level one

MANAGEMENT GUIDE

802.11a/b/g/n Outdoor
Dual-Band Wireless Access Point

WAB-7100

Outdoor Access Point Management Guide

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How to Use This Guide

This guide includes detailed information on the access point (AP) software, including how to operate and use the management functions of the AP. To deploy this AP effectively and ensure trouble-free operation, you should first read the relevant sections in this guide so that you are familiar with all its software features.

Who Should Read This Guide?

This guide is for network administrators who are responsible for operating and maintaining network equipment. The guide assumes a basic working knowledge of LANs (Local Area Networks), the Internet Protocol (IP), and Simple Network Management Protocol (SNMP).

How This Guide is Organized

The organization of this guide is based on the AP's main management interfaces. The web management interface and command line interface (CLI) are described in separate sections. An introduction and initial configuration information is also provided.

The guide includes these sections:

- Section I "Getting Started" — Includes an introduction to AP management and initial configuration settings.
- Section II "Web Configuration" — Includes all management options available through the web interface.
- Section III "Command Line Interface" — Includes information on how to use the CLI and details on all CLI commands.
- Section IV "Appendices" — Includes information on troubleshooting AP management access.

Related Documentation

This guide focuses on AP software configuration, it does not cover hardware installation of the AP. For specific information on how to install the AP, see the following guide:

Installation Guide

For all safety information and regulatory statements, see the following documents:

Quick Start Guide
Safety and Regulatory Information

Conventions

The following conventions are used throughout this guide to show information:

Note: Emphasizes important information or calls your attention to related features or instructions.

Caution: Alerts you to a potential hazard that could cause loss of data, or damage the system or equipment.

Warning: Alerts you to a potential hazard that could cause personal injury.

Revision History

This section summarizes the changes in each revision of this guide.

January 2013 Revision

This is the first revision of this guide. It is valid for software release v0.3.3.4.

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Section I

Getting Started

This section provides an overview of the access point, and introduces some basic concepts about wireless networking. It also describes the basic settings required to access the management interface.

This section includes these chapters:

- "Introduction" on page 18
- "Initial Configuration" on page 24

1 Introduction

The access point (AP) runs software that includes a network management agent. The agent offers a variety of management options, including SNMP and a web-based interface. A PC may also be connected directly to the AP's console port for configuration using a command line interface (CLI).

Configuration Options

The AP's HTTP web agent allows you to configure AP parameters, monitor wireless connections, and display statistics using a standard web browser such as Internet Explorer 6.x or above, and Mozilla Firefox 3.6.2/4/5. The AP's web management interface can be accessed from any computer attached to the network.

The CLI program can be accessed by a direct connection to the RS-232 serial console port on the AP, or remotely by a Telnet or Secure Shell (SSH) connection over the network.

The AP's management agent also supports SNMP (Simple Network Management Protocol). This SNMP agent permits the AP to be managed from any computer in the network using network management software.

The AP's web interface, console interface, and SNMP agent allow you to perform management functions such as:

- Set management access user names and passwords
- Configure IP settings
- Configure SNMP parameters
- Configure 2.4 GHz and 5 GHz radio settings
- Control access through wireless security settings
- Filter packets using Access Control Lists (ACLs)
- Upload and download system firmware or configuration files
- Display system information and statistics

Console Port Connection

The AP provides an RS-232 serial console port that enables a connection to a PC or terminal for monitoring and configuring the AP. A null-modem console cable is provided with the AP.

Attach a VT100-compatible terminal, or a PC running a terminal emulation program to the AP. You can use the console cable provided with this package, or use a null-modem cable that complies with the wiring assignments shown in the *Installation Guide*.

To connect a terminal to the console port, complete the following steps:

1. Connect the console cable to the serial port on a terminal, or a PC running terminal emulation software, and tighten the captive retaining screws on the DB-9 connector.
2. Connect the other end of the cable to the console port on the AP.
3. Make sure the terminal emulation software is set as follows:
   - Select the appropriate serial port (COM port 1 or COM port 2).
   - Set the baud rate to 115200 bps.
   - Set the data format to 8 data bits, 1 stop bit, and no parity.
   - Set flow control to none.
   - Set the emulation mode to VT100.
   - When using HyperTerminal, select Terminal keys, not Windows keys.

Note: Once you have set up the terminal correctly, the console login screen will be displayed.

For a description of how to use the CLI, see "Using the Command Line Interface" on page 109. For a list of all the CLI commands, refer to "Index of CLI Commands" on page 274.

Console Login

Access to the CLI is controlled by user names and passwords. The AP has a default user name and password. To log into the CLI using the default user name and password, perform these steps:

1. To initiate your console connection, press <Enter>. The "User Access Verification" procedure starts.

2. At the login prompt, enter "admin."

3. At the Password prompt, press <Enter>. There is no default password.

4. The session is opened and the CLI displays the "Accton#" prompt indicating you have access to the CLI commands.

Example

```
(none) login: admin
Password:
Jan  1 11:33:13 login[1918]: root login on 'ttyS0'

LevelOne#
```

Network Connections

Prior to accessing the AP's management agent through a network connection, you must first configure it with a valid IP address, subnet mask, and default gateway using a console connection, or the DHCP protocol.

The AP has a static default management IPv4 address of 192.168.1.10 and a subnet mask of 255.255.255.0.

Once the AP's IP settings are configured for the network, you can access the AP's management agent from anywhere within the attached network. The management agent can be accessed using Telnet from any computer attached to the network. The AP can also be managed by any computer using a web browser, or from a network computer using SNMP network management software.

Connecting to the Web Interface

The AP offers a user-friendly web-based management interface for the configuration of all the unit's features. Any PC directly attached to the unit can access the management interface using a web browser, such as Internet Explorer (version 6.x or above) or Firefox (version 2.x or above).

You may want to make initial configuration changes by connecting a PC directly to the AP's LAN port. The AP has a default management IP address of 192.168.1.10 and a subnet mask of 255.255.255.0. You must set your PC IP address to be on the same subnet as the AP (that is, the PC and AP addresses must both start 192.168.1.x).

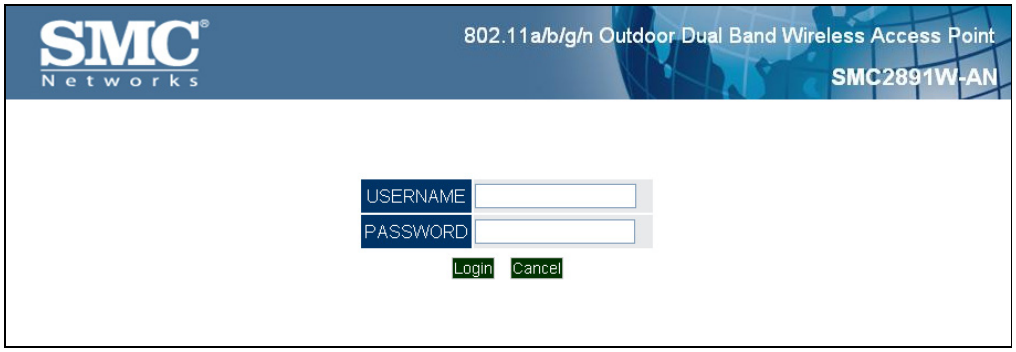
To access the AP's web management interface, follow these steps:

1. Use your web browser to connect to the management interface using the default IP address of 192.168.1.10.

2. Log into the interface by entering the default username “admin” with no password, then click Login.

Note: It is strongly recommended to change the default user name and password the first time you access the web interface. For information on changing user names and passwords, See “Administration Settings” on page 34.

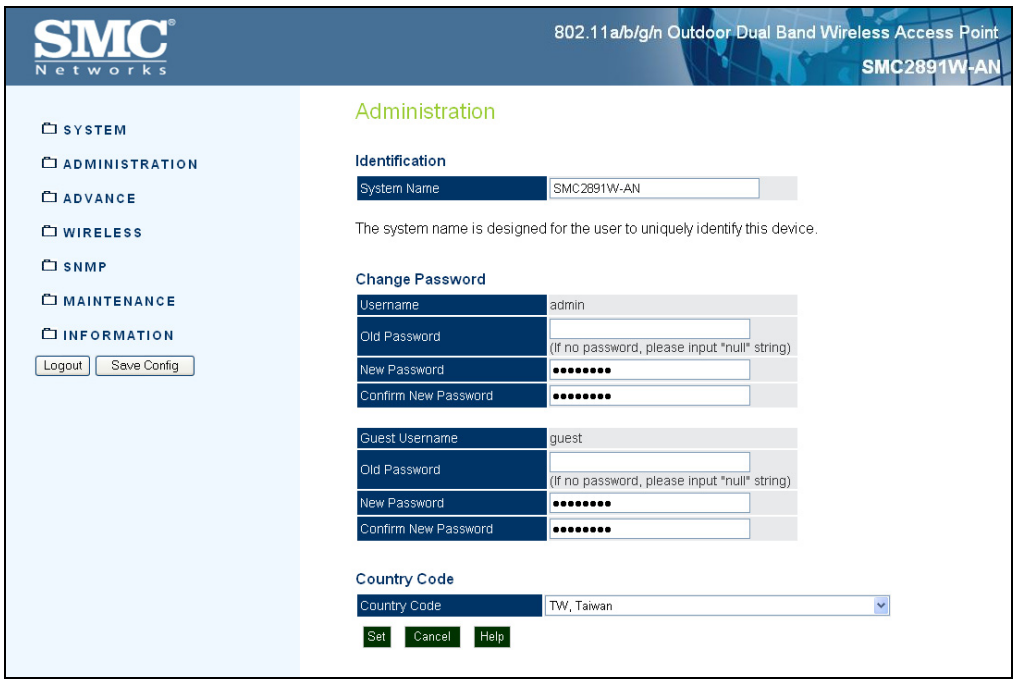
Figure 1: Login Page



Home Page and Main Menu

After logging in to the web interface, the home page displays. The home page shows some basic settings for the AP, including Country Code and the management access password.

Figure 2: The Home Page



The web interface Main Menu menu provides access to all the configuration settings available for the AP.

To configure settings, click the relevant Main Menu item. Each Main Menu item is sumarized below with links to the relevant section in this guide where configuration parameters are described in detail:

- **System** — Configures Management IP, WAN, LAN and QoS settings. See "System Settings" on page 33.
- **Administration** — Configures HTTP, Telnet, and SSH access settings. See "Management Settings" on page 49.
- **Advanced** — Confiures LLDP and Access Control Lists. See "Advanced Settings" on page 60**.**
- **Wireless** — Configures AP radio settings. See "Wireless Settings" on page 67.
- **SNMP** — Configures SNMP settings. See "Management Settings" on page 49.
- **Maintentance** — Enables firmware upgrades and resets the AP. See "Maintenance Settings" on page 91.
- **Information** — Displays current system settings. See "Status Information" on page 97.

Common Web Page Buttons

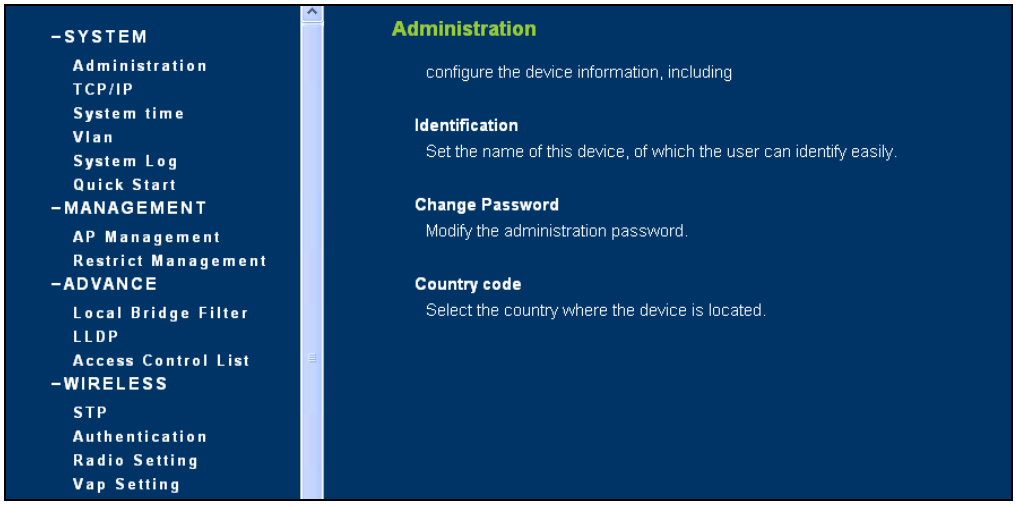
The list below describes the common buttons found on most web management pages:

- **Set** – Applies the new parameters and saves them to temporary RAM memory. Also displays a screen to inform you when it has taken affect. Clicking 'OK' returns to the home page. The running configuration will not be saved upon a reboot unless you use the "Save Config" button.

Figure 3: Set Configuration Changes

- **Cancel** – Cancels the newly entered settings and restores the originals.
- **Help** – Displays the help window.

Figure 4: Help Menu



- **Logout** – Ends the web management session.
- **Save Config** – Saves the current configuration so that it is retained after a restart.

2 Initial Configuration

The AP's initial configuration steps can be made through the CLI or web browser interface. If the AP is not configured with an IP address that is compatible with your network. You can first use the command line interface (CLI) as described below to configure a valid IP address.

CLI Initial Configuration Steps

First connect to the AP's console port and log in to the CLI, as described in "Console Port Connection" on page 19. Then proceed with the required configuration.

Setting an IP Address

If the default IP address is not compatible with your network or a DHCP server is not available, the AP's IP address must be configured manually using the CLI.

Type "configure" to enter configuration mode, then type "interface ethernet" to access the Ethernet interface-configuration mode.

```
LevelOne#configure
LevelOne(config)#interface ethernet
LevelOne(config-if)#
```

First type "no ip dhcp" to disable DHCP client mode. Then type "ip address *ip-address netmask gateway*," where "ip-address" is the access point's IP address, "netmask" is the network mask for the network, and "gateway" is the default gateway router. Check with your system administrator to obtain an IP address that is compatible with your network.

```
LevelOne(if-ethernet)#no ip dhcp
LevelOne(if-ethernet)#ip address 192.168.2.2 255.255.255.0 192.168.2.254
LevelOne(if-ethernet)#
```

After configuring the access point's IP parameters, you can access the management interface from anywhere within the attached network. The command line interface can also be accessed using Telnet from any computer attached to the network.

Note: Command examples shown later in this manual abbreviate the console prompt to "AP" for simplicity.

Setting a Password

If you are logging in to the CLI for the fist time, you should define management access passwords for an administrator and guest (used for CLI and web management), record them, and then keep them in a safe place.

Note: If you loose your management access passwords, you will need to use the Reset button on the AP to set the configuration back to factory default values.

Passwords can consist of 5 to 32 alphanumeric characters and are case sensitive. To prevent unauthorized access to the AP, set the passwords as follows:

Open the console interface to access the CLI prompt. Type "configure" and press <Enter>. Type "password admin *null password*," where "*null*" is the default old password, and "*password"* is your new password. Press <Enter>.

Example

```
AP#configure
AP(config)#password admin null tpschris
AP(config)#
```

Setting the Country Code

You must set the country code of the AP to be sure that the radios operate according to permitted local regulations. That is, setting the country code restricts operation of the AP to the radio channels and transmit power levels permitted for wireless networks in the specified country.

Caution: You must set the country code to the country of operation. Setting the country code ensures that the radios operate within the local regulations specified for wireless networks.

Note: The country code selection is for non-US models only and is not available to all US models. Per FCC regulation, all Wi-Fi products marketed in the US must be fixed to US operation channels only.

From the CLI prompt, type "country ?" to display the list of country codes. Select the code for your country, and enter the command again, following by your country code (for example., "tw" for Taiwan).

Example

```
AP#country ?
  WORD Country code:
       AL-ALBANIA, DZ-ALGERIA, AR-ARGENTINA, AM-ARMENIA, AU-AUSTRALIA,
       AT-AUSTRIA, AZ-AZERBAIJAN,
       BH-BAHRAIN, BY-BELARUS, BE-BELGIUM, BZ-BELIZE, BO-BOLIVIA,
```

```
        BA-BOSNIA, BR-BRAZIL, BN-BRUNEI_DARUSSALAM, BG-BULGARIA,
        CA-CANADA, CL-CHILE, CN-CHINA, CO-COLOMBIA, CR-COSTA_RICA,
        HR-CROATIA, CY-CYPRUS, CZ-CZECH_REPUBLIC, DK-DENMARK,
        DK-DENMARK, DO-DOMINICAN_REPUBLIC,
        EC-ECUADOR, EG-EGYPT, EE-ESTONIA,
        FI-FINLAND, FO-FAROE_ISLANDS, FR-FRANCE, F2-FRANCE2,
        GE-GEORGIA, DE-GERMANY, GR-GREECE, GT-GUATEMALA,
        HK-HONG_KONG, HN-HONDURAS, HU-HUNGARY,
        IS-ICELAND, IN-INDIA, ID-INDONESIA, IR-IRAN, IQ-IRAQ, IE-IRELAND,
        IL-ISRAEL, IT-ITALY,
       JM-JAMAICA, JP0-JAPAN0, JP3-JAPAN3(including 4.9G channels), JO-JORDAN,
        KE-KENYA, KZ-KAZAKHSTAN, KP-NORTH KOREA, KR-KOREA_REPUBLIC,
        K2-KOREA_REPUBLIC2(including 2.3G channels),
        K3-KOREA_REPUBLIC3(more channels in 5G), KW-KUWAIT,
        LV-LATVIA, LB-LEBANON, LI-LIECHTENSTEIN, LT-LITHUANIA,
        LU-LUXEMBOURG, LY-LIBYA, MO-MACAU,
        MO-MACAU, MK-MACEDONIA, MY-MALAYSIA, MT-MALTA, MX-MEXICO,
        MC-MONACO, MA-MOROCCO,
        NL-NETHERLANDS, AN-NETHERLANDS-ANTELLIS, NZ-NEW_ZEALAND,
        NI-NICARGUA, NO-NORWAY,
        OM-OMAN,
        PK-PAKISTAN, PA-PANAMA, PY-PARAGUAY, PE-PERU, PH-PHILIPPINES,
        PL-POLAND, PT-PORTUGAL, PR-PUERTO_RICO,
        QA-QATAR,
        RO-ROMANIA, RU-RUSSIA,
        SA-SAUDI_ARABIA, RS_ME-SERBIA & MONTENEGRO, SG-SINGAPORE, SI-SLOVENIA,
        SK-SLOVAK_REPUBLIC, SV-EL SALVADOR, ZA-SOUTH_AFRICA, ES-SPAIN,
        LK-SRILANKA, SE-SWEDEN, CH-SWITZERLAND, SY-SYRIA,
        TW-TAIWAN, TH-THAILAND, TT-TRINIDAD & TOBAGO, TN-TUNISIA, TR-TURKEY,
        AE-UNITED_ARAB_EMIRATES, GB-UNITED_KINGDOM, UA-UKRAINE,
        US-UNITED_STATES, PS-UNITED_STATES(PUBLIC SAFETY), UY-URUGUAY,
        UZ-UZBEKISTAN,
        VE-VENEZUELA, VN-VIETNAM, YE-YEMEN,
        ZW-ZIMBABWE
AP# country tw
AP#
```

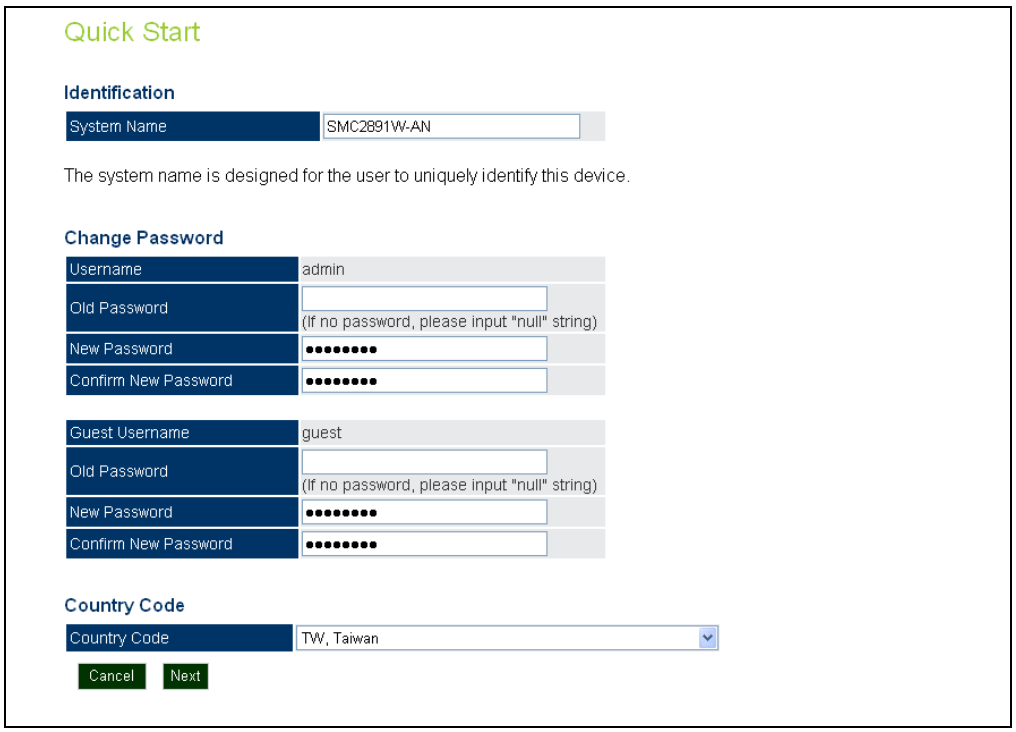
Web Quick Start

The web interface Quick Start menu is designed to help you configure the basic settings required to get the AP up and running.

Click “System”’ followed by “Quick Start”’

Step 1 The first page of the Quick Start configures the system identification, access password, and the Country Code.

Figure 5: Quick Start - Step 1



The following items are displayed on the first page of the Quick Start wizard:

Identification

- **System Name** — The name assigned to the access point. (Default: WAB-7100)

Change Password

- **Username/Guest Username** — The name of the user is fixed as either “admin” or “guest” and is not configurable.
- **Old Password** — If the unit has been configured with a password already, enter that password, otherwise enter the default password “null.”
- **New Password** — The password for management access. (Length: 5-32 characters, case sensitive)
- **Confirm New Password** — Enter the password again for verification.

Country Code

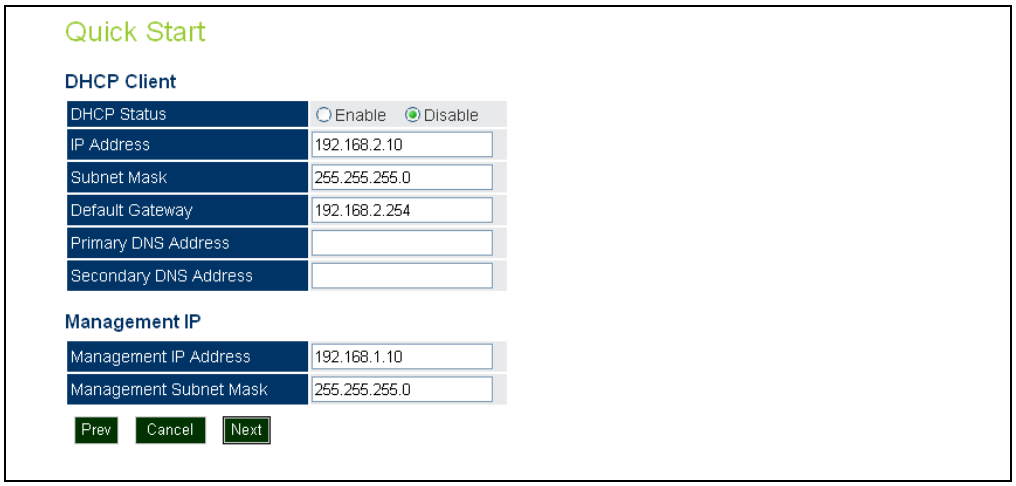
- **Country Code** — Configures the access point’s country code from a drop down menu, which identifies the country of operation and sets the authorized radio channels.

Caution: You must set the country code to the country of operation. Setting the country code restricts operation of the access point to the radio channels and transmit power levels permitted for wireless networks in the specified country.

- **Cancel** — Cancels the newly entered settings and restores the orignals.
- **Next** — Proceeds to the next page.

Step 2 The Step 2 page of the Quick Start configures IP settings and DHCP client status.

Figure 6: Quick Start - Step 2



The following items are displayed on this page:

DHCP

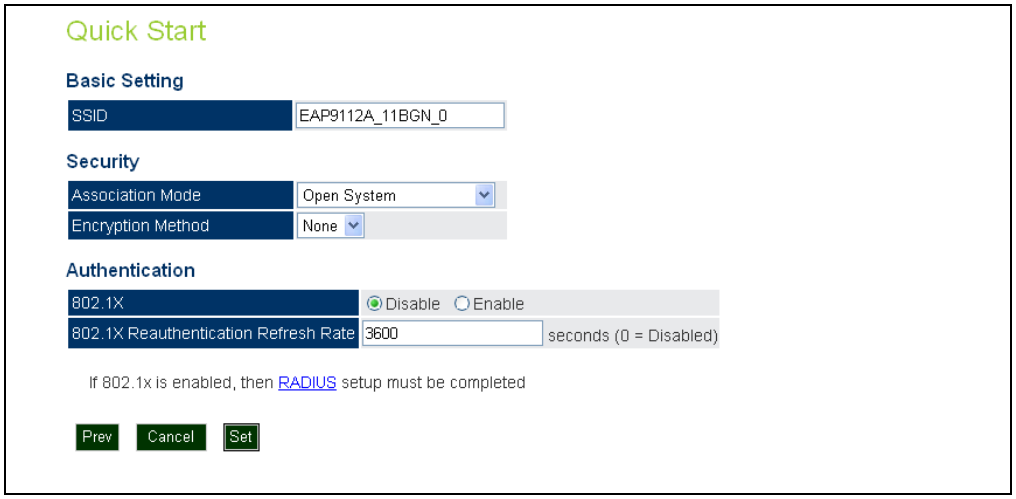
- **DHCP Status** — Enables/disables DHCP on the access point. (Default: Disabled)
- **IP Address** — Specifies an IP address for the access point. Valid IP addresses consist of four decimal numbers, 0 to 255, separated by periods. (Default: 192.168.2.10.)
- **Subnet Mask** — Indicates the local subnet mask. Select the desired mask from the drop down menu. (Default: 255.255.255.0)
- **Default Gateway** — The default gateway is the IP address of the router for the access point, which is used if the requested destination address is not on the local subnet. (Default: 192.168.2.254)

  If you have DNS, RADIUS, or other network servers located on another subnet, type the IP address of the default gateway router in the text field provided.

- **Primary and Secondary DNS Address** — The IP address of Domain Name Servers on the network. A DNS maps numerical IP addresses to domain names and can be used to identify network hosts by familiar names instead of the IP addresses. (The default Primary and Secondary DNS addresses are null values.)
- **Management IP** — The IPv4 address of the AP through which you can access management interfaces.
  - **Management IP Address** — Specifies an IPv4 address for management of the access point. (Default: 192.168.1.10.)
  - **Management Subnet Mask** — Indicates the local subnet mask. (Default: 255.255.255.0)
- **Prev** — Returns to the previous screen.
- **Cancel** — Cancels the newly entered settings and restores the orignals.
- **Next** — Proceeds to the final step in the Quick Start wizard.

Step 3 The Step 3 page of the Quick Start configures basic radio and wireless security settings.

Figure 7: Quick Start - Step 3



The following items are displayed on this page:

Basic Setting

- **SSID** — The name of the basic service set provided by the primary VAP interface. Clients that want to connect to the network through the AP must set their SSID to the same as that of a VAP interface.
  (Default: EAP9112A_11BGN_0; Range: 1-32 characters)

Security

- **Association Mode** — Defines the mode with which the VAP will associate with clients. (For more information on security modes, see "Wireless Security Settings" on page 78.)

  - **Open System**: The VAP is configured by default as an "open system," which broadcasts a beacon signal including the configured SSID. Wireless clients with an SSID setting of "any" can read the SSID from the beacon and automatically set their SSID to allow immediate connection.

  - **WPA**: WPA employs a combination of several technologies to provide an enhanced security solution for 802.11 wireless networks.

  - **WPA-PSK**: For enterprise deployment, WPA requires a RADIUS authentication server to be configured on the wired network. However, for small office networks that may not have the resources to configure and maintain a RADIUS server, WPA provides a simple operating mode that uses just a pre-shared password for network access. The Pre-Shared Key mode uses a common password for user authentication that is manually entered on the access point and all wireless clients. The PSK mode uses the same TKIP packet encryption and key management as WPA in the enterprise, providing a robust and manageable alternative for small networks.

  - **WPA2**: WPA was introduced as an interim solution for the vulnerability of WEP pending the ratification of the IEEE 802.11i wireless security standard. In effect, the WPA security features are a subset of the 802.11i standard. WPA2 includes the now ratified 802.11i standard, but also offers backward compatibility with WPA. Therefore, WPA2 includes the same 802.1X and PSK modes of operation and support for TKIP encryption.

  - **WPA2-PSK**: Clients using WPA2 with a Pre-shared Key are accepted for authentication.

  - **WPA-WPA2 Mixed**: Clients using WPA or WPA2 are accepted for authentication.

  - **WPA-WPA2-PSK-mixed**: Clients using WPA or WPA2 with a Pre-shared Key are accepted for authentication.

- **Encryption Method** — Selects an encryption method for the global key used for multicast and broadcast traffic, which is supported by all wireless clients.

  - **WEP**: WEP is used as the multicast encryption cipher. You should select WEP only when both WPA and WEP clients are supported.

  - **TKIP**: TKIP is used as the multicast encryption cipher.

  - **AES-CCMP**: AES-CCMP is used as the multicast encryption cipher. AES-CCMP is the standard encryption cipher required for WPA2.

Authentication

- **802.1X** — The access point supports 802.1X authentication only for clients initiating the 802.1X authentication process (i.e., the access point does not initiate 802.1X authentication). For clients initiating 802.1X, only those successfully authenticated are allowed to access the network. For those clients not initiating 802.1X, access to the network is allowed after successful wireless association with the access point. The 802.1X mode allows access for clients not using WPA or WPA2 security.

- **Pre-Authentication** — When using WPA2 over 802.1X, pre-authentication can be enabled, which allows clients to roam to a new access point and be quickly associated without performing full 802.1X authentication. (Default: Disabled)

- **802.1x Reauthentication Time** — The time period after which a connected client must be re-authenticated. During the re-authentication process of verifying the client's credentials on the RADIUS server, the client remains connected the network. Only if re-authentication fails is network access blocked. (Range: 0-65535 seconds; Default: 0 means disabled)

Note: When 802.1X is enabled, be sure to configure RADIUS server details. For more information, see "RADIUS Settings" on page 37.

Step 4 When you have clicked "Set" after Step 3, the AP saves the Quick Start configuration settings. Click "OK" to confirm that the Quick Start is complete.

Figure 8: Quick Start - Step 4

Section II

Web Configuration

This section provides details on configuring the access point using the web browser interface.

This section includes these chapters:

- "System Settings" on page 33
- "Management Settings" on page 49
- "Advanced Settings" on page 60
- "Wireless Settings" on page 67
- "Maintenance Settings" on page 91
- "Status Information" on page 97

3 System Settings

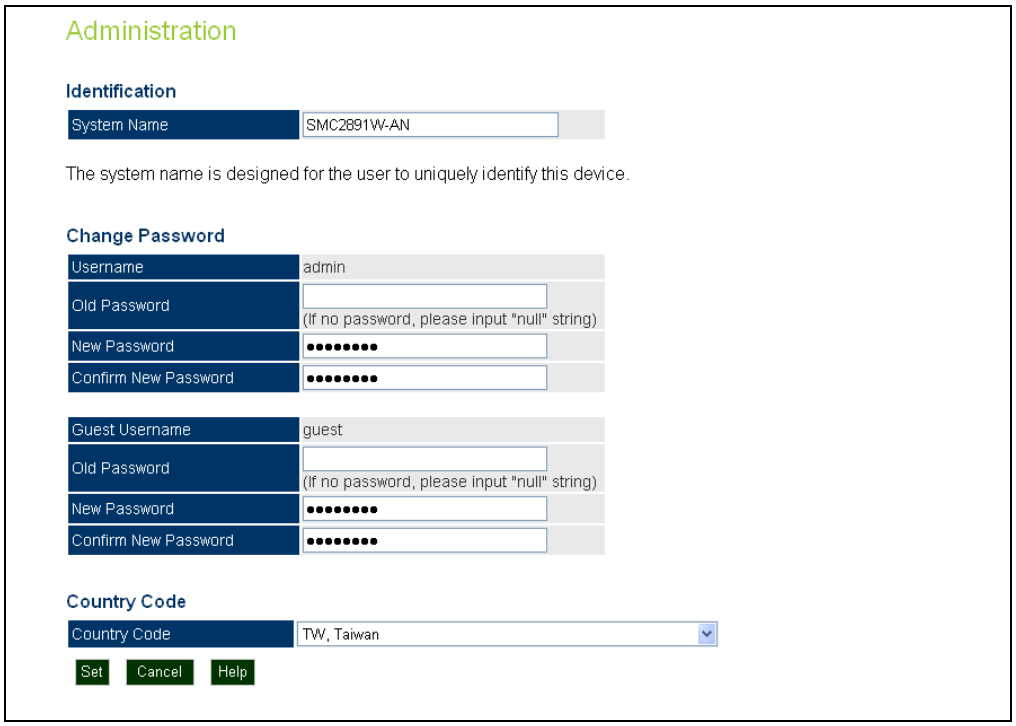
This chapter describes basic system settings on the access point. It includes the following sections:

- "Administration Settings" on page 34
- "IPv4 Address" on page 35
- "IPv6 Address" on page 36
- "RADIUS Settings" on page 37
- "System Time" on page 39
- "VLAN Configuration" on page 40
- "System Logs" on page 42
- "Quick Start Wizard" on page 43
- "System Resource" on page 44
- "Bridge STP Configuration" on page 45

Administration Settings

The Administration Settings page configures some basic settings for the AP, such as the system identification name, the management access passwords, and the wireless operation Country Code.

Figure 9: Administration



The following items are displayed on this page:

- **System Name** — An alias for the AP, enabling the device to be uniquely identified on the network. (Default: WAB-7100; Range: 1-32 characters)
- **Username/Guest Username** — The name of the user is fixed as either “admin” or “guest” and is not configurable.
- **Old Password** — Type your current password.
- **New Password** — The password for management access. (Length: 5-32 characters, case sensitive)
- **Confirm New Password** — Enter the password again for verification.
- **Country Code** — Configures the AP’s country code, which identifies the country of operation and sets the authorized radio channels.

Caution: You must set the country code to the country of operation. Setting the country code restricts operation of the AP to the radio channels and transmit power levels permitted for wireless networks in the specified country.

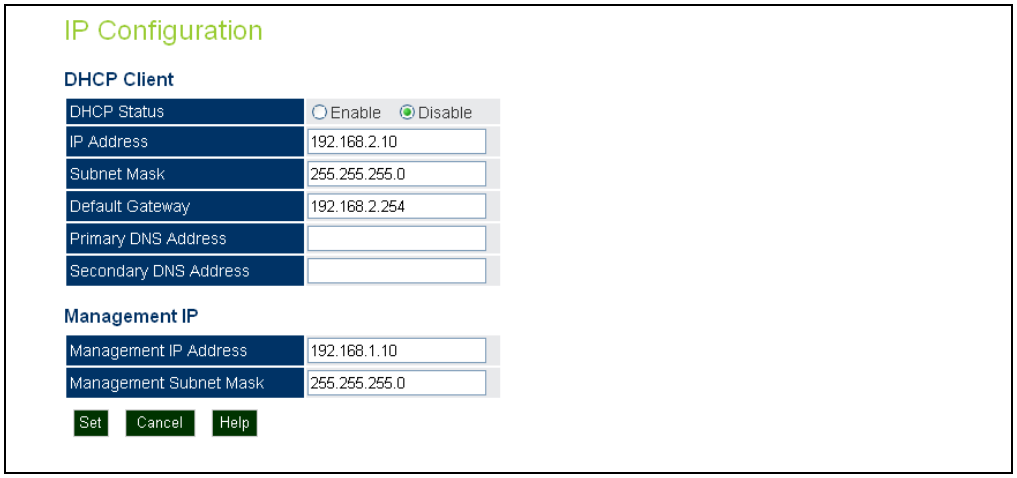
IPv4 Address

Configuring the AP with an IPv4 address expands your ability to manage the AP. A number of the AP's features depend on IPv4 addressing to operate.

You can use the web browser interface to access IPv4 addressing only if the access point already has an IPv4 address that is reachable through your network.

By default, the AP will be not be automatically configured with IPv4 settings from a Dynamic Host Configuration Protocol (DHCP) server. The default IPv4 address for management access is 192.168.1.10, with a subnet mask 255.255.255.0.

Figure 10: IPv4 Configuration



The following items are displayed on this page:

- **DHCP Status** — Enables/disables DHCP on the access point.
- **IP Address** — Specifies an IP address for the access point. Valid IP addresses consist of four decimal numbers, 0 to 255, separated by periods. (Default: 192.168.2.10.)
- **Subnet Mask** — Indicates the local subnet mask. (Default: 255.255.255.0)
- **Default Gateway** — The default gateway is the IP address of the router for the access point, which is used if the requested destination address is not on the local subnet.

If you have management stations, DNS, RADIUS, or other network servers located on another subnet, type the IP address of the default gateway router in the text field provided.

- **Primary and Secondary DNS Address** — The IP address of Domain Name Servers on the network. A DNS maps numerical IP addresses to domain names and can be used to identify network hosts by familiar names instead of the IP addresses.

  If you have one or more DNS servers located on the local network, type the IP addresses in the text fields provided.

- **Management IP** — The IPv4 address of the AP through which you can access management interfaces.

  - **Management IP Address** — Specifies an IPv4 address for management of the access point. (Default: 192.168.1.10.)

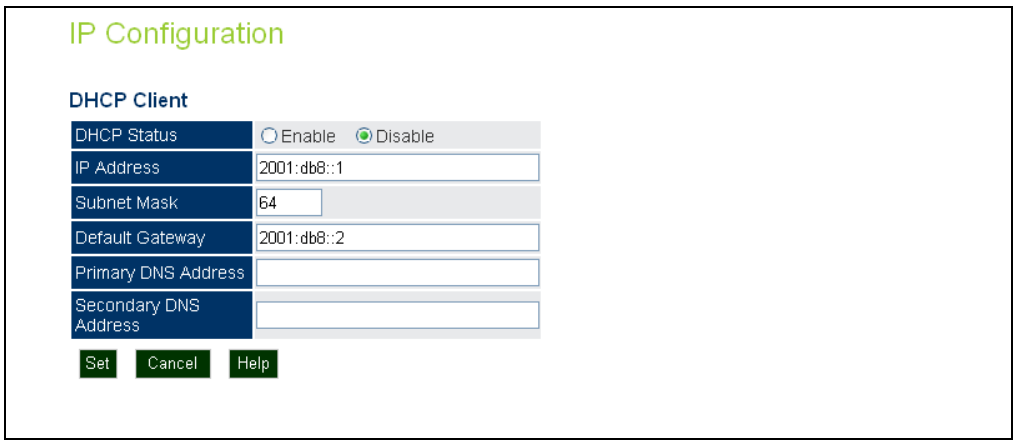
  - **Management Subnet Mask** — Indicates the local subnet mask. (Default: 255.255.255.0)

IPv6 Address

This section describes how to configure an IPv6 interface for management access over the network. This AP supports both IPv4 and IPv6, and can be managed through either of these address types.

By default, the AP will be not be automatically configured with IPv6 settings from a DHCPv6 server. The default IPv6 address is 2001:db8::1, subnet mask 64 and a default gateway of 2001:db8::2.

Figure 11: IPv6 Configuration



The following items are displayed on this page:

- **DHCP Status** — Enables/disables DHCPv6 on the access point.
- **IP Address** — Specifies an IPv6 address for management of the access point. (Default: 2001:db8::1)
- **Subnet Mask** — Indicates the local subnet mask. (Default: 64)
- **Default Gateway** — The default gateway is the IPv6 address of the router for the access point, which is used if the requested destination address is not on the local subnet.

  If you have management stations, DNS, RADIUS, or other network servers located on another subnet, type the IPv6 address of the default gateway router in the text field provided.
- **Primary and Secondary DNS Address** — The IPv6 address of Domain Name Servers on the network. A DNS maps numerical IPv6 addresses to domain names and can be used to identify network hosts by familiar names instead of the IPv6 addresses.

  If you have one or more DNS servers located on the local network, type the IPv6 addresses in the text fields provided.

RADIUS Settings

Remote Authentication Dial-in User Service (RADIUS) is an authentication protocol that uses software running on a central server to control access to RADIUS-aware devices on the network. An authentication server contains a database of user credentials for each user that requires access to the network.

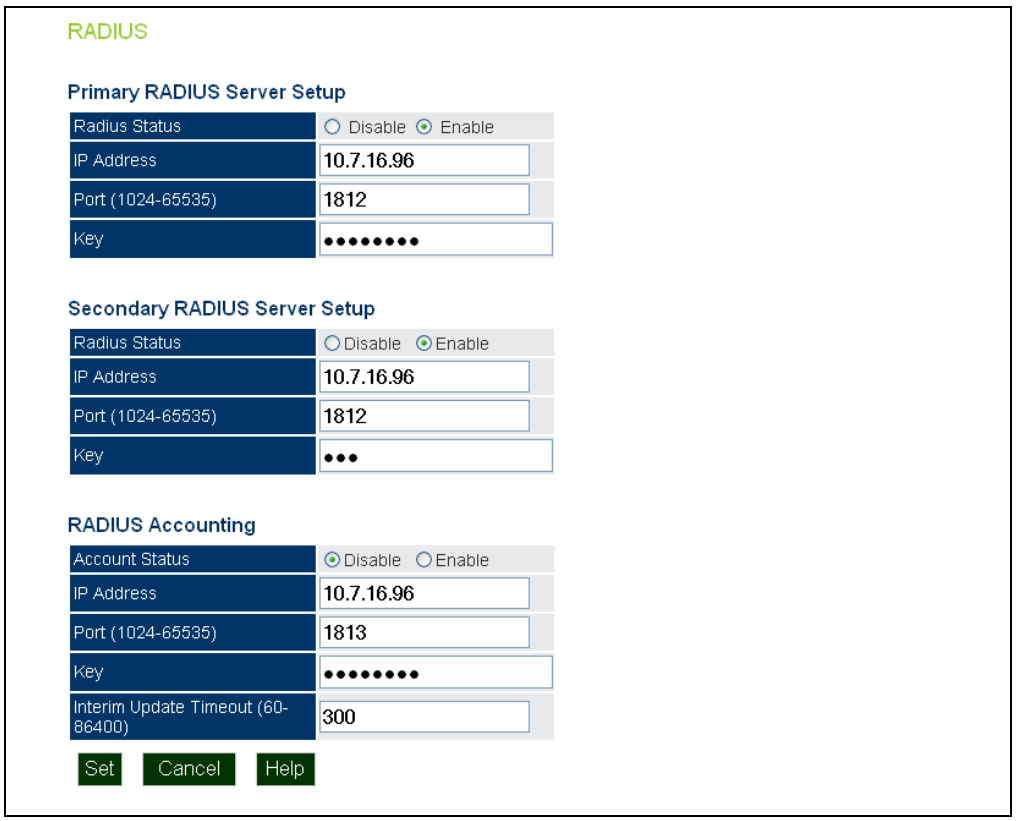
Primary and Secondary RADIUS Server Setup

A primary RADIUS server must be specified for the access point to implement IEEE 802.1X network access control and Wi-Fi Protected Access (WPA) wireless security. A secondary RADIUS server may also be specified as a backup should the primary server fail or become inaccessible.

In addition, you can configure a RADIUS Accounting server to receive user-session accounting information from the access point. RADIUS Accounting can be used to provide valuable information on user activity in the network.

This guide assumes that you have already configured RADIUS server(s) to support the access point. Configuration of RADIUS server software is beyond the scope of this guide, refer to the documentation provided with the RADIUS server software.

Figure 12: RADIUS Settings



The following items are displayed on the RADIUS Settings page:

- **RADIUS Status** — Enables/disables the primary RADIUS server.
- **IP Address** — Specifies the IP address or host name of the RADIUS server.
- **Port (1024-65535)** — The UDP port number used by the RADIUS server for authentication messages. (Range: 1024-65535; Default: 1812)
- **Key** — A shared text string used to encrypt messages between the access point and the RADIUS server. Be sure that the same text string is specified on the RADIUS server. Do not use blank spaces in the string. (Maximum length: 255 characters)

RADIUS Accounting

The following items are displayed on the RADIUS Settings page:

- **Account Status** — Enables/disables RADIUS accounting.
- **IP Address** — Specifies the IP address or host name of the RADIUS accounting server.

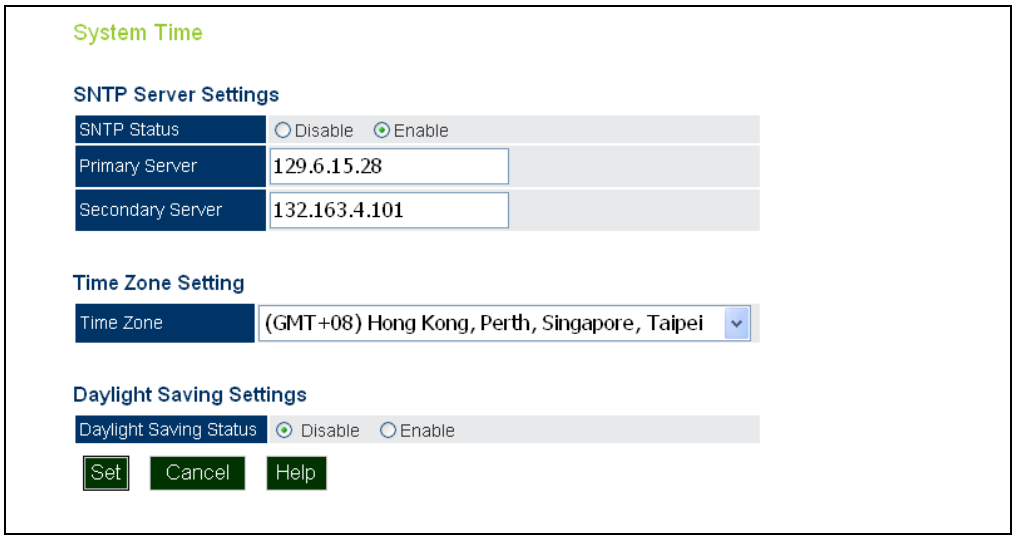
- **Port (1024-65535)** — The UDP port number used by the RADIUS accounting server for authentication messages. (Range: 1024-65535; Default: 1813)
- **Key** — A shared text string used to encrypt messages between the access point and the RADIUS accounting server. Be sure that the same text string is specified on the RADIUS server. Do not use blank spaces in the string. (Maximum length: 255 characters)
- **Interim Update Timeout (60-86400)** — The interval between transmitting accounting updates to the RADIUS server. (Range: 60-86400; Default: 300 seconds)

System Time

Simple Network Time Protocol (SNTP) allows the access point to set its internal clock based on periodic updates from a time server (SNTP or NTP). Maintaining an accurate time on the access point enables the system log to record meaningful dates and times for event entries. If the clock is not set, the access point will only record the time from the factory default set at the last bootup.

