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.

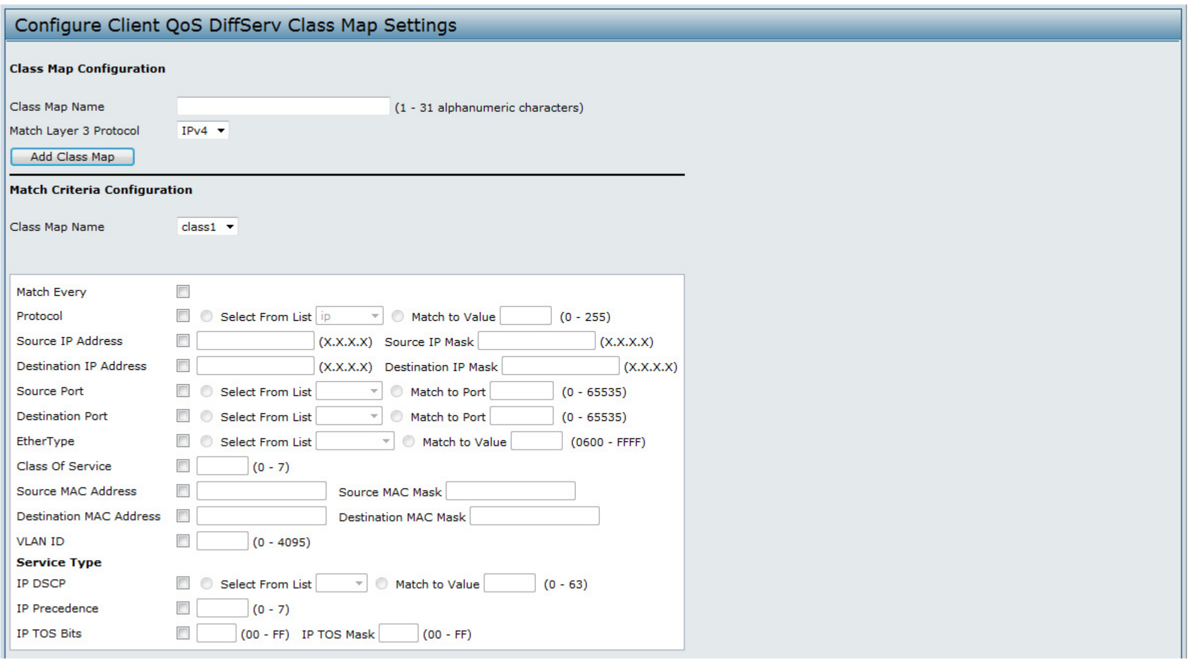
Packets are classified and processed based on defined criteria. The classification criteria is defined by a class. The processing is defined by a policy's attributes. Policy attributes may be defined on a per-class instance basis, and it is these attributes that are applied when a match occurs. A policy 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

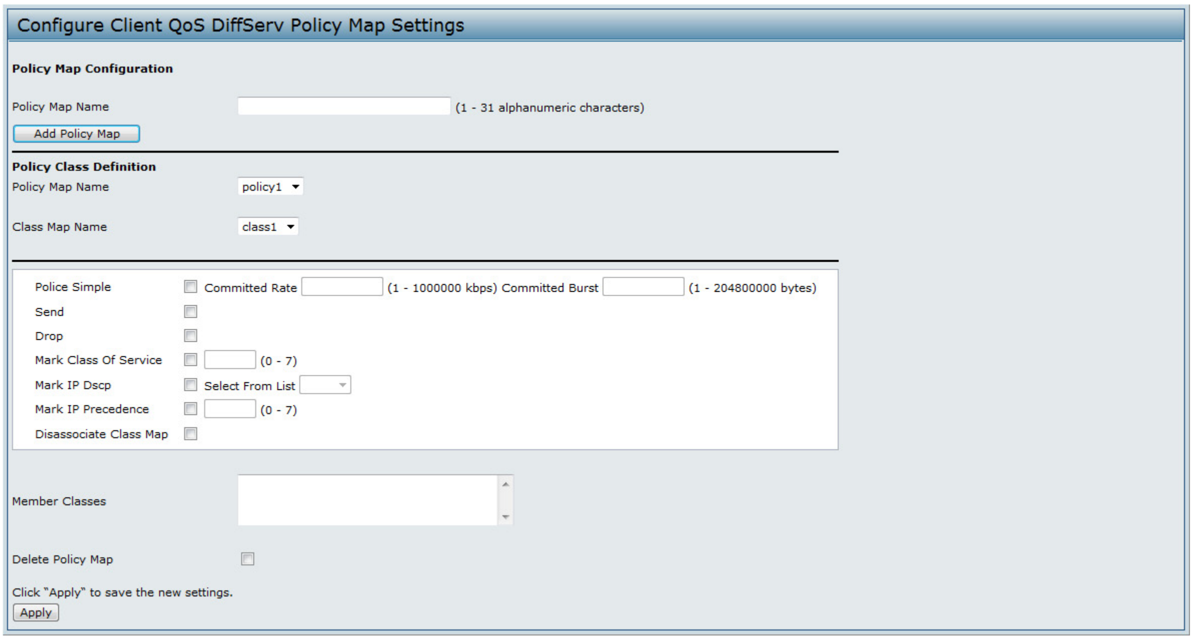
Use the **Policy Map** page to create DiffServ policies and to associate a collection of classes with one or more policy statements.

