Command Usage

Messages sent include the selected level down to Emergency level.

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

Example

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

logging facility-type

This command sets the facility type for remote logging of syslog messages.

Syntax

logging facility-type <*type*>

type - A number that indicates the facility used by the syslog server to dispatch log messages to an appropriate service. (Range: 16-23)

Default Setting

16

Command Mode

Global Configuration

Command Usage

The command specifies the facility type tag sent in syslog messages. (See RFC 3164.) This type has no effect on the kind of messages reported by the bridge. However, it may be used by the syslog server to sort messages or to store messages in the corresponding database.

Example

```
Enterprise AP(config)#logging facility 19
Enterprise AP(config)#
```

logging clear

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

Syntax

logging clear

Command Mode

Global Configuration

Example

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

show logging

This command displays the logging configuration.

Syntax

show logging

Command Mode

Exec

Example

```
Enterprise AP#show logging
Logging Information
============================================
Syslog State               : Enabled
Logging Console State      : Enabled
Logging Level              : Alert
Logging Facility Type      : 16
Servers
   1: 192.168.1.19, UDP Port: 514, State: Enabled
   2: 0.0.0.0, UDP Port: 514, State: Disabled
   3: 0.0.0.0, UDP Port: 514, State: Disabled
   4: 0.0.0.0, UDP Port: 514, State: Disabled
=============================================
Enterprise AP#
```

show event-log

This command displays log messages stored in the bridge’s memory.

Syntax

show event-log

Command Mode

Exec

Example

```
Enterprise AP#show event-log
Mar 09 11:57:55  Information: 802.11g:11g Radio Interface Enabled
Mar 09 11:57:55  Information: 802.11g:Radio channel updated to 8
Mar 09 11:57:34  Information: 802.11g:11g Radio Interface Enabled
Mar 09 11:57:18  Information: 802.11g:11g Radio Interface Enabled
Mar 09 11:56:35  Information: 802.11a:11a Radio Interface Enabled
Mar 09 11:55:52  Information: SSH task: Set SSH server port to 22
Mar 09 11:55:52  Information: SSH task: Enable SSH server.
Mar 09 11:55:52  Information: Enable Telnet.
Mar 09 11:55:40  Information: 802.11a:11a Radio Interface Disabled
Mar 09 11:55:40  Information: 802.11a:Transmit Power set to QUARTER
Press <n> next. <p> previous. <a> abort. <y> continue to end :
Enterprise AP#configure
Enter configuration commands, one per line. End with CTRL/Z
Enterprise AP(config)#logging clear
```

System Clock Commands

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

Table 7-7. System Clock Commands

Command	Function	Mode	Page
sntp-server ip	Specifies one or more time servers	GC	7-34
sntp-server enable	Accepts time from the specified time servers	GC	7-34
sntp-server date-time	Manually sets the system date and time	GC	7-35
sntp-server daylight-saving	Sets the start and end dates for daylight savings time	GC	7-36
sntp-server timezone	Sets the time zone for the bridge’s internal clock	GC	7-36
show sntp	Shows current SNTP configuration settings	Exec	7-37

sntp-server ip

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

Syntax

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

- **1** - First time server.
- **2** - Second time server.
- *ip* - IP address of an time server (NTP or SNTP).

Default Setting

137.92.140.80
192.43.244.18

Command Mode

Global Configuration

Command Usage

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

Example

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

Related Commands

sntp-server enable (7-34)
show sntp (7-37)

sntp-server enable

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

Syntax

sntp-server enable
no sntp-server enable

Default Setting

Enabled

Command Mode

Global Configuration

Command Usage

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

Example

```
Enterprise AP(config)#sntp-server enable
Enterprise AP(config)#
```

Related Commands

sntp-server ip (7-34)
show sntp (7-37)

sntp-server date-time

This command sets the system clock.

Default Setting

00:14:00, January 1, 1970

Command Mode

Global Configuration

Example

This example sets the system clock to 17:37 June 19, 2003.

```
Enterprise AP#sntp-server date-time
Enter Year<1970-2100>: 2003
Enter Month<1-12>: 6
Enter Day<1-31>: 19
Enter Hour<0-23>: 17
Enter Min<0-59>: 37
Enterprise AP#
```

Related Commands

sntp-server enable (7-34)

sntp-server daylight-saving

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

Syntax

sntp-server daylight-saving
no sntp-server daylight-saving

Default Setting

Disabled

Command Mode

Global Configuration

Command Usage

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

Example

This sets daylight savings time to be used from July 1st to September 1st.

```
Enterprise AP(config)#sntp-server daylight-saving
Enter Daylight saving from which month<1-12>: 6
and which day<1-31>: 1
Enter Daylight saving end to which month<1-12>: 9
and which day<1-31>: 1
Enterprise AP(config)#
```

sntp-server timezone

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

Syntax

sntp-server timezone <*hours*>

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

Default Setting

-5 (BOGOTA, EASTERN, INDIANA)

Command Mode

Global Configuration

Command Usage

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

Example

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

show sntp

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

Command Mode

Exec

Example

```
Enterprise AP#show sntp

SNTP Information
=========================================================
Service State        : Enabled
SNTP (server 1) IP   : 137.92.140.80
SNTP (server 2) IP   : 192.43.244.18
Current Time         : 08 : 04, Jun 20th, 2003
Time Zone            : +8 (TAIPEI, BEIJING)
Daylight Saving      : Enabled, from Jun, 1st to Sep, 1st
=========================================================

Enterprise AP#
```

DHCP Relay Commands

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

Table 7-8. DHCP Relay Commands

Command	Function	Mode	Page
dhcp-relay enable	Enables the DHCP relay agent	GC	7-38
dhcp-relay	Sets the primary and secondary DHCP server address	GC	7-39
show dhcp-relay	Shows current DHCP relay configuration settings	Exec	7-39

dhcp-relay enable

This command enables the bridge’s DHCP relay agent. Use the **no** form to disable the agent.

Syntax

[**no**] **dhcp-relay enable**

Default Setting

Disabled

Command Mode

Global Configuration

Command Usage

- For the DHCP relay agent to function, the primary DHCP server must be configured using the **dhcp-relay primary** command. A secondary DHCP server does not need to be configured, but it is recommended.
- If there is no response from the primary DHCP server, and a secondary server has been configured, the agent will then attempt to send DHCP requests to the secondary server.

Example

```
Enterprise AP(config)#dhcp-relay enable
Enterprise AP(config)#
```

dhcp-relay

This command configures the primary and secondary DHCP server addresses.

Syntax

dhcp-relay <**primary** | **secondary**> <*ip_address*>

- **primary** - The primary DHCP server.
- **secondary** - The secondary DHCP server.
- *ip_address* - IP address of the server.

Default Setting

Primary and secondary: 0.0.0.0

Command Mode

Global Configuration

Example

```
Enterprise AP(config)#dhcp-relay primary 192.168.1.10
Enterprise AP(config)#
```

show dhcp-relay

This command displays the current DHCP relay configuration.

Command Mode

Exec

Example

```
Enterprise AP#show dhcp-relay
DHCP Relay             : ENABLED
Primary DHCP Server    : 192.168.1.10
Secondary DHCP Server : 0.0.0.0
Enterprise AP#
```

SNMP Commands

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

Table 7-9. SNMP Commands

Command	Function	Mode	Page
snmp-server community	Sets up the community access string to permit access to SNMP commands	GC	7-41
snmp-server contact	Sets the system contact string	GC	7-41
snmp-server location	Sets the system location string	GC	7-42
snmp-server enable server	Enables SNMP service and traps	GC	7-42
snmp-server host	Specifies the recipient of an SNMP notification operation	GC	7-43
snmp-server trap	Enables specific SNMP notifications	GC	7-44
snmp-server engine id	Sets the engine ID for SNMP v3	GC	7-45
snmp-server user	Sets the name of the SNMP v3 user	GC	7-46
snmp-server targets	Configures SNMP v3 notification targets	GC	7-48
snmp-server filter	Configures SNMP v3 notification filters	GC	7-49
snmp-server filter-assignments	Assigns SNMP v3 notification filters to targets	GC	7-50
show snmp groups	Displays the pre-defined SNMP v3 groups	Exec	7-50
show snmp users	Displays SNMP v3 user settings	Exec	7-51
show snmp group-assignments	Displays the assignment of users to SNMP v3 groups	Exec	7-51
show snmp target	Displays the SNMP v3 notification targets	Exec	7-52
show snmp filter	Displays the SNMP v3 notification filters	Exec	7-52
show snmp filter-assignments	Displays the SNMP v3 notification filter assignments	Exec	7-53
show snmp	Displays the status of SNMP communications	Exec	7-54

snmp-server community

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

Syntax

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

- *string* - Community string that acts like a password and permits access to the SNMP protocol. (Maximum length: 23 characters, case sensitive)
- **ro** - Specifies read-only access. Authorized management stations are only able to retrieve MIB objects.
- **rw** - Specifies read/write access. Authorized management stations are able to both retrieve and modify MIB objects.

Default Setting

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

Command Mode

Global Configuration

Command Usage

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

Example

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

snmp-server contact

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

Syntax

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

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

Default Setting

None

Command Mode

Global Configuration

Example

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

Related Commands

snmp-server location (7-42)

snmp-server location

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

Syntax

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

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

Default Setting

None

Command Mode

Global Configuration

Example

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

Related Commands

snmp-server contact (7-41)

snmp-server enable server

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

Syntax

snmp-server enable server
no snmp-server enable server

Default Setting

Enabled

Command Mode

Global Configuration

Command Usage

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

Example

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

Related Commands

snmp-server host (7-43)

snmp-server host

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

Syntax

snmp-server host <1 | **2** | **3** | **4>** *<host_ip_address* | *host_name> <community-string>*

no snmp-server host

- **1** - First SNMP host.
- **2** - Second SNMP host.
- **3** - Third SNMP host.
- **4** - Fourth SNMP host.
- *host_ip_address* - IP of the host (the targeted recipient).
- *host_name* - Name of the host. (Range: 1-63 characters)
- *community-string* - Password-like community string sent with the notification operation. Although you can set this string using the **snmp-server host** command by itself, we recommend that you define this string using the **snmp-server community** command prior to using the **snmp-server host** command. (Maximum length: 23 characters)

Default Setting

Host Address: None
Community String: public

Command Mode

Global Configuration

Command Usage

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

Example

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

Related Commands

snmp-server enable server (7-42)

snmp-server trap

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

Syntax

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

- *trap* - One of the following SNMP trap messages:
  - **dot11InterfaceAGFail** - The 802.11a or 802.11g interface has failed.
  - **dot11InterfaceBFail** - The 802.11b interface has failed.
  - **dot11StationAssociation** - A client station has successfully associated with the bridge.
  - **dot11StationAuthentication** - A client station has been successfully authenticated.
  - **dot11StationReAssociation** - A client station has successfully re-associated with the bridge.
  - **dot11StationRequestFail** - A client station has failed association, re-association, or authentication.
  - **dot1xAuthFail** - A 802.1X client station has failed RADIUS authentication.
  - **dot1xAuthNotInitiated** - A client station did not initiate 802.1X authentication.
  - **dot1xAuthSuccess** - A 802.1X client station has been successfully authenticated by the RADIUS server.
  - **dot1xMacAddrAuthFail** - A client station has failed MAC address authentication with the RADIUS server.
  - **dot1xMacAddrAuthSuccess** - A client station has successfully authenticated its MAC address with the RADIUS server.
  - **iappContextDataSent** - A client station's Context Data has been sent to another bridge with which the station has associated.
  - **iappStationRoamedFrom** - A client station has roamed from another bridge (identified by its IP address).

- **iappStationRoamedTo** - A client station has roamed to another bridge (identified by its IP address).
- **localMacAddrAuthFail** - A client station has failed authentication with the local MAC address database on the bridge.
- **localMacAddrAuthSuccess** - A client station has successfully authenticated its MAC address with the local database on the bridge.
- **pppLogonFail** - The bridge has failed to log onto the PPPoE server using the configured user name and password.
- **sntpServerFail** - The bridge has failed to set the time from the configured SNTP server.
- **sysConfigFileVersionChanged** - The bridge's configuration file has been changed.
- **sysRadiusServerChanged** - The bridge has changed from the primary RADIUS server to the secondary, or from the secondary to the primary.
- **sysSystemDown** - The bridge is about to shutdown and reboot.
- **sysSystemUp** - The bridge is up and running.

Default Setting

All traps enabled

Command Mode

Global Configuration

Command Usage

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

Example

```
Enterprise AP(config)#no snmp-server trap dot11StationAssociation
Enterprise AP(config)#
```

snmp-server engine-id

This command is used for SNMP v3. It is used to uniquely identify the bridge among all bridges in the network. Use the **no** form to delete the engine ID.

Syntax

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

engine-id - Enter engine-id in hexadecimal (5-32 characters).

Default Setting

Enabled

Command Mode

Global Configuration

Command Usage

- This command is used in conjunction with the **snmp-server user** command.
- Entering this command invalidates all engine IDs that have been previously configured.
- If the engineID is deleted or changed, all SNMP users will be cleared. You will need to reconfigure all existing users

Example

```
Enterprise AP(config)#snmp-server engine-id 1a:2b:3c:4d:00:ff
Enterprise AP(config)#
```

snmp-server user

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

Syntax

snmp-server user <*user-name***>**

user-name - A user-defined string for the SNMP user. (32 characters maximum)

Default Setting

None

Command Mode

Global Configuration

Command Usage

- Up to 10 SNMPv3 users can be configured on the bridge.
- The SNMP engine ID is used to compute the authentication/privacy digests from the pass phrase. You should therefore configure the engine ID with the **snmp-server engine-id** command before using this configuration command.
- The bridge enables SNMP v3 users to be assigned to three pre-defined groups. Other groups cannot be defined. The available groups are:
  - RO - A read-only group using no authentication and no data encryption. Users in this group use no security, either authentication or encryption, in SNMP messages they send to the agent. This is the same as SNMP v1 or SNMP v2c.

  - RWAuth - A read/write group using authentication, but no data encryption. Users in this group send SNMP messages that use an MD5 key/password for authentication, but not a DES key/password for encryption.
  - RWPriv - A read/write group using authentication and data encryption. Users in this group send SNMP messages that use an MD5 key/password for authentication and a DES key/password for encryption. Both the MD5 and DES key/passwords must be defined.
- The command prompts for the following information to configure an SNMP v3 user:
  - *user-name* - A user-defined string for the SNMP user. (32 characters maximum)
  - *group-name* - The name of the SNMP group to which the user is assigned (32 characters maximum). There are three pre-defined groups: RO, RWAuth, or RWPriv.
  - *auth-proto* - The authentication type used for user authentication: md5 or none.
  - *auth-passphrase* - The user password required when authentication is used (8 – 32 characters).
  - *priv-proto* - The encryption type used for SNMP data encryption: des or none.
  - *priv-passphrase* - The user password required when data encryption is used (8 – 32 characters).
- Users must be assigned to groups that have the same security levels. If a user who has “AuthPriv” security (uses authentication and encryption) is assigned to a read-only (RO) group, the user will not be able to access the database. An AuthPriv user must be assigned to the RWPriv group with the AuthPriv security level.
- To configure a user for the RWAuth group, you must include the *auth-proto* and *auth-passphrase* keywords.
- To configure a user for the RWPriv group, you must include the *auth-proto, auth-passphrase, priv-proto,* and *priv-passphrase* keywords.

Example

```
Enterprise AP(config)#snmp-server user
User Name<1-32> :chris
Group Name<1-32> :RWPriv
Authtype(md5,<cr>none):md5
Passphrase<8-32>:a good secret
Privacy(des,<cr>none) :des
Passphrase<8-32>:a very good secret
Enterprise AP(config)#
```

snmp-server targets

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

Syntax

snmp-server targets <*target-id*> <*ip-addr*> <*sec-name*> [**version** {**3**}] [**udp-port** {*port-number*}] [**notification-type** {**TRAP**}]
no snmp-server targets <*target-id*>

- *target-id* - A user-defined name that identifies a receiver of SNMP notifications. (Maximum length: 32 characters)
- *ip-addr* - Specifies the IP address of the management station to receive notifications.
- *sec-name* - The defined SNMP v3 user name that is to receive notifications.
- **version** - The SNMP version of notifications. Currently only version **3** is supported in this command.
- **udp-port** - The UDP port that is used on the receiving management station for notifications.
- **notification-type** - The type of notification that is sent. Currently only **TRAP** is supported.

