

UNIFIED ACCESS POINT ADMINISTRATOR'S GUIDE

PRODUCT MODEL: DWL-2600AP, DWL-3600AP, DWL-3610AP, DWL-6600AP,
DWL-6610AP, DWL-6700AP, DWL-8600AP, DWL-8610AP, DWL-8710AP

UNIFIED WIRED & WIRELESS ACCESS SYSTEM

RELEASE 6.40

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Section 1 - About This Document

This guide describes setup, configuration, administration and maintenance for the D-Link DWL-x600AP Unified Access Point (UAP) on a wireless network.

Document Organization

The *Unified Access Point Administrator's Guide* contains the following sections:

- "Section 1 - About This Document" on page 9
- "Section 2 - Getting Started" on page 11
- "Section 3 - Viewing Access Point Status" on page 22
- "Section 4 - Managing the Access Point" on page 35
- "Section 5 - Configuring Access Point Services" on page 65
- "Section 6 - Configuring SNMPv3" on page 75
- "Section 7 - Maintaining the Access Point" on page 79
- "Section 8 - Configuring Client Quality of Service (QoS)" on page 88
- "Section 9 - Clustering Multiple APs" on page 104
- "Appendix A - Default AP Settings" on page 113
- "Appendix B - Configuration Examples" on page 115



Additional Documentation

The following documentation provides additional information about Unified Access Point software:

- The *Unified Access Point CLI Command Reference* describes the commands available from the command-line interface (CLI) for managing, monitoring, and configuring the switch.
- The *User Manual* for the D-Link Unified Wired and Wireless System provides information about setting up and managing the Unified Wireless Switch (UWS), including information about how to use the switch to manage multiple UAPs.
- Release notes for the D-Link Unified Wired and Wireless System detail the platform-specific functionality of the software packages, including issues and workarounds.

Document Conventions

This section describes the conventions this document uses.

	Note: A note provides more information about a feature or technology and cross-references to related topics.
	Caution! A caution provides information about critical aspects of AP configuration, combinations of settings, events, or procedures that can adversely affect network connectivity, security, and so on.

The following table describes the typographical conventions used in this guide.

Symbol	Example	Description
Bold	Click Apply to save your settings.	Menu titles, page names, and button names.
Blue Text	See "Document Conventions" on page 9	Hyperlink text.
Courier Font	WLAN-AP# show network	Screen text, file names, commands, user-typed command-line entries.
<i>Courier Font Italics</i>	Value	Command parameter, which might be a variable or fixed value.
Square Brackets []	[Value]	Indicates an optional fixed parameter.

Symbol	Example	Description
Curly Braces {}	{Choice1 Choice2}	Indicates that you must select a parameter from the list of choices.
Vertical Bars	Choice1 Choice2	Separates the mutually exclusive choices.
Braces within square brackets [{}]	[{Choice1 Choice2}]	Indicate a choice within an optional element.

Table 1 - Typographical Conventions

Online Help, Supported Browsers, and Limitations

Online help for the UAP Administration Web pages provides information about all fields and features available from the user interface (UI). The information in the online help is a subset of the information available in the *Unified Access Point Administrator's Guide*.

Online help information corresponds to each page on the UAP Administration UI.

For information about the settings on the current page, click the Help link on the upper right side of a page.

The following figure shows an example of the online help available from the links on the user interface.

Basic Settings

From the Basic Settings page, you can view various information about the UAP, including IP and MAC address information, and configure the administrator password for the UAP.

Field	Description
IP Address	Shows the IP address assigned to the AP. This field is not editable on this page because the IP address is already assigned (either by DHCP, or statically through the Ethernet Settings page).
IPv6 Address	Shows the IPv6 address assigned to the AP. This field is not editable on this page because the IP address is already assigned (either by DHCPv6, or statically through the Ethernet Settings page).
IPv6 Link Local Address	Shows the IPv6 Link Local address, which is the IPv6 address used by the local physical link. The link local address is not configurable and is assigned by using the IPv6 Neighbor Discovery process.
MAC Address	Shows the MAC address of the AP. The address shown here is the MAC address associated with the management interface. This is the address by which the AP is known externally to other networks.
Firmware Version	Shows version information about the firmware currently installed on the AP. As new versions of the WLAN AP firmware become available, you can upgrade the firmware on your APs.
Product Identifier	Identifies the AP hardware model.
Hardware Version	Identifies the AP hardware version.
Device Name	Generic name to identify the type of hardware.
Device Description	Provides information about the product hardware.
Current Password	Enter the current administrator password. You must correctly enter the current password before you are able to change it.
New Password	Enter a new administrator password. The characters you enter are displayed as bullet characters to prevent others from seeing your password as you type. The administrator password must be an alphanumeric string of up to 8 characters. Do not use special characters or spaces. Note: As an immediate first step in securing your wireless network, we recommend that you change the administrator password from the default.
Confirm New Password	Re-enter the new administrator password to confirm that you typed it as intended.
Baud Rate	Select a baud rate for the serial port connection. The baud rate on the AP must match the baud rate on the terminal or terminal emulator to connect to the AP command-line interface (CLI) by using a serial (console) connection. The following baud rates are available: <ul style="list-style-type: none"> • 9600 • 19200 • 38400 • 57600 • 115200
System Name	Enter a name for the AP. This name appears only on the Basic Settings page and is a name to identify the AP to the administrator. Use up to 64 alphanumeric characters, for example My AP.

Figure 1 - Administrator UI Online Help

Section 2 - Getting Started

The D-Link DWL-x600AP unified access point (UAP) provides continuous, high-speed access between wireless devices and Ethernet devices. It is an advanced, standards-based solution for wireless networking in businesses of any size. The UAP enables wireless local area network (WLAN) deployment while providing state-of-the-art wireless networking features.

The UAP can operate in two modes: Standalone Mode or Managed Mode. In Standalone Mode, the UAP acts as an individual access point in the network, and you manage it by using the Administrator Web User Interface (UI), command-line interface (CLI), or SNMP. In Managed Mode, the UAP is part of the D-Link Unified Wired and Wireless System, and you manage it by using the D-Link Unified Wireless Switch. If an AP is in Managed Mode, the Administrator Web UI, Telnet, SSH, and SNMP services are disabled.

This document describes how to perform the setup, management, and maintenance of the UAP in Standalone Mode. For information about configuring the AP in Managed Mode by using the D-Link Unified Wireless Switch, see the *User Manual* for the switch.

Before you power on a new UAP, review the following sections to check required hardware and software components, client configurations, and compatibility issues. Make sure you have everything you need for a successful launch and test of your new or extended wireless network.

The DWL-6600AP and DWL-8600AP are dual-radio access points and support the IEEE 802.11a, 802.11b, 802.11g, and 802.11n modes. The DWL-2600AP and DWL-3600AP are single-radio access points and support the IEEE 802.11b, IEEE 802.11g, and 802.11n (2.4 GHz) modes.

This section contains the following topics:

-) [“Administrator’s Computer Requirements” on page 11](#)
-) [“Wireless Client Requirements” on page 12](#)
-) [“Dynamic and Static IP Addressing on the AP” on page 13](#)
-) [“Installing the UAP” on page 13](#)
-) [“Basic Settings” on page 16](#)
-) [“Using the CLI to View the IP Address” on page 17](#)
-) [“Configuring the Ethernet Settings” on page 18](#)
-) [“Configuring IEEE 802.1X Authentication” on page 19](#)
-) [“Verifying the Installation” on page 20](#)
-) [“Configuring Security on the Wireless Access Point” on page 21](#)

To manage the UAP by using the Web interface or by using the CLI through Telnet or SSH, the AP needs an IP address. If you use VLANs or IEEE 802.1X Authentication (port security) on your network, you might need to configure additional settings on the AP before it can connect to the network.



Note: The WLAN AP is not designed to function as a gateway to the Internet. To connect your WLAN to other LANs or the Internet, you need a gateway device.

Administrator’s Computer Requirements

The following table describes the minimum requirements for the administrator’s computer for configuration and administration of the UAP through a Web-based user interface (UI).

Required Software or Component	Description
Serial or Ethernet Connection to the Access Point	The computer used to configure the first access point must be connected to the access point by a serial cable or an Ethernet cable.

Required Software or Component	Description
Wireless Connection to the Network	<p>After initial configuration and launch of the first access point on your new wireless network, you can make subsequent configuration changes through the Administration Web pages using a wireless connection to the internal network.</p> <p>For wireless connection to the access point, your administration device will need Wi-Fi capability similar to that of any wireless client:</p> <ul style="list-style-type: none"> •) Portable or built-in Wi-Fi client adapter that supports one or more of the IEEE 802.11 modes in which you plan to run the access point. •) Wireless client software configured to associate with the UAP.
Web Browser and Operating System	<p>Configuration and administration of the UAP is provided through a Web-based user interface hosted on the access point.</p> <p>We recommend using one of the following supported Web browsers to access the access point Administration Web pages:</p> <ul style="list-style-type: none"> •) Microsoft® Internet Explorer® version 7.x or 8.x (with up-to-date patch level for either major version) •) Mozilla® Firefox version 3.5 or later •) Safari 5 and later versions <p>The administration Web browser must have JavaScript™ enabled to support the interactive features of the administration interface.</p>
Security Settings	Ensure that security is disabled on the wireless client used to initially configure the access point.

Table 2 - Requirements for the Administrator's Computer

Wireless Client Requirements

The UAP provides wireless access to any client with a properly configured Wi-Fi client adapter for the 802.11 mode in which the access point is running. The UAP supports multiple client operating systems. Clients can be laptop or desktop computers, personal digital assistants (PDAs), or any other hand-held, portable or stationary device equipped with a Wi-Fi adapter and supporting drivers.

To connect to the access point, wireless clients need the software and hardware described in the following table.

Required Component	Description
Wi-Fi Client Adapter	Portable or built-in Wi-Fi client adapter that supports one or more of the IEEE 802.11 modes in which you plan to run the access point.
Wireless Client Software	Client software, such as Microsoft Windows Supplicant, configured to associate with the UAP.
Client Security Settings	<p>Security should be disabled on the client used to do initial configuration of the access point.</p> <p>If the Security mode on the access point is set to anything other than plain text, wireless clients will need to set a profile to the authentication mode used by the access point and provide a valid username and password, certificate, or similar user identity proof. Security modes are Static WEP, IEEE 802.1X, WPA with RADIUS server, and WPA-PSK.</p> <p>For information about configuring security on the access point, see “Virtual Access Point Settings” on page 47.</p>

Table 3 - Requirements for Wireless Clients

Dynamic and Static IP Addressing on the AP

When you power on the access point, the built-in DHCP client searches for a DHCP server on the network in order to obtain an IP Address and other network information. If the AP does not find a DHCP server on the network, the AP continues to use its default Static IP Address (10.90.90.91) until you re-assign it a new static IP address (and specify a static IP addressing policy) or until the AP successfully receives network information from a DHCP server.

To change the connection type and assign a static IP address by using the CLI, see [“Configuring the Ethernet Settings” on page 18](#) or, by using the Web UI, see [“Ethernet Settings” on page 35](#).



Caution! If you do not have a DHCP server on your internal network, and do not plan to use one, the first thing you must do after powering on the access point is change the connection type from DHCP to static IP. You can either assign a new static IP address to the AP or continue using the default address. We recommend assigning a new static IP address so that if you bring up another WLAN AP on the same network, the IP address for each AP will be unique.

Recovering an IP Address

If you experience trouble communicating with the access point, you can recover a static IP address by resetting the AP configuration to the factory defaults (see [“Resetting the Factory Default Configuration” on page 81](#)), or you can get a dynamically assigned address by connecting the AP to a network that has a DHCP server.

Discovering a Dynamically Assigned IP Address

If you have access to the DHCP server on your network and know the MAC address of your AP, you can view the new IP address associated with the MAC address of the AP.

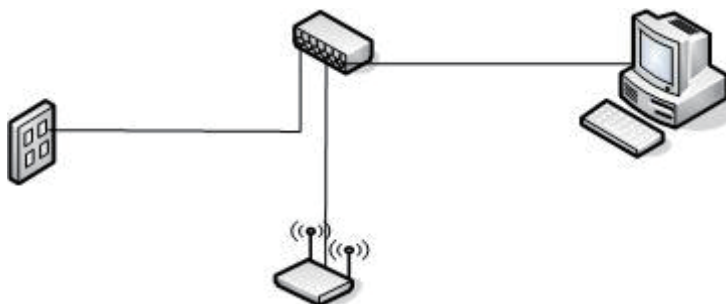
If you do not have access to the DHCP server that assigned the IP address to the AP or do not know the MAC address of the AP, you might need to use the CLI to find out what the new IP address is. For information about how to discover a dynamically assigned IP address, see [“Using the CLI to View the IP Address” on page 17](#).

Installing the UAP

To access the Administration Web UI, you enter the IP address of the AP into a Web browser. You can use the default IP address of the AP (10.90.90.91) to log on to the AP and assign a static IP address, or you can use a DHCP server on your network to assign network information to the AP. The DHCP client on the AP is enabled by default.

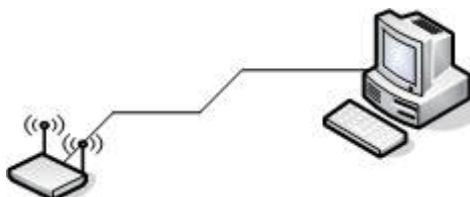
To install the UAP, use the following steps:

- 1.) Connect the AP to an administrative PC by using a LAN connection or a direct-cable connection.
 - To use a LAN connection, connect one end of an Ethernet cable to the network port on the access point and the other end to the same hub where your PC is connected, as shown in the following figure.



The hub or switch you use must permit broadcast signals from the access point to reach all other devices on the network.

-) To use a direct-cable connection, connect one end of an Ethernet straight-through or crossover cable to the network port on the access point and the other end of the cable to the Ethernet port on the PC, as shown in the following figure. You can also use a serial cable to connect the serial port on the AP to a serial port on the administrative computer.



For initial configuration with a direct Ethernet connection and no DHCP server, be sure to set your PC to a static IP address in the same subnet as the default IP address on the access point. (The default IP address for the access point is 10.90.90.91.)

If you use this method, you will need to reconfigure the cabling for subsequent startup and deployment of the access point so that the access point is no longer connected directly to the PC but instead is connected to the LAN (either by using a hub or directly).



Note: It is possible to detect access points on the network with a wireless connection. However, we strongly advise against using this method. In most environments you may have no way of knowing whether you are actually connecting to the intended AP. Also, many of the initial configuration changes required will cause you to lose connectivity with the AP over a wireless connection.

- 2.) Connect the power adapter to the power port on the back of the access point, and then plug the other end of the power cord into a power outlet.
- 3.) Use your Web browser to log on to the UAP Administration Web pages.
 -) If the AP did not acquire an IP address from a DHCP server on your network, enter 10.90.90.91 in the address field of your browser, which is the default IP address of the AP.
 -) If you used a DHCP server on your network to automatically configure network information for the AP, enter the new IP address of the AP into the Web browser.
 -) If you used a DHCP server and you do not know the new IP address of the AP, use the following procedures to obtain the information:
 -) Connect a serial cable from the administrative computer to the AP and use a terminal emulation program to access the command-line interface (CLI).
 -) At the login prompt, enter **admin** for the user name and **admin** for the password. At the command prompt, enter **get management**.
 -) The command output displays the IP address of the AP. Enter this address in the address field of your browser. For a more detailed explanation about how to log on to the CLI by using the console port, see "Using the CLI to View the IP Address" on page 24.
- 4.) When prompted, enter **admin** for the user name and **admin** for the password, then click **Logon**.

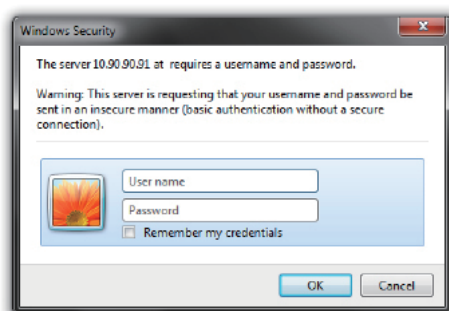


Figure 2 - Web UI Login Prompt

When you first log in, the **Basic Settings** page for UAP administration is displayed, as the following figure shows.

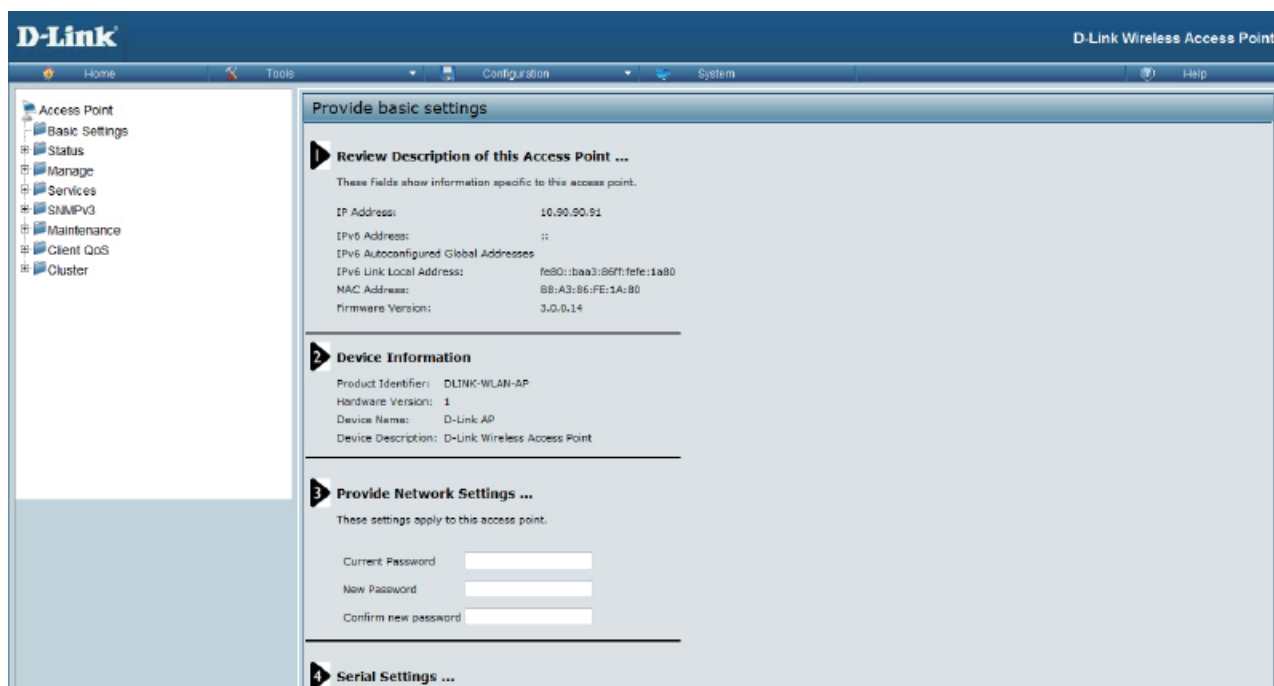


Figure 3 - Provide Basic Settings

5.) Verify the settings on the **Basic Settings** page.

- Review access point description and provide a new administrator password for the access point if you do not want to use the default password, which is **admin**.
- Click the **Apply** button to activate the wireless network with these new settings.



Note: The changes you make are not saved or applied until you click Apply. Changing some access point settings might cause the AP to stop and restart system processes. If this happens, wireless clients will temporarily lose connectivity. We recommend that you change access point settings when WLAN traffic is low.

For information about the fields and configuration options on the Basic Settings page, see [“Basic Settings” on page 16](#).

6.) If you do not have a DHCP server on the management network and do not plan to use one, you must change the Connection Type from DHCP to Static IP.

You can either assign a new Static IP address to the AP or continue using the default address. We recommend assigning a new Static IP address so that if you bring up another UAP on the same network, the IP address for each AP will be unique. To change the connection type and assign a static IP address, see [“Configuring the Ethernet Settings” on page 18 \(CLI\)](#) or [“Ethernet Settings” on page 35 \(Web\)](#).

7.) If your network uses VLANs, you might need to configure the management VLAN ID or untagged VLAN ID on the UAP in order for it to work with your network.

For information about how to configure VLAN information, see [“Configuring the Ethernet Settings” on page 18 \(CLI\)](#) or [“Ethernet Settings” on page 35 \(Web\)](#).

8.) If your network uses IEEE 802.1X port security for network access control, you must configure the 802.1X supplicant information on the AP.

For information about how to configure the 802.1X user name and password, see [“Configuring IEEE 802.1X Authentication” on page 19](#).

Basic Settings

From the Basic Settings page, you can view various information about the UAP, including IP and MAC address information, and configure the administrator password for the UAP. The following table describes the fields and configuration options on the **Basic Settings** page.

