MAC address. Please refer to the “**WDS Settings**” for detailed configuration.

  AP Repeater: The IEEE 802.11n JetWave 2450v2 servers as AP and Bridge concurrently. In other words, the IEEE 802.11n JetWave 2450v2 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 IEEE 802.11n JetWave 2450v2, so that malicious attack by some illegal STA could be avoided.

- **802.11 Mode**

  The IEEE 802.11n JetWave 2450v2 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 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 IEEE 802.11n JetWave 2450v2 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.

- **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. The output power will vary depending on each country's regulation.

- **Data Rate**

  Usually "**Auto**" is preferred. Under this rate, the IEEE 802.11n JetWave 2450v2 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.

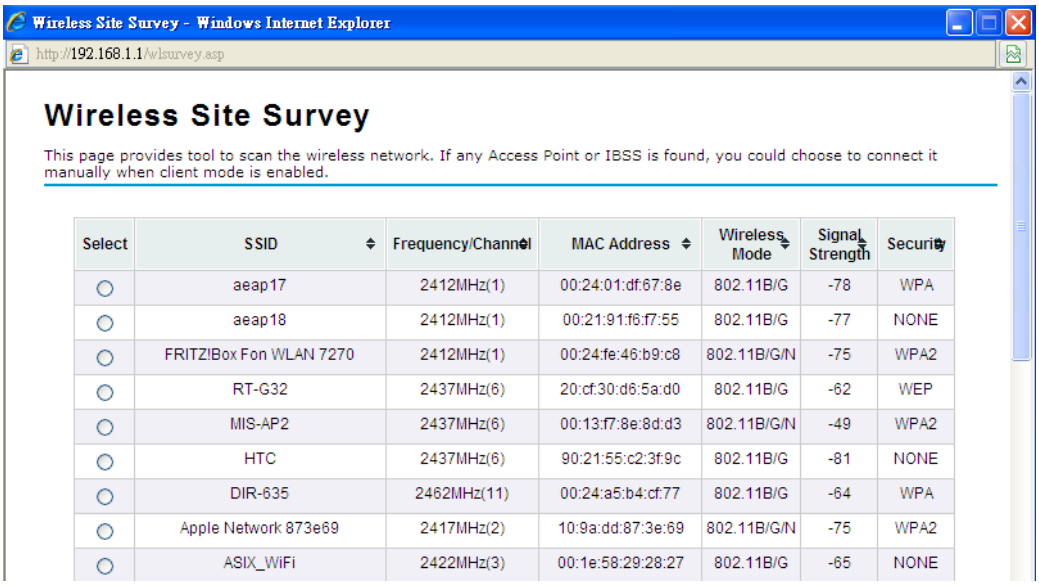
- **Enable MAC Clone**

  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 JetWave 2450v2 is able to perform site survey, through which, information on the available access points will be detected.

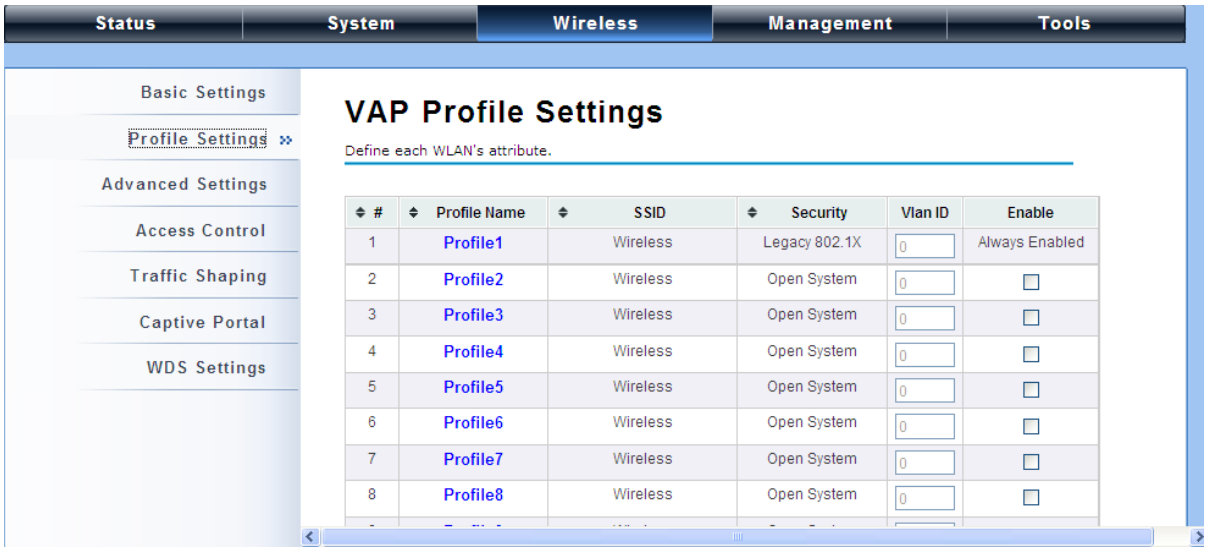
  Open "**Basic Settings**" in "**Wireless**", by clicking the "**Site Survey**" button beside "**Wireless Mode**" option, the wireless site survey window will pop up with a list of available AP in the vicinity. Select the AP you would like to connect and click "**Selected**" to establish connection.

