DWC-1000 Wireless Controller

User's Guide

FastFind Links

CONTENTS

PREFACE

Thank you for purchasing the D-Link DWC-1000 Wireless Controller. The DWC-1000 Wireless Controller lets you configure, manage, monitor, and troubleshoot D-LINK access points in your wireless network (WLAN) from a central point.

The DWC-1000 is part of D-Link's Unified Wireless Solution. This Solution consists of:

- A D-Link DWC-1000 Wireless Controller
- A collection of D-Link DWL-2600AP, DWL-3600AP, DWL-6600AP, and/or DWL-8600AP access points

A single wireless controller can manage 24 DWL-2600AP, DWL-3600AP, DWL-6600AP, or DWL-8600AP access points. Six access points are supported out of the box. Licenses can be purchased in 6 access point increments to support 18 additional access points for a single wireless controller. For greater scalability, four wireless controllers can be interconnected to create a cluster that manages up to 96 access points. Adding redundant wireless controllers also requires you to purchase licenses to support the required number of access points on the redundant wireless controllers.

All access points associated with a wireless controller can be concurrently configured and managed by an HTTP full-featured web user interface or command-line interface (CLI). This guide describes how to use the web user interface. For information about using the CLI, refer to the *Wireless Controller CLI Reference Guide: DWC-1000*.

Before using this manual, familiarize yourself with the Table of Contents on page ii. Set up of a wireless controller should not be attempted without reading Chapter 2 and Chapter 3. All first-time users should read Chapter 1. Users who want to use the wireless controller's advanced features should read Chapter 4, Chapter 5, and Chapter 6. Users responsible for monitoring and maintaining the wireless controller should read Chapter 7 and Chapter 8. A glossary of terms appears in Appendix C and troubleshooting suggestions are in Chapter 9.

Audience

This guide is designed for the person who installs, configures, deploys, and maintains the wireless controller. This document assumes the reader has moderate hardware, computer, and Internet skills.

Document Revision Level

This section provides a history of the revision changes to this document.

Revision	Document Version	Date	Description
A	Version 2	9/27/2012	Initial release

Changes in this Revision

N/A - this is first version of this document.

Related Documents

In addition to this guide, you may find the following additional documents helpful:

- DWL-2600AP Access Point User Manual
- DWL-3600AP Access Point User Manual
- DWL-6600AP Access Point User Manual
- DWL-8600AP Access Point User Manual
- Wireless Controller CLI Reference Guide: DWC-1000

Document Conventions

This guide uses the following conventions to draw your attention to certain information.

Safety and Warnings

This guide uses the following symbols to draw your attention to certain information.

Symbol	Meaning	Description
	Note	Notes emphasize or supplement important points of the main text.
	Tip	Tips provide helpful information, guidelines, or suggestions for performing tasks more effectively.
	Warning	Warnings indicate that failure to take a specified action could result in damage to the device, or could result in serious bodily injury.
	Electric Shock Hazard	This symbol warns users of electric shock hazard. Failure to take appropriate precautions such as not opening or touching hazardous areas of the equipment could result in injury or death.

Typographic Conventions

This guide also uses the following typographic conventions.

Convention	Description
Bold	Indicates text on a window, other than the window title, including menus, menu options, buttons, fields, and labels.
Italic	Indicates a variable, which is a placeholder for actual text provided by the user or system. Angled brackets (< >) are also used to indicate variables.
`screen/code`	Indicates text that is displayed on screen or entered by the user.
< > angled brackets	Indicates a variable, which is a placeholder for actual text provided by the user or system. Italic font is also used to indicate variables.
[ ] square brackets	Indicates optional values.
{ } braces	Indicates required or expected values.
| vertical bar	Indicates that you have a choice between two or more options or arguments.

1. PRODUCT OVERVIEW

The DWC-1000 Wireless Controller is intended to provide small-to-medium-sized businesses with a mechanism for configuring, managing, and monitoring up to 24 D-LINK DWL-2600AP, DWL-3600AP, DWL-6600AP, and/or DWL-8600AP access points from a central location.

Using the wireless controller and the access points with which it is associated lets you:

- Discover and configure D-LINK access points on the WLAN
- Optimize wireless access point performance with centralized RF management, security, Quality of Service (QoS), and other configuration features
- Streamline security configuration tasks and set up guest access
- Monitor network status and statistics
- Perform maintenance tasks and firmware updates for the wireless management system and for D-Link access points on the WLAN
- Conduct troubleshooting procedures

Configuration is performed using configuration profiles. A configuration profile allows a wireless controller to distribute a set of radio, Service Set Identifier (SSID), and QoS parameters to the access points associated with that profile.

The wireless controller comes with one profile predefined. You can use this profile as is, edit it to suit your requirements, or create new configuration profiles as necessary. For example:

- An office building might have one configuration profile for access points located in one area of a facility (such as a general work area) and a different profile for access points in another area of the facility (for example, in the Human Resources department).
- A shopping mall might need several configuration profiles if several businesses share a WLAN, but each business has its own network.
- Large networks that need different policies per building or department could have access points configured for security policies for each building and department (for example, one for guests, one for management, one for sales, and so on).

Features and Benefits

The DWC-1000 Wireless Controller is intended for campuses, branch offices, and small-to-medium businesses. In a stacked configuration with the appropriate licenses, a wireless controller can support up to 96 access points. The wireless controller allows you to manage your wireless network from a central point, implement security and QoS features centrally, configure a guest access captive portal, and support Voice over Wi-Fi.

Scalable Architecture with Stacking and Redundancy

- Supports for 6 access points on a single wireless controller with no additional license.
- Purchased license packs (DWC-1000-AP6-LIC) in increments of 6 access points allow for support of up to 24 access points on a single wireless controller.
- Maximum of 4 wireless controllers allows for up to 96 access points in a single network.
- Supports auto-failover redundancy.
- Supports IEEE 802.11a, 802.11b, 802.11g, and 802.11n protocols.

Centralized Management and Configuration

- Auto-discovery of access points in L2 and L3 domains.
- Single point of management for the entire wireless network.
- Simplified profile-based configuration.
- DHCP server for dynamic IP address provisioning.
- Configurable management VLAN.
- Real-time monitoring of access points and associated client stations.
- System alarms and statistics reports on managed access points for managing, controlling, and optimizing network performance.

Security

- Identity-based security authentication with an external RADIUS server or an internal authentication server.
- Rogue access point detection, classification, and mitigation.
- Guest access and captive portal access.
- Purchased license pack (DWC-1000-VPN-LIC) enables VPN, router, and firewall functionality via two Gigabit Ethernet Option ports.

2. UNPACKING AND INSTALLATION

A DWC-1000 wireless controller system consists of one or more wireless controllers and a collection of DWL-2600AP, DWL-3600AP, DWL-6600AP, and/or DWL-8600AP access points that are organized into groups based on location or network access. This chapter describes how to unpack and install the wireless controller system.

The topics covered in this chapter are:

Unpacking

Follow these steps to unpack the wireless controller and prepare it for operation:

1. Open the shipping container and carefully remove the contents.
2. Return all packing materials to the shipping container and save it.
3. Confirm that all items listed in the "Package Contents" section are included in the shipment. Check each item for damage. If any item is damaged or missing, notify your authorized D-Link representative.

Package Contents

Each wireless controller package contains the following items:

- One D-Link DWC-1000 Wireless Controller
- One power cord
- One RJ-45 to DB-9 console cable
- One 3-foot Ethernet Category 5 UTP/straight-through cable
- One Reference CD-ROM containing product documentation in PDF format
- Two rack-mounting brackets

Required Tools and Information

You will need the following additional items to install your wireless controller:

- D-Link DWL-2600AP, DWL-3600AP, DWL-6600AP, and/or DWL-8600AP access points
- A Power over Ethernet (PoE) switch
- A personal computer (PC) with one of the web browsers on page 28 installed

Selecting a Location

Selecting the proper location for the wireless controller is essential for its successful operation. To ensure optimum performance, D-LINK recommends that you perform a site survey. A site survey should enable you to:

- Identify how Wi-Fi coverage should be provided.
- Determine access point placement locations, and identify areas with weak signal or dead spots that require additional access points.
- Determine areas of heavier usage that might require dense access point coverage.
- Determine the indoor propagation of RF signals.
- Identify potential RF obstructions and interference sources.
- Run a spectrum analysis of channels of the site to ascertain current RF behavior, and detect both 802.11 and non-802.11 noise.
- Run an access point-to-client connectivity test to determine maximum throughput achievable on the client.

Note: D-Link offers a virtual site survey if a live survey cannot be performed. For more information, contact your D-Link representative.

After the site survey is complete, use the collected data to set up an RF plan using the Basic Planning Worksheet in Appendix A.

After you complete the Basic Planning Worksheet, select a location for the wireless controller. The ideal location should:

- Be flat and clean, with no dust, water, moisture, or exposure to direct sunlight or vibrations.
- Be fairly cool and dry, and does not exceed 104° F (40° C).
- Not be prone to variations in temperature and humidity, or close to strong magnetic fields or a device that generates electric noise.
- Not place the wireless controller next to, on top off, or below any device that generates heat or will block the free flow of air through the wireless controller’s ventilation slots. Leave at least 3 feet (91.4 cm) clear on both sides and rear of the controller.
- Allow you to reach the wireless controller and all cables attached to it.
- Have a working AC power outlet that is not controlled by a wall switch that can accidentally remove power to the outlet.

Front Panel Ports and LEDs

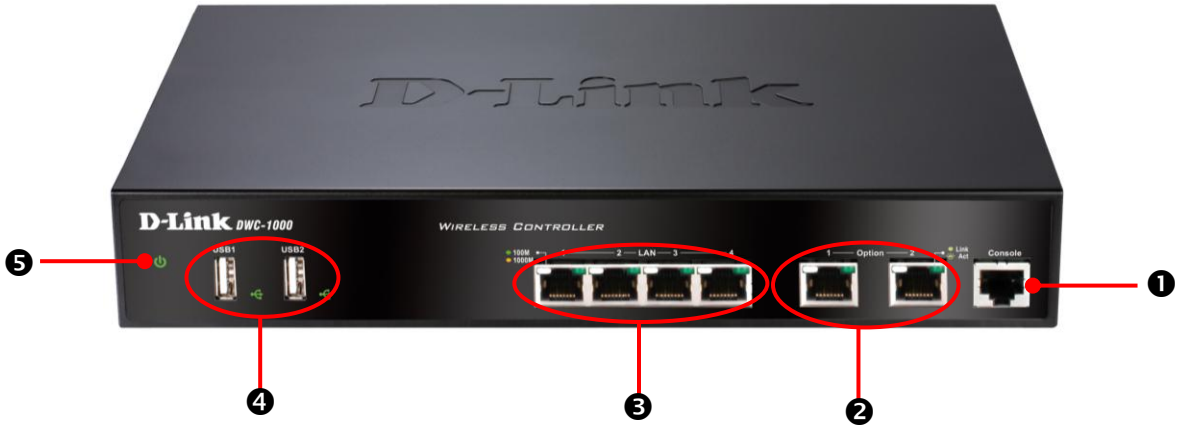
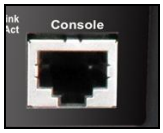


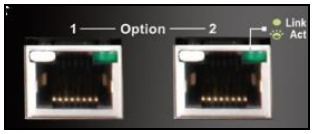
Figure 2-1. Front Panel Ports and Power LED

❶ One RJ-45 Console Port



The RJ-45 labeled **Console** lets you connect a PC console to access the wireless controller's command-line interface.

❷ Two Gigabit Option Ports

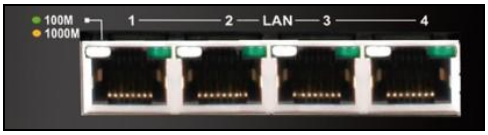


Two Gigabit Ethernet ports labeled **Option** let you connect the wireless controller to a backbone (requires DWC-1000-VPN-LIC License Pack upgrade – see page 19). Each port has an Activity LED (left) and Link LED (right) – see Table 2-1.

Table 2-1. Activity and Link LEDs

LED	Color	Description
Link LED 1000M 100M	 Orange Green	 ON = port is operating at 1000 Mbps (1 Gbps). ON = port is operating at 100 Mbps. OFF = port is operating at 10 Mbps.
Activity LED	Green	ON = port link status is present. Blink = port is sending or receiving data. OFF = port has no link.

❸ Four Gigabit Ethernet LAN Ports



Four Gigabit Ethernet ports labeled **LAN 1** through **LAN 4** let you connect Ethernet devices such as computers, switches, and hubs. Each port has an Activity LED (left) and Link LED (right) – see Table 2-2.

❹ Two USB 2.0 Ports

Two Universal Serial Bus (USB) 2.0 ports are provided for connecting USB flash drives, hard drives, computers, and printers. Each port has an LED.

Table 2-2. USB LEDs

LED	Color	Description
USB LED	Green	ON = link is good. Blink = there is activity on the port. OFF = device is powered off.

❺ Power LED

Facing the front of the wireless controller, the Power LED is located on the far left side. This LED provides a visual indication of the wireless controller's power-on or power-off state.

Table 2-3. Power LED

LED	Color	Description
Power LED	Green	ON = power-on process complete. OFF= wireless controller is powered OFF. Blink = system is defective and firmware upgrades have failed.
	Orange	ON = power-on process in progress. OFF= wireless controller is in recovery mode following a crash.

Rear Panel

Figure 2-2 and Table 2-4 describe the components on the rear panel of the wireless controller.

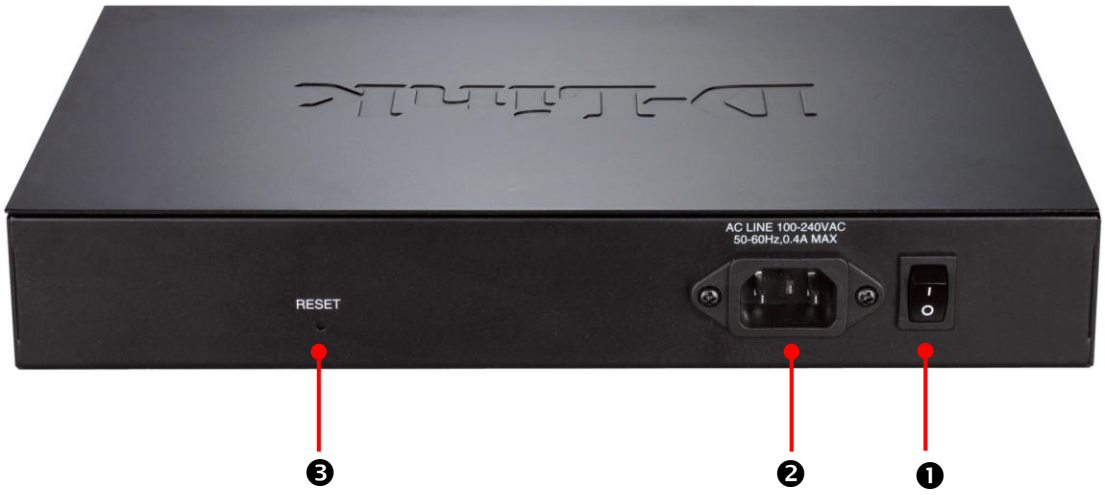


Figure 2-2. Rear Panel Ports

Table 2-4. Rear Panel (Viewed from Right to Left)

Legend	Description
❶	ON/OFF switch
❷	AC socket
❸	Reset button

Using the Reset Button

Using the reset button on the rear panel, you can perform a factory default reset. This operation removes all overrides made to the wireless controller's factory default configuration and returns the wireless controller to its original factory default settings. To protect against accidental resets, the reset button is recessed on the wireless controller's rear panel.

Note: You can also revert the wireless controller to its factory default settings from the FIRMWARE page (see "Restoring Factory Default Settings" on page 206).

To use the reset button to perform a factory default reset:

1. Leave power plugged into the wireless controller.

2. Find the reset button on the back panel, and then use a thin object to press and hold the reset button for at least 15 seconds.
3. Release the reset button.

Bottom Panel (Default IP Address)

The bottom of the wireless controller enclosure has a product label that shows the wireless controller's serial number, regulatory compliance, and other information.

Licenses

Two types of licenses are available for upgrading the wireless controller.

- **DWC-1000-AP6-LIC License Packs**. Allow the wireless controller to manage 6 additional access points. You can upgrade the wireless controller 3 times with these license packs, enabling it to support a maximum of 24 access points.
- **DWC-1000-VPN-LIC License Pack**. Allows the wireless controller to support VPN, firewall, and routing functions via its two Gigabit Ethernet Option ports.

For more information about licenses, visit http://www.dlink.com and see "Activating Licenses" on page 211.

Installing the Wireless Controller

Rack-Mounting the Wireless Controller

The wireless controller can be mounted in a standard 19-inch equipment rack.

1. Attach the mounting brackets to each side of the chassis (see Figure 2-3) and secure them with the supplied screws.

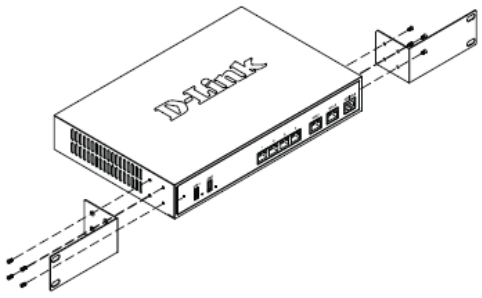


Figure 2-3. Attaching the Rack-Mount Brackets

2. Use the screws provided with the equipment rack to mount the wireless controller in the rack (see Figure 2-4).

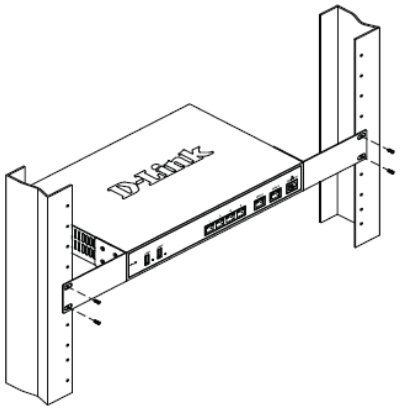


Figure 2-4. Install the Wireless Controller in a Standard-Sized Equipment Rack

Connecting the Wireless Controller

To install the wireless controller, perform the following procedure (and see Figure 2-5 on page 21).

1. Install the switch and access points according to the instructions in their documentation.
2. Connect one end of an Ethernet LAN cable to one of the ports labeled **LAN (1-4)** on the front of the wireless controller. Connect the other end of the cable to an available RJ-45 port on the PoE switch in the LAN network segment.
3. Connect one of the wireless controller ports labeled **LAN (1-4)** to the network or directly to a PC.

   Your installation should resemble the one in Figure 2-5.

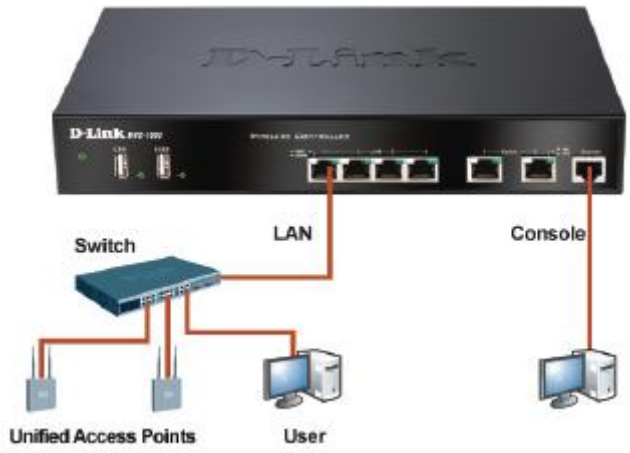


Figure 2-5. Wireless Controller Installation

4. If you purchased a VPN/Firewall/Router License Pack, use the **Option1** and **Option2** ports on the front of the wireless controller as follows:
   - **Option1** = WAN port for connecting to a cable or DSL modem.
   - **Option2** = WAN or DMZ port for dual WAN connections or internal server farm purposes. If used as a DMZ port, the port's IP address must be different than the IP address of the wireless controller's LAN interface.
5. Using the supplied power cord, connect the wireless controller to a working AC outlet.
6. Set the ON/OFF switch on the rear panel of the wireless controller to the ON position. The green Power LED to the left of the front panel USB ports goes ON. If the LED is not ON, see "Power LED is OFF" on page 215.

Sample Applications

The following sections describe three deployment scenarios to show how the wireless controller can operate in a variety of network configurations.

Connecting to a Secured Network

Figure 2-6 shows a simple network with a wireless controller, Power over Ethernet (PoE) switch, Layer 3 switch or router, and access points. This configuration allows you to send data over the WLAN using Wired Equivalent Privacy (WEP) or Wi-Fi Protected Access (WPA) to encrypt the data so that it becomes unreadable to outsiders.

In this configuration:

- The access points and wireless controller are connected in the same subnet and use the same IP address range assigned to that subnet.
- There are no routers between the access points and the wireless controller.
- The access points and wireless controller are connected to a PoE switch.
- The uplink of the PoE switch provides Internet access.
- The access points and wireless controller are configured for WEP or WPA.
- The operating system on the computer that contains the network-interface card (NIC) is configured with the same WEP or WPA network key settings configured on the switch and wireless controller.

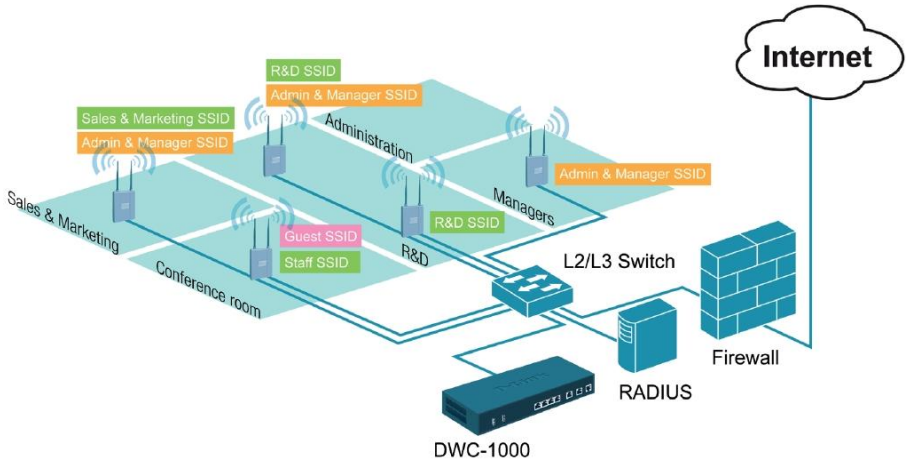


Figure 2-6. Example of Connecting to a Secured Network

To configure the wireless controller for WPA or WPA/WPA2 security, perform the basic configuration procedure described in Chapter 3, and then use the procedure below to configure the wireless controller for WPA or WPA/WPA2 security.

Step	Configuration	Path in web Management Interface	See Page
1.	Under the **SSID** column, click an SSID.	**ADVANCED > SSIDs**	36
2.	Change Wireless Network Configuration to desired settings, including security.		
3.	For **Security**, click **None**, **WEP**, or **WPA/WPA2**.		
4.	If using WEP, enter a WEP key.		
5.	If using WPA/WPA2, enter a WPA key.		
6.	Click **Save Settings**.		

Authenticating to an Authentication Server

Web authentication is a feature that denies a client access to the network until that client supplies a valid username and password.

Figure 2-6 on page 22 shows an example of a network configuration that uses a wireless controller, access points, PoE switch, and a Remote Authentication Dial In User Service (RADIUS) for authentication. In this configuration, the RADIUS server authenticates users before they gain access to the WLAN.

In this configuration:

- The access points and wireless controller are connected in the same subnet and use the same IP address range assigned to that subnet.
- There are no routers between the access points and the wireless controller.
- The access points and wireless controller are connected to a Power-over-Ethernet (PoE) switch. The uplink of the PoE switch connects to a Layer 3 switch or router that provides Internet access.
- There is a shared secret key exchanged between the access point and RADIUS server.
- User and user privileges are specified in the RADIUS database. (Servers using other types of authentication, such as Kerberos, have other settings that must be configured.)

To configure the wireless controller for this configuration, use the procedure below.

Step	Configuration	Path in web Management Interface	See Page
1.	Under the **SSID** column, click an SSID.	**ADVANCED > SSIDs**	51
2.	Edit the SSID name, if necessary.		
3.	Enter the RADIUS authentication server name.		
4.	Optional: Enter the RADIUS accounting server name.		
5.	Optional: Select a RADIUS use network configuration.		
6.	Optional: Check RADIUS accounting.		
7.	Optional: Enter a RADIUS authentication server name.		
8.	Optional: Enter a RADIUS accounting server name.		
9.	Click **Save Settings**.		

Logging In to a Captive Portal

The wireless controller lets you create a captive portal, which allows you to control which web page is viewed when users first log onto a WLAN. Captive portals are used to control Wi-Fi access at locations where users are “captive,” such as hotels, apartments, business centers, coffee houses, and restaurants.

A captive portal turns a user’s web browser into an authentication device by intercepting all packets, regardless of address or port, when the user opens a browser and tries to access the Internet. At that time, the browser is redirected to a web page that might require authentication, payment, or user agreement to a use policy.

Figure 2-7 shows an example of a captive portal configuration with a wireless controller, access points, PoE switch, and RADIUS authentication server.

In this configuration, you:

- Create a group configured for captive portal users.
- Add the captive portal users to the group and assign a password and idle timeout value to it.
- Select an interface for the captive portal.
- Test your settings and make any necessary adjustments.

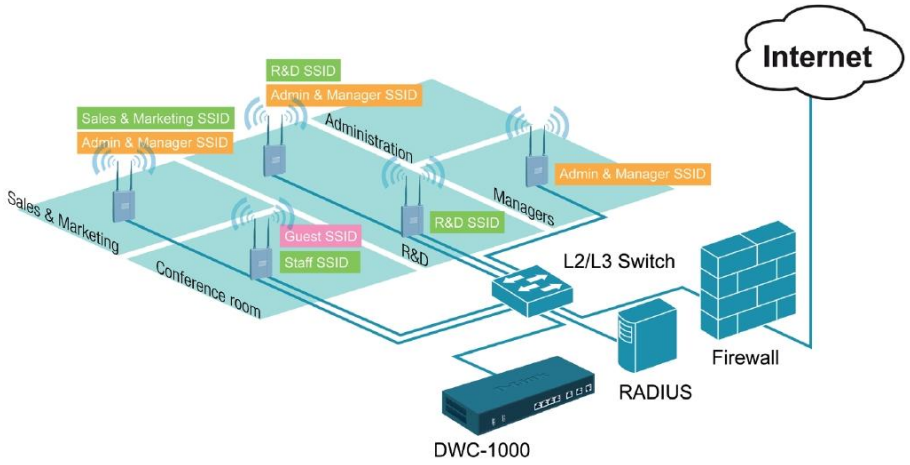


Figure 2-7. Example of a Captive Portal Configuration

To configure an interface for captive portal access, perform the basic configuration procedure described in Chapter 3, and then use the procedure below to configure an interface for captive portal access. You can associate a configured captive portal with a specific physical interface or wireless network (SSID).

Step	Configuration	Path in Web Management Interface	See Page
1.	Create a captive portal.	**ADVANCED > Users > Groups**	43
	a. Click **Add**.		
	b. Enter the name of a group and description.		
	c. Under **User Type**, check **Captive Portal User**.		
	d. Click **Save Settings**.		
2.	Add captive portal users.	**ADVANCED > Users > Users**	44
	a. Click **Add**.		
	b. Enter a user name, first name, and last name.		
	c. Use **Select Group** to click the captive portal group you created in step 1.		
	d. Enter a password.		
	e. Enter an idle timeout, in minutes.		
	f. Click **Save Settings**.		
3.	Associate the captive portal group to an interface.	**ADVANCE > Captive Portal > Wlan CP interface association**	47
	a. Select an interface in the **Interface List**.		
	b. Click **Save Settings**.		
4.	a. Add a new Profile.	**ADVANCED > Captive Portal > Captive Portal Setup**	48
	b. Configure the general details, header details, login details, and footer details.		
	c. Click **Save Settings**.		
5.	Test your settings.	**ADVANCED > Captive Portal > Captive Portal Setup**	50
	a. Click a profile.		
	b. Click **Show Preview**.		

Where to Go from Here

After installing the wireless controller, proceed to Chapter 3 to perform basic configuration procedures.

3. BASIC CONFIGURATION

After you install the wireless controller, perform the basic configuration instructions described in this chapter. A basic configuration includes:

- Logging In to the Web Management Interface (page 28)
- Web Management Interface Layout (page 31)
- Basic Configuration Procedures (page 32)

Using the information in this chapter, you can perform the basic information in minutes and get your wireless controller up and running in a short period of time.

Logging In to the Web Management Interface

Configuration procedures using the wireless controller's web management interface are performed using one of the following supported web browsers:

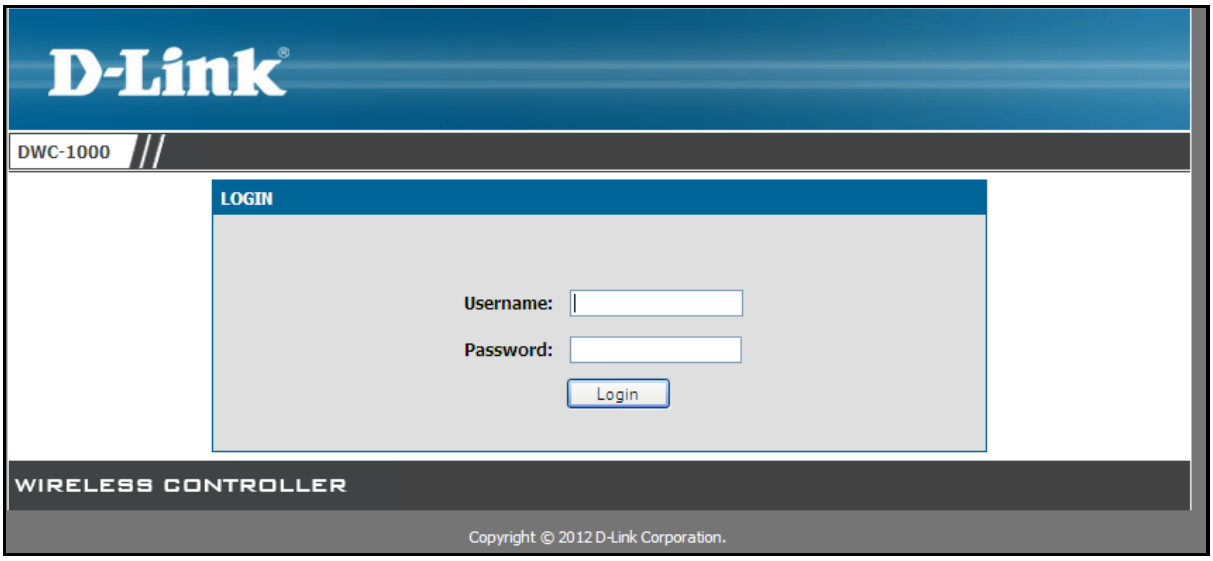
Browser	Version
Microsoft Internet Explorer	6.0 or higher
Mozilla Firefox	3.5 or higher
Netscape Navigator	9.0 or higher
Apple Safari	4.0
Google Chrome	5.0

Before you perform the following procedure:

- Configure your PC running the web browser to use an IP address on the 192.168.10.0 network, with a subnet mask of 255.255.255.0.
- Configure your web browser to accept cookies, prompt for pop-ups, and allow sites to run JavaScript.
- Upgrade the firmware for your wireless controller (see "Upgrading Firmware" on page 208).
- Upgrade the firmware for your access points after you upgrade the wireless controller firmware (refer to the documentation for your access points). Firmware can be downloaded from:
  - http://dlink.com/support/Wireless/dwl3600ap/Firmware/
  - http://dlink.com/support/Wireless/dwl6600ap/Firmware/
  - http://dlink.com/support/Wireless/dwl8600ap/Firmware/

To log in to the web management interface:

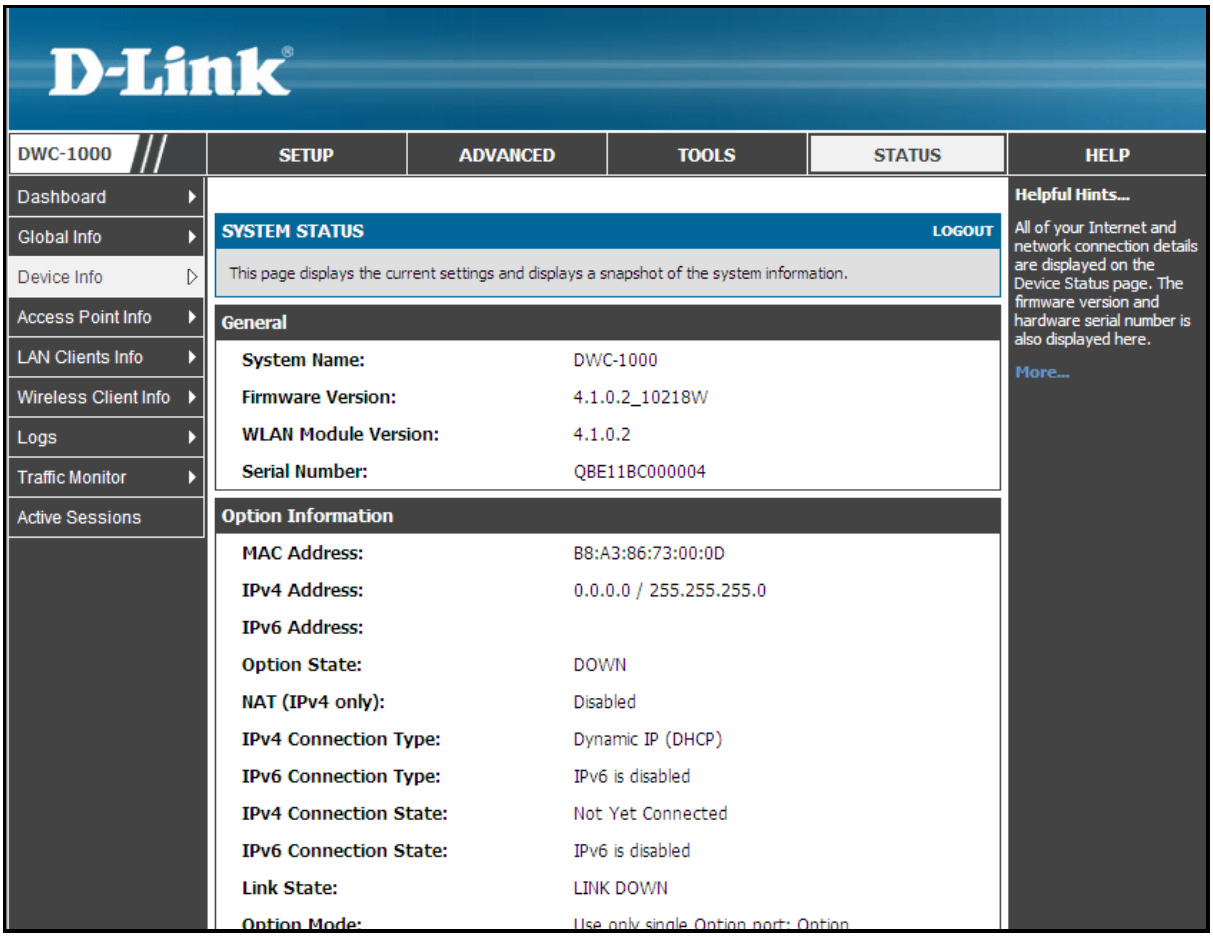
1. Launch a web browser on the PC.
2. In the address field of your web browser, type the IP address for the wireless controller web management interface. Its default IP address is http://192.168.10.1. A login prompt appears. If the login prompt does not appear, see "Troubleshooting the Web Management Interface" on page 216.



3. If you are logging in for the first time, type the default case-sensitive user name **admin** and the default case-sensitive password **admin** in lower-case letters.

Note: D-Link recommends that you change the password to a new, more secure password (see “Editing Users” on page 202) and record it in Appendix A.

4. Click **Login**. The web management interface opens, with the System Status page shown. This page shows general, option, and LAN status information. You can return to this page at any time by clicking **STATUS > Device Info > System Status**.



5. To log out of the web management interface, click **LOGOUT**, which appears to the right of the name of the currently displayed page.

Web Management Interface Layout

A web management interface screen can include the following components (see Figure 3-1):

- **1st level**: Main navigation menu tab. The main navigation menu tabs in the light gray bar appear across the top of the web management interface. These tabs provide access to all configuration menus and remain constant. The menu names appear in upper-case letters. When you click a tab, the letters change to dark characters against a white background.
- **2nd level**: Configuration menu tab. The configuration menu tabs appear at the left side of the web management interface. These tabs change according to the main navigation menu tab that you select. When you click a tab, the letters change to dark characters against a white background.
- **3rd level**: Submenu link. Some configuration menu tabs have one or more submenu links. Some submenu links may have additional submenu links. A right arrow next to the menu or submenu name indicates that there are submenu links. When you click one of these menus or submenus, a list of submenu links appears. You can then click a submenu link to display the configuration settings associated with it.
- **4th level**: Workspace. The workspace shows the parameters associated with the selected menu and submenu.
- **Action buttons**. Action buttons change the configuration or allow you to make changes to the configuration. Common action buttons are:
  - **Save Settings**. Saves all configuration changes made on the current screen. Saved settings are retained when the wireless controller is powered off or rebooted, while unsaved configuration changes are lost.
  - **Don't Save Settings**. Resets options on the current screen to the last-applied or last-saved settings.
  - **Add**. Adds a new item to the current screen.
  - **Edit**. Allows you to edit the configuration of the selected item.
  - **Delete**. Removes the selected item from the table or screen configuration.

Note: Below the Help menu on the main navigation tab is a Helpful Hints area that provides online help for the page displayed in the workspace.

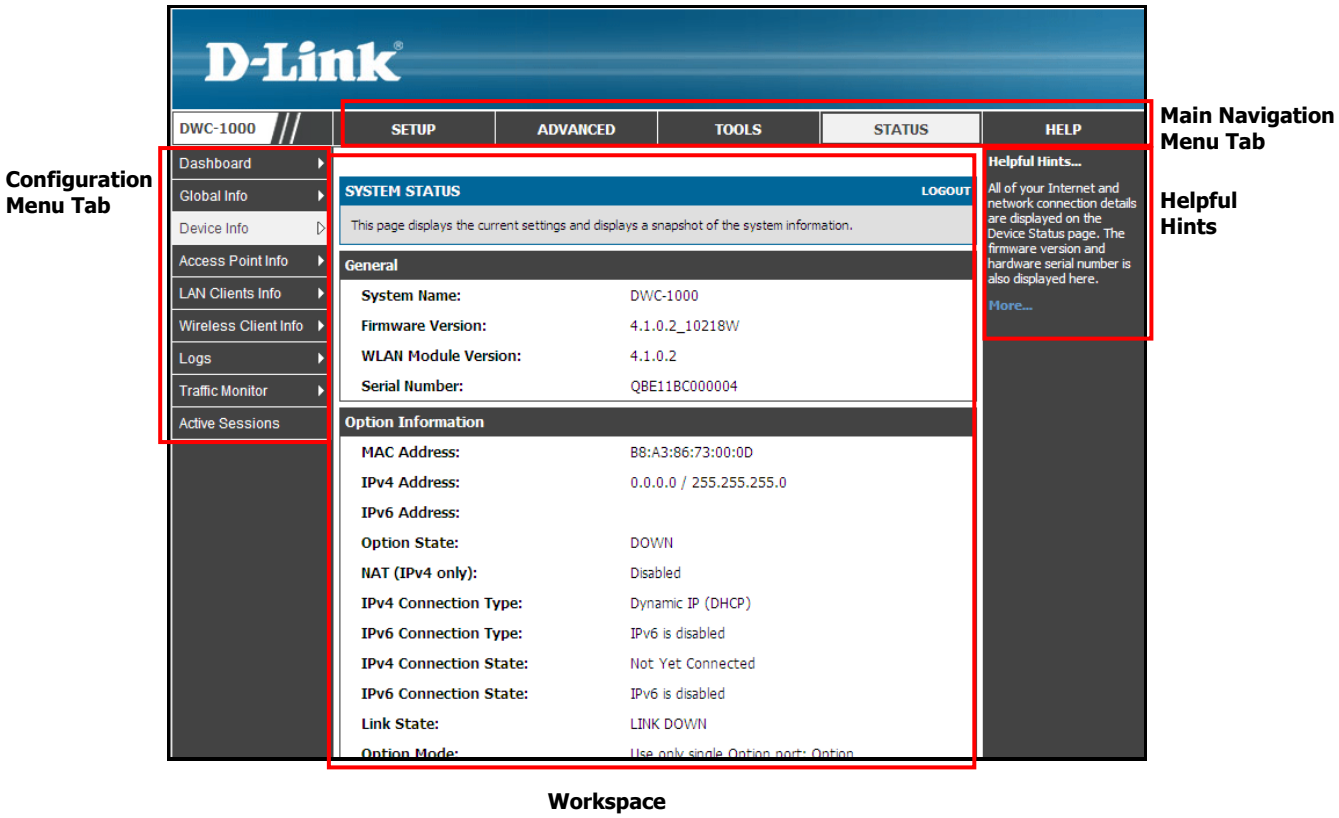


Figure 3-1. Web Management Interface

Basic Configuration Procedures

To perform a basic configuration:

Basic Configuration Step #1. Enable DHCP Server (Optional) – see page 33.

Basic Configuration Step #2. Select the Access Points to be Managed – see page 34.

Basic Configuration Step #3. Change the SSID Name and Set Up Security – see page 36.

Basic Configuration Step #4. Confirm Access Point Profile is Associated – see page 42.

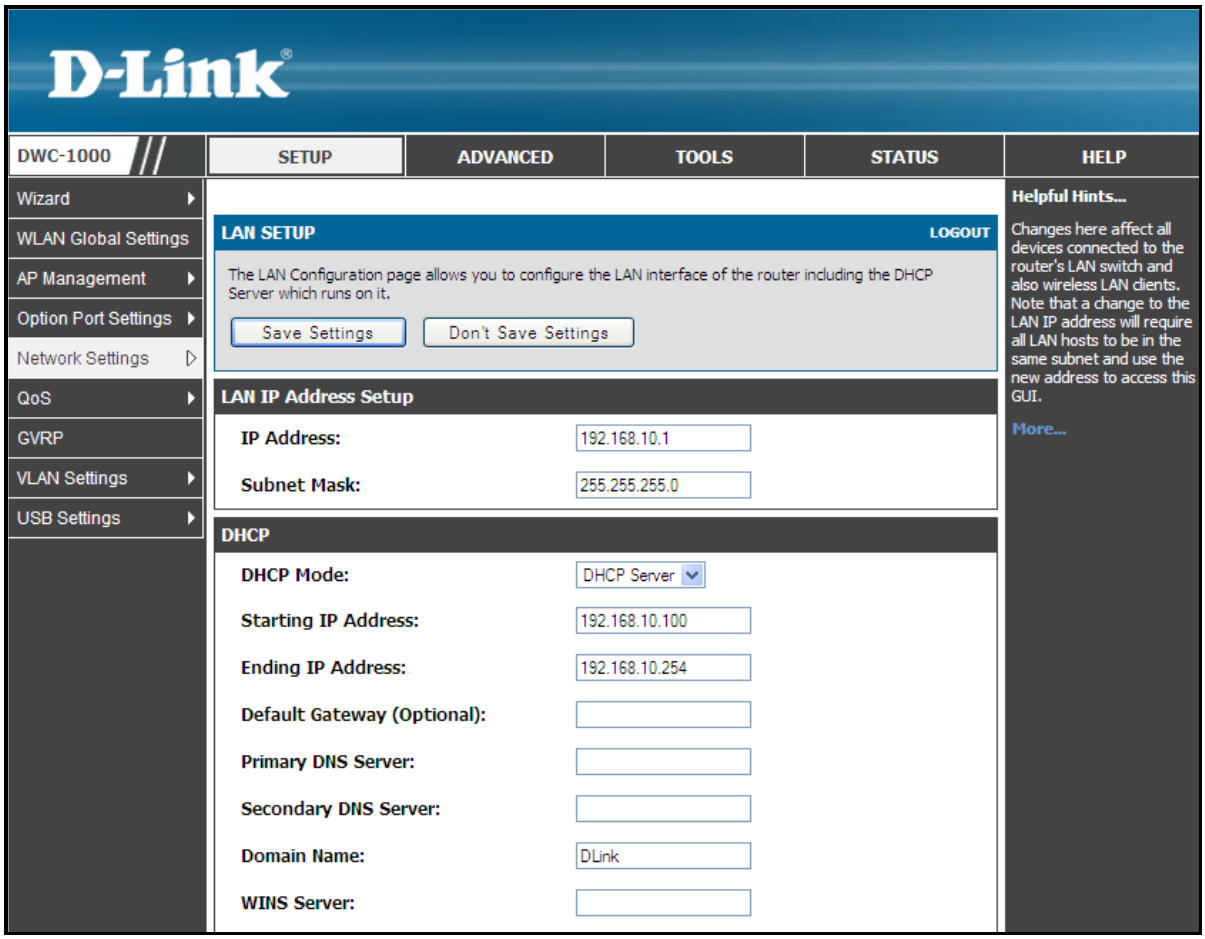
Basic Configuration Step #6. Use SSID with RADIUS – see page 51.

Basic Configuration Step #5. Configure Captive Portal Settings – see page 43.

Basic Configuration Step #1. Enable DHCP Server (Optional)

By default, Dynamic Host Configuration Protocol (DHCP) is disabled in the wireless controller. If you are not configuring your access points with static IP addresses, set up a DHCP server or DHCP server relay on the network. If desired, perform the following procedure to configure your wireless controller to act as a DHCP server.

1. Click **SETUP > Network Settings > LAN Setup Configuration**. The LAN SETUP page appears.



2. Under **LAN IP Address Setup**, change the **IP Address** and **Subnet Mask** to values used within your network. Record the settings below; you will refer to them later in this procedure:
   - IP address: _____
   - Subnet mask: _____
3. Click **Save Settings**.
4. Wait 60 seconds, and then start your web browser.

5. In the web browser's address field, enter the new IP address you recorded in step 2.
6. Click **SETUP > Network Settings > LAN Setup Configuration**.
7. In the LAN SETUP page, change **DHCP Mode** to **DHCP Server**.
8. Complete the fields in in the LAN SETUP page (see Table 3-1) and click **Save Settings**.

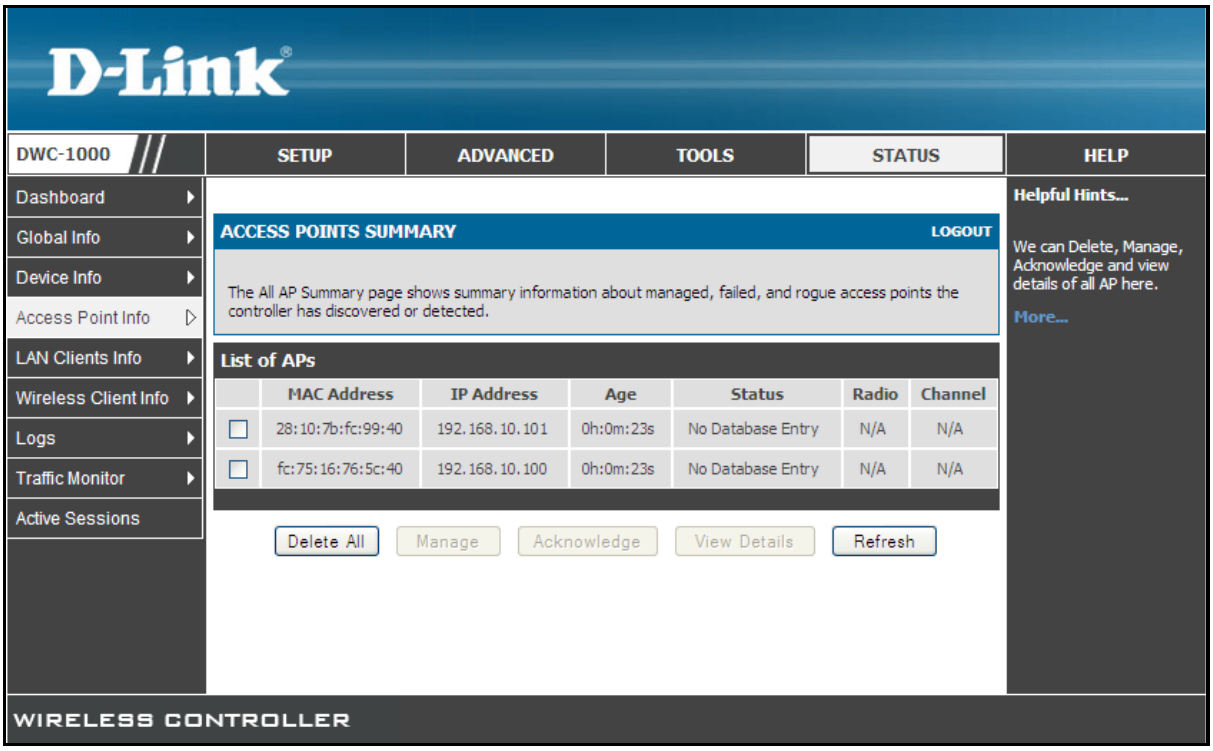
Table 3-1. DHCP Server Settings

Field	Description
DHCP	
Starting IP Address	Enter the starting IP address in the IP address pool. Any new DHCP client joining the LAN is assigned an IP address within the starting and ending IP address range. Starting and ending IP addresses should be in the same IP address subnet as the wireless controller's LAN IP address.
Ending IP Address	Enter the ending IP address in the IP address pool.
Default Gateway (Optional)	Enter the IP address of the gateway for your LAN.
Primary DNS Server	If configured domain name system (DNS) servers are available on the LAN, enter the IP address of the primary DNS server.
Secondary DNS Server	If configured domain name system (DNS) servers are available on the LAN, enter the IP address of the secondary DNS server.

Basic Configuration Step #2. Select the Access Points to be Managed

The wireless controller automatically discovers managed, unmanaged, and rogue access points on the WLAN that are in the same IP subnet. Use the following procedure to select the access points that the wireless controller will manage.

1. Click **STATUS > Access Point Info > APs Summary**. The ACCESS POINTS SUMMARY page appears, with a list of the access points that the wireless controller has discovered.



2. Under **List of APs**, check the first access point you want the wireless controller to manage, click **Manage**, complete the fields in the VALID AP page (see Table 3-2), and click **Save Settings**. When the confirmation appears, click **OK**.
3. Repeat step 2 for each additional access point you want the wireless controller to manage.

Table 3-2. Fields on the VALID AP Page

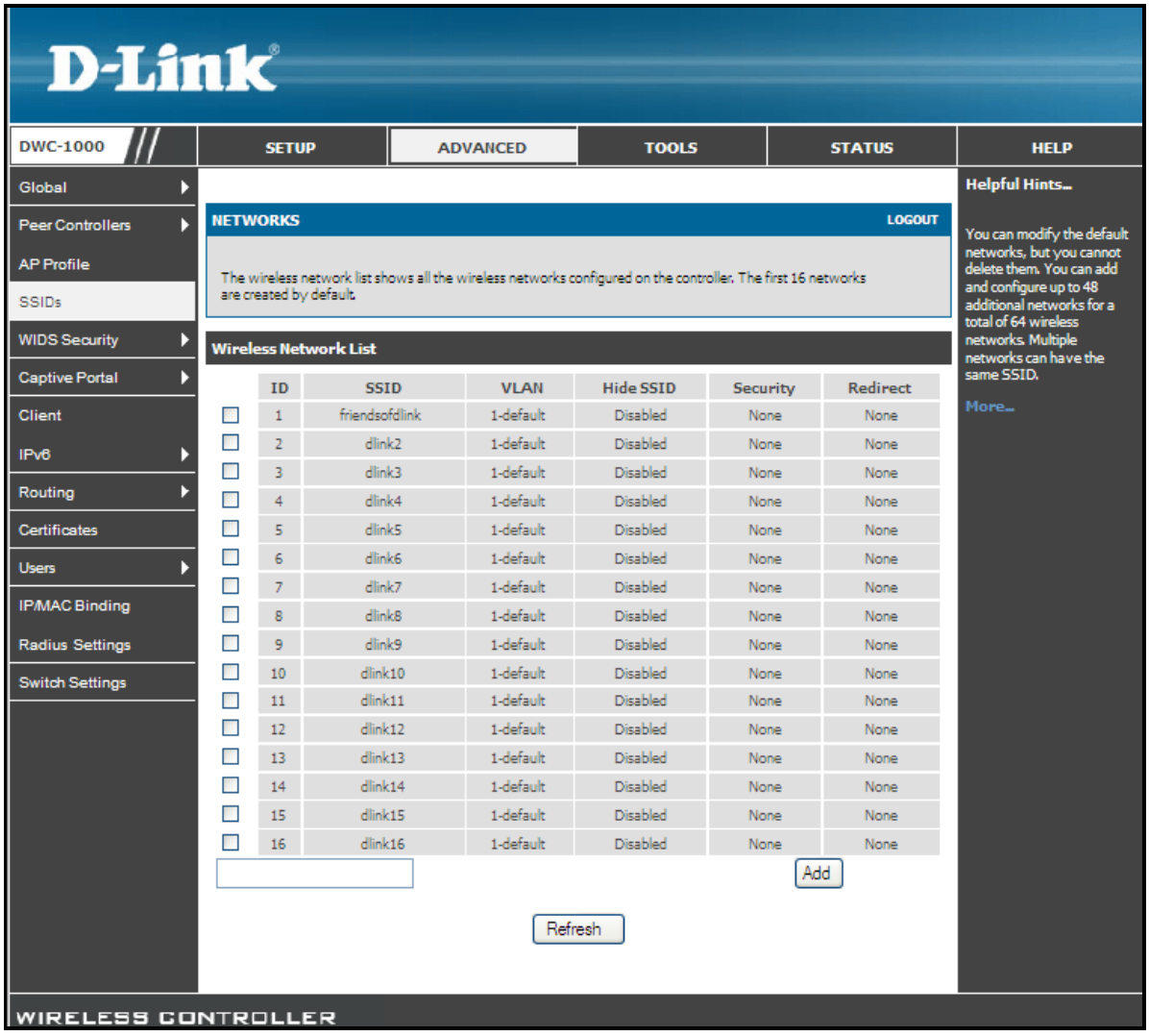
Field	Description
MAC Address	MAC address of the access point.
IP Address	Network address of the access point.
Age	Amount of time that has passed since the access point was last detected and the information was last updated.
Status	Access point status. Possible values are: • Managed = access point profile configuration has been applied to the access point and the access point operating in managed mode. • No Database Entry = access point's MAC address does not appear in the local or RADIUS Valid AP database. • Authentication (Failed AP) = access point failed to be authenticated by the wireless controller or RADIUS server. • Failed = wireless controller lost contact with the access point. A failed entry will remain in the Managed AP database unless you remove it. Note that a managed access point shows a failed status temporarily during a reset. • Rogue = access point has not tried to contact the wireless controller and the access point's MAC address is not in the Valid AP database.
Radio	Wireless radio mode the access point is using.

Field	Description
Channel	Operating channel for the radio.

Basic Configuration Step #3. Change the SSID Name and Set Up Security

You can configure up to 64 separate networks on the wireless controller and apply them across multiple radio and virtual access point interfaces. By default, 16 networks are pre-configured and applied in order to the access points on each radio. In this procedure, you will edit one of the preconfigured networks and change its SSID and security settings to suit your requirements.

1. Click **ADVANCED > SSIDs**. The following NETWORKS page appears, with a list of the wireless networks configured on the wireless controller.



2. Under the **SSID** column, click an SSID. The following NETWORKS page appears.

3. Complete the fields on the NETWORKS page (see Table 3-3) and click **Save Settings**.

Table 3-3. SSID and Security Settings

Field	Description
SSID	Enter the case-sensitive name of the wireless network. Be sure the SSID is the same for all devices in your wireless network.
Security	The default access point profile does not use any security mechanism. To protect your network, we recommend you select a security mechanism to prevent unauthorized wireless clients from gaining access to your network. Choices are: • None = no security mechanism is used. • WEP = enable WEP security. Complete the options in Table 3-4. • WPA/WPA2 = enable WPA/WPA2 security. Complete the options in Table 3-5.

Table 3-4. WEP Page Settings

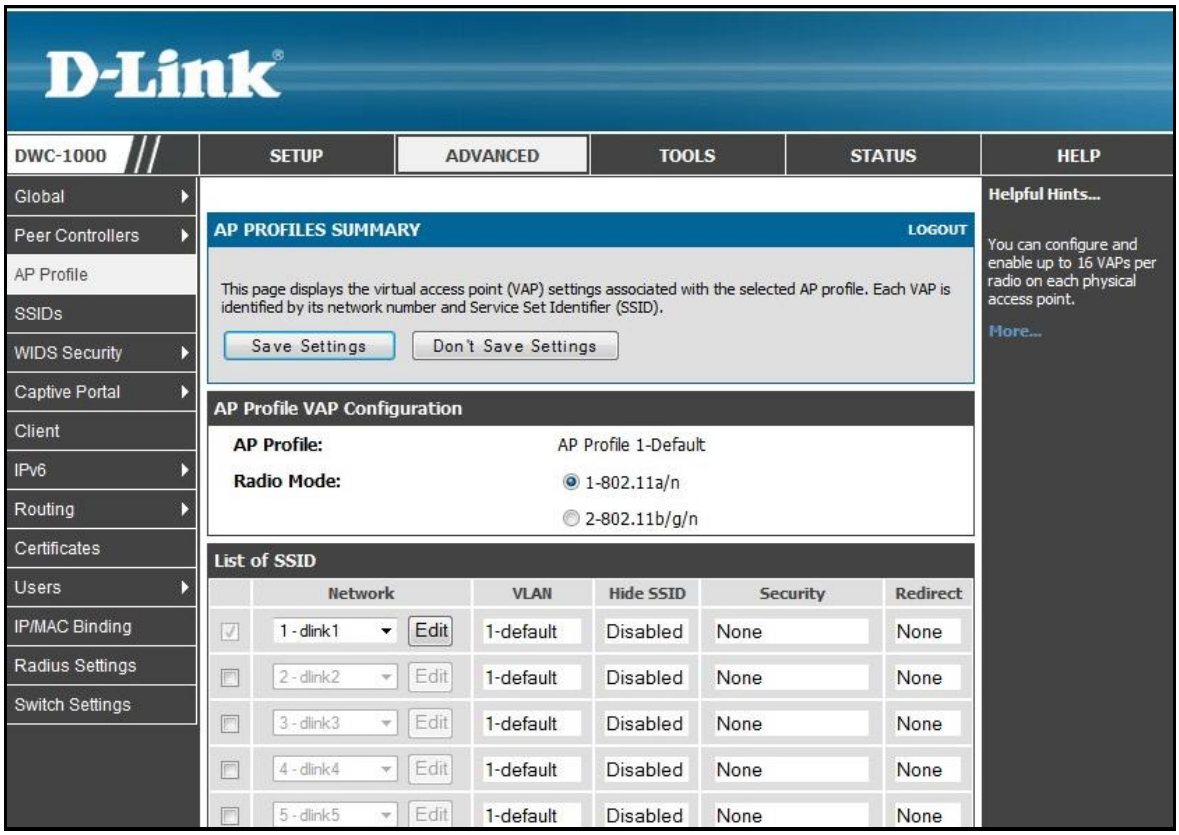
Field	Description
Security	If you select WEP for Security, the following two additional security options are displayed. • Static WEP = uses static key management. You manually configure the same keys to encrypt data on both the wireless client and the access point. Dynamic WEP (WEP IEEE 802.1x) uses dynamically generated keys to encrypt client-to- access point traffic. • WEP IEEE 802.1X = screen refreshes, and there are no more fields to configure. The access point uses the global RADIUS server or the RADIUS server you specified for the wireless network.
Authentication	Select the authentication type. Choices are: • Open System = any wireless station can request authentication. The station that needs to authenticate with another wireless station sends an authentication management frame that contains the identity of the sending station. The receiving station returns a frame that indicates whether it recognizes the sending station. • Shared Key = each wireless station is assumed to have received a secret shared key over a secure channel that is independent from the 802.11 wireless network communications channel.
WEP Key Type	Select the key type. Choices are: • ASCII = upper- and lower-case alphabetic letters, numeric digits, and special symbols such as @ and #. • HEX = digits 0 to 9 and letters A to F.
WEP Key Length (bits)	Select the length of the WEP key. Choices are: • 64 = 64 bits • 128 = 128 bits
Tx	Transfer Key Index. Indicates which WEP key the access point uses to encrypt the data it transmits. To select a transfer key, click the button between the key number and the field where you enter the key.
WEP Keys	You can specify four WEP keys. In each text box, enter a string of characters for each of the RC4 WEP keys shared with the stations using the access point. Use the same number of characters for each key. The number of keys you enter depends on the WEP Key Type and WEP Key Length selections. The following list shows the number of keys to enter in the field: • 64 bit = ASCII: 5 characters; Hex: 10 characters • 128 bit = ASCII: 13 characters; Hex: 26 characters Each client station must be configured to use one of these WEP keys in the same slot as specified here.

Table 3-5. WPA/WPA/2 Page Settings

Field	Description
Security	If you select WPA for Security, the following two additional security options are displayed. • WPA/WPA2 Personal = uses static key management. You manually configure the same keys to encrypt data on both the wireless client and the access point. WPA/WPA2 Enterprise uses a RADIUS server and dynamically generated keys to encrypt client-to- access point traffic. WPA Enterprise is more secure than WPA Personal, but you need a RADIUS server to manage the keys. • WPA Enterprise = more secure than WPA Personal, but you need a RADIUS server to manage the keys. If you click this option, the screen refreshes and the WPA Key Type and WPA Key fields are hidden. The access point uses the global RADIUS server or the RADIUS server you specified for the wireless network.
WPA Versions	Select the types of client stations you want to support. Choices are: WPA = if all client stations on the network support the original WPA but none supports WPA2, select WPA. WPA2 = if all client stations on the network support WPA2, use WPA2, which provides the best security per the IEEE 802.11i standard. WPA and WPA2 = if you have a mix of clients that support WPA2 or WPA, select both 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.
WPA Ciphers	Select the cipher suite you want to use. Choices are: • TKIP • CCMP (AES) • TKIP and CCMP (AES) Both TKIP and AES clients can associate with the access point. WPA clients must have a valid TKIP key or AES-CCMP key to associate with the access point. 802.11n clients cannot use the TKIP cipher. If you enable TKIP only, 802.11 clients cannot authenticate with the network.
WPA Key Type	Enter a WPA key type. Range: ASCII, including upper- and lower-case alphabetic letters, numeric digits, and special symbols such as @ and #
WPA Key	Enter the shared secret key for WPA Personal. Range: 8 – 62 characters, including upper- and lower-case alphabetic letters, numeric digits, and special symbols such as @ and #
Bcast Key Refresh Rate (seconds)	Enter a value to set the interval at which the broadcast (group) key is refreshed for clients associated to this VAP. Range: 0 - 86400 seconds (0 = broadcast key is not refreshed)

4. To add another SSID, repeat steps 1 through 3.
5. Click **Advanced > AP Profile**. The AP PROFILES SUMMARY page appears.

6. Under **Access Point Profile List**, check the box to the left of the access point profile you want to update.
7. Click **Configure SSID**. The AP PROFILES SUMMARY page appears.



8. Click the radio button next to the Radio Mode you prefer.
9. Under **List of SSID**, check the box to the left of the SSID network you want to enable.
10. Click **Save Settings**.

Basic Configuration Step #4. Confirm Access Point Profile is Associated

Use the following procedure to confirm that the access point profile is associated with the wireless controller.

Tip: Each time you change configuration settings, perform this procedure to apply the changes to the access point.

1. Click **ADVANCED > AP Profile**. The AP PROFILES SUMMARY page appears.

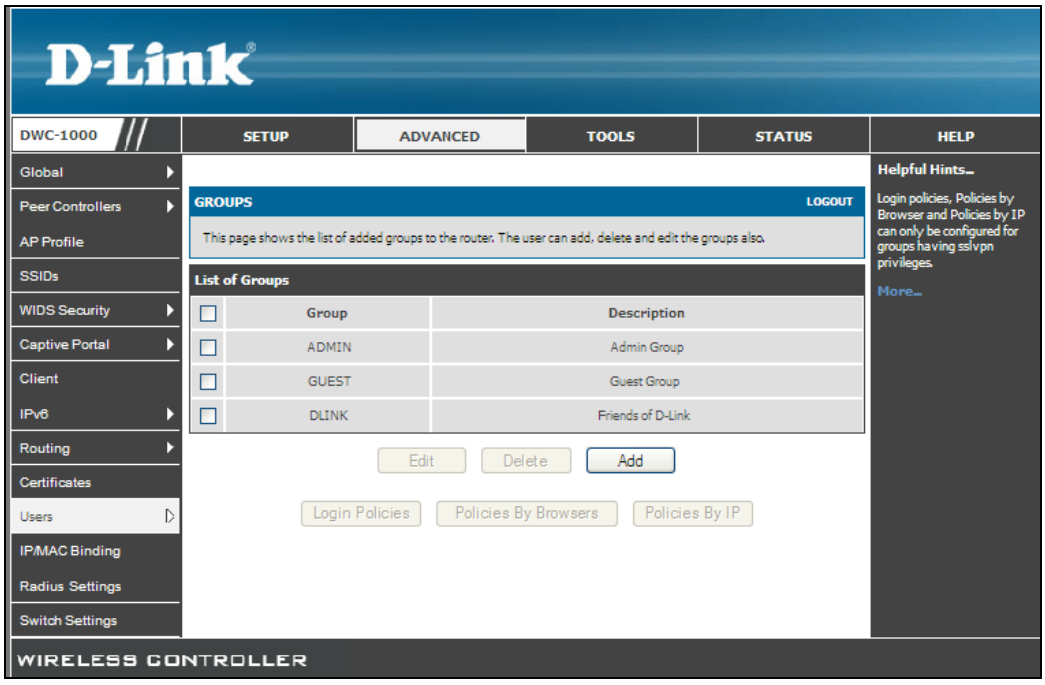
2. Under **Access Point Profile List**, check the box to the left of the access point profile you want to update.
3. Click **Apply**.
4. Wait 30 seconds, and then click **Refresh** to verify that the profile is associated. Your associated access point is configured and ready to authenticate wireless users.