Field	Description
IP Address	Shows the IP address assigned to the AP. This field is not editable on this page because the IP address is already assigned (either by DHCP, or statically through the Ethernet Settings page).
IPv6 Address	Shows the IPv6 address assigned to the AP. This field is not editable on this page because the IP address is already assigned (either by DHCPv6, or statically through the Ethernet Settings page).
IPv6 Address Status	Shows the operational status of the static IPv6 address assigned to the management interface of the AP. The possible values are Operational and Tentative.
IPv6 Autoconfigured Global Addresses	Shows each automatically-configured global IPv6 address for the management interface of the AP.
IPv6 Link Local Address	Shows the IPv6 Link Local address, which is the IPv6 address used by the local physical link. The link local address is not configurable and is assigned by using the IPv6 Neighbor Discovery process.
MAC Address	Shows the MAC address of the AP. The address shown here is the MAC address associated with the management interface. This is the address by which the AP is known externally to other networks.
Firmware Version	Shows version information about the firmware currently installed on the AP. As new versions of the WLAN AP firmware become available, you can upgrade the firmware on your APs.
Product Identifier	Identifies the AP hardware model.
Hardware Version	Identifies the AP hardware version.
Serial Number	Shows the AP serial number.
Device Name	Generic name to identify the type of hardware.
Device Description	Provides information about the product hardware.
Current Password	Enter the current administrator password. You must correctly enter the current password before you are able to change it.
New Password	<p>Enter a new administrator password. The characters you enter are displayed as bullet characters to prevent others from seeing your password as you type.</p> <p>The administrator password must be an alphanumeric string of up to 8 characters. Do not use special characters or spaces.</p> <p>Note: As an immediate first step in securing your wireless network, we recommend that you change the administrator password from the default.</p>
Confirm New Password	Re-enter the new administrator password to confirm that you typed it as intended.
Baud Rate	<p>Select a baud rate for the serial port connection. The baud rate on the AP must match the baud rate on the terminal or terminal emulator to connect to the AP command-line interface (CLI) by using a serial (console) connection.</p> <p>The following baud rates are available:</p> <ul style="list-style-type: none"> •) 9600 •) 19200 •) 38400 •) 57600 •) 115200
System Name	Enter a name for the AP. This name appears only on the Basic Settings page and is a name to identify the AP to the administrator. Use up to 64 alphanumeric characters, for example My AP.

Field	Description
System Contact	Enter the name, e-mail address, or phone number of the person to contact regarding issues related to the AP.
System Location	Enter the physical location of the AP, for example Conference Room A.

Table 4 - Basic Settings Page

Connecting to the AP Web Interface by Using the IPv6 Address

To connect to the AP by using the IPv6 global address or IPv6 link local address, you must enter the AP address into your browser in a special format.



Note: The following instructions and examples work with Microsoft Internet Explorer 7 (IE7) and might not work with other browsers.

To connect to an IPv6 global address, add square brackets around the IPv6 address. For example, if the AP global IPv6 address is 2520::230:abff:fe00:2420, type the following address into the IE7 address field: `http://[2520::230:abff:fe00:2420]`.

To connect to the IPv6 link local address, replace the colons (:) with hyphens (-), add the interface number preceded with an "s," then add ".ipv6-literal.net." For example, if the AP link local address is fe80::230:abff:fe00:2420, and the Windows interface is defined as "%6," type the following address into the IE7 address field: `http://fe80--230-abff-fe00-2420s6.ipv6-literal.net`.

Using the CLI to View the IP Address

The DHCP client on the UAP is enabled by default. If you connect the UAP to a network with a DHCP server, the AP automatically acquires an IP address. To manage the UAP by using the Administrator UI, you must enter the IP address of the access point into a Web browser.

If a DHCP server on your network assigns an IP address to the UAP, and you do not know the IP address, use the following steps to view the IP address of the UAP:

- 1.) Using a null-modem cable, connect a VT100/ANSI terminal or a workstation to the console (serial) port.
If you attached a PC, Apple, or UNIX workstation, start a terminal-emulation program, such as HyperTerminal or TeraTerm.
- 2.) Configure the terminal-emulation program to use the following settings:
 -) Baud rate: 115200 bps
 -) Data bits: 8
 -) Parity: none
 -) Stop bit: 1
 -) Flow control: none
- 3.) Press the return key, and a login prompt should appear.
The login name is **admin**. The default password is **admin**. After a successful login, the screen shows the *(Access Point Name)#* prompt.
- 4.) At the login prompt, enter `get management`.
Information similar to the following prints to the screen.

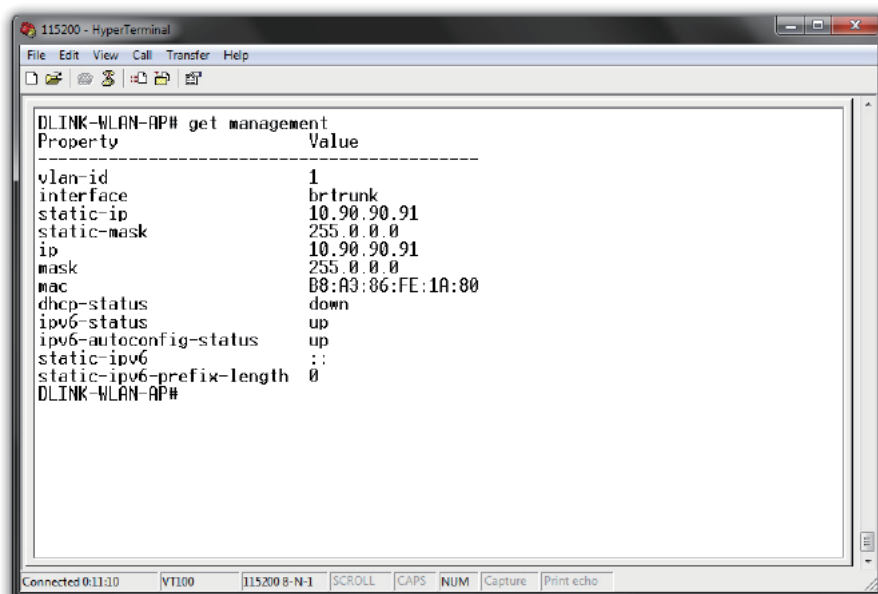


Figure 4 - Command Line Interface (CLI) Connection

Configuring the Ethernet Settings

The default Ethernet settings, which include DHCP and VLAN information, might not work for all networks.

By default, the DHCP client on the UAP automatically broadcasts requests for network information. If you want to use a static IP address, you must disable the DHCP client and manually configure the IP address and other network information.

The management VLAN is VLAN 1 by default. This VLAN is also the default untagged VLAN. If you already have a management VLAN configured on your network with a different VLAN ID, you must change the VLAN ID of the management VLAN on the access point.

For information about using the Web interface to configure the Ethernet settings, see [“Ethernet Settings” on page 35](#). You can also use the CLI to configure the Ethernet settings, which the following section describes.

Using the CLI to Configure Ethernet Settings

Use the commands shown in the following table to view and set values for the Ethernet (wired) interface. For more information about each setting, see the description for the field in the following table.

Action	Commands
Get the DNS Name	get host id
Set the DNS Name	set host id <host_name> For example: set host id lab-ap
Get Current Settings for the Ethernet (Wired) Internal Interface	get management
Set the management VLAN ID	set management vlan-id <1-4094>
View untagged VLAN information	get untagged-vlan
Enable the untagged VLAN	set untagged-vlan status up
Disable the untagged VLAN	set untagged-vlan status down
Set the untagged VLAN ID	set untagged-vlan vlan-id <1-4094>
View the connection type	get management dhcp-status

Action	Commands
Use DHCP as the connection type	set management dhcp-status up
Use a Static IP as the connection type	set management dhcp-status down
Set the Static IP address	set management static-ip <ip_address> For example: set management static-ip 10.10.12.221
Set a Subnet Mask	set management static-mask <netmask> For example: set management static-mask 255.255.255.0
Set the Default Gateway	set static-ip-route gateway <ip_address> For example: set static-ip-route gateway 10.10.12.1
View the DNS Nameserver mode Dynamic= up Manual=down	get host dns-via-dhcp
Set DNS Nameservers to Use Static IP Addresses (Dynamic to Manual Mode)	set host dns-via-dhcp down set host static-dns-1 <ip_address> set host static-dns-2 <ip_address> For example: set host static-dns-1 192.168.23.45
Set DNS Nameservers to Use DHCP IP Addressing (Manual to Dynamic Mode)	set host dns-via-dhcp up

Table 5 - CLI Commands for Ethernet Setting

In the following example, the administrator uses the CLI to set the management VLAN ID to 123 and to disable the untagged VLAN so that all traffic is tagged with a VLAN ID.

DLINK-WLAN-AP# set management vlan-id 123	
DLINK-WLAN-AP# set untagged-vlan status down	
DLINK-WLAN-AP# get management	
Property	Value
-----	-----
vlan-id	123
interface	brtrunk
static-ip	10.90.90.91
static-mask	255.0.0.0
ip	10.90.90.91
mask	255.0.0.0
mac	00:05:5E:80:70:00
dhcp-status	down
ipv6-status	up
ipv6-autoconfig-status	up
static-ipv6	::
static-ipv6-prefix-length	0
DLINK-WLAN-AP# get untagged-vlan	
Property	Value
-----	-----
vlan-id	1
status	down
DLINK-WLAN-AP#	

Configuring IEEE 802.1X Authentication

On networks that use IEEE 802.1X, port-based network access control, a supplicant (client) cannot gain access to the network until the 802.1X authenticator grants access. If your network uses 802.1X, you must configure 802.1X authentication information that the AP can supply to the authenticator.

If your network uses IEEE 802.1X see [“Configuring IEEE 802.1X Authentication” on page 19](#) for information about how to configure 802.1X by using the Web interface.

Using the CLI to Configure 802.1X Authentication Information

The following table shows the commands used to configure the 802.1X supplicant information using the CLI.

Action	Command
View 802.1X supplicant settings	get dot1x-supPLICant
Enable 802.1X supplicant	set dot1x-supPLICant status up
Disable 802.1X supplicant	set dot1x-supPLICant status down
Set the 802.1X user name	set dot1x-supPLICant user <name>
Set the 802.1X password	set dot1x-supPLICant password <password>

Table 6 - CLI Commands for the 802.1X Supplicant

In the following example, the administrator enables the 802.1X supplicant and sets the user name to wlanAP and the password to test1234.

```
DLINK-WLAN-AP# set dot1x-supPLICant status up
DLINK-WLAN-AP# set dot1x-supPLICant user wlanAP
DLINK-WLAN-AP# set dot1x-supPLICant password test1234
DLINK-WLAN-AP# get dot1x-supPLICant
Property      Value
-----
status        up
user          wlanAP
eap-method    md5
debug         off
cert-present  no
cert-exp-date Not Present

DLINK-WLAN-AP#
```

Verifying the Installation

Make sure the access point is connected to the LAN and associate some wireless clients with the network. Once you have tested the basics of your wireless network, you can enable more security and fine-tune the AP by modifying advanced configuration features.

- 1.) Connect the access point to the LAN.
 -) If you configured the access point and administrator PC by connecting both into a network hub, then your access point is already connected to the LAN. The next step is to test some wireless clients.
 -) If you configured the access point by using a direct cable connection from your computer to the access point, do the following procedures:
 -) Disconnect the cable from the computer and the access point.
 -) Connect an Ethernet cable from the access point to the LAN.
 -) Connect your computer to the LAN by using an Ethernet cable or a wireless card.
- 2.) Test LAN connectivity with wireless clients.

Test the UAP by trying to detect it and associate with it from some wireless client devices. For information about requirements for these clients, see [“Wireless Client Requirements” on page 12](#).
- 3.) Secure and configure the access point by using advanced features.

Once the wireless network is up and you can connect to the AP with some wireless clients, you can add in layers of security, create multiple virtual access points (VAPs), and configure performance settings.



Note: The WLAN AP is not designed for multiple, simultaneous configuration changes. If more than one administrator is logged onto the Administration Web pages and making changes to the configuration, there is no guarantee that all configuration changes specified by multiple users will be applied.

By default, no security is in place on the access point, so any wireless client can associate with it and access your LAN. An important next step is to configure security, as described in [“Virtual Access Point Settings” on page 47](#).

Configuring Security on the Wireless Access Point

You configure secure wireless client access by configuring security for each virtual access point (VAP) that you enable. You can configure up to 16 VAPs per radio that simulate multiple APs in one physical access point. By default, only one VAP is enabled. For each VAP, you can configure a unique security mode to control wireless client access.

Each radio has 16 VAPs, with VAP IDs from 0-15. By default, only VAP 0 on each radio is enabled. VAP0 has the following default settings:

-) VLAN ID: 1
-) Broadcast SSID: Enabled
-) SSID: dlink1
-) Security: None
-) MAC Authentication Type: None
-) Redirect Mode: None

All other VAPs are disabled by default. The default SSID for VAPs 1–15 is "dlinkx" where x is the VAP ID.

To prevent unauthorized access to the UAP, we recommend that you select and configure a security option other than None for the default VAP and for each VAP that you enable.

For information about how to configure the security settings on each VAP, see ["Virtual Access Point Settings" on page 47](#).

Section 3 - Viewing Access Point Status

This section describes the information you can view from the tabs under the **Status** heading on the Administration Web UI. This section contains the following subsections:

-) “Viewing Interface Status” on page 22
-) “Viewing Events” on page 23
-) “Viewing Transmit and Receive Statistics” on page 25
-) “Viewing Associated Wireless Client Information” on page 26
-) “Viewing TSPEC Client Associations” on page 26
-) “Viewing Rogue AP Detection” on page 28
-) “Viewing Managed AP DHCP Information” on page 31
-) “Viewing TSPEC Status and Statistics Information” on page 31
-) “Viewing TSPEC AP Statistics Information” on page 32
-) “Viewing Radio Statistics Information” on page 33
-) “Viewing Email Alert Operational Status” on page 34



Note: The web-based UI images show the DWL-8600AP administration pages. Pages for the DWL-2600AP or DWL-3600AP will display information for one radio only.

Viewing Interface Status

To monitor Ethernet LAN (wired) and wireless LAN (WLAN) settings, click the **Interfaces** tab.

View settings for network interfaces	
Wired Settings (Edit)	
Internal Interface	
MAC Address	88:A3:86:FE:1A:80
VLAN ID	1
IP Address	10.90.90.91
Subnet Mask	255.0.0.0
IPv6 Address	::
IPv6 Autoconfigured Global Addresses	
IPv6 Link Local Address	fe80::baa3:86ff:fe1a:80
DNS-1	
DNS-2	
Default Gateway	10.90.90.254
Default IPv6 Gateway	::
Wireless Settings (Edit)	
Radio One	
MAC Address	88:A3:86:FE:1A:80
Mode	IEEE 802.11n/n
Channel	60 (5300 MHz)
Radio Two	
MAC Address	88:A3:86:FE:1A:90
Mode	IEEE 802.11b/g/n
Channel	7 (2442 MHz)

Figure 5 - Viewing Interface Status

This page displays the current settings of the UAP. It displays the **Wired Settings** and the **Wireless Settings**.

Wired Settings (Internal Interface)

The Internal interface includes the Ethernet MAC Address, Management VLAN ID, IP Address (IPv4 and IPv6), Subnet Mask, and DNS information. To change any of these settings, click the **Edit** link. After you click **Edit**, you are redirected to the **Ethernet Settings** page.

For information about configuring these settings, see “Configuring the Ethernet Settings” on page 18.

Wireless Settings

The Radio Interface includes the AeroScout™ Engine Communication status, Radio Mode and Channel. The **Wireless Settings** section also shows the MAC address (read-only) associated with each radio interface.

To change the Radio Mode or Channel settings, click the **Edit** link. After you click **Edit**, you are redirected to the

For information about configuring these settings, see “Wireless Settings” on page 37 and “Modifying Radio Settings” on page 40.

The **Events** page shows real-time system events on the AP such as wireless clients associating with the AP and being authenticated.

[illegible]

Figure 6 - Viewing Events

- View the most recent, high-level events generated by this AP.
- Enable and configure **Persistent** logging to write system event logs to non-volatile memory so that the events are not erased when the system reboots.
- Set a **Severity Level** to determine what category of log messages are displayed.
- Set **Depth** to determine how many log messages are displayed in the Event log.
- Enable a remote log relay host to capture all system events and errors in a Kernel Log.



Note: The AP acquires its date and time information using the network time protocol (NTP). This data is reported in UTC format (also known as Greenwich Mean Time). You need to convert the reported time to your local time.

If the system unexpectedly reboots, log messages can be useful to diagnose the cause. However, log messages are erased when the system reboots unless you enable persistent logging.




Caution! Enabling persistent logging can wear out the flash (non-volatile) memory and degrade network performance. You should only enable persistent logging to debug a problem. Make sure you disable persistent logging after you finish debugging the problem.

To configure persistent logging on the **Events** page, set the persistence, severity, and depth options as described in the following table, and then click **Apply**.

Field	Description
Persistence	Choose Enabled to save system logs to non-volatile memory so that the logs are not erased when the AP reboots. Choose Disabled to save system logs to volatile memory. Logs in volatile memory are deleted when the system reboots.
Severity	Specify the severity level of the log messages to write to non-volatile memory. For example, if you specify 2, critical, alert, and emergency logs are written to non-volatile memory. Error messages with a severity level of 3 – 7 are written to volatile memory. <ul style="list-style-type: none"> •) 0 — emergency •) 1 — alert •) 2 — critical •) 3 — error •) 4 — warning •) 5 — notice •) 6 — info •) 7 — debug
Depth	You can store up to 128 messages in non-volatile memory. Once the number you configure in this field is reached, the oldest log event is overwritten by the new log event.

Table 7 - Logging Options

	Note: To apply your changes, click Apply . Changing some settings might cause the AP to stop and restart system processes. If this happens, wireless clients will temporarily lose connectivity. We recommend that you change AP settings when WLAN traffic is low.
---	---

Configuring the Log Relay Host for Kernel Messages


The Kernel Log is a comprehensive list of system events (shown in the System Log) and kernel messages such as error conditions, like dropping frames.

You cannot view kernel log messages directly from the Administration Web UI for an AP. You must first set up a remote server running a syslog process and acting as a syslog log relay host on your network. Then, you can configure the UAP to send syslog messages to the remote server.

Remote log server collection for AP syslog messages provides the following features:

-) Allows aggregation of syslog messages from multiple APs
-) Stores a longer history of messages than kept on a single AP
-) Triggers scripted management operations and alerts

To use Kernel Log relaying, you must configure a remote server to receive the syslog messages. The procedure to configure a remote log host depends on the type of system you use as the remote host.

	Note: The syslog process will default to use port 514. We recommend keeping this default port. However; If you choose to reconfigure the log port, make sure that the port number you assign to syslog is not being used by another process.
---	---

Enabling or Disabling the Log Relay Host on the Events Page

To enable and configure Log Relaying on the **Events** page, set the Log Relay options as described in the following table, and then click **Apply**.

Field	Description
Relay Log	Select Enabled to allow the UAP to send log messages to a remote host. Select Disabled to keep all log messages on the local system.
Relay Host	Specify the IP Address or DNS name of the remote log server.
Relay Port	Specify the Port number for the syslog process on the Relay Host. The default port is 514.

Table 8 - Log Relay Host



Note: To apply your changes, click **Apply**. Changing some settings might cause the AP to stop and restart system processes. If this happens, wireless clients will temporarily lose connectivity. We recommend that you change AP settings when WLAN traffic is low.

If you enabled the Log Relay Host, clicking **Apply** will activate remote logging. The AP will send its kernel messages real-time for display to the remote log server monitor, a specified kernel log file, or other storage, depending on how you configured the Log Relay Host.

If you disabled the Log Relay Host, clicking **Apply** will disable remote logging.

Viewing Transmit and Receive Statistics

The **Transmit/Receive** page provides some basic information about the current AP and a real-time display of the transmit and receive statistics for the Ethernet interface on the AP and for the VAPs on all supported radio interfaces. All transmit and receive statistics shown are totals since the AP was last started. If you reboot the AP, these figures indicate transmit and receive totals since the reboot.

To view transmit and receive statistics for the AP, click the **Transmit/Receive** page.