Default Setting

None

Command Mode

Global Configuration

Command Usage

- The bridge supports up to 10 SNMP v3 target IDs.
- The SNMP v3 user name that is specified in the target must first be configured using the **snmp-server user** command.

Example

```
Enterprise AP(config)#snmp-server targets mytraps 192.168.1.33 chris
Enterprise AP(config)#
```

snmp-server filter

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

Syntax

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

- *filter-id* - A user-defined name that identifies an SNMP v3 notification filter. (Maximum length: 32 characters)
- **include** - Defines a filter type that includes objects in the MIB subtree.
- **exclude** - Defines a filter type that excludes objects in the MIB subtree.
- *subtree* - The part of the MIB subtree that is to be filtered.
- *mask* - An optional hexadecimal value bit mask to define objects in the MIB subtree.

Default Setting

None

Command Mode

Global Configuration

Command Usage

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

Example

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

snmp-server filter-assignments

This command assigns SNMP v3 notification filters to targets. Use the **no** form to remove an SNMP v3 filter assignment.

Syntax

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

- *target-id* - A user-defined name that identifies a receiver of SNMP notifications. (Maximum length: 32 characters)
- *filter-id* - A user-defined name that identifies an SNMP v3 notification filter. (Maximum length: 32 characters)

Default Setting

None

Command Mode

Global Configuration

Example

```
Enterprise AP(config)#snmp-server filter-assignments mytraps trapfilter
Enterprise AP(config)#exit
Enterprise AP#show snmp target

Host ID      : mytraps
User         : chris
IP Address   : 192.168.1.33
UDP Port     : 162
=============================
Enterprise AP#show snmp filter-assignments

                             HostID  FilterID

                            mytraps  trapfilter

Enterprise AP(config)#
```

show snmp groups

This command displays the SNMP v3 pre-defined groups.

Syntax

show snmp groups

Command Mode

Exec

Example

```
Enterprise AP#show snmp groups


GroupName     :RO
SecurityModel :USM
SecurityLevel :NoAuthNoPriv

GroupName     :RWAuth
SecurityModel :USM
SecurityLevel :AuthNoPriv

GroupName     :RWPriv
SecurityModel :USM
SecurityLevel :AuthPriv
Enterprise AP#
```

show snmp users

This command displays the SNMP v3 users and settings.

Syntax

show snmp users

Command Mode

Exec

Example

```
Enterprise AP#show snmp users

=============================================
UserName     :chris
GroupName    :RWPriv
AuthType     :MD5
   Passphrase:****************
PrivType     :DES
   Passphrase:****************
=============================================
Enterprise AP#
```

show snmp group-assignments

This command displays the SNMP v3 user group assignments.

Syntax

show snmp group-assignments

Command Mode

Exec

Example

```
Enterprise AP#show snmp group-assignments


GroupName    :RWPriv
UserName     :chris
Enterprise AP#

Enterprise AP#
```

show snmp target

This command displays the SNMP v3 notification target settings.

Syntax

show snmp target

Command Mode

Exec

Example

```
Enterprise AP#show snmp target

Host ID      : mytraps
User         : chris
IP Address   : 192.168.1.33
UDP Port     : 162
=============================
Enterprise AP#
```

show snmp filter

This command displays the SNMP v3 notification filter settings.

Syntax

show snmp filter [*filter-id*]

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

Command Mode

Exec

Example

```
Enterprise AP#show snmp filter
Filter: trapfilter
     Type: include
  Subtree: iso.3.6.1.2.1.2.2.1

     Type: exclude
  Subtree: iso.3.6.1.2.1.2.2.1.1.23
=============================
Enterprise AP#
```

show snmp filter-assignments

This command displays the SNMP v3 notification filter assignments.

Syntax

show snmp filter-assignments

Command Mode

Exec

Example

```
Enterprise AP#show snmp filter-assignments

                             HostID  FilterID

                            mytraps  trapfilter
Enterprise AP#
```

show snmp

This command displays the SNMP configuration settings.

Command Mode

Exec

Example

```
Enterprise AP#show snmp

SNMP Information
==============================================
Service State                 : Enable
Community (ro)                : *****
Community (rw)                : *****
Location                      : WC-19
Contact                       : Paul

EngineId   :80:00:07:e5:80:00:00:2e:62:00:00:00:18
EngineBoots:1

Trap Destinations:
   1:      192.168.1.9, Community: *****, State: Enabled
   2:          0.0.0.0, Community: *****, State: Disabled
   3:          0.0.0.0, Community: *****, State: Disabled
   4:          0.0.0.0, Community: *****, State: Disabled


  dot11InterfaceAGFail  Enabled        dot11InterfaceBFail  Enabled
  dot11StationAssociation  Enabled dot11StationAuthentication
  Enabled
  dot11StationReAssociation  Enabled    dot11StationRequestFail
  Enabled
  dot1xAuthFail  Enabled      dot1xAuthNotInitiated  Enabled
  dot1xAuthSuccess  Enabled       dot1xMacAddrAuthFail  Enabled
  dot1xMacAddrAuthSuccess  Enabled        iappContextDataSent
    Enabled
  iappStationRoamedFrom  Enabled        iappStationRoamedTo
    Enabled
  localMacAddrAuthFail  Enabled    localMacAddrAuthSuccess  Enabled
    pppLogonFail  Enabled             sntpServerFail  Enabled
  configFileVersionChanged  Enabled        radiusServerChanged
    Enabled
  systemDown  Enabled                   systemUp  Enabled

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

Flash/File Commands

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

Table 7-10. Flash/File Commands

Command	Function	Mode	Page
bootfile	Specifies the file or image used to start up the system	GC	7-55
copy	Copies a code image or configuration between flash memory and a FTP/TFTP server	Exec	7-56
delete	Deletes a file or code image	Exec	7-57
dir	Displays a list of files in flash memory	Exec	7-58
show bootfile	Displays the name of the current operation code file that booted the system	Exec	7-58

bootfile

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

Syntax

bootfile <*filename*>

filename - Name of the image file.

Default Setting

None

Command Mode

Exec

Command Usage

- The file name should not contain slashes (\ or /), the leading letter of the file name should not be a period (.), and the maximum length for file names is 32 characters. (Valid characters: A-Z, a-z, 0-9, “.”, “-”, “_”)
- If the file contains an error, it cannot be set as the default file.

Example

```
Enterprise AP#bootfile -img.bin
Enterprise AP#
```

copy

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

Syntax

copy <**ftp** | **tftp**> **file**
copy config <**ftp** | **tftp**>

- **ftp** - Keyword that allows you to copy to/from an FTP server.
- **tftp** - Keyword that allows you to copy to/from a TFTP server.
- **file** - Keyword that allows you to copy to/from a flash memory file.
- **config** - Keyword that allows you to upload the configuration file from flash memory.

Default Setting

None

Command Mode

Exec

Command Usage

- The system prompts for data required to complete the copy command.
- Only a configuration file can be uploaded to an FTP/TFTP server, but every type of file can be downloaded to the bridge.
- The destination file name should not contain slashes (\ or /), the leading letter of the file name should not be a period (.), and the maximum length for file names on the FTP/TFTP server is 255 characters or 32 characters for files on the bridge. (Valid characters: A-Z, a-z, 0-9, “.”, “-”, “_”)
- Due to the size limit of the flash memory, the bridge supports only two operation code files.
- The system configuration file must be named “syscfg” in all copy commands.

Example

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

```
Enterprise AP#copy config tftp
TFTP Source file name:syscfg
TFTP Server IP:192.168.1.19
Enterprise AP#
```

The following example shows how to download a configuration file:

```
Enterprise AP#copy tftp file
1. Application image
2. Config file
3. Boot block image
Select the type of download<1,2,3>:  [1]:2
TFTP Source file name:syscfg
TFTP Server IP:192.168.1.19
Enterprise AP#
```

delete

This command deletes a file or image.

Syntax

delete *<filename>*

filename - Name of the configuration file or image name.

Default Setting

None

Command Mode

Exec

Caution: Beware of deleting application images from flash memory. At least one application image is required in order to boot the bridge. If there are multiple image files in flash memory, and the one used to boot the bridge is deleted, be sure you first use the **bootfile** command to update the application image file booted at startup before you reboot the bridge.

Example

This example shows how to delete the test.cfg configuration file from flash memory.

```
Enterprise AP#delete test.cfg
Are you sure you wish to delete this file? <y/n>:
Enterprise AP#
```

Related Commands

bootfile (7-55)
dir (7-58)

dir

This command displays a list of files in flash memory.

Command Mode

Exec

Command Usage

File information is shown below:

Column Heading	Description
File Name	The name of the file.
Type	(2) Operation Code and (5) Configuration file
File Size	The length of the file in bytes.

Example

The following example shows how to display all file information:

```
Enterprise AP#dir
File Name                     Type   File Size
--------------------------    ----  -----------
dflt-img.bin                    2     1044140
syscfg                          5       16860
syscfg_bak                      5       16860
zz-img.bin                      2     1044140

     1048576 byte(s) available

Enterprise AP#
```

show bootfile

This command displays the name of the current operation code file that booted the system.

Syntax

show snmp filter-assignments

Command Mode

Exec

Example

```
Enterprise AP#show bootfile

Bootfile Information
===================================
Bootfile : ec-img.bin
===================================
Enterprise AP#
```

RADIUS Client

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

Table 7-11. RADIUS Client

Command	Function	Mode	Page
radius-server address	Specifies the RADIUS server	GC	7-59
radius-server port	Sets the RADIUS server network port	GC	7-60
radius-server key	Sets the RADIUS encryption key	GC	7-60
radius-server retransmit	Sets the number of retries	GC	7-61
radius-server timeout	Sets the interval between sending authentication requests	GC	7-61
radius-server port-accounting	Sets the RADIUS Accounting server network port	GC	7-62
radius-server timeout-interim	Sets the interval between transmitting accounting updates to the RADIUS server	GC	7-62
radius-server radius-mac-format	Sets the format for specifying MAC addresses on the RADIUS server	GC	7-63
radius-server vlan-format	Sets the format for specifying VLAN IDs on the RADIUS server	GC	7-63
show radius	Shows the current RADIUS settings	Exec	7-64

radius-server address

This command specifies the primary and secondary RADIUS servers.

Syntax

radius-server [**secondary**] **address** <*host_ip_address* | *host_name*>

- **secondary** - Secondary server.
- *host_ip_address* - IP address of server.
- *host_name* - Host name of server. (Range: 1-20 characters)

Default Setting

None

Command Mode

Global Configuration

Example

```
Enterprise AP(config)#radius-server address 192.168.1.25
Enterprise AP(config)#
```

radius-server port

This command sets the RADIUS server network port.

Syntax

radius-server [**secondary**] **port** <*port_number*>

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

Default Setting

1812

Command Mode

Global Configuration

Example

```
Enterprise AP(config)#radius-server port 181
Enterprise AP(config)#
```

radius-server key

This command sets the RADIUS encryption key.

Syntax

radius-server [**secondary**] **key** <*key_string*>

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

Default Setting

DEFAULT

Command Mode

Global Configuration

Example

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

radius-server retransmit

This command sets the number of retries.

Syntax

radius-server [**secondary**] **retransmit** *number_of_retries*

- **secondary** - Secondary server.
- *number_of_retries* - Number of times the bridge will try to authenticate logon access via the RADIUS server. (Range: 1 - 30)

Default Setting

3

Command Mode

Global Configuration

Example

```
Enterprise AP(config)#radius-server retransmit 5
Enterprise AP(config)#
```

radius-server timeout

This command sets the interval between transmitting authentication requests to the RADIUS server.

Syntax

radius-server [**secondary**] **timeout** *number_of_seconds*

- **secondary** - Secondary server.
- *number_of_seconds* - Number of seconds the bridge waits for a reply before resending a request. (Range: 1-60)

Default Setting

5

Command Mode

Global Configuration

Example

```
Enterprise AP(config)#radius-server timeout 10
Enterprise AP(config)#
```

radius-server port-accounting

This command sets the RADIUS Accounting server network port.

Syntax

radius-server [**secondary**] **port-accounting** <*port_number*>

- **secondary** - Secondary server. If **secondary** is not specified, then the bridge assumes you are configuring the primary RADIUS server.
- *port_number* - RADIUS Accounting server UDP port used for accounting messages.
  (Range: 0 or 1024-65535)

Default Setting

0 (disabled)

Command Mode

Global Configuration

Command Usage

- When the RADIUS Accounting server UDP port is specified, a RADIUS accounting session is automatically started for each user that is successfully authenticated to the bridge.

Example

```
Enterprise AP(config)#radius-server port-accounting 1813
Enterprise AP(config)#
```

radius-server timeout-interim

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

Syntax

radius-server [**secondary**] **timeout-interim** <*number_of_seconds*>

- **secondary** - Secondary server.
- *number_of_seconds* - Number of seconds the bridge waits between transmitting accounting updates. (Range: 60-86400)

Default Setting

3600

Command Mode

Global Configuration

Command Usage

- The bridge sends periodic accounting updates after every interim period until the user logs off and a “stop” message is sent.

Example

```
Enterprise AP(config)#radius-server timeout-interim 500
Enterprise AP(config)#
```

radius-server radius-mac-format

This command sets the format for specifying MAC addresses on the RADIUS server.

Syntax

radius-server radius-mac-format <**multi-colon** | **multi-dash** | **no-delimiter** | **single-dash**>

- **multi-colon** - Enter MAC addresses in the form xx:xx:xx:xx:xx:xx.
- **multi-dash** - Enter MAC addresses in the form xx-xx-xx-xx-xx-xx.
- **no-delimiter** - Enter MAC addresses in the form xxxxxxxxxxxx.
- **single-dash** - Enter MAC addresses in the form xxxxxx-xxxxxx.

Default Setting

No delimiter

Command Mode

Global Configuration

Example

```
Enterprise AP(config)#radius-server radius-mac-format multi-dash
Enterprise AP(config)#
```

radius-server vlan-format

This command sets the format for specifying VLAN IDs on the RADIUS server.

Syntax

r**adius-server vlan-forma**t <**hex** | **ascii**>

- **hex** - Enter VLAN IDs as a hexadecimal number.
- **ascii** - Enter VLAN IDs as an ASCII string.

Default Setting

Hex

Command Mode

Global Configuration

Example

```
Enterprise AP(config)#radius-server vlan-format ascii
Enterprise AP(config)#
```

show radius

This command displays the current settings for the RADIUS server.

Default Setting

None

Command Mode

Exec

Example

```
Enterprise AP#show radius

Radius Server Information
========================================
IP                  : 0.0.0.0
Port                : 1812
Key                 : *****
Retransmit          : 3
Timeout             : 5
Radius MAC format   : no-delimiter
Radius VLAN format  : HEX
========================================