Basic Configuration Step #5. Configure Captive Portal Settings

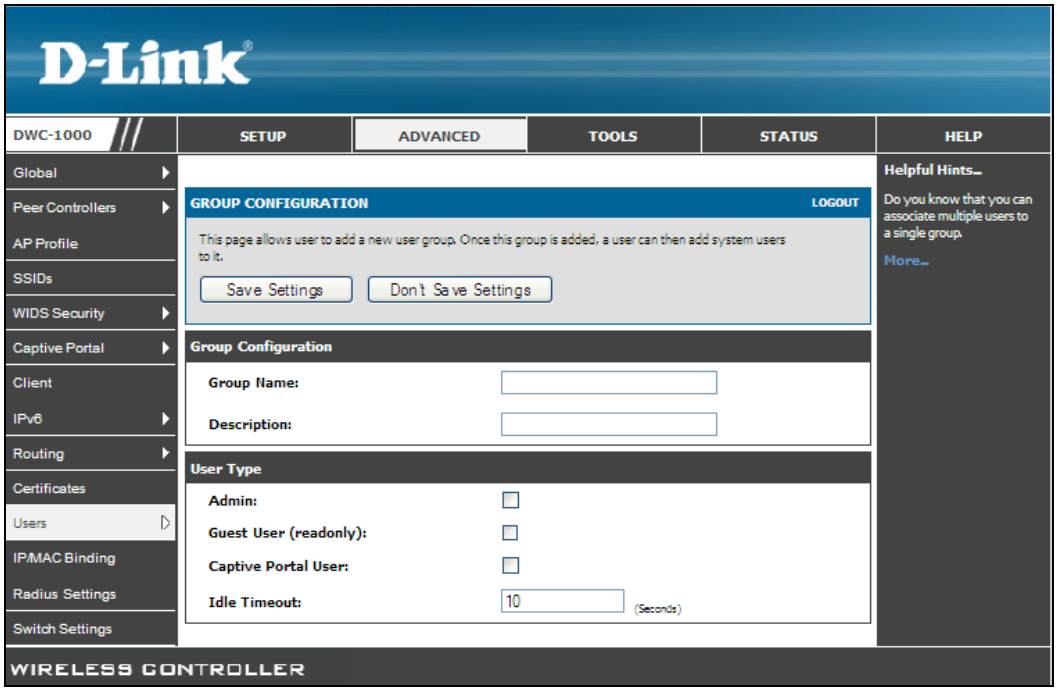
Configuring the wireless controller's captive portal settings is a 4-step process:

1. Create a captive portal group

a. Click **ADVANCED > Users > Groups**. The GROUPS page appears.



b. Click **Add**. The GROUP CONFIGURATION page appears.



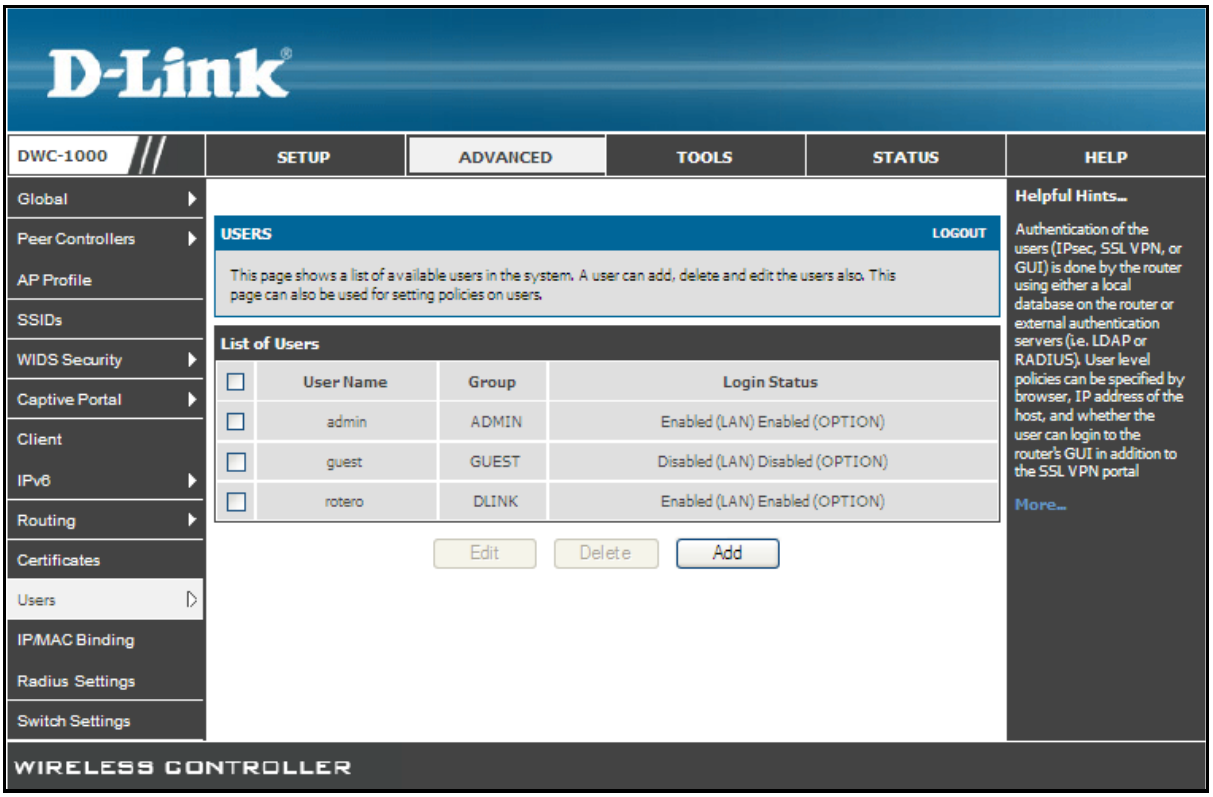
c. Complete the fields in Table 3-6 and click **Save Settings**.

Table 3-6. Captive Portal Settings

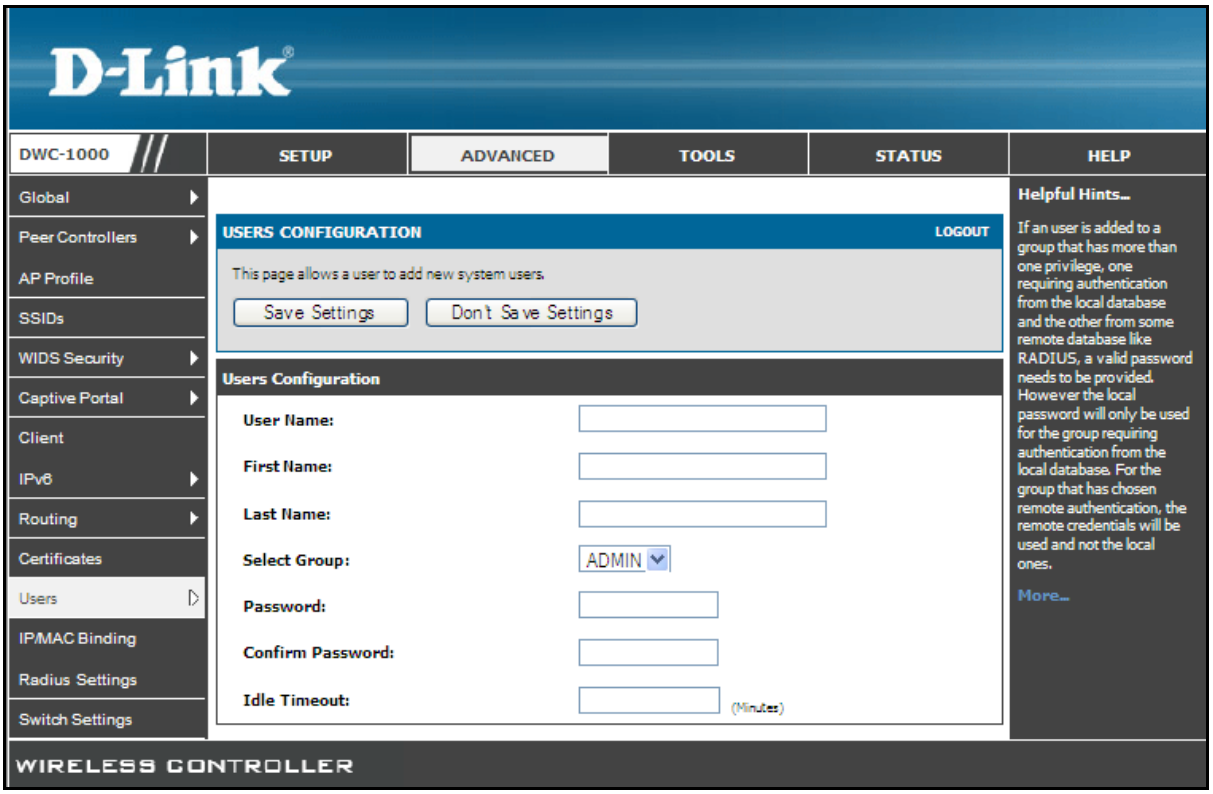
Field	Description
Group Configuration	
Group Name	Enter a name for the group.
Description	Enter a description of the group.
User Type	
Captive Portal User	Check this box.

2. Add captive portal users

a. Click **ADVANCED > Users > Users**. The USERS page appears.



b. Click **Add**. The USERS CONFIGURATION page appears.



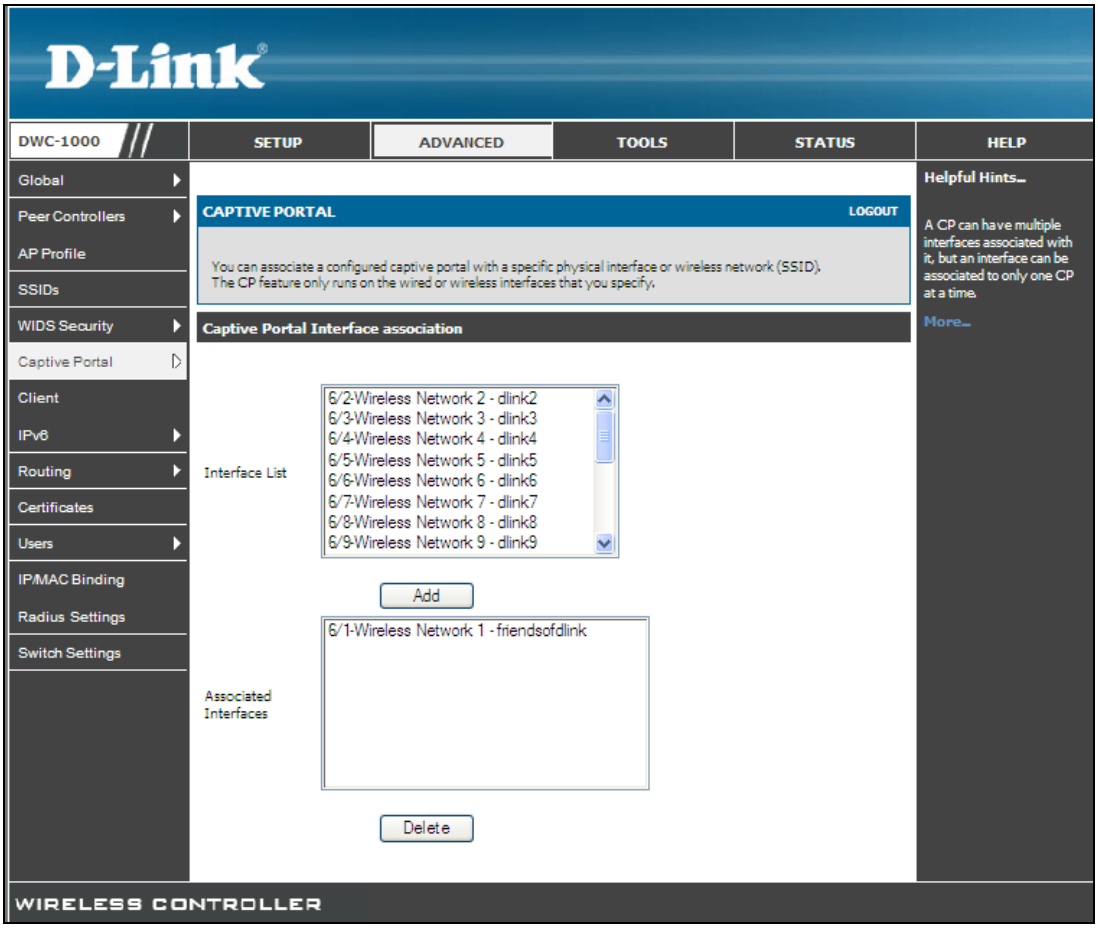
c. Complete the fields in Table 3-7 and click **Save Settings**.

Table 3-7. Captive Portal User Settings

Field	Description
User Name	Enter a unique name for this user. The name should allow you to easily identify this user from others you may add.
First Name	Enter the first name of the user. This is useful when the authentication domain is an external server, such as RADIUS.
Last Name	Enter the last name of the user. This is useful when the authentication domain is an external server, such as RADIUS.
Select Group	Select the captive portal group to which this user will belong.
Password	Enter a case-sensitive password that the user must specify before gaining access to the Internet. For security, each typed password character is masked with a dot (•).
Confirm Password	Enter the same case-sensitive password entered in the Password field. For security, each typed password character is masked with a dot (•).
Idle Timeout	Enter the number of minutes of inactivity that must occur before the user is logged out of his session automatically. Entering an Idle Timeout value of 0 (zero) means never log out.

3. Associate the captive portal group to an interface

a. Click **ADVANCED > Captive Portal > Wlan CP Interface Association**. The CAPTIVE PORTAL page appears.



b. In the **Interface List**, click an interface.

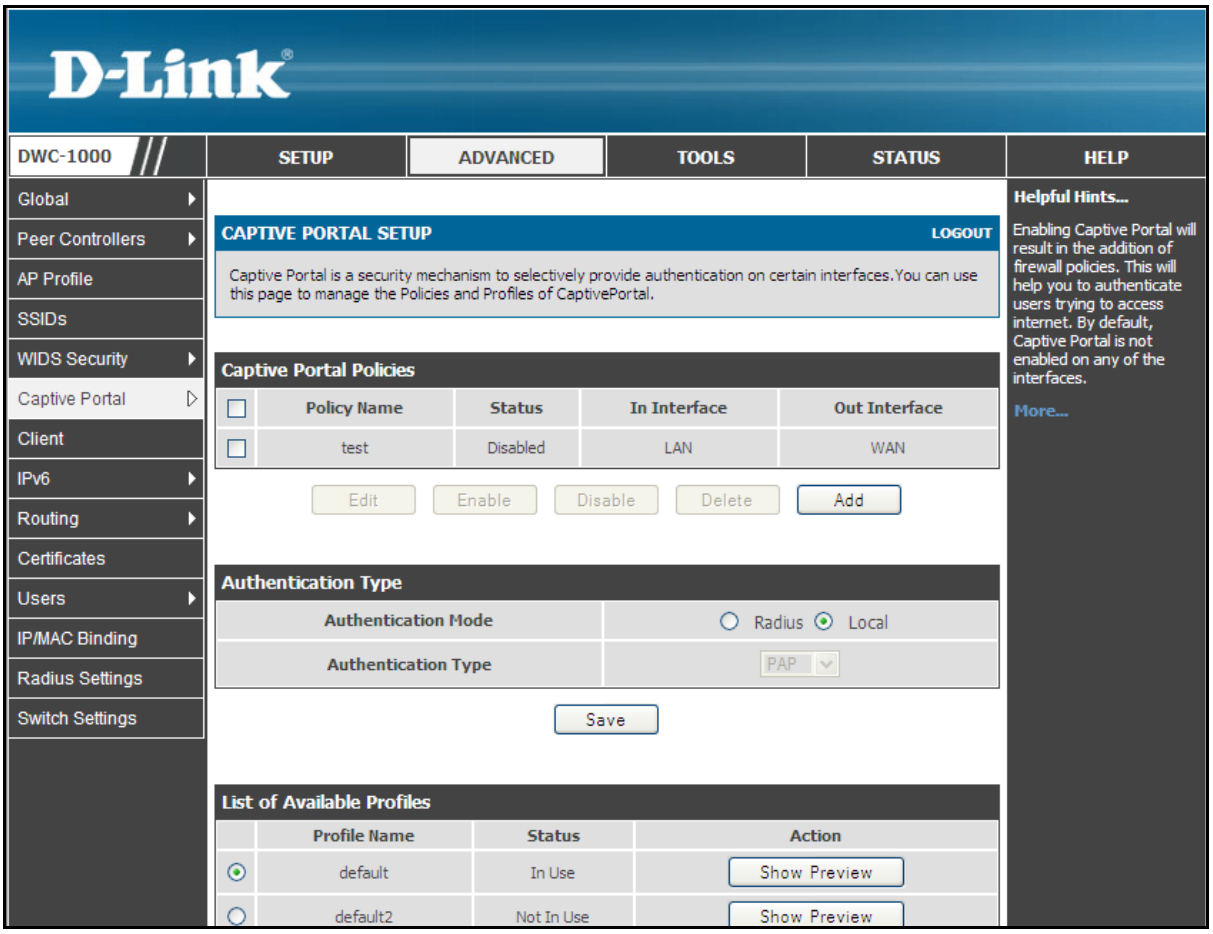
Tip: Hold down the Shift key when clicking to select a contiguous range of interfaces. To select non-contiguous interfaces hold down the Ctrl key and click each interface. To deselect an interface, hold down Ctrl and click the highlighted interface.

c. Click **Add**.

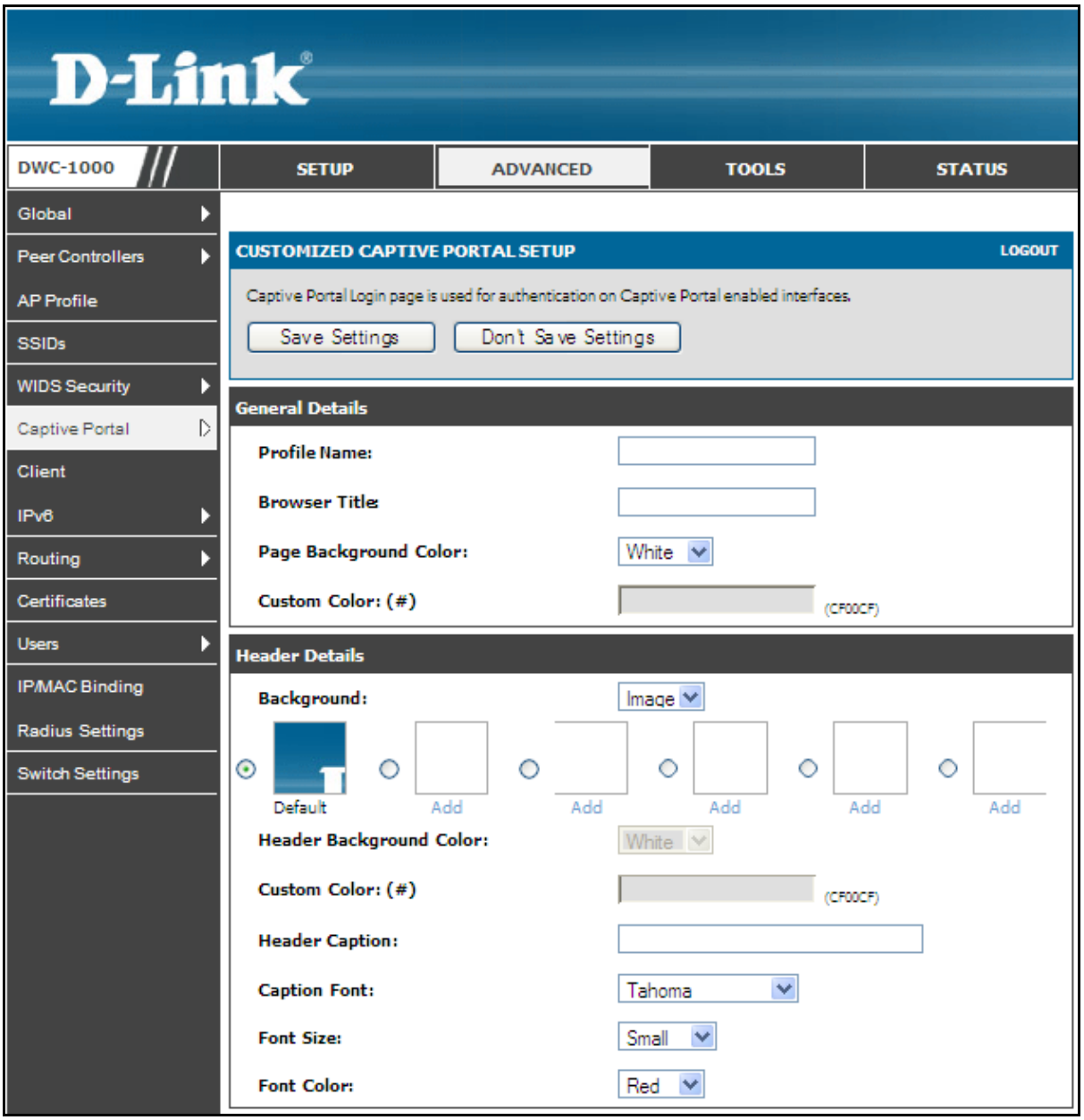
The captive portal is now associated to the selected interface. To test your configuration from a client, connect to the captive portal SSID to log in to the captive portal. Enter an IP address on the captive portal network to see the captive portal.

4. Customize the captive portal login page

a. Click **ADVANCED > Captive Portal > Captive Portal Setup**. The CAPTIVE PORTAL SETUP page appears.



b. Under **List of Available Profiles**, click **Add** to add a new profile or click the radio button that corresponds to a profile name and click **Edit** to edit an existing profile. The CUSTOMIZED CAPTIVE PORTAL SETUP page appears.



c. Complete the fields (see Table 3-8) and click **Save Settings**. The message **Operation Succeeded** appears and then the CAPTIVE PORTAL SETUP PAGE appears.

Table 3-8. Fields on the CUSTOMIZED CAPTIVE PORTAL SETUP Page

Field	Description
General Details	
Profile Name	Enter a name for this captive portal profile. The name should allow you to differentiate this captive profile from others you may set up.
Browser Title	Enter the text that will appear in the title of the browser during the captive portal session.
Page Background Color	Select the background color of the page that appears during the captive portal session.

Field	Description
General Details	
Custom Color (#)	Set the background color of the page that appears during the captive portal session.
Header Details	
Background	Select whether the login page displayed during the captive portal session will show an image or color. Choices are: • Image = show image on the page. Use the Header Background Color field to select a background color. The maximum size of the image is 100 kb. • Color = show background color on the page. Use the radio buttons to select an image.
Header Background Color	If you set Background to Color, select a background color for the header.
Custom Color (#)	Use this field to customize the background color.
Header Caption	Enter the text that appears in the header of the login page during the captive portal session.
Caption Font	Select the font for the header text.
Font Size	Select the font size for the header text.
Font Color	Select the font color for the header text.
Login Details	
Login Section Title	Enter the text that appears in the title of the login box when the user logs in to the captive portal session. This field is optional.
Welcome Message	Enter the welcome message that appears when users log in to the captive session successfully. This field is optional.
Error Message	Enter the error message that appears when users fail to log in to the captive session successfully. This field is optional.
Footer Details	
Change Footer Content	Enables or disables changes to the footer content on the login page. Choices are: • Checked – enable changes to the footer. • Unchecked – disable changes to the footer.
Footer Content	If Change Footer Content is checked, enter the text that appears in the footer.
Footer Font Color	If Change Footer Content is checked, select the color of the text that appears in the footer.

d. Under **List of Available Profiles**, click the profile and the **Show Preview** button for the profile you just configured. Confirm that the appearance of the login page suits your requirements. If not, repeat steps 5c through 5e as necessary.

e. When you are satisfied with the appearance of the custom portal page:

- Under **List of Available Profiles**, click the profile and then click the **Enable** button to enable the profile.
- Under **Captive Portal Policies**, click a policy and then click the **Enable** button to enable the policy.

Basic Configuration Step #6. Use SSID with RADIUS

To use SSID with RADIUS authentication, perform the following procedure.

1. Click **ADVANCED > SSIDs**. The NETWORKS page appears.
2. Under the **SSID** column, click the SSID you want to edit.
3. At the next NETWORKS page, update the SSID name in the **SSID** field if needed.
4. Complete the fields in Table 3-3 and click **Save Settings**. Your access point is configured to use RADIUS authentication server.

Table 3-9. RADIUS Settings

Field	Description
RADIUS Authentication Server Name	Enter the name of the RADIUS server that the virtual access point uses for access point and client authentication. Any RADIUS information you configure for the wireless network overrides the global RADIUS information configured on the Wireless Global Configuration page. The wireless controller acts as the RADIUS client and performs all RADIUS transactions on behalf of the access points and wireless clients. Range: 32 alpha-numeric characters, including spaces, underscores, and dashes
RADIUS Accounting Server Name	Enter the name of the RADIUS server that the virtual access point uses for reporting wireless client associations and disassociations. Range: 32 alpha-numeric characters, including spaces, underscores, and dashes
RADIUS Use Network Configuration	Click Enable.
RADIUS Accounting	Click Enable.

Where to Go from Here

After installing the basic configuration procedures, the wireless controller is ready for operation using the factory default settings in Appendix B. These settings should be suitable for most users and most situations.

The wireless controller also provides advanced configuration settings for users who want to take advantage of the more advanced features of the wireless controller. The following sections list the wireless controller's advanced settings. Users who do not understand these features should not attempt to reconfigure their wireless controller, unless advised to do so by the technical support staff.

For more information about advanced configuration settings, refer to the *DWC-1000 Wireless Controller User Manual* and the wireless controller Helpful Hints in the web management interface (see "Web Management Interface Layout" on page 31).

4. ADVANCED CONFIGURATION SETTINGS

While the basic configuration described in the previous chapter is satisfactory for most users, large wireless networks or a complex setup may require the wireless controller's advanced configuration settings to be configured.

This chapter covers the following commonly used advanced configuration settings.

- QoS Configuration (page 53)
- VLANs (page 59)
- DMZ Settings (page 69)
- Static Routing (page 72)
- Auto-Failover Settings (page 76)
- Load Balancing Settings (page 78)

For information about additional advanced configuration settings not described in this chapter, see "Additional Advanced Configuration " on page 80.

Note: The procedures in this chapter should only be performed by expert users who understand networking concepts and terminology.

QoS Configuration

Configuring QoS settings is a 2-step process:

1. Enable QOS mode (see “Enabling QoS Mode,” below), and
2. Define the DHCP or COS settings (see “Defining DSCP and CoS Settings” on page 55).

Enabling QoS Mode

Path: SETUP > QoS > LAN QoS > Trust Mode Configuration

Using the LAN QOS page, you can enable Quality of Service (QoS) on the wireless controller.

Typically, networks operate on a best-effort delivery basis, which means that all traffic has equal priority and an equal chance of being delivered in a timely manner. When congestion occurs, all traffic has an equal chance of being dropped.

When you configure the QoS feature, you can select specific network traffic, prioritize it according to its relative importance, and use congestion-management and congestion-avoidance techniques to provide preferential treatment. Implementing QoS in your network makes network performance more predictable and bandwidth utilization more effective. It is especially useful if you expect traffic congestion on the wireless controller LAN ports.

QoS classification can be applied in Layer 2 or Layer 3 frames. For this reason, you can configure the wireless controller to use Layer 2 CoS settings or Layer 3 DSCP settings.

Note: The wireless controller also provides a CoS-to-DSCP map to map CoS values in incoming packets to a DSCP value that QoS uses internally to represent the priority of the traffic. To access this feature, click **SETUP > QoS > Remark CoS to DSCP**.

To configure QoS mode:

1. Click **SETUP > QoS > LAN QoS > Trust Mode Configuration**. The LAN QOS page appears.

2. Under **LAN QoS**, check **Enable QoS for LAN ports**. The fields under **LAN QoS configuration** become available.
3. Under **LAN QoS configuration**, use the **Classify Using** drop-down list to select whether DSCP or CoS will be used for the port.
4. Click **Save Settings**.
5. Proceed to “Defining DSCP and CoS Settings” on page 55 to configure values for DSCP and CoS and their priority.

Defining DSCP and CoS Settings

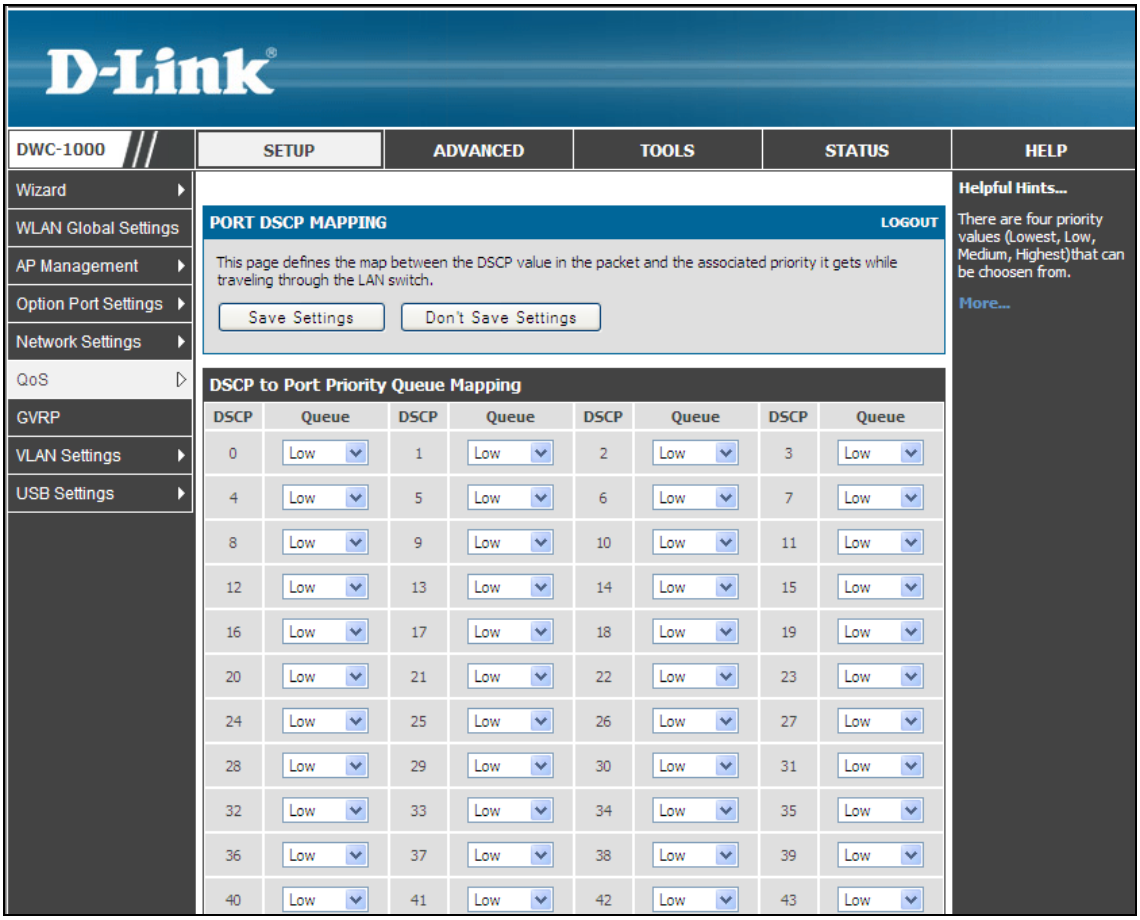
After you enable QoS mode, use the procedures in the following sections to configure the values and priorities used by DSCP and CoS.

Configuring DSCP Priorities

Path: SETUP > QoS > LAN QoS > IP DSCP Configuration

If you selected DSCP for your QoS configuration, use the following procedure to configure and assign priority to the DSCP fields in IP packets.

1. Click **SETUP > QoS > LAN QoS > IP DSCP Configuration**. The PORT DSCP MAPPING page appears. Each row corresponds to a DSCP field in an IP packet.



2. On the appropriate row, use the **Queue** drop-down list to select one of the following priorities:
   - Highest
   - Medium
   - Low
   - Lowest
3. Repeat step 2 for each additional DSCP field you want to prioritize.
4. When you finish, click **Save Settings**.

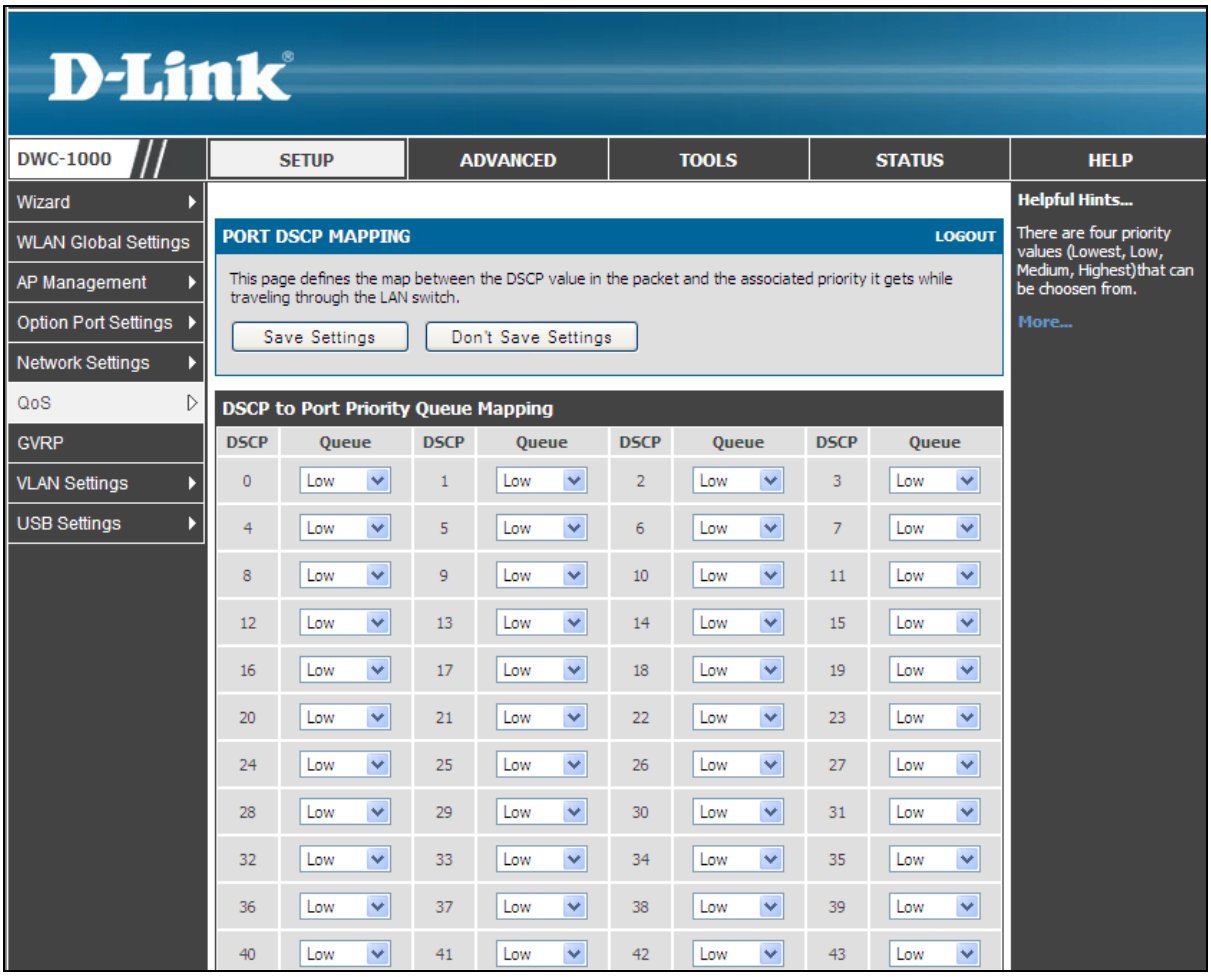
Configuring CoS Priorities

Path: SETUP > QoS > LAN QoS > 801.P Priority

If you selected CoS for your QoS configuration, use the following procedure to configure and assign priority to the CoS fields in the IP packets.

1. Click **SETUP > QoS > LAN QoS > 801.P Priority**. The PORT COS MAPPING page appears. Each row corresponds to a CoS field in an IP packet.

2. On the appropriate row, use the **Queue** drop-down list to select one of the following priorities:
   - Highest
   - Medium
   - Low
   - Lowest
3. Repeat step 2 for each additional CoS field you want to prioritize.
4. When you finish, click **Save Settings**.



5. On the appropriate row, use the **Queue** drop-down list to select one of the following priorities:
   - Highest
   - Medium
   - Low
   - Lowest
6. Repeat step 2 for each additional CoS field you want to prioritize.
7. When you finish, click **Save Settings**.

VLANs

A virtual Local Area Network (VLAN) is a logical segment in a switched network. It allows independent logical networks to be created within a single physical network. VLANs separate devices into different broadcast domains and Layer 3 subnets. Devices within a VLAN can communicate without routing. The primary use of VLANs is to split large switched networks, which are large broadcast domains.

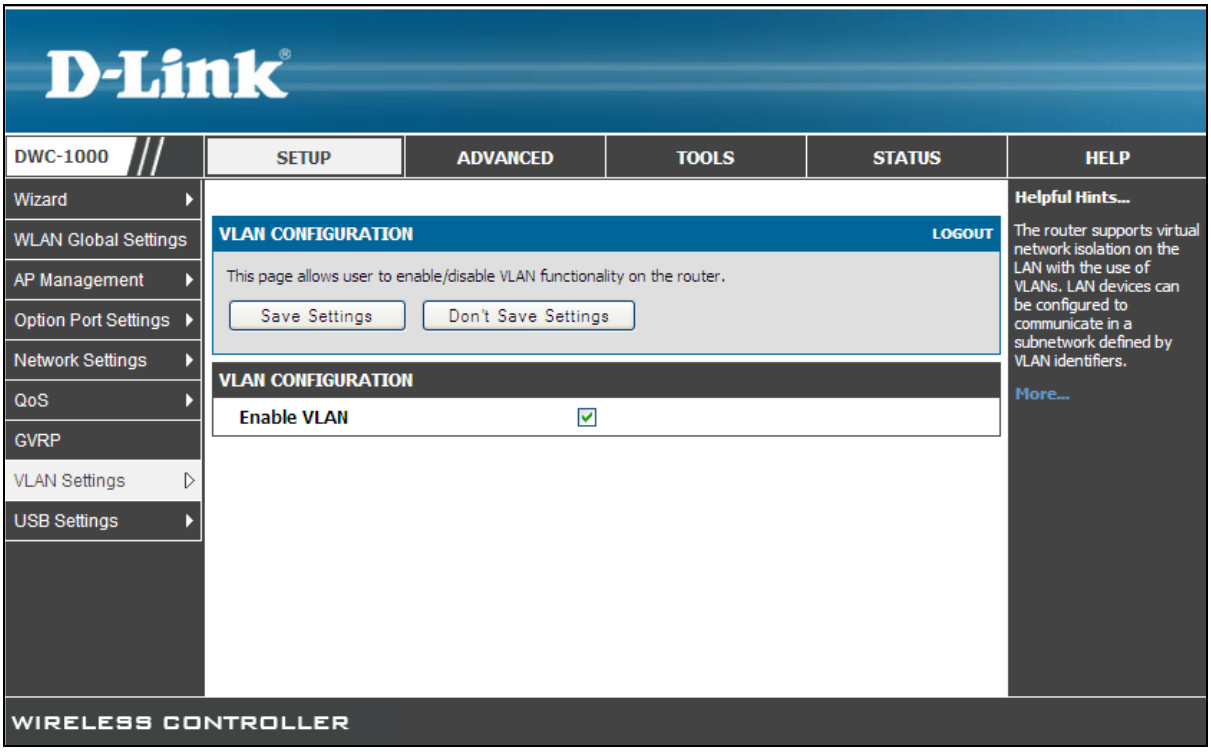
The wireless controller provides VLAN functionality for assigning unique VLAN IDs to LAN ports so that traffic to and from that physical port can be isolated from the general LAN. VLAN filtering is particularly useful to limit broadcast packets of a device in a large network.

Enabling VLANs

Path: SETUP > VLAN Settings > VLAN Configuration

By default, the wireless controller's VLAN function is disabled. To enable it:

1. Click **SETUP > VLAN Settings > VLAN Configuration**. The VLAN CONFIGURATION page appears.



2. Under **VLAN Configuration**, check **Enable VLAN**.

3. Click **Save Settings**.

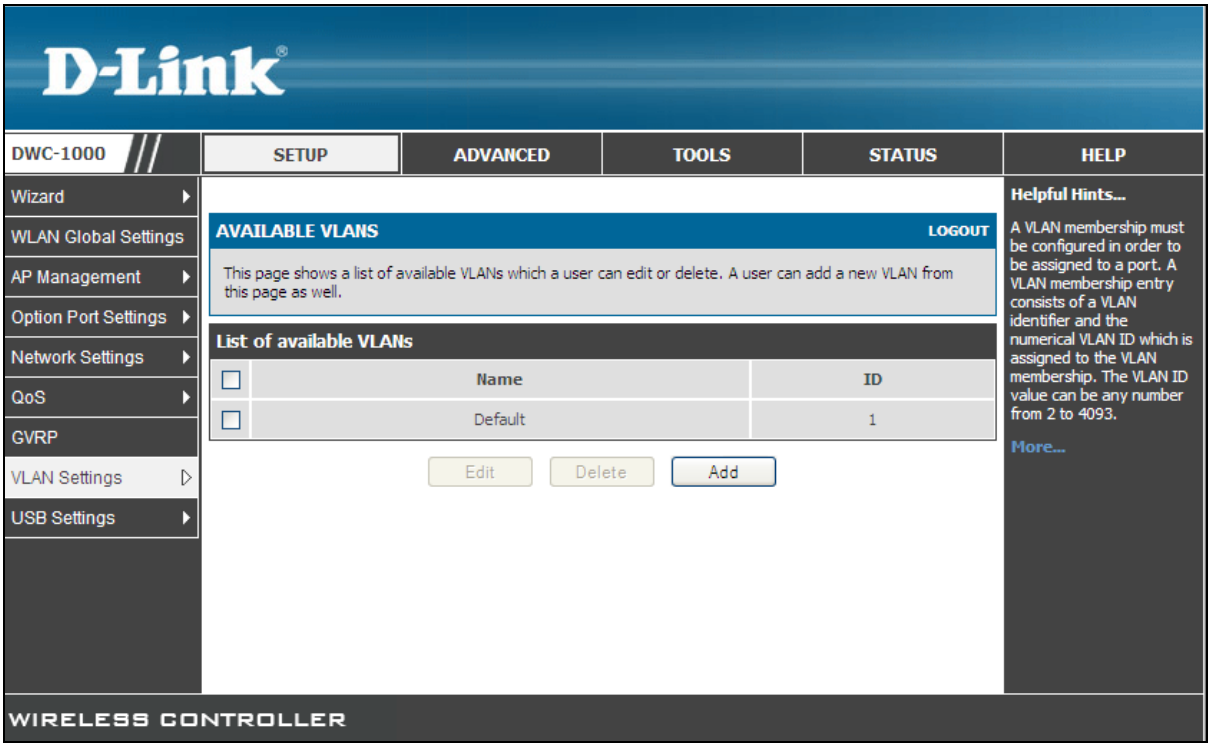
Creating VLANs

Path: SETUP > VLAN Settings > Available VLANs

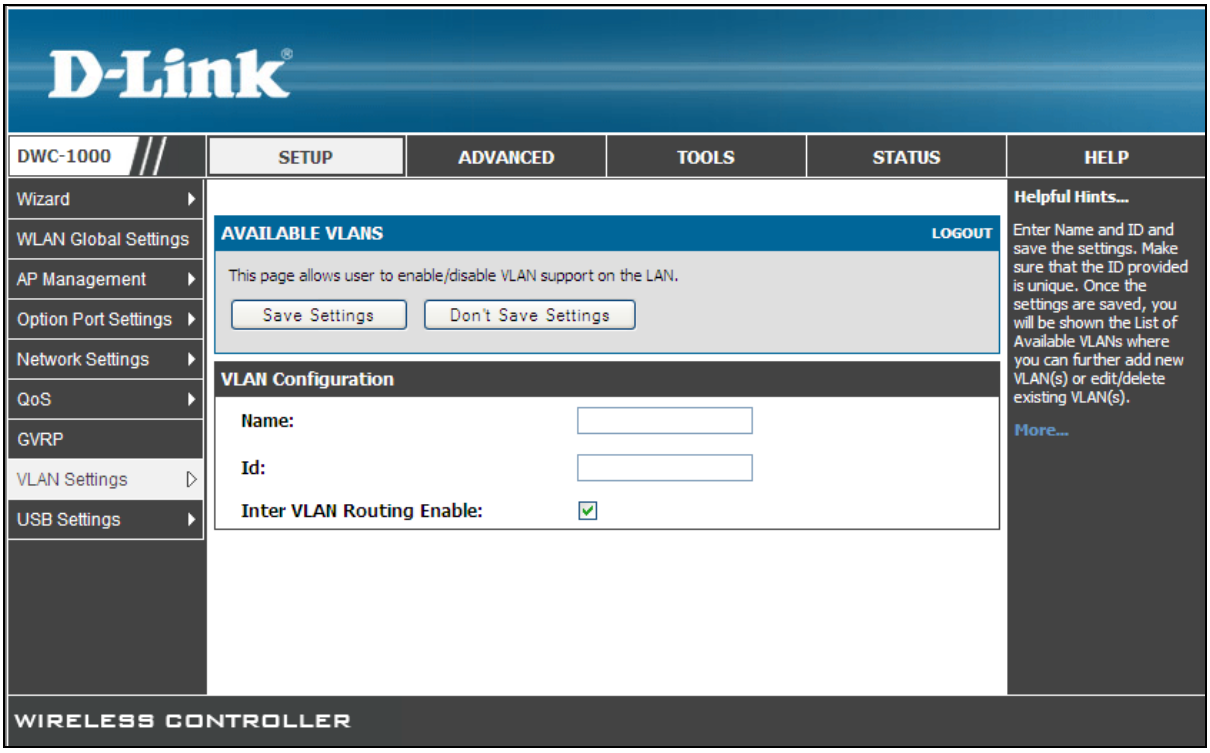
After you enable the wireless controller's VLAN function, use the AVAILABLE VLANS page to create VLANs. After you create VLANs, you can use the same page to view, edit, and delete VLANs.

To create a VLAN:

1. Click **SETUP > VLAN Settings > Available VLANs**. The AVAILABLE VLANs page appears.



2. Click **Add**. The following page appears.



3. Complete the fields in the page (see Table 4-1).
4. Click **Save Settings**.

Table 4-1. Fields on the AVAILABLE VLANS Page

Field	Description
Name	Enter a unique name for this VLAN. The name should allow you to easily identify this VLAN from others you may add.
Id	Enter a unique ID to this VLAN. Range: 2 - 4093
Inter VLAN Routing Enable	Allows or denies communication between VLAN networks. Choices are: • Checked = allow communications between different VLANs. • Unchecked = deny communications between different VLANs.

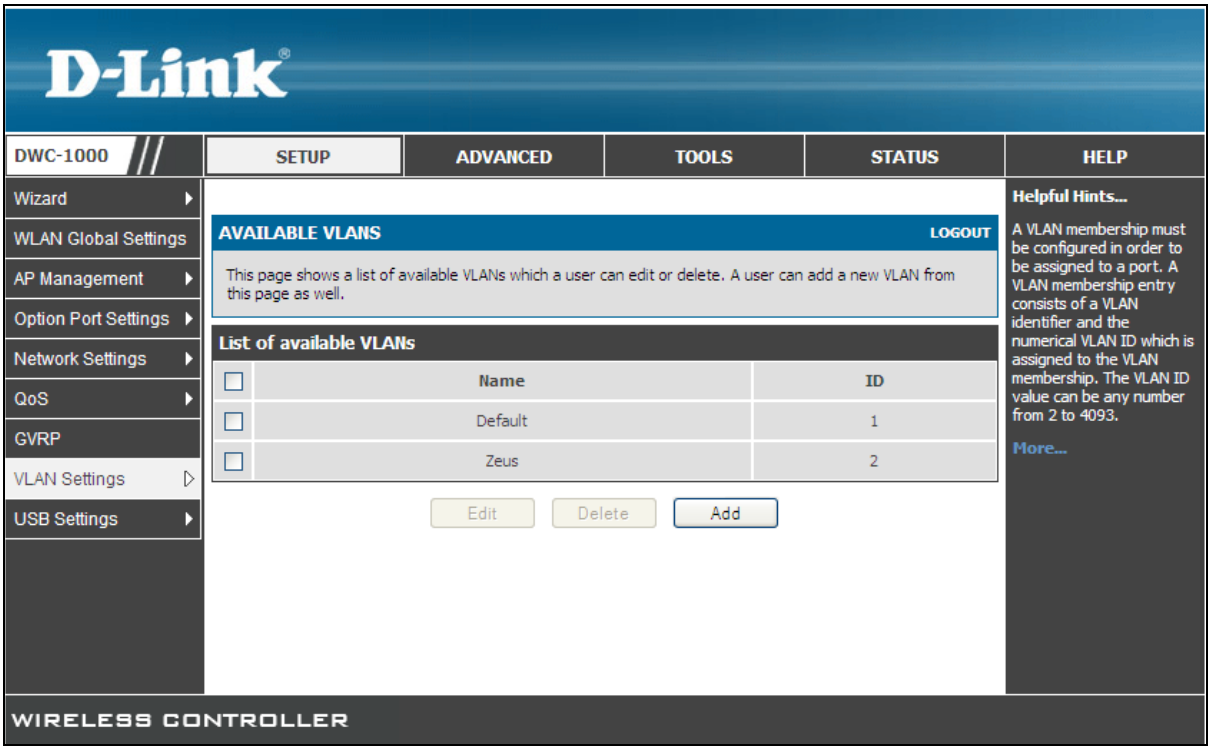
Editing VLANs

Path: SETUP > VLAN Settings > Available VLANs

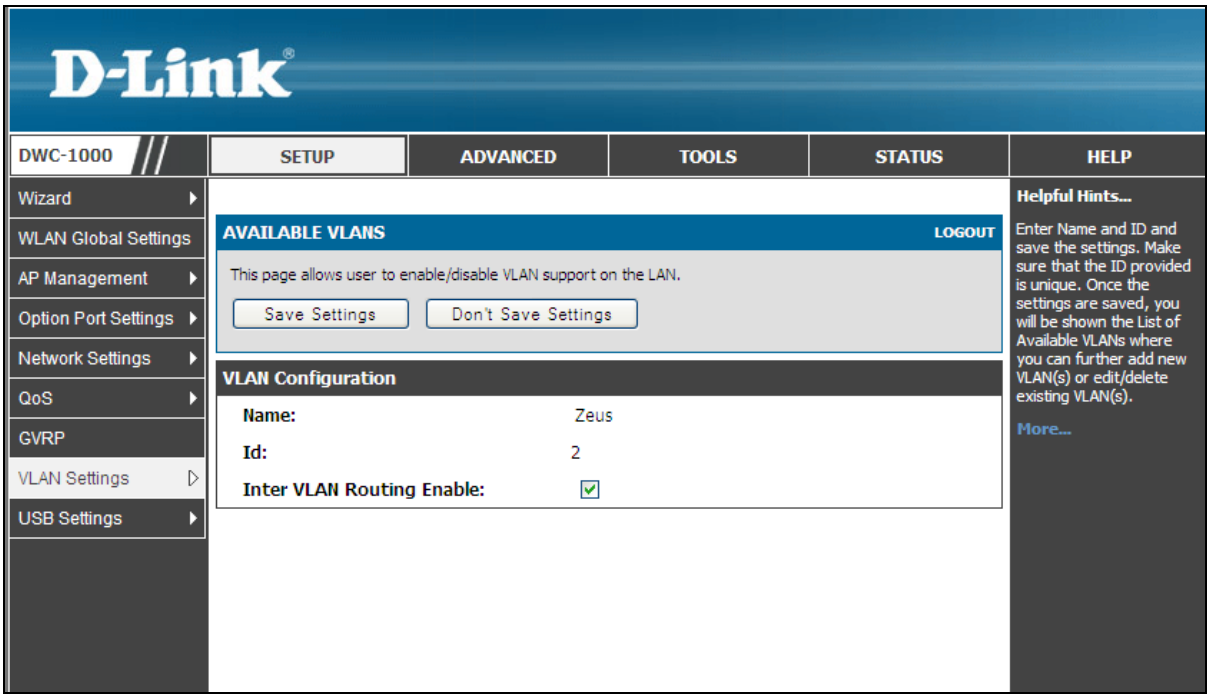
After you add VLANs, there is only one setting you can change: inter-VLAN routing, which allows or prevents communications between VLANs.

To edit a VLAN:

1. Click **SETUP > VLAN Settings > Available VLANs**. The AVAILABLE VLANs page appears.



2. Under **List of available VLANs**, click the VLAN you want to edit and click **Edit**. The following page appears.



3. Change the **Inter VLAN Routing Enable** setting as desired (see Table 4-1 on page 61).
4. Click **Save Settings**.

Deleting VLANs

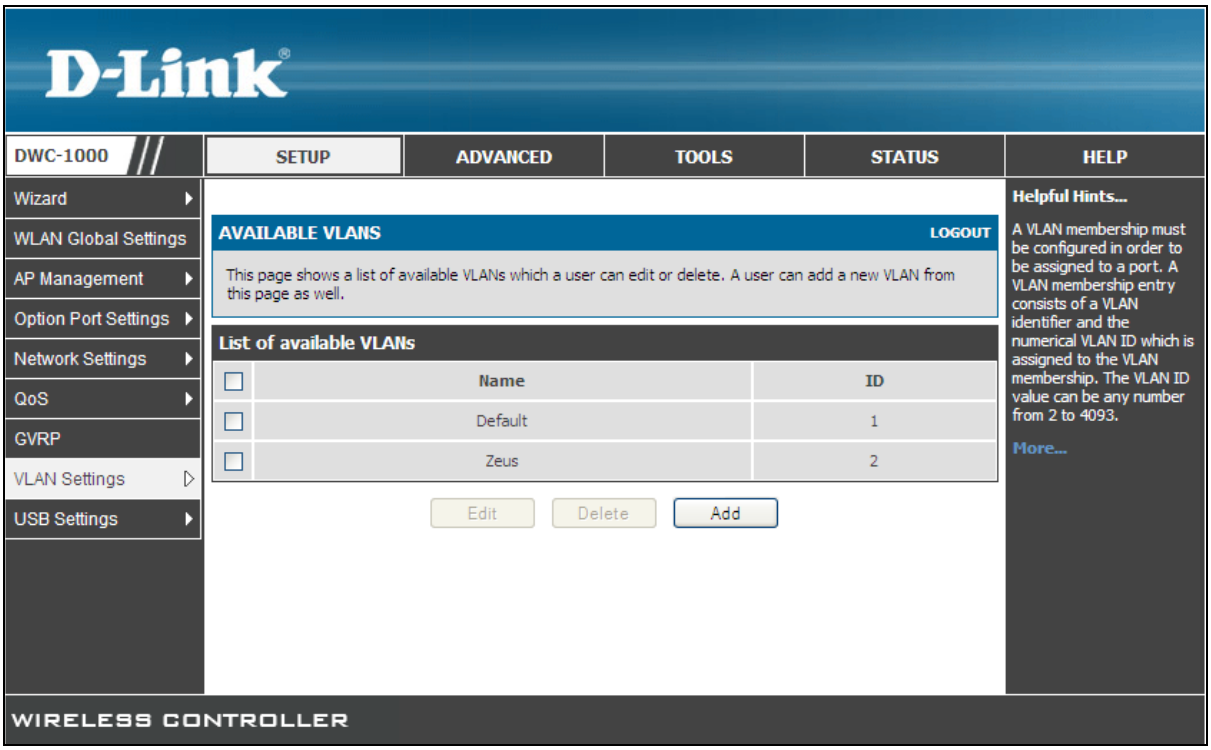
Path: SETUP > VLAN Settings > Available VLANs

If you no longer need a VLAN, you can delete it.

Note: A precautionary message does not appear before you delete a VLAN. Therefore, be sure you do not need a VLAN before you delete it.

To delete a VLAN:

1. Click **SETUP > VLAN Settings > Available VLANs**. The AVAILABLE VLANs page appears.



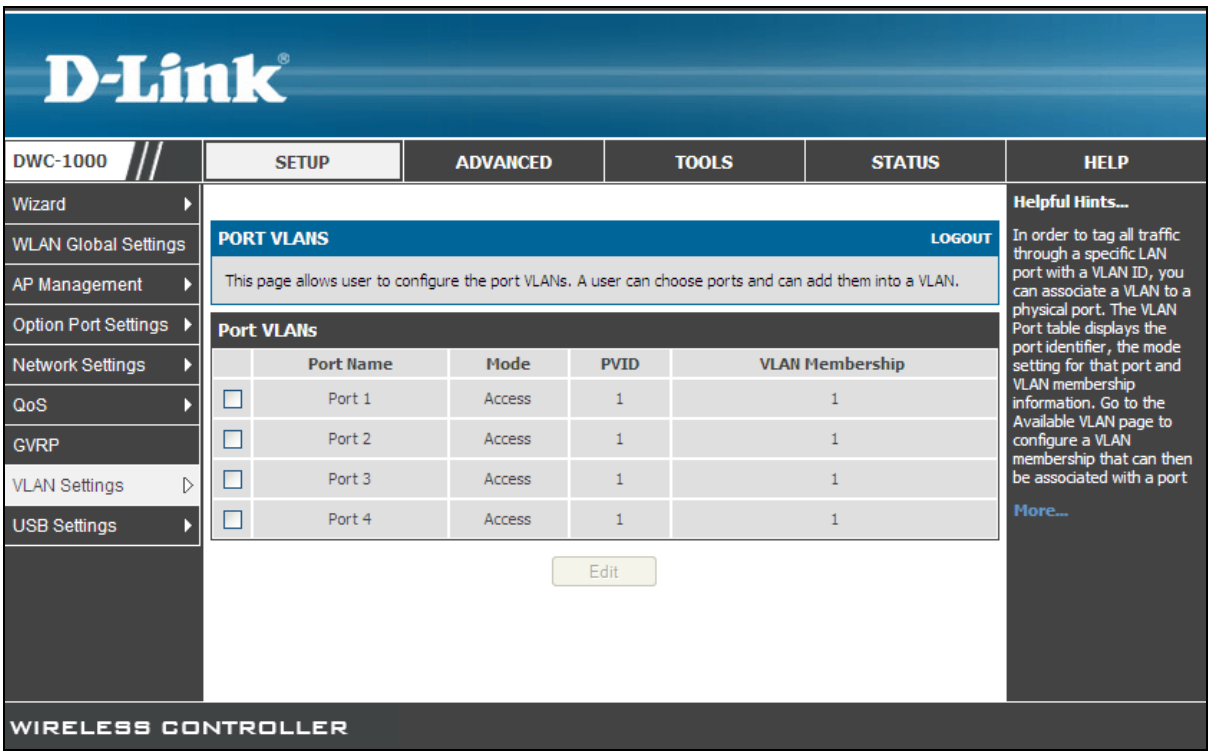
2. Under **List of available VLANs**, click the VLAN you want to delete. (Or click the box next to **Name** to select all VLANs.)
3. Click **Delete**. The selected VLAN is deleted.

Port VLANs

Path: SETUP > VLAN Settings > Port VLAN

After you enable the wireless controller's VLAN function, use the PORT VLANS page to configure the ports participating in the VLAN.

1. Click **SETUP > VLAN Settings > Port VLAN**. The PORT VLAN page appears.



MultiVLAN Subnets

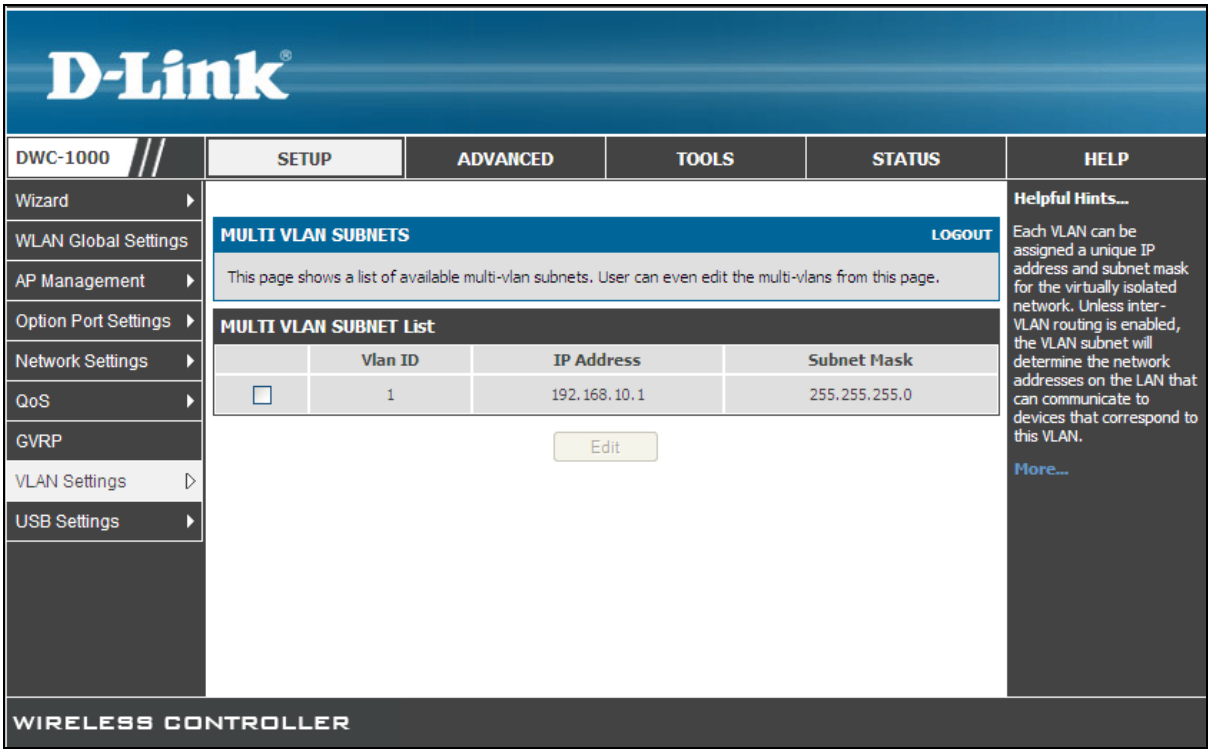
Path: SETUP > VLAN Settings > Multiple VLAN Subnets

Each VLAN can be assigned a unique IP address and subnet mask for the virtually isolated network. Unless you enabled inter-VLAN routing for the VLAN, the VLAN subnet determines the network address on the LAN that can communicate with the devices that correspond to the VLAN.

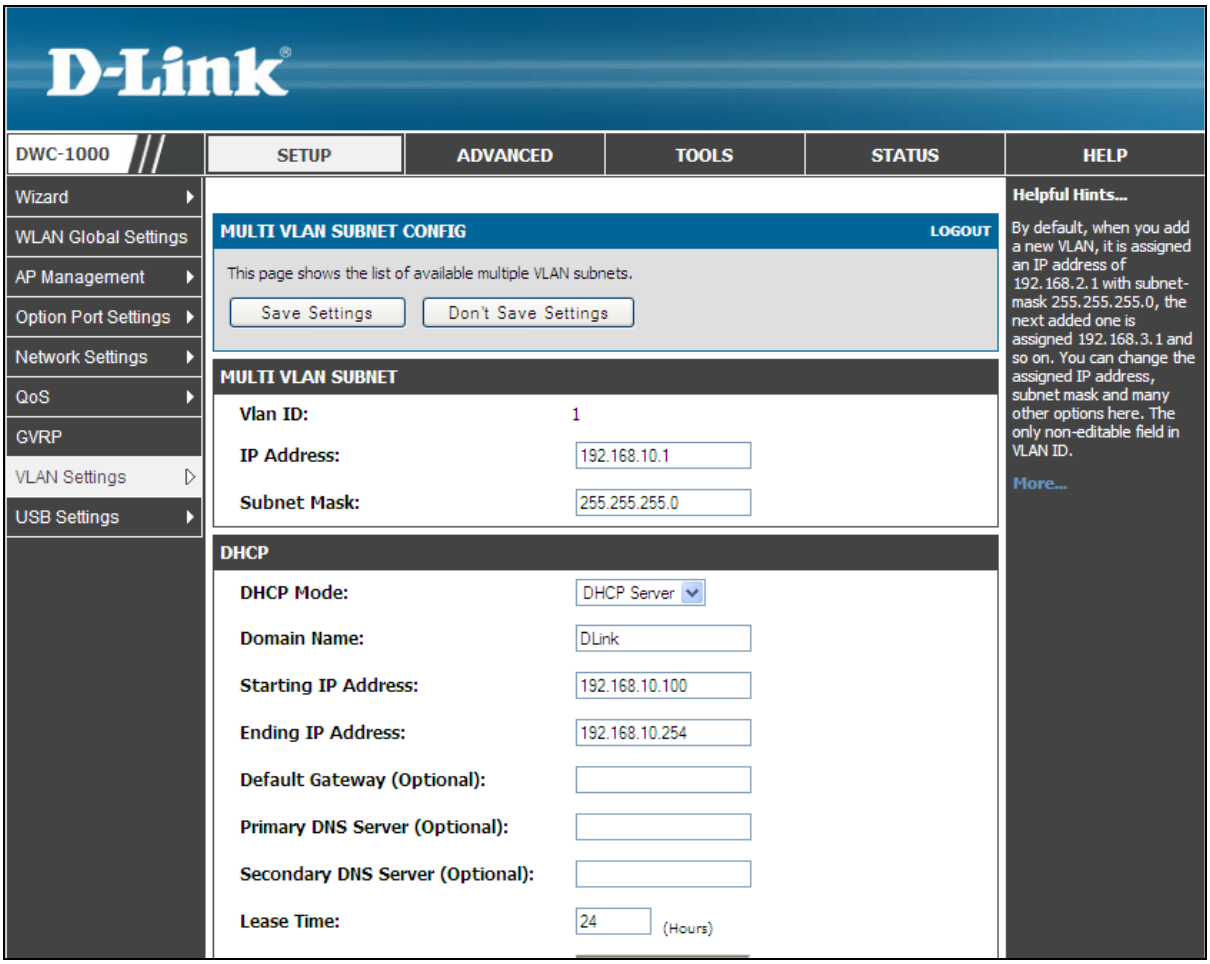
Using the MULTI VLAN SUBNETS page, you can view and edit the available multi-VLAN subnets.