The access point acts as an SNTP client, periodically sending time synchronization requests to specific time servers. You can configure up to two time server IP addresses. The access point will attempt to poll each server in the configured sequence.

Figure 13: SNTP Settings



SNTP Server Settings

Configures the access point to operate as an SNTP client. When enabled, at least one time server IP address must be specified.

- **SNTP Status** — Enables/disables SNTP. (Default: enabled)
- **Primary Server** — The IP address of an SNTP or NTP time server that the access point attempts to poll for a time update.
- **Secondary Server** — The IP address of a secondary SNTP or NTP time server. The access point first attempts to update the time from the primary server; if this fails it attempts an update from the secondary server.

Time Zone Setting

SNTP uses Greenwich Mean Time, or GMT (sometimes referred to as Coordinated Universal Time, or UTC) based on the time at the Earth's prime meridian, zero degrees longitude. To display a time corresponding to your local time, you must indicate the number of hours your time zone is located before (east) or after (west) GMT.

- **Time Zone** — Select from the scroll down list the locale you are situated most close to, for example for New York, select '(GMT-05) Eastern Time (US & Canada)'.

Daylight Saving Settings

The access point provides a way to automatically adjust the system clock for Daylight Savings Time changes. To use this feature you must define the month and date to begin and to end the change from standard time. During this period the system clock is set back by one hour.

- **Daylight Saving Status** — Enalbes/disables daylight savings time. (Default: disabled)

  When enabled, set the month, day, and week to start and stop the daylight savings time.

VLAN Configuration

VLANs (virtual local area networks) are turned off by default when first installing the access point. If turned on they will automatically tag any packets received by the LAN port before sending them on to the relevant VAP (virtual access point).

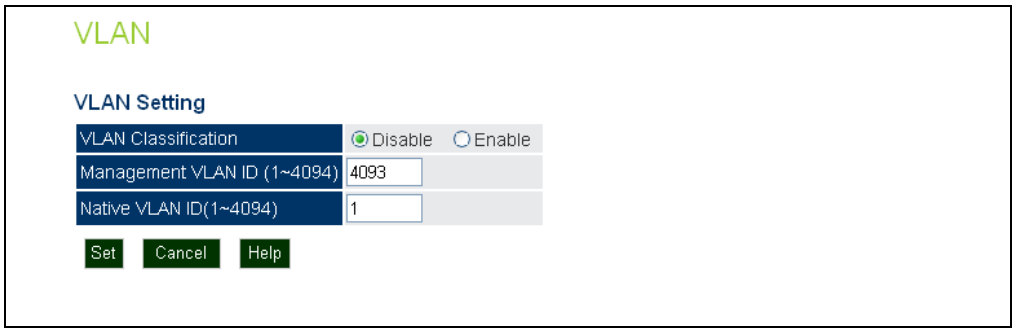
The access point can employ VLAN tagging support to control access to network resources and increase security. VLANs separate traffic passing between the access point, associated clients, and the wired network. There can be a default VLAN for each VAP (Virtual Access Point) interface, and a management VLAN for the access point.

Note the following points about the access point's VLAN support:

- The management VLAN is for managing the access point through remote management tools, such as the web interface, SSH, SNMP, or Telnet. The access point only accepts management traffic that is tagged with the specified management VLAN ID.
- All wireless clients associated to the access point are assigned to a VLAN. Wireless clients are assigned to the default VLAN for the VAP interface with which they are associated. The access point only allows traffic tagged with default VLAN IDs to access clients associated on each VAP interface.
- When VLAN support is enabled on the access point, traffic passed to the wired network is tagged with the appropriate VLAN ID, either a VAP default VLAN ID, or the management VLAN ID. Traffic received from the wired network must also be tagged with one of these known VLAN IDs. Received traffic that has an unknown VLAN ID or no VLAN tag is dropped.
- When VLAN support is disabled, the access point does not tag traffic passed to the wired network and ignores the VLAN tags on any received frames.

Note: Before enabling VLAN tagging on the access point, be sure to configure the attached network switch port to support tagged VLAN frames from the access point's management VLAN ID and default VLAN IDs. Otherwise, connectivity to the access point will be lost when you enable the VLAN feature.

Figure 14: Setting the VLAN Identity



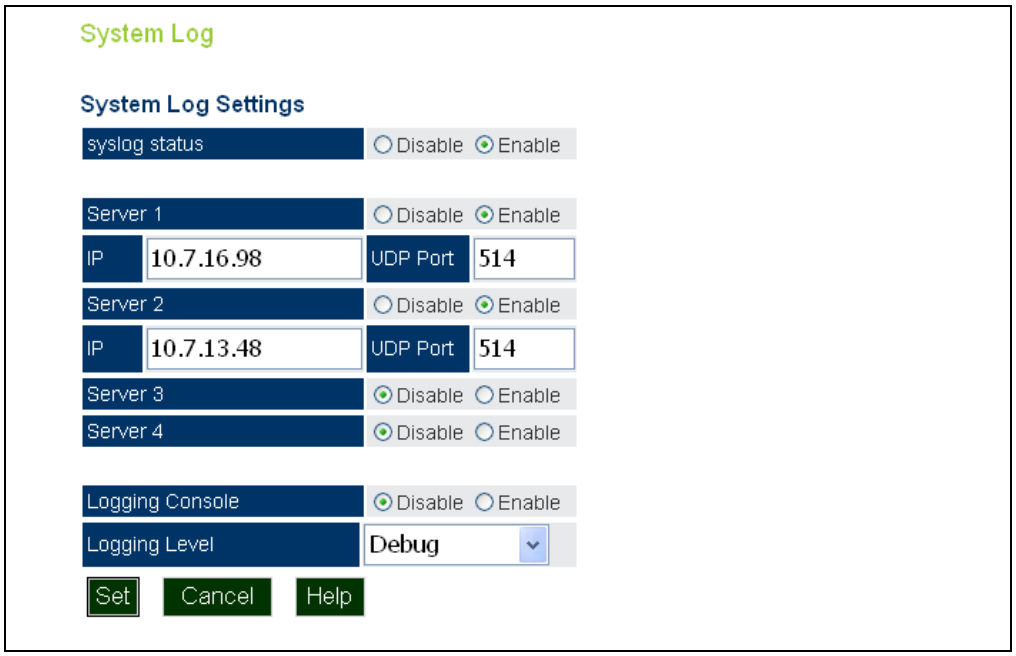
The following items are displayed on this page:

- **VLAN Classification** — Enables VLAN packet tagging. (Default: disabled)
- **Management VLAN ID** — The VLAN ID that traffic must have to be able to manage the access point. (Range 1-4094; Default: 4093)
- **Native VLAN ID** — The VLAN ID assigned to untagged packets received by the LAN port. (Range: 1-4094; Default: 1)

System Logs

The access point can be configured to send event and error messages to a System Log Server. The system clock can also be synchronized with a time server, so that all the messages sent to the Syslog server are stamped with the correct time and date.

Figure 15: System Log Settings



The following items are displayed on this page:

- **Syslog Status** — Enables/disables the logging of error messages. (Default: enabled)
- **Server 1~4** — Enables the sending of log messages to a Syslog server host. Up to four Syslog servers are supported on the access point. (Default: disabled)
- **IP** — The IP address or name of a Syslog server. (Server 1 Default: 10.7.16.98; Server 2 Default: 10.7.13.48; Server 3 Default: 10.7.123.123; Server 4 Default: 10.7.13.77)
- **UDP Port** — The UDP port used by a Syslog server. (Range: 514 or 11024-65535; Server 1~2 Default: 514; Server 3 Default: 6553; Server 4 Default: 5432)
- **Logging Console** — Enables the logging of error messages to the console. (Default: disabled)

- **Logging Level** — Sets the minimum severity level for event logging. (Default: Debug)

  The system allows you to limit the messages that are logged by specifying a minimum severity level. The following table lists the error message levels from the most severe (Emergency) to least severe (Debug). The message levels that are logged include the specified minimum level up to the Emergency level.

Table 1: Logging Levels

Error Level	Description
Emergency	System unusable
Alerts	Immediate action needed
Critical	Critical conditions (e.g., memory allocation, or free memory error - resource exhausted)
Error	Error conditions (e.g., invalid input, default used)
Warning	Warning conditions (e.g., return false, unexpected return)
Notice	Normal but significant condition, such as cold start
Informational	Informational messages only
Debug	Debugging messages

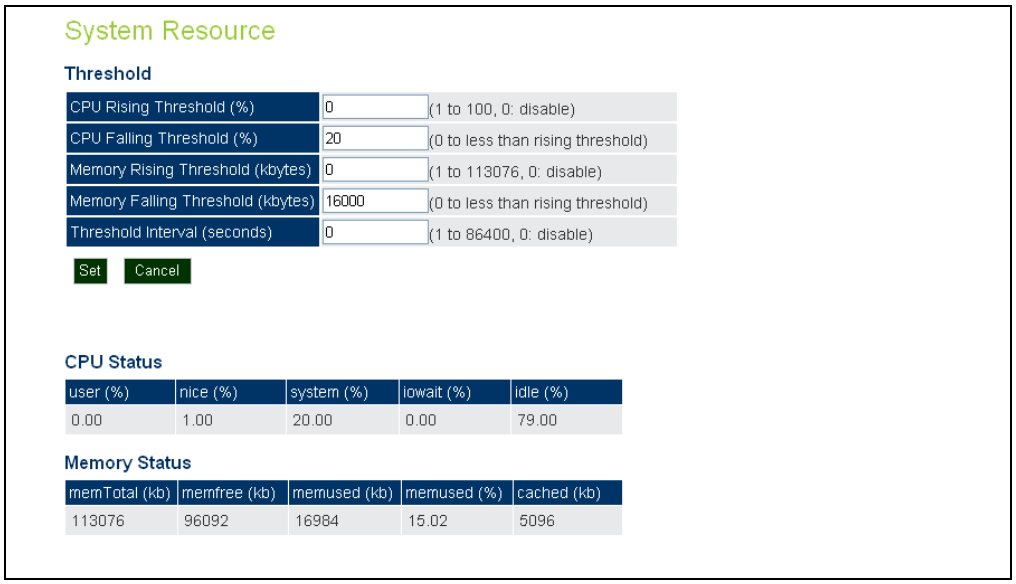
Quick Start Wizard

The Quick Start menu item is described in the preceding chapter, see "Web Quick Start" on page 26.

System Resource

The System Resource page displays information on the AP's current CPU and memory utilization. This page also allows you to set thresholds for the CPU and memory usage, where an SNMP trap can be sent as an alert.

Figure 16: System Resource



The following items are displayed on this page:

- **CPU Rising Threshold** — A high CPU utilization percentage above which a "CPU Busy" SNMP trap message is sent (only sent once). (Range: 1-100 percent, 0 is disabled; Default: 0)
- **CPU Falling Threshold** — A low CPU utilization percentage below which a "CPU Free" SNMP trap message is sent once the Rising Threshold has been exceeded. (Range: 0 to less than the Rising Threshold; Default: 20)
- **Memory Rising Threshold** — A high memory utilization threshold in Kbytes above which a "Memory Overload" SNMP trap message is sent (only sent once). (Range: 1-113076 Kbytes, 0 is disabled; Default: 0)
- **Memory Falling Threshold** — A low memory utilization threshold in Kbytes below which a "Memory Free" SNMP trap message is sent once the Rising Threshold has been exceeded. (Range: 0 to less than the Rising Threshold; Default: 16000 Kbytes)
- **Threshold Interval** — The interval in seconds between each CPU utilization check. (Range: 1 to 86400 seconds, 0 is disabled; Default: 0)
- **CPU Status** — Displays detailed information on the current CPU utilization.

- **Memory Status** — Displays detailed information on the current memory utilization.

Bridge STP Configuration

The Bridge menu enables configuration of the Spanning Tree Protocol (STP) and the address table aging time.

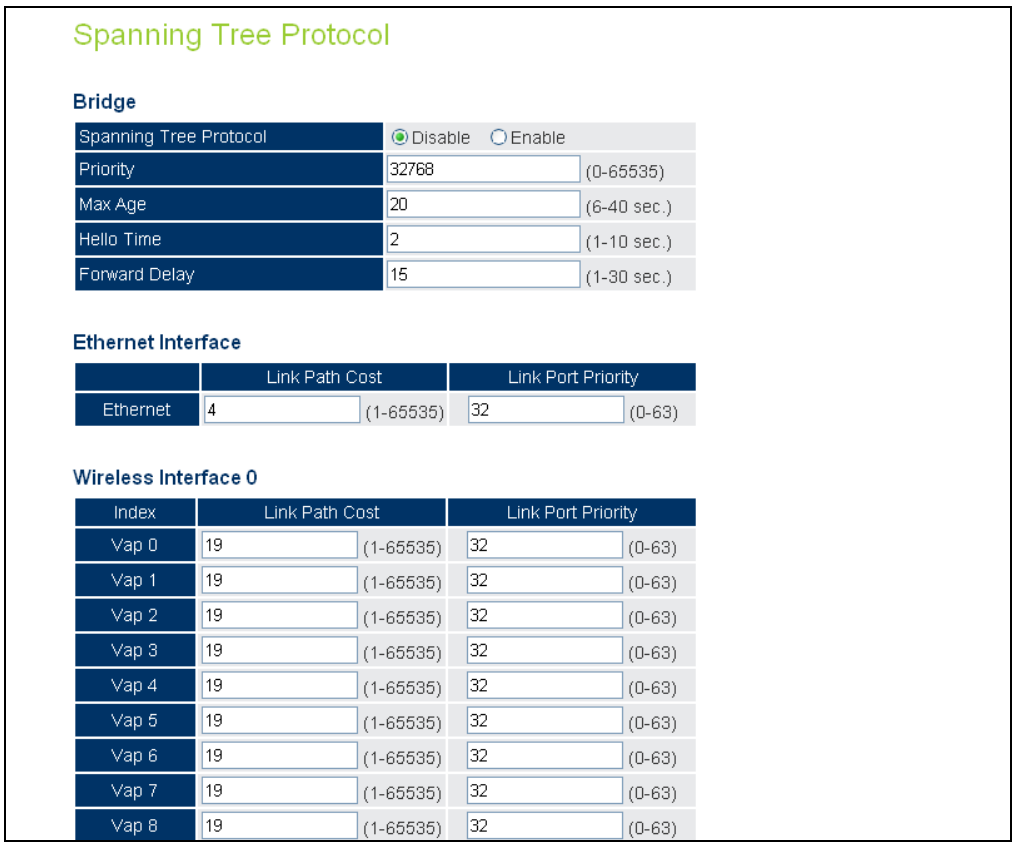
Spanning Tree Protocol (STP)

The Spanning Tree Protocol (STP) can be used to detect and disable network loops, and to provide backup links between switches, bridges or routers. This allows the wireless bridge to interact with other bridging devices (that is, an STP-compliant switch, bridge or router) in your network to ensure that only one route exists between any two stations on the network, and provide backup links which automatically take over when a primary link goes down.

STP uses a distributed algorithm to select a bridging device (STP-compliant switch, bridge or router) that serves as the root of the spanning tree network. It selects a root port on each bridging device (except for the root device) which incurs the lowest path cost when forwarding a packet from that device to the root device. Then it selects a designated bridging device from each LAN which incurs the lowest path cost when forwarding a packet from that LAN to the root device. All ports connected to designated bridging devices are assigned as designated ports. After determining the lowest cost spanning tree, it enables all root ports and designated ports, and disables all other ports. Network packets are therefore only forwarded between root ports and designated ports, eliminating any possible network loops.

Once a stable network topology has been established, all bridges listen for Hello BPDUs (Bridge Protocol Data Units) transmitted from the root bridge. If a bridge does not get a Hello BPDU after a predefined interval (Maximum Age), the bridge assumes that the link to the root bridge is down. This bridge will then initiate negotiations with other bridges to reconfigure the network to reestablish a valid network topology.

Figure 17: Spanning Tree Protocol



Bridge

Sets STP bridge link parameters.

The following items are displayed on the STP page:

- **Spanning Tree Protcol** — Enables/disables STP on the AP. (Default: Disabled)

- **Priority** — Used in selecting the root device, root port, and designated port. The device with the highest priority becomes the STP root device. However, if all devices have the same priority, the device with the lowest MAC address will then become the root device. (Note that lower numeric values indicate higher priority.) (Default:32768; Range: 0-65535)

- **Max Age** — The maximum time (in seconds) a device can wait without receiving a configuration message before attempting to reconfigure. All device ports (except for designated ports) should receive configuration messages at regular intervals. Any port that ages out STP information (provided in the last configuration message) becomes the designated port for the attached LAN. If it is a root port, a new root port is selected from among the device ports attached

to the network.
(Default: 20 seconds; Range: 6-40 seconds)

Minimum: The higher of 6 or [2 x (Hello Time + 1)].
Maximum: The lower of 40 or [2 x (Forward Delay - 1)]

- **Hello Time** — Interval (in seconds) at which the root device transmits a configuration message. (Default: 2 seconds; Range: 1-10 seconds)
  Minimum: 1
  Maximum: The lower of 10 or [(Max. Message Age / 2) -1]

- **Forwarding Delay** — The maximum time (in seconds) this device waits before changing states (i.e., discarding to learning to forwarding). This delay is required because every device must receive information about topology changes before it starts to forward frames. In addition, each port needs time to listen for conflicting information that would make it return to a discarding state; otherwise, temporary data loops might result. (Default: 15 seconds; Range: 1-30 seconds)
  Minimum: The higher of 1 or [(Max. Message Age / 2) + 1]
  Maximum: 30

Ethernet Interface

Sets STP settings for the Ethernet port.

- **Link Path Cost** — This parameter is used by the STP to determine the best path between devices. Therefore, lower values should be assigned to ports attached to faster media, and higher values assigned to ports with slower media. (Path cost takes precedence over port priority.) (Default: 4; Range: 1-65535)

- **Link Port Priority** — Defines the priority used for this port in the Spanning Tree Protocol. If the path cost for all ports on a switch are the same, the port with the highest priority (i.e., lowest value) will be configured as an active link in the spanning tree. This makes a port with higher priority less likely to be blocked if the Spanning Tree Protocol is detecting network loops. Where more than one port is assigned the highest priority, the port with lowest numeric identifier will be enabled. (Default: 32; Range: 0-63)

Wireless Interface

Sets STP settings for the radio interface.

- **Index** — Describes the VAP in question.

- **Link Path Cost** — This parameter is used by the STP to determine the best path between devices. Therefore, lower values should be assigned to ports attached to faster media, and higher values assigned to ports with slower media. (Path cost takes precedence over port priority.) (Default: 19; Range: 1-65535.)

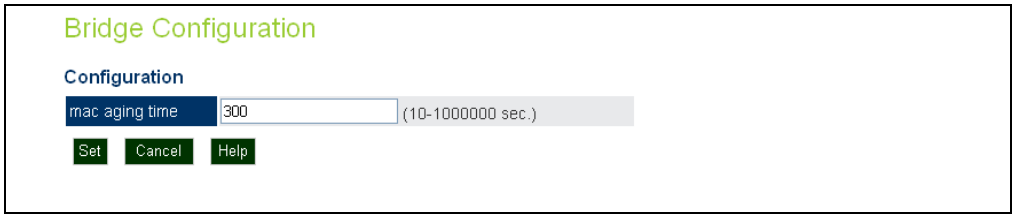
- **Link Port Priority** — Defines the priority used for this port in the Spanning Tree Protocol. If the path cost for all ports on a switch are the same, the port with the highest priority (i.e., lowest value) will be configured as an active link in the spanning tree. This makes a port with higher priority less likely to be blocked if the Spanning Tree Protocol is detecting network loops. Where more than one port is assigned the highest priority, the port with lowest numeric identifier will be enabled. (Default: 32; Range: 0-63)

Bridge Configuration

Use the Bridge Configuration page to configure the aging time for the MAC address table.

The AP stores the MAC addresses for all known devices. All the addresses learned by monitoring traffic are stored in a dynamic address table. This information is used to pass traffic directly between inbound and outbound interfaces.

Figure 18: Bridge Configuration



The following items are displayed on the STP page:

- **mac aging time** — The time after which a learned MAC address is discarded. (Range: 10-1000000 seconds; Default: 300 seconds)

4 Management Settings

This chapter describes management access settings on the access point. It includes the following sections:

- "Remote Management Settings" on page 49
- "Access Limitation" on page 51
- "Simple Network Management Protocol" on page 52

Remote Management Settings

The Web, Telnet, and SNMP management interfaces are enabled and open to all IP addresses by default. To provide more security for management access to the access point, specific interfaces can be disabled and management restricted to a single IP address or a limited range of IP addresses.

Once you specify an IP address or range of addresses, access to management interfaces is restricted to the specified addresses. If anyone tries to access a management interface from an unauthorized address, the access point will reject the connection.

Telnet is a remote management tool that can be used to configure the access point from anywhere in the network. However, Telnet is not secure from hostile attacks. The Secure Shell (SSH) can act as a secure replacement for Telnet. The SSH protocol uses generated public keys to encrypt all data transfers passing between the access point and SSH-enabled management station clients and ensures that data traveling over the network arrives unaltered. Clients can then securely use the local user name and password for access authentication.

Note that SSH client software needs to be installed on the management station to access the access point for management via the SSH protocol.

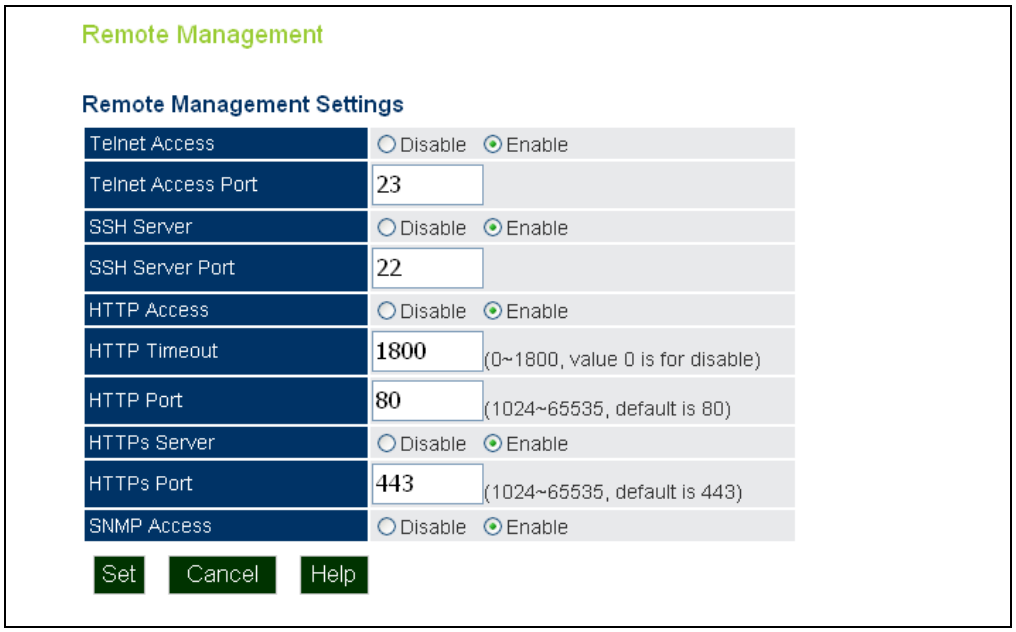
Both HTTP and HTTPS service can be enabled independently. If you enable HTTPS, you must indicate this in the URL: https://device:port_number]

When you start HTTPS, the connection is established in this way:

- The client authenticates the server using the server's digital certificate.
- The client and server negotiate a set of security protocols to use for the connection.

- The client and server generate session keys for encrypting and decrypting data.
- The client and server establish a secure encrypted connection.
- A padlock icon should appear in the status bar for Internet Explorer.

Figure 19: Remote Management



The following items are displayed on Admin Interface page:

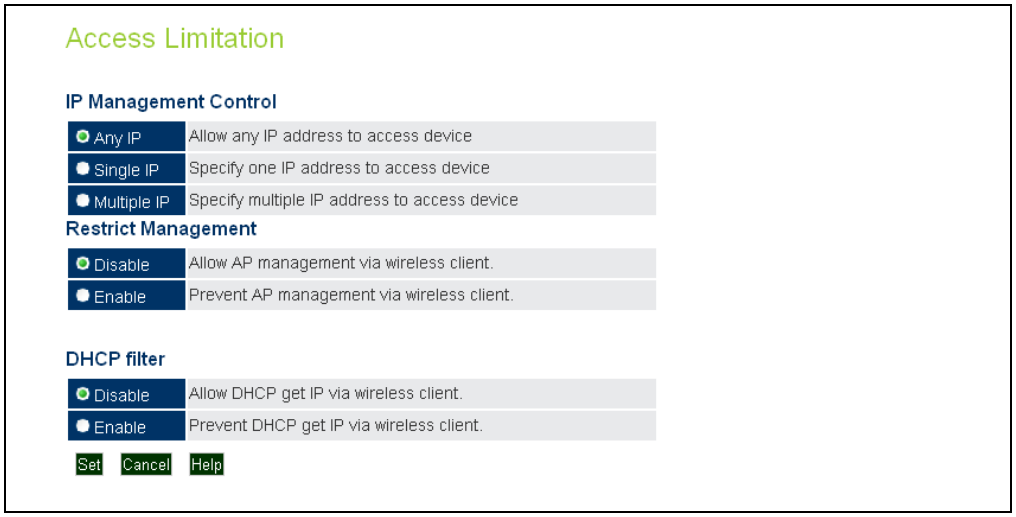
- **Telnet Access** — Enables/disables management access from Telnet interfaces. (Default: enabled)
- **Telnet Access Port** — Sets the specified Telnet port for communication. (Default: 23)
- **SSH Server** — Enables/disables management access from SSH Servers. (Default: enabled)
- **SSH Server Port** — Sets the specified SSH Server port for communication. (Default: 22)
- **HTTP Access** — Enables/disables management access from any IP address. (Default: enabled)
- **HTTP Timeout** — Specifies the time after which the HTTP connection will be lost with a period of inactivity. (Default: 1800 seconds; Range: 1-1800 seconds; 0=disabled)

- **HTTP Port** — Specifies the HTTP port for IP connectivity. (Default: 80; Range 1024-65535)
- **HTTPS Server** — Enables/disables management access from a HTTPS server. (Default: enabled)
- **HTTPS Port** — Specifies the HTTPS port for secure IP connectivity. (Default: 443; Range 1024-65535)
- **SNMP Access** — Enables management access through SNMP. For more information on SNMP access, see "Simple Network Management Protocol" on page 52. (Default: enabled)

Access Limitation

The Access Limitation page limits management access to the access point from specified IP addresses or wireless clients.

Figure 20: Access Limitation



The following items are displayed on the Access Limitation page:

IP Management Control

- **Any IP** — Indicates that any IP address is allowed management access.
- **Single IP** — Specifies a single IP address that is allowed management access.
- **Multiple IP** — Specifies an address range as defined by the entered IP address and subnet mask. For example, IP address 192.168.1.6 and subnet mask 255.255.255.0, defines all IP addresses from 192.168.1.1 to 192.168.1.254.

- **IP Address** — Specifies the IP address.
- **Subnet Mask** — Specifies the subnet mask in the form 255.255.255.x

Restrict Management

- **Enable/Disable** — Enables/disables management of the device by a wireless client. (Default: disabled)

DHCP Filter

- **Enable/Disable** — Enables/disables the AP and wireless clients from obtaining an IP address from a DHCP server installed on wireless client. (Default: disabled)

Simple Network Management Protocol

Simple Network Management Protocol (SNMP) is a communication protocol designed specifically for managing devices on a network. Equipment commonly managed with SNMP includes switches, routers and host computers. SNMP is typically used to configure these devices for proper operation in a network environment, as well as to monitor them to evaluate performance or detect potential problems.

Managed devices supporting SNMP contain software, which runs locally on the device and is referred to as an agent. A defined set of variables, known as managed objects, is maintained by the SNMP agent and used to manage the device. These objects are defined in a Management Information Base (MIB) that provides a standard presentation of the information controlled by the agent. SNMP defines both the format of the MIB specifications and the protocol used to access this information over the network.

The access point includes an onboard agent that supports SNMP versions 1, 2c, and 3 clients. This agent continuously monitors the status of the access point, as well as the traffic passing to and from wireless clients. A network management station can access this information using SNMP management software that is compliant with MIB II. To implement SNMP management, the access point must first have an IP address and subnet mask, configured either manually or dynamically. Access to the onboard agent using SNMP v1 and v2c is controlled by community strings. To communicate with the access point, the management station must first submit a valid community string for authentication.

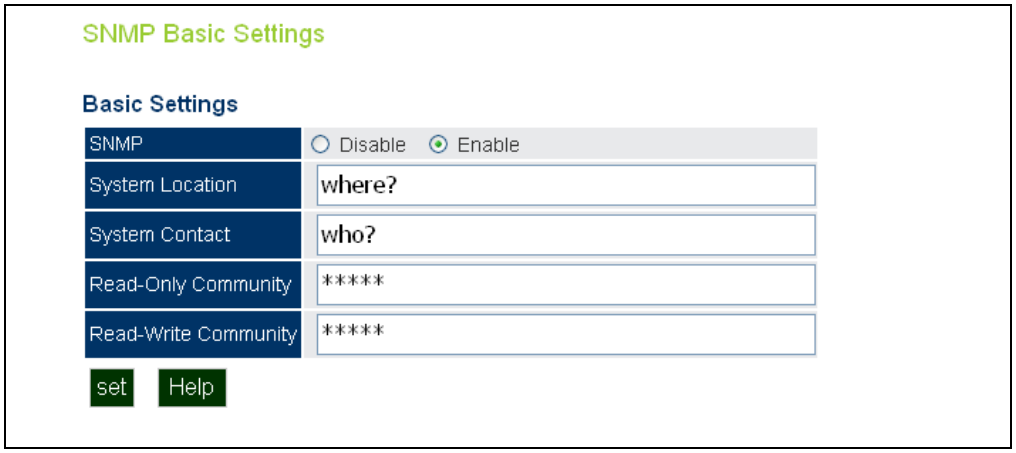
Access to the access point using SNMP v3 provides additional security features that cover message integrity, authentication, and encryption; as well as controlling notifications that are sent to specified user targets.

SNMP Basic Settings

The access point SNMP agent must be enabled to function (for versions 1, 2c, and 3 clients). Management access using SNMP v1 and v2c also requires community

strings to be configured for authentication. Trap notifications can be enabled and sent to up to four management stations.

Figure 21: SNMP Basic Settings



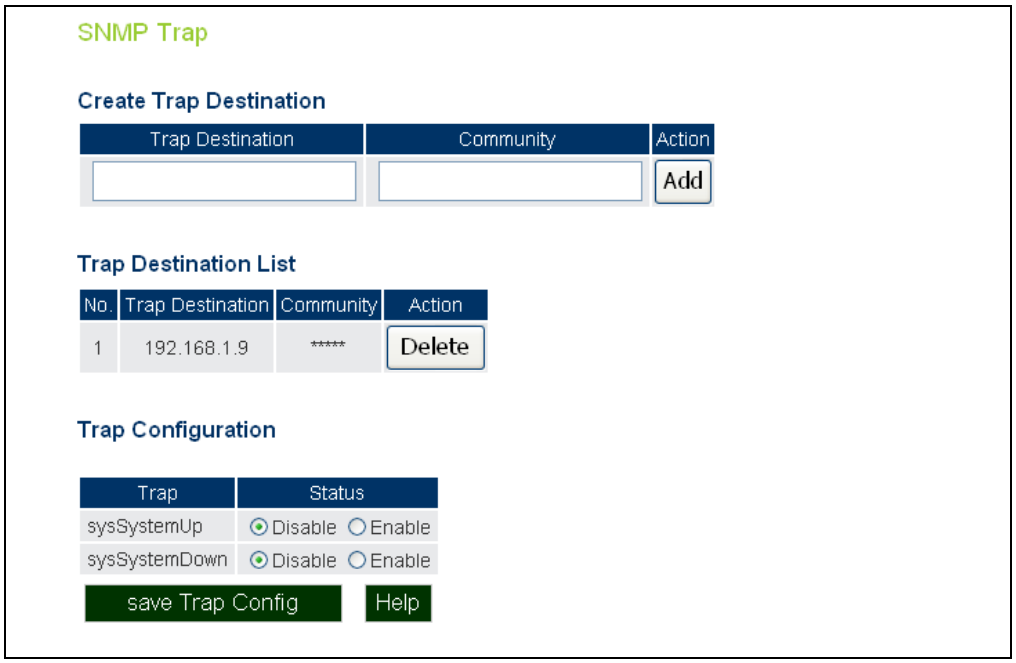
The following items are displayed on this page:

- **SNMP** — Enables or disables SNMP management access and also enables the access point to send SNMP traps (notifications). (Default: Disable)
- **System Location** — A text string that describes the system location. (Maximum length: 255 characters)
- **System Contact** — A text string that describes the system contact. (Maximum length: 255 characters)
- **Read-Only Community** — Defines the SNMP community access string that has read-only access. Authorized management stations are only able to retrieve MIB objects. (Maximum length: 23 characters, case sensitive; Default: public)
- **Read-Write Community** — Defines the SNMP community access string that has read/write access. Authorized management stations are able to both retrieve and modify MIB objects. (Maximum length: 23 characters, case sensitive; Default: private)

SNMP Trap Settings

Traps indicating status changes are issued by the AP to specified trap managers. You must specify trap managers so that key events are reported by the AP to your management station (using network management platforms).

Figure 22: SNMP Trap Settings



The following items are displayed on this page:

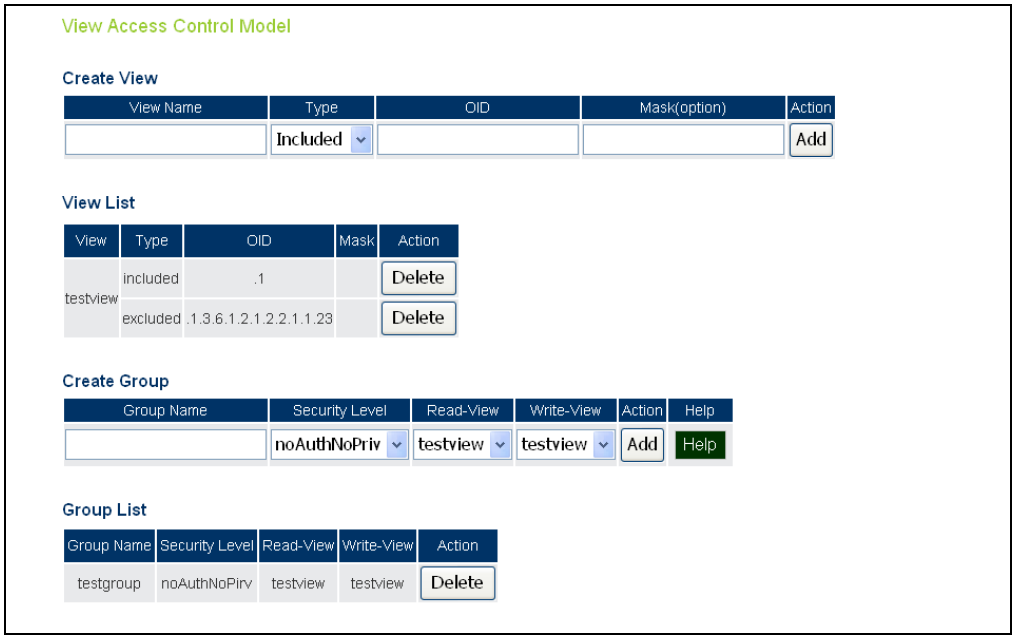
- **Trap Destination** — Specifies the recipient of SNMP notifications. Enter the IP address or the host name. (Host Name: 1 to 63 characters, case sensitive)
- **Community** — The community string sent with the notification operation. (Maximum length: 23 characters, case sensitive; Default: public)
- **Action** — Adds a new SNMP trap destination to the list.
- **Trap Destination List** — Lists the configured SNMP trap destinations.
- **Trap Configuration** — Enables or disables trap status.
  - **sysSystemUp**: The access point is up and running.
  - **sysSystemDown**: The access point is about to shutdown and reboot.
- **Save Trap Config** — Applies the new parameters and saves them to RAM memory. Also prompts a screen to inform you when it has taken affect. Clicking 'OK' returns to the home page. Changes will not be saved upon a reboot unless the running configuration file is saved.

View Access Control Model

To configure SNMPv3 management access to the AP, follow these steps:

1. Specify read and write access views for the AP MIB tree.
2. Configure SNMP user groups with the required security model (that is, SNMP v1, v2c, or v3) and security level (authentication and privacy).
3. Assign SNMP users to groups, along with their specific authentication and privacy passwords.

Figure 23: SNMP VACM



Creating Views

SNMPv3 views are used to restrict user access to specified portions of the MIB tree. The are no predefined views by default.

The following items are displayed on the VACM page.

- **View Name** – The name of the SNMP view. (Range: 1-32 characters)
- **Type** – Indicates if the object identifier of a branch within the MIB tree is included or excluded from the SNMP view.
- **OID** – Allows you to configure the object identifiers of branches within the MIB tree. Wild cards can be used to mask a specific portion of the OID string.
- **Mask** (option) – A hexadecimal value with each bit masking the corresponding ID in the MIB subtree. A "1" in the mask indicates an exact match and a "0" indicates a "wild card." For example, a mask value of 0xFFBF provides a bit mask

"1111 1111 1011 1111." If applied to the subtree "1.3.6.1.2.1.2.2.1.1.23," the zero corresponds to the 10th subtree ID. When there are more subtree IDs than bits in the mask, the mask is padded with ones.

- **View List** – Shows the currently configured object identifiers of branches within the MIB tree that define the SNMP view.

Creating Groups

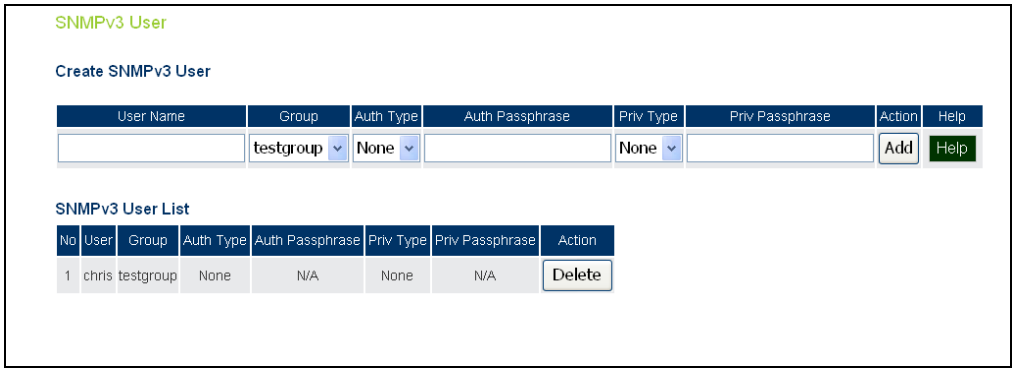
An SNMPv3 group sets the access policy for its assigned users, restricting them to specific read, write, and notify views. You can create new groups to map a set of SNMP users to SNMP views.

- **Group Name** – The name of the SNMP group. (Range: 1-32 characters)
- **Security Level** – The security level used for the group:
  - **noAuthNoPriv** – There is no authentication or encryption used in SNMP communications.
  - **AuthNoPriv** – SNMP communications use authentication, but the data is not encrypted.
  - **AuthPriv** – SNMP communications use both authentication and encryption.
- **Read View** – The configured view for read access. (Range: 1-32 characters)
- **Write View** – The configured view for write access. (Range: 1-32 characters)

SNMPv3 Users

The access point allows multiple SNMP v3 users to be configured. Each SNMPv3 user is defined by a unique name. Users must be configured with a specific security level and assigned to a group. The SNMPv3 group restricts users to a specific read, write, or notify view.

Figure 24: Configuring SNMPv3 Users



The following items are displayed on this page:

- **User Name** — The SNMPv3 user name. (32 characters maximum)
- **Group** — The SNMPv3 group name.
- **Auth Type** — The authentication type used for the SNMP user; either MD5 or none. When MD5 is selected, enter a password in the corresponding Passphrase field.
- **Auth Passphrase** — The authentication password or key associated with the authentication and privacy settings. A minimum of eight plain text characters is required.
- **Priv Type** — The data encryption type used for the SNMP user; either DES or none. When DES is selected, enter a key in the corresponding Passphrase field.
- **Priv Passphrase** — The password or key associated with the authentication and privacy settings. A minimum of eight plain text characters is required.
- **Action** — Click the Add button to add a new user to the list. Click the edit button to change details of an existing user. Click the Del button to remove a user from the list.

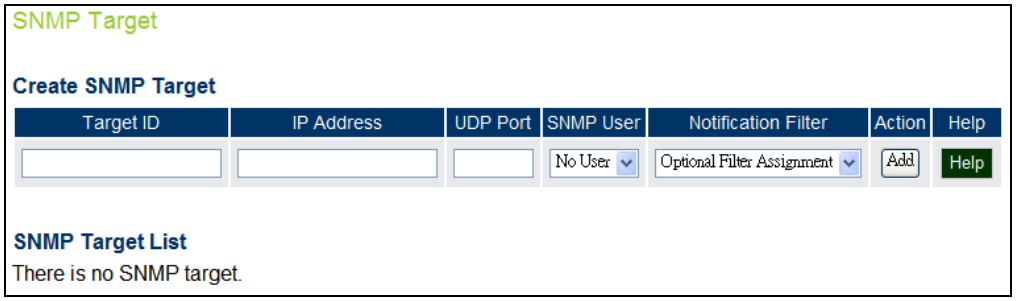
Note: Users must be assigned to groups that have the same security levels. For example, a user who has "Auth Type" and "Priv Type" configured to MD5 and DES respectively (that it, uses both authentication and data encryption) must be assigned to the RWPriv group. If this same user were instead assigned to the read-only (RO) group, the user would not be able to access the database.

SNMPv3 Targets

An SNMP v3 notification Target ID is specified by the SNMP v3 user, IP address, and UDP port. A user-defined filter can also be assigned to specific targets to limit the notifications received to specific MIB objects. (Note that the filter must first be configured. See "SNMPv3 Notification Filters" on page 58.)

To configure a new notification receiver target, define the parameters and select a filter, if required. Note that the SNMP v3 user name must first be defined (See "SNMPv3 Users" on page 56.)

Figure 25: SNMPv3 Targets



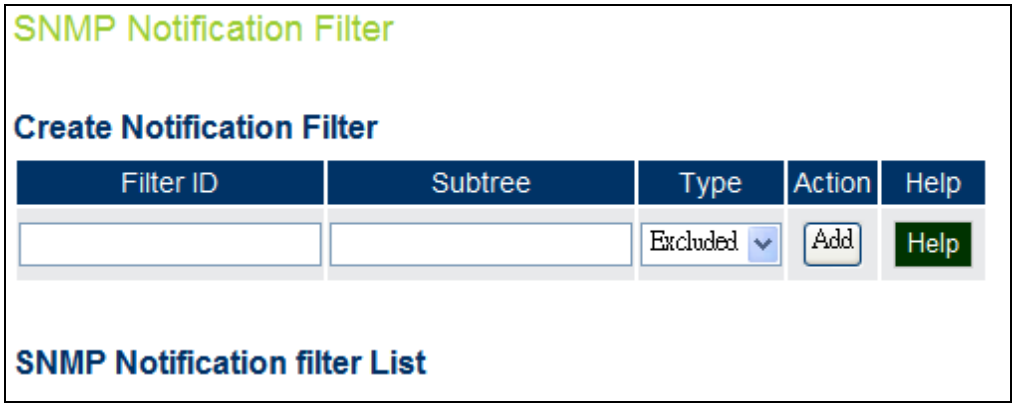
The following items are displayed on this page:

- **Target ID** — A user-defined name that identifies a receiver of notifications. (Maximum length: 32 characters)
- **IP Address** — Specifies the IP address of the receiving management station.
- **UDP Port** — The UDP port that is used on the receiving management station for notification messages.
- **SNMP User** — The defined SNMP v3 user that is to receive notification messages.
- **Notification Filter** — The name of a user-defined notification filter that is applied to the target.

SNMPv3 Notification Filters

SNMP v3 users can be configured to receive notification messages from the access point. An SNMP Target ID is created that specifies the SNMP v3 user, IP address, and UDP port. A user-defined notification filter can be created so that specific notifications can be prevented from being sent to particular targets.

Figure 26: SNMP Notification Filter



The following items are displayed on this page:

- **Filter ID** — A user-defined name that identifies the filter. (Maximum length: 32 characters)
- **Subtree** — Specifies MIB subtree to be filtered. The MIB subtree must be defined in the form ".1.3.6.1" and always start with a ".".
- **Type** — Indicates if the filter is to "include" or "exclude" the MIB subtree objects from the filter. Note that MIB objects included in the filter are not sent to the receiving target and objects excluded are sent. By default all traps are sent, so you can first use an "include" filter entry for all trap objects. Then use "exclude" entries for the required trap objects to send to the target. Note that the filter entries are applied in the sequence that they are defined.
- **Action** — Adds the notification filter.

5 Advanced Settings

This chapter describes advanced settings on the access point. It includes the following sections:

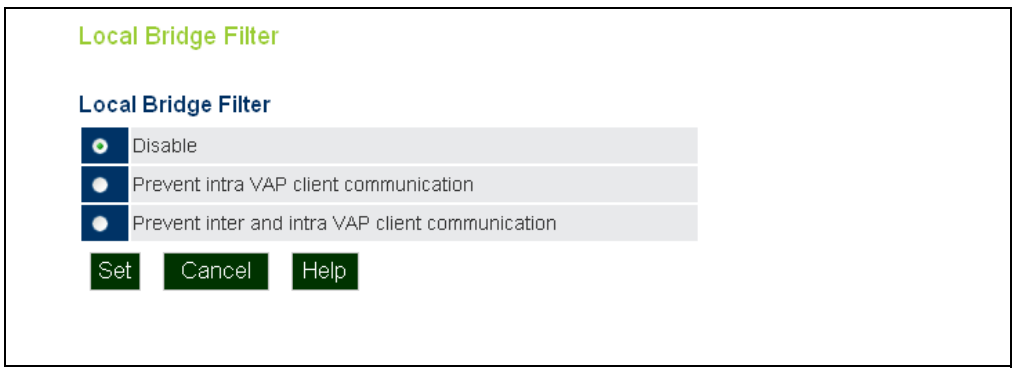
- "Local Bridge Filter" on page 60
- "Link Layer Discovery Protocol" on page 61
- "Access Control Lists" on page 63
- "Link Integrity" on page 66

Local Bridge Filter

The access point can employ network traffic frame filtering to control access to network resources and increase security. You can prevent communications between wireless clients and prevent access point management from wireless clients. Also, you can block specific Ethernet traffic from being forwarded by the access point.

The Local Bridge Filter sets the global mode for wireless-to-wireless communications between clients associated to Virtual AP (VAP) interfaces on the access point. (Default: Disabled)

Figure 27: Local Bridge Filter



The following items are displayed on this page:

- **Disabled** — All clients can communicate with each other through the access point.