View transmit and receive statistics for this access point

Interface	Status	MAC Address	VLAN ID	Name (SSID)
LAN	up	B8:A3:86:FE:1A:80	1	-
wlan0-vap0	up	B8:A3:86:FE:1A:80	1	clink1
wlan0-vap1	down		1	clink2
wlan0-vap2	down		1	clink3
wlan0-vap3	down		1	clink4
wlan0-vap4	down		1	clink5
wlan0-vap5	down		1	clink6
wlan0-vap6	down		1	clink7
wlan0-vap7	down		1	clink8
wlan0-vap8	down		1	clink9
wlan0-vap9	down		1	clink10
wlan0-vap10	down		1	clink11
wlan0-vap11	down		1	clink12
wlan0-vap12	down		1	clink13
wlan0-vap13	down		1	clink14
wlan0-vap14	down		1	clink15
wlan0-vap15	down		1	clink16
wlan1-vap0	up	B8:A3:86:FE:1A:90	1	clink1
wlan1-vap1	down		1	clink2
wlan1-vap2	down		1	clink3
wlan1-vap3	down		1	clink4
wlan1-vap4	down		1	clink5
wlan1-vap5	down		1	clink6
wlan1-vap6	down		1	clink7
wlan1-vap7	down		1	clink8
wlan1-vap8	down		1	clink9
wlan1-vap9	down		1	clink10
wlan1-vap10	down		1	clink11
wlan1-vap11	down		1	clink12

Figure 7 - Viewing Traffic Statistics

Field	Description
Interface	The name of the Ethernet or VAP interface.
Status	Shows whether the interface is up or down.
MAC Address	MAC address for the specified interface. The UAP has a unique MAC address for each interface. Each radio has a different MAC address for each interface on each of its two radios.
VLAN ID	Virtual LAN (VLAN) ID. You can use VLANs to establish multiple internal and guest networks on the same AP. The VLAN ID is set on the VAP page. (See “Configuring Load Balancing” on page 60)
Name (SSID)	Wireless network name. Also known as the SSID, this alphanumeric key uniquely identifies a wireless local area network. The SSID is set on the VAP page. (See “Configuring Load Balancing” on page 60)
Transmit and Receive Information	
Total Packets	Indicates total packets sent (in Transmit table) or received (in Received table) by this AP.
Total Bytes	Indicates total bytes sent (in Transmit table) or received (in Received table) by this AP.

Field	Description
Total Drop Packets	Indicates total number of packets sent (in Transmit table) or received (in Received table) by this AP that were dropped.
Total Drop Bytes	Indicates total number of bytes sent (in Transmit table) or received (in Received table) by this AP that were dropped.
Errors	Indicates total errors related to sending and receiving data on this AP.

Table 9 - Transmit/Receive

Viewing Associated Wireless Client Information

To view the client stations associated with a particular access point, click the **Client Associations** tab.

View list of currently associated client stations

Network	Station	Status		From Station				To Station			
		Authenticated	Associated	Packets	Bytes	Drop Packets	Drop Bytes	Packets	Bytes	Drop Packets	Drop Bytes
wlan1	00:0c:43:30:60:00	Yes	Yes	83	13340	0	0	27	5770	0	0

Figure 8 - Viewing Client Association Information

The associated stations are displayed along with information about packet traffic transmitted and received for each station.

The following describes the fields on the **Client Associations** page.

Field	Description
Network	Shows which VAP the client is associated with. For example, an entry of wlan0vap2 means the client is associated with Radio 1, VAP 2. An entry of wlan0 means the client is associated with VAP 0 on Radio 1. An entry of wlan1 means the client is associated with VAP 0 on Radio 2.
Station	Shows the MAC address of the associated wireless client.
Status	The Authenticated and Associated Status shows the underlying IEEE 802.11 authentication and association status, which is present no matter which type of security the client uses to connect to the AP. This status does not show IEEE 802.1X authentication or association status. Some points to keep in mind with regard to this field are: <ul style="list-style-type: none"> • If the AP security mode is None or Static WEP, the authentication and association status of clients showing on the Client Associations page will be in line with what is expected; that is, if a client shows as authenticated to the AP, it will be able to transmit and receive data. (This is because Static WEP uses only IEEE 802.11 authentication.) • If the AP uses IEEE 802.1X or WPA security, however, it is possible for a client association to show on this page as authenticated (via the IEEE 802.11 security) but actually not be authenticated to the AP via the second layer of security.
From Station	Shows the number of packets and bytes received from the wireless client and the number of packets and bytes that were dropped after being received.
To Station	Shows the number of packets and bytes transmitted from the AP to the wireless client and the number of packets and bytes that were dropped upon transmission.

Table 10 - Associated Clients

Viewing TSPEC Client Associations

The **TSPEC Client Association Status and Statistics** page provides some basic information about the client associations status and a real-time display of the transmit and receive statistics for the TSPEC clients. All transmit and receive statistics shown are totals since the client association started.

A TSPEC is a traffic specification that is sent from a QoS-capable wireless client to an AP requesting a certain amount of network access for the traffic stream (TS) it represents. A traffic stream is a collection of data packets identified by the wireless client as belonging to a particular user priority. An example of a voice traffic stream is a Wi-Fi CERTIFIED™ telephone handset that marks its codec-generated data packets as voice priority traffic. An example of a video traffic stream is a video player application on a wireless laptop that prioritizes a video conference feed from a corporate server.

To view TSPEC client association statistics, click the **TSPEC Client Associations** tab.

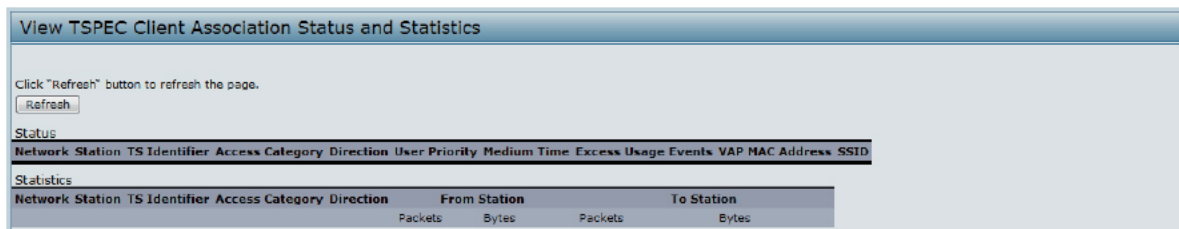


Figure 9 - Viewing TSPEC Client Associations

The following table describes the information provided on the **TSPEC Client Association Status and Statistics** page.

Field	Description
Status	
Network	Radio interface used by the client.
Station	Client station MAC address.
TS Identifier	TSPEC Traffic Session Identifier (range 0-7).
Access Category	TS Access Category (voice or video).
Direction	The traffic direction for this TS. Direction can be: <ul style="list-style-type: none"> • uplink • downlink • bidirectional
User Priority	The User Priority (UP) for this TS. The UP is sent with each packet in the UP portion of the IP header. Typical values are: <ul style="list-style-type: none"> • 6 or 7 for voice • 4 or 5 for video The value may differ depending on other priority traffic sessions.
Medium Time	The time (in 32 microsecond per second units) that the TS traffic occupies the transmission medium.
Excess Usage Events	The number of times the client has exceeded the medium time established for its TSPEC. Minor, infrequent violations are ignored.
VAP	The Virtual Access Point associated with this TS client.
MAC Address	The Virtual Access Point MAC address.
SSID	The service set identifier associated with this TS client.
Statistics	
Network	Radio interface used by the client.
Station	Client station MAC address.
TS Identifier	TSPEC Traffic Session Identifier (range 0-7).
Access Category	TS Access Category (voice or video).
Direction	The traffic direction for this TS. Direction can be: <ul style="list-style-type: none"> • uplink • downlink • bidirectional

Field	Description
From Station	Shows the number of packets and bytes received from the wireless client and the number of packets and bytes that were dropped after being received. Also shows the number of packets: <ul style="list-style-type: none"> • in excess of an admitted TSPEC. • for which no TSPEC has been established when admission is required by the AP.
To Station	Shows the number of packets and bytes transmitted from the AP to the wireless client and the number of packets and bytes that were dropped upon transmission. Also shows the number of packets: <ul style="list-style-type: none"> • in excess of an admitted TSPEC. • for which no TSPEC has been established when admission is required by the AP.

Table 11 - TSPEC Client Associations

Link Integrity Monitoring

The UAP provides link integrity monitoring to continually verify its connection to each associated client. To do this, the AP sends data packets to clients every few seconds when no other traffic is passing. This allows the AP to detect when a client goes out of range, even during periods when no normal traffic is exchanged. The client connection drops off the list within 300 seconds if these data packets are not acknowledged, even if no disassociation message is received.

Viewing Rogue AP Detection

The status page to view **Rogue AP Detection** information provides real-time statistics for all APs within range of the AP on which you are viewing the Administration Web pages. When AP detection is enabled, the radio will periodically switch from its operating channel to scan other channels within the same band. Click **Refresh** to update the screen and display the most current information.

The **Rogue AP Detection** page contains the following two lists:

- Detected Rogue AP List — Lists all APs within range of the AP that have not been acknowledged as known APs.
- Known AP List — Lists all APs within range of the AP that have been acknowledged as known APs either by clicking the **Grant** button associated with an AP in the Detected Rogue AP List or by appearing in an imported AP list.

To view information about other access points on the wireless network, click the **Rogue AP Detection** tab.

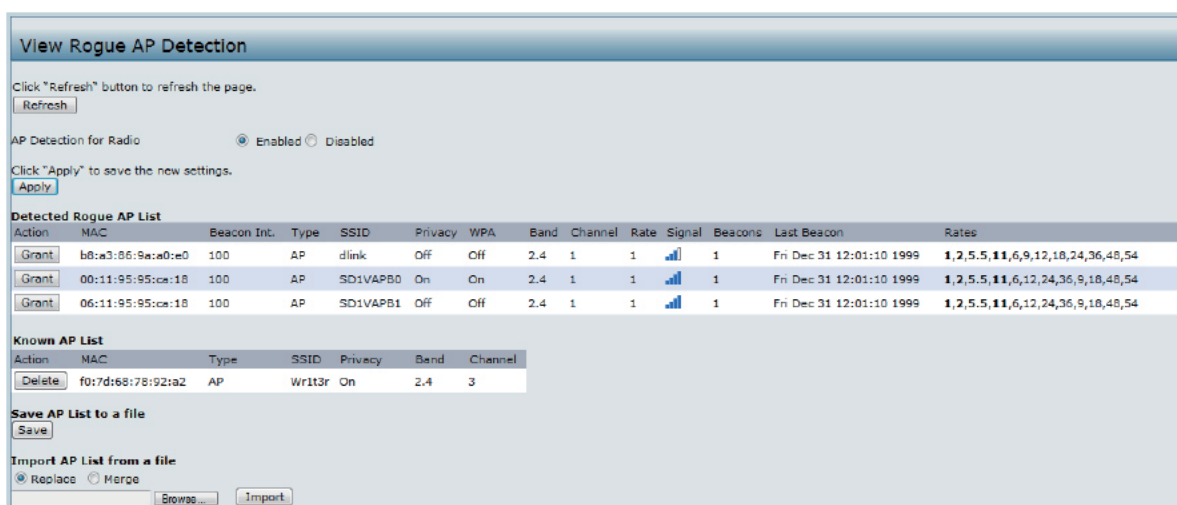


Figure 10 - Viewing Rogue and Known Access Points

You must enable the AP detection on a radio in order to collect information about other APs within range.

The following table describes the information provided on neighboring access points.

Field	Description
AP Detection for Radio	To allow the AP radios to perform neighbor AP detection and collect information about neighbor APs, click Enabled . To disable neighbor AP detection on the radios, click Disabled . If you change the AP detection mode, click Apply to save the new settings.
Detected Rogue AP List	
Action	Click Grant to move the AP from the Detected Rogue AP List to the Known AP List. Note: The Detected Rouge AP and Known AP lists provide information. The DWL-x600AP does not have any control over the APs on the list and cannot apply any security policies to APs detected through the RF scan.
MAC	Shows the MAC address of the neighboring AP.
Radio	The Radio field indicates which radio detected the neighboring AP: <ul style="list-style-type: none"> • wlan0 (Radio One) • wlan1 (Radio Two)
Beacon Int.	Shows the Beacon interval being used by this AP. Beacon frames are transmitted by an AP at regular intervals to announce the existence of the wireless network. The default behavior is to send a beacon frame once every 100 milliseconds (or 10 per second). The Beacon Interval is set on the Radio page. (See “Modifying Radio Settings” on page 40)
Type	Indicates the type of device: <ul style="list-style-type: none"> • AP indicates the neighboring device is an AP that supports the IEEE 802.11 Wireless Networking Framework in Infrastructure Mode. • Ad hoc indicates a neighboring station running in Ad hoc Mode. Stations set to ad hoc mode communicate with each other directly, without the use of a traditional AP. Ad-hoc mode is an IEEE 802.11 Wireless Networking Framework also referred to as <i>peer-to-peer</i> mode or an <i>Independent Basic Service Set (IBSS)</i>.
SSID	The <i>Service Set Identifier (SSID)</i> for the AP. The SSID is an alphanumeric string of up to 32 characters that uniquely identifies a wireless local area network. It is also referred to as the <i>Network Name</i> . The SSID is set on the VAP page. (See “Configuring Load Balancing” on page 60)
Privacy	Indicates whether there is any security on the neighboring device. <ul style="list-style-type: none"> • Off indicates that the Security mode on the neighboring device is set to None (no security). • On indicates that the neighboring device has some security in place. • Security is configured on the AP from the VAP page.
WPA	Indicates whether WPA security is on or off for this AP.
Band	This indicates the IEEE 802.11 mode being used on this AP. (For example, IEEE 802.11a, IEEE 802.11b, IEEE 802.11g.) The number shown indicates the mode according to the following map: <ul style="list-style-type: none"> • 2.4 indicates IEEE 802.11b, 802.11g, or 802.11n mode (or a combination of the modes) • 5 indicates IEEE 802.11a or 802.11n mode (or both modes)
Channel	Shows the Channel on which the AP is currently broadcasting. The channel defines the portion of the radio spectrum that the radio uses for transmitting and receiving. The channel is set in Radio Settings. (See “Modifying Radio Settings” on page 40)
Rate	Shows the rate (in megabits per second) at which this AP is currently transmitting. The current rate will always be one of the rates shown in Supported Rates.
Signal	Indicates the strength of the radio signal emitting from this AP. If you hover the mouse pointer over the bars, a number appears and shows the strength in decibels (dB).
Beacons	Shows the total number of beacons received from this AP since it was first discovered.
Last Beacon	Shows the date and time of the last beacon received from this AP.
Rates	Shows supported and basic (advertised) rate sets for the neighboring AP. Rates are shown in megabits per second (Mbps). All Supported Rates are listed, with Basic Rates shown in bold. Rate sets are configured on the Radio Settings page. (See “Modifying Radio Settings” on page 40)

Field	Description
Known AP List	
Action	An AP can appear in the Known AP List if it has been moved from the Detected Rogue AP List by clicking the Grant button or if the MAC address of the AP appears in an AP list that has been imported. To move the AP from the Known AP List to the Detected Rogue AP List, click Delete . Note: The Detected Rouge AP and Known AP lists provide information. The DWL-x600AP does not have any control over the APs on the list and cannot apply any security policies to APs detected through the RF scan.
MAC	Shows the MAC address of the neighboring AP.
Type	Indicates the type of device: <ul style="list-style-type: none"> • AP indicates the neighboring device is an AP that supports the IEEE 802.11 Wireless Networking Framework in Infrastructure Mode. • Ad hoc indicates a neighboring station running in Ad hoc Mode. Stations set to ad hoc mode communicate with each other directly, without the use of a traditional AP. Ad-hoc mode is an IEEE 802.11 Wireless Networking Framework also referred to as <i>peer-to-peer mode</i> or an <i>Independent Basic Service Set (IBSS)</i>.
SSID	The <i>Service Set Identifier (SSID)</i> for the AP. The SSID is an alphanumeric string of up to 32 characters that uniquely identifies a wireless local area network. It is also referred to as the <i>Network Name</i> . The SSID is set on the VAP page. (See “Configuring Load Balancing” on page 60)
Privacy	Indicates whether there is any security on the neighboring device. <ul style="list-style-type: none"> • Off indicates that the Security mode on the neighboring device is set to None (no security). • On indicates that the neighboring device has some security in place. • Security is configured on the AP from the VAP page.
Band	This indicates the IEEE 802.11 mode being used on this AP. (For example, IEEE 802.11a, IEEE 802.11b, IEEE 802.11g.) The number shown indicates the mode according to the following map: <ul style="list-style-type: none"> • 2.4 indicates IEEE 802.11b, 802.11g, or 802.11n mode (or a combination of the modes) • 5 indicates IEEE 802.11a or 802.11n mode (or both modes)
Channel	Shows the Channel on which the AP is currently broadcasting. The channel defines the portion of the radio spectrum that the radio uses for transmitting and receiving. The channel is set in Radio Settings. (See “Modifying Radio Settings” on page 40)

Table 12 - Rogue AP Detection

Saving and Importing the Known AP List

To save the Known AP list to a file, click **Save**. The list contains the MAC addresses of all AP that have been added to the Known AP List. By default, the filename is *Rogue1.cfg*. You can use a text editor or Web browser to open the file and view its contents.

Use the Import feature to import a list of Known APs from a saved list. The list might be from another DWL-x600AP or created from a text file. If the MAC address of an AP appears in the Known AP List, it will not be detected as a rogue.

To import an AP List from a file, use the following steps:

- 1.) Choose whether to replace the existing Known AP list or add the entries in the imported file to the Known AP list.
 - Select the **Replace** option to import the list and replace the contents of the Known AP List.
 - Select the **Merge** option to import the list and add the APs in the imported file to the APs currently displayed in the Known AP List.
- 2.) Click **Browse** and choose the file to import.
 - The file you import must be a plain-text file with a .txt or .cfg extension. Entries in the file are MAC addresses in hexadecimal format with each octet separated by colons, for example 00:11:22:33:44:55. Separate entries with a single space. For the AP to accept the file, it must contain only MAC addresses.
- 3.) Click **Import**.
 - Once the import is complete, the screen refreshes and the MAC addresses of the APs in the imported file

appear in the Known AP List.

Viewing Managed AP DHCP Information

The UAP can learn about D-Link Unified Wireless Switches on the network through DHCP responses to its initial DHCP request. The **Managed AP DHCP** page displays the DNS names or IP addresses of up to four D-Link Unified Wireless Switches that the AP learned about from a DHCP server on your network.

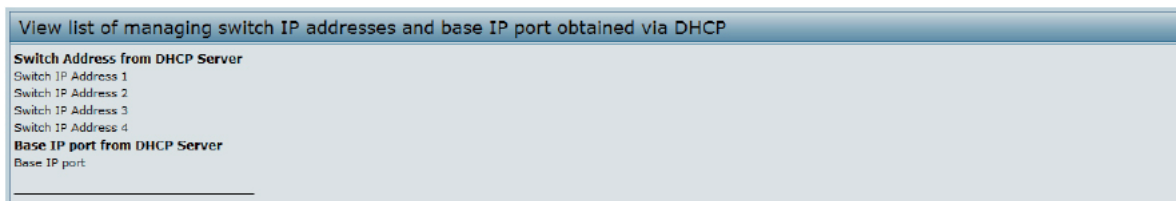


Figure 11 - Managed AP DHCP Information

For information about how to configure a DHCP server to respond to AP DHCP requests with the switch IP address information, see the *User Manual* for the switch.

Viewing TSPEC Status and Statistics Information

The **TSPEC Status and Statistics** page provides:

- Summary information about TSPEC sessions by radio
- Summary information about TSPEC sessions by VAP
- Real-time transmit and receive statistics for the TSPEC VAPs on all radio interfaces.

All of the transmit and receive statistics shown are totals since the AP was last started. If you reboot the AP, these figures indicate transmit and receive totals since the reboot.

To view TSPEC status and statistics, click the **TSPEC Status and Statistics** tab.