To view and edit the available multi-VLAN subnets:

1. Click **SETUP > VLAN Settings > Multiple VLAN Subnets**. The MULTI VLAN SUBNETS page appears.



2. To edit a multi-subnet VLAN, check it and click **Edit**. The MULTI VLAN SUBNET CONFIG page appears with the settings for the selected VLAN.



3. Edit the settings as desired (see 67).
4. Click **Save Settings**.

Table 4-2. Fields on the MULTI VLAN SUBNET CONFIG Page

Field	Description
MULTI VLAN SUBNET	
VLAN ID	Read-only field that shows the ID you assigned to the VLAN when you created it.
IP Address	Enter the IP address for the VLAN.
Subnet Mask	Enter the subnet mask for the VLAN.
DHCP	
DHCP Mode	Select a DHCP mode for the VLAN. Choices are: • None = select this setting if the computers on the LAN are configured with static IP addresses or are configured to use another DHCP server. The remaining fields become unavailable. • DHCP Server = select this setting to use the wireless controller as a DHCP server. Complete the remaining settings on the page. • DHCP Relay = if you select this setting, you need only enter the relay gateway information.
Domain Name	Enter the domain name for the VLAN.

Field	Description
MULTI VLAN SUBNET	
Starting IP Address	Enter the starting IP address in the IP address pool. Any new DHCP client joining the LAN is assigned an IP address within the starting and ending IP address range. Starting and ending IP addresses should be in the same IP address subnet as the wireless controller's LAN IP address.
Ending IP Address	Enter the ending IP address in the IP address pool.
Default Gateway (Optional)	Enter the IP address of the gateway for your LAN.
Primary DNS Server (Optional)	If configured domain name system (DNS) servers are available on the VLAN, enter the IP address of the primary DNS server.
Secondary DNS Server (Optional)	If configured domain name system (DNS) servers are available on the VLAN, enter the IP address of the secondary DNS server.
Lease Time	Enter a time interval, in hours, that a DHCP client can use the IP address that it receives from the DHCP server. When the lease time is about to expire, the client sends a request to the DHCP server to get a new lease.
Relay Gateway	Enter the gateway address. This is the only configuration parameter required in this section when DHCP Mode = DHCP Relay.
LAN Proxy	
Enable DNS Proxy	Enables or disables DNS proxy on this LAN. The feature is particularly useful in Auto Rollover mode. For example, if the DNS servers for each connection are different, a link failure can render the DNS servers inaccessible. However, when the DNS proxy is enabled, clients can make requests to the wireless controller and the controller, in turn, sends those requests to the DNS servers of the active connection. Choices are: • Checked = wireless controller acts as a proxy for all DNS requests and communicates with the ISP's DNS servers (as configured in the Option settings page). All DHCP clients receive the primary and secondary DNS IP addresses, along with the IP address where the DNS proxy is running (i.e., the wireless controller's LAN IP). • Unchecked = all DHCP clients receive the DNS IP addresses of the ISP, excluding the DNS proxy IP address.

DMZ Settings

The wireless controller allows an Option port to be configured as a secondary Ethernet port or dedicated Demilitarized Zone (DMZ) port. A DMZ allows one IP address (computer) to be exposed to the Internet for activities such as Internet gaming and videoconferencing.

Configuring DMZ settings is a 2-step process:

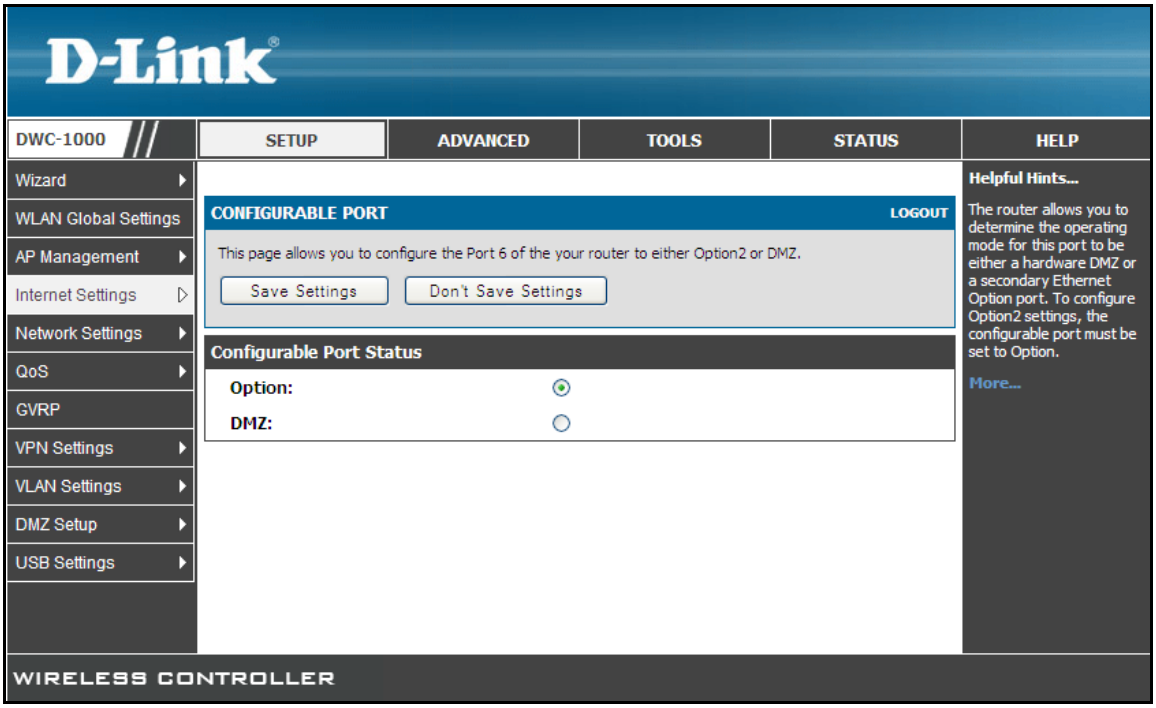
1. Configure the wireless controller port to act as a DMZ (see “Configuring a Port to Operate as a DMZ,” below), and
2. Configure the DMZ settings for the port (see “Configuring DMZ Settings” on page 70).

Configuring a Port to Operate as a DMZ

Path: SETUP > Internet Settings > Configurable Port

To configure a port to operate as a DMZ:

1. Click **SETUP > Internet Settings > Configurable Port**. The CONFIGURABLE PORT page appears.



2. Under **Configurable Port Status**, click **DMZ**.
3. Click **Save Settings**.

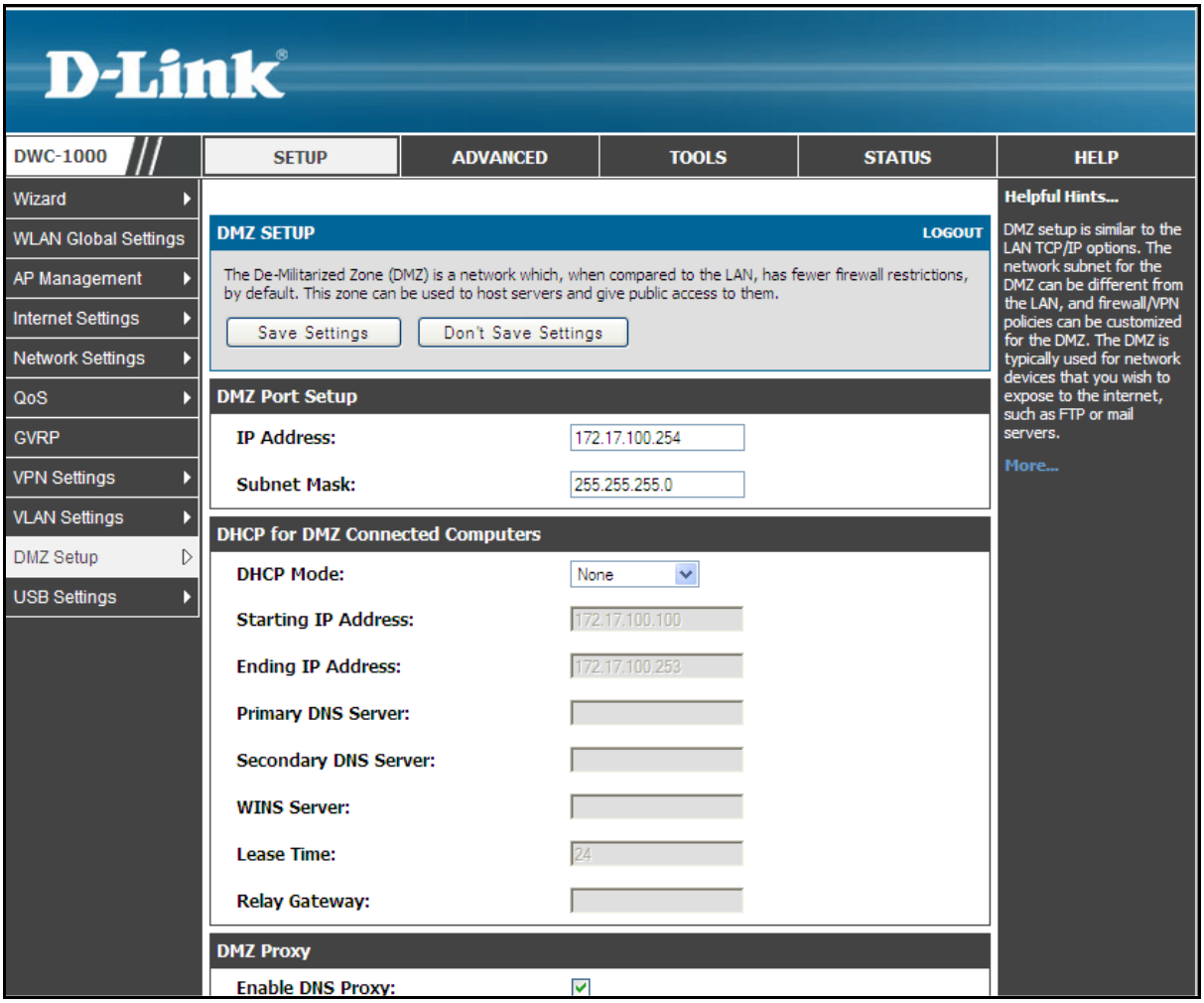
Configuring DMZ Settings

Path: SETUP > DMZ Setup > DMZ Setup Configuration

After you change the configurable port status to DMZ, use the following procedure to configure DMZ settings.

Note: Your wireless controller may not display VPN-related menu options without the DWC-1000-VPN-LIC License Pack (see “Licenses” on page 19).

1. Click **SETUP > DMZ Setup > DMZ Setup Configuration**. The DMZ SETUP page appears.



2. Complete the fields in the page (see Table 4-3).
3. Click **Save Settings**.

Table 4-3. Fields on the DMZ SETUP Page

Field	Description
DMZ Port Setup	
IP Address	Enter the IP address assigned to the wireless controller's DMZ interface.
Subnet Mask	Enter the subnet mask assigned to the wireless controller's DMZ interface.
DHCP for DMZ Connected Computers	
DHCP Mode	Select a DHCP mode for the DMZ. Choices are: • None = select this setting if the computers on the DMZ are configured with static IP addresses or are configured to use another DHCP server. The remaining fields become unavailable. • DHCP Server = select this setting to use the wireless controller as a DHCP server. Complete the remaining settings on the page. • DHCP Relay = if you select this setting, you need only enter the relay gateway information.
Starting IP Address	Enter the first IP address in the range. Any new DHCP client joining the LAN will be assigned an IP address between this address and the Ending IP Address. The Starting IP addresses should be in the same network as the LAN TCP/IP address of the wireless controller.
Ending IP Address	Enter the last IP address in the range. Any new DHCP client joining the LAN will be assigned an IP address between this address and the Ending IP Address. The Ending IP addresses should be in the same network as the LAN TCP/IP address of the wireless controller.
Primary DNS Server	Enter the IP address of the primary DNS server.
Secondary DNS Server	Enter the IP address of a secondary DNS server.
WINS Server	(Optional) Windows Internet Naming Service (WINS) is equivalent to a DNS server, but uses the NetBIOS protocol to resolve hostnames. If the network consists only of Windows-based computers and you want to use a WINS server for name resolution, enter the IP address of the WINS server. The router will include the WINS server IP address in the DHCP configuration when acknowledging a DHCP request from a DHCP client.
Lease Time	Enter the duration, in hours, for which IP addresses will be leased to clients.
Relay Gateway	Enter the gateway address. This is the only configuration parameter required in this section when DHCP Relay is selected as its DHCP mode.
DMZ Proxy	
Enable DNS Proxy	Enables or disables DNS proxy on this LAN. Choices are: • Checked = enable DNS proxy on this LAN. The wireless controller acts as a proxy for all DNS requests and communicates with the ISP's DNS servers (as configured in the Option settings page). All DHCP clients receive the Primary/Secondary DNS IP along with the IP address, where the DNS Proxy is running, i.e. the box's LAN IP. All DHCP clients receive the DNS IP addresses of the ISP, excluding the DNS Proxy IP address when it is disabled. The feature is useful in Auto Rollover mode. For example, if the DNS servers for each connection are different, then a link failure may render the DNS servers inaccessible. However, when the DNS proxy is enabled, then clients can make requests to the wireless controller and the controller, in turn, sends those requests to the DNS servers of the active connection. • Unchecked = disable DNS proxy on this LAN.

Static Routing

A static route tells network devices about an exact, fixed (hard-coded) destination. Static routes can work well with small networks. Configuring your wireless controller for static routing allows data transfers between it and a routing device without needing to use dynamic routing protocols.

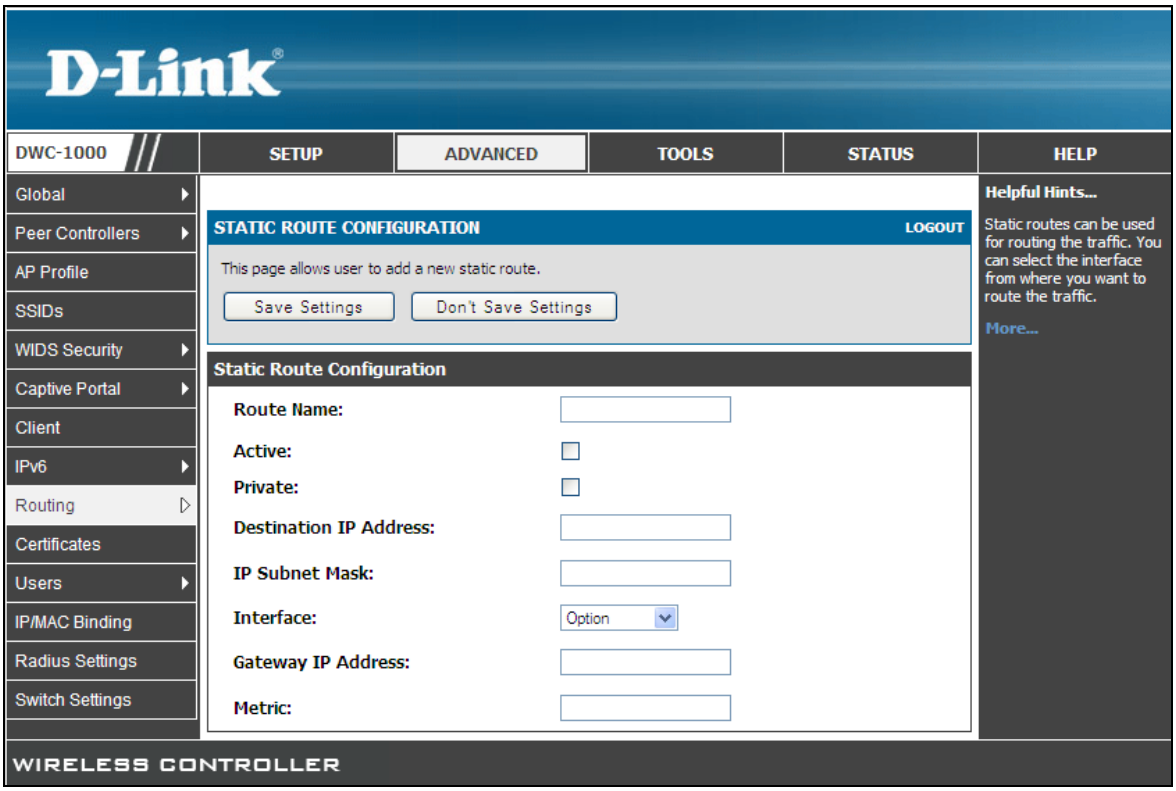
Adding a Static Route

Path: ADVANCED > Routing > Static Routing

To add a static route:

1. Click **ADVANCED > Routing > Static Routing**. The STATIC ROUTING page appears.

2. Click **Add**. The STATIC ROUTE CONFIGURATION page appears.



3. Complete the fields in the page (see Table 4-4).
4. Click **Save Settings**.

Table 4-4. Fields on the STATIC ROUTE CONFIGURATION Page

Field	Description
Route Name	Enter a unique name for this static route. The name should allow you to easily identify this static route from others you may add.
Active	Activates or deactivates the status route. Choices are: • Checked = activate static route. • Unchecked = deactivate static route.
Private	Designates the static route as private. Choices are: • Checked = static route is private. • Unchecked = static route is not private.
Destination IP Address	Enter the IP address of the static route's destination.
IP Subnet Mask	Enter the subnet mask of the static route.
Interface	Select the wireless controller interface that will interface to the static route. Choices are: • Option = the wireless controller's Option port will interface to the static route. • LAN > VLAN = the wireless controller's LAN or VLAN port will interface to the static route.
Gateway IP Address	Enter the IP address of the gateway router, which is the next hop address for the wireless controller.
Metric	Enter the administrative distance of the route.

Editing Static Routes

Path: ADVANCED > Routing > Static Routing

After you add static routes, you can edit it if you need to change settings.

To edit a static route:

1. Click **ADVANCED > Routing > Static Routing**. The STATIC ROUTING page appears.

2. Under **List of available static routes**, click the static route you want to edit and click **Edit**.
3. Change the desired settings (see Table 4-4 on page 73).
4. Click **Save Settings**.

Deleting Static Routes

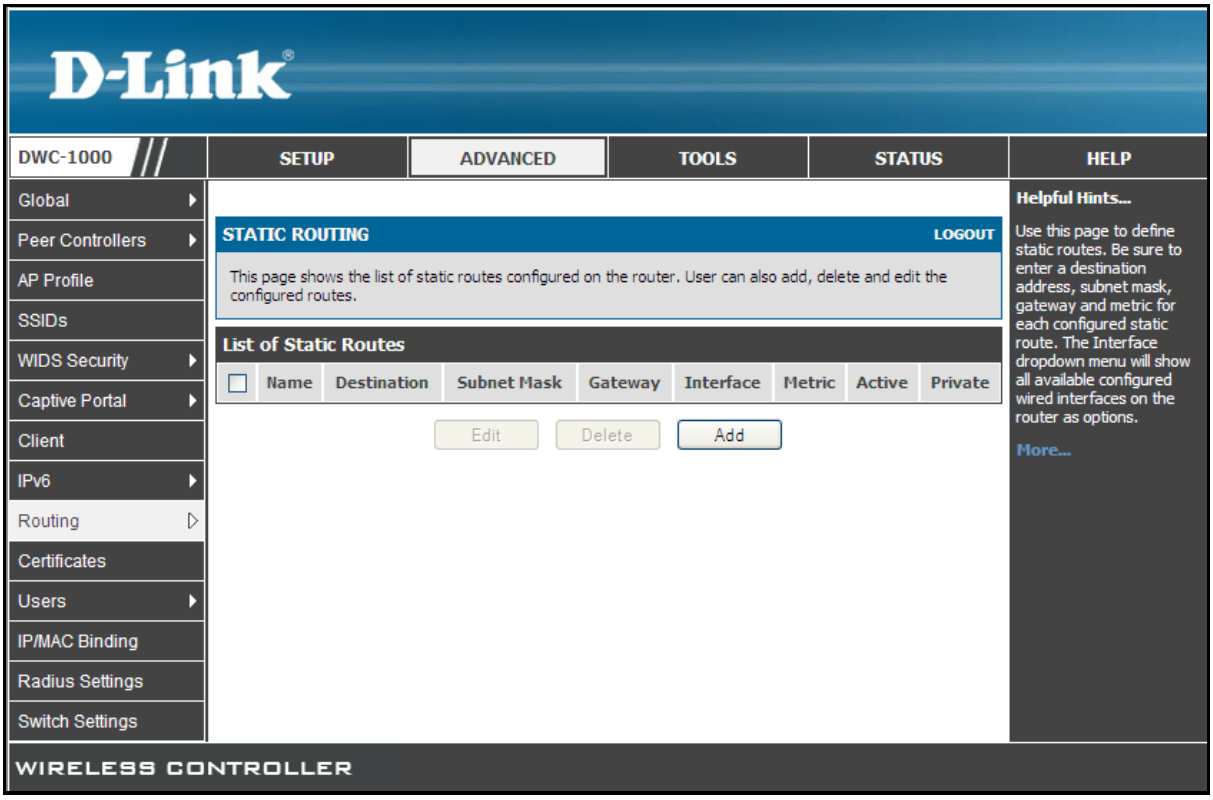
Path: ADVANCED > Routing > Static Routing

If you no longer need a static route, you can delete it.

Note: A precautionary message does not appear before you delete a static route. Therefore, be sure you do not need a static route before you delete it.

To delete a static route:

1. Click **ADVANCED > Routing > Static Routing**. The STATIC ROUTING page appears.



2. Under **List of available Static Routes**, click the static route you want to delete. (Or click the box next to **Name** to select all static routes.)
3. Click **Delete**. The selected static route is deleted.

Auto-Failover Settings

Path: SETUP > Internal Settings > Option Mode

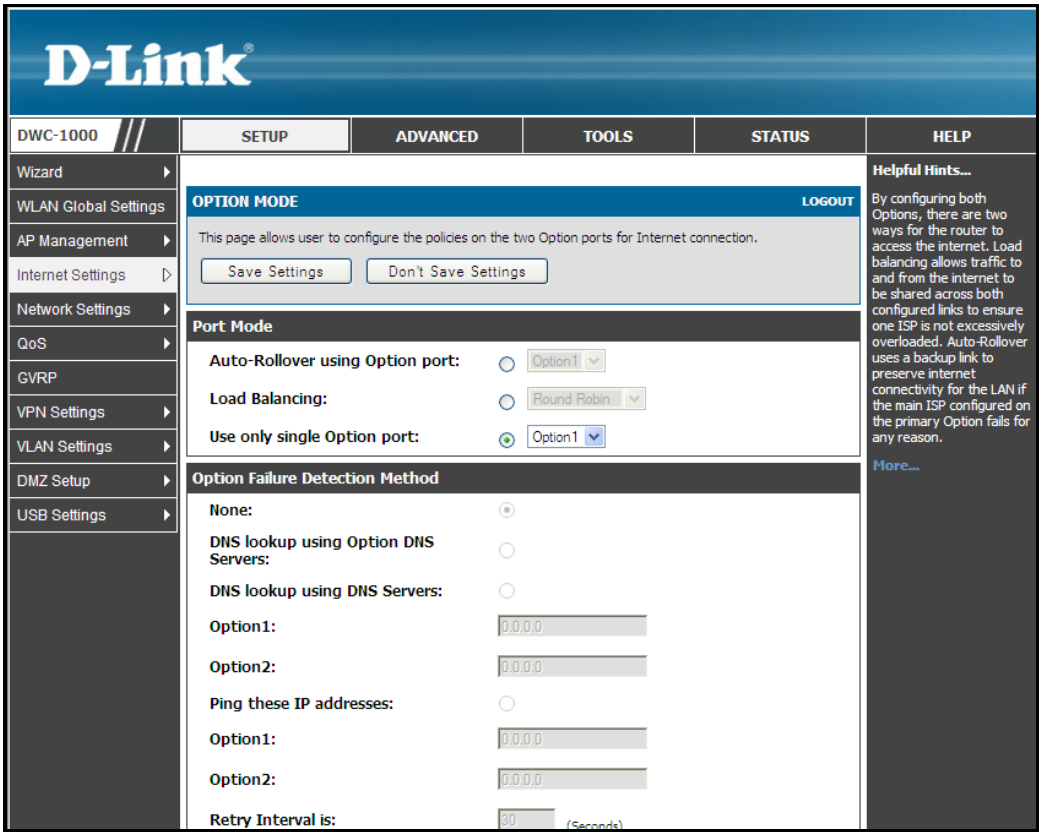
You can configure two Option ports to form a redundancy group. You then designate one Option port as the primary Internet link and the other as the secondary port. If the primary port fails or is disconnected from the network, an automatic failover to the redundant port occurs. The Option port then takes over all functions of the primary port.

The wireless controller supports auto-failover when:

- A D-Link VPN license key has been installed (see “Activating Licenses” on page 211).
- Multiple Option ports are configured.

To configure the wireless controller for auto-failover:

1. Click **SETUP > Internal Settings > Option Mode**. The OPTION MODE page appears.



2. Under **Port Mode**, click **Auto-Rollover using Option port**. Then use the adjacent drop-down list to select the Option port that will be used as the failover port in case the primary port encounters a problem

3. Complete the settings under **Option Failure Detection Method** (see Table 4-5).
4. Click **Save Settings**.

Table 4-5. Option Failure Detection Method Fields

Field	Description
None	Wireless controller does not check for link failures.
DNS lookup using Option DNS Servers	Detects failure of an Option link using the DNS servers configured in the Dedicated WAN or Configurable Port WAN pages under the Networking menu.
DNS lookup using DNS Servers	Detects failure of an Option link using the DNS servers whose IP addresses you specify in the Option 1 and Option 2 fields.
Option 1	If DNS lookup using DNS Servers is selected, enter the IP address of the first DNS server that will check for link failures.
Option 2	If DNS lookup using DNS Servers is selected, enter the IP address of a second DNS server that will check for link failures.
Ping these IP addresses	Detects Option failures by pinging the IP addresses you specify in the Option 1 and Option 2 fields.
Option 1	If Ping these IP addresses is selected, enter the first IP address to be pinged if a link failure occurs.
Option 2	If Ping these IP addresses is selected, enter a second IP address to be pinged if a link failure occurs.
Retry Interval is	Enter a number that tells the wireless controller how often, in seconds, to run the failure detection method(s) configured above.
Failover after	Enter the number of retries the wireless controller attempts before initiating failover.

Load Balancing Settings

Path: SETUP > Internal Settings > Option Mode

The wireless controller supports load balancing when:

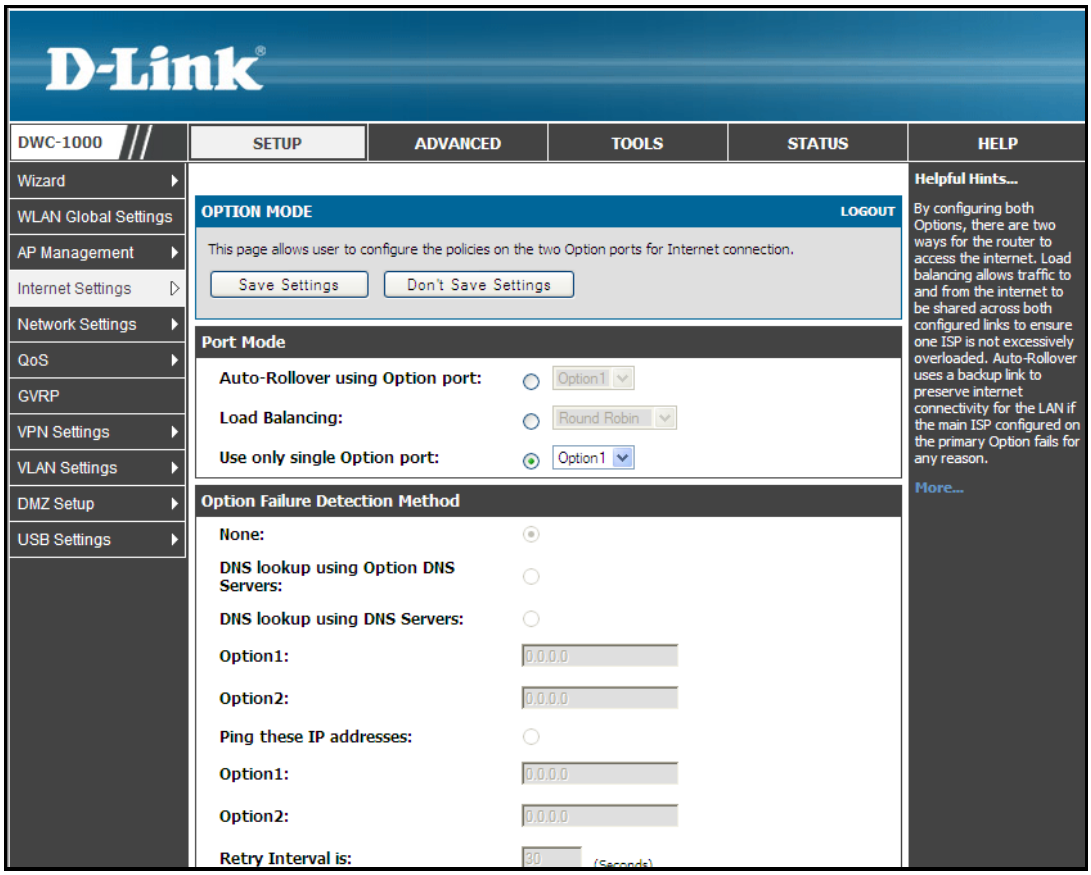
- A D-Link VPN license key has been installed (see “Activating Licenses” on page 211).
- Multiple Option ports are configured.
- Protocol bindings have been configured (go to **ADVANCED > Routing > Protocol Bindings** and refer to the online help).

Load balancing allows the wireless controller to distribute traffic among multiple Option ports. The wireless controller supports the following types of load-balancing methods:

- **Round Robin** – divides traffic equally among all Option ports. This selection is useful when the connection speed of one Option port differs greatly from another. In this case you can define protocol bindings to route low-latency services (such as VOIP) over the higher-speed link and let low-volume background traffic (such as SMTP) go over the lower speed link.
- **Spillover Mode** – configures the Option port as a dedicated link until a user-defined load tolerance or link bandwidth threshold is reached. If the link bandwidth exceeds the threshold, the wireless controller directs the next connections to the secondary Option port.

To configure the wireless controller for load balancing:

1. Click **SETUP > Internal Settings > Option Mode**. The OPTION MODE page appears.



2. Under **Port Mode**, click **Load Balancing**. Then use the adjacent drop-down list to select one of the following port balancing methods:
   - **Round Robin** – new connections to the Internet alternate between available links. If you select this setting, complete the **Option Failure Detection Method** settings (see Table 4-5 on page 77).
   - **Spillover Mode** – a single Option link is used for all connections until the bandwidth threshold is reached, after which point the other Option link is used for new connections. If you select this setting, complete the **Option Failure Detection Method** settings (see Table 4-5) and **SPILLOVER CONFIRMATION** settings (see Table 4-6).
3. Click **Save Settings**.

Table 4-6. SPILLOVER CONFIGURATION Fields

Field	Description
Load Tolerance	Enter the percentage of maximum bandwidth after which the wireless controller switches to the secondary Option port.
Max Bandwidth	Enter the maximum bandwidth tolerable by the Primary Option. If the bandwidth falls below the load tolerance value of configured Max Bandwidth, the wireless controller switches to the secondary Option port.

Additional Advanced Configuration Settings

The wireless controller provides more advanced configuration settings than covered in this chapter. The following table describes these settings. For more information, go to the page in the web management interface and then access the wireless controller online help in the **Helpful Hints** area (see Figure 3-1 on page 32).

Note: Asterisks in the table below indicate advanced configuration settings that require a DWC-1000-VPN-LIC License Pack.

Advanced Configuration Setting	Path
Advertisement prefixes	ADVANCED > IPv6 > IPv6 LAN > Advertisement Prefixes
Application rules*	ADVANCED > Application Rules > Application Rules
Application rules status*	ADVANCED > Application Rules > Application Rules Status
Auto VOIP	SETUP > QoS > LAN QoS > Auto VOIP
Configuration items	ADVANCED > Peer Controllers > Configuration Items
Configuration request status	ADVANCED > Peer Controllers > Configuration Request Status
Date and Time	TOOLS > Date and Time
DHCP v6 leased clients	ADVANCED > IPv6 > IPv6 LAN > DHCPv6 Leased Clients
Distributed tunneling	ADVANCED > Global > Distributed Tunneling
DMZ DHCP reserved leased clients	SETUP > DMZ Setup > DMZ DHCP Leased Clients
DMZ DHCP reserved IPs	SETUP > DMZ Setup > DMZ DHCP Reserved IPs
Double VLANs	SETUP > VLAN Settings > Double VLAN
Firmware via USB	TOOLS > Firmware via USB
Flow control	SETUP > QoS > LAN QoS > Flow Control
Get user database to the router	ADVANCED > Users > Get Users DB
GVRP	SETUP > GVRP
IGMP	ADVANCED > Advanced Network > IGMP Setup
IP aliasing*	SETUP > Internet Settings > IP Aliasing
IP/MAC binding	ADVANCED > IP/MAC Binding
IP mode	ADVANCED > IPv6 > IP Mode
IP option configuration	ADVANCED > IPv6 > IP Config
IP v6 LAN configuration	ADVANCED > IPv6 > IPv6 LAN > IPv6 LAN Config
IP v6 options*	ADVANCED > IPv6 > IPv6 LAN > IPv6 Option 1 Config ADVANCED > IPv6 > IPv6 LAN > IPv6 Option 2 Config

Advanced Configuration Setting	Path
LAN DHCP leased clients	SETUP > Network Settings > LAN DHCP Leased Clients
LAN DHCP reserved IPs	SETUP > Network Settings > LAN DHCP Reserved IPs
MAC-based VLANs	SETUP > VLAN Settings > MAC-based VLAN > MAC VLAN
Option mode*	SETUP > Internet Settings > Option Mode
Option port setup	SETUP > Option Port Settings > Option Setup ADVANCED > Advanced Network > Option Port Setup*
Option port status	SETUP > Option Port Settings > Option Status ADVANCED > Advanced Network > Option Port Setup*
Option QoS configuration	SETUP > QoS > LAN QoS > Policy based LAN QoS
OSPF	ADVANCED > Routing > OSPF ADVANCED > IPv6 > OSPF
Peer controller configuration request status*	ADVANCED > Peer Controllers > Configuration Request Status
Peer controller configuration items*	ADVANCED > Peer Controllers > Configuration Items
Policy-based QoS	SETUP > Option Port Settings > Option Status
Port shaping	SETUP > QoS > LAN QoS > Port Shaping Rule
Protocol bindings	ADVANCED > Routing > Protocol Bindings
Protocol VLANs	SETUP > VLAN Settings > Protocol VLAN
Queue management	SETUP > QoS > LAN QoS > Queue Management
Queue scheduler	SETUP > QoS > LAN QoS > Queue Scheduler
Remark CoS to DSCP	SETUP > QoS > Remark CoS to DSCP.
Router advertisement	ADVANCED > IPv6 > IPv6 LAN > Router Advertisement
Routing mode*	SETUP > Internet Settings > Routing Mode
SNMP settings	TOOLS > Admin > SNMP
SNMP traps	ADVANCED > Global > SNMP Trap
Switch settings (including jumbo frames and power savings)	ADVANCED > Switch Settings
System check	TOOLS > System Check
Universal Plug and Play	ADVANCED > Advanced Network > UPnP
Voice VLANs	SETUP > VLAN Settings > MAC-based VLAN > Voice VLAN
WLAN global settings	SETUP > WLAN Global Settings

5. SECURING YOUR NETWORK

The wireless controller supports a number of features for securing your network. This chapter describes the following commonly used security features:

- Managing Clients (page 83)
- Content Filtering (page 88)

For information about additional security settings not described in this chapter, see “Additional Security Settings” on page 94.

Note: The procedures in this chapter should only be performed by expert users who understand networking concepts and terminology.

Managing Clients

Using the KNOWN CLIENTS page, you can view wireless clients in the Known Client database. The data base contains wireless client MAC addresses and names. The database is used to retrieve descriptive client names from the RADIUS server and implement MAC authentication.

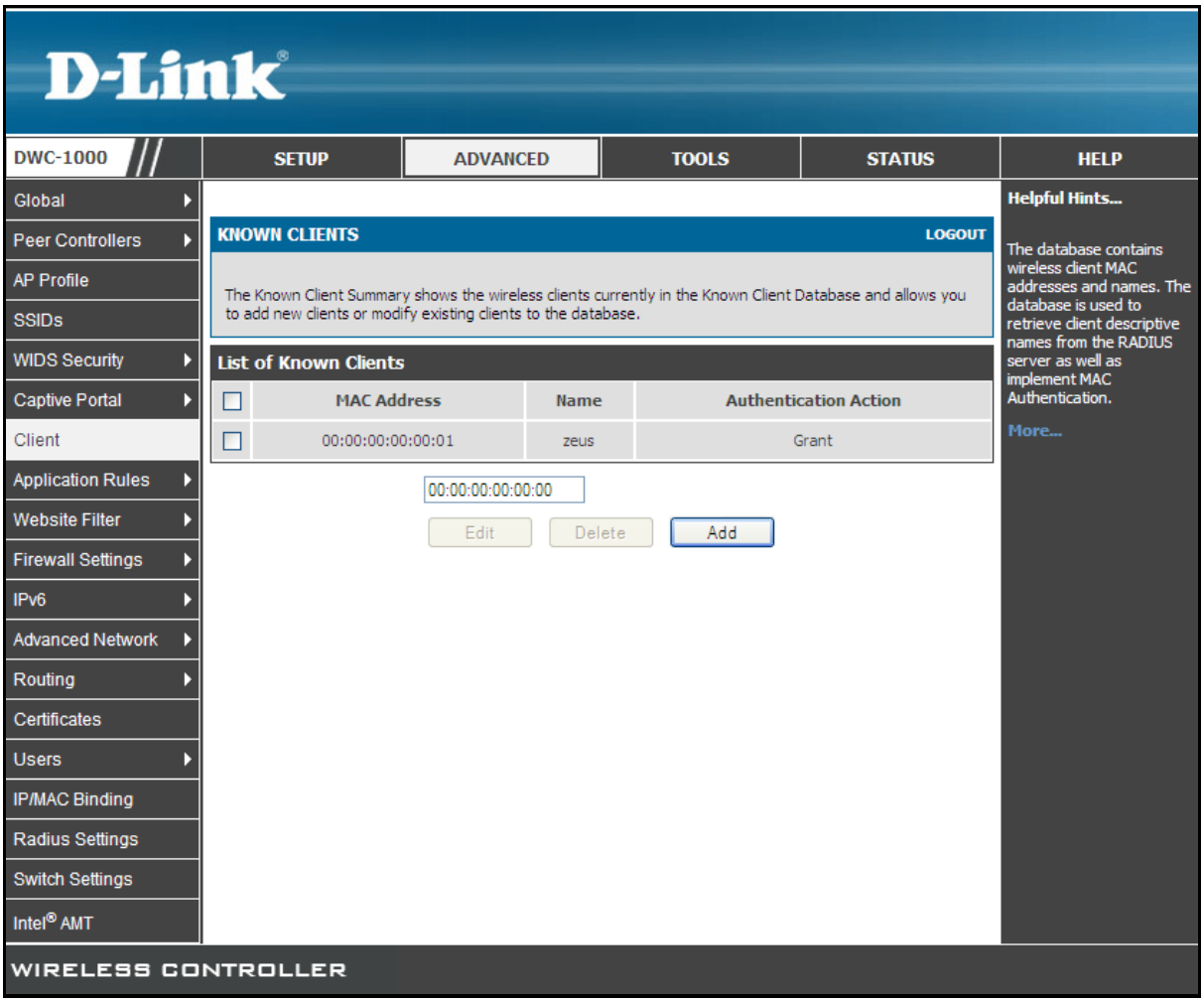
The KNOWN CLIENTS page also lets you add, edit, and delete clients.

Viewing Known Clients and Adding Clients

Path: ADVANCED > Client

To view known clients:

1. Click **ADVANCED > Client**. The KNOWN CLIENTS page appears, with a list of the wireless clients in the Known Client database.



2. Click **Add**. The STATIC ROUTE CONFIGURATION page appears.

3. Complete the fields in the page (see Table 5-1).
4. Click **Save Settings**.

Table 5-1. Fields on the KNOWN CLIENTS Page

Field	Description
MAC Address	Enter the MAC address for the known client.
Name	Enter the name of the known client. The name should allow you to differentiate this known client from others you may add.
Authentication Action	If MAC authentication is enabled on the network, select the action to take on a wireless client. Choices are: • Global Action = use the global white-list or black-list action configured on the Advanced Global Configuration page to determine how to handle the client. • Grant = allow the client with the specified MAC address to access the network. • Deny = prohibit the client with the specified MAC address from accessing the network.

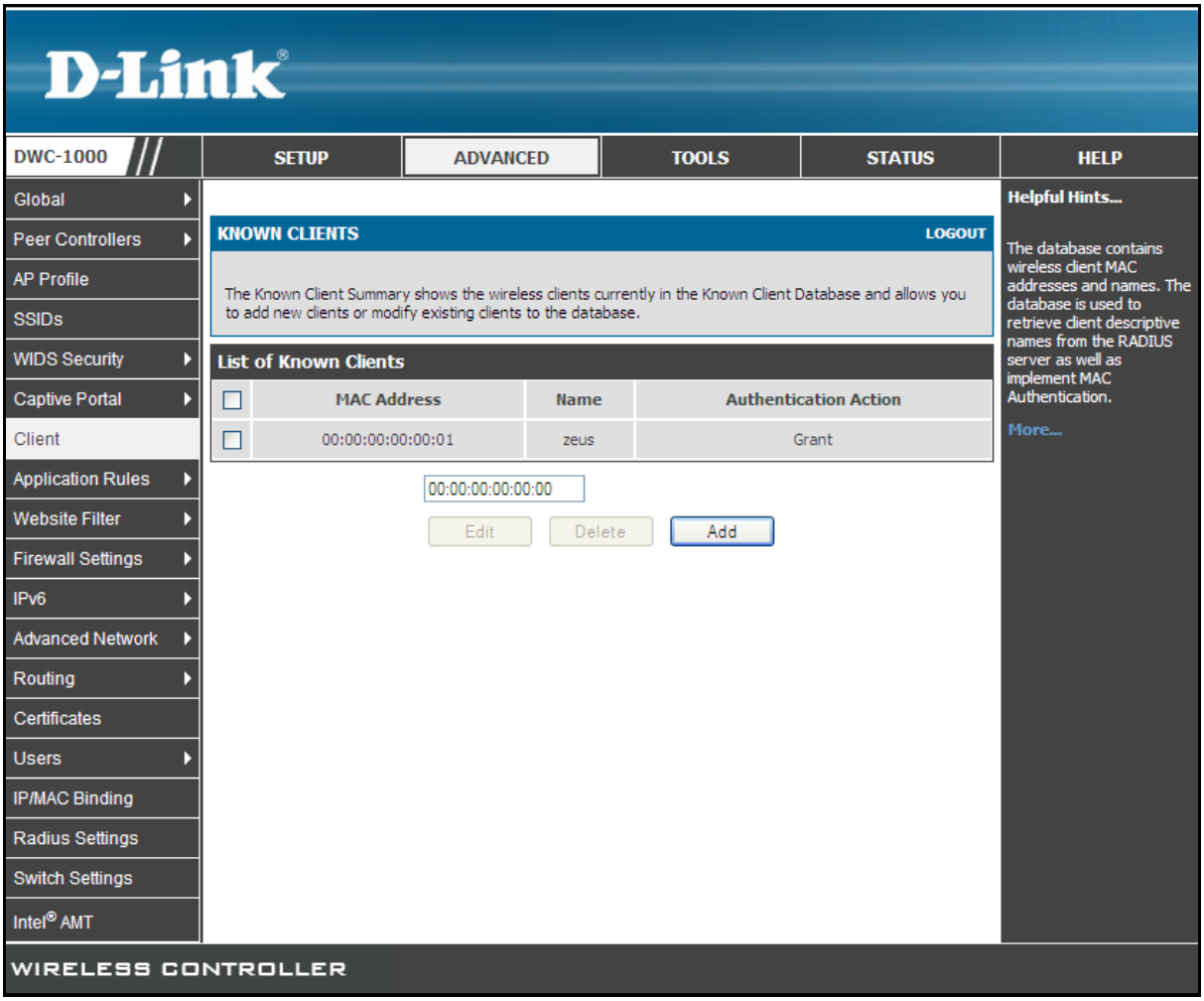
Editing Clients

Path: ADVANCED > Client

After you add clients, you can edit it if you need to change settings.

To edit a client:

1. Click **ADVANCED > Client**. The KNOWN CLIENTS page appears.



2. Under **List of Known Clients**, click the client you want to edit and click **Edit**.
3. Change the desired settings (see Table 5-1 on page 85).
4. Click **Save Settings**.

Deleting Clients

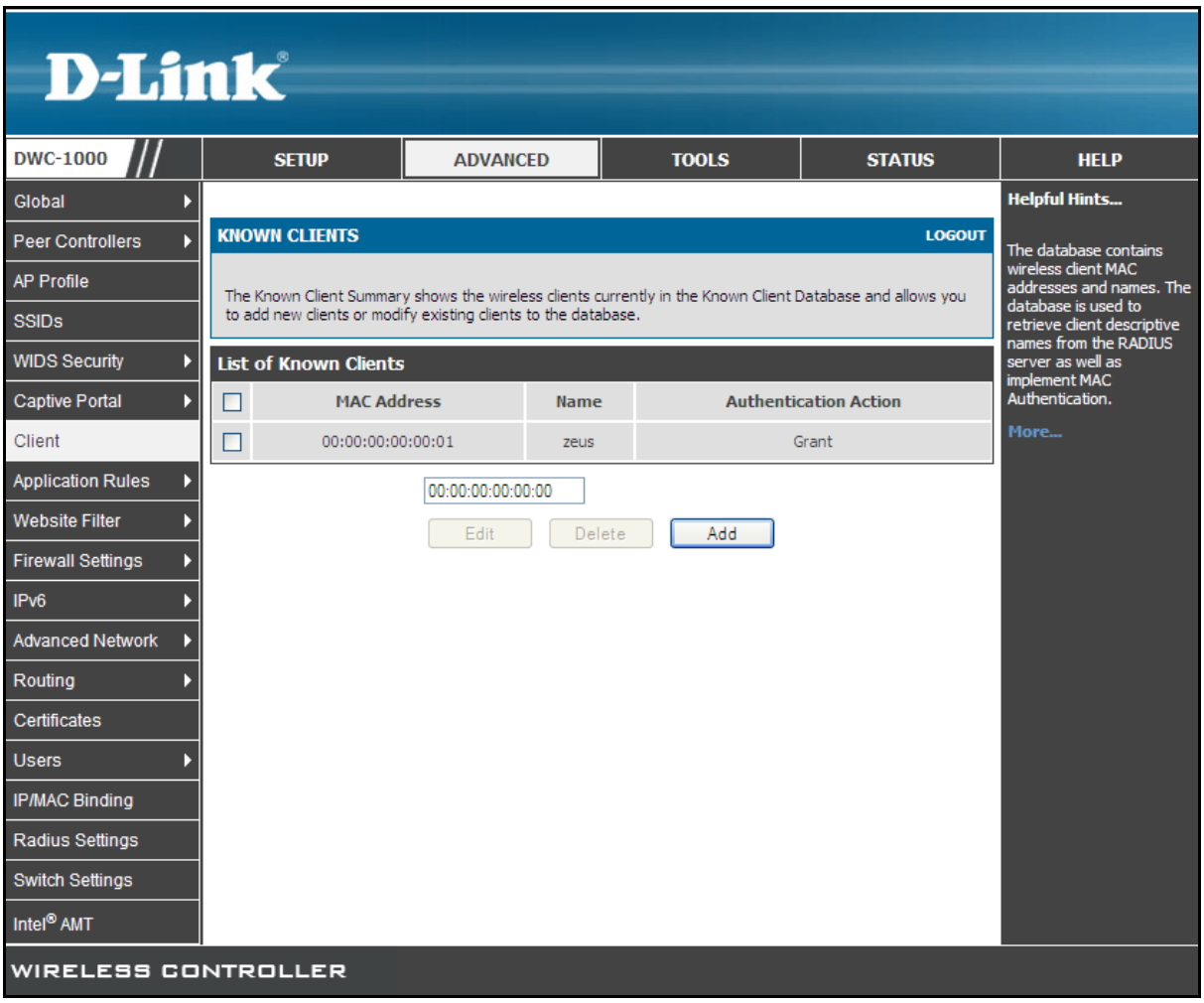
Path: ADVANCED > Client

If you no longer need a client, you can delete it.

Note: A precautionary message does not appear before you delete a client. Therefore, be sure you do not need a client before you delete it.

To delete a client:

1. Click **ADVANCED > Client**. The KNOWN CLIENTS page appears.



2. Under **List of Known Clients**, click the client you want to delete. (Or click the box next to **List of Known Clients** to select all clients.)
3. Click **Delete**. The selected client is deleted.

Content Filtering

The wireless controller lets you control access to specific Web site addresses, URLs, and keywords containing certain words or phrases. Using this feature, you can prevent objectionable content from reaching your PCs.

Enabling Content Filtering

Path: ADVANCED > Website Filter > Content Filtering

By default, the wireless controller's content-filtering function is disabled. Before you can perform content-filtering tasks, enable the wireless controller's content-filtering functions.

To enable content filtering:

1. Click **ADVANCED > Website Filter > Content Filtering**. The CONTENT FILTERING page appears.

2. Under **Content Filtering Configuration**, check **Enable Content Filtering**. The fields under **Web Components** become available.

3. Under **Web Components**, check the Web components you want to subject to parental controls.
4. Click **Save Settings**. Parental control settings are now enabled for the Web components you selected. You can now use the procedures in this section to enforce parental controls.

Specifying Approved URLs

Path: ADVANCED > Website Filter > Approved URLs

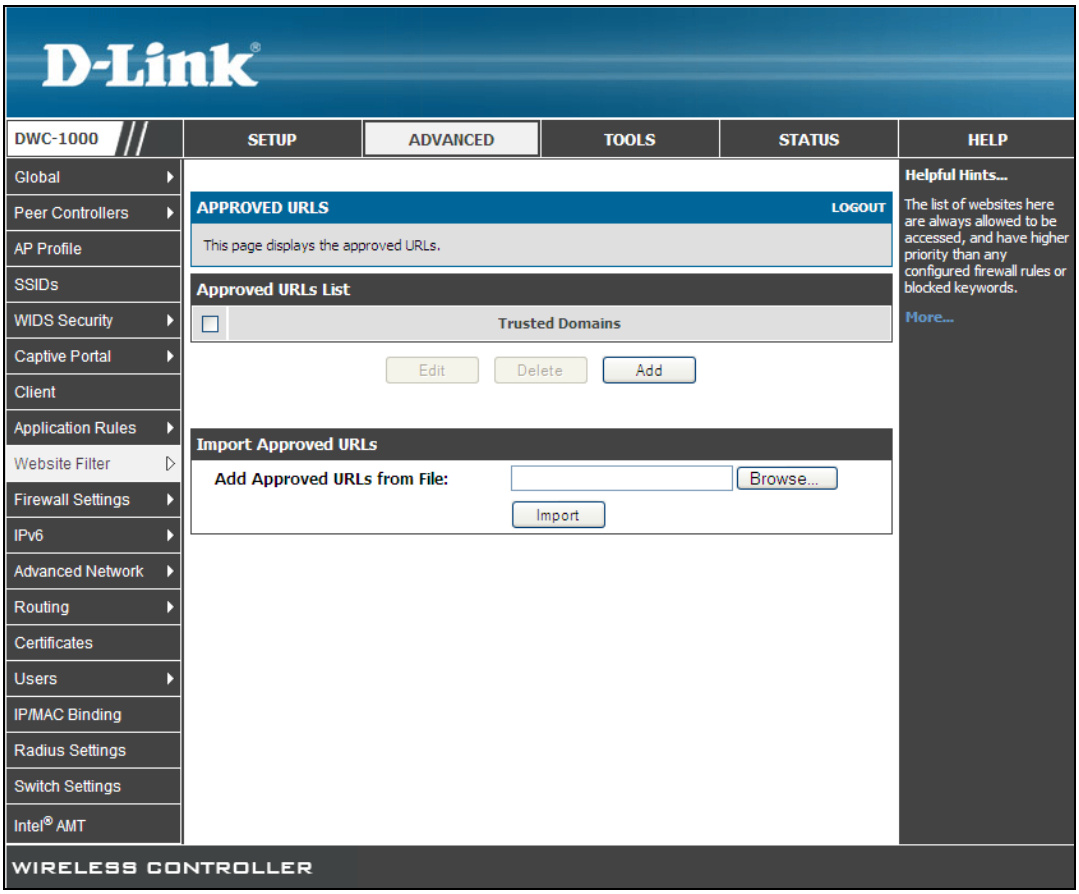
With its content-filtering feature, the wireless controller prevents objectionable content from reaching PCs by screening URLs. Using the APPPROVED URLS page, you can specify the URLs that will not be blocked by parental controls. This page lets you create an acceptance list for all URL domain names that are allowed in any form. For example, if you add **Yahoo** to this list, examples of URLs that are permitted access from the LAN include **www.yahoo.com** and **yahooco.uk**.

URLs can be entered individually or imported from comma-separated-value (CSV) files.

Note: The approved URLs you define here can be exported to a CSV file (see “Exporting Web Filters” on page 92).

To specify approved URLs:

1. Click **ADVANCED > Website Filter > Approved URLs**. The APPROVED URLS page appears.



2. To enter individual URLs, under **Approved URLs List**, click **Add**. When the APPROVED URL CONFIGURATION page appears, enter an approved URL in the **URL** field and click **Save Settings**. Repeat this step for each additional approved URL you want to add.
3. To import a CSV file of URLs, under **Import Approved URLs**, click **Browse**. In the Choose File dialog box, find the file you want to import, click it, and click **Open**. Click **Import** on the **APPROVED URLs** page and click **Save Settings**. Repeat this step for each additional file of approved URLs you want to import.
4. To edit an approved URL, check the URL under **Approved URLs List** and click **Edit**. When the APPROVED URL CONFIGURATION page appears, edit the URL in the **URL** field and click **Save Settings**.
5. To delete an approved URL, check the URL under **Approved URLs List** and click **Delete**. The URL is deleted without displaying a precautionary message.

Specifying Blocked Keywords

Path: ADVANCED > Website Filter > Blocked Keywords

You can use the wireless controller to restrict access to Internet content based on keywords. Up to 32 entries are supported. Keywords can be entered individually or imports from CSV files.

Alternatively, you can configure the wireless controller to block all URLs.

Note: The blocked keywords you define here can be exported to a CSV file (see “Exporting Web Filters” on page 92).

To block all URLs or certain URLs based on keywords:

1. Click **ADVANCED > Website Filter > Blocked Keywords**. The BLOCKED KEYWORDS page appears.

2. To block all URLs, under **Blocked All URL Configuration**, check **Block All URLs**.

3. To enter individual keywords, click **Add** under **Blocked Keywords**. When the APPROVED KEYWORD CONFIGURATION page appears, enter a keyword in the **Blocked Keyword** field and click **Save Settings**. Repeat this step for each additional keyword you want to add.
4. To import a CSV file of keywords, under **Import Blocked Keywords**, click **Browse**. In the Choose File dialog box, find the file you want to import, click it, and click **Open**. Click **Import** on the **BLOCKED KEYWORDS** page and click **Save Settings**. Repeat this step for each additional file of blocked keywords you want to import
5. To edit a keyword, check the keyword under **Blocked Keywords** and click **Edit**. When the APPROVED KEYWORD CONFIGURATION page appears, edit the keyword in the **Blocked Keyword** field and click **Save Settings**.
6. To enable a keyword, check the keyword under **Blocked Keywords** and click **Enable**.
7. To disable a keyword, check the keyword under **Blocked Keywords** and click **Disable**.
8. To delete a keyword, check the keyword under **Blocked Keywords** and click **Delete**. The keyword is deleted without displaying a precautionary message.

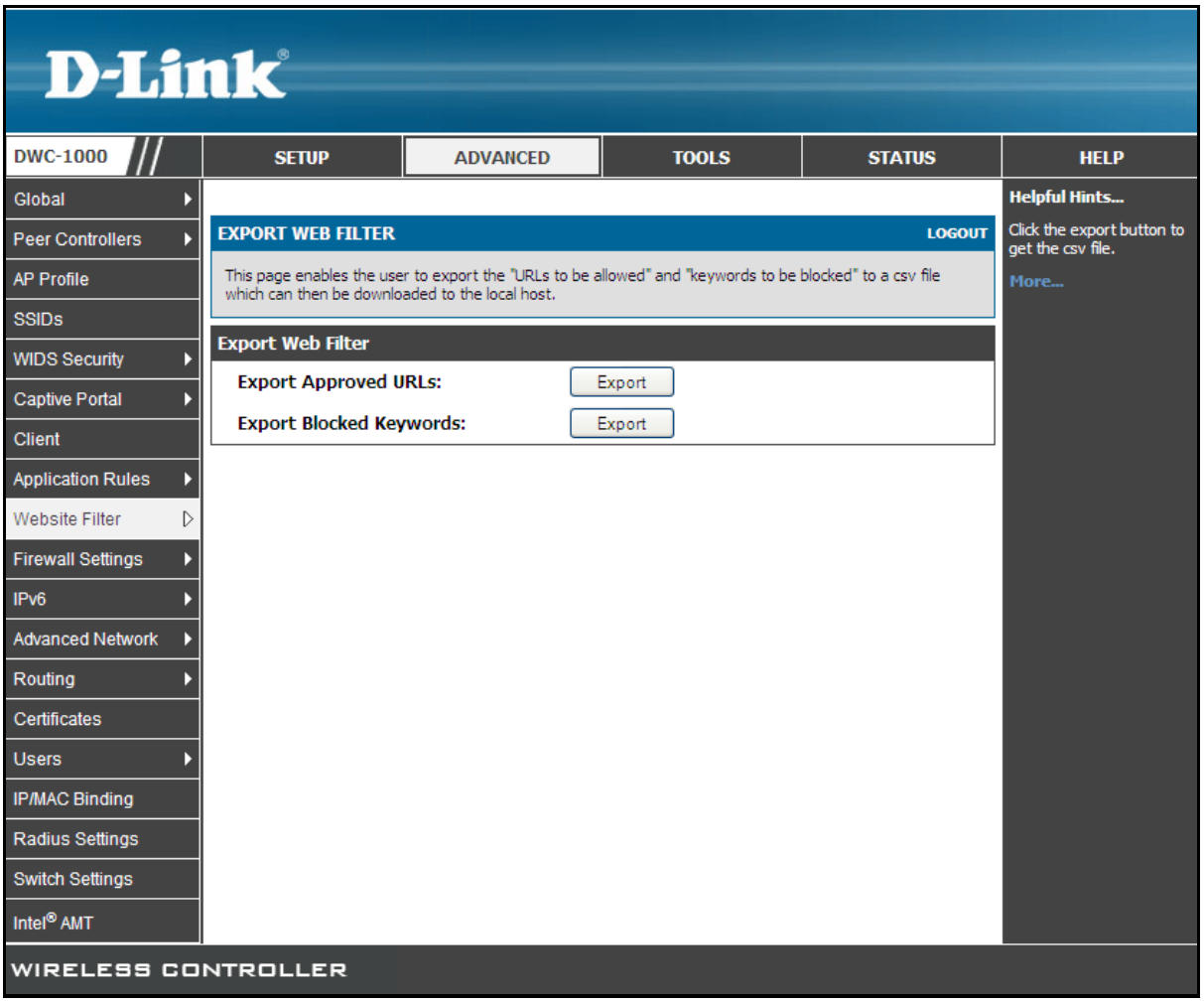
Exporting Web Filters

Path: ADVANCED > Website Filter > Export

Using the EXPORT WEB FILTER page, you can export the approved URLs and blocked keywords you defined in the previous sections to a CSV file from which they can be downloaded to a local host.

To enable Web filters:

1. Click **ADVANCED > Website Filter > Export**. The EXPORT WEB FILTER page appears.



2. To export the approved URLs you defined under “Specifying Approved URLs” on page 89, under **Export Web Filter**, click the **Export** button next to **Export Approved URLs**. When the File Download dialog box appears, click **Save** and save the file to a location.
3. To export the blocked keywords you defined under “Specifying Blocked Keywords” on page 91, under **Export Web Filter**, click the **Export** button next to **Export Blocked Keywords**. When the File Download dialog box appears, click **Save** and save the file to a location.

Additional Security Settings

The wireless controller provides more security settings than those covered in this chapter. The following table describes these settings. For more information, go to the page in the web management interface and then access the wireless controller online help in the **Helpful Hints** area (see Figure 3-1 on page 32).

Note: Asterisks in the table below indicate settings that require a DWC-1000-VPN-LIC License Pack.

Security Setting	Path
Attack checks*	ADVANCED > Advanced Network > Attack Checks
Certificates	ADVANCED > Certificates
Firewall settings • Default outbound policy • Firewall rules • Custom services • ALGs • SMTP ALG	ADVANCED > Firewall Settings • ADVANCED > Firewall Settings > Default Outbound Policy • ADVANCED > Firewall Settings > Firewall Rules • ADVANCED > Firewall Settings > Custom Services • ADVANCED > Firewall Settings > ALGs • ADVANCED > Firewall Settings > SMTP ALG > SMTP ALG Configuration • ADVANCED > Firewall Settings > SMTP ALG > Approved Mail Ids • ADVANCED > Firewall Settings > SMTP ALG > Blocked Mail Ids • ADVANCED > Firewall Settings > SMTP ALG > Subject list
Intel AMT*	ADVANCED > Intel AMT
RADIUS settings	ADVANCED > Radius Settings
USB device status	SETUP > USB Settings > USB Status
USB port sharing	SETUP > USB Settings > USB Share Port

6. VPN SETTINGS

A Virtual Private Network (VPN) is a technology designed to increase the security of information transferred over the Internet. A VPN creates a private encrypted tunnel from the user's computer, through the local wireless network and Internet, all the way to the remote endpoint, such as corporate servers and databases.

The wireless controller uses the Internet Protocol Security (IPSec) to secure IP traffic. IPSec builds “virtual tunnels” between a local and remote subnet for secure communication between two networks. This connection is commonly known as a Virtual Private Network (VPN).

Alternatively, tunneling protocols such as L2TP and PPTP can be used to achieve a secure connection (such as to a corporate LAN) over the Internet. These tunneling protocols can optionally be secured themselves using IPSec. The wireless controller supports a number of features for securing your network.

This chapter describes the most commonly used VPN features:

- Configuring VPN Clients (page 96)
- Configuring IPsec Policies (page 98)
- Mode Config Settings (page 112)
- DHCP Range (page 115)
- PPTP/LT2P Tunnels (page 116)

For information about additional VPN settings not described in this chapter, see “Additional VPN Settings” on page 126.

Note: The procedures in this chapter should only be performed by expert users who understand networking concepts and terminology.

Configuring VPN Clients

The wireless controller supports the following types of tunnels:

- Gateway-to-gateway VPN. This setup connects two or more wireless controllers to secure traffic between remote sites. Figure 6-1 shows an example of this configuration.
- Remote Client (client-to-gateway VPN tunnel). In this setup, the IP address of the remote PC is not known. Therefore, the remote client initiates the VPN tunnel and the gateway acts as a responder.
- Remote client behind a NAT controller: In this setup, the client has a dynamic IP address and is located behind a NAT controller. The remote PC client at the NAT controller initiates a VPN tunnel, as the IP address of the remote NAT controller is not known in advance. The gateway Option port acts as a responder.

Note: VPN client software is required to establish a VPN tunnel between the wireless controller and remote endpoint. Open source software, such as OpenVPN or Openswan, as well as Microsoft IPsec VPN software can be configured with the required IKE policy parameters to establish an IPsec VPN tunnel. For more information, refer to the documentation for the VPN client software.

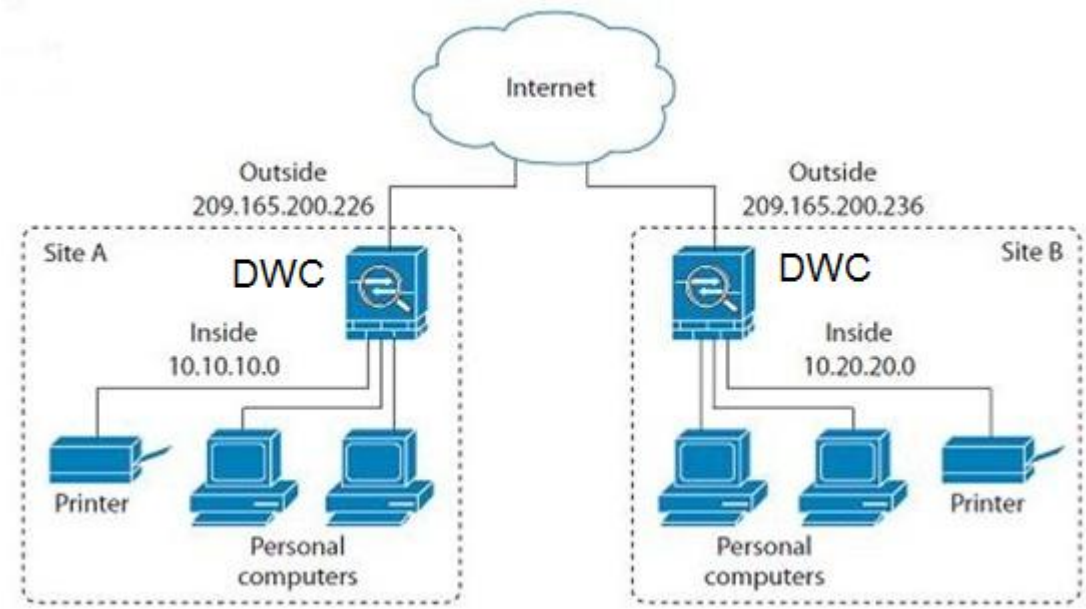


Figure 6-1. Example of Gateway-to-Gateway IPsec VPN Tunnel Using Two Wireless Controllers Connected to the Internet

Figure 6-2 shows an example of a configuration where three IPsec clients are connected to an internal network through the wireless controller IPsec gateway.