Radius Secondary Server Information
========================================
IP                  : 0.0.0.0
Port                : 1812
Key                 : *****
Retransmit          : 3
Timeout             : 5
Radius MAC format   : no-delimiter
Radius VLAN format  : HEX
========================================
Enterprise AP#
```

802.1X Authentication

The bridge supports IEEE 802.1X access control for wireless clients. This control feature prevents unauthorized access to the network by requiring an 802.1X client application to submit user credentials for authentication. Client authentication is then verified by a RADIUS server using EAP (Extensible Authentication Protocol) before the bridge grants client access to the network. The 802.1X EAP packets are also used to pass dynamic unicast session keys and static broadcast keys to wireless clients.

Table 7-12. 802.1X Authentication

Command	Function	Mode	Page
802.1x	Configures 802.1X as disabled, supported, or required	IC-W-VAP	7-65
802.1x broadcast-key-refresh-rate	Sets the interval at which the primary broadcast keys are refreshed for stations using 802.1X dynamic keying	IC-W-VAP	7-66
802.1x session-key-refresh-rate	Sets the interval at which unicast session keys are refreshed for associated stations using dynamic keying	IC-W-VAP	7-67
802.1x session-timeout	Sets the timeout after which a connected client must be re-authenticated	IC-W-VAP	7-67
802.1x-supplicant enable	Enables the bridge to operate as a 802.1X supplicant	GC	7-68
802.1x-supplicant user	Sets the supplicant user name and password for the bridge	GC	7-68
show authentication	Shows all 802.1X authentication settings, as well as the address filter table	Exec	7-68

802.1x

This command configures 802.1X as optionally supported or as required for wireless clients. Use the **no** form to disable 802.1X support.

Syntax

802.1x <**supported** | **required**>
no 802.1x

- **supported** - Authenticates clients that initiate the 802.1X authentication process. Uses standard 802.11 authentication for all others.
- **required** - Requires 802.1X authentication for all clients.

Default Setting

Disabled

Command Mode

Global Configuration

Command Usage

- When 802.1X is disabled, the bridge does not support 802.1X authentication for any station. After successful 802.11 association, each client is allowed to access the network.
- When 802.1X is supported, the bridge supports 802.1X authentication only for clients initiating the 802.1X authentication process (i.e., the bridge does NOT initiate 802.1X authentication). For stations initiating 802.1X, only those stations successfully authenticated are allowed to access the network. For those stations not initiating 802.1X, access to the network is allowed after successful 802.11 association.
- When 802.1X is required, the bridge enforces 802.1X authentication for all 802.11 associated stations. If 802.1X authentication is not initiated by the station, the bridge will initiate authentication. Only those stations successfully authenticated with 802.1X are allowed to access the network.
- 802.1X does not apply to the 10/100Base-TX port.

Example

```
Enterprise AP(config)#802.1x supported
Enterprise AP(config)#
```

802.1x broadcast-key-refresh-rate

This command sets the interval at which the broadcast keys are refreshed for stations using 802.1X dynamic keying.

Syntax

802.1x broadcast-key-refresh-rate <*rate*>

rate - The interval at which the bridge rotates broadcast keys. (Range: 0 - 1440 minutes)

Default Setting

0 (Disabled)

Command Mode

Global Configuration

Command Usage

- The bridge uses Enterprise APOL (Extensible Authentication Protocol Over LANs) packets to pass dynamic unicast session and broadcast keys to wireless clients. The **802.1x broadcast-key-refresh-rate** command specifies the interval after which the broadcast keys are changed. The **802.1x session-key-refresh-rate** command specifies the interval after which unicast session keys are changed.

- Dynamic broadcast key rotation allows the bridge to generate a random group key and periodically update all key-management capable wireless clients.

Example

```
Enterprise AP(config)#802.1X broadcast-key-refresh-rate 5
Enterprise AP(config)#
```

802.1x session-key-refresh-rate

This command sets the interval at which unicast session keys are refreshed for associated stations using dynamic keying.

Syntax

802.1x session-key-refresh-rate <*rate*>

rate - The interval at which the bridge refreshes a session key. (Range: 0 - 1440 minutes)

Default Setting

0 (Disabled)

Command Mode

Global Configuration

Command Usage

Session keys are unique to each client, and are used to authenticate a client connection, and correlate traffic passing between a specific client and the bridge.

Example

```
Enterprise AP(config)#802.1x session-key-refresh-rate 5
Enterprise AP(config)#
```

802.1x session-timeout

This command sets the time period after which a connected client must be re-authenticated. Use the **no** form to disable 802.1X re-authentication.

Syntax

802.1x session-timeout <*seconds*>
no 802.1x session-timeout

seconds - The number of seconds. (Range: 0-65535)

Default

0 (Disabled)

Command Mode

Global Configuration

Example

```
Enterprise AP(config)#802.1x session-timeout 300
Enterprise AP(config)#
```

802.1x-supplicant enable

This command enables the bridge to operate as an 802.1X supplicant for authentication. Use the **no** form to disable 802.1X authentication of the bridge.

Syntax

802.1x-supplicant enable
no 802.1x-supplicant

Default

Disabled

Command Mode

Global Configuration

Command Usage

A user name and password must be configured first before the 802.1X supplicant feature can be enabled.

Example

```
Enterprise AP(config)#802.1x-supplicant enable
Enterprise AP(config)#
```

802.1x-supplicant user

This command sets the user name and password used for authentication of the bridge when operating as a 802.1X supplicant. Use the **no** form to clear the supplicant user name and password.

Syntax

802.1x-supplicant user <*username*> <*password*>
no 802.1x-supplicant user

- *username* - The bridge name used for authentication to the network. (Range: 1-32 alphanumeric characters)
- *password* - The MD5 password used for bridge authentication. (Range: 1-32 alphanumeric characters)

Default

None

Command Mode

Global Configuration

Command Usage

The bridge currently only supports EAP-MD5 CHAP for 802.1X supplicant authentication.

Example

```
Enterprise AP(config)#802.1x-supplicant user OAP6626A dot1xpass
Enterprise AP(config)#
```

show authentication

This command shows all 802.1X authentication settings, as well as the address filter table.

Command Mode

Exec

Example

```
Enterprise AP#show authentication

Authentication Information
===========================================================
MAC Authentication Server      : DISABLED
MAC Auth Session Timeout Value : 0 min
802.1x supplicant              : DISABLED
802.1x supplicant user         : EMPTY
802.1x supplicant password     : EMPTY
Address Filtering              : ALLOWED

System Default : ALLOW addresses not found in filter table.
Filter Table

MAC Address             Status
-----------------       ----------
00-70-50-cc-99-1a       DENIED
00-70-50-cc-99-1b       ALLOWED
=========================================================
Enterprise AP(config)#
```

MAC Address Authentication

Use these commands to define MAC authentication on the bridge. For local MAC authentication, first define the default filtering policy using the address filter default command. Then enter the MAC addresses to be filtered, indicating if they are allowed or denied. For RADIUS MAC authentication, the MAC addresses and filtering policy must be configured on the RADIUS server.

Table 7-13. MAC Address Authentication

Command	Function	Mode	Page
address filter default	Sets filtering to allow or deny listed addresses	GC	7-70
address filter entry	Enters a MAC address in the filter table	GC	7-71
address filter delete	Removes a MAC address from the filter table	GC	7-71
mac- authentication server	Sets address filtering to be performed with local or remote options	GC	7-72
mac- authentication session-timeout	Sets the interval at which associated clients will be re-authenticated with the RADIUS server authentication database	GC	7-72
show authentication	Shows all 802.1X authentication settings, as well as the address filter table	Exec	7-68

address filter default

This command sets filtering to allow or deny listed MAC addresses.

Syntax

address filter default <**allowed** | **denied**>

- **allowed** - Only MAC addresses entered as “denied” in the address filtering table are denied.
- **denied** - Only MAC addresses entered as “allowed” in the address filtering table are allowed.

Default

allowed

Command Mode

Global Configuration

Example

```
Enterprise AP(config)#address filter default denied
Enterprise AP(config)#
```

Related Commands

address filter entry (7-71)
802.1x-supplicant user (7-68)

address filter entry

This command enters a MAC address in the filter table.

Syntax

address filter entry <*mac-address*> <**allowed** | **denied**>

- *mac-address* - Physical address of client. (Enter six pairs of hexadecimal digits separated by hyphens; e.g., 00-90-D1-12-AB-89.)
- **allowed** - Entry is allowed access.
- **denied** - Entry is denied access.

Default

None

Command Mode

Global Configuration

Command Mode

- The bridge supports up to 1024 MAC addresses.
- An entry in the address table may be allowed or denied access depending on the global setting configured for the **address entry default** command.

Example

```
Enterprise AP(config)#address filter entry 00-70-50-cc-99-1a allowed
Enterprise AP(config)#
```

Related Commands

address filter default (7-70)
802.1x-supplicant user (7-68)

address filter delete

This command deletes a MAC address from the filter table.

Syntax

address filter delete <*mac-address*>

mac-address - Physical address of client. (Enter six pairs of hexadecimal digits separated by hyphens.)

Default

None

Command Mode

Global Configuration

Example

```
Enterprise AP(config)#address filter delete 00-70-50-cc-99-1b
Enterprise AP(config)#
```

Related Commands

802.1x-supplicant user (7-68)

mac-authentication server

This command sets address filtering to be performed with local or remote options. Use the **no** form to disable MAC address authentication.

Syntax

mac-authentication server [**local** | **remote**]

- **local** - Authenticate the MAC address of wireless clients with the local authentication database during 802.11 association.
- **remote** - Authenticate the MAC address of wireless clients with the RADIUS server during 802.1X authentication.

Default

Disabled

Command Mode

Global Configuration

Example

```
Enterprise AP(config)#mac-authentication server remote
Enterprise AP(config)#
```

Related Commands

address filter entry (7-71)
radius-server address (7-59)
802.1x-supplicant user (7-68)

mac-authentication session-timeout

This command sets the interval at which associated clients will be re-authenticated with the RADIUS server authentication database. Use the **no** form to disable reauthentication.

Syntax

mac-authentication session-timeout <*minutes*>

minutes - Re-authentication interval. (Range: 0-1440)

Default

0 (disabled)

Command Mode

Global Configuration

Example

```
Enterprise AP(config)#mac-authentication session-timeout 1
Enterprise AP(config)#
```

Filtering Commands

The commands described in this section are used to filter communications between wireless clients, control access to the management interface from wireless clients, and filter traffic using specific Ethernet protocol types.

Table 7-14. Filtering Commands

Command	Function	Mode	Page
filter local-bridge	Disables communication between wireless clients	GC	7-74
filter ap-manage	Prevents wireless clients from accessing the management interface	GC	7-74
filter uplink enable	Ethernet port MAC address filtering	GC	7-75
filter uplink	Adds or deletes a MAC address from the filtering table	GC	7-75
filter ethernet-type enable	Checks the Ethernet type for all incoming and outgoing Ethernet packets against the protocol filtering table	GC	7-75
filter ethernet-type protocol	Sets a filter for a specific Ethernet type	GC	7-76
show filters	Shows the filter configuration	Exec	7-77

filter local-bridge

This command disables communication between wireless clients. Use the **no** form to disable this filtering.

Syntax

filter local-bridge <**all-VAP** | **intra-VAP**>
no filter local-bridge

- **all-VAP** - When enabled, clients cannot establish wireless communications with any other client, either those associated to the same VAP interface or any other VAP interface.
- **intra-VAP** - When enabled, clients associated with a specific VAP interface cannot establish wireless communications with each other. Clients can communicate with clients associated to other VAP interfaces.

Default

Disabled

Command Mode

Global Configuration

Command Usage

This command can disable wireless-to-wireless communications between clients via the bridge. However, it does not affect communications between wireless clients and the wired network.

Example

```
Enterprise AP(config)#filter local-bridge
Enterprise AP(config)#
```

filter ap-manage

This command prevents wireless clients from accessing the management interface on the bridge. Use the **no** form to disable this filtering.

Syntax

filter ap-manage
no filter ap-manage

Default

Enabled

Command Mode

Global Configuration

Example

```
Enterprise AP(config)#filter AP-manage
Enterprise AP(config)#
```

filter uplink enable

This command enables filtering of MAC addresses from the Ethernet port.

Syntax

[**no**] **filter uplink enable**

Default

Disabled

Command Mode

Global Configuration

Example

```
Enterprise AP(config)#filter uplink enable
Enterprise AP(config)#
```

filter uplink

This command adds or deletes MAC addresses from the uplink filtering table.

Syntax

filter uplink <add | delete> *MAC address*

MAC address - Specifies a MAC address in the form xx-xx-xx-xx-xx-xx. A maximum of eight addresses can be added to the filtering table.

Default

Disabled

Command Mode

Global Configuration

Example

```
Enterprise AP(config)#filter uplink add 00-12-34-56-78-9a
Enterprise AP(config)#
```

filter ethernet-type enable

This command checks the Ethernet type on all incoming and outgoing Ethernet packets against the protocol filtering table. Use the **no** form to disable this feature.

Syntax

filter ethernet-type enable
no filter ethernet-type enable

Default

Disabled

Command Mode

Global Configuration

Command Usage

This command is used in conjunction with the **filter ethernet-type protocol** command to determine which Ethernet protocol types are to be filtered.

Example

```
Enterprise AP(config)#filter ethernet-type enable
Enterprise AP(config)#
```

Related Commands

filter ethernet-type protocol (7-76)

filter ethernet-type protocol

This command sets a filter for a specific Ethernet type. Use the **no** form to disable filtering for a specific Ethernet type.

Syntax

filter ethernet-type protocol <*protocol*>
no filter ethernet-type protocol <*protocol*>

protocol - An Ethernet protocol type. (Options: ARP, RARP, Berkeley-Trailer-Negotiation, LAN-Test, X25-Level-3, Banyan, CDP, DEC XNS, DEC-MOP-Dump-Load, DEC-MOP, DEC-LAT, Ethertalk, Appletalk-ARP, Novell-IPX(old), Novell-IPX(new), EAPOL, Telxon-TXP, Aironet-DDP, Enet-Config-Test, IP, IPv6, NetBEUI, PPPoE_Discovery, PPPoE_PPP_Session)

Default

None

Command Mode

Global Configuration

Command Usage

Use the **filter ethernet-type enable** command to enable filtering for Ethernet types specified in the filtering table, or the no **filter ethernet-type enable** command to disable all filtering based on the filtering table.

Example

```
Enterprise AP(config)#filter ethernet-type protocol ARP
Enterprise AP(config)#
```

Related Commands

filter ethernet-type enable (7-75)

show filters

This command shows the filter options and protocol entries in the filter table.

Command Mode

Exec

Example

```
Enterprise AP#show filters

Protocol Filter Information
=======================================================================
Local Bridge         :Traffic among all client STAs blocked
AP Management        :ENABLED
Ethernet Type Filter :DISABLED

UPlink Access Table
-----------------------------------------------------------------------
UPlink access control:Enabled
UPlink MAC access control list       :
00-12-34-56-78-9a
-----------------------------------------------------------------------
Enabled Protocol Filters
-----------------------------------------------------------------------
No protocol filters are enabled
=======================================================================
Enterprise AP#
```

WDS Bridge Commands

The commands described in this section are used to set the operation mode for each bridge interface and configure WIreless Distribution System (WDS) forwarding table settings.

Command	Function	Mode	Page
bridge role	Selects the bridge operation mode for a radio interface	IC-W	7-78
bridge-link parent	Configures the MAC addresses of the parent bridge node	IC-W	7-78
bridge-link child	Configures MAC addresses of connected child bridge nodes	IC-W	7-79
bridge dynamic-entry age-time	Sets the aging time for dynamic entries in the WDS forwarding table	GC	7-80
show bridge aging-time	Displays the current WDS forwarding table aging time	Exec	7-80
show bridge filter-entry	Displays current entries in the bridge MAC address table	Exec	7-81
show bridge link	Displays current bridge settings for specified interfaces	Exec	7-81

bridge role (WDS)

This command selects the bridge operation mode for the radio interface.

Syntax

bridge role <**ap** | **repeater** | **bridge** | **root-bridge** >

- **ap** - Operates only as an bridge for wireless clients.
- **repeater** - Operates as a wireless repeater, extending the range for remote wireless clients and connecting them to the root bridge. The “Parent” link to the root bridge must be configured. In this mode, traffic is not forwarded to the Ethernet port from the radio interface.
- **bridge** - Operates as a bridge to other bridges also in bridge mode.
- **root-bridge** - Operates as the root bridge in the wireless bridge network.

Default Setting

AP

Command Mode

Interface Configuration (Wireless)

Command Usage

- When the bridge role is set to “repeater,” the “Parent” link to the root bridge must be configured (see “bridge-link parent” on page 7-78). When the bridge is operating in this mode, traffic is not forwarded to the Ethernet port from the radio interface.
- Up to four WDS bridge links (MAC addresses) per radio interface can be specified for each unit in the wireless bridge network. One unit only must be configured as the “root bridge” in the wireless network. The root bridge is the unit connected to the main core of the wired LAN. Other bridges need to specify one “Parent” link to the root bridge or to a bridge connected to the root bridge. The other seven WDS links are available as “Child” links to other bridges.
- The bridge link on the radio interface always uses the default VAP interface. In any bridge mode, VAP interfaces 1 to 7 are not available for use.

Example