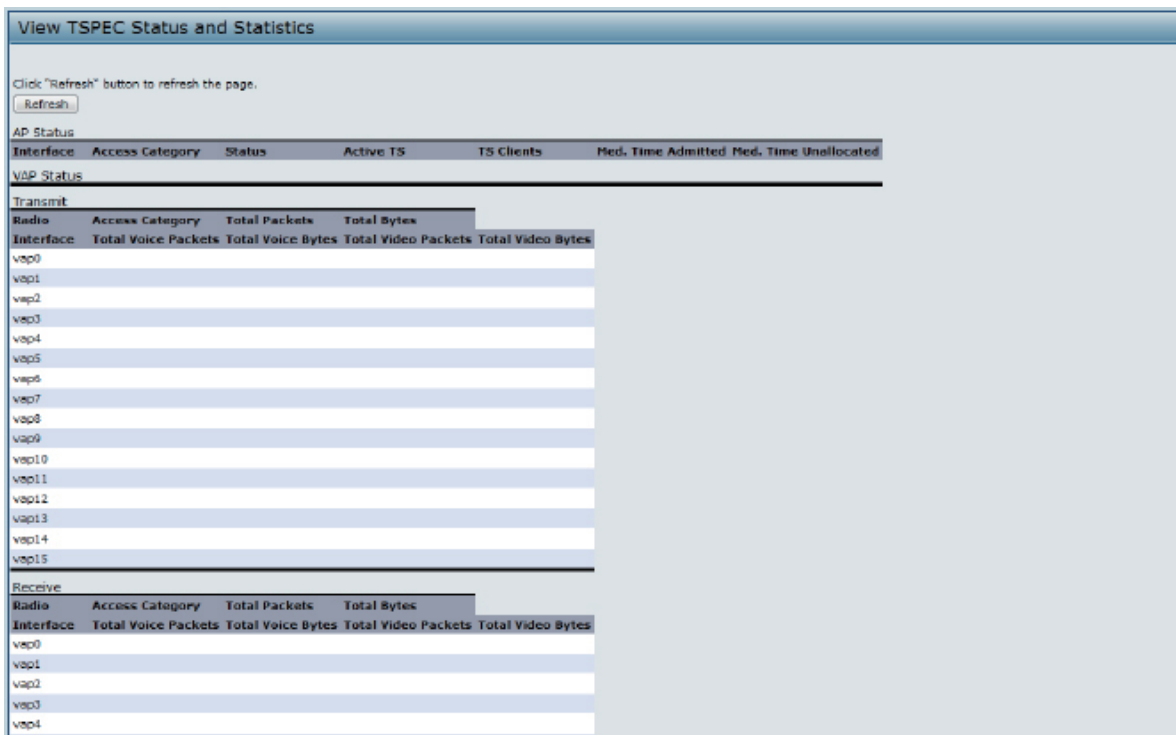


Figure 12 - Viewing TSPEC Status and Statistics

The following table describes the information provided on TSPEC Status and Statistics page.

Field	Description
AP and VAP Status	
Interface	Indicates the name of the Radio or VAP interface.
Access Category	Indicates Current Access Category associated with this Traffic Stream (voice or video).
Status	Indicates whether the TSPEC session is enabled (up) or not (down) for the corresponding Access Category. Note: This is a configuration status (does not necessarily represent the current session activity).
Active TS	Indicates the number of currently active TSPEC Traffic Streams for this radio and Access Category.
TS Clients	Indicates the number of Traffic Stream clients associated with this radio and Access Category.
Medium Time Admitted	Time (in 32 microsecond per second units) allocated for this Access Category over the transmission medium to carry data. This value should be less than or equal to the maximum bandwidth allowed over the medium for this TS.
Medium Time Unallocated	Time (in 32 microsecond per second units) of unused bandwidth for this Access Category.
Transmit and Receive Statistics	
Total Packets	Indicates the total number of TS packets sent (in Transmit table) or received (in Received table) by this Radio for the specified Access Category.
Total Bytes	Indicates the total number of TS bytes sent (in Transmit table) or received (in Received table) by this Radio for the specified Access Category.
Total Voice Packets	Indicates the total number of TS voice packets sent (in Transmit table) or received (in Received table) by this AP for this VAP.
Total Voice Bytes	Indicates the total TS voice bytes sent (in Transmit table) or received (in Received table) by this AP for this VAP.
Total Video Packets	Indicates the total number of TS video packets sent (in Transmit table) or received (in Received table) by this AP for this VAP.
Total Video Bytes	Indicates the total TS video bytes sent (in Transmit table) or received (in Received table) by this AP for this VAP.

Table 13 - TSPEC Status and Statistics

Viewing TSPEC AP Statistics Information

The **View TSPEC AP Statistics** page provides information on the voice and video Traffic Streams accepted and rejected by the AP.

To view TSPEC AP statistics, click the **TSPEC AP Statistics** tab.

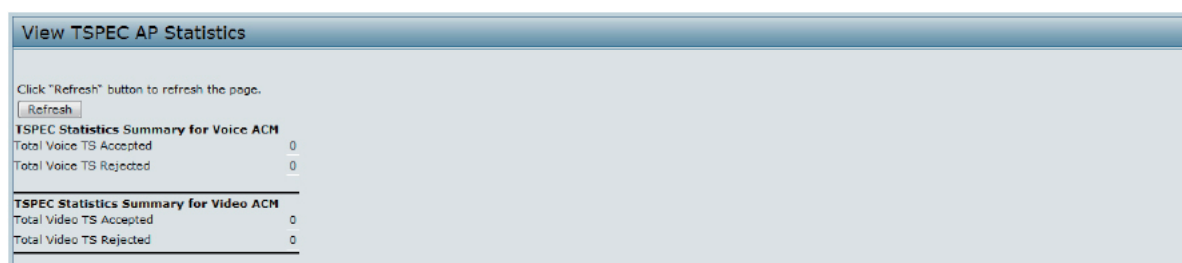


Figure 13 - View TSPEC Status and Statistics

The following table describes the information provided on TSPEC AP Statistics page.

Field	Description
TSPEC Statistics Summary for Voice ACM	Indicates the total number of accepted and the total number of rejected voice Traffic Streams.
TSPEC Statistics Summary for Video ACM	Indicates the total number of accepted and the total number of rejected video Traffic Streams.

Table 14 - TSPEC AP Statistics

Viewing Radio Statistics Information

The Radio Statistics page provides detailed information about the packets and bytes transmitted and received on the radio interface of this access point.

Figure 14 - View Radio Statistics

The following table describes details about the Radio Statistics information.

Field	Description
Radio	Choose either radio 1 or radio 2 to view statistics for the selected radio
WLAN Packets Received	Total packets received by the AP on this radio interface.
WLAN Bytes Received	Total bytes received by the AP on this radio interface.
WLAN Packets Transmitted	Total packets transmitted by the AP on this radio interface.
WLAN Bytes Transmitted	Total bytes transmitted by the AP on this radio interface.
WLAN Packets Receive Dropped	Number of packets received by the AP on this radio interface that were dropped.
WLAN Bytes Receive Dropped	Number of bytes received by the AP on this radio interface that were dropped.
WLAN Packets Transmit Dropped	Number of packets transmitted by the AP on this radio interface that were dropped.
WLAN Bytes Transmit Dropped	Number of bytes transmitted by the AP on this radio interface that were dropped.
Fragments Received	Count of successfully received MPDU frames of type data or management.
Fragments Transmitted	Number of transmitted MPDU with an individual address or an MPDU with a multicast address of type Data or Management.
Multicast Frames Received	Count of MSDU frames received with the multicast bit set in the destination MAC address.

Field	Description
Multicast Frames Transmitted	Count of successfully transmitted MSDU frames where the multicast bit is set in the destination MAC address.
Duplicate Frame Count	Number of times a frame is received and the Sequence Control field indicates is a duplicate.
Failed Transmit Count	Number of times an MSDU is not transmitted successfully due to transmit attempts exceeding either the short retry limit or the long retry limit.
Transmit Retry Count	Number of times an MSDU is successfully transmitted after one or more retries.
Multiple Retry Count	Number of times an MSDU is successfully transmitted after more than one retry.
RTS Success Count	Count of CTS frames received in response to an RTS frame.
RTS Failure Count	Count of CTS frames not received in response to an RTS frame.
ACK Failure Count	Count of ACK frames not received when expected.
FCS Error Count	Count of FCS errors detected in a received MPDU frame.
Frames Transmitted	Count of each successfully transmitted MSDU.
WEP Undecryptable Count	Count of encrypted frames received and the key configuration of the transmitter indicates that the frame should not have been encrypted or that frame was discarded due to the receiving station not implementing the privacy option.

Table 15 - Radio Statistics Information

Viewing Email Alert Operational Status

The Email Alert Operational Status page provides information about the email alerts sent based on the syslog messages generated in the AP.

To view the Email Alert Operational Status, click the **Status > Email Alert Status** tab.

To configure the email alerts, see [“Configuring Email Alert” on page 72.](#)

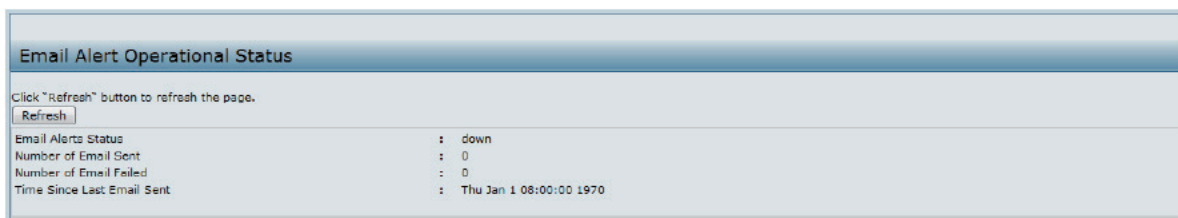


Figure 15 - Email Alert Operational Status

The following table describes details about the Email Alert Operational Status.

Field	Description
Email Alert Status	The Email Alert operational status The status is either Up or Down . The default is Down .
Number of Email Sent	The total number of email sent so far. The range is an unsigned integer of 32 bits. The default is 0.
Number of Email Failed	The total number of email failures so far. The range is an unsigned integer of 32 bits. The default is 0.
Time Since Last Email Sent	The time since the last email was sent. Time format is used. The default is 00 days 00 hours 00 minutes 00 seconds.

Table 16 - Email Alert Status

Section 4 - Managing the Access Point

This section describes how to manage the UAP and contains the following subsections:

-) "Ethernet Settings" on page 35
-) "Wireless Settings" on page 37
-) "Modifying Radio Settings" on page 40
-) "Configuring Radio and VAP Scheduler" on page 44
-) "Scheduler Association Settings" on page 46
-) "Virtual Access Point Settings" on page 47
-) "Configuring the Wireless Distribution System (WDS)" on page 56
-) "Controlling Access by MAC Authentication" on page 58
-) "Configuring Load Balancing" on page 60
-) "" on page 60
-) "Configuring 802.1X Authentication" on page 62
-) "Creating a Management Access Control List (ACL)" on page 63

The configuration pages for the features in this section are located under the **Manage** heading on the Administration Web UI.

Ethernet Settings

The default wired interface settings, which include DHCP and VLAN information, might not work for all networks.

By default, the DHCP client on the UAP automatically broadcasts requests for network information. If you want to use a static IP address, you must disable the DHCP client and manually configure the IP address and other network information.

The management VLAN is VLAN 1 by default. This VLAN is also the default untagged VLAN. If you already have a management VLAN configured on your network with a different VLAN ID, you must change the VLAN ID of the management VLAN on the AP.

To configure the LAN settings, click the **Ethernet Settings** tab.

Figure 16 - Modify Ethernet (Wired) settings

The following table describes the fields to view or configure on the **Ethernet Settings** page.

Field	Description
Hostname	Enter a hostname for the AP. The hostname appears in the CLI prompt. <ul style="list-style-type: none"> • The hostname has the following requirements: • The length must be between 1 – 63 characters. • Upper and lower case characters, numbers, and hyphens are accepted. • The first character must be a letter (a – z or A – Z), and the last character cannot be a hyphen.
MAC Address	Shows the MAC address for the LAN interface for the Ethernet port on this AP. This is a read-only field that you cannot change.
Management VLAN ID	The management VLAN is the VLAN associated with the IP address you use to access the AP. The default management VLAN ID is 1. Provide a number between 1 and 4094 for the management VLAN ID.
Untagged VLAN	If you disable the untagged VLAN, all traffic is tagged with a VLAN ID. By default all traffic on the UAP uses VLAN 1, which is the default untagged VLAN. This means that all traffic is untagged until you disable the untagged VLAN, change the untagged traffic VLAN ID, or change the VLAN ID for a VAP or client using RADIUS.
Untagged VLAN ID	Provide a number between 1 and 4094 for the untagged VLAN ID. Traffic on the VLAN that you specify in this field will not be tagged with a VLAN ID.
Connection Type	If you select DHCP , the UAP acquires its IP address, subnet mask, DNS, and gateway information from a DHCP server. If you select Static IP , you must enter information in the Static IP Address, Subnet Mask, and Default Gateway fields.
Static IP Address	Enter the static IP address in the text boxes. This field is disabled if you use DHCP as the connection type.
Subnet Mask	Enter the Subnet Mask in the text boxes.
Default Gateway	Enter the Default Gateway in the text boxes.
DNS Nameservers	Select the mode for the DNS. In Dynamic mode, the IP addresses for the DNS servers are assigned automatically via DHCP. This option is only available if you specified DHCP for the Connection Type. In Manual mode, you must assign static IP addresses to resolve domain names.
IPv6 Admin Mode	Enable or disable IPv6 management access to the AP
IPv6 Auto Config Admin Mode	Enable or disable IPv6 auto address configuration on the AP. When IPv6 Auto Config Mode is enabled, automatic IPv6 address configuration and gateway configuration is allowed by processing the Router Advertisements received on the LAN port. The AP can have multiple auto configured IPv6 addresses.
Static IPv6 Address	Enter a static IPv6 address. The AP can have a static IPv6 address even if addresses have already been configured automatically.
Static IPv6 Address Prefix Length	Enter the static IPv6 prefix length, which is an integer in the range of 0 – 128.
IPv6 Autoconfigured Global Addresses	If the AP has been assigned one or more IPv6 addresses automatically, the addresses are listed.
IPv6 Link Local Address	Shows the IPv6 Link Local address, which is the IPv6 address used by the local physical link. The link local address is not configurable and is assigned by using the IPv6 Neighbor Discovery process.
Default IPv6 Gateway	Enter the default IPv6 gateway.

Table 17 - Ethernet Settings



Note: After you configure the wired settings, you must click **Apply** to apply the changes and to save the settings. Changing some settings might cause the AP to stop and restart system processes. If this happens, wireless clients will temporarily lose connectivity. We recommend that you change AP settings when WLAN traffic is low.

Wireless Settings

Wireless settings describe aspects of the local area network (LAN) related specifically to the radio device in the access point (802.11 Mode and Channel) and to the network interface to the access point (MAC address for access point and Wireless Network name, also known as SSID).

To configure the wireless interface, click the **Manage > Wireless Settings** tab.

The screenshot shows a web-based configuration page titled "Modify wireless settings". At the top, there are radio buttons for "802.11d Regulatory Domain Support" (set to "Enabled") and "IEEE802.11h support present." Below this is a checkbox for "Station Isolation" which is unchecked. The page is divided into two sections for "Radio Interface" and "Radio Interface 2". Each section has a radio button to turn it "On" or "Off", a text field for the "MAC Address", a dropdown menu for the "Mode", and a dropdown menu for the "Channel". For Radio Interface 1, the MAC Address is "B8:A3:86:FE:1A:80", Mode is "IEEE 802.11a/n", and Channel is "Auto". For Radio Interface 2, the MAC Address is "B8:A3:86:FE:1A:90", Mode is "IEEE 802.11b/g/n", and Channel is "Auto". At the bottom left, there is a note "Click 'Apply' to save the new settings." and an "Apply" button.

Figure 17 - Modify Wireless Settings

The following table describes the fields and configuration options available on the **Wireless Settings** page.

Field	Description
TSPEC Violation Interval	Specify the time interval (in seconds) for the AP to report (through the system log and SNMP traps) associated clients that do not adhere to mandatory admission control procedures.
Radio Interface	Specify whether you want the radio interface on or off.
MAC Address	Indicates the Media Access Control (MAC) addresses for the interface. Dual-radio APs have a unique MAC address for each radio. A MAC address is a permanent, unique hardware address for any device that represents an interface to the network. The MAC address is assigned by the manufacturer. You cannot change the MAC address. It is provided here for informational purposes as a unique identifier for an interface.

Field	Description
Mode	<p>The Mode defines the Physical Layer (PHY) standard the radio uses.</p> <p>Note: The modes available depend on the country code setting and the radio selected.</p> <p>Select one of the following modes for radio 1:</p> <ul style="list-style-type: none"> • IEEE 802.11a is a PHY standard that specifies operating in the 5 GHz U-NII band using orthogonal frequency division multiplexing (OFDM). It supports data rates ranging from 6 to 54 Mbps. • IEEE 802.11a/n operates in the 5 GHz ISM band and includes support for both 802.11a and 802.11n devices. IEEE 802.11n is an extension of the 802.11 standard that includes multiple-input multiple-output (MIMO) technology. IEEE 802.11n supports data ranges of up to 248 Mbps and nearly twice the indoor range of 802.11b, 802.11g, and 802.11a. • 5 GHz IEEE 802.11n is the recommended mode for networks with 802.11n devices that operate in the 5 GHz frequency that do not need to support 802.11a devices. IEEE 802.11n can achieve a higher throughput when it does not need to be compatible with legacy devices (802.11a). <p>Select one of the following modes for radio 2:</p> <ul style="list-style-type: none"> • IEEE 802.11b/g operates in the 2.4 GHz ISM band. IEEE 802.11b is an enhancement of the initial 802.11 PHY to include 5.5 Mbps and 11 Mbps data rates. It uses direct sequence spread spectrum (DSSS) or frequency hopping spread spectrum (FHSS) as well as complementary code keying (CCK) to provide the higher data rates. It supports data rates ranging from 1 to 11 Mbps. IEEE 802.11g is a higher speed extension (up to 54 Mbps) to the 802.11b PHY. It uses orthogonal frequency division multiplexing (OFDM). It supports data rates ranging from 1 to 54 Mbps. • IEEE 802.11b/g/n operates in the 2.4 GHz ISM band and includes support for 802.11b, 802.11g, and 802.11n devices. • 2.4 GHz IEEE 802.11n is the recommended mode for networks with 802.11n devices that operate in the 2.4 GHz frequency that do not need to support 802.11b/g devices. IEEE 802.11n can achieve a higher throughput when it does not need to be compatible with legacy devices (802.11b/g).
Channel	<p>Select the Channel.</p> <p>The range of available channels is determined by the mode of the radio interface and the country code setting. If you select Auto for the channel setting, the AP scans available channels and selects a channel where no traffic is detected.</p> <p>The Channel defines the portion of the radio spectrum the radio uses for transmitting and receiving. Each mode offers a number of channels, depending on how the spectrum is licensed by national and transnational authorities such as the Federal Communications Commission (FCC) or the International Telecommunication Union (ITU-R).</p> <p>When automatic channel assignment is enabled on the Channel Management page for Clustering, the channel policy for the radio is automatically set to static mode, and the Auto option is not available for the Channel field. This allows the automatic channel feature to set the channels for the radios in the cluster.</p>
Station Isolation	<p>To enable Station Isolation, select the check box directly beside it.</p> <p>When Station Isolation is disabled, wireless clients can communicate with one another normally by sending traffic through the AP.</p> <p>When Station Isolation is enabled, the AP blocks communication between wireless clients on the same radio and VAP. The AP still allows data traffic between its wireless clients and wired devices on the network, across a WDS link, and with other wireless clients associated with a different VAP, but not among wireless clients associated with the same VAP.</p>

Field	Description
AeroScout™ Engine Protocol Support	<p>AeroScout Engine support provides location-based services for wireless networks. Specify whether to enable support for the AeroScout protocol.</p> <p>Options are Enabled or Disabled. The default is Disabled. When enabled, Aeroscout devices are recognized and data is sent to an Aeroscout Engine (AE) for analysis. The AE determines the geographical location of 802.11 capable devices, such as STAs, APs, and AeroScout's line of 802.11 enabled RFID devices, or tags. The AE communicates with APs that support the AE protocol in order to collect information about the RF devices detected by the APs. Using the AE protocol, D-Link supports direct communication between AE and the APs. When operating in managed mode, the AE is configured with the IP address of the managed access points from which it collects information. The Wireless Switch cannot communicate with the AE.</p> <p>For more information about the AeroScout protocol, see “Enabling AeroScout™ Engine Support” on page 39.</p> <p>Note: Only AeroScout tag hardware of types T2 and T3 are explicitly supported. Other tag models are also supported only if their implementation of the AeroScout protocol conforms to the <i>AeroScout Engine - Access Point Interface Specification</i>, version 2.1.</p> <p>Note: AeroScout tags operate only in 802.11 b/g mode. Therefore, network administrators who use the AeroScout tags must configure at least one radio on APs that are expected to detect tags in either 802.11b/g or 802.11b/g/n mode. The radios configured in 2.4 GHz IEEE 802.11 mode or any of the 5GHz modes cannot detect AeroScout tags.</p> <p>Note: The AE protocol allows access points to mark detected APs as rogue devices. The D-Link APs do not support this feature and never report detected APs as rogues.</p>

Table 18 - Wireless Settings



Note: After you configure the wireless settings, you must click **Apply** to apply the changes and to save the settings. Changing some settings might cause the AP to stop and restart system processes. If this happens, wireless clients will temporarily lose connectivity. We recommend that you change AP settings when WLAN traffic is low.

Using the 802.11h Wireless Mode

For 802.11a radios, if the regulatory domain requires radar detection on the channel, the Dynamic Frequency Selection (DFS) and Transmit Power Control (TPC) features of 802.11h are automatically activated.