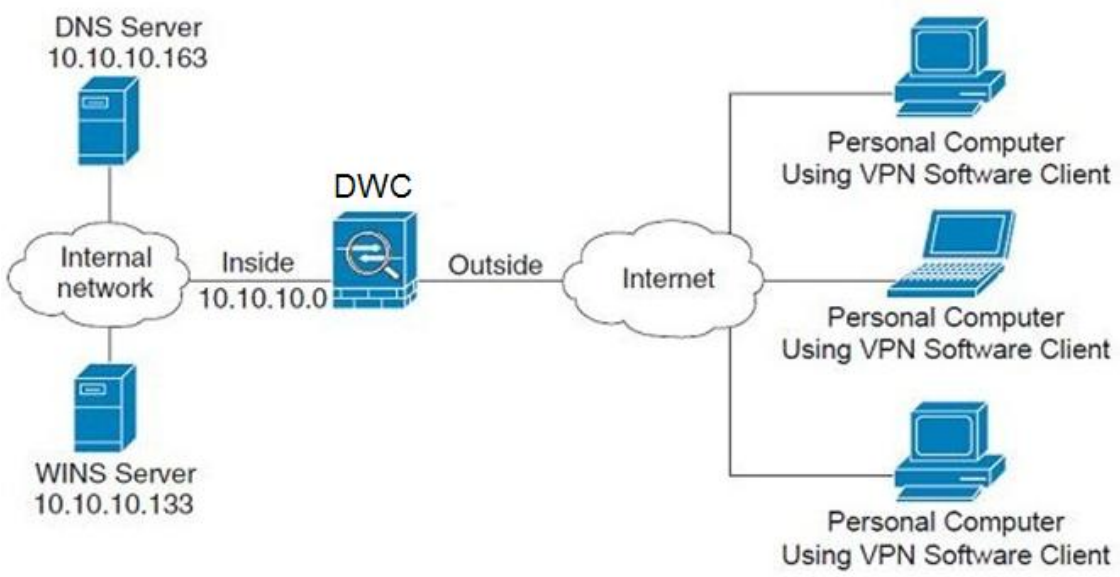


Figure 6-2. Example of Three IPsec Client Connections to an Internal Network through the Wireless Controller IPsec Gateway

Configuring IPsec Policies

IP Security (IPsec) is a suite of related protocols for cryptographically securing communications at the IP Packet Layer. IPsec also provides methods for the manual and automatic negotiation of security associations (SAs) and key distribution.

An IPsec tunnel consists of a pair of unidirectional SAs – one at each end of the tunnel – that specify the security parameter index (SPI), destination IP address, and security protocol.

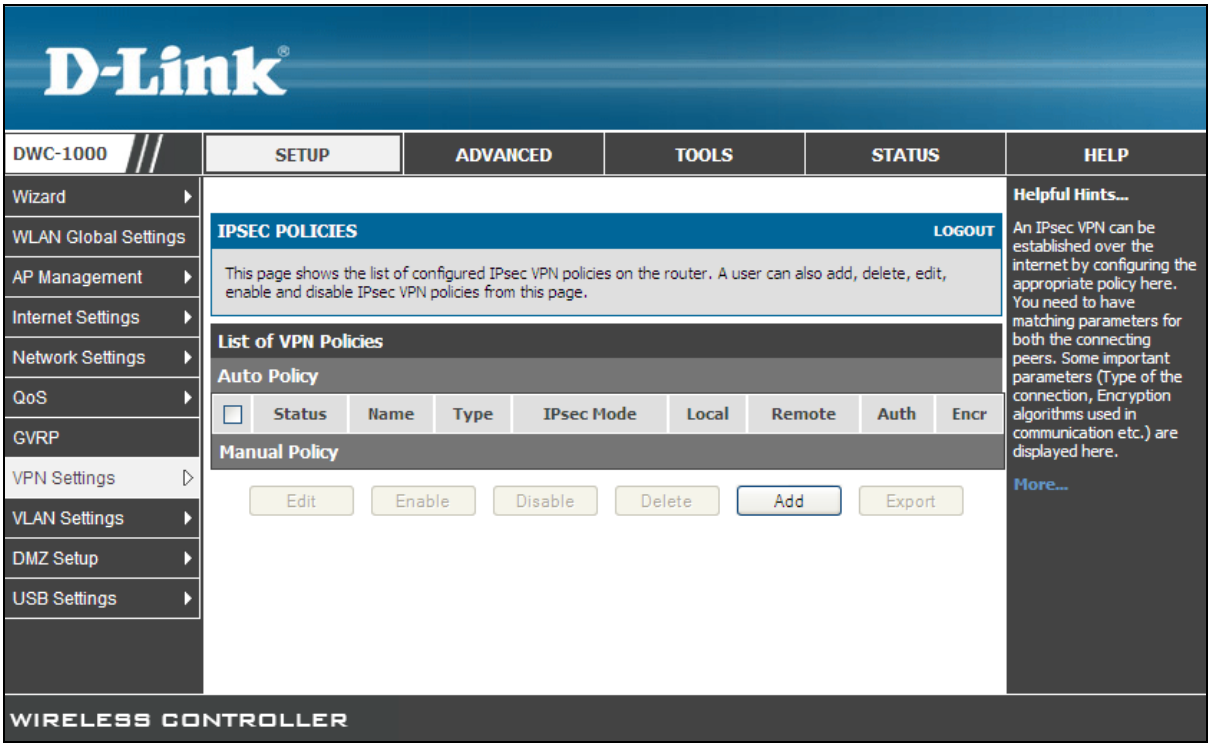
IPsec routing policies allow you to specify the parameters for SAs between endpoints and the wireless controller. You manage IPsec policies using the IPSEC POLICIES page.

Adding IPsec Policies

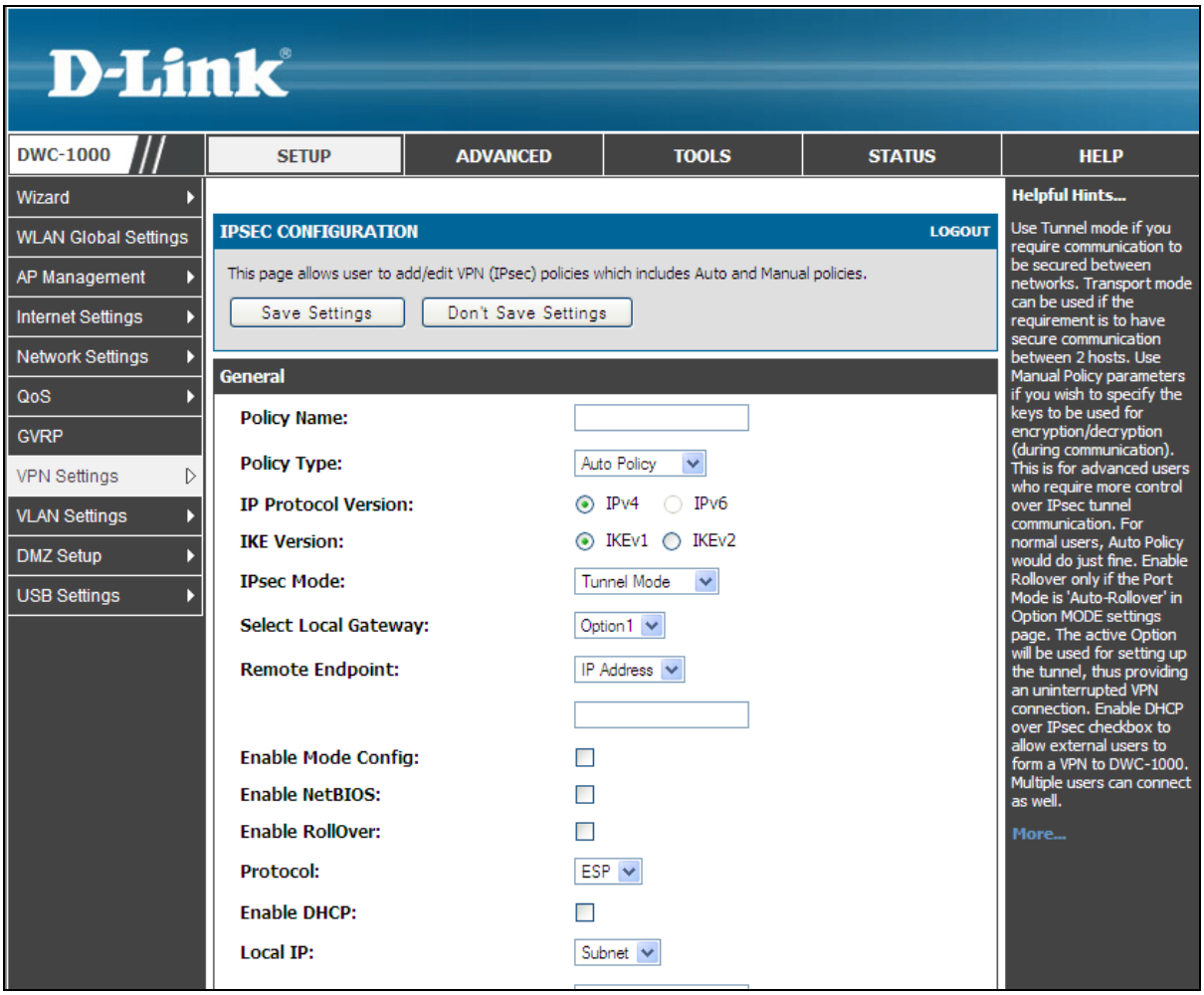
Path: SETUP > VPN Settings > IPsec > IPsec Policies

To add an IPsec policy:

1. Click **SETUP > VPN Settings > IPsec > IPsec Policies**. The IPSEC POLICIES page appears.



2. Click **Add**. The IPSEC CONFIGURATION page appears.



3. Complete the fields in the page (see Table 6-1).
4. Click **Save Settings**.

Table 6-1. Fields on the IPSEC CONFIGURATION Page

Field	Description
General	
Policy Name	Enter a unique name for this policy. The name should allow you to easily identify this policy from others you may add.
Policy Type	Select a policy type. Choices are: • Auto Policy = some parameters for the VPN tunnel are generated automatically. This requires using the Internet Key Exchange (IKE) protocol to perform negotiations between the two VPN endpoints. • Manual Policy = all settings, including the keys, for the VPN tunnel are manually entered for each end point. No third-party server or organization is involved.
IP Protocol Version	Select the Internet protocol version to be used. Choices are: • IPv4 • IPv6

Field	Description
IKE Version	Select the IKE version to be used. Choices are: • IKEv1 • IKEv2
IPsec Mode	Select the IPsec mode. Choices are: • Tunnel Mode = most commonly used between gateways, or at an end-station to a gateway, the gateway acting as a proxy for the hosts behind it. • Transport Mode = used between end-stations or between an end-station and a gateway, if the gateway is being treated as a host — for example, an encrypted Telnet session from a workstation to a router, in which the wireless controller is the actual destination.
Select Local Gateway	If two Option ports are configured to connect to an ISP, select the gateway that will be used as the local endpoint for this IPsec tunnel.
Remote Endpoint	Select the type of identifier that you want to provide for the gateway at the remote endpoint. Choices are: • IP Address • FQDN
Enable Mode Config	Enables or disables the Mode Config feature. Mode Config is similar to DHCP and is used to assign IP addresses to remote VPN clients, like iPhone VPN Client. Choices are: • Checked = enable Mode Config. If you enable Mode Config, configure the Mode Config settings (see “Mode Config Settings” on page 112). • Unchecked = disable Mode Config.
Enable NetBIOS	Determined whether NetBIOS broadcasts travel over the VPN tunnel. For client policies, the NetBIOS feature is available by default. Choices are: • Checked = allows NetBIOS broadcasts to travel over the VPN tunnel • Unchecked = disables NetBIOS broadcasts over the VPN tunnel.
Enable RollOver	Determines whether the VPN will roll over when Option Mode is set to Auto Rollover on the Option Mode page. Choices are: • Checked = allows the VPN to roll over when Option Mode is set to Auto Rollover on the Option Mode page. • Unchecked = disables VPN rollover.
Protocol	
Enable DHCP	Determines whether VPN clients obtain an assigned IP address using DHCP when they connect to the wireless controller over IPsec. Choices are: • Checked = VPN clients get an IP address. • Unchecked = VPN clients do not get an IP address.
Tunnel mode IPsec policies require local and remote traffic settings to be defined. For both local and remote endpoints configure the following settings.	

Field	Description
Local / Remote IP	Select the type of identifier that you want to provide for the endpoint. Choices are: • Any = policy is for traffic from the given end point (local or remote). Note that selecting Any for both local and remote end points is not valid. • Single = limits the policy to one host. Enter the IP address of the host that will be part of the VPN in the Start IP Address field. • Range = allows computers within an IP address range to connect to the VPN. Enter the Start IP Address and End IP Address in the provided fields. • Subnet = allows an entire subnet to connect to the VPN. Enter the network address in the Start IP Address field and enter the Subnet Mask in the Subnet Mask field.
Local / Remote Start IP Address	Enter the first IP address in the range.
Local / Remote End IP Address	Enter the last IP address in the range. If Local / Remote IP = Single, leave the End IP Address field blank.
Local / Remote Subnet Mask	If Local / Remote IP = Subnet, enter the Subnet Mask of the network. Do not use overlapping subnets for remote or local traffic selectors. Otherwise, you must add static routes on the wireless controller and the hosts to be used. Example of a combination to avoid is: • Local Traffic Selector = 192.168.75.0/24 • Remote Traffic Selector = 192.168.0.0./16.
Local / Remote Prefix Length	If Local / Remote IP = Subnet and Protocol = IPv6, enter the prefix length of the network.
Enable Keepalive	Determined whether the wireless controller sends ping packets periodically to the host on the peer side of the network to keep the tunnel alive. Choices are: • Checked = enables Keepalive. • Unchecked = disables Keepalive.
Source IP Address	If Enable Keepalive is checked, enter the IP address from which ping packet must be sent.
Destination IP Address	If Enable Keepalive is checked, enter the IP Address to which ping packet needs to be sent.
Detection Protocol	If Enable Keepalive is checked, specify how often the wireless controller sends ping packets.
Reconnect After Failure Count	If Enable Keepalive is checked, fresh negotiation starts when no acknowledgement is received for the number of consecutive packets specified here.
Phase (IKE SA Parameters)	
These settings are applicable for Auto IPsec policies that use IKE to perform negotiations between the two VPN endpoints.	
Exchange Mode	IKE phase can occur in one of two exchange modes. Select an exchange mode. Choices are: • Main = negotiates the tunnel with higher security, but is slower than aggressive mode. • Aggressive = fewer exchanges are made and with fewer packets than main mode, allowing this mode to establish a faster connection than main mode, but with lower security.
Direction / Type	Select a connection method. Choices are: • Initiator = wireless controller initiates the connection to the remote end. • Responder = wireless controller waits passively and responds to remote IKE requests. • Both = wireless controller work in either Initiator or Responder mode.
NAT Traversal	Enables or disables Network Address Translation (NAT) traversal. Choices are: • On = select this setting if you expect any NAT to occur during IPsec communication. • Off = select this setting if you do not expect NAT to occur during IPsec communication.

Field	Description
NAT Keep Alive Frequency	If NAT Traversal = On, use this option to control the keep-alive-frequency value. Keep-alive packets are sent at the specified time interval and are used to keep the NAT mappings alive on the NAT device. Setting this value to 0 disables this feature.
Local Identifier Type	Select the ISAKMP identifier for this router. Choices are: • Local WAN IP • FQDN • User-FQDN • DER ASN1 DN
Local Identifier	Enter the appropriate value for the local identifier. If the Local or Remote Identifier is not an IP address, negotiation is only possible in aggressive mode. If FQDN, User FQDN or DER ASN1 DN is selected, the wireless controller disables main mode and sets the default setting to aggressive mode.
Remote Identifier Type	Select the ISAKMP identifier for this router. Choices are: • Remote WAN IP • FQDN • User-FQDN • DER ASN1 DN
Remote Identifier	Enter the appropriate value for the remote identifier. If the Local or Remote Identifier is not an IP address, negotiation is only possible in aggressive mode. If FQDN, User FQDN or DER ASN1 DN is selected, the wireless controller disables main mode and sets the default setting to aggressive mode.
Encryption Algorithm	Check the algorithm used to negotiate the SA. Choices are: • DES = faster than 3DES, but less secure. • 3DES = triple DES. More secure method than DES, but with lower throughput. • Advanced Encryption Standard is a block cipher that can be used at 128, 192, or 256 bits. The higher the bit rate, the stronger the encryption but the trade-off is lower throughput. It is more secure than DES or 3DES. The following AES choices are supported: – AES-128 – AES-192 – AES-256 • BLOWFISH = a symmetric encryption algorithm that uses the same secret key to both encrypt and decrypt messages. Blowfish is also a block cipher that divides a message into fixed length blocks during encryption and decryption. Blowfish has a 64-bit block size and a key length of anywhere from 32 bits to 448 bits, and uses 16 rounds of main algorithm. • CAST128 = a 128-bit block cipher. CAST is a strong, military-grade encryption algorithm that has a solid reputation for its ability to withstand unauthorized access.
Authentication Algorithm	Specify the authentication algorithm for the VPN header. Ensure that the same authentication algorithm is configured on both sides of the tunnel. Choices are: • MD5 = Message-Digest algorithm 5 (MD5). MD5 is less secure than SHA, but faster. • SHA-1 = Secure Hash Algorithm (SHA-1) hash function. SHA-1 uses a 160-bit encryption key and is stronger than MD5. • SHA2-256 = SHA-256 hash function that uses 32-bit words. • SHA2-384 = SHA-384 hash function. • SHA2-512 = SHA-512 hash function that uses 64-bit words.

Field	Description
Authentication Method	Select an authentication method. Choices are: • Pre-Shared Key = simple password-based key. • RSA-Signature = disables the Pre-shared key field and uses the Active Self Certificate uploaded in the Certificates page. A certificate must be configured in order for RSA-Signature to work.
Pre-shared key	If Authentication Mode = Pre-Shared Key, enter an alpha-numeric key to be shared with IKE peer. The key does not support double-quotation marks.
Diffie-Hellman (DH) Group	Determines whether the Diffie-Hellman algorithm is used when exchanging keys. The DH Group sets the strength of the algorithm in bits. Ensure that the DH Group is configured identically on both sides of the IKE policy.
SA-Lifetime	Enter the interval, in seconds, after which the Security Association becomes invalid.
Enable Dead Peer Detection	Determines whether dead peer detection is used to detect whether the Peer is alive or not. Choices are: • Checked = enable dead peer detection. If a peer is detected as dead, it deletes the IPsec and IKE Security Association. • Unchecked = disable dead peer detection.
Detection Period	Enter the interval between consecutive DPD R-U-THERE messages. DPD R-U-THERE messages are sent only when the IPsec traffic is idle.
Reconnect after failure count	Enter the maximum number of DPD failures allowed before tearing down the connection.
Extended Authentication	Enables or disables Extended Authentication (XAUTH). Instead of configuring a unique VPN policy for each user, you can enable the wireless controller to authenticate users from a stored list of user accounts or with an external authentication server such as a RADIUS server. When connecting many VPN clients to a VPN gateway router, XAUTH allows authentication of users with methods in addition to the authentication method mentioned in the IKE SA parameters. Choices are: • None = disable XAUTH. • IPsec Host = authentication performed by remote gateway. In the Username and Password fields, enter the user name and password associated with the IKE policy for authenticating this gateway by the remote gateway. • Edge Device = use this VPN firewall as a VPN concentrator, where one or more gateway tunnels terminate. Enter the Authentication Type to be used in verifying credentials of the remote VPN gateways.
Authentication Type	If Extended Authentication = Edge Device, select the type of authentication to be used. Choices are: • User Database = verify against the wireless controller's VPN user database. Users must be added to the database. • Radius – PAP = VPN firewall checks the user database for user credentials. If the user account is not present, the VPN firewall connects to the RADIUS server • Radius – CHAP = uses the challenge to hide the password.
Username	If Extended Authentication = IPsec Host, enter the user name associated with the IKE policy for authenticating this gateway by the remote gateway.
Password	If Extended Authentication = IPsec Host, enter an alphanumeric password associated with the IKE policy for authenticating this gateway by the remote gateway.
Phase 2 (Manual Policy Parameters)	
This section is used when Policy Type = Manual under the General section of this page. The Manual Policy creates a Security Association (SA) based on the following static inputs. For an example, see "Example of a Manual Policy" on page 106.	

Field	Description
SPI-Incoming	Enter a hexadecimal value from 3 and 8 characters. For example: 0x1234.
SPI-Outgoing	Enter a hexadecimal value from 3 and 8 characters. For example: 0x1234.
Encryption Algorithm	Select an algorithm to encrypt the data.
Key Length	If Encryption Algorithm = BLOWFISH or CAST12, enter a key length. • For BLOWFISH, the Key Length must be a value between 40 and 448, and a multiple of 8. • For CAST128, the Key Length must be a value between 40 and 128, and a multiple of 8.
Key-In	Enter the encryption key of the inbound policy. The length of the key depends on the algorithm chosen: • DES = 8 characters • 3DES = 24 characters • AES=128 = 16 characters • AES=192 = 24 characters • AES=256 = 32 characters • AES=CCM = 16 characters • AES=GCM = 20 characters • TWOFISH (128) = 16 characters • TWOFISH (192) = 24 characters • TWOFISH (256) = 32 characters • BLOWFISH and CAST128 are variable length algorithms
Key-Out	Enter the encryption key of the outbound policy. The length of the key depends on the algorithm chosen, as shown for Key-In.
Integrity Algorithm	Select the algorithm used to verify the integrity of the data. Choices are: • SHA-1 • SHA-224 • SHA-256 • SHA-384 • SHA-512 • MD5
Key-In	Enter the integrity key (for ESP with Integrity-mode) for the inbound policy. The length of the key depends on the algorithm chosen: • MD5 = 16 characters • SHA=1 = 20 characters • SHA2=224 = 28 characters • SHA2=256 = 32 characters • SHA2=384 = 48 characters • SHA2=512 = 64 characters
Key-Out	Enter the integrity key (for ESP with Integrity-mode) for the outbound policy. The length of the key depends on the algorithm chosen, as shown for Key-In.
Phase 2 (Auto Policy Parameters)	

Field	Description
This section is used when Policy Type = Auto Policy under the General section of this page. These settings configure Phase 2 negotiations and should match the Phase 2 settings on the remote tunnel endpoint.	
SA Lifetime	Enter the duration of the Security Association and select the unit (seconds or Kbytes) from the drop-down list. • Seconds = measures the SA Lifetime in seconds. After the specified number of seconds passes, the Security Association is renegotiated. Default value is 3600 seconds. Minimum value is 300 seconds. • Kbytes = measures the SA Lifetime in kilobytes. After the specified number of kilobytes of data is transferred, the SA is renegotiated. Minimum value is 1920000 KB. When configuring a Lifetime in kilobytes (also known as lifebytes), two SAs are created for each policy. One SA for inbound traffic and one for outbound traffic. Due to differences in the upstream and downstream traffic flows, the SA may expire asymmetrically. For example, if the downstream traffic is very high, the lifebyte for a download stream may expire frequently. The lifebyte of the upload stream may not expire as frequently. Therefore, set the values reasonably to reduce the difference in expiry frequencies of the SAs; otherwise, this asymmetry might exhaust system resources. Lifebyte specifications are recommended for advanced users only.
Encryption Algorithm	Check the algorithm used to encrypt the data.
Integrity Algorithm	Check the algorithm used to verify the integrity of the data.
PFS Key Group	Enables or disables Perfect Forward Secrecy (PFS) to improve security. While slower, this protocol helps to prevent eavesdroppers by ensuring that a Diffie-Hellman exchange is performed for every phase-2 negotiation. Choices are: • Checked = enable PFS. • Unchecked = disable PFS.

Example of a Manual Policy

The following example shows settings on the IPSEC CONFIGURATION page for creating a VPN tunnel between two routers:

```
Router 1: Option=10.0.0.1 LAN=192.168.10.1 Subnet=255.255.255.0
Policy Name: manualVPN
Policy Type: Manual Policy
Local Gateway: Option
Remote Endpoint: 10.0.0.2
Local IP: Subnet 192.168.10.0 255.255.255.0
Remote IP: Subnet 192.168.20.0 255.255.255.0
SPI-Incoming: 0x1111
Encryption Algorithm: DES
Key-In: 11112222
Key-Out: 33334444
SPI-Outgoing: 0x2222
Integrity Algorithm: MD5
Key-In: 1122334444332211
Key-Out: 5566778888776655
Router 2: Option=10.0.0.2 LAN=192.168.20.1 Subnet=255.255.255.0
Policy Name: manualVPN
Policy Type: Manual Policy
Local Gateway: Option
Remote Endpoint: 10.0.0.1
Local IP: Subnet 192.168.20.0 255.255.255.0
Remote IP: Subnet 192.168.20.0 255.255.255.0
SPI-Incoming: 0x2222
Encryption Algorithm: DES
Key-In: 33334444
Key-Out: 11112222
SPI-Outgoing: 0x1111
Integrity Algorithm: MD5
Key-In: 5566778888776655
Key-Out: 1122334444332211
```

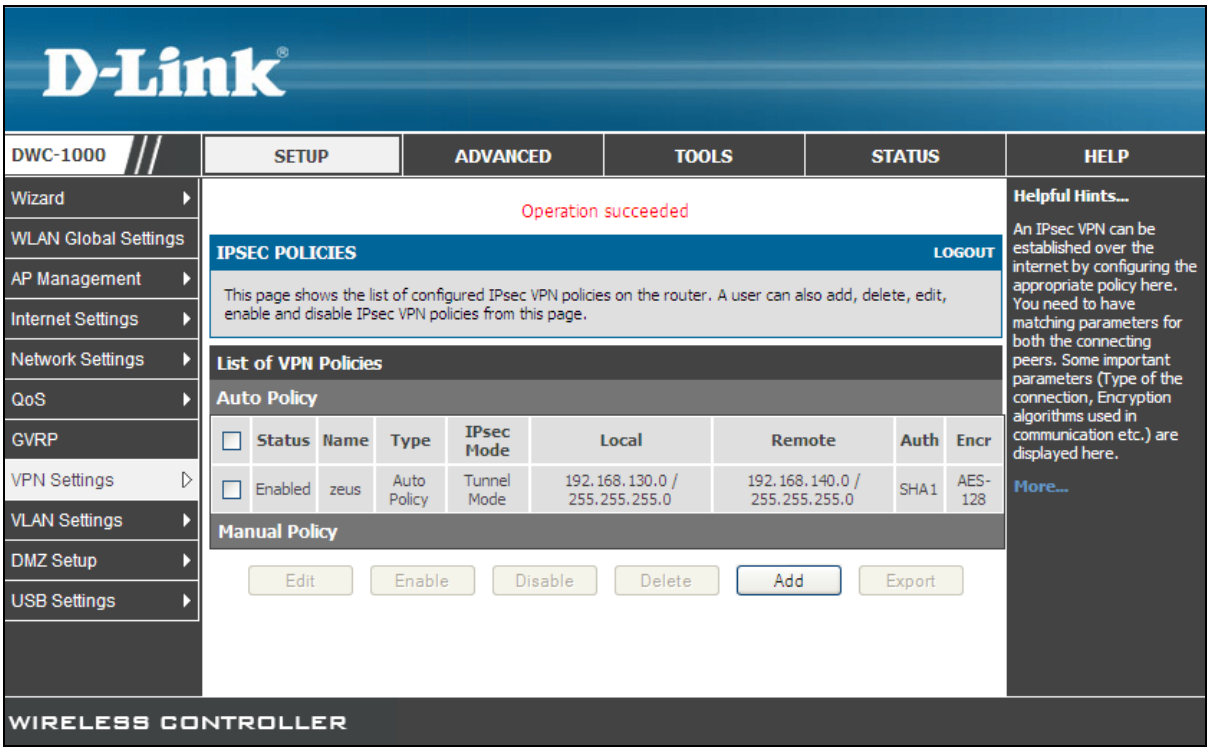
Editing IPsec Policies

Path: SETUP > VPN Settings > IPsec > IPsec Policies

After you add IPsec policies, you may need to change their settings.

To edit an IPsec policy:

1. Click **SETUP > VPN Settings > IPsec > IPsec Policies**. The IPSEC POLICIES page appears.



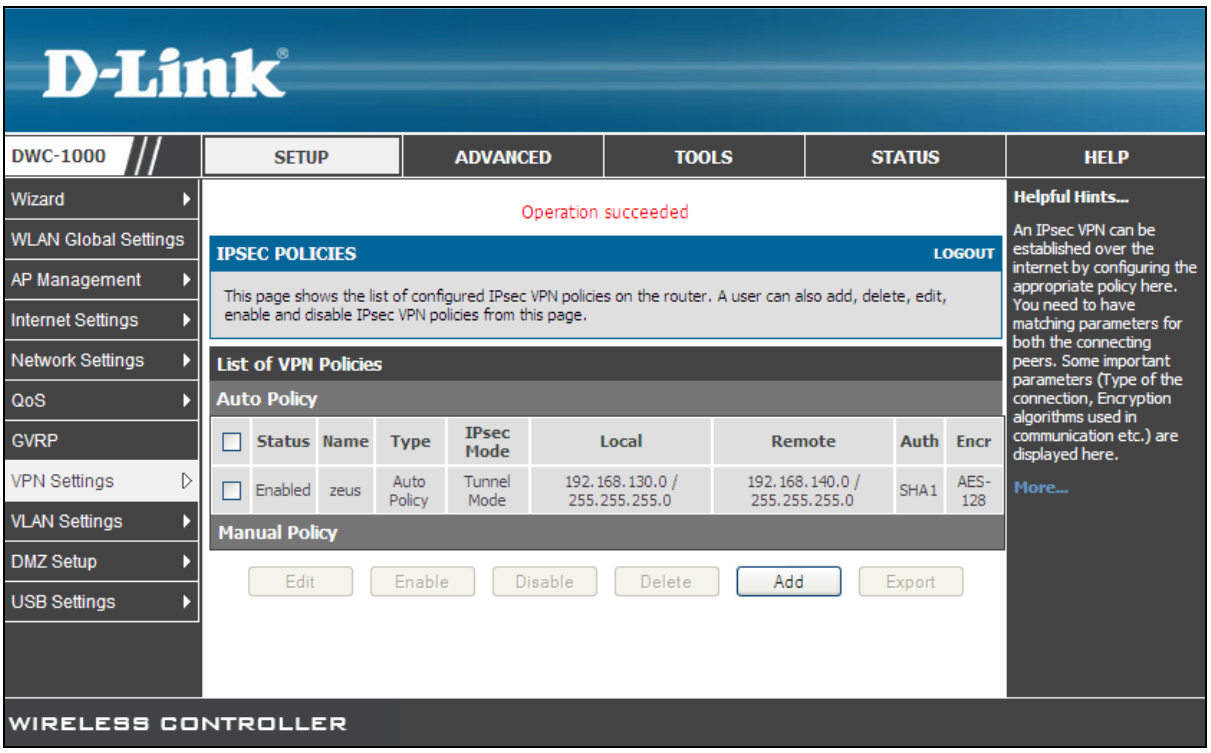
2. Under **List of VPN Policies**, check the IPsec auto policy or manual policy you want to edit and click **Edit**. The IPSEC CONFIGURATION page appears.
3. Complete the fields in the page (see Table 6-1).
4. Click **Save Settings**.

Enabling IPsec Policies

Path: SETUP > VPN Settings > IPsec > IPsec Policies

To enable an IPsec policy:

1. Click **SETUP > VPN Settings > IPsec > IPsec Policies**. The IPSEC POLICIES page appears.



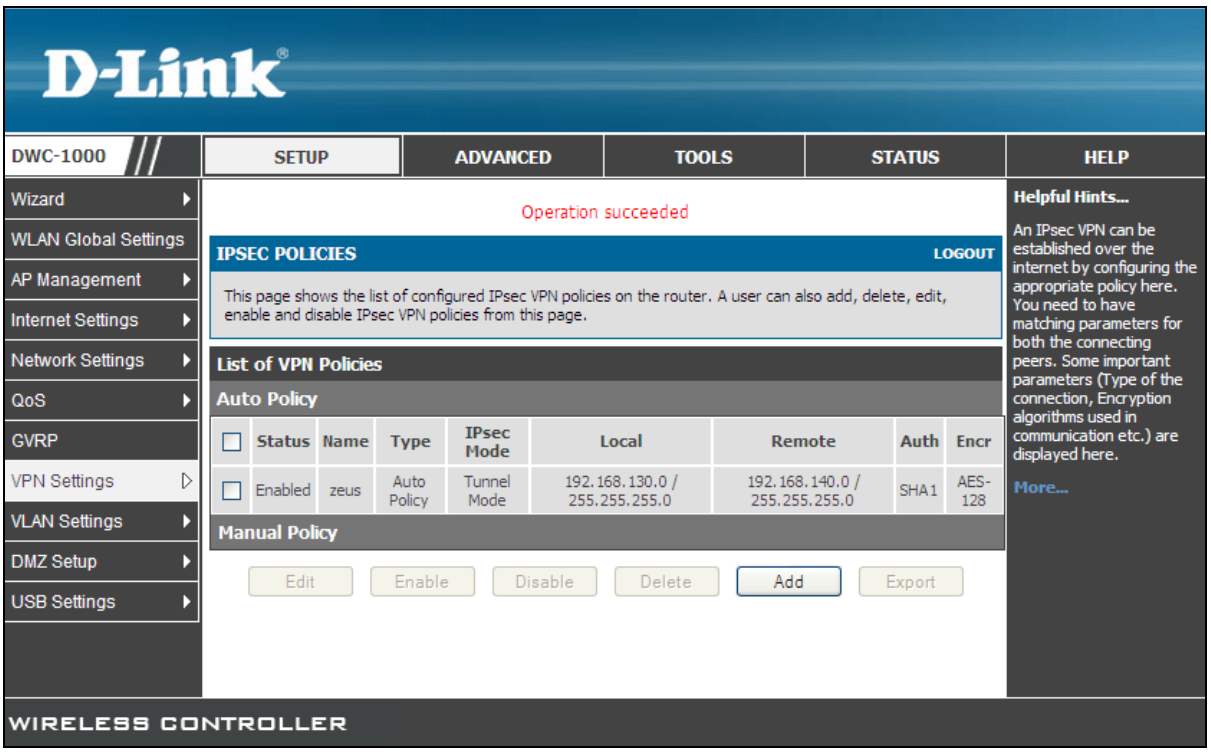
2. Under **List of VPN Policies**, check the IPsec auto policy or manual policy you want to enable and click **Enable**.

Disabling IPsec Policies

Path: SETUP > VPN Settings > IPsec > IPsec Policies

To disable an IPsec policy:

1. Click **SETUP > VPN Settings > IPsec > IPsec Policies**. The IPSEC POLICIES page appears.



2. Under **List of VPN Policies**, check the IPsec auto policy or manual policy you want to disable and click **Disable**.

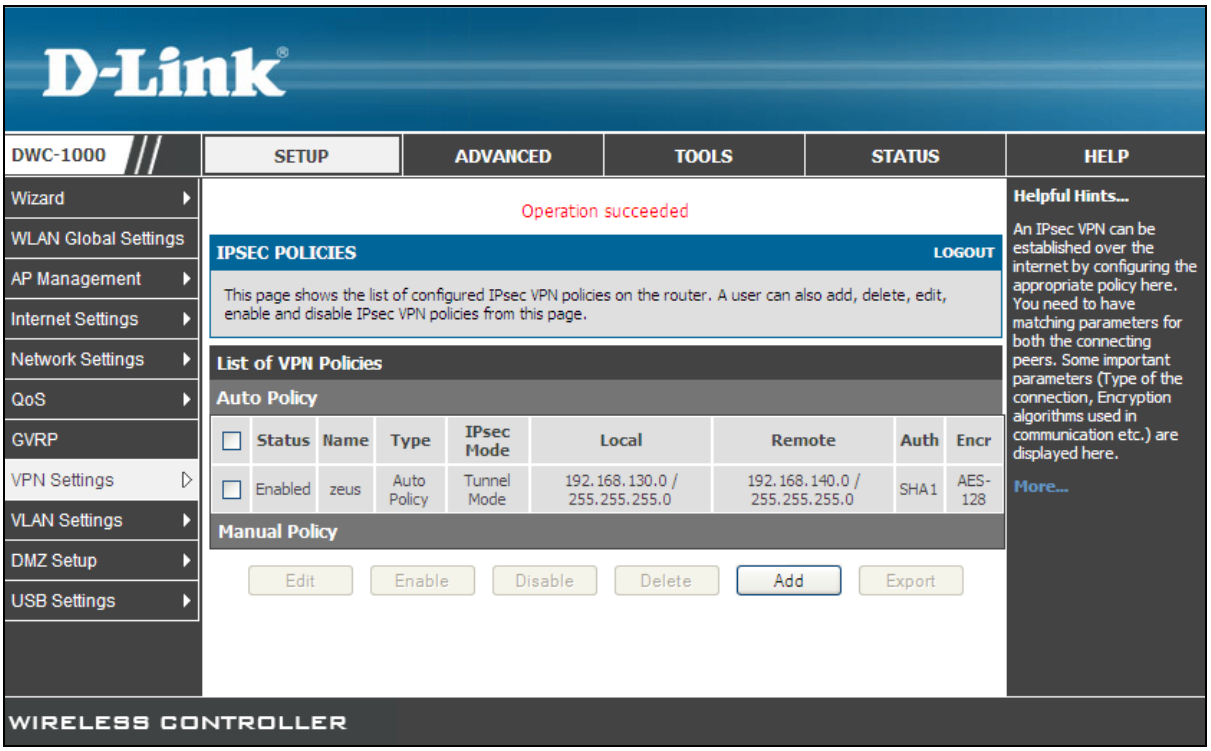
Exporting IPsec Policies

Path: SETUP > VPN Settings > IPsec > IPsec Policies

You can export an IPsec policy to a local host.

To export an IPsec policy:

1. Click **SETUP > VPN Settings > IPsec > IPsec Policies**. The IPSEC POLICIES page appears.



2. Under **List of VPN Policies**, check the IPsec auto policy or manual policy you want to export and click **Export**. The VPN CONFIG EXPORT WIZARD FOR REMOTE DSR appears.
3. Review and complete the settings as needed.
4. Click **Export Policy** at the bottom of the page to export the settings.

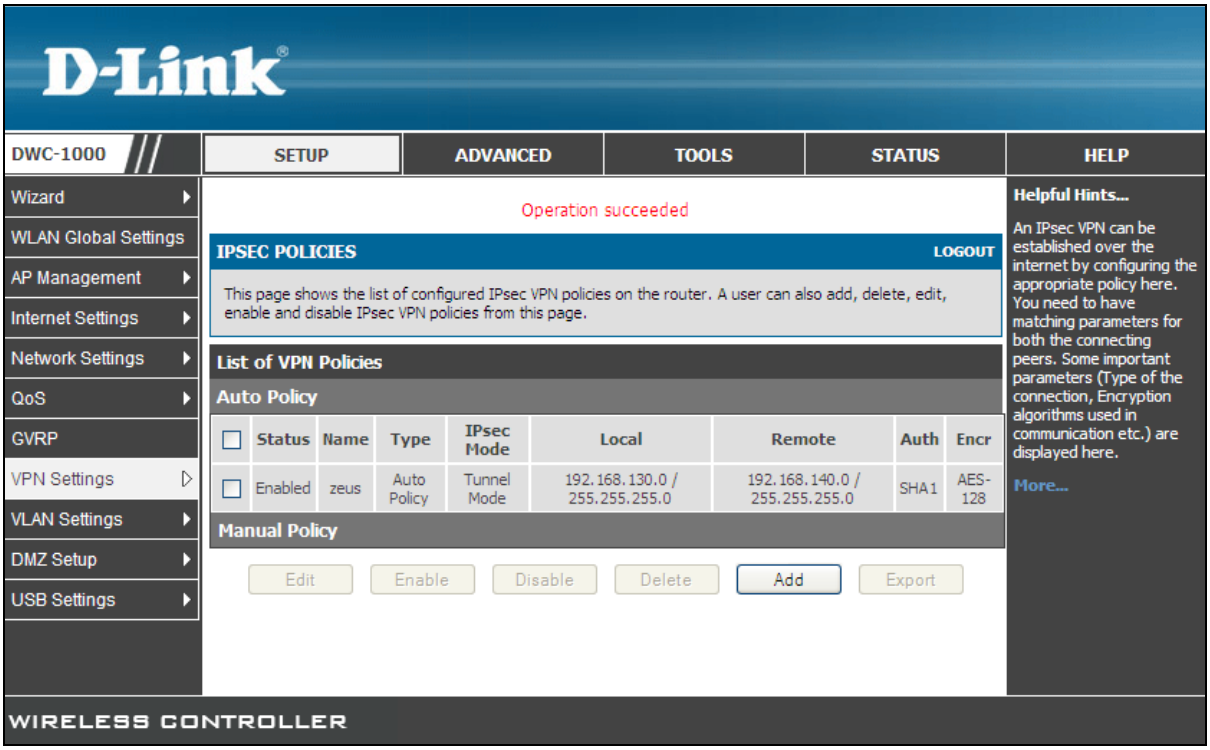
Deleting IPsec Policies

Path: SETUP > VPN Settings > IPsec > IPsec Policies

If you no longer need an IPsec policy, you can delete it.

Note: A precautionary message does not appear before you delete an IPsec policy. Therefore, be sure you do not need an IPsec before you delete it.

1. Click **SETUP > VPN Settings > IPsec > IPsec Policies**. The IPSEC POLICIES page appears.



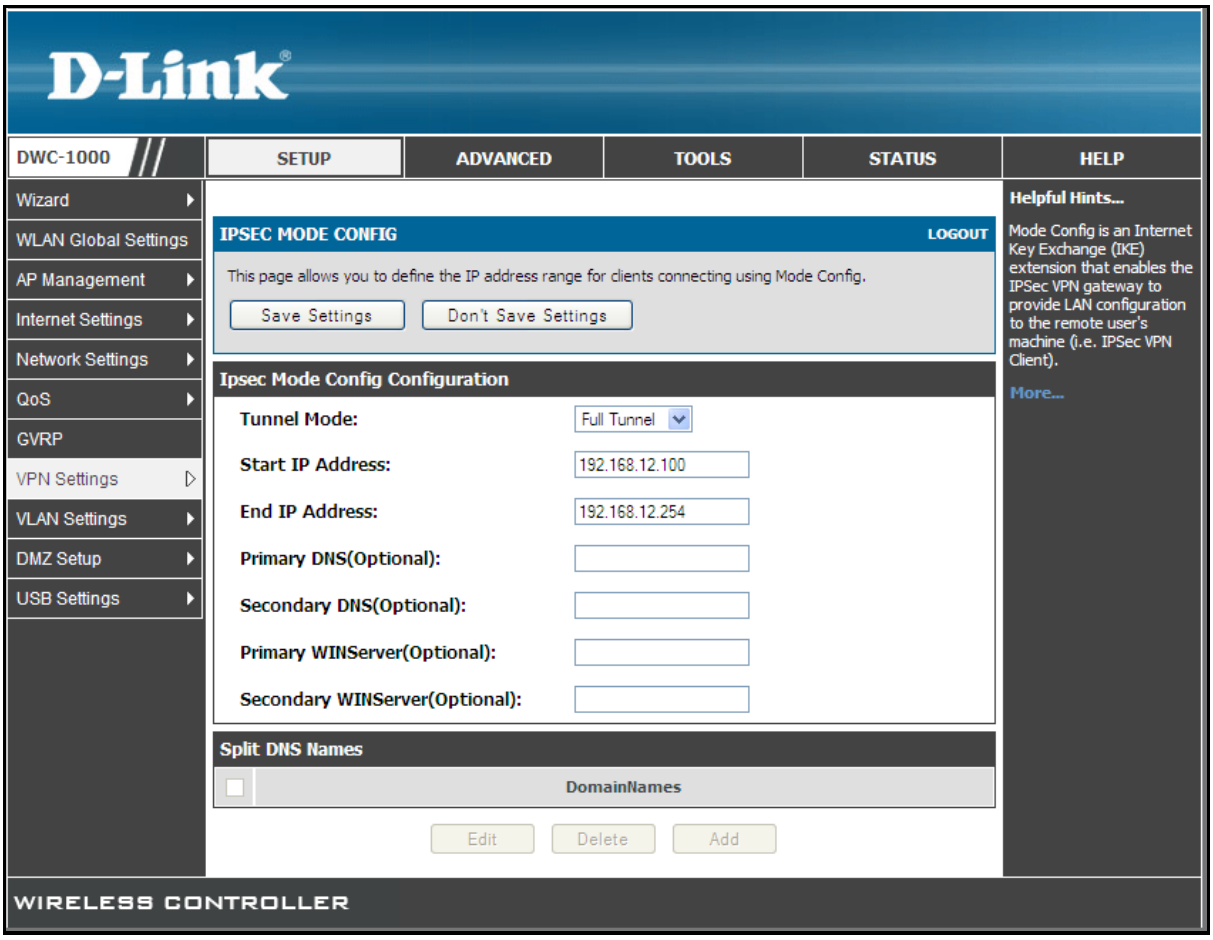
2. Under **List of VPN Policies**, check the IPsec auto policy or manual policy you want to delete and click **Delete**.

Mode Config Settings

Path: SETUP > VPN Settings > IPsec > IPsec Mode Config

If you enabled Mode Config settings on the IPSEC CONFIGURATION page, use the following procedure to configure the Mode Config settings.

1. Click **SETUP > VPN Settings > IPsec > IPsec Mode Config**. The IPSEC MODE CONFIG page appears.



2. Complete the fields in the page (see Table 6-2).
3. Click **Save Settings**.
4. To split DNS names, under **Split DNS Names**, click **Add**. In a split DNS infrastructure, you create two zones for the same domain, one to be used by the internal network and the other used by the external network. Split DNS directs internal hosts to an internal domain name server for name resolution and external hosts are directed to an external domain

name server for name resolution.

When you click **Add**, the SPLIT DNS NAMES page appears. Enter a Domain Name in the **Domain Name** field and click **Save Settings**.

The **Split DNS Name** section provides **Edit** and **Delete** buttons for changing or deleting split DNS name configurations.

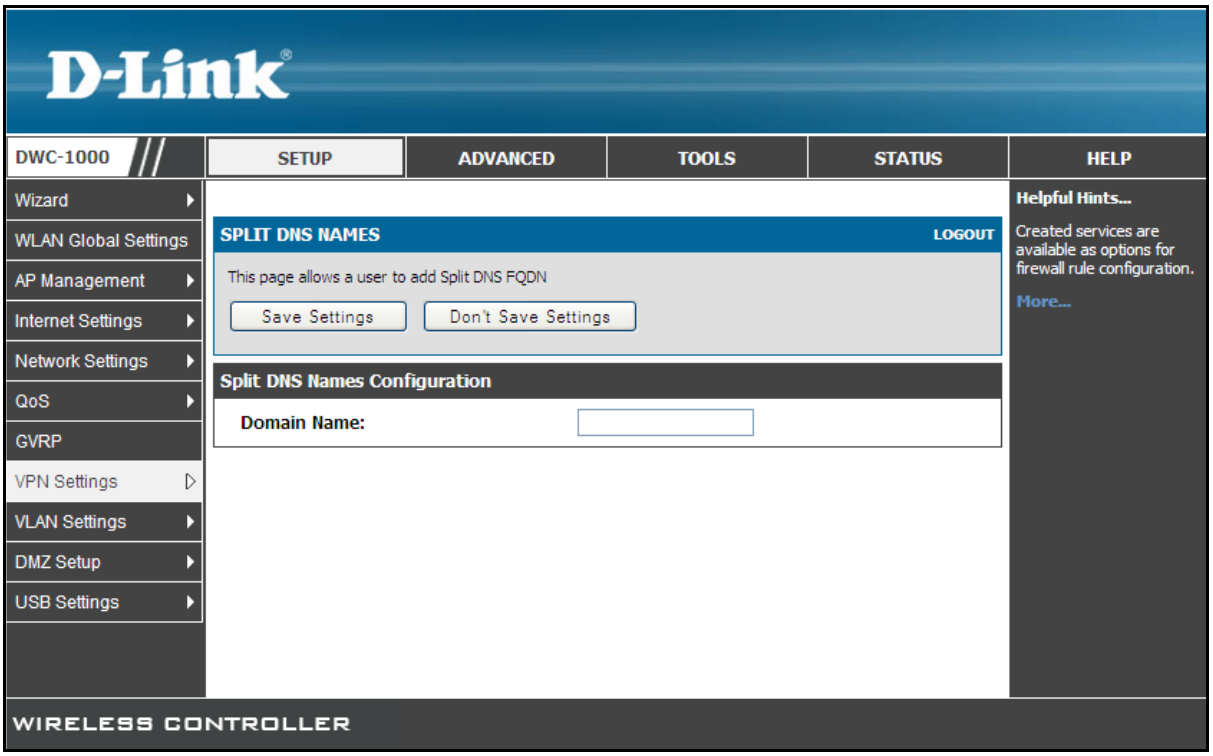


Table 6-2. Fields on the IPSEC MODE CONFIG Page

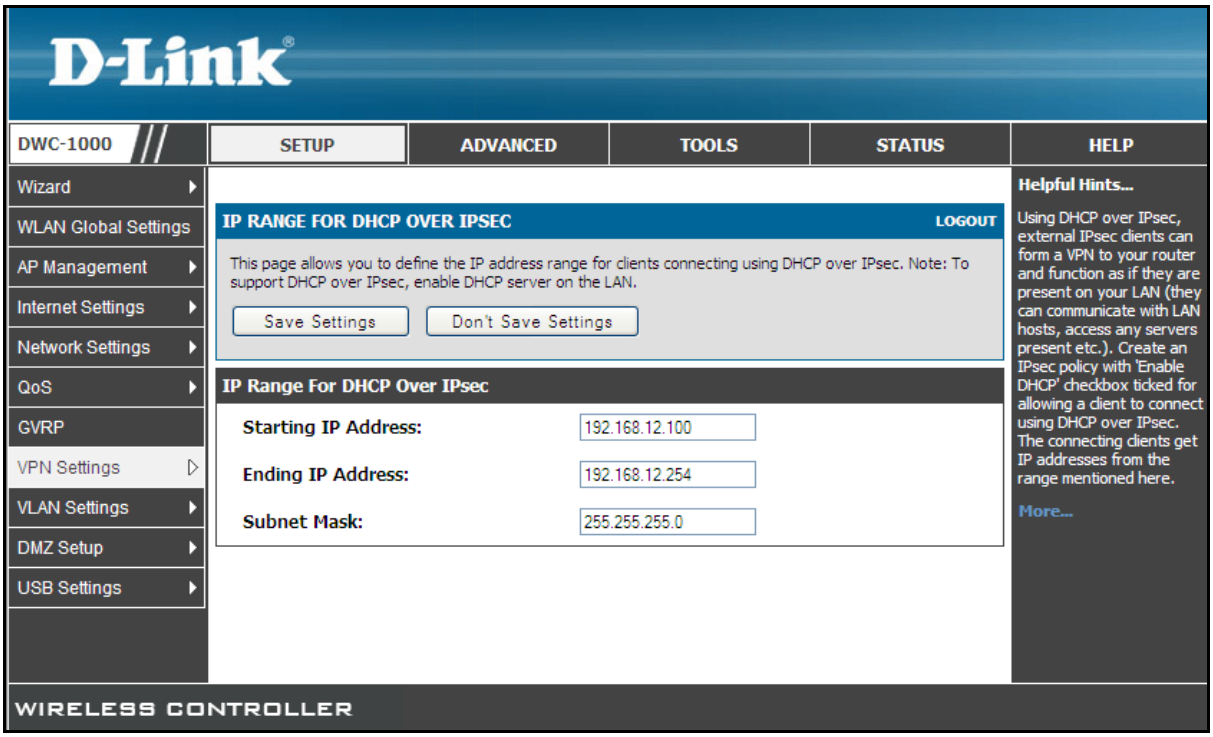
Field	Description
Tunnel Mode	Select a tunnel mode. Choices are: • Full Tunnel = every packet destined to the Internet or remote server goes through the tunnel. • Split Tunnel = traffic destined to the Internet does not pass through the tunnel.
Start IP Address	Enter the first address to be allocated in this pool.
End IP Address	Enter the last address to be allocated in this pool.
Primary DNS	Primary DNS server is used by clients connected to this router to resolve domain names. If Tunnel Mode = Split Tunnel, the DNS server should be internal domain name server.
Secondary DNS	Secondary DNS Server is used by clients connected to this router to resolve domain names. If Tunnel Mode = Split Tunnel, the DNS server should be internal domain name server.
Primary WINServer	Enter the primary Windows NetBIOS Name Server used by clients to resolve NetBIOS names.
Secondary WINServer	Enter the secondary Windows NetBIOS Name Server used by clients to resolve NetBIOS names.
Split DNS Names	
In a split DNS infrastructure, you create two zones for the same domain, one to be used by the internal network and the other used by the external network. Split DNS directs internal hosts to an internal domain name server for name resolution and external hosts are directed to an external domain name server for name resolution.	

DHCP Range

Path: SETUP > VPN Settings > IPsec > DHCP Range

If clients will connect to the IPsec VPN using DHCP, use the IP RANGE FOR DHCP OVER IPSEC to configure the DHCP settings.

1. Click **SETUP > VPN Settings > IPsec > SHCP Range**. The IP RANGE FOR DHCP OVER IPSEC page appears.



2. Complete the fields in the page (see Table 6-3).
3. Click **Save Settings**.

Table 6-3. Fields on the IP RANGE FOR DHCP OVER IPSEC Page

Field	Description
Starting IP Address	Enter the starting IP address to be allocated in this range.
Ending IP Address	Enter the last IP address to be allocated in this range.
Subnet Mask	Enter the subnet mask for the IP address range.

PPTP/LT2P Tunnels

The wireless controller supports VPN tunnels from either PPTP or L2TP ISP servers. In this role, the wireless controller acts as a broker to allow the ISP's server to create a TCP control connection between the LAN VPN client and the VPN server.

PPTP Tunnel Support

Configuring PPTP Clients

Path: SETUP > VPN Settings > PPTP > PPTP Client

PPTP VPN clients can be configured on the wireless controller. Using this client, you can access a remote network that is local to the PPTP server. After client is enabled, you can use the STATUS > Active VPNs page to establish a PPTP VPN tunnel.

To configure PPTP clients:

1. Click **SETUP > VPN Settings > PPTP > PPTP Client**. The PPTP CLIENT page appears.

2. Complete the fields in the page (see Table 6-4).

3. Click **Save Settings**.

Table 6-4. Fields on the PPTP CLIENT Page

Field	Description
PPTP Client Configuration	
Enable PPTP Client	Enables or disables the PPTP client. Choices are: • Checked = enable PPTP client. • Unchecked = disable PPTP client.
PPTP Client Configuration	
Server IP	Enter the IP address of the PPTP server.
Remote Network	Enter the network address of the remote network that is local to the PPTP server.
Remote Netmask	Enter the subnetmask of the remote network which is local to the PPTP server.
Username	Enter the username that the PPTP Client needs to connect to the PPTP server.
Password	Enter the password that the PPTP Client needs to connect to the PPTP server.
Mppe Encryption	Enables or disables the MPPE encryption client. MPPE is an encryption technology developed by Microsoft to encrypt point-to-point links over a VPN tunnel. MPPE uses the RC4 algorithm with either 40- or 128-bit keys. All keys are derived from the cleartext authentication password of the user. RC4 is stream cipher; therefore, the sizes of the encrypted and decrypted frames are the same size as the original frame. Choices are: • Checked = enable MPPE encryption. • Unchecked = disable MPPE encryption.
Idle Time Out	If there is no traffic from a user for more than the specified time-out, the connection is disconnected.

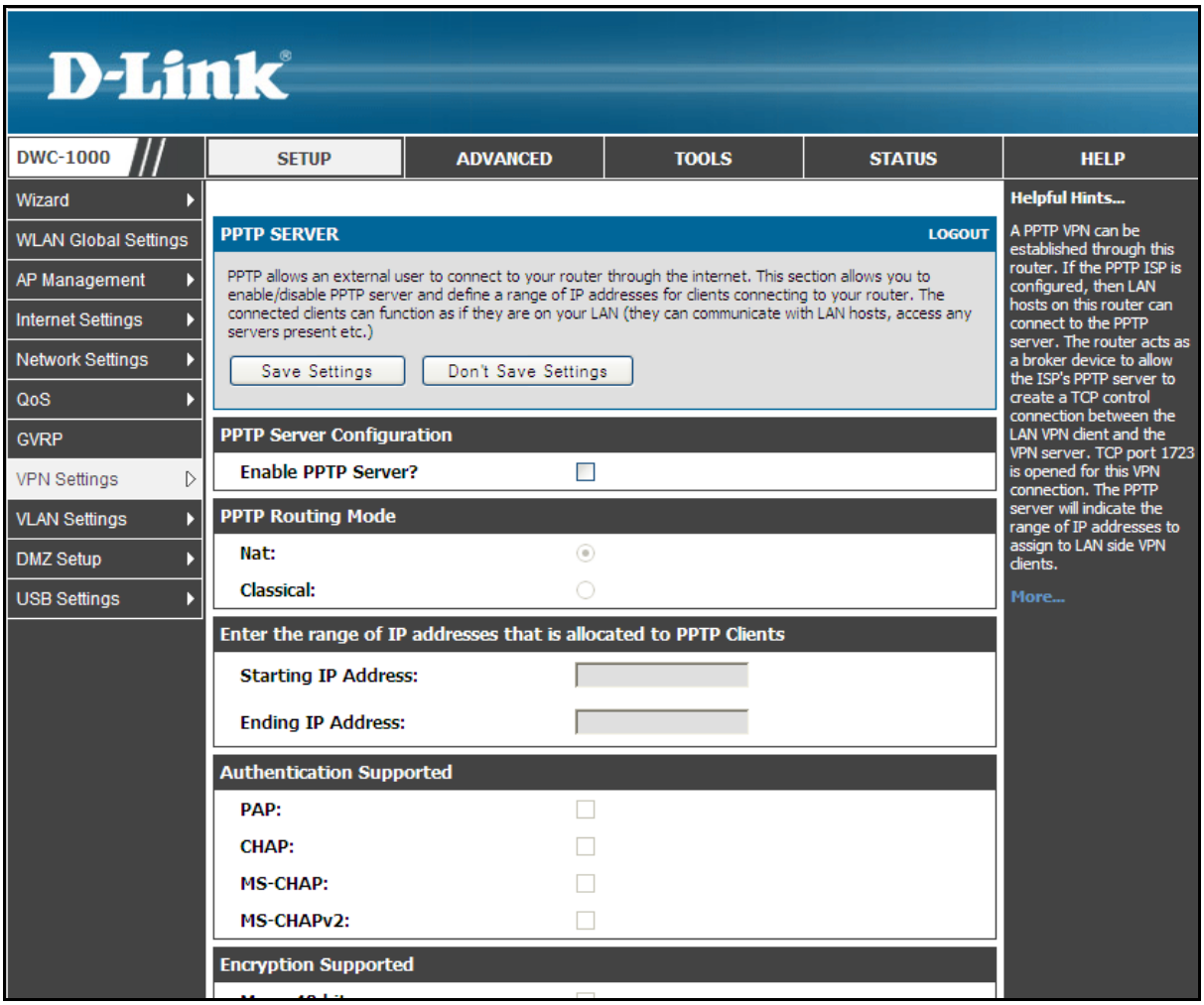
Configuring PPTP Servers

Path: SETUP > VPN Settings > PPTP > PPTP Server

After you configure the PPTP clients for the PPTP VPN, use the following procedure to configure the PPTP server. Once enabled, a PPTP server is available on the wireless controller for LAN and Option PPTP client users to access. PPTP clients within range of configured IP addresses of allowed clients can reach the wireless controller's PPTP server. After they are authenticated by the PPTP server (the tunnel endpoint), PPTP clients have access to the network managed by the wireless controller.

To configure PPTP clients:

1. Click **SETUP > VPN Settings > PPTP > PPTP Server**. The PPTP SERVER page appears.



2. Complete the fields in the page (see Table 6-5).
3. Click **Save Settings**.

Table 6-5. Fields on the PPTP SERVER Page

Field	Description
PPTP Client Configuration	
Enable PPTP Server	Enables or disable the PPTP server. Choices are: • Checked = enable PPTP server. • Unchecked = disable PPTP server.
PPTP Routing Mode	
Nat	NAT is a technique that allows several computers on a LAN to share an Internet connection. The computers on the LAN use a "private" IP address range while the Option port on the router is configured with a single "public" IP address. Along with connection sharing, NAT also hides internal IP addresses from the computers on the Internet. Select NAT if your ISP has assigned only one IP address to you. The computers that connect through the router will need to be assigned IP addresses from a private subnet (for example:,192.168.10.0).
Classical	Enables or disables classical routing. Choices are: • Checked = enable classical routing. IP addresses on the LAN will be exposed and be in the same subnet as the Option. If your ISP assigned an IP address for every computer you use, select this option. • Unchecked = disable classical routing.
Enter the range of IP addresses that is allocated to PPTP Clients	
Starting IP Address	Enter the starting IP address of the range of IP addresses to assign to connecting users. This IP address is taken as the server IP address and rest of the addresses in the range are assigned to clients.
Ending IP Address	Enter the ending IP address of the range of IP addresses to assign to connecting users.
Authentication Supported	
PAP	Enables or disables support for Password Authentication Protocol (PAP) authentication method. PAP is a 2-way handshake protocol designed for use with PPP. Password Authentication Protocol is a plain text password used on older SLIP systems. It is not secure. Choices are: • Checked = enable support for PAP. • Unchecked = disable support for PAP.
CHAP	Enables or disables support for Challenge Handshake Authentication Protocol (CHAP) authentication method. CHAP is a 3-way handshake protocol that is considered more secure than PAP. Choices are: • Checked = enable support for CHAP. • Unchecked = disable support for CHAP.
MS-CHAP	Enables or disables support for MS-CHAP authentication method. MS-CHAP uses a Microsoft version of RSA Message Digest 4 challenge-and-reply protocol. This only works on Microsoft systems and enables data encryption. To select this authentication method causes all data to be encrypted. Choices are: • Checked = enable support for MS-CHAP. • Unchecked = disable support for MS-CHAP.

Field	Description
PPTP Client Configuration	
MS-CHAPv2	Enables or disables support for MS-CHAPv2 authentication method. Introduces an additional feature not available with MSCHAP or standard CHAP authentication: the change password feature. This feature lets the client change the account password if the RADIUS server reports that the password has expired. Choices are: • Checked = enable support for MS-CHAPv2. • Unchecked = disable support for MS-CHAPv2.
Encryption Supported	
Mppe 40 bit	Enables or disables MPPE 40-bit encryption (available only for MS-CHAP and MS-CHAPv2 authentication methods). Choices are: • Checked = enable MPPE 40-bit encryption. • Unchecked = disable MPPE 40-bit encryption.
Mppe 128 bit	Enables or disables MPPE 128-bit encryption (available only for MS-CHAP and MS-CHAPv2 authentication methods). Choices are: • Checked = enable MPPE 128-bit encryption. • Unchecked = disable MPPE 128-bit encryption.
Stateful Mppe	Enables or disables stateful MPPE encryption (available only for MS-CHAP and MS-CHAPv2 authentication methods). Stateful encryption provides the best performance, but may be adversely affected by networks experiencing substantial packet loss. If you choose stateful encryption, configure flow control (SETUP > QoS > LAN QoS > Flow Control) to minimize the detrimental effects of this lossiness. Choices are: • Checked = enable stateful MPPE encryption. • Unchecked = disable stateful MPPE encryption.
User Time-out	
Idle TimeOut	If there is no traffic from a user for more than the specified time out, the connection is disconnected. Entering an Idle TimeOut value of 0 (zero) means never log out.

L2TP Tunnel Support

Path: SETUP > VPN Settings > L2TP > L2TP Server

After you configure PPTP tunnel support, then configure L2TP tunnel support. Once enabled, a L2TP server is available on the wireless controller for LAN and Option L2TP client users to access. After the L2TP server is enabled, L2TP clients within the range of configured IP addresses of allowed clients can reach the wireless controller's L2TP server. Once authenticated by the L2TP server (the tunnel endpoint), L2TP clients have access to the network managed by the controller.