```
Enterprise AP(if-wireless a)#bridge role root-bridge
Enterprise AP(if-wireless a)#
```

bridge-link parent

This command configures the MAC address of the parent bridge node.

Syntax

bridge-link parent <*mac-address*>

mac-address - The wireless MAC address of the parent bridge unit. (12 hexadecimal digits in the form “xx-xx-xx-xx-xx-xx”).

Default Setting

None

Command Mode

Interface Configuration (Wireless)

Command Usage

Every bridge (except the root bridge) in the wireless bridge network must specify the MAC address of the parent bridge that is linked to the root bridge, or the root bridge itself.

Example

```
Enterprise AP(if-wireless a)#bridge-link parent 00-08-2d-69-3a-51
Enterprise AP(if-wireless a)#
```

bridge-link child

This command configures the MAC addresses of child bridge nodes.

Syntax

bridge-link child <*index*> <*mac-address*>

- *index* - The link index number of the child node. (Range: 1 - 6)
- *mac-address* - The wireless MAC address of a child bridge unit. (12 hexadecimal digits in the form “xx-xx-xx-xx-xx-xx”).

Default Setting

None

Command Mode

Interface Configuration (Wireless)

Command Usage

- In root bridge mode, up to six child bridge links can be specified using link index numbers 1 to 6.
- In bridge mode, up to five child links can be specified using link index numbers 2 to 6. Index number 1 is reserved for the parent link, which must be set using the **bridge parent** command.

Example

```
Enterprise AP(if-wireless a)#bridge-link child 2 00-08-3e-84-bc-6d
Enterprise AP(if-wireless a)#bridge-link child 3 00-08-3e-85-13-f2
Enterprise AP(if-wireless a)#bridge-link child 4 00-08-3e-84-79-31
Enterprise AP(if-wireless a)#
```

bridge dynamic-entry age-time

This command sets the time for aging out dynamic entries in the WDS forwarding table.

Syntax

bridge dynamic-entry age-time <*seconds*>

seconds - The time to age out an address entry. (Range: 10-10000 seconds).

Default Setting

300 seconds

Command Mode

Global Configuration

Command Usage

If the MAC address of an entry in the address table is not seen on the associated interface for longer than the aging time, the entry is discarded.

Example

```
Enterprise AP(config)#bridge dynamic-entry age-time 100
Enterprise AP(config)#
```

show bridge aging-time

This command displays the current WDS forwarding table aging time setting.

Command Mode

Exec

Example

```
Enterprise AP#show bridge aging-time
Aging time:  300
Enterprise AP#
```

show bridge filter-entry

This command displays current entries in the WDS forwarding table.

Command Mode

Exec

Example

```
Enterprise AP#show bridge filter-entry


max entry numbers =512
current entry nums =13
*****************************************************************************
*********************** Bridge MAC Addr Table ******************************
*****************************************************************************
|       MAC       |  Port  |Fwd_type| VlanID|origin life|remain Life|  Type  |
 01 80 c2 00 00 00        0        5    4095         300         300   Static
 01 80 c2 00 00 03        0        5    4095         300         300   Static
 00 30 f1 f0 9b 20        1        0       1         300         300   Static
 00 30 f1 f0 9b 21        1        0       1         300         300   Static
 00 30 f1 f0 9b 22        1        0       1         300         300   Static
 00 30 f1 f0 9b 23        1        0       1         300         300   Static
 00 30 f1 f0 9b 24        1        0       1         300         300   Static
 00 30 f1 f0 9b 25        1        0       1         300         300   Static
 00 30 f1 f0 9b 26        1        0       1         300         300   Static
 00 30 f1 f0 9b 27        1        0       1         300         300   Static
 00 30 f1 2f be 30        1        3       0         300         175  Dynamic
 00 30 f1 f0 9a 9c        1        0       1         300         300   Static
 ff ff ff ff ff ff        0        4    4095         300         300   Static
Enterprise AP#
```

show bridge link

This command displays WDS bridge link and spanning tree settings for specified interfaces.

Syntax

show bridge link <ethernet | wireless <a | g> [*index*]>

- **ethernet** - Specifies the Ethernet interface.
- **wireless** - Specifies a wireless interface.
  - **a** - The 802.11a radio interface.
  - **g** - The 802.11g radio interface.
  - *index* - The index number of a bridge link. (Range: 1 - 6)

Command Mode

Exec

Example

```
Enterprise AP#show bridge link wireless a

Interface Wireless A WDS Information
====================================
AP Role:   Bridge
Parent:    00-12-34-56-78-9a
Child:
      Child 2:    00-08-12-34-56-de
      Child 3:    00-00-00-00-00-00
      Child 4:    00-00-00-00-00-00
      Child 5:    00-00-00-00-00-00
      Child 6:    00-00-00-00-00-00
STAs:
      No WDS Stations.
Enterprise AP#
```

```
Enterprise AP#show bridge link wireless a 2

Port-No             : 11
status              : Enabled
state               : Disabled
priority            : 0
path cost           : 19
message age Timer   : Inactive
message age         : 4469
designated-root    : priority = 32768, MAC = 00:30:F1:F0:9A:9C
designated-cost    : 0
designated-bridge  : priority = 32768, MAC = 00:30:F1:F0:9A:9C
designated-port    : priority = 0, port No = 11
forward-transitions : 0
Enterprise AP#
```

```
Enterprise AP#show bridge link ethernet

status              : Enabled
state               : Forwarding
priority            : 0
path cost           : 19
message age Timer   : Inactive
message age         : 4346
designated-root    : priority = 32768, MAC = 00:30:F1:F0:9A:9C
designated-cost    : 0
designated-bridge  : priority = 32768, MAC = 00:30:F1:F0:9A:9C
designated-port    : priority = 0, port No = 1
forward-transitions : 1
Enterprise AP#
```

Spanning Tree Commands

The commands described in this section are used to set the MAC address table aging time and spanning tree parameters for both the Ethernet and wireless interfaces.

Table 7-15. Bridge Commands

Command	Function	Mode	Page
bridge stp enable	Enables the Spanning Tree feature	GC	7-83
bridge stp forwarding-delay	Configures the spanning tree bridge forward time	GC	7-84
bridge stp hello-time	Configures the spanning tree bridge hello time	GC	7-84
bridge stp max-age	Configures the spanning tree bridge maximum age	GC	7-85
bridge stp priority	Configures the spanning tree bridge priority	GC	7-85
bridge-link path-cost	Configures the spanning tree path cost of a port	IC	7-86
bridge-link port-priority	Configures the spanning tree priority of a port	IC	7-86
show bridge stp	Displays the global spanning tree settings	Exec	7-87
show bridge link	Displays current bridge settings for specified interfaces	Exec	7-81

bridge stp enable

This command enables the Spanning Tree Protocol. Use the **no** form to disable the Spanning Tree Protocol.

Syntax

bridge stp enable
no bridge stp enable

Default Setting

Enabled

Command Mode

Global Configuration

Example

This example globally enables the Spanning Tree Protocol.

```
Enterprise AP(config)bridge stp enable
Enterprise AP(config)
```

bridge stp forwarding-delay

Use this command to configure the spanning tree bridge forward time globally for the wireless bridge. Use the **no** form to restore the default.

Syntax

bridge stp forwarding-delay <*seconds*>
no bridge stp forwarding-delay

seconds - Time in seconds. (Range: 4 - 30 seconds)
The minimum value is the higher of 4 or [(max-age / 2) + 1].

Default Setting

15 seconds

Command Mode

Global Configuration

Command Usage

This command sets the maximum time (in seconds) the root device will wait before changing states (i.e., discarding to learning to forwarding). This delay is required because every device must receive information about topology changes before it starts to forward frames. In addition, each port needs time to listen for conflicting information that would make it return to the discarding state; otherwise, temporary data loops might result.

Example

```
Enterprise AP(config)#bridge stp forwarding-delay 20
Enterprise AP(config)#
```

bridge stp hello-time

Use this command to configure the spanning tree bridge hello time globally for the wireless bridge. Use the **no** form to restore the default.

Syntax

bridge stp hello-time <*time*>
no bridge stp hello-time

time - Time in seconds. (Range: 1-10 seconds).
The maximum value is the lower of 10 or [(max-age / 2) -1].

Default Setting

2 seconds

Command Mode

Global Configuration

Command Usage

This command sets the time interval (in seconds) at which the root device transmits a configuration message.

Example

```
Enterprise AP(config)#bridge stp hello-time 5
Enterprise AP(config)#
```

bridge stp max-age

Use this command to configure the spanning tree bridge maximum age globally for the wireless bridge. Use the **no** form to restore the default.

Syntax

bridge stp max-age <*seconds*>
no bridge stp max-age

seconds - Time in seconds. (Range: 6-40 seconds)
The minimum value is the higher of 6 or [2 x (hello-time + 1)].
The maximum value is the lower of 40 or [2 x (forward-time - 1)].

Default Setting

20 seconds

Command Mode

Global Configuration

Command Usage

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

Example

```
Enterprise AP(config)#bridge stp max-age 40
Enterprise AP(config)#
```

bridge stp priority

Use this command to configure the spanning tree priority globally for the wireless bridge. Use the **no** form to restore the default.

Syntax

bridge stp priority<*priority*>
no bridge stp priority

priority - Priority of the bridge. (Range: 0 - 65535)

Default Setting

32768

Command Mode

Global Configuration

Command Usage

Bridge priority is used in selecting the root device, root port, and designated port. The device with the highest priority becomes the STP root device. However, if all devices have the same priority, the device with the lowest MAC address will then become the root device.

Example

```
Enterprise AP(config)#bridge stp-bridge priority 40000
Enterprise AP(config)#
```

bridge-link path-cost

Use this command to configure the spanning tree path cost for the specified port.

Syntax

bridge-link path-cost <*index*> <*cost*>

- *index* - Specifies the bridge link number on the wireless bridge. (Range: 1-6 required on wireless interface only)
- *cost* - The path cost for the port. (Range: 1-65535)

Default Setting

19

Command Mode

Interface Configuration

Command Usage

- This command is used by the Spanning Tree Protocol to determine the best path between devices. Therefore, lower values should be assigned to ports attached to faster media, and higher values assigned to ports with slower media.
- Path cost takes precedence over port priority.

Example

```
Enterprise AP(if-wireless a)#bridge-link path-cost 1 50
Enterprise AP(if-wireless a)#
```

bridge-link port-priority

Use this command to configure the priority for the specified port.

Syntax

bridge-link port-priority <*index*> <*priority*>

- *index* - Specifies the bridge link number on the wireless bridge. (Range: 1-6 required on wireless interface only)
- *priority* - The priority for a port. (Range: 1-255)

Default Setting

128

Command Mode

Interface Configuration

Command Usage

- This command defines the priority for the use of a port in the Spanning Tree Protocol. If the path cost for all ports on a wireless bridge are the same, the port with the highest priority (that is, lowest value) will be configured as an active link in the spanning tree.
- Where more than one port is assigned the highest priority, the port with lowest numeric identifier will be enabled.

Example

```
Enterprise AP(if-wireless a)#bridge-link port-priority 1 64
Enterprise AP(if-wireless a)#
```

Related Commands

bridge-link path-cost (7-86)

show bridge stp

This command displays aging time and spanning tree settings for the Ethernet and wireless interfaces.

Syntax

show bridge stp

Command Mode

Exec

Example

```
Enterprise AP#show bridge stp

Bridge MAC           : 00:12:CF:05:B7:84
Status               : Disabled
priority             : 0
designated-root     : priority = 0, MAC = 00:00:00:00:00:00
root-path-cost       : 0
root-Port-no         : 0
Hold Time            :     1 Seconds
Hello Time           :     2 Seconds
Maximum Age          :    20 Seconds
Forward Delay        :    15 Seconds
bridge Hello Time    :     2 Seconds
bridge Maximum Age   :    20 Seconds
bridge Forward Delay :    15 Seconds
time-since-top-change: 89185 Seconds
topology-change-count: 0
Enterprise AP#
```

Ethernet Interface Commands

The commands described in this section configure connection parameters for the Ethernet port and wireless interface.

Table 7-16. Ethernet Interface Commands

Command	Function	Mode	Page
interface ethernet	Enters Ethernet interface configuration mode	GC	7-88
dns primary- server	Specifies the primary name server	IC-E	7-89
dns secondary- server	Specifies the secondary name server	IC-E	7-89
ip address	Sets the IP address for the Ethernet interface	IC-E	7-89
ip dhcp	Submits a DHCP request for an IP address	IC-E	7-90
speed-duplex	Configures speed and duplex operation on the Ethernet interface	IC-E	7-91
shutdown	Disables the Ethernet interface	IC-E	7-92
show interface ethernet	Shows the status for the Ethernet interface	Exec	7-92

interface ethernet

This command enters Ethernet interface configuration mode.

Default Setting

None

Command Mode

Global Configuration

Example

To specify the 10/100Base-TX network interface, enter the following command:

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

dns server

This command specifies the address for the primary or secondary domain name server to be used for name-to-address resolution.

Syntax

dns primary-server <*server-address*>
dns secondary-server <*server-address*>

- **primary-server** - Primary server used for name resolution.
- **secondary-server** - Secondary server used for name resolution.
- *server-address* - IP address of domain-name server.

Default Setting

None

Command Mode

Global Configuration

Command Usage

The primary and secondary name servers are queried in sequence.

Example

This example specifies two domain-name servers.

```
Enterprise AP(if-ethernet)#dns primary-server 192.168.1.55
Enterprise AP(if-ethernet)#dns secondary-server 10.1.0.55
Enterprise AP(if-ethernet)#
```

Related Commands

show interface ethernet (7-92)

ip address

This command sets the IP address for the bridge. Use the **no** form to restore the default IP address.

Syntax

ip address <*ip-address*> <*netmask*> <*gateway*>
no ip address

- *ip-address* - IP address
- *netmask* - Network mask for the associated IP subnet. This mask identifies the host address bits used for routing to specific subnets.
- *gateway* - IP address of the default gateway

Default Setting

IP address: 192.168.1.1
Netmask: 255.255.255.0

Command Mode

Interface Configuration (Ethernet)

Command Usage

- DHCP is enabled by default. To manually configure a new IP address, you must first disable the DHCP client with the **no ip dhcp** command.
- You must assign an IP address to this device to gain management access over the network or to connect the bridge to existing IP subnets. You can manually configure a specific IP address using this command, or direct the device to obtain an address from a DHCP server using the **ip dhcp** command. Valid IP addresses consist of four numbers, 0 to 255, separated by periods. Anything outside this format will not be accepted by the configuration program.

Example

```
Enterprise AP(config)#interface ethernet
Enter Ethernet configuration commands, one per line.
Enterprise AP(if-ethernet)#ip address 192.168.1.2 255.255.255.0
192.168.1.253
Enterprise AP(if-ethernet)#
```

Related Commands

ip dhcp (7-90)

ip dhcp

This command enables the bridge to obtain an IP address from a DHCP server. Use the **no** form to restore the default IP address.

Syntax

ip dhcp
no ip dhcp

Default Setting

Enabled

Command Mode

Interface Configuration (Ethernet)

Command Usage

- You must assign an IP address to this device to gain management access over the network or to connect the bridge to existing IP subnets. You can manually configure a specific IP address using the **ip address** command, or direct the device to obtain an address from a DHCP server using this command.

- When you use this command, the bridge will begin broadcasting DHCP client requests. The current IP address (i.e., default or manually configured address) will continue to be effective until a DHCP reply is received. Requests will be broadcast periodically by this device in an effort to learn its IP address. (DHCP values can include the IP address, subnet mask, and default gateway.)

Example

```
Enterprise AP(config)#interface ethernet
Enter Ethernet configuration commands, one per line.
Enterprise AP(if-ethernet)#ip dhcp
Enterprise AP(if-ethernet)#
```

Related Commands

ip address (7-89)

speed-duplex

This command configures the speed and duplex mode of a given interface when autonegotiation is disabled. Use the **no** form to restore the default.

Syntax

speed-duplex <**auto** | **10MH** | **10MF** | **100MF** | **100MH**>

- **auto** - autonegotiate speed and duplex mode
- **10MH** - Forces 10 Mbps, half-duplex operation
- **10MF** - Forces 10 Mbps, full-duplex operation
- **100MH** - Forces 100 Mbps, half-duplex operation
- **100MF** - Forces 100 Mbps, full-duplex operation

Default Setting

Auto-negotiation is enabled by default.

Command Mode

Interface Configuration (Ethernet)

Command Usage

If autonegotiation is disabled, the speed and duplex mode must be configured to match the setting of the attached device.

Example

The following example configures the Ethernet port to 100 Mbps, full-duplex operation.