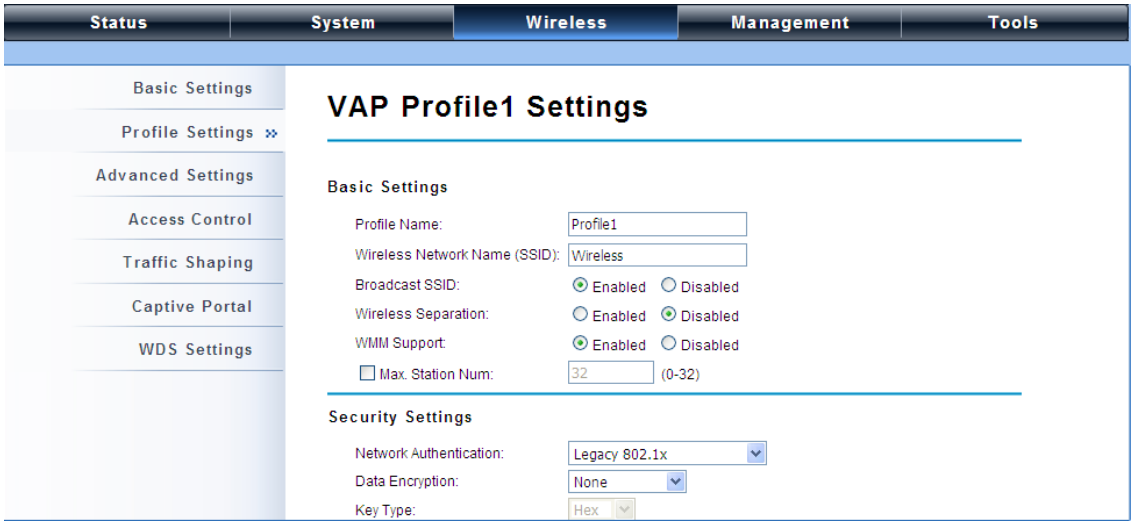


VAP Profile Settings

Available in AP mode, the IEEE 802.11n JetWave 2450v2 allows up to 8 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.





- **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 IEEE 802.11n JetWave 2450v2, so that malicious attack by some illegal STA could be avoided.

Wireless Separation: 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.

WMM Support: 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

Max. Station Number: By checking the "**Max. Station Num**" the JetWave 2450v2 will only allow up to 32 wireless clients to associate with for better bandwidth for each client. By disabling the checkbox the JetWave 2450v2 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 IEEE 802.11a/n JetWave 2450v2 provides you with rock solid security settings.

- **Network Authentication**

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

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

  Legacy 802.1x: 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.

  WPA with RADIUS: Wi-Fi Protected Access (WPA) is a subset of the IEEE 802.11i standard. 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: WPA2 (IEEE 802.11i) is a wireless security standard that defines stronger encryption, authentication and key management than WPA. If it is selected, AES encryption and RADIUS server are required.