To configure L2TP tunnel support:

1. Click **SETUP > VPN Settings > L2TP > L2TP Server**. The L2TP SERVER page appears.

2. Complete the fields in the page (see Table 6-6).
3. Click **Save Settings**.

Table 6-6. Fields on the L2TP SERVER Page

Field	Description
L2TP Server Configuration	
Enable L2TP Server	Enables or disable the L2TP server. Choices are: • Checked = enable L2TP server. • Unchecked = disable L2TP server.
L2TP Routing Mode	
Nat	NAT is a technique that allows several computers on a LAN to share an Internet connection. The computers on the LAN use a "private" IP address range while the Option port on the router is configured with a single "public" IP address. Along with connection sharing, NAT also hides internal IP addresses from the computers on the Internet. Select NAT if your ISP has assigned only one IP address to you. The computers that connect through the router will need to be assigned IP addresses from a private subnet (for example:,192.168.10.0).
Classical	Enables or disables classical routing. Choices are: • Checked = enable classical routing. IP addresses on the LAN will be exposed and be in the same subnet as the Option. If your ISP assigned an IP address for every computer you use, select this option. • Unchecked = disable classical routing.
Enter the range of IP addresses that is allocated to L2TP Clients	
Starting IP Address	Enter the starting IP address of the range of IP addresses to assign to connecting users. This IP address is taken as the server IP address and rest of the addresses in the range are assigned to clients.
Ending IP Address	Enter the ending IP address of the range of IP addresses to assign to connecting users.
Authentication Supported	
PAP	Enables or disables support for Password Authentication Protocol (PAP) authentication method. PAP is a 2-way handshake protocol designed for use with PPP. Password Authentication Protocol is a plain text password used on older SLIP systems. It is not secure. Choices are: • Checked = enable support for PAP. • Unchecked = disable support for PAP.
CHAP	Enables or disables support for Challenge Handshake Authentication Protocol (CHAP) authentication method. CHAP is a 3-way handshake protocol that is considered more secure than PAP. Choices are: • Checked = enable support for CHAP. • Unchecked = disable support for CHAP.
MS-CHAP	Enables or disables support for MS-CHAP authentication method. MS-CHAP uses a Microsoft version of RSA Message Digest 4 challenge-and-reply protocol. This only works on Microsoft systems and enables data encryption. To select this authentication method causes all data to be encrypted. Choices are: • Checked = enable support for MS-CHAP. • Unchecked = disable support for MS-CHAP.

Field	Description
L2TP Server Configuration	
MS-CHAPv2	Enables or disables support for MS-CHAPv2 authentication method. Introduces an additional feature not available with MSCHAP or standard CHAP authentication, the change password feature. This feature lets the client change the account password if the RADIUS server reports that the password has expired. Choices are: • Checked = enable support for MS-CHAPv2. • Unchecked = disable support for MS-CHAPv2.
L2TP Secret Key	
Enable L2TP Secret Key	Enables or disables the L2TP secret key. Choices are: • Checked = enable L2TP secret key. • Unchecked = disable L2TP secret key.
Secret Key	If Enable L2TP Secret Key = checked, enter the secret key required to make a L2TP connection.
User Time-out	
Idle TimeOut	If there is no traffic from a user for more than the specified time out, the connection is disconnected. Entering an Idle TimeOut value of 0 (zero) means never log out.

OpenVPN Support

Path: SETUP > VPN Settings > OpenVPN > Open VPN Configuration

An Open VPN session can be established through the wireless controller. OpenVPN allows peers to authenticate each other using a pre-shared secret key, certificates, or username/password. When used in a multiclient-server configuration, OpenVPN lets the server release an authentication certificate for every client, using signature and Certificate authority.

To configure OpenVPN support:

1. Click **SETUP > VPN Settings > OpenVPN > Open VPN Configuration**. The OPENVPN CONFIGURATION page appears.

2. Complete the fields in the page (see Table 6-7).
3. Click **Save Settings**.

Table 6-7. Fields on the OPENVPN CONFIGURATION Page

Field	Description
OpenVPN Server/Client Configuration	
Enable Openvpn	Enables or disables OpenVPN support. Choices are: • Checked = enable OpenVPN support. • Unchecked = disable OpenVPN support.
Mode	Select an OpenVPN daemon mode. Choices are: • Server = run OpenVPN daemon in server mode. • Client = run OpenVPN daemon in client mode. • Access Server Client = user must download the auto login profile from the OpenVPN Access Server and upload the same to connect.
Server IP	If Mode = Client, enter the OpenVPN server IP address to which the client connects (Applicable in client mode).
Vpn Network	Enter the IP address of the virtual network.
Vpn Netmask	Enter the netmask of the virtual network.
Port	Enter the port number on which OpenVPN server (or access server) runs.
Tunnel Protocol	Select the protocol used to communicate with the remote host. Choices are: • UDP • TCP
Encryption Algorithm	Select the cipher with which the packets are encrypted. Choices are: • BF-CBC • AES-128 • AES-192 • AES-256
Hash Algorithm	Select the message digest algorithm used to authenticate packets. Choices are: • SHA1 • SHA256 • SHA512
Tunnel Type	If Mode = Server, select the type of tunnel through which traffic is redirected. Choices are: • Full Tunnel = redirect all the traffic through the tunnel. • Split Tunnel = redirect traffic to only specified resources (added from openVpnClient Routes) through the tunnel.
Enable Client to Client Communication	Enables or disables OpenVPN clients to communicate with each other in split tunnel scenarios. Choices are: • Checked = enable client-to-client communication. • Unchecked = disable client-to-client communication.
Updated Access Server-Client Configuration	
Upload Status	Shows whether the user must download the auto-login profile and upload here to connect this wireless controller to the OpenVPN access server.
File	Use this field and the Browse button to select the file containing the profile.

Certificates
Select the set of certificates OpenVPN server uses: • First Row = set of certificates and keys the server uses. • Second Row = set of newly uploaded certificates and keys.
Enable TLS Authentication Key
Enabling this option adds Transport Layer Security (TLS) authentication, which adds a layer of authentication. TLS uses public key infrastructure (PKI) to acquire and validate digital certificates. A digital certificate is a cryptographically signed structure that guarantees the association between at least one identifier and a public key. It is valid for a limited time period and use, subject to certificate policy conditions. The Certificate Authority issues certificates to client and server. This option can only be checked if a TLS key is uploaded.

Additional VPN Settings

The wireless controller provides more VPN settings than those covered in this chapter. The following table describes these settings. For more information, go to the page in the web management interface and then access the wireless controller online help in the **Helpful Hints** area (see Figure 3-1 on page 32).

Note: Asterisks in the table below indicate settings that require a DWC-1000-VPN-LIC License Pack.

VPN Setting	Path
L2TP active users	SETUP > VPN Settings > L2TP > L2TP Active Users
OpenVPN • Local networking (split tunneling) • Remote networking (site to site) • OpenVPN authentication	 • SETUP > VPN Settings > OpenVPN > OpenVPN Local Networks (Split Tunneling) • SETUP > VPN Settings > OpenVPN > OpenVPN Remote Networks (Site To Site) • SETUP > VPN Settings > OpenVPN > OpenVPN Authentication
PPTP active users	SETUP > VPN Settings > PPTP > PPTP Active Users
SSL VPN client • SSL VPN client • Client routes	 • SETUP > VPN Settings > SSL VPN Client > SSL VPN Client • SETUP > VPN Settings > SSL VPN Client > Configured Client Routes
SSL VPN server • Enable SSL VPN server • Login profiles • Portal layouts • SSL VPN policies • Resources • Port forwarding	 • SETUP > VPN Settings > SSL VPN Server > SSL VPN Server Enable • SETUP > VPN Settings > SSL VPN Server > Login Profiles • SETUP > VPN Settings > SSL VPN Server > Portal Layouts • SETUP > VPN Settings > SSL VPN Server > SSL VPN Policies • SETUP > VPN Settings > SSL VPN Server > Resources • SETUP > VPN Settings > SSL VPN Server > Port Forwarding

7. VIEWING STATUS AND STATISTICS

This chapter describes the following pages, which display wireless controller and access point status information and statistics.

Path	Description	See Page
STATUS > Dashboard > General	Shows CPU and memory utilization.	129
STATUS > Device Info > System Status	Summarizes the wireless controller configuration settings.	131
STATUS > Device Info > Wireless LAN AP Info	Shows details about the managed access points.	133
STATUS > Device Info > Cluster Information	Shows information about other wireless controllers in the network.	135
STATUS > Dashboard > Interface	Shows information about resources the system is using.	137
STATUS > Traffic Monitor > Device Statistics	Shows detailed transmit and receive statistics for each physical port.	139
STATUS > Traffic Monitor > Managed AP Statistics	Shows information about traffic on the access point's wired and wireless interfaces.	140
STATUS > Traffic Monitor > Associated Clients Statistics > WLAN Associated Clients	Tracks the traffic associated with the client connected to the wireless controller.	142
STATUS > Wireless Client Info > Associated Clients > Status	Shows statistics about client traffic while the client is associated with a single access point as well as throughout the roaming session.	144
STATUS > Active Sessions	Shows local and remote IP addresses, protocol used during the Internet sessions, and state.	145
STATUS > Associated Clients > Status	Shows clients associated with the managed access points.	146
STATUS > LAN Clients Info > LAN Clients	Shows NetBios name (if available) and IP and MAC addresses of discovered LAN hosts.	148
STATUS > LAN Clients Info > Detected Clients	Shows information about clients that have authenticated with an access point, and clients that disassociate and are no longer connected to the system.	149
STATUS > Dashboard > Access Point	Shows summary information about managed, failed, and rogue access points the wireless controller has discovered or detected.	151
STATUS > Access Points Info > APs Summary	Shows summary information about managed, failed, and rogue access points the wireless controller has discovered or detected. Status entries can be deleted manually.	153
Access Point Info > Managed AP Status	Shows a variety of information about each access point that the wireless controller is managing.	155
Status > Access Point Info > Authentication Failure Status	Shows information about access points that failed to establish communication with the wireless controller.	157

Path	Description	See Page
Status > Access Point Info > AP RF Scan Status	Shows information about other access points and wireless clients that the wireless controller has detected.	159
Path: STATUS > Global Info > Global Status	Shows status and statistics about the wireless controller and the objects associated with it.	161
Status > Global Info > Peer Controller > Status	Shows information about other wireless controllers in the network.	164
Status > Global Info > Peer Controller > Configuration	Shows information about the access points that each peer controller in the cluster manages.	166
Status > Global Info > Peer Controller > Managed AP	Shows information about the access points that each peer controller in the cluster manages.	167
Status > Global Info > IP Discovery	Shows IP addresses of peer controllers and access points for the wireless controller to discover and associate with as part of the WLAN.	169
Status > Global Info > Config Receive Status	Shows information about the configuration a controller receives from a peer.	171
Status > Global Info > AP H/W Capability	Shows information about radio hardware and IEEE mode supported by access points, along with software images available for downloading to access points.	173
Status > Dashboard > Client	Shows information about all the clients connected through managed access points.	174
Status > Wireless Client Info > Associated Clients > Status	Shows a variety of information about the wireless clients that are associated with the access points the wireless controller is managing.	176
STATUS > Wireless Client Info > Associated Clients > SSID Status	Shows SSID information for the wireless clients on the WLAN.	178
STATUS > Wireless Client Info > Associated Clients > VAP Status	Shows information about the virtual access points on the managed access point that are associated wireless clients.	180
STATUS > Wireless Client Info > Associated Clients > Controller Status	Shows information about the controller that manages the access point to which the client is associated.	182
STATUS > Wireless Client Info > Detected Clients	Shows information about clients that have authenticated with an access point and clients that have disassociated and are no longer connected to the system.	184
STATUS > Wireless Client Info > Pre-Auth History	Shows detected clients that have made pre-authentication requests and identifies the access points that received the requests.	186
STATUS > Wireless Client Info > Roam History	Shows a client's roaming history between access points.	187

Viewing CPU and Memory Utilization

Path: STATUS > Dashboard > General

The wireless controller provides a dashboard that displays CPU and memory utilization. The DASHBOARD page is organized into the following sections (see Table 7-1):

- **CPU Utilization** – shows statistics for the wireless controller's processor.
- **Memory Utilization** – shows the system's memory status.

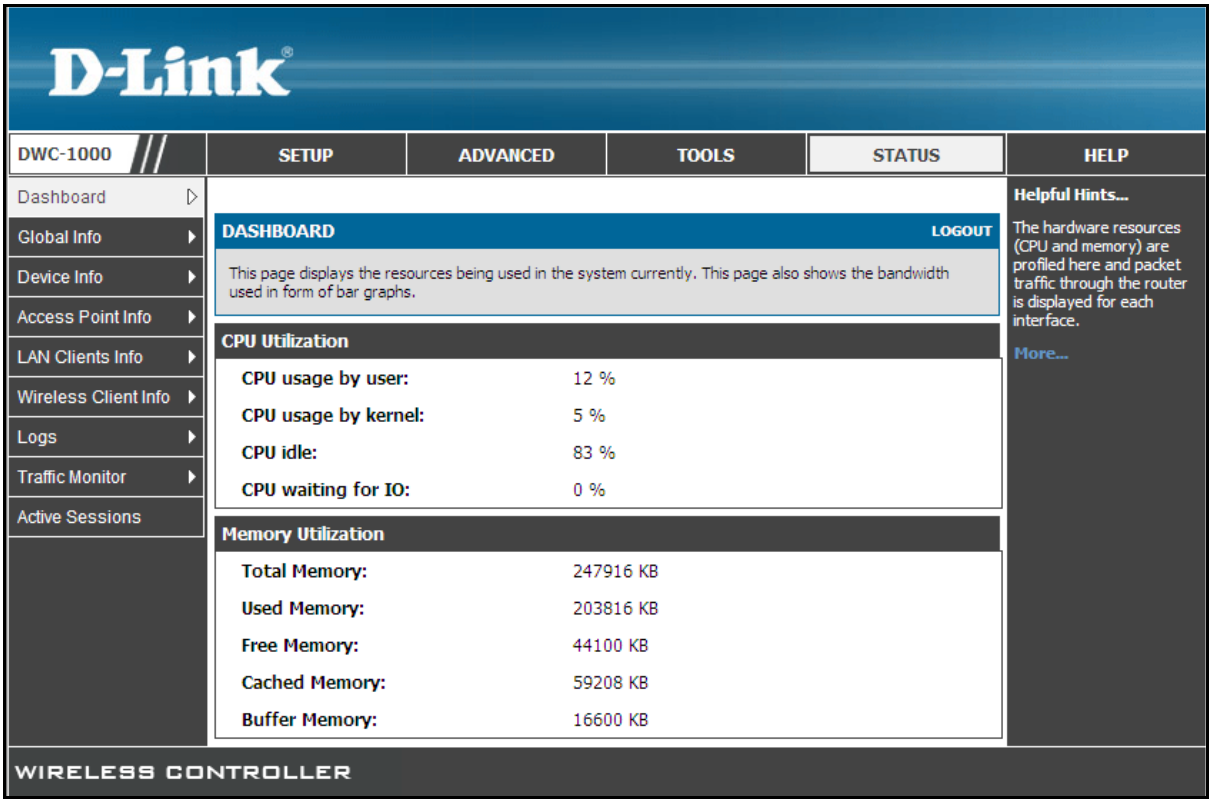


Figure 7-1. DASHBOARD Page

Table 7-1. Fields on the DASHBOARD Page

Field	Description
CPU Utilization	
CPU usage by user	Percent of the CPU utilization currently consumed by all user space processes, such as SSL VPN or management operations.
CPU usage by kernel	Percent of the CPU utilization currently consumed by kernel space processes, such as firewall operations.
CPU idle	Percent of CPU cycles currently not in use.
CPU waiting for IO	Percent of CPU cycles allocated to input/output devices.
Memory Utilization	
Total Memory	Total available volatile physical memory.
Used Memory	Memory used by all processes in the system.
Free Memory	Available free memory in the system.
Cached Memory	Cached memory in the system.
Buffer Memory	Buffered memory in the system.

Viewing System Status

Path: STATUS > Device Info > System Status

The SYSTEM STATUS page summarizes the wireless controller configuration settings configured in the Setup and Advanced menus. This page is organized into the following sections:

- **General** - shows system name, firmware and WLAN module version, and serial number.
- **Option Information** and **LAN Information** – shows information based on the administrator configuration parameters.

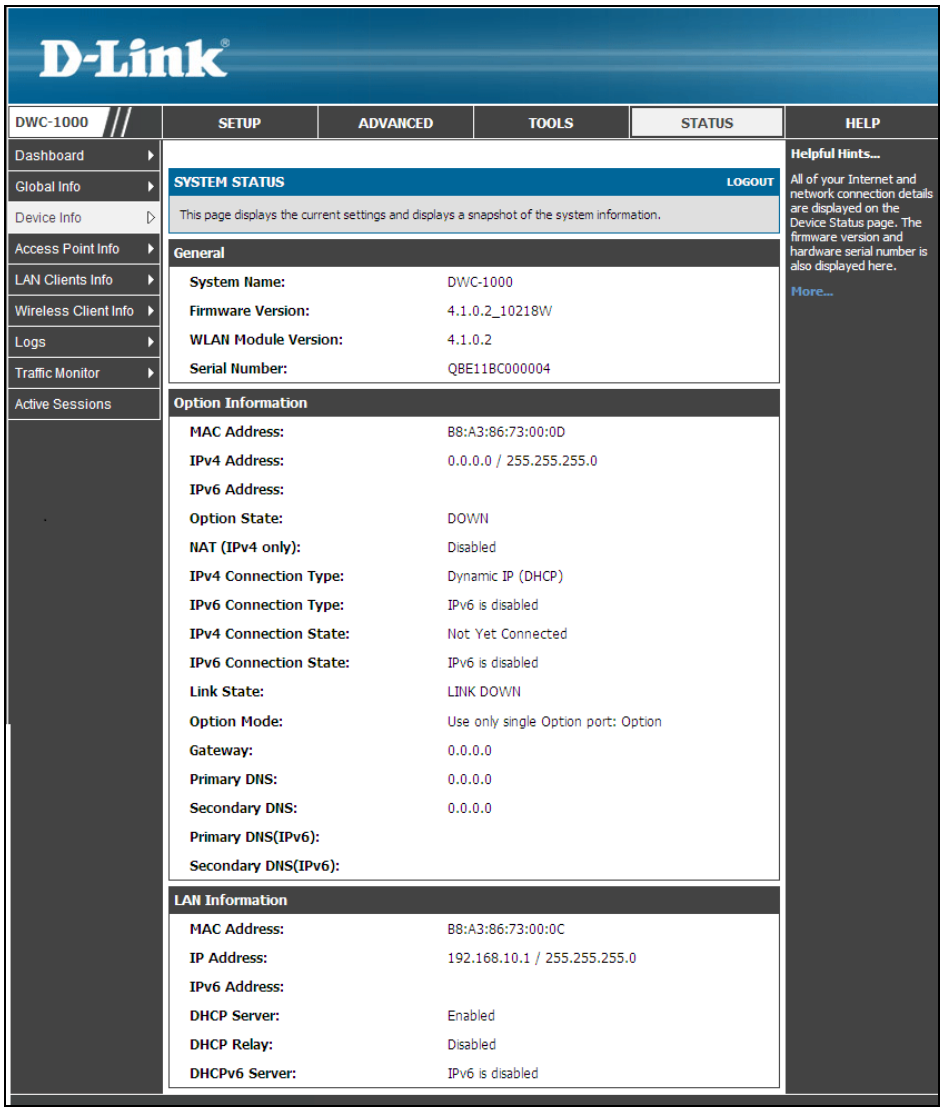


Figure 7-2. SYSTEM STATUS Page

Viewing Managed Access Point Information

Path: STATUS > Device Info > Wireless LAN AP Info

The WIRELESS LAN AP INFORMATION page shows details about the managed access points (see Table 7-2). Checking a managed access point enables the buttons described in Table 7-3.

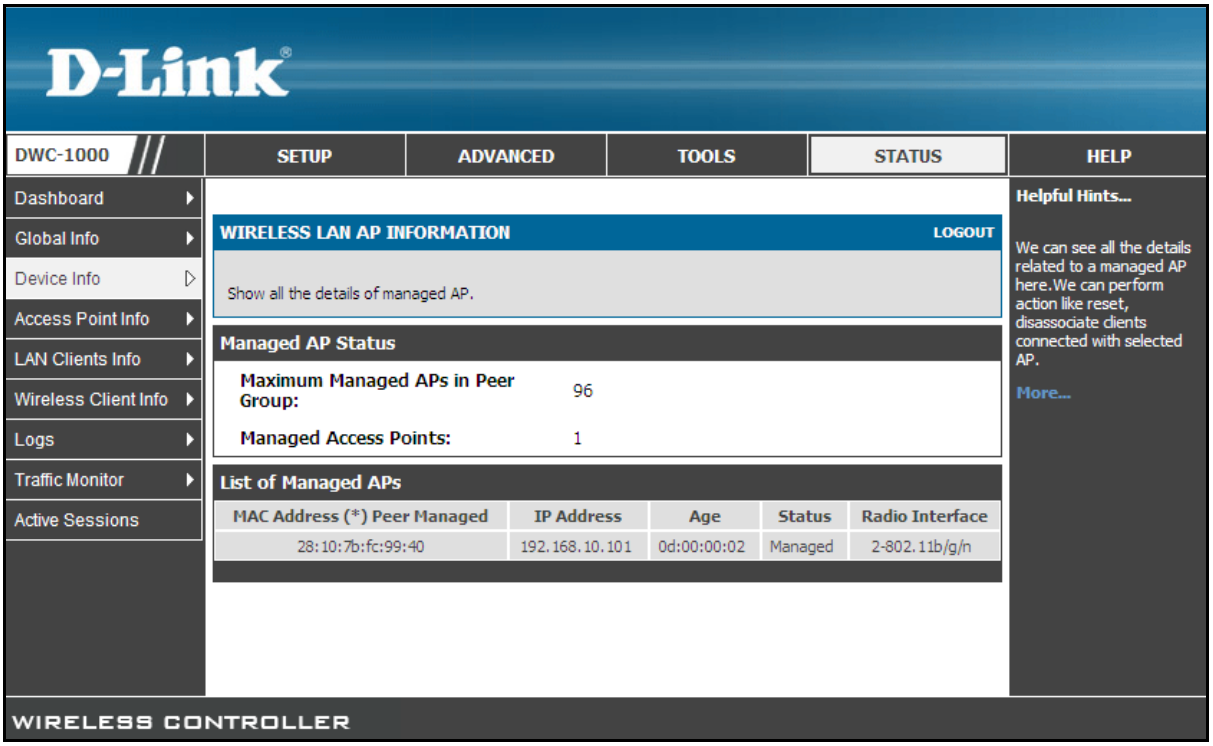


Figure 7-3. WIRELESS LAN AP INFORMATION Page

Table 7-2. Fields on the WIRELESS LAN AP INFORMATION Page

Field	Description
MAC Address (*) Peer Managed	Ethernet address of the managed access point. If an asterisk (*) follows the MAC address, the access point is managed by a peer controller.
IP Address	Network IP address of the managed access point.
Age	Time since last communication occurred between the wireless controller and the access point.
Status	Current managed state of the access point. Possible values are: • Discovered = access point is discovered by the wireless controller, but not authenticated. • Authenticated = access point has been validated and authenticated (if authentication is enabled), but it is not configured. • Managed = profile configuration has been applied to the access point and the access point is operating in managed mode. • Failed = wireless controller lost contact with the access point. A failed entry remains in the Managed AP database, unless you remove it. Note that a managed access point shows a failed status temporarily during a reset. If management connectivity is lost for a managed access point, both of its radios are turned down and all clients associated with the access point are disassociated. The radios resume operation when that access point is managed again by a wireless controller.
Profile	Configuration profile applied to the managed access point. The profile is assigned to the access point in the Valid AP database.
Radio Interface	Wireless radio mode that each radio on the access point is using.

Table 7-3. Buttons on the WIRELESS LAN AP INFORMATION Page

Button	Description
View AP Details	Shows detailed status information collected from the access point.
View Radio Details	Shows detailed status for a radio interface.
View Neighbor APs	Shows the neighbor APs that the specified AP has discovered through periodic RF scans on the selected radio interface.
View Neighbor Clients	Shows information about wireless clients associated with an access point or detected by the access point radio.
View VAP Details	Shows summary information about the virtual access points (VAPs) for the selected access point and the access point radio interface that the wireless controller manages.
View Distributed Tunnelling Details	Shows information about the L2 tunnels currently in use on the access point.

Viewing Cluster Information

Path: STATUS > Device Info > Cluster Information

The CLUSTER INFORMATION page shows information about other wireless controllers in the network. Peer wireless controllers within the same cluster exchange data about themselves, their managed access points, and their clients. The wireless controller maintains a database with this data, so you can view information about a peer, such as its IP address and software version. If the wireless controller loses contact with a peer, all of the data for that peer is deleted.

One wireless controller in a cluster is elected as a Cluster Controller. The Cluster Controller collects status and statistics from the other controllers in the cluster, including information about the access point's peer controller and the clients associated to those access points.

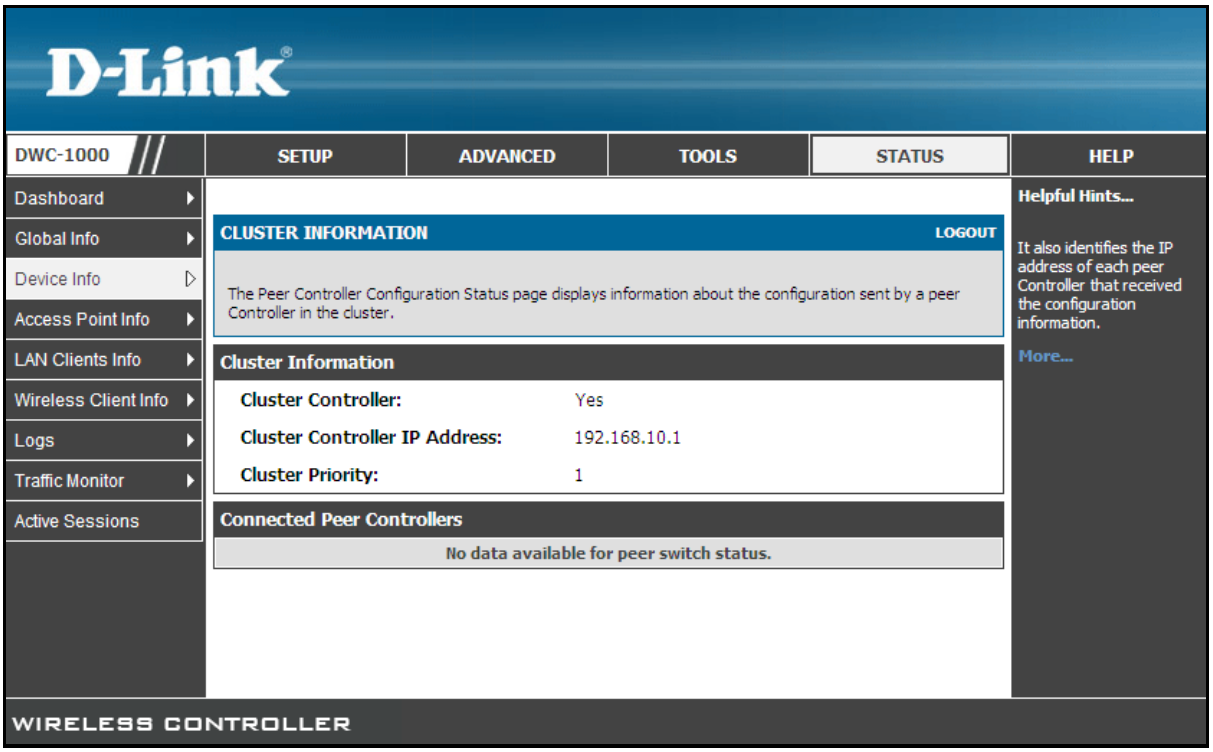


Figure 7-4. CLUSTER INFORMATION Page

Table 7-4. Fields on the CLUSTER Page

Field	Description
Cluster Information	
Cluster Controller	Identifies whether the wireless controller is part of a cluster. • Yes = wireless controller is part of a cluster. • No = wireless controller is not part of a cluster.
Cluster Controller IP Address	IP address of the controller that controls the cluster.
Cluster Priority	
Connected Peer Controllers	
IP Address	IP address of the peer wireless controller in the cluster.
Vendor ID	Vendor ID of the peer controller software.
Software Version	Software version for the given peer controllers.
Protocol Version	Protocol version supported by the software on the peer wireless controllers.
Discovery Reason	Discovery method of the given peer wireless controller, either through an L2 Poll or IP Poll.
Managed AP Count	Number of access points that the wireless controller manages currently.
Age	Time since last communication with the wireless controller, in hours, minutes, and seconds.

Viewing Hardware and Usage Statistics

Path: STATUS > Dashboard > Interface

The wireless controller provides a dashboard that displays information about the resources the system is using.

- Bandwidth usage and application usage are shown as graphs. A drop-down list lets you filter the graphs to show all, LAN, or option interfaces.
- Interface statistics for wired connections (LAN, Option1, Option 2/DMZ, and VLANs) show information about packets through and packets dropped by the interface. Click refresh to have this page retrieve the most current statistics (see Table 7-1):

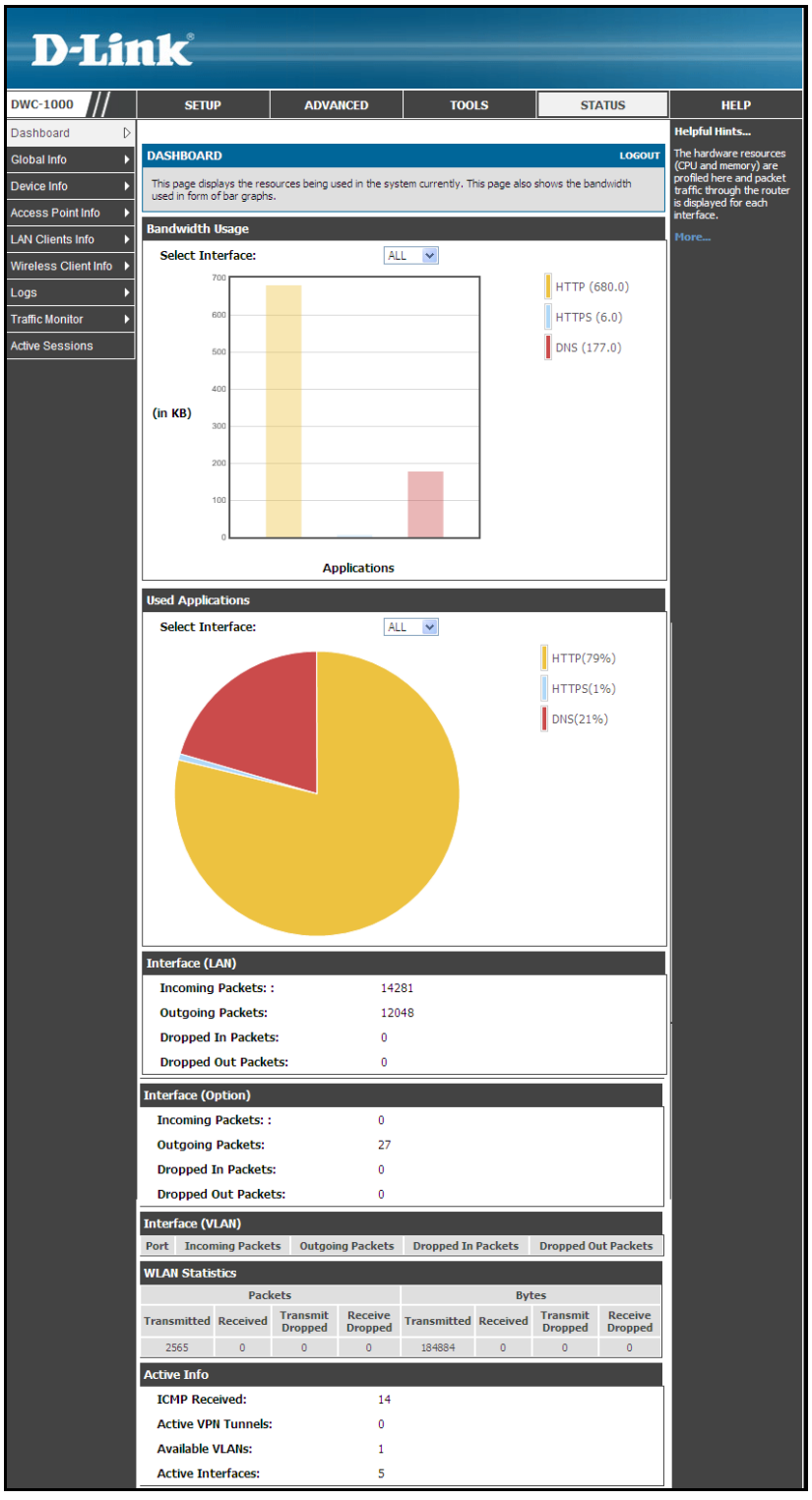


Figure 7-5. DASHBOARD Page

Wired Port Statistics

Path: STATUS > Traffic Monitor > Device Statistics

The DEVICE STATISTICS page shows detailed transmit and receive statistics for each physical port. This includes:

- Port-specific packet-level information for each interface (Option1, Option 2/DMZ, LAN, and VLANs)
- Transmitted and received packets
- Port collisions
- Cumulating bytes/sec for transmit/receive directions for each interface
- Port up time

If you suspect issues with any of the wired ports, use this table to identify uptime or transmit level issues with the port. The statistics table has an auto-refresh control for displaying the most current port level data at each page refresh. The default auto-refresh for this page is 10 seconds.

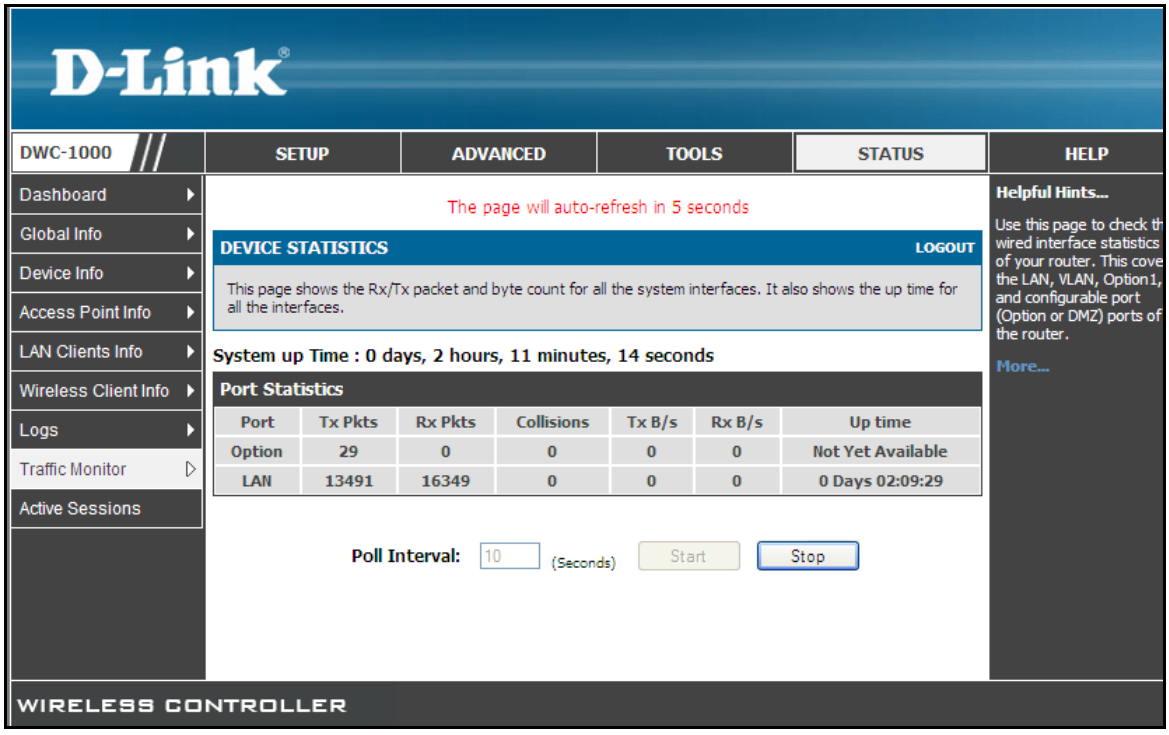


Figure 7-6. DEVICE STATISTICS Page

Managed Access Points and Associated Clients Statistics

Path: STATUS > Traffic Monitor > Managed AP Statistics

The MANAGED AP STATISTICS page shows information about traffic on the access point's wired and wireless interfaces. This information can help diagnose network issues, such as throughput problems.

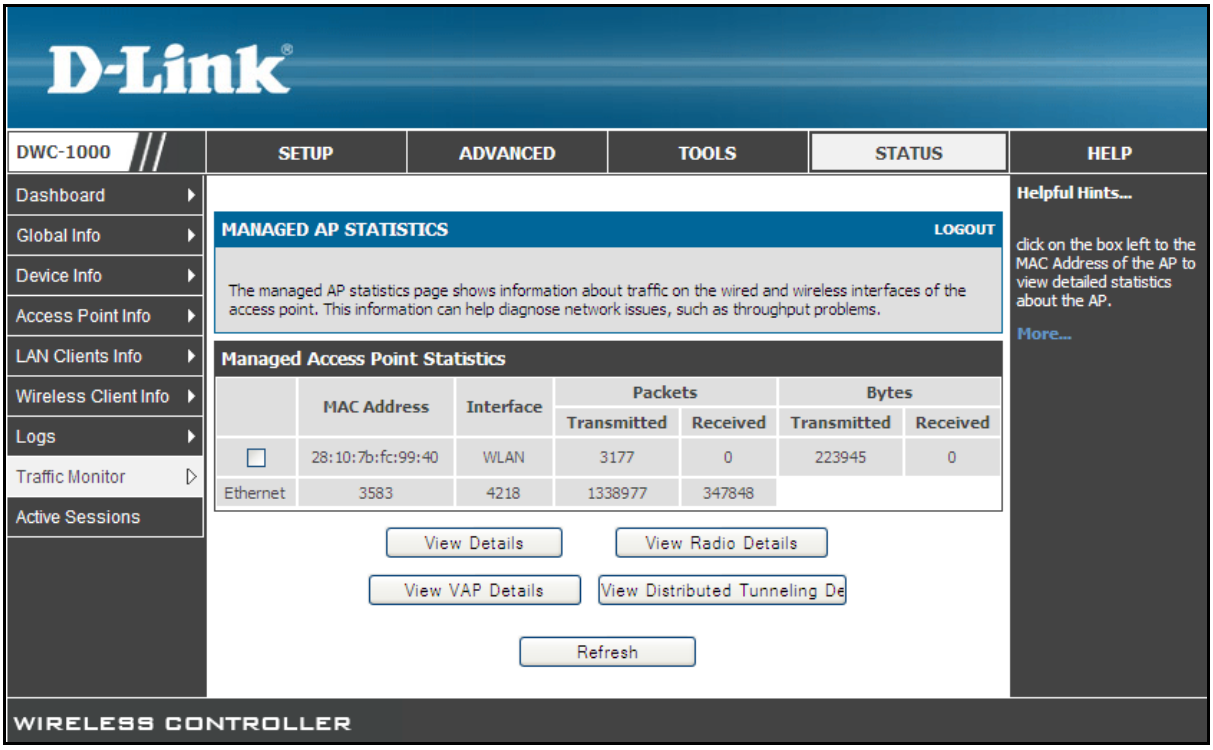


Figure 7-7. MANAGED AP STATISTICS Page

Table 7-5. Fields on the MANAGED AP STATISTICS Page

Field	Description
MAC Address	MAC address of the client station.
Interface	Interface type (WLAN or Ethernet.).
Packets Transmitted	Number of packets transmitted to the client station.
Packets Received	Number of packets received by the client station.
Bytes Transmitted	Number of bytes transmitted to the client station.
Bytes Received	Number of bytes received by the client station.

Table 7-6. Buttons on the MANAGED AP STATISTICS Information

Button	Description
View Details	Shows detailed status information collected from the access point
View Radio Details	Shows detailed status for a radio interface.
View VAP Details	Shows summary information about the virtual access points (VAPs) for the selected access point and radio interface on the access points that the wireless controller manages.
View Distributed Tunneling Details	Shows information about access points that the client detects. The access point-access point tunnelling mode is used to support L3 roaming for wireless clients without forwarding any data traffic to the wireless controller.
Refresh	Updates the information shown on the page.

LAN-Associated Clients

Path: STATUS > Traffic Monitor > Associated Clients Statistics > WLAN Associated Clients

The ASSOCIATED CLIENTS STATISTICS page tracks the traffic associated with the client connected to the wireless controller. A **Refresh** button lets you update the information shown on the page. Checking a client and clicking the **View Details** button displays detailed information about the selected client.

After clicking next to the MAC address, the View Details page shows the fields in Table 7-7. This page shows information about the traffic a wireless client receives and transmits while it is associated with a single access point. Use the menu above the table to view details about an associated client. Each client is identified by its MAC address.

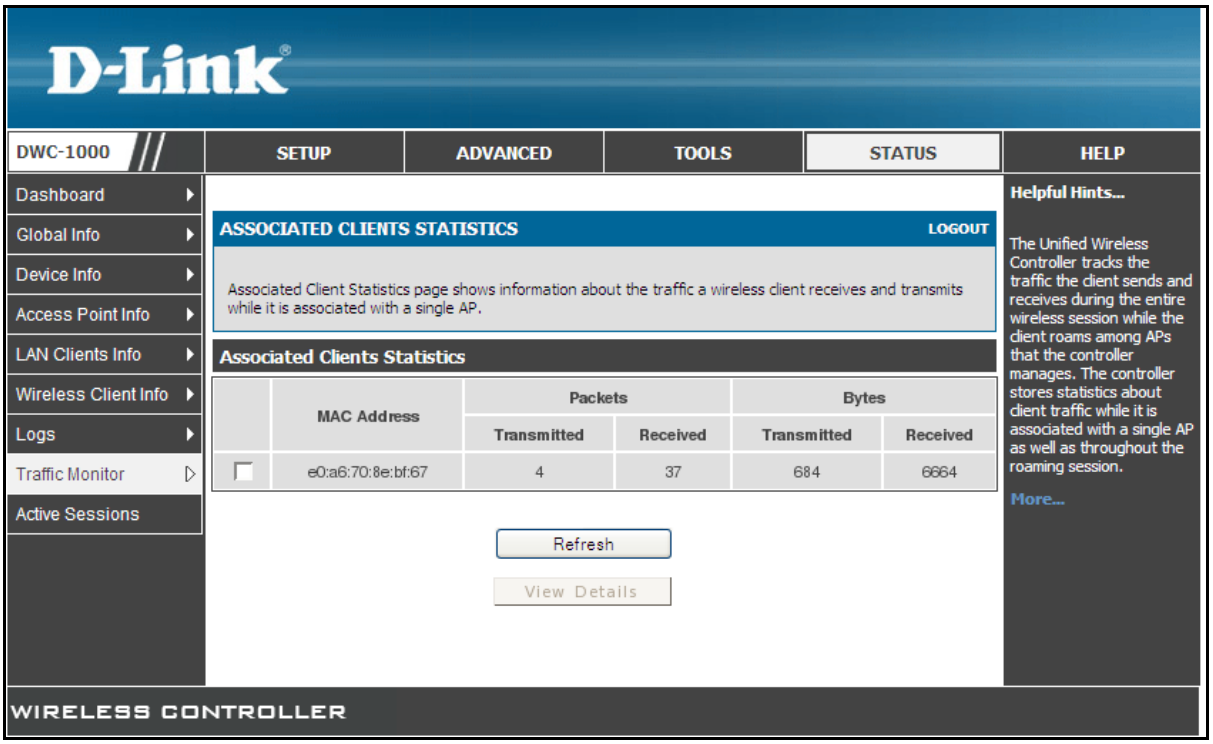


Figure 7-8. ASSOCIATED CLIENTS STATISTICS Page

Table 7-7. Fields on the ASSOCIATED CLIENTS STATISTICS Page

Field	Description
Packets Received	Total number of packets received from the client station.
Bytes Received	Total number of bytes received from the client station.
Packets Transmitted	Total number of packets transmitted to the client station.
Bytes Transmitted	Total number of bytes transmitted to the client station.
Packets Receive Dropped	Number of packets received from the client station that were dropped.
Bytes Receive Dropped	Number of bytes received from the client station that were dropped.
Packets Transmit Dropped	Number of packets transmitted to the client station that were dropped.
Bytes Transmit Dropped	Number of bytes transmitted to the client station that were dropped.
Fragments Received	Total number of fragmented packets received from the client station.
Fragments Transmitted	Total number of fragmented packets transmitted to the client station.
Transmit Retries	Number of times transmits to client station succeeded after one or more retries.
Transmit Retries Failed	Number of times transmits to client station failed after one or more retries.
TS Violate Packets Received	Count of packets received by an access point from a wireless client for the specified access category.
TS Violate Packets Transmitted	Count of packets transmitted by an access point to a wireless client for the specified access category.
Duplicates Received	Total number of duplicate packets received from the client station.

Table 7-8. Buttons on the ASSOCIATED CLIENTS STATISTICS Page

Field	Description
Refresh	Updates the information shown on the page.
View Details	Shows detailed status associated client.

WLAN-Associated Clients

Path: STATUS > Wireless Client Info > Associated Clients > Status

The wireless client can roam among access points without interruption in WLAN service. The wireless controller tracks the traffic the client sends and receives during the entire wireless session while the client roams among access points being managed by the wireless controller.

Using the ASSOCIATED CLIENTS STATUS page, you can view statistics stored by the wireless controller about client traffic while the client is associated with a single access point as well as throughout the roaming session.

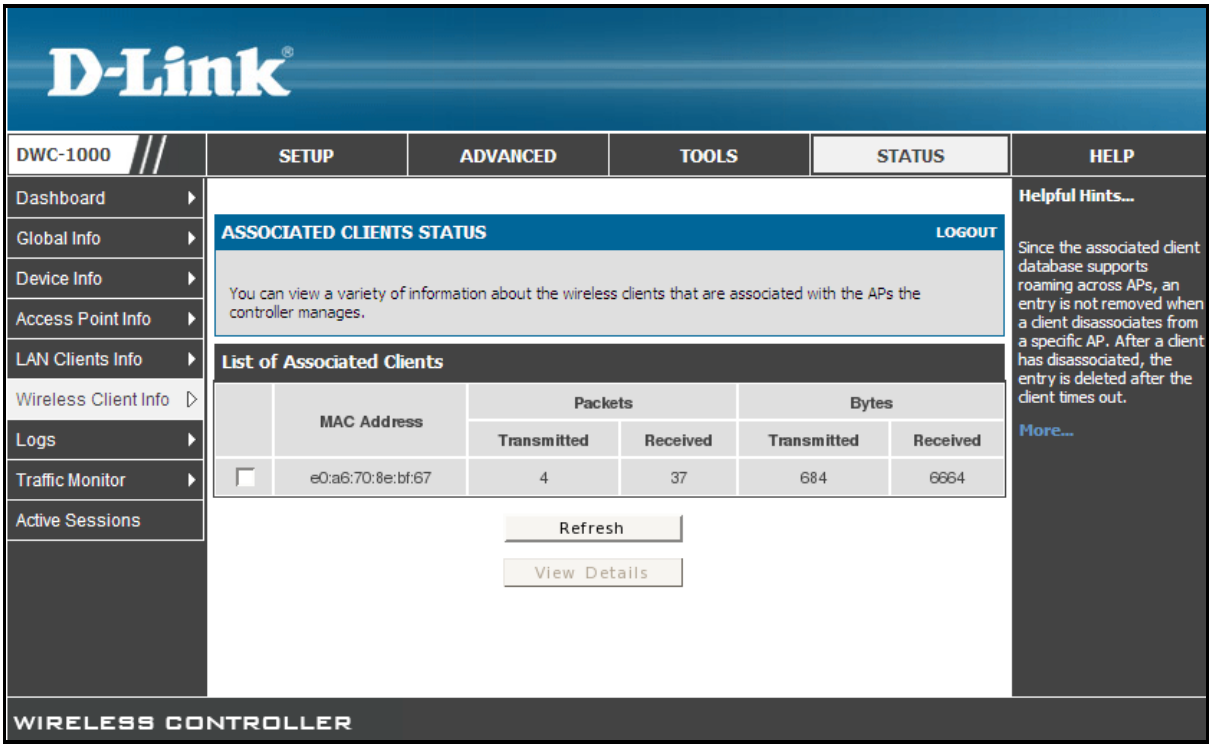


Figure 7-9. ASSOCIATED CLIENTS STATISTICS Page

Table 7-9. Fields on the ASSOCIATED CLIENTS STATISTICS Page

Field	Description
MAC Address	MAC address of the client station.
Packets Transmitted	Number of packets transmitted to the client station.
Packet Received	Number of packets received by the client station.

Field	Description
Bytes Transmitted	Number of bytes transmitted to the client station.
Bytes Received	Number of bytes received by the client station.

Sessions through the Wireless Controller

Path: STATUS > Active Sessions

The ACTIVE SESSIONS page shows the following information about the active Internet sessions through the wireless controller:

- Local and remote IP addresses
- Protocol used during the Internet sessions
- State

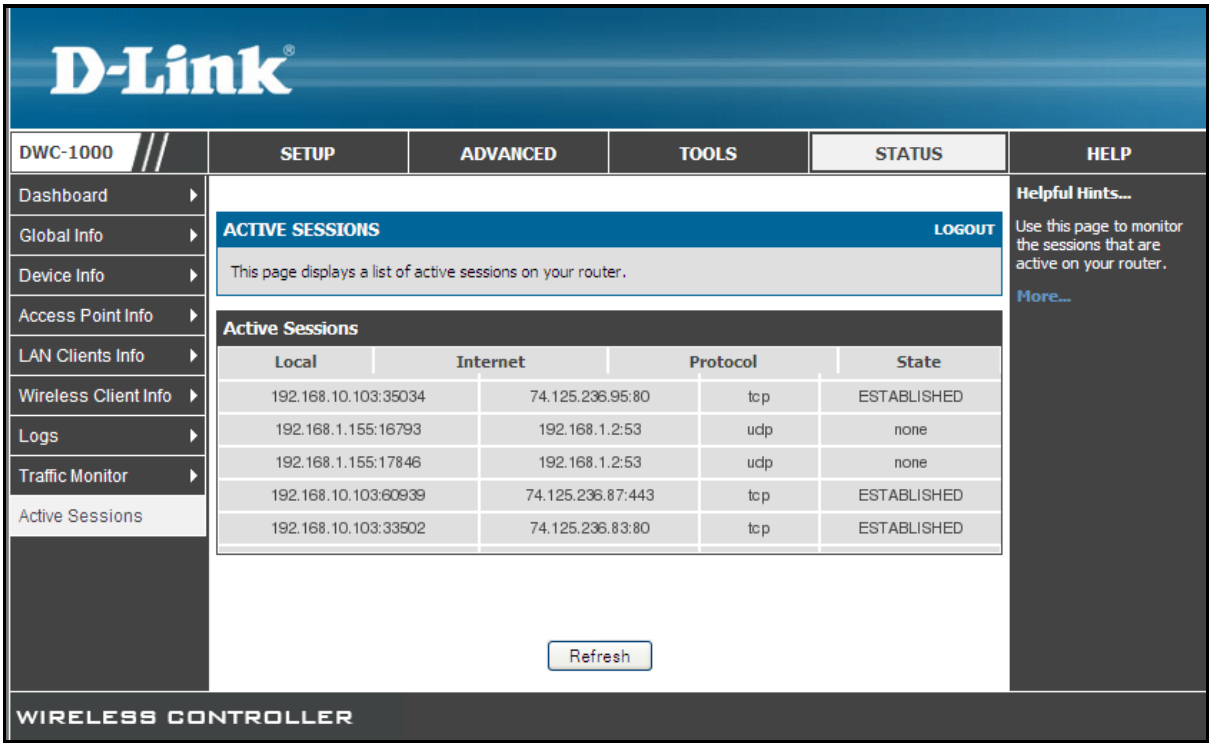


Figure 7-10. ACTIVE SESSIONS Page

Associated Clients

Path: STATUS > Associated Clients > Status

The ASSOCIATED CLIENTS STATUS page shows clients that are associated with the access points being managed by the wireless controller.

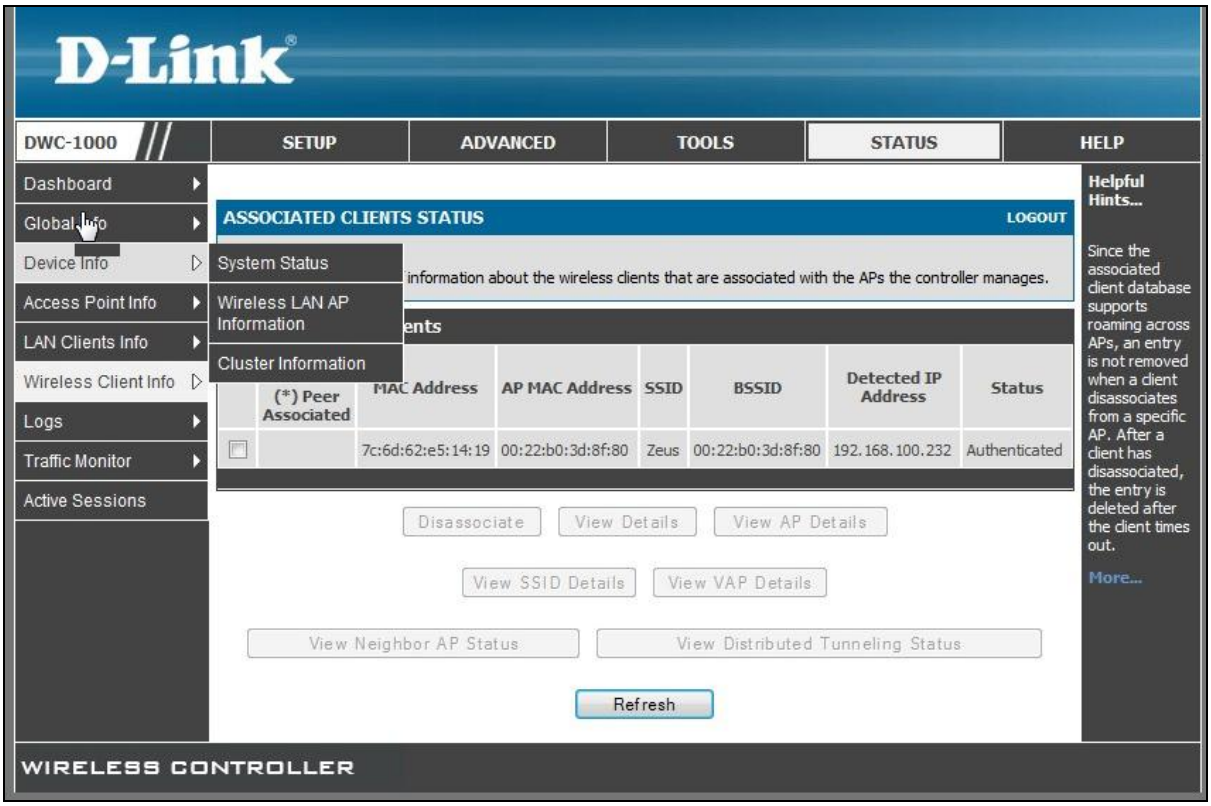


Figure 7-11. ASSOCIATED CLIENTS STATUS Page

Table 7-10. Fields on the ASSOCIATED CLIENTS STATUS Page

Field	Description
MAC Address	Ethernet address of the client station. If the MAC address is followed by an asterisk (*), the client is associated with an access point managed by a peer controller.
AP MAC Address	Ethernet address of the access point.
SSID	Name of the network on which the client is connected.
BSSID	Ethernet MAC address for the managed access point/virtual access point where this client is associated.
Detected IP Address	IPv4 address of the client, if available.

Field	Description
Status	Indicates whether the client is associated and/or authenticated. The valid values are: • Associated = client is currently associated to the managed access point. • Authenticated = client is currently associated and authenticated to the managed access point. • Disassociated = client has disassociated from the managed access point. If the client does not roam to another managed access point within the client roam timeout, it is deleted.

Table 7-11. Buttons on the ASSOCIATED CLIENTS STATUS Page

Button	Description
Disassociate	Disassociates the client from the managed access point.
View Details	For each client associated with an access point that the wireless controller manages, you can view detailed status information about the client and its association with the access point.
View Neighbor Status	Shows information about access points that the client detects. The information on this page can help you determine the managed access point an associated client might use for roaming.
View Distributed Tunneling Status	Shows information about access points that the client detects. The tunnelling mode is used to support L3 roaming for wireless clients without forwarding any data traffic to the wireless controller.
View SSID Details	Each managed access point can be from different networks that each have a unique SSID. Although several wireless clients might be connected to the same physical AP, they might not connect by using the same SSID. The **WLAN > Monitoring > Client > Associated Clients > SSID Status** page lists the SSIDs of the networks that each wireless client associated with a managed access point has used for WLAN access.
View VAP Details	Each access point has a set of Virtual Access Points (VAPs) per radio, and every VAP has a unique MAC address (BSSID). This displays the VAP Associated Client Status page, which shows information about the VAPs on the managed AP that have associated wireless clients.

LAN Clients

Path: STATUS > LAN Clients Info > LAN Clients

LAN clients to the wireless controller are identified by an address resolution protocol (ARP) scan through the LAN controller. The LAN CLIENTS page shows the:

- NetBios name (if available)
- IP address of discovered LAN hosts
- MAC address of discovered LAN hosts

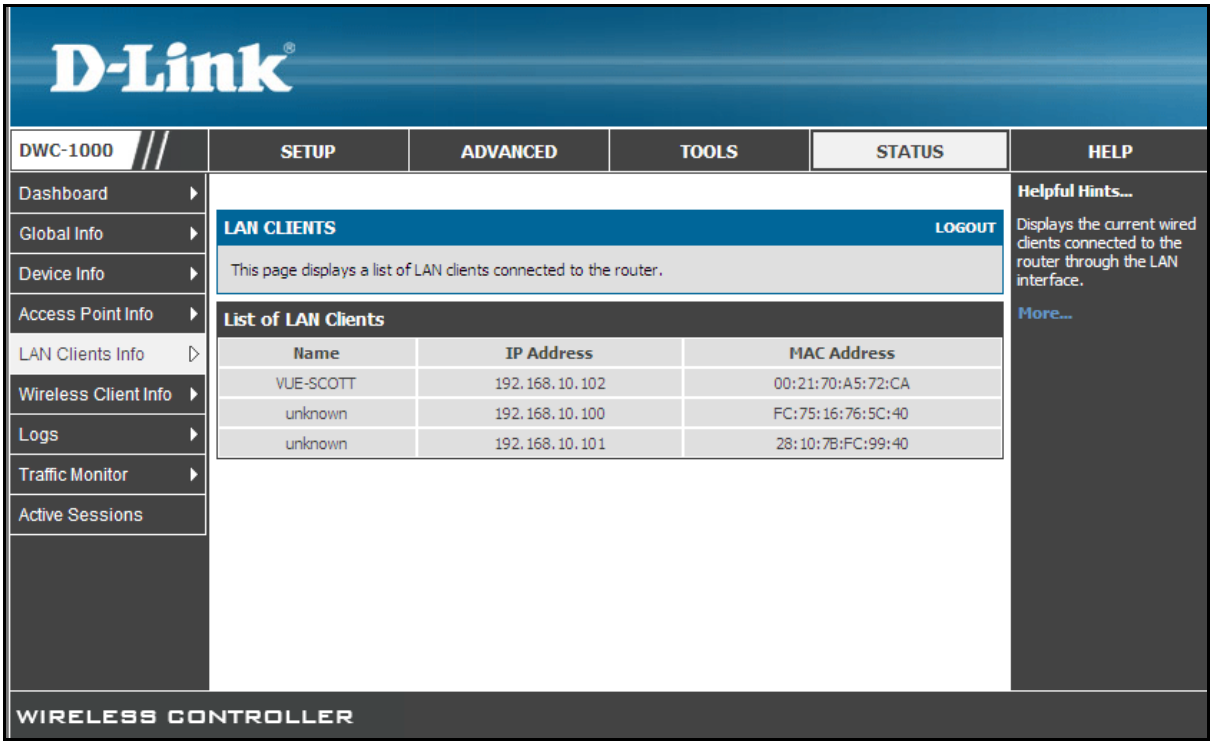


Figure 7-12. LAN CLIENTS Page

Detected Clients

Path: STATUS > LAN Clients Info > Detected Clients

Wireless clients are detected by the wireless system either when the clients attempt to interact with the system or when the system detects traffic from the clients. The Detected Client Status page shows information about clients that have authenticated with an access point as well information about clients that disassociate and are no longer connected to the system.

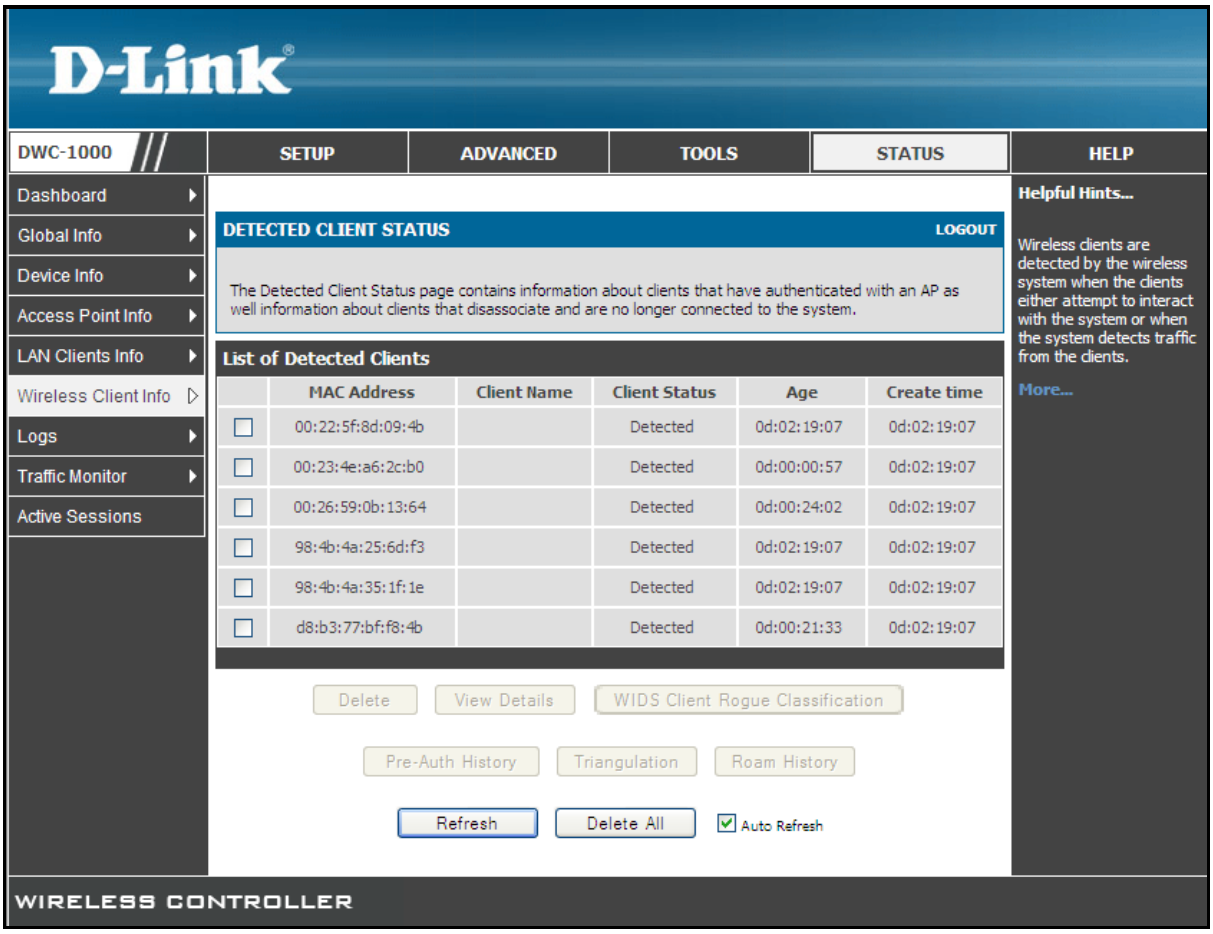


Figure 7-13. DETECTED CLIENT STATUS Page

Table 7-12. Fields on the DETECTED CLIENT STATUS Page

Field	Description
MAC Address	Ethernet MAC address of the client.
Client Name	Name of the client, if available, from the Known Client Database. If the client is not in the database, the field is blank.
Client Status	Client status, which can be one of the following values: • Authenticated = wireless client is authenticated with the wireless system. • Detected = wireless client is detected by the wireless system, but is not a security threat. • Black-Listed = client with this MAC address is specifically denied access via MAC authentication. • Rogue = client is classified as a threat by one of the threat-detection algorithms.
Age	Time since any event has been received for this client that updated the detected client database entry.
Create Time	Time since this entry was first added to the detected client database.

Access Point Status

Path: STATUS > Dashboard > Access Point

The ACCESS POINT page shows summary information about managed, failed, and rogue access points the wireless controller has discovered or detected. A pie chart at the bottom of the page provides a graphical representation of the total access point utilization.

