Field	Description
Max. Burst Length	The **Max. Burst Length** is an AP EDCA parameter and only applies to traffic flowing from the AP to the client station. This value specifies (in milliseconds) the maximum burst length allowed for packet bursts on the wireless network. A packet burst is a collection of multiple frames transmitted without header information. The decreased overhead results in higher throughput and better performance. Valid values for maximum burst length are 0.0 through 999.
Wi-Fi Multimedia (WMM) Settings	
Wi-Fi MultiMedia (WMM)	Wi-Fi MultiMedia (WMM) is enabled by default. With WMM enabled, QoS prioritization and coordination of wireless medium access is on. With WMM enabled, QoS settings on the UAP control *downstream* traffic flowing from the AP to client station (AP EDCA parameters) and the *upstream* traffic flowing from the station to the AP (station EDCA parameters). Disabling WMM deactivates QoS control of station EDCA parameters on *upstream* traffic flowing from the station to the AP. With WMM disabled, you can still set some parameters on the *downstream* traffic flowing from the AP to the client station (AP EDCA parameters). To disable WMM extensions, click **Disabled**. To enable WMM extensions, click **Enabled**.
Station EDCA Parameters	
Queue	Queues are defined for different types of data transmitted from station-to-AP: •) **Data 0 (Voice)** — Highest priority queue, minimum delay. Time-sensitive data such as VoIP and streaming media are automatically sent to this queue. •) **Data 1(Video)** — Highest priority queue, minimum delay. Time-sensitive video data is automatically sent to this queue. •) **Data 2 (Best Effort)** — Medium priority queue, medium throughput and delay. Most traditional IP data is sent to this queue. •) **Data 3 (Background)** — Lowest priority queue, high throughput. Bulk data that requires maximum throughput and is not time-sensitive is sent to this queue (FTP data, for example).
AIFS (Inter-Frame Space)	The **Arbitration Inter-Frame Spacing (AIFS)** specifies a wait time for data frames. The wait time is measured in slots. Valid values for AIFS are 1 through 255.
cwMin (Minimum Contention Window)	This parameter is used by the algorithm that determines the initial random back off wait time (window) for retry of a data transmission during a period of contention for Unified Access Point resources. The value specified here in the Minimum Contention Window is the upper limit (in milliseconds) of a range from which the initial random back off wait time will be determined. The first random number generated will be a number between 0 and the number specified here. If the first random back off wait time expires before the data frame is sent, a retry counter is incremented and the random back off value (window) is doubled. Doubling will continue until the size of the random back off value reaches the number defined in the Maximum Contention Window.
cwMax (Maximum Contention Window)	The value specified here in the Maximum Contention Window is the upper limit (in milliseconds) for the doubling of the random back off value. This doubling continues until either the data frame is sent or the Maximum Contention Window size is reached. Once the Maximum Contention Window size is reached, retries will continue until a maximum number of retries allowed is reached.
TXOP Limit	The TXOP Limit is a station EDCA parameter and only applies to traffic flowing from the client station to the AP. The Transmission Opportunity (TXOP) is an interval of time, in milliseconds, when a WME client station has the right to initiate transmissions onto the wireless medium (WM) towards the Unified Access Point. The TXOP Limit maximum value is 65535.
Other QoS Settings	
No Acknowledgement	Select On to specify that the AP should not acknowledge frames with QosNoAck as the service class value.
APSD	Select On to enable Automatic Power Save Delivery (APSD), which is a power management method. APSD is recommended if VoIP phones access the network through the AP.

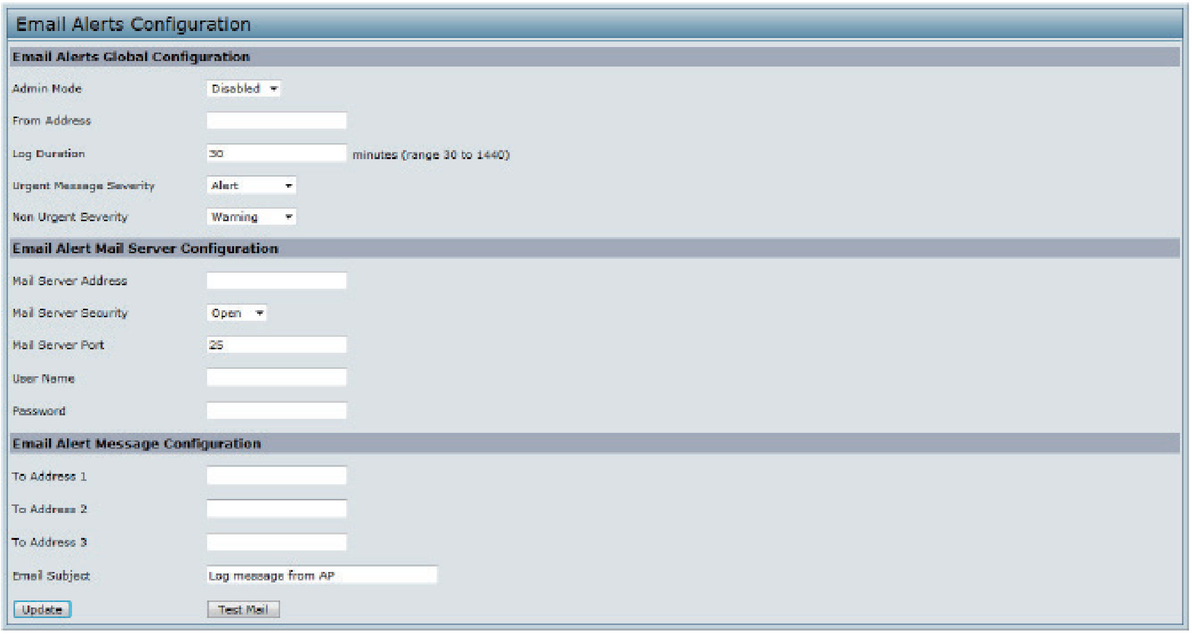
	Note: After you configure the QoS settings, you must click **Apply** to apply the changes and to save the settings. Changing some settings might cause the AP to stop and restart system processes. If this happens, wireless clients will temporarily lose connectivity. We recommend that you change AP settings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

Table 40 - QoS Settings

Configuring Email Alert

The Email Alert feature allows the AP to automatically send email messages when an event at or above the configured severity level occurs. Use the Email Alert Configuration page to configure mail server settings, to set the severity level that triggers alerts, and to add up to three email addresses where urgent and non-urgent email alerts are sent.

	Note: Email alert is operationally disabled when the AP transitions to managed mode.



Email Alerts Configuration

Email Alerts Global Configuration

Admin Mode	Disabled
From Address	
Log Duration	30 minutes (range 30 to 1440)
Urgent Message Severity	Alert
Non Urgent Severity	Warning

Email Alert Mail Server Configuration

Mail Server Address	
Mail Server Security	Open
Mail Server Port	25
User Name	
Password	

Email Alert Message Configuration

To Address 1	
To Address 2	
To Address 3	
Email Subject	Log message from AP

Figure 38 - Email Alerts Configuration

Field	Description
Email Alert Global Configuration	
Admin Mode	Globally **enable** or **disable** the Email Alert feature on the AP. By default, email alerts are disabled.
From Address	Specify the email address that appears in the *From* field of alert messages sent from the AP, for example dlinkAP23@foo.com. The address can be a maximum of 255 characters and can contain only printable characters. By default, no address is configured.
Log Duration	This duration, in minutes, determines how frequently the non-critical messages are sent to the SMTP Server. The range is 30-1440 minutes. The default is 30 minutes.
Urgent Message Severity	Configures the severity level for log messages that are considered to be urgent. Messages in this category are sent immediately. The security level you select and all higher levels are urgent: •) **Emergency** indicates system is unusable. It is the highest level of severity. •) **Alert** indicates action must be taken immediately. •) **Critical** indicates critical conditions. •) **Error** indicates error conditions. •) **Warning** indicates warning conditions. •) **Notice** indicates normal but significant conditions. •) **Info** indicates informational messages. •) **Debug** indicates debug-level messages.

Field	Description
Non Urgent Severity	Configures the severity level for log messages that are considered to be non-urgent. Messages in this category are collected and sent in a digest form at the time interval specified by the Log Duration field. The security level you select and all levels up to, but not including the lowest Urgent level are considered non-urgent. Messages below the security level you specify are not sent via email. See the Urgent Message field description for information about the security levels.
Email Alert Mail Server Configuration	
Mail Server Address	Specify the IP address or hostname of the SMTP server on the network.
Mail Server Security	Specify whether to use SMTP over SSL (TLSv1) or no security (Open) for authentication with the mail server. The default is **Open**.
Mail Server Port	Configures the TCP port number for SMTP. The range is a valid port number from 0 to 65535. The default is **25**, which is the standard port for SMTP.
Username	Specify the username to use when authentication with the mail server is required. The username is a 64-byte character string with all printable characters. The default is **admin**.
Password	Specify the password associated with the username configured in the previous field.
Email Alert Message Configuration	
To Address 1	Configure the first email address to which alert messages are sent. The address must be a valid email address. By default, no address is configured.
To Address 2	Optionally, configure the second email address to which alert messages are sent. The address must be a valid email address. By default, no address is configured.
To Address 3	Optionally, configure the third email address to which alert messages are sent. The address must be a valid email address. By default, no address is configured.
Email Subject	Specify the text to be displayed in the subject of the email alert message. The subject can contain up to 255 alphanumeric characters. The default is **Log message from AP**.

Table 41 - Email Alert Configuration

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

To validate the configured email server credentials, click **Test Mail**. You can send a test email once the email server details are configured.

The following text shows an example of an email alert sent from the AP to the network administrator:

```
From: AP-192.168.2.10@mailserver.com
Sent: Wednesday, July 08, 2011 11:16 AM
To: administrator@mailserver.com
Subject: log message from AP

TIME               Priority   Process Id            Message
Jul 8 03:48:25     info       login[1457]           root login on ‘ttyp0’
Jul 8 03:48:26     info       mini_http-ssl[1175]   Max concurrent connections of 20 reached
```

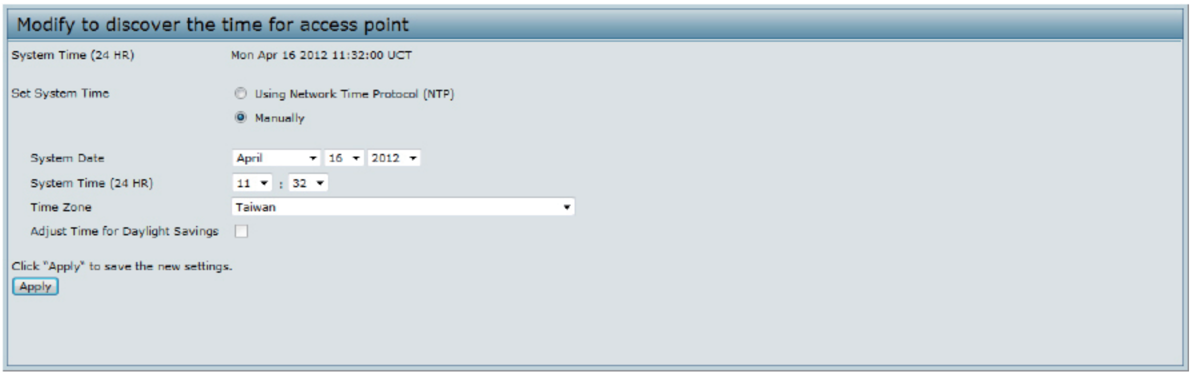
Enabling the Time Settings (NTP)

Use the **Time Settings** page to specify the Network Time Protocol (NTP) server to use to provide time and date information to the AP or to configure the time and date information manually.

NTP is an Internet standard protocol that synchronizes computer clock times on your network. NTP servers transmit Coordinated Universal Time (UTC, also known as Greenwich Mean Time) to their client systems. NTP sends periodic time requests to servers, using the returned time stamp to adjust its clock. The timestamp is used to indicate the date and time of each event in log messages.

See http://www.ntp.org for more information about NTP.

To set the system time either manually or by specifying the address of the NTP server for the AP to use, click the **Services > Time Settings (NTP)** tab and update the fields as described in the table below.



Modify to discover the time for access point

System Time (24 HR) Mon Apr 16 2012 11:32:00 UCT

Set System Time ○ Using Network Time Protocol (NTP)
● Manually

System Date: April ▾ 16 ▾ 2012 ▾
System Time (24 HR): 11 ▾ : 32 ▾
Time Zone: Taiwan ▾
Adjust Time for Daylight Savings □

Click "Apply" to save the new settings.

Figure 39 - Time Settings (NTP)

Field	Description
Set System Time	NTP provides a way for the AP to obtain and maintain its time from a server on the network. Using an NTP server gives your AP the ability to provide the correct time of day in log messages and session information. Choose to use a network time protocol (NTP) server to determine the system time, or set the system time manually: •) To permit the AP to poll an NTP server, click **Using Network Time Protocol (NTP)**. •) To prevent the AP from polling an NTP server, click **Manually**.
NTP Server (Use NTP)	If NTP is enabled, specify the NTP server to use. You can specify the NTP server by hostname or IP address, although using the IP address is not recommended as these can change more readily. If you specify a hostname, note the following requirements: •) The length must be between 1 – 63 characters. •) Upper and lower case characters, numbers, and hyphens are accepted. •) The first character must be a letter (a–z or A–Z), and the last character cannot be a hyphen.
System Date (Manual configuration)	Specify the current month, day, and year.
System Time (Manual configuration)	Specify the current time in hours and minutes. The system uses a 24-hour clock, so 6:00 PM is configured as 18:00.
Time Zone	Select your local time zone from the menu. The default is **USA (Pacific)**.
Adjust Time for Daylight Savings	Select to have the system adjust the reported time for Daylight Savings Time (DST). When this field is selected, fields to configure Daylight Savings Time settings appear.
DST Start (24 HR)	Configure the date and time to begin Daylight Savings Time for the System Time.
DST End (24 HR)	Configure the date and time to end Daylight Savings Time for the System Time.
DST Offset (minutes)	Select the number of minutes to offset DST. The default is **60** minutes.

Table 42 - NTP Settings

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

Section 6 - Configuring SNMPv3

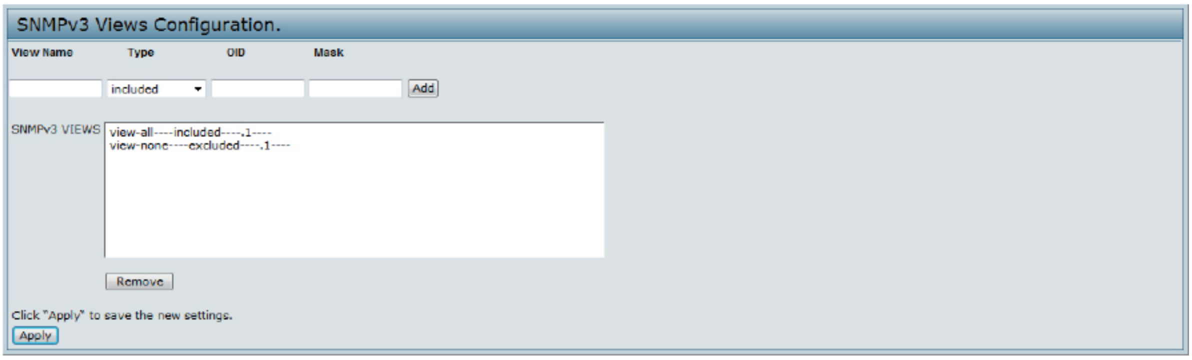
This section describes how to configure the SNMPv3 settings on the UAP and contains the following subsections:

Configuring SNMPv3 Views

A MIB view is a combination of a set of view subtrees or a family of view subtrees where each view subtree is a subtree within the managed object naming tree. You can create MIB views to control the OID range that SNMPv3 users can access.

A MIB view called “all” is created by default in the system. This view contains all management objects supported by the system.

Note: If you create an *excluded* view subtree, create a corresponding *included* entry with the same view name to allow subtrees outside of the excluded subtree to be included. For example, to create a view that excludes the subtree 1.3.6.1.4, create an *excluded* entry with the OID 1.3.6.1.4. Then, create an *included* entry with OID .1 with the same view name.



Type: included

```
view-all----included----.1----
view-none----excluded----.1----
```

Click "Apply" to save the new settings.

Figure 40 - SNMPv3 Views Configuration

The following table describes the fields you can configure on the SNMPv3 Views page.

Field	Description
View Name	Enter a name to identify the MIB view. View names can contain up to 32 alphanumeric characters.
Type	Specifies whether to **include** or **exclude** the view subtree or family of subtrees from the MIB view.
OID	Enter an **OID string** for the subtree to include or exclude from the view. For example, the system subtree is specified by the OID string .1.3.6.1.2.1.1.
Mask	The **OID mask** is 47 characters in length. The format of the OID mask is xx.xx.xx (.)... or xx:xx:xx.... (:) and is 16 octets in length. Each octet is 2 hexadecimal characters separated by either . (period) or : (colon). Only hex characters are accepted in this field. For example, OID mask FA.80 is 11111010.10000000. A family mask is used to define a family of view subtrees. The family mask indicates which sub-identifiers of the associated family OID string are significant to the family’s definition. A family of view subtrees allows control access to one row in a table, in a more efficient manner.
SNMPv3 Views	This field shows the MIB views on the UAP. To remove a view, select it and click **Remove**.

Table 43 - SNMPv3 Views

Note: After you configure the SNMPv3 Views settings, you must click **Apply** to apply the changes and to save the settings.

Configuring SNMPv3 Groups

SNMPv3 groups allow you to combine users into groups of different authorization and access privileges.

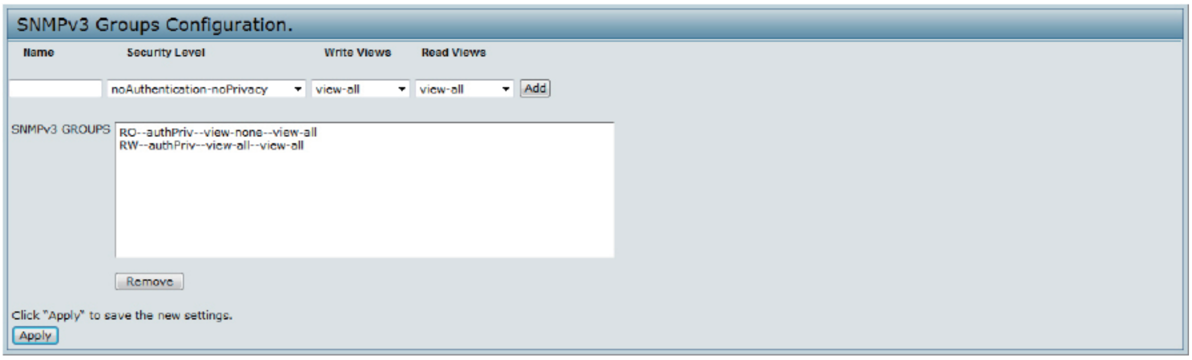
By default, the UAP has two groups:

- **RO** — A read-only group using authentication and data encryption. Users in this group use an MD5 key/password for authentication and a DES key/password for encryption. Both the MD5 and DES key/passwords must be defined. By default, users of this group will have read only access to the default all MIB view, which can be modified by the user.
- **RW** — A read/write group using authentication and data encryption. Users in this group use an MD5 key/password for authentication and a DES key/password for encryption. Both the MD5 and DES key/passwords must be defined. By default, users of this group will have read and write access to the default all MIB view, which can be modified by the user.

RW and RO groups are defined by default.

Note: The UAP supports maximum of eight groups.

To define additional groups, navigate to the **SNMPv3 Groups** page and configure the settings that the table below describes.



SNMPv3 Groups Configuration.

Name:
Security Level: noAuthentication-noPrivacy
Write Views: view-all
Read Views: view-all

SNMPv3 GROUPS:
RO--authPriv--view-none--view-all
RW--authPriv--view-all--view-all

Click "Apply" to save the new settings.

Figure 41 - SNMPv3 Groups Configuration

Field	Description
Name	Specify a name to use to identify the group. The default group names are RW and RO. Group names can contain up to 32 alphanumeric characters.
Security Level	Select one of the following security levels for the group: •) **noAuthentication-noPrivacy** — No authentication and no data encryption (no security). •) **Authentication-noPrivacy** — Authentication, but no data encryption. With this security level, users send SNMP messages that use an MD5 key/password for authentication, but not a DES key/password for encryption. •) **Authentication-Privacy** — Authentication and data encryption. With this security level, users send an MD5 key/password for authentication and a DES key/password for encryption. For groups that require authentication, encryption, or both, you must define the MD5 and DES key/passwords on the SNMPv3 Users page.
Write Views	Select the write access to management objects (MIBs) for the group: •) **write-all** — The group can create, alter, and delete MIBs. •) **write-none** — The group is not allowed to create, alter, or delete MIBS.

Field	Description
Read Views	Select the read access to management objects (MIBs) for the group: •) **view-all** — The group is allowed to view and read all MIBs. •) **view-none** — The group cannot view or read MIBs.
SNMPv3 Groups	This field shows the default groups and the groups that you have defined on the AP. To remove a group, select the group and click **Remove**.

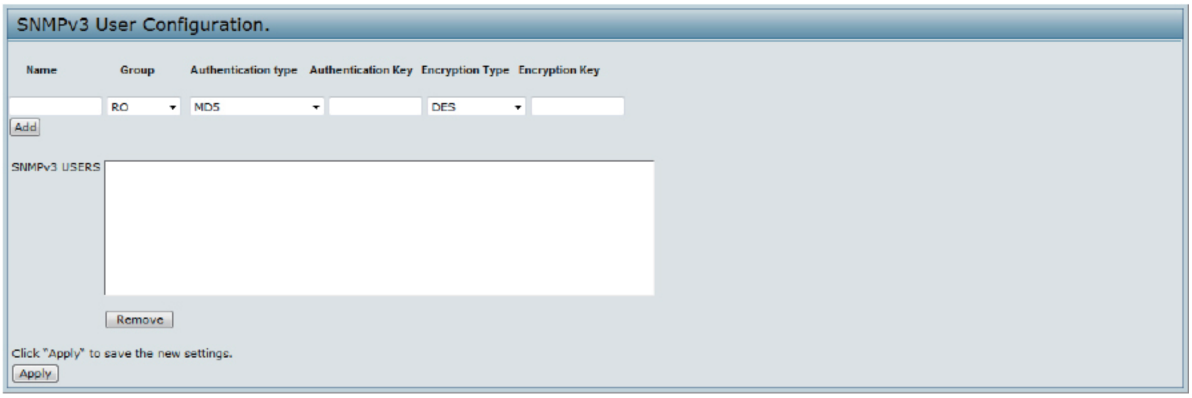
Table 44 - SNMPv3 Groups

	Note: After you configure the SNMPv3 Groups settings, you must click **Apply** to apply the changes and to save the settings.

Configuring SNMPv3 Users

From the **SNMPv3 Users** page, you can define multiple users, associate the desired security level to each user, and configure security keys.

For authentication, only MD5 type is supported, and for encryption only DES type is supported. There are no default SNMPv3 users on the UAP.



SNMPv3 User Configuration.

Name	Group	Authentication type	Authentication Key	Encryption Type	Encryption Key
	RO	MD5		DES	

SNMPv3 USERS

Click "Apply" to save the new settings.

Figure 42 - SNMPv3 User Configuration

The following table describes the fields to configure SNMPv3 users.

Field	Description
Name	Enter the user name to identify the SNMPv3 user. User names can contain up to 32 alphanumeric characters.
Group	Map the user to a group. The default groups are **RWAuth**, **RWPriv**, and **RO**. You can define additional groups on the SNMPv3 Groups page.
Authentication Type	Select the type of authentication to use on SNMP requests from the user: •) **MD5** — Require MD5 authentication on SNMPv3 requests from the user. •) **None** — SNMPv3 requests from this user require no authentication.
Authentication Key	If you specify **MD5** as the authentication type, enter a password to enable the SNMP agent to authenticate requests sent by the user. The passphrase must be between 8 and 32 characters in length.
Encryption Type	Select the type of privacy to use on SNMP requests from the user: •) **DES** — Use DES encryption on SNMPv3 requests from the user. •) **None** — SNMPv3 requests from this user require no privacy.
Encryption Key	If you specify **DES** as the privacy type, enter a key to use to encrypt the SNMP requests. The passphrase must be between 8 and 32 characters in length.
SNMPv3 Users	This field shows the users that you have defined on the AP. To remove a user, select the user and click **Remove**.

Table 45 - SNMPv3 Users

	Note: After you configure the SNMPv3 Users settings, you must click **Apply** to apply the changes and to save the settings.

Configuring SNMPv3 Targets

SNMPv3 Targets send “inform” messages to the SNMP manager. Each target is identified by a target name and associated with target IP address, UDP port, and SNMP user name.