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)

Add Policy Map

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.

Apply

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.

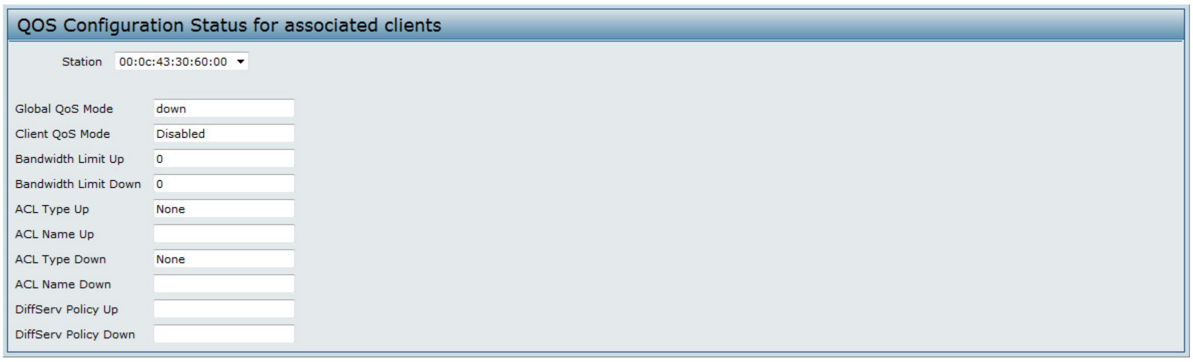
Table 55 - DiffServ Policy Map

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.

Clustering APs

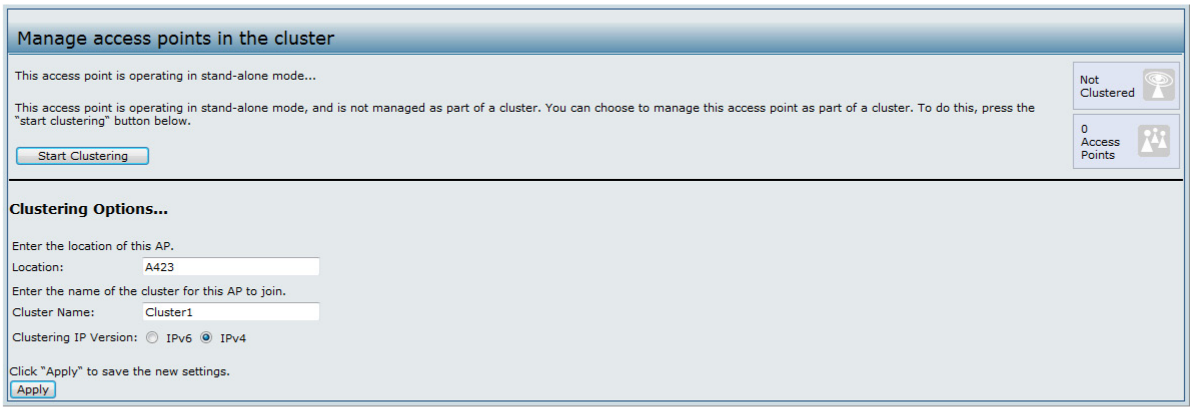
Only identical models may be clustered together. For example, the DWL-2600AP can only form a cluster with other DWL-2600APs.

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.

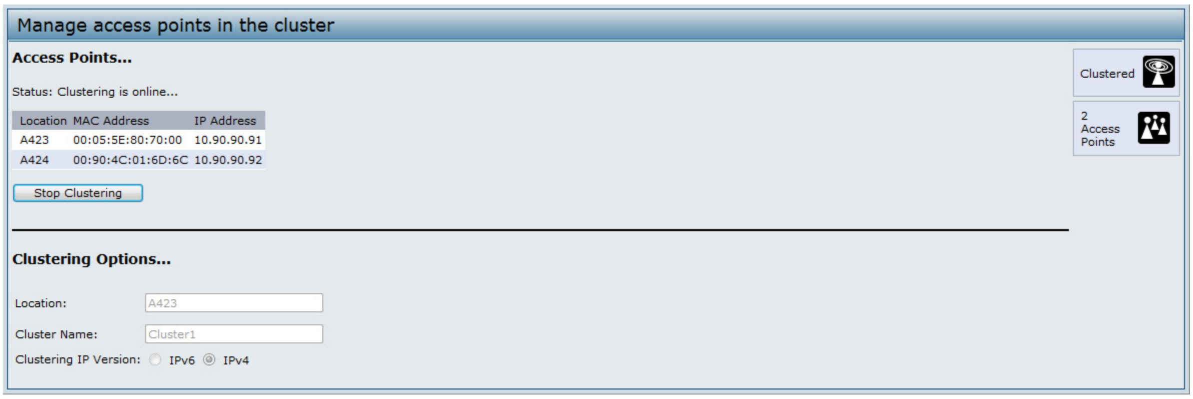
Cluster Name: Cluster1

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

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

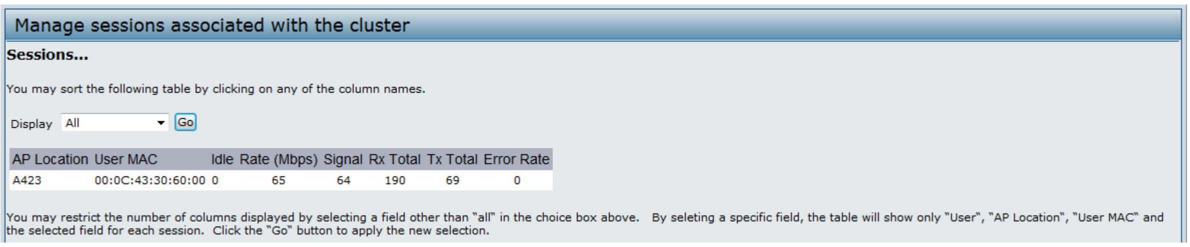
The **Sessions** page shows information about client stations associated with access points in the cluster. Each client is identified by its MAC address, along with the AP (location) to which it is currently connected.