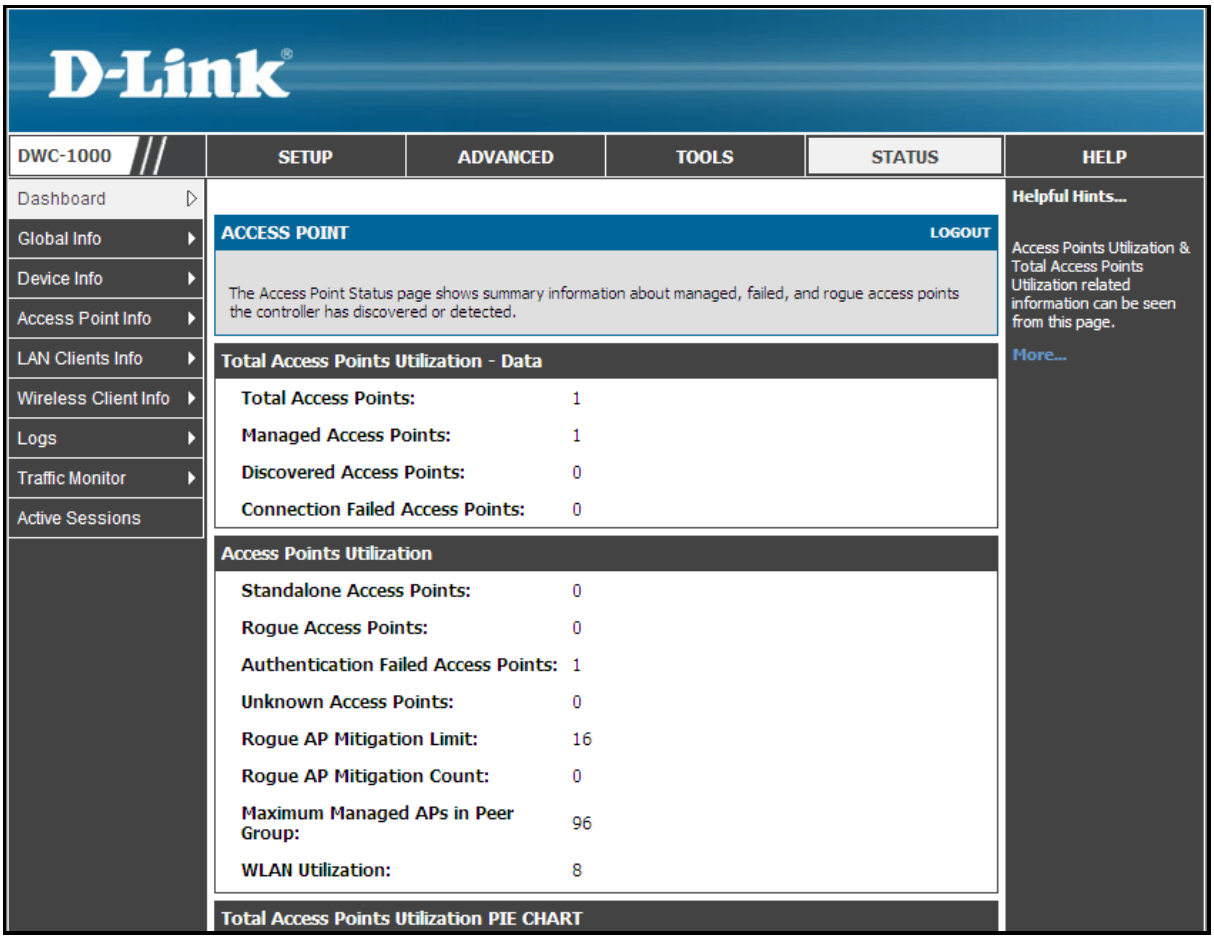


Figure 7-14. ACCESS POINT Page

Table 7-13. Fields on the ACCESS POINT Page

Field	Description
Total Access Points Utilization - Data	
Total Access Points	Total number of managed access points in the database. This value equals the sum of Managed Access Points, Connection Failed Access Points, and Discovered Access Points.
Managed Access Points	Number of access points in the Managed AP database that are authenticated, configured, and have an active connection with the controller.
Discovered Access Points	Access points that have a connection with the controller, but have not been configured completely. This value includes all managed access points with a Discovered or Authenticated status.
Connection Failed Access Points	Number of access points that were previously authenticated and managed, but currently don't have connection with the wireless controller.
Access Points Utilization	
Standalone Access Points	Number of trusted access points in Standalone mode. Access points in Standalone mode are not managed by a wireless controller.
Rogue Access Points	Number of rogue access points currently detected on the WLAN. When an access point performs an RF scan and detects access points that have not been validated, it reports them as rogues.
Authentication Failed Access Points	Number of access points that failed to establish communication with the controller.
Unknown Access Points	Number of Unknown access points currently detected on the WLAN. If an access point configured to be managed by the controller is detected through an RF scan at any time that it is not actively managed it is classified as an Unknown access point.
Rogue access point Mitigation Limit	Maximum number of access points for which the system can send de-authentication frames.
Rogue access point Mitigation Count	Number of access points to which the wireless system is currently sending de-authentication messages to mitigate against rogue access points. A value of 0 indicates that mitigation is not in progress.
Maximum Managed access points in Peer Group	Maximum number of access points that can be managed by the cluster.
WLAN Utilization	Total network utilization across all access points managed by this controller. This value is based on global statistics.

Access Point Summary

Path: STATUS > Access Points Info > APs Summary

The ACCESS POINTS SUMMARY page shows summary information about managed, failed, and rogue access points the wireless controller has discovered or detected. Status entries can be deleted manually.

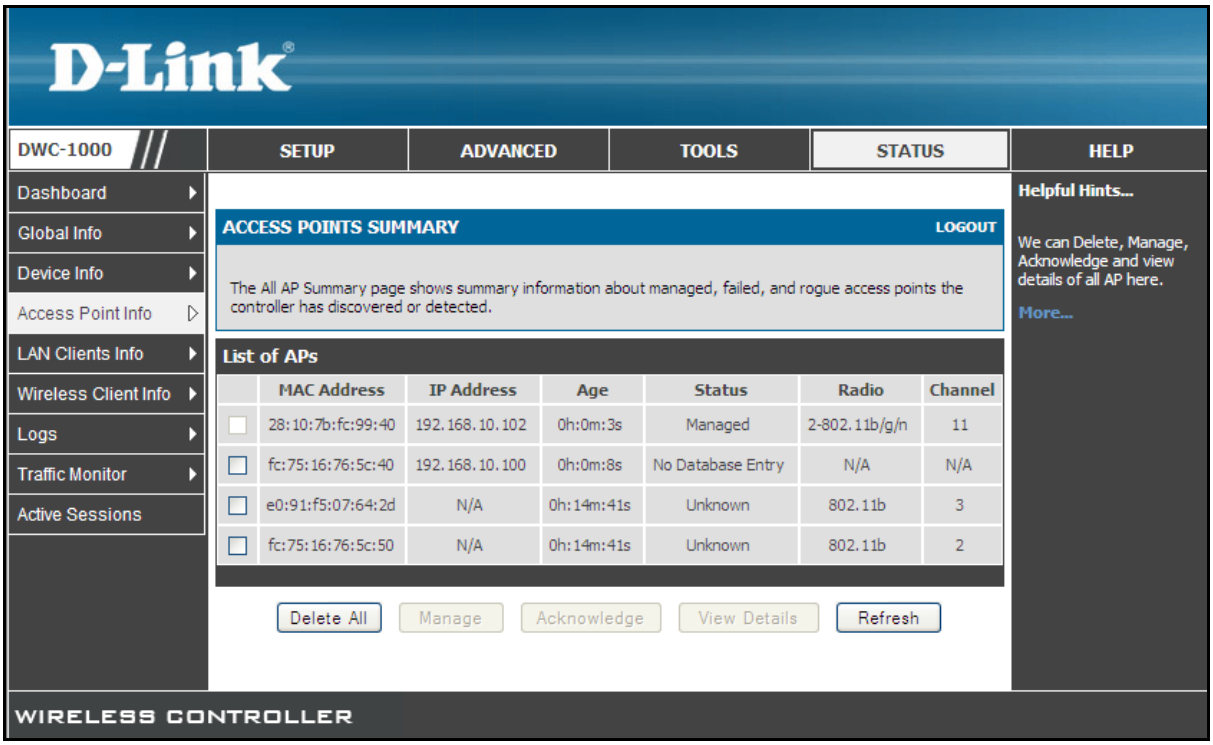


Figure 7-15. ACCESS POINTS SUMMARY Page

Table 7-14. Fields on the ACCESS POINTS SUMMARY Page

Field	Description
MAC Address	MAC address of the access point.
IP Address	Network address of the access point.
Age	Amount of time that has passed since the access point was last detected and the information was last updated.
Status	Access point status. Possible values are: • Managed = access point profile configuration has been applied to the access point and the access point is operating in managed mode. • No Database Entry = access point's MAC address does not appear in the local or RADIUS Valid AP database. • Authentication (Failed AP) = access point failed to be authenticated by the wireless controller or RADIUS server. • Failed = wireless controller lost contact with the access point. A failed entry will remain in the Managed AP database unless you remove it. Note: a managed access point shows a failed status temporarily during a reset. • Rogue = access point has not tried to contact the wireless controller and the access point's MAC address is not in the Valid AP database.
Radio	Wireless radio mode the access point is using.
Channel	Operating channel for the radio.

Table 7-15. Buttons on the ACCESS POINTS SUMMARY Page

Button	Description
Delete All	Clears all access points, except Managed Access Points, from the page. You do not have to check the access points before clicking this button. After you click this button, a confirmation page asks to you to confirm the deletion.
Manage	Configures an access point with a status of Authentication Failed to be managed by the wireless controller the next time the access point is discovered. Check the box next to the MAC address of the access point and click Manage. The VALID AP page appears, where you can configure the access point (see Table 3-2 on page 35). You can then configure the access point and click Submit to save it in the local Valid AP database. If you use a RADIUS server to validate access points, add the access point's MAC address to the access point database on the RADIUS server.
Acknowledge	Identifies an access point as an Acknowledged Rogue. Check the box next to the MAC address of the access point and click Acknowledge. The wireless controller adds the access point to the Valid Access Point database as an Acknowledged Rogue.
View Details	To view details for a configured access point, check its box next to the MAC address and then click View Details. The AP RF SCAN STATUS page appears, with detailed information about the access point (see "AP RF Scan Status" on page 159).
Refresh	Updates the information shown on the page.

Managed Access Point

Path: STATUS > Access Point Info > Managed AP Status

The MANAGED AP STATUS page shows a variety of information about each access point that the wireless controller is managing.

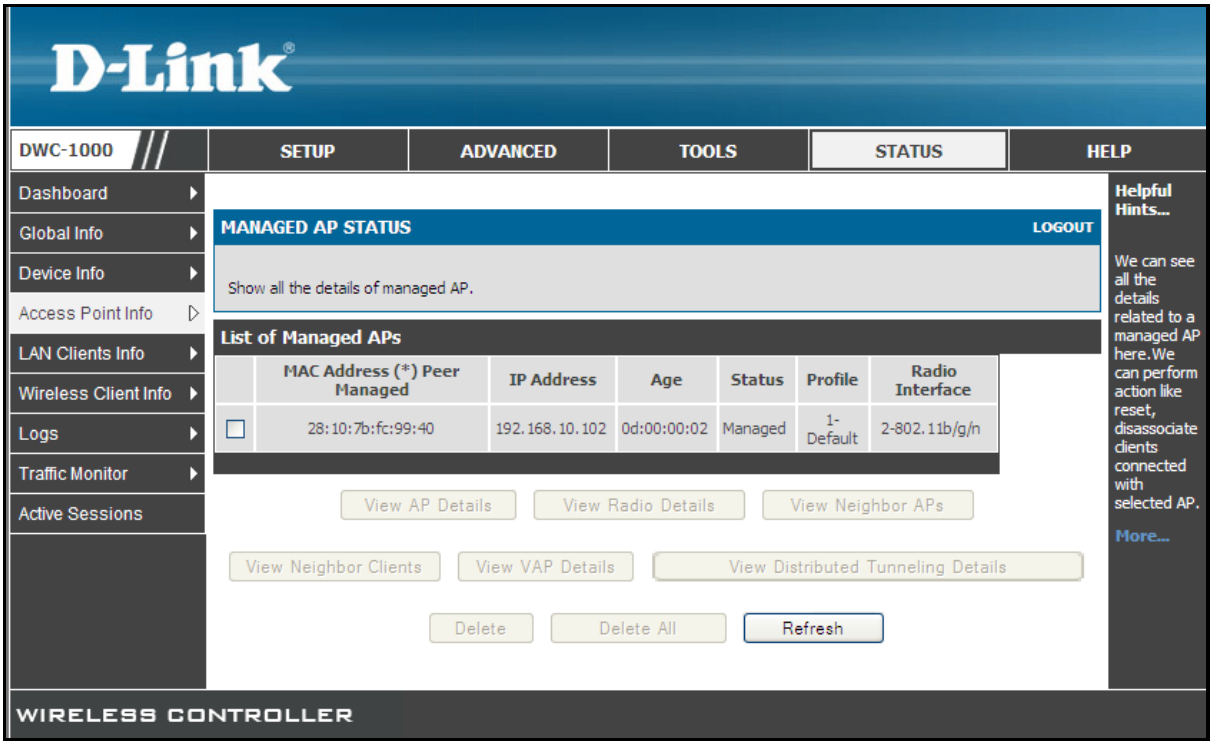


Figure 7-16. MANAGED AP STATUS Page

Table 7-16. Fields on the MANAGED AP STATUS Page

Field	Description
MAC Address	Ethernet address of the access point being managed by the wireless controller.
IP Address	Network IP address of the managed access point.
Age	Time of the last communication between the wireless controller and the access point.
Status	Current managed state of the access point. Possible values are: • Discovered = access point is discovered by the wireless controller, but is not yet authenticated. • Authenticated = access point has been validated and authenticated (if authentication is enabled), but it is not configured. • Managed = access point profile configuration has been applied to the access point and the access point is operating in managed mode. • Failed = wireless controller lost contact with the access point. A failed entry will remain in the Managed AP database unless you remove it. Note: a managed access point shows a failed status temporarily during a reset.
Profile	Access point profile configuration currently applied to the managed access point. The profile is assigned to the access point in the Valid AP database.
Radio Interface	Wireless radio mode that each radio on the access point is using.

Table 7-17. Buttons on the MANAGED AP STATUS Page

Button	Description
Delete	Clears existing access point.
View AP Details	Shows detailed status information collected from the access point.
View Radio Details	Shows detailed status for a radio interface.
View Neighbor Details	Shows the neighbor access points that the specified access point has discovered through periodic RF scans on the selected radio interface.
View Neighbor Clients	Shows information about wireless clients associated with an AP or detected by the access point radio.
View VAP Details	Shows summary information about the virtual access points (VAPs) for the selected access point and radio interface on the access points that the controller manages.

Authentication Failure Status

Path: STATUS > Access Point Info > Authentication Failure Status

An access point might fail to associate to the wireless controller due to errors such as invalid packet format or vendor ID, or because the access point is not configured as a valid access point with the correct local or RADIUS authentication information. The AP AUTHENTICATION FAILURE STATUS page shows information about access points that failed to establish communication with the wireless controller.

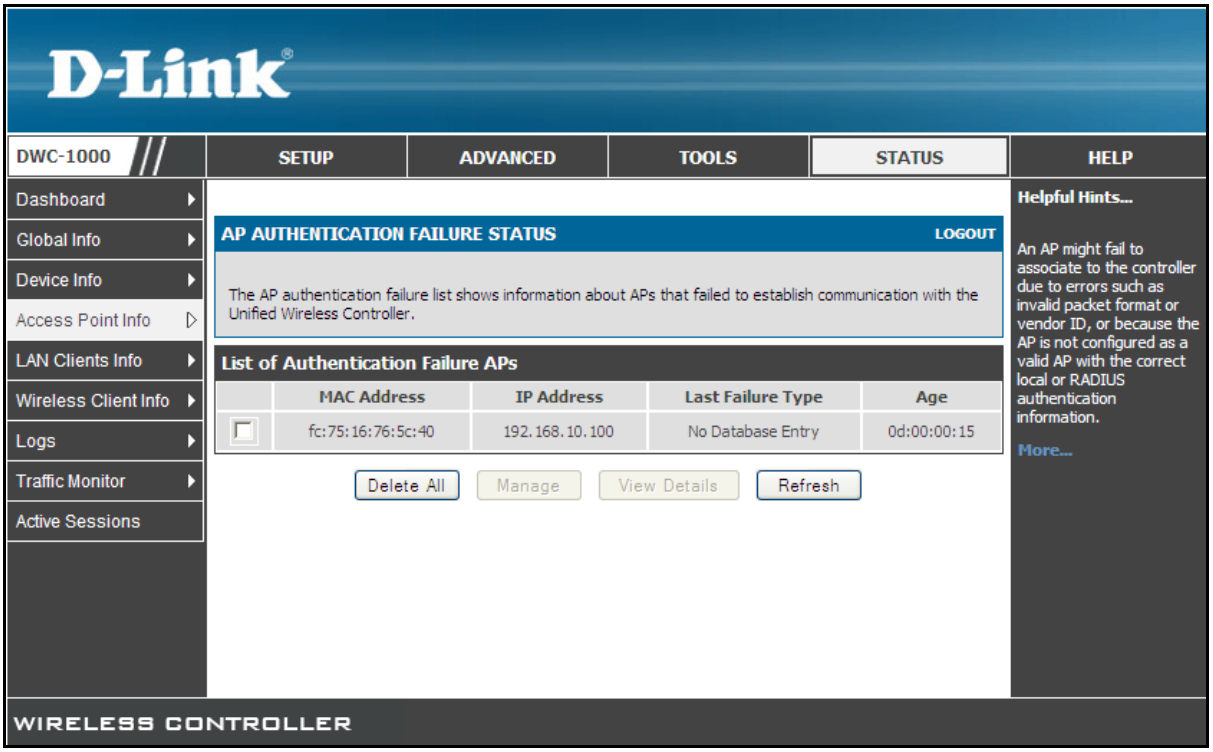


Figure 7-17. AP AUTHENTICATION FAILURE STATUS Page

An access point can fail due to any of the reasons in Table 7-18.

Table 7-18. Reasons for Access Point Failures

Failure	Description
No Database Entry	MAC address of the access point is not in the local Valid AP database or the external RADIUS server database, so the access point has not been validated.
Local Authorization	Authentication password configured in the access point did not match the password configured in the local database.
Not Managed	Access point is in the Valid AP database, but the access point Mode in the local database is not set to Managed.
RADIUS Authentication	The password configured in the RADIUS client for the RADIUS server was rejected by the server.
RADIUS Challenged	The RADIUS server is configured to use the Challenge-Response authentication mode, which is incompatible with the access point.
RADIUS Unreachable	The RADIUS server that the access point is configured to use is unreachable.
Invalid RADIUS Response	The access point received a response packet from the RADIUS server that was not recognized or invalid.
Invalid Profile ID	The profile ID specified in the RADIUS database may not exist on the controller. This can also happen with the local database when the configuration has been received from a peer controller.
Profile Mismatch	Hardware Type: The access point hardware type specified in the access point Profile is not compatible with the actual access point hardware.

Table 7-19. Fields on the AP AUTHENTICATION FAILURE STATUS Page

Field	Description
MAC Address	Ethernet address of the AP. If the MAC address of the access point is followed by an asterisk (*), it was reported by a peer controller.
IP Address	IP address of the access point.
Last Failure Type	Last type of failure that occurred. Possible values are: • Local Authentication • No Database Entry • Not Managed • RADIUS Authentication • RADIUS Challenged • RADIUS Unreachable • Invalid RADIUS Response • Invalid Profile ID • Profile Mismatch-Hardware Type
Age	Time since failure occurred.

AP RF Scan Status

Path: STATUS > Access Point Info > AP RF Scan Status

The radios on each access point can scan the radio frequency periodically to collect information about other access points and wireless clients that are within range. In normal operating mode, the access point always scans on the operational channel for the radio. The AP RF SCAN STATUS page shows information about other access points and wireless clients that the wireless controller has detected.

Figure 7-18. AP RF SCAN STATUS Page

Table 7-20. Fields on the AP RF SCAN STATUS Page

Field	Description
MAC Address	Ethernet MAC address of the detected access point. This could be a physical radio interface or VAP MAC.
SSID	Service Set ID of the network, which is broadcast in the detected beacon frame.
Physical Mode	802.11 mode used on the access point.
Channel	Transmit channel of the access point.
Status	Managed status of the access point. The valid values are: • Managed = neighbor access point is managed by the wireless system. • Standalone = access point is managed in standalone mode and configured as a valid AP entry (local or RADIUS). • Rogue = access point is classified as a threat by one of the threat detection algorithms. • Unknown = access point is detected in the network but is not classified as a threat by the threat detection algorithms.
Age	Time since this access point was last detected in an RF scan. Status entries for this page are collected at a point in time and eventually age out. The age value for each entry shows how long ago the wireless controller recorded the entry.

Global Status

Path: STATUS > Global Info > Global Status

The wireless controller collects information periodically from the access points it manages and from the associated peer controller. The SUMMARY page shows status and statistics about the wireless controller and the objects associated with it.

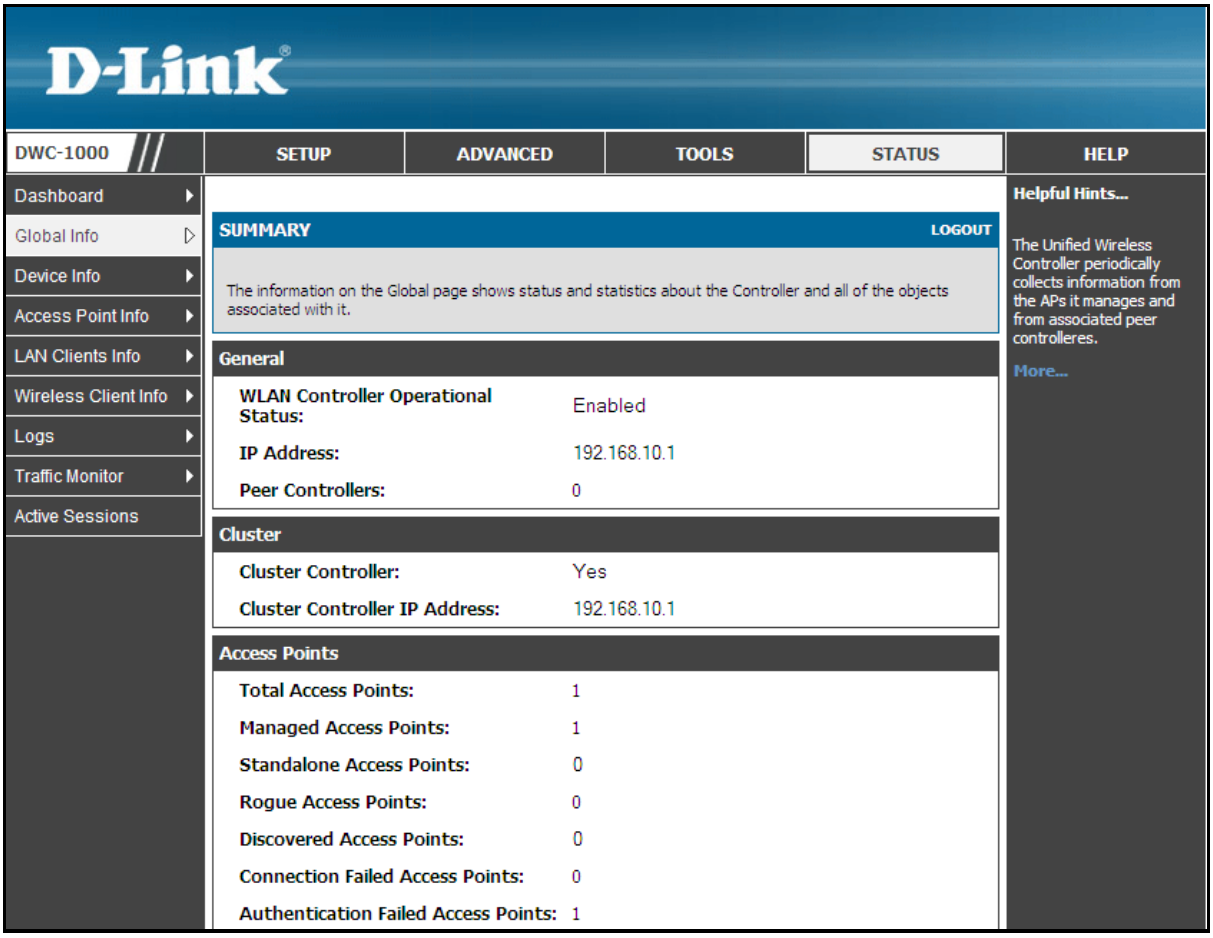


Figure 7-19. SUMMARY Page

Table 7-21. Fields on the SUMMARY Page

Field	Description
General	
WLAN Controller Operational Status	Operational status of this wireless (WLAN) controller. The controller might be configured as enabled, but is operationally disabled due to configuration dependencies. If the operational status is disabled, the reason appears in the following status field.
IP Address	IP address of the wireless controller.
Peer Controllers	Number of peer WLAN controllers detected on the network.
Cluster	
Cluster Controller	Indicates whether this controller is the Cluster Controller for the cluster.
Cluster Controller IP Address	IP address of the peer controller that is the Cluster Controller.
Access Points	
Total Access Points	Total number of Managed access points in the database. This value equals the sum of Managed Access Points, Connection Failed Access Points, and Discovered Access Points.
Managed Access Points	Number of access points in the managed access point database that are authenticated, configured, and have an active connection with the controller.
Standalone Access Points	Number of trusted access points in standalone mode. Access points in Standalone mode are not managed by a controller.
Rogue Access Points	Number of rogue access points currently detected on the WLAN. When an access point performs an RF scan, it might detect access points that have not been validated. It reports these access points as rogues.
Discovered Access Points	Access points that have a connection with the wireless controller, but have not been configured completely. This value includes all managed access points with a Discovered or Authenticated status.
Connection Failed Access Points	Number of access points that were previously authenticated and managed, but currently do not have connection with the wireless controller.
Authentication Failed Access Points	Number of access points that failed to establish communication with the wireless controller.
Unknown Access Points	Number of Unknown access points currently detected on the WLAN. If an access point configured to be managed by the wireless controller is detected through an RF scan when it is not actively managed, it is classified as an Unknown access point.
Rogue AP Mitigation List	Maximum number of access points for which the system can send de-authentication frames.
Rogue AP Mitigation Count	Number of access points to which the wireless system is currently sending the authentication messages to mitigate against rogue access points. 0 = mitigation is not in progress.
Maximum Managed APs in Peer Group	Maximum number of access points that can be managed by the cluster.
WLAN Utilization	Total network utilization across all access points managed by this controller. This is based on global statistics.
Clients	
Total Clients	Total number of clients in the database. This total includes clients with an Associated, Authenticated, or Disassociated status.
Authenticated Clients	Total number of clients in the associated client database with an Authenticated status.
802.11a Clients	Total number of IEEE 802.11a only clients that are authenticated.

Field	Description
802.11b/g Clients	Total number of IEEE 802.11b/g-only clients that are authenticated.
802.11n Clients	Total number of clients that are IEEE 802.11n-capable and are authenticated. These include IEEE 802.11a/n, IEEE 802.11b/g/n, 5 GHz IEEE 802.11n, and 2.4GHz IEEE 802.11n.
Maximum Associated Clients	Maximum number of clients that can associate with the wireless system. This is the maximum number of entries allowed in the Associated Client database.
Detected Clients	Number of wireless clients detected in the wireless network environment.
Maximum Detected Clients	Maximum number of clients that can be detected by the wireless controller. The number is limited by the size of the Detected Client Database.
Maximum Pre-authentication History Entries	Maximum number of Client Pre-authentication events that can be recorded by the system.
Total Pre-authentication History Entries	Current number of Pre-authentication history entries in use by the system.
Maximum Roam History Entries	Maximum number of entries that can be recorded in the roam history for all detected clients.
Total Roam History Entries	Current number of roam history entries in use by the system.
WLAN Statistics	
Packets Transmitted	Total packets transmitted across all access points managed by the wireless controller.
Packets Received	Total packets received across all access points managed by the wireless controller.
Packets Transmit Dropped	Total packets transmitted across all access points managed by the wireless controller that were dropped.
Packets Receive Dropped	Total bytes received across all access points managed by the wireless controller that were dropped.
Bytes Transmitted	Total bytes transmitted across all access points managed by the wireless controller.
Bytes Received	Total bytes received across all access points managed by the wireless controller.
Bytes Transmit Dropped	Total bytes transmitted across all access points managed by the wireless controller that were dropped.
Bytes Receive Dropped	Total bytes received across all access points managed by the wireless controller that were dropped.
Distributed Tunneling	
Distributed Tunneling Packets Transmitted	Total number of packets sent by all access points via distributed tunnels.
Distributed Tunnel Roamed Clients	Total number of clients that successfully roamed away from Home access point using distributed tunneling.
Distributed Tunnel Clients	Total number of clients that are associated with an access point that are using distributed tunneling.
Distributed Tunnel Client Details	Total number of clients for which the system was unable to set up a distributed tunnel when client roamed.

Table 7-22. Buttons on the SUMMARY Page

Button	Description
Refresh	Updates the information shown on the page.
Clear Statistics	Reset all counters on the page to zero.

Peer Controller Status

Path: STATUS > Global Info > Peer Controller > Status

The PEER CONTROLLER STATUS page provides information about other wireless controllers in the network. Peer wireless controllers in the same cluster exchange data about themselves, their managed access points, and clients. The controller maintains a database with this data so you can view information about a peer, such as its IP address and software version.

If the wireless controller loses contact with a peer, all of the data for that peer is deleted.

One wireless controller in a cluster is elected as a Cluster Controller. The Cluster Controller collects status and statistics from the other wireless controllers in the cluster, including information about the access point peer controllers and the clients associated to those access points.

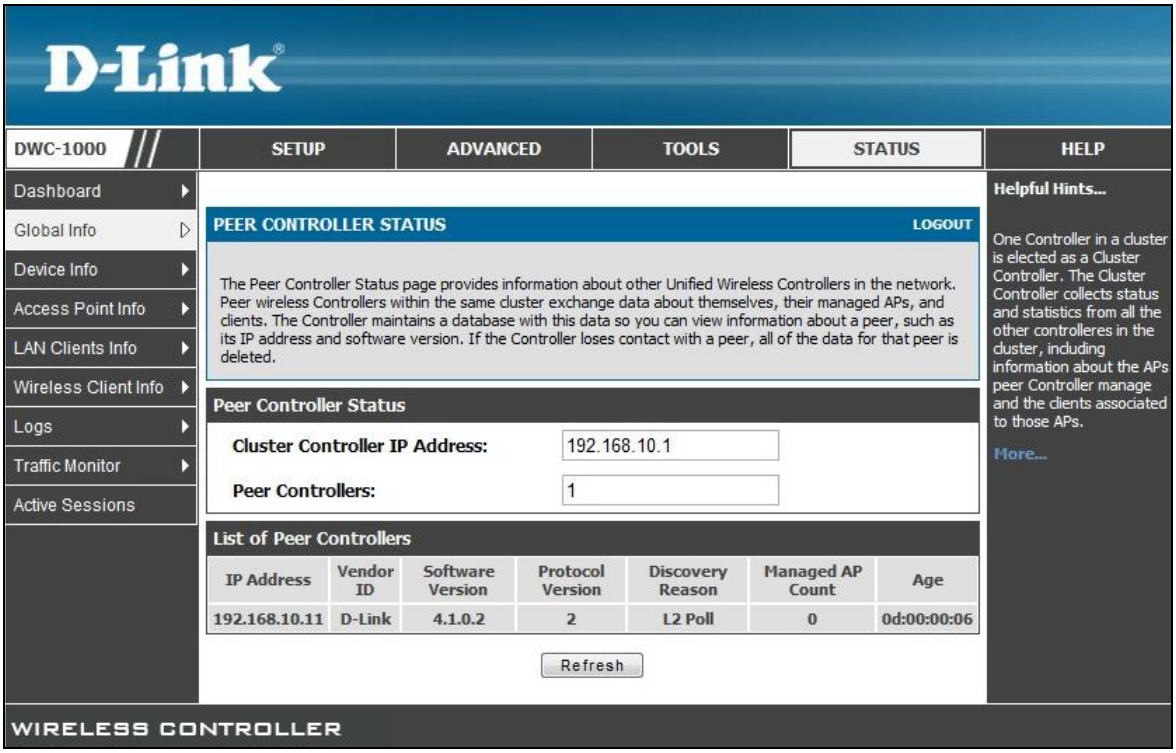


Table 7-23. Fields on the PEER CONTROLLER STATUS Page

Field	Description
Peer Controller Status	
Cluster Controller IP Address	IP address of the wireless controller that controls the cluster.
Peer Controllers	Number of peer controllers in the cluster.
List of Peer Controllers	
IP Address	IP address of the peer wireless controller in the cluster.
Vendor ID	Vendor ID of the peer controller software.
Software Version	Software version for the given peer controller.
Protocol Version	Protocol version supported by the software on the peer controller.
Discovery Reason	Discovery method of the given peer controller, which can be through an L2 Poll or IP Poll.
Managed AP Count	Number of access points that the wireless controller manages currently.
Age	Time since last communication with the controller in hours, minutes, and seconds.

Peer Controller Configuration Status

Path: STATUS > Global Info > Peer Controller > Configuration

The PEER CONTROLLER CONFIGURATION STATUS page provides information about the access points that each peer controller in the cluster manages. Use the menu above the table to select the peer controller with the access point information to display. Each peer controller is identified by its IP address.

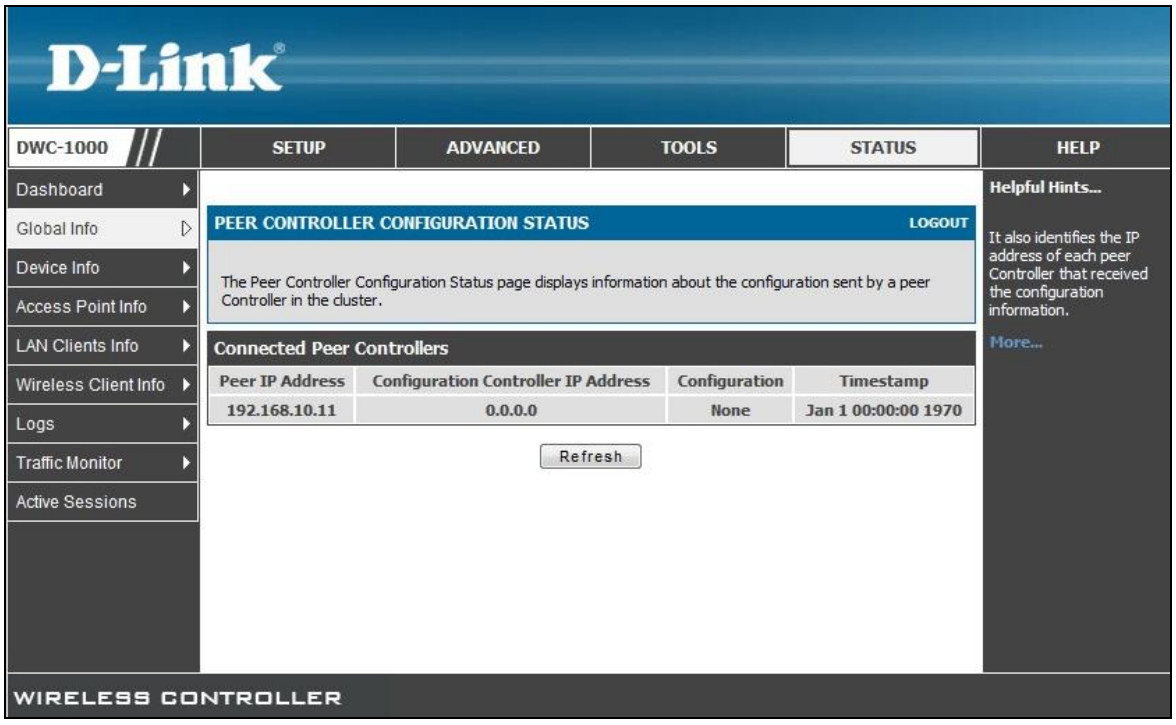


Table 7-24. Fields on the PEER CONTROLLER CONFIGURATION Page

Field	Description
Peer IP Address	IP address of each peer wireless controller in the cluster that received configuration information.
Configuration Controller IP Address	IP address of the wireless controller that sent the configuration information.
Configuration	Identifies which parts of the configuration the controller received from the peer controller.
Timestamp	Day and time when the configuration was applied to the wireless controller. The time is displayed as Coordinated Universal Time (UTC). This information is only useful if the administrator has configured each peer controller to use the network time protocol (NTP).

Peer Controller Managed AP Status

Path: STATUS > Global Info > Peer Controller > Managed AP

The PEER CONTROLLER MANAGED AP STATUS page provides information about the access points that each peer controller in the cluster manages. Use the drop-down list at the top of this page to select the peer controller associated with the access point whose information you want to display. Each peer controller is identified by its IP address.

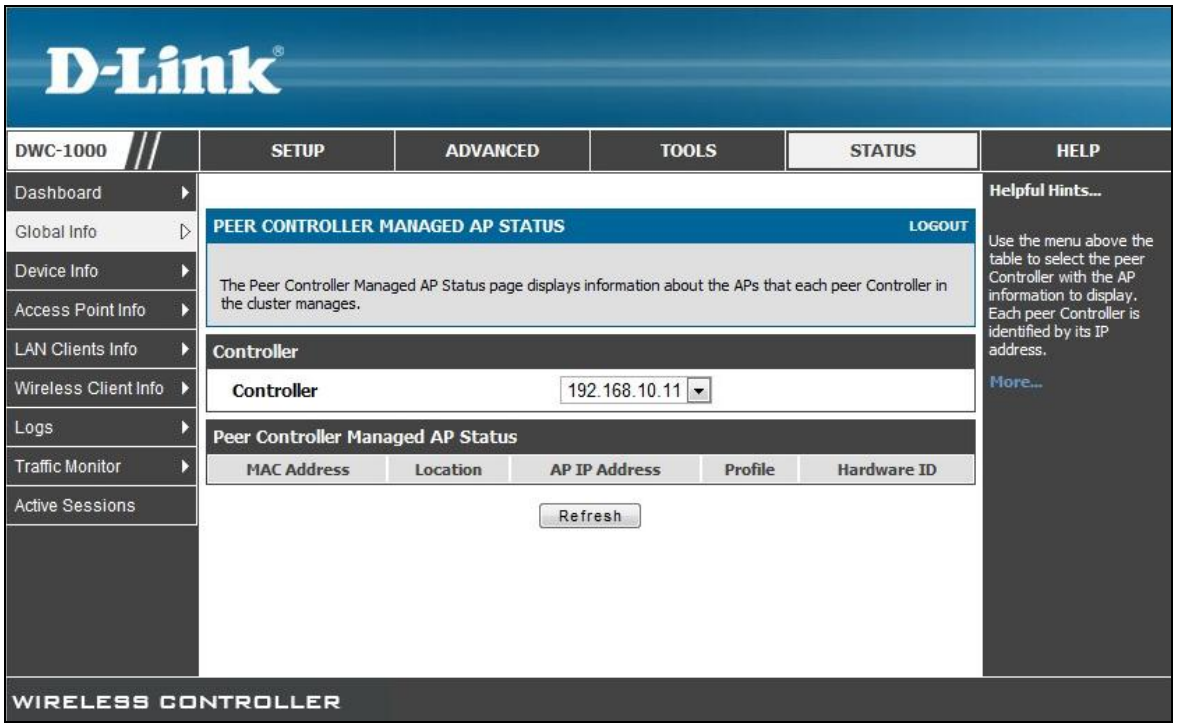


Table 7-25. Fields on the PEER CONTROLLER MANAGED AP STATUS Page

Field	Description
MAC Address	MAC address of each access point managed by the peer controller.
Peer Controller IP	IP address of the peer controller that manages the access point. This field appears when **All** is selected from the drop-down menu.
Location	Descriptive location configured for the managed access point.
AP IP Address	IP address of the access point.
Profile	Access point profile that the wireless controller applies to the access point.
Hardware ID	Hardware ID associated with the access point hardware platform.

IP Discovery

Path: STATUS > Global Info > IP Discovery

The IP DISCOVERY page shows IP addresses of peer controllers and access points for the wireless controller to discover and associate with as part of the WLAN.

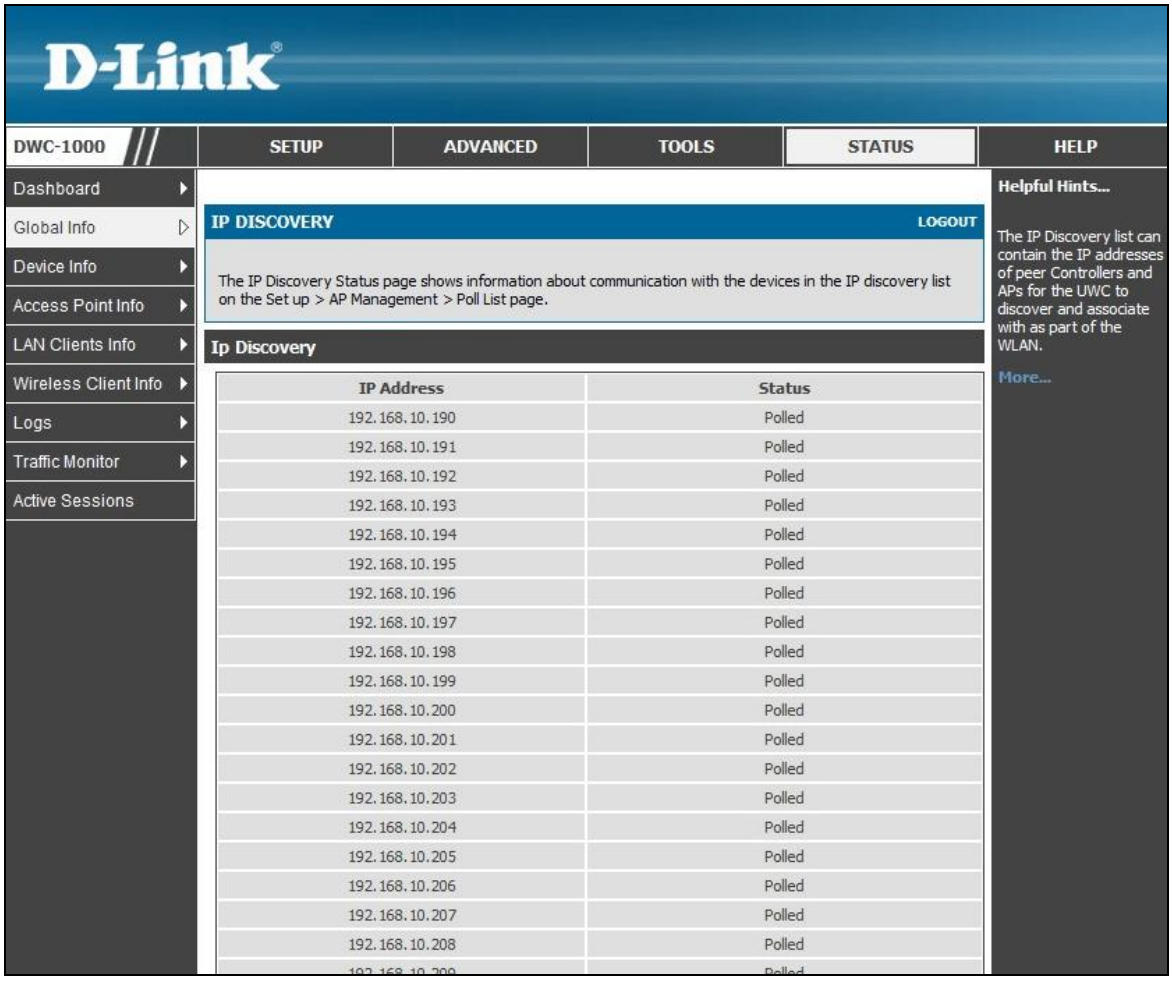


Table 7-26. Fields on the IP DISCOVERY Page

Field	Description
IP Address	IP address of the device configured in the IP discovery list.
Status	One of the following states: • Not Polled = wireless controller has not tried to contact the IP address in the L3/IP discovery list. • Polled = wireless controller tried to contact the IP address. • Discovered = wireless controller contacted the peer controller or the AP in the L3/IP discovery list and has authenticated or validated the device. • Discovered – Failed = wireless controller contacted the peer controller or access point with IP address in the L3/IP discovery list and was unable to authenticate or validate the device. If the device is an access point, an entry and a failure reason appear in the AP failure list.

Configuration Receive Status

Path: STATUS > Global Info > Config Receive Status

The Peer Controller Configuration feature lets you send a wireless configuration from one wireless controller to all other controllers. In addition to keeping the controllers synchronized, this function lets you manage all wireless controllers in the cluster from one controller. The CONFIGURATION RECEIVE STATUS page provides information about the configuration a controller has received from one of its peers.

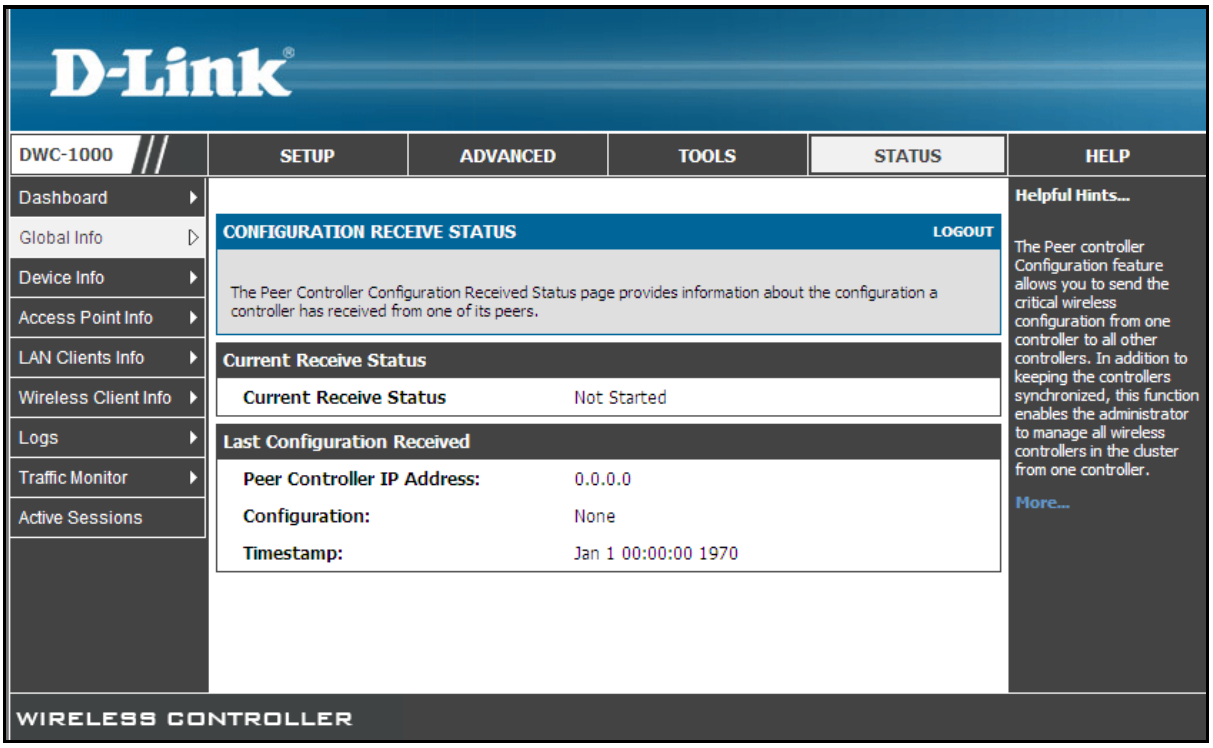


Table 7-27. Fields on the CONFIGURATION RECEIVE STATUS Page

Field	Description
Current Receive Status	
Current Receive Status	Global status when wireless configuration is received from a peer controller. Possible status values are: • Not Started • Receiving Configuration • Saving Configuration • Applying AP Profile Configuration • Success • Failure - Invalid Code Version • Failure - Invalid Hardware Version • Failure - Invalid Configuration
Last Configuration Received	
Peer Controller IP Address	Peer controller IP address of the last wireless controller from which this controller received any wireless configuration data.
Configuration	Shows which portions of configuration were last received from a peer controller. Possible values are: • Global • Discovery • Channel/Power • AP Database • AP Profiles • Known Client • Captive Portal • RADIUS Client • QoS ACL • QoS DiffServ • None = wireless controller has not received any configuration for another controller
Timestamp	Shows the last time this wireless controller received any configuration data from a peer controller. The Peer Controller Managed AP Status page shows information about the access points that each peer controller in the cluster manages. Use the drop-down list at the top of this page to select a peer controller whose access point information you want to view. Each peer controller is identified by its IP address.

AP Hardware Capability

Path: STATUS > Global Info > AP H/W Capability

The wireless controller supports access points that have different hardware capabilities, such as number of radios, supported IEEE 802.11 modes, and software images. Using the AP HARDWARE CAPABILITY page, you view information about the radio hardware and IEEE modes supported by access points, as well as software images that are available for download to the access point.

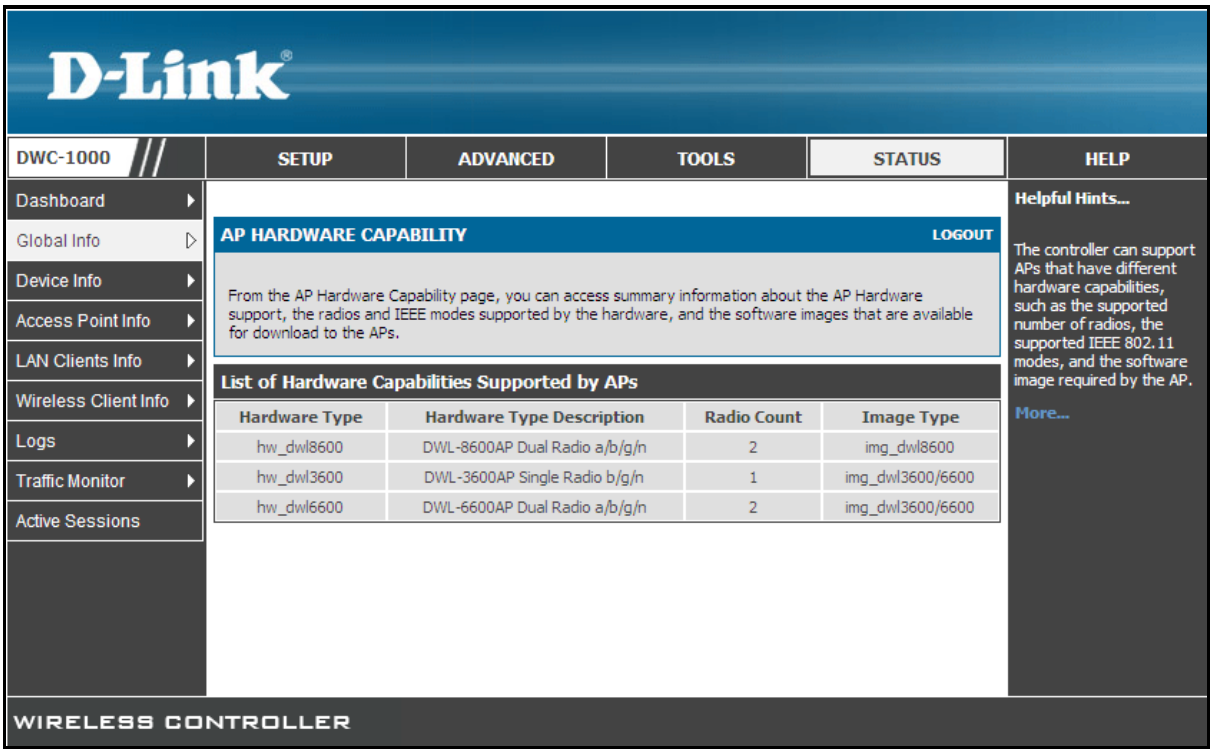


Table 7-28. Fields on the AP HARDWARE CAPABILITY Page

Field	Description
Hardware Type	Shows ID number assigned to each access point hardware type. The wireless controller supports six different types of access point hardware.
Hardware Type Description	Describes the platform and the supported IEEE 802.11 modes.
Radio Count	Shows whether the hardware supports one radio or two radios.
Image Type	Shows the type of software the hardware requires.

Client Status

Path: STATUS > Dashboard > Client

The CLIENT STATISTICS page shows information about all the clients connected through managed access points.

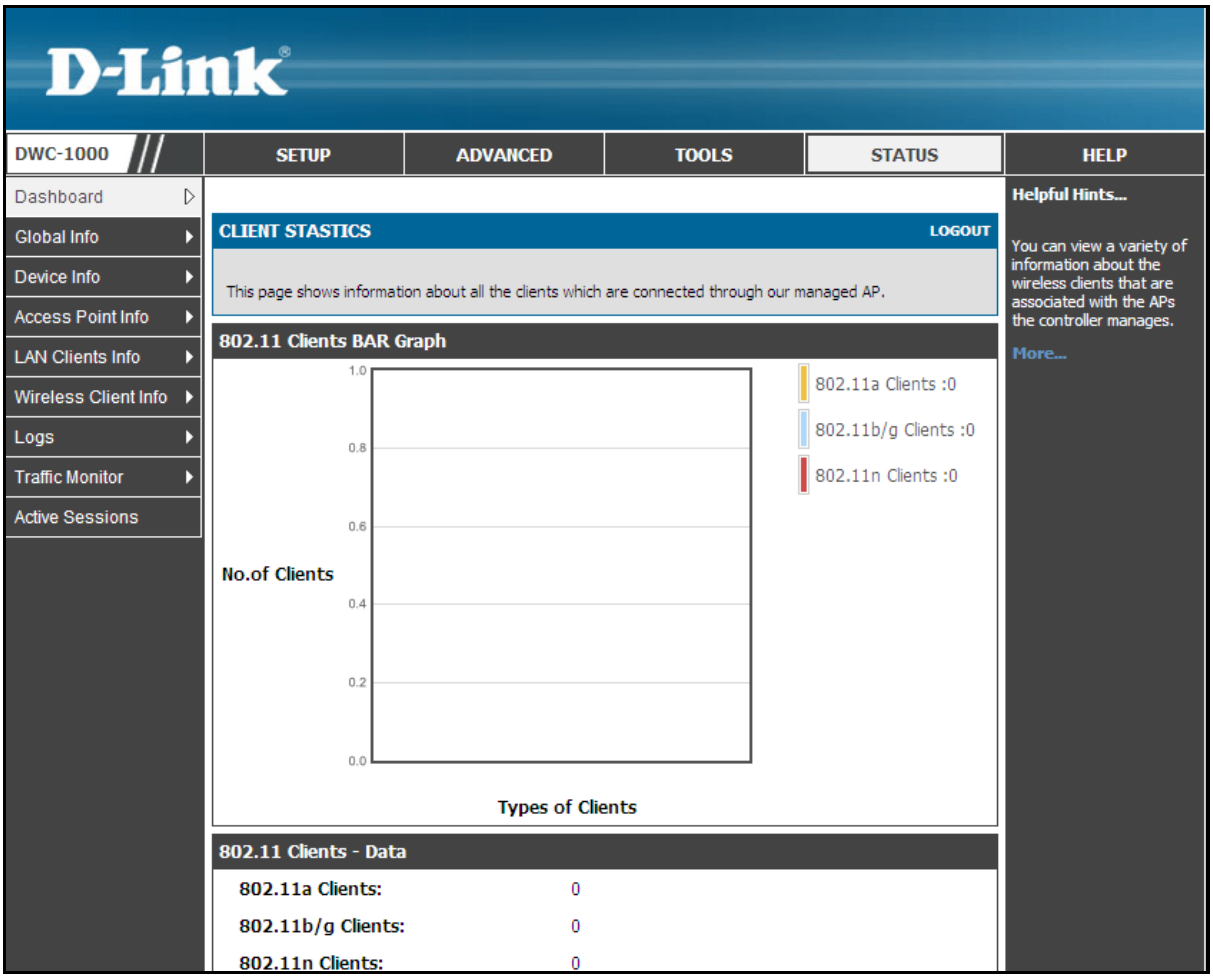


Table 7-29. Fields on the CLIENT STATISTICS Page

Field	Description
802.11 Clients BAR Graph	
The bar graph provides a graphical representation of clients connected through access points managed by the wireless controller.	
802.11 Clients - Data	
802.11a Clients	Total number of IEEE 802.11a only clients that are authenticated.
802.11b/g Clients	Total number of IEEE 802.11b/g only clients that are authenticated.
802.11n Clients	Total number of clients that are IEEE 802.11n capable and authenticated. These include IEEE 802.11a/n, IEEE 802.11b/g/n, 5 GHz IEEE 802.11n, and 2.4GHz IEEE 802.11n.
Clients - Data	
Total Clients	Total number of clients in the database. This total includes clients with an Associated, Authenticated, or Disassociated status.
Authenticated Clients	Total number of clients in the associated client database with an Authenticated status.
Maximum Associated Clients	Maximum number of clients that can associate with the wireless system. This is the maximum number of entries allowed in the Associated Client database.
Detected Clients	Number of wireless clients detected in the WLAN.
Maximum Detected Clients	Maximum number of clients that can be detected by the wireless controller. This number is limited by the size of the Detected Client Database.
Maximum Pre-authentication History Entries	Maximum number of Client Pre-authentication events that can be recorded by the system.
Total Pre-authentication History Entries	Current number of Pre-authentication history entries the system is using.
Maximum Roam History Entries	Maximum number of entries that can be recorded in the roam history for all detected clients.
Total Roam History Entries	Number of Pre-authentication history entries the system is using.

Associated Client Status

Path: STATUS > Wireless Client Info > Associated Clients > Status

The ASSOCIATED CLIENT STATUS page shows a variety of information about the wireless clients that are associated with the access points the wireless controller is managing.

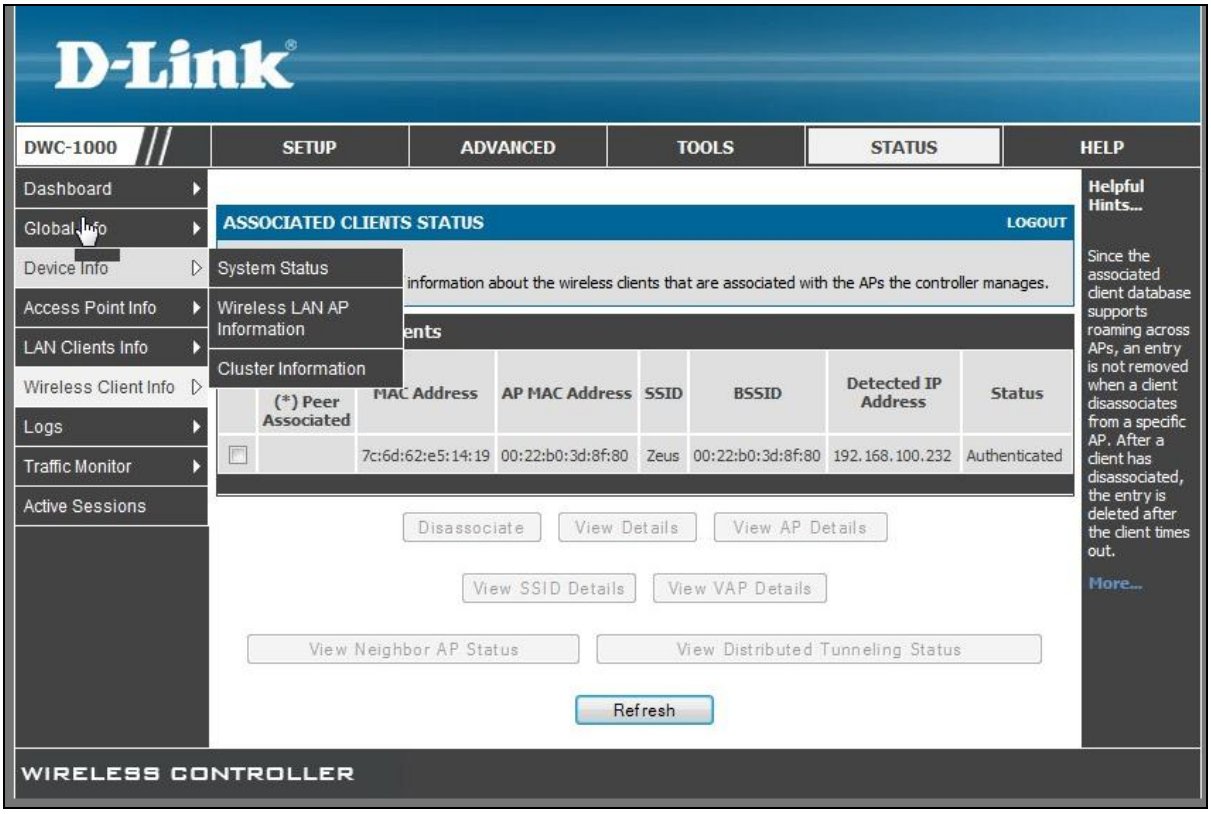


Table 7-30. Fields on the ASSOCIATED CLIENT STATUS Page

Field	Description
MAC Address	Ethernet address of the client station. If the MAC address is followed by an asterisk (*), the client is associated with an access point managed by a peer controller.
AP MAC Address	Ethernet address of the access point.
SSID	Network on which the client is connected.
BSSID	Ethernet MAC address for the managed access point Virtual Access Point where this client is associated.
Detected IP Address	IPv4 address of the client, if available.

Table 7-31. Buttons on the ASSOCIATED CLIENT STATUS Page

Field	Description
Disassociate	Disassociates the selected client from the managed access point.
View Details	Shows associated client details.
View AP Details	Shows associated access point details.
View SSID Details	Lists the SSIDs of the networks that each wireless client associated with a managed access point has used for WLAN access.
View VAP Details	Shows information about the VAPs on the managed access point that have associated wireless clients.
View Neighbor AP Details	Shows information about access points that the client detects.

Associated Client SSID Status

Path: STATUS > Wireless Client Info > Associated Clients > SSID Status

The SSID ASSOCIATED CLIENT STATUS page shows SSID information for the wireless clients on the WLAN.

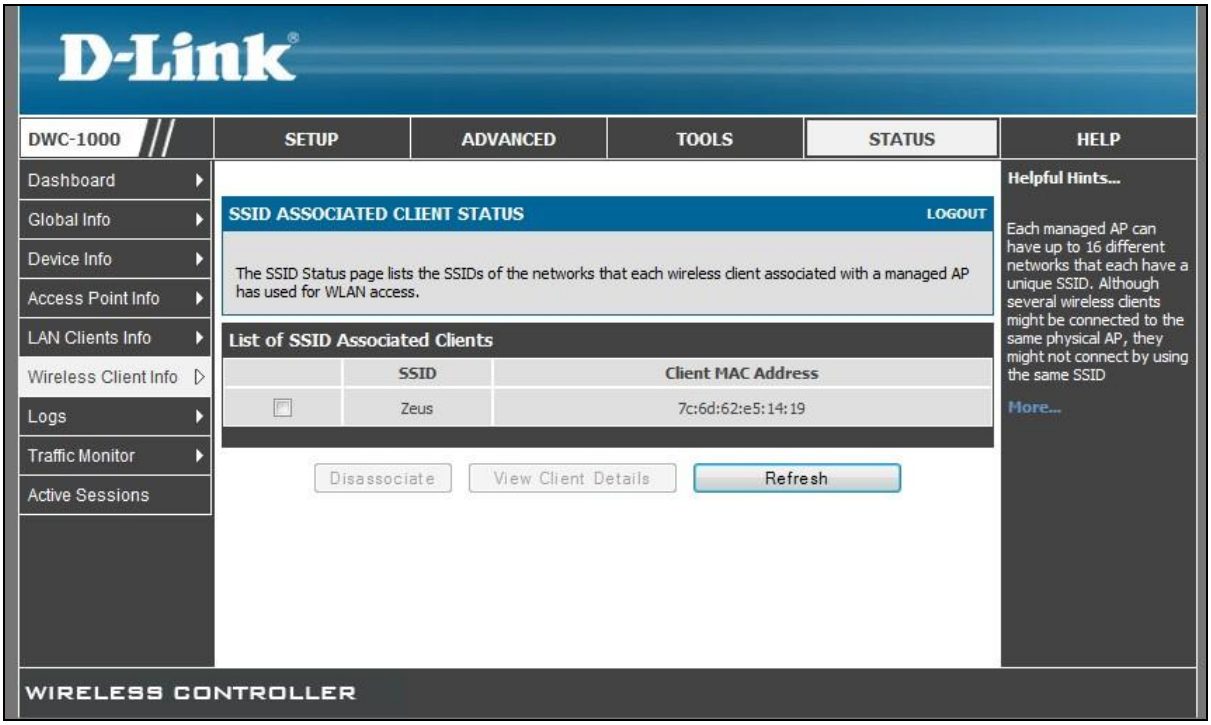


Table 7-32. Fields on the SSID ASSOCIATED CLIENT STATUS Page

Field	Description
SSID	Network on which the client is connected.
Client MAC Address	Ethernet address of the client station.

Table 7-33. Buttons on the SSID ASSOCIATED CLIENT STATUS Page

Field	Description
Disassociate	Disassociates the selected client from the managed access point.
View Client Details	Shows associated client details.
Refresh	Updates the information on the page.

Associated Client VAP Status

Path: STATUS > Wireless Client Info > Associated Clients > VAP Status

Each AP has 16 virtual access points (VAPs) per radio, and every VAP has a unique MAC address (BSSID). The VAP ASSOCIATED CLIENT STATUS page shows information about the VAPs on the managed access point that have associated wireless clients. To disconnect a client from an access point, check the box next to the BSSID and click **Disassociate**.