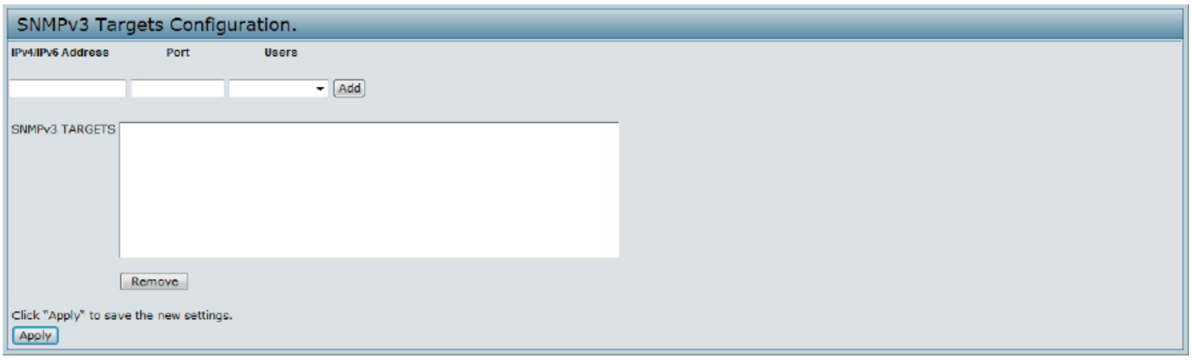

SNMPv3 Targets Configuration.
IPv4/IPv6 Address
Port
Users
Add
SNMPv3 TARGETS
Remove
Click "Apply" to save the new settings.
Apply

Figure 43 - SNMPv3 Targets Configuration

Field	Description
IPv4/IPv6 Address	Enter the IP address of the remote SNMP manager to receive the target.
Port	Enter the UDP port to use for sending SNMP targets.
Users	Select the name of the SNMP user to associate with the target. To configure SNMP users, see “Configuring SNMPv3 Users” on page 77.
SNMPv3 Targets	This field shows the SNMPv3 Targets on the UAP. To remove a target, select it and click **Remove**.

Table 46 - SNMPv3 Targets

	Note: After you configure the SNMPv3 Target settings, you must click **Apply** to apply the changes and to save the settings.

Section 7 - Maintaining the Access Point

This section describes how to maintain the UAP.

From the UAP Administrator UI, you can perform the following maintenance tasks:

- “Saving the Current Configuration to a Backup File” on page 79
- “Restoring the Configuration from a Previously Saved File” on page 80
- “Rebooting the Access Point” on page 81
- “Performing AP Maintenance” on page 81
- “Resetting the Factory Default Configuration” on page 81
- “Upgrading the Firmware” on page 81
- “Packet Capture Configuration and Settings” on page 83

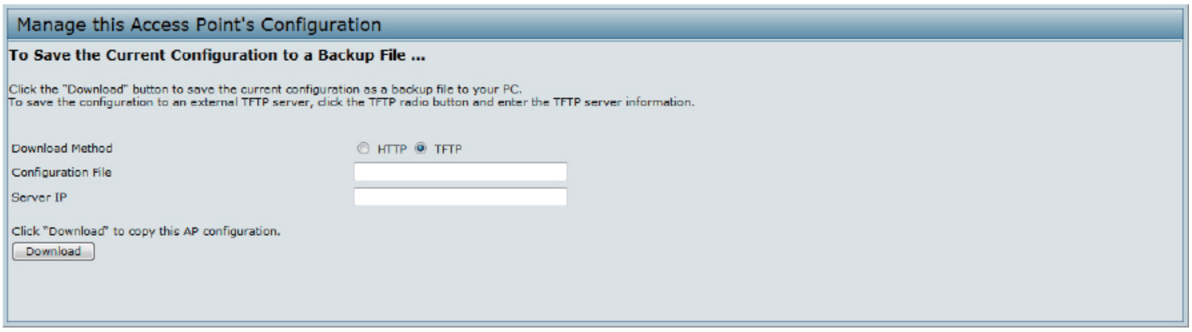
Saving the Current Configuration to a Backup File

The AP configuration file is in XML format and contains all of the information about the AP settings. You can download the configuration file to a management station to manually edit the content or to save as a back-up copy.

You can use HTTP or TFTP to transfer files to and from the UAP. After you download a configuration file to the management station, you can manually edit the file, which is in XML format. Then, you can upload the edited configuration file to apply those configuration settings to the AP.

Use the following steps to save a copy of the current settings on an AP to a backup configuration file by using TFTP:

1.) Select **TFTP** for **Download Method**.



Manage this Access Point's Configuration

To Save the Current Configuration to a Backup File ...

Click the "Download" button to save the current configuration as a backup file to your PC.
To save the configuration to an external TFTP server, click the TFTP radio button and enter the TFTP server information.

Download Method ○ HTTP ● TFTP

Configuration File

Server IP

Click "Download" to copy this AP configuration.

Figure 44 - Manage this Access Point’s Configuration - Save (TFTP)

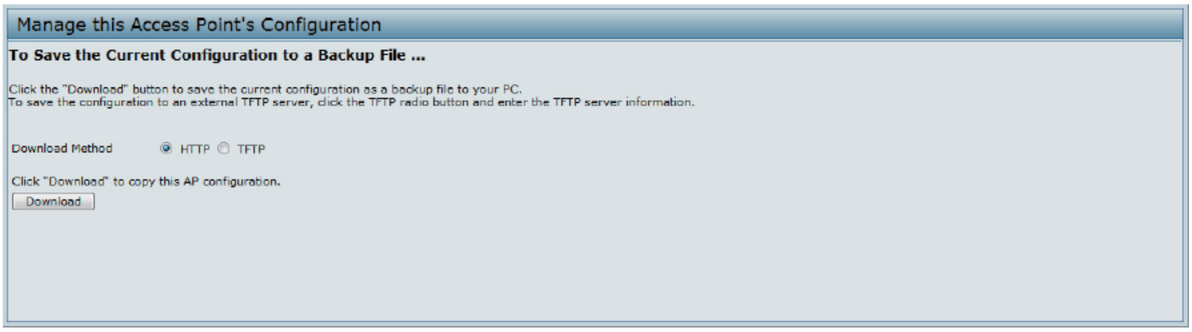
2.) Enter a name (1 to 63 characters) for the backup file in the **Configuration File** field, including the .xml file name extension and the path to the directory where you want to save the file.

3.) Enter the **Server IP** address of the TFTP server.

4.) Click **Download** to save a copy of the file to the TFTP server.

Use the following steps to save a copy of the current settings on an AP to a backup configuration file by using HTTP:

1.) Select **HTTP** for **Download Method**.



Manage this Access Point's Configuration

To Save the Current Configuration to a Backup File ...

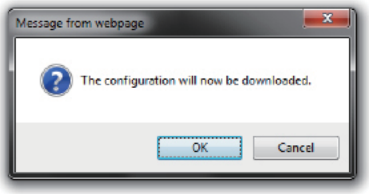
Click the "Download" button to save the current configuration as a backup file to your PC.
To save the configuration to an external TFTP server, click the TFTP radio button and enter the TFTP server information.

Download Method ● HTTP ○ TFTP

Click "Download" to copy this AP configuration.

Figure 45 - Manage this Access Point’s Configuration - Save (HTTP)

2.) Click the **Download** button.
A dialog box displays verifying the download.



Message from webpage

The configuration will now be downloaded.

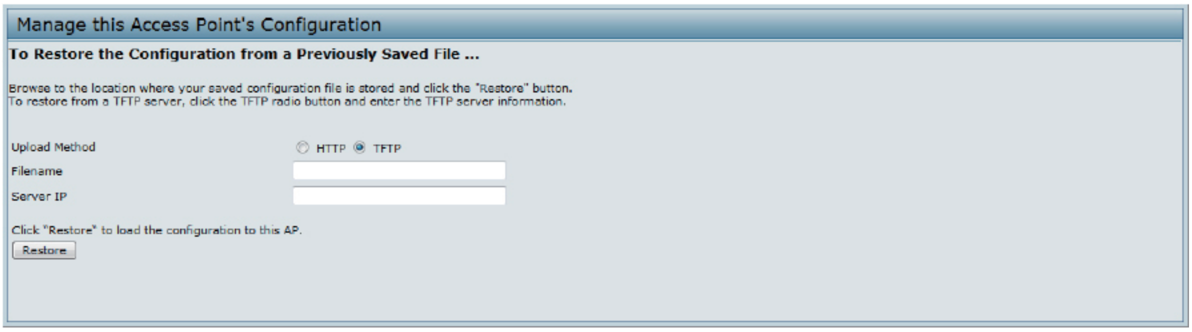
Figure 46 - Confirmation Prompt

3.) To proceed with the download, select **OK**.
A dialog box opens allowing you to view or save the file.
4.) Select the **Save File** option and select **OK**.
5.) Use the file browser to navigate to the directory where you want to save the file, and click **OK** to save the file. You can keep the default file name (config.xml) or rename the backup file, but be sure to save the file with an .xml extension.

Restoring the Configuration from a Previously Saved File

You can use HTTP or TFTP to transfer files to and from the UAP. After you download a configuration file to the management station, you can manually edit the file, which is in XML format. Then, you can upload the edited configuration file to apply those configuration settings to the AP.

Use the following procedures to restore the configuration on an AP to previously saved settings by using TFTP:
1.) Select **TFTP** for **Upload Method**.



Manage this Access Point's Configuration

To Restore the Configuration from a Previously Saved File ...

Browse to the location where your saved configuration file is stored and click the "Restore" button.
To restore from a TFTP server, click the TFTP radio button and enter the TFTP server information.

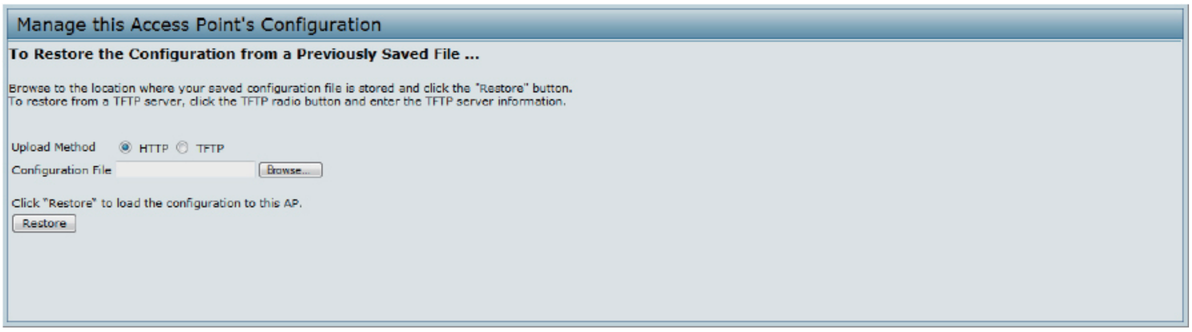
Upload Method ○ HTTP ● TFTP
Filename
Server IP

Click "Restore" to load the configuration to this AP.

Figure 47 - Manage this Access Point’s Configuration - Restore (TFTP)

2.) Enter a name (1 to 63 characters) for the backup file in the **Filename** field, including the .xml file name extension and the path to the directory that contains the configuration file to upload.
3.) Enter the IP address of the TFTP server in the **Server IP** field.
4.) Click the **Restore** button.
The AP reboots. A reboot confirmation dialog and follow-on rebooting status message displays. Please wait for the reboot process to complete, which might take several minutes.
The Administration Web UI is not accessible until the AP has rebooted.

Use the following steps to save a copy of the current settings on an AP to a backup configuration file by using HTTP:
1.) Select **HTTP** for **Upload Method**.



Manage this Access Point's Configuration

To Restore the Configuration from a Previously Saved File ...

Browse to the location where your saved configuration file is stored and click the "Restore" button.
To restore from a TFTP server, click the TFTP radio button and enter the TFTP server information.

Upload Method ● HTTP ○ TFTP
Configuration File

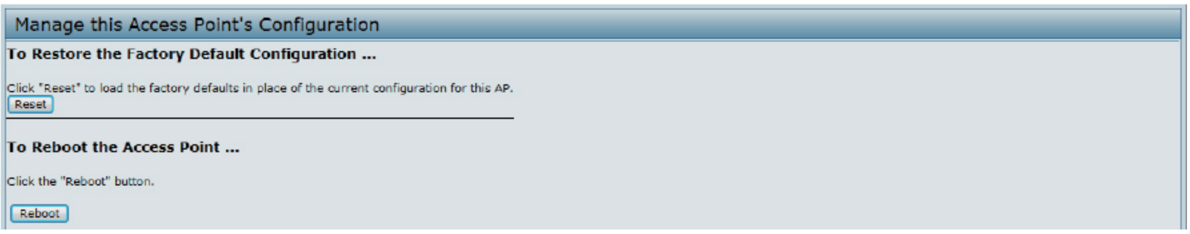
Click "Restore" to load the configuration to this AP.

Figure 48 - Manage this Access Point’s Configuration - Restore (HTTP)

2.) Use the **Browse** button to select the file to restore.
3.) Click the **Restore** button.
A File Upload or Choose File dialog box displays.
4.) Navigate to the directory that contains the file, then select the file to upload and click **Open**.
(Only those files created with the Backup function and saved as .xml backup configuration files are valid to use with Restore; for example, `ap_config.xml`.)
5.) Click the **Restore** button.
A dialog box opens verifying the restore.
6.) Click **OK** to proceed.
The AP reboots. A reboot confirmation dialog and follow-on rebooting status message displays. Please wait for the reboot process to complete, which might take several minutes.
The Administration Web UI is not accessible until the AP has rebooted.

Performing AP Maintenance

From the **Maintenance** page, you can reset the AP to its factory default settings or reboot the AP.


Manage this Access Point's Configuration

To Restore the Factory Default Configuration ...

Click "Reset" to load the factory defaults in place of the current configuration for this AP.

To Reboot the Access Point ...

Click the "Reboot" button.

Figure 49 - Performing AP Maintenance

Resetting the Factory Default Configuration

If you are experiencing problems with the UAP and have tried all other troubleshooting measures, click **Reset**. This restores factory defaults and clears all settings, including settings such as a new password or wireless settings. You can also use the reset button on the back panel to reset the system to the default configuration.

Rebooting the Access Point

For maintenance purposes or as a troubleshooting measure, you can reboot the UAP. To reboot the AP, click the **Reboot** button on the **Configuration** page.

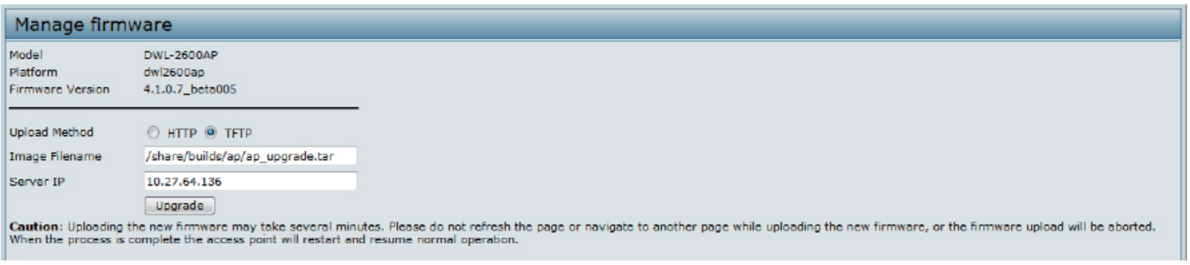
Upgrading the Firmware

As new versions of the UAP firmware become available, you can upgrade the firmware on your devices to take advantage of new features and enhancements. The AP uses a TFTP client for firmware upgrades. You can also use HTTP to perform firmware upgrades.

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.

	Note: When you upgrade the firmware, the access point retains the existing configuration information.

Use the following steps to upgrade the firmware on an access point by using TFTP:
1.) Select **TFTP** for **Upload Method**.



Manage firmware

Model DWL-2600AP
Platform dwl2600ap
Firmware Version 4.1.0.7_beta005

Upload Method ○ HTTP ● TFTP
Image Filename /share/builds/ap/ap_upgrade.tar
Server IP 10.27.64.136

Caution: Uploading the new firmware may take several minutes. Please do not refresh the page or navigate to another page while uploading the new firmware, or the firmware upload will be aborted. When the process is complete the access point will restart and resume normal operation.

Figure 50 - Manage Firmware (TFTP)

2.) Enter a name (1 to 63 characters) for the image file in the **Image Filename** field, including the path to the directory that contains the image to upload.
For example, to upload the `ap_upgrade.tar` image located in the `/share/builds/ap directory`, enter `/share/builds/ap/ap_upgrade.tar` in the **Image Filename** field.
The firmware upgrade file supplied must be a *tar* file. Do not attempt to use *bin* files or files of other formats for the upgrade; these types of files will not work.

3.) Enter the **Server IP** address of the TFTP server.

4.) Click **Upgrade**.
Upon clicking **Upgrade** for the firmware upgrade, a popup confirmation window is displayed that describes the upgrade process.

5.) Click OK to confirm the upgrade and start the process.

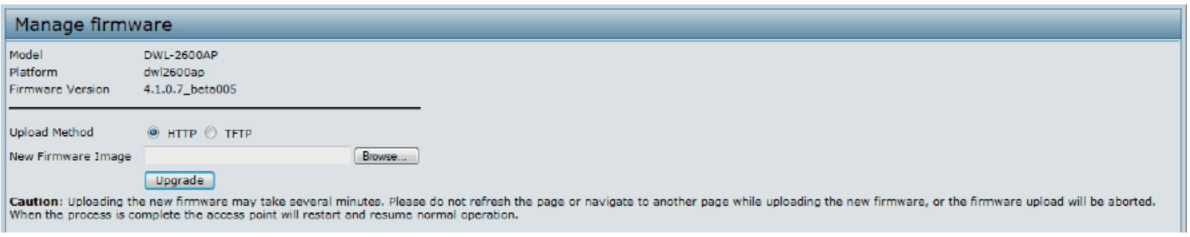
Note: The firmware upgrade process begins once you click **Upgrade** and then **OK** in the pop-up confirmation window.

The upgrade process may take several minutes during which time the access point will be unavailable. Do not power down the access point while the upgrade is in process. When the upgrade is complete, the access point restarts. The AP resumes normal operation with the same configuration settings it had before the upgrade.

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

Use the following steps to upgrade the firmware on an access point by using HTTP:

1.) Select **HTTP** for **Upload Method**.



Manage firmware

Model DWL-2600AP
Platform dwl2600ap
Firmware Version 4.1.0.7_beta005

Upload Method ● HTTP ○ TFTP
New Firmware Image

Caution: Uploading the new firmware may take several minutes. Please do not refresh the page or navigate to another page while uploading the new firmware, or the firmware upload will be aborted. When the process is complete the access point will restart and resume normal operation.

Figure 51 - Manage Firmware (HTTP)

2.) 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 attempt to use *bin* files or files of other formats for the upgrade; these types of files will not work.

3.) Click **Upgrade** to apply the new firmware image.
Upon clicking **Upgrade** for the firmware upgrade, a popup confirmation window is displayed that describes the upgrade process.

4.) Click **OK** to confirm the upgrade and start the process.

Note: The firmware upgrade process begins once 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 power down the access point while the upgrade is in process. When the upgrade is complete, the access point restarts. The AP resumes normal operation with the same configuration settings it had before the upgrade.

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

Packet Capture Configuration and Settings

Wireless packet capture operates in two modes:

- Capture file mode.
- Remote capture mode.

For *capture file mode*, captured packets are stored in a file on the Access Point. The AP can transfer the file to a TFTP server. The file is formatted in pcap format and can be examined using tools such as Wireshark and OmniPeek.

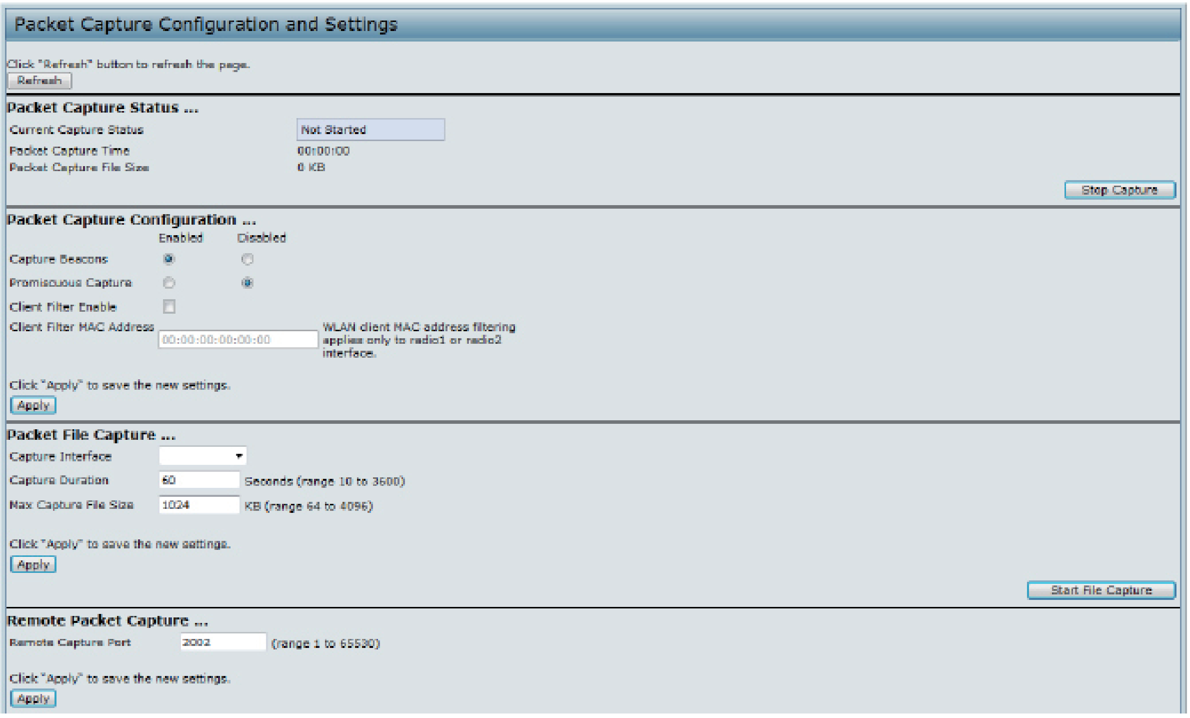
For *remote capture mode*, the captured packets are redirected in real time to an external PC running the Wireshark® tool.

The AP can capture the following types of packets:

- 802.11 packets received and transmitted on radio interfaces. Packets captured on radio interfaces include the 802.11 header.
- 802.3 packets received and transmitted on the Ethernet interface.
- 802.3 packets received and transmitted on the internal logical interfaces such as VAPs and WDS interfaces.

From the Packet Capture Configuration and Settings page, you can:

- View the current packet capture status.
- Configure packet capture parameters.
- Configure packet file capture.
- Configure a remote capture port.
- Download a packet capture file.



Packet Capture Configuration and Settings

Click "Refresh" button to refresh the page.

Packet Capture Status ...

Current Capture Status	Not Started
Packet Capture Time	00:00:00
Packet Capture File Size	0 KB

Packet Capture Configuration ...

	Enabled	Disabled
Capture Beacons	●	○
Promiscuous Capture	○	●
Client Filter Enable	□	

Client Filter MAC Address 00:00:00:00:00:00 WLAN client MAC address filtering applies only to radio1 or radio2 interface.

Click "Apply" to save the new settings.

Packet File Capture ...

Capture Interface		
Capture Duration	60	Seconds (range 10 to 3600)
Max Capture File Size	1024	KB (range 64 to 4096)

Click "Apply" to save the new settings.

Remote Packet Capture ...

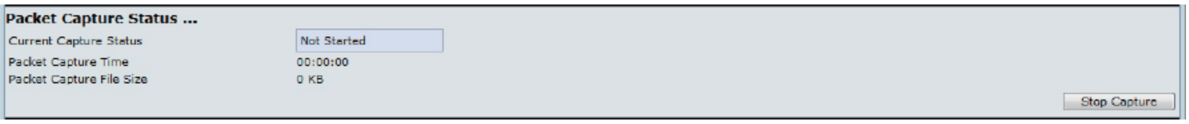
Remote Capture Port 2002 (range 1 to 65530)

Click "Apply" to save the new settings.

Figure 52 - Packet Capture Configuration & Settings

Packet Capture Status

Packet Capture Status allows you to view the status of packet capture on the AP.



Packet Capture Status ...

Current Capture Status: Not Started

Packet Capture Time: 00:00:00

Packet Capture File Size: 0 KB

Figure 53 - Packet Capture Status

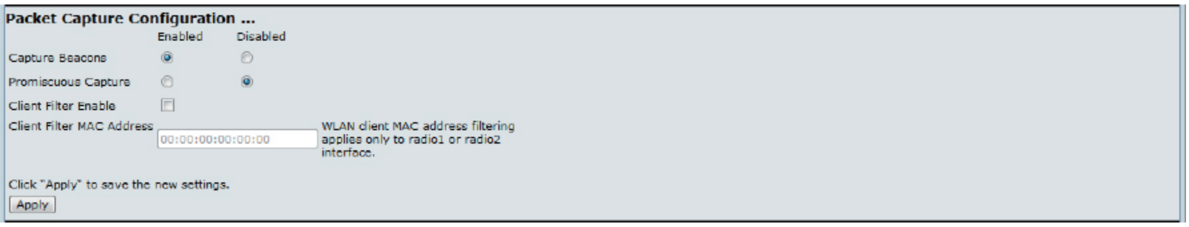
The following table describes information the packet capture status fields display.

Field	Description
Current Capture Status	Shows whether packet capture is running or stopped.
Packet Capture Time	Shows elapsed capture time.
Packet Capture File Size	Shows the current capture file size.

Table 47 - Packet Capture Status

Packet Capture Parameter Configuration

Packet Capture Configuration allows you to configure parameters that affect how packet capture functions on the radio interfaces.



Packet Capture Configuration ...

	Enabled	Disabled
Capture Beacons	●	○
Promiscuous Capture	○	●
Client Filter Enable	□	

Client Filter MAC Address: 00:00:00:00:00:00

WLAN client MAC address filtering applies only to radio1 or radio2 interface.