  WPA&WPA2 with RADIUS: 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.

Note:

- If Radius relevant authentication type is selected, please go to **Wireless → Radius Settings** for further radius server configuration.

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.

128 bits WEP: 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 the same Authentication, Data Encryption and Key among the IEEE 802.11n JetWave 2450v2 and wireless clients can the communication be established!

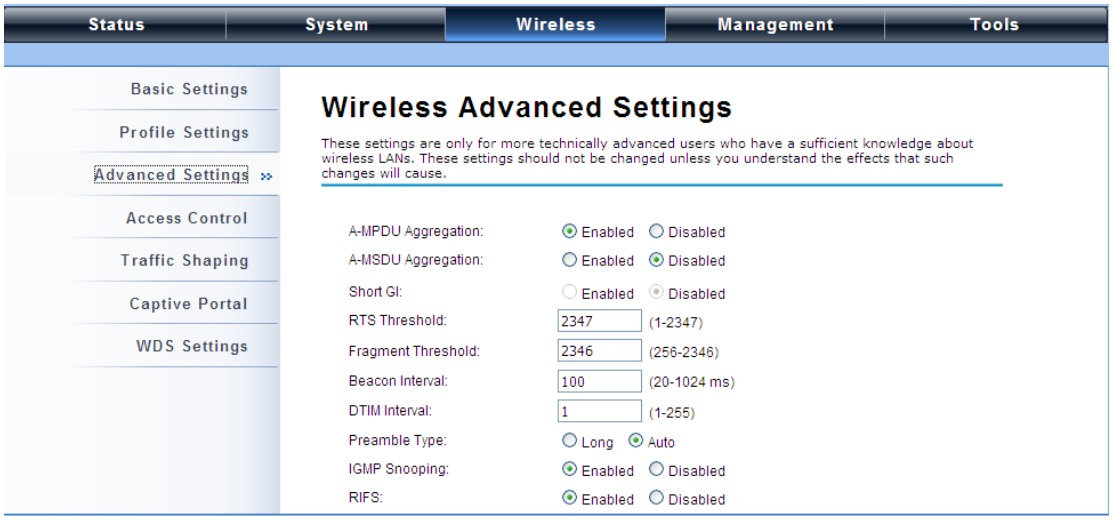
VLAN

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 IEEE 802.11a/n JetWave 2450v2, 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 of accessing the Web page of the IEEE 802.11n JetWave 2450v2.

Advanced Settings

Open "**Advanced Settings**" in "**Wireless**" to make 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 IEEE 802.11n JetWave 2450v2 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 IEEE 802.11n JetWave 2450v2 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.

Access Control

The Access Control appoints the authority to wireless client on accessing IEEE 802.11n JetWave 2450v2, thus a further security mechanism is provided. This function is available only under AP/Router mode.

Open “**Access Control**” in “**Wireless Settings**” as below.

- **Profile Selection:** Select the VAP network you would like to enable access control.
- **Access Control Mode**

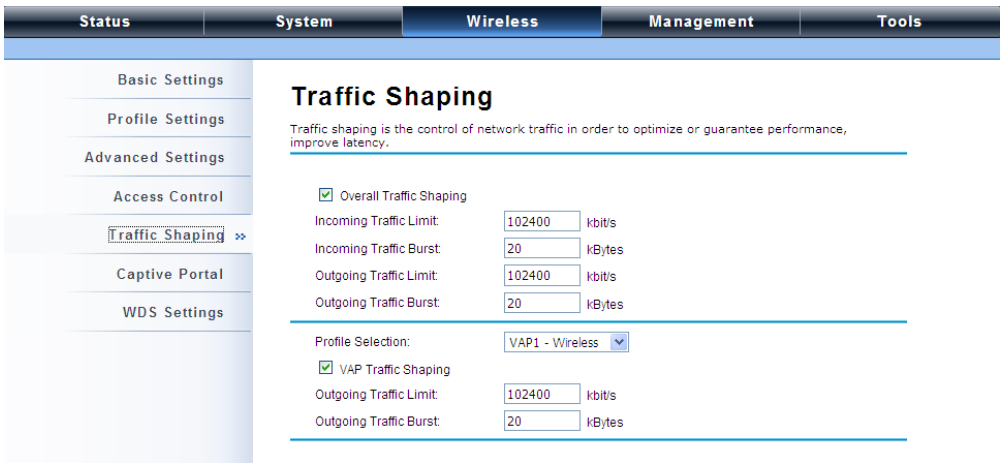
  If you select "**Allow Listed**", only those clients whose wireless MAC addresses are in the access control list will be able to connect to your AP. While when "**Deny Listed**" is selected, those wireless clients on the list will not be able to connect the AP.
- **MAC Address**