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.

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

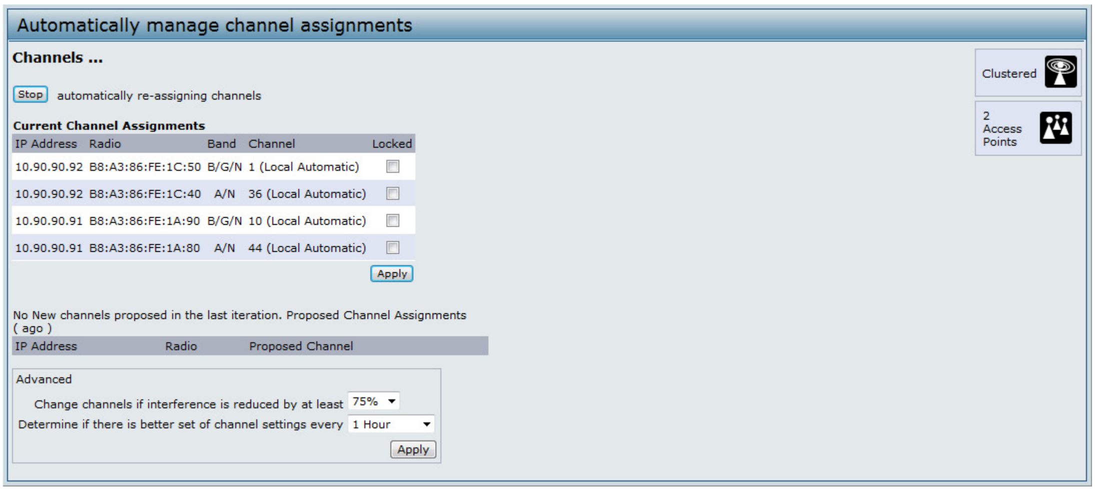
When Channel Management is enabled, the UAP automatically assigns radio channels used by clustered access points. The automatic channel assignment reduces mutual interference (or interference with other access points outside of its cluster) and maximizes Wi-Fi bandwidth to help maintain the efficiency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



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	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)	□

Apply

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

Apply

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.

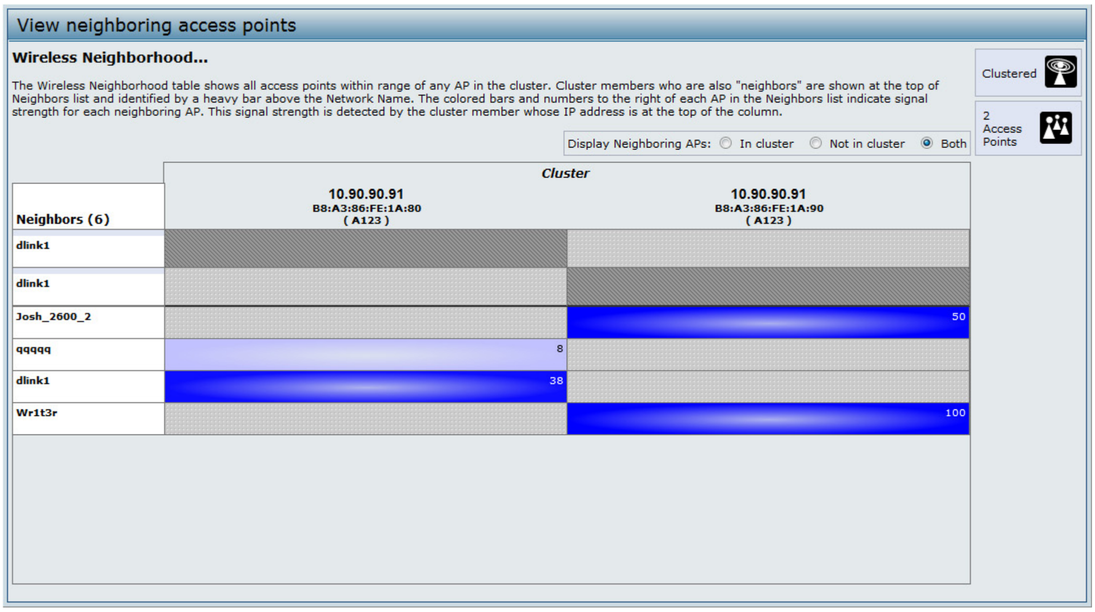
For each neighbor access point, the Wireless Neighborhood view shows identifying information (SSID or Network Name, IP Address, MAC address) along with radio statistics (signal strength, channel, beacon interval). You can click on an AP to get additional statistics about the APs in radio range of the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

Clustered

2 Access Points

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

	Cluster	
Neighbors (6)	10.90.90.91 B8:A3:86:FE:1A:80 (A123)	10.90.90.91 B8:A3:86:FE:1A:90 (A123)
dlink1		
dlink1		
Josh_2600_2		50
qqqqq	8	
dlink1	38	
Wr1t3r		100