```
Enterprise AP(if-ethernet)#speed-duplex 100mf
Enterprise AP(if-ethernet)#
```

shutdown

This command disables the Ethernet interface. To restart a disabled interface, use the **no** form.

Syntax

shutdown
no shutdown

Default Setting

Interface enabled

Command Mode

Interface Configuration (Ethernet)

Command Usage

This command allows you to disable the Ethernet port due to abnormal behavior (e.g., excessive collisions), and reenable it after the problem has been resolved. You may also want to disable the Ethernet port for security reasons.

Example

The following example disables the Ethernet port.

```
Enterprise AP(if-ethernet)#shutdown
Enterprise AP(if-ethernet)#
```

show interface ethernet

This command displays the status for the Ethernet interface.

Syntax

show interface [**ethernet**]

Default Setting

Ethernet interface

Command Mode

Exec

Example

```
Enterprise AP#show interface ethernet
Ethernet Interface Information
========================================
IP Address          : 192.168.2.2
Subnet Mask         : 255.255.255.0
Default Gateway     : 192.168.1.253
Primary DNS         : 192.168.1.55
Secondary DNS       : 10.1.0.55
Speed-duplex        : 100Base-TX Half Duplex
Admin status        : Up
Operational status  : Up
========================================
Enterprise AP#
```

Wireless Interface Commands

The commands described in this section configure connection parameters for the wireless interfaces.

Table 7-17. Wireless Interface Commands

Command	Function	Mode	Page
interface wireless	Enters wireless interface configuration mode	GC	7-94
vap	Provides access to the VAP interface configuration mode	IC-W	7-95
speed	Configures the maximum data rate at which the bridge transmits unicast packets	IC-W	7-95
turbo	Configures turbo mode to use a faster data rate	IC-W (a)	7-96
multicast-data-rate	Configures the maximum rate for transmitting multicast packets on the wireless interface	IC-W	7-97
channel	Configures the radio channel	IC-W	7-98
transmit-power	Adjusts the power of the radio signals transmitted from the bridge	IC-W	7-98
radio-mode	Forces the operating mode of the 802.11g radio	IC-W (b/g)	7-99
preamble	Sets the length of the 802.11g signal preamble	IC-W (b/g)	7-100
antenna control	Selects the antenna control method to use for the radio	IC-W	7-100
antenna id	Selects the antenna ID to use for the radio	IC-W	7-101
antenna location	Selects the location of the antenna	IC-W	7-102

Table 7-17. Wireless Interface Commands

Command	Function	Mode	Page
beacon-interval	Configures the rate at which beacon signals are transmitted from the bridge	IC-W	7-102
dtim-period	Configures the rate at which stations in sleep mode must wake up to receive broadcast/multicast transmissions	IC-W	7-103
fragmentation- length	Configures the minimum packet size that can be fragmented	IC-W	7-104
rts-threshold	Sets the packet size threshold at which an RTS must be sent to the receiving station prior to the sending station starting communications	IC-W	7-104
super-a	Enables Atheros proprietary Super A performance enhancements	IC-W (a)	7-105
super-g	Enables Atheros proprietary Super G performance enhancements	IC-W (b/g)	7-106
description	Adds a description to the wireless interface	IC-W-VAP	7-106
ssid	Configures the service set identifier	IC-W-VAP	7-107
closed system	Opens access to clients without a pre-configured SSID	IC-W-VAP	7-107
max-association	Configures the maximum number of clients that can be associated with the bridge at the same time	IC-W-VAP	7-108
assoc- timeout-interval	Configures the idle time interval (when no frames are sent) after which a client is disassociated from the VAP interface	IC-W-VAP	7-108
auth- timeout-value	Configures the time interval after which clients must be re-authenticated	IC-W-VAP	7-108
shutdown	Disables the wireless interface	IC-W-VAP	7-109
show interface wireless	Shows the status for the wireless interface	Exec	7-110
show station	Shows the wireless clients associated with the bridge	Exec	7-112

interface wireless

This command enters wireless interface configuration mode.

Syntax

interface wireless <**a** | **g**>

- **a** - 802.11a radio interface.
- **g** - 802.11g radio interface.

Default Setting

None

Command Mode

Global Configuration

Example

To specify the 802.11a interface, enter the following command:

```
Enterprise AP(config)#interface wireless a
Enterprise AP(if-wireless a)#
```

vap

This command provides access to the VAP (Virtual bridge) interface configuration mode.

Syntax

vap <*vap-id*>

vap-id - The number that identifies the VAP interface. (Options: 0-7)

Default Setting

None

Command Mode

Interface Configuration (Wireless)

Example

```
Enterprise AP(if-wireless g)#vap 0
Enterprise AP(if-wireless g: VAP[0])#
```

speed

This command configures the maximum data rate at which the bridge transmits unicast packets.

Syntax

speed <*speed*>

speed - Maximum access speed allowed for wireless clients.
(Options for 802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps)
(Options for 802.11b/g: 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, 54 Mbps)

Default Setting

54 Mbps

Command Mode

Interface Configuration (Wireless)

Command Usage

- The maximum transmission distance is affected by the data rate. The lower the data rate, the longer the transmission distance. Please refer to the table for maximum distances on page -6.
- When turbo mode is enabled (page 7-107) for 802.11a, the effective maximum speed specified by this command is double the entered value (e.g., setting the speed to 54 Mbps limits the effective maximum speed to 108 Mbps).

Example

```
Enterprise AP(if-wireless g)#speed 6
Enterprise AP(if-wireless g)#
```

turbo

This command sets the bridge to an enhanced proprietary modulation mode (not regulated in IEEE 802.11a) that provides a higher data rate of up to 108 Mbps.

Syntax

turbo <**static** | **dynamic**>
no turbo

static - Always uses turbo mode.
dynamic - Will use turbo mode when no other nearby bridges are detected or active.

Default Setting

Disabled

Command Mode

Interface Configuration (Wireless - 802.11a)

Command Usage

- The normal 802.11a wireless operation mode provides connections up to 54 Mbps. Turbo Mode is an enhanced mode (not regulated in IEEE 802.11a) that provides a higher data rate of up to 108 Mbps. Enabling Turbo Mode allows the bridge to provide connections up to 108 Mbps.
- In normal mode, the bridge provides a channel bandwidth of 20 MHz, and supports the maximum number of channels permitted by local regulations (e.g., 11 channels for the United States). In Turbo Mode, the channel bandwidth is increased to 40 MHz to support the increased data rate.

However, this reduces the number of channels supported (e.g., 5 channels for the United States).

Example

```
Enterprise AP(if-wireless a)#turbo
Enterprise AP(if-wireless a)#
```

multicast-data-rate

This command configures the maximum data rate at which the bridge transmits multicast and management packets (excluding beacon packets) on the wireless interface.

Syntax

multicast-data-rate <*speed*>

speed - Maximum transmit speed allowed for multicast data.
(Options for 802.11a: 6, 12, 24 Mbps)
(Options for 802.11b/g; 1, 2, 5.5, 11 Mbps)

Default Setting

1 Mbps for 802.11b/g
6 Mbps for 802.11a

Command Mode

Interface Configuration (Wireless)

Example

```
Enterprise AP(if-wireless g)#multicast-data-rate 5.5
Enterprise AP(if-wireless g)#
```

channel

This command configures the radio channel through which the bridge communicates with wireless clients.

Syntax

channel <*channel* | **auto**>

- *channel* - Manually sets the radio channel used for communications with wireless clients. (Range for 802.11a: 36, 40, 44, 48, 52, 56, 60, 64, 149, 153, 157, 161, 165 for normal mode, and 42, 50, 58, 152, 160 for turbo mode; Range for 802.11b/g: 1 to 14)
- **auto** - Automatically selects an unoccupied channel (if available). Otherwise, the lowest channel is selected.

Default Setting

Automatic channel selection

Command Mode

Interface Configuration (Wireless)

Command Usage

- The available channel settings are limited by local regulations, which determine the number of channels that are available.
- When multiple bridges are deployed in the same area, be sure to choose a channel separated by at least two channels for 802.11a to avoid having the channels interfere with each other, and at least five channels for 802.11b/g. You can deploy up to four bridges in the same area for 802.11a (e.g., channels 36, 56, 149, 165) and three bridges for 802.11b/g (e.g., channels 1, 6, 11).
- For most wireless adapters, the channel for wireless clients is automatically set to the same as that used by the bridge to which it is linked.

Example

```
Enterprise AP(if-wireless g)#channel 1
Enterprise AP(if-wireless g)#
```

transmit-power

This command adjusts the power of the radio signals transmitted from the bridge.

Syntax

transmit-power <*signal-strength*>

signal-strength - Signal strength transmitted from the bridge. (Options: full, half, quarter, eighth, min)

Default Setting

full

Command Mode

Interface Configuration (Wireless)

Command Usage

- The “min” keyword indicates minimum power.
- The longer the transmission distance, the higher the transmission power required. But to support the maximum number of users in an area, you must keep the power as low as possible. Power selection is not just a trade off between coverage area and maximum supported clients. You also have to ensure that high strength signals do not interfere with the operation of other radio devices in your area.

Example

```
Enterprise AP(if-wireless g)#transmit-power half
Enterprise AP(if-wireless g)#
```

radio-mode

This command forces the operating mode for the 802.11g wireless interface.

Syntax

radio-mode <**b** | **g** | **b+g**>

- **b** - b-only mode: Both 802.11b and 802.11g clients can communicate with the bridge, but 802.11g clients can only transfer data at 802.11b standard rates (up to 11 Mbps).
- **g** - g-only mode: Only 802.11g clients can communicate with the bridge (up to 54 Mbps).
- **b+g** - b & g mixed mode: Both 802.11b and 802.11g clients can communicate with the bridge (up to 54 Mbps).

Default Setting

b+g mode

Command Mode

Interface Configuration (Wireless - 802.11g)

Command Usage

- For Japan, only 13 channels are available when set to **g** or **b+g** modes. When set to **b** mode, 14 channels are available.
- Both the 802.11g and 802.11b standards operate within the 2.4 GHz band. If you are operating in **g** mode, any 802.11b devices in the service area will contribute to the radio frequency noise and affect network performance.

Example

```
Enterprise AP(if-wireless g)#radio-mode g
Enterprise AP(if-wireless g)#
```

preamble

This command sets the length of the signal preamble that is used at the start of a 802.11b/g data transmission.

Syntax

preamble [**long** | **short-or-long**]

- **long** - Sets the preamble to long (192 microseconds).
- **short-or-long** - Sets the preamble to short if no 802.11b clients are detected (96 microseconds).

Default Setting

Short-or-Long

Command Mode

Interface Configuration (Wireless - 802.11b/g)

Command Usage

- Using a short preamble instead of a long preamble can increase data throughput on the bridge, but requires that all clients can support a short preamble.
- Set the preamble to long to ensure the bridge can support all 802.11b and 802.11g clients.

Example

```
Enterprise AP(if-wireless g)#preamble short
Enterprise AP(if-wireless g)#
```

antenna control

This command selects the use of two diversity antennas or a single antenna for the radio interface.

Syntax

antenna control <**diversity** | **left** | **right**>

- **diversity** - The radio uses both antennas in a diversity system. Select this method when the Antenna ID is set to “Default Antenna” to use the bridge's integrated antennas. The bridge does not support external diversity antennas.
- **left** - The radio only uses the antenna on the left side (the side farthest from the bridge LEDs). The bridge does not support an external antenna connection on its left antenna. Therefore, this method is not valid for the bridge.

- **right** - The radio only uses the antenna on the right side (the side closest to the bridge LEDs). Select this method when using an optional external antenna that is connected to the right antenna connector.

Default Setting

Diversity

Command Mode

Interface Configuration (Wireless)

Command Usage

The antenna ID must be selected in conjunction with the antenna control method to configure proper use of any of the antenna options.

Example

```
Enterprise AP(if-wireless g)#antenna control right
Enterprise AP(if-wireless g)#
```

antenna id

This command specifies the antenna type connected to the bridge represented by a four-digit hexadecimal ID number, either the integrated diversity antennas (the "Default Antenna") or an optional external antenna.

Syntax

antenna id <*antenna-id*>

- *antenna-id* - Specifies the ID number of an approved antenna that is connected to the bridge
  (Range: 0x0000 - 0xFFFF)

Default Setting

0x0000 (built-in antennas)

Command Mode

Interface Configuration (Wireless)

Command Usage

- The optional external antennas (if any) that are certified for use with the bridge are listed by typing **antenna control id ?**. Selecting the correct antenna ID ensures that the bridge's radio transmissions are within regulatory power limits for the country of operation.
- The antenna ID must be selected in conjunction with the antenna control method to configure proper use of any of the antenna options.

Example

```
Enterprise AP(if-wireless g)#antenna id 0000
Enterprise AP(if-wireless g)#
```

antenna location

This command selects the antenna mounting location for the radio interface.

Syntax

antenna location <**indoor** | **outdoor**>

- **indoor** - The antenna is mounted indoors.
- **outdoor** - The antenna is mounted outdoors.

Default Setting

Indoor

Command Mode

Interface Configuration (Wireless)

Command Usage

- When an external antenna is selected, the antenna control must be set to “right.”
- Selecting the correct location ensures that the bridge only uses radio channels that are permitted in the country of operation.

Example

```
Enterprise AP(if-wireless g)#antenna location indoor
Enterprise AP(if-wireless g)#
```

beacon-interval

This command configures the rate at which beacon signals are transmitted from the bridge.

Syntax

beacon-interval <*interval*>

interval - The rate for transmitting beacon signals.
(Range: 20-1000 milliseconds)

Default Setting

100

Command Mode

Interface Configuration (Wireless)

Command Usage

The beacon signals allow wireless clients to maintain contact with the bridge. They may also carry power-management information.

Example

```
Enterprise AP(if-wireless g)#beacon-interval 150
Enterprise AP(if-wireless g)#
```

dtim-period

This command configures the rate at which stations in sleep mode must wake up to receive broadcast/multicast transmissions.

Syntax

dtim-period <*interval*>

interval - Interval between the beacon frames that transmit broadcast or multicast traffic. (Range: 1-255 beacon frames)

Default Setting

1

Command Mode

Interface Configuration (Wireless)

Command Usage

- The Delivery Traffic Indication Map (DTIM) packet interval value indicates how often the MAC layer forwards broadcast/multicast traffic. This parameter is necessary to wake up stations that are using Power Save mode.
- The DTIM is the interval between two synchronous frames with broadcast/multicast information. The default value of 2 indicates that the bridge will save all broadcast/multicast frames for the Basic Service Set (BSS) and forward them after every second beacon.
- Using smaller DTIM intervals delivers broadcast/multicast frames in a more timely manner, causing stations in Power Save mode to wake up more often and drain power faster. Using higher DTIM values reduces the power used by stations in Power Save mode, but delays the transmission of broadcast/multicast frames.

Example

```
Enterprise AP(if-wireless g)#dtim-period 100
Enterprise AP(if-wireless g)#
```

fragmentation-length

This command configures the minimum packet size that can be fragmented when passing through the bridge.

Syntax

fragmentation-length <*length*>

length - Minimum packet size for which fragmentation is allowed. (Range: 256-2346 bytes)

Default Setting

2346

Command Mode

Interface Configuration (Wireless)

Command Usage

- If the packet size is smaller than the preset Fragment size, the packet will not be segmented.
- Fragmentation of the PDUs (Package Data Unit) can increase the reliability of transmissions because it increases the probability of a successful transmission due to smaller frame size. If there is significant interference present, or collisions due to high network utilization, try setting the fragment size to send smaller fragments. This will speed up the retransmission of smaller frames. However, it is more efficient to set the fragment size larger if very little or no interference is present because it requires overhead to send multiple frames.

Example