  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.

Traffic Shaping

It allows the administrator to manage the traffic flow to ensure optimal performance.



- **Overall Traffic Shaping**

  Check this box to control the overall bandwidth of the JetWave 2450v2.

  Incoming Traffic Limit: To specify maximum incoming bandwidth to a certain rate in kbit/s.

  Incoming Traffic Burst: To specify the buffer size for incoming traffic that can be sent within a given unit of time. The suggested value is 20KBytes. You may just leave the default value there, and then the connection will be bound to the traffic shaping rule at all times. You may decrease it to smaller value if the incoming traffic limit is smaller.

  Outgoing Traffic Limit: To limit the outbound traffic to a certain rate in kbit/s.

  Outgoing Traffic Burst: To specify the buffer size for outbound traffic. The suggested value is 20KBytes. You may decrease it to smaller value if the outbound traffic limit is smaller.

- **VAP Traffic Shaping**

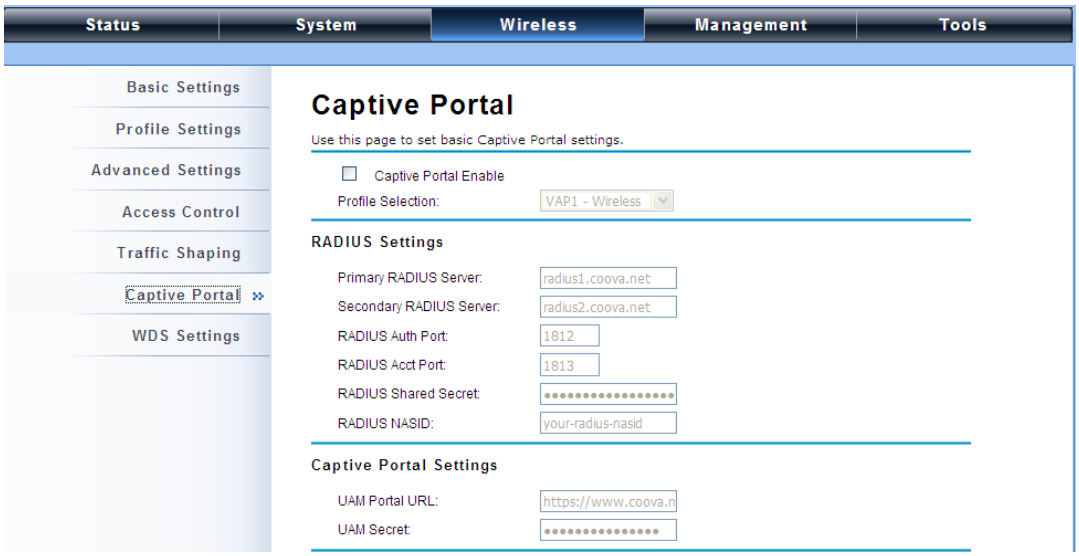
  Check this box to control the overall bandwidth for a specific VAP network.

  Incoming Traffic Limit: To specify maximum incoming bandwidth to a certain rate in kbit/s.

  Incoming Traffic Burst: To specify the buffer size for incoming traffic that can be sent within a given unit of time. The suggested value is 20KBytes. You may just leave the default value there, and then the connection will be bound to the traffic shaping rule at all times. You may decrease it to smaller value if the incoming traffic limit is smaller.