Figure 67 - View Neighboring Access Points

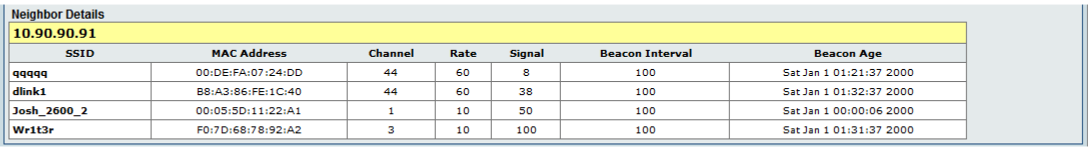
The following table describes details about the Wireless Neighborhood information.

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-8600AP: 1.3.6.1.4.1.171.10.37.29.1.26
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

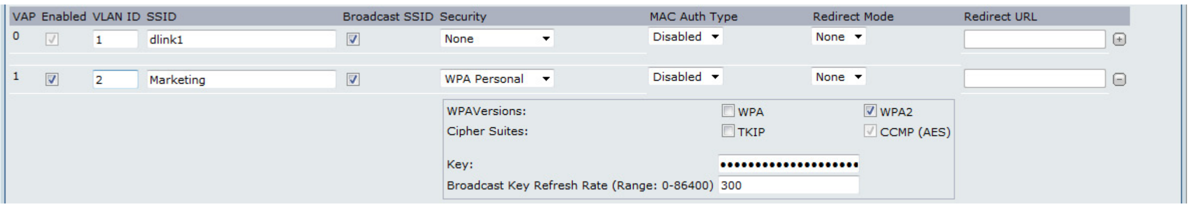
Configuring a VAP

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).

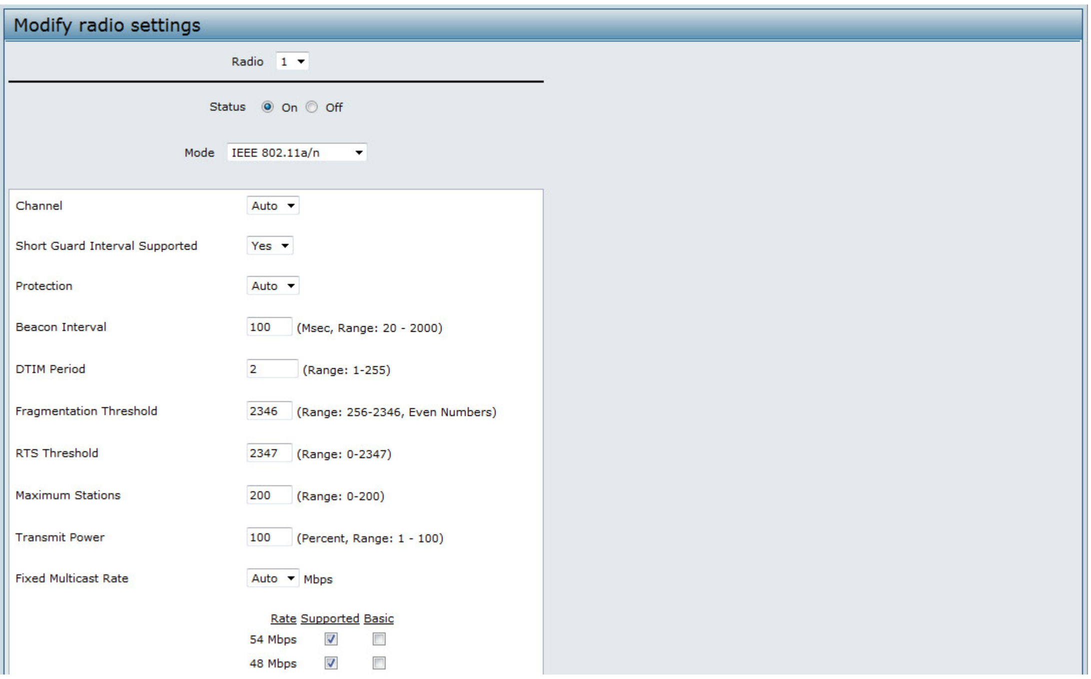
Configuring Radio Settings

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.

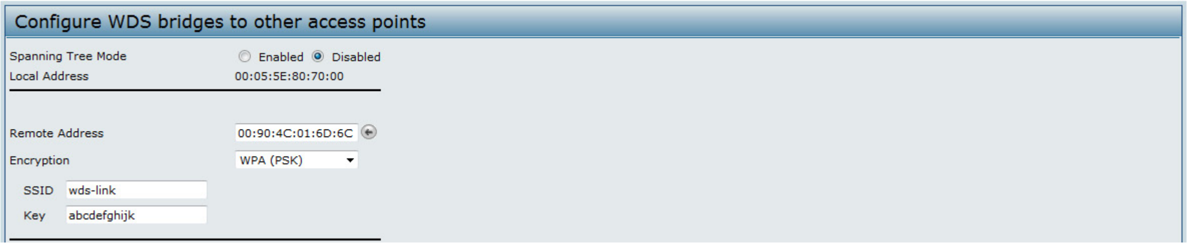
Configuring the Wireless Distribution System