There are a number of key points about the IEEE 802.11h standard:

- 802.11h only works for the 802.11a band. It is not required for 802.11b or 802.11g.
- If you are operating in an 802.11h enabled domain, the AP attempts to use the channel you assign. If the channel has been blocked by a previous radar detection, or if the AP detects a radar on the channel, then the AP automatically selects a different channel.
- When 802.11h is enabled, the AP will not be operational in the 5GHz band for at least 60 seconds due to radar scanning.
- Setting up WDS links may be difficult when 802.11h is operational. This is because the operating channels of the two APs on the WDS link may keep changing depending on channel usage and radar interference. WDS will only work if both the APs operate on the same channel. For more information on WDS, see [“Configuring Load Balancing” on page 60](#).

Enabling AeroScout™ Engine Support

The AeroScout Engine (AE) is a software platform produced by AeroScout Inc. for location-based services. The AE can determine the physical location of 802.11 capable AeroScout devices. The AE communicates with APs that have the AE protocol enabled in order to collect information about the RF devices detected by the APs.

The DWS-4000 Series switch supports only direct communication between the AE and the APs. When operating in managed mode, the AE is configured with the IP address of the managed access points from which it collects

information. The DWS-4000 Series switch does not communicate with the AE.

AeroScout tags operate only in 802.11b/g mode. Therefore, network administrators who use the AeroScout tags must configure at least one radio on APs that are expected to detect tags in either 802.11b/g or 802.11b/g/n mode. The radios configured in 2.4 GHz IEEE 802.11n mode cannot detect AeroScout tags.



Note: The following notes apply to AeroScout product and protocol support:

-) D-Link does not sell AeroScout products. Contact AeroScout for AeroScout hardware, software or deployment information.
-) The AE protocol does not support any authentication or encryption between the AE server and the access point.
-) The AE protocol requires radios to operate in promiscuous mode. This means that the AP receives and processes all packets detected by the radios, as opposed to processing only packets destined to the APs BSSID. This can affect AP throughput.

Modifying Radio Settings

Radio settings directly control the behavior of the radio devices in the AP and its interaction with the physical medium; that is, how and what type of electromagnetic waves the AP emits.

To specify radio settings, click the **Radio** tab in the Manage section.

Different settings display depending on the mode you select. All settings are described in the table below.

Figure 18 - Modify Radio Settings

The following table describes the fields and configuration options for the **Radio Settings** page.

Field	Description
Radio	Select Radio 1 or Radio 2 to specify which radio to configure. The rest of the settings on this page apply to the radio you select in this field. Be sure to configure settings for both radios. Radio 1 operates in the 5 GHz band (802.11a/n), and Radio 2 operates in the 2.4 GHz band (802.11b/g/n).
Status (On/Off)	Specify whether you want the radio on or off by clicking On or Off . If you turn off a radio, the AP sends disassociation frames to all the wireless clients it is currently supporting so that the radio can be gracefully shutdown and the clients can start the association process with other available APs.

Field	Description
Mode	<p>The Mode defines the Physical Layer (PHY) standard the radio uses.</p> <p>Note: The modes available depend on the country code setting and the radio selected.</p> <p>Select one of the following modes for radio 1:</p> <ul style="list-style-type: none"> • IEEE 802.11a is a PHY standard that specifies operating in the 5 GHz U-NII band using orthogonal frequency division multiplexing (OFDM). It supports data rates ranging from 6 to 54 Mbps. • IEEE 802.11a/n operates in the 5 GHz ISM band and includes support for both 802.11a and 802.11n devices. IEEE 802.11n is an extension of the 802.11 standard that includes multiple-input multiple-output (MIMO) technology. IEEE 802.11n supports data ranges of up to 248 Mbps and nearly twice the indoor range of 802.11b, 802.11g, and 802.11a. • 5 GHz IEEE 802.11n is the recommended mode for networks with 802.11n devices that operate in the 5 GHz frequency that do not need to support 802.11a devices. IEEE 802.11n can achieve a higher throughput when it does not need to be compatible with legacy devices (802.11a). <p>Select one of the following modes for radio 2:</p> <ul style="list-style-type: none"> • IEEE 802.11b/g operates in the 2.4 GHz ISM band. IEEE 802.11b is an enhancement of the initial 802.11 PHY to include 5.5 Mbps and 11 Mbps data rates. It uses direct sequence spread spectrum (DSSS) or frequency hopping spread spectrum (FHSS) as well as complementary code keying (CCK) to provide the higher data rates. It supports data rates ranging from 1 to 11 Mbps. IEEE 802.11g is a higher speed extension (up to 54 Mbps) to the 802.11b PHY. It uses orthogonal frequency division multiplexing (OFDM). It supports data rates ranging from 1 to 54 Mbps. • IEEE 802.11b/g/n operates in the 2.4 GHz ISM band and includes support for 802.11b, 802.11g, and 802.11n devices. • 2.4 GHz IEEE 802.11n is the recommended mode for networks with 802.11n devices that operate in the 2.4 GHz frequency that do not need to support 802.11b/g devices. IEEE 802.11n can achieve a higher throughput when it does not need to be compatible with legacy devices (802.11b/g).
Channel	<p>Select the Channel.</p> <p>The range of available channels is determined by the mode of the radio interface and the country code setting. If you select Auto for the channel setting, the AP scans available channels and selects a channel where no traffic is detected.</p> <p>The channel defines the portion of the radio spectrum the radio uses for transmitting and receiving. Each mode offers a number of channels, depending on how the spectrum is licensed by national and transnational authorities such as the Federal Communications Commission (FCC) or the International Telecommunication Union (ITU-R).</p> <p>When automatic channel assignment is enabled on the Channel Management page for Clustering, the channel policy for the radio is automatically set to static mode, and the Auto option is not available for the Channel field. This allows the automatic channel feature to set the channels for the radios in the cluster.</p>
Channel Bandwidth (802.11n modes only)	<p>The 802.11n specification allows a 40 MHz wide channel in addition to the legacy 20 MHz channel available with other modes. The 40 MHz channel enables higher data rates but leaves fewer channels available for use by other 2.4 GHz and 5 GHz devices.</p> <p>Set the field to 20 MHz to restrict the use of the channel bandwidth to a 20 MHz channel.</p>
Primary Channel (802.11n modes only)	<p>This setting can be changed only when the channel bandwidth is set to 40 MHz. A 40 MHz channel can be considered to consist of two 20 MHz channels that are contiguous in the frequency domain. These two 20 MHz channels are often referred to as the Primary and Secondary channels. The Primary Channel is used for 802.11n clients that support only a 20 MHz channel bandwidth and for legacy clients.</p> <p>Select one of the following options:</p> <ul style="list-style-type: none"> • Lower — Set the Primary Channel as the lower 20 MHz channel in the 40 MHz band. • Upper — Set the Primary Channel as the upper 20 MHz channel in the 40 MHz band.

Field	Description
Short Guard Interval Supported	<p>This field is available only if the selected radio mode includes 802.11n. The guard interval is the dead time, in nanoseconds, between OFDM symbols. The guard interval prevents Inter-Symbol and Inter-Carrier Interference (ISI, ICI). The 802.11n mode allows for a reduction in this guard interval from the a and g definition of 800 nanoseconds to 400 nanoseconds. Reducing the guard interval can yield a 10% improvement in data throughput.</p> <p>Select one of the following options:</p> <ul style="list-style-type: none"> •) Yes — The AP transmits data using a 400ns guard Interval when communicating with clients that also support the short guard interval. •) No — The AP transmits data using an 800ns guard interval.
STBC Mode	<p>This field is available only if the selected radio mode includes 802.11n. Space Time Block Coding (STBC) is an 802.11n technique intended to improve the reliability of data transmissions. The data stream is transmitted on multiple antennas so the receiving system has a better chance of detecting at least one of the data streams.</p> <p>Select one of the following options:</p> <ul style="list-style-type: none"> •) On — The AP transmits the same data stream on multiple antennas at the same time. •) Off — The AP does not transmits the same data on multiple antennas.
Protection	<p>The protection feature contains rules to guarantee that 802.11n transmissions do not cause interference with legacy stations or APs. By default, these protection mechanisms are enabled (Auto). With protection enabled, protection mechanisms will be invoked if legacy devices are within range of the AP. This causes more overhead on every transmission, which will impact performance. However, there is no impact on performance if there are no legacy devices within range of the AP.</p> <p>You can disable (Off) these protection mechanisms; however, when 802.11n protection is off, legacy clients or APs within range can be affected by 802.11n transmissions. The 802.11 protection feature is also available when the mode is 802.11b/g. When protection is enabled in this mode, it protects 802.11b clients and APs from 802.11g transmissions.</p> <p>Note: This setting does not affect the ability of the client to associate with the AP.</p>
Beacon Interval	<p>Beacon frames are transmitted by an AP at regular intervals to announce the existence of the wireless network. The default behavior is to send a beacon frame once every 100 milliseconds (or 10 per second).</p> <p>Enter a value from 20 to 2000 milliseconds.</p>
DTIM Period	<p>Specify a DTIM period from 1 to 255 beacons.</p> <p>The Delivery Traffic Information Map (DTIM) message is an element included in some Beacon frames. It indicates which client stations, currently sleeping in low-power mode, have data buffered on the AP awaiting pick-up.</p> <p>The DTIM period you specify indicates how often the clients served by this AP should check for buffered data still on the AP awaiting pickup.</p> <p>The measurement is in beacons. For example, if you set this field to 1, clients will check for buffered data on the AP at every beacon. If you set this field to 10, clients will check on every 10th beacon.</p>
Fragmentation Threshold	<p>Specify a number between 256 and 2,346 to set the frame size threshold in bytes.</p> <p>The fragmentation threshold is a way of limiting the size of packets (frames) transmitted over the network. If a packet exceeds the fragmentation threshold you set, the fragmentation function is activated and the packet is sent as multiple 802.11 frames.</p> <p>If the packet being transmitted is equal to or less than the threshold, fragmentation is not used.</p> <p>Setting the threshold to the largest value (2,346 bytes) effectively disables fragmentation. Fragmentation plays no role when Aggregation is enabled.</p> <p>Fragmentation involves more overhead both because of the extra work of dividing up and reassembling of frames it requires, and because it increases message traffic on the network. However, fragmentation can help improve network performance and reliability if properly configured.</p> <p>Sending smaller frames (by using lower fragmentation threshold) might help with some interference problems; for example, with microwave ovens.</p> <p>By default, fragmentation is off. We recommend not using fragmentation unless you suspect radio interference. The additional headers applied to each fragment increase the overhead on the network and can greatly reduce throughput.</p>

Field	Description
RTS Threshold	Specify a Request to Send (RTS) Threshold value between 0 and 2347. The RTS threshold indicates the number of octets in an MPDU, below which an RTS/CTS handshake is not performed. Changing the RTS threshold can help control traffic flow through the AP, especially one with a lot of clients. If you specify a low threshold value, RTS packets will be sent more frequently. This will consume more bandwidth and reduce the throughput of the packet. On the other hand, sending more RTS packets can help the network recover from interference or collisions which might occur on a busy network, or on a network experiencing electromagnetic interference.
Maximum Stations	Specify the maximum number of stations allowed to access this AP at any one time. You can enter a value between 0 and 200.
Transmit Power	Enter a percentage value for the transmit power level for this AP. The default value, which is 100% , can be more cost-efficient than a lower percentage since it gives the AP a maximum broadcast range and reduces the number of APs needed. To increase capacity of the network, place APs closer together and reduce the value of the transmit power. This helps reduce overlap and interference among APs. A lower transmit power setting can also keep your network more secure because weaker wireless signals are less likely to propagate outside of the physical location of your network.
Fixed Multicast Rate	Select the multicast traffic transmission rate you want the AP to support.
Legacy Rate Sets	Check the transmission rate sets you want the AP to support and the basic rate sets you want the AP to advertise: <ul style="list-style-type: none"> • Rates are expressed in megabits per second. • Supported Rate Sets indicate rates that the AP supports. You can check multiple rates (click a check box to select or de-select a rate). The AP will automatically choose the most efficient rate based on factors like error rates and distance of client stations from the AP. • Basic Rate Sets indicate rates that the AP will advertise to the network for the purposes of setting up communication with other APs and client stations on the network. It is generally more efficient to have an AP broadcast a subset of its supported rate sets.
MCS (Data Rate) Settings (802.11n modes only)	This field shows the Modulation and Coding Scheme (MCS) index values supported by the radio. Each index can be enabled and disabled independently.
Broadcast/Multicast Rate Limiting	Enabling multicast and broadcast rate limiting can improve overall network performance by limiting the number of packets transmitted across the network. By default the Multicast/Broadcast Rate Limiting option is disabled. Until you enable Multicast/Broadcast Rate Limiting , the following fields will be disabled: <ul style="list-style-type: none"> • Rate Limit - Enter the rate limit you want to set for multicast and broadcast traffic. The limit should be greater than 1, but less than 50 packets per second. Any traffic that falls below this rate limit will always conform and be transmitted to the appropriate destination. The default and maximum rate limit setting is 50 packets per second. • Rate Limit Burst - Setting a rate limit burst determines how much traffic bursts can be before all traffic exceeds the rate limit. This burst limit allows intermittent bursts of traffic on a network above the set rate limit. The default and maximum rate limit burst setting is 75 packets per second.
TSPEC Mode	Regulates the overall TSPEC mode on the AP. The options are: <ul style="list-style-type: none"> • On — The AP handles TSPEC requests according to the TSPEC settings you configure on the Radio page. Use this setting if the AP handles traffic from QoS-capable devices, such as a Wi-Fi CERTIFIED phone. • Off — The AP ignores TSPEC requests from client stations. Use this setting if you do not want to use TSPEC to give QoS-capable devices priority for time-sensitive traffic.
TSPEC Voice ACM Mode	Regulates mandatory admission control (ACM) for the voice access category. The options are: <ul style="list-style-type: none"> • On — A station is required to send a TSPEC request for bandwidth to the AP before sending or receiving a voice traffic stream. The AP responds with the result of the request, which includes the allotted medium time if the TSPEC was admitted. • Off — A station can send and receive voice priority traffic without requiring an admitted TSPEC; the AP ignores voice TSPEC requests from client stations.

Field	Description
TSPEC Voice ACM Limit	Specify an upper limit on the amount of traffic the AP attempts to transmit on the wireless medium using a voice AC to gain access.
TSPEC Video ACM Mode	Regulates mandatory admission control for the video access category. The options are: <ul style="list-style-type: none"> •) On — A station is required to send a TSPEC request for bandwidth to the AP before sending or receiving a video traffic stream. The AP responds with the result of the request, which includes the allotted medium time if the TSPEC was admitted. •) Off — A station can send and receive video priority traffic without requiring an admitted TSPEC; the AP ignores video TSPEC requests from client stations.
TSPEC Video ACM Limit	Specify an upper limit on the amount of traffic the AP attempts to transmit on the wireless medium using a video AC to gain access.
TSPEC AP Inactivity Timeout	Specify the amount of time for an AP to detect an downlink TS as idle before deleting it.
TSPEC Station Inactivity Timeout	Specify the amount of time for an AP to detect an uplink TS as idle before deleting it.
TSPEC Legacy WMM Queue Map Mode	Select Enable to allow intermixing of legacy traffic on queues operating as ACM.

Table 19 - Radio Settings

Use the **Radio** page to configure both Radio One and Radio Two. The settings on the page apply only to the radio that you choose from the Radio drop-down list. After you configure settings for one of the radios, click **Apply** and then select and configure the other radio. Be sure to click **Apply** to apply the second set of configuration settings for the other radio.

Configuring Radio and VAP Scheduler

The Radio and VAP scheduler is a standalone DWL-x600AP feature. To configure the Radio and VAP scheduler, select the **Scheduler** tab in the **Manage** section. The Radio and VAP Scheduler allows you to configure a rule with a specific time interval for VAPs or radios to be operational, thereby automating the enabling or disabling of the VAPs and Radios.

One of the ways you can use this feature is to schedule radios to operate only during the office working hours in order to achieve security and reduce power consumption. You can also use the Scheduler to allow access to VAPs for wireless clients only during specific times of day.

Each rule specifies the start time, end time and day (or days) of the week the radio or VAP can be operational. The rules are periodic in nature and are repeated every week.

A valid rule must contain all of the following parameters:

-) Days of the Week.
-) Start Time (hour and minutes).
-) End Time (hour and minutes).

Only valid rules are added to the profile. Up to 16 rules are grouped together to form a scheduling profile. Any two periodic rules time entries belonging to the same profile must not overlap. The time granularity for the schedules is one minute. The DWL-x600AP supports up to 16 profiles.

Figure 19 - Scheduler Configuration

Field	Description
Global Scheduler Mode	A global switch to enable or disable the scheduler feature. The default is Disable .
<i>Scheduler Operational Status</i>	
Status	The operational status of the Scheduler. The range is Up or Down . The default is Down .
Reason	Provides additional information about the status. The reason can be one or more of the following: <ul style="list-style-type: none"> • IsActive – Operational status is up. • ConfigDown – Operational status is down because global configuration is disabled. • TimeNotSet – Operational status is down because the AP time has not been set, either manually or by specifying an NTP server to use. • ManagedMode – Operational status is down because the AP is in managed mode.
Scheduler Profile	The Scheduler profile defines the list of profiles names that can be associated to the VAP or Radio configuration. Rules are associated with a named scheduler profile. You can define up to 16 scheduler profile names. By default, no profiles are created. The profile name can be up to 32 alphanumeric characters. Click Add to add the profile name.
Rule Configuration	Each scheduler profile may have up to 16 periodic rules. The list of parameters for each periodic rule are described below.
Select Profile	Select the profile name from the menu.
Set Schedule	The day of the week. Range is: Daily , Weekday (Monday to Friday), Weekend (Saturday and Sunday), Monday , Tuesday , Wednesday , Thursday , Friday , Saturday , Sunday . The default is Daily .
Start Time	The time when the radio or VAP will be operationally enabled. The time is in HH:MM 24-hour format. The range is <00-24>:<00-59>. The default is 00:00.
End Time	The time when the radio or VAP will be operationally disabled. The time is in HH:MM 24-hour format. The range is <00-24>:<00-59>. The default is 00:00.

Table 20 - Scheduler Configuration

To change an existing rule, select the rule, update the values in the **Rule Configuration** area, and click **Modify Rule**.

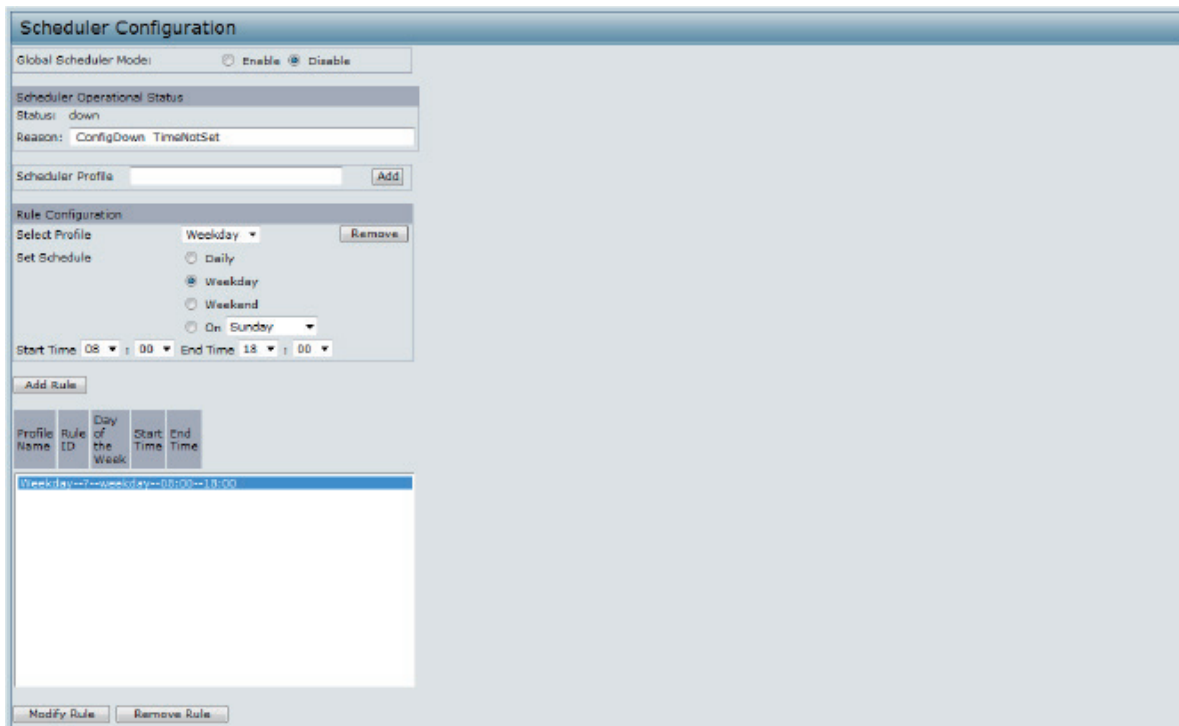
The screenshot shows the 'Scheduler Configuration' window. At the top, 'Global Scheduler Mode' is set to 'Disable'. Below, 'Scheduler Operational Status' shows 'Status: down' and 'Reason: ConfigDown TimeNotSet'. The 'Scheduler Profile' section has an empty dropdown and an 'Add' button. The 'Rule Configuration' section includes a 'Select Profile' dropdown set to 'Weekday', a 'Remove' button, and 'Set Schedule' options: 'Daily', 'Weekday' (selected), 'Weekend', and 'On Sunday'. 'Start Time' is 08:00 and 'End Time' is 18:00. An 'Add Rule' button is below. A table at the bottom lists rules with columns: Profile Name, Rule ID, Day of the Week, Start Time, and End Time. One rule is listed: 'Weekday--7--weekday--(00:00--18:00)'. 'Modify Rule' and 'Remove Rule' buttons are at the bottom.