- **Prevent Intra VAP client communication** — When enabled, clients associated with a specific VAP interface cannot establish wireless communications with each other. Clients can communicate with clients associated to other VAP interfaces.

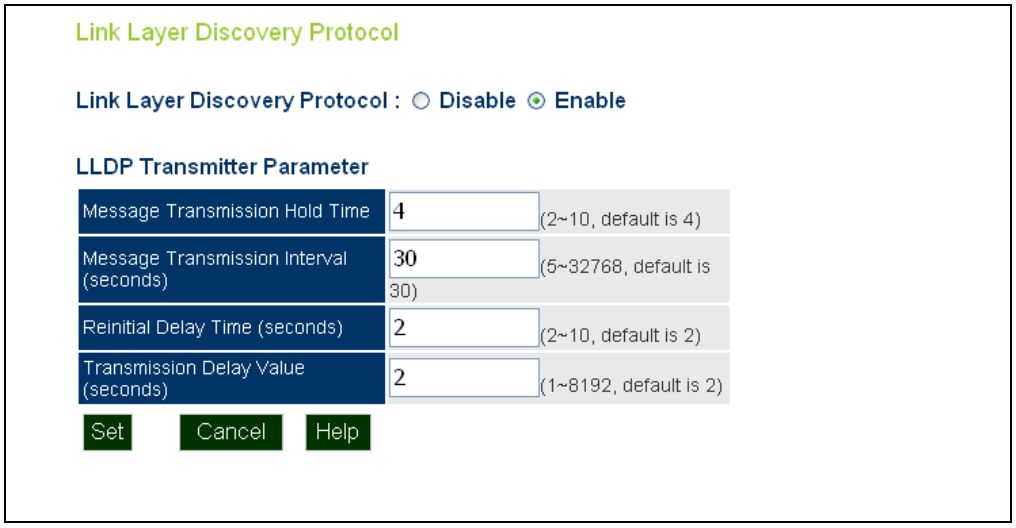
- **Prevent Inter and Intra VAP client communication** — When enabled, clients cannot establish wireless communications with any other client, either those associated to the same VAP interface or any other VAP interface.

Link Layer Discovery Protocol

This page allows you to configure the Link Layer Discovery Protocol (LLDP). LLDP allows devices in the local broadcast domain to share information about themselves. LLDP-capable devices periodically transmit information in messages called Type Length Value (TLV) fields to neighbor devices. Advertised information is represented in Type Length Value (TLV) format according to the IEEE 802.1ab standard, and can include details such as device identification, capabilities and configuration settings.

This information can be used by SNMP applications to simplify troubleshooting, enhance network management, and maintain an accurate network topology.

Figure 28: LLDP Settings



The following items are displayed on this page:

- **Disable/Enable** — Disables/Enables LLDP on the access point.

- **Message Transmission Hold Time** — Configures the time-to-live (TTL) value sent in LLDP advertisements as shown in the formula below. (Range: 2-10; Default: 4)

The time-to-live tells the receiving LLDP agent how long to retain all information pertaining to the sending LLDP agent if it does not transmit updates in a timely manner. TTL in seconds is based on the following rule: (Transmission Interval * Hold time) ≤ 65536. Therefore, the default TTL is 4*30 = 120 seconds.

- **Message Transmission Interval (seconds)** — Configures the periodic transmit interval for LLDP advertisements. (Range: 5-32768 seconds; Default: 30 seconds)

  This attribute must comply with the following rule: (Transmission Interval * Hold Time) ≤ 65536, and Transmission Interval >= (4 * Delay Interval)

- **ReInitial Delay Time (seconds)** — Configures the delay before attempting to re-initialize after LLDP ports are disabled or the link goes down. (Range: 1-10 seconds; Default: 2 seconds)

  When LLDP is re-initialized on a port, all information in the remote systems LLDP MIB associated with this port is deleted.

- **Transmission Delay Value (seconds)** — Configures a delay between the successive transmission of advertisements initiated by a change in local LLDP MIB variables. (Range: 1-8192 seconds; Default: 4 seconds)

  The transmit delay is used to prevent a series of successive LLDP transmissions during a short period of rapid changes in local LLDP MIB objects, and to increase the probability that multiple, rather than single changes, are reported in each transmission.

  This attribute must comply with the rule: (4 * Delay Interval) ≤ Transmission Interval

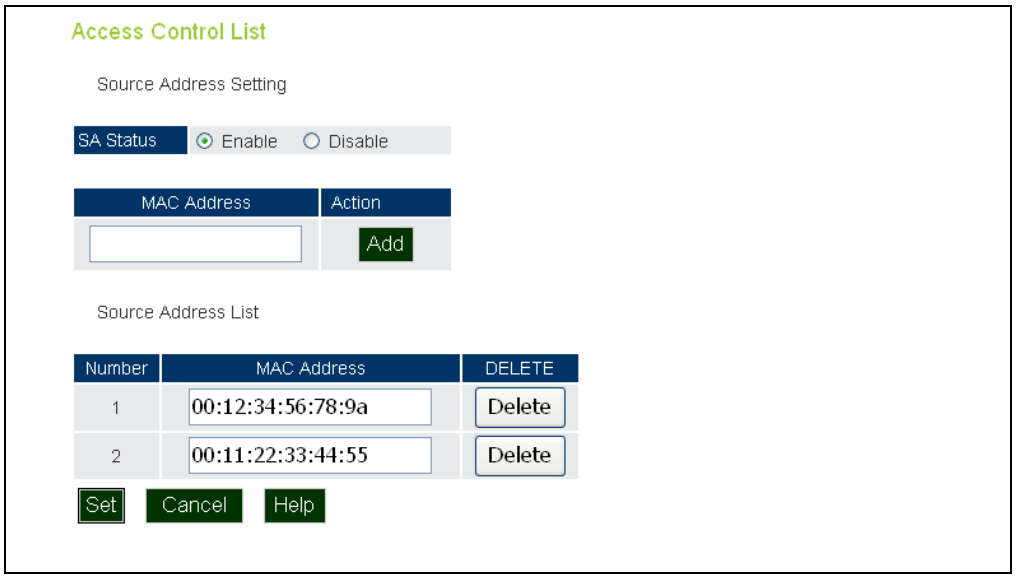
Access Control Lists

Access Control Lists allow you to configure a list of wireless client MAC addresses that are not authorized to access the network. A database of MAC addresses can be configured locally on the access point.

Source Address Settings

The ACL Source Address Settings page enables traffic filtering based on the source MAC address in the data frame.

Figure 29: Source ACLs



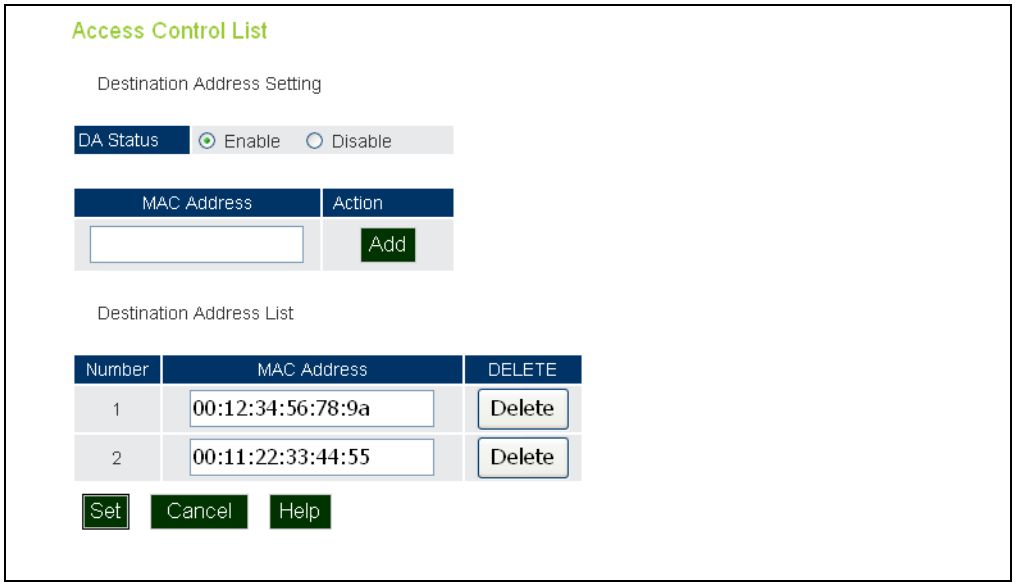
The following items are displayed on this page:

- **SA Status** — Enables network traffic with specific source MAC addresses to be filtered (dropped) from the access point.
- **MAC Address** — Specifies a source MAC address to filter, in the form xx.xx.xx.xx.xx.xx, or xx-xx-xx-xx-xx-xx.
- **Action** — Selecting "Add" adds a new MAC address to the filter list, selecting delete removes the specified MAC address.
- **Number** — Specifies the number associated with the MAC address.
- **MAC Address** — Displays the configured source MAC address.

Destination Address Settings

The ACL Destination Address Settings page enables traffic filtering based on the destination MAC address in the data frame.

Figure 30: Destination ACLs



The following items are displayed on this page:

- **DA Status** — Enables network traffic with specific destination MAC addresses to be filtered (dropped) from the access point.
- **MAC Address** — Specifies a destination MAC address to filter, in the form xx:xx:xx:xx:xx:xx or xx-xx-xx-xx-xx-xx.
- **Action** — Selecting "Add" adds a new MAC address to the filter list, selecting delete deletes the specified MAC address.
- **Number** — Specifies the number of the MAC address in the filter table.
- **MAC Address** — Displays the configured destination MAC address.

Ethernet Type

The Ethernet Type Filter controls checks on the Ethernet type of all incoming and outgoing Ethernet packets against the protocol filtering table. (Default: Disabled)

Figure 31: Ethernet Type Filter

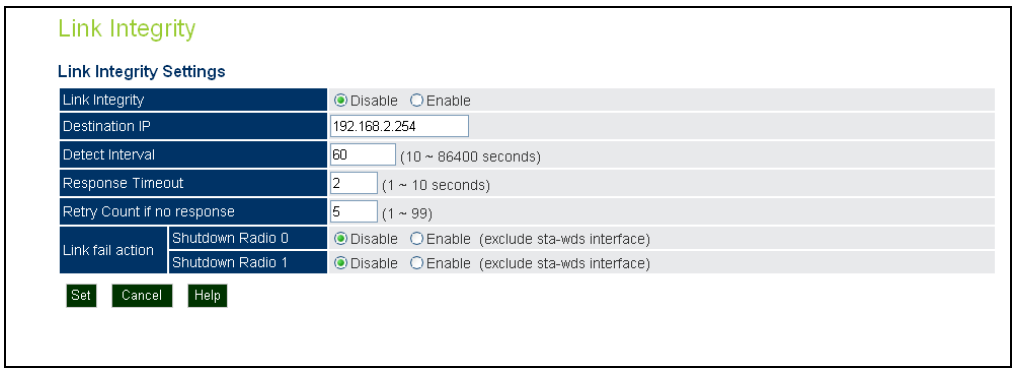
The following items are displayed on this page:

- **Disabled** — Access point does not filter Ethernet protocol types.
- **Enabled** — Access point filters Ethernet protocol types based on the configuration of protocol types in the filter table. If the status of a protocol is set to "ON," the protocol is filtered from the access point.
- **Local Management** — Describes the Ethernet filter type.
- **ISO Designator** — Describes the ISO Designator identifier.
- **Filter Status** — Turns the filter on or off.

Link Integrity

The AP provides a link integrity feature that can be used to ensure that wireless clients are connected to resources on the wired network. The AP does this by periodically sending Ping messages to a host device in the wired Ethernet network. If the AP detects that the connection to the host has failed, it can disable the radio interfaces, forcing clients to find and associate with another AP. When the connection to the host is restored, the AP re-enables the radio interfaces.

Figure 32: Link Integrity



The following items are displayed on this page:

- **Link Integrity** — Enables the feature. (Default: Disabled)
- **Destination IP** — The link host IP address on the wired network to which Ping messages are sent. (Default: 192.168.2.254)
- **Detect Interval** — The interval time between each Ping sent to the host IP address.(Range: 10-86400 seconds; Default: 60 seconds)
- **Response Timeout** — The time to wait for a response to a Ping message. (Range: 1-10 seconds; Default: 2 seconds)
- **Retry Count if no response** — The number of consecutive failed Ping counts before the link is determined as lost. (Range: 1-99; Default: 5)
- **Link Fail Action** — When a link integrity test fails you can optionally disable either radio interface. Note that the shutdown action does not apply for a VAP interface set to WDS station mode. (Default: Disabled)

6 Wireless Settings

This chapter describes wireless settings on the access point. It includes the following sections:

- "Authentication" on page 68
- "Radio Settings" on page 71
- "Virtual Access Points (VAPs)" on page 75
- "Rogue AP Detection" on page 84
- "Wi-Fi Multimedia (WMM)" on page 86

Authentication

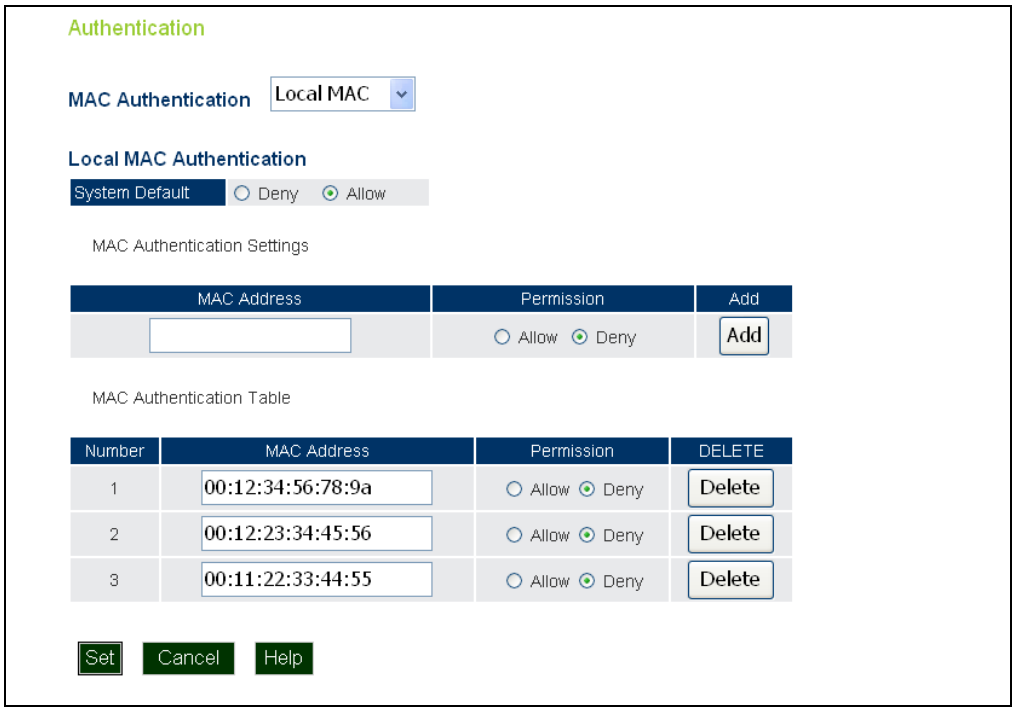
Wireless clients can be authenticated for network access by checking their MAC address against the local database configured on the access point, or by using a database configured on a central RADIUS server. Alternatively, authentication can be implemented using the IEEE 802.1X network access control protocol.

You can configure a list of the MAC addresses for wireless clients that are authorized to access the network. This provides a basic level of authentication for wireless clients attempting to gain access to the network. A database of authorized MAC addresses can be stored locally on the access point or remotely on a central RADIUS server. (Default: Local MAC)

Local MAC Authentication

Configures the local MAC authentication database. The MAC database provides a mechanism to take certain actions based on a wireless client's MAC address. The MAC list can be configured to allow or deny network access to specific clients.

Figure 33: Local Authentication



The following items are displayed on Authentication page:

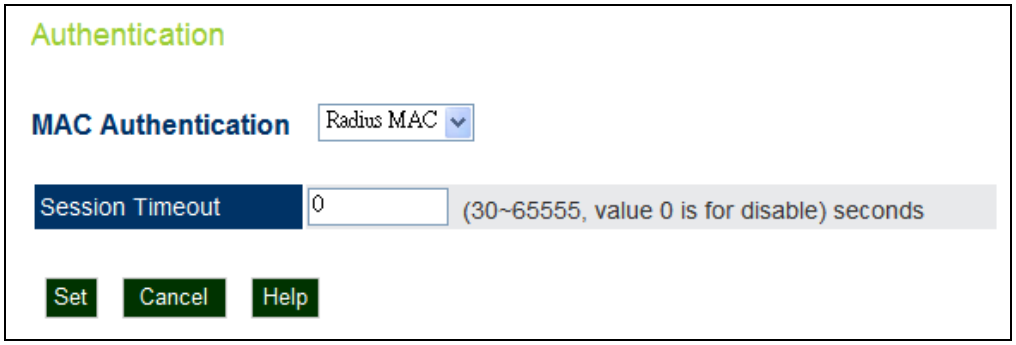
MAC Authentication — Selects between, disabled, Local MAC authentication and RADIUS authentication.

- **Local MAC** — The MAC address of the associating station is compared against the local database stored on the access point. The Local MAC Authentication section enables the local database to be set up.
- **System Default** — Specifies a default action for all unknown MAC addresses (that is, those not listed in the local MAC database).
  - **Deny**: Blocks access for all MAC addresses except those listed in the local database as "Allow."
  - **Allow**: Permits access for all MAC addresses except those listed in the local database as "Deny."
- **MAC Authentication Settings** — Enters specified MAC addresses and permissions into the local MAC database.
  - **MAC Address**: Physical address of a client. Enter six pairs of hexadecimal digits separated by hyphens; for example, 00-90-D1-12-AB-89.
  - **Permission**: Select Allow to permit access or Deny to block access.
  - **Add/Delete**: Adds or deletes the specified MAC address and permission setting into or from the local database.
- **MAC Authentication Table** — Displays current entries in the local MAC database.

RADIUS MAC Authentication

The MAC address of the associating station is sent to a configured RADIUS server for authentication. When using a RADIUS authentication server for MAC address authentication, the server must first be configured on the RADIUS page.

Figure 34: RADIUS Authentication



The following items are displayed on Authentication page:

MAC Authentication — Selects between, disabled, Local MAC authentication and RADIUS authentication.

- **RADIUS MAC** — The MAC address of the associating station is compared against the RADIUS server database. The RADIUS MAC Authentication section enables the RADIUS database to be set up.

- **Session Timeout** — The time period after which a connected client must be re-authenticated. During the re-authentication process of verifying the client's credentials on the RADIUS server, the client remains connected the network. Only if re-authentication fails is network access blocked. (Default: 0 means disabled; Range: 30-65535 seconds)

Radio Settings

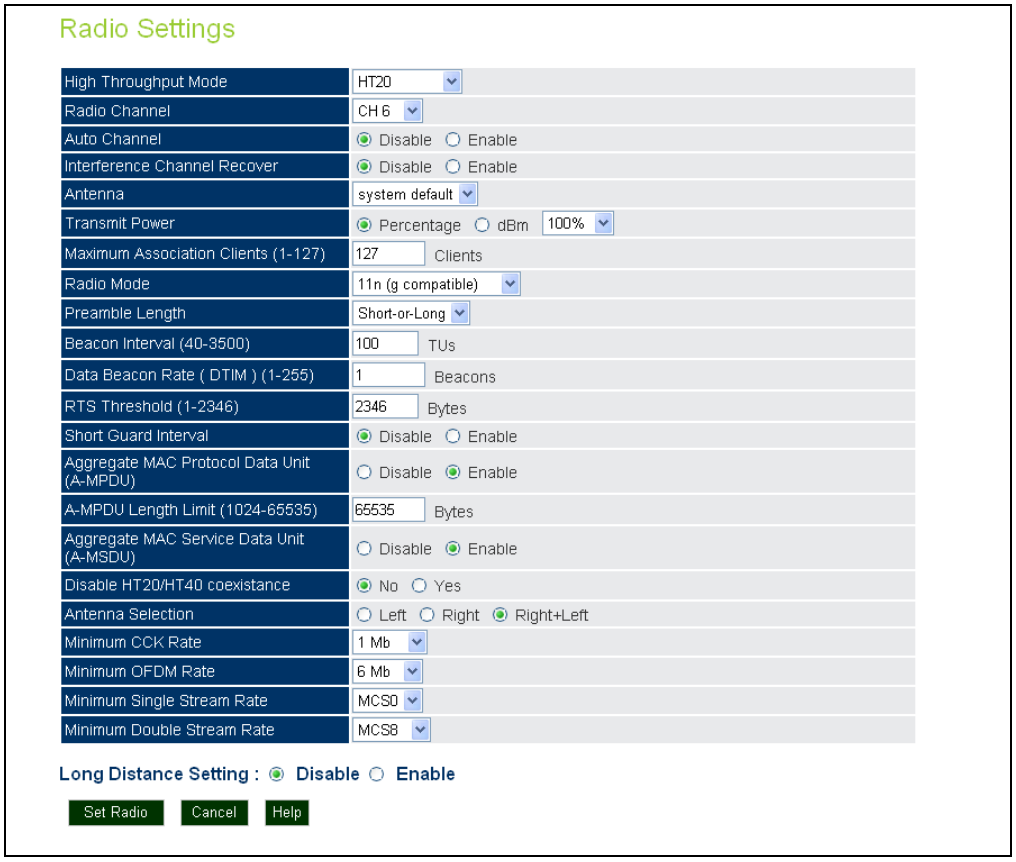
The IEEE 802.11n wireless interfaces include configuration options for radio signal characteristics and wireless security features.

The AP can operate in several radio modes, mixed 802.11b/g/n (2.4 GHz), or mixed 802.11a/n (5 GHz). Note that the radios can operate at 2.4 GHz and 5 GHz at the same time. The web interface identifies the radio configuration pages as:

- **Radio 0** — the 2.4 GHz 802.11b/g/n radio interface
- **Radio 1** — the 5 GHz 802.11a/n radio interface

Each radio supports 16 virtual access point (VAP) interfaces, referred to as VAP 0 ~ VAP 15. Each VAP functions as a separate access point, and can be configured with its own Service Set Identification (SSID) and security settings. However, most radio signal parameters apply to all VAP interfaces. The configuration options are nearly identical, and are therefore both covered in this section of the manual. Traffic to specific VAPs can be segregated based on user groups or application traffic. The clients associate with each VAP in the same way as they would with separate physical access points. The AP supports up to a total of 127 wireless clients across all VAP interfaces per radio.

Figure 35: Radio Settings



The following items are displayed on this page:

- **High Throughput Mode** — The access point provides a channel bandwidth of 20 MHz by default giving an 802.11g connection speed of 54 Mbps and a 802.11n connection speed of up to 108 Mbps, and ensures backward compliance for slower 802.11b devices. Setting the HT Channel Bandwidth to 40 MHz increases connection speed for 802.11n up to 300 Mbps. HT40plus indicates that the secondary channel is above the primary channel. HT40minus indicates that the secondary channel is below the primary channel. (Default: HT20; Range:HT20, HT40PLUS, HT40MINUS)

- **Radio Channel** — The radio channel that the access point uses to communicate with wireless clients. When multiple access points are deployed in the same area, set the channel on neighboring access points at least five channels apart to avoid interference with each other. For example, for 11g/n HT20 mode you can deploy up to three access points in the same area using channels 1, 6, 11. Note that wireless clients automatically set the channel to the same as that used by the access point to which it is linked. (The available channels are dependent on the Radio Mode, High Throughput Mode, and Country Code settings.)

- **Auto Channel** — Selecting Auto Select enables the access point to automatically select an unoccupied radio channel.

- **Interference Channel Recover** — Rescans all channels when interference is detected on the current channel, and then changes to a clear channel. (Default: Disabled)

- **Antenna** — Sets the antenna options for this AP to "system default."

- **Transmit Power** — Adjusts the power of the radio signals transmitted from the access point. The higher the transmission power, the farther the transmission range. Power selection is not just a trade off between coverage area and maximum supported clients. You also have to ensure that high-power signals do not interfere with the operation of other radio devices in the service area. (Range - Percentage mode: min, 12.5%, 25%, 50%, 100%; Default: 100%) (Range - dBm mode: 3-20 dBm; Default: 18 dBm)

- **Maximum Association Clients** — The total maximum number of clients that may associate with the radio. (Range: 1-127; Default: 127)

- **Radio Mode** — Defines the radio operation mode.

  - **Radio 0 (2.4 GHz Radio)** — Default: 11n (g compatible); Options: 11n (b&g compatible), 11n (g compatible).

  - **Radio 1 (5 GHz Radio)** — Default: 11n; Options: 11n (a compatible), 11n.

Note: Enabling the AP to communicate with 802.11b/g clients in both 802.11b/g/n Mixed and 802.11n modes also requires that HT Operation be set to HT20.

- **Preamble Length** — The radio preamble (sometimes called a header) is a section of data at the head of a packet that contains information that the wireless device and client devices need when sending and receiving packets. You can set the radio preamble to long or short. A short preamble improves throughput performance, whereas a long preamble is required when legacy wireless devices are part of your network.

- **Beacon Interval** — The rate at which beacon signals are transmitted from the access point. The beacon signals allow wireless clients to maintain contact with the access point. They may also carry power-management information. (Range: 40-3500 TUs; Default: 100 TUs)

- **Data Beacon Rate (DTIM)** — The rate at which stations in sleep mode must wake up to receive broadcast/multicast transmissions.

  Known also as the Delivery Traffic Indication Map (DTIM) interval, it indicates how often the MAC layer forwards broadcast/multicast traffic, which is necessary to wake up stations that are using Power Save mode. The default value of 2 indicates that the access point will save all broadcast/multicast frames for the Basic Service Set (BSS) and forward them after every second beacon. Using smaller DTIM intervals delivers broadcast/multicast frames in a more timely manner, causing stations in Power Save mode to wake up more often and drain power faster. Using higher DTIM values reduces the power used by stations in Power Save mode, but delays the transmission of broadcast/multicast frames. (Range: 1-255 beacons; Default: 1 beacon)

- **RTS Threshold** — Sets the packet size threshold at which a Request to Send (RTS) signal must be sent to a receiving station prior to the sending station starting communications. The access point sends RTS frames to a receiving station to negotiate the sending of a data frame. After receiving an RTS frame, the station sends a CTS (clear to send) frame to notify the sending station that it can start sending data.

  If the RTS threshold is set to 1, the access point always sends RTS signals. If set to 2346, the access point never sends RTS signals. If set to any other value, and the packet size equals or exceeds the RTS threshold, the RTS/CTS (Request to Send / Clear to Send) mechanism will be enabled.

  The access points contending for the medium may not be aware of each other. The RTS/CTS mechanism can solve this "Hidden Node Problem." (Range: 1-2346 bytes: Default: 2346 bytes)

- **Short Guard Interval** — The 802.11n draft specifies two guard intervals: 400ns (short) and 800ns (long). Support of the 400ns GI is optional for transmit and receive. The purpose of a guard interval is to introduce immunity to

propagation delays, echoes, and reflections to which digital data is normally very sensitive. Enabling the Short Guard Interval sets it to 400ns. (Default: Disabled)

- **Aggregate MAC Protocol Data Unit (A-MPDU)** — Enables / disables the sending of this four frame packet header for statistical purposes. (Default: Enabled)
- **A-MPDU Length Limit (1024-65535)** — Defines the A-MPDU length. (Default: 65535 bytes; Range: 1024-65535 bytes)
- **Aggregate MAC Service Data Unit (A-MSDU)** — Enables / disables the sending of this four frame packet header for statistical purposes. (Default: Enabled)
- **Disable HT20/HT40 Coexistance** — Prevents 802.11n 20 MHz and 40 MHz channel bandwidths from operating together in the same network. (Default: Disabled)
- **Antenna Selection** — Sets the radio to use one or both antennas. (Options: Left, Right, Right+Left; Default: Right+Left)
- **Minimum CCK Rate** — (2.4 GHz radio only) The minimum CCK data rate at which the AP transmits packets on the wireless interface. (Options: 1, 2, 5.5, 11 Mbps; Default 1 Mbps)
- **Minimum OFDM Rate** — The minimum OFDM data rate at which the AP transmits packets on the wireless interface. (Range: 6, 9, 12, 18, 24, 36, 48, 54 Mbps; Default 6 Mbps)
- **Minimum Single Stream Rate** — The minimum 802.11n single stream data rate at which the AP transmits packets on the wireless interface. (Range: MCS0-MCS7; Default MCS0)
- **Minimum Double Stream Rate** — The minimum 802.11n double stream data rate at which the AP transmits packets on the wireless interface. (Range: MCS8-MCS15; Default MCS8)
- **Long Distance Setting** — When you have long-distance links in the wireless network, some timing parameters require an adjustment to maintain communications.

  Enter the approximate distance (in meters) of the client from the AP. Click on the “Show Reference Data” button to compute a set of recommended values for SlotTime, ACKTimeOut and CTSTimeOut. You can use the recommended values or enter your own values that work for your specific environment.
- **Set Radio** — Sets all entered parameters.

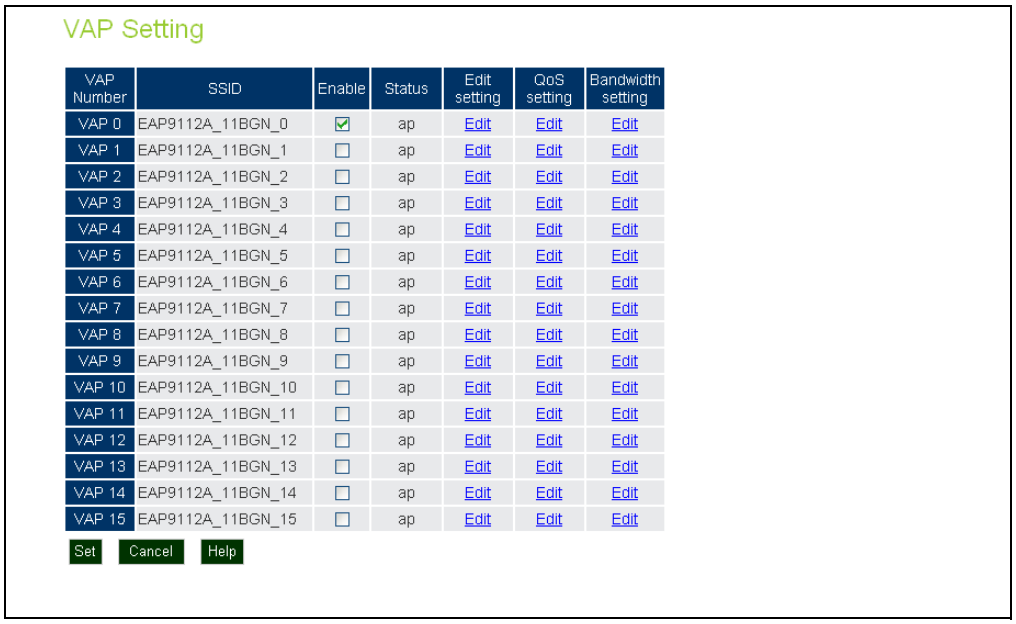
Virtual Access Points (VAPs)

The AP supports up to 16 virtual access point (VAP) interfaces per radio, numbered 0 to 15. Each VAP functions as a separate access point, and can be configured with its own Service Set Identification (SSID) and security settings. However, most radio signal parameters apply to all VAP interfaces.

The VAPs function similar to a VLAN, with each VAP mapped to its own default VLAN ID. Traffic to specific VAPs can be segregated based on user groups or application traffic. All VAPs can support up to a total of 127 wireless clients, whereby the clients associate with each VAP the same way as they would with separate physical access points.

Note: The radio channel settings for the access point are limited by local regulations, which determine the number of channels that are available. See "Operating Channels" on page 46 for additional information on the maximum number channels available.

Figure 36: VAP Settings



The following items are displayed on this page:

- **VAP Number** — The number associated with the VAP, 0-15.
- **SSID** — The name of the basic service set provided by a VAP interface. Clients that want to connect to the network through the access point must set their SSID to the same as that of an access point VAP interface. (Default: EAP9112A_11BGN_# (0 to 15); Range: 1-32 characters)

- **Enable** — Enables the specified VAP. (Default: Disabled)
- **Status** — Displays the mode of the VAP. The default is set to "AP," for normal access point services.
- **Edit Setting** — Click to open the page to configure basic and security settings for the selected VAP.
- **QoS Setting** — Click to open the page to configure QoS settings for the selected VAP.
- **Bandwidth Setting** — Click to open the page to configure bandwidth control for the selected VAP.

VAP Basic Settings

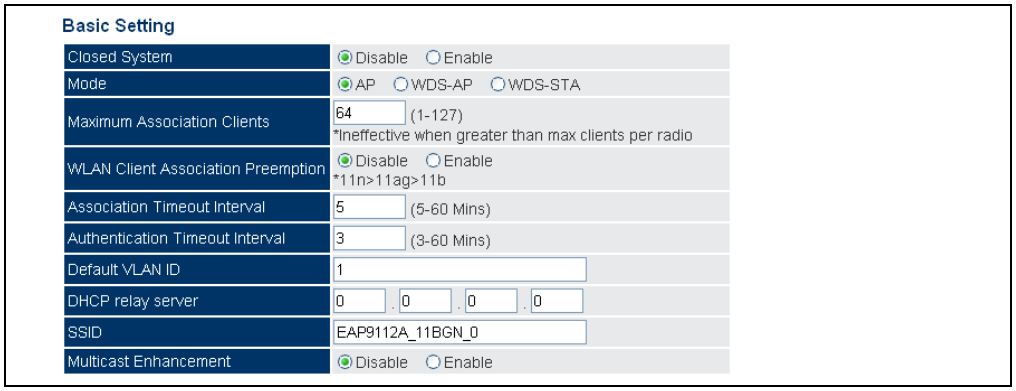
Sets the basic operating mode and other settings for the VAP.

Each VAP can operate in one of three modes; normal AP mode, WDS-AP bridge AP mode, or WDS-STA bridge station mode. The default mode is AP for the VAP to support normal access point services.

Note: For more information and examples for setting up WDS networks, see "WDS Setup Examples" on page 45.

Note that the Basic Settings are the same for both AP and WDS-AP modes.

Figure 37: VAP Basic Settings



The following items are displayed on this page:

- **Closed System** — When enabled, the VAP does not include its SSID in beacon messages. Nor does it respond to probe requests from clients that do not include a fixed SSID. (Default: Disable)

- **Mode** — Selects the mode in which the VAP will function.
  - **AP Mode**: The VAP provides services to clients as a normal access point.
  - **WDS-AP Mode**: The VAP operates as an access point in WDS mode, which accepts connections from APs in WDS-STA mode.
  - **WDS-STA Mode**: The VAP operates as a client station in WDS mode, which connects to an access point VAP in WDS-AP mode. The user needs to specify the MAC address of the access point in WDS-AP mode to which it intends to connect.
- **Maximum Association Clients** — The total maximum number of clients that may associate with this VAP. The maximum is 127, which is the total associated clients for all VAP interfaces. (Range: 1 to 127; Default 64)
- **WLAN Client Association Preemption** — When enabled, the AP applies a priority order for associating clients when the maximum clients for the VAP has been reached. The priority order is 11n clients, 11a/g clients, then 11b clients.

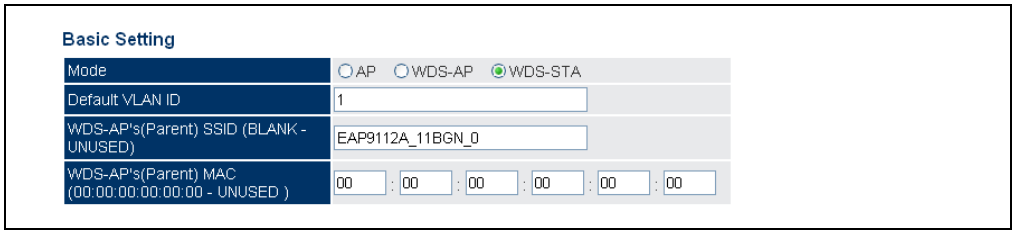
  When the association pool for the VAP is full and the AP receives an association request from a high-priority (11n) client, the AP sends a disassociation to a lower priority client (11a/g or 11b) in order to be able to associate the high-priority client. If there are no lower-priority clients to disassociate, the AP will reject the association request. (Default: Disabled)
- **Association Timeout Interval** — The idle time interval (when no frames are sent) after which a client is disassociated from the VAP interface. (Range: 5-60 minutes; Default: 30 minutes)
- **Authentication Timeout Interval** — The time within which the client should finish authentication before authentication times out.
  (Range: 5-60 minutes; Default: 60 minutes)
- **Default VLAN ID** — The VLAN ID assigned to wireless clients associated to the VAP interface that are not assigned to a specific VLAN by RADIUS server configuration. (Default: 1)
- **DHCP Relay Server** — The IP address of the DHCP relay server. Dynamic Host Configuration Protocol (DHCP) can dynamically allocate an IP address and other configuration information to network clients that broadcast a request. To receive the broadcast request, the DHCP server would normally have to be on the same subnet as the client. However, when the access point's DHCP relay agent is enabled, received client requests can be forwarded directly by the access point to a known DHCP server on another subnet. Responses from the DHCP server are returned to the access point, which then broadcasts them back to clients. (Default: 0.0.0.0 (disabled))
- **SSID** — The service set identifier for the VAP.

- **Multicast Enhancement** — When a wireless client joins a multicast group, this feature converts multicast packets to unicast packets to improve multicast video quality.

WDS-STA Mode

Describes additional basic VAP settings when functioning in WDS-STA mode.

Figure 38: WDS-STA Mode



The following items are displayed in the VAP Basic Settings when WDS-AP mode is selected:

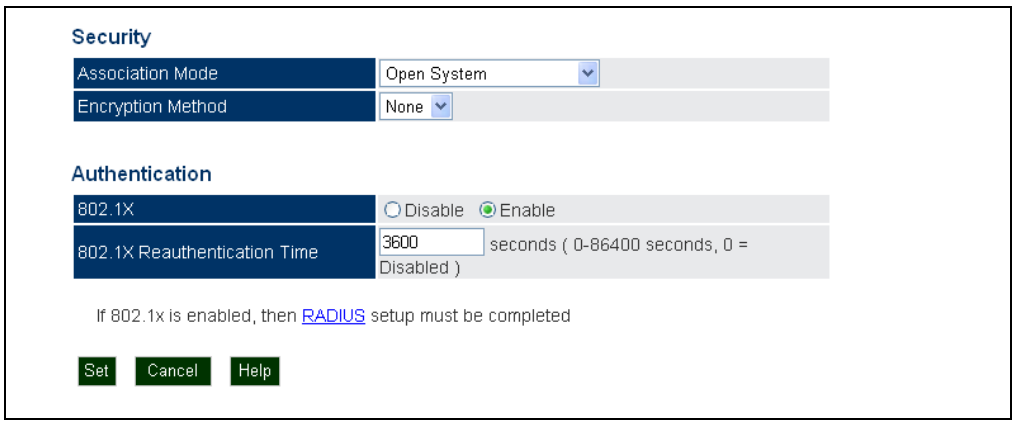
- **WDS-AP (Parent) SSID** — The SSID of the VAP on the connecting access point that is set to WDS-AP mode.
- **WDS-AP (Parent) MAC** — The MAC address of the VAP on the connecting access point that is set to WDS-AP mode.

Wireless Security Settings

Describes the wireless security settings for each VAP, including association mode, encryption, and authentication.

Note: For VAPs set to WDS-AP or WDS-STA mode, the security options are limited to WPA-PSK and WPA2-PSK only.

Figure 39: Configuring VAPs - Security Settings



The following items are available for VAP security:

- **Association Mode** — Defines the mode with which the VAP will associate with clients.
  - **Open System**: The VAP is configured by default as an "open system," which broadcasts a beacon signal including the configured SSID. Wireless clients with an SSID setting of "any" can read the SSID from the beacon and automatically set their SSID to allow immediate connection.
  - **WPA**: WPA employs a combination of several technologies to provide an enhanced security solution for 802.11 wireless networks.
  - **WPA-PSK**: For enterprise deployment, WPA requires a RADIUS authentication server to be configured on the wired network. However, for small office networks that may not have the resources to configure and maintain a RADIUS server, WPA provides a simple operating mode that uses just a pre-shared password for network access. The Pre-Shared Key mode uses a common password for user authentication that is manually entered on the access point and all wireless clients. The PSK mode uses the same TKIP packet encryption and key management as WPA in the enterprise, providing a robust and manageable alternative for small networks.
  - **WPA2**: WPA was introduced as an interim solution for the vulnerability of WEP pending the ratification of the IEEE 802.11i wireless security standard. In effect, the WPA security features are a subset of the 802.11i standard. WPA2 includes the now ratified 802.11i standard, but also offers backward compatibility with WPA. Therefore, WPA2 includes the same 802.1X and PSK modes of operation and support for TKIP encryption.
  - **WPA2-PSK**: Clients using WPA2 with a Pre-shared Key are accepted for authentication.
  - **WPA-WPA2 Mixed**: Clients using WPA or WPA2 are accepted for authentication.
  - **WPA-WPA2-PSK-mixed**: Clients using WPA or WPA2 with a Pre-shared Key are accepted for authentication.
- **Encryption Method** — Selects an encryption method for the global key used for multicast and broadcast traffic, which is supported by all wireless clients.
  - **WEP**: WEP is used as the multicast encryption cipher. You should select WEP only when both WPA and WEP clients are supported.
  - **TKIP**: TKIP is used as the multicast encryption cipher.
  - **AES-CCMP**: AES-CCMP is used as the multicast encryption cipher. AES-CCMP is the standard encryption cipher required for WPA2.

- **802.1X** — The access point supports 802.1X authentication only for clients initiating the 802.1X authentication process (i.e., the access point does not initiate 802.1X authentication). For clients initiating 802.1X, only those successfully authenticated are allowed to access the network. For those clients not initiating 802.1X, access to the network is allowed after successful wireless association with the access point. The 802.1X mode allows access for clients not using WPA or WPA2 security.

- **Pre-Authentication** — When using WPA2 over 802.1X, pre-authentication can be enabled, which allows clients to roam to a new access point and be quickly associated without performing full 802.1X authentication. (Default: Disabled)

- **802.1x Reauthentication Time** — The time period after which a connected client must be re-authenticated. During the re-authentication process of verifying the client's credentials on the RADIUS server, the client remains connected the network. Only if re-authentication fails is network access blocked. (Range: 0-65535 seconds; Default: 0 means disabled)

Wired Equivalent Privacy (WEP)

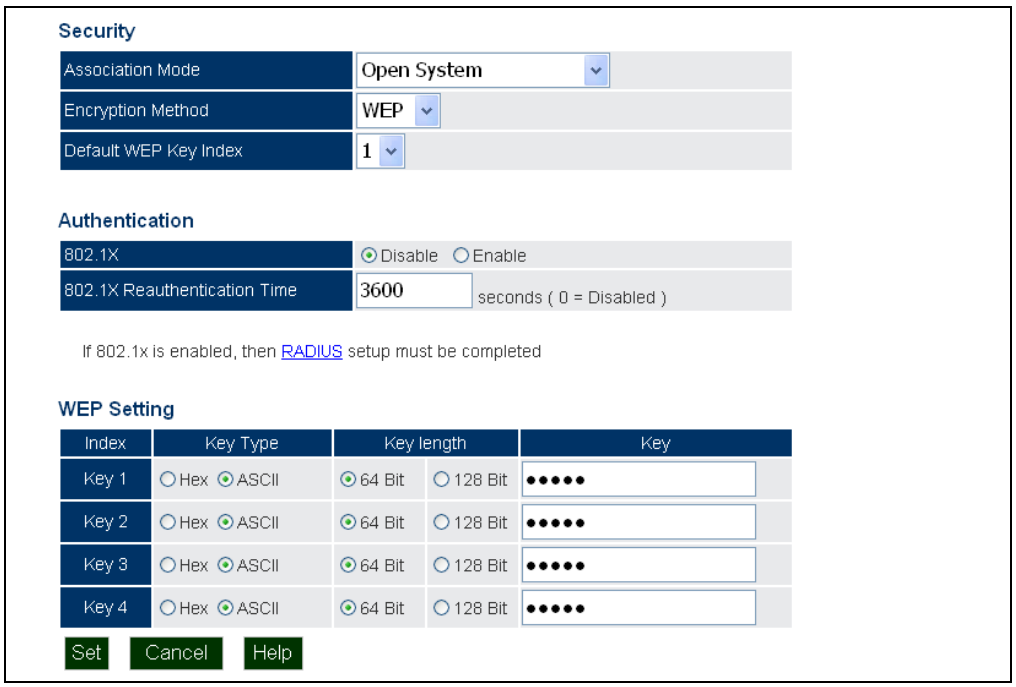
WEP provides a basic level of security, preventing unauthorized access to the network, and encrypting data transmitted between wireless clients and the VAP. WEP uses static shared keys (fixed-length hexadecimal or alphanumeric strings) that are manually distributed to all clients that want to use the network.

WEP is the security protocol initially specified in the IEEE 802.11 standard for wireless communications. Unfortunately, WEP has been found to be seriously flawed and cannot be recommended for a high level of network security. For more robust wireless security, the access point provides Wi-Fi Protected Access (WPA) and WPA2 for improved data encryption and user authentication.

Setting up shared keys enables the basic IEEE 802.11 Wired Equivalent Privacy (WEP) on the access point to prevent unauthorized access to the network.

If you choose to use WEP shared keys instead of an open system, be sure to define at least one static WEP key for user authentication and data encryption. Also, be sure that the WEP shared keys are the same for each client in the wireless network. All clients share the same keys, which are used for user authentication and data encryption. Up to four keys can be specified.

Figure 40: WEP Configuration



The following items are on this page for WEP configuration:

- **Default WEP Key Index** – Selects the key number to use for encryption for the VAP interface. If the clients have all four WEP keys configured to the same values, you can change the encryption key to any of the settings without having to update the client keys.
  (Default: Key 1)

- **Key Type** – Select the preferred method of entering WEP encryption keys for the VAP, either hexadecimal digits (Hex) or alphanumeric characters (ASCII).

- **Key Length** – Select 64 Bit or 128 Bit key length. Note that the same size of encryption key must be supported on all wireless clients. (Default: 64 bit)

- **Key** – Enter up to four WEP encryption keys for the VAP.

  - **Hex**: Enter keys as 10 hexadecimal digits (0-9 and A-F) for 64 bit keys, or 26 hexadecimal digits for 128 bit keys.