Click "Apply" to save the new settings.

Figure 54 - Packet Capture Configuration

The following table describes the fields to configure the packet capture.

Field	Description
Capture Beacons	**Enable** to capture the 802.11 beacons detected or transmitted by the radio.
Promiscuous Capture	**Enable** to place the radio in promiscuous mode when the capture is active. In promiscuous mode the radio receives all traffic on the channel, including traffic that is not destined to this AP. While the radio is operating in promiscuous mode, it continues serving associated clients. Packets not destined to the AP are not forwarded. As soon as the capture is completed, the radio reverts to non-promiscuous mode operation.
Client Filter Enable	**Enable** to use the WLAN client filter to capture only frames that are transmitted to, or received from a WLAN client with a specified MAC address.
Client Filter MAC Address	Specify a MAC address for WLAN client filtering. **Note:** The MAC filter is active only when capture is performed on an 802.11 interface.

Table 48 - Packet Capture Configuration

Note: Changes to packet capture configuration parameters take affect after packet capture is restarted. Modifying the parameters while the packet capture is running doesn’t affect the current packet capture session. In order to begin using new parameter values, an existing packet capture session must be stopped and re-started.

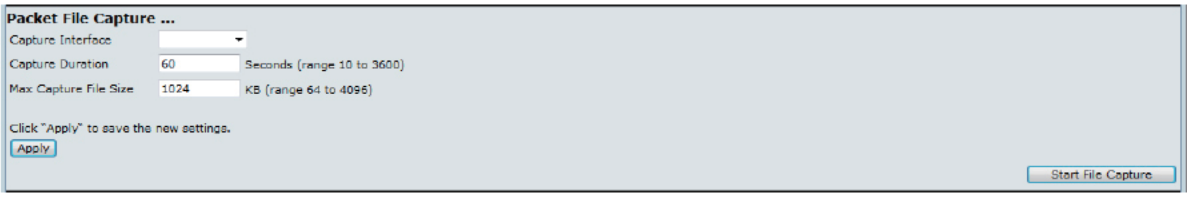
Packet File Capture

In Packet File Capture mode the AP stores captured packets in the RAM file system.

Upon activation, the packet capture proceeds until one of the following occurs:

- •) The capture time reaches configured duration.
- •) The capture file reaches its maximum size.
- •) The administrator stops the capture.

During the capture, you can monitor the capture status, elapsed capture time, and the current capture file size. This information can be updated, while the capture is in progress, by clicking **Refresh**.



Packet File Capture ...

Capture Interface		
Capture Duration	60	Seconds (range 10 to 3600)
Max Capture File Size	1024	KB (range 64 to 4096)

Click "Apply" to save the new settings.

Figure 55 - Packet File Capture

The following table describes the fields to configure the packet capture status.

Field	Description
Capture Interface	Select an AP **Capture Interface** name from the drop-down menu. AP capture interface names are eligible for packet capture are: •) **brtrunk** - Linux bridge interface in the AP •) **eth0** - 802.3 traffic on the Ethernet port. •) **wlan0** - VAP0 traffic on radio 1. •) **wlan1** - VAP0 traffic on radio 2. •) **radio1** - 802.11 traffic on radio 1. •) **radio2** - 802.11 traffic on radio 2.
Capture Duration	Specify the time duration in seconds for the capture (range 10 to 3600).
Max Capture File Size	Specify the maximum allowed size for the capture file in KB (range 64 to 4096).

Table 49 - Packet File Capture

Remote Packet Capture

Remote Packet Capture allows you to specify a remote port as the destination for packet captures. This feature works in conjunction with the Wireshark network analyzer tool for Windows. A packet capture server runs on the AP and sends the captured packets via a TCP connection to the Wireshark tool.

A Windows PC running the Wireshark tool allows you to display, log, and analyze captured traffic.

When the remote capture mode is in use, the AP doesn’t store any captured data locally in its file system.

Your can trace up to five interfaces on the AP at the same time. However, you must start a separate Wireshark session for each interface. You can configure the IP port number used for connecting Wireshark to the AP. The default port number is 2002. The system uses 5 consecutive port numbers starting with the configured port for the packet capture sessions.

If a firewall is installed between the Wireshark PC and the AP, these ports must be allowed to pass through the firewall. The firewall must also be configured to allow the Wireshark PC to initiate TCP connection to the AP.

To configure Wireshark to use the AP as the source for captured packets, you must specify the remote interface in the “Capture Options” menu. For example to capture packets on an AP with IP address 192.168.1.10 on radio 1 using the default IP port, specify the following interface:

rpcap://192.168.1.10/radio1

To capture packets on the Ethernet interface of the AP and VAP0 on radio 1 using IP port 58000, start two Wireshark sessions and specify the following interfaces:

rpcap://192.168.1.10:58000/eth0
rpcap://192.168.1.10:58000/wlan0

When you are capturing traffic on the radio interface, you can disable beacon capture, but other 802.11 control frames are still sent to Wireshark. You can set up a display filter to show only:

•) Data frames in the trace.
•) Traffic on specific BSSIDs.
•) Traffic between two clients.

Some examples of useful display filters are:

•) Exclude beacons and ACK/RTS/CTS frames:
!(wlan.fc.type_subtype == 8 || wlan.fc.type == 1)
•) Data frames only:
wlan.fc.type == 2
•) Traffic on a specific BSSID:
wlan.bssid == 00:02:bc:00:17:d0
•) All traffic to and from a specific client:
wlan.addr == 00:00:e8:4e:5f:8e

In remote capture mode, traffic is sent to the PC running Wireshark via one of the network interfaces. Depending on where the Wireshark tool is located the traffic can be sent on an Ethernet interface or one of the radios. In order to avoid a traffic flood caused by tracing the trace packets, the AP automatically installs a capture filter to filter out all packets destined to the Wireshark application. For example if the Wireshark IP port is configured to be 58000 then the following capture filter is automatically installed on the AP:

not portrange 58000-58004.

Enabling the packet capture feature impacts performance of the AP and can create a security issue (unauthorized clients may be able to connect to the AP and trace user data). The AP performance is negatively impacted even if there is no active Wireshark session with the AP. The performance is negatively impacted to a greater extent when packet capture is in progress.

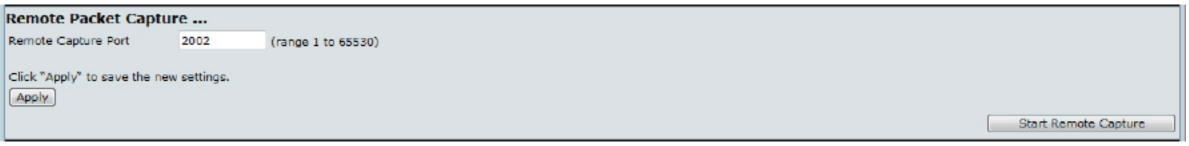
Due to performance and security issues, the packet capture mode is not saved in NVRAM on the AP; if the AP resets, the capture mode is disabled and the you must re-enable it in order to resume capturing traffic. Packet capture parameters (other than mode) are saved in NVRAM.

In order to minimize performance impact on the AP while traffic capture is in progress, you should install capture filters to limit which traffic is sent to the Wireshark tool. When capturing 802.11 traffic, large portion of the captured frames tend to be beacons (typically sent every 100ms by all Access Points). Although Wireshark supports a display filter for beacon frames, it does not support a capture filter to prevent the AP from forwarding captured beacon packets to the Wireshark tool. In order to reduce performance impact of capturing the 802.11 beacons, you can disable the capture beacons mode.

The remote packet capture facility is a standard feature of the Wireshark tool for Windows.

Note: Remote packet capture is not standard on the Linux version of Wireshark; the Linux version doesn’t work with the AP.

Wireshark is an open source tool and is available for free; it can be downloaded from http://www.wireshark.org.



Remote Packet Capture ...

Remote Capture Port: 2002 (range 1 to 65530)

Click "Apply" to save the new settings.

Figure 56 - Remote Packet Capture

The following table describes the fields to configure the packet capture status.

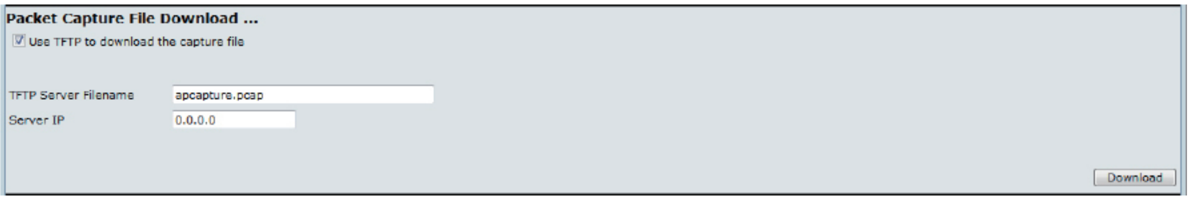
Field	Description
Remote Capture Port	Specify the remote port to use as the destination for packet captures. (range 1 to 65530).

Table 50 - Remote Packet Capture

Packet Capture File Download

Packet Capture File Download allows you to download the capture file by TFTP to a configured TFTP server or by HTTP(S) to a PC. The captured packets are stored in file /tmp/apcapture.pcap on the AP. A capture is automatically stopped when the capture file download command is triggered.

Because the capture file is located in the RAM file system, it disappears if the AP is reset.



Packet Capture File Download ...

☑ Use TFTP to download the capture file

TFTP Server Filename: apcapture.pcap

Server IP: 0.0.0.0

Figure 57 - Packet Capture File Download

The following table describes the fields to configure the packet capture status.

Field	Description
Use TFTP to download the capture file	Select or clear this option to determine whether to use TFTP or HTTP(S) to download the capture file: •) To download the file by using TFTP, select this option and complete the additional fields. •) To download the file by using HTTP or HTTPS, clear this option and click **Download** to browse to the location where the file is to be saved.
TFTP Server Filename	When using TFTP to download the file, specify a name for the packet capture file, including the .pcap file name extension and the path to the directory where you want to save the file.
Server IP	When using TFTP to download the file, specify the IP address of the TFTP server.

Table 51 - Packet Capture File Download

Section 8 - Configuring Client Quality of Service (QoS)

This section describes how to configure QoS settings that affect traffic from the wireless clients to the AP. By using the UAP Client QoS features, you can limit bandwidth and apply ACLs and DiffServ policies to the wireless interface. If a VAP uses WPA Enterprise security to authenticate clients, you can configure the RADIUS server to provide per-client QoS information.

This section describes the following features:

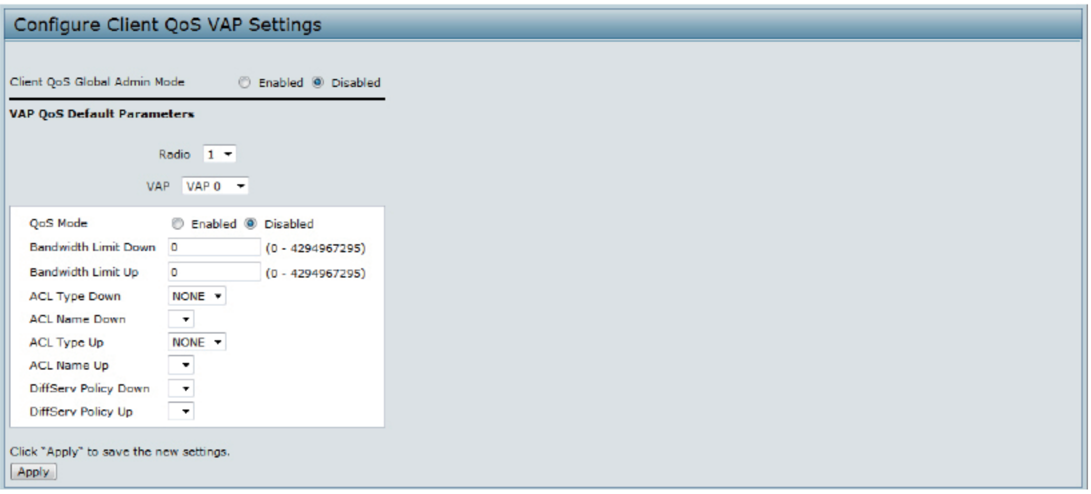
Configuring VAP QoS Parameters

The client QoS features on the UAP provide additional control over certain QoS aspects of wireless clients that connect to the network, such as the amount of bandwidth an individual client is allowed to send and receive. To control general categories of traffic, such as HTTP traffic or traffic from a specific subnet, you can configure ACLs and assign them to one or more VAPs.

In addition to controlling general traffic categories, Client QoS allows you to configure per-client conditioning of various micro-flows through Differentiated Services (DiffServ). DiffServ policies are a useful tool for establishing general micro-flow definition and treatment characteristics that can be applied to each wireless client, both inbound and outbound, when it is authenticated on the network.

From the **VAP QoS Parameters** page, you can enable the Client QoS feature, specify client bandwidth limits, and select the ACLs and DiffServ policies to use as default values for clients associated with the VAP when the client does not have their own attributes defined by a RADIUS server.

To configure the Client QoS administrative mode and to configure the QoS settings for a VAP, click the **VAP QoS Parameters** tab.



Configure Client QoS VAP Settings

Client QoS Global Admin Mode ○ Enabled ● Disabled

VAP QoS Default Parameters

Radio: 1

VAP: VAP 0

QoS Mode ○ Enabled ● Disabled

Bandwidth Limit Down: 0 (0 - 4294967295)

Bandwidth Limit Up: 0 (0 - 4294967295)

ACL Type Down: NONE

ACL Name Down:

ACL Type Up: NONE

ACL Name Up:

DiffServ Policy Down:

DiffServ Policy Up:

Click "Apply" to save the new settings.

Figure 58 - Configure Client QoS VAP Settings

Field	Description
Client QoS Global Admin Mode	**Enable** or **disable** Client QoS operation on the AP. Changing this setting will not affect the WMM settings you configure on the QoS page.
Radio	For dual-radio APs, select Radio 1 or Radio 2 to specify which radio to configure.
VAP	Specify the **VAP** that will have the Client QoS settings that you configure. The QoS settings you configure for the selected VAP will not affect clients that access the network through other VAPs.

Field	Description
Client QoS Mode	**Enable** or **disable** QoS operation on the VAP selected in the VAP menu. QoS must be enabled globally (from the **Client QoS Global Admin Mode** field) and on the VAP (**QoS Mode** field) for the Client QoS settings to be applied to wireless clients.
Bandwidth Limit Down	Enter the maximum allowed transmission rate from the AP to the wireless client in bits per second. The valid range is 0 – 429496000 bits/sec. The value you enter must be a multiple of 8000 bits/sec, in other words, the value must be *n* × 8000 bits/sec, where *n* = 0, 1, 2, 3... If you attempt to set the limit to a value that is not a multiple of 8000 bits/sec, the configuration will be rejected. A value of 0 means that the bandwidth maximum limit is not enforced in this direction.
Bandwidth Limit Up	Enter the maximum allowed client transmission rate to the AP in bits per second. The valid range is 0 – 4294967295 bps. The value you enter must be *n* × 8000 bits/sec, where *n* = 0, 1, 2, 3... If you attempt to set the limit to a value that is not a multiple of 8000 bits/sec, the configuration will be rejected. A value of 0 means that the bandwidth maximum limit is not enforced in this direction.
ACL Type Down	Select the type of ACL to apply to traffic in the outbound (down) direction, which can be one of the following: •) **IPv4:** The ACL examines IPv4 packets for matches to ACL rules •) **IPv6:** The ACL examines IPv6 packets for matches to ACL rules •) **MAC:** The ACL examines layer 2 frames for matches to ACL rules
ACL Name Down	Select the name of the ACL applied to traffic in the outbound (down) direction. After switching the packet or frame to the outbound interface, the ACL's rules are checked for a match. The packet or frame is transmitted if it is permitted, and discarded if it is denied.
ACL Type Up	Select the type of ACL to apply to traffic in the inbound (up) direction, which can be one of the following: •) **IPv4:** The ACL examines IPv4 packets for matches to ACL rules •) **IPv6:** The ACL examines IPv6 packets for matches to ACL rules •) **MAC:** The ACL examines layer 2 frames for matches to ACL rules
ACL Name Up	Select the name of the ACL applied to traffic entering the AP in the inbound (up) direction. When a packet or frame is received by the AP, the ACL's rules are checked for a match. The packet or frame is processed if it is permitted, and discarded if it is denied.
DiffServ Policy Down	Select the name of the DiffServ policy applied to traffic from the AP in the outbound (down) direction.
DiffServ Policy Up	Select the name of the DiffServ policy applied to traffic sent to the AP in the inbound (up) direction.

Table 52 - VAP QoS Parameters

Managing Client QoS ACLs

ACLs are a collection of permit and deny conditions, called rules, that provide security by blocking unauthorized users and allowing authorized users to access specific resources. ACLs can block any unwarranted attempts to reach network resources.

The UAP supports up to 50 IPv4, IPv6, and MAC ACLs.

IPv4 and IPv6 ACLs

IP ACLs classify traffic for Layers 3 and 4.

Each ACL is a set of up to 10 rules applied to traffic sent from a wireless client or to be received by a wireless client. Each rule specifies whether the contents of a given field should be used to permit or deny access to the network. Rules can be based on various criteria and may apply to one ore more fields within a packet, such as the source or destination IP address, the source or destination L4 port, or the protocol carried in the packet.

MAC ACLs

MAC ACLs are Layer 2 ACLs. You can configure the rules to inspect fields of a frame such as the source or destination MAC address, the VLAN ID, or the Class of Service 802.1p priority. When a frame enters or exits the AP port (depending on whether the ACL is applied in the up or down direction), the AP inspects the frame and checks the ACL rules against the content of the frame. If any of the rules match the content, a permit or deny action is taken on the frame.

ACL Configuration Process

Configure ACLs and rules on the **Client QoS ACL** page (steps 1–5), and then apply the rules to a specified VAP on the **AP QoS Parameters** page (step 6).

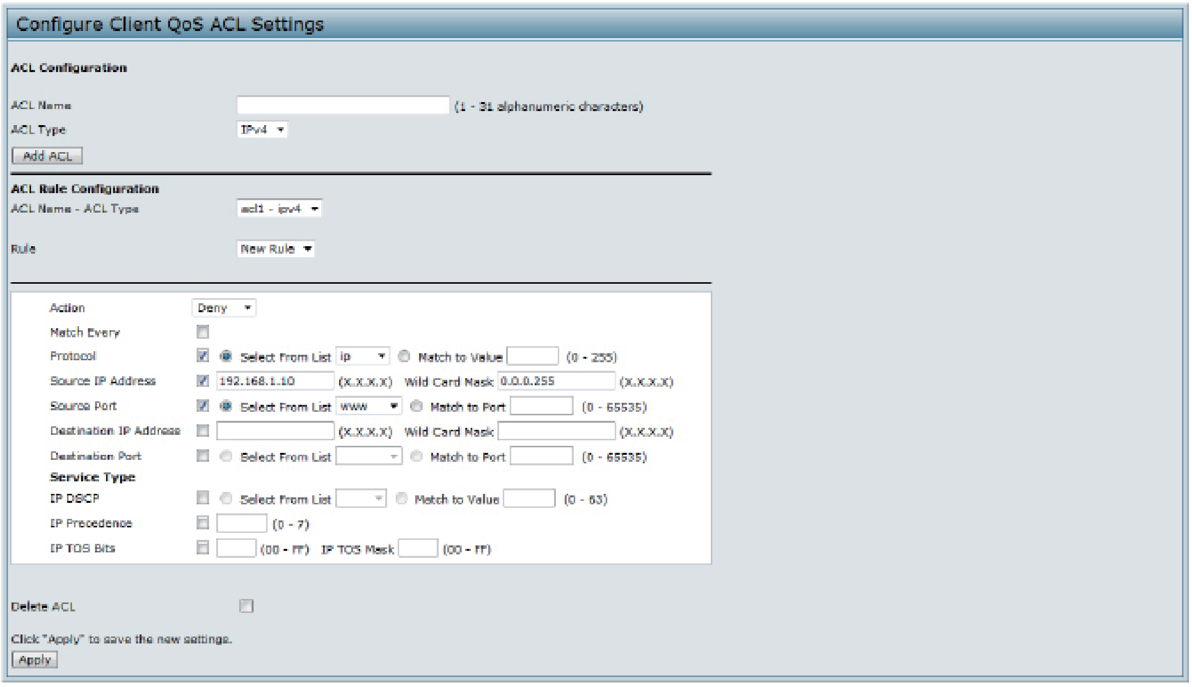
Use the following general steps to configure ACLs:

1.) Specify a name for the ACL.
2.) Select the type of ACL to add.
3.) Add the ACL.
4.) Add new rules to the ACL.
5.) Configure the match criteria for the rules.
6.) Apply the ACL to one or more VAPs.

For an example of how to configure an ACL, see “ACL Configuration Process” on page 90.

To configure an ACL, click the **Client QoS ACL** tab.

The fields to configure ACL rules appear only after you have created an ACL. The following image shows the configuration of a new rule for the IPv4 ACL named acl1. The rule prevents HTTP traffic from all clients in the 192.168.20.0 network from being forwarded.



Configure Client QoS ACL Settings

ACL Configuration

ACL Name: (1 - 31 alphanumeric characters)

ACL Type: IPv4

[Add ACL]

ACL Rule Configuration

ACL Name - ACL Type: acl1 - ipv4

Rule: New Rule

Action: Deny

Match Every: □

Protocol: ☑ ● Select From List ip ○ Match to Value (0 - 255)

Source IP Address: ☑ 192.168.1.10 (X.X.X.X) Wild Card Mask 0.0.0.255 (X.X.X.X)

Source Port: ☑ ● Select From List www ○ Match to Port (0 - 65535)

Destination IP Address: □ (X.X.X.X) Wild Card Mask (X.X.X.X)

Destination Port: □ ○ Select From List ○ Match to Port (0 - 65535)

Service Type

IP DSCP: □ ○ Select From List ○ Match to Value (0 - 63)

IP Precedence: □ (0 - 7)

IP TOS Bits: □ (00 - FF) IP TOS Mask (00 - FF)

Delete ACL: □

Click "Apply" to save the new settings.

[Apply]

Figure 59 - Configure Client QoS ACL Settings

The following table describes the fields available on the **Client QoS ACL** page.

Field	Description
ACL Configuration	
ACL Name	Enter a name to identify the ACL. The name can contain from 1 – 31 alphanumeric characters. Spaces are not allowed.

Field	Description
ACL Type	Select the type of ACL to configure: •) **IPv4** •) **IPv6** •) **MAC** IPv4 and IPv6 ACLs control access to network resources based on Layer 3 and Layer 4 criteria. MAC ACLs control access based on Layer 2 criteria.
ACL Rule Configuration	
ACL Name - ACL Type	Select the ACL to configure with the new rule. The list contains all ACLs added in the ACL Configuration section.
Rule	To configure a new rule to add to the selected ACL, select **New Rule**. To add an existing rule to an ACL or to modify a rule, select the rule number. When an ACL has multiple rules, the rules are applied to the packet or frame in the order in which you add them to the ACL. There is an implicit deny all rule as the final rule.
Action	Specifies whether the ACL rule permits or denies an action. •) When you select **Permit**, the rule allows all traffic that meets the rule criteria to enter or exit the AP (depending on the ACL direction you select). Traffic that does not meet the criteria is dropped. •) When you select **Deny**, the rule blocks all traffic that meets the rule criteria from entering or exiting the AP (depending on the ACL direction you select). Traffic that does not meet the criteria is forwarded unless this rule is the final rule. Because there is an implicit deny all rule at the end of every ACL, traffic that is not explicitly permitted is dropped.
Match Every	Indicates that the rule, which either has a permit or deny action, will match the frame or packet regardless of its contents. If you select this field, you cannot configure any additional match criteria. The **Match Every** option is selected by default for a new rule. You must clear the option to configure other match fields.
IPv4 ACL	
Protocol	Select the **Protocol** field to use an L3 or L4 protocol match condition based on the value of the IP Protocol field in IPv4 packets or the Next Header field of IPv6 packets. Once you select the field, choose the protocol to match by keyword or enter a protocol ID. **Select From List** Select one of the following protocols from the list: •) **IP** •) **ICMP** •) **IGMP** •) **TCP** •) **UDP** **Match to Value** To match a protocol that is not listed by name, enter the protocol ID. The protocol ID is a standard value assigned by the IANA. The range is a number from 0–255.
Source IP Address	Select this field to require a packet’s source IP address to match the address listed here. Enter an IP address in the appropriate field to apply this criteria.
Wild Card Mask	Specifies the source IP address wildcard mask. The wild card masks determines which bits are used and which bits are ignored. A wild card mask of 255.255.255.255 indicates that no bit is important. A wildcard of 0.0.0.0 indicates that all of the bits are important. This field is required when Source IP Address is checked. A wild card mask is, in essence, the inverse of a subnet mask. For example, To match the criteria to a single host address, use a wildcard mask of 0.0.0.0. To match the criteria to a 24-bit subnet (for example 192.168.10.0/24), use a wild card mask of 0.0.0.255.