```
Enterprise AP(if-wireless g)#fragmentation-length 512
Enterprise AP(if-wireless g)#
```

rts-threshold

This command sets the packet size threshold at which a Request to Send (RTS) signal must be sent to the receiving station prior to the sending station starting communications.

Syntax

rts-threshold <*threshold*>

threshold - Threshold packet size for which to send an RTS. (Range: 0-2347 bytes)

Default Setting

2347

Command Mode

Interface Configuration (Wireless)

Command Usage

- If the threshold is set to 0, the bridge always sends RTS signals. If set to 2347, the bridge never sends RTS signals. If set to any other value, and the packet size equals or exceeds the RTS threshold, the RTS/CTS (Request to Send / Clear to Send) mechanism will be enabled.
- The bridge sends RTS frames to a receiving station to negotiate the sending of a data frame. After receiving an RTS frame, the station sends a CTS frame to notify the sending station that it can start sending data.
- bridges contending for the wireless medium may not be aware of each other. The RTS/CTS mechanism can solve this “Hidden Node” problem.

Example

```
Enterprise AP(if-wireless g)#rts-threshold 256
Enterprise AP(if-wireless g)#
```

super-a

This command enables Atheros proprietary Super A performance enhancements. Use the **no** form to disable this function.

Syntax

[**no**] **super-a**

Default Setting

Disabled

Command Mode

Interface Configuration (Wireless - 802.11a)

Command Usage

Super A enhancements include bursting, compression, and fast frames. Maximum throughput ranges between 40 to 60 Mbps for connections to Atheros-compatible clients.

Example

```
Enterprise AP(if-wireless a)#super a
Enterprise AP(if-wireless a)#
```

super-g

This command enables Atheros proprietary Super G performance enhancements. Use the **no** form to disable this function.

Syntax

[**no**] **super-g**

Default Setting

Disabled

Command Mode

Interface Configuration (Wireless - 802.11g)

Command Usage

These enhancements include bursting, compression, fast frames and dynamic turbo. Maximum throughput ranges between 40 to 60 Mbps for connections to Atheros-compatible clients.

Example

```
Enterprise AP(if-wireless a)#super g
Enterprise AP(if-wireless a)#
```

description

This command adds a description to a the wireless interface. Use the **no** form to remove the description.

Syntax

description <*string*>
no description

string - Comment or a description for this interface.
(Range: 1-80 characters)

Default Setting

None

Command Mode

Interface Configuration (Wireless-VAP)

Example

```
Enterprise AP(if-wireless g: VAP[0])#description RD-AP#3
Enterprise AP(if-wireless g: VAP[0])#
```

ssid

This command configures the service set identifier (SSID).

Syntax

ssid <*string*>

string - The name of a basic service set supported by the bridge. (Range: 1 - 32 characters)

Default Setting

802.11a Radio: VAP_TEST_11A (0 to 3)
802.11g Radio: VAP_TEST_11G (0 to 3)

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

Clients that want to connect to the wireless network via an bridge must set their SSIDs to the same as that of the bridge.

Example

```
Enterprise AP(if-wireless g: VAP[0])#ssid RD-AP#3
Enterprise AP(if-wireless g)#
```

closed-system

This command prohibits access to clients without a pre-configured SSID. Use the **no** form to disable this feature.

Syntax

closed-system
no closed-system

Default Setting

Disabled

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

When closed system is enabled, the bridge will not include its SSID in beacon messages. Nor will it respond to probe requests from clients that do not include a fixed SSID.

Example

```
Enterprise AP(if-wireless g: VAP[0])#closed-system
Enterprise AP(if-wireless g)#
```

max-association

This command configures the maximum number of clients that can be associated with the bridge at the same time.

Syntax

max-association <*count*>

count - Maximum number of associated stations. (Range: 0-64)

Default Setting

64

Command Mode

Interface Configuration (Wireless-VAP)

Example

```
Enterprise AP(if-wireless g: VAP[0])#max-association 32
Enterprise AP(if-wireless g)#
```

assoc-timeout-interval

This command configures the idle time interval (when no frames are sent) after which the client is disassociated from the VAP interface.

Syntax

assoc-timeout-interval <*minutes*>

minutes - The number of minutes of inactivity before disassociation. (Range: 5-60)

Default Setting

30

Command Mode

Interface Configuration (Wireless-VAP)

Example

```
Enterprise AP(if-wireless g: VAP[0])#association-timeout-interval 20
Enterprise AP(if-wireless g: VAP[0])#
```

auth-timeout-value

This command configures the time interval within which clients must complete authentication to the VAP interface.

Syntax

auth-timeout-value <*minutes*>

minutes - The number of minutes before re-authentication. (Range: 5-60)

Default Setting

60

Command Mode

Interface Configuration (Wireless-VAP)

Example

```
Enterprise AP(if-wireless g: VAP[0])#auth-timeout-value 40
Enterprise AP(if-wireless g: VAP[0])#
```

shutdown

This command disables the wireless interface. Use the **no** form to restart the interface.

Syntax

shutdown
no shutdown

Default Setting

Interface enabled

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

You must first enable VAP interface 0 before you can enable VAP interfaces 1, 2, 3, 4, 5, 6, or 7.

Example

```
Enterprise AP(if-wireless g: VAP[0])#shutdown
Enterprise AP(if-wireless g)#
```

show interface wireless

This command displays the status for the wireless interface.

Syntax

show interface wireless <**a** | **g**> *vap-id*

- **a** - 802.11a radio interface.
- **g** - 802.11g radio interface.
- *vap-id* - The number that identifies the VAP interface. (Options: 0~7)

Command Mode

Exec

Example

```
Enterprise AP#show interface wireless g 0

Wireless Interface Information
=========================================================================
----------------Identification-------------------------------------------
Description                      : Enterprise 802.11g bridge
SSID                             : VAP_TEST_11G 0
Channel                          : 1 (AUTO)
Status                           : ENABLED
MAC Address                      : 00:03:7f:fe:03:02
----------------802.11 Parameters----------------------------------------
Radio Mode                       : b & g mixed mode
Protection Method                : CTS only
Transmit Power                   : FULL (16 dBm)
Max Station Data Rate            : 54Mbps
Multicast Data Rate              : 5.5Mbps
Fragmentation Threshold          : 2346 bytes
RTS Threshold                    : 2347 bytes
Beacon Interval                  : 100 TUs
Authentication Timeout Interval : 60 Mins
Association Timeout Interval     : 30 Mins
DTIM Interval                    : 1 beacon
Preamble Length                  : LONG
Maximum Association              : 64 stations
MIC Mode                         : Software
Super G                          : Disabled
VLAN ID                          : 1
----------------Security-------------------------------------------------
Closed System                    : Disabled
Multicast cipher                 : WEP
Unicast cipher                   : TKIP and AES
WPA clients                      : DISABLED
WPA Key Mgmt Mode                : PRE SHARED KEY
WPA PSK Key Type                 : PASSPHRASE
WPA PSK Key                      : EMPTY
PMKSA Lifetime                   : 720 minutes
Encryption                       : ENABLED
Default Transmit Key             : 1
Common Static Keys               : Key 1: EMPTY     Key 2: EMPTY
                                   Key 3: EMPTY     Key 4: EMPTY
Pre-Authentication               : DISABLED
Authentication Type              : SHARED
```

```
----------------802.1x---------------------------------------------------
802.1x                          : DISABLED
Broadcast Key Refresh Rate      : 30 min
Session Key Refresh Rate        : 30 min
802.1x Session Timeout Value    : 0 min
----------------Antenna--------------------------------------------------
Antenna Control method          : Diversity
Antenna ID                      : 0x0000(Default Antenna)
Antenna Location                : Indoor
----------------Quality of Service---------------------------------------
WMM Mode                        : SUPPORTED
WMM Acknowledge Policy
AC0(Best Effort)                : Acknowledge
AC1(Background)                 : Acknowledge
AC2(Video)                      : Acknowledge
AC3(Voice)                      : Acknowledge
WMM BSS Parameters
AC0(Best Effort)                : logCwMin:  4  logCwMax: 10  AIFSN:  3
                                  Admission Control: No
                                  TXOP Limit: 0.000 ms
AC1(Background)                 : logCwMin:  4  logCwMax: 10  AIFSN:  7
                                  Admission Control: No
                                  TXOP Limit: 0.000 ms
AC2(Video)                      : logCwMin:  3  logCwMax:  4  AIFSN:  2
                                  Admission Control: No
                                  TXOP Limit: 3.008 ms
AC3(Voice)                      : logCwMin:  2  logCwMax:  3  AIFSN:  2
                                  Admission Control: No
                                  TXOP Limit: 1.504 ms
WMM AP Parameters
AC0(Best Effort)                : logCwMin:  4  logCwMax:  6  AIFSN:  3
                                  Admission Control: No
                                  TXOP Limit: 0.000 ms
AC1(Background)                 : logCwMin:  4  logCwMax: 10  AIFSN:  7
                                  Admission Control: No
                                  TXOP Limit: 0.000 ms
AC2(Video)                      : logCwMin:  3  logCwMax:  4  AIFSN:  1
                                  Admission Control: No
                                  TXOP Limit: 3.008 ms
AC3(Voice)                      : logCwMin:  2  logCwMax:  3  AIFSN:  1
                                  Admission Control: No
                                  TXOP Limit: 1.504 ms
=========================================================================
Enterprise AP#
```

show station

This command shows the wireless clients associated with the bridge.

Command Mode

Exec

Example

```
Enterprise AP#show station

Station Table Information
========================================================
if-wireless A VAP [0]   :
802.11a Channel : 60

No 802.11a Channel Stations.
.
.
.
if-wireless G VAP [0]   :
802.11g Channel : 1
802.11g Channel Station Table

Station Address   : 00-04-23-94-9A-9C VLAN ID: 0
Authenticated Associated    Forwarding    KeyType
TRUE          FALSE         FALSE         NONE
Counters:pkts   Tx   /   Rx    bytes   Tx   /   Rx
                   20/       0           721/       0
Time:Associated  LastAssoc   LastDisAssoc LastAuth
              0          0          0          0

if-wireless G VAP [1]   :
802.11g Channel : 1

No 802.11g Channel Stations.
.
.
.
Enterprise AP#
```

Rogue AP Detection Commands

A “rogue AP” is either an bridge that is not authorized to participate in the wireless network, or an bridge that does not have the correct security configuration. Rogue APs can potentially allow unauthorized users access to the network. Alternatively, client stations may mistakenly associate to a rogue AP and be prevented from accessing network resources. Rogue APs may also cause radio interference and degrade the wireless LAN performance.

The bridge can be configured to periodically scan all radio channels and find other bridges within range. A database of nearby bridges is maintained where any rogue APs can be identified.

Table 7-18. Rogue AP Detection Commands

Command	Function	Mode	Page
rogue-ap enable	Enables the periodic detection of other nearby bridges	GC	7-113
rogue-ap authenticate	Enables identification of all bridges	GC	7-114
rogue-ap duration	Sets the duration that all channels are scanned	GC	7-114
rogue-ap interval	Sets the time between each scan	GC	7-115
rogue-ap scan	Forces an immediate scan of all radio channels	GC	7-116
show rogue-ap	Shows the current database of detected bridges	Exec	7-117

rogue-ap enable

This command enables the periodic detection of nearby bridges. Use the **no** form to disable periodic detection.

Syntax

[no] rogue-ap enable

Default Setting

Disabled

Command Mode

Interface Configuration (Wireless)

Command Usage

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

- A “rogue AP” is either an bridge that is not authorized to participate in the wireless network, or an bridge that does not have the correct security configuration. Rogue bridges can be identified by unknown BSSID (MAC address) or SSID configuration. A database of nearby bridges should therefore be maintained on a RADIUS server, allowing any rogue APs to be identified (see “rogue-ap authenticate” on page 7-114). The rogue AP database can be viewed using the **show rogue-ap** command.
- The bridge sends Syslog messages for each detected bridge during a rogue AP scan.

Example

```
Enterprise AP(if-wireless g)#rogue-ap enable
configure either syslog or trap or both to receive the rogue APs
detected.
Enterprise AP(if-wireless g)#
```

rogue-ap authenticate

This command forces the unit to authenticate all bridges on the network. Use the **no** form to disable this function.

Syntax

[**no**] **rogue-ap authenticate**

Default Setting

Disabled

Command Mode

Interface Configuration (Wireless)

Command Usage

Enabling authentication in conjunction with a database of approved bridges stored on a RADIUS server allows the bridge to discover rogue APs. With authentication enabled and a configure RADIUS server, the bridge checks the MAC address/Basic Service Set Identifier (BSSID) of each bridge that it finds against a RADIUS server to determine whether the bridge is allowed. With authentication disabled, the bridge can identify its neighboring bridges only; it cannot identify whether the bridges are allowed or are rogues. If you enable authentication, you should also configure a RADIUS server for this bridge (see “Radius” on page 6-7).

Example

```
Enterprise AP(if-wireless g)#rogue-ap authenticate
Enterprise AP(if-wireless g)#
```

rogue-ap duration

This command sets the scan duration for detecting bridges.

Syntax

rogue-ap duration <*milliseconds*>

milliseconds - The duration of the scan. (Range: 100-1000 milliseconds)

Default Setting

350 milliseconds

Command Mode

Interface Configuration (Wireless)

Command Usage

- During a scan, client access may be disrupted and new clients may not be able to associate to the bridge. If clients experience severe disruption, reduce the scan duration time.
- A long scan duration time will detect more bridges in the area, but causes more disruption to client access.

Example

```
Enterprise AP(if-wireless g)#rogue-ap duration 200
Enterprise AP(if-wireless g)#
```

Related Commands

rogue-ap interval (7-115)

rogue-ap interval

This command sets the interval at which to scan for bridges.

Syntax

rogue-ap interval <*minutes*>

minutes - The interval between consecutive scans. (Range: 30-10080 minutes)

Default Setting

720 minutes

Command Mode

Interface Configuration (Wireless)

Command Usage

This command sets the interval at which scans occur. Frequent scanning will more readily detect other bridges, but will cause more disruption to client access.

Example

```
Enterprise AP(if-wireless g)#rogue-ap interval 120
Enterprise AP(if-wireless g)#
```

Related Commands

rogue-ap duration (7-114)

rogue-ap scan

This command starts an immediate scan for bridges on the radio interface.

Default Setting

Disabled

Command Mode

Interface Configuration (Wireless)

Command Usage

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

Example

```
Enterprise AP(if-wireless g)#rogue-ap scan
Enterprise AP(if-wireless g)#rogueApDetect Completed (Radio G) : 9 APs
detected
rogueAPDetect (Radio G): refreshing ap database now

Enterprise AP(if-wireless g)#
```

show rogue-ap

This command displays the current rogue AP database.

Command Mode

Exec

Example

```
Enterprise AP#show rogue-ap

802.11a Channel : Rogue AP Status
AP Address(BSSID)            SSID   Channel(MHz) RSSI Type Privacy RSN
======================================================================