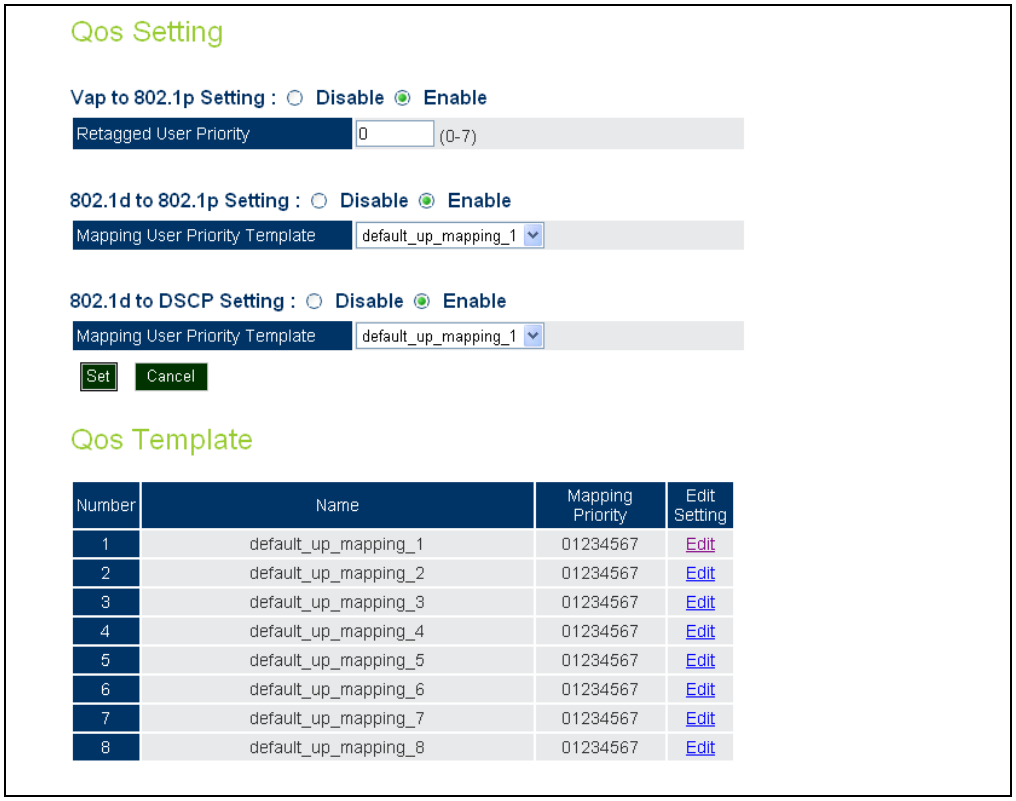
  - **ASCII**: Enter keys as 5 alphanumeric characters for 64 bit keys, or 13 alphanumeric characters for 128 bit keys.

Note: Key index, type, and length must match that configured on the clients.

VAP QoS Settings

Click the QoS Setting link from the VAP Settings page to access the QoS priority mapping configuration for traffic on the VAP interface.

Figure 41: QoS Settings



The following items are displayed in the VAP QoS Settings page:

- **VAP to 802.1p Setting** — You can modify the VLAN priority tags of traffic on the VAP interface with a specified priority value. Requires the default VLAN ID for the VAP to be any other value than 1.

Note: The VAP-to-802.1p priority QoS feature cannot be enabled together with the 802.1d-to-802.1p or 802.1d-to-DSCP features.

- **802.1d to 802.1p Setting** — Enables the mapping of traffic priority from WMM 802.1d priorities to 802.1p VLAN tag priority values. The priorities are mapped according to the user-defined QoS Template map. Requires the default VLAN ID for the VAP to be any other value than 1.

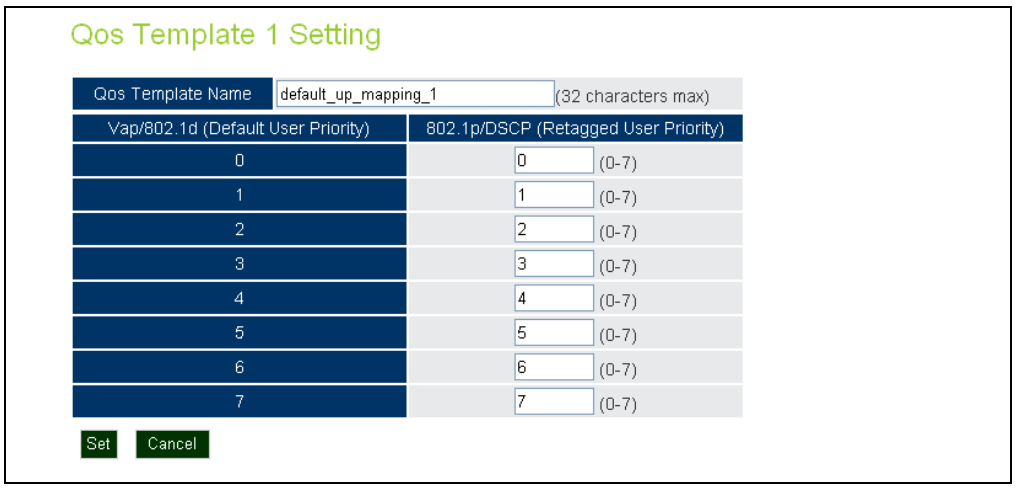
- **802.1d to DSCP Setting** — Enables the mapping of traffic priority from WMM 802.1d priorities to IP DSCP priority values. The priorities are mapped according to the user-defined QoS Template map.

Both "802.1d to 802.1p" mapping and "802.1d to DSCP" mapping can be enabled simultaneously when the default VLAN ID for the VAP is any other value than 1. When only "802.1d to DSCP" mapping is enabled, the default VLAN ID for the VAP must be set to 1.

- **QoS Template** — Enables up to eight user-defined priority mapping tables to be configued. The tables are used to map the WMM 802.1d priorities to 802.1p/ DSCP priorities.

  Click the "Edit" link in the list to define a template priority map.

Figure 42: QoS Template Setting



The following items are displayed in the QoS Template Setting page:

- **QoS Template Name —** A descriptive name that identifies the mappng template. All eight templates have a default name that can be edited by the user (maximum 32 characters).

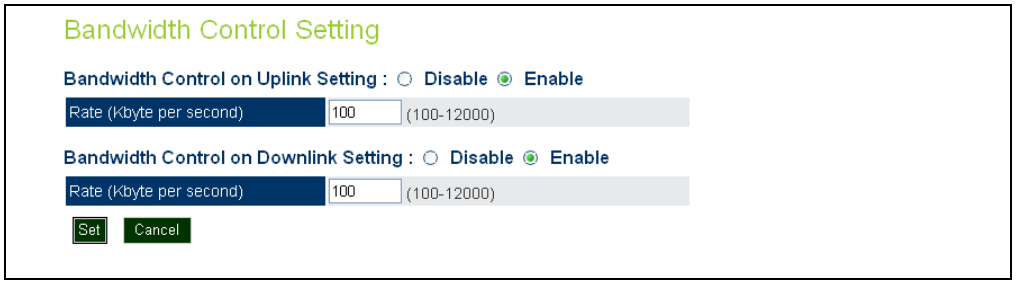
- **Vap/802.1d (Default User Priority) —** The WMM 802.1d priority value in a tagged packet.

- **802.1p/DSCP (Retagged User Priority) —** The 802.1p or IP DSCP priority value that replaces the WMM 802.1d value in tagged packets. (Range: 0-7)

VAP Bandwidth Settings

Click the Bandwidth Setting link from the VAP Settings page to configure rate limiting for traffic on the VAP interface.

Figure 43: Bandwidth Settings



The following items are displayed on this page:

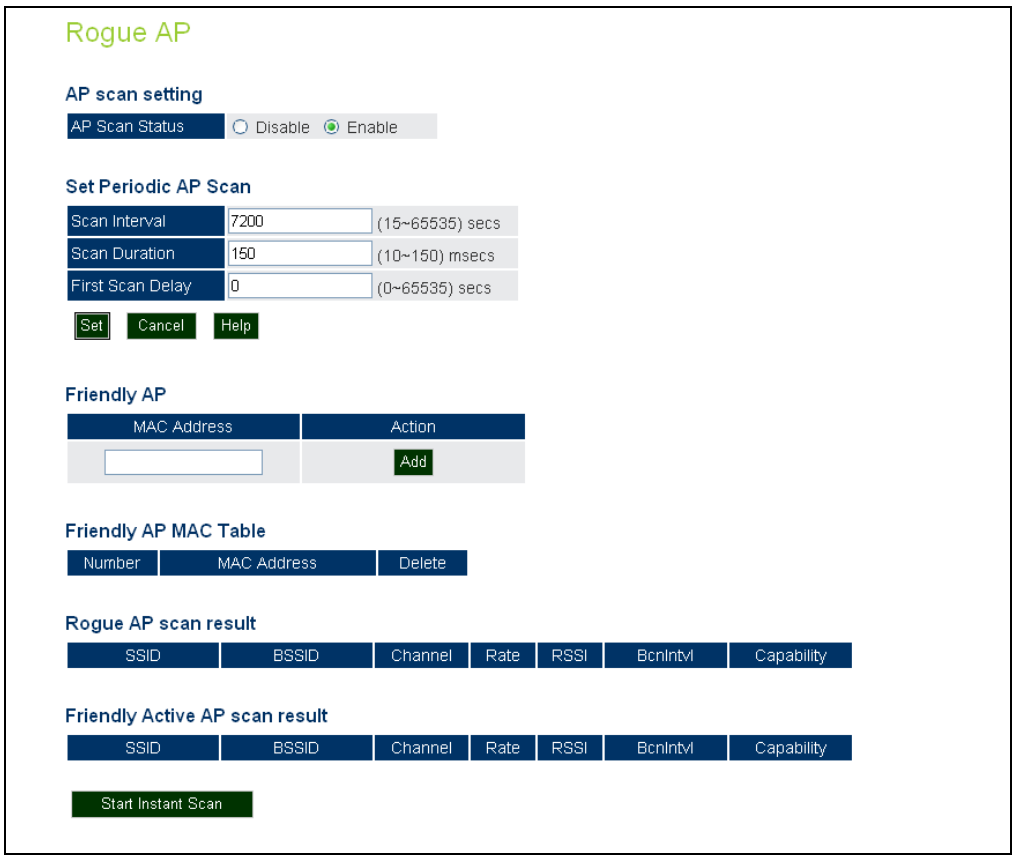
- **Bandwidth Control on Uplink Setting** — Enables the rate limiting of traffic from the VAP interface as it is passed to the wired network. You can set a maximum rate in kbytes per second. (Range: 100-12000 Kbytes per second; Default: 100 Kbytes per second)
- **Bandwidth Control on Downlink Setting** — Enables the rate limiting of traffic from the wired network as it is passed to the VAP interface. You can set a maximum rate in kbytes per second. (Range: 100-12000 Kbytes per second; Default: 100 Kbytes per second)

Rogue AP Detection

A "rogue AP" is either an access point that is not authorized to participate in the wireless network, or an access point that does not have the correct security configuration. Rogue APs can allow unauthorized access to the network, or fool client stations into mistakenly associating with them and thereby blocking access to network resources.

The access point can be configured to periodically scan all radio channels and find other access points within range. A database of nearby access points is maintained where any rogue APs can be identified. Rogue access points can be identified by unknown BSSID (MAC address).

Figure 44: Rogue AP Detection



The following items are displayed on this page:

- **AP Scan Setting** — Enables the periodic scanning for other nearby access points. (Default: Disable)
- **Scan Interval** — Sets the time between each rogue AP scan. (Range: 15 -65535 seconds; Default: 7200 seconds)
- **Scan Duration** — Sets the length of time for each rogue AP scan. A long scan duration time will detect more access points in the area, but causes more disruption to client access. (Range: 10 -150 milliseconds; Default: 150 milliseconds)
- **First Scan Delay** — Delays the start of rogue AP scanning after enabling the feature or booting the AP. (Range: 0 -65535 seconds; Default: 65535 seconds)
- **Friendly AP** — Allows you to enter the MAC address/Basic Service Set Identifier (BSSID) of known APs in the network. These MAC addresses will be filtered out of the list of detected APs during a scan.
- **Friendly AP MAC Table** — Displays the MAC addresses of known APs in the network.

- **Rogue AP Scan Result** — Displays information of unknown APs detected within the range of the AP running the scan.
- **Friendly Active AP Scan Result** — Displays information of known APs detected within the range of the AP running the scan.
- **Start Instant Scan** — Starts an immediate rogue AP scan on the radio interface. (Default: Disable)

Note: While the access point scans a channel for rogue APs, wireless clients will not be able to connect to the access point. Therefore, avoid frequent scanning or scans of a long duration unless there is a reason to believe that more intensive scanning is required to find a rogue AP.

Wi-Fi Multimedia (WMM)

Wireless networks offer an equal opportunity for all devices to transmit data from any type of application. Although this is acceptable for most applications, multimedia applications (with audio and video) are particularly sensitive to the delay and throughput variations that result from this "equal opportunity" wireless access method. For multimedia applications to run well over a wireless network, a Quality of Service (QoS) mechanism is required to prioritize traffic types and provide an "enhanced opportunity" wireless access method.

The access point implements QoS using the Wi-Fi Multimedia (WMM) standard. Using WMM, the access point is able to prioritize traffic and optimize performance when multiple applications compete for wireless network bandwidth at the same time. WMM employs techniques that are a subset of the IEEE 802.11e QoS standard and it enables the access point to interoperate with both WMM-enabled clients and other devices that may lack any WMM functionality.

Access Categories — WMM defines four access categories (ACs): voice, video, best effort, and background. These categories correspond to traffic priority levels and are mapped to IEEE 802.1D priority tags (see "WMM Access Categories" on page 87). The direct mapping of the four ACs to 802.1D priorities is specifically intended to facilitate inter operability with other wired network QoS policies. While the four ACs are specified for specific types of traffic, WMM allows the priority levels to be configured to match any network-wide QoS policy. WMM also specifies a protocol that access points can use to communicate the configured traffic priority levels to QoS-enabled wireless clients.

Table 2: WMM Access Categories

Access Category	WMM Designation	Description	802.1D Tags
AC_VO (AC3)	Voice	Highest priority, minimum delay. Time-sensitive data such as VoIP (Voice over IP) calls.	7, 6
AC_VI (AC2)	Video	High priority, minimum delay. Time-sensitive data such as streaming video.	5, 4
AC_BE (AC0)	Best Effort	Normal priority, medium delay and throughput. Data only affected by long delays. Data from applications or devices that lack QoS capabilities.	0, 3
AC_BK (AC1)	Background	Lowest priority. Data with no delay or throughput requirements, such as bulk data transfers.	2, 1

WMM Operation — WMM uses traffic priority based on the four ACs; Voice, Video, Best Effort, and Background. The higher the AC priority, the higher the probability that data is transmitted.

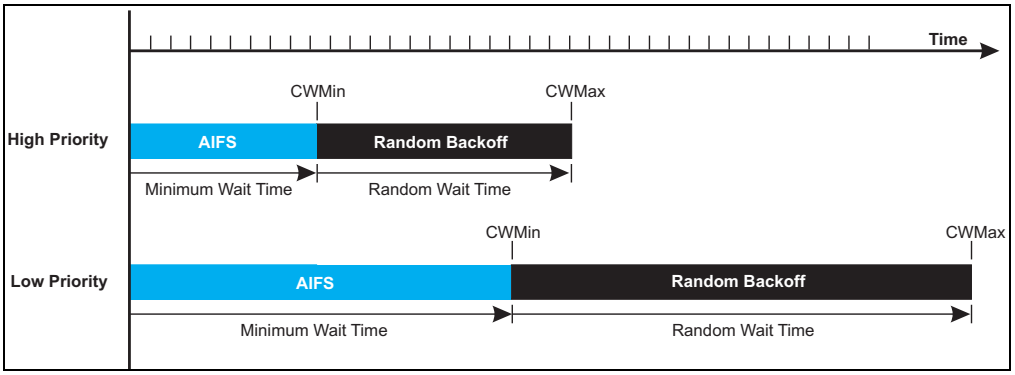
When the access point forwards traffic, WMM adds data packets to four independent transmit queues, one for each AC, depending on the 802.1D priority tag of the packet. Data packets without a priority tag are always added to the Best Effort AC queue. From the four queues, an internal "virtual" collision resolution mechanism first selects data with the highest priority to be granted a transmit opportunity. Then the same collision resolution mechanism is used externally to determine which device has access to the wireless medium.

For each AC queue, the collision resolution mechanism is dependent on two timing parameters:

- AIFSN (Arbitration Inter-Frame Space Number), a number used to calculate the minimum time between data frames
- CW (Contention Window), a number used to calculate a random backoff time

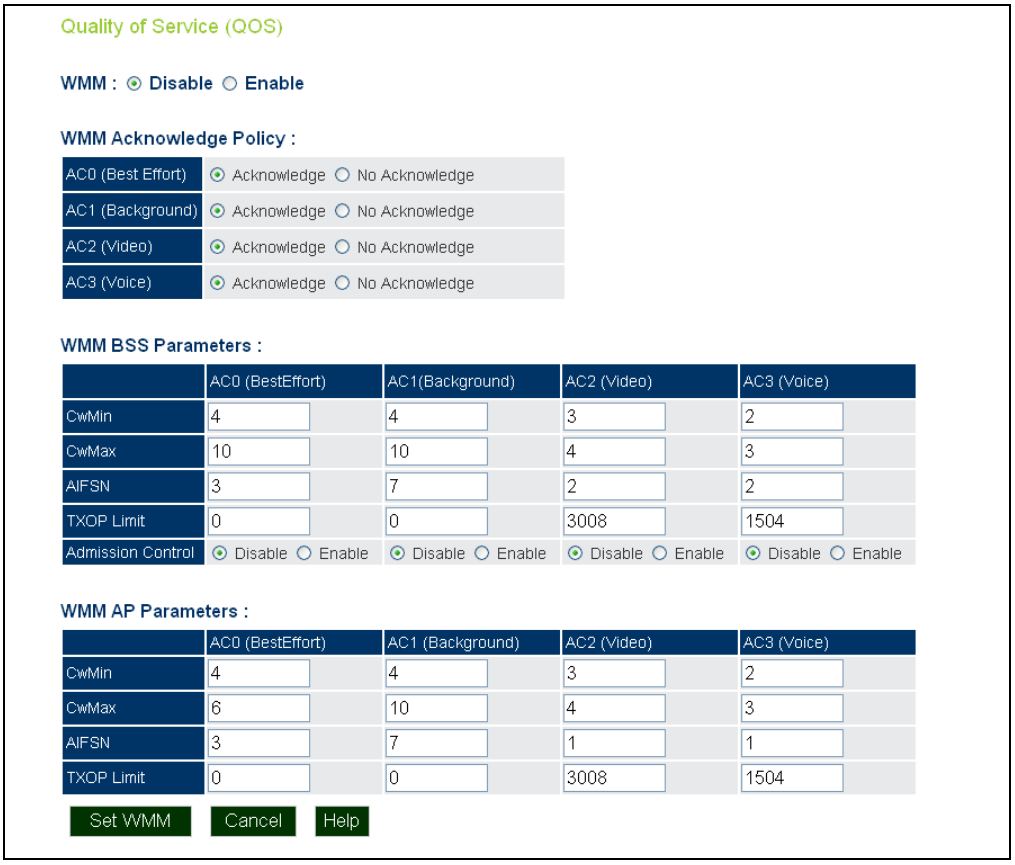
After a collision detection, a backoff wait time is calculated. The total wait time is the sum of a minimum wait time (Arbitration Inter-Frame Space, or AIFS) determined from the AIFSN, and a random backoff time calculated from a value selected from zero to the CW. The CW value varies within a configurable range. It starts at CWMin and doubles after every collision up to a maximum value, CWMax. After a successful transmission, the CW value is reset to its CWMin value.

Figure 45: WMM Backoff Wait Times



For high-priority traffic, the AIFSN and CW values are smaller. The smaller values equate to less backoff and wait time, and therefore more transmit opportunities.

Figure 46: QoS



The following items are displayed on this page:

- **WMM** — Sets the WMM operational mode on the access point. When enabled, the parameters for each AC queue will be employed on the access point and QoS capabilities are advertised to WMM-enabled clients. (Default: Disabled)
  - **Disable**: WMM is disabled.
  - **Enable**: WMM must be supported on any device trying to associated with the access point. Devices that do not support this feature will not be allowed to associate with the access point.
- **WMM Acknowledge Policy** — By default, all wireless data transmissions require the sender to wait for an acknowledgement from the receiver. WMM allows the acknowledgement wait time to be turned off for each Access Category (AC) 0-3. Although this increases data throughput, it can also result in a high number of errors when traffic levels are heavy. (Default: Acknowledge)
  - **Aknowledge** — Applies the WMM policy.
  - **No Aknowledge** — Ignores the WMM policy.
- **WMM BSS Parameters** — These parameters apply to the wireless clients.
- **WMM AP Parameters** — These parameters apply to the access point.
  - **logCWMin** (Minimum Contention Window): The initial upper limit of the random backoff wait time before wireless medium access can be attempted. The initial wait time is a random value between zero and the CWMin value. Specify the CWMin value in the range 0-15 microseconds. Note that the CWMin value must be equal or less than the CWMax value.
  - **logCWMax** (Maximum Contention Window): The maximum upper limit of the random backoff wait time before wireless medium access can be attempted. The contention window is doubled after each detected collision up to the CWMax value. Specify the CWMax value in the range 0-15 microseconds. Note that the CWMax value must be greater or equal to the CWMin value.
  - **AIFSN** (Arbitration Inter-Frame Space): The minimum amount of wait time before the next data transmission attempt. Specify the AIFS value in the range 0-15 microseconds.
  - **TXOP Limit** (Transmit Opportunity Limit): The maximum time an AC transmit queue has access to the wireless medium. When an AC queue is granted a transmit opportunity, it can transmit data for a time up to the TxOpLimit. This data bursting greatly improves the efficiency for high data-rate traffic. Specify a value in the range 0-65535 microseconds.

- **Admission Control**: The admission control mode for the access category. When enabled, clients are blocked from using the access category. (Default: Disabled)

- **Set WMM** — Applies the new parameters and saves them to RAM memory. Also prompts a screen to inform you when it has taken affect. Click "OK" to return to the home page. Changes will not be saved upon a reboot unless the running configuration file is saved.

7 Maintenance Settings

Maintenance settings includes the following sections:

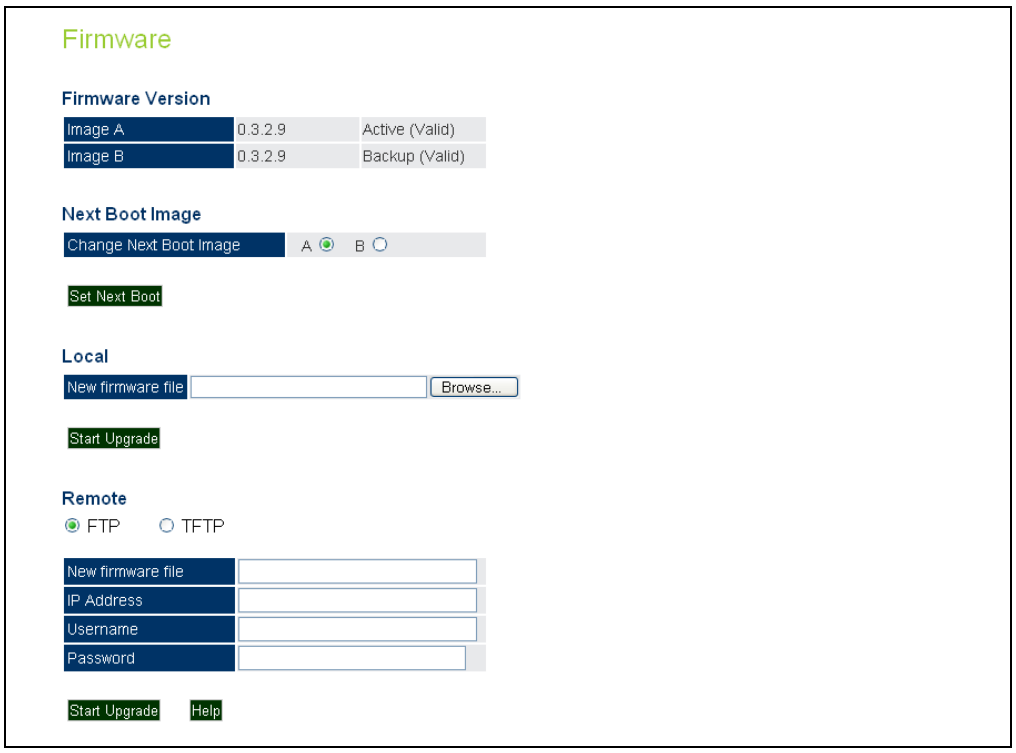
- "Upgrading Firmware" on page 91
- "Running Configuration" on page 93
- "Resetting the Access Point" on page 94
- "Scheduled Reboot" on page 95

Upgrading Firmware

You can upgrade new access point software from a local file on the management workstation, or from an FTP or TFTP server. New software may be provided periodically from your distributor.

After upgrading new software, you must reboot the access point to implement the new code. Until a reboot occurs, the access point will continue to run the software it was using before the upgrade started. Also note that new software that is incompatible with the current configuration automatically restores the access point to the factory default settings when first activated after a reboot.

Figure 47: Firmware



The following items are displayed on this page:

- **Firmware Version** — Displays the software image version that is being used as the runtime image. The "Active" image is the current running software, and the "Backup" image is the second software file installed on the AP, but not running.
- **Next Boot Image** — Specifies what version of software will be used as a runtime image upon bootup.
- **Set Next Boot** — Applies the runtime image setting.
- **Local** — Downloads an operation code image file from the web management station to the access point using HTTP. Use the Browse button to locate the image file locally on the management station and click Start Upgrade to proceed.
  - **New Firmware File**: Specifies the name of the code file on the server. The new firmware file name should not contain slashes (\ or /), the leading letter of the file name should not be a period (.), and the maximum length for file names is 32 characters for files on the access point. (Valid characters: A-Z, a-z, 0-9, "", ".", "-", "_")
- **Remote** — Downloads an operation code image file from a specified remote FTP or TFTP server. After filling in the following fields, click Start Upgrade to proceed.

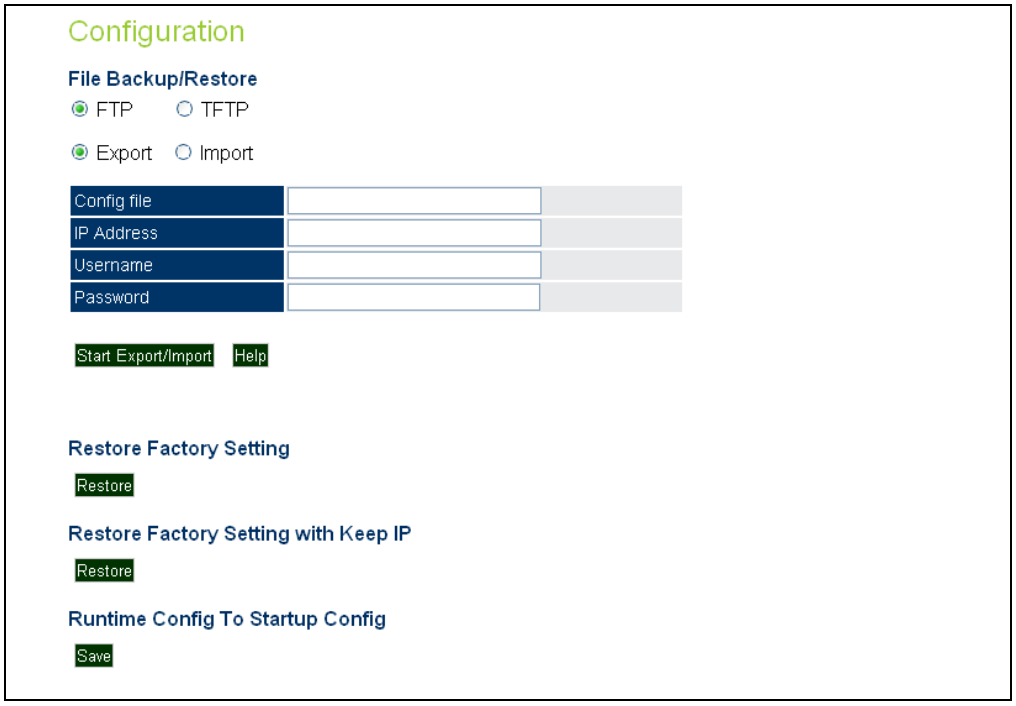
- **New Firmware File**: Specifies the name of the code file on the server. The new firmware file name should not contain slashes (\ or /), the leading letter of the file name should not be a period (.), and the maximum length for file names on the FTP/TFTP server is 255 characters or 32 characters for files on the access point. (Valid characters: A-Z, a-z, 0-9, "", "-", "_")
- **IP Address**: IP address or host name of FTP or TFTP server.
- **Username**: The user ID used for login on an FTP server.
- **Password**: The password used for login on an FTP server.

◆ **Start Upgrade** — Commences the upgrade process.

Running Configuration

A copy of a previous running configuration may be uploaded to the access point as a saved file from a remote location, or the current configuration saved and stored for restoration purposes at a later point. A configuration file may be saved or downloaded to/from a specified remote FTP or TFTP server.

Figure 48: Running Configuration File



The following items are displayed on this page:

- **File Backup/Restore** — Downloads an operation code image file from a specified remote FTP or TFTP server. After filling in the following fields, click Start Export/Import to proceed.
- **Export/Import** — Select Export to upload a file to an FTP/TFTP server. Select Import to download a file from an FTP/TFTP server.
- **Config file** — Specifies the name of the configuration file. A path on the server can be specified using "/" in the name, providing the path already exists; for example, "myfolder/." Other than to indicate a path, the file name must not contain any slashes (\ or /), the leading letter cannot be a period (.), and the maximum length for file names on the FTP/TFTP server is 255 characters. (Valid characters: A-Z, a-z, 0-9, "", ".", "-", "_")
- **IP Address** — IP address or host name of FTP or TFTP server.
- **Username** — The user ID used for login on an FTP server.
- **Password** — The password used for login on an FTP server.
- **Start Import/Export** — Initiates the selected backup or restore.
- **Restore Factory Setting** — Click the Restore button to reset the configuration settings for the access point to the factory defaults and reboot the system. Note that all user configured information will be lost. You will have to re-enter the default user name and password to re-gain management access to this device.
- **Restore Factory Setting with Keep IP** — Click the Restore button to reset the AP's configuration settings, except for the IP, to the factory defaults and reboot the system. Note that other than the IP settings, all user configured information will be lost. You will have to re-enter the default user name and password to re-gain management access to this device.
- **Running Config To Startup Config** — Click "Save" to save the running configuration to the startup file.

Resetting the Access Point

The Reset page allows you to reset the access point and save the running configuration before the reboot.

Figure 49: Resetting the Access Point

The following items are displayed on this page:

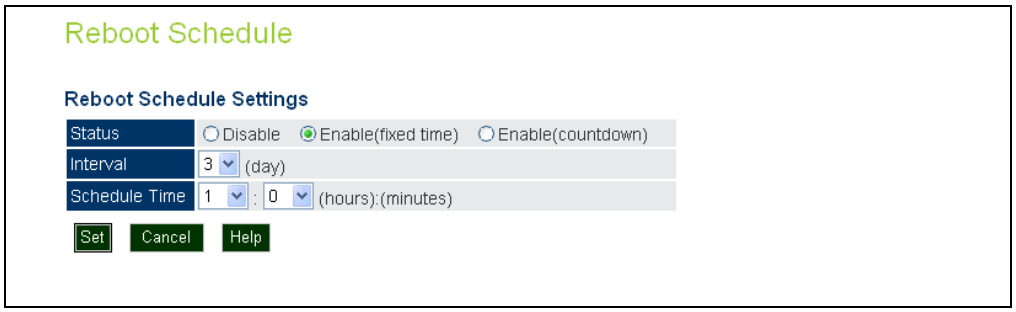
- **Save Runtime config before Reboot** — Checking this option saves the current running configuration to the startup file.
- **Reboot** — Click the "Reboot" button to reset the configuration settings for the AP and reboot the system. Note that all unsaved user configured information will be lost.

Note: If you have upgraded system software, then you must reboot the access point to implement the new operation code. New software that is incompatible with the current configuration automatically restores the access point to default values when first activated after a reboot.

Scheduled Reboot

The Reboot Schedule page allows you to set the AP to reboot on a specified time schedule. The time can be either by days and hours, or a simple countdown in minutes.

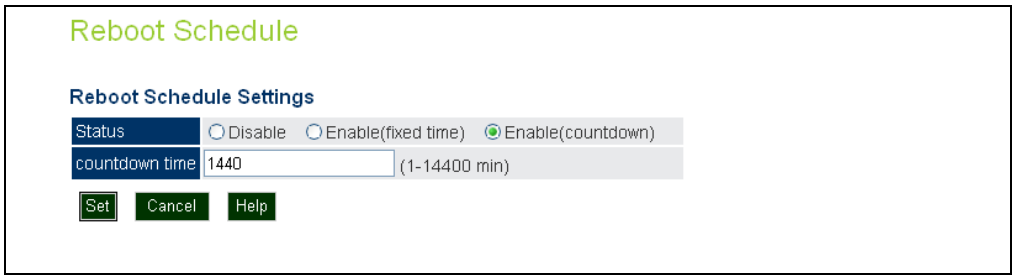
Figure 50: Reboot Schedule — Fixed Time



The following items are displayed on this page:

- **Status** — Selects a fixed time interval or a countdown time, or disables the feature.
- **Interval** — Specifies the interval in days. (Range: 1~7 days)
- **Schedule Time** — Specifies a time in hours and minutes. (Range: 0~23 hours, 0~59 minutes)

Figure 51: Reboot Schedule — Countdown Time



The following items are displayed on this page:

- **Status** — Selects a fixed time interval or a countdown time, or disables the feature.
- **Countdown Time** — Specifies a time in minutes. (Default: 14400 minutes; Range: 1~14400 minutes)

8 Status Information

The Information menu displays information on the current system configuration, the wireless interface, the station status and system logs.

Status Information includes the following sections:

- "AP Status" on page 98
- "Station Status" on page 101
- "Station Statistics" on page 102
- "Event Logs" on page 103
- "WDS Status" on page 104

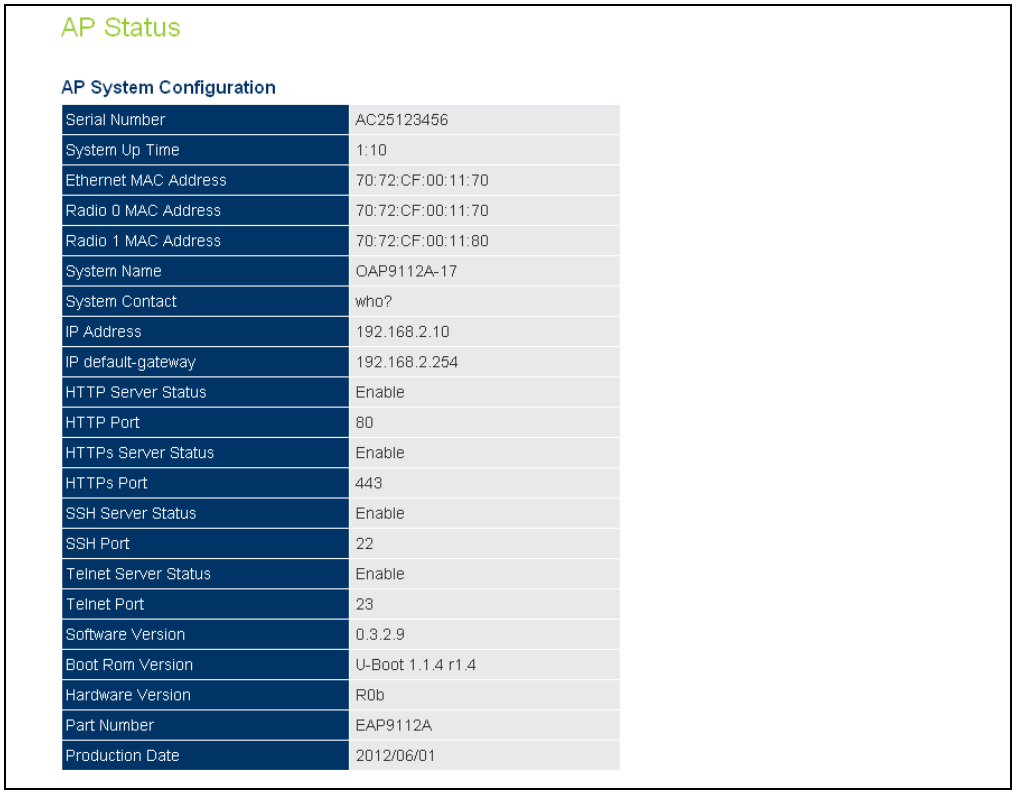
AP Status

The AP Status window displays basic system configuration settings, as well as the settings for the wireless interfaces.

AP System Configuration

The AP System Configuration table displays the basic system configuration settings

Figure 52: AP System Configuration



The following items are displayed on this page:

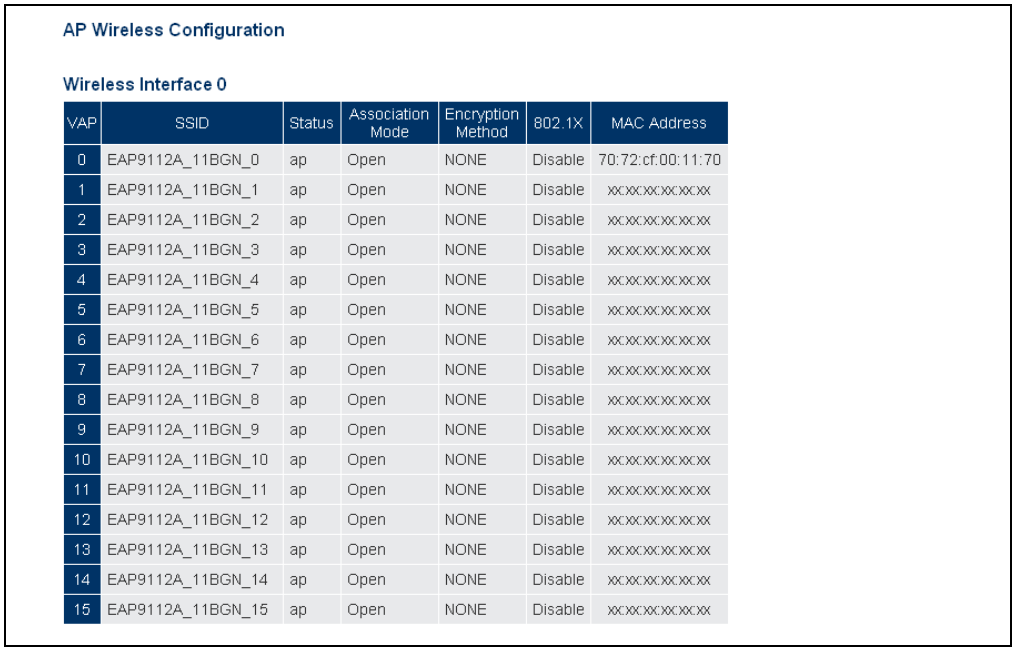
- **Serial Number** — The serial number of the physical access point.
- **System Up Time** — Length of time the management agent has been up.
- **Ethernet MAC Address** — The physical layer address for the Ethernet port.
- **Radio 0 MAC Address** — The base physical layer address of the 2.4 GHz interface.
- **Radio 1 MAC Address** — The base physical layer address for the 5 GHz interface.

- **System Name** — Name assigned to this system.
- **System Contact** — Administrator responsible for the system.
- **IP Address** — IP address of the management interface for this device.
- **IP Default Gateway** — IP address of the gateway router between this device and management stations that exist on other network segments.
- **HTTP Server Status** — Shows if management access via HTTP is enabled.
- **HTTP Port** — Shows the TCP port used by the HTTP interface.
- **HTTPS Server Status** — Shows if management access via HTTPS is enabled.
- **HTTPS Port** — Shows the TCP port used by the HTTPS interface.
- **SSH Server Status** — Shows if management access via SSH is enabled.
- **SSH Port** — Shows the TCP port used for SSH access.
- **Telnet Server Status** — Shows if management access via Telnet is enabled.
- **Telnet Port** — Shows the TCP port used for Telnet access.
- **Software Version** — Shows the software version number.
- **Boot Rom Version** — Show the boot software version number.
- **Hardware Version** — Shows the unit's hardware version number.
- **Part Number** — Shows the model number of the unit.
- **Production Date** — Shows the production date of the unit.

AP Wireless Configuration

The AP Wireless Configuration displays the VAP interface settings for the 2.4 GHz and 5 GHz radios.

Figure 53: AP Wireless Configuration



AP Wireless Configuration

Wireless Interface 0

VAP	SSID	Status	Association Mode	Encryption Method	802.1X	MAC Address
0	EAP9112A_11BGN_0	ap	Open	NONE	Disable	70:72:cf:00:11:70
1	EAP9112A_11BGN_1	ap	Open	NONE	Disable	xx:xx:xx:xx:xx:xx
2	EAP9112A_11BGN_2	ap	Open	NONE	Disable	xx:xx:xx:xx:xx:xx
3	EAP9112A_11BGN_3	ap	Open	NONE	Disable	xx:xx:xx:xx:xx:xx
4	EAP9112A_11BGN_4	ap	Open	NONE	Disable	xx:xx:xx:xx:xx:xx
5	EAP9112A_11BGN_5	ap	Open	NONE	Disable	xx:xx:xx:xx:xx:xx
6	EAP9112A_11BGN_6	ap	Open	NONE	Disable	xx:xx:xx:xx:xx:xx
7	EAP9112A_11BGN_7	ap	Open	NONE	Disable	xx:xx:xx:xx:xx:xx
8	EAP9112A_11BGN_8	ap	Open	NONE	Disable	xx:xx:xx:xx:xx:xx
9	EAP9112A_11BGN_9	ap	Open	NONE	Disable	xx:xx:xx:xx:xx:xx
10	EAP9112A_11BGN_10	ap	Open	NONE	Disable	xx:xx:xx:xx:xx:xx
11	EAP9112A_11BGN_11	ap	Open	NONE	Disable	xx:xx:xx:xx:xx:xx
12	EAP9112A_11BGN_12	ap	Open	NONE	Disable	xx:xx:xx:xx:xx:xx
13	EAP9112A_11BGN_13	ap	Open	NONE	Disable	xx:xx:xx:xx:xx:xx
14	EAP9112A_11BGN_14	ap	Open	NONE	Disable	xx:xx:xx:xx:xx:xx
15	EAP9112A_11BGN_15	ap	Open	NONE	Disable	xx:xx:xx:xx:xx:xx

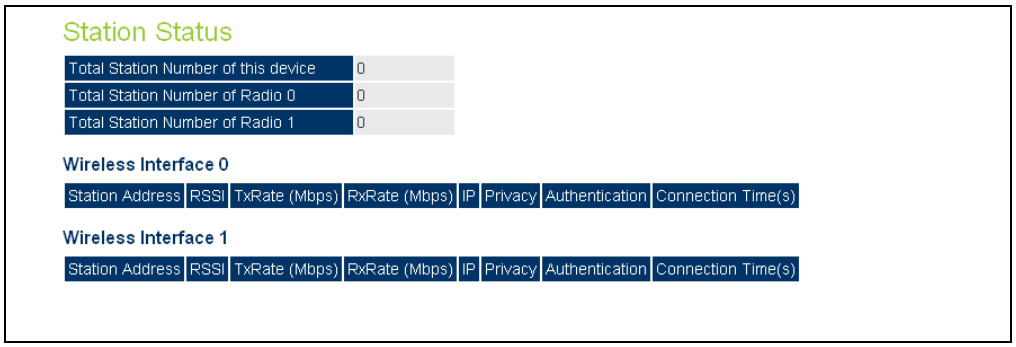
The following items are displayed on this page for the 2.4 GHz and 5 GHz radio interfaces:

- **VAP** — Displays the VAP number.
- **SSID** — The service set identifier for the VAP interface.
- **Status** — Displays the interface mode setting, either “ap”, “wds-ap”, or “wds-sta”.
- **Association Mode** — Shows the basic security mode configured for the VAP.
- **Encryption Method** — Displays the encryption method used on the interface.
- **802.1X** — Shows if IEEE 802.1X access control for wireless clients is enabled.
- **MAC Address** — Displays the MAC address of the VAP interface.

Station Status

The Station Status window shows the wireless clients currently associated with the 2.4 GHz and 5 GHz radio interfaces.

Figure 54: Station Status



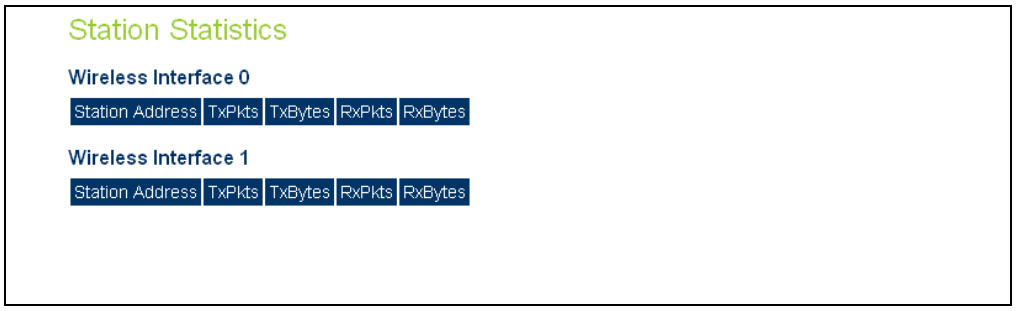
The following items are displayed on this page:

- **Total Station Number of this device** — The total number of clients associated to the AP.
- **Total Station Number of Radio 0** — The total number of clients associated to the 2.4 GHz radio.
- **Total Station Number of Radio 1** — The total number of clients associated to the 5 GHz radio.
- **Station Address** — The MAC address of the wireless client.
- **RSSI** — The Receive Signal Strength Indicator for the wireless client.
- **TxRate (Mbps)** — The data tranmit rate to the wireless client.
- **RxRate (Mbps)** — The data receive rate from the wireless client.
- **IP** — The IP address assigned to the wireless client.
- **Privacy** — The data encryption method used by the wireless client.
- **Authentication** — The authentication method used by the wireless client.
- **Connection Time** — The time the wireless client has been associated.

Station Statistics

The Station Statistics window shows the statistic information for wireless clients currently associated with the 2.4 GHz and 5 GHz radio interfaces.

Figure 55: Station Statistics



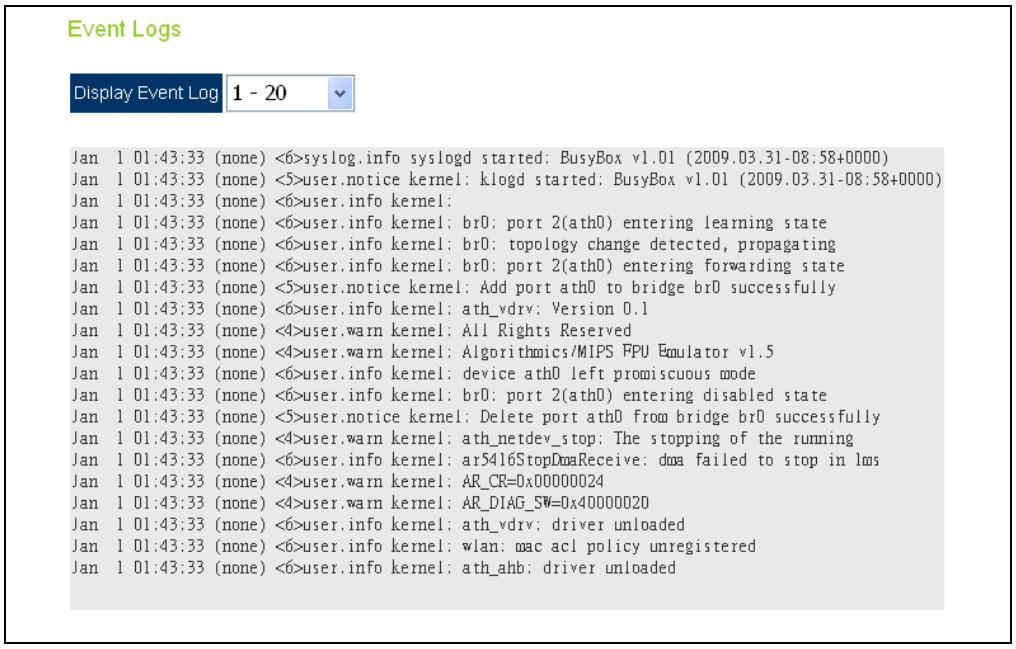
The following items are displayed on this page:

- **Station Address** — The MAC address of the wireless client.
- **TxPkts** — The number of transmitted packets from this client.
- **TxBytes** — The number of transmitted bytes from this client.
- **RxPkts** — The number of received packets from this client.
- **RxBytes** — The number of received bytes from this client.