Figure 20 - Scheduler Configuration (Modify Rule)

Click **Apply** to save the new configuration settings.



Note: After making any modifications, you must click **Apply** to apply the changes and to save the settings.

Scheduler Association Settings

For a Scheduler profile to take effect, you must associate it with at least one radio or VAP interface. To associate the Scheduler profiles, select the **Scheduler Association** tab in the **Manage** section. By default, there are no Scheduler profiles created, so no profile is associated to any radio or VAP. The Scheduler profile needs to be explicitly associated to a radio or VAP configuration. Only one Scheduler profile can be associated to any radio or VAP configuration; however, a single profile can be associated to multiple radios or VAPs. If the Scheduler profile associated with a VAP or radio is deleted, then the associated profile to the VAP or radio is removed implicitly. If the radio is operationally disabled, then all the VAPs associated to that radio are also operationally disabled irrespective of the VAP configuration.

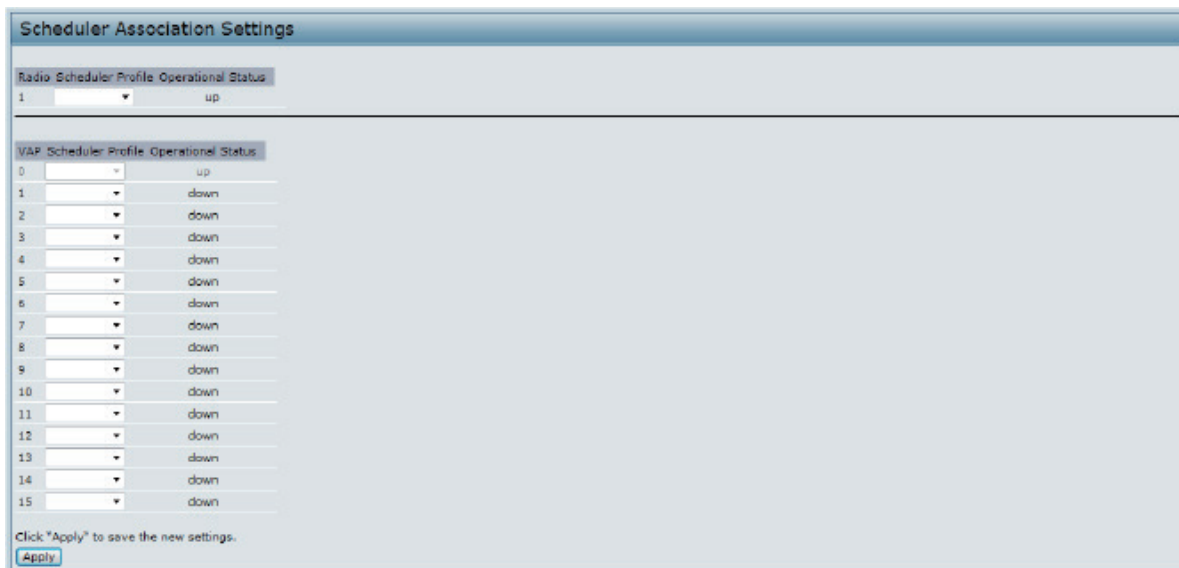
The screenshot shows the 'Scheduler Association Settings' window. It has two main sections: 'Radio Scheduler Profile Operational Status' and 'VAP Scheduler Profile Operational Status'. The 'Radio' section shows a dropdown set to '1' and 'up'. The 'VAP' section shows a list of 16 VAPs (0-15) with their respective Scheduler Profile and Operational Status. All VAPs are currently set to 'down'. At the bottom, there is a note: 'Click "Apply" to save the new settings.' and an 'Apply' button.

Figure 21 - Scheduler Association Settings

Field	Description
Radio Scheduler Profile Operational Status	
1 or 2	From the menu, select the Scheduler profile to associate with Radio 1 or Radio 2.
Scheduler Profile	From the menu, select the Scheduler profile to associate with the Radio.
Status	The operational status of the Scheduler. The range is Up or Down .
VAP Scheduler Profile Operational Status	
Radio	From the menu, select Radio 1 or Radio 2 to associate the VAP Scheduler Profile.
0-15	From the menu, select the Scheduler profile to associate with the respective VAP.
Status	The operational status of the Scheduler. The range is Up or Down .

Table 21 - Scheduler Association Settings



Note: After you associate a Scheduler profile with a Radio interface or a VAP interface, you must click **Apply** to apply the changes and to save the settings.

Virtual Access Point Settings

To change VAP 0 or to enable and configure additional VAPs, select the **VAP** tab in the **Manage** section.

VAPs segment the wireless LAN into multiple broadcast domains that are the wireless equivalent of Ethernet VLANs. VAPs simulate multiple APs in one physical AP. Each radio supports up to 16 VAPs.

For each VAP, you can customize the security mode to control wireless client access. Each VAP can also have a unique SSID. Multiple SSIDs make a single AP look like two or more APs to other systems on the network. By configuring VAPs, you can maintain better control over broadcast and multicast traffic, which affects network performance.

You can configure each VAP to use a different VLAN, or you can configure multiple VAPs to use the same VLAN, whether the VLAN is on the same radio or on a different radio. VAP0, which is always enabled on both radios, is assigned to the default VLAN 1.

The AP adds VLAN ID tags to wireless client traffic based on the VLAN ID you configure on the VAP page or by using the RADIUS server assignment. If you use an external RADIUS server, you can configure multiple VLANs on each VAP. The external RADIUS server assigns wireless clients to the VLAN when the clients associate and authenticate.

You can configure up to four global IPv4 or IPv6 RADIUS servers. One of the servers always acts as a primary while the others act as backup servers. The network type (IPv4 or IPv6) and accounting mode are common across all configured RADIUS servers. You can configure each VAP to use the global RADIUS server settings, which is the default, or you can configure a per-VAP RADIUS server set. You can also configure separate RADIUS server settings for each VAP. For example, you can configure one VAP to use an IPv6 RADIUS server while other VAPs use the global IPv4 RADIUS server settings you configure.

If wireless clients use a security mode that does not communicate with the RADIUS server, or if the RADIUS server does not provide the VLAN information, you can assign a VLAN ID to each VAP. The AP assigns the VLAN to all wireless clients that connect to the AP through that VAP.



Note: Before you configure VLANs on the AP, be sure to verify that the switch and DHCP server the AP uses can support IEEE 802.1Q VLAN encapsulation.

To set up multiple VAPs, click **Manage > VAP**.

Figure 22 - Modify Virtual Access Point Settings

The following table describes the fields and configuration options on the **VAP** page.

Field	Description
RADIUS IP Address Type	Specify the IP version that the RADIUS server uses. You can toggle between the address types to configure IPv4 and IPv6 global RADIUS address settings, but the AP contacts only the RADIUS server or servers for the address type you select in this field.
RADIUS IP Address RADIUS IPv6 Address	Enter the IPv4 or IPv6 address for the primary global RADIUS server. By default, each VAP uses the global RADIUS settings that you define for the AP at the top of the VAP page. When the first wireless client tries to authenticate with the AP, the AP sends an authentication request to the primary server. If the primary server responds to the authentication request, the AP continues to use this RADIUS server as the primary server, and authentication requests are sent to the address you specify. If the IPv4 RADIUS IP Address Type option is selected in the previous field, enter the IP address of the RADIUS server that all VAPs use by default, for example 192.168.10.23. If the IPv6 RADIUS IP Address Type option is selected, enter the IPv6 address of the primary global RADIUS server, for example 2001:0db8:1234::abcd.
RADIUS IP or IPv6 Address 1–3	Enter up to three IPv4 or IPv6 addresses to use as the backup RADIUS servers. The field label is RADIUS IP Address when the IPv4 RADIUS IP Address Type option is selected and RADIUS IPv6 Address when the IPv6 RADIUS IP Address Type option is selected. If authentication fails with the primary server, each configured backup server is tried in sequence. The IPv4 or IPv6 address must be valid in order for the AP to attempt to contact the server.
RADIUS Key	Enter the RADIUS key in the text box. The <i>RADIUS Key</i> is the shared secret key for the global RADIUS server. You can use up to 63 standard alphanumeric and special characters. The key is case sensitive, and you must configure the same key on the AP and on your RADIUS server. The text you enter will be displayed as “*” characters to prevent others from seeing the RADIUS key as you type.
RADIUS Key 1–3	Enter the RADIUS key associated with the configured backup RADIUS servers. The server at RADIUS IP Address-1 uses RADIUS Key-1, RADIUS IP Address-2 uses RADIUS Key-2, and so on.
Enable RADIUS Accounting	Select this option to track and measure the resources a particular user has consumed such as system time, amount of data transmitted and received, and so on. If you enable RADIUS accounting, it is enabled for the primary RADIUS server and all backup servers.
Enable RADIUS FailThrough	Select this option to allow the secondary RADIUS server to authenticate wireless clients if the authentication with the primary RADIUS server is unsuccessful, or if the primary RADIUS server is unavailable.

Field	Description
Radio	Select the radio to configure. VAPs are configured independently on each radio.
VAP	You can configure up to 16 VAPs for each radio. VAP0 is the physical radio interface, so to disable VAP0, you must disable the radio.
Enabled	<p>You can enable or disable a configured network.</p> <ul style="list-style-type: none"> • To enable the specified network, select the Enabled option beside the appropriate VAP. • To disable the specified network, clear the Enabled option beside the appropriate VAP. <p>If you disable the specified network, you will lose the VLAN ID you entered.</p>
VLAN ID	<p>When a wireless client connects to the AP by using this VAP, the AP tags all traffic from the wireless client with the VLAN ID you enter in this field unless you enter the untagged VLAN ID or use a RADIUS server to assign a wireless client to a VLAN. The range for the VLAN ID is 1 – 4094.</p> <p>If you use RADIUS-based authentication for clients, you can optionally add the following attributes to the appropriate file in the RADIUS or AAA server to configure a VLAN for the client:</p> <ul style="list-style-type: none"> • "Tunnel-Type" • "Tunnel-Medium-Type" • "Tunnel-Private-Group-ID" <p>The RADIUS-assigned VLAN ID overrides the VLAN ID you configure on the VAP page. You configure the untagged and management VLAN IDs on the Ethernet Settings page. For more information, see "Ethernet Settings" on page 35.</p>
SSID	<p>Enter a name for the wireless network. The SSID is an alphanumeric string of up to 32 characters. You can use the same SSID for multiple VAPs, or you can choose a unique SSID for each VAP.</p> <p>Note: If you are connected as a wireless client to the same AP that you are administering, resetting the SSID will cause you to lose connectivity to the AP. You will need to reconnect to the new SSID after you save this new setting.</p>
Broadcast SSID	<p>Specify whether to allow the AP to broadcast the Service Set Identifier (SSID) in its beacon frames. The Broadcast SSID parameter is enabled by default. When the VAP does not broadcast its SSID, the network name is not displayed in the list of available networks on a client station. Instead, the client must have the exact network name configured in the supplicant before it is able to connect.</p> <ul style="list-style-type: none"> • To enable the SSID broadcast, select the Broadcast SSID check box. • To prohibit the SSID broadcast, clear the Broadcast SSID check box. <p>Note: Disabling the broadcast SSID is sufficient to prevent clients from accidentally connecting to your network, but it will not prevent even the simplest of attempts by a hacker to connect or monitor unencrypted traffic. Suppressing the SSID broadcast offers a very minimal level of protection on an otherwise exposed network (such as a guest network) where the priority is making it easy for clients to get a connection and where no sensitive information is available.</p>
Security	<p>Select one of the following Security modes for this VAP:</p> <ul style="list-style-type: none"> • None • Static WEP • WPA Personal • IEEE 802.1X • WPA Enterprise <p>If you select a security mode other than None, additional fields appear. These fields are explained below.</p> <p>Note: The Security mode you set here is specifically for this VAP.</p>
MAC Authentication Type	<p>You can configure a global list of MAC addresses that are allowed or denied access to the network. The drop-down menu for this feature allows you to select the type of MAC Authentication to use:</p> <ul style="list-style-type: none"> • Disabled: Do not use MAC Authentication. • Local: Use the MAC Authentication list that you configure on the MAC Authentication page. • RADIUS: Use the MAC Authentication list on the external RADIUS server. <p>For more information about MAC Authentication, see "Controlling Access by MAC Authentication" on page 58.</p>

Table 22 - Virtual Access Point Settings



Note: After you configure the VAP settings, you must click **Apply** to apply the changes and to save the settings. Changing some settings might cause the AP to stop and restart system processes. If this happens, wireless clients will temporarily lose connectivity. We recommend that you change AP settings when WLAN traffic is low.

None (Plain-text)

If you select **None** as your security mode, no further options are configurable on the AP. This mode means that any data transferred to and from the UAP is not encrypted. This security mode can be useful during initial network configuration or for problem solving, but it is not recommended for regular use on the Internal network because it is not secure.

Static WEP

Wired Equivalent Privacy (WEP) is a data encryption protocol for 802.11 wireless networks. All wireless stations and APs on the network are configured with a static 64-bit (40-bit secret key + 24-bit initialization vector (IV)) or 128-bit (104-bit secret key + 24-bit IV) Shared Key for data encryption.

Static WEP is not the most secure mode available, but it offers more protection than setting the security mode to None (Plain-text) as it does prevent an outsider from easily sniffing out unencrypted wireless traffic.

WEP encrypts data moving across the wireless network based on a static key. (The encryption algorithm is a stream cipher called RC4.)

Figure 23 - Modify Virtual Access Point Settings (Static WEP)

Field	Description
Transfer Key Index	Select a key index from the drop-down menu. Key indexes 1 through 4 are available. The default is 1. The Transfer Key Index indicates which WEP key the AP will use to encrypt the data it transmits.
Key Length	Specify the length of the key by clicking one of the radio buttons: <ul style="list-style-type: none"> • 64 bits • 128 bits
Key Type	Select the key type by clicking one of the radio buttons: <ul style="list-style-type: none"> • ASCII • Hex

Field	Description
WEP Keys	<p>You can specify up to four WEP keys. In each text box, enter a string of characters for each key. The keys you enter depend on the key type selected:</p> <ul style="list-style-type: none"> •) ASCII — Includes upper and lower case alphabetic letters, the numeric digits, and special symbols such as @ and #. •) Hex — Includes digits 0 to 9 and the letters A to F. <p>Use the same number of characters for each key as specified in the Characters Required field. These are the RC4 WEP keys shared with the stations using the AP.</p> <p>Each client station must be configured to use one of these same WEP keys in the same slot as specified here on the AP.</p> <p>Characters Required: The number of characters you enter into the WEP Key fields is determined by the Key length and Key type you select. For example, if you use 128-bit ASCII keys, you must enter 26 characters in the WEP key. The number of characters required updates automatically based on how you set Key Length and Key Type.</p>
Authentication	<p>The authentication algorithm defines the method used to determine whether a client station is allowed to associate with an AP when static WEP is the security mode.</p> <p>Specify the authentication algorithm you want to use by choosing one of the following options:</p> <ul style="list-style-type: none"> •) Open System authentication allows any client station to associate with the AP whether that client station has the correct WEP key or not. This algorithm is also used in plaintext, IEEE 802.1X, and WPA modes. When the authentication algorithm is set to Open System, any client can associate with the AP. <p>Note: Just because a client station is allowed to associate does not ensure it can exchange traffic with an AP. A station must have the correct WEP key to be able to successfully access and decrypt data from an AP, and to transmit readable data to the AP.</p> <ul style="list-style-type: none"> •) Shared Key authentication requires the client station to have the correct WEP key in order to associate with the AP. When the authentication algorithm is set to Shared Key, a station with an incorrect WEP key will not be able to associate with the AP. •) Both Open System and Shared Key. When you select both authentication algorithms: <ul style="list-style-type: none"> •) Client stations configured to use WEP in shared key mode must have a valid WEP key in order to associate with the AP. •) Client stations configured to use WEP as an open system (shared key mode not enabled) will be able to associate with the AP even if they do not have the correct WEP key.

Table 23 - Static WEP

Static WEP Rules

If you use Static WEP, the following rules apply:

-) All client stations must have the Wireless LAN (WLAN) security set to WEP, and all clients must have one of the WEP keys specified on the AP in order to de-code AP-to-station data transmissions.
-) The AP must have all keys used by clients for station-to-AP transmit so that it can de-code the station transmissions.
-) The same key must occupy the same slot on all nodes (AP and clients). For example if the AP defines abc123 key as WEP key 3, then the client stations must define that same string as WEP key 3.
-) Client stations can use different keys to transmit data to the access point. (Or they can all use the same key, but this is less secure because it means one station can decrypt the data being sent by another.)
-) On some wireless client software, you can configure multiple WEP keys and define a client station "transfer key index", and then set the stations to encrypt the data they transmit using different keys. This ensures that neighboring APs cannot decode each other's transmissions.
-) You cannot mix 64-bit and 128-bit WEP keys between the access point and its client stations.

IEEE 802.1X

IEEE 802.1X is the standard defining port-based authentication and infrastructure for doing key management. Extensible Authentication Protocol (EAP) messages sent over an IEEE 802.11 wireless network using a protocol called EAP Encapsulation Over LANs (EAPOL). IEEE 802.1X provides dynamically-generated keys that are periodically refreshed. An RC4 stream cipher is used to encrypt the frame body and cyclic redundancy checking (CRC) of each 802.11 frame.

This mode requires the use of an external RADIUS server to authenticate users. The AP requires a RADIUS server capable of EAP, such as the Microsoft Internet Authentication Server. To work with Windows clients, the authentication server must support Protected EAP (PEAP) and MSCHAP V2.

You can use any of a variety of authentication methods that the IEEE 802.1X mode supports, including certificates, Kerberos, and public key authentication. You must configure the client stations to use the same authentication method the AP uses.

Figure 24 - Modify Virtual Access Point Settings (IEEE802.1X)

Field	Description
Use Global RADIUS Server Settings	By default each VAP uses the global RADIUS settings that you define for the AP at the top of the VAP page. However, you can configure each VAP to use a different set of RADIUS servers. To use the global RADIUS server settings, make sure the check box is selected. To use a separate RADIUS server for the VAP, clear the check box and enter the RADIUS server IP address and key in the following fields.
RADIUS IP Address Type	Specify the IP version that the RADIUS server uses. You can toggle between the address types to configure IPv4 and IPv6 global RADIUS address settings, but the AP contacts only the RADIUS server or servers for the address type you select in this field.
RADIUS IP Address RADIUS IPv6 Address	Enter the IPv4 or IPv6 address for the primary RADIUS server for this VAP. If the IPv4 RADIUS IP Address Type option is selected in the previous field, enter the IP address of the RADIUS server that all VAPs use by default, for example 192.168.10.23. If the IPv6 RADIUS IP Address Type option is selected, enter the IPv6 address of the primary global RADIUS server, for example 2001:0db8:1234::abcd.
RADIUS IP or IPv6 Address 1–3	Enter up to three IPv4 and/or IPv6 addresses to use as the backup RADIUS servers for this VAP. The field label is RADIUS IP Address when the IPv4 RADIUS IP Address Type option is selected and RADIUS IPv6 Address when the IPv6 RADIUS IP Address Type option is selected. If authentication fails with the primary server, each configured backup server is tried in sequence.
RADIUS Key	Enter the RADIUS key in the text box. The <i>RADIUS Key</i> is the shared secret key for the global RADIUS server. You can use up to 63 standard alphanumeric and special characters. The key is case sensitive, and you must configure the same key on the AP and on your RADIUS server. The text you enter will be displayed as “*” characters to prevent others from seeing the RADIUS key as you type.
RADIUS Key 1 – 3	Enter the RADIUS key associated with the configured backup RADIUS servers. The server at RADIUS IP Address-1 uses RADIUS Key-1, RADIUS IP Address-2 uses RADIUS Key-2, and so on.
Enable RADIUS Accounting	Select this option to track and measure the resources a particular user has consumed such as system time, amount of data transmitted and received, and so on. If you enable RADIUS accounting, it is enabled for the primary RADIUS server and all backup servers.