802.11g Channel : Rogue AP Status
AP Address(BSSID)            SSID   Channel(MHz) RSSI Type Privacy RSN
======================================================================
00-04-e2-2a-37-23         WLAN1AP   11(2462 MHz)   17  ESS       0   0
00-04-e2-2a-37-3d             ANY    7(2442 MHz)   42  ESS       0   0
00-04-e2-2a-37-49         WLAN1AP    9(2452 MHz)   42  ESS       0   0
00-90-d1-08-9d-a7         WLAN1AP    1(2412 MHz)   12  ESS       0   0
00-30-f1-fb-31-f4            WLAN    6(2437 MHz)   16  ESS       0   0
Enterprise AP#
```

Wireless Security Commands

The commands described in this section configure parameters for wireless security on the 802.11a and 802.11g interfaces.

Table 7-19. Wireless Security Commands

Command	Function	Mode	Page
auth	Defines the 802.11 authentication type allowed by the bridge	IC-W-VAP	7-121
encryption	Defines whether or not WEP encryption is used to provide privacy for wireless communications	IC-W-VAP	7-120
key	Sets the keys used for WEP encryption	IC-W	7-121
transmit-key	Sets the index of the key to be used for encrypting data frames sent between the bridge and wireless clients	IC-W-VAP	7-122
cipher-suite	Selects an encryption method for the global key used for multicast and broadcast traffic	IC-W-VAP	7-123
mic_mode	Specifies how to calculate the Message Integrity Check (MIC)	IC-W	7-124
wpa-pre-shared- key	Defines a WPA preshared-key value	IC-W-VAP	7-125

Table 7-19. Wireless Security Commands

Command	Function	Mode	Page
pmksa-lifetime	Sets the lifetime PMK security associations	IC-W-VAP	7-125
pre-authentication	Enables WPA2 pre-authentication for fast roaming	IC-W-VAP	7-126

auth

This command configures authentication for the VAP interface.

Syntax

auth <**open-system** | **shared-key** | **wpa** | **wpa-psk** | **wpa2** | **wpa2-psk** | **wpa-wpa2-mixed** | **wpa-wpa2-psk-mixed** | > <required | supported>

- **open-system** - Accepts the client without verifying its identity using a shared key. “Open” authentication means either there is no encryption (if encryption is disabled) or WEP-only encryption is used (if encryption is enabled).
- **shared-key** - Authentication is based on a shared key that has been distributed to all stations.
- **wpa** - Clients using WPA are accepted for authentication.
- **wpa-psk** - Clients using WPA with a Pre-shared Key are accepted for authentication.
- **wpa2** - Clients using WPA2 are accepted for authentication.
- **wpa2-psk** - Clients using WPA2 with a Pre-shared Key are accepted for authentication.
- **wpa-wpa2-mixed** - Clients using WPA or WPA2 are accepted for authentication.
- **wpa-wpa2-psk-mixed** - Clients using WPA or WPA2 with a Pre-shared Key are accepted for authentication
- **required** - Clients are required to use WPA or WPA2.
- **supported** - Clients may use WPA or WPA2, if supported.

Default Setting

open-system

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

- The **auth** command automatically configures settings for each authentication type, including encryption, 802.1X, and cipher suite. The command **auth open-system** disables encryption and 802.1X.

- To use WEP shared-key authentication, set the authentication type to “shared-key” and define at least one static WEP key with the **key** command. Encryption is automatically enabled by the command.
- To use WEP encryption only (no authentication), set the authentication type to “open-system.” Then enable WEP with the **encryption** command, and define at least one static WEP key with the **key** command.
- When any WPA or WPA2 option is selected, clients are authenticated using 802.1X via a RADIUS server. Each client must be WPA-enabled or support 802.1X client software. The 802.1X settings (see “802.1X Authentication” on page 7-65) and RADIUS server details (see “RADIUS Client” on page 7-59) must be configured on the bridge. A RADIUS server must also be configured and be available in the wired network.
- If a WPA/WPA2 mode that operates over 802.1X is selected (WPA, WPA2, WPA-WPA2-mixed, or WPA-WPA2-PSK-mixed), the 802.1X settings (see “802.1X Authentication” on page 7-65) and RADIUS server details (see “RADIUS Client” on page 7-59) must be configured. Be sure you have also configured a RADIUS server on the network before enabling authentication. Also, note that each client has to be WPA-enabled or support 802.1X client software. A RADIUS server must also be configured and be available in the wired network.
- If a WPA/WPA2 Pre-shared Key mode is selected (WPA-PSK, WPA2-PSK or WPA-WPA2-PSK-mixed), the key must first be generated and distributed to all wireless clients before they can successfully associate with the bridge. Use the wpa-preshared-key command to configure the key (see “key” on page 7-121 and “transmit-key” on page 7-122).
- WPA2 defines a transitional mode of operation for networks moving from WPA security to WPA2. WPA2 Mixed Mode allows both WPA and WPA2 clients to associate to a common VAP interface. When the encryption cipher suite is set to TKIP, the unicast encryption cipher (TKIP or AES-CCMP) is negotiated for each client. The bridge advertises it’s supported encryption ciphers in beacon frames and probe responses. WPA and WPA2 clients select the cipher they support and return the choice in the association request to the bridge. For mixed-mode operation, the cipher used for broadcast frames is always TKIP. WEP encryption is not allowed.
- The “required” option places the VAP into TKIP only mode. The “supported” option places the VAP into TKIP+AES+WEP mode. The “required” mode is used in WPA-only environments.
- The “supported” mode can be used for mixed environments with legacy WPA products, specifically WEP. (For example, WPA+WEP. The WPA2+WEP environment is not available because WPA2 does not support WEP). To place the VAP into AES only mode, use “required” and then select the “cipher-ccmp” option for the cipher-suite command.

Example

```
Enterprise AP(if-wireless g: VAP[0])#auth shared-key
Enterprise AP(if-wireless g)#
```

Related Commands

encryption (7-120)
key (7-121)

encryption

This command enables data encryption for wireless communications. Use the **no** form to disable data encryption.

Syntax

encryption
no encryption

Default Setting

disabled

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

- Wired Equivalent Privacy (WEP) is implemented in this device to prevent unauthorized access to your wireless network. For more secure data transmissions, enable encryption with this command, and set at least one static WEP key with the **key** command.
- The WEP settings must be the same on each client in your wireless network.
- Note that WEP protects data transmitted between wireless nodes, but does not protect any transmissions over your wired network or over the Internet.
- You must enable data encryption in order to enable all types of encryption (WEP, TKIP, and AES-CCMP) in the bridge.

Example

```
Enterprise AP(if-wireless g: VAP[0])#encryption
Enterprise AP(if-wireless g)#
```

Related Commands

key (7-121)

key

This command sets the keys used for WEP encryption. Use the **no** form to delete a configured key.

Syntax

key <*index*> <*size*> <*type*> <*value*>
no key *index*

- *index* - Key index. (Range: 1-4)
- *size* - Key size. (Options: 64, 128, or 152 bits)
- *type* - Input format. (Options: ASCII, HEX)
- *value* - The key string.
  - For 64-bit keys, use 5 alphanumeric characters or 10 hexadecimal digits.
  - For 128-bit keys, use 13 alphanumeric characters or 26 hexadecimal digits.
  - For 152-bit keys, use 16 alphanumeric characters or 32 hexadecimal digits.

Default Setting

None

Command Mode

Interface Configuration (Wireless)

Command Usage

- To enable Wired Equivalent Privacy (WEP), use the **auth shared-key** command to select the “shared key” authentication type, use the **key** command to configure at least one key, and use the **transmit-key** command to assign a key to one of the VAP interfaces.
- If WEP option is enabled, all wireless clients must be configured with the same shared keys to communicate with the bridge.
- The encryption index, length and type configured in the bridge must match those configured in the clients.

Example

```
Enterprise AP(if-wireless g)#key 1 64 hex 1234512345
Enterprise AP(if-wireless g)#key 2 128 ascii asdeipadjsipd
Enterprise AP(if-wireless g)#key 3 64 hex 12345123451234512345123456
Enterprise AP(if-wireless g)#
```

Related Commands

key (7-121)
encryption (7-120)
transmit-key (7-122)

transmit-key

This command sets the index of the key to be used for encrypting data frames for broadcast or multicast traffic transmitted from the VAP to wireless clients.

Syntax

transmit-key <*index*>

index - Key index. (Range: 1-4)

Default Setting

1

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

- If you use WEP key encryption option, the bridge uses the transmit key to encrypt multicast and broadcast data signals that it sends to client devices. Other keys can be used for decryption of data from clients.
- When using IEEE 802.1X, the bridge uses a dynamic key to encrypt unicast and broadcast messages to 802.1X-enabled clients. However, because the bridge sends the keys during the 802.1X authentication process, these keys do not have to appear in the client's key list.
- In a mixed-mode environment with clients using static and dynamic keys, select transmit key index 2, 3, or 4. The bridge uses transmit key index 1 for the generation of dynamic keys.

Example

```
Enterprise AP(if-wireless g: VAP[0])#transmit-key 2
Enterprise AP(if-wireless g)#
```

cipher-suite

This command defines the cipher algorithm used to encrypt the global key for broadcast and multicast traffic when using Wi-Fi Protected Access (WPA) security.

Syntax

multicast-cipher <**aes-ccmp** | **tkip** | **wep**>

- **aes-ccmp** - Use AES-CCMP encryption for the unicast and multicast cipher.
- **tkip** - Use TKIP encryption for the multicast cipher. TKIP or AES-CCMP can be used for the unicast cipher depending on the capability of the client.
- **wep** - Use WEP encryption for the multicast cipher. TKIP or AES-CCMP can be used for the unicast cipher depending on the capability of the client.

Default Setting

wep

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

- WPA enables the bridge to support different unicast encryption keys for each client. However, the global encryption key for multicast and broadcast traffic must be the same for all clients.
- If any clients supported by the bridge are not WPA enabled, the multicast-cipher algorithm must be set to WEP.
- WEP is the first generation security protocol used to encrypt data crossing the wireless medium using a fairly short key. Communicating devices must use the same WEP key to encrypt and decrypt radio signals. WEP has many security flaws, and is not recommended for transmitting highly sensitive data.
- TKIP provides data encryption enhancements including per-packet key hashing (i.e., changing the encryption key on each packet), a message integrity check, an extended initialization vector with sequencing rules, and a re-keying mechanism. Select TKIP if there are clients in the network that are not WPA2 compliant.
- TKIP defends against attacks on WEP in which the unencrypted initialization vector in encrypted packets is used to calculate the WEP key. TKIP changes the encryption key on each packet, and rotates not just the unicast keys, but the broadcast keys as well. TKIP is a replacement for WEP that removes the predictability that intruders relied on to determine the WEP key.

- AES-CCMP (Advanced Encryption Standard Counter-Mode/CBCMAC Protocol): WPA2 is backward compatible with WPA, including the same 802.1X and PSK modes of operation and support for TKIP encryption. The main enhancement is its use of AES Counter-Mode encryption with Cipher Block Chaining Message Authentication Code (CBC-MAC) for message integrity. The AES Counter-Mode/CBCMAC Protocol (AES-CCMP) provides extremely robust data confidentiality using a 128-bit key. The AES-CCMP encryption cipher is specified as a standard requirement for WPA2. However, the computational intensive operations of AES-CCMP requires hardware support on client devices. Therefore to implement WPA2 in the network, wireless clients must be upgraded to WPA2-compliant hardware.

Example

```
Enterprise AP(if-wireless g: VAP[0])#multicast-cipher TKIP
Enterprise AP(if-wireless g)#
```

mic_mode

This command specifies how to calculate the Message Integrity Check (MIC).

Syntax

mic_mode <hardware | software>

- **hardware** - Uses hardware to calculate the MIC.
- **software** - Uses software to calculate the MIC.

Default Setting

software

Command Mode

Interface Configuration (Wireless)

Command Usage

- The Michael Integrity Check (MIC) is part of the Temporal Key Integrity Protocol (TKIP) encryption used in Wi-Fi Protected Access (WPA) security. The MIC calculation is performed in the bridge for each transmitted packet and this can impact throughput and performance. The bridge supports a choice of hardware or software for MIC calculation. The performance of the bridge can be improved by selecting the best method for the specific deployment.
- Using the “hardware” option provides best performance when the number of supported clients is less than 27.
- Using the “software” option provides the best performance for a large number of clients on one radio interface. Throughput may be reduced when both 802.11a and 802.11g interfaces are supporting a high number of clients simultaneously.

Example

```
Enterprise AP(if-wireless a)#mic_mode hardware
Enterprise AP(if-wireless g)#
```

wpa-pre-shared-key

This command defines a Wi-Fi Protected Access (WPA/WPA2) Pre-shared-key.

Syntax

wpa-pre-shared-key <**hex** | **passphrase-key**> <*value*>

- **hex** - Specifies hexadecimal digits as the key input format.
- **passphrase-key** - Specifies an ASCII pass-phrase string as the key input format.
- *value* - The key string. For ASCII input, specify a string between 8 and 63 characters. For HEX input, specify exactly 64 digits.

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

- To support WPA or WPA2 for client authentication, use the **auth** command to specify the authentication type, and use the **wpa-preshared-key** command to specify one static key.
- If WPA or WPA2 is used with pre-shared-key mode, all wireless clients must be configured with the same pre-shared key to communicate with the bridge's VAP interface.

Example

```
Enterprise AP(if-wireless g: VAP[0])#wpa-pre-shared-key ASCII agoodsecret
Enterprise AP(if-wireless g)#
```

Related Commands

auth (7-118)

pmksa-lifetime

This command sets the time for aging out cached WPA2 Pairwise Master Key Security Association (PMKSA) information for fast roaming.

Syntax

pmksa-lifetime <*minutes*>

minutes - The time for aging out PMKSA information.
(Range: 0 - 14400 minutes)

Default Setting

720 minutes

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

- WPA2 provides fast roaming for authenticated clients by retaining keys and other security information in a cache, so that if a client roams away from an bridge and then returns reauthentication is not required.
- When a WPA2 client is first authenticated, it receives a Pairwise Master Key (PMK) that is used to generate other keys for unicast data encryption. This key and other client information form a Security Association that the bridge names and holds in a cache. The lifetime of this security association can be configured with this command. When the lifetime expires, the client security association and keys are deleted from the cache. If the client returns to the bridge, it requires full reauthentication.
- The bridge can store up to 256 entries in the PMKSA cache.

Example

```
Enterprise AP(if-wireless g: VAP[0])#wpa-pre-shared-key ASCII agoodsecret
Enterprise AP(if-wireless g: VAP[0])#
```

pre-authentication

This command enables WPA2 pre-authentication for fast secure roaming.

Syntax

pre-authentication <**enable** | **disable**>

- **enable** - Enables pre-authentication for the VAP interface.
- **disable** - Disables pre-authentication for the VAP interface.

Default Setting

Disabled

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

- Each time a client roams to another bridge it has to be fully re-authenticated. This authentication process is time consuming and can disrupt applications running over the network. WPA2 includes a mechanism, known as pre-authentication, that allows clients to roam to a new bridge and be quickly associated. The first time a client is authenticated to a wireless network it has to be fully authenticated. When the client is about to roam to another bridge in the network, the bridge sends pre-authentication messages to the new bridge that include the client’s security association information. Then when the client sends an association request to the new bridge the client is known to be already authenticated, so it proceeds directly to key exchange and association.

- To support pre-authentication, both clients and bridges in the network must be WPA2 enabled.
- Pre-authentication requires all bridges in the network to be on the same IP subnet.

Example

```
Enterprise AP(if-wireless g: VAP[0])#wpa-pre-shared-key ASCII agoodsecret
Enterprise AP(if-wireless g: VAP[0])#
```

Link Integrity Commands

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

Table 7-20. Link Integrity Commands

Command	Function	Mode	Page
link-integrity ping-detect	Enables link integrity detection	GC	7-128
link-integrity ping-host	Specifies the IP address of a host device in the wired network	GC	7-128
link-integrity ping-interval	Specifies the time between each Ping sent to the link host	GC	7-129
link-integrity ping-fail-retry	Specifies the number of consecutive failed Ping counts before the link is determined as lost	GC	7-129
link-integrity ethernet-detect	Enables integrity check for Ethernet link	GC	7-129
show link-integrity	Displays the current link integrity configuration	Exec	7-130

link-integrity ping-detect

This command enables link integrity detection. Use the **no** form to disable link integrity detection.

Syntax

[**no**] **link-integrity ping-detect**

Default Setting

Disabled

Command Mode

Global Configuration

Command Usage

- When link integrity is enabled, the IP address of a host device in the wired network must be specified.
- The bridge periodically sends an ICMP echo request (Ping) packet to the link host IP address. When the number of failed responses (either the host does not respond or is unreachable) exceeds the limit set by the **link-integrity ping-fail-retry** command, the link is determined as lost.

Example

```
Enterprise AP(config)#link-integrity ping-detect
Enterprise AP(config)#
```

link-integrity ping-host

This command configures the link host name or IP address. Use the **no** form to remove the host setting.

Syntax

link-integrity ping-host <*host_name* | *ip_address*>
no link-integrity ping-host

- *host_name* - Alias of the host.
- *ip_address* - IP address of the host.

Default Setting

None

Command Mode

Global Configuration

Example