Event Logs

The Event Logs window shows the log messages generated by the access point and stored in memory.

Figure 56: Event Logs



The following items are displayed on this page:

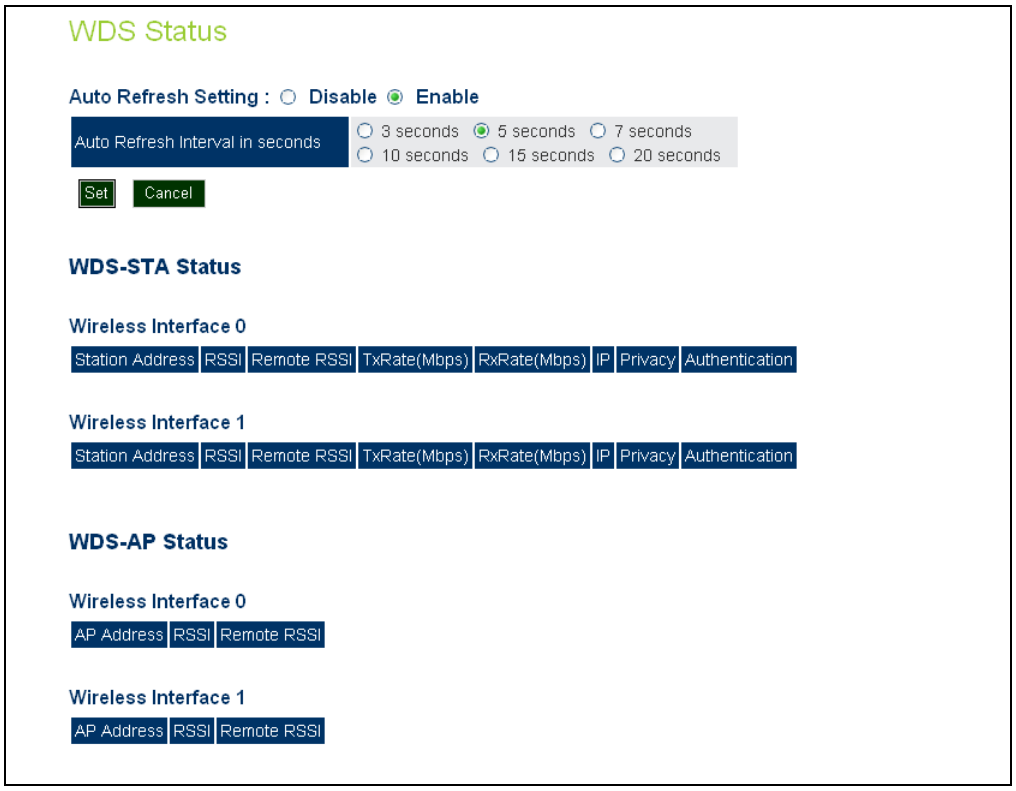
- **Display Event Log** — Selects the log entries to display. Up to 20 log messages can be displayed at one time.

  Each log entry includes the time the log message was generated, the logging level associated with the message, and the text of the log message.

WDS Status

The WDS Status window shows the WDS information for the 2.4 GHz and 5 GHz radio interfaces.

Figure 57: WDS Status



The following items are displayed on this page:

- **Auto Refresh Setting** — Enables the automatic refresh of WDS status information. When enabled, you can also set the time interval between each status refresh.
- **WDS-STA Status** — The status of other APs in WDS-STA mode connected to the AP interfaces.
  - **Station Address** — The MAC address of the AP client.
  - **RSSI** — The Receive Signal Strength Indicator of the received signal sent from the peer WDS client.
  - **Remote RSSI** — The Receive Signal Strength Indicator of the AP signal received by the peer WDS-STA client.
  - **TxRate (Mbps)** — The data tranmit rate to the AP client.

- **RxRate (Mbps)** — The data receive rate from the AP client.
- **IP** — The IP address assigned to the AP client.
- **Privacy** — The data encryption method used by the AP client.
- **Authentication** — The authentication method used by the AP client.

◆ **WDS-AP Status** — The status of other APs in WDS-AP mode connected to AP interfaces.

- **Station Address** — The MAC address of the WDS-enabled AP.
- **RSSI** — The Receive Signal Strength Indicator of the received signal sent from the peer WDS AP.
- **Remote RSSI** — The Receive Signal Strength Indicator of the AP signal received by the peer WDS-AP.

Section III

Command Line Interface

This section provides a detailed description of the Command Line Interface, along with examples for all of the commands.

This section includes these chapters:

- "Using the Command Line Interface" on page 109
- "General Commands" on page 115
- "System Management Commands" on page 119
- "System Logging Commands" on page 139
- "System Clock Commands" on page 144
- "DHCP Relay Commands" on page 149
- "SNMP Commands" on page 151
- "Flash/File Commands" on page 164
- "RADIUS Client Commands" on page 167
- "802.1X Authentication Commands" on page 173
- "MAC Address Authentication Commands" on page 175
- "Filtering Commands" on page 179
- "Spanning Tree Commands" on page 185
- "WDS Bridge Commands" on page 197
- "Ethernet Interface Commands" on page 199
- "Wireless Interface Commands" on page 206

- "Wireless Security Commands" on page 232
- "Rogue AP Detection Commands" on page 241
- "Link Integrity Commands" on page 247
- "Link Layer Discovery Commands" on page 250
- "VLAN Commands" on page 254
- "WMM Commands" on page 258
- "QoS Commands" on page 263

9 Using the Command Line Interface

When accessing the management interface for the over a direct connection to the console port, or via a Telnet connection, the access point can be managed by entering command keywords and parameters at the prompt. Using the access point's command-line interface (CLI) is very similar to entering commands on a UNIX system.

Console Connection

To access the AP through the console port, first set up a console connection to the AP. See "Console Port Connection" on page 19 for more information.

At the console prompt, enter the user name and password. (The default user name is "admin" with no default password.) After the password is entered, the CLI displays the "LevelOne#" prompt.

Example

```
(none) login: admin
Password:
Jan  1 11:33:13 login[1918]: root login on 'ttyS0'

LevelOne#
```

Note: Command examples shown later in this chapter abbreviate the console prompt to "AP" for simplicity.

Enter the necessary commands to complete your desired tasks.

When finished, exit the session with the "exit" command.

Telnet Connection

Telnet operates over the IP transport protocol. In this environment, your management station and any network device you want to manage over the network must have a valid IP address. If the access point does not acquire an IP address from a DHCP server, the default IP address used by the access point is 192.168.2.10.

To access the AP through a Telnet session, you must first set the IP address for the AP, and set the default gateway if you are managing the AP from a different IP subnet. For example:

```
AP#configure
AP(config)#interface ethernet
AP(if-ethernet)#ip address 10.1.0.1 255.255.255.0 10.1.0.254
AP(if-ethernet)#
```

After you configure the access point with an IP address, you can open a Telnet session by performing these steps.

1. From the remote host, enter the Telnet command and the IP address of the device you want to access.

2. At the prompt, enter the user name and system password. The CLI will display the "AP#" prompt to show that you are using executive access mode (that is, Exec).

```
(none) login: admin
Password:
AP#
```

3. Enter the necessary commands to complete your desired tasks.

4. When finished, exit the session with the "quit" or "exit" command.

Note: You can open up to four sessions to the device through Telnet.

Entering Commands

This section describes how to enter CLI commands.

Keywords and Arguments

A CLI command is a series of keywords and arguments. Keywords identify a command, and arguments specify configuration parameters. For example, in the command "show interfaces ethernet," **show** and **interfaces** are keywords, and ethernet is an argument that specifies the interface type.

You can enter commands as follows:

- To enter a simple command, enter the command keyword.
- To enter commands that require parameters, enter the required parameters after the command keyword. For example, to set a password for the administrator, enter:

```
AP(config)#password admin tpschris
```

Minimum Abbreviation

The CLI will accept a minimum number of characters that uniquely identify a command. For example, the command "configure" can be entered as **con**. If an entry is ambiguous, the system will prompt for further input.

Command Completion

If you terminate input with a Tab key, the CLI will print the remaining characters of a partial keyword up to the point of ambiguity. In the "configure" example, typing **con** followed by a tab will result in printing the command up to "**configure**."

Getting Help on Commands

You can display a brief description of the help system by entering the **help** command. You can also display command syntax by following a command with the "**?**" character to list keywords or parameters.

Showing Commands

If you enter a "**?**" at the command prompt, the system will display the first level of keywords for the current configuration mode (Exec, Global Configuration, or Interface). You can also display a list of valid keywords for a specific command. For example, the command "**show ?**" displays a list of possible show commands:

```
AP# show ?
  APmanagement    Show management AP information.
  authentication  Show Authentication parameters.
  bridge          Show bridge.
  config          Show current configuration.
  event-log       Show event log on console.
  filters         Show filters.
  firmware-image  Show firmware images version.
```

```
  interface       Show interface information.
  line            TTY line information.
  lldp            Show lldp parameters.
  logging         Show the logging buffers.
  long-distance   Show the outdoor parameter information.
  radius          Show radius server.
  rogue-ap        Show Rogue AP information.
  snmp            Show snmp configuration.
  sntp            Show sntp configuration.
  station         Show 802.11 station table.
  system          Show system information.
  version         Show system version.
  wds             Show WDS service.
AP: show
```

The command "**show interface ?**" will display the following information:

```
AP# show interface ?
  ethernet  Show Ethernet interface
  wireless  Show Wireless interface
AP# show interface
```

Negating the Effect of Commands

For many configuration commands you can enter the prefix keyword "no" to cancel the effect of a command or reset the configuration to the default value. For example, the **logging** command will log system messages to a host server. To disable logging, specify the **no logging** command. This guide describes the negation effect for all applicable commands.

Using Command History

The CLI maintains a history of commands that have been entered. You can scroll back through the history of commands by pressing the up arrow key. Any command displayed in the history list can be executed again, or first modified and then executed.

Understanding Command Modes

The command set is divided into Exec and Configuration classes. Exec commands generally display information on system status or clear statistical counters. Configuration commands, on the other hand, modify interface parameters or enable certain functions. These classes are further divided into different modes. Available commands depend on the selected mode. You can always enter a question mark "**?**" at the prompt to display a list of the commands available for the

current mode. The command classes and associated modes are displayed in the following table:

Table 3: Command Modes

Class	Mode
Exec	Privileged
Configuration	Global Interface-ethernet Interface-wireless Interface-wireless-vap

Exec Commands

When you open a new console session on an access point, the system enters Exec command mode. Only a limited number of the commands are available in this mode. You can access all other commands only from the configuration mode. To access Exec mode, open a new console session with the user name "admin." The command prompt displays as "AP#" for Exec mode.

```
(none) login: admin
Password: [system login password]
AP#
```

Configuration Commands

Configuration commands are used to modify access point settings. These commands modify the running configuration and are saved in memory.

The configuration commands are organized into four different modes:

- Global Configuration (GC) - These commands modify the system level configuration, and include commands such as **system name** and **password**.
- Interface-Ethernet Configuration (IC-E) - These commands modify the Ethernet port configuration, and include command such as **dns** and **ip**.
- Interface-Wireless Configuration (IC-W) - These commands modify the wireless port configuration of global parameters for the radio, and include commands such as **channel** and **beacon-interval**.
- Interface-Wireless Virtual Access Point Configuration (IC-W-VAP) - These commands modify the wireless port configuration for each VAP, and include commands such as **ssid** and **encryption**.

To enter the Global Configuration mode, enter the command **configure** in Exec mode. The system prompt will change to "AP(config)#" which gives you access privilege to all Global Configuration commands.

```
AP#configure
AP(config)#
```

To enter Interface mode, you must enter the "**interface ethernet**" while in Global Configuration mode. The system prompt will change to "AP(if-ethernet)#," or "AP(if-wireless 0)" indicating that you have access privileges to the associated commands. You can use the **exit** command to return to the Exec mode.

```
AP(config)#interface ethernet
AP(if-ethernet)#
```

Command Line Processing

Commands are not case sensitive. You can abbreviate commands and parameters as long as they contain enough letters to differentiate them from any other currently available commands or parameters. You can use the Tab key to complete partial commands, or enter a partial command followed by the "**?**" character to display a list of possible matches.

10 General Commands

This chapter details general commands that apply to the CLI.

Table 4: General Commands

Command	Function	Mode	Page
configure	Activates global configuration mode	Exec	115
end	Returns to previous configuration mode	GC, IC	116
exit	Returns to the previous configuration mode, or exits the CLI	any	116
cli-session-timeout	Sets a timeout for CLI and Telnet sessions	Exec	116
ping	Sends ICMP echo request packets to another node on the network	Exec	117
reset	Restarts the system	Exec	118
show line	Shows the configuration settings for the console port	Exec	118

configure

This command activates Global Configuration mode. You must enter this mode to modify most of the settings on the access point. You must also enter Global Configuration mode prior to enabling the context modes for Interface Configuration. See "Using the Command Line Interface" on page 109.

Default Setting

None

Command Mode

Exec

Example

```
AP#configure
AP(config)#
```

Related Commands

end

end This command returns to the previous configuration mode.

Default Setting
None

Command Mode
Global Configuration, Interface Configuration

Example
This example shows how to return to the Configuration mode from the Interface Configuration mode:

```
AP(if-ethernet)#end
AP(config)#
```

exit This command returns to the Exec mode or exits the configuration program.

Default Setting
None

Command Mode
Any

Example
This example shows how to return to the Exec mode from the Interface Configuration mode, and then quit the CLI session:

```
AP(if-ethernet)#exit
AP#exit

(none) login:
```

cli-session-timeout This command enables a timeout for console and Telnet sessions.

Syntax
cli-session-timeout <**enable** | **disable** | *value*>

enable - Enables the timeout.

disable - Disables the timeout.

value - Sets a time for the timeout (Range: 60~3600 seconds).

Default Setting
120 seconds

Command Mode
Exec

Example
The following example disables the CLI timeout.

```
AP(config)# cli-session-timeout disable
AP(config)#
```

ping
This command sends ICMP echo request packets to another node on the network.

Syntax
ping <*host_name* | *ip_address*>

host_name - Alias of the host.

ip_address - IP address of the host.

Default Setting
None

Command Mode
Exec

Command Usage
- Use the ping command to see if another site on the network can be reached.
- The following are some results of the ping command:
  - Normal response - The normal response occurs in one to ten seconds, depending on network traffic.
  - Destination does not respond - If the host does not respond, a “timeout” appears in ten seconds.
  - Destination unreachable - The gateway for this destination indicates that the destination is unreachable.
  - Network or host unreachable - The gateway found no corresponding entry in the route table.

Example
```
AP#ping 192.168.1.19
192.168.1.19 is alive
AP#
```

reset

This command restarts the system or restores the factory default settings.

Syntax

reset <**board** | **configuration** | **configuration-keep-ip**>

board - Reboots the system.

configuration - Resets the configuration settings to the factory defaults, and then reboots the system.

configuration-keep-ip - Resets the configuration settings to the factory defaults except for the IP address, and then reboots the system.

Default Setting

None

Command Mode

Exec

Command Usage

When the system is restarted, it will always run the Power-On Self-Test.

Example

This example shows how to reset the system:

```
AP#reset board
Please wait a moment...
```

show line

This command displays the console port's configuration settings.

Command Mode

Exec

Example

The console port settings are fixed at the values shown below.

```
AP#show line
Console Line Information
=======================================================
  databits   : 8
  parity     : none
  speed      : 115200
  stop bits  : 1
=======================================================
AP#
```

11 System Management Commands

These commands are used to configure the password, system logs, browser management options, clock settings, and a variety of other system information.

Table 5: System Management Commands

Command	Function	Mode	Page
country	Sets the access point country code	Exec	120
prompt	Customizes the command line prompt	GC	121
system name	Specifies the host name for the access point	GC	122
system-resource	Sets rising and falling CPU and memory thresholds	GC	122
password	Specifies the password for management access	GC	123
reboot-schedule	Restarts the AP after a specified time	GC	124
apmgmtui ssh enable	Enables the Secure Shell server	GC	124
apmgmtui ssh port	Sets the Secure Shell port	GC	125
ip telnet-server enable	Enables the Telnet server	GC	125
apmgmtip	Specifies an IP address or range of addresses allowed access to management interfaces	GC	129
apmgmtui telnet-server	Enables Telnet management access	GC	125
apmgmtui snmp	Enables SNMP management access	GC	129
apmgmtui http port	Specifies the port to be used by the web browser interface	GC	126
apmgmtui http server	Allows the access point to be monitored or configured from a browser	GC	126
apmgmtui http session-timeout	Sets the web interface timeout	GC	127
apmgmtui https port	Specifies the UDP port number used for a secure HTTP connection to the access point's Web interface	GC	127
apmgmtui https server	Enables the secure HTTP server on the access point	GC	128
show apmanagement	Shows the AP management configuration	Exec	130
show system	Displays system information	Exec	130
show system resource	Displays CPU and memory usage information	Exec	131

Table 5: System Management Commands (Continued)

Command	Function	Mode	Page
show version	Displays version information for the system	Exec	132
show config	Displays detailed configuration information for the system	Exec	132

country

This command configures the access point's country code, which identifies the country of operation and sets the authorized radio channels.

Syntax

country <*country_code*>

country_code - A two character code that identifies the country of operation. See the following table for a full list of codes.

Table 6: Country Codes

Country	Code	Country	Code	Country	Code	Country	Code
Albania	AL	Dominican Republic	DO	Kuwait	KW	Romania	RO
Algeria	DZ	Ecuador	EC	Latvia	LV	Russia	RU
Argentina	AR	Egypt	EG	Lebanon	LB	Saudi Arabia	SA
Armenia	AM	Estonia	EE	Liechtenstein	LI	Singapore	SG
Australia	AU	Finland	FI	Lithuania	LT	Slovak Republic	SK
Austria	AT	France	FR	Macao	MO	Spain	ES
Azerbaijan	AZ	Georgia	GE	Macedonia	MK	Sweden	SE
Bahrain	BH	Germany	DE	Malaysia	MY	Switzerland	CH
Belarus	BY	Greece	GR	Malta	MT	Syria	SY
Belgium	BE	Guatemala	GT	Mexico	MX	Taiwan	TW
		Honduras	HN	Monaco	MC	Thailand	TH
Belize	BZ	Hong Kong	HK	Morocco	MA	Trinidad & Tobago	TT
Bolivia	BO	Hungary	HU	Netherlands	NL	Tunisia	TN
Brazil	BR	Iceland	IS	New Zealand	NZ	Turkey	TR
Brunei Darussalam	BN	India	IN	Norway	NO	Ukraine	UA
Bulgaria	BG	Indonesia	ID	Qatar	QA	United Arab Emirates	AE
Canada	CA	Iran	IR	Oman	OM	United Kingdom	GB
Chile	CL	Ireland	IE	Pakistan	PK	United States	US

Table 6: Country Codes (Continued)

Country	Code	Country	Code	Country	Code	Country	Code
China	CN	Israel	IL	Panama	PA	Uruguay	UY
Colombia	CO	Italy	IT	Peru	PE	Uzbekistan	UZ
Costa Rica	CR	Japan	JP	Philippines	PH	Yemen	YE
Croatia	HR	Jordan	JO	Poland	PL	Venezuela	VE
Cyprus	CY	Kazakhstan	KZ	Portugal	PT	Vietnam	VN
Czech Republic	CZ	North Korea	KP	Puerto Rico	PR	Zimbabwe	ZW
Denmark	DK	Korea Republic	KR	Slovenia	SI		
Elsalvador	SV	Luxembourg	LU	South Africa	ZA		

Default Setting

US - for units sold in the United States
99 (no country set) - for units sold in other countries

Command Mode

Exec

Command Usage

- If you purchased an access point outside of the United States, the country code must be set before radio functions are enabled.
- The available Country Code settings can be displayed by using the **country ?** command.

Example

```
AP#country tw
AP#
```

prompt

This command customizes the CLI prompt. Use the **no** form to restore the default prompt.

Syntax

prompt <*string*>
no prompt

string - Any alphanumeric string to use for the CLI prompt. (Maximum length: 32 characters)

Default Setting
Enterprise AP

Command Mode
Global Configuration

Example

```
AP(config)#prompt RD2
RD2(config)#
```

system name

This command specifies or modifies the system name for this device.

Syntax

system name <*name*>

name - The name of this host.
(Maximum length: 32 characters)

Default Setting
Enterprise AP

Command Mode
Global Configuration

Example

```
AP(config)#system name AP
AP(config)#
```

system-resource

This command sets CPU and memory rising and falling thresholds that monitor system resources.

Syntax

system-resource threshold <*cpu-rising*> <*cpu-falling*> <*memory-rising*> <*memory-falling*> <*interval*>

threshold - Keyword that sets CPU and memory threshold values.

cpu-rising - The CPU utilization rising threshold as a percentage.
(Range: 1-100 percent, 0 is disabled)

cpu-falling - The CPU utilization falling threshold as a percentage.
(Range: 0 to less than the CPU rising threshold)

memory-rising - The memory utilization rising threshold in Kbytes.
(Range: 1-113076 Kbytes, 0 is disabled)

memory-falling - The memory utilization falling threshold in Kbytes. (Range: 0 to less than the memory rising threshold)

interval - The utilization check interval in seconds. (Range: 1 to 86400 seconds, 0 is disabled)

Default Setting

CPU Rising Threshold: 0 (disabled)
CPU Falling Threshold: 20 percent
Memory Rising Threshold: 0 (disabled)
Memory Falling Threshold: 16000 Kbytes
Threshold Interval: 0 (disabled)

Command Mode

Global Configuration

Command Usage

- When the CPU rising threshold is exceeded, a "CPU Busy" SNMP trap message is sent (only sent once). When the CPU utilization then drops below the falling threshold, a "CPU Free" trap message is sent .
- When the memory rising threshold is exceeded, a "Memory Overload" SNMP trap message is sent (only sent once). When the memory utilization then drops below the falling threshold, a "Memory Free" trap message is sent .

Example

```
AP(config)# system-resource threshold 80 20 100000 16000 20
AP(config)#
```

password

After initially logging onto the system, you should set the access passwords. Remember to record them in a safe place.

Syntax

password <**admin** | **guest**> <*old-password*> <*new-password*>

admin - The keyword for the administrator password.

guest - The keyword for the guest password

old-password - The current password for management access. When there is no password set, enter the string "null".
(Length: 5-32 characters, case sensitive)

new-password - The new password for management access.
(Length: 5-32 characters, case sensitive)

Default Setting
None. There are no admin or guest passwords.

Command Mode
Global Configuration

Example

```
AP(config)#password admin null tpschris
AP(config)#
```

reboot-schedule

This command restarts the system after a scheduled time.

Syntax

reboot-schedule {**fixed-time** <*day*><*hour*><*minutes*> | **countdown** <*minutes*> | **disable**}

fixed-time - Reboots after a specified time in days, hours, and minutes.

countdown - Reboots after a specified coundown time in minutes.

disable - Disables the reboot schedule.

Default Setting
Disabled

Command Mode
Global Configuration

Command Usage
When the system is restarted, it will always run the Power-On Self-Test.

Example
This example shows how to set a scheduled reboot time:

```
AP(config)# reboot-schedule fixed-time 1 2 3
AP(config)#
```

apmgmtui ssh enable

This command enables the Secure Shell server. Use the **no** form to disable the server.

Syntax

apmgmtui ssh enable
no apmgmtui ssh-server

Default Setting
Enabled

Command Mode
Global Configuration

Command Usage
- The access point supports Secure Shell version 2.0 only.
- After boot up, the SSH server needs about two minutes to generate host encryption keys. The SSH server is disabled while the keys are being generated. The **show system** command displays the status of the SSH server.

Example
```
AP(config)# apmgmtui ssh enable
AP(config)#
```

apmgmtui ssh port
This command sets the Secure Shell server port.

Syntax
apmgmtui ssh port <*port-number*>

port-number - The UDP port used by the SSH server. (Range: 1-65535)

Default Setting
22

Command Mode
Global Configuration

Example
```
AP(config)# apmgmtui ssh port 1124
AP(config)#
```

apmgmtui telnet-server enable
This command enables the Telnet server. Use the **no** form to disable the server.

Syntax
apmgmtui telnet-server enable
no apmgmtui telnet-server

Default Setting
Interface enabled

Command Mode
Global Configuration

Example

```
AP(config)# apmgmtui telnet-server enable
AP(config)#
```

apmgmtui http port

This command specifies the TCP port number used by the web browser interface. Use the **no** form to use the default port.

Syntax

apmgmtui http port <*port-number*>
no apmgmtui http port

port-number - The TCP port to be used by the browser interface. (Range: 80 or 1024-65535)

Default Setting
80

Command Mode
Global Configuration

Example

```
AP(config)# apmgmtui http port 769
AP(config)
```

Related Commands
apmgmtui http server

apmgmtui http server

This command allows this device to be monitored or configured from a web browser. Use the **no** form to disable this function.

Syntax

[no] apmgmtui http server

Default Setting
Enabled

Command Mode
Global Configuration

Example

```
AP(config)# apmgmtui http server
AP(config)#
```

Related Commands
apmgmtui http port

apmgmtui http session-timeout

This command sets the web browser timeout limit.

Syntax

apmgmtui http session-timeout <*seconds*>

seconds - The web session timeout. (Range: 0-1800 seconds, 0 means disabled)

Default Setting
1800 seconds

Command Mode
Global Configuration

Example

```
AP(config)# apmgmtui http session-timeout 0
AP(config)#
```

Related Commands
apmgmtui http server

apmgmtui https port

Use this command to specify the UDP port number used for HTTPS/SSL connection to the access point's web interface. Use the **no** form to restore the default port.

Syntax

apmgmtui https port <*port_number*>
no apmgmtui https port

port_number – The UDP port used for HTTPS/SSL. (Range: 443, 1024-65535)

Default Setting
443

Command Mode
Global Configuration

Command Usage
- You cannot configure the HTTP and HTTPS servers to use the same port.
- To avoid using common reserved TCP port numbers below 1024, the configurable range is restricted to 443 and between 1024 and 65535.
- If you change the HTTPS port number, clients attempting to connect to the HTTPS server must specify the port number in the URL, in this format: **https://***device***:***port_number*

Example

```
AP(config)# apmgmtui https port 1234
AP(config)#
```

apmgmtui https server

Use this command to enable the secure hypertext transfer protocol (HTTPS) over the Secure Socket Layer (SSL), providing secure access (that is, an encrypted connection) to the access point's web interface. Use the **no** form to disable this function.

Syntax

[no] apmgmtui https server

Default Setting
Enabled

Command Mode
Global Configuration

Command Usage
- Both HTTP and HTTPS service can be enabled independently.
- If you enable HTTPS, you must indicate this in the URL: **https://***device*:*port_number*]
- When you start HTTPS, the connection is established in this way:
  - The client authenticates the server using the server's digital certificate.
  - The client and server negotiate a set of security protocols to use for the connection.
  - The client and server generate session keys for encrypting and decrypting data.

- The client and server establish a secure encrypted connection. A padlock icon should appear in the status bar for Internet Explorer.

Example

```
AP(config)# apmgmtui https server
AP(config)#
```

apmgmtui snmp

This command enables and disables SNMP management access to the AP.

Syntax

apmgmtui snmp [**enable** | **disable**]

enable - Enables SNMP management access.

disable - Disables SNMP management access.

Default Setting

Enabled

Command Mode

Global Configuration

Example

```
AP(config)# apmgmtui snmp enable
AP(config)#
```

apmgmtip

This command specifies the client IP addresses that are allowed management access to the access point through various protocols.

Note: Secure Web (HTTPS) connections are not affected by the UI Management or IP Management settings.

Syntax

apmgmtip [**multiple <***ip-address*> <*subnet-mask*> | **single** <*ip-address*> | **any**]

multiple - Adds IP addresses within a specifiable range to the SNMP, web and Telnet groups.

single - Adds an IP address to the SNMP, web and Telnet groups.

any - Allows any IP address access through SNMP, web and Telnet groups.

ip-address - Adds IP addresses to the SNMP, web and Telnet groups.

subnet-mask - Specifies a range of IP addresses allowed management access.

Default Setting
All addresses

Command Mode
Global Configuration

Command Usage
- If anyone tries to access a management interface on the access point from an invalid address, the unit will reject the connection, enter an event message in the system log, and send a trap message to the trap manager.
- Management access applies to SNMP, HTTP (web), Telnet, and SSH connections.

Example
This example restricts management access to the specified addresses.

```
AP(config)#apmgmtip multiple 192.168.1.50 255.255.255.0
AP(config)#
```

show apmanagement
This command shows the AP management configuration, including the IP addresses of management stations allowed to access the AP, and the protocols that are open to management access.

Command Mode
Exec

Example

```
AP#show apmanagement
================================
AP Management IP Mode: static
Telnet UI: Enable
WEB UI   : Enable
SNMP UI  : Enable
================================
AP#
```

show system
This command displays basic system configuration settings.

Command Mode
Exec

Example

```
AP#show system

System Information
============================================================
Serial Number          : AC25123456
System Up time         : 1 min
System Name            : WAB-7100
System Location        : where?
System Contact         : who?
System Country Code    : TW - Taiwan
MAC Address            : 70:72:CF:00:11:70
Radio 0 MAC Address    : 70:72:CF:00:11:70
Radio 1 MAC Address    : 70:72:CF:00:11:80
IP Address             : 192.168.2.10
Subnet Mask            : 255.255.255.0
Default Gateway        : 192.168.2.254
Management IP          : 192.168.1.10
Management Subnet      : 255.255.255.0
IPv6 Address           : 2001:db8::1
IPv6 Subnet Mask       : 64
IPv6 Gateway           : 2001:db8::2
VLAN Status            : Disable
Management VLAN ID(AP): 4093
Native VLAN ID(AP)     : 1
DHCP Client            : static
HTTP Access            : Enable
HTTP Port              : 80
HTTP Timeout           : 1800
HTTPs Access           : Enable
HTTPs Port             : 443
SSH Access             : Enable
SSH Port               : 22
Telnet Access          : Enable
Telnet Port            : 23
Slot Status            : Dual band(a/g)
Boot Rom Version       : U-Boot 1.1.4 r1.4
Software Version       : 0.3.3.4
Hardware Version       : R0b
Part Number            :
Production Date        : 2012/06/01
User Name              : admin
Reboot scheduling      : disable
============================================================
AP#
```

show system resource

This command displays CPU and memory usage information for the system.

Command Mode

Exec

Example

```
AP#show system resource
=============== CPU ========================================
user (%)              0.00
nice (%)              0.00
system (%)            7.92
```

```
iowait (%)           0.00
idle (%)             92.08
=============== Memory ====================================
free (kb)            95820
used (kb)            17256
used (%)             15.26
cached (kb)          4900
============================================================
AP#
```

show version

This command displays the software version for the system.

Command Mode

Exec

Example

```
AP#show version
Boot Rom Version      : U-Boot 1.1.4 r1.4
Software Version      : 0.3.3.4
Hardware Version      : R0b
AP#
```

show config

This command displays detailed configuration information for the system.

Command Mode

Exec

Example

```
AP#show config

System Information
============================================================
Serial Number         : AC25123456
System Up time        : 1 min
System Name           : WAB-7100
System Location       : where?
System Contact        : who?
System Country Code   : TW - Taiwan
MAC Address           : 70:72:CF:00:11:70
Radio 0 MAC Address   : 70:72:CF:00:11:70
Radio 1 MAC Address   : 70:72:CF:00:11:80
IP Address            : 192.168.2.10
Subnet Mask           : 255.255.255.0
Default Gateway       : 192.168.2.254
Management IP         : 192.168.1.10
Management Subnet     : 255.255.255.0
IPv6 Address          : 2001:db8::1
IPv6 Subnet Mask      : 64
IPv6 Gateway          : 2001:db8::2
VLAN Status           : Disable
Management VLAN ID(AP): 4093
Native VLAN ID(AP)    : 1
DHCP Client           : static
```

```
HTTP Access           : Enable
HTTP Port             : 80
HTTP Timeout          : 1800
HTTPs Access          : Enable
HTTPs Port            : 443
SSH Access            : Enable
SSH Port              : 22
Telnet Access         : Enable
Telnet Port           : 23
Slot Status           : Dual band(a/g)
Boot Rom Version      : U-Boot 1.1.4 r1.4
Software Version      : 0.3.3.4
Hardware Version      : R0b
Part Number           :
Production Date       : 2012/06/01
User Name             : admin
Reboot scheduling     : disable

============================================================

SVP Information
============================================================
SVP:    Enabled
============================================================

SNTP Information
============================================================
Service State        : ENABLED
SNTP (server 1) IP   : 129.6.15.28
SNTP (server 2) IP   : 132.163.4.101
Current Time         : Thu Jan  1 08:07:56 CST 1970
Time Zone            : (GMT+08) Taiwan : Taipei
Daylight Saving      : DISABLED
Daylight Saving Time : From MAR, Fourth Week, Wednesday To NOV, Last Week,
  Sunday
============================================================

SNMP Information
============================================
Service State                 : Enable
Community (ro)                : *******
Community (rw)                : ********
Location                      : where?
Contact                       : who?
============================================


Trap Destination List:
============================================
There is no SNMP Trap Host.
============================================

Trap Configuration:
================================================================================
                  systemUp: Disabled                  systemDown: Disabled
================================================================================

View List:
==================================
There is no view.
==================================


Group List:
==================================
```

```
There is no group.
==================================

User List:
==================================
There is no SNMPv3 User.
==================================

Target List:
==================================
There is no SNMP target.
==================================

Filter List:
==================================
There is no notification filter.
==================================

Bridge STP Information
==================================
Bridge MAC            : 70:72:CF:00:11:70
Status                : Disabled
priority              : 32768
Hello Time            : 2 seconds
Maximum Age           : 20 seconds
Forward Delay         : 15 seconds
==================================

Bridge Aging Time Information
============================================================
Aging time:  20
============================================================

Logging Information
========================================================
Syslog State                    : DISABLE
Logging Console State           : DISABLE
Logging Level                   : Debug
Servers
1: 10.7.16.98, UDP Port: 514, State: DISABLE
2: 10.7.13.48, UDP Port: 514, State: DISABLE
3: 10.7.123.123, UDP Port: 514, State: DISABLE
4: 10.7.13.77, UDP Port: 514, State: DISABLE
========================================================

Protocol Filter Information
================================================================================
Local Bridge         :DISABLED
access-limitation    :DISABLED
dhcp                 :DISABLED
EtherType Filter     :DISABLED

Enabled EtherType Filters
--------------------------------------------------------------------------------
================================================================================

ACL Information
========================================
Source Filter :DISABLED
Source MAC    :

========================================

ACL Information
========================================
```

```
Destination Filter :DISABLED
Destination MAC    :

========================================

Console Line Information
============================================================
  databits   : 8
  parity     : none
  speed      : 115200
  stop bits  : 1
============================================================

Ethernet Interface Information
======================================
IP Address          : 192.168.2.10
Subnet Mask         : 255.255.255.0
Default Gateway     : 192.168.2.254
Primary DNS         :
Secondary DNS       :
IPv6 Address        : 2001:db8::1
IPv6 Subnet Mask    : 64
IPv6 Gateway        : 2001:db8::2
IPv6 Primary DNS    :
IPv6 Secondary DNS  :
Admin status        : Up
Operational status  : Up
======================================

------------------------------Basic Setting--------------------------------
SSID                                  : EAP9112A_11BGN_0
Wireless Network Mode                 : 11ng
Auto Channel Select                   : DISABLE
Channel                               : 6
High Throughput Mode                  : HT20
Allowed Rates                         :
  1,2,5.5,6,9,11,12,18,24,36,48,54,MCS0,MCS1,MCS2,MCS3,MCS4,MCS5,MCS6,MCS7,MC
  S8,MCS9,MCS10,MCS11,MCS12,MCS13,MCS14,MCS15
Status                                : ENABLE
MAC Address                           : 70:72:CF:00:11:70
VLAN-ID                               : 1
Dhcp-Relay Server Ip                  : 0.0.0.0
--------------------------------Capacity-----------------------------------
Maximum Association Client Per Vap    : 16 Clients
Maximum Association Client Per Radio  : 127 Clients
-----------------------------802.11 Parameters-----------------------------
Transmit Power                        : 100%(Tx dBm)
Preamble Length                       : Short-or-Long
Fragmentation Threshold               : 2346
RTS Threshold                         : 2346
Beacon Interval                       : 100
Authentication Timeout Interval       : 3 Mins
Association Timeout Interval          : 5 Mins
DTIM Interval                         : 1
Short Guard Interval Status           : Disabled
A-MPDU Status                         : Enabled
A-MPDU Length Limit                   : 65535 Bytes
A-MSDU Status                         : Enabled
Disable HT20/H40 coexistence          : n

--------------------------------Security-----------------------------------


Closed System                         : DISABLE
WPA Function                          : OPEN-SYSTEM, WPA FUNCTION DISABLE
```

```
WPA PSK Key Type                          : ascii
WPA PSK Key                               : ********
Default Transmit Key                      : 1
Static WEP Keys
Key 1                                     : *****
Key 2                                     : *****
Key 3                                     : *****
Key 4                                     : *****
Pre-Authentication                        : DISABLE
---------------------------------802.1x-----------------------------------
802.1x                                    : DISABLE
802.1x Reauthentication Time Value        : 3600 seconds

--------------------Bandwidth Control for Uplink/Downlink------------------
Bandwidth Control for Uplink              : DISABLE
Bandwidth Control for Uplink rate         : 100 Kbyte/s
Bandwidth Control for Downlink            : DISABLE
Bandwidth Control for Downlink rate       : 100 Kbyte/s

-------------------------------Qos Mapping--------------------------------
Qos Mapping for vap to 802.1p             : DISABLE
User Priority for vap to 802.1p           : 0
Qos Mapping for 802.1d to 802.1p          : DISABLE
Template Name for 802.1d to 802.1p        : default_up_mapping_1
Template Priority for 802.1d to 802.1p    : 01234567
Qos Mapping for 802.1d to DSCP            : DISABLE
Template Name for 802.1d to DSCP          : default_up_mapping_1
Template Priority for 802.1d to DSCP      : 01234567



----------------------------Quality of Service----------------------------
WMM Mode                                  : ENABLED

WMM Acknowledge Policy
AC0(BE)                                   : Acknowledge
AC1(BK)                                   : Acknowledge
AC2(VI)                                   : Acknowledge
AC3(VO)                                   : Acknowledge
WMM AP Parameters:
AC0(BE)  CwMin:   4  CwMax:   6  AIFSN:   3  TXOP Limit:   0
AC1(BK)  CwMin:   4  CwMax:  10  AIFSN:   7  TXOP Limit:   0
AC2(VI)  CwMin:   3  CwMax:   4  AIFSN:   1  TXOP Limit:3008
AC3(VO)  CwMin:   2  CwMax:   3  AIFSN:   1  TXOP Limit:1504
WMM BSS Parameters:
AC0(BE)  CwMin:   4  CwMax:  10  AIFSN:   3  TXOP Limit:   0  ACM:Disabled
AC1(BK)  CwMin:   4  CwMax:  10  AIFSN:   7  TXOP Limit:   0  ACM:Disabled
AC2(VI)  CwMin:   3  CwMax:   4  AIFSN:   2  TXOP Limit:3008  ACM:Disabled
AC3(VO)  CwMin:   2  CwMax:   3  AIFSN:   2  TXOP Limit:1504  ACM:Disabled

-----------------------------Basic Setting-------------------------------
SSID                                      : WAB-7100_A0 : 11na
Wireless Network Mode                     : DISABLE
Auto Channel Select                       : 56
Channel                                   : HT20
High Throughput Mode                      :
Allowed Rates
  1,2,5.5,6,9,11,12,18,24,36,48,54,MCS0,MCS1,MCS2,MCS3,MCS4,MCS5,MCS6,MCS7,MC
  S8,MCS9,MCS10,MCS11,MCS12,MCS13,MCS14,MCS15
Status                                    : ENABLE
MAC Address                               : 70:72:CF:00:11:80
VLAN-ID                                   : 1
Dhcp-Relay Server Ip                      : 0.0.0.0
-------------------------------Capacity----------------------------------
Maximum Association Client Per Vap        : 16 Clients
```

```
Maximum Association Client Per Radio    : 127 Clients
----------------------------802.11 Parameters----------------------------
Transmit Power                          : 100%(Tx dBm)
Fragmentation Threshold                 : 2346
RTS Threshold                           : 2346
Beacon Interval                         : 100
Authentication Timeout Interval         : 3 Mins
Association Timeout Interval            : 5 Mins
DTIM Interval                           : 1
Short Guard Interval Status             : Disabled
A-MPDU Status                           : Enabled
A-MPDU Length Limit                     : 65535 Bytes
A-MSDU Status                           : Enabled
Disable HT20/H40 coexistence            : n

---------------------------------Security---------------------------------
Closed System                           : DISABLE


WPA Function                            : OPEN-SYSTEM, WPA FUNCTION DISABLE
WPA PSK Key Type                        : ascii
WPA PSK Key                             : ********
Default Transmit Key                    : 1
Static WEP Keys
Key 1                                   : *****
Key 2                                   : *****
Key 3                                   : *****
Key 4                                   : *****
Pre-Authentication                      : DISABLE
---------------------------------802.1x---------------------------------
802.1x                                  : DISABLE
802.1x Reauthentication Time Value      : 3600 seconds

------------------Bandwidth Control for Uplink/Downlink------------------
Bandwidth Control for Uplink            : DISABLE
Bandwidth Control for Uplink rate       : 100 Kbyte/s
Bandwidth Control for Downlink          : DISABLE
Bandwidth Control for Downlink rate     : 100 Kbyte/s

-----------------------------Qos Mapping-----------------------------
Qos Mapping for vap to 802.1p           : DISABLE
User Priority for vap to 802.1p         : 0
Qos Mapping for 802.1d to 802.1p        : DISABLE
Template Name for 802.1d to 802.1p      : default_up_mapping_1
Template Priority for 802.1d to 802.1p  : 01234567
Qos Mapping for 802.1d to DSCP          : DISABLE
Template Name for 802.1d to DSCP        : default_up_mapping_1
Template Priority for 802.1d to DSCP    : 01234567



---------------------------Quality of Service---------------------------
WMM Mode                                : ENABLED

WMM Acknowledge Policy
AC0(BE)                                 : Acknowledge
AC1(BK)                                 : Acknowledge
AC2(VI)                                 : Acknowledge
AC3(VO)                                 : Acknowledge
WMM AP Parameters:
AC0(BE)  CwMin:   4  CwMax:   6  AIFSN:   3  TXOP Limit:   0
AC1(BK)  CwMin:   4  CwMax:  10  AIFSN:   7  TXOP Limit:   0
AC2(VI)  CwMin:   3  CwMax:   4  AIFSN:   1  TXOP Limit:3008
AC3(VO)  CwMin:   2  CwMax:   3  AIFSN:   1  TXOP Limit:1504
WMM BSS Parameters:
```

```
AC0(BE)  CwMin:   4  CwMax:  10  AIFSN:   3  TXOP Limit:   0  ACM:Disabled
AC1(BK)  CwMin:   4  CwMax:  10  AIFSN:   7  TXOP Limit:   0  ACM:Disabled
AC2(VI)  CwMin:   3  CwMax:   4  AIFSN:   2  TXOP Limit:3008  ACM:Disabled
AC3(VO)  CwMin:   2  CwMax:   3  AIFSN:   2  TXOP Limit:1504  ACM:Disabled

LLDP Information
=================================================================
Status                                  :Disabled
Message Transmission Hold Time          :4
Message Transmission Interval (seconds) :30
Reinitial Delay Time (seconds)          :2
Transmission Delay Value (seconds)      :2
=================================================================

Radius Accounting Information
=============================================
Status          : DISABLED
IP              : 10.7.16.96
Shared Secret   : ********
Port            : 1813
timeout-interim : 300
=============================================

Radius Primary Server Information
=============================================
Status : ENABLED
IP     : 10.7.16.96
Port   : 1812
Shared Secret : ********
=============================================

Radius Secondary Server Information
=============================================
Status : ENABLED
IP     : 10.7.16.96
Port   : 1812
Shared Secret : ***
=============================================


AP#
```

12 System Logging Commands

These commands are used to configure system logging on the access point.

Table 7: System Management Commands

Command	Function	Mode	Page
logging on	Controls logging of error messages	GC	139
logging host	Adds a syslog server host IP address that will receive logging messages	GC	140
logging console	Initiates logging of error messages to the console	GC	140
logging level	Defines the minimum severity level for event logging	GC	141
logging clear	Clears all log entries in access point memory	GC	141
show logging	Displays the state of logging	Exec	142
show event-log	Displays all log entries in access point memory	Exec	142

logging on

This command controls logging of error messages; i.e., sending debug or error messages to memory. The **no** form disables the logging process.

Syntax

[**no**] **logging on**

Default Setting

Disabled

Command Mode

Global Configuration

Command Usage

The logging process controls error messages saved to memory. You can use the **logging level** command to control the type of error messages that are stored in memory.

Example

```
AP(config)#logging on
AP(config)#
```

logging host

This command specifies syslog servers host that will receive logging messages. Use the **no** form to remove syslog server host.

Syntax

logging host <**1** | **2** | **3** | **4**> <*host_name* | *host_ip_address*> [*udp_port*]
no logging host <**1** | **2** | **3** | **4**>

1 - First syslog server.

2 - Second syslog server.

3 - Third syslog server.

4 - Fourth syslog server.

host_name - The name of a syslog server. (Range: 1-20 characters)

host_ip_address - The IP address of a syslog server.

udp_port - The UDP port used by the syslog server.

Default Setting

None

Command Mode

Global Configuration

Example

```
AP(config)#logging host 1 10.1.0.3
AP(config)#
```

logging console

This command initiates logging of error messages to the console. Use the **no** form to disable logging to the console.

Syntax

[no] logging console

Default Setting

Disabled

Command Mode

Global Configuration

Example

```
AP(config)#logging console
AP(config)#
```

logging level

This command sets the minimum severity level for event logging.

Syntax

logging level <**Emergency** | **Alert** | **Critical** | **Error** | **Warning** | **Notice** | **Informational** | **Debug**>

Default Setting

Informational

Command Mode

Global Configuration

Command Usage

Messages sent include the selected level down to Emergency level.

Table 8: Logging Levels

Level Argument	Description
Emergency	System unusable
Alert	Immediate action needed
Critical	Critical conditions (e.g., memory allocation, or free memory error - resource exhausted)
Error	Error conditions (e.g., invalid input, default used)
Warning	Warning conditions (e.g., return false, unexpected return)
Notice	Normal but significant condition, such as cold start
Informational	Informational messages only
Debug	Debugging messages

Example

```
AP(config)#logging level alert
AP(config)#
```

logging clear

This command clears all log messages stored in the access point's memory.