Field	Description
Enable RADIUS FailThrough	Select this option to allow the secondary RADIUS server to authenticate wireless clients if the authentication with the primary RADIUS server is unsuccessful, or if the primary RADIUS server is unavailable.
Active Server	Specify which configured RADIUS server to use as the active RADIUS server.
Broadcast Key Refresh Rate	Enter a value to set the interval at which the broadcast (group) key is refreshed for clients associated to this VAP (the default is 300). The valid range is 0 – 86400 seconds. A value of 0 indicates that the broadcast key is not refreshed.
Session Key Refresh Rate	Enter a value to set the interval at which the AP will refresh session (unicast) keys for each client associated to the VAP. The valid range is 0 – 86400 seconds. A value of 0 indicates that the broadcast key is not refreshed.

Table 24 - IEEE 802.1X



Note: After you configure the security settings, you must click **Apply** to apply the changes and to save the settings.

WPA Personal

WPA Personal is a Wi-Fi Alliance IEEE 802.11i standard, which includes AES-CCMP and TKIP mechanisms. The Personal version of WPA employs a pre-shared key (instead of using IEEE 802.1X and EAP as is used in the Enterprise WPA security mode). The PSK is used for an initial check of credentials only.

This security mode is backwards-compatible for wireless clients that support the original WPA.

Figure 25 - Modify Virtual Access Point Settings (WPA Personal)

Field	Description
WPA Versions	Select the types of client stations you want to support: <ul style="list-style-type: none"> • WPA. If all client stations on the network support the original WPA but none support the newer WPA2, then select WPA. • WPA2. If all client stations on the network support WPA2, we suggest using WPA2 which provides the best security per the IEEE 802.11i standard. • WPA and WPA2. If you have a mix of clients, some of which support WPA2 and others which support only the original WPA, select both of the check boxes. This lets both WPA and WPA2 client stations associate and authenticate, but uses the more robust WPA2 for clients who support it. This WPA configuration allows more interoperability, at the expense of some security.
Cipher Suites	Select the cipher suite you want to use: <ul style="list-style-type: none"> • TKIP • CCMP (AES) • TKIP and CCMP (AES) Both TKIP and AES clients can associate with the AP. WPA clients must have one of the following to be able to associate with the AP: <ul style="list-style-type: none"> • A valid TKIP key • A valid AES-CCMP key Clients not configured to use a WPA Personal will not be able to associate with the AP.
Key	The Pre-shared Key is the shared secret key for WPA Personal. Enter a string of at least 8 characters to a maximum of 63 characters. Acceptable characters include upper and lower case alphabetic letters, the numeric digits, and special symbols such as @ and #.

Field	Description
Broadcast Key Refresh Rate	Enter a value to set the interval at which the broadcast (group) key is refreshed for clients associated to this VAP (the default is 300). The valid range is 0–86400 seconds. A value of 0 indicates that the broadcast key is not refreshed.

Table 25 - WPA Personal



Note: After you configure the security settings, you must click **Apply** to apply the changes and to save the settings.

WPA Enterprise

WPA Enterprise with RADIUS is an implementation of the Wi-Fi Alliance IEEE 802.11i standard, which includes CCMP (AES), and TKIP mechanisms. The Enterprise mode requires the use of a RADIUS server to authenticate users.

This security mode is backwards-compatible with wireless clients that support the original WPA.

Figure 26 - Modify Virtual Access Point Settings (WPA Enterprise)

Field	Description
WPA Versions	Select the types of client stations you want to support: <ul style="list-style-type: none"> • WPA. If all client stations on the network support the original WPA but none support the newer WPA2, then select WPA. • WPA2. If all client stations on the network support WPA2, we suggest using WPA2 which provides the best security per the IEEE 802.11i standard. • WPA and WPA2. If you have a mix of clients, some of which support WPA2 and others which support only the original WPA, select both WPA and WPA2. This lets both WPA and WPA2 client stations associate and authenticate, but uses the more robust WPA2 for clients who support it. This WPA configuration allows more interoperability, at the expense of some security.
Enable pre-authentication	If for WPA Versions you select only WPA2 or both WPA and WPA2, you can enable pre-authentication for WPA2 clients. Click Enable pre-authentication if you want WPA2 wireless clients to send pre-authentication packet. The pre-authentication information will be relayed from the AP the client is currently using to the target AP. Enabling this feature can help speed up authentication for roaming clients who connect to multiple APs. This option does not apply if you selected WPA for WPA Versions because the original WPA does not support this feature.

Field	Description
Cipher Suites	<p>Select the cipher suite you want to use:</p> <ul style="list-style-type: none"> •) TKIP •) CCMP (AES) •) TKIP and CCMP (AES) <p>By default both TKIP and CCMP are selected. When both TKIP and CCMP are selected, client stations configured to use WPA with RADIUS must have one of the following:</p> <ul style="list-style-type: none"> •) A valid TKIP RADIUS IP address and RADIUS Key •) A valid CCMP (AES) IP address and RADIUS Key
Use Global RADIUS Server Settings	<p>By default each VAP uses the global RADIUS settings that you define for the AP at the top of the VAP page. However, you can configure each VAP to use a different set of RADIUS servers.</p> <p>To use the global RADIUS server settings, make sure the check box is selected.</p> <p>To use a separate RADIUS server for the VAP, clear the check box and enter the RADIUS server IP address and key in the following fields.</p>
RADIUS IP Address Type	<p>Specify the IP version that the RADIUS server uses.</p> <p>You can toggle between the address types to configure IPv4 and IPv6 global RADIUS address settings, but the AP contacts only the RADIUS server or servers for the address type you select in this field.</p>
RADIUS IP Address RADIUS IPv6 Address	<p>Enter the IPv4 or IPv6 address for the primary RADIUS server for this VAP.</p> <p>If the IPv4 RADIUS IP Address Type option is selected in the previous field, enter the IP address of the RADIUS server that all VAPs use by default, for example 192.168.10.23.</p> <p>If the IPv6 RADIUS IP Address Type option is selected, enter the IPv6 address of the primary global RADIUS server, for example 2001:0db8:1234::abcd.</p>
RADIUS IP or IPv6 Address 1–3	<p>Enter up to three IPv4 and/or IPv6 addresses to use as the backup RADIUS servers for this VAP. The field label is RADIUS IP Address when the IPv4 RADIUS IP Address Type option is selected and RADIUS IPv6 Address when the IPv6 RADIUS IP Address Type option is selected.</p> <p>If authentication fails with the primary server, each configured backup server is tried in sequence.</p>
RADIUS Key	<p>Enter the RADIUS key in the text box.</p> <p>The <i>RADIUS Key</i> is the shared secret key for the global RADIUS server. You can use up to 63 standard alphanumeric and special characters. The key is case sensitive, and you must configure the same key on the AP and on your RADIUS server. The text you enter will be displayed as “*” characters to prevent others from seeing the RADIUS key as you type.</p>
RADIUS Key 1–3	<p>Enter the RADIUS key associated with the configured backup RADIUS servers. The server at RADIUS IP Address-1 uses RADIUS Key-1, RADIUS IP Address-2 uses RADIUS Key-2, and so on.</p>
Enable RADIUS Accounting	<p>Select this option to track and measure the resources a particular user has consumed such as system time, amount of data transmitted and received, and so on.</p> <p>If you enable RADIUS accounting, it is enabled for the primary RADIUS server and all backup servers.</p>
Enable RADIUS FailThrough	<p>Select this option to allow the secondary RADIUS server to authenticate wireless clients if the authentication with the primary RADIUS server is unsuccessful, or if the primary RADIUS server is unavailable.</p>
Active Server	<p>Specify which configured RADIUS server to use as the active RADIUS server.</p>
Broadcast Key Refresh Rate	<p>Enter a value to set the interval at which the broadcast (group) key is refreshed for clients associated to this VAP (the default is 300).</p> <p>The valid range is 0–86400 seconds. A value of 0 indicates that the broadcast key is not refreshed.</p>
Session Key Refresh Rate	<p>Enter a value to set the interval at which the AP will refresh session (unicast) keys for each client associated to the VAP.</p> <p>The valid range is 0–86400 seconds. A value of 0 indicates that the broadcast key is not refreshed.</p>

Table 26 - WPA Enterprise



Note: After you configure the security settings, you must click **Apply** to apply the changes and to save the settings.

Configuring the Wireless Distribution System (WDS)

The Wireless Distribution System (WDS) allows you to connect multiple UAPs. With WDS, APs communicate with one another without wires in a standardized way. This capability is critical in providing a seamless experience for roaming clients and for managing multiple wireless networks. It can also simplify the network infrastructure by reducing the amount of cabling required. You can configure the AP in point-to-point or point-to-multipoint bridge mode based on the number of links to connect.

In the point-to-point mode, the AP accepts client associations and communicates with wireless clients and other repeaters. The AP forwards all traffic meant for the other network over the tunnel that is established between the APs. The bridge does not add to the hop count. It functions as a simple OSI layer 2 network device.

In the point-to-multipoint bridge mode, one AP acts as the common link between multiple APs. In this mode, the central AP accepts client associations and communicates with the clients and other repeaters. All other APs associate only with the central AP that forwards the packets to the appropriate wireless bridge for routing purposes.

The UAP can also act as a repeater. In this mode, the AP serves as a connection between two APs that might be too far apart to be within cell range. When acting as a repeater, the AP does not have a wired connection to the LAN and repeats signals by using the wireless connection. No special configuration is required for the AP to function as a repeater, and there are no repeater mode settings. Wireless clients can still connect to an AP that is operating as a repeater.



Note: When you move an AP from Standalone Mode to Managed Mode, WDS is disabled. In Managed Mode, you configure the AP by using the D-Link Unified Wireless Switch. The Administrator UI, as well as Telnet, SSH, and SNMP access are disabled when the AP is in Managed Mode.

To specify the details of traffic exchange from this access point to others, click the **WDS** tab.

Figure 27 - Configure WDS Bridges

Before you configure WDS on the AP, note the following guidelines:

- When using WDS, be sure to configure WDS settings on *both* APs participating in the WDS link.
- You can have only one WDS link between any pair of APs. That is, a remote MAC address may appear only once on the WDS page for a particular AP.


-) Both APs participating in a WDS link must be on the same Radio channel and using the same IEEE 802.11 mode. (See [“Modifying Radio Settings” on page 40](#) for information on configuring the Radio mode and channel.)
-) When 802.11h is operational, setting up two WDS links can be difficult.

To configure WDS on this AP, describe each AP intended to receive handoffs and send information to this AP. For each destination AP, configure the fields listed in the table below.

Field	Description
Spanning Tree Mode	Spanning Tree Protocol (STP) prevents switching loops. STP is recommended if you configure WDS links. Select Enabled to use STP Select Disabled to turn off STP links (not recommended)
Radio	For each WDS link on a two-radio AP, select Radio One or Radio Two. The rest of the settings for the link apply to the radio selected in this field. The read-only Local Address will change depending on which Radio you select in this field.
Local Address	Indicates the MAC addresses for this AP. For each WDS link on a two-radio AP, the Local Address reflects the MAC address for the internal interface on the selected radio (Radio One on wlan0 or Radio Two on wlan1).
Remote Address	Specify the MAC address of the destination AP; that is, the AP on the other end of the WDS link to which data will be sent or handed-off and from which data will be received. Click the drop-down arrow to the right of the Remote Address field to see a list of all the available MAC Addresses and their associated SSIDs on the network. Select the appropriate MAC address from the list. Note: The SSID displayed in the drop-down list is simply to help you identify the correct MAC Address for the destination AP. This SSID is a separate SSID to that which you set for the WDS link. The two do not (and should not) be the same value or name.
Encryption	You can use no encryption , WEP , or WPA (PSK) on the WDS link. If you are unconcerned about security issues on the WDS link you may decide not to set any type of encryption. Alternatively, if you have security concerns you can choose between Static WEP and WPA (PSK). In WPA (PSK) mode, the AP uses WPA2-PSK with CCMP (AES) encryption over the WDS link.

Table 27 - WDS Settings

If you select **None** as your preferred WDS encryption option, you will not be asked to fill in any more fields on the **WDS** page. All data transferred between the two APs on the WDS link will be unencrypted.

	Note: To disable a WDS link, you must remove the value configured in the Remote Address field.
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WEP on WDS Links

The following table describes the additional fields that appear when you select WEP as the encryption type.

Field	Description
Encryption	WEP
WEP	Select this option if you want to set WEP encryption on the WDS link.
Key Length	If WEP is enabled, specify the length of the WEP key: <ul style="list-style-type: none"> •) 64 bits •) 128 bits
Key Type	If WEP is enabled, specify the WEP key type: <ul style="list-style-type: none"> •) ASCII •) Hex

Field	Description
Characters Required	Indicates the number of characters required in the WEP key. The number of characters required updates automatically based on how you set Key Length and Key Type.
WEP Key	Enter a string of characters. If you selected ASCII, enter any combination of 0 – 9, a – z, and A – Z. If you selected HEX, enter hexadecimal digits (any combination of 0 – 9 and a – f or A – F). These are the RC4 encryption keys shared with the stations using the AP.

Table 28 - WEP on WDS Links

WPA/PSK on WDS Links

The following table describes the additional fields that appear when you select WPA/PSK as the encryption type.

Field	Description
Encryption	WPA (PSK)
SSID	Enter an appropriate name for the new WDS link you have created. This SSID should be different from the other SSIDs used by this AP. However, it is important that the same SSID is also entered at the other end of the WDS link. If this SSID is not the same for both APs on the WDS link, they will not be able to communicate and exchange data. The SSID can be any alphanumeric combination.
Key	Enter a unique shared key for the WDS bridge. This unique shared key must also be entered for the AP at the other end of the WDS link. If this key is not the same for both APs, they will not be able to communicate and exchange data. The WPA-PSK key is a string of at least 8 characters to a maximum of 63 characters. Acceptable characters include upper and lower case alphabetic letters, the numeric digits, and special symbols such as @ and #.

Table 29 - WPA/PSK on WDS Links



Note: After you configure the WDS settings, you must click **Apply** to apply the changes and to save the settings. Changing some settings might cause the AP to stop and restart system processes. If this happens, wireless clients will temporarily lose connectivity. We recommend that you change AP settings when WLAN traffic is low.

Controlling Access by MAC Authentication

A Media Access Control (MAC) address is a hardware address that uniquely identifies each node of a network. All IEEE 802 network devices share a common 48-bit MAC address format, usually displayed as a string of 12 hexadecimal digits separated by colons, for example 00:DC:BA:09:87:65. Each wireless network interface card (NIC) used by a wireless client has a unique MAC address.

You can use the Administrator UI on the AP or use an external RADIUS server to control access to the network through the AP based on the MAC address of the wireless client. This feature is called MAC Authentication or MAC Filtering. To control access, you configure a global list of MAC addresses locally on the AP or on an external RADIUS server. Then, you set a filter to specify whether the clients with those MAC addresses are allowed or denied access to the network. When a wireless client attempts to associate with an AP, the AP looks up the MAC address of the client in the local Stations List or on the RADIUS server. If it is found, the global allow or deny setting is applied. If it is not found, the opposite is applied.

On the **VAP** page, the MAC Authentication Type setting controls whether the AP uses the station list configured locally on the **MAC Authentication** page or the external RADIUS server. The Allow/Block filter setting on the **MAC Authentication** page determines whether the clients in the station list (local or RADIUS) can access the network through the AP. For more information about setting the MAC authentication type, see [“Virtual Access Point Settings” on page 47](#).

Configuring a MAC Filter and Station List on the AP

The **MAC Authentication** page allows you to control access to UAP based on MAC addresses. Based on how you set the filter, you can *allow* only client stations with a listed MAC address or *deny* access to the stations listed.

When you enable MAC Authentication and specify a list of approved MAC addresses, only clients with a listed MAC address can access the network. If you specify MAC addresses to deny, all clients can access the network except for the clients on the deny list.

To enable filtering by MAC address, click the **MAC Authentication** tab.

Figure 28 - Configure MAC Authentication



Note: Global MAC Authentication settings apply to all VAPs on all supported radios.

The following table describes the fields and configuration options available on the MAC Authentication page.

Field	Description
Filter	<p>To set the MAC Address Filter, select one of the following options:</p> <ul style="list-style-type: none"> • Allow only stations in the list. Any station that is not in the Stations List is denied access to the network through the AP. • Block all stations in list. Only the stations that appear in the list are denied access to the network through the AP. All other stations are permitted access. <p>Note: The filter you select is applied to the clients in the station list, regardless of whether that station list is local or on the RADIUS server.</p>
Stations List	<p>This is the local list of clients that are either permitted or denied access to the network through the AP. To add a MAC Address to the local Stations List, enter its 48-bit MAC address into the lower text boxes, then click Add.</p> <p>To remove a MAC Address from the Stations List, select its 48-bit MAC address, then click Remove.</p> <p>The stations in the list will either be allowed or denied access based on how you set the filter in the previous field.</p> <p>Note: If the MAC authentication type for the VAP is set to Local, the AP uses the Stations List to permit or deny the clients access to the network. If the MAC authentication type is set to RADIUS, the AP ignores the MAC addresses configured in this list and uses the list that is stored on the RADIUS server. The MAC authentication type is set on the VAP configuration page.</p>

Table 30 - MAC Authentication



Note: After you configure local MAC Authentication settings, you must click **Apply** to apply the changes and to save the settings. Changing some settings might cause the AP to stop and restart system processes. If this happens, wireless clients will temporarily lose connectivity. We recommend that you change AP settings when WLAN traffic is low.

Configuring MAC Authentication on the RADIUS Server

If you use RADIUS MAC authentication for MAC-based access control, you must configure a station list on the RADIUS server. The station list contains client MAC address entries, and the format for the list is described in the following table.

RADIUS Server Attribute	Description	Value
User-Name (1)	MAC address of the client station.	Valid Ethernet MAC Address.
User-Password (2)	A fixed global password used to lookup a client MAC entry.	NOPASSWORD

Table 31 - RADIUS Server Attributes for MAC Authentication

Configuring Load Balancing

You can set network utilization thresholds on the UAP to maintain the speed and performance of the wireless network as clients associate and disassociate with the AP. The load balancing settings apply to all supported radios.

To configure load balancing and set limits and behavior to be triggered by a specified utilization rate of the access point, click the **Load Balancing** tab and update the fields shown in the following figure.

Figure 29 - Modify Load Balancing Settings

Field	Description
Load Balancing	Enable or disable load balancing: To enable load balancing on this AP, click Enable . To disable load balancing on this AP, click Disable .
Utilization for No New Associations	Provide the percentage of network bandwidth utilization allowed on the radio before the AP stops accepting new client associations. The default is 0, which means that all new associations will be allowed regardless of the utilization rate.

Table 32 - Load Balancing



Note: After you configure the load balancing settings, you must click **Apply** to apply the changes and to save the settings. Changing some settings might cause the AP to stop and restart system processes. If this happens, wireless clients will temporarily lose connectivity. We recommend that you change AP settings when WLAN traffic is low.

Managed Access Point Overview

The UAP can operate in two modes: **Standalone Mode** or **Managed Mode**. In Standalone Mode, the UAP acts as an individual AP in the network, and you manage it by using the Administrator Web User Interface (UI), CLI, or SNMP. In Managed Mode, the UAP is part of the D-Link Unified Wired and Wireless System, and you manage it by using the D-Link Unified Wireless Switch. If an AP is in Managed Mode, the Administrator Web UI, Telnet, SSH, and SNMP services are disabled.

On the UAP, you can configure the IP addresses of up to four D-Link Unified Wireless Switches that can manage it. In order to manage the AP, the switch and AP must discover each other. There are multiple ways for a switch to discover an AP. Adding the IP address of the switch to the AP while it is in Standalone Mode is one way to enable switch-to-AP discovery.

Transitioning Between Modes

Every 30 seconds, the D-Link Unified Wireless Switch sends a keepalive message to all of the access points it manages. Each AP checks for the keepalive messages on the SSL TCP connection. As long as the AP maintains communication with the switch through the keepalive messages, it remains in Managed Mode.

If the AP does not receive a message within 45 seconds of the last keepalive message, the AP assumes the switch has failed and terminates its TCP connection to the switch, and the AP enters Standalone Mode.

Once the AP transitions to Standalone Mode, it continues to forward traffic without any loss. The AP uses the configuration on the VAPs configured in VLAN Forwarding mode (the standard, non-tunneled mode).

While the AP is in Standalone Mode, you can manage it by using the Web interface or the CLI (through Telnet or SSH).

For any clients that are connected to the AP through tunneled VAPs, the AP sends disassociate messages and disables the tunneled VAPs.

As long as the Managed AP Administrative Mode is set to Enabled, the AP starts discovery procedures. If the AP establishes a connection with a wireless switch, which may or may not be the same switch it was connected to before, the switch sends the AP its configuration and the AP sends the wireless switch information about all currently associated clients.