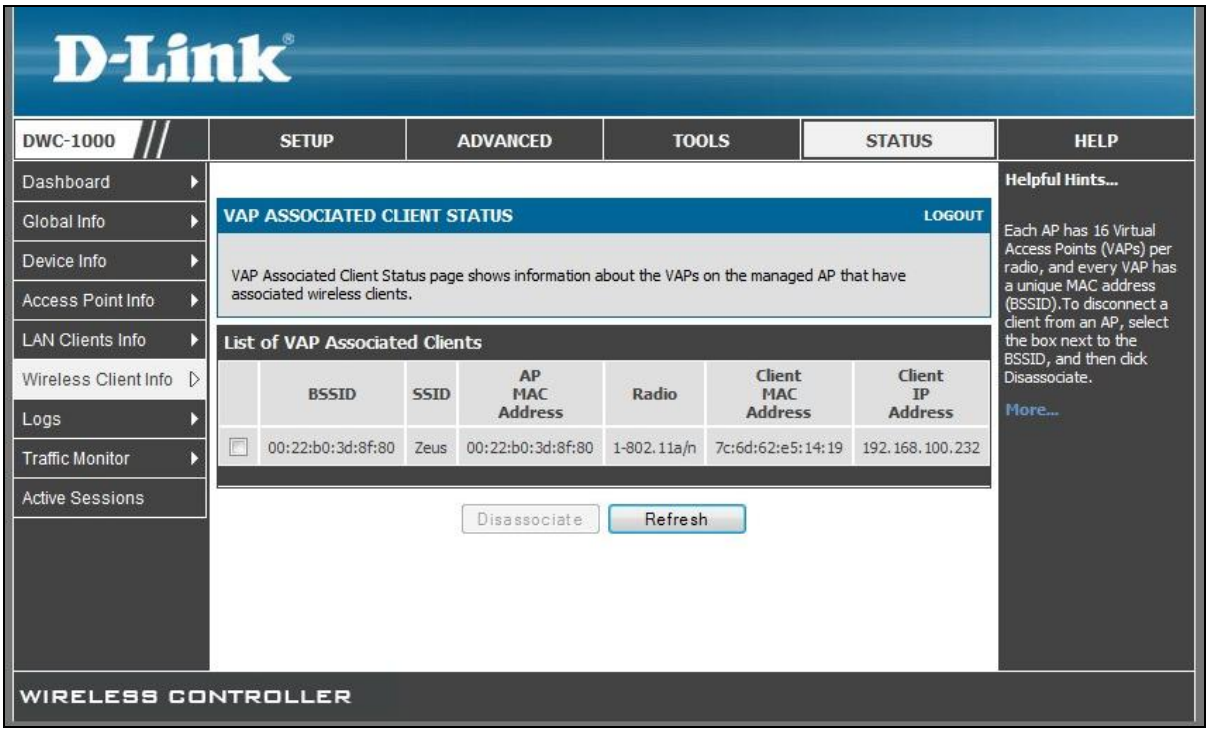


Table 7-34. Fields on the VAP ASSOCIATED CLIENT STATUS Page

Field	Description
BSSID	Ethernet MAC address for the managed access point VAP where this client is associated.
SSID	SSID for the managed access point VAP where this client is associated.
AP MAC Address	Base access point Ethernet MAC address for the managed access point.
Radio	Managed access point radio interface with which the client is associated and its configured mode.
Client MAC Address	Ethernet address of the client station.
Client IP Address	IP address of the client station.

Table 7-35. Buttons on the VAP ASSOCIATED CLIENT STATUS Page

Field	Description
Disassociate	Disassociates the selected client from the managed access point.
Refresh	Updates the information on the page.

Controller Associated Client Status

Path: STATUS > Wireless Client Info > Associated Clients > Controller Status

The CONTROLLER ASSOCIATED CLIENT STATUS page shows information about the controller that manages the access point to which the client is associated.

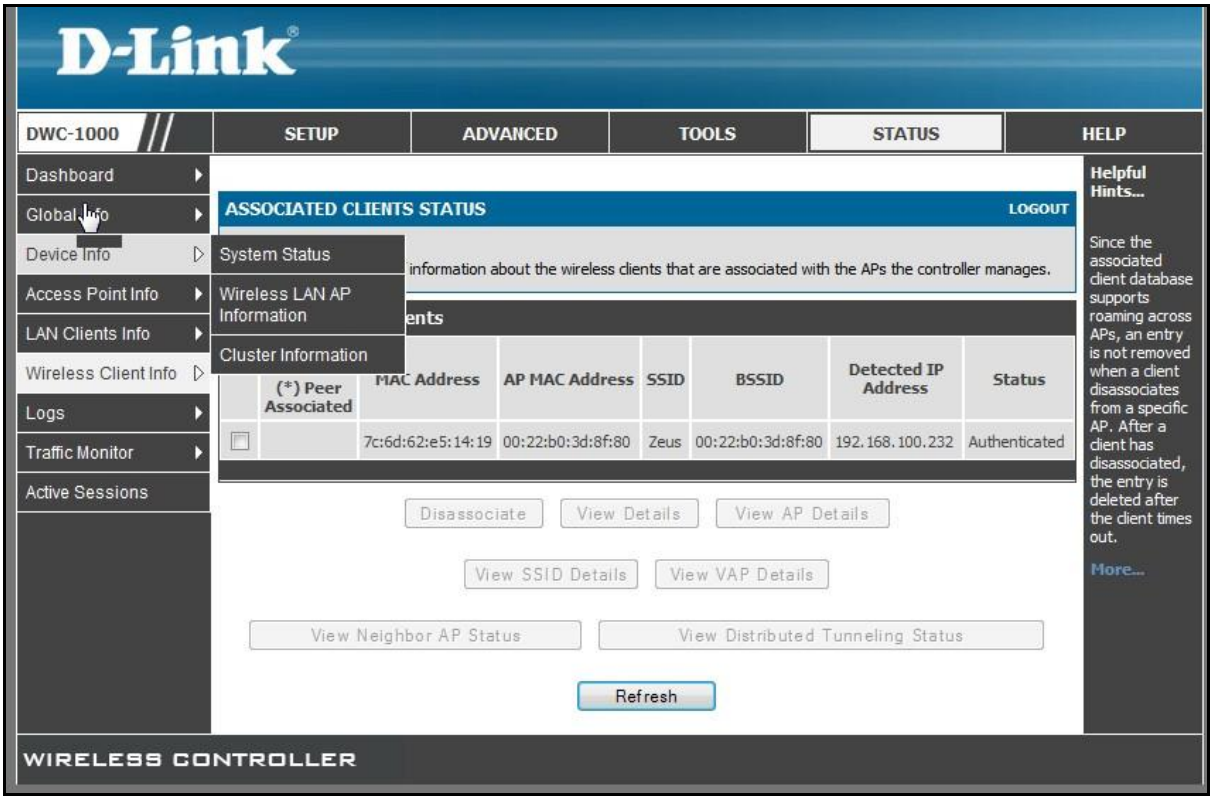


Table 7-36. Fields on the CONTROLLER ASSOCIATED CLIENT STATUS Page

Field	Description
Controller IP Address	IP address of the controller that manages the access point to which the client is associated.
Client MAC Address	MAC address of the associated client.

Table 7-37. Buttons on the CONTROLLER ASSOCIATED CLIENT STATUS Page

Field	Description
Disassociate	Disassociates the selected client from the managed access point.
View Client Details	Displays associated client details.
Refresh	Updates the information on the page.

Detected Client Status

Path: STATUS > Wireless Client Info > Detected Clients

Wireless clients are detected by the wireless system when the clients attempt to interact with the system or when the system detects traffic from the clients. The DETECTED CLIENT STATUS page shows information about clients that have authenticated with an access point, as well information about clients that disassociate and are no longer connected to the system.

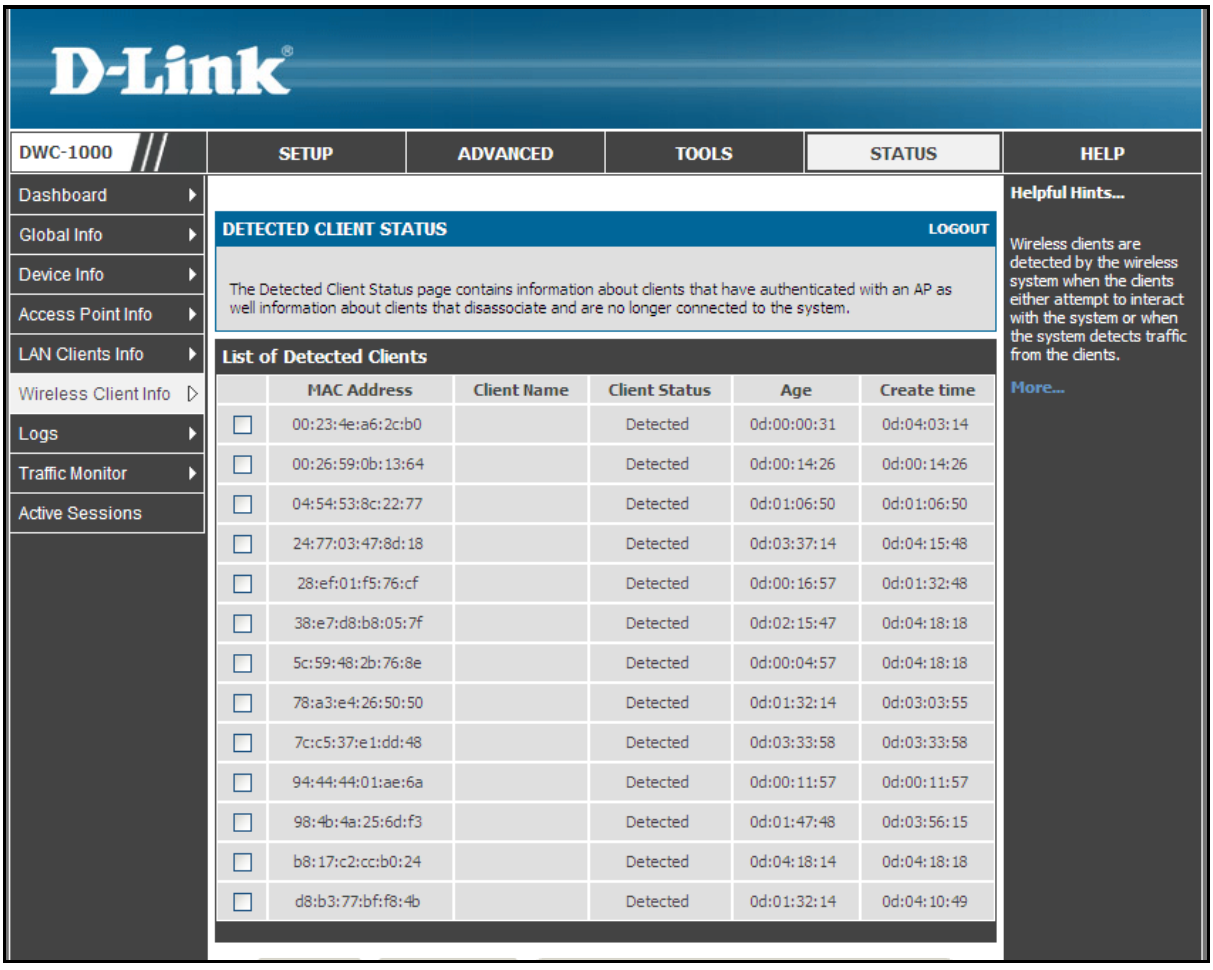


Table 7-38. Fields on the DETECTED CLIENT STATUS Page

Field	Description
MAC Address	Ethernet address of the client.
Client Name	Name of the client, if available, from the Known Client Database. If client is not in the database, this field is blank.
Client Status	Client status, which can be one of the following: • Authenticated = wireless client is authenticated with the wireless system. • Detected = wireless client is detected by the wireless system but is not a security threat. • Black-Listed = client with this MAC address is specifically denied access via MAC authentication. • Rogue = client is classified as a threat by one of the threat-detection algorithms.
Age	Time since any event has been received for this client that updated the detected client database entry.
Create Time	Time since this entry was first added to the detected client's database.

Table 7-39. Buttons on the DETECTED CLIENT STATUS Page

Field	Description
Delete	Deletes the selected client from the list. If the client is detected again, it will be added to the list.
Delete All	Deletes all non-authenticated clients from the Detected Client database. As clients are detected, they are added to the database and appear in the list.
Acknowledge All Rogues	Clears the rogue status of all clients listed as rogues in the Detected Client database. The status of an acknowledged client returns to the status it had when it was first detected. If the detected client fails any of the tests that classify it as a threat, it appears as a Rogue again.
Refresh	Updates the information on the page.

Pre-Authorization History

Path: STATUS > Wireless Client Info > Pre-Auth History

To help authenticated clients roam without losing sessions and needing to re-authenticate, wireless clients can try to authenticate to other access points within range of the client. For successful pre-authentication, the target access point must have a VAP with an SSID and security configuration that match the client, including MAC authentication, encryption method, and pre-shared key or RADIUS parameters. The access point that the client is associated with captures all pre-authentication requests and sends them to the controller.

The DETECTED CLIENT PRE-AUTHENTICATION HISTORY SUMMARY page shows detected clients that have made pre-authentication requests and identifies the access points that received the requests.

Table 7-40. Fields on the DETECTED CLIENT PRE-AUTHENTICATION HISTORY SUMMARY Page

Field	Description
MAC Address	MAC address of the client.
AP MAC Address	MAC address of the managed access point to which the client has pre-authenticated.
Radio Interface Number	Radio number to which the client is authenticated (Radio 1 or Radio 2).
VAP MAC Address	VAP MAC address to which the client roamed.
SSID	SSID name used by the VAP.
Age	Time since the history entry was added.
User Name	User name of client that authenticated via 802.1X.
Pre-Authorization Status	Indicates whether the client successfully authenticated. Shows a status of Success or Failure.

Table 7-41. Button on the DETECTED CLIENT STATUS Page

Field	Description
Refresh	Updates the information on the page.

Detected Client Roam History

Path: STATUS > Wireless Client Info > Roam History

The wireless system keeps a record of clients as they roam from one managed access point to another, and displays this information on the ROAM HISTORY page.

Table 7-42. Fields on the ROAM HISTORY Page

Field	Description
MAC Address	MAC address of the detected client.
AP MAC Address	MAC address of the managed access point to which the client has pre-authenticated.
Radio Interface Number	Radio number to which the client is authenticated.
VAP MAC Address	VAP MAC address to which the client roamed.
SSID	SSID name used by the VAP.
New Authentication	Shows whether the history entry represents a new authentication or a roam event.
Age	Time since the history entry was added.

Table 7-43. Buttons on the ROAM HISTORY Page

Field	Description
Refresh	Updates the information on the page.
Purge History	Purges the history when the list of entries is full.
View Details	Shows details about the detected clients.

8. MAINTENANCE

This chapter describes the following maintenance activities:

Group Management

A user group is a collection of users who share the same privileges. The following section describes how to add user groups. After you add a user group, you can configure its login policies, policies for browsers, and policies by IP. You can also edit user groups when changes are required and delete user groups you no longer need.

Adding User Groups

Path: ADVANCED > Users > Groups

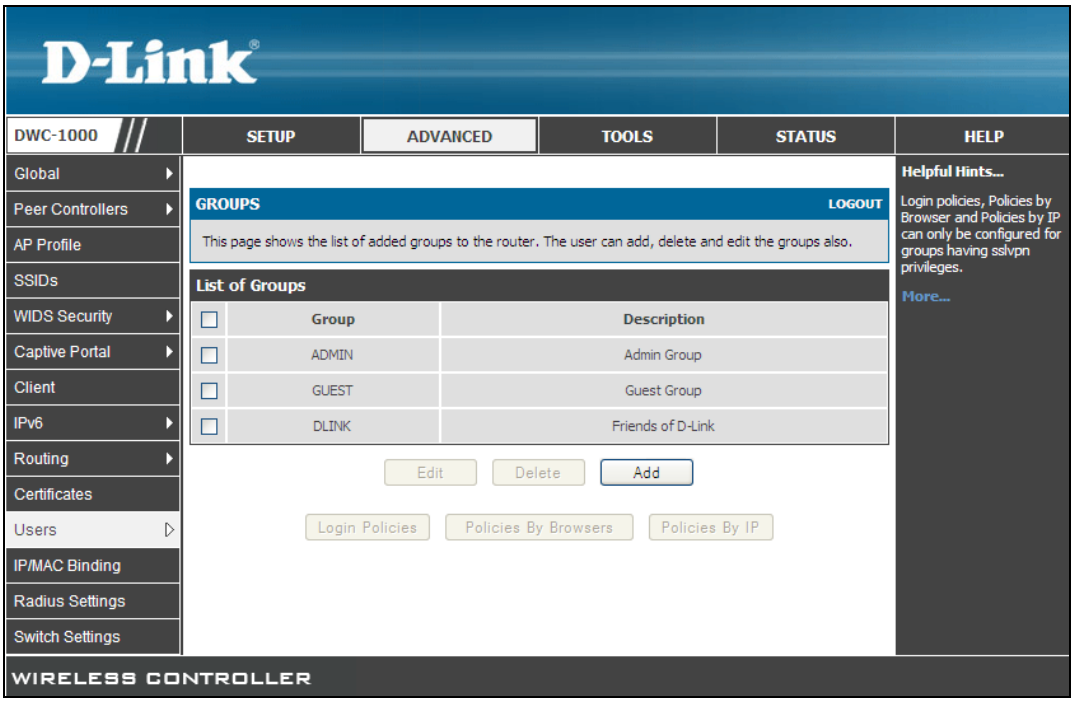
When you add a user group, you assign:

- A name that identifies the user group
- An optional user group description
- At least one privilege (or “user type”)
- An idle timeout value

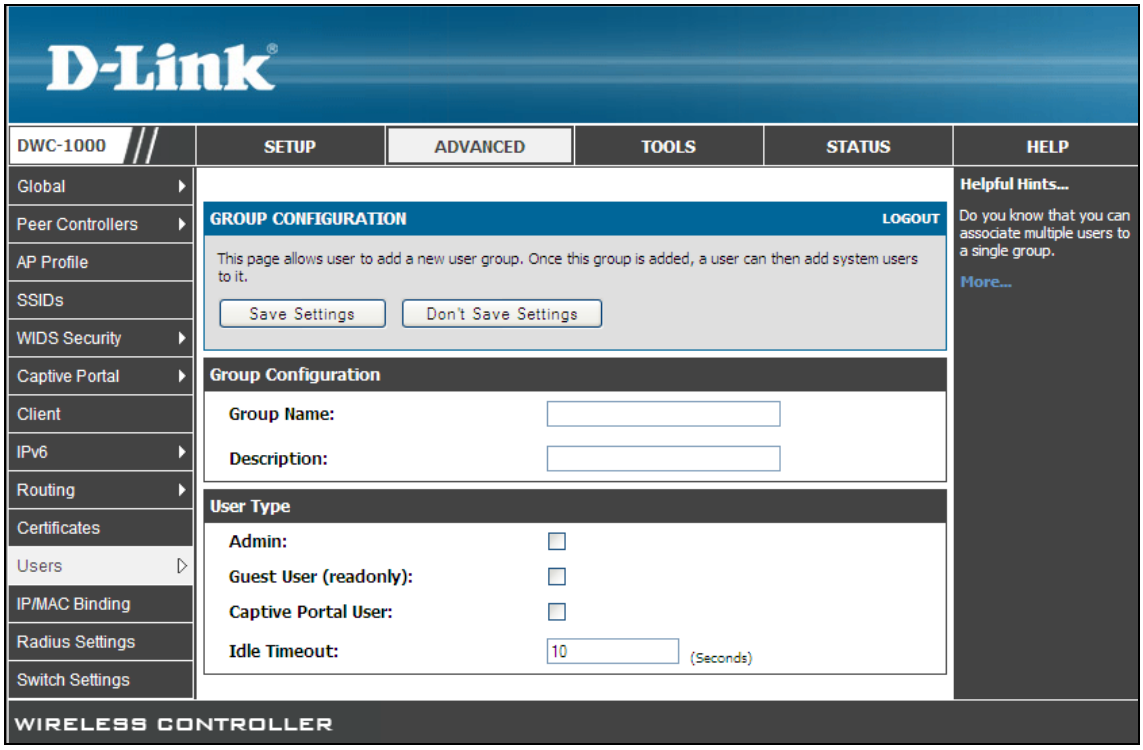
After you define user groups, you can use the procedure under “User Management” on page 199 to populate the groups with users.

To add a user group:

1. Click **ADVANCED > Users > Groups**. The GROUPS page appears.



2. Click the **Add** button. The GROUP CONFIGURATION page appears.



3. Complete the fields in the page (see Table 8-1) and click **Save Settings**.

Table 8-1. GROUP CONFIGURATION Page Settings

Field	Description
Group Configuration	
Group Name	Enter a unique name for this group. The name should allow you to easily identify this group from others you may add.
Description	Enter an optional description for this user group.
User Type	
Admin	Check this box to grant all users in this group super-user privileges. These include managing the wireless controller, using SSL VPN to access network resources, and logging in to L2TP/PPTP servers on the Option port. By default, there is one admin user.
Guest User (read-only)	Check this box to grant all members in this group read-only access to the web management interface. Guest users cannot change configuration settings or access to SSL VPN functions.
Captive Portal	Check this box to grant all members in this group captive portal access. Wireless controller access for captive portal users is based on the captive portal policies you configured (see “4. Customize the captive portal login page” on page 48)
Idle Timeout	Enter the number of minutes of inactivity that must occur before the users in this user group are logged out of their web management session automatically. Entering an Idle Timeout value of 0 (zero) means never log out.

Editing User Groups

Path: ADVANCED > Users > Groups

There may be times when you need to edit a user group. For example, you might want to change the privileges for the user group or idle timeout.

To edit a user group:

1. Click **ADVANCED > Users > Groups**. The GROUPS page appears.
2. Check the box next to the user group you want to edit.
3. Click the **Edit** button. The GROUP CONFIGURATION page appears.

Complete the fields in the page (see Table 8-1) and click **Save Settings**.

Deleting User Groups

Path: ADVANCED > Users > Groups

If you no longer need a user group, you can delete it. Before you delete a user group, you must delete all users in it (see “Deleting Users” on page 203).

Note: A precautionary message does not appear before you delete a user group. Therefore, be sure you do not need a user group before you delete it.

To delete a user group:

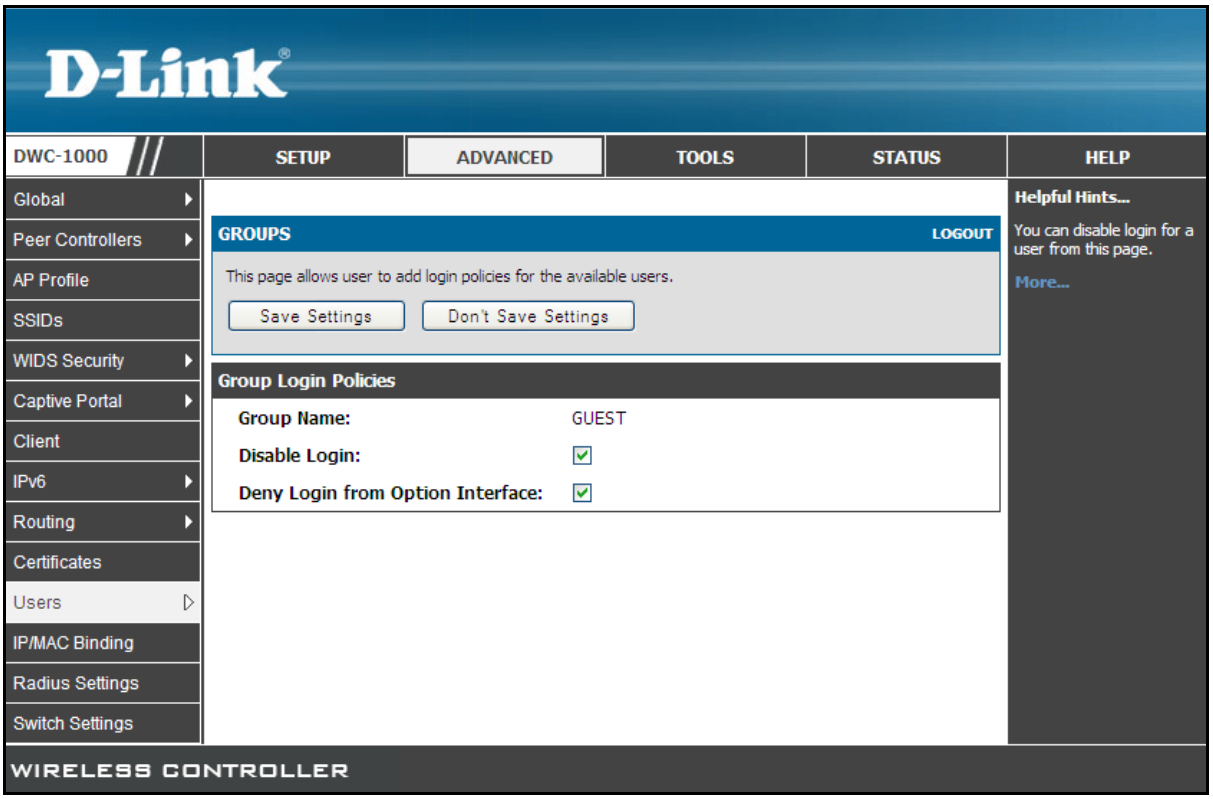
1. Click **ADVANCED > Users > Groups**. The GROUPS page appears.
2. Check the box next to each user group you want to delete. (Or click the box next to **Group** to select all user groups.)
3. Click the **Delete** button.

Configuring Login Policies

Path: ADVANCED > Users > Groups

Using the following procedure, you can grant or deny a user group log in access to the web management interface and to the wireless controller Option port.

1. Click **ADVANCED > Users > Groups**. The GROUPS page appears.
2. Check the box next to a user group.
3. Click the **Login Policies** button. The GROUPS page appears.



4. Complete the fields in the page (see Table 8-2) and click **Save Settings**.

Table 8-2. GROUPS Page Settings

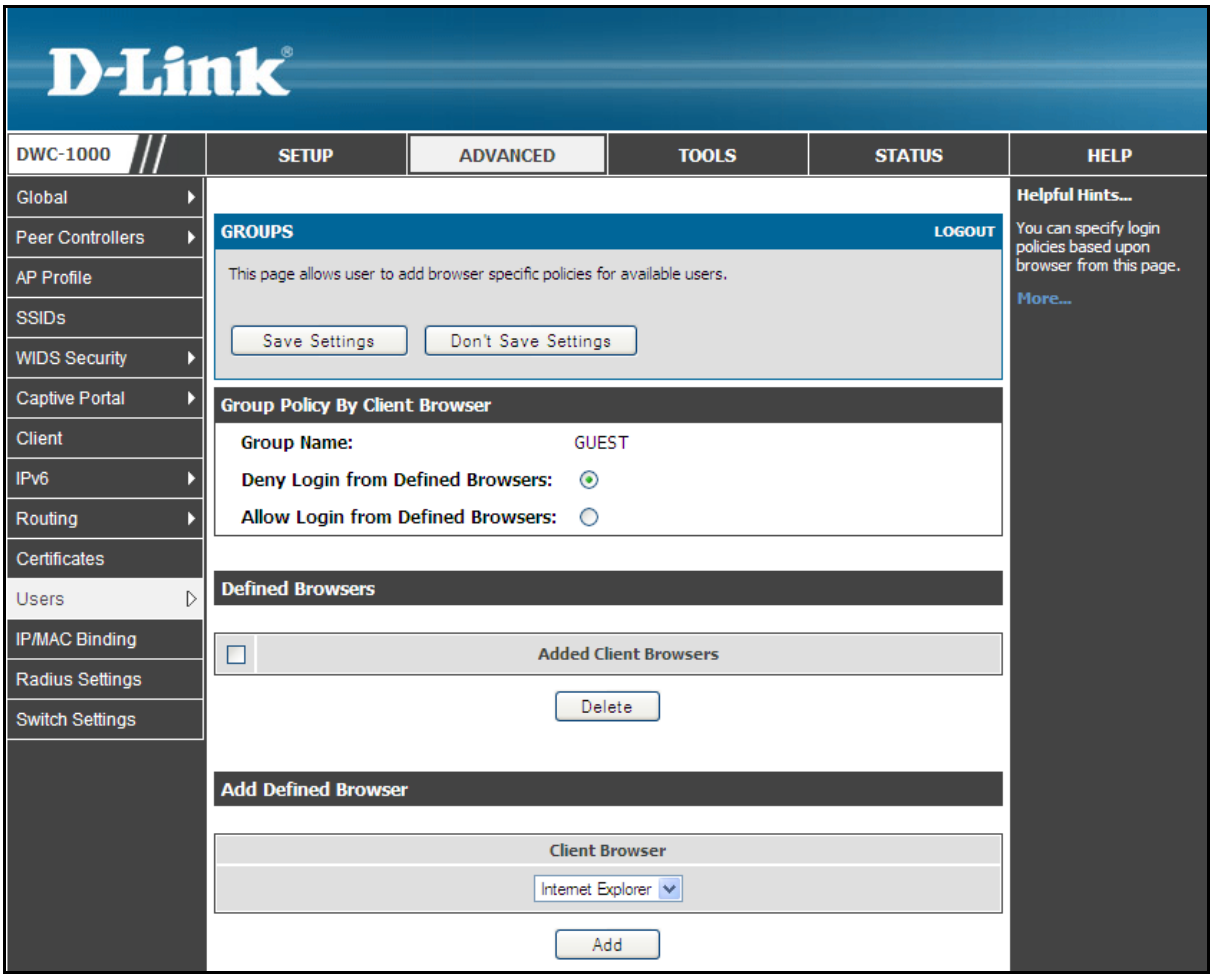
Field	Description
Group Name	Name of the group.
Disable Login	Grants or denies login access to the web management interface for all users in this user group. Choices are: • Checked = disable login access. • Unchecked = enable login access.
Deny Login from Option Interface	Grants or denies login access from the wireless controller's Option port. Choices are: • Checked = disable login access. • Unchecked = enable login access.

Configuring Browser Policies

Path: ADVANCED > Users > Groups

The following procedure describes how to configure browser-specific policies for user groups. Using this procedure, you can allow or deny the users in a user group from using particular web browsers to log in to the wireless controllers' web management interface.

1. Click **ADVANCED > Users > Groups**. The GROUPS page appears.
2. Check the box next to a user group.
3. Click the **Policies by Browsers** button. The GROUPS page appears.



4. To prevent the users in this user group from using a browser to access the web management interface:
   a. Under **Group Policy By Client Browser**, click **Deny Login from Defined Browser**.
   b. Under **Add Defined Browser**, click a browser from the **Client Browser** dropdown list, and then click **Add**. The selected browser appears in the **Defined Browsers** area.
   c. To prevent additional browsers from logging in to the web management interface, repeat the previous step.
   d. When you finish, click **Save Settings**.
5. To allow the users in this user group to use a browser to access the web management interface:
   a. Under **Group Policy By Client Browser**, click **Allow Login from Defined Browser**.
   b. Under **Add Defined Browser**, click a browser from the **Client Browser** dropdown list, and then click **Add**. The selected browser appears in the **Defined Browsers** area.
   c. To allow additional browsers to log in to the web management interface, repeat the previous step.

d. When you finish, click **Save Settings**.

6. To remove browsers from the **Defined Browsers** area:

   a. Click each browser. (Or click the box next to **Added Client Browser** to select all browsers.)

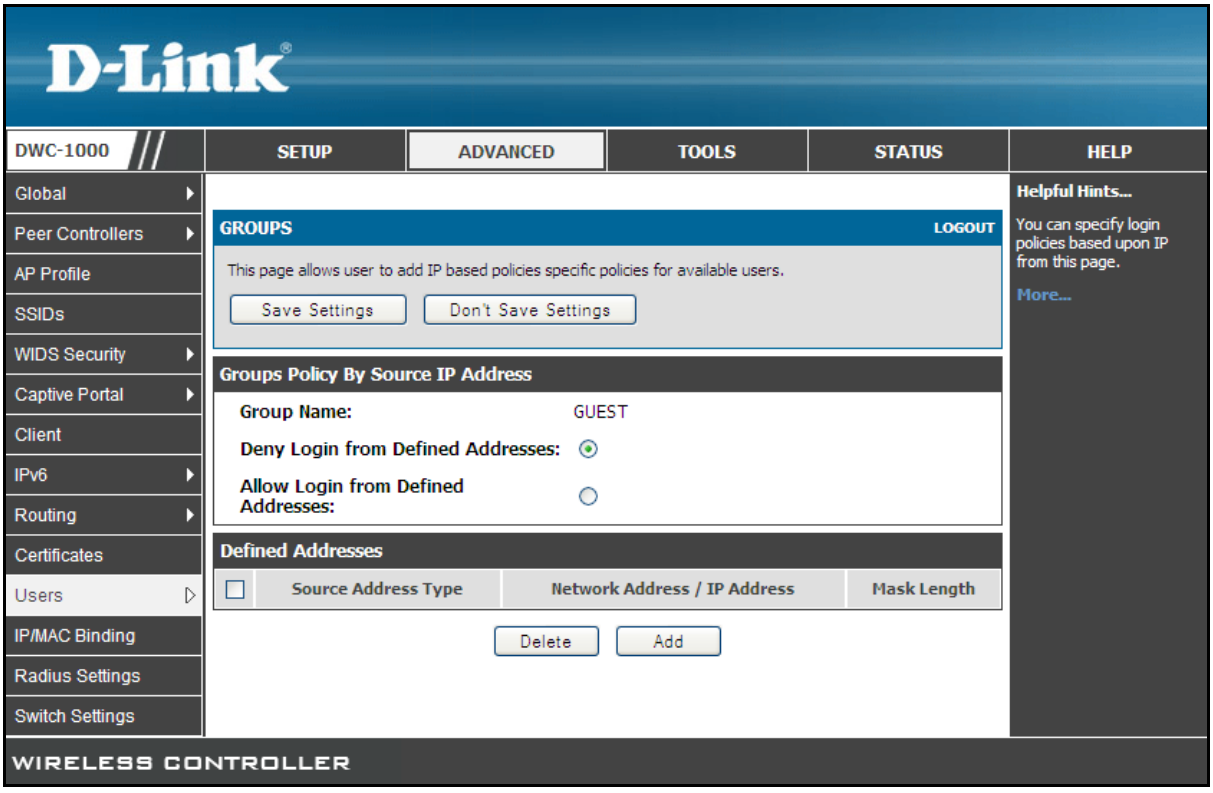
   b. Click **Delete**. A precautionary message does not appear prior to deleting the browsers.

Configuring IP Policies

Path: ADVANCED > Users > Groups

The following procedure describes how to configure IP-specific policies for user groups. Using this procedure, you can allow or deny the users in a user group to log in to the wireless controllers' web management interface from a particular network or IP address.

1. Click **ADVANCED > Users > Groups**. The GROUPS page appears.
2. Check the box next to a user group.
3. Click the **Policies by IP** button. The GROUPS page appears.

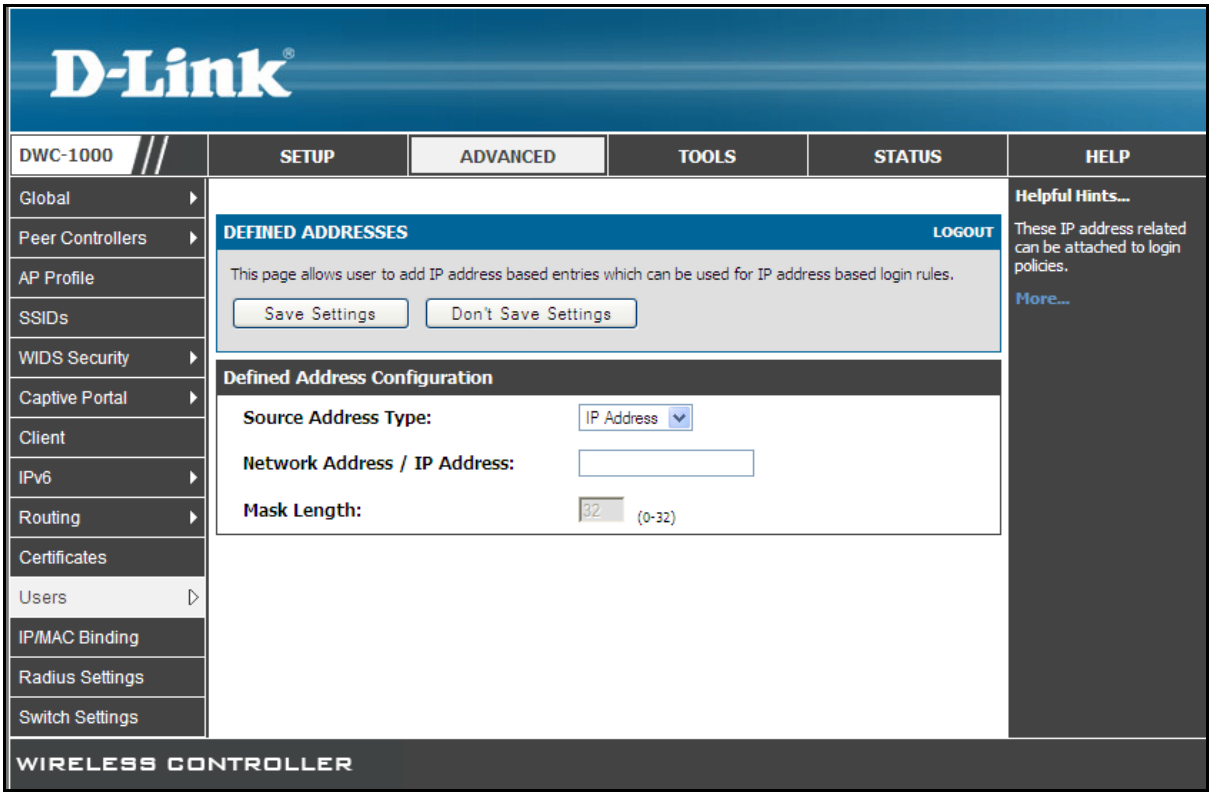


4. To prevent the users in this user group from logging in to the web management interface using a particular network or IP address:

a. Under **Group Policy By Source IP Address**, click **Deny Login from Defined Addresses**.

b. Click the **Add** button. The DEFINED ADDRESSES page appears.

c. Complete the fields in the page (see Table 8-3) and click **Save Settings**. The address you defined appears in the **Defined Addresses** area.



5. To allow the users in this user group to log in to the web management interface using a particular network or IP address:

   a. Under **Group Policy By Source IP Address**, click **Allow Login from Defined Addresses**.

   b. Click the **Add** button. The DEFINED ADDRESSES page appears.

   c. Complete the fields in the page (see Table 8-3) and click **Save Settings**. The address you defined appears in the **Defined Addresses** area.

6. To remove addresses from the **Defined Addresses** area:

   a. Click each address. (Or click the box next to **Added Client Browser** to select all addresses.)

   b. Click **Delete**. A precautionary message does not appear prior to deleting the addresses.

Table 8-3. DEFINED ADDRESSES Page Settings

Field	Description
Source Address Type	Name of the group. Choices are: • IP Address = specifies a particular IP address. • IP Network = specifies an entire IP network.
Network Address / IP Address	Enter the network or IP address.
Mask Length	Enter a subnet mask.

User Management

After you add user groups, you can add users to the user groups. Users can be added individually, or they can be imported from a comma-separated-value (CSV) formatted file.

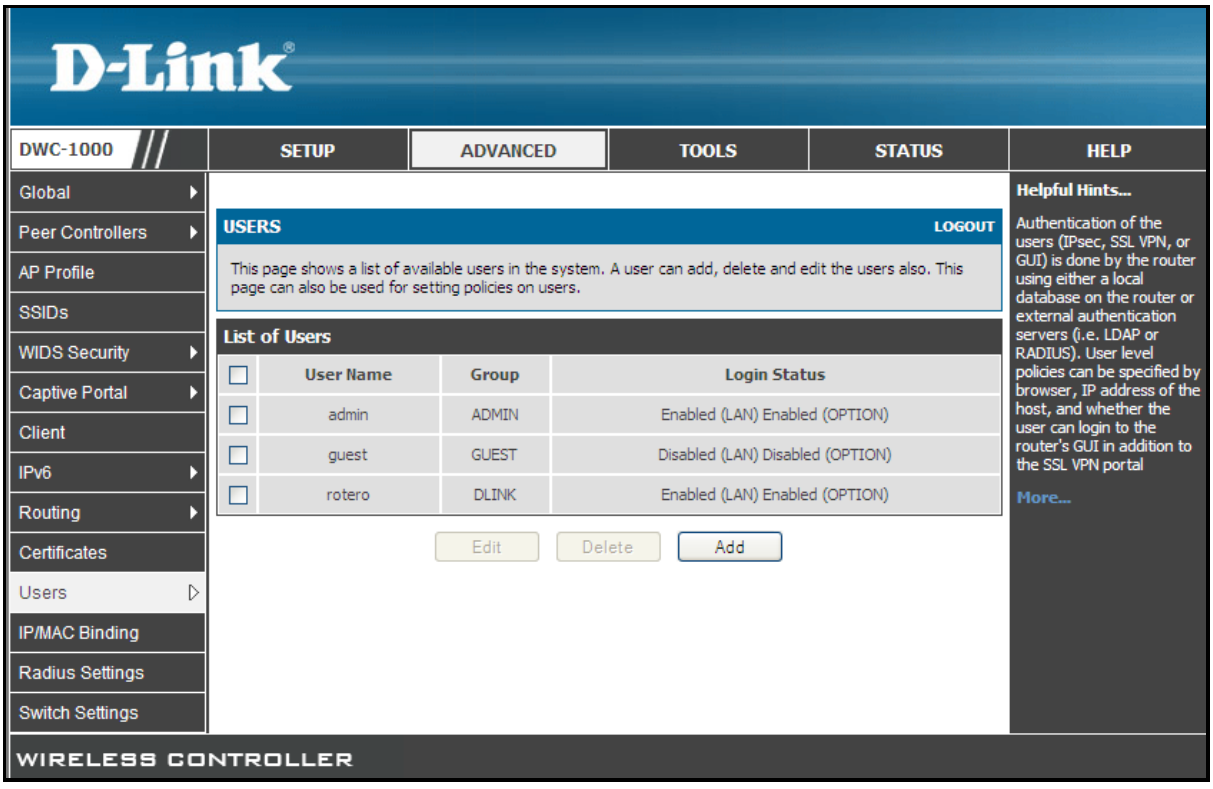
After you add users, you can edit them when changes are required and delete users when you no longer need them.

Adding Users Manually

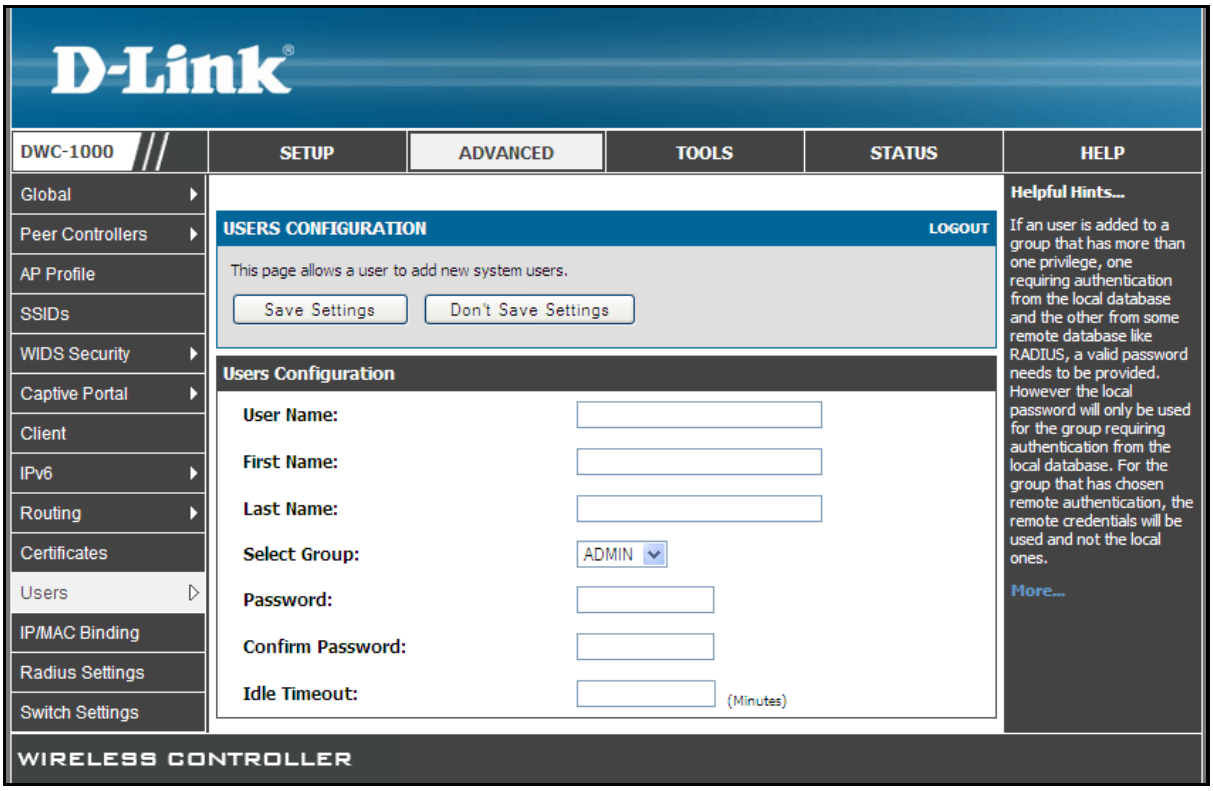
Path: ADVANCED > Users > Users

One way of adding users is to add users individually.

1. Click **ADVANCED > Users > Users**. The USERS page appears.



2. Click the **Add** button. The USERS CONFIGURATION page appears.



3. Complete the fields in the page (see Table 8-4) and click **Save Settings**.

Table 8-4. USERS CONFIGURATION Page Settings

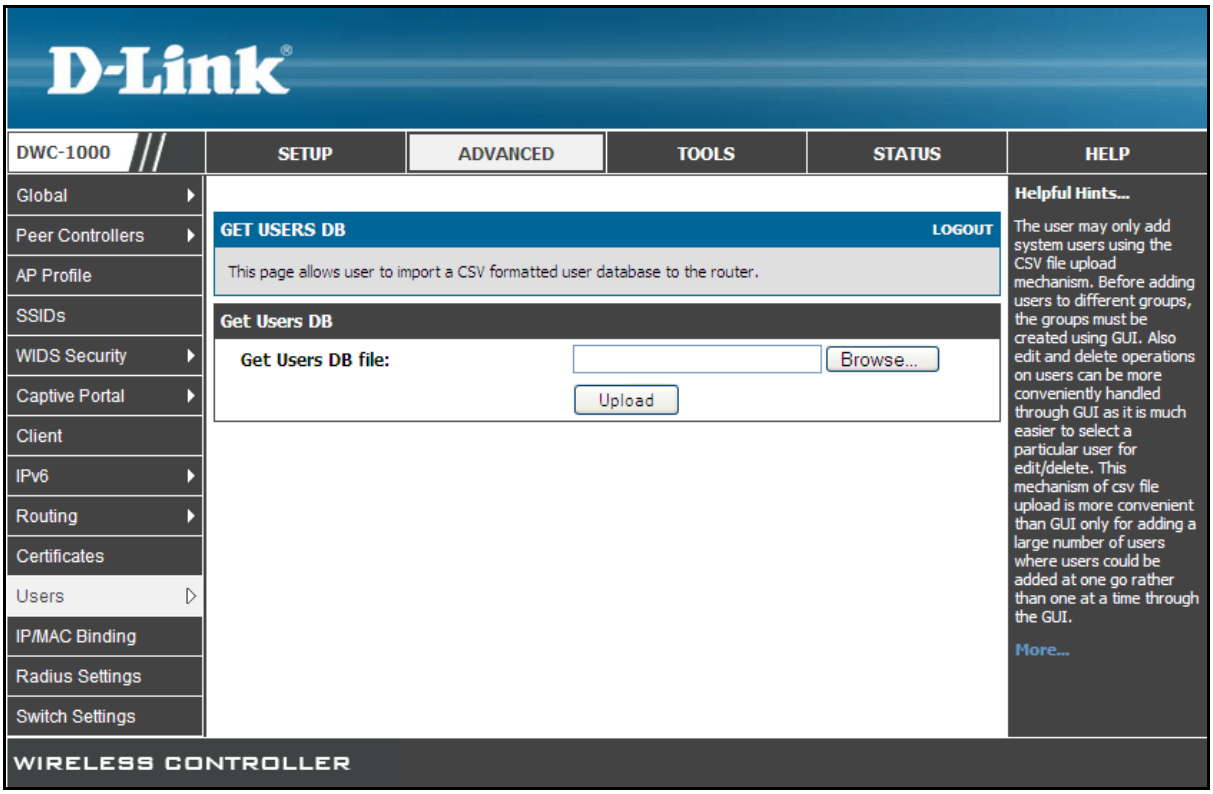
Field	Description
User Name	Enter a unique name for this user. The name should allow you to easily identify this user from others you may add.
First Name	Enter the first name of the user. This is useful when the authentication domain is an external server, such as RADIUS.
Last Name	Enter the last name of the user. This is useful when the authentication domain is an external server, such as RADIUS.
Select Group	Select the captive portal group to which this user will belong.
Password	Enter a case-sensitive login password that the user must specify at the log in prompt to access the web management interface. For security, each typed password character is masked with a dot (•).
Confirm Password	Enter the same case-sensitive password entered in the Password field. For security, each typed password character is masked with a dot (•).
Idle Timeout	Enter the number of minutes of inactivity that must occur before the user is logged out of his session automatically. Entering an Idle Timeout value of 0 (zero) means never log out.

Importing Users

Path: ADVANCED > Users > Get Users DB

A faster alternative to adding individual users is to import users from a CSV-formatted file.

1. Click **ADVANCED > Users > Get Users DB**. The GET USERS DB page appears.



2. Click the **Browse** button.
3. In the Choose File dialog box, navigate to the location of the CSV file, and then click the file and click **Open**.
4. Click **Upload**.

Editing Users

Path: ADVANCED > Users > Users

There may be times when you need to edit a user. For example, you might want to change the user's login password or idle timeout.

To edit a user:

1. Click **ADVANCED > Users > Users**. The USERS page appears.
2. Check the box next to the user you want to edit.
3. Click the **Edit** button. The USERS CONFIGURATION page appears.

4. Complete the fields in the page (see Table 8-5) and click **Save Settings**.

Table 8-5. USERS CONFIGURATION Page Settings

Field	Description
User Name	Enter a unique name for this user. The name should allow you to easily identify this user from others you may add.
First Name	Enter the first name of the user. This is useful when the authentication domain is an external server, such as RADIUS.
Last Name	Enter the last name of the user. This is useful when the authentication domain is an external server, such as RADIUS.
Select Group	Select the group to which this user will belong.
Check to Edit Password	Check this box to change the password used by this user to log in to the web management interface.
Enter Current Logged in Administrator Password	Enter the current case-sensitive login password. For security, each typed password character is masked with a dot (•).
New Password	Enter the new case-sensitive login password. For security, each typed password character is masked with a dot (•). Record the new password in Appendix A.
Confirm Password	Enter the same case-sensitive password entered in the New Password field. For security, each typed password character is masked with a dot (•).
Idle Timeout	Enter the number of minutes of inactivity that must occur before the user is logged out of his session automatically. Entering an Idle Timeout value of 0 (zero) means never log out.

Deleting Users

Path: ADVANCED > Users > Users

If you no longer a user, you can delete the user.

Note: A precautionary message does not appear before you delete a user. Therefore, be sure you do not need a user before you delete it.

To delete a user:

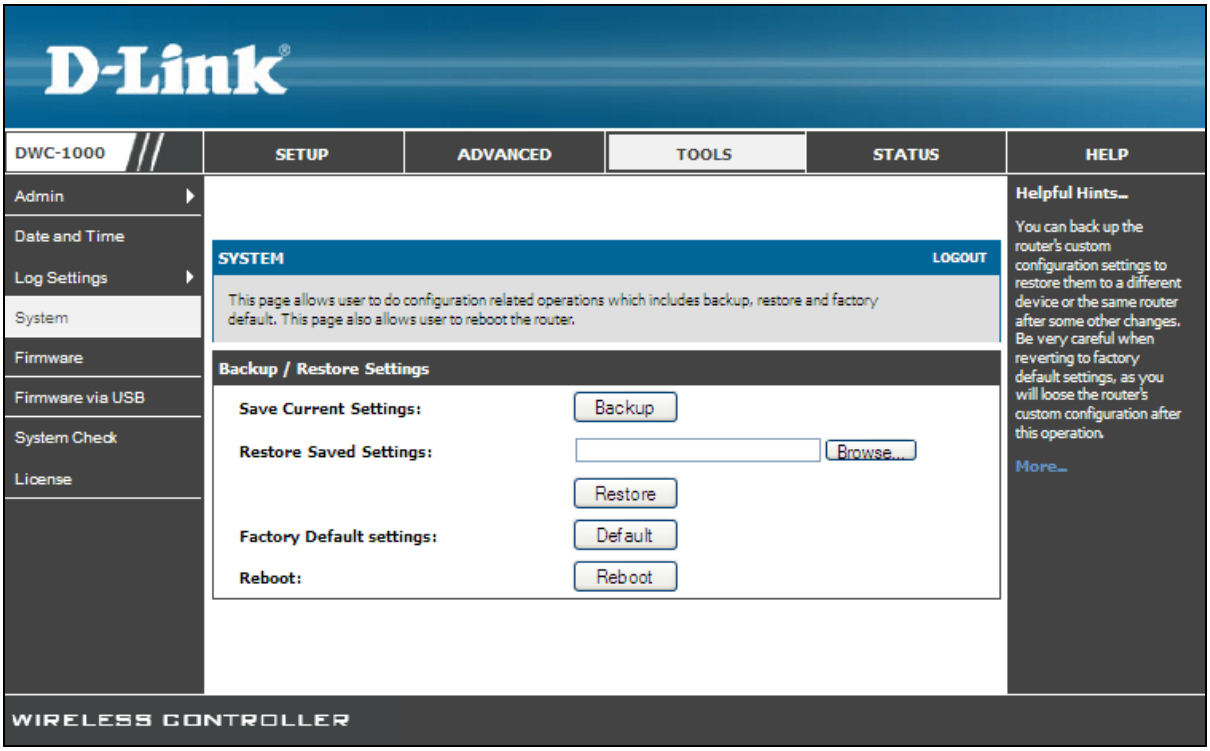
1. Click **ADVANCED > Users > Users**. The USERS page appears.
2. Check the box next to each user you want to delete. (Or click the box next to **List of Users** to select all users.)
3. Click the **Delete** button.

Backing Up Configuration Settings

Path: TOOLS > System

After you configure the wireless controller as desired, back up the configuration settings. When you back up the settings, they are saved as a file. You can then use the file to restore the settings on the same wireless controller if something goes wrong or on a different wireless controller that will replace or work with other wireless controllers.

1. Click **TOOLS > System**. The SYSTEM page appears.



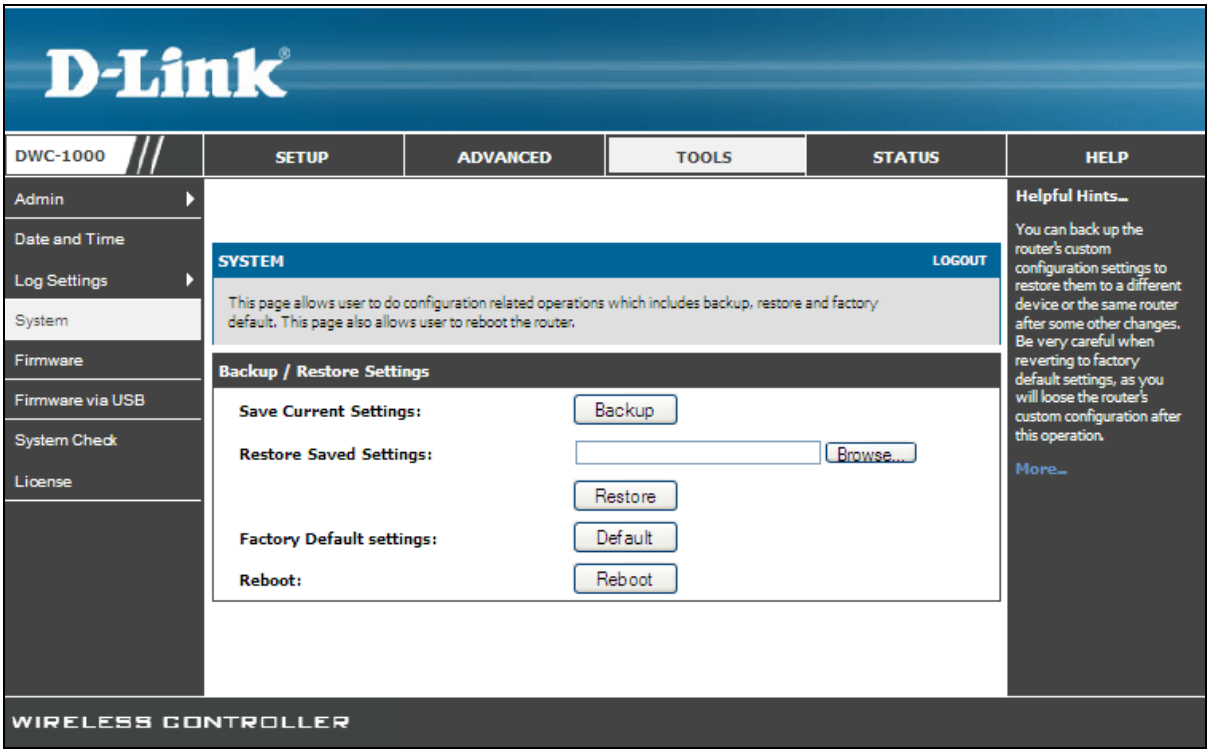
2. Click the **Backup** button. A message appears.
3. Click **OK** to close the message. A File Download dialog box appears.
4. Click **Save**. The Save As dialog box appears.
5. In the Save As dialog box, go to the location where you want to save the settings, and then click **Save**.

Restoring Configuration Settings

Path: TOOLS > System

After you use the procedure on the previous page to back up a wireless controller's configuration settings, you can restore the settings using the following procedure.

1. Click **TOOLS > System**. The SYSTEM page appears.



2. In the **Restore Saved Settings** field, either:
   - Enter the complete path where the backup file is located.
   - Click the **Browse** button. Use the Choose file dialog box to find the backup file. Then click the file and click **Open**.
3. Click the **Restore** button. A message appears.
4. Click **OK** to close the message and restore the configuration settings from the selected file.

Restoring Factory Default Settings

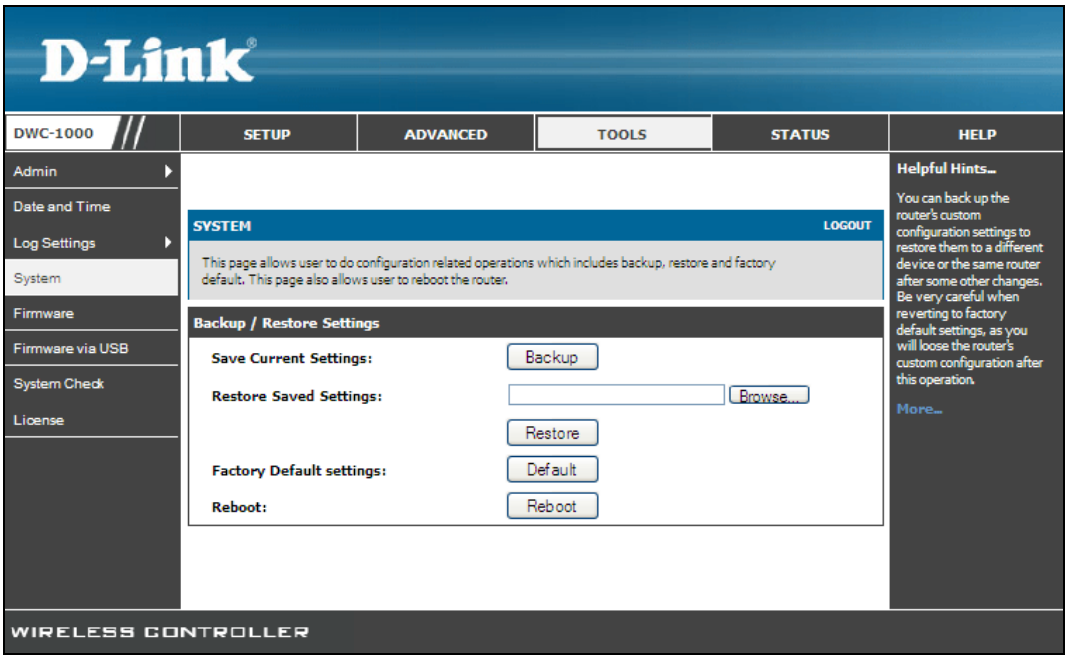
Path: TOOLS > System

If you reset a wireless controller to its factory default settings, it returns to the state when it was new — all changes you made to the default configuration are lost. Examples of settings that get restored include critical things you need to get online, such as login password, SSID, IP addresses, and wireless security keys.

There are two ways to restore a wireless controller to its original factory default settings:

- Use the reset button on the back of the wireless controller (see “Using the Reset Button” on page 18).
- Use the web management interface instructions below.

1. Click **TOOLS > System**. The SYSTEM page appears.



2. Next to **Factory Default settings**, click the **Default** message.
3. At the confirmation message, click **OK** to restore factory default settings. (Or click **Cancel** to retain your current settings.)

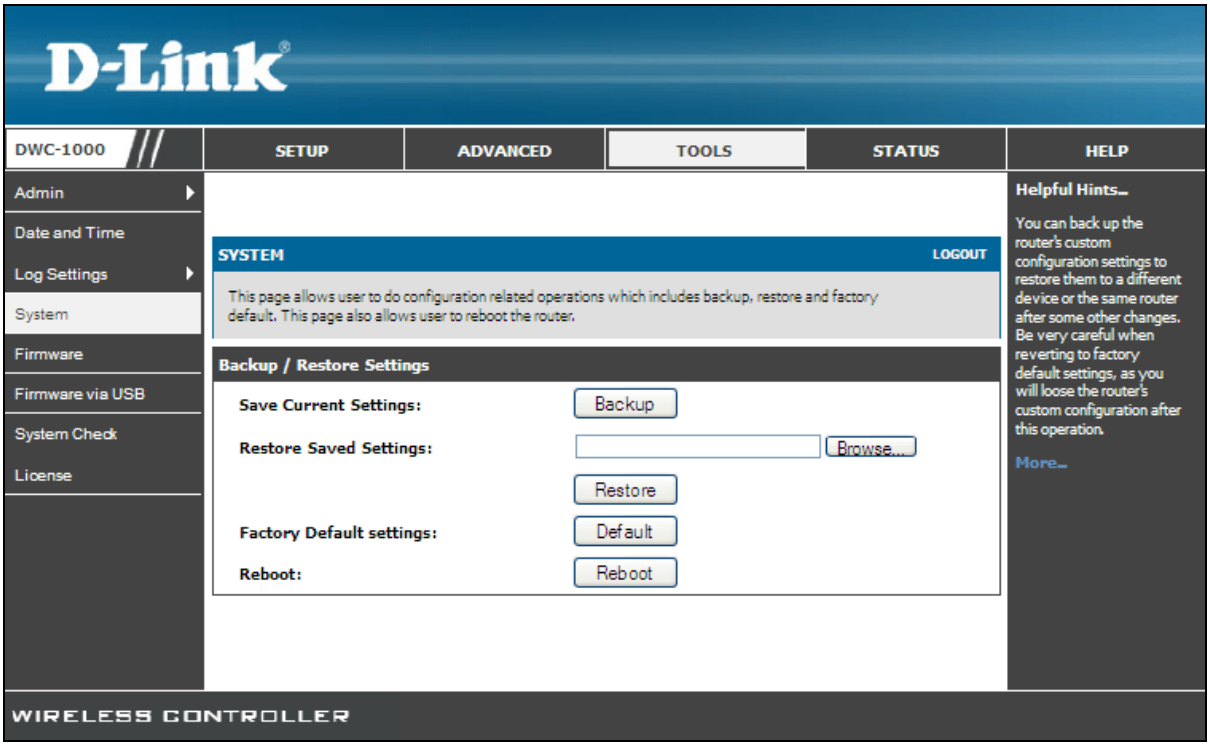
Note: After restoring the factory default configuration, the wireless controller’s default LAN IP address is 192.168.10.1, the default login user name is **admin**, and the default login password is **admin**.

Rebooting the Wireless Controller

Path: TOOLS > System

You can reboot the wireless controller. Rebooting performs a power cycle and keeps any customized overrides you made to the default settings.

1. Click **TOOLS > System**. The SYSTEM page appears.



2. Next to **Reboot**, click the **Reboot** message.
3. At the confirmation message, click **OK** to reboot the wireless controller. (Or click **Cancel** to not reboot.)

Upgrading Firmware

Access Point Firmware Upgrade

As new versions of the access point firmware become available, you can upgrade the firmware on your devices to take advantage of new features and enhancements. The access point uses the Hypertext Transfer Protocol (HTTP) to perform firmware upgrades. You can also use a Trivial File Transfer Protocol (TFTP) client or USB to perform firmware upgrades. This guide covers the HTTP upgrade procedure.

After you upload new firmware and the system reboots, the newly added firmware becomes the primary image. If the upgrade fails, the original firmware remains as the primary image.

If the access point has not been assigned an IP address using DHCP, configure your PC running the web browser to use the IP address 10.90.90.0 network, with the subnet mask 255.0.0.0. You must log in to the access point default IP address 10.90.90.91. After the access point is managed by the wireless controller, firmware upgrades are performed on the wireless controller. For more information, refer to the wireless controller user manual.

Before upgrading firmware, observe the following guidelines:

- Upgrade the access point firmware before you upgrade the firmware for the wireless controller. Otherwise, the wireless controller might not discover the access point.
- After the access point is managed by the wireless controller you must upgrade the access point firmware from the wireless controller.

To upgrade the firmware on an access point by using HTTP:

1. Log in to the access point http://10.90.90.91. Default username and password is “admin”.
2. Click **Tools > Upgrade**.
3. For **Upload Method**, select **HTTP**.
4. If you know the path to the new firmware image file, enter it in the **Image Filename** field. Otherwise, click the **Browse** button and locate the firmware image file.

   The firmware upgrade file supplied must be a tar file. Do not try to use binary (bin) files or files of other formats for the upgrade, as these types of files will not work.
5. Click **Upgrade** to apply the new firmware image. A popup confirmation window describes the upgrade process.
6. Click **OK** to confirm the upgrade and start the process.

Note: The firmware upgrade process begins after you click **Upgrade** and then **OK** in the popup confirmation window.

The upgrade process may take several minutes during which time the access point will be unavailable. Do not interrupt the upgrade or turn off the system; otherwise, you can damage the firmware. Wait for the upgrade to complete before browsing any sites from your browser.

The access point resumes normal operation with the same configuration settings it had before the upgrade.

7. To verify that the firmware upgrade completed successfully, check the firmware version on the Upgrade page or Basic Settings page. If the upgrade was successful, the updated version name or number is shown.