Captive Portal

Captive portal is a management which allows WLAN users to easily and securely access the Internet. Under Router mode, when captive portal is enabled, the IEEE 802.11n JetWave 2450v2 will redirect the client to go to an authentication web page before browsing Internet web pages. Captive portals are used on most Wi-Fi hotspots networks. Therefore, to use captive portal, you need to find the service providers that have the additional services needed to make captive portal work.



To enable Captive Portal, check "**Captive Portal**" and select the VAP network needed for captive portal.

- **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: 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

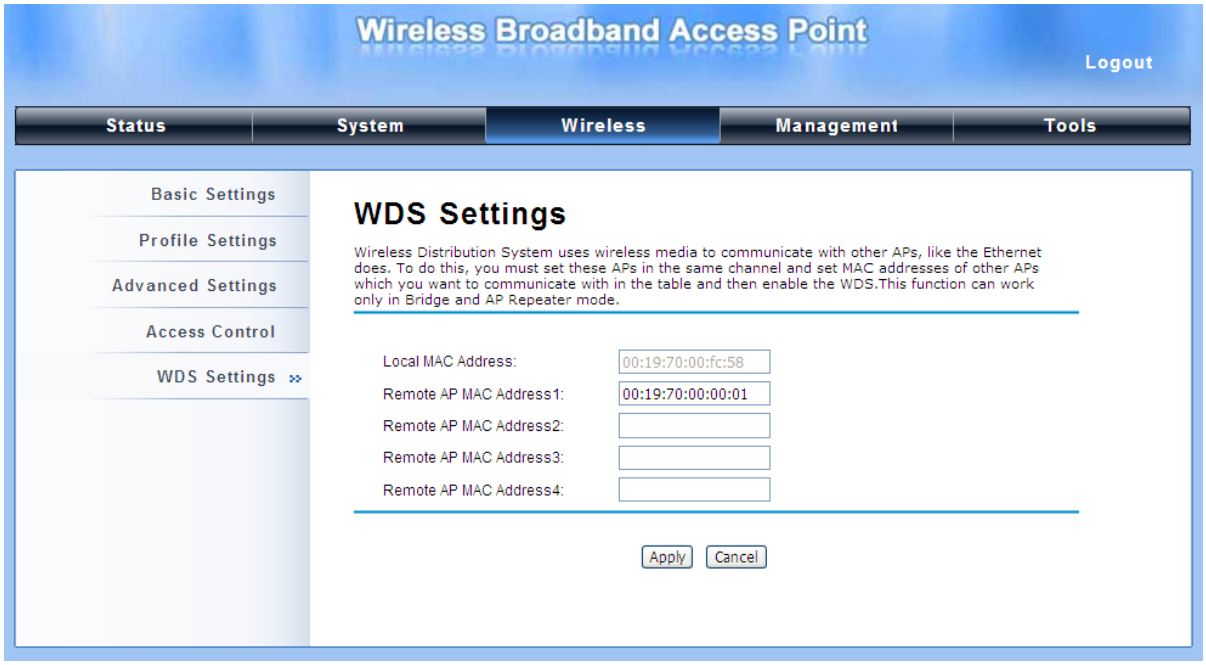
- **Captive Portal**

  UAM Portal URL: Enter the address of the UAM portal server

  UAM Secret: Enter the secret password between the redirect URL and the Hotspot.

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:



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

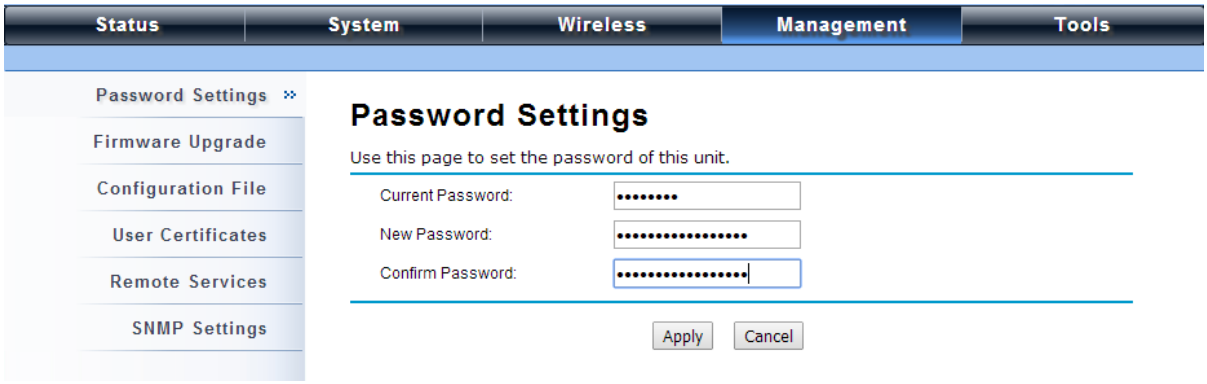
Note:

- 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 AP2 in any case). Mesh and Ring network topologies are not supported by WDS and should be avoided in all the use cases.

Management

Password

From “**Password Settings**” in “**Management**”, you can change the password to manage your IEEE 802.11n JetWave 2450v2.



- **Current Password**: Enter the current password.
- **New Password:** Enter the new password.
- **Confirm Password:** Enter the new password again for confirmation.

Note:

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

Upgrade Firmware

Open “**Firmware Upload**” in “**Management**” and follow the steps below to upgrade firmware locally or remotely through IEEE 802.11n JetWave 2450v2’s Web:

- Click “**Browse**” to select the firmware file you would like to load;
- Click “**Upload**” to start the upload process;
- Wait a few minutes, the JetWave 2450v2 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:

- **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 IEEE 802.11n JetWave 2450v2 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.

- **Restore factory default settings via Reset Button**

  If software in IEEE 802.11n JetWave 2450v2 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.

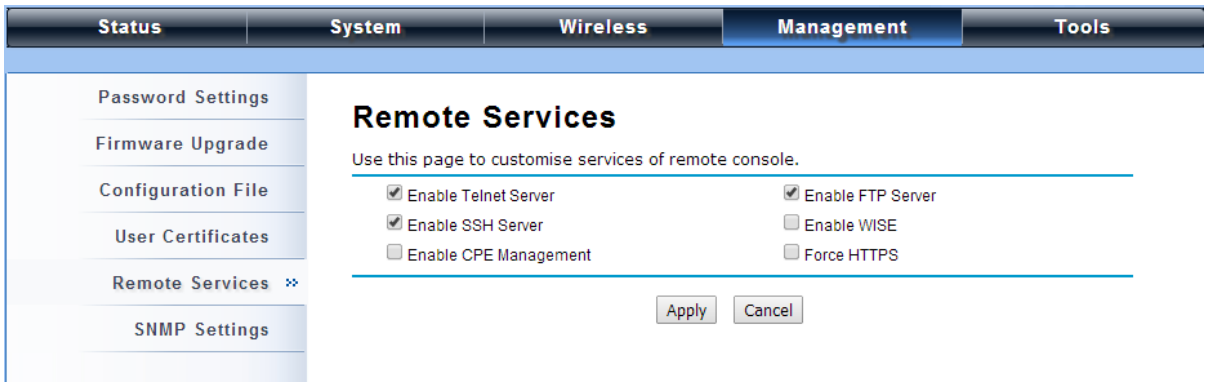
Reboot

You can reboot your IEEE 802.11n JetWave 2450v2 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.