Syntax

logging clear

Command Mode

Global Configuration

Example

```
AP(config)#logging clear
AP(config)#
```

show logging

This command displays the logging configuration.

Syntax

show logging

Command Mode

Exec

Example

```
AP#show logging

Logging Information
=================================================
Syslog State                    : ENABLE
Logging Console State           : DISABLE
Logging Level                   : Debug
Servers
1: 10.7.16.98, UDP Port: 514, State: DISABLE
2: 10.7.13.48, UDP Port: 514, State: DISABLE
3: 10.7.123.123, UDP Port: 65535, State: DISABLE
4: 10.7.13.77, UDP Port: 5432, State: DISABLE
=================================================
AP#
```

show event-log

This command displays log messages stored in the access point's memory.

Syntax

show event-log

Command Mode

Exec

Example

```
AP#show event-log
Jan  1 05:45:50 (none) <6>user.info kernel: ar5416Reset Setting CFG 0x10a
Jan  1 05:45:50 (none) <6>user.info kernel: Howl Revision ID 0xb9
Jan  1 05:45:50 (none) <6>user.info kernel: ar5416Reset Setting CFG 0x10a
Jan  1 05:45:50 (none) <6>user.info kernel: Howl Revision ID 0xb9
Jan  1 05:45:50 (none) <6>user.info kernel: MBSSID Set bit 22 of AR_STA_ID
  0xb8c1817b
Jan  1 05:45:50 (none) <6>user.info kernel: Force rf_pwd_icsyndiv to 2 on 2462
  (1 0)
```

```
AP#
```

13 System Clock Commands

These commands are used to configure SNTP and system clock settings on the access point.

Table 9: System Clock Commands

Command	Function	Mode	Page
sntp-server ip	Specifies one or more time servers	GC	144
sntp-server enabled	Accepts time from the specified time servers	GC	145
sntp-server date-time	Manually sets the system date and time	GC	145
sntp-server daylight-saving	Sets the start and end dates for daylight savings time	GC	146
sntp-server timezone	Sets the time zone for the access point's internal clock	GC	147
show sntp	Shows current SNTP configuration settings	Exec	147

sntp-server ip

This command sets the IP address of the servers to which SNTP time requests are issued. Use the this command with no arguments to clear all time servers from the current list.

Syntax

sntp-server ip <**1** | **2**> <*ip*>

1 - First time server.

2 - Second time server.

ip - IP address of an time server (NTP or SNTP).

Default Setting

129.6.15.28
132.163.4.101

Command Mode

Global Configuration

Command Usage

When SNTP client mode is enabled using the **sntp-server enabled** command, the **sntp-server ip** command specifies the time servers from which the access point polls for time updates. The access point will poll the time servers in the order specified until a response is received.

Example

```
AP(config)#sntp-server ip 1 10.1.0.19
AP#
```

Related Commands

sntp-server enabled
show sntp

sntp-server enabled

This command enables SNTP client requests for time synchronization with NTP or SNTP time servers specified by the **sntp-server ip** command. Use the **no** form to disable SNTP client requests.

Syntax

[no] sntp-server enabled

Default Setting

Enabled

Command Mode

Global Configuration

Command Usage

The time acquired from time servers is used to record accurate dates and times for log events. Without SNTP, the access point only records the time starting from the factory default set at the last bootup (i.e., 00:14:00, January 1, 1970).

Example

```
AP(config)#sntp-server enabled
AP(config)#
```

Related Commands

sntp-server ip
show sntp

sntp-server date-time

This command sets the system clock.

Syntax

sntp-server <*year*> <*month*> <*day*> <*hour*> <*minute*>

year - Sets the year. (Range: 1970-2100)

month - Sets the month. (Range: 1-12)

day - Sets the day. (Range: 1-31)

hour - Sets the hour. (Range: 0-23)

minute - Sets the minute. (Range: 0-59)

Default Setting
00:14:00, January 1, 1970

Command Mode
Global Configuration

Example
This example sets the system clock to 12:10 April 27, 2009.

```
AP(config)# sntp-server date-time 2009 4 27 12 10
AP(config)#
```

Related Commands
sntp-server enabled

sntp-server daylight-saving

This command sets the start and end dates for daylight savings time. Use the **no** form to disable daylight savings time.

Syntax

sntp-server daylight-saving [**date-week** <*start-month*> <*start-week*> <*start-day*> <*end-month*> <*end-week*> <*end-day*>]
no sntp-server daylight-saving

date-week - The key word to set the date on which to start and end the daylight-saving time.

start-month - Sets the start month. (Range: 1-12)

start-week - Sets the start week. (Range: 1-5)

start-day - Sets the start day. (Range: 0-6, where 0 is Sunday)

end-month - Sets the end month. (Range: 1-12)

end-week - Sets the end week. (Range: 1-5)

end-day - Sets the end day. (Range: 0-6, where 0 is Sunday)

Default Setting
Disabled

Command Mode
Global Configuration

Command Usage
- The command sets the system clock back one hour during the specified period.

- Using the command without setting the start and end date enables the daylight-saving feature.

Example

This sets daylight savings time to be used from the Sunday in the fourth week of April, to the Sunday in the fourth week of October.

```
AP(config)# sntp-server daylight-saving date-week 4 4 0 10 4 0
AP(config)#
```

sntp-server timezone

This command sets the time zone for the access point's internal clock.

Syntax

sntp-server timezone <*hours*>

hours - Number of hours before/after UTC.
(Range: -12 to +12 hours)

Default Setting

+08 hours (Hong Kong, Perth, Singapore, Taipei)

Command Mode

Global Configuration

Command Usage

This command sets the local time zone relative to the Coordinated Universal Time (UTC, formerly Greenwich Mean Time or GMT), based on the earth's prime meridian, zero degrees longitude. To display a time corresponding to your local time, you must indicate the number of hours and minutes your time zone is east (before) or west (after) of UTC.

Example

```
AP(config)#sntp-server timezone +8
AP(config)#
```

show sntp

This command displays the current time and configuration settings for the SNTP client.

Command Mode

Exec

Example

```
AP#show sntp
```

```
SNTP Information
============================================================
Service State         : ENABLED
SNTP (server 1) IP    : 129.6.15.28
SNTP (server 2) IP    : 132.163.4.101
Current Time          : Mon Apr 27 13:39:23 UTC 2009
Time Zone             : (GMT+08) Hong Kong, Perth, Singapore, Taipei
Daylight Saving       : DISABLED
Daylight Saving Time  : From MAR, Fourth Week, Wednesday To NOV, Last Week,
  Sunday
============================================================
AP#
```

14 DHCP Relay Commands

Dynamic Host Configuration Protocol (DHCP) can dynamically allocate an IP address and other configuration information to network clients that broadcast a request. To receive the broadcast request, the DHCP server would normally have to be on the same subnet as the client. However, when the access point's DHCP relay agent is enabled, received client requests can be forwarded directly by the access point to a known DHCP server on another subnet. Responses from the DHCP server are returned to the access point, which then broadcasts them back to clients.

Table 10: DHCP Relay Commands

Command	Function	Mode	Page
dhcp-relay server	Sets the DHCP server address and enables the DHCP relay agent	IC-W-VAP	149

dhcp-relay server

This command configures the DHCP server address and enables the DHCP relay agent.

Syntax

dhcp-relay server <*ip_address*>

ip_address - IP address of the DHCP server.

Default Setting

0.0.0.0 (disabled)

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

- For the DHCP relay agent to function, the DHCP server IP address must be configured. The default IP address "0.0.0.0" disables the DHCP relay agent.
- To view the DHCP relay status, use the **show interface wireless** command.

Example

```
AP(if-wireless 0: VAP[0])# dhcp-relay server 192.168.1.10
AP(if-wireless 0: VAP[0])#
```

Related Commands
show interface wireless

15 SNMP Commands

Controls access to this access point from management stations using the Simple Network Management Protocol (SNMP), as well as the hosts that will receive trap messages.

Table 11: SNMP Commands

Command	Function	Mode	Page
snmp-server community	Sets up the community access string to permit access to SNMP commands	GC	152
snmp-server contact	Sets the system contact string	GC	152
snmp-server location	Sets the system location string	GC	153
snmp-server enable server	Enables SNMP service and traps	GC	153
snmp-server host	Specifies the recipient of an SNMP notification operation	GC	154
snmp-server trap	Enables specific SNMP notifications	GC	155
snmp-server vacm view	Configures the VACM view	GC	155
snmp-server vacm group	Configures the VACM group	GC	156
snmp-server user	Sets the name of the SNMP v3 user	GC	157
snmp-server target	Configures SNMP v3 notification targets	GC	158
snmp-server filter	Configures SNMP v3 notification filters	GC	159
show snmp vacm group	Displays the VACM group	Exec	163
show snmp vacm view	Displays VACM views	Exec	162
show snmp users	Displays SNMP v3 user settings	Exec	160
show snmp target	Displays the SNMP v3 notification targets	Exec	160
show snmp filter	Displays the SNMP v3 notification filters	Exec	161
show snmp	Displays the status of SNMP communications	Exec	161

snmp-server community

This command defines the community access string for the Simple Network Management Protocol. Use the **no** form to remove the specified community string.

Syntax

snmp-server community *string* [**ro** | **rw**]
no snmp-server community *string*

string - Community string that acts like a password and permits access to the SNMP protocol. (Maximum length: 23 characters, case sensitive)

ro - Specifies read-only access. Authorized management stations are only able to retrieve MIB objects.

rw - Specifies read/write access. Authorized management stations are able to both retrieve and modify MIB objects.

Default Setting

- public - Read-only access. Authorized management stations are only able to retrieve MIB objects.
- private - Read/write access. Authorized management stations are able to both retrieve and modify MIB objects.

Command Mode

Global Configuration

Command Usage

If you enter a community string without the **ro** or **rw** option, the default is read only.

Example

```
AP(config)#snmp-server community alpha rw
AP(config)#
```

snmp-server contact

This command sets the system contact string. Use the **no** form to remove the system contact information.

Syntax

snmp-server contact *string*
no snmp-server contact

string - String that describes the system contact. (Maximum length: 255 characters)

Default Setting

None

Command Mode
Global Configuration

Example

```
AP(config)#snmp-server contact Paul
AP(config)#
```

Related Commands
snmp-server location

snmp-server location

This command sets the system location string. Use the **no** form to remove the location string.

Syntax

snmp-server location <*text*>
no snmp-server location

text - String that describes the system location. (Maximum length: 255 characters)

Default Setting
None

Command Mode
Global Configuration

Example

```
AP(config)#snmp-server location WC-19
AP(config)#
```

Related Commands
snmp-server contact

snmp-server enable server

This command enables SNMP management access and also enables this device to send SNMP traps (i.e., notifications). Use the **no** form to disable SNMP service and trap messages.

Syntax

[**no**] **snmp-server enable server**

Default Setting
Enabled

Command Mode
Global Configuration

Command Usage
- This command enables both authentication failure notifications and link-up-down notifications.
- The **snmp-server host** command specifies the host device that will receive SNMP notifications.

Example
```
AP(config)#snmp-server enable server
AP(config)#
```

Related Commands
snmp-server host

snmp-server host
This command specifies the recipient of an SNMP notification. Use the **no** form to remove the specified host.

Syntax
snmp-server host <*host_ip_address*> <*community-string*>
no snmp-server host

host_ip_address - IP of the host (the targeted recipient).

community-string - Password-like community string sent with the notification operation. (Maximum length: 23 characters)

Default Setting
None

Command Mode
Global Configuration

Command Usage
- The **snmp-server host** command is used in conjunction with the **snmp-server enable server** command to enable SNMP notifications. You can configure up to four host IP addresses. A separate **snmp-server host** command must be entered for each host.
- Although you can set the community string using the **snmp-server host** command by itself, it is recommended that you define this string using the **snmp-server community** command prior to using the **snmp-server host** command.

Example

```
AP(config)#snmp-server host 1 10.1.19.23 batman
AP(config)#
```

Related Commands

snmp-server enable server

snmp-server trap

This command enables the access point to send specific SNMP traps (i.e., notifications). Use the **no** form to disable specific trap messages.

Syntax

snmp-server trap <*trap*>
no snmp-server trap <*trap*>

trap - One of the following SNMP trap messages:

sysSystemDown - The access point is about to shutdown and reboot.

sysSystemUp - The access point is up and running.

Default Setting

All traps enabled

Command Mode

Global Configuration

Command Usage

This command is used in conjunction with the **snmp-server host** and **snmp-server enable server** commands to enable SNMP notifications.

Example

```
AP(config)#no snmp-server trap syssystemup
AP(config)#
```

snmp-server vacm view

This command configures SNMP v3 views. Use the **no** form to delete an SNMP v3 view or remove a subtree from a filter.

Syntax

snmp-server vacm view <*name*> [**included** | **excluded**] <*subtree*> [**mask** <*mask*>]

no snmp-server vacm view <*name*> [**included** | **excluded**] <*subtree*>

name - A user-defined name that identifies an SNMP v3 view. (Maximum length: 32 characters)

include - Defines a filter type that includes objects in the MIB subtree.

exclude - Defines a filter type that excludes objects in the MIB subtree.

subtree - The part of the MIB subtree that is to be filtered.

mask - An optional hexadecimal value bit mask to define objects in the MIB subtree.

Default Setting
None

Command Mode
Global Configuration

Command Usage
- The access point allows multiple notification filters to be created. Each filter can be defined by up to 20 MIB subtree ID entries.
- Use the command more than once with the same filter ID to build a filter that includes or excludes multiple MIB objects. Note that the filter entries are applied in the sequence that they are defined.
- The MIB subtree must be defined in the form ".1.3.6.1" and always start with a ".".
- The mask is a hexadecimal value with each bit masking the corresponding ID in the MIB subtree. A "1" in the mask indicates an exact match and a "0" indicates a "wild card." For example, a mask value of 0xFFBF provides a bit mask "1111 1111 1011 1111." If applied to the subtree 1.3.6.1.2.1.2.2.1.1.23, the zero corresponds to the 10th subtree ID. When there are more subtree IDs than bits in the mask, the mask is padded with ones.

Example

```
AP(config)#snmp-server vacm view testview include .1
AP(config)#snmp-server vacm view testview exclude .1.3.6.1.2.1.2.2.1.1.23
```

snmp-server vacm group

This command configures SNMP v3 groups. Use the **no** form to delete an SNMP v3 group.

Syntax

snmp-server vacm group <*name*> {**security-level** <*level*>} <*read-view*> <*write-view*>

no snmp-server vacm group <*name*>

name - A user-defined name that identifies an SNMP v3 group. (Maximum length: 32 characters)

level - The SNMPv3 security level of the group. One of the following:

NoAuthNoPriv - A group using no authentication and no data encryption. Users in this group use no security, either authentication or encryption, in SNMP messages they send to the agent.

AuthNoPriv - A group using authentication, but no data encryption. Users in this group send SNMP messages that use an MD5 key/password for authentication, but not a DES key/password for encryption.

AuthPriv - A group using authentication and data encryption. Users in this group send SNMP messages that use an MD5 key/password for authentication and a DES key/password for encryption.

read-view - The name of a defined SNMPv3 view for read access.

write-view - The name of a defined SNMPv3 view for write access.

Default Setting
None

Command Mode
Global Configuration

Command Usage
- The access point allows multiple groups to be created.
- A group sets the access policy for the assigned users.
- When authentication is selected, the MD5 algorithm is used as specified in the snmp-server user command.
- When privacy is selected, the DES algorithm is used for data encryption.

Example

```
AP(config)#snmp-server vacm group testgroup security-level authpriv rdview
  wrview
AP(config)#
```

snmp-server user

This command configures the SNMP v3 users that are allowed to manage the access point. Use the **no** form to delete an SNMP v3 user.

Syntax

snmp-server user <*username*> <*groupname*> {**none** | **md5** <*auth-passphrase*>} {**none** | **des** <*priv-passphrase*>}

no snmp-server user <*username*> <*groupname*>

username - Name of the user connecting to the SNMP agent. (Range: 1-32 characters)

groupname - Name of an SNMP group to which the user is assigned. (Range: 1-32 characters)

none | **md5** - Uses no authentication or MD5 authentication.

auth-passphrase - Authentication password. Enter a minimum of eight characters for the user. (8 – 32 characters)

none | **des** - Uses SNMPv3 with no privacy, or with DES56 encryption.

priv-passphrase - Privacy password. Enter a minimum of eight characters for the user. (8 – 32 characters)

Default Setting
None

Command Mode
Global Configuration

Command Usage
- Multiple SNMPv3 users can be configured on the access point.
- Users must be assigned to groups that have the same security levels. If a user who has "AuthPriv" security (uses authentication and encryption) is assigned to a NoAuthNoPriv group, the user will not be able to access the database. An AuthPriv user must be assigned to the group with the AuthPriv security level.

Example

```
AP(config)#snmp-server user chris grname md5 passw1 des passw2
AP(config)#
```

snmp-server target

This command configures SNMP v3 notification targets. Use the **no** form to delete an SNMP v3 target.

Syntax

snmp-server target <*target-id*> <*ip-addr*> <*sec-name*> <*port-number*> [*notification-filter-id*]

no snmp-server target <*target-id*>

target-id - A user-defined name that identifies a receiver of SNMP notifications. (Maximum length: 32 characters)

ip-addr - Specifies the IP address of the management station to receive notifications.

sec-name - The defined SNMP v3 user name that is to receive notifications.

port-number - The UDP port that is used on the receiving management station for notifications.

notification-filter-id **-** The name if a defined notification filter.

Default Setting
None

Command Mode
Global Configuration

Command Usage
- The access point supports multiple SNMP v3 target IDs.
- The SNMP v3 user name that is specified in the target must first be configured using the **snmp-server user** command.

Example

```
AP(config)#snmp-server target tarname 192.168.1.33 chris 1234
AP(config)#
```

snmp-server filter

This command configures SNMP v3 notification filters. Use the **no** form to delete an SNMP v3 filter or remove a subtree from a filter.

Syntax

snmp-server filter <*filter-id*> <**include** | **exclude**> <*subtree*>
no snmp-server filter <*filter-id*> [*subtree*]

filter-id - A user-defined name that identifies an SNMP v3 notification filter. (Maximum length: 32 characters)

include - Defines a filter type that includes objects in the MIB subtree.

exclude - Defines a filter type that excludes objects in the MIB subtree.

subtree - The part of the MIB subtree that is to be filtered.

Default Setting
None

Command Mode
Global Configuration

Command Usage
- The access point allows multiple notification filters to be created. Each filter can be defined by up to 20 MIB subtree ID entries.

- Use the command more than once with the same filter ID to build a filter that includes or excludes multiple MIB objects. Note that the filter entries are applied in the sequence that they are defined.
- The MIB subtree must be defined in the form ".1.3.6.1" and always start with a ".".

Example

```
AP(config)#snmp-server filter trapfilter include .1
AP(config)#snmp-server filter trapfilter exclude .1.3.6.1.2.1.2.2.1.1.23
```

show snmp users

This command displays the SNMP v3 users and settings.

Syntax

show snmp users

Command Mode

Exec

Example

```
AP# show snmp users

User List:
==================================
UserName      : chris
GroupName     : testgroup
AuthType      : None
PrivType      : None

UserName      : david
GroupName     : group2
AuthType      : MD5,   Passphrase: ****************
PrivType      : DES,   Passphrase: ****************

==================================
AP#
```

show snmp target

This command displays the SNMP v3 notification target settings.

Syntax

show snmp target

Command Mode

Exec

Example

```
AP# show snmp target

Target List:
================================
Target ID  : christraps
IP Address : 192.168.1.33
User Name  : chris
UDP Port   : 4321
Filter ID  : Not Defined

================================
AP#
```

show snmp filter

This command displays the SNMP v3 notification filter settings.

Syntax

show snmp filter [*filter-id*]

filter-id - A user-defined name that identifies an SNMP v3 notification filter. (Maximum length: 32 characters)

Command Mode

Exec

Example

```
AP# show snmp filter

Filter List:
================================
Filter: defaultfilter
     Type: Included
  Subtree: .1

     Type: Excluded
  Subtree: .1.3.6.1.2.1.2.2.1.1.23

Filter: testfilter
     Type: Excluded
  Subtree: .13.6.1.2.1.2.2.1.2

================================
AP#
```

show snmp

This command displays the SNMP configuration settings.

Command Mode

Exec

Example

```
AP# show snmp

SNMP Information
================================================
Service State                  : Enable
Community (ro)                 : *******
Community (rw)                 : ********
Location                       : where?
Contact                        : who?
================================================


Trap Destination List:
================================================
Trap Destination: 192.168.1.22,  Community : *****
================================================

Trap Configuration:
================================================================================
                  systemUp: Disabled                  systemDown: Disabled
================================================================================
AP#
```

show snmp vacm view

This command displays the configured SNMP v3 views.

Syntax

show snmp vacm view [*view-name*]

view-name - The name of a user-defined SNMPv3 view.

Command Mode

Exec

Example

```
AP# sh snmp vacm view
View List:
==================================
View Name    : defaultview
     Type    : included
     OID         : .1
     Mask        :

View Name    : testview
     Type    : included
     OID         : .1
     Mask        :

     Type    : excluded
     OID         : .13.6.1.2.1.2.2.1.2.1.1
     Mask        :

==================================

AP#
```

show snmp vacm group

This command displays the configured SNMP v3 groups.

Syntax

show snmp vacm group [*group-name*]

group-name - The name of a user-defined SNMPv3 group.

Command Mode

Exec

Example

```
AP# sh snmp vacm group

Group List:
==================================
Group Name     : testgroup
Security Level : NoAuthNoPriv
Read-View      : defaultview
Write-View     : defaultview

Group Name     : group2
Security Level : AuthPriv
Read-View      : defaultview
Write-View     : defaultview

==================================
AP#
```

16 Flash/File Commands

These commands are used to manage the system code or configuration files.

Table 12: Flash/File Commands

Command	Function	Mode	Page
dual-image	Specifies the file or image used to start up the system	GC	164
copy	Copies a code image or configuration between flash memory and a FTP/TFTP server	Exec	165
show dual-image	Displays the name of the current operation code file that booted the system	Exec	166

dual-image

This command specifies the image used to start up the system.

Syntax

dual-image boot image [**a** | **b**]

a - Selects image file A as the startup software.

b - Selects image file B as the startup software.

Default Setting

None

Command Mode

Exec

Command Usage

- The access point supports two software image files (A and B), one of which is set as the boot image, or "Active" file, and the other acts as a "Backup" file.
- You can upgrade new access point software from a local file on the management workstation, or from an FTP or TFTP server. The new software file replaces the image (A or B) that is not currently set as the boot image.
- After upgrading new software, you must reboot the access point to implement the new code. Until a reboot occurs, the access point will continue to run the software it was using before the upgrade started. Also note that new software that is incompatible with the current configuration automatically restores the access point to the factory default settings when first activated after a reboot.

Example

```
AP# dual-image boot-image A
Change image to A
AP#
```

copy

This command copies a boot file, code image, or configuration file between the access point's flash memory and a FTP/TFTP server. When you save the configuration settings to a file on a FTP/TFTP server, that file can later be downloaded to the access point to restore system operation. The success of the file transfer depends on the accessibility of the FTP/TFTP server and the quality of the network connection.

Syntax

copy {**ftp [firmware** | **config]** <*file-name*> <*ip-address*> <*user-name*> <*password*> | **tftp [firmware** | **config]** <*file-name*> <*ip-address*>}

copy config {**ftp** <*file-name*> <*ip-address*> <*user-name*> <*password*> | **tftp** <*file-name*> <*ip-address*>}

copy running startup

ftp - Keyword that allows you to copy to/from an FTP server.

tftp - Keyword that allows you to copy to/from a TFTP server.

firmware - Keyword that allows you to copy a software image file from an FTP/TFTP server to flash memory.

config - Keyword that allows you to copy a configuration file to/from an FTP/TFTP server.

running startup - Keywords that save the current running configuration to the startup configuration file in flash memory.

file-name **-** The name of a file to copy.

ip-address **-** The IP address of an FTP or TFTP server.

user-name **-** The access user name for the FTP server.

password **-** The access password for the FTP server.

Default Setting

None

Command Mode

Exec

Command Usage

- Only a configuration file can be uploaded to an FTP/TFTP server, but every type of file can be downloaded to the access point.

- The destination file name should not contain slashes (\ or /), the leading letter of the file name should not be a period (.), and the maximum length for file names on the FTP/TFTP server is 255 characters or 32 characters for files on the access point. (Valid characters: A-Z, a-z, 0-9, "", "-", "_")
- Due to the size limit of the flash memory, the access point supports only two operation code files.

Example

The following example shows how to upload the configuration settings to a file on the TFTP server:

```
AP# copy config tftp syscfg 192.168.1.19
Backup Config to tftp was successful!!
AP#
```

The following example shows how to download a configuration file:

```
AP# copy tftp config syscfg 192.168.1.19
  Restore Config from tftp was successful.
AP#
```

show dual-image

This command displays the name of the current operation code file that booted the system and the file saved as a secondary image.

Syntax

show dual image

Command Mode

Exec

Example

```
AP#show dual-image
   Image      Status    Version
-----------------------------------------------
   Image A   (Active)   1.1.0.6

   Image B   (Backup)   1.1.0.1

AP#
```

17 RADIUS Client Commands

Remote Authentication Dial-in User Service (RADIUS) is a logon authentication protocol that uses software running on a central server to control access for RADIUS-aware devices to the network. An authentication server contains a database of credentials, such as users names and passwords, for each wireless client that requires access to the access point.

Table 13: RADIUS Client Commands

Command	Function	Mode	Page
radius-server enable	Enables the RADIUS server.	GC	167
radius-server address	Specifies the RADIUS server	GC	168
radius-server port	Sets the RADIUS server network port	GC	168
radius-server key	Sets the RADIUS encryption key	GC	169
radius-server accounting address	Sets the RADIUS server accounting address	GC	169
radius-server accounting port	Sets the RADIUS server accounting port	GC	170
radius-server accounting key	Sets the RADIUS server accounting key	GC	170
radius-server accounting timeout-interim	Sets the interval between transmitting accounting updates to the RADIUS server	GC	171
make-radius-effective	Implements RADIUS command changes made in current CLI session.	GC	171
show radius	Shows the current RADIUS settings	Exec	172

radius-server enable

This command enables the RADIUS server.

Syntax

radius-server {**primary** | **secondary**} **enable**

primary - Specifies the primary RADIUS server.

secondary - Specifies the secondary RADIUS server.

Default Setting

Enabled

Command Mode
Global Configuration

Example

```
AP(config)# radius-server primary enable
This setting has not been effective !
If want to take effect, please execute make-radius-effective command !

AP(config)#
```

radius-server address

This command specifies the primary and secondary RADIUS server address.

Syntax

radius-server {**primary** | **secondary**} **address** <*address*>

address - IP address of server.

Default Setting
10.7.16.96

Command Mode
Global Configuration

Example

```
AP(config)# radius-server primary address 192.168.1.9

This setting has not been effective !
If want to take effect, please execute make-radius-effective command !

AP(config)#
```

radius-server port

This command sets the RADIUS server network port.

Syntax

radius-server {**primary** | **secondary**} **port** <*port_number*>

port_number - RADIUS server UDP port used for authentication messages. (Range: 1024-65535)

Default Setting
1812

Command Mode
Global Configuration

Example

```
AP(config)# radius-server primary port 1810

This setting has not been effective !
If want to take effect, please execute make-radius-effective command !

AP(config)#
```

radius-server key

This command sets the RADIUS encryption key.

Syntax

radius-server {**primary** | **secondary**] **key** <*key_string*>

key_string - Encryption key used to authenticate logon access for client. Do not use blank spaces in the string. (Maximum length: 20 characters)

Default Setting

DEFAULT

Command Mode

Global Configuration

Example

```
AP(config)# radius-server primary key green

This setting has not been effective !
If want to take effect, please execute make-radius-effective command !

AP(config)#
```

radius-server accounting address

This command sets the RADIUS Accounting server network IP address.

Syntax

radius-server accounting address <*address*>

address - IP address of the RADIUS Accounting server

Default Setting

10.7.16.96

Command Mode

Global Configuration

Command Usage
When the RADIUS Accounting server UDP address is specified, a RADIUS accounting session is automatically started for each user that is successfully authenticated to the access point.

Example

```
AP(config)# radius-server accounting address 192.168.1.19

This setting has not been effective !
If want to take effect, please execute make-radius-effective command !

AP(config)#
```

radius-server accounting port

This command sets the RADIUS Accounting port.

Syntax

radius-server accounting port <*port*>

port - The port used by the RADIUS Accounting server. (Range: 1024~65535)

Default Setting
1813

Command Mode
Global Configuration

Command Usage
When the RADIUS Accounting server UDP port is specified, a RADIUS accounting session is automatically started for each user that is successfully authenticated to the access point.

Example

```
AP(config)# radius-server accounting port 1882

This setting has not been effective !
If want to take effect, please execute make-radius-effective command !

AP(config)#
```

radius-server accounting key

This command sets the RADIUS Accounting key.

Syntax

radius-server accounting key <*key*>

key - The RADIUS Accounting server keyphrase.

Default Setting
DEFAULT

Command Mode
Global Configuration

Example

```
AP(config)# radius-server accounting key green

This setting has not been effective !
If want to take effect, please execute make-radius-effective command !

AP(config)#
```

radius-server accounting timeout-interim

This command sets the interval between transmitting accounting updates to the RADIUS server.

Syntax

radius-server accounting timeout-interim <*number_of_seconds*>}

number_of_seconds - Number of seconds the access point waits between transmitting accounting updates. (Range: 60-86400)

Default Setting
300

Command Mode
Global Configuration

Command Usage
The access point sends periodic accounting updates after every interim period until the user logs off and a “stop” message is sent.

Example

```
AP(config)# radius-server accounting timeout-interim 600

This setting has not been effective !
If want to take effect, please execute make-radius-effective command !

AP(config)#
```

make-radius-effective

This command implements the RADIUS settings made in the current CLI session.

Default Setting
None

Command Mode
Global Configuration

Example

```
AP(config)# make-radius-effective

It will take several minutes !
Please wait a while...

AP(config)#
```

show radius

This command displays the current settings for the RADIUS server.

Default Setting
None

Command Mode
Exec

Example

```
AP#show radius

Radius Accounting Information
=============================================
IP              : 10.7.16.96
Key             : *********
Port            : 1813
timeout-interim : 300
=============================================

Radius Primary Server Information
=============================================
Status : ENABLED
IP     : 192.168.1.1
Port   : 1812
Key    : *********
=============================================

Radius Secondary Server Information
=============================================
Status : ENABLED
IP     : 10.7.16.96
Port   : 1812
Key    : ****
=============================================

AP#
```

18 802.1X Authentication Commands

The access point supports IEEE 802.1X access control for wireless clients. This control feature prevents unauthorized access to the network by requiring an 802.1X client application to submit user credentials for authentication. Client authentication is then verified by a RADIUS server using EAP (Extensible Authentication Protocol) before the access point grants client access to the network. The 802.1X EAP packets are also used to pass dynamic unicast session keys and static broadcast keys to wireless clients.

Table 14: 802.1x Authentication

Command	Function	Mode	Page
802.1x enable	Configures 802.1X as enabled or disabled	IC-W-VAP	173
802.1x reauthentication-time	Sets the timeout after which a connected client must be re-authenticated	IC-W-VAP	174

802.1x enable

This command configures 802.1X as enabled for wireless clients. Use the **no** form to disable 802.1X support.

Syntax

802.1x enable
no 802.1x

Default Setting

Disabled

Command Mode

Inface Configuration (Wireless-VAP)

Command Usage

- When 802.1X is disabled, the access point does not support 802.1X authentication for any station. After successful 802.11 association, each client is allowed to access the network.
- 802.1X does not apply to the 1000BASE-T port.
- To display the current 802.1X status, use the **show interface wireless** command.

Example

```
AP(if-wireless 0: VAP[0])# 802.1x enable

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0: VAP[0])#
```

Related Commands

show interface wireless

802.1x reauthentication-time

This command sets the time period after which a connected client must be re-authenticated.

Syntax

802.1x reauthentication-time <*seconds*>

seconds - The number of seconds. (Range: 0-1440)

Default

600 seconds

Command Mode

Interface Configuration (Wireless-VAP)

Example

```
AP(if-wireless 0: VAP[0])# 802.1x reauthentication-time 600

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0: VAP[0])#
```

19 MAC Address Authentication Commands

Use these commands to define MAC authentication on the access point. For local MAC authentication, first define the default filtering policy, then enter the MAC addresses to be filtered, indicating if they are allowed or denied. For RADIUS MAC authentication, the MAC addresses and filtering policy must be configured on the RADIUS server.

Table 15: MAC Address Authentication

Command	Function	Mode	Page
mac-authentication server	Sets address filtering to be performed with local or remote options	GC	175
mac-authentication server local address default	Sets local filtering to allow or deny listed addresses	GC	176
mac-authentication server local address entry	Enters a MAC address in the local filter table	GC	176
mac-authentication server local address delete	Removes a MAC address from the local filter table	GC	177
mac-authentication session-timeout	Sets the interval at which associated clients will be re-authenticated with the RADIUS server authentication database	GC	178
show authentication	Shows all authentication settings, as well as the address filter table	Exec	178

mac-authentication server

This command sets address filtering to be performed with local or remote options. Use the **no** form to disable MAC address authentication.

Syntax

mac-authentication server [**local** | **remote**]
no mac-authentication server

local - Authenticate the MAC address of wireless clients with the local authentication database during 802.11 association.

remote - Authenticate the MAC address of wireless clients with the RADIUS server during 802.1X authentication.

Default

Disabled

Command Mode

Global Configuration

Example

```
AP(config)#mac-authentication server remote
AP(config)#
```

Related Commands

mac-authentication server local address entry
radius-server address

mac-authentication server local address default

This command sets local filtering to allow or deny listed MAC addresses.

Syntax

mac-authentication server local address default <**allowed** | **denied**>

allowed - Only MAC addresses entered as "denied" in the address filtering table are denied.

denied - Only MAC addresses entered as "allowed" in the address filtering table are allowed.

Default

Allowed

Command Mode

Global Configuration

Example

```
AP(config)#mac-authentication server local address default denied
AP(config)#
```

Related Commands

mac-authentication server local address entry

mac-authentication server local address entry

This command enters a MAC address in the local filter table.

Syntax

mac-authentication server local address entry <**allowed** | **denied**> <*mac-address*>

allowed - Entry is allowed access.

denied - Entry is denied access.

mac-address - Physical address of client. (Enter six pairs of hexadecimal digits separated by hyphens; e.g., 00-90-D1-12-AB- 89.)

Default
None

Command Mode
Global Configuration

Command Mode
- The access point supports up to 1024 MAC addresses.
- An entry in the address table may be allowed or denied access depending on the global setting configured for the mac-authentication server local address default command.

Example

```
AP(config)#mac-authentication server local address entry allowed 00-70-50-cc-
  99-1a
AP(config)#
```

Related Commands
mac-authentication server local address default

mac-authentication server local address delete

This command deletes a MAC address from the local filter table.

Syntax

mac-authentication server local address delete <**allowed** | **denied**> <*mac-address*>

allowed - Entry is allowed access.

denied - Entry is denied access.

mac-address - Physical address of client. (Enter six pairs of hexadecimal digits separated by hyphens; e.g., 00-90-D1-12-AB-89.)

Default
None

Command Mode
Global Configuration

Example

```
AP(config)#mac-authentication server local address delete allowed 00-70-50-
  cc-99-1b
AP(config)#
```

mac-authentication session-timeout

This command sets the interval at which associated clients will be re-authenticated with the RADIUS server authentication database. Use the **no** form to disable reauthentication.

Syntax

mac-authentication session-timeout <*seconds*>
no mac-authentication session-timeout

seconds - Re-authentication interval. (Range: 30-65555)

Default

0 (disabled)

Command Mode

Global Configuration

Example

```
AP(config)#mac-authentication session-timeout 300
AP(config)#
```

show authentication

This command shows all authentication settings, as well as the address filter table.

Command Mode

Exec

Example

```
AP# show authentication

Authentication Information
============================================================
MAC Authentication Server : Disable
Session Timeout           : Disable

Filter Table (Allow List):
-----------------------
-----------------------

Filter Table (Deny List):
-----------------------
-----------------------
============================================================

AP#
```

20 Filtering Commands

The commands described in this section are used to filter communications between wireless clients, control access to the management interface from wireless clients, and filter traffic using specific Ethernet protocol types.

Table 16: Filtering Commands

Command	Function	Mode	Page
filter local-bridge	Disables communication between wireless clients	GC	179
filter restrict-management	Prevents wireless clients from accessing the management interface	GC	180
filter dhcp	Prevents wireless clients from accessing a DHCP server	GC	180
filter acl-source-address	Configures ACL filtering based on source MAC addresses	GC	181
filter acl-destination-address	Configures ACL filtering based on destination MAC addresses	GC	181
filter ethernet-type enable	Checks the Ethernet type for all incoming and outgoing Ethernet packets against the protocol filtering table	GC	182
filter ethernet-type protocol	Sets a filter for a specific Ethernet type	GC	182
show filters	Shows the filter configuration	Exec	183

filter local-bridge

This command disables communication between wireless clients. Use the **no** form to disable this filtering.

Syntax

filter local-bridge <all-VAP | intra-VAP>
no filter local-bridge

all-VAP - When enabled, clients cannot establish wireless communications with any other client, either those associated to the same VAP interface or any other VAP interface.

intra-VAP - When enabled, clients associated with a specific VAP interface cannot establish wireless communications with each other. Clients can communicate with clients associated to other VAP interfaces.

Default

Disabled

Command Mode
Global Configuration

Command Usage
This command can disable wireless-to-wireless communications between clients via the access point. However, it does not affect communications between wireless clients and the wired network.

Example

```
AP(config)#filter local-bridge all-vap
AP(config)#
```

filter restrict-management

This command prevents wireless clients from accessing the management interface on the access point. Use the **no** form to disable this filtering.

Syntax

[no] filter restrict-management

Default
Disabled

Command Mode
Global Configuration

Example

```
AP(config)#filter restrict-management
AP(config)#
```

filter dhcp

This command prevents the AP or wireless clients from obtaining an IP address from a DHCP server installed on wireless client.

Syntax

filter dhcp <**enable** | **disable**>

enable - Prevent DHCP IP assignment from a wireless client.

disable - Allow DHCP IP assignment from a wireless client.

Default
Disabled

Command Mode
Global Configuration

Example

```
AP(config)#filter dhcp enable
AP(config)#
```

filter acl-source-address

This command configures ACL filtering based on source MAC addresses in data frames.

Syntax

filter acl-source-address {**enable** | **disable** | **add** <*mac-address*> | **delete** <*mac-address*>}

enable - Key word that enables ACL filtering on the access point.

disable - Key word that disables ACL filtering on the access point.

add - Key word that adds a MAC address to the filter table.

delete - Key word that removes a MAC address from the filter table

mac-address - Specifies a MAC address in the form xx-xx-xx-xx-xx-xx.

Default

Disabled

Command Mode

Global Configuration

Command Usage

You can add up to 128 MAC addresses to the filtering table.

Example

```
AP(config)#filter acl-source-address add 00-12-34-56-78-9a
AP(config)#filter acl-source-address enable
AP(config)#
```

filter acl-destination-address

This command configures ACL filtering based on source MAC addresses in data frames.

Syntax

filter acl-destination-address {**enable** | **disable** | **add** <*mac-address*> | **delete** <*mac-address*>}

enable - Key word that enables ACL filtering on the access point.

disable - Key word that disables ACL filtering on the access point.

add - Key word that adds a MAC address to the filter table.

delete - Key word that removes a MAC address from the filter table

mac-address - Specifies a MAC address in the form xx-xx-xx-xx-xx-xx.

Default
Disabled

Command Mode
Global Configuration

Example

```
AP(config)#filter acl-destination-address add 00-12-34-56-78-9a
AP(config)#filter acl-destination-address enable
AP(config)#
```

filter ethernet-type enabled

This command checks the Ethernet type on all incoming and outgoing Ethernet packets against the protocol filtering table. Use the **no** form to disable this feature.

Syntax

[**no**] **filter ethernet-type enabled**

Default
Disabled

Command Mode
Global Configuration

Command Usage
This command is used in conjunction with the **filter ethernet-type protocol** command to determine which Ethernet protocol types are to be filtered.

Example

```
AP(config)#filter ethernet-type enabled
AP(config)#
```

Related Commands
filter ethernet-type protocol

filter ethernet-type protocol

This command sets a filter for a specific Ethernet type. Use the **no** form to disable filtering for a specific Ethernet type.

Syntax

[**no**] **filter ethernet-type protocol** <*protocol*>

protocol - An Ethernet protocol type. (Options: ARP, RARP, Berkeley-Trailer-Negotiation, LAN-Test, X25-Level-3, Banyan, CDP, DEC XNS, DEC-MOP-Dump-Load, DEC-MOP, DEC-LAT, Ethertalk, Appletalk-ARP, Novell-IPX(old), Novell-IPX(new), EAPOL, Telxon-TXP, Aironet-DDP, Enet-Config-Test, IP, IPv6, NetBEUI, PPPoE_Discovery, PPPoE_PPP_Session)

Default
None

Command Mode
Global Configuration

Command Usage
Use the **filter ethernet-type enable** command to enable filtering for Ethernet types specified in the filtering table, or the **no filter ethernet-type enable** command to disable all filtering based on the filtering table.

Example

```
AP(config)#filter ethernet-type protocol ARP
AP(config)#
```

Related Commands
filter ethernet-type enabled

show filters

This command shows the filter options and protocol entries in the filter table.

Syntax

show filters [**acl-source-address** | **acl-destination-address**]

Command Mode
Exec

Example

```
AP#show filters

Protocol Filter Information
================================================================================
Local Bridge         :Traffic among all client STAs blocked
AP Management        :DISABLED
EtherType Filter     :DISABLED

Enabled EtherType Filters
--------------------------------------------------------------------------------
================================================================================

AP#
```

21 Spanning Tree Commands

The commands described in this section are used to set the MAC address table aging time and spanning tree parameters for both the Ethernet and wireless interfaces.

Table 17: Spanning Tree Commands

Command	Function	Mode	Page
bridge stp service	Enables the Spanning Tree feature	GC	186
bridge stp br-conf forwarding-delay	Configures the spanning tree bridge forward time	GC	186
bridge stp br-conf hello-time	Configures the spanning tree bridge hello time	GC	187
bridge stp br-conf max-age	Configures the spanning tree bridge maximum age	GC	187
bridge stp br-conf priority	Configures the spanning tree bridge priority	GC	188
bridge stp port-conf interface	Enters STP interface configuration mode	GC	188
bridge-link path-cost	Configures the spanning tree path cost for the Ethernet port	IC-E	189
bridge-link port-priority	Configures the spanning tree priority for the Ethernet port	IC-E	189
vap	Selects the VAP interface in STP interface configuration mode	GC-STP	190
path-cost	Sets the path cost for a VAP interface in STP interface configuration mode	GC-STP	190
port-priority	Sets the port priority for a VAP interface in STP interface configuration mode	GC-STP	191
bridge mac-aging	Sets the MAC address aging time	GC	191
show bridge stp	Displays the global spanning tree settings	Exec	192
show bridge br-conf	Displays spanning tree settings for specified VLANs	Exec	192
show bridge port-conf	Displays spanning tree settings for specified interfaces	Exec	193
show bridge status	Displays STP bridge status for a specified VLAN or all VLANs	Exec	194
show bridge forward address	Displays STP settings for forwarding MAC addesses on specified interfaces or VLANs	Exec	195
show bridge mac-aging	Displays the current MAC address table aging time	Exec	196

bridge stp service

This command enables the Spanning Tree Protocol. Use the **no** form to disable the Spanning Tree Protocol.

Syntax

[**no**] **bridge stp service**

Default Setting

Enabled

Command Mode

Global Configuration

Example

This example globally enables the Spanning Tree Protocol.

```
AP(config)bridge stp service
AP(config)
```

bridge stp br-conf forwarding-delay

Use this command to configure the spanning tree bridge forward time globally for the wireless bridge.

Syntax

bridge stp br-conf forwarding-delay <*seconds*>

seconds - Time in seconds. (Range: 4 - 30 seconds)
The minimum value is the higher of 4 or [(max-age / 2) + 1].

Default Setting

15 seconds

Command Mode

Global Configuration

Command Usage

This command sets the maximum time (in seconds) the root device will wait before changing states (i.e., discarding to learning to forwarding). This delay is required because every device must receive information about topology changes before it starts to forward frames. In addition, each port needs time to listen for conflicting information that would make it return to the discarding state; otherwise, temporary data loops might result.

Example

```
AP(config)#bridge stp br-conf forwarding-delay 20
AP(config)#
```

bridge stp br-conf hello-time

Use this command to configure the spanning tree bridge hello time globally for the wireless bridge.

Syntax

bridge stp br-conf hello-time <*time*>

time - Time in seconds. (Range: 1-10 seconds).
The maximum value is the lower of 10 or [(max-age / 2) -1].

Default Setting

2 seconds

Command Mode

Global Configuration

Command Usage

This command sets the time interval (in seconds) at which the root device transmits a configuration message.

Example

```
AP(config)#bridge stp br-conf hello-time 5
AP(config)#
```

bridge stp br-conf max-age

Use this command to configure the spanning tree bridge maximum age globally for the wireless bridge.

Syntax

bridge stp br-conf max-age <*seconds*>

seconds - Time in seconds. (Range: 6-40 seconds)
The minimum value is the higher of 6 or [2 x (hello-time + 1)].
The maximum value is the lower of 40 or [2 x (forward-time - 1)].

Default Setting

20 seconds

Command Mode

Global Configuration

Command Usage

This command sets the maximum time (in seconds) a device can wait without receiving a configuration message before attempting to reconfigure. All device ports (except for designated ports) should receive configuration messages at regular intervals. Any port that ages out STP information (provided in the last configuration message) becomes the designated port for the attached LAN. If it is a

root port, a new root port is selected from among the device ports attached to the network.

Example

```
AP(config)#bridge stp max-age 40
AP(config)#
```

bridge stp br-conf priority

Use this command to configure the spanning tree priority globally for the wireless bridge.

Syntax

bridge stp br-conf priority <*priority*>

priority - Priority of the bridge. (Range: 0 - 65535)

Default Setting

32768

Command Mode

Global Configuration

Command Usage

Bridge priority is used in selecting the root device, root port, and designated port. The device with the highest priority becomes the STP root device. However, if all devices have the same priority, the device with the lowest MAC address will then become the root device.

Example

```
AP(config)#bridge stp br-conf priority 40000
AP(config)#
```

bridge stp port-conf interface

This command enters STP interface configuration mode.

Syntax

bridge stp port-conf interface {**ethernet** | **wireless** <*index*>}

index - The wireless interface index number. (Only "0" for this AP.)

Default Setting

None

Command Mode

Global Configuration

Command Usage
Use this command to enter STP interface configuration mode. In this mode STP settings for specific VAP interfaces can be configured.

Example

```
AP(config)# bridge stp port-conf interface wireless 0
Enter Wireless configuration commands, one per line.
AP(stp-if-wireless 0)#
```

bridge-link path-cost

Use this command to configure the spanning tree path cost for the Ethernet port.