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

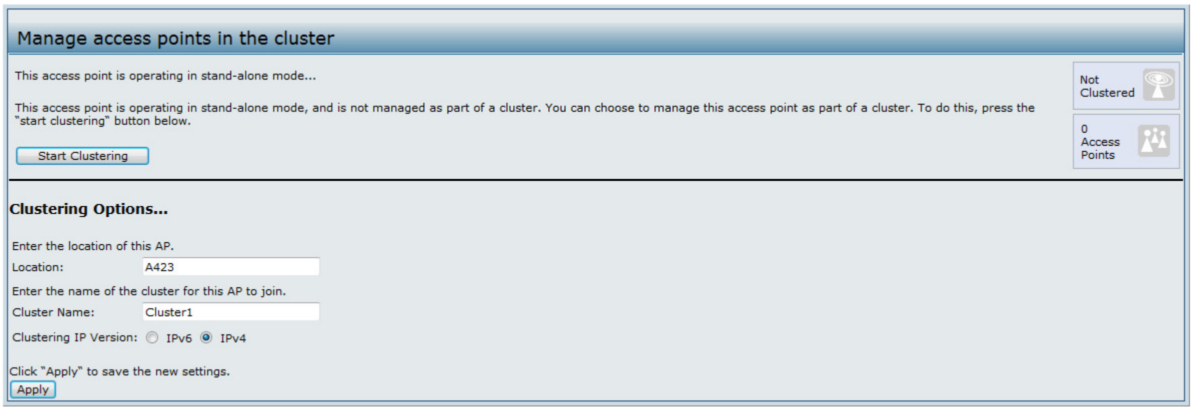
1.) Load the DLINK-WLAN-ACCESS-POINT-X600-MIB module.
2.) From the MIB tree, navigate to the objects in the apIfConfig table.
3.) Walk the apIfConfigName object to view the instance ID for the first WDS link (wlan0wds0).
The first WDS link is instance 1.
4.) Set the value of instance 1 in the apIfConfigRemoteMac 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

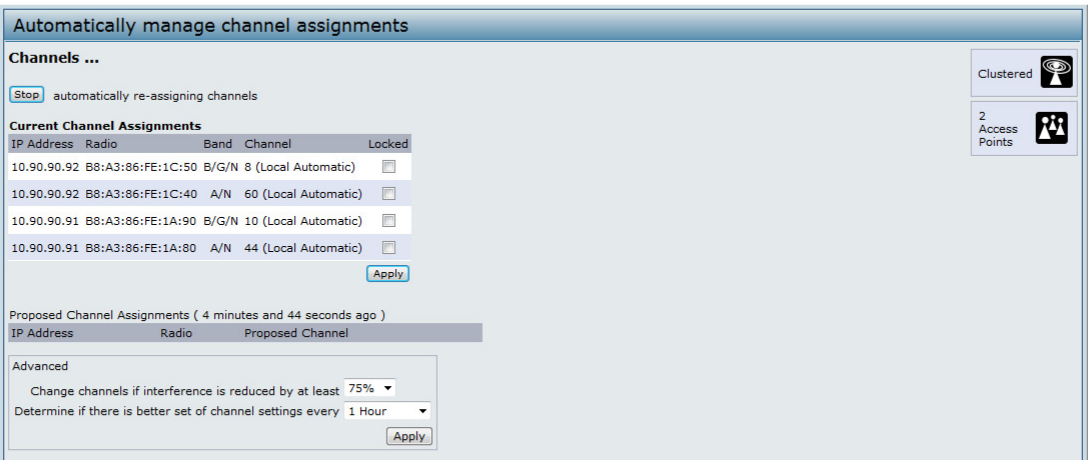
Click "Apply" to save the new settings.

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 ...

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)	□

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

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.

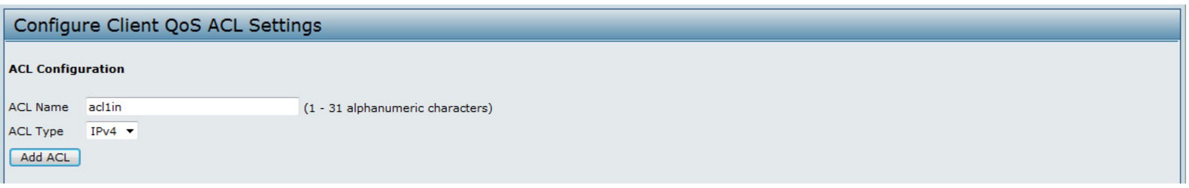
The IPv4 ACL is named acl1 and contains two rules. The first rule allows HTTP traffic from the 192.168.1.0 subnet. The second rule allows all IP traffic from the management station (192.168.1.23). All other traffic is denied due to the implicit deny all rule at the end of the ACL. The ACL is applied 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