After the configuration from the switch is applied, the AP radio(s) restart. Client traffic is briefly interrupted until the radio(s) are up and the clients are re-associated.

Configuring Managed Access Point Settings

To add the IP address of a D-Link Unified Wireless Switch to the AP, click the **Managed Access Point** tab under the **Manage** heading and update the fields shown in the table below.

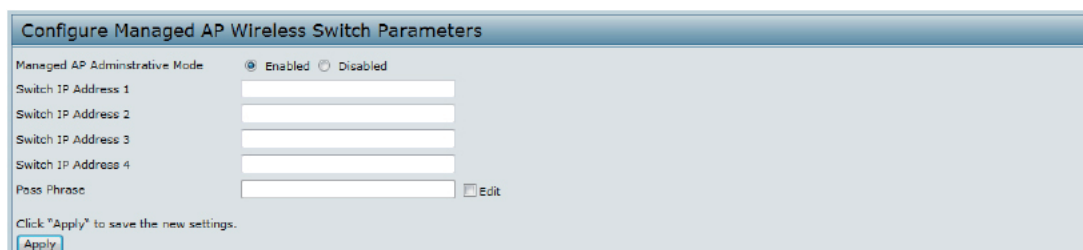


Figure 30 - Configure Managed AP Wireless Switch Parameters

Field	Description
Managed AP Administrative Mode	Click Enabled to allow the AP and switch to discover each other. If the AP successfully authenticates itself with a wireless switch, you will not be able to access the Administrator UI. Click Disabled to prevent the AP from contacting wireless switches.
Switch IP Address (1-4)	Enter the IP address of up to four wireless switches that can manage the AP. You can enter the IP address in dotted format or as a DNS name. You can view a list of wireless switches on your network that were configured by using a DHCP server. The AP attempts to contact Switch IP Address 1 first.

Field	Description
Base IP Port	The starting IP port number used by the wireless feature (in a range of 10 consecutive port numbers). Only the first number in the range is configurable. The default value is 57775 (through 57784). Note: When the wireless Base IP Port number is changed on the switch, the wireless feature is automatically disabled and re-enabled. The new value is not sent as part of the global switch configuration in the cluster configuration distribution command; every switch in the cluster must be configured independently with the new Wireless IP port number. Note: When the wireless Base IP Port number is changed from its default value on the switch, it must also be changed on the Access Points.
Pass Phrase	Select the Edit option and enter a passphrase to allow the AP to authenticate itself with the wireless switch. The passphrase must be between 8 and 63 characters. To remove the password, select Edit , delete the existing password, and then click Apply . You must configure the same passphrase on the switch.
WDS Managed Mode	Specify whether the AP will act as a Root AP or Satellite AP within the WDS group: <ul style="list-style-type: none"> • Root AP — Acts as a bridge or repeater on the wireless medium and communicates with the switch via the wired link. • Satellite AP — Communicates with the switch via a WDS link to the Root AP. This mode enables the Satellite AP to discover and establish WDS link with the Root AP.
WDS Managed Ethernet Port	Specify whether the Ethernet port is to be enabled or disabled when the AP becomes part of a WDS group.
WDS Group Password	Password for WPA2 Personal authentication used to establish the WDS links. Only the Satellite APs need this configuration. The Root APs get the password from the switch when they become managed.

Table 33 - Managed Access Point



Note: After you configure the settings on the Managed Access Point page, you must click **Apply** to apply the changes and to save the settings. Changing some settings might cause the AP to stop and restart system processes. If this happens, wireless clients will temporarily lose connectivity. We recommend that you change AP settings when WLAN traffic is low.

If the UAP successfully authenticates with a D-Link Unified Wireless Switch, you will lose access to the AP through the Administrator UI.

Configuring 802.1X Authentication

On networks that use IEEE 802.1X, port-based network access control, a supplicant (client) cannot gain access to the network until the 802.1X authenticator grants access. If your network uses 802.1X, you must configure 802.1X authentication information that the AP can supply to the authenticator.

To configure the UAP 802.1X supplicant user name and password by using the Web interface, click the **Authentication** tab and configure the fields shown in the table below.

Figure 31 - Modify 802.1X Supplicant Authentication Settings

Field	Description
802.1X Supplicant	Click Enabled to enable the Administrative status of the 802.1X Supplicant. Click Disabled to disable the Administrative status of the 802.1X Supplicant.
EAP Method	Select one of the following EAP methods to use for communication between the AP and the authenticator: <ul style="list-style-type: none"> • MD5 • PEAP • TLS
Username	Enter the user name for the AP to use when responding to requests from an 802.1X authenticator. The user name can be 1 to 64 characters in length. ASCII printable characters are allowed, which includes upper and lower case alphabetic letters, the numeric digits, and special symbols such as @ and #.
Password	Enter the password for the AP to use when responding to requests from an 802.1X authenticator. The password can be 1 to 64 characters in length. ASCII printable characters are allowed, which includes upper and lower case letters, numbers, and special symbols such as @ and #.
Certificate File Status	Indicates whether a certificate file is present and when that certificate expires.
Certificate File Upload	Upload a certificate file to the AP by using HTTP or TFTP: <ul style="list-style-type: none"> • HTTP — Browse to the location where the certificate file is stored and click Upload. • TFTP — Specify the IP address of the TFTP server where the certificate file is located and provide the file name, including the file path, then click Upload.

Table 34 - IEEE 802.1X Supplicant Authentication



Note: After you configure the settings on the Authentication page, you must click **Apply** to apply the changes and to save the settings. Changing some settings might cause the AP to stop and restart system processes. If this happens, wireless clients will temporarily lose connectivity. We recommend that you change AP settings when WLAN traffic is low.

Creating a Management Access Control List (ACL)

You can create an access control list (ACL) that lists up to five IPv4 hosts and five IPv6 hosts that are authorized to access the AP management interface. If this feature is disabled, anyone can access the management interface from any network client by supplying the correct AP username and password.

To create an access list, click the **Management ACL** tab.

Figure 32 - Configure Management Access Control Parameters

Field	Description
Management ACL Mode	Enable or disable the management ACL feature. At least one IPv4 address should be configured before enabling Management ACL Mode. If enabled, only the IP addresses you specify will have Web, Telnet, SSH, and SNMP access to the management interface.
IP Address (1–5)	Enter up to five IPv4 addresses that are allowed management access to the AP. Use dotted-decimal format (for example, 192.168.10.10).
IPv6 Address (1–5)	Enter up to five IPv6 addresses that are allowed management access to the AP. Use the standard IPv6 address format (for example 2001:0db8:1234::abcd).

Table 35 - Management ACL



Note: After you configure the settings, click **Apply** to apply the changes and to save the settings.

Section 5 - Configuring Access Point Services

This section describes how to configure services on the UAP and contains the following subsections:

-) "Web Server Settings" on page 65
-) "Configuring SNMP on the Access Point" on page 66
-) "Setting the SSH Status" on page 68
-) "Setting the Telnet Status" on page 69
-) "Configuring Quality of Service" on page 69
-) "Configuring Email Alert" on page 72
-) "Enabling the Time Settings (NTP)" on page 73

Web Server Settings

The AP can be managed through HTTP or secure HTTP (HTTPS) sessions. By default both HTTP and HTTPS access are enabled. Either access type can be disabled separately.

To configure Web server settings, click **Web Server** tab.

Figure 33 - Configure Web Server Settings

Field	Description
HTTPS Server Status	Enable or disable access through a Secure HTTP Server (HTTPS).
HTTP Server Status	Enable or disable access through HTTP. This setting is independent of the HTTPS server status setting.
HTTP Port	Specify the port number for HTTP traffic (default is 80).
Maximum Sessions	When a user logs on to the AP web interface, a session is created. This session is maintained until the user logs off or the session inactivity timer expires. Enter the number web sessions, including both HTTP and HTTPSs, that can exist at the same time. The range is 1–10 sessions. If the maximum number of sessions is reached, the next user who attempts to log on to the AP web interface receives an error message about the session limit.
Session Timeout	Enter the maximum amount of time, in minutes, an inactive user remains logged on to the AP web interface. When the configured timeout is reached, the user is automatically logged off the AP. The range is 1–1440 minutes (1440 minutes = 1 day).

Field	Description
Generate HTTP SSL Certificate	Select this option to generate a new SSL certificate for the secure Web server. This should be done once the access point has an IP address to ensure that the common name for the certificate matches the IP address of the UAP. Generating a new SSL certificate will restart the secure Web server. The secure connection will not work until the new certificate is accepted on the browser. Click the Update button to generate the new SSL certificate.
HTTP SSL Certificate File Status	Indicates whether a certificate file is present and specifies its expiration date and issuer common name.
To Get the Current HTTP SSL Certificate	Save a copy of the current HTTP SSL certificate on a local system or TFTP server. <ul style="list-style-type: none"> •) HTTP — Click Download and specify where to store the backup copy of the certificate file. •) TFTP — Provide a file name for the certificate file, including the file path, specify the IP address of the TFTP server where the certificate file copy is to be stored, and then click Download.
To upload a HTTP SSL Certificate from a PC or a TFTP Server	Upload a certificate file to the AP by using HTTP or TFTP: <ul style="list-style-type: none"> •) HTTP — Browse to the location where the certificate file is stored and click Upload. •) TFTP — Specify the IP address of the TFTP server where the certificate file is located and provide the file name, including the file path, then click Upload.

Table 36 - Web Server Settings



Note: Click **Apply** to apply the changes and to save the settings. If you disable the protocol you are currently using to access the AP management interface, the current connection will end and you will not be able to access the AP by using that protocol until it is enabled.

Configuring SNMP on the Access Point

Simple Network Management Protocol (SNMP) defines a standard for recording, storing, and sharing information about network devices. SNMP facilitates network management, troubleshooting, and maintenance. The AP supports SNMP versions 1, 2, and 3. Unless specifically noted, all configuration parameters on this page apply to SNMPv1 and SNMPv2c only.

Key components of any SNMP-managed network are managed devices, SNMP agents, and a management system. The agents store data about their devices in Management Information Bases (MIBs) and return this data to the SNMP manager when requested. Managed devices can be network nodes such as APs, routers, switches, bridges, hubs, servers, or printers.

The UAP can function as an SNMP managed device for seamless integration into network management systems such as HP OpenView.

From the **SNMP** page under the Services heading, you can start or stop control of SNMP agents, configure community passwords, access MIBs, and configure SNMP Trap destinations.

From the pages under the SNMPv3 heading, you can manage SNMPv3 users and their security levels and define access control to the SNMP MIBs. For information about how to configure SNMPv3 views, groups, users, and targets, see [“Section 6 - Configuring SNMPv3” on page 75](#).

To configure SNMP, click the **SNMP** tab under the **Services** heading and update the fields described in the table below.

The screenshot shows the 'SNMP Configuration' page. At the top, there's a title bar. Below it, the 'SNMP' status is set to 'Enabled'. The 'Read-only community name' is 'public'. The 'Port number the SNMP agent will listen to' is '161'. 'Allow SNMP set requests' is 'Enabled'. The 'Read-write community name' is 'private'. 'Restrict the source of SNMP requests to only the designated hosts or subnets' is 'Disabled'. There are input fields for 'Hostname, address, or subnet of Network Management System' and 'IPv6 hostname, address, or subnet of Network Management System'. Below these is the 'Trap Destinations' section, which includes a 'Community name for traps' field and a table with columns 'Enabled', 'Host Type', and 'Hostname or IP Address'. The table has three rows, all with 'IPv6' in the 'Host Type' column. At the bottom, there's a note to 'Click "Apply" to save the new settings.' and an 'Apply' button.

Figure 34 - SNMP Configuration

Field	Description
SNMP Enabled/Disabled	You can specify the SNMP administrative mode on your network. By default SNMP is enabled. To enable SNMP, click Enabled . To disable SNMP, click Disabled . After changing the mode, you must click Apply to save your configuration changes. Note: If SNMP is disabled, all remaining fields on the SNMP page are disabled. This is a global SNMP parameter which applies to SNMPv1, SNMPv2c, and SNMPv3.
Read-only community name (for permitted SNMP get operations)	Enter a read-only community name. The valid range is 1-256 characters. The community name, as defined in SNMPv2c, acts as a simple authentication mechanism to restrict the machines on the network that can request data to the SNMP agent. The name functions as a password, and the request is assumed to be authentic if the sender knows the password. The community name can be in any alphanumeric format.
Port number the SNMP agent will listen to	By default an SNMP agent only listens to requests from port 161 . However, you can configure this so the agent listens to requests on another port. Enter the port number on which you want the SNMP agents to listen to requests. The valid range is 1-65535. Note: This is a global SNMP parameter that applies to SNMPv1, SNMPv2c, and SNMPv3.
Allow SNMP set requests	You can choose whether or not to allow SNMP set requests on the AP. Enabling SNMP set requests means that machines on the network can execute configuration changes via the SNMP agent on the AP to the D-Link System MIB. To enable SNMP set requests, click Enabled . To disable SNMP set requests, click Disabled .
Read-write community name (for permitted SNMP set operations)	If you have enabled SNMP set requests you can set a read-write community name. The valid range is 1-256 characters. Setting a community name is similar to setting a password. Only requests from the machines that identify themselves with this community name will be accepted. The community name can be in any alphanumeric format.
Restrict the source of SNMP requests to only the designated hosts or subnets	You can restrict the source of permitted SNMP requests. To restrict the source of permitted SNMP requests, click Enabled . To permit any source submitting an SNMP request, click Disabled .

Field	Description
Hostname, address or subnet of Network Management System	<p>Specify the IPv4 DNS hostname or subnet of the machines that can execute get and set requests to the managed devices. The valid range is 1-256 characters.</p> <p>As with community names, this provides a level of security on SNMP settings. The SNMP agent will only accept requests from the hostname or subnet specified here.</p> <p>To specify a subnet, enter one or more subnetwork address ranges in the form <code>address/mask_length</code> where <i>address</i> is an IP address and <i>mask_length</i> is the number of mask bits. Both formats <code>address/mask</code> and <code>address/mask_length</code> are supported. Individual hosts can be provided for this, i.e. IP Address or Hostname. For example, if you enter a range of 192.168.1.0/24 this specifies a subnetwork with address 192.168.1.0 and a subnet mask of 255.255.255.0.</p> <p>The address range is used to specify the subnet of the designated NMS. Only machines with IP addresses in this range are permitted to execute get and set requests on the managed device. Given the example above, the machines with addresses from 192.168.1.1 through 192.168.1.254 can execute SNMP commands on the device. (The address identified by suffix .0 in a subnetwork range is always reserved for the subnet address, and the address identified by .255 in the range is always reserved for the broadcast address).</p> <p>As another example, if you enter a range of 10.10.1.128/25 machines with IP addresses from 10.10.1.129 through 10.10.1.254 can execute SNMP requests on managed devices. In this example, 10.10.1.128 is the network address and 10.10.1.255 is the broadcast address. 126 addresses would be designated.</p>
IPv6 Hostname or IPv6 subnet of Network Management System	Specify the IPv6 DNS hostname or subnet of the machines that can execute get and set requests to the managed devices.
Community name for traps	<p>Enter the global community string associated with SNMP traps. The valid range is 1-256 characters.</p> <p>Traps sent from the device will provide this string as a community name.</p> <p>The community name can be in any alphanumeric format. Special characters are not permitted.</p>
Hostname or IP address	<p>Enter the DNS hostname of the computer to which you want to send SNMP traps. The valid range is 1-256 characters.</p> <p>An example of a DNS hostname is: snmptraps.foo.com. Since SNMP traps are sent randomly from the SNMP agent, it makes sense to specify where exactly the traps should be sent. You can add up to a maximum of three DNS hostnames. Ensure you select the Enabled check box beside the appropriate hostname.</p>

Table 37 - SNMP Settings



Note: After you configure the SNMP settings, you must click **Apply** to apply the changes and to save the settings. Changing some settings might cause the AP to stop and restart system processes. If this happens, wireless clients will temporarily lose connectivity. We recommend that you change AP settings when WLAN traffic is low.

Setting the SSH Status

Secure Shell (SSH) is a program that provides access to the DWL-x600AP CLI from a remote host. SSH is more secure than Telnet for remote access because it provides strong authentication and secure communications over insecure channels. From the SSH page, you can enable or disable SSH access to the system.

Figure 35 - Set SSH Status

Field	Description
SSH Status	Choose to either enable or disable SSH access to the AP CLI: <ul style="list-style-type: none">• To permit remote access to the AP by using SSH, click Enabled.• To prevent remote access to the AP by using SSH, click Disabled.

Table 38 - SSH Settings

Setting the Telnet Status

Telnet is a program that provides access to the DWL-x600AP CLI from a remote host. From the Telnet page, you can enable or disable Telnet access to the system.

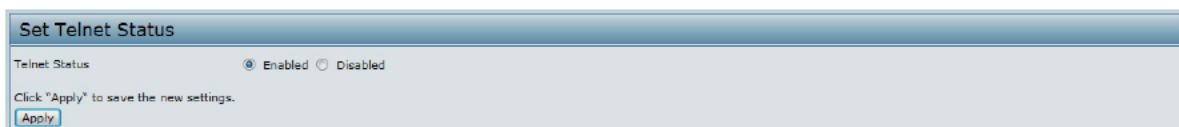


Figure 36 - Set Telnet Status

Field	Description
Telnet Status	Choose to either enable or disable Telnet access to the AP CLI: <ul style="list-style-type: none">• To permit remote access to the AP by using Telnet, click Enabled.• To prevent remote access to the AP by using Telnet, click Disabled.

Table 39 - Telnet Settings

Configuring Quality of Service

Quality of Service (QoS) provides you with the ability to specify parameters on multiple queues for increased throughput and better performance of differentiated wireless traffic like Voice-over-IP (VoIP), other types of audio, video, and streaming media, as well as traditional IP data over the UAP.

Configuring QoS on the UAP consists of setting parameters on existing queues for different types of wireless traffic, and effectively specifying minimum and maximum wait times (through Contention Windows) for transmission. The settings described here apply to data transmission behavior on the AP only, not to that of the client stations.

AP Enhanced Distributed Channel Access (EDCA) Parameters affect traffic flowing from the AP to the client station.

Station Enhanced Distributed Channel Access (EDCA) Parameters affect traffic flowing from the client station to the AP.

The default values for the AP and station EDCA parameters are those suggested by the Wi-Fi Alliance in the WMM specification. In normal use these values should not need to be changed. Changing these values will affect the QoS provided.



Note: On the DWL-6600AP and DWL-8600AP, the QoS settings apply to both radios, but the traffic for each radio is queued independently.

To set up queues for QoS, click the **QoS** tab under the **Services** heading and configure settings as described in the table below.

Figure 37 - Modify QoS Queue Parameters

Field	Description
EDCA Template	Possible options are: Default , Optimized for Voice , and Custom .
AP EDCA Parameters	
Queue	Queues are defined for different types of data transmitted from AP-to-station: <ul style="list-style-type: none"> • Data 0 (Voice) — High priority queue, minimum delay. Time-sensitive data such as VoIP and streaming media are automatically sent to this queue. • Data 1 (Video) — High priority queue, minimum delay. Time-sensitive video data is automatically sent to this queue. • Data 2 (Best Effort) — Medium priority queue, medium throughput and delay. Most traditional IP data is sent to this queue. • Data 3 (Background) — Lowest priority queue, high throughput. Bulk data that requires maximum throughput and is not time-sensitive is sent to this queue (FTP data, for example).
AIFS (Inter-Frame Space)	The Arbitration Inter-Frame Spacing (AIFS) specifies a wait time for data frames. The wait time is measured in slots. Valid values for AIFS are 1 through 255.
cwMin (Minimum Contention Window)	This parameter is input to the algorithm that determines the initial random back off wait time (window) for retry of a transmission. The value specified for Minimum Contention Window is the upper limit (in milliseconds) of a range from which the initial random back off wait time is determined. The first random number generated will be a number between 0 and the number specified here. If the first random back off wait time expires before the data frame is sent, a retry counter is incremented and the random back off value (window) is doubled. Doubling will continue until the size of the random back off value reaches the number defined in the Maximum Contention Window. Valid values for cwMin are 1, 3, 7, 15, 31, 63, 127, 255, 511, or 1024. The value for cwMin must be lower than the value for cwMax.
cwMax (Maximum Contention Window)	The value specified for the Maximum Contention Window is the upper limit (in milliseconds) for the doubling of the random back off value. This doubling continues until either the data frame is sent or the Maximum Contention Window size is reached. Once the Maximum Contention Window size is reached, retries will continue until a maximum number of retries allowed is reached. Valid values for cwMax are 1, 3, 7, 15, 31, 63, 127, 255, 511, or 1024. The value for cwMax must be higher than the value for cwMin.