Syntax

bridge-link path-cost <*cost*>

cost - The path cost for the port. (Range: 1-65535)

Default Setting
4

Command Mode
Interface Configuration (Ethernet)

Command Usage
- This command is used by the Spanning Tree Protocol to determine the best path between devices. Therefore, lower values should be assigned to ports attached to faster media, and higher values assigned to ports with slower media.
- Path cost takes precedence over port priority.

Example

```
AP(if-wireless a)#bridge-link path-cost 1 50
AP(if-wireless a)#
```

bridge-link port-priority

Use this command to configure the priority for the Ethernet port.

Syntax

bridge-link port-priority <*priority*>

priority - The priority for a port. (Range: 1-255)

Default Setting
32

Command Mode
Interface Configuration (Ethernet)

Command Usage
- This command defines the priority for the use of a port in the Spanning Tree Protocol. If the path cost for all ports on a wireless bridge are the same, the port with the highest priority (that is, lowest value) will be configured as an active link in the spanning tree.
- Where more than one port is assigned the highest priority, the port with lowest numeric identifier will be enabled.

Example

```
AP(if-wireless a)#bridge-link port-priority 1 64
AP(if-wireless a)#
```

Related Commands
bridge-link path-cost

vap (STP Interface)

This command selects the VAP interface for configuring STP settings.

Syntax

vap <*vap-index*>

vap-index - The index number for the VAP interface. (Range: 0-7)

Command Mode
Global Configuration (STP interface)

Example

```
AP(stp-if-wireless 0)# vap 0
AP(stp-if-wireless 0: VAP[0])#
```

path-cost (STP Interface)

This command sets the spanning tree path cost for the VAP interface.

Syntax

path-cost <*cost*>

cost - The path cost for the VAP interface. (Range: 1-65535)

Command Mode
Global Configuration (STP interface)

Command Usage

- This command is used by the Spanning Tree Protocol to determine the best path between devices. Therefore, lower values should be assigned to interfaces with faster media, and higher values assigned to interfaces with slower media.
- Path cost takes precedence over port priority.

Example

```
AP(stp-if-wireless 0: VAP[0])# path-cost 512
AP(stp-if-wireless 0: VAP[0])#
```

port-priority (STP Interface)

This command sets the spanning tree path cost for the VAP interface.

Syntax

port-priority <*priority*>

priority - The priority for the VAP interface. (Range: 0-63)

Command Mode

Global Configuration (STP interface)

Command Usage

- This command defines the priority for the use of an interface in the Spanning Tree Protocol. If the path cost for all interfaces on a bridge are the same, the interface with the highest priority (that is, lowest value) will be configured as an active link in the spanning tree.
- Where more than one interface is assigned the highest priority, the interface with lowest numeric identifier will be enabled.

Example

```
AP(stp-if-wireless 0: VAP[0])# port-priority 10
AP(stp-if-wireless 0: VAP[0])#
```

bridge mac-aging

This command sets the MAC address table aging time.

Syntax

bridge mac-aging <*aging-time*>

aging-time - The time after which a learned MAC address is discarded. (Range: 10-1000000 seconds)

Default

300 seconds

Command Mode
Global Configuration

Command Usage
The AP stores the MAC addresses for all known devices. All the addresses learned by monitoring traffic are stored in a dynamic address table. This information is used to pass traffic directly between inbound and outbound interfaces. When the MAC address table "aging time" has expired, a learned MAC address is discarded from the table.

Example

```
AP(config)# bridge mac-aging 300
AP(config)#
```

show bridge stp

This command displays the global spanning tree settings for the bridge.

Syntax

show bridge stp

Command Mode
Exec

Example

```
AP#show bridge stp

Bridge STP Information
==================================
Bridge MAC            : 00:12:CF:A2:54:30
Status                : Disabled
priority              : 32768
Hello Time            : 2 seconds
Maximum Age           : 20 seconds
Forward Delay         : 15 seconds
==================================
AP#
```

show bridge br-conf

This command displays spanning tree settings for a specified VLAN.

Syntax

show bridge br-conf <**all** | *vlan-id*>

all - Keyword to show the STP configuration for all VLANs.

vlan-id - Specifies a VLAN ID. (Range: 0-4095)

Command Mode
Exec

Example

```
AP# show bridge br-conf all

BR0 configuration
=======================================
BRIDGE MAC        : 00:12:cf:a2:54:30
Priority          : 32768
Hello Time        : 2
Maximum Age       : 20
Forward Delay     : 0
=======================================
AP#
```

show bridge port-conf interface

This command displays spanning tree settings for specified interfaces.

Syntax

show bridge port-conf interface {**all** | **ethernet** | **wireless** *index* <**all** | **vap** *vap-index*>}

all - Keyword to display STP settings for all interfaces.

ethernet - Keyword to display STP settings for the Ethernet interface.

wireless - Keyword to display STP settings for the Wireless interface.

vap - Keyword to display STP settings for a specific VAP interface.

Command Mode

Exec

Example

```
AP#show bridge port-conf interface all

ETH0 configuration
=======================================
Link Port Priority           : 32
Link Path Cost               : 4
=======================================

ATH0 configuration
=======================================
Link Port Priority           : 32
Link Path Cost               : 19
=======================================

ATH1 configuration
=======================================
Link Port Priority           : 32
Link Path Cost               : 19
=======================================

ATH2 configuration
=======================================
Link Port Priority           : 32
Link Path Cost               : 19
=======================================
```

```
ATH3 configuration
=======================================
Link Port Priority           : 32
Link Path Cost               : 19
=======================================

ATH4 configuration
=======================================
Link Port Priority           : 32
Link Path Cost               : 19
=======================================

ATH5 configuration
=======================================
Link Port Priority           : 32
Link Path Cost               : 19
=======================================

ATH6 configuration
=======================================
Link Port Priority           : 32
Link Path Cost               : 19
=======================================

ATH7 configuration
=======================================
Link Port Priority           : 32
Link Path Cost               : 19
=======================================
AP#
```

show bridge status

This command displays STP bridge status for a specified VLAN or all VLANs.

Syntax

show bridge status <**all** | *vlan-id*>

all - Keyword to show the bridge status for all VLANs.

vlan-id - Specifies a VLAN ID. (Range: 0-4095)

Command Mode

Exec

Example

```
AP# show bridge status all

br0 status
=====================================================
Bridge ID              : 8000.0012cfa25430
Designated Root ID     : 8000.0012cfa25430
Root Port              : 0

ath0 --- port 0x2

  Port ID              : 0x8002
  Designated Root ID   : 8000.0012cfa25430
```

```
  Designated Bridge ID : 8000.0012cfa25430
  Root Port Path Cost  : 0
  State                : FORWARDING

eth0 --- port 0x1

  Port ID              : 0x8001
  Designated Root ID   : 8000.0012cfa25430
  Designated Bridge ID : 8000.0012cfa25430
  Root Port Path Cost  : 0
  State                : DISABLED
=====================================================

AP#
```

show bridge forward address

This command displays STP settings for forwarding MAC addesses on specified interfaces or VLANs.

Syntax

show bridge forward address {**all** | **mac** <*mac-address*> | <*vlan-id*>}

show bridge forward address {**ethernet** | **wireless** <*index*> **vap** <*vap-index*>}

all - Show settings for all forwarding MAC addresses.

mac - Show settings for specific forwarding MAC addresses. MAC addresses are specified in the form xx-xx-xx-xx-xx-xx.

ethernet - The Ethernet port interface.

wireless - The wireless port interface.

vap - Wireless VAP interfaces. (Wireless Range: 0; VAP Range: 0-7)

vlan-id - Show settings for forwarding addresses on specific VLANs. (Range: 0-4095)

Command Mode

Exec

Example

```
AP# show bridge forward-addr interface wireless 0 vap 0

MAC ADDRESS              INTERFACE  VLAN   AGE
=====================================================
02:12:cf:a2:54:30             ath0     0     0
=====================================================
AP#
```

show bridge mac-aging

This command displays the MAC address table aging time.

Syntax

show bridge mac-aging

Command Mode

Exec

Example

```
AP# show bridge mac-aging
mac-aging time 300
AP#
```

22 WDS Bridge Commands

The commands described in this section are used to set the operation mode for each access point interface and configure Wireless Distribution System (WDS) forwarding table settings.

Table 18: WDS Bridge Commands

Command	Function	Mode	Page
wds ap	Selects the bridge operation mode for a radio interface	IC-W VAP	197
wds sta	Configures the MAC addresses of the parent bridge node	IC-W VAP	197
show wds wireless	Configures MAC addresses of connected child bridge nodes	Exec	198

wds ap

This command enables the bridge operation mode for the radio interface.

Syntax

wds ap

Default Setting

Disabled

Command Mode

Interface Configuration (Wireless) VAP

Example

```
AP(if-wireless 0 [VAP 0])#wds ap
AP(if-wireless 0 [VAP 0])#
```

wds sta

This command configures WDS station mode on a VAP interface.

Syntax

wds sta ap-ssid <*ssid*> **address** <*mac-address*>

ssid - Severice set identifier. Maximum: 32 characters.

mac-address - The MAC address of the connecting VAP in WDS-AP mode.

Default Setting
None

Command Mode
Interface Configuration (Wireless) VAP

Command Usage
In WDS-STA mode, the VAP operates as a client station in WDS mode, which connects to an access point in WDS-AP mode. The user needs to specify the SSID and MAC address of the VAP to which it intends to connect.

Example

```
AP(if-wireless 0 [VAP 0])#wds sta ap-ssid red address 00-11-22-33-44-55
AP(if-wireless 0 [VAP 0])#
```

show wds wireless

This command displays the current WDS settings for VAPs.

Syntax

show wds wireless <*index*> **vap** {**all** | <*vap-index*>}

index -The wireless interface index number. (Option: 0)

vap-index - The VAP index number. (Range: 0-7)

Command Mode
Exec

Example

```
AP# show wds wireless 0 vap 0

WDS Status(wireless 0 vap 0)
========================================
Status: up
Mode: STA
AP SSID: red
AP MAC: 00:11:22:33:44:55
========================================
AP#
```

23 Ethernet Interface Commands

The commands described in this section configure connection parameters for the Ethernet port and wireless interface.

Table 19: Ethernet Interface Commands

Command	Function	Mode	Page
interface ethernet	Enters Ethernet interface configuration mode	GC	199
dns	Specifies the primary and secondary name servers	IC-E	200
ip address	Sets the IP address for the Ethernet interface	IC-E	200
ip dhcp	Submits a DHCP request for an IP address	IC-E	201
ip management address	Sets a static IP address for management access	IC-E	202
ipv6 address	Sets the IPv6 address for the Ethernet interface	IC-E	202
ipv6 dhcp	Submits a DHCPv6 request for an IPv6 address	IC-E	203
shutdown	Disables the Ethernet interface	IC-E	204
show interface ethernet	Shows the status for the Ethernet interface	Exec	205

interface ethernet

This command enters Ethernet interface configuration mode.

Default Setting

None

Command Mode

Global Configuration

Example

To specify the 1000BASE-T network interface, enter the following command:

```
AP(config)#interface ethernet
AP(if-ethernet)#
```

dns

This command specifies the address for the primary or secondary domain name server to be used for name-to-address resolution.

Syntax

dns {**primary-server** | **secondary-server**} <*server-address*>

primary-server - Primary server used for name resolution.

secondary-server - Secondary server used for name resolution.

server-address - IP address of domain-name server.

Default Setting

None

Command Mode

Global Configuration

Command Usage

The primary and secondary name servers are queried in sequence.

Example

This example specifies two domain-name servers.

```
AP(if-ethernet)#dns primary-server 192.168.1.55
AP(if-ethernet)#dns secondary-server 10.1.0.55
AP(if-ethernet)#
```

Related Commands

show interface ethernet

ip address

This command sets the IP address for the access point. Use the **no** form to restore the default IP address.

Syntax

ip address <*ip-address*> <*netmask*> <*gateway*>
no ip address

ip-address - IP address.

netmask - Network mask for the associated IP subnet. This mask identifies the host address bits used for routing to specific subnets.

gateway - IP address of the default gateway.

Default Setting

IP address: 192.168.2.10
Netmask: 255.255.255.0

Command Mode
Interface Configuration (Ethernet)

Command Usage
- DHCP is disabled by default. If DHCP is enabled, you must first disable the DHCP client with the **no ip dhcp** command before you manually configure a new IP address.

- You must assign an IP address to this device to gain management access over the network or to connect the access point to existing IP subnets. You can manually configure a specific IP address using this command, or direct the device to obtain an address from a DHCP server using the **ip dhcp** command. Valid IP addresses consist of four numbers, 0 to 255, separated by periods. Anything other than this format will not be accepted by the configuration program.

Example

```
AP(config)#interface ethernet
Enter Ethernet configuration commands, one per line.
AP(if-ethernet)#ip address 192.168.1.2 255.255.255.0 192.168.1.253
AP(if-ethernet)#
```

Related Commands
ip dhcp

ip dhcp

This command enables the access point to obtain an IP address from a DHCP server. Use the **no** form to restore the default IP address.

Syntax

[**no**] **ip dhcp**

Default Setting
Disabled

Command Mode
Interface Configuration (Ethernet)

Command Usage
- You must assign an IP address to this device to gain management access over the network or to connect the access point to existing IP subnets. You can manually configure a specific IP address using the **ip address** command, or direct the device to obtain an address from a DHCP server using this command.

- When you use this command, the access point will begin broadcasting DHCP client requests. The current IP address will continue to be effective until a DHCP reply is received. Requests will be broadcast periodically by this device in an

effort to learn its IP address. (DHCP values can include the IP address, subnet mask, and default gateway.)

Example

```
AP(config)#interface ethernet
Enter Ethernet configuration commands, one per line.
AP(if-ethernet)#ip dhcp
AP(if-ethernet)#
```

Related Commands

ip address

ip management address

This command sets the IP address for management access to the AP.

Syntax

ip management address <*ip-address*> <*netmask*>

ip-address - The IP address for management access.

netmask - Network mask for the associated IP subnet.

Default Setting

IP address: 192.168.1.10
Netmask: 255.255.255.0

Command Mode

Interface Configuration (Ethernet)

Command Usage

The AP must have an IP address to gain management access over the network. The management IP is a static address that can be used to access the AP in the event that DHCP assignment fails.

Example

```
AP(config)#interface ethernet
Enter Ethernet configuration commands, one per line.
AP(if-ethernet)# ip management address 192.168.1.2 255.255.255.0
AP(if-ethernet)#
```

ipv6 address

This command sets the IPv6 address for the access point. Use the **no** form to restore the default IPv6 address.

Syntax

ipv6 address <*ipv6-address*> <*netmask*> <*gateway*>
no ipv6 address

ipv6-address - IPv6 address.

netmask - Network mask for the associated IPv6 subnet. This mask identifies the host address bits used for routing to specific subnets.

gateway - IPv6 address of the default gateway.

Default Setting
IP address: 2001:db8::1
Netmask: 64
Gateway: 2001:db8::2

Command Mode
Interface Configuration (Ethernet)

Command Usage
- DHCPv6 is disabled by default. To manually configure a new IPv6 address, you must first disable the DHCPv6 client with the **no ipv6 dhcp** command.
- You must assign an IPv6 address to this device to gain management access over the network or to connect the access point to existing IPv6 subnets. You can manually configure a specific IPv6 address using this command, or direct the device to obtain an address from a DHCPv6 server using the **ipv6 dhcp** command.

Example

```
AP(config)#interface ethernet
Enter Ethernet configuration commands, one per line.
Enterprise AP(if-ethernet)#ipv6 address 2001:db8::10 64 2001:db8::19
AP(if-ethernet)#
```

Related Commands
ipv6 dhcp

ipv6 dhcp

This command enables the access point to obtain an IPv6 address from a DHCPv6 server. Use the **no** form to restore the default IPv6 address.

Syntax

[**no**] **ipv6 dhcp**

Default Setting
Disabled

Command Mode
Interface Configuration (Ethernet)

Command Usage

- You must assign an IPv6 address to this device to gain management access over the network or to connect the access point to existing IPv6 subnets. You can manually configure a specific IPv6 address using the **ipv6 address** command, or direct the device to obtain an address from a DHCPv6 server using this command.

- When you use this command, the access point will begin broadcasting DHCPv6 client requests. The current IPv6 address (i.e., default or manually configured address) will continue to be effective until a DHCPv6 reply is received. Requests will be broadcast periodically by this device in an effort to learn its IPv6 address. (DHCPv6 values can include the IPv6 address, subnet mask, and default gateway.)

Example

```
AP(config)#interface ethernet
Enter Ethernet configuration commands, one per line.
AP(if-ethernet)#ipv6 dhcp
AP(if-ethernet)#
```

Related Commands

ipv6 address

shutdown (Ethernet)

This command disables the Ethernet interface. To restart a disabled interface, use the **no** form.

Syntax

[**no**] **shutdown**

Default Setting

Interface enabled

Command Mode

Interface Configuration (Ethernet)

Command Usage

This command allows you to disable the Ethernet port due to abnormal behavior (e.g., excessive collisions), and reenable it after the problem has been resolved. You may also want to disable the Ethernet port for security reasons.

Example

The following example disables the Ethernet port.

```
AP(if-ethernet)#shutdown
AP(if-ethernet)#
```

show interface ethernet

This command displays the status for the Ethernet interface.

Syntax

show ethernet interface

Default Setting

Ethernet interface

Command Mode

Exec

Example

```
AP#show interface ethernet
Ethernet Interface Information
=======================================
IP Address           : 192.168.2.10
Subnet Mask          : 255.255.255.0
Default Gateway      : 192.168.2.254
Primary DNS          :
Secondary DNS        :
Management IP        : 192.168.1.10
Management Subnet    : 255.255.255.0
IPv6 Address         : 2001:db8::1
IPv6 Subnet Mask     : 64
IPv6 Gateway         : 2001:db8::2
IPv6 Primary DNS     :
IPv6 Secondary DNS   :
Admin status         : Up
Operational status   : Up
=======================================

AP#
```

24 Wireless Interface Commands

The commands described in this section configure connection parameters for the wireless interfaces.

Table 20: Wireless Interface Commands

Command	Function	Mode	Page
interface wireless	Enters wireless interface configuration mode	GC	207
vap	Provides access to the VAP interface configuration mode	IC-W	208
a-mpdu	Sets the Aggregate MAC Protocol Data Unit (A-MPDU)	IC-W	208
a-msdu	Sets the Aggregate MAC Service Data Unit (A-MSDU)	IC-W	209
channel	Configures the radio channel	IC-W	209
transmit-power	Adjusts the power of the radio signals transmitted from the access point	IC-W	210
min-allowed-rate	Selects minimum allowed transmit data rates	IC-W	211
disable-coexist	Prevents 20 MHz and 40 MHz channels operating together	IC-W	212
make-rf-setting-effective	Implements wireless command changes made in current CLI session	IC-W	212
preamble	Sets the length of the 802.11g signal preamble	IC-W	213
short-guard-interval	Enables the 802.11n short guard interval	IC-W	213
beacon-interval	Configures the rate at which beacon signals are transmitted from the access point	IC-W	214
dtim-period	Configures the rate at which stations in sleep mode must wake up to receive broadcast/multicast transmissions	IC-W	214
rts-threshold	Sets the packet size threshold at which an RTS must be sent to the receiving station prior to the sending station starting communications	IC-W	215
ssid	Configures the service set identifier	IC-W-VAP	216
closed system	Opens access to clients without a pre-configured SSID	IC-W-VAP	217
max-client	Sets the maximum number of clients per radio	IC-W	217
max-association	Sets the maximum number of clients per VAP	IC-W-VAP	218
client-assoc-preempt	Implements a priority for associating clients	IC-W-VAP	218

Table 20: Wireless Interface Commands (Continued)

Command	Function	Mode	Page
assoc- timeout-interval	Configures the idle time interval (when no frames are sent) after which a client is disassociated from the VAP interface	IC-W-VAP	219
auth- timeout-value	Configures the time interval after which clients must be re-authenticated	IC-W-VAP	220
multicast-enhance	Enhances multicast quality for wireless clients	IC-W-VAP	220
shutdown	Disables the wireless interface	IC-W-VAP	221
interfere-chan-recover	Rescans channels when interference is detected	IC-W	221
antenna-chain	Sets the internal antennas to use	IC-W	222
long-distance	Enables long distance parameter settings	IC-W	222
long-distance reference-data	Computes settings from a distance reference	IC-W	223
long-distance slottime	Sets the slot time parameter	IC-W	223
long-distance acktimeout	Sets the acknowledge timeout parameter	IC-W	224
long-distance ctstimeout	Sets the CTS timeout parameter	IC-W	224
bandwidth-control downlink	Enables downlink bandwidth control on a VAP interface	IC-W-VAP	225
bandwidth-control downlink rate	Sets the downlink bandwidth rate for a VAP interface	IC-W-VAP	225
bandwidth-control uplink	Enables uplink bandwidth control on a VAP interface	IC-W-VAP	226
bandwidth-control uplink rate	Sets the uplink bandwidth rate for a VAP interface	IC-W-VAP	226
show interface wireless	Shows the status for the wireless interface	Exec	227
show station	Shows the wireless clients associated with the access point	Exec	228
show station statistics	Shows traffic statistics for wireless clients associated with the access point	Exec	229

interface wireless

This command enters wireless interface configuration mode.

Syntax

interface wireless <*index*>

index - The index of the wireless interface. (Range: 0 or 1, where "0" is the 2.4 GHz interface and "1" the 5 GHz interface)

Default Setting

None

Command Mode
Global Configuration

Example

```
AP(config)# interface wireless 0
Enter Wireless configuration commands, one per line.
AP(if-wireless 0)#
```

vap

This command provides access to the VAP (Virtual Access Point) interface configuration mode.

Syntax

vap <*vap-index*>

vap-index - The number that identifies the VAP interface. (Options: 0-15)

Default Setting
None

Command Mode
Interface Configuration (Wireless)

Example

```
AP(if-wireless 0)#vap 0
AP(if-wireless 0: VAP[0])#
```

a-mpdu

This command enables and sets the Aggregate MAC Protocol Data Unit (A-MPDU).

Syntax

a-mpdu {**enable** | **disable** | **length** | <*length* >}

enable - Enable A-MPDU.

disable - Disable A-MPDU.

length - 1024-65535 bytes.

Default Setting
Disabled

Command Mode
Interface Configuration (Wireless)

Example

```
AP(if-wireless 0)#a-mpdu enable
AP(if-wireless 0)#
```

a-msdu

This command enables and sets the Aggregate MAC Service Data Unit (A-MSDU).

Syntax

a-msdu {**enable** | **disable** | **length** <*length*>}

enable - Enable A-MSDU.

disable - Disable A-MSDU.

length - 1024-65535 bytes.

Default Setting

Disabled

Command Mode

Interface Configuration (Wireless)

Example

```
AP(if-wireless 0)#a-msdu enable
AP(if-wireless 0)#
```

channel

This command configures the radio channel through which the access point communicates with wireless clients.

Syntax

channel {**ht20** <*ht20-channel*> | **ht40** <*ht40-channel*> | **auto**}

ht20-channel - The 802.11n 20 MHz channel number:

11ng mode: 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11

11na mode: 36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140, 149, 153, 157, 161, 165

ht40-channel - The 802.11n 40 MHz channel number:

11ng mode: 01Plus, 02Plus, 03Plus, 04Plus, 05Plus, 05Minus, 06Plus, 06Minus, 07Plus, 07Minus, 08Minus, 09Minus, 10Minus, 11Minus

11na mode: 36Plus, 40Minus, 44Plus, 48Minus, 52Plus, 56Minus, 60Plus, 64Minus, 100Plus, 104Minus, 108Plus, 112Minus, 116Plus, 120Minus, 124Plus, 128Minus, 132Plus, 136Minus, 149Plus, 153Minus, 157Plus, 161Minus

auto - Automatically selects an unoccupied channel (if available). Otherwise, the lowest channel is selected.

Default Setting

Automatic channel selection

Command Mode

Interface Configuration (Wireless)

Command Usage

- The available channel settings are limited by local regulations, which determine the number of channels that are available.
- The available channels depend on the radio interface, either 11b/g/n (2.4 GHZ) or 11a/n (5 GHz).
- The access point provides a channel bandwidth of 20 MHz by default giving an 802.11g connection speed of 54 Mbps and a 802.11n connection speed of up to 108 Mbps, and ensures backward compliance for slower 802.11b devices. Setting the HT Channel Bandwidth to 40 MHz increases connection speed for 802.11n up to 300 Mbps.
- HT40plus indicates that the secondary channel is above the primary channel. HT40minus indicates that the secondary channel is below the primary channel.
- For most wireless adapters, the channel for wireless clients is automatically set to the same as that used by the access point to which it is linked.

Example

```
AP(if-wireless 0)# channel ht20 06

This setting has not been effective !
If want to take effect, please execute make-RF-setting-effective command !

AP(if-wireless 0)#
```

transmit-power

This command adjusts the power of the radio signals transmitted from the access point.

Syntax

transmit-power {**percentage** <*percent-power*> | **dbm** <*dbm-power*>}

percent-power - Signal strength as a percentage transmitted from the AP. (Options: full, half, quarter, eighth, min)

dbm-power - Signal strength in dBm transmitted from the AP. (Range: 3-20 dBm)

Default Setting
Percentage Mode: Full (100%)
dBm Mode: 18 dBm

Command Mode
Interface Configuration (Wireless)

Command Usage
- The "min" keyword indicates minimum power.
- The longer the transmission distance, the higher the transmission power required. But to support the maximum number of users in an area, you must keep the power as low as possible. Power selection is not just a trade off between coverage area and maximum supported clients. You also have to ensure that high strength signals do not interfere with the operation of other radio devices in your area.

Example

```
AP(if-wireless 0)# transmit-power percentage half
AP(if-wireless 0)#
```

min-allowed-rate

This command selects minimum allowed transmit data rates for the AP.

Syntax

min-allowed-rate {**all** | *<cck-rate> <ofdm-rate> <singlestream-rate> <doublestream-rate>}*

all - Selects all available rates.

cck-rate - Specifies the minimum CCK rate (2.4 GHz radio only). (Options: 1, 2, 5. 5, 11 Mbps)

ofdm-rate - Specifies the minimum OFDM rate. (Options: 6, 9, 12, 18, 24, 36, 48, 54 Mbps)

singlestream-rate - Specifies the minimum 802.11n single stream rate. (Options: MCS0, MCS1, MCS2, MCS3, MCS4, MCS5, MCS6, MCS7)

doublestream-rate - Specifies the minimum 802.11n double stream rate. (Options: MCS8, MCS9, MCS10, MCS11, MCS12, MCS13, MCS14, MCS15)

Default Setting
CCK Rate: 1 Mbps
OFDM Rate: 6 Mbps
Single Stream Rate: MCS0
Double Stream Rate: MCS8

Command Mode
Interface Configuration (Wireless)

Example

```
AP(if-wireless 0)# min-allowed-rate 1 6 mcs0 mcs8
AP(if-wireless 0)#
```

disable-coexist

This command prevents the operation of both 20 MHz and 40 MHz channel bandwidths in the wireless network.

Syntax

disable-coexist <**n** | **y**>

n - No, do not disable channel coexistance.

y - Yes, disable channel coexistance.

Default Setting

No

Command Mode

Interface Configuration (Wireless)

Example

```
AP(if-wireless 0)# disable-coexist y
AP(if-wireless 0)#
```

make-rf-setting-effective

This command implements all wireless command changes made in current CLI session.

Syntax

make-rf-setting-effective

Command Mode

Interface Configuration (Wireless)

Example

```
AP(if-wireless 0)# make-RF-setting-effective

It will take several minutes !
Please wait a while...

AP(if-wireless 0)#
```

preamble

This command sets the length of the signal preamble that is used at the start of a 802.11b/g data transmission.

Syntax

preamble [**long** | **short-or-long**]

long - Sets the preamble to long (192 microseconds).

short-or-long - Sets the preamble to short if no 802.11b clients are detected (96 microseconds).

Default Setting

Short-or-Long

Command Mode

Interface Configuration (Wireless)

Command Usage

- Using a short preamble instead of a long preamble can increase data throughput on the access point, but requires that all clients can support a short preamble.
- Set the preamble to long to ensure the access point can support all 802.11b and 802.11g clients.

Example

```
AP(if-wireless 0)# preamble short-or-long

This setting has not been effective !
If want to take effect, please execute make-RF-setting-effective command !

AP(if-wireless 0)#
```

short-guard-interval

This command sets the 802.11n guard interval to 400ns (short) or 800ns (long).

Syntax

short-guard-interval <**enable** | **disable**>

Default Setting

Disabled

Command Mode

Interface Configuration (Wireless)

Command Usage

The 802.11n draft specifies two guard intervals: 400ns (short) and 800ns (long). Support of the 400ns guard interval is optional for transmit and receive. The

purpose of a guard interval is to introduce immunity to propagation delays, echoes, and reflections to which digital data is normally very sensitive. Enabling the short guard interval sets it to 400ns.

Example

```
AP(if-wireless 0)# short-guard-interval enable

This setting has not been effective !
If want to take effect, please execute make-RF-setting-effective command !

AP(if-wireless 0)#
```

beacon-interval

This command configures the rate at which beacon signals are transmitted from the access point.

Syntax

beacon-interval <*interval*>

interval - The rate for transmitting beacon signals. (Range: 40-3500 TUs)

Default Setting

100 TUs

Command Mode

Interface Configuration (Wireless)

Command Usage

The beacon signals allow wireless clients to maintain contact with the access point. They may also carry power-management information.

Example

```
AP(if-wireless 0)# beacon-interval 60

This setting has not been effective !
If want to take effect, please execute make-RF-setting-effective command !

AP(if-wireless 0)#
```

dtim-period

This command configures the rate at which stations in sleep mode must wake up to receive broadcast/multicast transmissions.

Syntax

dtim-period <*interval*>

interval - Interval between the beacon frames that transmit broadcast or multicast traffic. (Range: 1-255 beacon frames)

Default Setting
1

Command Mode
Interface Configuration (Wireless)

Command Usage
- The Delivery Traffic Indication Map (DTIM) packet interval value indicates how often the MAC layer forwards broadcast/multicast traffic. This parameter is necessary to wake up stations that are using Power Save mode.
- The DTIM is the interval between two synchronous frames with broadcast/multicast information. The default value of 1 indicates that the access point will save all broadcast/multicast frames for the Basic Service Set (BSS) and forward them after every beacon.
- Using smaller DTIM intervals delivers broadcast/multicast frames in a more timely manner, causing stations in Power Save mode to wake up more often and drain power faster. Using higher DTIM values reduces the power used by stations in Power Save mode, but delays the transmission of broadcast/multicast frames.

Example

```
AP(if-wireless 0)# dtim-period 10

This setting has not been effective !
If want to take effect, please execute make-RF-setting-effective command !

AP(if-wireless 0)#
```

rts-threshold

This command sets the packet size threshold at which a Request to Send (RTS) signal must be sent to the receiving station prior to the sending station starting communications.

Syntax

rts-threshold <*threshold*>

threshold - Threshold packet size for which to send an RTS. (Range: 1-2346 bytes)

Default Setting
2346

Command Mode
Interface Configuration (Wireless)

Command Usage

- If the threshold is set to 1, the access point always sends RTS signals. If set to 2346, the access point never sends RTS signals. If set to any other value, and the packet size equals or exceeds the RTS threshold, the RTS/CTS (Request to Send / Clear to Send) mechanism will be enabled.
- The access point sends RTS frames to a receiving station to negotiate the sending of a data frame. After receiving an RTS frame, the station sends a CTS frame to notify the sending station that it can start sending data.
- Access points contending for the wireless medium may not be aware of each other. The RTS/CTS mechanism can solve this "Hidden Node" problem.

Example

```
AP(if-wireless 0)# rts-threshold 1

This setting has not been effective !
If want to take effect, please execute make-RF-setting-effective command !

AP(if-wireless 0)#
```

ssid

This command configures the service set identifier (SSID) of the VAP.

Syntax

ssid <*string*>

string - The name of a basic service set supported by the access point. (Range: 1 - 32 characters)

Default Setting

2.4 GHz: EAP9112A_11BGN_0 to 15 (for VAPs 0-15)
5 GHz: EAP9112A_11NA_0 to 15 (for VAPs 0-15)

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

Clients that want to connect to the wireless network through an access point must set their SSIDs to the same as that of the access point.

Example

```
AP(if-wireless 0: VAP[0])# ssid net-name

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0: VAP[0])#
```

closed-system

This command prohibits access to clients without a pre-configured SSID. Use the **no** form to disable this feature.

Syntax

[**no**] **closed-system**

Default Setting

Disabled

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

When closed system is enabled, the access point will not include its SSID in beacon messages. Nor will it respond to probe requests from clients that do not include a fixed SSID.

Example

```
AP(if-wireless 0: VAP[0])#closed-system

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0)#
```

max-client

This command configures the maximum number of wireless clients that can associate with a radio.

Syntax

max-client <*max-clients*>

max-clients - The maximum number associated clients for the radio. (Range: 1-127)

Default Setting

127

Command Mode

Interface Configuration (Wireless)

Command Usage

This command sets the total maximum number of clients that may associate with the radio. This includes the total clients associated to all VAP interfaces. The maximum number of clients that can associate to a specific VAP interface can be set using the max-association command.

Example

```
AP(if-wireless 0)# max-client 64

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0)#
```

max-association

This command configures the maximum number of wireless clients that can associate with a VAP interface.

Syntax

max-association <*max-clients*>

max-clients - The maximum number associated clients for the VAP interface. (Range: 1-127)

Default Setting

127

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

This command sets the total maximum number of clients that may associate with a VAP interface. If the value is greater than the setting for the maximum clients per radio (max-client command), the command does not take effect.

Example

```
AP(if-wireless 0: VAP[0])# max-association 64
AP(if-wireless 0: VAP[0])#
```

client-assoc-preempt

This command enables a feature that implements a priority for associating clients when the maximum has been reached. Use the **no** form to disable the feature.

Syntax

[**no**] **client-assoc-preempt**

Default Setting

Disabled

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

- When enabled, the AP applies a priority order for associating clients when the maximum clients for the VAP has been reached. The priority order is 11n clients, 11a/g clients, then 11b clients.

- When the association pool for the VAP is full and the AP receives an association request from a high-priority (11n) client, the AP sends a disassociation to a lower priority client (11a/g or 11b) in order to be able to associate the high-priority client. If there are no lower-priority clients to disassociate, the AP will reject the association request.

Example

```
AP(if-wireless 0: VAP[0])# client-assoc-preempt
set_vap_assoc_pri 0 0 y

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0: VAP[0])#
```

assoc-timeout-interval

This command configures the idle time interval (when no frames are sent) after which the client is disassociated from the VAP interface.

Syntax

assoc-timeout-interval <*minutes*>

minutes - The number of minutes of inactivity before disassociation. (Range: 5-60 minutes)

Default Setting

5 minutes

Command Mode

Interface Configuration (Wireless-VAP)

Example

```
AP(if-wireless 0: VAP[0])# assoc-timeout-interval 10

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0: VAP[0])#
```

auth-timeout-interval

This command configures the time interval within which clients must complete authentication to the VAP interface.

Syntax

auth-timeout-interval <*minutes*>

minutes - The number of minutes before re-authentication. (Range: 3-60 minutes)

Default Setting

3 minutes

Command Mode

Interface Configuration (Wireless-VAP)

Example

```
AP(if-wireless 0: VAP[0])# auth-timeout-interval 10

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0: VAP[0])#
```

multicast-enhance

This command enables a feature that improves multicast video quality for wireless clients. Use the **no** form to disable the feature.

Syntax

[**no**] **multicast-enhance**

Default Setting

Disabled

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

When a wireless client joins a multicast group, this feature converts multicast packets to unicast packets to improve multicast video quality.

Example

```
AP(if-wireless 0: VAP[0])# multicast-enhance
set_vap_mcastenhance 0 0 2

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0: VAP[0])#
```

shutdown (VAP)

This command disables the VAP interface. Use the **no** form to restart the interface.

Syntax

[**no**] **shutdown**

Default Setting

Interface enabled

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

You must first enable VAP interface 0 before you can enable VAP interfaces 1 to 15.

Example

```
AP(if-wireless 0: VAP[0])# shutdown

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0: VAP[0])#
```

interfere-chan-recover

This command rescans channels when interference is detected on the current channel. Use the **no** form to disable the feature.

Syntax

[**no**] **interfere-chan-recover**

Default Setting

Disabled

Command Mode

Interface Configuration (Wireless)

Command Usage

- When interference is detected on the current channel, the AP re-scans all channels and then changes to a new clear channel.
- There is too much interference on a channel when the AP is unable to send the beacon signal more than ten times. The AP will then use its auto-channel algorithm to find a new clear channel.

Example

```
AP(if-wireless 0)# interfere-chan-recover
AP(if-wireless 0)#
```

antenna-chain

This command selects the use of two antennas or a single antenna for radio transmissions.

Syntax

antenna-chain <**right-left** | **left** | **right**>

right-left - The radio transmits from both internal antennas.

left - The radio only transmits from one internal antenna.

right - The radio only transmits from one internal antenna.

Default Setting

right-left

Command Mode

Interface Configuration (Wireless)

Example

```
AP(if-wireless 0)# antenna-chain left

This setting has not been effective !
If want to take effect, please execute make-RF-setting-effective command !

AP(if-wireless 0)#
```

long-distance

This command computes settings that allow wireless clients a long distance from the AP to maintain communications.

Syntax

long-distance <**enable** | **disable**>

enable - Enables the long distance settings.

disable - Disables the feature.

Default

Disabled

Command Mode

Interface Configuration (Wireless)

Command Usage

When you have long-distance links in the wireless network, some timing parameters require an adjustment to maintain communications. You can enable this feature and then use the long-distance reference-data command to suggest settings based on an approximate distance.

Example

```
AP(if-wireless 0)# long-distance enable
For making changes effective, please execute make-RF-setting-effective
  command !
AP(if-wireless 0)#
```

long-distance reference-data

This command computes settings that allow wireless clients a long distance from the AP to maintain communications.

Syntax

long-distance reference-data <*distance*>

distance - An approximate distance in meters. (Range: 1-50000 meters)

Default

0

Command Mode

Interface Configuration (Wireless)

Command Usage

Enter the approximate distance (in meters) of the client from the AP. The AP computes a set of recommended values for SlotTime, ACKTimeOut and CTSTimeOut. You can use the recommended values or enter your own values that work for your specific environment.

Example

```
AP(if-wireless 0)# long-distance reference-data 1000
Distance(m): 1000
Slot time(us): 15
ACKTimeOut(us): 56
CTSTimeOut(us): 56
AP(if-wireless 0)#
```

long-distance slottime

This command sets the slot time for long-distance communications.

Syntax

long-distance slottime <*time*>

time - The adjusted slot time in microseconds.

Default

9 microseconds

Command Mode
Interface Configuration (Wireless)

Example

```
AP(if-wireless 0)# long-distance slottime 25
For making changes effective, please execute make-RF-setting-effective
  command after entering all three long distance parameters!
AP(if-wireless 0)#
```

long-distance acktimeout

This command sets the acknowledge timeout for long-distance communications.

Syntax

long-distance acktimeout <*time*out>

timeout - The adjusted acknowledge timeout in microseconds.

Default
64 microseconds

Command Mode
Interface Configuration (Wireless)

Example

```
AP(if-wireless 0)# long-distance acktimeout 56
For making changes effective, please execute make-RF-setting-effective
  command after entering all three long distance parameters!
AP(if-wireless 0)#
```

long-distance ctstimeout

This command sets the CTS (clear to send) timeout for long-distance communications.

Syntax

long-distance ctstimeout <*time*out>

timeout - The adjusted CTS timeout in microseconds.

Default
48 microseconds

Command Mode
Interface Configuration (Wireless)

Example

```
AP(if-wireless 0)# long-distance ctstimeout 56
For making changes effective, please execute make-RF-setting-effective
  command after entering all three long distance parameters!
AP(if-wireless 0)#
```

bandwidth-control downlink

This command enables the downlink bandwidth control for a VAP interface.

Syntax

bandwidth-control downlink <**enable** | **disable**>

enable - Enables the downlink bandwidth control setting.

disable - Disables the feature.

Default

Disabled

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

This command enables the rate limiting of traffic from the wired network as it is passed to the VAP interface. You can set a maximum rate in Kbytes per second.

Example

```
AP(if-wireless 0: VAP[0])# bandwidth-control downlink enable

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0: VAP[0])#
```

bandwidth-control downlink rate

This command sets the downlink bandwidth rate for a VAP interface.

Syntax

bandwidth-control downlink rate <*rate*>

rate - The allowed downlink rate in Kbytes per second.
(Range: 100-12000 Kbytes per second)

Default

100 Kbytes per second

Command Mode

Interface Configuration (Wireless-VAP)

Example

```
AP(if-wireless 0: VAP[0])# bandwidth-control downlink rate 512

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0: VAP[0])#
```

bandwidth-control uplink

This command enables the uplink bandwidth control for a VAP interface.

Syntax

bandwidth-control uplink <**enable** | **disable**>

enable - Enables the uplink bandwidth control setting.

disable - Disables the feature.

Default

Disabled

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

This command enables the rate limiting of traffic from the VAP interface as it is passed to the wired network. You can set a maximum rate in Kbytes per second.

Example

```
AP(if-wireless 0: VAP[0])# bandwidth-control uplink enable

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0: VAP[0])#
```

bandwidth-control uplink rate

This command sets the uplink bandwidth rate for a VAP interface.

Syntax

bandwidth-control uplink rate <*rate*>

rate - The allowed uplink rate in Kbytes per second.
(Range: 100-12000 Kbytes per second)

Default

100 Kbytes per second

Command Mode
Interface Configuration (Wireless-VAP)

Example

```
AP(if-wireless 0: VAP[0])# bandwidth-control uplink rate 512

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0: VAP[0])#
```

show interface wireless

This command displays the status for a specified VAP interface.

Syntax

show interface wireless <*index*> **vap** <*vap-index*>

index - The wireless interface slot number. (Range: 0 or 1)

vap-index - The number that identifies a VAP interface. (Options: 0-15)

Command Mode
Exec

Example

```
AP# show interface wireless 0 vap 0
----------------------------------Basic Setting-----------------------------
SSID                                : EAP9112A_11BGN_0
Wireless Network Mode               : 11ng
Auto Channel Select                 : DISABLE
Channel                             : 6
High Throughput Mode                : HT20
Status                              : ENABLE
VLAN-ID                             : 1
Dhcp-Relay Server Ip                : 0.0.0.0
-----------------------------------Capacity-----------------------------------
Maximum Association Client Per Vap      : 16 Clients
Maximum Association Client Per Radio    : 127 Clients
-------------------------------802.11 Parameters---------------------------
Transmit Power                      : 100%(20 dBm)
Preamble Length                     : Short-or-Long
Fragmentation Threshold             : 2346
RTS Threshold                       : 2346
Beacon Interval                     : 100
Authentication Timeout Interval     : 3 Mins
Association Timeout Interval        : 5 Mins
DTIM Interval                       : 1
Short Guard Interval Status         : Disabled
A-MPDU Status                       : Enabled
A-MPDU Length Limit                 : 65535 Bytes
A-MSDU Status                       : Enabled

-----------------------------------Security-----------------------------------
Closed System                       : DISABLE
```

```
WPA Function                              : OPEN-SYSTEM, WPA FUNCTION DISABLE
WPA PSK Key Type                          : ascii
WPA PSK Key                               : ********
Default Transmit Key                      : 1
Static WEP Keys
Key 1                                     : *****
Key 2                                     : *****
Key 3                                     : *****
Key 4                                     : *****
Pre-Authentication                        : DISABLE
-------------------------------------802.1x---------------------------------
802.1x                                    : DISABLE
802.1x Reauthentication Time Value        : 3600 seconds

----------------------Bandwidth Control for Uplink/Downlink------------------
Bandwidth Control for Uplink              : DISABLE
Bandwidth Control for Uplink rate         : 100 Kbyte/s
Bandwidth Control for Downlink            : DISABLE
Bandwidth Control for Downlink rate       : 100 Kbyte/s

------------------------------Qos Mapping-------------------------------
Qos Mapping for vap to 802.1p             : DISABLE
User Priority for vap to 802.1p           : 0
Qos Mapping for 802.1d to 802.1p          : DISABLE
Template Name for 802.1d to 802.1p        : default_up_mapping_1
Template Priority for 802.1d to 802.1p    : 01234567
Qos Mapping for 802.1d to DSCP            : DISABLE
Template Name for 802.1d to DSCP          : default_up_mapping_1
Template Priority for 802.1d to DSCP      : 01234567

--------------------------------Quality of Service---------------------------
WMM Mode                                  : ENABLED

WMM Acknowledge Policy
AC0(BE)                                   : Acknowledge
AC1(BK)                                   : Acknowledge
AC2(VI)                                   : Acknowledge
AC3(VO)                                   : Acknowledge
WMM AP Parameters:
AC0(BE)  CwMin:   4  CwMax:   6  AIFSN:   3  TXOP Limit:   0
AC1(BK)  CwMin:   4  CwMax:  10  AIFSN:   7  TXOP Limit:   0
AC2(VI)  CwMin:   3  CwMax:   4  AIFSN:   1  TXOP Limit:3008
AC3(VO)  CwMin:   2  CwMax:   3  AIFSN:   1  TXOP Limit:1504
WMM BSS Parameters:
AC0(BE)  CwMin:   4  CwMax:  10  AIFSN:   3  TXOP Limit:   0  ACM:Disabled
AC1(BK)  CwMin:   4  CwMax:  10  AIFSN:   7  TXOP Limit:   0  ACM:Disabled
AC2(VI)  CwMin:   3  CwMax:   4  AIFSN:   2  TXOP Limit:3008  ACM:Disabled
AC3(VO)  CwMin:   2  CwMax:   3  AIFSN:   2  TXOP Limit:1504  ACM:Disabled

AP#
```

show station

This command shows the wireless clients associated with the access point.

Command Mode

Exec

Example

```
AP#show station
```

```
Station Table Information
=========================================
Wireless Interface 0 VAPs List:
if-wireless 0 VAP [0] :
ADDR               RSSI  Tx(Mbps)  Rx(Mbps)  IP              Privacy
  Authentication
fc:25:3f:70:1a:4f  22    0M        6M        0.0.0.0         off      Open
fc:25:3f:5c:32:49  20    0M        13M       0.0.0.0         off      Open

if-wireless 0 VAP [1] :
if-wireless 0 VAP [2] :
if-wireless 0 VAP [3] :
if-wireless 0 VAP [4] :
if-wireless 0 VAP [5] :
if-wireless 0 VAP [6] :
if-wireless 0 VAP [7] :
if-wireless 0 VAP [8] :
if-wireless 0 VAP [9] :
if-wireless 0 VAP [10] :
if-wireless 0 VAP [11] :
if-wireless 0 VAP [12] :
if-wireless 0 VAP [13] :
if-wireless 0 VAP [14] :
if-wireless 0 VAP [15] :

Wireless Interface 1 VAPs List:
if-wireless 1 VAP [0] :
if-wireless 1 VAP [1] :
if-wireless 1 VAP [2] :
if-wireless 1 VAP [3] :
if-wireless 1 VAP [4] :
if-wireless 1 VAP [5] :
if-wireless 1 VAP [6] :
if-wireless 1 VAP [7] :
if-wireless 1 VAP [8] :
if-wireless 1 VAP [9] :
if-wireless 1 VAP [10] :
if-wireless 1 VAP [11] :
if-wireless 1 VAP [12] :
if-wireless 1 VAP [13] :
if-wireless 1 VAP [14] :
if-wireless 1 VAP [15] :

=========================================

AP#
```

show station statistics

This command shows statistics information for wireless clients associated with the access point.