Field	Description
Source Port	Select this field to include a source port in the match condition for the rule. The source port is identified in the datagram header. Once you select the field, choose the port name or enter the port number. **Select From List** Select the keyword associated with the source port to match: **•) ftp** **•) ftpdata** **•) http** **•) smtp** **•) snmp** **•) telnet** **•) tftp** **•) www** Each of these keywords translates into its equivalent port number. **Match to Port** Enter the IANA port number to match to the source port identified in the datagram header. The port range is 0 – 65535 and includes three different types of ports: •) 0 – 1023: Well Known Ports •) 1024 – 49151: Registered Ports •) 49152 – 65535: Dynamic and/or Private Ports
Destination IP Address	Select this field to require a packet’s destination IP address to match the address listed here. Enter an IP address in the appropriate field to apply this criteria.
Wild Card Mask	Specifies the destination IP address wildcard mask. The wild card masks determines which bits are used and which bits are ignored. A wild card mask of 255.255.255.255 indicates that no bit is important. A wildcard of 0.0.0.0 indicates that all of the bits are important. This field is required when Source IP Address is checked. A wild card mask is in essence the inverse of a subnet mask. For example, To match the criteria to a single host address, use a wildcard mask of 0.0.0.0. To match the criteria to a 24-bit subnet (for example 192.168.10.0/24), use a wild card mask of 0.0.0.255.
Destination Port	Select this field to include a destination port in the match condition for the rule. The destination port is identified in the datagram header. Once you select the field, choose the port name or enter the port number. **Select From List** Select the keyword associated with the destination port to match: **•) ftp** **•) ftpdata** **•) http** **•) smtp** **•) snmp** **•) telnet** **•) tftp** **•) www** Each of these keywords translates into its equivalent port number. **Match to Port** Enter the IANA port number to match to the destination port identified in the datagram header. The port range is 0 – 65535 and includes three different types of ports: •) 0 – 1023: Well Known Ports •) 1024 – 49151: Registered Ports •) 49152 – 65535: Dynamic and/or Private Ports
IP DSCP	To use IP DSCP as a match criteria, select the check box and select a DSCP value keyword or enter a DSCP value to match. You can select only one service type (DSCP, IP Precedence or TOS bits) to use for match criteria. **Select from List** Select from a list of DSCP types. **Match to Value** Enter a DSCP Value to match (0 – 63).

Field	Description
IP Precedence	Select this option and enter a value to use the packet’s IP Precedence value in the IP header as match criteria. You can select only one service type (DSCP, IP Precedence or TOS bits) to use for match criteria. The IP Precedence range is 0 – 7.
IP TOS Bits	Select this option and enter a value to use the packet’s Type of Service bits in the IP header as match criteria. You can select only one service type (DSCP, IP Precedence or TOS bits) to use for match criteria. The IP TOS field in a packet is defined as all eight bits of the Service Type octet in the IP header. The TOS Bits value is a two-digit hexadecimal number from 00 to ff. The high-order three bits represent the IP precedence value. The high-order six bits represent the IP Differentiated Services Code Point (DSCP) value.
IP TOS Mask	Enter an IP TOS mask value to identify the bit positions in the TOS Bits value that are used for comparison against the IP TOS field in a packet. The TOS Mask value is a two-digit hexadecimal number from 00 to ff, representing an inverted (i.e. wildcard) mask. The zero-valued bits in the TOS Mask denote the bit positions in the TOS Bits value that are used for comparison against the IP TOS field of a packet. For example, to check for an IP TOS value having bits 7 and 5 set and bit 1 clear, where bit 7 is most significant, use a TOS Bits value of a0 and a TOS Mask of 00. This is an optional configuration.
IPv6 ACL	
Protocol	Select the **Protocol** field to use an L3 or L4 protocol match condition based on the value of the IP Protocol field in IPv4 packets or the Next Header field of IPv6 packets. Once you select the field, choose the protocol to match by keyword or enter a protocol ID. **Select From List** Select one of the following protocols from the list: •) **IP** •) **ICMP** •) **IPv6** •) **ICMPv6** •) **IGMP** •) **TCP** •) **UDP** **Match to Value** To match a protocol that is not listed by name, enter the protocol ID. The protocol ID is a standard value assigned by the IANA. The range is a number from 0–255.
Source IPv6 Address	Select this field to require a packet’s source IPv6 address to match the address listed here. Enter an IPv6 address in the appropriate field to apply this criteria.
Source IPv6 Prefix Length	Enter the prefix length of the source IPv6 address.

Field	Description
Source Port	Select this option to include a source port in the match condition for the rule. The source port is identified in the datagram header. Once you select the field, choose the port name or enter the port number. **Select From List** Select the keyword associated with the source port to match: •) **ftp** •) **ftpdata** •) **http** •) **smtp** •) **snmp** •) **telnet** •) **tftp** •) **www** Each of these keywords translates into its equivalent port number. **Match to Port** Enter the IANA port number to match to the source port identified in the datagram header. The port range is 0 – 65535 and includes three different types of ports: •) 0 – 1023: Well Known Ports •) 1024 – 49151: Registered Ports •) 49152 – 65535: Dynamic and/or Private Ports
Destination IPv6 Address	Select this field to require a packet's destination IPv6 address to match the address listed here. Enter an IPv6 address in the appropriate field to apply this criteria.
Destination IPv6 Prefix Length	Enter the prefix length of the destination IPv6 address.
Destination Port	Select this option to include a destination port in the match condition for the rule. The destination port is identified in the datagram header. Once you select the field, choose the port name or enter the port number. **Select From List** Select the keyword associated with the destination port to match: •) **ftp** •) **ftpdata** •) **http** •) **smtp** •) **snmp** •) **telnet** •) **tftp** •) **www** Each of these keywords translates into its equivalent port number. **Match to Port** Enter the IANA port number to match to the destination port identified in the datagram header. The port range is 0 – 65535 and includes three different types of ports: •) 0 – 1023: Well Known Ports •) 1024 – 49151: Registered Ports •) 49152 – 65535: Dynamic and/or Private Ports
IPv6 Flow Label	Flow label is 20-bit number that is unique to an IPv6 packet. It is used by end stations to signify quality-of-service handling in routers (range 0 to 1048575).
IPv6 DSCP	To use IPv6 DSCP as a match criteria, select the check box and select a DSCP value keyword or enter a DSCP value to match. You can select only one service type (DSCP, IP Precedence or TOS bits) to use for match criteria. **Select from List** Select from a list of DSCP types. **Match to Value** Enter a DSCP Value to match (0 – 63).
MAC ACL	

Field	Description
EtherType	Select the EtherType field to compare the match criteria against the value in the header of an Ethernet frame. Select an EtherType keyword or enter an EtherType value to specify the match criteria. **Select from List Select** Select one of the following protocol types: •) **appletalk** •) **arp** •) **ipv4** •) **ipv6** •) **ipx** •) **netbios** •) **pppoe** **Match to Value** Enter a custom protocol identifier to which packets are matched. The value is a four-digit hexadecimal number in the range of 0600 – FFFF.
Class of Service	Select this field and enter an 802.1p user priority to compare against an Ethernet frame. The valid range is 0 – 7. This field is located in the first/only 802.1Q VLAN tag.
Source MAC Address	Select this field and enter the source MAC address to compare against an Ethernet frame.
Source MAC Mask	Select this field and enter the source MAC address mask specifying which bits in the source MAC to compare against an Ethernet frame. A 0 indicates that the address bit is significant, and an f indicates that the address bit is to be ignored. A MAC mask of 00:00:00:00:00:00 matches a single MAC address.
Destination MAC Address	Select this field and enter the destination MAC address to compare against an Ethernet frame.
Destination MAC Mask	Enter the destination MAC address mask specifying which bits in the destination MAC to compare against an Ethernet frame. A 0 indicates that the address bit is significant, and an f indicates that the address bit is to be ignored. A MAC mask of 00:00:00:00:00:00 matches a single MAC address.
VLAN ID	Select this field and enter the VLAN IDs to compare against an Ethernet frame. This field is located in the first/only 802.1Q VLAN tag.

Table 53 - ACL Configuration

After you set the desired rule criteria, click **Apply**. To delete an ACL, select the **Delete ACL** option and click **Apply**.

Creating a DiffServ Class Map

The Client QoS feature contains Differentiated Services (DiffServ) support that allows traffic to be classified into streams and given certain QoS treatment in accordance with defined per-hop behaviours.

Standard IP-based networks are designed to provide *best effort* data delivery service. Best effort service implies that the network delivers the data in a timely fashion, although there is no guarantee that it will. During times of congestion, packets may be delayed, sent sporadically, or dropped. For typical Internet applications, such as e-mail and file transfer, a slight degradation in service is acceptable and in many cases unnoticeable. However, on applications with strict timing requirements, such as voice or multimedia, any degradation of service has undesirable effects.

By classifying the traffic and creating policies that define how to handle these traffic classes, you can make sure that time-sensitive traffic is given precedence over other traffic.

The UAP supports up to 50 Class Maps.

Defining DiffServ

To use DiffServ for Client QoS, use the **Class Map** and **Policy Map** pages to define the following categories and their criteria:

- •) Class: create classes and define class criteria
- •) Policy: create policies, associate classes with policies, and define policy statements

Once you define the class and associate it with a policy, apply the policy to a specified VAP on the **VAP QoS Parameters** page.

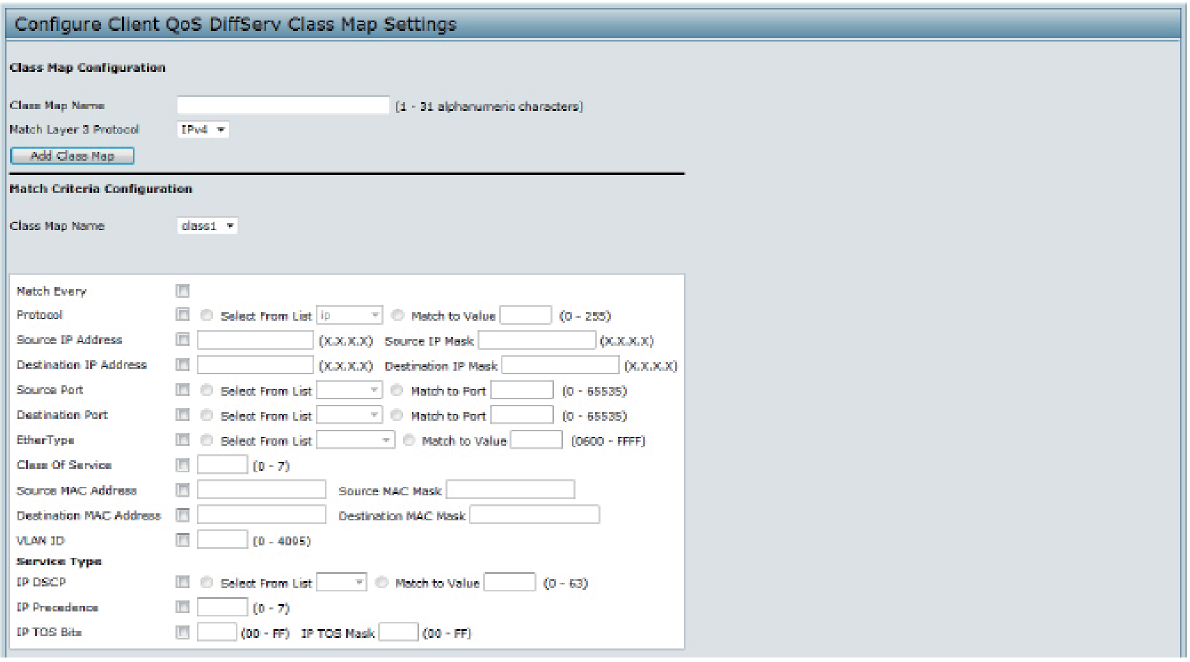
Packets are classified and processed based on defined criteria. The classification criteria is defined by a class. The processing is defined by a policy's attributes. Policy attributes may be defined on a per-class instance basis, and it is these attributes that are applied when a match occurs. A policy can contain multiple classes. When the policy is active, the actions taken depend on which class matches the packet.

Packet processing begins by testing the class match criteria for a packet. A policy is applied to a packet when a class match within that policy is found. DiffServ is supported for IPv4 and IPv6 packets.

Use the **Class Map** page to add a new Diffserv class name, or to rename or delete an existing class, and define the criteria to associate with the DiffServ class.

To configure a DiffServ Class Map, click the **Class Map** tab.

	Note: The **Class Map** page displays the Match Criteria Configuration fields only if a Class Map has been created. To create a Class Map, enter a name in the Class Map Name field and click **Add Class Map**.



Configure Client QoS DiffServ Class Map Settings

Class Map Configuration

Class Map Name (1 - 31 alphanumeric characters)
Match Layer 3 Protocol IPv4

Add Class Map

Match Criteria Configuration

Class Map Name class1

Match Every □
Protocol □ ○ Select From List ip ○ Match to Value (0 - 255)
Source IP Address □ (X.X.X.X) Source IP Mask (X.X.X.X)
Destination IP Address □ (X.X.X.X) Destination IP Mask (X.X.X.X)
Source Port □ ○ Select From List ○ Match to Port (0 - 65535)
Destination Port □ ○ Select From List ○ Match to Port (0 - 65535)
EtherType □ ○ Select From List ○ Match to Value (0600 - FFFF)
Class Of Service □ (0 - 7)
Source MAC Address □ Source MAC Mask
Destination MAC Address □ Destination MAC Mask
VLAN ID □ (0 - 4095)
Service Type
IP DSCP □ ○ Select From List ○ Match to Value (0 - 63)
IP Precedence □ (0 - 7)
IP TOS Bits □ (00 - FF) IP TOS Mask (00 - FF)

Figure 60 - Configure Client QoS DiffServ Class Map Settings

Field	Description
Class Map Configuration	
Class Map Name	Enter a **Class Map Name** to add. The name can range from 1 to 31 alphanumeric characters.
Match Layer 3 Protocol	Specify whether to classify **IPv4** or **IPv6** packets.
Match Criteria Configuration	

Field	Description
Class Map Name	Select name of the class to configure. Use the fields in the **Match Criteria Configuration** area to match packets to a class. Select the check box for each field to be used as a criterion for a class and enter data in the related field. You can have multiple match criteria in a class. **Note:** The match criteria fields that are available depend on whether the class map is an IPv4 or IPv6 class map.
Match Every	Select **Match Every** to specify that the match condition is true to all the parameters in an L3 packet. All L3 packets will match an **Match Every** match condition.
Protocol	Select the **Protocol** field to use an L3 or L4 protocol match condition based on the value of the IP Protocol field in IPv4 packets or the Next Header field of IPv6 packets. Once you select the field, choose the protocol to match by keyword or enter a protocol ID. **Select From List** Select one of the following protocols from the list: •) **IP** •) **ICMP** •) **IPv6** •) **ICMPv6** •) **IGMP** •) **TCP** •) **UDP** **Match to Value** To match a protocol that is not listed by name, enter the protocol ID. The protocol ID is a standard value assigned by the IANA. The range is a number from 0 – 255.
IPv4 Class Maps	
Source IP Address	Select this field to require a packet's source IP address to match the address listed here. Enter an IP address in the appropriate field to apply this criteria.
Source IP Mask	Enter the source IP address mask. The mask for DiffServ is a network-style bit mask in IP dotted decimal format indicating which part(s) of the destination IP Address to use for matching against packet content. A DiffServ mask of 255.255.255.255 indicates that all bits are important, and a mask of 0.0.0.0 indicates that no bits are important. The opposite is true with an ACL wild card mask. For example, to match the criteria to a single host address, use a DiffServ mask of 255.255.255.255. To match the criteria to a 24-bit subnet (for example 192.168.10.0/24), use a mask of 255.255.255.0.
Destination IP Address	Select this field to require a packet's destination IP address to match the address listed here. Enter an IP address in the appropriate field to apply this criteria.
Destination IP Mask	Enter the destination IP address mask. The mask for DiffServ is a network-style bit mask in IP dotted decimal format indicating which part(s) of the destination IP Address to use for matching against packet content. A DiffServ mask of 255.255.255.255 indicates that all bits are important, and a mask of 0.0.0.0 indicates that no bits are important. The opposite is true with an ACL wild card mask. For example, to match the criteria to a single host address, use a DiffServ mask of 255.255.255.255. To match the criteria to a 24-bit subnet (for example 192.168.10.0/24), use a mask of 255.255.255.0.
IPv6 Class Maps	
Source IPv6 Address	Select this field to require a packet's source IPv6 address to match the address listed here. Enter an IPv6 address in the appropriate field to apply this criteria.
Source IPv6 Prefix Length	Enter the prefix length of the source IPv6 address.
Destination IPv6 Address	Select this field to require a packet's destination IPv6 address to match the address listed here. Enter an IPv6 address in the appropriate field to apply this criteria.
Destination IPv6 Prefix Length	Enter the prefix length of the destination IPv6 address.
IPv6 Flow Label	Flow label is 20-bit number that is unique to an IPv6 packet. It is used by end stations to signify quality-of-service handling in routers (range 0 to 1048575).

Field	Description
IP DSCP	To use IP DSCP as a match criteria, select the check box and select a DSCP value keyword or enter a DSCP. **Select from List** Select from a list of DSCP types. **Match to Value** Enter a DSCP Value to match (0 – 63).
IPv4 and IPv6 Class Maps	
Source Port	Select this field to include a source port in the match condition for the rule. The source port is identified in the datagram header. Once you select the field, choose the port name or enter the port number. **Select From List** Select the keyword associated with the source port to match: •) **ftp** •) **ftpdata** •) **http** •) **smtp** •) **snmp** •) **telnet** •) **tftp** •) **www** Each of these keywords translates into its equivalent port number. **Match to Port** Enter the IANA port number to match to the source port identified in the datagram header. The port range is 0 – 65535 and includes three different types of ports: •) 0 – 1023: Well Known Ports •) 1024 – 49151: Registered Ports •) 49152 – 65535: Dynamic and/or Private Ports
Destination Port	Select this field to include a destination port in the match condition for the rule. The destination port is identified in the datagram header. Once you select the field, choose the port name or enter the port number. **Select From List** Select the keyword associated with the destination port to match: •) **ftp** •) **ftpdata** •) **http** •) **smtp** •) **snmp** •) **telnet** •) **tftp** •) **www** Each of these keywords translates into its equivalent port number. **Match to Port** Enter the IANA port number to match to the destination port identified in the datagram header. The port range is 0 – 65535 and includes three different types of ports: •) 0 – 1023: Well Known Ports •) 1024 – 49151: Registered Ports •) 49152 – 65535: Dynamic and/or Private Ports

Field	Description
EtherType	Select the EtherType field to compare the match criteria against the value in the header of an Ethernet frame. Select an EtherType keyword or enter an EtherType value to specify the match criteria. **Select from List Select** Select one of the following protocol types: •) **appletalk** •) **arp** •) **ipv4** •) **ipv6** •) **ipx** •) **netbios** •) **pppoe** **Match to Value** Enter a custom protocol identifier to which packets are matched. The value is a four-digit hexidecimal number in the range of 0600 – FFFF.
Class of Service	Select the field and enter a class of service 802.1p user priority value to be matched for the packets. The valid range is 0 – 7.
Source MAC Address	Select this field and enter the source MAC address to compare against an Ethernet frame.
Source MAC Mask	Enter the source MAC address mask specifying which bits in the destination MAC to compare against an Ethernet frame. An *f* indicates that the address bit is significant, and a 0 indicates that the address bit is to be ignored. A MAC mask of *ff:ff:ff:ff:ff:ff* matches a single MAC address.
Destination MAC Address	Select this field and enter the destination MAC address to compare against an Ethernet frame.
Destination MAC Mask	Enter the destination MAC address mask specifying which bits in the destination MAC to compare against an Ethernet frame. An *f* indicates that the address bit is significant, and a 0 indicates that the address bit is to be ignored. A MAC mask of *ff:ff:ff:ff:ff:ff* matches a single MAC address.
VLAN ID	Select the field and enter a **VLAN ID** to be matched for packets. The VLAN ID range is 0 – 4095.
IPv4 Class Maps	
Service Type	You can specify one type of service to use in matching packets to class criteria.
IP DSCP	To use IP DSCP as a match criteria, select the check box and select a DSCP value keyword or enter a DSCP. **Select from List** Select from a list of DSCP types. **Match to Value** Enter a DSCP Value to match (0 – 63).
IP Precedence	Select this field to match the packet's IP Precedence value to the class criteria IP Precedence value. The IP Precedence range is 0 – 7.
IP TOS Bits	Select this field and enter a value to use the packet's Type of Service bits in the IP header as match criteria. The TOS bit value ranges between (00 – FF). The high-order three bits represent the IP precedence value. The high-order six bits represent the IP Differentiated Services Code Point (DSCP) value.
IP TOS Mask	Enter an IP TOS mask value to perform a boolean AND with the TOS field in the header of the packet and compared against the TOS entered for this rule. The TOS Mask can be used to compare specific bits (Precedence/Type of Service) from the TOS field in the IP header of a packet against the TOS value entered for this rule. (00 – FF).
Delete Class Map	Check to delete the class map selected in the **Class Map Name** menu. The class map cannot be deleted if it is already attached to a policy.

Table 54 - DiffServ Class Map

To delete a Class Map, select the **Delete Class Map** option and click **Apply**.

Creating a DiffServ Policy Map

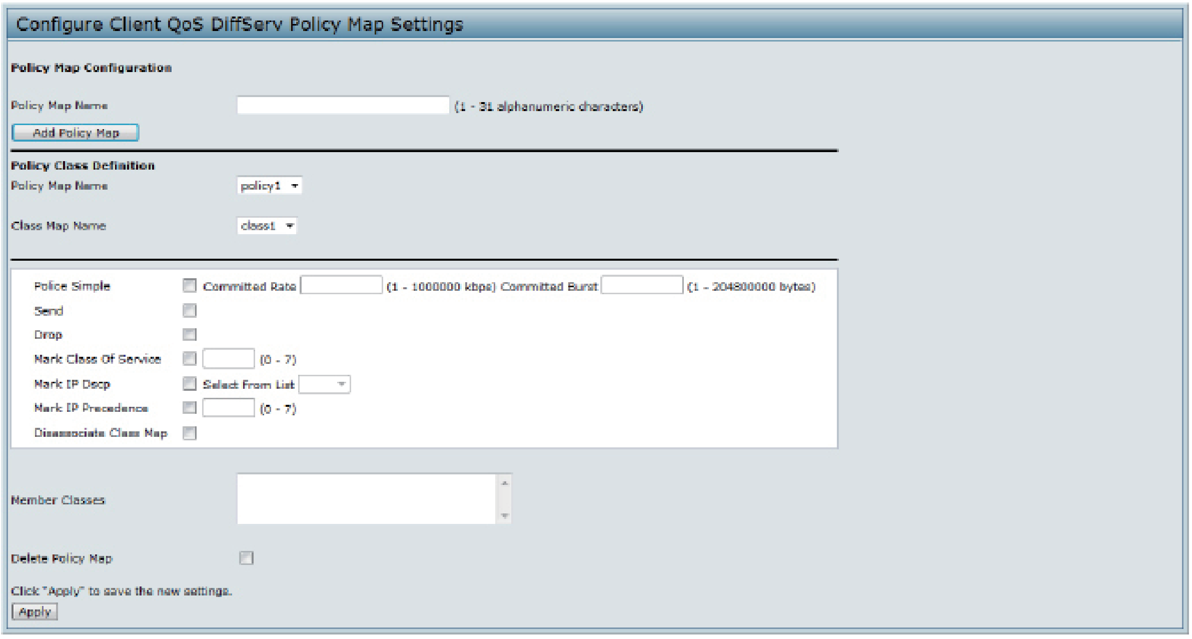
Use the **Policy Map** page to create DiffServ policies and to associate a collection of classes with one or more policy statements.

The UAP supports up to 50 Policy Maps.

Packets are classified and processed based on defined criteria. The classification criteria is defined by a class on the **Class Map** page. The processing is defined by a policy’s attributes on the **Policy Map** page. Policy attributes may be defined on a per-class instance basis, and it is these attributes that are applied when a match occurs. A Policy Map can contain up to 10 Class Maps. When the policy is active, the actions taken depend on which class matches the packet.

Packet processing begins by testing the class match criteria for a packet. A policy is applied to a packet when a class match within that policy is found.

To create a DiffServ policy, click the **Policy Map** tab.



Configure Client QoS DiffServ Policy Map Settings

Policy Map Configuration

Policy Map Name (1 - 31 alphanumeric characters)

Policy Class Definition

Policy Map Name policy1

Class Map Name class1

Police Simple □ Committed Rate (1 - 1000000 kbps) Committed Burst (1 - 204800000 bytes)

Send □

Drop □

Mark Class Of Service □ (0 - 7)

Mark IP Dscp □ Select From List

Mark IP Precedence □ (0 - 7)

Disassociate Class Map □

Member Classes

Delete Policy Map □

Click "Apply" to save the new settings.

Figure 61 - Configure Client QoS DiffServ Policy Map Settings

Field	Description
Policy Map Name	Enter then name of the policy map to add. The name can contain up to 31 alphanumeric characters.
Policy Map Name (Policy Class Definition)	Select the policy to associate with a member class.
Class Map Name (Policy Class Definition)	Select the member class to associate with this policy name.
Police Simple	Select this option to establish the traffic policing style for the class. The simple form of the policing style uses a single data rate and burst size, resulting in two outcomes: conform and non-conform. **Committed Rate** Enter the committed rate, in Kbps, to which traffic must conform. **Committed Burst** Enter the committed burst size, in bytes, to which traffic must conform.
Send	Select **Send** to specify that all packets for the associated traffic stream are to be forwarded if the class map criteria is met.