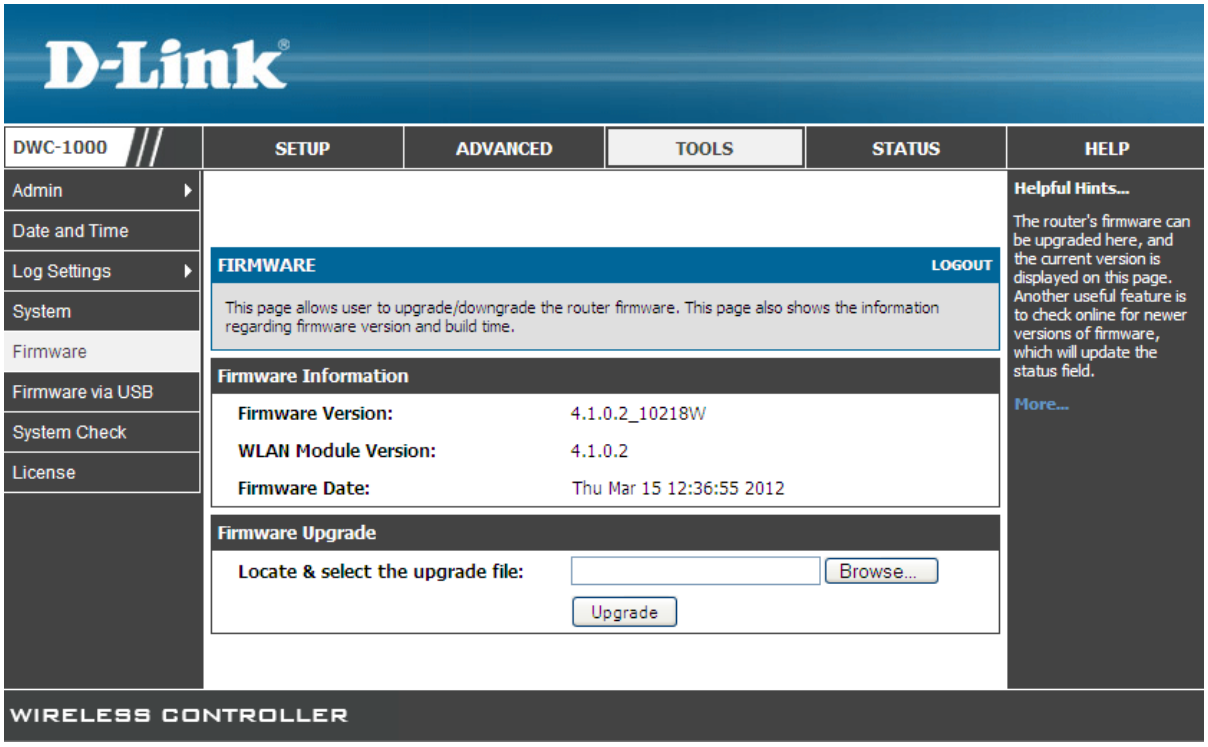
Wireless Controller Firmware Upgrade

Path: TOOLS > Firmware

D-Link is constantly improving the operation and performance of the wireless controller. When improvements are available, they are offered to customers as firmware upgrade releases.

After you install the wireless controller, check that it has the latest firmware. Thereafter, check for firmware releases and install them as they become available.

1. Go to http://www.dlink.com/support to find the latest firmware version available for the wireless controller.
2. In the wireless controller web management interface, click **TOOLS > Firmware**. The FIRMWARE page appears.



3. If the firmware version on the D-Link support website has a higher number than the firmware version shown under **Firmware Information**, continue with this procedure.
4. Download the new firmware from the D-Link website.
5. Under **Firmware Upgrade**, click the **Browse** button.
6. In the Choose File dialog box, navigate to the firmware file, and then click the file and click **Open**.
7. Click **Upgrade**.
8. At the confirmation message, click **OK** to start the firmware upgrade. A progress bar shows the progress of the upgrade.

Note: The upgrade process takes a few minutes. Do not interrupt the upgrade or turn off the system; otherwise, you can damage the firmware. Wait for the upgrade to complete before browsing any sites from your browser.

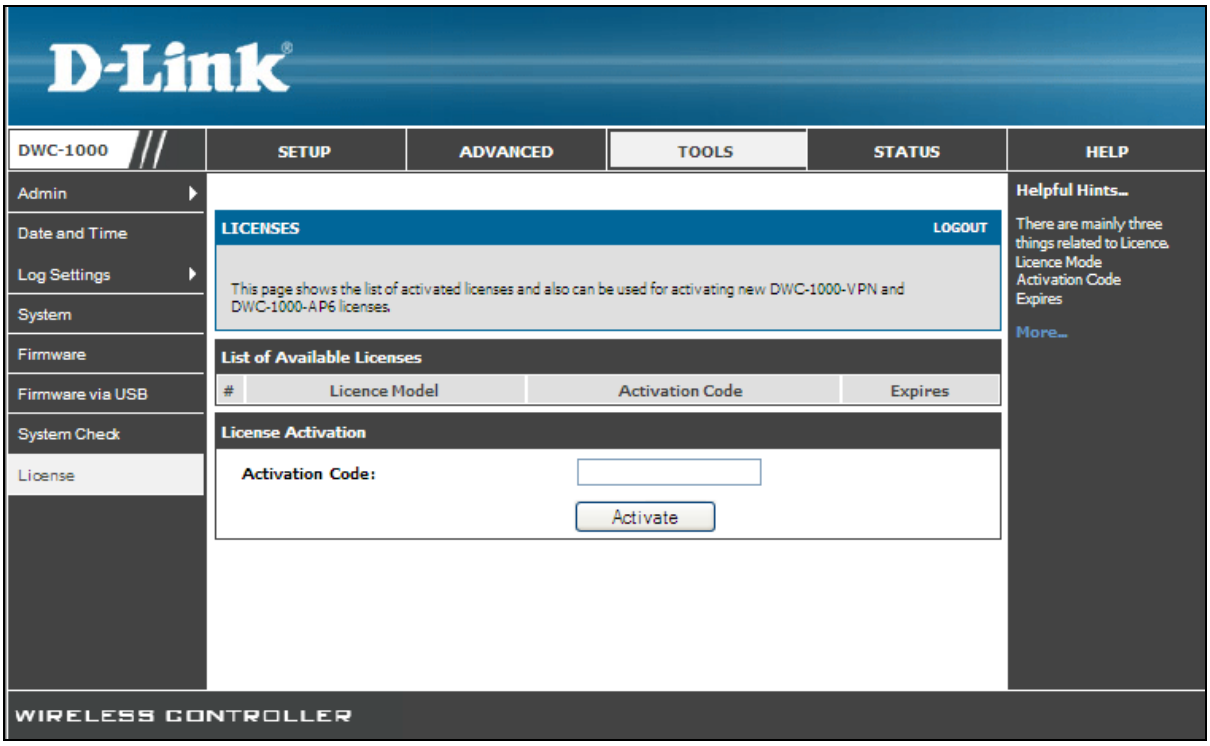
9. When the upgrade completes, log in to the wireless controller web management interface, click **TOOLS > Firmware**, and confirm that the new firmware appears next to **Firmware** on the FIRMWARE page.
10. Record the firmware level in Appendix A.

Activating Licenses

Path: TOOLS > License

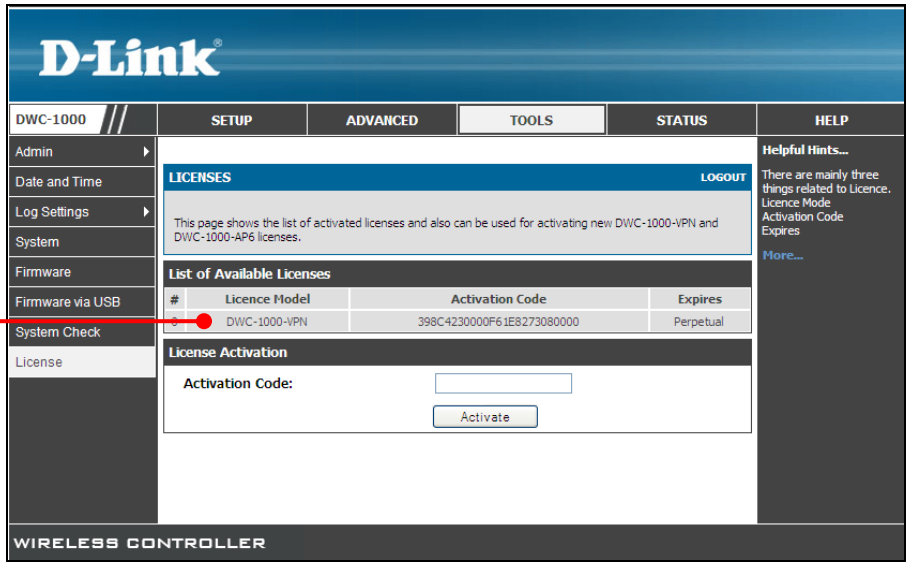
The LICENSES page lets you activate licenses for additional access points and VPN, firewall, and routing functions on the wireless controller.

1. Obtain an Activation Key from D-Link:
   a. Find the wireless controller serial number on the bottom of the device.
   b. Obtain a license key from D-Link via e-mail after purchasing the license.
   c. Open a Web browser and go https://register.dlink.com to register with D-Link.
   d. If you do not have an account, register for a new account.
   e. Log in with your username and password.
   f. Click **License key Activation**.
   g. Follow the directions to receive an Activation key.
2. After obtaining the Activation Key, click **TOOLS > License**. The LICENSES page appears.

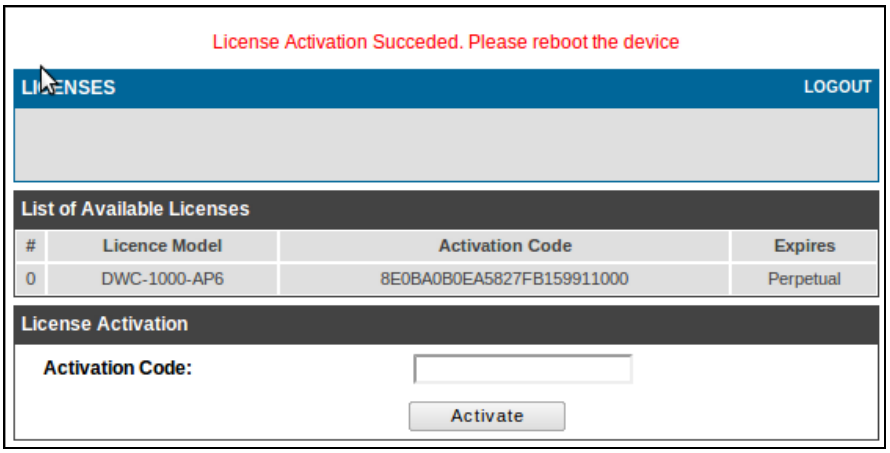


3. Under **License Activation**, click in the **Activation Code** field and enter the D-Link-supplied code for the license you want to activate.

4. Click **Activate**. The activation code appears under **List of Available Licenses**.



5. In the **Activation Code** text box, enter the Activation Key.
6. Click **Activate**. After the license is activated, a page similar to the following shows the activated license.



7. Reboot the wireless controller to have the license take effect (see”Rebooting the Wireless Controller” on page 207).

Using the Command Line Interface

The wireless controller supports a command-line interface (CLI). The CLI lets you use a VT-100 terminal-emulation program to locally or remotely configure, monitor, and control the wireless controller and its managed access points via a simple text-based, tree-structured interface. The wireless controller supports SSH and Telnet management for command-line interaction.

The following procedure describes how to access the CLI

Tip: A separately purchased USB-to-DB9Fserial adapter will be helpful when connecting a PC or Linux workstation to the console. An RJ-45-to-DB9M cable is included with the wireless controller.

1. Connect a PC with a VT-100 terminal-emulation program to the **Console** port on the front panel of the wireless controller (see Figure 2-1 on page 16).
2. CLI login credentials are shared with the GUI for administrator users. When prompted, type **cli** in the SSH or console prompt and login with administrator user credentials.

For more information, refer to the *Wireless Controller CLI Reference Guide: DWC-1000*.

9. TROUBLESHOOTING

In the unlikely event you encounter a problem using the wireless controller, refer to the troubleshooting suggestions in this chapter to identify and resolve the problem.

The topics covered in this chapter are:

LED Troubleshooting

After you apply power and turn on the wireless controller, the following sequence of events should occur:

1. When power is first applied, verify that the front panel (green) Power LED to the left of the USB ports is ON.
2. After approximately 2 minutes, verify that the right LAN port LED is ON for any local ports that are connected. This indicates that a link has been established to the connected device.
3. If a port is connected to a 1000 Mbps device, verify that the port's right LED is orange. If a port is connected to a 100 Mbps device, verify that the port's right LED is green. If a port is connected to a 10 Mbps device, verify that the port's right LED is OFF.

If any of these conditions do not occur, see the appropriate section below.

Power LED is OFF

If the Power and other LEDs are off when your wireless controller is turned on, confirm that the power cord is connected properly to the wireless controller and that the power cord is connected to a functioning power outlet that is not controlled by a wall switch.

If the error persists, please contact D-Link technical support.

LAN Port LEDs Not ON

If the LAN LEDs do not go ON when the Ethernet connection is made:

1. Check that the Ethernet cable connections are secure at the wireless controller and at the switch.
2. Be sure power is applied to the connected switch and that the switch is turned on.
3. Be sure you are using the correct cables (straight-through or crossover).

Troubleshooting the Web Management Interface

If you cannot access the wireless controller's web management interface from a PC on your local network:

- Check the Ethernet connection between the PC and the wireless controller.
- Be sure your PC's IP address is on the same subnet as the wireless controller. If you are using the recommended addressing scheme, be sure your PC is configured to use a static IP v4 address of 192.168.10.*nnn* (where *nnn* is the number 0 or a number from 2 to 255) and a subnet of 255.255.255.0.
- If the wireless controller's IP address has been changed and you do not know the current IP address, reset the wireless controller's configuration to factory default settings. This sets the wireless controller's IP address to 192.168.10.1 (see "Restoring Factory Default Settings" on page 206), but it also loses any changes you made to the factory default settings.
- If you do not want to revert to the factory default settings and lose your configuration settings, you can reboot the wireless controller and use a sniffer to capture packets sent during the reboot. Look at the ARP packets to find the wireless controller's LAN interface address.

Using the Reset Button to Restore Default Settings

If you cannot access the wireless controller's management interface for some reason, press the reset button on the rear panel to restore the factory default settings (see "Using the Reset Button" on page 18).

To clear all settings and restore the factory default values:

1. Press and hold the reset button for at least 15 seconds.
2. Release the reset button. The reboot process is complete after several minutes.

Note: After restoring the factory default configuration, the wireless controller's default LAN IP address is 192.168.10.1, the default login user name is **admin**, and the default login password is **admin**.

Problems with Date and Time

The DATE AND TIME page shows the current date and time of day. The wireless controller uses the Network Time Protocol (NTP) to obtain the current time from one of several network time servers on the Internet. Each entry in the log is stamped with the date and time of day.

If you find that the date and time stamps are not accurate, confirm that the wireless controller can reach the Internet.

Discovery Problems with Access Points

If the wireless controller does not discover any or all access points:

- Be sure the wireless controller is connected to the LAN (see “LAN Port LEDs Not ON” on page 215).
- Be sure you entered the appropriate IP address range if the access points operate in different VLANs, reside behind an IP subnet, or operate in standalone mode (see “Basic Configuration Step #1. Enable DHCP Server (Optional)” on page 33).
- If you are using a firewall, unblock the UDP port number for each access port in the firewall.
- Be sure each access point is using a unique IP address (see “IP Discovery” on page 169). If more than one access point has the same IP address, only one of them is discovered. In this case, add the access point to the managed list, change its IP address, and then run discovery again to discover the next access point with that IP address (see “Basic Configuration Step #2. Select the Access Points to be Managed” on page 34.

Connection Problems

When an access point is converted from standalone mode to managed mode, its static IP address changes to an IP address that is issued by the DHCP server, either one in the network or one that is configured on the wireless controller. This occurs to ensure that each managed access point has a unique IP address.

If there is no DHCP server or if the access point cannot reach the DHCP server, the access point remains in the Connecting state as it tries to obtain an IP address. If there is no DHCP server in the network, configure one on the wireless controller (see “Basic Configuration Step #1. Enable DHCP Server (Optional)” on page 33). When a DHCP server becomes available, the access point can transition from the Connecting state to the Connected state.

If you added a new SSID, but the SSID does not appear under Wi-Fi Networks within 5 minutes, use the following procedure to reboot the Wireless Controller.

1. Click **Tools > System**. The SYSTEM page appears.
2. Click **Reboot**.

Network Performance and Rogue Access Point Detection

When rogue access point detection is enabled, access points intermittently go off channel for short periods, which can affect network performance. If security concerns are more important than network performance, you can enable rogue access point detection. If network performance is more important than security concerns, you can temporarily disable rogue access point detection.

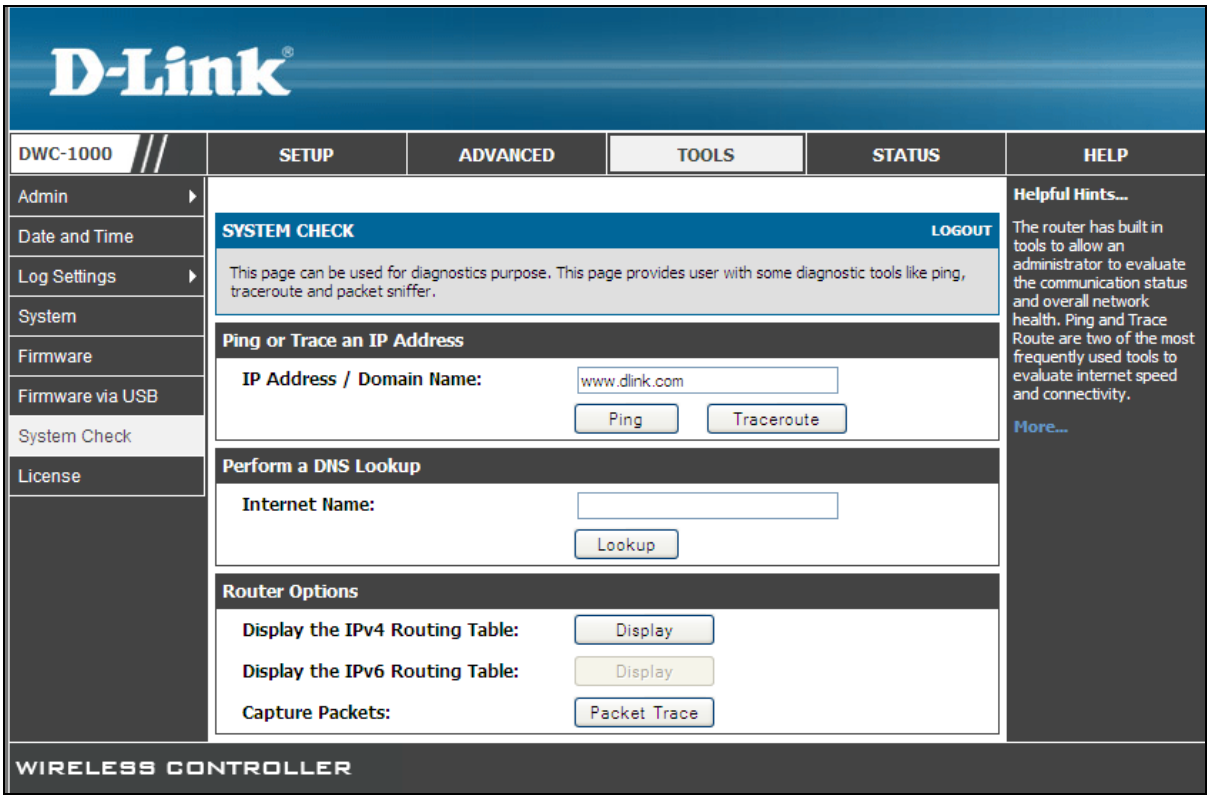
Using Diagnostic Tools on the Wireless Controller

Pinging an IP Address

Path: TOOLS > System Check

As part of the diagnostics functions on the wireless controller, you can ping an IP address. You can use this function to test connectivity between the wireless controller and another device on the network connected to the wireless controller.

1. Click **TOOLS > System Check**. The SYSTEM CHECK page appears.



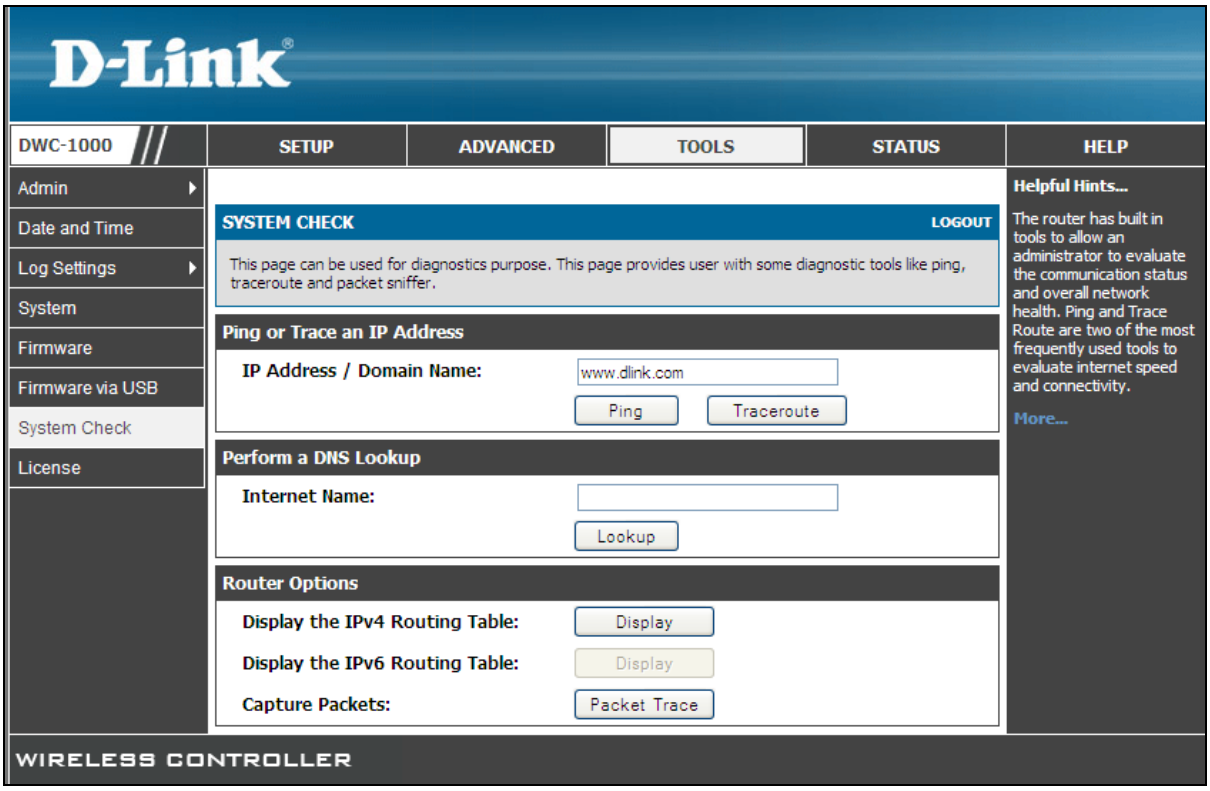
2. Under **Ping or Trace an IP Address**, in the **IP Address / Domain Name** field, enter an IP address to be pinged.
3. Click **Ping**. The results appear in the Command Output page.
4. Click **Back** to return to the SYSTEM CHECK page.

Using Traceroute

Path: TOOLS > System Check

The wireless controller provides a Traceroute function that lets you map the network path to a public host. Up to 30 intermediate controllers (or “hops”) between this wireless controller and the destination will be displayed.

1. Click **TOOLS > System Check**. The SYSTEM CHECK page appears.



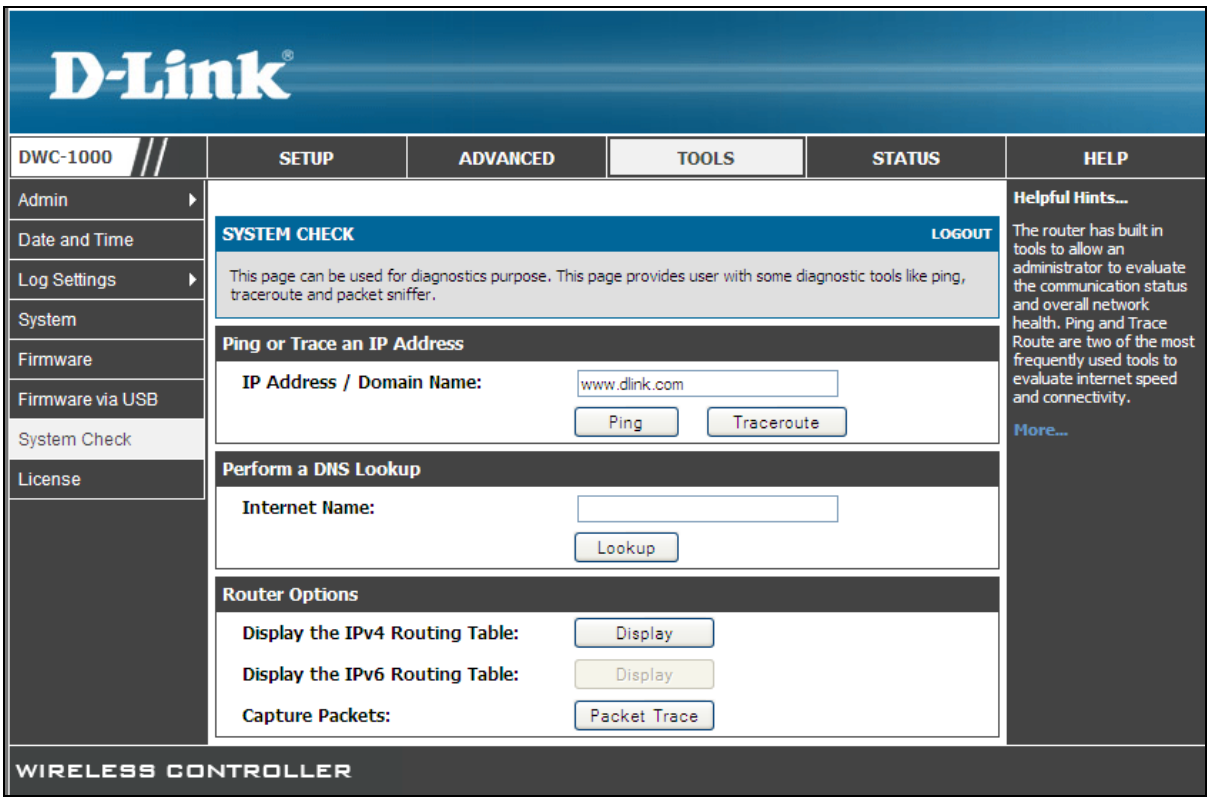
2. Under **Ping or Trace an IP Address**, in the **IP Address / Domain Name** field, enter an IP address.
3. Click **Traceroute**. The results appear in the Command Output page.
4. Click **Back** to return to the SYSTEM CHECK page.

Performing DNS Lookups

Path: TOOLS > System Check

The wireless controller provides a DNS lookup function that lets you retrieve the IP address of a Web, FTP, Mail, or any other server on the Internet.

1. Click **TOOLS > System Check**. The SYSTEM CHECK page appears.



2. Under **Perform a DMS Lookup**, in the **Internet Name** field, enter an Internet name.
3. Click **Lookup**. The results appear in the Command Output page. If the host or domain entry exists, a response appears with the IP address. If the message **Host Unknown** appears, the Internet name does not exist.
4. Click **Back** to return to the SYSTEM CHECK page.

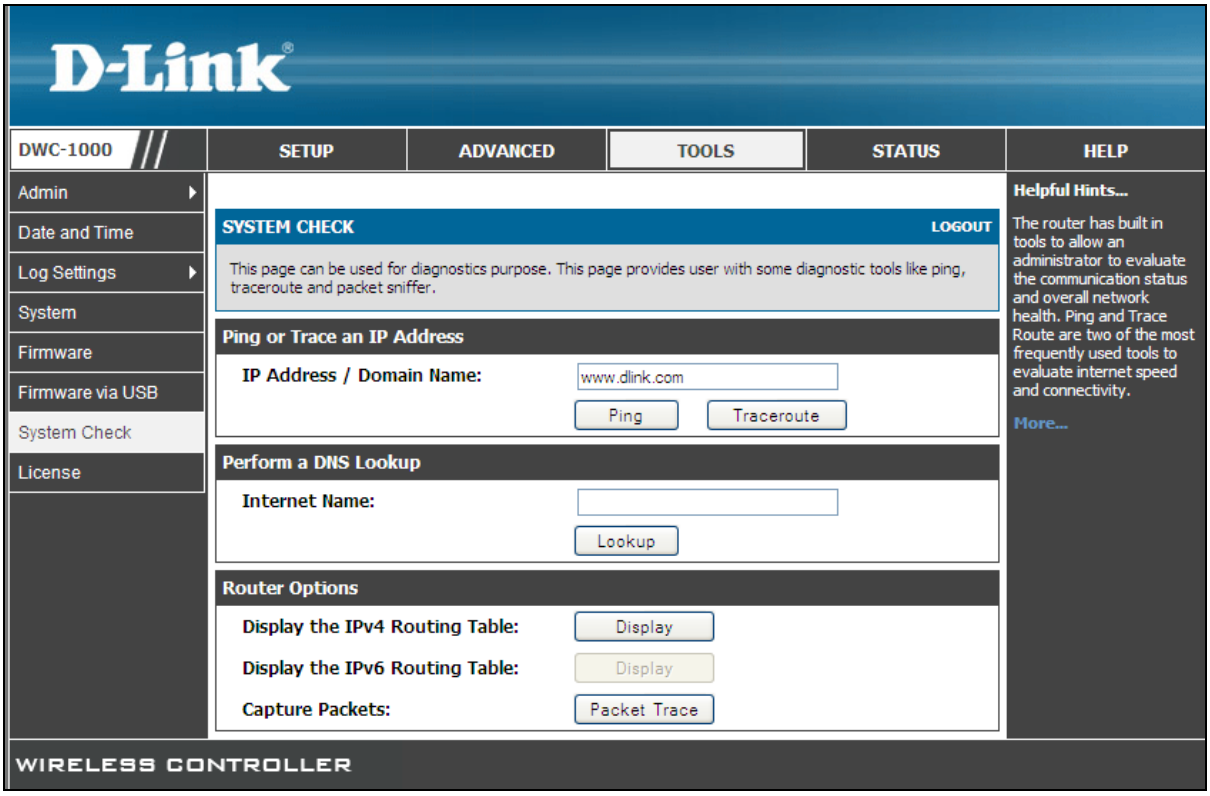
Capturing Log Packets

Path: TOOLS > System Check

The wireless controller lets you capture all packets that pass through the LAN or Option interface. The packet trace is limited to 1 MB of data per capture session. If the capture file size exceeds 1MB, it is deleted automatically and a new capture file is created.

To capture packets:

1. Click **TOOLS > System Check**. The SYSTEM CHECK page appears.



2. Under **Router Options**, in the **Capture Packets** field, enter an Internet name.
3. Click **Lookup**. The results are shown in the Command Output page. If the host or domain entry exists, a response appears with the IP address. If the message **Host Unknown** appears, the Internet name does not exist.
4. Click **Back** to return to the SYSTEM CHECK page.

Checking Log Settings

The wireless controller lets you capture log messages for traffic through the firewall, VPN, and over the wireless access point. You can monitor the type of traffic that goes through the wireless controller and be notified of potential attacks or errors when they are detected by the controller. The following sections describe the log configuration settings and the ways you can access these logs.

Defining What to Log

Path: TOOLS > Log Settings > Logs Facility

The LOGS FACILITY page lets you determine the granularity of logs to receive from the wireless controller. Using the **Facility** drop-down list, you can select one of the following facilities:

- **Kernel** = the Linux kernel. Log messages that correspond to this facility would correspond to traffic through the firewall or network stack.
- **System** = application- and management-level features available on this wireless controller, including SSL VPN and administrator changes, for managing the unit.

For each facility, the following events (in order of severity) can be logged:

Severity	Description
Emergency	System is unusable
Alert	Action must be taken immediately
Critical	Critical conditions
Error	Error conditions
Warning	Warning conditions
Notification	Normal but significant condition
Information	Informational
Debugging	Debug-level messages

The display for logging can be customized based on whether the logs are sent to the Event Log viewer in the web management interface (the Event Log viewer is in the **Status > Logs > View All Logs**) or a remote Syslog server for later review. E-mail logs, discussed in a subsequent section, follow the same configuration as logs configured for a Syslog server.

Tracking Traffic

TOOLS > Log Settings > Logs Configuration

The LOGS CONFIGURATION page lets you select the type of traffic passing through the wireless controller that you want to log for display in Syslog, E-mailed logs, or the Event Viewer. This page helps you capture suspicious activity such as denial-of-service attacks, general attack information, login attempts, dropped packets, and similar events. Traffic through each network segment (LAN, Option, and DMZ) can be tracked based on whether the packet was accepted or dropped by the firewall.

The following table describes the logging options.

Option	Description
Accepted Packets	If checked, tracks packets that were transferred through the segment successfully. This option is useful when the Default Outbound Policy is set to Block Always, so traffic that passes through the firewall can be monitored using the Firewall Rules page (ADVANCED > Firewall Settings > Firewall Rules). Also, see “Accepted Packets Example” on page 226. Enabling accepted packet logging through the firewall can generate a significant volume of log messages depending on typical network traffic. This is recommended for debugging purposes only.
Dropped Packets	If checked, tracks packets that were blocked from being transferred through the segment. This option is useful when the Default Outbound Policy is set to Allow Always on the Firewall Rules page (ADVANCED > Firewall Settings > Firewall Rules). Also, see “Dropped Packets Example” on page 226.
Routing Logs	
LAN to Option	If checked, tracks traffic from the LAN port to the Option port.
Option to LAN	If checked, tracks traffic from the Option port to the LAN port.
System Logs	
All Unicast Traffic	If checked, tracks packets directed to the wireless controller.
All Broadcast / Multicast Traffic	If checked, tracks all broadcast or multicast packets directed to the wireless controller.
FTP Logs	If checked, logged information is sent to FTP logs.
Redirected ICMP Packets	If checked, tracks the number of redirected Internet Control Message Protocol (ICMP) packets.
Invalid Packets	If checked, tracks the number of invalid packets received.
Other Events Logs	
Bandwidth Limit	If checked, tracks logs related to packets dropped due to Bandwidth Limiting. By logging packets that are dropped due to configured bandwidth profiles over a particular interface, you can decide whether the bandwidth profile must be changed to account for the desired Internet traffic of LAN users.

Accepted Packets Example

If a LAN machine tries to make an SSH connection when the option **Accept Packets from LAN to Option** is enabled and there is a firewall rule to allow SSH traffic from a LAN, those packets are accepted and a message is logged if the log option is set to **Allow for the SSH firewall rule** .

Dropped Packets Example

If a LAN machine tries to make an SSH connection when the option **Drop Packets from LAN to Option** is enabled and there is a firewall rule to block SSH traffic from a LAN, those packets are dropped and a message is logged. (Be sure the log option is set to allow for this firewall rule.)

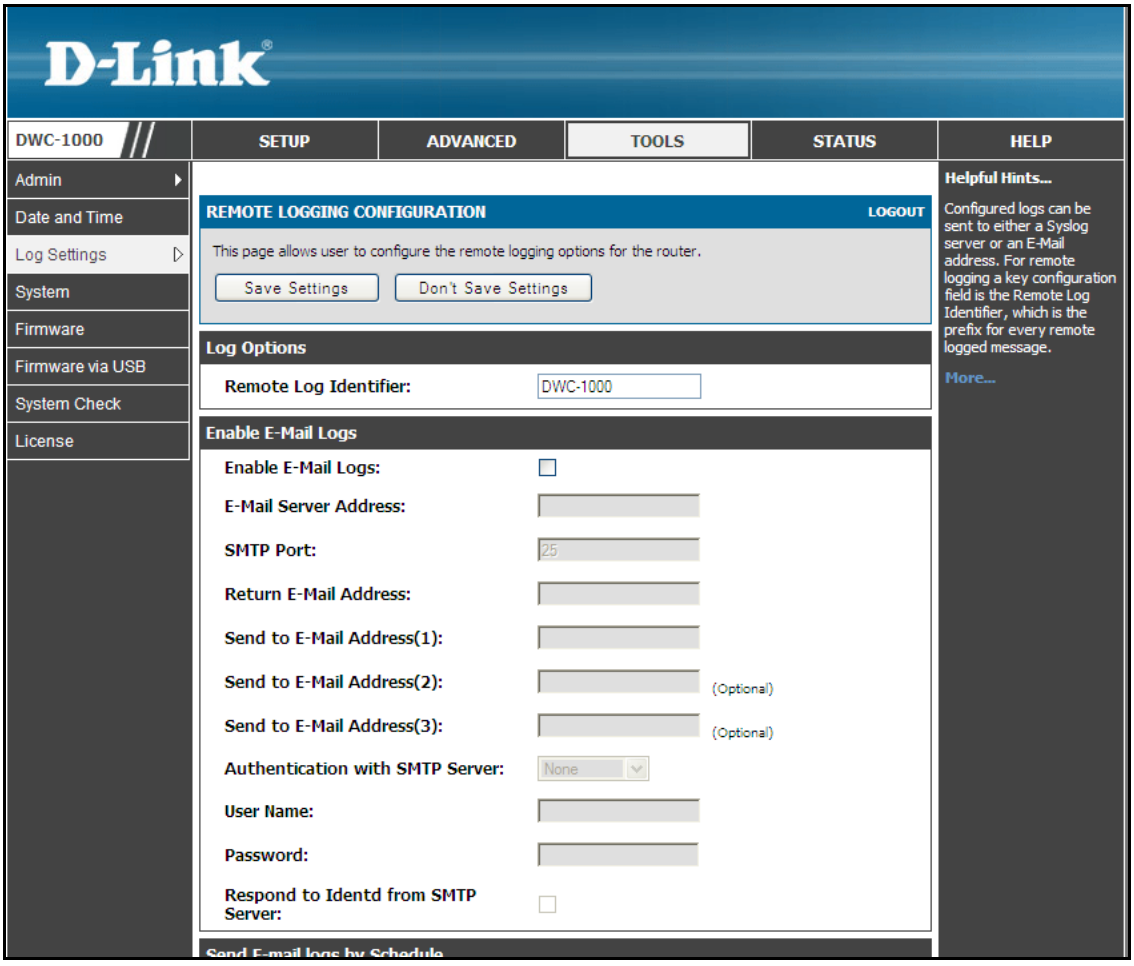
After making your selections on this page, click **Save Settings** to save your changes or click **Don't Save Settings** to revert to the previous settings.

Remote Logging

TOOLS > Log Settings > Remote Logging

An external Syslog server is often used by network administrator to collect and store logs from the wireless controller. This remote device typically has less memory constraints than the local Event Viewer on the wireless controller's web management interface (see "Wireless Controller Event Log" on page 230). Therefore, a number of logs can be collected over a sustained period. This is useful for debugging network issues or to monitor controller traffic over a long duration.

The wireless controller supports 8 concurrent Syslog servers. Each server can be configured to receive different log facility messages of varying severity using the REMOTE LOGGING CONFIGURATION page. This page also lets you send configuration logs to 3 email recipients.



The following table describes the options on this page.

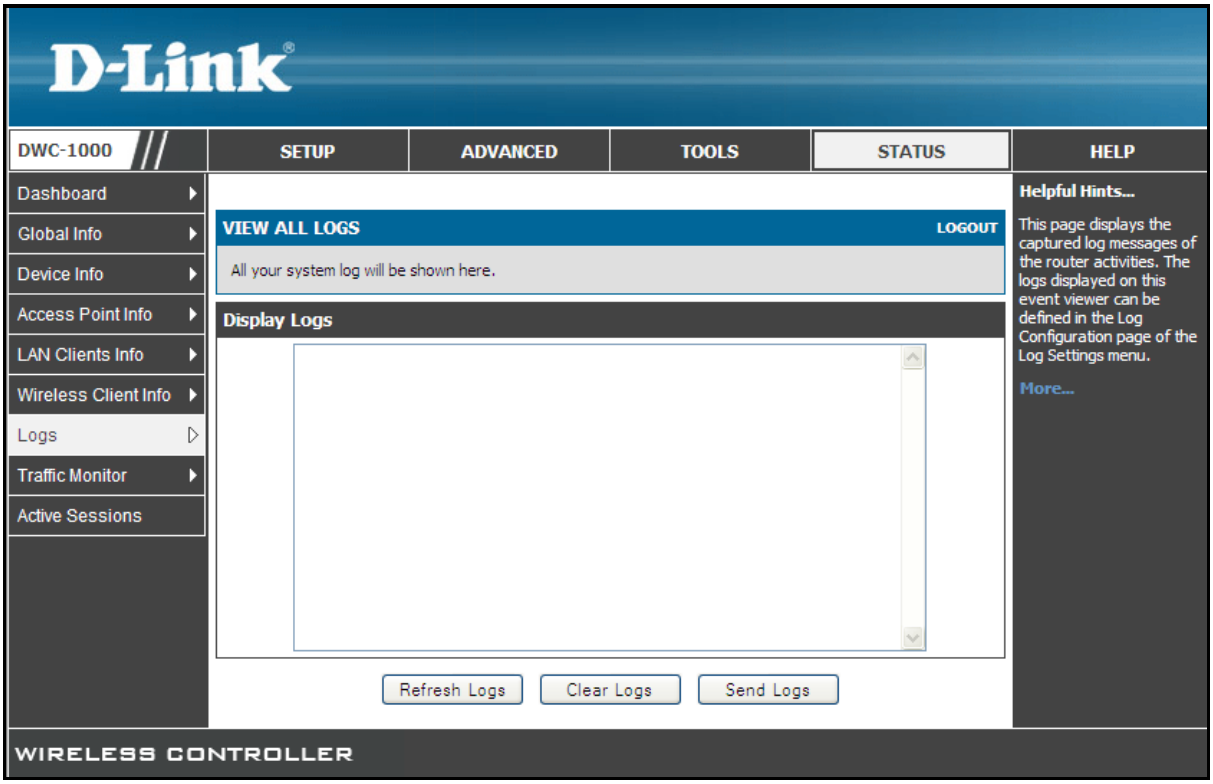
Option	Description
Log Options	
Remote Log Identifier	Enter a prefix used to identify the source of the message. This identifier is prefixed to both e-mail and Syslog messages.
Routing Logs	
Enable E-Mail Logs	Enables or disables email logs. Choices are: • Checked = enable email logs. Complete the remaining fields on this page. • Unchecked = disable email logs. The remaining fields on this page are unavailable.
E-Mail Server Address	If Enable E-Mail Logs is checked, enter the IP address or Internet Name of a Simple Mail Transfer Protocol (SMTP) server. The wireless controller will connect to this server to send e-mail logs when required. The SMTP server must be operational for email notifications to be received.
SMTP Port	If Enable E-Mail Logs is checked, enter the SMTP port of the e-mail server.
Return E-Mail Address	If Enable E-Mail Logs is checked, enter the e-mail address where replies from the SMTP server are to be sent (required for failure messages).
Send to E-mail Address(1) (2) (3)	If Enable E-Mail Logs is checked, enter up to three email addresses where logs and alerts are to be sent.
Authentication with SMTP Server	If Enable E-Mail Logs is checked, select an authentication if the SMTP server requires authentication before accepting connections. Choices are: • None = no authentication is used. The User Name and Password fields are not available. • Login Plain = authentication used to log in using Base64-encoded passwords over non-encrypted communication session. Base64-encoded passwords offer no cryptographic protection, making them vulnerable. • CRAM-MD5 = a challenge-response authentication mechanism defined in RFC 2195 based on the HMAC-MD5 MAC algorithm. CRAM-MD5 offers a higher level of authentication than Login Plain.
User Name	If Authentication with SMTP Server is set to Login Plain or CRAM-MD5, enter the user name to be used for authentication.
Password	If Authentication with SMTP Server is set to Login Plain or CRAM-MD5, enter the case-sensitive password to be used for authentication.
Respond to Identd from SMTP Server	If Enable E-Mail Logs is checked, this option determines whether the wireless controller responds to IDENT requests from the SMTP server. Choices are: • Checked = wireless controller responds to an IDENT request from the SMTP server. • Unchecked = wireless controller ignores IDENT requests from the SMTP server.
Send E-Mail Logs by Schedule	
To receive e-mail logs according to a schedule, configure the appropriate schedule settings. Scheduling options are enabled when the Enable E-Mail Logs option is checked.	

Option	Description
Unit	Select the period of time that you need to send the log. This option is useful when you do not want to receive logs by e-mail, but want to keep e-mail options configured, so you can use the Send Log function Event Log viewer pages. Choices are: • Never = disable sending of logs. • Hourly = send logs every hour. • Daily = send logs every day at the Time specified. • Weekly = send logs weekly, at the Day and Time specified.
Day	If Unit is set to Weekly, select the day when logs will be sent.
Time	If Unit is set to Daily or Weekly, select the time when logs will be sent.
SYSLOG SERVER CONFIGURATION	
To enable a Syslog server, check the box next to an empty Syslog server field and enter an IP address or FQDN in the Name field. The selected facility and severity level messages are sent to the configured (and enabled) Syslog server after you save the settings on this page.	
Check box	To have the wireless controller send logs to a Syslog server, check one or more boxes. You can check up to 8 Syslog servers and use them concurrently.
Name	Enter the IP address or Internet Name of the Syslog server.
Syslog Facility	For each syslog server, select a unique facility for logging. Facility values are defined in RFC 3164. Choices are: • All • Kernel • System
Syslog Severity	Select the appropriate Syslog severity. When a severity is selected, all Syslogs with severity equal to or greater than the chosen severity are logged on the configured Syslog Server.

Wireless Controller Event Log

STATUS > Logs > View All Logs

The wireless controller's web management interface displays configured log messages from the Status menu. When traffic through or to the wireless controller matches the settings in the **TOOLS > Log Settings > Logs Facility** page (see "Defining What to Log" on page 223) or **TOOLS > Log Settings > Logs Configuration** page (see "Tracking Traffic" on page 225), the corresponding log message appears in this window with a timestamp:

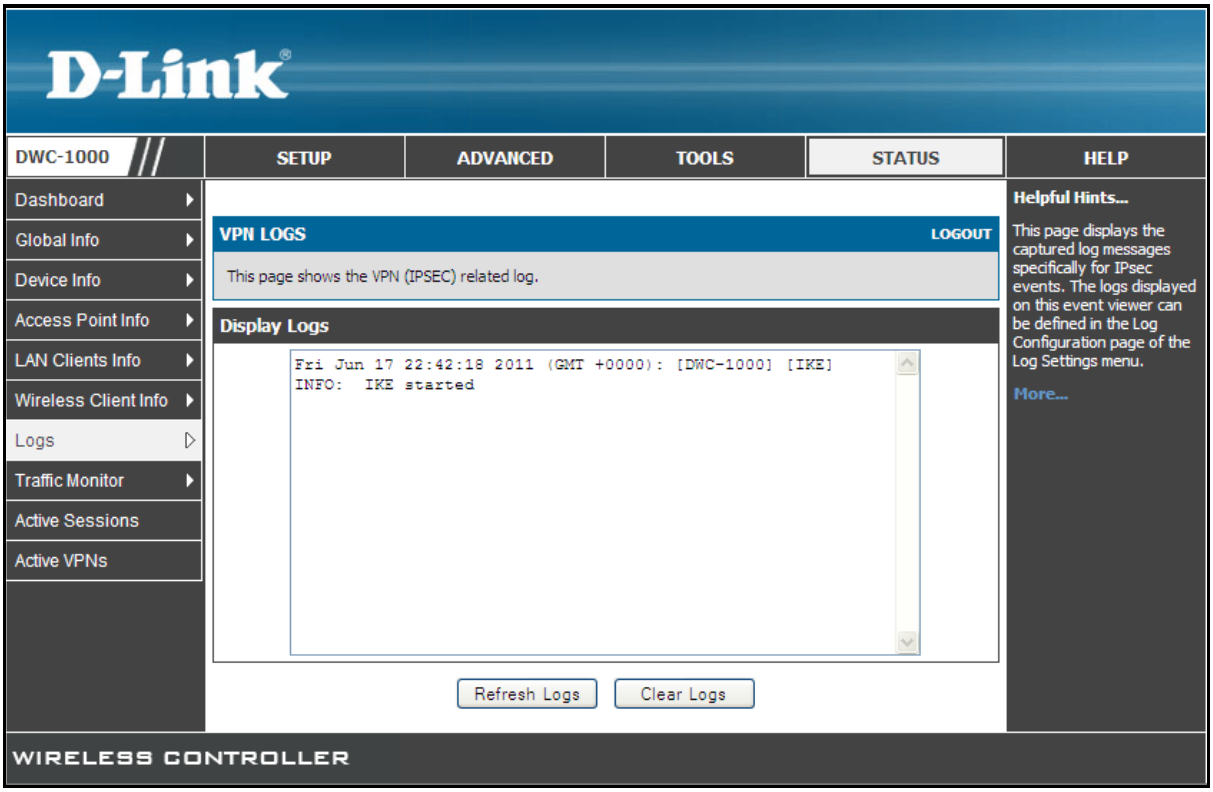


Note: To understand log messages, it is very important to have accurate system time that has been set manually or from a NTP server.

IPsec VPN Log Messages

STATUS > Logs > VPN Logs

If you activated the VPN / Firewall license for the wireless controller, you can use the VPN VPN LOGS page to view IPsec VPN log messages based on the facility and severity configuration settings. This data is useful when evaluating IPsec VPN traffic and tunnel health.



APPENDIX A. BASIC PLANNING WORKSHEET

RF planning enables you to specify how Wi-Fi coverage will be provided. It provides coverage maps and locations prone to weak signals or dead spots that might require additional access points to provide adequate Wi-Fi coverage.

A Basic Planning Worksheet similar to the one in this appendix allows you to collect the following critical information to expedite your planning efforts.

- Building dimensions
- Walls and possible obstructions to wireless coverage
- Number of floors
- Distance between floors
- Total number of users and number of users per access point
- Radio type(s)
- Desired access point data rates
- Areas where you want to deploy access points
- Areas where you cannot deploy an access point
- Areas where you do not want coverage

Check each step that applies in the Worksheet after the step is completed.

Step	Task	Completed?
Site Planning		
1.	Height of building:	❑
2.	Width of building:	❑
3.	Number of floors:	❑
4.	Floor dimensions:	❑
5.	Distance between floors:	❑
6.	Visual obstructions:	❑
7.	Possible causes of interference:	❑

Access Point Planning		
1.	Frequency band:	❑
2.	Expected signal quality:	❑
3.	Number of clients per access point:	❑
4.	Total number of clients per floor:	❑
5.	Desired access point data rate:	❑
Wireless Controller Planning		
1.	Change the wireless controller default password and record it here:	❑
2.	Configure your timezone and record it here: _____	❑
3.	Use default radio configuration? Profile Name: _____ Clients (200 is maximum) _____ Modes Available _____ 802.11 b/g _____ 802.11 n _____ 802.11 b/g/n _____ 802.11 a – 5 GHz Only _____ 802.11 a/n – 5 GHz Only _____	❑
4.	SSID information: Service Set Identifier (SSID) name: _____ Security (None, WEP, WPA, or WPA2): _____	❑
5.	Use wireless controller as a DHCP server? Yes = host name and IP address should be assigned dynamically. No = use DHCP relay, or configure static IP addresses and record them below. IP address: _____ IP subnet mask: _____ Gateway IP address: _____ Primary DNS server: _____ Secondary DNS server: _____	 ❑ ❑
6.	LAN IP address: _____	❑
7.	Subnet mask: _____	❑
8.	IP address range: Starting IP address range: _____ Ending IP address range: _____	❑
9.	Default gateway (optional): _____	❑
10.		
11.	DNS server Primary DNS server: _____ Secondary DNS server: _____	 ❑ ❑
12.	Domain: _____	❑

13.	WINS server: _____	❑
14.	Are you connected to the Internet: Yes No	 ❑ ❑
15.	Confirm and record firmware levels for the wireless controller and all access points: DWC-1000 wireless controller: _____ DWL-8600AP access point: _____ DWL-6600AP access point: _____ DWL-3600AP access point: _____ DWL-2600AP access point: _____	❑
16.	Record MAC addresses fort the wireless controller and all access points: DWC-1000 wireless controller: _____ DWL-8600AP access point: _____ DWL-8600AP access point: _____ DWL-8600AP access point: _____ DWL-8600AP access point: _____ DWL-6600AP access point: _____ DWL-6600AP access point: _____ DWL-6600AP access point: _____ DWL-6600AP access point: _____ DWL-3600AP access point: _____ DWL-3600AP access point: _____ DWL-3600AP access point: _____ DWL-3600AP access point: _____ DWL-2600AP access point: _____ DWL-2600AP access point: _____ DWL-2600AP access point: _____	❑

APPENDIX B. FACTORY DEFAULT SETTINGS

Feature	Description	Default Setting
Device login	User login URL	http://192.168.10.1
	User name (case sensitive)	admin
	Login password (case sensitive)	admin
Internet Connection	Option MAC address	Use default address
	Option MTU size	1500
	Port speed	Autosense
Local area network (LAN)	IP address	192.168.10.1
	IPv4 subnet mask	255.255.255.0
	RIP direction	None
	RIP version	Disabled
	RIP authentication	Disabled
	DHCP server	Enabled
	DHCP starting IP address	192.168.10.2
	DHCP ending IP address	192.168.10.100
	Time zone	GMT
	Time zone adjusted for Daylight Savings Time	Disabled
	SNMP	Disabled
	Remote management	Disabled
Firewall	Inbound communications from the Internet	Disabled (except traffic on port 80, the HTTP port)
	Outbound communications to the Internet	Enabled (all)

Feature	Description	Default Setting
	Source MAC filtering	Disabled
	Stealth mode	Enabled

APPENDIX C. GLOSSARY

Term	Definition
Access point	A device that provides network access to wireless devices.
ARP	Address Resolution Protocol. Broadcast protocol for mapping IP addresses to MAC addresses.
CHAP	Challenge-Handshake Authentication Protocol. Protocol for authenticating users to an ISP.
DDNS	Dynamic DNS. System for updating domain names in real time. Allows a domain name to be assigned to a device with a dynamic IP address.
DHCP	Dynamic Host Configuration Protocol. Protocol for allocating IP addresses dynamically so that addresses can be reused when hosts no longer need them.
DNS	Domain Name System. A hierarchical distributed naming system for computers, services, or any resource connected to the Internet or a private network.
FQDN	Fully qualified domain name. Complete domain name, including the host portion. Example: serverA.companyA.com.
FTP	File Transfer Protocol. Protocol for transferring files between network nodes.
HTTP	Hypertext Transfer Protocol. Protocol used by web browsers and web servers to transfer files.
IKE	Internet Key Exchange. Mode for securely exchanging encryption keys in ISAKMP as part of building a VPN tunnel.
IP	Internet Protocol. The principal communications protocol used for relaying datagrams known as network packets across an internetwork using the Internet Protocol Suite. IP is responsible for routing packets across network boundaries. It is the primary protocol that establishes the Internet
IPsec	IP security. Suite of protocols for securing VPN tunnels by authenticating or encrypting IP packets in a data stream. IPsec operates in either transport mode (encrypts payload but not packet headers) or tunnel mode (encrypts both payload and packet headers).
ISAKMP	Internet Key Exchange Security Protocol. Protocol for establishing security associations and cryptographic keys on the Internet.
ISP	Internet service provider.
MAC Address	Media-access-control address. Unique physical-address identifier attached to a network adapter.
MTU	Maximum transmission unit. Size, in bytes, of the largest packet that can be passed on. The MTU for Ethernet is a 1500-byte packet.
NAT	Network Address Translation. Process of rewriting IP addresses as a packet passes through a controller or firewall. NAT enables multiple hosts on a LAN to access the Internet using the single public IP address of the LAN's gateway controller.
NetBIOS	Microsoft Windows protocol for file sharing, printer sharing, messaging, authentication, and name resolution.
NTP	Network Time Protocol. Protocol for synchronizing a controller to a single clock on the network, known as the clock master.
PAP	Password Authentication Protocol. Protocol for authenticating users to a remote access server or ISP.
PPPoE	Point-to-Point Protocol over Ethernet. Protocol for connecting a network of hosts to an ISP without the ISP having to manage the allocation of IP addresses.
PPTP	Point-to-Point Tunneling Protocol. Protocol for creation of VPNs for the secure transfer of data from remote clients to private servers over the Internet.

Term	Definition
RADIUS	Remote Authentication Dial-In User Service. Protocol for remote user authentication and accounting. Provides centralized management of usernames and passwords.
RSA	Rivest-Shamir-Adleman. Public key encryption algorithm.
SSID	Service Set Identifier. A case-sensitive, 32-alphanumeric character unique identifier used for naming wireless networks. The SSID differentiates one wireless network from another. All access points and devices trying to connect to a specific wireless network must use the same SSID to enable effective roaming.
Subnet	A portion of a network that shares a common address component. On TCP/IP networks, subnets are defined as all devices whose IP addresses have the same prefix. For example, all devices with IP addresses that start with 100.100.100 belong to the same subnet.
TCP	Transmission Control Protocol. Protocol for transmitting data over the Internet with guaranteed reliability and in-order delivery.
UDP	User Data Protocol. Protocol for transmitting data over the Internet quickly but with no guarantee of reliability or in-order delivery.
VPN	Virtual private network. Network that enables IP traffic to travel securely over a public TCP/IP network by encrypting all traffic from one network to another. Uses tunneling to encrypt all information at the IP level.
WINS	Windows Internet Name Service. Service for name resolution. Allows clients on different IP subnets to dynamically resolve addresses, register themselves, and browse the network without sending broadcasts.
Wireless controller	D-Link device that centralizes and simplifies network management of a wireless LAN by consolidating individually managed access points into a single, unified solution.

APPENDIX D. LIMITED LIFETIME WARRANTY

(USA and Canada Only)

Subject to the terms and conditions set forth herein, D-Link provides this Limited Lifetime Warranty:

- Only to the person or entity that originally purchased the product from D-Link or its authorized reseller or distributor, and
- Only for products purchased and delivered within the fifty states of the United States, the District of Columbia, Canada, U.S. Possessions or Protectorates, U.S. Military Installations, or addresses with an APO or FPO.

Limited Warranty: D-Link warrants that the hardware portion of the D-Link product ("Hardware") will be free from material defects in workmanship and materials under normal use from the date of original purchase of the product for the period set forth below ("Warranty Period"), except as otherwise stated herein.

Limited Lifetime Warranty for the product is defined as follows:

- Hardware: For as long as the original customer/end user owns the product, or five (5) years after product discontinuance, whichever occurs first
- Power supplies and fans: Five (5) years
- Spare parts and spare kits: Ninety (90) days

The customer's sole and exclusive remedy and the entire liability of D-Link and its suppliers under this Limited Lifetime Warranty will be, at D-Link's option, to repair or replace the defective product with the same or a functionally equivalent product or refund the actual purchase price paid, less a reasonable usage charge. Replacement products may be refurbished or contain refurbished materials. Repaired or replacement products will be warranted for the remainder of the original Warranty Period or ninety (90) days, whichever is longer, and is subject to the same limitations and exclusions. All Hardware or part thereof that is replaced by D-Link, or for which the purchase price is refunded, shall become the property of D-Link upon replacement or refund.

Limited Software Warranty: D-Link warrants that the software portion of the product ("Software") will substantially conform to D-Link's then current functional specifications for the Software as set forth in the applicable documentation, from the date of original purchase of the Software for a period of ninety (90) days ("Software Warranty Period"), provided that the Software is properly installed on approved hardware and operated as contemplated in its documentation. D-Link further warrants that, during the Software Warranty Period, the media on which D-Link delivers the Software will be free of physical defects. The customer's sole and exclusive remedy and the entire liability of D-Link and its suppliers under this Limited Lifetime Warranty will be, at D-Link's option, to replace the non-conforming Software (or defective media) with software that substantially conforms to D-Link's functional specifications for the Software or to refund the portion of the actual purchase price paid that is attributable to the Software. The replacement Software is provided only to the original licensee, and is subject to the terms and conditions of the license granted by D-Link for the Software. Replacement Software will be warranted for the remainder of the original Software Warranty Period and is subject to the same limitations and exclusions. The license granted with respect to any Software for which a refund is given automatically terminates.

Non-Applicability of Warranty: The Limited Lifetime Warranty is not applicable to any refurbished product and any product purchased as part of an inventory clearance or liquidation sale or other sale in which D-Link, the sellers, or the liquidators expressly disclaim their warranty obligations pertaining to the product and in that case, the product is being sold "As-Is" and without any warranty whatsoever including, without limitation, the Limited Lifetime Warranty as described herein, notwithstanding anything stated herein to the contrary.

Submitting A Claim: The customer shall return the product to the original purchase point in accordance with its return policy. In the event the return policy period has expired and the product is within warranty, the customer shall submit a claim to D-Link in accordance with the process described at our website as indicated below:

- For D-Link products purchased in the United States, its territories and military installations: http://www.dlink.com/support/submitting-RMA-claim
- For D-Link products purchased in Canada: http://www.dlink.ca/support/submitting-RMA-claim

The customer is responsible for all in-bound shipping charges to D-Link. No Cash on Delivery ("COD") is allowed. Products sent COD will either be rejected by D-Link or become the property of D-Link. Products shall be fully insured by the customer, and D-Link will not be held responsible for any packages that are lost in transit to D-Link. Return shipping charges shall be prepaid by D-Link for addresses within the United States (for US warranty returns) or Canada (for Canadian warranty returns), otherwise the product will be sent freight collect. Expedited shipping may be available upon request provided shipping charges are prepaid by the customer.

D-Link may reject or return any product that is not packaged and shipped in strict compliance with the foregoing requirements, or for which an RMA number is not visible from the outside of the package. The customer agrees to pay D-Link's reasonable handling and return shipping charges for any product that is not packaged and shipped in accordance with the foregoing requirements, or that is determined by D-Link not to be defective or non-conforming.

What Is Not Covered: The Limited Lifetime Warranty does not: (i) apply to products that, in D-Link's reasonable opinion, have been subjected to abuse, accident, alteration, modification, tampering, negligence, misuse, faulty installation, lack of reasonable care, repair or service in any way that is not contemplated in the documentation for the product, or if the model or serial number has been altered, tampered with, defaced or removed; (ii) cover costs of initial installation, removal of the product for repair and shipping; (iii) apply to damage that occurs in shipment or due to acts of God, failures due to power surge, or cosmetic damage; and (iv) apply to any hardware, software, firmware or other products or services provided by anyone other than D-Link. Improper or incorrectly performed maintenance or repair voids this Limited Lifetime Warranty.

Disclaimer of Other Warranties: EXCEPT FOR THE LIMITED WARRANTY SPECIFIED HEREIN, THE PRODUCT IS PROVIDED "AS-IS" WITHOUT ANY WARRANTY OF ANY KIND WHATSOEVER INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NON-INFRINGEMENT. IF AN IMPLIED WARRANTY CANNOT BE DISCLAIMED IN ANY TERRITORY WHERE A PRODUCT IS SOLD, THE DURATION OF SUCH IMPLIED WARRANTY SHALL BE LIMITED TO NINETY (90) DAYS. EXCEPT AS EXPRESSLY COVERED UNDER THE LIMITED WARRANTY PROVIDED HEREIN, THE ENTIRE RISK AS TO THE QUALITY, SELECTION AND PERFORMANCE OF THE PRODUCT IS WITH THE PURCHASER OF THE PRODUCT.

Limitation of Liability: TO THE MAXIMUM EXTENT PERMITTED BY LAW, D-LINK IS NOT LIABLE UNDER ANY CONTRACT, NEGLIGENCE, STRICT LIABILITY OR OTHER LEGAL OR EQUITABLE THEORY FOR ANY LOSS OF USE OF THE PRODUCT, INCONVENIENCE OR DAMAGES OF ANY CHARACTER, WHETHER DIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL (INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF GOODWILL, LOSS OF REVENUE OR PROFIT, WORK STOPPAGE, COMPUTER FAILURE OR MALFUNCTION, LOSS OF INFORMATION OR DATA CONTAINED IN, STORED ON, OR INTEGRATED WITH ANY PRODUCT RETURNED TO D-LINK FOR WARRANTY SERVICE) RESULTING FROM THE USE OF THE PRODUCT, RELATING TO WARRANTY SERVICE, OR ARISING OUT OF ANY BREACH OF THIS LIMITED WARRANTY, EVEN IF D-LINK HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. THE SOLE REMEDY FOR A BREACH OF THE FOREGOING LIMITED WARRANTY IS REPAIR, REPLACEMENT OR REFUND OF THE DEFECTIVE OR NON-CONFORMING PRODUCT AS STATED HEREIN. THE MAXIMUM LIABILITY OF D-LINK UNDER THIS WARRANTY IS LIMITED TO THE PURCHASE PRICE ACTUALLY PAID BY THE CUSTOMER FOR THE PRODUCT COVERED BY THIS WARRANTY. THE FOREGOING EXPRESS WRITTEN WARRANTIES AND REMEDIES ARE EXCLUSIVE AND ARE IN LIEU OF ANY OTHER WARRANTIES OR REMEDIES, EXPRESS, IMPLIED OR STATUTORY.

Some states and provinces do not allow the exclusion or limitation of incidental or consequential damages, or exclusions or limitations on the duration of implied warranties, so the foregoing limitations and exclusions may not apply to you. This Limited Lifetime Warranty provides specific legal rights and you may also have other rights that vary by state or province.

FCC Statements:

The following information is for FCC compliance of Class A devices: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

The following information is for FCC compliance of Class B devices: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If the equipment causes interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by implementing one or more of the following measures:

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

Modifications to the equipment not authorized by D-Link could void the FCC approval and negate your authority to operate the equipment.

For detailed warranty information applicable to products purchased outside the United States and Canada, please contact the corresponding local D-Link office.

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D-Link DWC-1000 Wireless Controller User's Guide

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