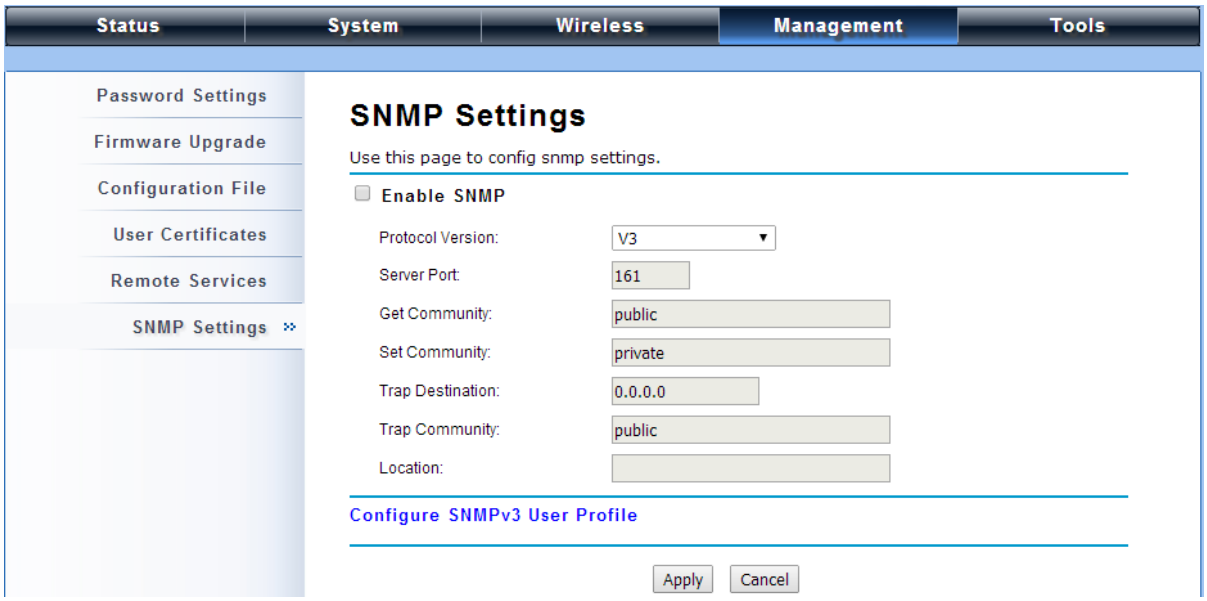
Remote Management

The IEEE 802.11n JetWave 2450v2 provides a variety of remotes managements including Telnet, SNMP, FTP, SSH, HTTPS and exclusive WISE tool, making configuration more convenient and secure.



SNMP Management

The IEEE 802.11n JetWave 2450v2 supports SNMP for convenient remote management. Open "**SNMP Settings**" in "**Management**" shown below. Set the SNMP parameters and obtain MIB file before remote management.



Protocol Version: Select the SNMP version, and keep it identical on the IEEE 802.11n JetWave 2450v2 and the SNMP manager. The IEEE 802.11n JetWave 2450v2 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.

  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 IEEE 802.11n JetWave 2450v2.

  Password: Specify a password for the SNMPv3 administrator or user. Only the SNMP commands carrying this password are allowed to access the IEEE 802.11n Wireless JetWave 2450v2.

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

  Access Type: Select "**Read Only**" or "**Read and Write**" accordingly.

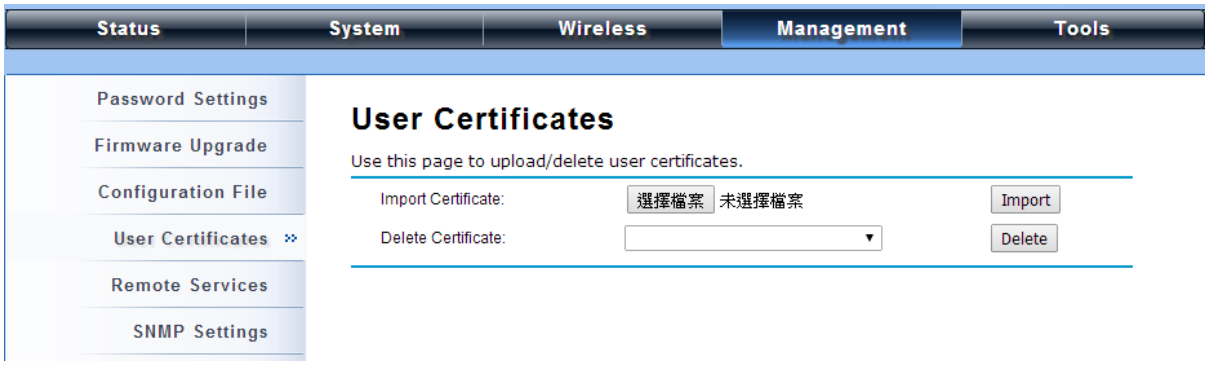
  Authentication Protocol: Select an authentication algorithm. SHA authentication is stronger than MD5 but is slower.