Field	Description
Drop	Select **Drop** to specify that all packets for the associated traffic stream are to be dropped if the class map criteria is met.
Mark Class of Service	Select this field to mark all packets for the associated traffic stream with the specified class of service value in the priority field of the 802.1p header. If the packet does not already contain this header, one is inserted. The CoS value is an integer from 0 – 7.
Mark IP DSCP	Select this field to mark all packets for the associated traffic stream with the IP DSCP value you select from the list or specify. **Select from List** Select from a list of DSCP types. **Match to Value** Enter a DSCP Value to match (0 – 63).
Mark IP Precedence	Select this field to mark all packets for the associated traffic stream with the specified IP Precedence value. The IP Precedence value is an integer from 0 – 7.
Disassociate Class Map	Select this option and click **Apply** to remove the class selected in the Class Map Name menu from the policy selected in the Policy Map Name menu.
Member Classes	Lists all DiffServ classes currently defined as members of the selected policy. If no class is associated with the policy, the field is empty.
Delete Policy Map	Select this field to delete the policy map showing in the Policy Map Name menu.

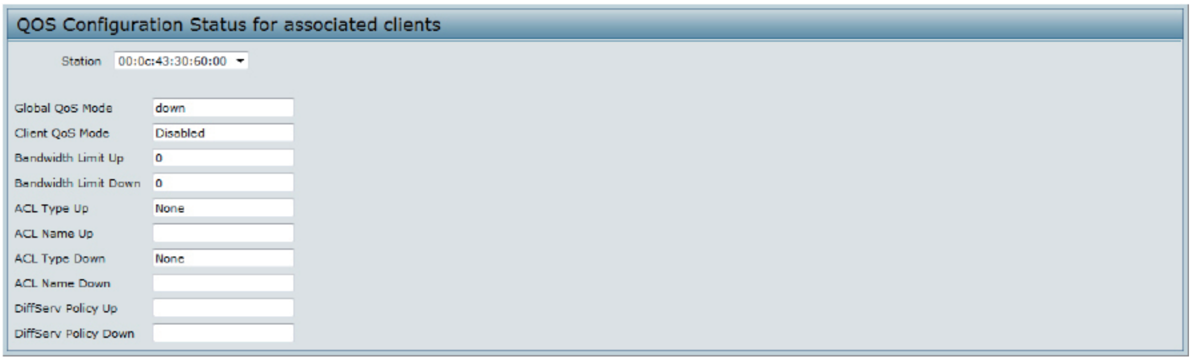
Table 55 - DiffServ Policy Map

To delete a Policy Map, select the **Delete Policy Map** option and click **Apply**.

Client QoS Status

The **Client QoS Status** page shows the client QoS settings that are applied to each client currently associated with the AP.

To view QoS settings for an associated client, click the **Client QoS Status** tab.



QOS Configuration Status for associated clients

Station 00:0c:43:30:60:00

Global QoS Mode: down
Client QoS Mode: Disabled
Bandwidth Limit Up: 0
Bandwidth Limit Down: 0
ACL Type Up: None
ACL Name Up:
ACL Type Down: None
ACL Name Down:
DiffServ Policy Up:
DiffServ Policy Down:

Figure 62 - QoS Configuration Status For Associated Clients

Field	Description
Station	The Station menu contains the MAC address of each client currently associated with the AP. To view the QoS settings applied to a client, select its **MAC address** from the list.
Global QoS Mode	Shows the current Client QoS Global Admin Mode on the AP.
Client QoS Mode	Shows whether the QOS mode for the selected client is **enabled** or **disabled**. **Note:** For the Qos Mode to be enabled on a client, it must be globally enabled on the AP and enabled on the VAP the client is associated with. Use the **VAP QoS Parameters** page to enable the QoS Global Admin mode and the per-VAP QoS Mode.
Bandwidth Limit Up	Shows the maximum allowed transmission rate from the client to the AP in bits per second (bps). The valid range is 0 – 4294967295 bps.
Bandwidth Limit Down	Shows the maximum allowed transmission rate from the AP to the client in bits per second (bps). The valid range is 0 – 4294967295 bps.

Field	Description
ACL Type Up	Shows the type of ACL that is applied to traffic in the inbound (client-to-AP) direction, which can be one of the following: •) **IPv4:** The ACL examines IPv4 packets for matches to ACL rules. •) **IPv6:** The ACL examines IPv6 packets for matches to ACL rules. •) **MAC:** The ACL examines layer 2 frames for matches to ACL rules.
ACL Name Up	Shows the name of the ACL applied to traffic entering the AP in the inbound direction. When a packet or frame is received by the AP, the ACL's rules are checked for a match. The packet or frame is processed if it is permitted and discarded if it is denied.
ACL Type Down	Shows the type of ACL to apply to traffic in the outbound (AP-to-client) direction, which can be one of the following: •) **IPv4:** The ACL examines IPv4 packets for matches to ACL rules. •) **IPv6:** The ACL examines IPv6 packets for matches to ACL rules •) **MAC:** The ACL examines layer 2 frames for matches to ACL rules
ACL Name Down	Shows the name of the ACL applied to traffic in the outbound direction. After switching the packet or frame to the outbound interface, the ACL's rules are checked for a match. The packet or frame is transmitted if it is permitted and discarded if it is denied.
DiffServ Policy Up	Shows the name of the DiffServ policy applied to traffic sent to the AP in the inbound (client-to-AP) direction.
DiffServ Policy Down	Shows the name of the DiffServ policy applied to traffic from the AP in the outbound (AP-to-client) direction.

Table 56 - Client QoS Status

Configuring RADIUS-Assigned Client QoS Parameters

If a VAP is configured to use WPA Enterprise security, you can include client QoS information in the client database on the RADIUS server. When a client successfully authenticates, the RADIUS server can include bandwidth limits and identify the ACLs and DiffServ policies to apply to the specific wireless client. ACLs and DiffServ policies referenced in the RADIUS client database must match the names of the ACLs and DiffServ policies configured on the AP to be successfully applied to the wireless clients.

The following table describes the QoS attributes that can be included in the client's RADIUS server entry. If a wireless client successfully authenticates using WPA Enterprise, each QoS RADIUS attribute that exists for the client is sent to the AP for processing. The attributes are optional and do not need to be present in the client entry. If the attribute is not present, the Client QoS setting on the AP is used.

RADIUS Attribute	ID	Description	Type/Range
Vendor-Specific (26), WISPr-Bandwidth-Max-Down	14122,8	Maximum allowed client reception rate from the AP in bits per second. If nonzero, the specified value is rounded down to the nearest 64 Kbps value when used in the AP (64 Kbps minimum). If zero, bandwidth limiting is not enforced for the client in this direction.	Type: integer 32-bit unsigned integer value (0-4294967295)
Vendor-Specific (26), WISPr-Bandwidth-Max-Up	14122,7	Maximum allowed client transmission rate to the AP in bits per second. If nonzero, the specified value is rounded down to the nearest 64 Kbps value when used in the AP (64 Kbps minimum). If zero, bandwidth limiting is not enforced for the client in this direction.	Type: integer 32-bit unsigned integer value (0-4294967295)
Vendor-Specific (26), LVL7-Wireless-Client-ACL-Dn	6132,120	Access list identifier to be applied to 802.1X authenticated wireless client traffic in the outbound (down) direction. If this attribute refers to an ACL that does not exist on the AP, all packets for this client will be dropped until the ACL is defined.	Type: string 5-36 characters (not null-terminated) The string is of the form "type:name" where: type = ACL type identifier: IPV4, IPV6, MAC : = required separator character name = 1-31 alphanumeric characters, specifying the ACL number (IPV4) or name (IPV6, MAC)

RADIUS Attribute	ID	Description	Type/Range
Vendor-Specific (26), LVL7-Wireless-Client-ACL-Up	6132,121	Access list identifier to be applied to 802.1X authenticated wireless client traffic in the inbound (up) direction. If this attribute refers to an ACL that does not exist on the AP, all packets for this client will be dropped until the ACL is defined.	Type: string 5-36 characters (not null-terminated) The string is of the form “type:name” where: type = ACL type identifier: IPV4, IPV6, MAC : = required separator character name = 1-31 alphanumeric characters, specifying the ACL number (IPV4) or name (IPV6, MAC)
Vendor-Specific (26), LVL7-Wireless-Client-Policy-Dn	6132,122	Name of DiffServ policy to be applied to 802.1X authenticated wireless client traffic in the outbound (down) direction. If this attribute refers to a policy name that does not exist on the AP, all packets for this client will be dropped until the DiffServ policy is defined.	Type: string 1-31 characters (not null-terminated)
Vendor-Specific (26), LVL7-Wireless-Client-Policy-Up	6132,123	Name of DiffServ policy to be applied to 802.1X authenticated wireless client traffic in the inbound (up) direction. If this attribute refers to a policy name that does not exist on the AP, all packets for this client will be dropped until the DiffServ policy is defined.	Type: string 1-31 characters (not null-terminated)

Table 57 - Client QoS RADIUS Attributes

Section 9 - Clustering Multiple APs

The UAP supports AP clusters. A cluster provides a single point of administration and lets you view, deploy, configure, and secure the wireless network as a single entity rather than a series of separate wireless devices.

Managing Cluster Access Points in the Cluster

The AP cluster is a dynamic, configuration-aware group of APs in the same subnet of a network. Each cluster can have up to **8 members**. Only one cluster per wireless network is supported; however, a network subnet can have multiple clusters. Clusters can share various configuration information, such as VAP settings and QoS queue parameters.

A cluster can be formed between two APs if the following conditions are met:

•) The APs are identical models.
•) The APs are connected on the same bridged segment.
•) The APs joining the cluster have the same Cluster Name.
•) Clustering mode is enabled on both APs.

Note: For two APs to be in the same cluster, they do not need to have the same number of radios; however, the supported capabilities of the radios should be same.
Note: DWL-6700AP doesn’t support clustering.

Clustering APs

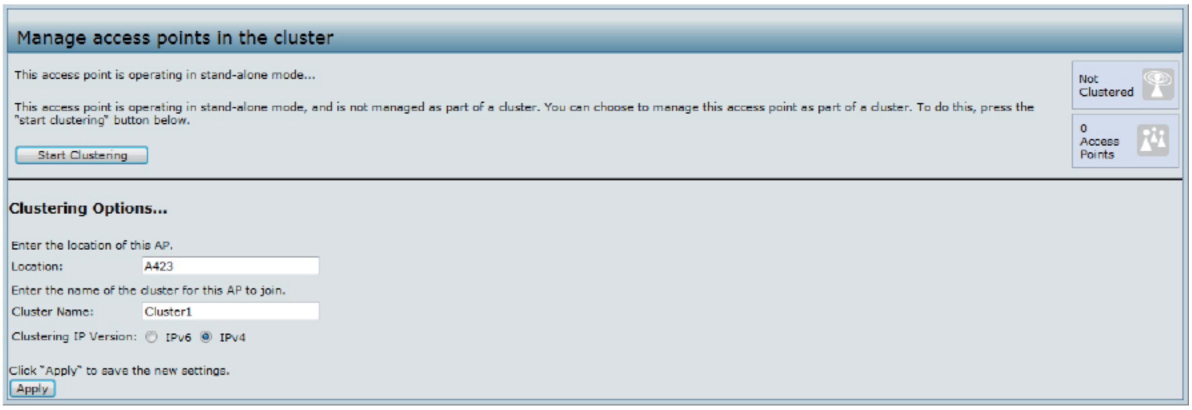
Only identical models may be clustered together. For example, the DWL-2600AP can only form a cluster with other DWL-2600APs.

Viewing and Configuring Cluster Members

The **Access Points** page allows you to start or stop clustering on an AP, view the cluster members, and configure the location and cluster name for a cluster member. From the **Access Points** page, you can also click the IP address of each cluster member to navigate to configuration settings and data on an access point in the cluster.

To view information about cluster members and to configure the location and cluster of an individual member, click the **Access Points** tab.

The following figure shows the **Cluster > Access Points** page when clustering is not enabled.



Manage access points in the cluster

This access point is operating in stand-alone mode...

This access point is operating in stand-alone mode, and is not managed as part of a cluster. You can choose to manage this access point as part of a cluster. To do this, press the "start clustering" button below.

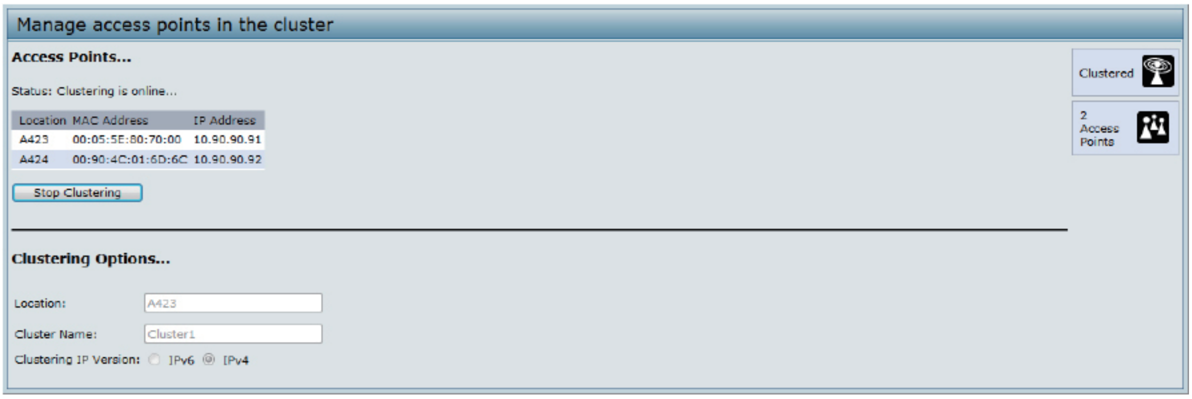
Clustering Options...

Enter the location of this AP.
Location: A423
Enter the name of the cluster for this AP to join.
Cluster Name: Cluster1
Clustering IP Version: ○ IPv6 ● IPv4

Click "Apply" to save the new settings.

Figure 63 - Manage Access Points In The Cluster (Passive)

The following figure shows the **Cluster > Access Points** page when clustering is enabled and two access points are in the cluster.



Manage access points in the cluster

Access Points...

Status: Clustering is online...

Location	MAC Address	IP Address
A423	00:05:5E:80:70:00	10.90.90.91
A424	00:90:4C:01:6D:6C	10.90.90.92

Stop Clustering

Clustering Options...

Location: A423

Cluster Name: Cluster1

Clustering IP Version: ○ IPv6 ● IPv4

Figure 64 - Manage Access Points In The Cluster (Active)

If clustering is currently disabled on the AP, the **Start Clustering** button is visible. If clustering is enabled, the **Stop Clustering** button is visible. You can edit the clustering option information when clustering is disabled.

The following table describes the configuration and status information available on the cluster **Access Points** page.

Field	Description
Status	If the status field is visible, then the AP is enabled for clustering. If clustering is not enabled, then the AP is operating in stand-alone mode and none of the information in this table is visible. To disable clustering on the AP, click **Stop Clustering**.
Location	Description of where the access point is physically located.
MAC Address	Media Access Control (MAC) address of the access point. The address shown here is the MAC address for the bridge (br0). This is the address by which the AP is known externally to other networks.
IP Address	Specifies the IP address for the access point. Each IP address is a link to the Administration Web pages for that access point. You can use the links to navigate to the Administration Web pages for a specific access point. This is useful for viewing data on a specific access point to make sure a cluster member is picking up cluster configuration changes, to configure advanced settings on a particular access point, or to switch a standalone access point to cluster mode.

Table 58 - Access Points in the Cluster

The following table describes the cluster information to configure for an individual member. The clustering options are read-only when clustering is enabled. To configure the clustering options, you must stop clustering.

Field	Description
Location	Enter a description of where the access point is physically located.
Cluster Name	Enter the name of the cluster for the AP to join. The cluster name is not sent to other APs in the cluster. You must configure the same cluster name on each AP that is a member of the cluster. The cluster name must be unique for each cluster you configure on the network.
Clustering IP Version	Specify the IP version that the APs in the cluster use to communicate with each other.

Table 59 - Cluster Options

Removing an Access Point from the Cluster

To remove an access point from the cluster, do the following.

1.) Go to the Administration Web pages for the clustered access point.
The Administration Web pages for the standalone access point are displayed.
2.) Click the **Cluster > Access Points** link in the Administration pages.
3.) Click **Stop Clustering**.
4.) The change will be reflected under Status for that access point; the access point will now show as stand-alone (instead of cluster).

Adding an Access Point to a Cluster

To add an access point that is currently in standalone mode back into a cluster, do the following.

1.) Go to the Administration Web pages for the standalone access point.
2.) Click the **Cluster > Access Points** link in the Administration pages for the stand-alone access point.
The **Access Points** page for a standalone access point indicates that the current mode is standalone.
3.) Type the name or location of the AP in the **Location** field to identify the AP within the cluster.
4.) Type the name of the cluster for the AP to join in the **Cluster Name** field.
5.) Click **Start Clustering**.
6.) The access point is now a cluster member. Its Status (Mode) on the **Cluster > Access Points** page now indicates Cluster instead of Not Clustered.

Navigating to Configuration Information for a Specific AP

In general, the UAP is designed for central management of *clustered* access points. For access points in a cluster, all access points in the cluster reflect the same configuration. In this case, it does not matter which access point you actually connect to for administration.

There may be situations, however, when you want to view or manage information on a particular access point. For example, you might want to check status information such as client associations or events for an access point. In this case, you can navigate to the Administration Web interface for individual access points by clicking the IP address links on the **Access Points** page.

All clustered access points are shown on the **Cluster > Access Points** page. To navigate to clustered access points, you can simply click on the IP address for a specific cluster member shown in the list.

Navigating to an AP by Using its IP Address in a URL

You can also link to the Administration Web pages of a specific access point, by entering the IP address for that access point as a URL directly into a Web browser address bar in the following form:

http://*IPAddressOfAccessPoint*

where *IPAddressOfAccessPoint* is the address of the particular access point you want to monitor or configure.

Managing Cluster Sessions

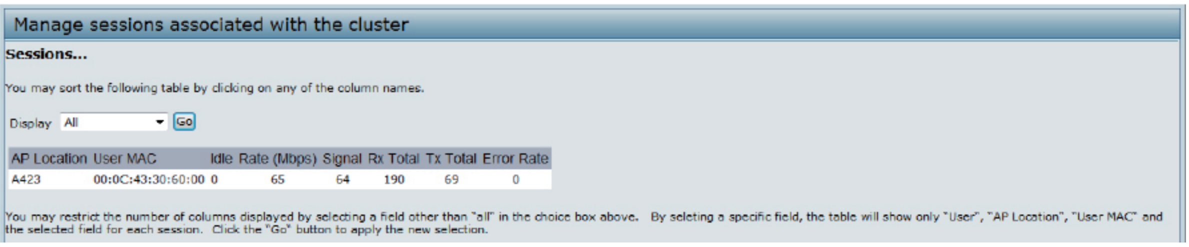
The **Sessions** page shows information about client stations associated with access points in the cluster. Each client is identified by its MAC address, along with the AP (location) to which it is currently connected.

To view a particular statistic for client sessions, select an item from the Display drop-down list and click **Go**. You can view information about idle time, data rate, signal strength and so on; all of which are described in detail in the table below.

A session in this context is the period of time in which a user on a client device (station) with a unique MAC address maintains a connection with the wireless network. The session begins when the client logs on to the network, and the session ends when the client either logs off intentionally or loses the connection for some other reason.

Note: A session is not the same as an association, which describes a client connection to a particular access point. A client network connection can shift from one clustered AP to another within the context of the same session. A client station can roam between APs and maintain the session.

To manage sessions associated with the cluster, click **Cluster > Sessions**.



Manage sessions associated with the cluster

Sessions...

You may sort the following table by clicking on any of the column names.

Display All Go

AP Location	User MAC	Idle	Rate (Mbps)	Signal	Rx Total	Tx Total	Error Rate
A423	00:0C:43:30:60:00	0	65	64	190	69	0

You may restrict the number of columns displayed by selecting a field other than "all" in the choice box above. By seleting a specific field, the table will show only "User", "AP Location", "User MAC" and the selected field for each session. Click the "Go" button to apply the new selection.

Figure 65 - Manage Sessions Associated With The Cluster

Details about the session information shown is described in the following table.

Field	Description
AP Location	Indicates the location of the access point. This is derived from the location description specified on the **Basic Settings** page.
User MAC	Indicates the MAC address of the wireless client device. A MAC address is a hardware address that uniquely identifies each node of a network.
Idle	Indicates the amount of time this station has remained inactive. A station is considered to be idle when it is not receiving or transmitting data.
Rate	The speed at which this access point is transferring data to the specified client. The data transmission rate is measured in *megabits per second* (Mbps). This value should fall within the range of the advertised rate set for the mode in use on the access point. For example, 6 to 54 Mbps for 802.11a.
Signal	Indicates the strength of the radio frequency (RF) signal the client receives from the access point. The measure used for this is a value known as *Received Signal Strength Indication* (RSSI), and will be a value between 0 and 100. RSSI is determined by a mechanism implemented on the network interface card (NIC) of the client station.
Rx Total	Indicates number of total packets received by the client during the current session.
Tx Total	Indicates number of total packets transmitted to the client during this session.
Error Rate	Indicates the percentage of time frames are dropped during transmission on this access point.

Table 60 - Session Management

Sorting Session Information

To sort the information shown in the tables by a particular indicator, click the column label by which you want to order things. For example, if you want to see the table rows ordered by signal strength, click the **Signal** column label. The entries will be sorted by signal strength.

Configuring and Viewing Channel Management Settings

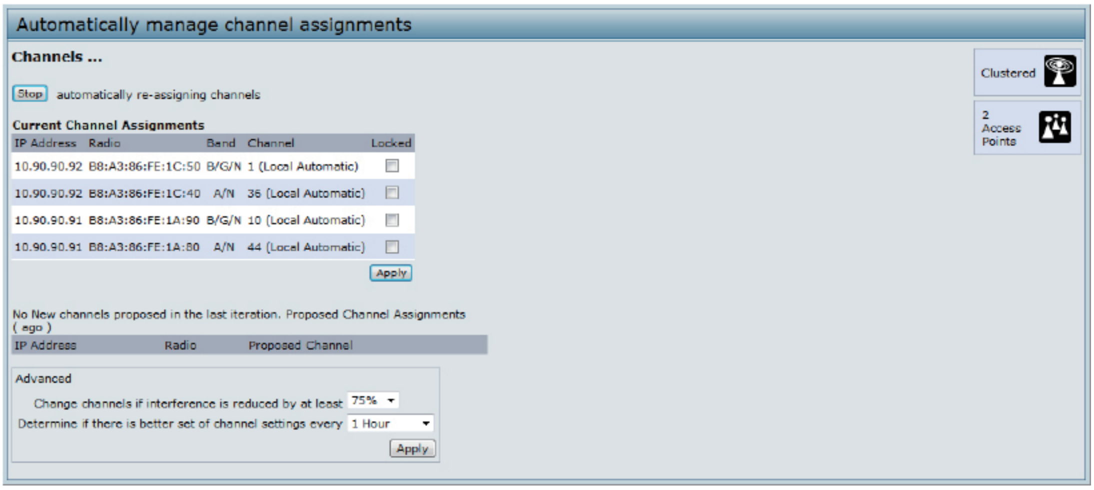
When Channel Management is enabled, the UAP automatically assigns radio channels used by clustered access points. The automatic channel assignment reduces mutual interference (or interference with other access points outside of its cluster) and maximizes Wi-Fi bandwidth to help maintain the efficiency of communication over the wireless network.

You must start channel management to get automatic channel assignments; it is disabled by default on a new AP.

At a specified interval, the Channel Manager maps APs to channel use and measures interference levels in the cluster. If significant channel interference is detected, the Channel Manager automatically re-assigns some or all of the APs to new channels per an efficiency algorithm (or *automated channel plan*). If the Channel Manager determines that a change is necessary, that information is sent to all members of the cluster and a syslog message is generated indicating the sender AP, new and old channel assignments.

The Channel Management page shows previous, current, and planned channel assignments for clustered access points. By default, automatic channel assignment is disabled. You can start channel management to optimize channel usage across the cluster on a scheduled interval.

To configure and view the channel assignments for the cluster members, click the **Channel Management** tab.



Channels ...

Stop automatically re-assigning channels

Current Channel Assignments

IP Address	Radio	Band	Channel	Locked
10.90.90.92	B8:A3:86:FE:1C:50	B/G/N	1 (Local Automatic)	□
10.90.90.92	B8:A3:86:FE:1C:40	A/N	36 (Local Automatic)	□
10.90.90.91	B8:A3:86:FE:1A:90	B/G/N	10 (Local Automatic)	□
10.90.90.91	B8:A3:86:FE:1A:80	A/N	44 (Local Automatic)	□

No New channels proposed in the last iteration. Proposed Channel Assignments (ago)

IP Address	Radio	Proposed Channel

Advanced

Change channels if interference is reduced by at least: 75%

Determine if there is better set of channel settings every: 1 Hour

Figure 66 - Automatically Manage Channel Assignments

From this page, you can view channel assignments for all APs in the cluster and stop or start automatic channel management. By using the Advanced settings on the page, you can modify the interference reduction potential that triggers channel re-assignment, change the schedule for automatic updates, and re-configure the channel set used for assignments.

Stopping/Starting Automatic Channel Assignment

By default, automatic channel assignment is disabled (off).

	Note: Channel Management overrides the default cluster behavior, which is to synchronize radio channels of all APs across a cluster. When Channel Management is enabled, the radio Channel is not synced across the cluster to other APs.