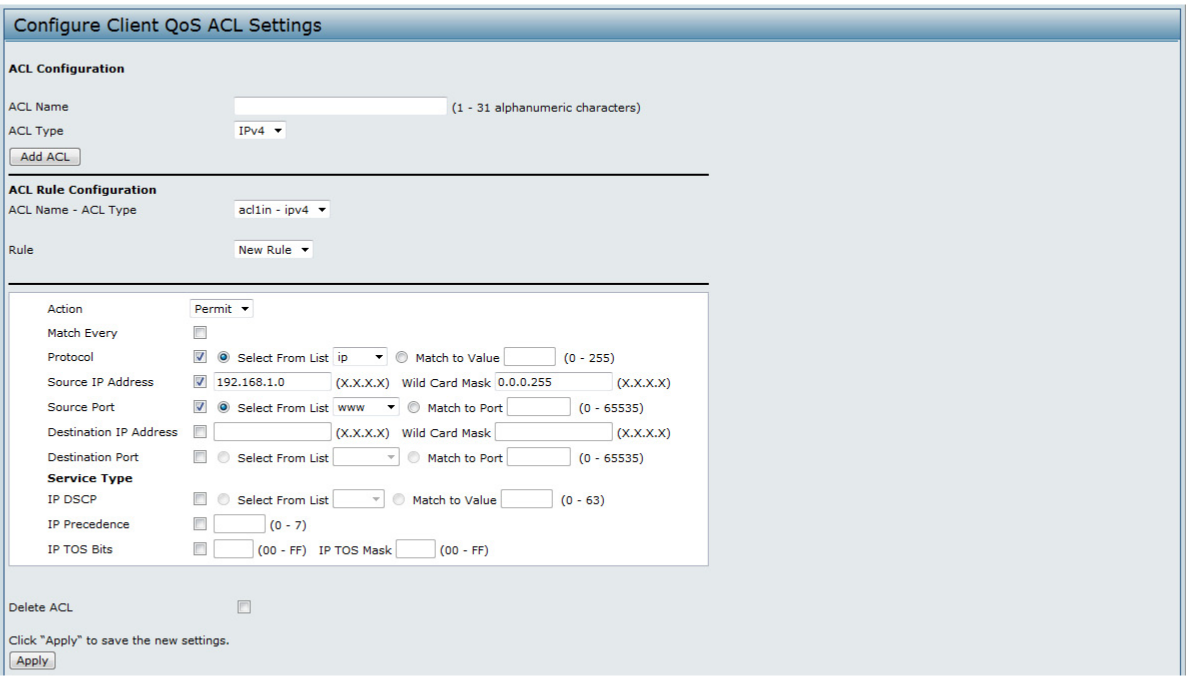
ACL Configuration

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 □

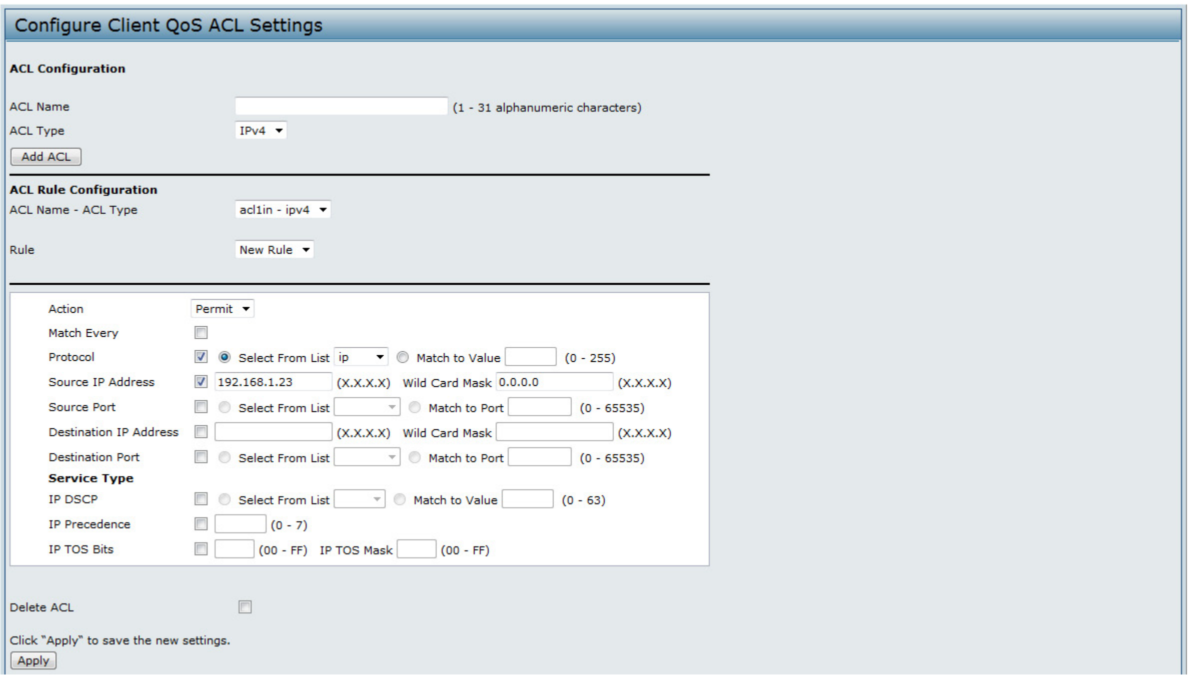
Click "Apply" to save the new settings.