  PriZACy Protocol: Specify the encryption method for SNMP communication. None and DES are available. **None** means no encryption is applied. **DES** is a Data Encryption Standard that applies a 58-bit key to each 64-bit block of data.

Certificate Settings

Under Wireless 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**".



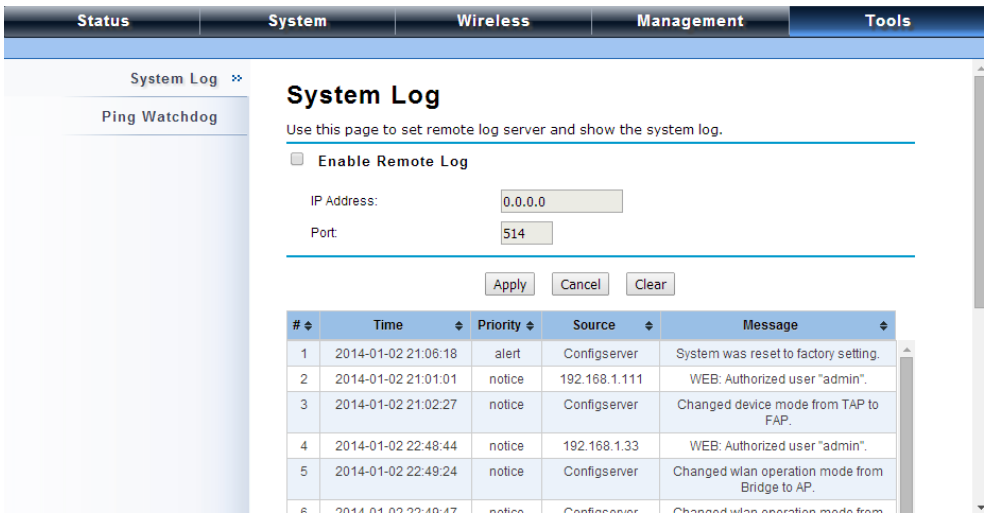
- **Delete User Certificate:** Delete the selected user certificate.
- **Import User Certificates:** Imported the user certificate

Tools

System Log

System log is used for recording events occurred on the IEEE 802.11n JetWave 2450v2, including station connection, disconnection, system reboot and etc.

Open “**System Log**” in “**Tools**” as below.



- **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.

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.

- **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.

  Startup Delay: Specify the startup delay time to prevent reboot before the IEEE 802.11n JetWave 2450v2 is fully initialized.

  Failure Count To Reboot: If the ping timeout packets reached the value, the IEEE 802.11n JetWave 2450v2 will reboot automatically.

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.

Table 1 ACSII

ASCII Character	Hex Equivalent	ASCII Character	Hex Equivalent	ASCII Character	Hex Equivalent	ASCII Character	Hex Equivalent
!	21	9	39	Q	51	i	69
"	22	:	3A	R	52	j	6A
#	23	;	3B	S	53	k	6B
$	24	<	3C	T	54	l	6C
%	25	=	3D	U	55	m	6D
&	26	>	3E	V	56	n	6E
‘	27	?	3F	W	57	o	6F
(	28	@	40	X	58	p	70
)	29	A	41	Y	59	q	71
*	2A	B	42	Z	5A	r	72
+	2B	C	43	[	5B	s	73
,	2C	D	44	\	5C	t	74
-	2D	E	45	]	5D	u	75
.	2E	F	46	^	5E	v	76
/	2F	G	47	_	5F	w	77
0	30	H	48	`	60	x	78
1	31	I	49	a	61	y	79
2	32	J	4A	b	62	z	7A
3	33	K	4B	c	63	{	7B
4	34	L	4C	d	64	|	7C
5	35	M	4D	e	65	}	7D
6	36	N	4E	f	66	~	7E
7	37	O	4F	g	67		
8	38	P	50	h	68		