•) Click **Start** to resume automatic channel assignment.
When automatic channel assignment is enabled, the Channel Manager periodically maps radio channels used by clustered access points and, if necessary, re-assigns channels on clustered APs to reduce interference (with cluster members or other APs outside the cluster).

•) Click **Stop** to stop automatic channel assignment. (No channel usage maps or channel re-assignments will be made. Only manual updates will affect the channel assignment.)

Viewing Current Channel Assignments and Setting Locks

The *Current Channel Assignments* section shows a list of all access points in the cluster by IP Address. The display shows the band on which each AP is broadcasting (a/b/g/n), the current channel used by each AP, and an option to lock an AP on its current radio channel so that it cannot be re-assigned to another.

The following table provides details about Current Channel Assignments.

Field	Description
IP Address	Specifies the IP Address for the access point.
Radio	Identifies the MAC address of the radio.
Band	Indicates the band on which the access point is broadcasting.
Current	Indicates the radio Channel on which this access point is currently broadcasting.
Status	Shows whether the radio is up (on) or down (off).
Locked	Click **Locked** to force the access point to remain on the current channel. When Locked is selected (enabled) for an access point, automated channel management plans will not re-assign the AP to a different channel as a part of the optimization strategy. Instead, APs with locked channels will be factored in as requirements for the plan. If you click **Apply**, you will see that locked APs show the same channel for the Current Channel and Proposed Channel fields. Locked APs will keep their current channels.

Table 61 - Channel Assignments

Viewing the Last Proposed Set of Changes

The *Proposed Channel Assignments* shows the last channel plan. The plan lists all access points in the cluster by IP Address, and shows the current and proposed channels for each AP. Locked channels will not be re-assigned and the optimization of channel distribution among APs will take into account the fact that locked APs must remain on their current channels. APs that are not locked may be assigned to different channels than they were previously using, depending on the results of the plan.

Field	Description
IP Address	Specifies the IP Address for the access point.
Radio	Indicates the radio channel on which this access point is currently broadcasting.
Proposed Channel	Indicates the radio channel to which this access point would be re-assigned if the Channel Plan is executed.

Table 62 - Last Proposed Changes

Configuring Advanced Settings

The advanced settings allow you to customize and schedule the channel plan for the cluster. If you use Channel Management as provided (without updating Advanced Settings), channels are automatically fine-tuned once every hour if interference can be reduced by 25 percent or more. Channels will be re-assigned even if the network is busy. The appropriate channel sets will be used (b/g for APs using IEEE 802.11b/g and a for APs using IEEE 802.11a).

The default settings are designed to satisfy most scenarios where you would need to implement channel management.

Use **Advanced Settings** to modify the interference reduction potential that triggers channel re-assignment, change the schedule for automatic updates, and re-configure the channel set used for assignments. If there are no fields showing in the Advanced section, click the toggle button to display the settings that modify timing and details of the channel planning algorithm.

Field	Description
Change channels if interference is reduced by at least	Specify the minimum percentage of interference reduction a proposed plan must achieve in order to be applied. The default is 75 percent. Use the drop-down menu to choose percentages ranging from 5 percent to 75 percent. This setting lets you set a gating factor for channel re-assignment so that the network is not continually disrupted for minimal gains in efficiency. For example, if channel interference must be reduced by 75 percent and the proposed channel assignments will only reduce interference by 30 percent, then channels will not be re-assigned. However; if you re-set the minimal channel interference benefit to 25 percent and click **Apply**, the proposed channel plan will be implemented and channels re-assigned as needed.
Determine if there is better set of channels every	Use the drop-down menu to specify the schedule for automated updates. A range of intervals is provided, from 30 Minutes to 6 Months The default is 1 Hour (channel usage re-assessed and the resulting channel plan applied every hour).

Table 63 - Advanced Channel Management Settings

Click **Apply** under **Advanced** settings to apply these settings.
Advanced settings will take effect when they are applied and influence how automatic channel management is performed.

Viewing Wireless Neighborhood Information

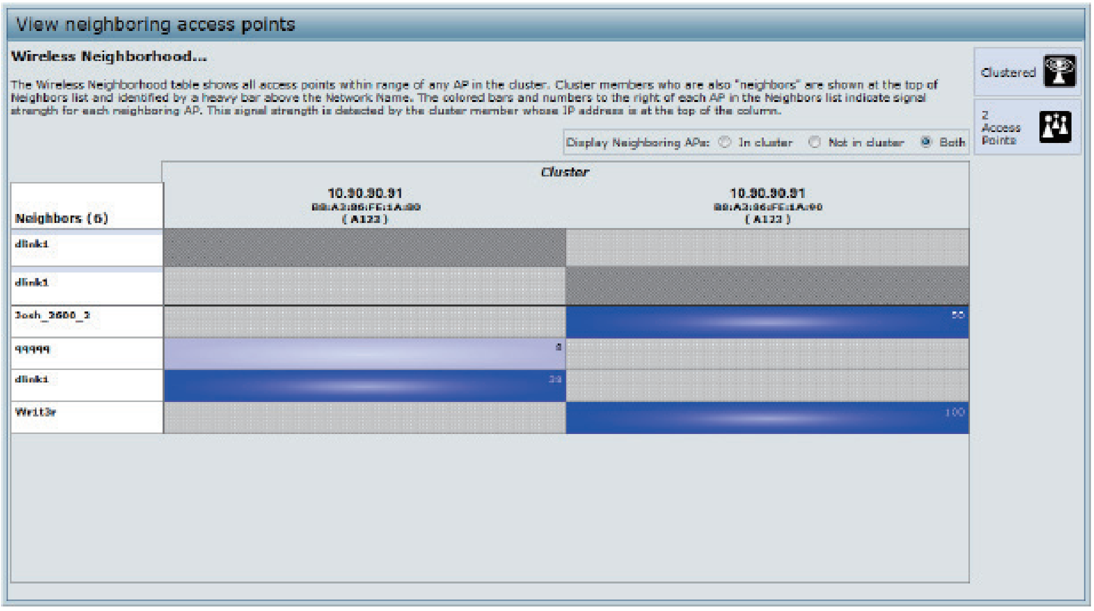
The Wireless Neighborhood shows up to 20 access points per radio within range of every member of the cluster, shows which access points are within range of which cluster members, and distinguishes between cluster members and non-members.

Note: The Wireless Neighborhood page shows up to 20 access points per radio. To see all the access points detected on a given cluster access point, navigate to that cluster member’s web interface and go to the **Status > Neighboring Access Points** page.

For each neighbor access point, the Wireless Neighborhood view shows identifying information (SSID or Network Name, IP Address, MAC address) along with radio statistics (signal strength, channel, beacon interval). You can click on an AP to get additional statistics about the APs in radio range of the currently selected AP.

The Wireless Neighborhood view can help you:

- Detect and locate unexpected (or *rogue*) access points in a wireless domain so that you can take action to limit associated risks
- Verify coverage expectations. By assessing which APs are visible at what signal strength from other APs, you can verify that the deployment meets your planning goals.
- Detect faults. Unexpected changes in the coverage pattern are evident at a glance in the color coded table.



View neighboring access points

Wireless Neighborhood...

The Wireless Neighborhood table shows all access points within range of any AP in the cluster. Cluster members who are also "neighbors" are shown at the top of Neighbors list and identified by a heavy bar above the Network Name. The colored bars and numbers to the right of each AP in the Neighbors list indicate signal strength for each neighboring AP. This signal strength is detected by the cluster member whose IP address is at the top of the column.

Display Neighboring APs: ○ In cluster ○ Not in cluster ● Both

	Cluster	
Neighbors (6)	10.90.90.91 00:A3:86:FE:1A:90 (A123)	10.90.90.91 00:A3:96:FE:1A:90 (A123)
dlink1		
dlink1		
Josh_3600_2		50
99999	0	
dlink1	24	
Writ3r		100

Figure 67 - View Neighboring Access Points

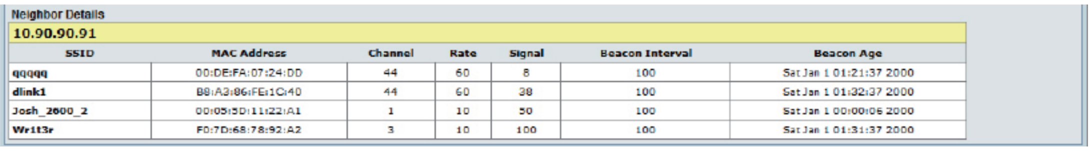
The following table describes details about the Wireless Neighborhood information.

Field	Description
Display neighboring APs	Click one of the following radio buttons to change the view: •) **In cluster** — Shows only neighbor APs that are members of the cluster •) **Not in cluster** — Shows only neighbor APs that are not cluster members •) **Both** — Shows all neighbor APs (cluster members and non-members)
Cluster	The Cluster list at the top of the table shows IP addresses for all access points in the cluster. (This is the same list of cluster members shown on the **Cluster > Access Points** tab.) If there is only one AP in the cluster, only a single IP address column will be displayed here; indicating that the AP is clustered with itself. You can click on an IP address to view more details on a particular AP.
Neighbors	Access points which are neighbors of one or more of the clustered APs are listed in the left column by SSID (Network Name). An access point which is detected as a neighbor of a cluster member can also be a cluster member itself. Neighbors who are also cluster members are always shown at the top of the list with a heavy bar above and include a location indicator. The colored bars to the right of each AP in the Neighbors list shows the signal strength for each of the neighbor APs as detected by the cluster member whose IP address is shown at the top of the column. The color of the bar indicates the signal strength: •) **Dark Blue Bar** — A dark blue bar and a high signal strength number (for example 50) indicates good signal strength detected from the Neighbor seen by the AP whose IP address is listed above that column. •) **Lighter Blue Bar** — A lighter blue bar and a lower signal strength number (for example 20 or lower) indicates medium or weak signal strength from the Neighbor seen by the AP whose IP address is listed above that column •) **White Bar** — A white bar and the number 0 indicates that a neighboring AP that was detected by one of the cluster members cannot be detected by the AP whose IP address if listed above that column. •) **Light Gray Bar** — A light gray bar and no signal strength number indicates a Neighbor that is detected by other cluster members but not by the AP whose IP address is listed above that column. •) **Dark Gray Bar** — A dark gray bar and no signal strength number indicates this is the AP whose IP address is listed above that column (since it is not applicable to show how well the AP can detect itself).

Table 64 - Wireless Neighborhood Information

Viewing Details for a Cluster Member

To view details on a cluster member AP, click on the IP address of a cluster member at the top of the page. The following figure shows the Neighbor Details of the AP with an IP address of 10.90.90.91.



Neighbor Details

10.90.90.91

SSID	MAC Address	Channel	Rate	Signal	Beacon Interval	Beacon Age
qqqqq	00:DE:FA:07:24:DD	44	60	8	100	Sat Jan 1 01:21:37 2000
dlink1	B8:A3:86:FE:1C:40	44	60	38	100	Sat Jan 1 01:32:37 2000
Josh_2600_2	00:05:5D:11:22:A1	1	10	50	100	Sat Jan 1 00:00:06 2000
Wr1t3r	F0:7D:68:78:92:A2	3	10	100	100	Sat Jan 1 01:31:37 2000

Figure 68 - Viewing Details For A Cluster Member

The following table explains the details shown about the selected AP.

Field	Description
SSID	The Service Set Identifier (SSID) for the access point. The SSID is an alphanumeric string of up to 32 characters that uniquely identifies a wireless local area network. It is also referred to as the *Network Name*. A Guest network and an Internal network running on the same access point must always have two different network names.
MAC Address	Shows the MAC address of the neighboring access point. A MAC address is a hardware address that uniquely identifies each node of a network.
Channel	Shows the channel on which the access point is currently broadcasting. The Channel defines the portion of the radio spectrum that the radio uses for transmitting and receiving.
Rate	Shows the rate (in megabits per second) at which this access point is currently transmitting. The current rate will always be one of the rates shown in Supported Rates.
Signal	Indicates the strength of the radio signal emitting from this access point as measured in decibels (Db).
Beacon Interval	Shows the Beacon interval being used by this access point. Beacon frames are transmitted by an access point at regular intervals to announce the existence of the wireless network. The default behavior is to send a beacon frame once every 100 milliseconds (or 10 per second).
Beacon Age	Shows the date and time of the last beacon received from this access point.

Table 65 - Cluster Member Details

Appendix A - Default AP Settings

When you first power on a UAP, it has the default settings shown in the following table.

Feature	Default
System Information	
User Name	admin
Password	admin
Ethernet Interface Settings	
Connection Type	DHCP
DHCP	Enabled
IP Address	10.90.90.91 (if no DHCP server is available)
Subnet Mask	255.0.0.0
DNS Name	None
Management VLAN ID	1
Untagged VLAN ID	1
IPv6 Admin Mode	Enabled
IPv6 Auto Config Admin Mode	Enabled
Radio Settings	
Radio (1 and 2)	One
Radio 1 IEEE 802.11 Mode	802.11a/n
Radio 2 IEEE 802.11 Mode	802.11b/g/n
802.11a/n Channel	Auto
802.11b/g/n Channel	Auto
Radio 1 Channel Bandwidth	40 MHz
Radio 2 Channel Bandwidth	20 MHz
Primary Channel	Lower
Short Guard Interval Supported	Yes
STBC Mode	On
Protection	Auto
Maximum Wireless Clients	200
Transmit Power	100 percent
Legacy Rate Sets Supported (Mbps)	IEEE 802.11a: 54, 48, 36, 24, 18, 12, 9, 6 IEEE 802.11b: 11, 5.5, 2, 1 IEEE 802.11g: 54, 48, 36, 24, 18, 12, 11, 9, 6, 5.5, 2, 1
Legacy Rate Sets (Mbps) (Basic/Advertised)	IEEE 802.11a: 24, 12, 6 IEEE 802.11b: 2, 1 IEEE 802.11g: 11, 5.5, 2, 1
MCS (Data Rate) Settings (802.11n only)	0–15 Enabled
Broadcast/Multicast Rate Limiting	Disabled
Fixed Multicast Rate	Auto
Beacon Interval	100
DTIM Period	2
Fragmentation Threshold	2346
RTS Threshold	2347
TSPEC Mode	Off
TSPEC Voice ACM Mode	Off
Virtual Access Point Settings	
Status	VAP0 is enabled on both radios, all other VAPs disabled

Feature	Default
VLAN ID	1
Network Name (SSID)	dlink1 through dlink16
Broadcast SSID	Allow
Security Mode	None (plain text)
MAC Authentication Type	None
RADIUS IP Address	10.90.90.1
RADIUS Key	secret
RADIUS Accounting	Disabled
Redirect Mode	None
Other Default Settings	
WDS Settings	None
STP	Disabled
MAC Authentication	No stations in list
Load Balancing	Disabled
SNMP	Enabled
RO SNMP Community Name	public
SNMP Agent Port	161
SNMP Set Requests	Enabled
Managed AP Mode	Enabled
Authentication (802.1X Supplicant)	Disabled
Management ACL	Disabled
HTTP Access	Enabled; disabled in Managed Mode
HTTPS Access	Enabled; disabled in Managed Mode
Console Port Access	Enabled
Telnet Access	Enabled; disabled in Managed Mode
SSH Access	Enabled; disabled in Managed Mode
WMM	Enabled
Email Alert Admin Mode	Down
Time	Manual (Not set)
Client QoS Global Admin Mode	Disabled
Per-VAP Client QoS Mode	Disabled
Clustering	Stopped

Table 66 - UAP Default Settings

Appendix B - Configuration Examples

This appendix contains examples of how to configure selected features available on the UAP. Each example contains procedures on how to configure the feature by using the Web interface, CLI, and SNMP.

This appendix describes how to perform the following procedures:

For all SNMP examples, the objects you use to AP are in a private MIB. Take DWL-6600AP for example, the path to the tables that contain the objects is iso(1).org(3).dod(6).internet(1).private(4).enterprises(1).dlink(171).dlink-products(10).dwl-6600AP(128).dwl6600AP(1).dwl_6600AP(1).dwlWLANAPNewMibs(26).

DWL-8710AP: 1.3.6.1.4.1.171.10.149.1.1.26
DWL-8610AP: 1.3.6.1.4.1.171.10.136.1.1.26
DWL-6610AP: 1.3.6.1.4.1.171.10.143.1.1.26
DWL-8600AP: 1.3.6.1.4.1.171.10.37.29.1.26
DWL-6700AP: 1.3.6.1.4.1.171.10.142.1.1.26
DWL-6600AP: 1.3.6.1.4.1.171.10.128.1.1.26
DWL-3600AP: 1.3.6.1.4.1.171.10.129.1.1.26
DWL-2600AP: 1.3.6.1.4.1.171.10.130.1.1.26
DWL-3610AP: 1.3.6.1.4.1.171.10.151.1.1.26
DWL-6610AP/B1: 1.3.6.1.4.1.171.10.152.1.1.26

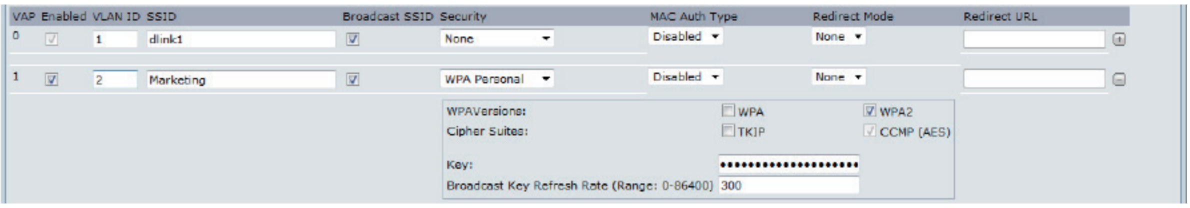
Configuring a VAP

This example shows how to configure VAP 1 with the following non-default settings:

- VLAN ID: 2
- SSID: Marketing
- Security: WPA Personal using WPA2 with CCMP (AES)

VAP Configuration from the Web Interface

1.) Log onto the AP and navigate to the **Manage > VAP** page.



VAP	Enabled	VLAN ID	SSID	Broadcast SSID	Security	MAC Auth Type	Redirect Mode	Redirect URL
0	☑	1	dlink1	☑	None	Disabled	None	
1	☑	2	Marketing	☑	WPA Personal	Disabled	None	

WPAVersions: ☐ WPA ☑ WPA2
Cipher Suites: ☐ TKIP ☑ CCMP (AES)
Key: ••••••••••••••••••••
Broadcast Key Refresh Rate (Range: 0-86400) 300

Figure 69 - VAP Configuration from the Web Interface

2.) In the **Enabled** column for VAP 1, select the check box.
3.) Enter **2** in the **VLAN ID** column.
4.) In the **SSID** column, delete the existing SSID and type *Marketing*.
5.) Select **WPA Personal** from the menu in the Security column. Additional fields appear.
6.) Select the **WPA2** and **CCMP (AES)** options, and clear the WPA and TKIP options.
7.) Enter a WPA encryption key in the **Key** field. The key can be a mix of alphanumeric and special characters. The key is case sensitive and can be between 8 and 63 characters.

- Click **Apply** to update the AP with the new settings.

VAP Configuration from the CLI

1.) Connect to the AP by using Telnet, SSH, or a serial connection.
2.) Enable VAP 1.

```
set vap vap1 status up
```

3.) Set the VLAN ID to 2.

```
set vap vap1 vlan-id 2
```

Note: The previous command sets the VLAN ID to 2 for VAP 1 on both radios. To set the VLAN ID for VAP 1 on radio one only, use the following command: `set vap 1 with radio wlan0 to vlan-id 2`.

4.) Set the SSID to Marketing.

```
set interface wlan0vap1 ssid Marketing
```

5.) Set the Security Mode to WPA Personal.

```
set interface wlan0vap1 security wpa-personal
```

6.) Allow WPA2 clients, and not WPA clients, to connect to the AP.

```
set bss wlan0bssvap1 wpa-allowed off
set bss wlan0bssvap1 wpa2-allowed on
```

7.) Set the Cipher Suite to CCMP (AES) only.

```
set bss wlan0bssvap1 wpa-cipher-tkip off
set bss wlan0bssvap1 wpa-cipher-ccmp on
```

8.) Set the Pre-shared key.

```
set interface wlan0vap1 wpa-personal-key JuPXkC7GvY$moQiUttp2
```

If the shared secret keys includes spaces, place the key inside quotation marks.

9.) Use the following commands to view and verify the settings.

```
get interface wlan0vap1 detail
get vap vap1 detail
```

VAP Configuration Using SNMP

1.) Load the DLINK-WLAN-ACCESS-POINT-X600-MIB module.
2.) From the MIB tree, navigate to the objects in the apVap table.
3.) Walk the apVapDescription object to view the instance ID for VAP 1 (wlan0vap1).
VAP 1 on Radio 1 is instance 3.
4.) Use the apVapStatus object to set the status of VAP 1 to up (1).
5.) Use the apVapVlanID object to set the VLAN ID of VAP 1 to 2.
6.) Navigate to the objects in the apIfConfig table.
7.) Walk the apIfConfigName object to view the instance ID for VAP 1 (wlan0vap1).
VAP 1 on Radio 1 is instance 3.
8.) Set the value of instance 3 in the apIfConfigSsid object to Marketing.
9.) Set the value of instance 3 in the apIfConfigSecurity object to wpa-personal (3).
10.) Set the value of instance3 in the apIfConfigWpaPersonalKey object to JuPXkC7GvY$moQiUttp2, which is the WPA pre-shared key.
11.) Navigate to the objects in the apRadioBss > apBssTable table.
12.) Walk the apBssDescr object to view the instance ID for VAP 1.
VAP 1 on Radio 1 is instance 1.
13.) Set the value of instance 1 in the apBssWpaAllowed object to false (2).
14.) Set the value of instance 1 in the apBssWpaCipherTkip object to false (2).
15.) Set the value of instance 1 in the apBssWpaCipherCcmp object to true (1).

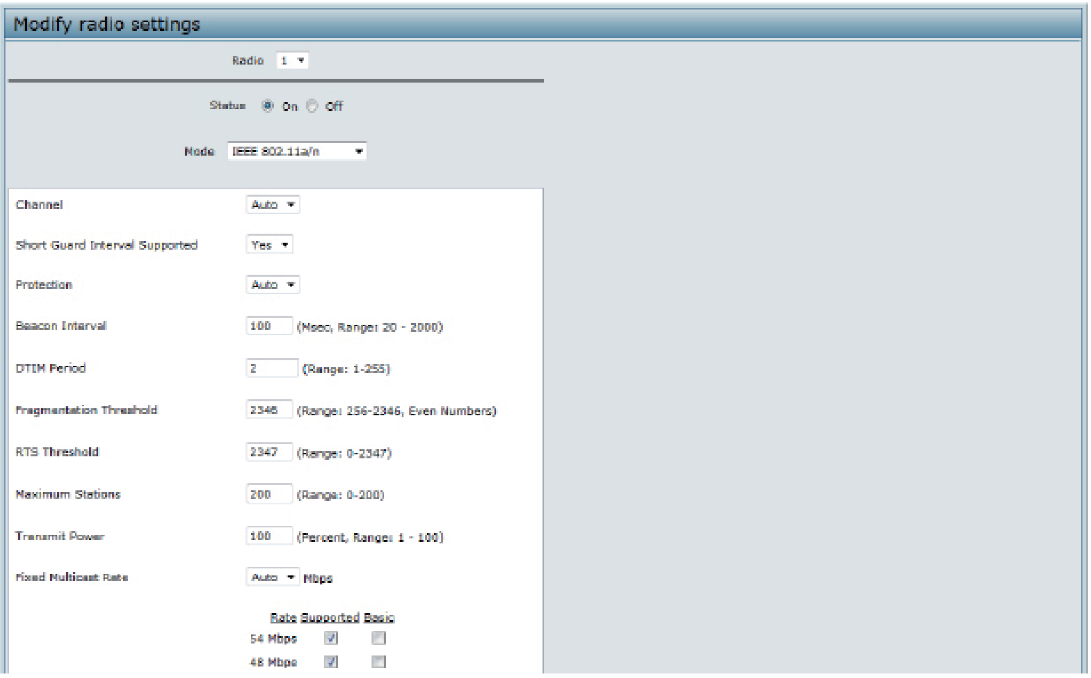
Configuring Radio Settings

This example shows how to configure Radio 12 with the following settings:

- •) Mode: IEEE 802.11b/g/n
- •) Channel: 6
- •) Channel Bandwidth: 40 MHz
- •) Maximum Stations: 100
- •) Transmit Power: 75%

Radio Configuration from the Web Interface

1.) Log onto the AP and navigate to the **Manage > Radio** page.



Modify radio settings

Radio: 1

Status: ● On ○ Off

Mode: IEEE 802.11a/n

Channel	Auto
Short Guard Interval Supported	Yes
Protection	Auto
Beacon Interval	100 (Msec, Range: 20 - 2000)
DTIM Period	2 (Range: 1-255)
Fragmentation Threshold	2346 (Range: 256-2346, Even Numbers)
RTS Threshold	2347 (Range: 0-2347)
Maximum Stations	200 (Range: 0-200)
Transmit Power	100 (Percent, Range: 1 - 100)
Fixed Multicast Rate	Auto Mbps

Rate	Supported	Basic
54 Mbps	☑	□
48 Mbps	☑	□

Figure 70 - Radio Configuration from the Web Interface

2.) Make sure that the **Status** is **On**.
3.) From the **Mode** menu, select **IEEE 802.11b/g/n**.
4.) From the **Channel** field, select **6**.
5.) From the **Channel Bandwidth** field, select **40 MHz**.
6.) In the **Maximum Stations** field, change the value to **100**.
7.) In the **Transmit Power** field, change the value to **75**.
8.) Click **Apply** to update the AP with the new settings.