Command Mode

Exec

Example

```
AP#show station statistics

Station Table Information
=========================================
Wireless Interface 0 VAPs List:
if-wireless 0 VAP [0] :
Total Station Number of this vap: 0
if-wireless 0 VAP [1] :
Total Station Number of this vap: 0
if-wireless 0 VAP [2] :
Total Station Number of this vap: 0
if-wireless 0 VAP [3] :
Total Station Number of this vap: 0
if-wireless 0 VAP [4] :
Total Station Number of this vap: 0
if-wireless 0 VAP [5] :
Total Station Number of this vap: 0
if-wireless 0 VAP [6] :
Total Station Number of this vap: 0
if-wireless 0 VAP [7] :
Total Station Number of this vap: 0
if-wireless 0 VAP [8] :
Total Station Number of this vap: 0
if-wireless 0 VAP [9] :
Total Station Number of this vap: 0
if-wireless 0 VAP [10] :
Total Station Number of this vap: 0
if-wireless 0 VAP [11] :
Total Station Number of this vap: 0
if-wireless 0 VAP [12] :
Total Station Number of this vap: 0
if-wireless 0 VAP [13] :
Total Station Number of this vap: 0
if-wireless 0 VAP [14] :
Total Station Number of this vap: 0
if-wireless 0 VAP [15] :
Total Station Number of this vap: 0

Wireless Interface 1 VAPs List:
if-wireless 1 VAP [0] :
Total Station Number of this vap: 0
if-wireless 1 VAP [1] :
Total Station Number of this vap: 0
if-wireless 1 VAP [2] :
Total Station Number of this vap: 0
if-wireless 1 VAP [3] :
Total Station Number of this vap: 0
if-wireless 1 VAP [4] :
Total Station Number of this vap: 0
if-wireless 1 VAP [5] :
Total Station Number of this vap: 0
if-wireless 1 VAP [6] :
Total Station Number of this vap: 0
if-wireless 1 VAP [7] :
Total Station Number of this vap: 0
if-wireless 1 VAP [8] :
Total Station Number of this vap: 0
if-wireless 1 VAP [9] :
Total Station Number of this vap: 0
if-wireless 1 VAP [10] :
Total Station Number of this vap: 0
if-wireless 1 VAP [11] :
```

```
Total Station Number of this vap: 0
if-wireless 1 VAP [12] :
Total Station Number of this vap: 0
if-wireless 1 VAP [13] :
Total Station Number of this vap: 0
if-wireless 1 VAP [14] :
Total Station Number of this vap: 0
if-wireless 1 VAP [15] :
Total Station Number of this vap: 0

=======================================
Total Station Number of this device: 0
Total Station Number of Radio 0: 0
Total Station Number of Radio 1: 0
=======================================

AP#
```

25 Wireless Security Commands

The commands described in this section configure parameters for wireless security on the VAP interfaces.

Table 21: Wireless Security Commands

Command	Function	Mode	Page
auth	Defines the 802.11 authentication type allowed by the access point	IC-W-VAP	235
encryption	Defines whether or not WEP encryption is used to provide privacy for wireless communications	IC-W-VAP	234
key	Sets the keys used for WEP encryption	IC-W	235
transmit-key	Sets the index of the key to be used for encrypting data frames sent between the access point and wireless clients	IC-W-VAP	236
cipher-suite	Selects an encryption method for the global key used for multicast and broadcast traffic	IC-W-VAP	237
wpa-pre-shared-key	Defines a WPA preshared-key value	IC-W-VAP	238
pmksa-lifetime	Sets the lifetime PMK security associations	IC-W-VAP	239
make-security-effective	Implements wireless security changes made in current CLI session	IC-W-VAP	239

auth

This command configures authentication for the VAP interface.

Syntax

auth <**open-system** | **shared-key** | **wpa** | **wpa-psk** | **wpa2** | **wpa2-psk** | **wpa-wpa2-mixed** | **wpa-wpa2-psk-mixed**>

open-system - Accepts the client without verifying its identity using a shared key. "Open" authentication means either there is no encryption (if encryption is disabled) or WEP-only encryption is used (if encryption is enabled).

shared-key - Authentication is based on a WEP shared key that has been distributed to all stations.

wpa - Clients using WPA are accepted for authentication.

wpa-psk - Clients using WPA with a Pre-shared Key are accepted for authentication.

wpa2 - Clients using WPA2 are accepted for authentication.

wpa2-psk - Clients using WPA2 with a Pre-shared Key are accepted for authentication.

wpa-wpa2-mixed - Clients using WPA or WPA2 are accepted for authentication.

wpa-wpa2-psk-mixed - Clients using WPA or WPA2 with a Pre-shared Key are accepted for authentication

Default Setting
open-system

Command Mode
Interface Configuration (Wireless-VAP)

Command Usage
- The **auth** command automatically configures settings for each authentication type, including encryption, 802.1X, and cipher suite. The command **auth open-system** disables encryption and 802.1X.

- To use WEP shared-key authentication, set the authentication type to "shared-key" and define at least one static WEP key with the **key** command. Encryption is automatically enabled by the command.

- To use WEP encryption only (no authentication), set the authentication type to "open-system." Then enable WEP with the **encryption** command, and define at least one static WEP key with the **key** command.

- When any WPA or WPA2 option is selected, clients are authenticated using 802.1X via a RADIUS server. Each client must be WPA-enabled or support 802.1X client software. The 802.1X settings (see "802.1X Authentication Commands" on page 173) and RADIUS server details (see "RADIUS Client Commands" on page 167) must be configured on the access point. A RADIUS server must also be configured and be available in the wired network.

- If a WPA/WPA2 mode that operates over 802.1X is selected (WPA, WPA2, WPA-WPA2-mixed, or WPA-WPA2-PSK-mixed), the 802.1X settings (see "802.1X Authentication Commands" on page 173) and RADIUS server details (see "RADIUS Client Commands" on page 167) must be configured. Be sure you have also configured a RADIUS server on the network before enabling authentication. Also, note that each client has to be WPA-enabled or support 802.1X client software. A RADIUS server must also be configured and be available in the wired network.

- If a WPA/WPA2 Pre-shared Key mode is selected (WPA-PSK, WPA2-PSK or WPA-WPA2-PSK-mixed), the key must first be generated and distributed to all wireless clients before they can successfully associate with the access point. Use the wpa-preshared-key command to configure the key (see "key" on page 235 and "transmit-key" on page 236).

- WPA2 defines a transitional mode of operation for networks moving from WPA security to WPA2. WPA2 Mixed Mode allows both WPA and WPA2 clients to associate to a common VAP interface. When the encryption cipher suite is set to TKIP, the unicast encryption cipher (TKIP or AES-CCMP) is negotiated for each client. The access point advertises it's supported encryption ciphers in beacon frames and probe responses. WPA and WPA2 clients select the cipher they support and return the choice in the association request to the access point. For mixed-mode operation, the cipher used for broadcast frames is always TKIP. WEP encryption is not allowed.

Example

```
AP(if-wireless 0: VAP[0])# auth wpa-psk
AP(if-wireless 0: VAP[0])#
```

Related Commands

encryption
key

encryption

This command enables data encryption for wireless communications. Use the **no** form to disable data encryption.

Syntax

[**no**] **encryption**

Default Setting

disabled

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

- Selecting a security method using the **auth** command, automatically enables data encryption (WEP, TKIP, or AES-CCMP) for the VAP. Only use this command when using WEP encryption with an Open System.

- Encryption is implemented in this device to prevent unauthorized access to your wireless network. For more secure data transmissions, enable encryption by selecting a security method using the **auth** command, or by using the **encryption** command when using WEP encryption only.

- The encryption settings must be the same on each client in your wireless network.

- Note that encryption protects data transmitted between wireless nodes, but does not protect any transmissions over your wired network or over the Internet.

Example

```
AP(if-wireless 0: VAP[0])# encryption

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0: VAP[0])#
```

Related Commands

key

key

This command sets the keys used for WEP encryption. Use the **no** form to delete a configured key.

Syntax

key {<*index*> <*size*> <*type*> <*value*> | **static** | **dynamic**}

no key <*index*>

index - Key index. (Range: 1-4)

size - Key size. (Options: 64 or 128 bits)

type - Input format. (Options: ASCII, HEX)

value - The key string.

For 64-bit keys, use 5 alphanumeric characters or 10 hexadecimal digits.

For 128-bit keys, use 13 alphanumeric characters or 26 hexadecimal digits.

static - Uses static WEP keys with 802.1X authentication.

dynamic - When using 802.1X authentication, allows WEP keys to be dynamically generated by the RADIUS server.

Default Setting

None

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

- To enable WEP, use the **auth shared-key** command to select the "shared key" authentication type, use the **key** command to configure at least one key, and then use the **transmit-key** command to select a key to use.

- If WEP is enabled, all wireless clients must be configured with the same shared keys to communicate with the VAP.

- The WEP key index, length and type configured for the VAP must match those configured for clients.

Example

```
AP(if-wireless 0: VAP[0])# key 1 64 hex 1234512345

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0: VAP[0])#
```

Related Commands

key
encryption
transmit-key

transmit-key

This command sets the index of the WEP key to be used for encrypting data frames transmitted from the VAP to wireless clients.

Syntax

transmit-key <*index*>

index - Key index. (Range: 1-4)

Default Setting

1

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

- If you use WEP key encryption option, the access point uses the transmit key to encrypt multicast and broadcast data signals that it sends to client devices. Other keys can be used for decryption of data from clients.

- When using dynamic keys with 802.1X, the access point uses a dynamic key to encrypt unicast and broadcast messages to 802.1X-enabled clients. However, because the access point sends the keys during the 802.1X authentication process, these keys do not have to appear in the client's key list.

Example

```
AP(if-wireless 0: VAP[0])# transmit-key 1

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0: VAP[0])#
```

cipher-suite

This command defines the cipher algorithm used to encrypt the global key for broadcast and multicast traffic when using WPA or WPA2 security.

Syntax

multicast-cipher <**aes-ccmp** | **tkip** >

aes-ccmp - Use AES-CCMP encryption for the unicast and multicast cipher.

tkip - Use TKIP encryption for the multicast cipher. TKIP or AES-CCMP can be used for the unicast cipher depending on the capability of the client.

Default Setting

None

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

- WPA and WPA2 enable a VAP to support different unicast encryption keys for each client. However, the global encryption key for multicast and broadcast traffic must be the same for all clients.
- TKIP provides data encryption enhancements including per-packet key hashing (i.e., changing the encryption key on each packet), a message integrity check, an extended initialization vector with sequencing rules, and a re-keying mechanism. Select TKIP if there are clients in the network that are not WPA2 compliant.
- TKIP defends against attacks on WEP in which the unencrypted initialization vector in encrypted packets is used to calculate the WEP key. TKIP changes the encryption key on each packet, and rotates not just the unicast keys, but the broadcast keys as well. TKIP is a replacement for WEP that removes the predictability that intruders relied on to determine the WEP key.
- AES-CCMP (Advanced Encryption Standard Counter-Mode/CBCMAC Protocol): WPA2 is backward compatible with WPA, including the same 802.1X and PSK modes of operation and support for TKIP encryption. The main enhancement is its use of AES Counter-Mode encryption with Cipher Block Chaining Message Authentication Code (CBC-MAC) for message integrity. The AES Counter-Mode/CBCMAC Protocol (AES-CCMP) provides extremely robust data confidentiality using a 128-bit key. The AES-CCMP encryption cipher is specified as a standard requirement for WPA2. However, the computational intensive operations of AES-CCMP requires hardware support on client devices. Therefore to implement WPA2 in the network, wireless clients must be upgraded to WPA2-compliant hardware.

Example

```
AP(if-wireless 0: VAP[0])# cipher-suite tkip

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0: VAP[0])#
```

wpa-pre-shared-key

This command defines a Wi-Fi Protected Access (WPA/WPA2) Pre-shared-key.

Syntax

wpa-pre-shared-key <**hex** | **passphrase-key**> <*value*>

hex - Specifies hexadecimal digits as the key input format.

passphrase-key - Specifies an ASCII pass-phrase string as the key input format.

value - The key string. For ASCII input, specify a string between 8 and 63 characters. For HEX input, specify exactly 64 digits.

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

- To support WPA or WPA2 for client authentication, use the **auth** command to specify the authentication type, and use the **wpa-preshared-key** command to specify one static key.
- If WPA or WPA2 is used with pre-shared-key mode, all wireless clients must be configured with the same pre-shared key to communicate with the access point's VAP interface.

Example

```
AP(if-wireless 0: VAP[0])# wpa-pre-shared-key passphrase-key agoodsecret

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0: VAP[0])#
```

Related Commands

auth

pmksa-lifetime

This command sets the time for aging out cached WPA2 Pairwise Master Key Security Association (PMKSA) information for fast roaming.

Syntax

pmksa-lifetime <*minutes*>

minutes - The time for aging out PMKSA information. (Range: 0 - 14400 minutes)

Default Setting

720 minutes

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

- WPA2 provides fast roaming for authenticated clients by retaining keys and other security information in a cache, so that if a client roams away from an access point and then returns reauthentication is not required.
- When a WPA2 client is first authenticated, it receives a Pairwise Master Key (PMK) that is used to generate other keys for unicast data encryption. This key and other client information form a Security Association that the access point names and holds in a cache. The lifetime of this security association can be configured with this command. When the lifetime expires, the client security association and keys are deleted from the cache. If the client returns to the access point, it requires full reauthentication.

Example

```
AP(if-wireless 0: VAP[0])# pmksa-lifetime 600

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0: VAP[0])#
```

make-security-effective

This command implements all wireless security changes made in the current CLI session.

Syntax

make-security-effective

Default Setting

None

Command Mode

Interface Configuration (Wireless-VAP)

Example

```
AP(if-wireless 0: VAP[0])# make-security-effective

It will take several minutes !
Please wait a while...


device eth0 left promiscuous mode
br0: port 1(eth0) entering disabled state
br0: port 3(ath16) entering disabled state
br0: port 2(ath0) entering disabled state
device ath16 left promiscuous mode
br0: port 3(ath16) entering disabled state
device ath0 left promiscuous mode
br0: port 2(ath0) entering disabled state
wlan_vap_delete : enter. vaphandle=0x879a2000
wlan_vap_delete : exit. vaphandle=0x879a2000
wlan_vap_delete : enter. vaphandle=0x8729c000
wlan_vap_delete : exit. vaphandle=0x8729c000
device eth0 entered promiscuous mode
br0: port 1(eth0) entering forwarding state
wlan_vap_create : enter. devhandle=0x87ae8300, opmode=IEEE80211_M_HOSTAP,
  flags=0x1
wlan_vap_create : exit. devhandle=0x87ae8300, opmode=IEEE80211_M_HOSTAP,
  flags=0x1.
VAP device ath0 created
Setting Max Stations:17

 DES SSID SET=EAP9112A_11BGN_0
 ieee80211_ioctl_siwmode: imr.ifm_active=393856, new mode=3, valid=1
wlan_vap_create : enter. devhandle=0x87048300, opmode=IEEE80211_M_HOSTAP,
  flags=0x1
wlan_vap_create : exit. devhandle=0x87048300, opmode=IEEE80211_M_HOSTAP,
  flags=0x1.
VAP device ath16 created
Setting Max Stations:17

 DES SSID SET=EAP9112A_11NA_0
 ieee80211_ioctl_siwmode: imr.ifm_active=328320, new mode=3, valid=1
device ath0 entered promiscuous mode
br0: port 2(ath0) entering forwarding state
device ath16 entered promiscuous mode
br0: port 3(ath16) entering forwarding state

AP(if-wireless 0: VAP[0])#
```

26 Rogue AP Detection Commands

A “rogue AP” is either an access point that is not authorized to participate in the wireless network, or an access point that does not have the correct security configuration. Rogue APs can potentially allow unauthorized users access to the network. Alternatively, client stations may mistakenly associate to a rogue AP and be prevented from accessing network resources. Rogue APs may also cause radio interference and degrade the wireless LAN performance.

The access point can be configured to periodically scan all radio channels and find other access points within range. A database of access points is maintained so that any rogue APs can be identified.

Table 22: Rogue AP Detection Commands

Command	Function	Mode	Page
rogue-ap enable	Enables the periodic detection of other nearby access points	GC	241
rogue-ap disable	Disables the periodic detection of other nearby access points	GC	242
rogue-ap add friendly	Configures a database of known AP MAC addresses	GC	242
rogue-ap delete friendly	Removes AP MAC addresses from the database	GC	243
rogue-ap duration	Sets the duration that all channels are scanned	GC	243
rogue-ap interval	Sets the time between each scan	GC	244
rogue-ap instant-scan	Forces an immediate scan of all radio channels	GC	245
show rogue-ap	Shows the current database of detected access points	Exec	245

rogue-ap enable

This command enables the periodic detection of nearby access points.

Syntax

rogue-ap enable

Default Setting

Disabled

Command Mode

Interface Configuration (Wireless)

Command Usage

- While the access point scans a channel for rogue APs, wireless clients will not be able to connect to the access point. Therefore, avoid frequent scanning or scans of a long duration unless there is a reason to believe that more intensive scanning is required to find a rogue AP.

- A "rogue AP" is either an access point that is not authorized to participate in the wireless network, or an access point that does not have the correct security configuration. Rogue access points can be identified by unknown BSSID (MAC address). A database of nearby access points should therefore be maintained on the AP, allowing any rogue APs to be identified (see rogue-ap add friendly). The rogue AP database can be viewed using the **show rogue-ap** command.

Example

```
AP(if-wireless 0)#rogue-ap enable
If want to take effect, please execute make-RF-setting-effective command !
AP(if-wireless 0)#
```

rogue-ap disable

This command disables the periodic detection of nearby access points.

Syntax

rogue-ap disable

Default Setting

Disabled

Command Mode

Interface Configuration (Wireless)

Example

```
AP(if-wireless 0)#rogue-ap disable
If want to take effect, please execute make-RF-setting-effective command !
AP(if-wireless 0)#
```

rogue-ap add friendly

This command adds MAC addresses of known APs in the network to a local databaseon the AP on the network.

Syntax

rogue-ap add friendly <*mac-address*>

mac-address - A known AP MAC address.

Default Setting

None

Command Mode
Interface Configuration (Wireless)

Command Usage
Enter the MAC address/Basic Service Set Identifier (BSSID) of known APs in the network. These MAC addresses will be filtered out of the list of detected APs during a scan. Building a database of approved APs allows the AP to discover rogue APs. Without a configured database, the AP can detect neighboring APs only, it cannot identify whether the APs are rogues.

Example

```
AP(if-wireless 0)#rogue-ap add friendly 00-12-34-56-78-9a
AP(if-wireless 0)#
```

rogue-ap delete friendly

This command removes MAC addresses from the database of known APs.

Syntax

rogue-ap delete friendly <*mac-address* | **all**>

mac-address - Removes the specified MAC address.

all - Removes all AP MAC address from the database.

Default Setting
None

Command Mode
Interface Configuration (Wireless)

Example

```
AP(if-wireless 0)#rogue-ap delete friendly 00-12-34-56-78-9a
AP(if-wireless 0)#
```

rogue-ap duration

This command sets the scan duration for detecting access points.

Syntax

rogue-ap duration <*milliseconds*>

milliseconds - The duration of the scan. (Range: 10-150 milliseconds)

Default Setting
150 milliseconds

Command Mode
Interface Configuration (Wireless)

Command Usage
- During a scan, client access may be disrupted and new clients may not be able to associate to the access point. If clients experience severe disruption, reduce the scan duration time.
- A long scan duration time will detect more access points in the area, but causes more disruption to client access.

Example
```
AP(if-wireless 0)#rogue-ap duration 200
AP(if-wireless 0)#
```

Related Commands
rogue-ap interval (244)

rogue-ap interval
This command sets the interval at which to scan for access points.

Syntax
rogue-ap interval <*seconds*>

seconds - The interval between consecutive scans. (Range: 15-65535 seconds)

Default Setting
7200 seconds

Command Mode
Interface Configuration (Wireless)

Command Usage
This command sets the interval at which scans occur. Frequent scanning will more readily detect other access points, but will cause more disruption to client access.

Example
```
AP(if-wireless 0)#rogue-ap interval 120
AP(if-wireless 0)#
```

Related Commands
rogue-ap duration (243)

rogue-ap instant-scan

This command starts an immediate scan for access points on the radio interface.

Default Setting

Disabled

Command Mode

Interface Configuration (Wireless)

Command Usage

While the access point scans a channel for rogue APs, wireless clients will not be able to connect to the access point. Therefore, avoid frequent scanning or scans of a long duration unless there is a reason to believe that more intensive scanning is required to find a rogue AP.

Example

```
AP(if-wireless 0)#rogue-ap scan
AP(if-wireless 0)#
```

show rogue-ap

This command displays the current rogue AP configuration and the databases of known and rogue APs.

Syntax

show rogue-ap <config | table>

config - Displays the current rogue AP configuration.

table - Displays the database of known and rogue APs after scanning.

Command Mode

Exec

Example

```
AP#show rogue-ap config

Rogue AP Config Information
===================================
Radio 0
Rogue AP scan Status: Enabled
AP Scan Interval    : 7200 seconds
AP Scan Duration    : 150 milliseconds
AP First Scan Delay : 0 seconds
Radio 1
Rogue AP scan Status: Disabled
AP Scan Interval    : 7200 seconds
AP Scan Duration    : 150 milliseconds
AP First Scan Delay : 0 seconds
===================================

AP#
```

27 Link Integrity Commands

The access point provides a link integrity feature that can be used to ensure that wireless clients are connected to resources on the wired network. The access point does this by periodically sending Ping messages to a host device in the wired Ethernet network. If the access point detects that the connection to the host has failed, it disables the radio interfaces, forcing clients to find and associate with another access point. When the connection to the host is restored, the access point re-enables the radio interfaces.

Table 23: Link Integrity Commands

Command	Function	Mode	Page
link-integrity	Enables link integrity detection and specifies the IP address of a host device in the wired network	GC	247
link-integrity link-fail-action	Sets the link fail action	GC	248
show link-integrity	Displays the current link integrity configuration	Exec	249

link-integrity

This command enables link integrity detection and configures the IP address, detect interval, response timeout, and retry count for the link integrity host test. Use the **no** form to disable link integrity detection.

Syntax

link-integrity [<*ip_address*> **interval** <*interval*> **timeout** <*timeout*> **retry** <*retry*>]

no link-integrity

ip_address - IP address of the host.

interval - The interval time between each Ping sent to the host. (Range: 10-86400 seconds)

timeout - The time to wait for a response to a Ping message. (Range: 1-10 seconds)

retry - The number of consecutive failed Ping counts before the link is determined as lost. (Range: 1-99)

Default Setting

Status: Disabled
Host IP Address: 192.168.2.254
Detect Interval: 60 seconds

Response Timeout: 2 seconds
Retry Counts: 5

Command Mode
Global Configuration

Command Usage
- When link integrity is enabled, the IP address of a host device in the wired network must be specified.
- The access point periodically sends an ICMP echo request (Ping) packet to the link host IP address. When the number of failed responses (either the host does not respond or is unreachable) exceeds the limit set by this command, the link is determined as lost. The link-integrity link-fail-action command can be used to disable radio interfaces when the host link is lost.
- The AP continues to send Ping messages to determine if the link to the host is restored. When the connection to the host is restored, the access point re-enables the radio interfaces if they have been shut down.

Example

```
AP(config)#link-integrity 10.20.30.40 interval 500 timeout 5 retry 3
AP(config)#link-integrity
AP(config)#
```

link-integrity link-fail-action

This command configures the fail action for a link integrity test.

Syntax

link-integrity link-fail-action <*radio*> <**enable** | **disable**>

radio - The radio interface, 2.4 GHz (0) or 5 GHz (1). (Options: 0 or 1)

enable - Enables the link fail action to shut down radio interfaces.

disable - Disables the link fail action.

Default Setting
Disabled

Command Mode
Global Configuration

Command Usage
When the host link is determined to be lost, one or both radio interfaces can be disabled. The AP continues to send Ping messages to determine if the link to the host is restored. When the connection to the host is restored, the AP re-enables the radio interfaces if they have been shut down.

Example

```
AP(config)# link-integrity link-fail-action 0 enable
AP(config)#
```

show link-integrity

This command displays the current link integrity configuration.

Command Mode

Exec

Example

```
AP#show link-integrity

Link Integrity Information
=================================================================
  Link integrity:                       disabled
  Destination IP:                       192.168.2.254
  Detect Interval:                      60
  Response Timeout:                     2
  Retry Count if no response:           5
  Link fail action - Shutdown Radio 0: disabled
  Link fail action - Shutdown Radio 1: disabled
AP#
```

28 Link Layer Discovery Commands

LLDP allows devices in the local broadcast domain to share information about themselves. LLDP-capable devices periodically transmit information in messages called Type Length Value (TLV) fields to neighbor devices. Advertised information is represented in Type Length Value (TLV) format according to the IEEE 802.1ab standard, and can include details such as device identification, capabilities and configuration settings.

This information can be used by SNMP applications to simplify troubleshooting, enhance network management, and maintain an accurate network topology.

Table 24: Link Layer Discovery Commands

Command	Function	Mode	Page
lldp service	Enables the transmission of LLDP information	GC	250
lldp transmit hold-muliplier	Sets the message transmission hold time	GC	251
lldp transmit interval	Sets the message transmission interval time	GC	251
lldp transmit re-init-delay	Sets the reinitial delay time	GC	252
lldp transmit delay-to-local-change	Sets the transmission delay value	GC	252
show lldp	Shows the current LLDP information	Exec	253

lldp service

This command enables LLDP on the access point. Use the **no** form to disable LLDP.

Syntax

[**no**] **lldp service**

Default Setting

Enabled

Command Mode

Global Configuration

Example

```
AP(config)# lldp service
AP(config)#
```

lldp-transmit hold-muliplier

This command configures the time-to-live (TTL) value sent in LLDP advertisements.

Syntax

lldp transmit hold-multiplier <*multiplier*>

multiplier - The hold multiplier number. (Range: 2-10)

Default Setting

4

Command Mode

Global Configuration

Command Usage

- This command configures the time-to-live (TTL) value sent in LLDP advertisements as shown in the following formula:
  (Transmission Interval * Hold time) ≤ 65536
  Therefore, the default TTL is 4*30 = 120 seconds.

- The time-to-live tells the receiving LLDP agent how long to retain all information pertaining to the sending LLDP agent if it does not transmit updates in a timely manner.

Example

```
AP(config)# lldp transmit hold-multiplier 6
AP(config)#
```

lldp transmit interval

This command configures the periodic transmit interval for LLDP advertisements.

Syntax

lldp transmit interval <*interval*>

interval - The time between LLDP advertisements.
(Range: 5-32768 seconds)

Default Setting

30 seconds

Command Mode

Global Configuration

Command Usage

This command configures the periodic transmit interval for LLDP advertisements. This parameter must comply with the following rule:
(Transmission Interval * Hold Time) ≤ 65536, and
Transmission Interval >= (4 * Delay Interval)

Example

```
AP(config)# lldp transmit interval 30
AP(config)#
```

lldp transmit re-init-delay

This command configures the delay before attempting to re-initialize after LLDP ports are disabled or the link goes down.

Syntax

lldp transmit re-init-delay <*seconds*>

seconds - Time in seconds. (Range: 2 - 10)

Default Setting

2 seconds

Command Mode

Global Configuration

Command Usage

- This command configures the delay before attempting to re-initialize after LLDP ports are disabled or the link goes down.
- When LLDP is re-initialized on a port, all information in the remote systems LLDP MIB associated with this port is deleted.

Example

```
AP(config)#lldp transmit re-init-delay 10
AP(config)#
```

lldp transmit delay-to-local-change

This command configures a delay between the successive transmission of LLDP advertisements initiated by a change in local LLDP MIB variables.

Syntax

lldp transmit delay-to-local-change <*seconds*>

seconds - Time in seconds. (Range: 1-8192 seconds)

Default Setting

2 seconds

Command Mode

Global Configuration

Command Usage

- The transmit delay is used to prevent a series of successive LLDP transmissions during a short period of rapid changes in local LLDP MIB objects, and to increase the probability that multiple, rather than single changes, are reported in each transmission.

- This attribute must comply with the rule: (4 * Delay Interval) ≤ Transmission Interval

Example

```
AP(config)# lldp transmit delay-to-local-change 10
txDelay range is 1 to quter of msgTxInterval
AP(config)#
```

show lldp

This command displays the current LLDP configuration.

Command Mode

Exec

Example

```
AP# show lldp
LLDP Information
=====================================================================
Status                                  :Enabled
Message Transmission Hold Time          :5
Message Transmission Interval (seconds) :30
Reinitial Delay Time (seconds)          :2
Transmission Delay Value (seconds)      :2
=====================================================================
AP#
```

29 VLAN Commands

The access point can enable the support of VLAN-tagged traffic passing between wireless clients and the wired network. VLAN IDs can be mapped to specific VAP interfaces, allowing users to remain within the same VLAN as they move around a campus site.

Caution: When VLANs are enabled, the access point's Ethernet port drops all received traffic that does not include a VLAN tag. To maintain network connectivity to the access point and wireless clients, be sure that the access point is connected to a device port on a wired network that supports IEEE 802.1Q VLAN tags.

The VLAN commands supported by the access point are listed below.

Table 25: VLAN Commands

Command	Function	Mode	Page
vlan	Enables a single VLAN for all traffic	GC	254
management-vlanid	Configures the management VLAN for the access point	GC	255
native-vlanid	Configures the default VLAN for the LAN port	GC	256
vlan-id	Configures the default VLAN for the VAP interface	IC-W-VAP	256

vlan

This command enables VLANs for all traffic. Use the **no** form to disable VLANs.

Syntax

vlan enabled
no vlan

Default

Disabled

Command Mode

Global Configuration

Command Description

- When VLANs are enabled, the access point tags frames received from wireless clients with the VAP's default VLAN ID.

- Traffic entering the Ethernet port must be tagged with a VLAN ID that matches the access point's management VLAN ID, or with a VLAN tag that matches one of the VAP default VLAN IDs.

Example

```
AP(config)# vlan enabled

Warning!  VLAN's status has been changed now !

It will take several seconds !
Please wait a while...

AP(config)#
```

Related Commands
management-vlanid

management-vlanid

This command configures the management VLAN ID for the access point.

Syntax

management-vlanid <*vlan-id*>

vlan-id - Management VLAN ID. (Range: 1-4094)

Default Setting
4093

Command Mode
Global Configuration

Command Usage
The management VLAN is for managing the access point. For example, the access point allows traffic that is tagged with the specified VLAN to manage the access point through remote management, SNMP, Telnet, SSH, etc.

Example

```
AP(config)# management-vlanid 3

Warning!  VLAN's structure is re-created now !

It will take several seconds !
Please wait a while...

AP(config)#
```

Related Commands
vlan

native-vlanid

This command configures the default VLAN ID for the LAN port interface.

Syntax

native-vlanid <*vlan-id*>

vlan-id - Default VLAN ID. (Range: 1-4094)

Default Setting

1

Command Mode

Global Configuration

Command Usage

- To implement the default VLAN ID setting for the LAN port, the AP must first enable VLAN support using the **vlan** command.
- When VLANs are enabled, the AP assigns the default VLAN ID to untagged frames received on the LAN port interface.

Example

```
AP(config)# native-vlanid 123

Warning!  VLAN's structure is re-created now !

It will take several seconds !
Please wait a while...

AP(config)#
```

vlan-id

This command configures the default VLAN ID for the VAP interface.

Syntax

vlan-id <*vlan-id*>

vlan-id - Default VLAN ID. (Range: 1-4094)

Default Setting

1

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

- To implement the default VLAN ID setting for VAP interface, the access point must enable VLAN support using the **vlan** command.

- When VLANs are enabled, the access point tags frames received from wireless clients with the default VLAN ID for the VAP interface.

Example

```
AP(if-wireless 0: VAP[0])# vlan-ID 6

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0: VAP[0])#
```

30 WMM Commands

The access point implements QoS using the Wi-Fi Multimedia (WMM) standard. Using WMM, the access point is able to prioritize traffic and optimize performance when multiple applications compete for wireless network bandwidth at the same time. WMM employs techniques that are a subset of the IEEE 802.11e QoS standard and it enables the access point to inter-operate with both WMM-enabled clients and other devices that may lack any WMM functionality.

Table 26: WMM Commands

Command	Function	Mode	Page
wmm	Enables WMM on the access point	IC-W	258
wmm-acknowledge-policy	Allows the acknowledgement wait time to be enabled or disabled for each Access Category (AC)	IC-W	259
wmmparam	Configures detailed WMM parameters that apply to the access point (AP) or the wireless clients (BSS)	IC-W	259

wmm

This command enables WMM on the access point. Use the **no** form to disable WMM.

Syntax

wmm required
no wmm

required - WMM must be supported on any device trying to associated with the access point. Devices that do not support this feature will not be allowed to associate with the access point.

Default

Disabled

Command Mode

Interface Configuration (Wireless)

Example

```
AP(if-wireless 0)# wmm required

This setting has not been effective !
If want to take effect, please execute make-RF-setting-effective command !

AP(if-wireless 0)#
```

wmm-acknowledge-policy

This command allows the acknowledgement wait time to be enabled or disabled for each Access Category (AC).

Syntax

wmm-acknowledge-policy <*ac_number*> <**ack** | **noack**>

ac_number - Access categories. (Range: 0-3)

ack - Require the sender to wait for an acknowledgement from the receiver.

noack - Does not require the sender to wait for an acknowledgement from the receiver.

Default

ack

Command Mode

Interface Configuration (Wireless)

Command Usage

- WMM defines four access categories (ACs) – voice, video, best effort, and background. These categories correspond to traffic priority levels and are mapped to IEEE 802.1D priority tags. The direct mapping of the four ACs to 802.1D priorities is specifically intended to facilitate interpretability with other wired network QoS policies. While the four ACs are specified for specific types of traffic, WMM allows the priority levels to be configured to match any network-wide QoS policy. WMM also specifies a protocol that access points can use to communicate the configured traffic priority levels to QoS-enabled wireless clients.

- Although turning off the requirement for the sender to wait for an acknowledgement can increases data throughput, it can also result in a high number of errors when traffic levels are heavy.

Example

```
AP(if-wireless 0)# wmm-acknowledge-Policy 0 noAck

This setting has not been effective !
If want to take effect, please execute make-RF-setting-effective command !

AP(if-wireless 0)#
```

wmmparam

This command configures detailed WMM parameters that apply to the access point (AP) or the wireless clients (BSS).

Syntax

wmmparam <**AP** | **BSS**> <*ac_number*> <*LogCwMin*> <*LogCwMax*> <*AIFS*> <*TxOpLimit*> <*admission_control*>

AP - Access Point

BSS - Wireless client

ac_number - Access categories (ACs) – voice, video, best effort, and background. These categories correspond to traffic priority levels and are mapped to IEEE 802.1D priority tags as shown in Table 2 on page 87. (Range: 0-3)

LogCwMin - Minimum log value of the contention window. This is the initial upper limit of the random backoff wait time before wireless medium access can be attempted. The initial wait time is a random value between zero and the LogCwMin value. Specify the LogCwMin value. Note that the LogCwMin value must be equal or less than the LogCwMax value. (Range: 1-15 microseconds)

LogCwMax - Maximum log value of the contention window. This is the maximum upper limit of the random backoff wait time before wireless medium access can be attempted. The contention window is doubled after each detected collision up to the LogCwMax value. Note that the CWMax value must be greater or equal to the LogCwMin value. (Range: 1-15 microseconds)

AIFS - Arbitrary InterFrame Space specifies the minimum amount of wait time before the next data transmission attempt. (Range: 1-15 microseconds)

TXOPLimit - Transmission Opportunity Limit specifies the maximum time an AC transmit queue has access to the wireless medium. When an AC queue is granted a transmit opportunity, it can transmit data for a time up to the TxOpLimit. This data bursting greatly improves the efficiency for high data-rate traffic. (Range: 0-65535 microseconds)

admission_control - The admission control mode for the access category. When enabled, clients are blocked from using the access category. (Options: 0 to disable, 1 to enable)

Default

Table 27: AP Parameters

WMM Parameters	AC0 (Best Effort)	AC1 (Background)	AC2 (Video)	AC3 (Voice)
LogCwMin	4	4	3	2
LogCwMax	10	10	4	3
AIFS	3	7	2	2
TXOP Limit	0	0	94	47
Admission Control	Disabled	Disabled	Disabled	Disabled

Table 28: BSS Parameters

WMM Parameters	AC0 (Best Effort)	AC1 (Background)	AC2 (Video)	AC3 (Voice)
LogCwMin	4	4	3	2
LogCwMax	6	10	4	3
AIFS	3	7	1	1
TXOP Limit	0	0	94	47
Admission Control	Disabled	Disabled	Disabled	Disabled

Command Mode

Interface Configuration (Wireless)

Example

```
AP(if-wireless 0)# wmmparam ap 0 5 10 3 64 1

This setting has not been effective !
If want to take effect, please execute make-RF-setting-effective command !

AP(if-wireless 0)#
```

31 QoS Commands

The QoS commands configure QoS priority mapping for traffic on VAP interfaces. The AP enables Wi-Fi Multimedia (WMM) 802.1d priorities to be mapped to 802.1p priorities or IP DSCP priorities.

Table 29: QoS Commands

Command	Function	Mode	Page
qos vap-802.1p	Enables the setting of VAP traffic to a specific 802.1p priority value	IC-W VAP	263
qos vap-802.1p retagged-user-priority	Sets the 802.1p priority value for VAP traffic	IC-W VAP	264
qos 802.1d-802.1p	Enables the mapping of WMM 802.1d priority values to 802.1p values	IC-W VAP	265
qos 802.1d-802.1p mapping-template	Sets the mapping template for WMM 802.1d to 802.1p priority mapping	IC-W VAP	265
qos 802.1d-dscp	Enables the mapping of WMM 802.1d priority values to IP DSCP values	IC-W VAP	266
qos 802.1d-dscp mapping-template	Sets the mapping template for WMM 802.1d to IP DSCP priority mapping	IC-W VAP	267
qos qos-template qos-template-name	Sets the name for a QoS mapping template	IC-W VAP	268
qos qos-template qos-template-priority	Maps priority values in a QoS mapping template	IC-W VAP	268
qos qos-template qos-template-show	Shows the priority mapping in all QoS templates	IC-W VAP	269

qos vap-802.1p

This command enables the setting of VAP traffic to a specific 802.1p priority value.

Syntax

qos vap-802.1p <**enable** | **disable**>

enable - Enables the VAP traffic mapping to an 802.1p priority value.

disable - Disables the feature.

Default

Disabled

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

- To implement this command on a VAP interface the default VLAN ID for the VAP must be set to any other value than 1.
- The VAP-to-802.1p priority QoS feature cannot be enabled together with the 802.1d-to-802.1p or 802.1d-to-DSCP features.

Example

```
AP(if-wireless 0: VAP[0])# qos vap-802.1p enable

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0: VAP[0])#
```

qos vap-802.1p retagged-user-priority

This command sets the 802.1p priority value for all traffic on a VAP interface.

Syntax

qos vap-802.1p retagged-user-priority *<user-priority>*

user-priority - The 802.1p priority value for traffic on the VAP interface.

Default

0

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

- Requires the QoS feature be enabled using the qos vap-802.1p command.
- To implement the QoS priority setting on a VAP interface, the default VLAN ID for the VAP must be set to any other value than 1.

Example

```
AP(if-wireless 0: VAP[0])# qos vap-802.1p retagged-user-priority 7

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0: VAP[0])#
```

qos 802.1d-802.1p

This command enables the mapping of WMM 802.1d priority values to 802.1p values on a VAP interface.

Syntax

qos 802.1d-802.1p <**enable** | **disable**>

enable - Enables the mapping of WMM 802.1d to 802.1p priority values.

disable - Disables the feature.

Default

Disabled

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

- This QoS feature requires a QoS mapping template to be configured using the qos qos-template qos-template-priority command. The mapping template can then be linked to the 802.1d-to-802.1p priority mapping using the qos 802.1d-802.1p mapping-template command.
- To implement this command on a VAP interface the default VLAN ID for the VAP must be set to any other value than 1.

Example

```
AP(if-wireless 0: VAP[0])# qos 802.1d-802.1p enable

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0: VAP[0])#
```

qos 802.1d-802.1p mapping-template

This command sets the mapping template to use for the WMM 802.1d to 802.1p priority mapping on a VAP interface.

Syntax

qos 802.1d-802.1p mapping-template <*template-id*>

template-id - The identifying number of a QoS mapping template. (Range: 1-8)

Default

1

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

- The AP supports eight QoS priority mapping templates, each identified by an ID number (1 to 8). The templates also have user-defined name that can be configured using the qos qos-template qos-template-name command.
- The QoS priority mapping templates can be configured using the qos qos-template qos-template-priority command.

Example

```
AP(if-wireless 0: VAP[0])# qos 802.1d-802.1p mapping-template 3

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0: VAP[0])#
```

qos 802.1d-dscp

This command enables the mapping of WMM 802.1d priority values to IP DSCP values on a VAP interface.

Syntax

qos 802.1d-dscp <**enable** | **disable**>

enable - Enables the mapping of WMM 802.1d to DSCP priority values.

disable - Disables the feature.

Default

Disabled

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

- This QoS feature requires a QoS mapping template to be configured using the qos qos-template qos-template-priority command. The mapping template can then be linked to the 802.1d-to-DSCP priority mapping using the qos 802.1d-dscp mapping-template command.
- Both “802.1d to 802.1p” mapping and “802.1d to DSCP” mapping can be enabled simultaneously when the default VLAN ID for the VAP is any other value than 1. When only 802.1d-to-DSCP mapping is enabled, the default VLAN ID for the VAP must be set to 1.

Example

```
AP(if-wireless 0: VAP[0])# qos 802.1d-dscp enable

This setting has not been effective !
If want to take effect, please execute make-security-effective command !
```

```
AP(if-wireless 0: VAP[0])#
```

qos 802.1d-dscp mapping-template

This command sets the mapping template to use for the WMM 802.1d to DSCP priority mapping on a VAP interface.

Syntax

qos 802.1d-dscp mapping-template <*template-id*>

template-id - The identifying number of a QoS mapping template. (Range: 1-8)

Default

1

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

- The AP supports eight QoS priority mapping templates, each identified by an ID number (1 to 8). The templates also have user-defined name that can be configured using the qos qos-template qos-template-name command.
- The QoS priority mapping templates can be configured using the qos qos-template qos-template-priority command.

Example

```
AP(if-wireless 0: VAP[0])# qos 802.1d-dscp mapping-template 3

This setting has not been effective !
If want to take effect, please execute make-security-effective command !

AP(if-wireless 0: VAP[0])#
```

qos qos-template qos-template-name

This command sets the name of a QoS priority mapping template.

Syntax

qos qos-template qos-template-name <*template-id*> <*template-name*>

template-id - The identifying number of a QoS mapping template. (Range: 1-8)

template-name - The user-defined name of a QoS mapping template. (Maximum 32 alphanumeric characters; can include "-" and "_")

Default

ID 1: default_up_mapping_1
ID 2: default_up_mapping_2
ID 3: default_up_mapping_3
ID 4: default_up_mapping_4
ID 5: default_up_mapping_5
ID 6: default_up_mapping_6
ID 7: default_up_mapping_7
ID 8: default_up_mapping_8

Command Mode

Interface Configuration (Wireless-VAP)

Example

```
AP(if-wireless 0: VAP[0])# qos qos-template qos-template-name 3 test-template
AP(if-wireless 0: VAP[0])#
```

qos qos-template qos-template-priority

This command configures priority values in a QoS priority mapping template.

Syntax

qos qos-template qos-template-priority <*template-id*> <*prirority-list*>

template-id - The identifying number of a QoS mapping template. (Range: 1-8)

prirority-list - The mapped priority values a QoS mapping template. (Range: 0-7; the list is enterd as a sequence of eight numbers, for example "01234567")

Default

01234567

Command Mode

Interface Configuration (Wireless-VAP)

Example

```
AP(if-wireless 0: VAP[0])# qos qos-template qos-template-priority 1 10234765
AP(if-wireless 0: VAP[0])#
```

qos qos-template qos-template-show

This command displays the user-defined QoS priority mapping templates and their priority mapping configuration.

Syntax

qos qos-template qos-template-show

Default

none

Command Mode

Interface Configuration (Wireless-VAP)

Example

```
AP(if-wireless 0: VAP[0])# qos qos-template qos-template-show
----------Qos Mapping Template---------------
id    priority    name
1     10234765    test-template
2     01234567    default_up_mapping_2
3     01234567    default_up_mapping_3
4     01234567    default_up_mapping_4
5     01234567    default_up_mapping_5
6     01234567    default_up_mapping_6
7     01234567    default_up_mapping_7
8     01234567    default_up_mapping_8
----------Qos Mapping Template---------------
AP(if-wireless 0: VAP[0])#
```

Section IV

Appendices

This section provides additional information and includes these items:

- "Troubleshooting" on page 272

A Troubleshooting

Problems Accessing the Management Interface

Table 30: Troubleshooting Chart

Symptom	Action
Cannot connect using Telnet, web browser, or SNMP software	◆ Be sure the AP is powered up. ◆ Check network cabling between the management station and the AP. ◆ Check that you have a valid network connection to the AP and that intermediate switch ports have not been disabled. ◆ Be sure you have configured the AP with a valid IP address, subnet mask and default gateway. ◆ Be sure the management station has an IP address in the same subnet as the AP's IP. ◆ If you are trying to connect to the AP using a tagged VLAN group, your management station, and the ports connecting intermediate switches in the network, must be configured with the appropriate tag. ◆ If you cannot connect using Telnet, you may have exceeded the maximum number of concurrent Telnet/SSH sessions permitted. Try connecting again at a later time.
Cannot access the CLI through a serial port connection	◆ Be sure you have set the terminal emulator program to VT100 compatible, 8 data bits, 1 stop bit, no parity, and the baud rate set to 115200 bps. ◆ Check that the null-modem serial cable conforms to the pin-out connections provided in the Installation Guide.
Forgot or lost the password	◆ Reset the AP to factory defaults using its Reset button.

Using System Logs

If a fault does occur, refer to the Installation Guide to ensure that the problem you encountered is actually caused by the AP. If the problem appears to be caused by the AP, follow these steps:

1. Enable logging.
2. Set the error messages reported to include all categories.
3. Enable SNMP.
4. Enable SNMP traps.

5. Designate the SNMP host that is to receive the error messages.

6. Repeat the sequence of commands or other actions that lead up to the error.

7. Make a list of the commands or circumstances that led to the fault. Also make a list of any error messages displayed.

8. Set up your terminal emulation software so that it can capture all console output to a file. Then enter the "show config" command to record all system settings in this file.

9. Contact your distributor's service engineer, and send a detailed description of the problem, along with the file used to record your system settings.

For example:

```
AP(config)#logging on
AP(config)#logging host 1 10.1.0.3
AP(config)#logging level alert
AP(config)#snmp-server host 1 10.1.0.23 batman
⋮
```

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