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

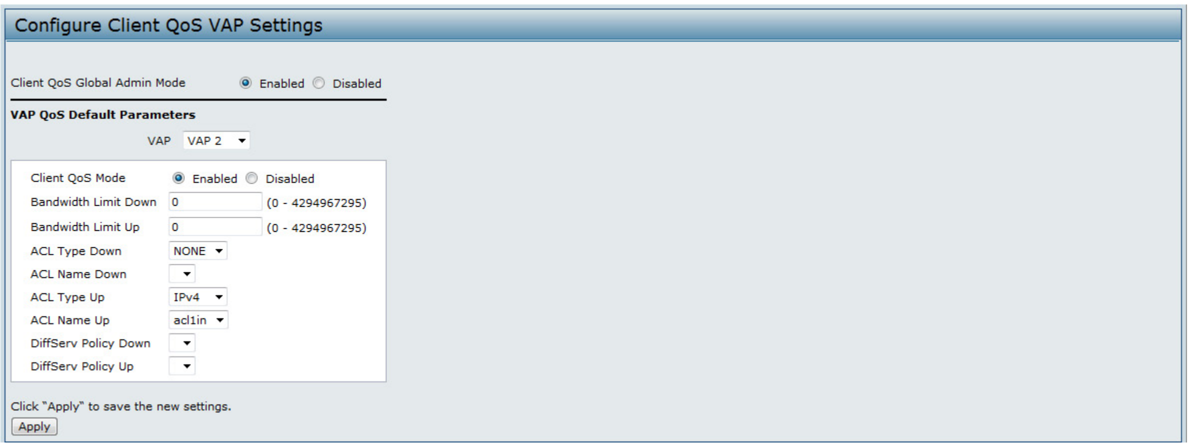
Figure 76 - Configuring QoS by Using the Web Interface (Rule2)

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

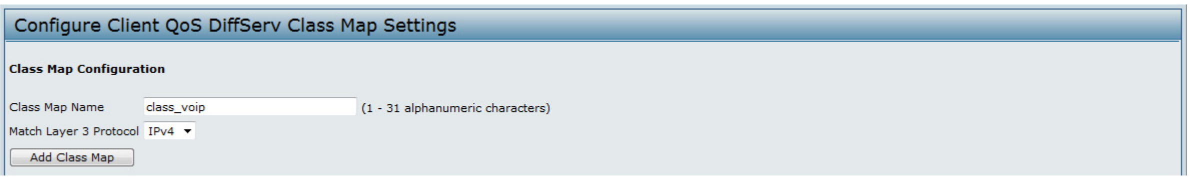
Click "Apply" to save the new settings.
Apply

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

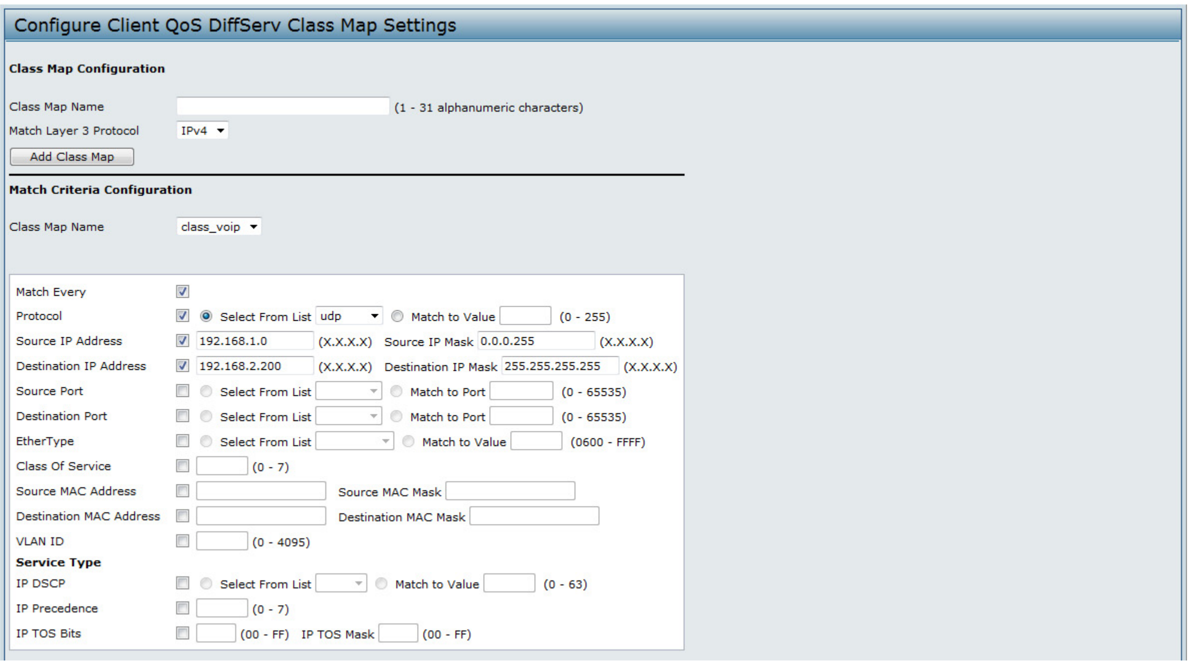
Class Map Name: class_voip (1 - 31 alphanumeric characters)

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

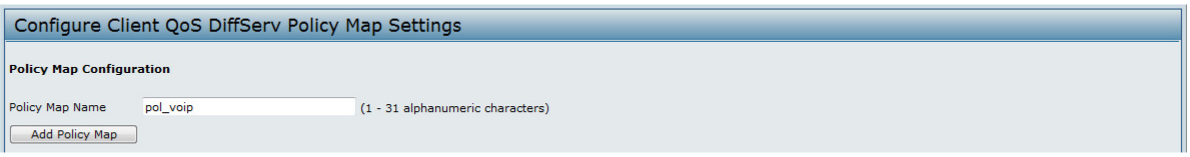
6.) Select the **Destination IP Address** option and enter the following information for the VoIP server:

•) 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

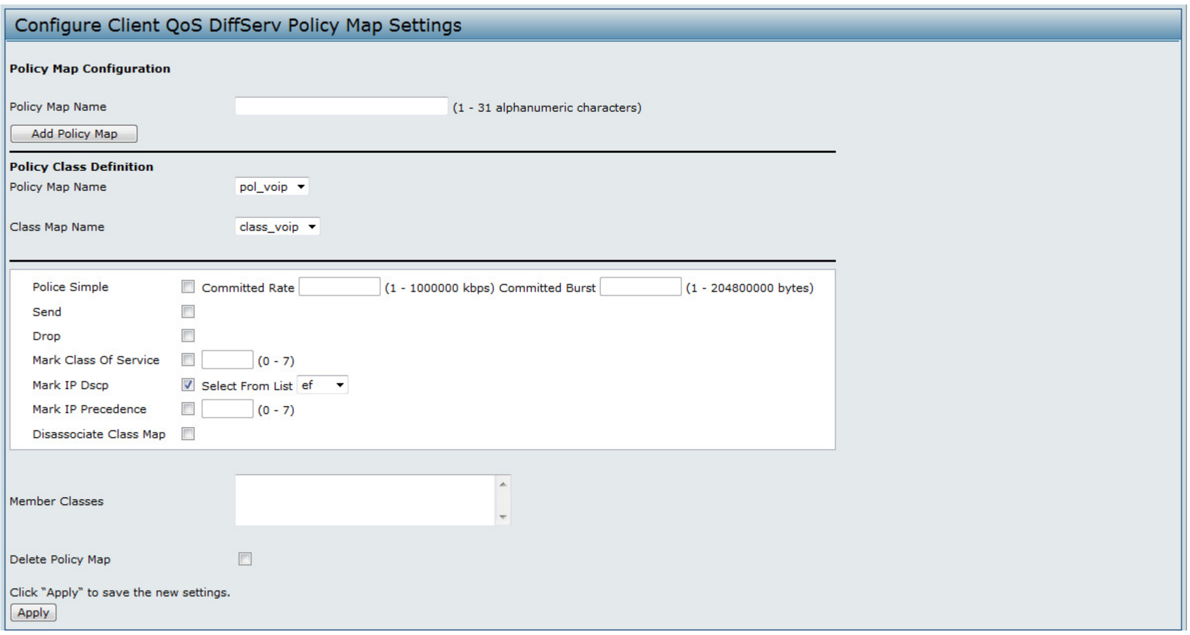
Policy Map Configuration

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 □

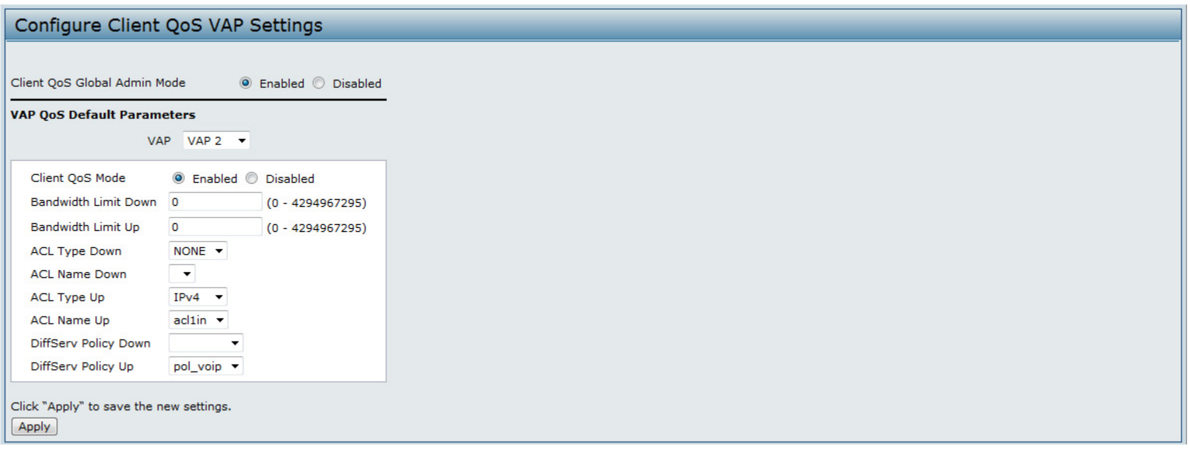
Click "Apply" to save the new settings.

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 - Statements

Federal Communication Commission Interference Statement

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.

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

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

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate this equipment.

This transmitter must not be collocated or operating in conjunction with any other antenna or transmitter.

Note: The country code selection is for non-US model only and is not available to all US model. Per FCC regulation, all WiFi product marketed in US must fixed to US operation channels only.

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-210 of the Industry Canada 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.

Ce dispositif est conforme à la norme CNR-210 d’Industrie Canada applicable aux appareils radio exempts de licence. Son fonctionnement est sujet aux deux conditions suivantes: (1) le dispositif ne doit pas produire de brouillage préjudiciable, et (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

Radiation Exposure Statement:

This equipment complies with IC 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.

Declaration d’exposition aux radiations: Cet equipement est conforme aux limites d’exposition aux rayonnements IC etablies pour un environnement non controle. Cet equipement doit etre installe et utilise avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

CE Mark Warning:

This is a Class B product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

NCC Statement:

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，應改善至無干擾時方得繼續使用。前項合法通信，指依電信法規定作業之無線電通信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。