Radio Configuration from the CLI

1.) Connect to the AP by using Telnet, SSH, or a serial connection.
2.) Turn Radio 12 on if the status is not currently up.

```
set radio wlan01 status on
```

3.) Set the mode to IEEE 802.11b/g/n.

```
set radio wlan01 mode bg-n
```

4.) Set the channel to 6.

```
set radio wlan01 channel-policy static
set radio wlan01 static-channel 6
```

5.) Set the channel bandwidth to 40 MHz.

```
set radio wlan01 n-bandwidth 40
```

6.) Allow a maximum of 100 stations to connect to the AP at a time.

```
set bss wlan01bssvap0 max-stations 100
```

7.) Set the transmit power to 75 percent.

```
set radio wlan01 tx-power 75
```

8.) View information about the radio settings.

```
get radio wlan01 detail
```

Radio Configuration Using SNMP

1.) Load the DLINK-WLAN-ACCESS-POINT-X600-MIB module.
2.) From the MIB tree, navigate to the objects in the apRadio table (apRadioBss > apRadioTable).
3.) Use the apRadioStatus object to set the status of Radio 12 to up (1).
4.) Use the apRadioMode object to set the Radio 12 mode to IEEE 802.11b/g/n, which is bg-n (4).
5.) Use the apRadioChannelPolicy object to set the channel policy to static (1), which disables the automatic channel assignment.
6.) Use the apRadioStaticChannel object to set the channel to 6.
7.) Use the apRadioChannelBandwith object to set the channel bandwidth for Radio 12 to forty-MHz (2).
8.) Use the apRadioTxPower object to set the transmission power on Radio 12 to 75.
9.) Navigate to the objects in the apBssTable.
10.) Use the apBssMaxStations object to set the value of the maximum allowed stations to 100.

Configuring the Wireless Distribution System

This examples shows how to configure a WDS link between two APs. The local AP is MyAP1 and has a MAC address of 00:1B:E9:16:32:40, and the remote AP is MyAP2 with a MAC address of 00:30:AB:00:00:B0.

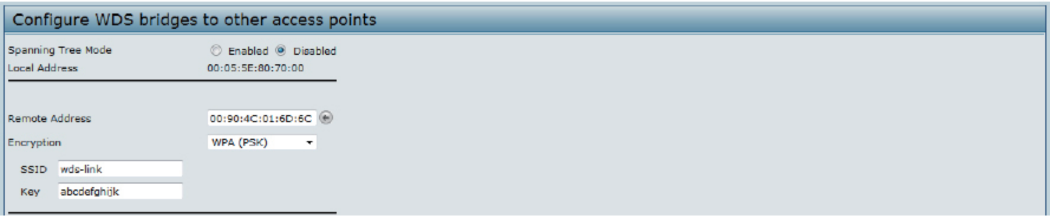
The WDS link has the following settings, which must be configured on both APs:

•) Encryption: WPA (PSK)
•) SSID: wds-link
•) Key: abcdefghijk

WDS Configuration from the Web Interface

To create a WDS link between a pair of access points “**MyAP1**” and “**MyAP2**” use the following steps:

1.) Log onto **MyAP1** and navigate to the **Manage > WDS** page.



Configure WDS bridges to other access points

Spanning Tree Mode ○ Enabled ● Disabled
Local Address 00:05:5E:80:70:00

Remote Address 00:90:4C:01:6D:6C
Encryption WPA (PSK)
SSID wds-link
Key abcdefghijk

Figure 71 - WDS Configuration from the Web Interface

The **MAC address** for **MyAP1** (the access point you are currently viewing) is automatically provided in the **Local Address** field.

2.) Enter the **MAC address** for **MyAP2** in the **Remote Address** field, or click the arrow next to the field and select the MAC address of MyAP2 from the pop-up list.
3.) Select **WPA (PSK)** from the Encryption menu.

4.) Enter *wds-link* in the **SSID** field and *abcdefghijk* in the **Key** field.
5.) Click **Apply** to apply the WDS settings to the AP.
6.) Log onto **MyAP2** and repeat steps 2-5 (but be sure to use the **MAC address** of **MyAP1** in the **Remote Address** field.

Note: MyAP1 and MyAP2 must be set to the same IEEE 802.11 Mode and be transmitting on the same channel.

WDS Configuration from the CLI

1.) Connect to the MyAP1 by using Telnet, SSH, or a serial connection.
2.) Configure the remote MAC address for MyAP2.

```
set interface wlan0wds0 status up remote-mac 00:30:AB:00:00:B0
```

3.) Set WPA (PSK) as the encryption type for the link.

```
set interface wlan0wds0 wds-security-policy wpa-personal
```

4.) Set the SSID on the WDS link.

```
set interface wlan0wds0 wds-ssid wds-link
```

5.) Configure the encryption key.

```
set interface wlan0wds0 wds-wpa-psk-key abcdefghijk
```

6.) Administratively enable the WDS link.

```
set interface wlan0wds0 status up
```

7.) Perform the same configuration steps on MyAP2.

WDS Configuration Using SNMP

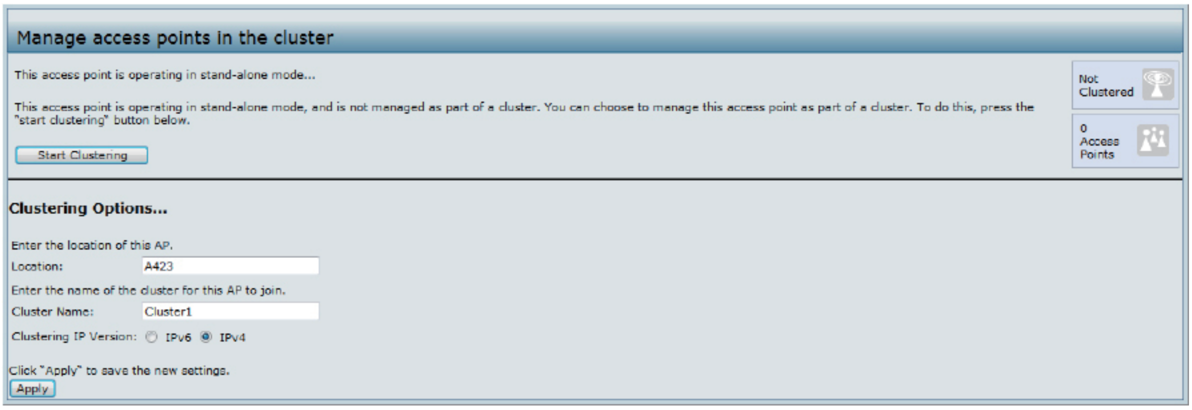
1.) Load the DLINK-WLAN-ACCESS-POINT-X600-MIB module.
2.) From the MIB tree, navigate to the objects in the apIfConfig table.
3.) Walk the apIfConfigName object to view the instance ID for the first WDS link (wlan0wds0).
The first WDS link is instance 1.
4.) Set the value of instance 1 in the apIfConfigRemoteMac object to 00:30:AB:00:00:B0.
In the MG-Soft browser, the format for the MAC address value to set is # 0x00 0x30 0xAB 0x00 0x00 0xB0.
5.) Set the value of instance 1 in the apIfConfigWdsSecPolicy object to WPA Personal (3).
6.) Set the value of instance 1 in the apIfConfigSsid object to wds-link.
7.) Set the value of instance 1 in the apIfConfigWdsWpaPskKey object to abcdefthijk.
Some MIB browsers require that the value be entered in HEX values rather than ASCII values.
8.) Perform the same configuration steps on MyAP2.

Clustering Access Points

This example shows how to configure a cluster with two APs and to enable automatic channel reassignment. The location of the local AP is Room 214, and the cluster name is MyCluster.

Clustering APs by Using the Web Interface

1.) Log onto the AP and navigate to the **Cluster > Access Points** page.



Manage access points in the cluster

This access point is operating in stand-alone mode...

This access point is operating in stand-alone mode, and is not managed as part of a cluster. You can choose to manage this access point as part of a cluster. To do this, press the "start clustering" button below.

Clustering Options...

Enter the location of this AP.
Location: A423
Enter the name of the cluster for this AP to join.
Cluster Name: Cluster1
Clustering IP Version: ○ IPv6 ● IPv4

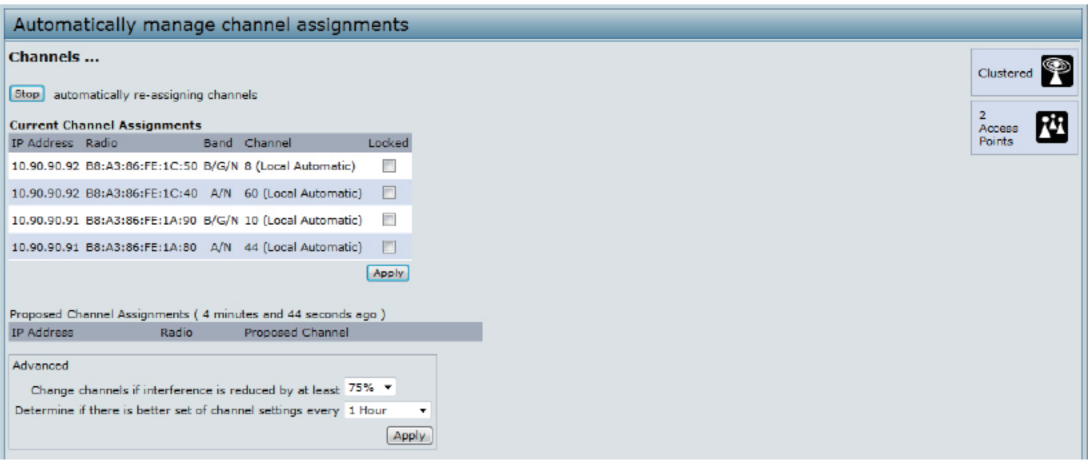
Click "Apply" to save the new settings.

Figure 72 - Clustering APs by Using the Web Interface (Passive)

2.) If clustering has started, click **Stop Clustering** so you can change the Clustering Options.
3.) Enter the AP location and the name of the cluster for it to join.
4.) Click **Apply**.

5.) Click **Start Clustering** to enable the clustering feature.
After you refresh the page, other APs that are on the same bridged segment, have radios in the same operating mode, are enabled for clustering, and have the same cluster name appear in the Access Points table.

6.) Go to the **Channel Management** page to view the channel assignments.



Automatically manage channel assignments

Channels ...

Stop automatically re-assigning channels

Current Channel Assignments

IP Address	Radio	Band	Channel	Locked
10.90.90.92	B8:A3:86:FE:1C:50	B/G/N	8 (Local Automatic)	□
10.90.90.92	B8:A3:86:FE:1C:40	A/N	60 (Local Automatic)	□
10.90.90.91	B8:A3:86:FE:1A:90	B/G/N	10 (Local Automatic)	□
10.90.90.91	B8:A3:86:FE:1A:80	A/N	44 (Local Automatic)	□

Apply

Proposed Channel Assignments (4 minutes and 44 seconds ago)

IP Address	Radio	Proposed Channel

Advanced

Change channels if interference is reduced by at least 75%

Determine if there is better set of channel settings every 1 Hour

Apply

Figure 73 - Clustering APs by Using the Web Interface (Active)

A table on the page displays the current channel assignments and the proposed channel assignments. The interval setting in the Advanced section determine how often proposed changes are applied.

Clustering APs by Using the CLI

1.) Connect to the AP by using Telnet, SSH, or a serial connection.

2.) Stop clustering so you can change the location and cluster name.

```
set cluster clustered 0
```

3.) Set the AP Location.

```
set cluster cluster-name “Room 214”
```

Note: If the cluster name or cluster location has spaces, you must enclose the text in quotation marks when you enter the text in the CLI, as the command example shows. You do not need to use quotation marks when you enter text by using the Web UI.

4.) Set the cluster name.

```
set cluster location MyCluster
```

5.) Start clustering.

```
set cluster clustered 1
```

6.) View information about the cluster settings on the AP.

```
get cluster detail
```

7.) Start the automatic channel planner.

```
set channel-planner status up
```

8.) View the settings for the automatic channel planner.

```
get channel-planner detail
```

Clustering APs by Using SNMP

Cluster configuration by using SNMP is not supported.

Configuring Client QoS

This example shows how to enable client QoS, configure an ACL and a DiffServ policy on the AP, and to apply the ACL and the Policy to traffic transmitted from clients associated with VAP 2 and received by the AP.

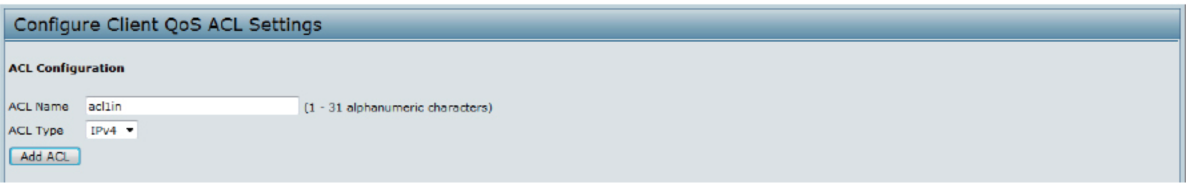
The IPv4 ACL is named acl1 and contains two rules. The first rule allows HTTP traffic from the 192.168.1.0 subnet. The second rule allows all IP traffic from the management station (192.168.1.23). All other traffic is denied due to the implicit deny all rule at the end of the ACL. The ACL is applied to the inbound interface on the AP so that packets are checked when the AP receives traffic from associated clients.

The DiffServ policy in this example shows how to establish default DiffServ behavior for clients associating with the VAP that do not obtain a DiffServ policy name through the RADIUS server. Voice traffic (UDP packets) received from clients in the 192.168.1.0 subnet that has the VoIP server as its destination address (192.168.2.200), is marked with the IP DSCP value for expedited forwarding so that it takes priority over other traffic.

Configuring QoS by Using the Web Interface

ACL Configuration

1.) Log onto the AP and navigate to the **Client QoS > Client QoS ACL** page.
2.) Enter *acl1in* the **ACL Name** field, and click **Add ACL**.



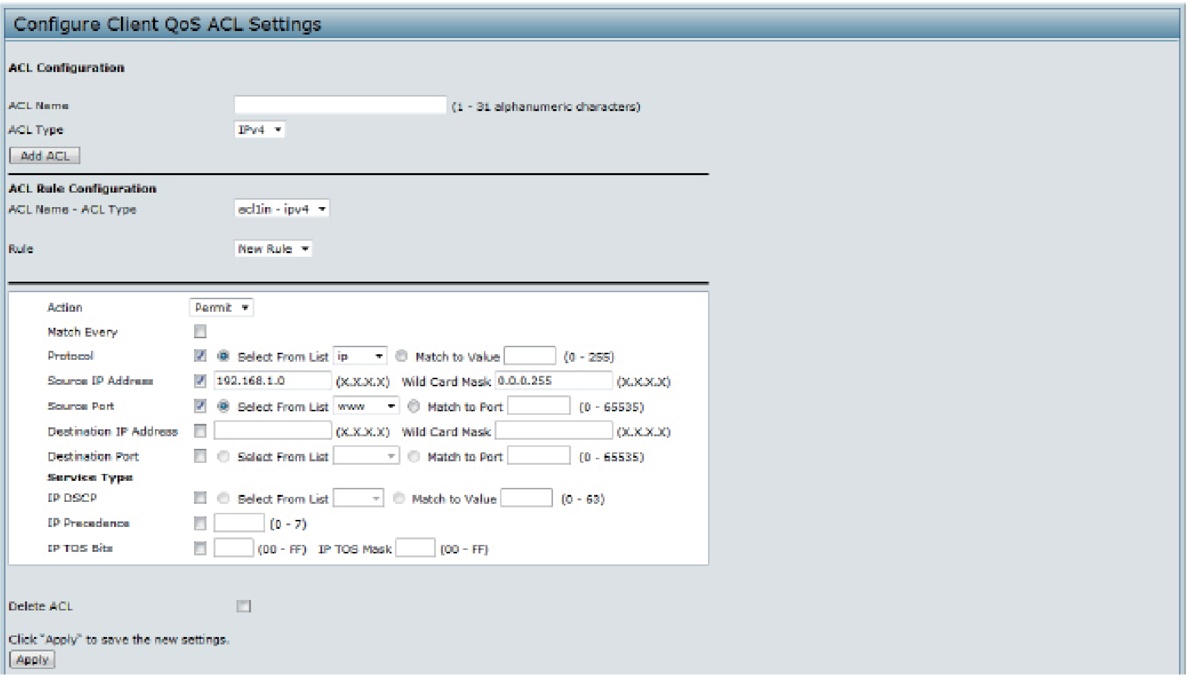
Configure Client QoS ACL Settings

ACL Configuration

ACL Name: acl1in (1 - 31 alphanumeric characters)
ACL Type: IPv4

Figure 74 - Configuring QoS by Using the Web Interface (ACL Name)

The screen refreshes, and additional fields appear.



Configure Client QoS ACL Settings

ACL Configuration

ACL Name: (1 - 31 alphanumeric characters)
ACL Type: IPv4

ACL Rule Configuration
ACL Name - ACL Type: acl1in - ipv4
Rule: New Rule

Action: Permit
Match Every: □
Protocol: ☑ ● Select From List: ip ○ Match to Value (0 - 255)
Source IP Address: ☑ 192.168.1.0 (X.X.X.X) Wild Card Mask 0.0.0.255 (X.X.X.X)
Source Port: ☑ ● Select From List: www ○ Match to Port (0 - 65535)
Destination IP Address: □ (X.X.X.X) Wild Card Mask (X.X.X.X)
Destination Port: □ ○ Select From List ○ Match to Port (0 - 65535)
Service Type
IP DSCP: □ ○ Select From List ○ Match to Value (0 - 63)
IP Precedence: □ (0 - 7)
IP TOS Bits: □ (00 - FF) IP TOS Mask (00 - FF)

Delete ACL: □

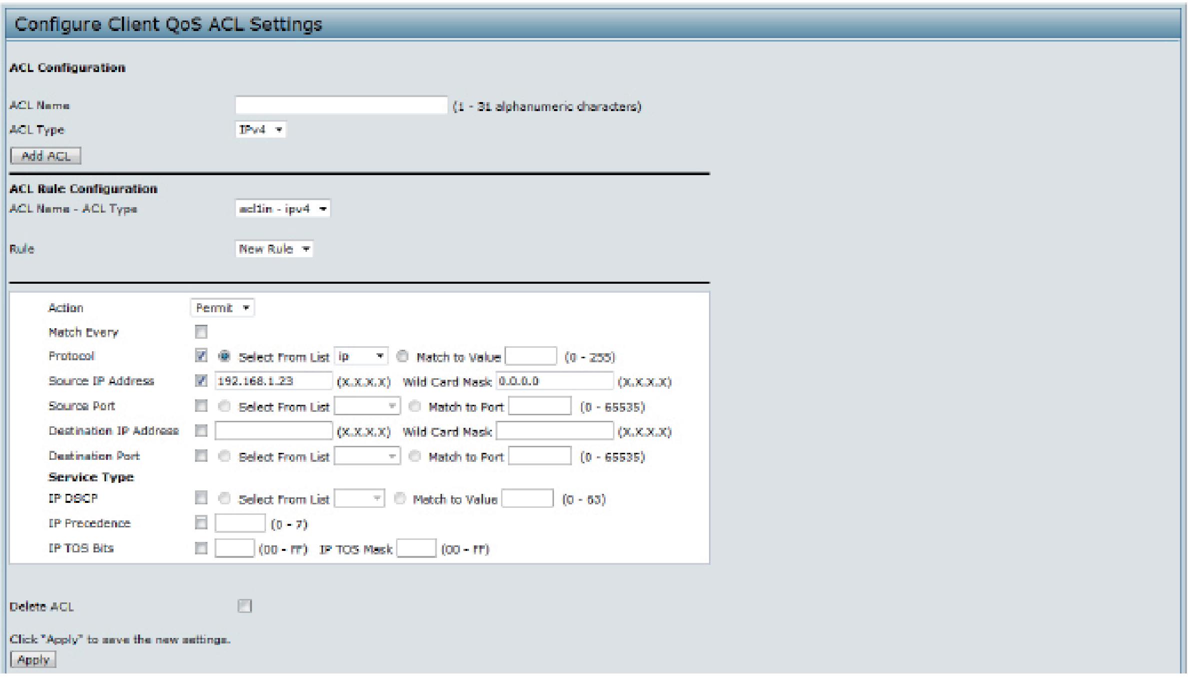
Click "Apply" to save the new settings.

Figure 75 - Configuring QoS by Using the Web Interface (Rule1)

3.) From the **Action** menu, select **Permit**.
4.) Clear the **Match Every** option.
5.) Verify that the **Protocol** option is selected and **IP** is selected from the **Select From List** menu.
6.) Configure the remaining settings:
  •) **Source IP Address**: 192.168.1.0

- **Wild Card Mask**: 0.0.0.255
- **Source Port**: Select the option
- **Select From List (Source Port)**: www

7.) Click **Apply** to save the rule.



Configure Client QoS ACL Settings

ACL Configuration

ACL Name [ ] (1 - 31 alphanumeric characters)

ACL Type IPv4

Add ACL

ACL Rule Configuration

ACL Name - ACL Type acl1in - ipv4

Rule New Rule

Action Permit

Match Every □

Protocol ☑ ● Select From List ip ○ Match to Value [ ] (0 - 255)

Source IP Address ☑ 192.168.1.23 (X.X.X.X) Wild Card Mask 0.0.0.0 (X.X.X.X)

Source Port □ ○ Select From List [ ] ○ Match to Port [ ] (0 - 65535)

Destination IP Address □ [ ] (X.X.X.X) Wild Card Mask [ ] (X.X.X.X)

Destination Port □ ○ Select From List [ ] ○ Match to Port [ ] (0 - 65535)

Service Type

IP DSCP □ ○ Select From List [ ] ○ Match to Value [ ] (0 - 63)

IP Precedence □ [ ] (0 - 7)

IP TOS Bits □ [ ] (00 - FF) IP TOS Mask [ ] (00 - FF)

Delete ACL □

Click "Apply" to save the new settings.

Apply

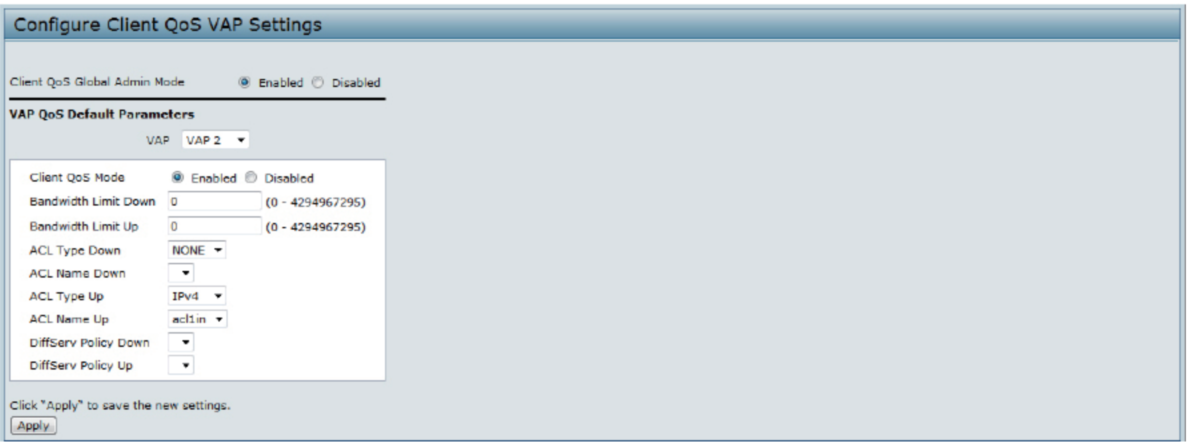
Figure 76 - Configuring QoS by Using the Web Interface (Rule2)

8.) Select **New Rule** from the **Rule** menu and create another rule with the following settings:

- **Action**: Permit
- **Match Every**: Clear the option
- **Protocol**: IP
- **Address**: 192.168.1.23
- **Wild Card Mask**: 0.0.0.0

9.) Click **Apply** to save the rule.

10.) Navigate to the **Client QoS > VAP QoS Parameters** page.



Configure Client QoS VAP Settings

Client QoS Global Admin Mode ● Enabled ○ Disabled

VAP QoS Default Parameters

VAP VAP 2

Client QoS Mode ● Enabled ○ Disabled

Bandwidth Limit Down 0 (0 - 4294967295)

Bandwidth Limit Up 0 (0 - 4294967295)

ACL Type Down NONE

ACL Name Down

ACL Type Up IPv4

ACL Name Up acl1in

DiffServ Policy Down

DiffServ Policy Up

Click "Apply" to save the new settings.

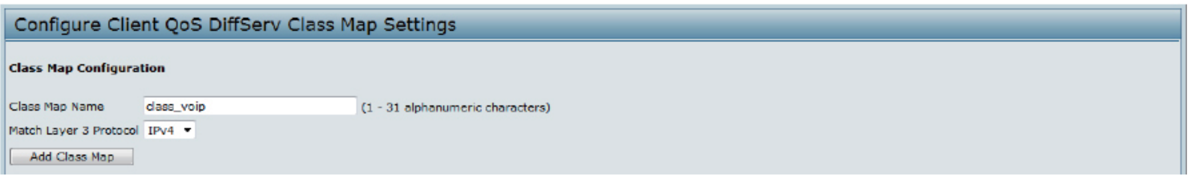
Apply

Figure 77 - Configuring QoS by Using the Web Interface (VAP QoS Parameters)

11.) For the **Client QoS Global Admin Mode** option, select **Enabled**.
12.) From the **VAP** menu, select **VAP 2**.
13.) Select the **Enabled** option for **Client QoS Mode**.
14.) From the **ACL Type Up** menu, select **IPv4**.
15.) From the **ACL Name Up** menu, select *acl1in*.
16.) Click **Apply** to update the AP with the QoS settings.

DiffServ Configuration

1.) Log onto the AP and navigate to the **Client QoS > Class Map** page.



Configure Client QoS DiffServ Class Map Settings

Class Map Configuration

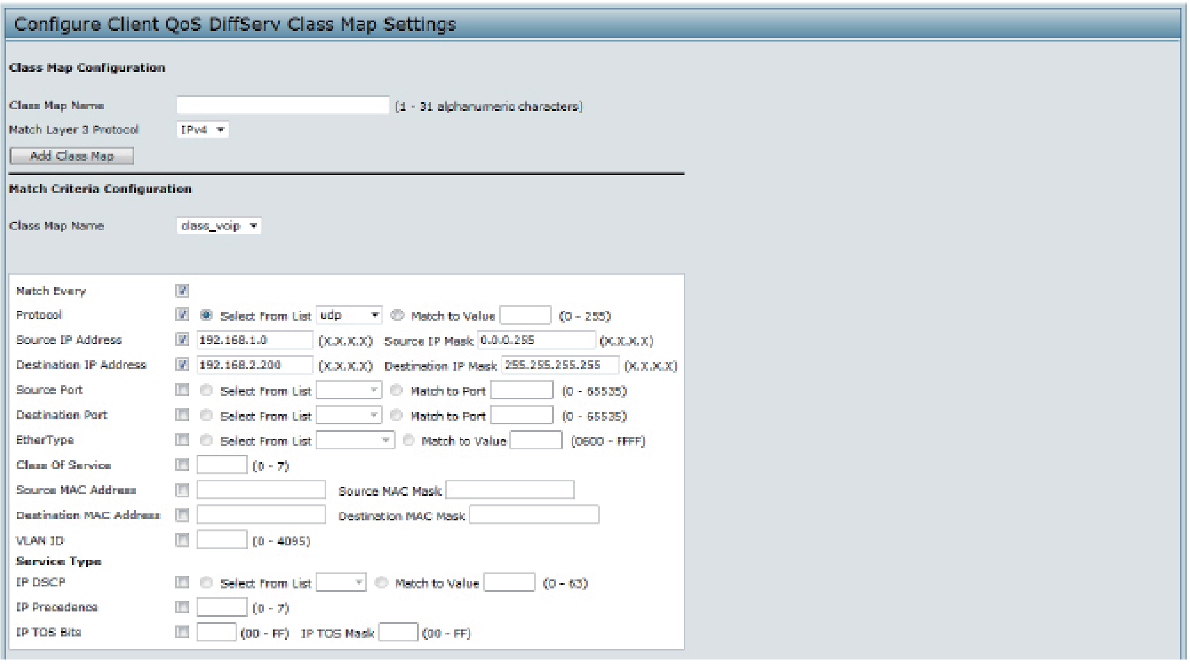
Class Map Name: class_voip (1 - 31 alphanumeric characters)

Match Layer 3 Protocol: IPv4

Figure 78 - Configuring QoS by Using the Web Interface (Class Map Name)

2.) Enter *class_voip* in the **Class Map Name** field and click **Add Class Map**.

The page refreshes and additional fields appear.



Configure Client QoS DiffServ Class Map Settings

Class Map Configuration

Class Map Name: (1 - 31 alphanumeric characters)

Match Layer 3 Protocol: IPv4

Match Criteria Configuration

Class Map Name: class_voip

Match Every ☑

Protocol ☑ ● Select From List udp ○ Match to Value (0 - 255)

Source IP Address ☑ 192.168.1.0 (X.X.X.X) Source IP Mask 0.0.0.255 (X.X.X.X)

Destination IP Address ☑ 192.168.2.200 (X.X.X.X) Destination IP Mask 255.255.255.255 (X.X.X.X)

Source Port □ ○ Select From List ○ Match to Port (0 - 65535)

Destination Port □ ○ Select From List ○ Match to Port (0 - 65535)

EtherType □ ○ Select From List ○ Match to Value (0600 - FFFF)

Class Of Service □ (0 - 7)

Source MAC Address □ Source MAC Mask

Destination MAC Address □ Destination MAC Mask

VLAN ID □ (0 - 4095)

Service Type

IP DSCP □ ○ Select From List ○ Match to Value (0 - 63)

IP Precedence □ (0 - 7)

IP TOS Bits □ (00 - FF) IP TOS Mask (00 - FF)

Figure 79 - Configuring QoS by Using the Web Interface (Rule)

3.) Select the **Match Every** option to indicate that all match criteria defined for the class must be satisfied in order for a packet to be considered a match.

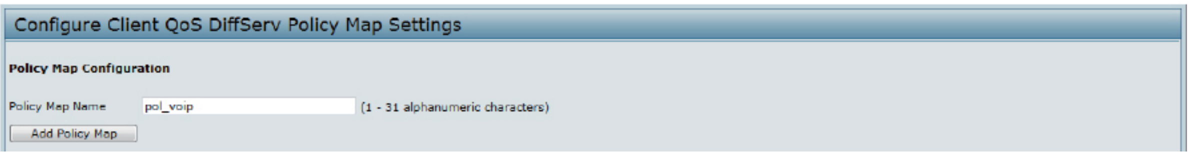
4.) Select **Protocol**, and then select **UDP** from the **Select From List** field to define UDP as a match criteria.

5.) Select **Source IP Address** and enter the following information:
•) Address: 192.168.1.0
•) Source IP Mask: 255.255.255.0

6.) Select the **Destination IP Address** option and enter the following information for the VoIP server:
•) Address: 192.168.2.200
•) Destination IP Mask: 255.255.255.255

7.) Click **Apply** to save the match criteria.

8.) Navigate to the **Client QoS > Policy Map** page.



Configure Client QoS DiffServ Policy Map Settings

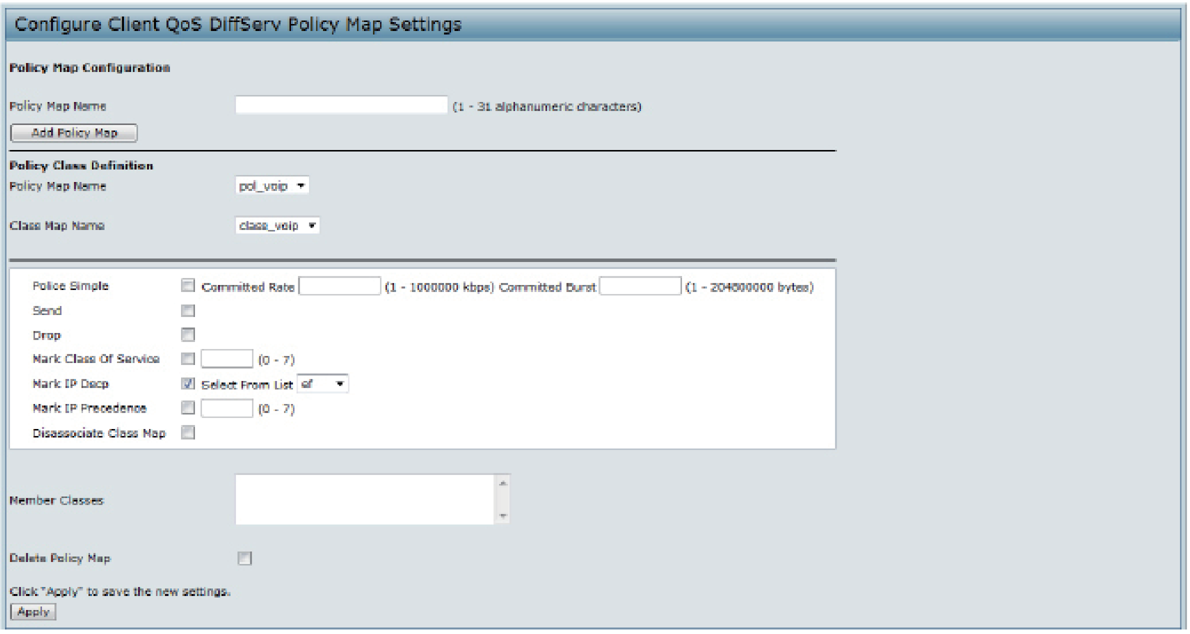
Policy Map Configuration

Policy Map Name: pol_voip (1 - 31 alphanumeric characters)

Figure 80 - Configure Client QoS DiffServ Policy Map Settings (Policy Map Name)

9.) To create a policy, enter *pol_voip* into the **Policy Map Name** field, and then click **Add Policy Map**.

The page refreshes and additional fields appear.



Configure Client QoS DiffServ Policy Map Settings

Policy Map Configuration

Policy Map Name (1 - 31 alphanumeric characters)

Add Policy Map

Policy Class Definition

Policy Map Name: pol_voip

Class Map Name: class_voip

Police Simple □ Committed Rate (1 - 1000000 kbps) Committed Burst (1 - 204800000 bytes)

Send □

Drop □

Mark Class Of Service □ (0 - 7)

Mark IP Dscp ☑ Select From List: ef

Mark IP Precedence □ (0 - 7)

Disassociate Class Map □

Member Classes

Delete Policy Map □

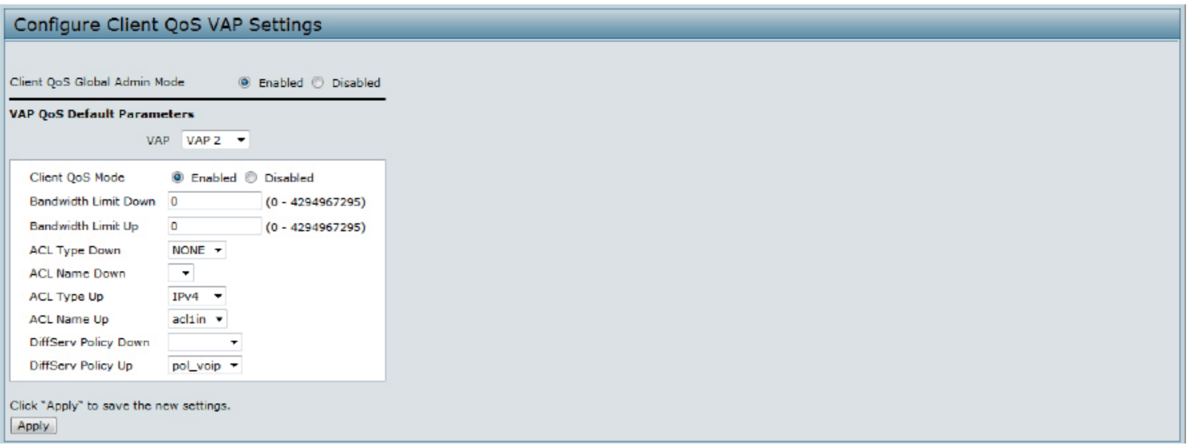
Click "Apply" to save the new settings.

Apply

Figure 81 - Configure Client QoS DiffServ Policy Map Settings (Rule)

10.) For the *class_voip* **Class Map**, select the **Mark IP Dscp** option, and then select **ef** from the **Select From List** menu.
11.) Traffic that meets the criteria defined in the *class_voip* class is marked with a DSCP value of EF (expedited forwarding).
12.) Click **Apply** to save the policy.

13.) Navigate to the **Client QoS > VAP QoS Parameters** page.



Configure Client QoS VAP Settings

Client QoS Global Admin Mode ● Enabled ○ Disabled

VAP QoS Default Parameters

VAP: VAP 2

Client QoS Mode ● Enabled ○ Disabled

Bandwidth Limit Down: 0 (0 - 4294967295)

Bandwidth Limit Up: 0 (0 - 4294967295)

ACL Type Down: NONE

ACL Name Down:

ACL Type Up: IPv4

ACL Name Up: acl1in

DiffServ Policy Down:

DiffServ Policy Up: pol_voip

Click "Apply" to save the new settings.

Apply

Figure 82 - Configure Client QoS VAP Settings

14.) Select **VAP 2** from the **VAP** menu.
15.) Make sure that the **Client QoS Global Admin Mode** and the **QoS Mode** are both enabled.
16.) From the **DiffServ Policy Up** menu, select *pol_voip*.
17.) Click **Apply** to update the AP with the QoS settings.

Configuring QoS by Using the CLI

ACL Configuration

1.) Connect to the AP.
2.) Create an ACL named acl1.
```
add acl acl1 acl-type ipv4
```
3.) Add a rule to acl1 that allows HTTP traffic from the 192.168.1.0 subnet.
```
add rule acl-name acl2 acl-type ipv4 action permit protocol ip src-ip 192.168.1.0 src-ip-
mask 0.0.0.255 src-port http
```

4.) Add another rule to acl1 that allows all traffic from the host with an IP address of 192.168.1.23.
```
add rule acl-name acl2 acl-type ipv4 action permit protocol ip src-ip 192.168.1.23 src-ip-mask 0.0.0.0
```
5.) Enable Client QoS on the AP.
```
set client-qos mode up
```
6.) Enable Client QoS on VAP2
```
set vap wlan0vap2 qos-mode up
```
7.) Apply acl1 to VAP2 in the inbound direction (from the client to the AP).
```
set vap wlan0vap2 def-acl-up acl1
```

DiffServ Configuration

1.) Log onto the AP CLI.
2.) Create a class map named class_voip and configure it to match all UDP packets from the 192.168.1.0 network that have a destination IP address of 192.168.2.200 (the VoIP server).
```
add class-map class_voip every yes protocol udp src-ip 192.168.1.0 src-ip-mask 255.255.255.0
dst-ip 192.168.2.200 dst-ip-mask 255.255.255.255
```
3.) Add a policy map named pol_voip.
```
add policy-map pol_voip
```
4.) Define the pol_voip policy map by adding the class_voip class map and specifying that packets that match the class_voip criteria will be marked with a DSCP value of EF (expedited forwarding).
```
add policy-attr policy-map-name pol_voip class-map-name class_voip mark-ip-dscp ef
```
5.) Enable Client QoS on the AP.
```
set client-qos mode up
```
6.) Enable Client QoS on VAP2
```
set vap wlan0vap2 qos-mode up
```
7.) Apply pol_voip to VAP2 in the inbound direction (from the client to the AP).
```
set vap wlan0vap2 def-policy-up pol_voip
```
Configuring QoS by Using SNMP

ACL Configuration

1.) Load the DLINK-WLAN-ACCESS-POINT-X600-MIB module.
2.) From the MIB tree, navigate to the objects in the apQos > apAclTable.
3.) Use the apQosAclStatus object to create a row entry with apQosAclName and apQosAclType as the indexes for apQosAclEntry.

The new apQosAclEntry value includes the apQosAclType (1) followed by the number of characters in the name (4), and then the ASCII code for the name. In this example, acl1 is 97.99.108.49. The value to set is 4, which is Create and Go.

4.) Add a rule to acl1 that allows HTTP traffic from the 192.168.1.0 subnet.
- •) Use 1.3.6.1.4.1.171.10.128.1.1.26.10.3.1.**14.1.4.97.99.108.49.1** to set the apQosAclRuleStatus of Rule 1 to active (1)
  In the OID, the **14** (bold) is the sequence identifier for the apQosAclRuleStatuss object, **1** is the ACL type, **4.97.99.108.49** is the ACL name (the number of characters followed by the ASCII code), and the final **1** is the ACL rule number.
- •) Use 1.3.6.1.4.1.171.10.128.1.1.26.10.3.1.4.1.4.97.99.108.49.1 to set the apQosAclRuleSrcIpAddress to a value of 192.168.1.0.
- •) Use 1.3.6.1.4.1.171.10.128.1.1.26.10.3.1.5.1.4.97.99.108.49.1 to set the apQosAclRuleSrcIpMask to a value of 0.0.0.255.
- •) Use 1.3.6.1.4.1.171.10.128.1.1.26.10.3.1.3.1.4.97.99.108.49.1 to set apQosAclRuleProtocol to a value of 80 (HTTP).
- •) Use 1.3.6.1.4.1.171.10.128.1.1.26.10.3.1.16.1.4.97.99.108.49.1 to set apQosAclRuleCommit to a value of 1 (true), which saves the rule.

5.) Add another rule to acl1 that allows all traffic from the host with an IP address of 192.168.1.23.
- •) Use 1.3.6.1.4.1.171.10.128.1.1.26.10.3.1.14.1.4.97.99.108.49.2 to set the apQosAclRuleStatus of Rule 2 to active (1)
- •) Use 1.3.6.1.4.1.171.10.128.1.1.26.10.3.1.4.1.4.97.99.108.49.2 to set the apQosAclRuleSrcIpAddress to a value of 192.168.1.23.
- •) Use 1.3.6.1.4.1.171.10.128.1.1.26.10.3.1.5.1.4.97.99.108.49.2 to set the apQosAclRuleSrcIpMask to a value of 0.0.0.0.

- •) Use 1.3.6.1.4.1.171.10.128.1.1.26.10.3.1.16.1.4.97.99.108.49.2 to set apQosAclRuleCommit to a value of 1 (true), which saves the rule.

6.) Use the apQosGlobalMode object to set the status to up (1), which enables Client QoS on the AP.
7.) Walk the apVapDescription object to view the instance ID for VAP 2 (wlan0vap2).
VAP 2 on Radio 1 is instance 5.
8.) Use the apVapQosMode object to set the status of VAP 2 to up (1).
9.) Use the apVapAclUp object to apply acl1 to VAP2 in the inbound direction (from the client to the AP).
The ACL name is the text string, and not the ASCII code.

DiffServ Configuration

1.) Load the DLINK-WLAN-ACCESS-POINT-X600-MIB module.
2.) From the MIB tree, navigate to the objects in the apQos > apAclTable.
3.) Use the apQosDsClassMapStatus object to set the status of the class map named class_voip to Create and Go (4).
The OID to set is 1.3.6.1.4.1.171.10.128.1.1.26.10.4.1.3.10.**99.108.97.115.115.95.118.111.105.112**, where 10 is the number of characters, and **99.108.97.115.115.95.118.111.105.112** is class_voip in ASCII code.
4.) Configure class_voip to match all UDP packets from the 192.168.1.0 network that have a destination IP address of 192.168.2.200 (the VoIP server).
•) Set apQosDsClassMapMatchEvery to true (1).
•) Set apQosDsClassMapMatchProtocol to UDP (17).
•) Set apQosDsClassMapMatchSrcIpAddress to 192.168.1.0.
•) Set apQosDsClassMapMatchSrcIpMask to 255.255.255.0.
•) Set apQosDsClassMapMatchDestIpAddress to 192.168.2.200.
•) Set apQosDsClassMapMatchDestIpMask to 255.255.255.255
•) Set apQosDsClassMapMatchCommit to true (1).
5.) Create a policy map named pol_voip (which is **112.111.108.95.118.111.105.112** in ASCII) by setting the value of the OID 1.3.6.1.4.1.171.10.128.1.1.26.10.5.1.2.8.**112.111.108.95.118.111.105.112** to Create and Go (4).
6.) Define the pol_voip policy map by adding the class_voip class map and specifying that packets that match the class_voip criteria will be marked with a DSCP value of EF (expedited forwarding).
•) Set apQosDsPolicyMapAttrStatus.8.112.111.108.95.118.111.105.112.10.99.108.97.115.115.95.118.111.105.112.1 to a value of 4 (Create and Go)
•) Set apQosDsPolicyMapAttrMarkIpDscp.8.112.111.108.95.118.111.105.112.10.99.108.97.115.115.95.118.111.105.112.1 to 46 (which is the equivalent of ef).
7.) Enable Client QoS on the AP.

```
set client-qos mode up
```

8.) Use the apQosGlobalMode object to set the status to up (1), which enables Client QoS on the AP.
9.) Walk the apVapDescription object to view the instance ID for VAP 2 (wlan0vap2).
VAP 2 on Radio 1 is instance 5.
10.) Use the apVapQosMode object to set the status of VAP 2 to up (1).
11.) Use the apVapPolUp object to apply pol_voip to VAP2 in the inbound direction (from the client to the AP).

The policy name is the text string, and not the ASCII code.

Appendix C - DWL-6700AP Profile and Configuration Table

DWL-6700AP doesn't support some features like, IEEE 802.1X Authentication, CLI command (no console port supported), TSPEC etc…, details please see the following table.

Radio Configuration	DWL-6700AP	DWL-6600AP
Radio mode	Yes	Yes
Radio configuration state	Yes	Yes
RTS threshold	Yes	Yes
Load Balancing	NO	Yes
Load Utilization	NO	Yes
Maximum Clients	Yes	Yes
RF Scan Other Channels	NO	Yes
RF Scan Sentry	NO	Yes
Mode	Yes	Yes
DTIM Period	Yes	Yes
Beacon Interval	Yes	Yes
Automatic Channel	Yes	Yes
Automatic Power	Yes	Yes
Initial Power	Yes	Yes
APSD mode	NO	Yes
RF Scan Interval (secs)	Yes	Yes
Frag Threshold (bytes)	Yes	Yes
RF Scan Sentry Channels	NO	Yes
Radio Configuration	DWL-6700AP	DWL-6600AP
Short Retries	NO	Yes
RF Scan Duration (msecs)	Yes	Yes
Long Retries	NO	Yes
Rate Limiting	NO	Yes
Transmit Lifetime (msecs)	NO	Yes
Rate Limit (pkts/sec)	NO	Yes
Receive Lifetime (msecs)	NO	Yes
Rate Limit Burst (pkts/sec)	NO	Yes
Station Isolation	Yes	Yes
Channel Bandwidth	Yes	Yes
Primary Channel	Yes	Yes
Protection	Yes	Yes
Short Guard Interval	Yes	Yes
Space Time Block Code	NO	Yes
Radio Resource Management	NO	Yes
NO ack	NO	Yes
Multicast TX rate (Mbps)	Yes	Yes
Network Configuration	DWL-6700AP	DWL-6600AP
SSID	Yes	Yes
Hide SSID	Yes	Yes
Ignore Broadcst	Yes	Yes
VLAN	Yes	Yes

MAC Authentication	**Yes**	**Yes**
Redirect	**NO**	**Yes**
Redirect URL	**NO**	**Yes**
Wireless ARP Suppression Mode	**NO**	**Yes**
L2 Distributed Tunneling Mode	**NO**	**Yes**
RADIUS Autentication Server Name	**NO**	**Yes**
RADIUS Autentication Server Status	**NO**	**N/A**
RADIUS Accounting Server Name	**NO**	**Yes**
RADIUS Accounting Server Status	**NO**	**N/A**
RADIUS Use Network Configuraiton	**NO**	**Yes**
RADIUS Accounting	**NO**	**Yes**
Security	**Yes**	**Yes**
WPA Versions	**Yes**	**Yes**
WPA Ciphers	**Yes**	**Yes**
Network Configuration	**DWL-6700AP**	**DWL-6600AP**
WPA Key Type	**Yes**	**Yes**
WPA Key	**Yes**	**Yes**
Bcast Key Refresh Rate (seconds)	**NO**	**Yes**
WDS Configuration	**DWL-6700AP**	**DWL-6600AP**
ACK Timer Value (Standalone mode)	**Yes**	**NO**
Others	**DWL-6700AP**	**DWL-6600AP**
Turn Off all LEDs via GUI (Standalone mode)	**Yes**	**NO**

Federal Communication Commission Interference Statement

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

FCC Caution:

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

Non-modification Statement:

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Industry Canada Statement

This device complies with RSS-247 of Industry Canada
Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.
The device for operation in the band 5150-5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems. The maximum antenna gain permitted for devices in the band 5725-5825 MHz shall comply with the e.i.r.p. limits specified for point-topoint and non point-to-point operation as appropriate.
IC Radiation Exposure Statement
This equipment complies with IC RSS-102 radiation exposure limit set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

Avis d'industrie Canada
Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence.
L'exploitation est autorisée aux deux conditions suivantes:
(1) l'appareil ne doit pas produire de brouillage, et, and
(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.
Les dispositifs fonctionnant dans la bande 5150-5250 MHz sont réservés uniquement pour une utilisation à l'intérieur afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les mêmes canaux. Le gain maximal d'antenne permis (pour les dispositifs utilisant la bande 5725-5825 MHz) doit se conformer à la limite de p.i.r.e. spécifiée pour l'exploitation point à point et non point à point, selon le cas.

Déclaration d'exposition à la radiation : Cet équipement respecte les limites d'exposition aux rayonnements IC définies pour un environnement non contrôlé. Cet équipement doit être installé et mis en marche à une distance minimale de 20 cm qui sépare l'élément rayonnant de votre corps.
L'émetteur ne doit ni être utilisé avec une autre antenne ou un autre émetteur ni se trouver à leur proximité.

一般設備**(低功率電波輻射性電機管理辦法第12、14條)**
--- 經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率，加大功率或變更原設計之特性及功能。

--- 低功率射頻電機之使用不得影響飛航安全及干擾合法通信：經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。
前項合法通信，指依電信法規定作業之無線電通信低功率射頻電機需忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

--本產品使用時建議應至少距離人體 20cm;電磁波曝露量MPE標準值1mW/c㎡，送測產品實測值為0.3331 mW/cm2.