```
Enterprise AP(config)#link-integrity ping-host 192.168.1.10
Enterprise AP(config)#
```

link-integrity ping-interval

This command configures the time between each Ping sent to the link host.

Syntax

link-integrity ping-interval <*interval*>

interval - The time between Pings. (Range: 5 - 60 seconds)

Default Setting

30 seconds

Command Mode

Global Configuration

Example

```
Enterprise AP(config)#link-integrity ping-interval 20
Enterprise AP(config)#
```

link-integrity ping-fail-retry

This command configures the number of consecutive failed Ping counts before the link is determined as lost.

Syntax

link-integrity ping-fail-retry <*counts*>

counts - The number of failed Ping counts before the link is determined as lost. (Range: 1 - 10)

Default Setting

6

Command Mode

Global Configuration

Example

```
Enterprise AP(config)#link-integrity ping-fail-retry 10
Enterprise AP(config)#
```

link-integrity ethernet-detect

This command enables an integrity check to determine whether or not the bridge is connected to the wired Ethernet.

Syntax

[**no**] **link-integrity ethernet-detect**

Default Setting

Disabled

Command Mode

Global Configuration

Example

```
Enterprise AP(config)#link-integrity ethernet-detect

Notification : Ethernet Link Detect SUCCESS - RADIO(S) ENABLED

Enterprise AP(config)#
```

show link-integrity

This command displays the current link integrity configuration.

Command Mode

Exec

Example

```
Enterprise AP#show link-integrity

Link Integrity Information
===========================================================
 Ethernet Detect : Enabled
 Ping Detect     : Enabled
 Target IP/Name  : 192.168.0.140
 Ping Fail Retry : 6
 Ping Interval   : 30
===========================================================
Enterprise AP#
```

IAPP Commands

The command described in this section enables the protocol signaling required to ensure the successful handover of wireless clients roaming between different 802.11f-compliant bridges. In other words, the 802.11f protocol can ensure successful roaming between bridges in a multi-vendor environment.

iapp

This command enables the protocol signaling required to hand over wireless clients roaming between different 802.11f-compliant bridges. Use the **no** form to disable 802.11f signaling.

Syntax

[**no**] **iapp**

Default

Enabled

Command Mode

Global Configuration

Command Usage

The current 802.11 standard does not specify the signaling required between bridges in order to support clients roaming from one bridge to another. In particular, this can create a problem for clients roaming between bridges from different vendors. This command is used to enable or disable 802.11f handover signaling between different bridges, especially in a multi-vendor environment.

Example

```
Enterprise AP(config)#iapp
Enterprise AP(config)#
```

VLAN Commands

The bridge can enable the support of VLAN-tagged traffic passing between wireless clients and the wired network. Up to 64 VLAN IDs can be mapped to specific wireless clients, allowing users to remain within the same VLAN as they move around a campus site.

When VLAN is enabled on the bridge, a VLAN ID (a number between 1 and 4094) can be assigned to each client after successful authentication using IEEE 802.1X and a central RADIUS server. The user VLAN IDs must be configured on the RADIUS server for each user authorized to access the network. If a user does not have a configured VLAN ID, the bridge assigns the user to its own configured native VLAN ID.

Caution: When VLANs are enabled, the bridge's Ethernet port drops all received traffic that does not include a VLAN tag. To maintain network connectivity to the bridge and wireless clients, be sure that the bridge is connected to a device port on a wired network that supports IEEE 802.1Q VLAN tags.

The VLAN commands supported by the bridge are listed below.

Table 7-21. VLAN Commands

Command	Function	Mode	Page
vlan	Enables a single VLAN for all traffic	GC	7-132
management-vlanid	Configures the management VLAN for the bridge	GC	7-133
vlan-id	Configures the default VLAN for the VAP interface	IC-W-VAP	7-133

vlan

This command enables VLANs for all traffic. Use the **no** form to disable VLANs.

Syntax

[**no**] **vlan enable**

Default

Disabled

Command Mode

Global Configuration

Command Description

- When VLANs are enabled, the bridge tags frames received from wireless clients with the VLAN ID configured for each client on the RADIUS server. If the VLAN ID has not been configured for a client on the RADIUS server, then the frames are tagged with the bridge's native VLAN ID.

- Traffic entering the Ethernet port must be tagged with a VLAN ID that matches the bridge's native VLAN ID, or with a VLAN tag that matches one of the wireless clients currently associated with the bridge.

Example

```
Enterprise AP(config)#vlan enable
Reboot system now? <y/n>: y
```

Related Commands

management-vlanid (7-133)

management-vlanid

This command configures the management VLAN ID for the bridge.

Syntax

management-vlanid <*vlan-id*>

vlan-id - Management VLAN ID. (Range: 1-4094)

Default Setting

1

Command Mode

Global Configuration

Command Usage

The management VLAN is for managing the bridge. For example, the bridge allows traffic that is tagged with the specified VLAN to manage the bridge via remote management, SSH, SNMP, Telnet, etc.

Example

```
Enterprise AP(config)#management-vlanid 3
Enterprise AP(config)#
```

Related Commands

vlan (7-132)

vlan-id

This command configures the default VLAN ID for the VAP interface.

Syntax

vlan-id <*vlan-id*>

vlan-id - Native VLAN ID. (Range: 1-4094)

Default Setting

1

Command Mode

Interface Configuration (Wireless-VAP)

Command Usage

- To implement the default VLAN ID setting for VAP interface, the bridge must enable VLAN support using the **vlan** command.
- When VLANs are enabled, the bridge tags frames received from wireless clients with the default VLAN ID for the VAP interface. If IEEE 802.1X is being used to authenticate wireless clients, specific VLAN IDs can be configured on the RADIUS server to be assigned to each client. Using IEEE 802.1X and a central RADIUS server, up to 64 VLAN IDs can be mapped to specific wireless clients.
- If the VLAN ID has not been configured for a client on the RADIUS server, then the frames are tagged with the default VLAN ID of the VAP interface.

Example

```
Enterprise AP(if-wireless g: VAP[0])#vlan-id 3
Enterprise AP(if-wireless g: VAP[0])#
```

WMM Commands

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

The WMM commands supported by the bridge are listed below.

Table 7-22. WMM Commands

Command	Function	Mode	Page
wmm	Sets the WMM operational mode on the bridge	IC-W	7-135
wmm-acknowledge-policy	Allows the acknowledgement wait time to be enabled or disabled for each Access Category (AC)	IC-W	7-135
wmmparam	Configures detailed WMM parameters that apply to the bridge (AP) or the wireless clients (BSS)	IC-W	7-136

wmm

This command sets the WMM operational mode on the bridge. Use the **no** form to disable WMM.

Syntax

[**no**] **wmm** <**supported** | **required**>

- **supported** - WMM will be used for any associated device that supports this feature. Devices that do not support this feature may still associate with the bridge.
- **required** - WMM must be supported on any device trying to associated with the bridge. Devices that do not support this feature will not be allowed to associate with the bridge.

Default

supported

Command Mode

Interface Configuration (Wireless)

Example

```
Enterprise AP(if-wireless a)#wmm required
Enterprise AP(if-wireless a)#
```

wmm-acknowledge-policy

This command allows the acknowledgement wait time to be enabled or disabled for each Access Category (AC).

Syntax

wmm-acknowledge-policy <*ac_number*> <**ack** | **noack**>

- *ac_number* - Access categories. (Range: 0-3)
- **ack** - Require the sender to wait for an acknowledgement from the receiver.
- **noack** - Does not require the sender to wait for an acknowledgement from the receiver.

Default

ack

Command Mode

Interface Configuration (Wireless)

Command Usage

- WMM defines four access categories (ACs) – voice, video, best effort, and background. These categories correspond to traffic priority levels and are mapped to IEEE 802.1D priority tags (see Table 6-1). The direct mapping of the four ACs to 802.1D priorities is specifically intended to facilitate interpretability with other wired network QoS policies. While the four ACs are specified for specific types of traffic, WMM allows the priority levels to be configured to match any network-wide QoS policy. WMM also specifies a protocol that bridges can use to communicate the configured traffic priority levels to QoS-enabled wireless clients.

- Although turning off the requirement for the sender to wait for an acknowledgement can increases data throughput, it can also result in a high number of errors when traffic levels are heavy.

Example

```
Enterprise AP(if-wireless a)#wmm-acknowledge-policy 0 noack
Enterprise AP(if-wireless a)#
```

wmmparam

This command configures detailed WMM parameters that apply to the bridge (AP) or the wireless clients (BSS).

Syntax

wmmparam <**AP** | **BSS**> <*ac_number*> <*LogCwMin*> <*LogCwMax*> <*AIFS*> <*TxOpLimit*> <*admission_control*>

- **AP** - Access Point
- **BSS** - Wireless client
- *ac_number* - Access categories (ACs) – voice, video, best effort, and background. These categories correspond to traffic priority levels and are mapped to IEEE 802.1D priority tags as shown in Table 6-1. (Range: 0-3)
- *LogCwMin* - Minimum log value of the contention window. This is the initial upper limit of the random backoff wait time before wireless medium access can be attempted. The initial wait time is a random value between zero and the LogCwMin value. Specify the LogCwMin value. Note that the LogCwMin value must be equal or less than the LogCwMax value.
  (Range: 1-15 microseconds)
- *LogCwMax* - Maximum log value of the contention window. This is the maximum upper limit of the random backoff wait time before wireless medium access can be attempted. The contention window is doubled after each detected collision up to the LogCwMax value. Note that the CWMax value must be greater or equal to the LogCwMin value.
  (Range: 1-15 microseconds)
- *AIFS* - Arbitrary InterFrame Space specifies the minimum amount of wait time before the next data transmission attempt.
  (Range: 1-15 microseconds)
- *TXOPLimit* - Transmission Opportunity Limit specifies the maximum time an AC transmit queue has access to the wireless medium. When an AC queue is granted a transmit opportunity, it can transmit data for a time up to the TxOpLimit. This data bursting greatly improves the efficiency for high data-rate traffic. (Range: 0-65535 microseconds)

- *admission_control* - The admission control mode for the access category. When enabled, clients are blocked from using the access category. (Options: 0 to disable, 1 to enable)

Default

AP Parameters				
WMM Parameters	AC0 (Best Effort)	AC1 (Background)	AC2 (Video)	AC3 (Voice)
LogCwMin	4	4	3	2
LogCwMax	10	10	4	3
AIFS	3	7	2	2
TXOP Limit	0	0	94	47
Admission Control	Disabled	Disabled	Disabled	Disabled

BSS Parameters				
WMM Parameters	AC0 (Best Effort)	AC1 (Background)	AC2 (Video)	AC3 (Voice)
LogCwMin	4	4	3	2
LogCwMax	6	10	4	3
AIFS	3	7	1	1
TXOP Limit	0	0	94	47
Admission Control	Disabled	Disabled	Disabled	Disabled

Command Mode

Interface Configuration (Wireless)

Example

```
Enterprise AP(if-wireless a)#wmmparams ap 0 4 6 3 1 1
Enterprise AP(if-wireless a)#
```

A TROUBLESHOOTING

Check the following items before you contact local Technical Support.

1 If wireless bridge units do not associate with each other, check the following:

- Check the power injector LED for each bridge unit to be sure that power is being supplied
- Be sure that antennas in the link are properly aligned.
- Be sure that channel settings match on all bridges
- If encryption is enabled, ensure that all bridge links are configured with the same encryption keys.

2 If you experience poor performance (high packet loss rate) over the wireless bridge link:

- Check that the range of the link is within the limits for the antennas used.
- Be sure that antennas in the link are properly aligned.
- Check that there is an unobstructed radio line-of-sight between the antennas.
- Be sure there is no interference from other radio sources. Try setting the bridge link to another radio channel.
- Be sure there is no other radio transmitter too close to either antenna. If necessary, move the antennas to another location.

3 If wireless clients cannot access the network, check the following:

- Be sure the bridge and the wireless clients are configured with the same Service Set ID (SSID).
- If authentication or encryption are enabled, ensure that the wireless clients are properly configured with the appropriate authentication or encryption keys.
- If authentication is being performed through a RADIUS server, ensure that the clients are properly configured on the RADIUS server.
- If authentication is being performed through IEEE 802.1X, be sure the wireless users have installed and properly configured 802.1X client software.
- If MAC address filtering is enabled, be sure the client's address is included in the local filtering database or on the RADIUS server database.
- If the wireless clients are roaming between bridges, make sure that all the bridges and wireless devices in the Extended Service Set (ESS) are configured to the same SSID, and authentication method.

4 If the bridge cannot be configured using the Telnet, a web browser, or SNMP software:

- Be sure to have configured the bridge with a valid IP address, subnet mask and default gateway.
- If VLANs are enabled on the bridge, the management station should be configured to send tagged frames with a VLAN ID that matches the bridge's management VLAN (default VLAN 1, page 18). However, to manage the bridge from a wireless client, the AP Management Filter should be disabled (page 18).
- Check that you have a valid network connection to the bridge and that the Ethernet port or the wireless interface that you are using has not been disabled.
- If you are connecting to the bridge through the wired Ethernet interface, check the network cabling between the management station and the bridge. If you are connecting to bridge from a wireless client, ensure that you have a valid connection to the bridge.
- If you cannot connect using Telnet, you may have exceeded the maximum number of concurrent Telnet sessions permitted (i.e, four sessions). Try connecting again at a later time.

5 If you cannot access the on-board configuration program via a serial port connection:

- Be sure you have set the terminal emulator program to VT100 compatible, 8 data bits, 1 stop bit, no parity and 9600 bps.
- Check that the null-modem serial cable conforms to the pin-out connections provided on page B-3.

6 If you forgot or lost the password:

- Set the bridge to its default configuration by pressing the reset button on the back panel for 5 seconds or more. Then use the default user name “admin” and a null password to access the management interface.

7 If all other recovery measure fail, and the bridge is still not functioning properly, take any of these steps:

- Reset the bridge’s hardware using the console interface, web interface, or through a power reset.
- Reset the bridge to its default configuration by pressing the reset button on the back panel for 5 seconds or more. Then use the default user name “admin” and a null password to access the management interface.

A REGULATORY COMPLIANCE INFORMATION

General Statements

The 3Com Outdoor 11a Building to Building Bridge and 11bg Access Point, Model WL-546 (3CRWEASYA73) must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.

This product contains encryption. It is unlawful to export out of the U.S. without obtaining a U.S. Export License.

This product does not contain any user serviceable components. Any unauthorized product changes or modifications will invalidate 3Com's warranty and all applicable regulatory certifications and approvals.

Only antennas specified for your region by 3Com can be used with this product. The use of external amplifiers or non-3Com antennas may invalidate regulatory certifications and approvals.

Federal Communication Commission Interference Statement

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

IMPORTANT NOTE:
FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters (8 inches) between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Wireless 5 GHz Band Statements:

As the Bridge can operate in the 5150-5250 MHz frequency band it is limited by the FCC, Industry Canada and some other countries to indoor use only so as to reduce the potential for harmful interference to co-channel Mobile Satellite systems.

High power radars are allocated as primary users (meaning they have priority) of the 5250-5350 MHz and 5650-5850 MHz bands. These radars could cause interference and /or damage to the Bridge when used in Canada.

The term "IC" before the radio certification number only signifies that Industry Canada technical specifications were met.

Industry Canada - Class B

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled “Digital Apparatus,” ICES-003 of Industry Canada.

Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Classe B prescrites dans la norme sur le matérial brouilleur: “Appareils Numériques,” NMB-003 édictée par l’Industrie.

Japan VCCI Class B

　この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＢ情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると受信障害を引き起こすことがあります。

　取り扱い説明書に従って正しい取り扱いをして下さい。

Australia/New Zealand AS/NZS 4771

ACN 066 352010

EC Conformance Declaration

Marking by the above symbol indicates compliance with the Essential Requirements of the R&TTE Directive of the European Union (1999/5/EC). This equipment meets the following conformance standards:

- EN 60950-1 (IEC 60950-1) - Product Safety
- EN 301 893 - Technical requirements for 5 GHz radio equipment
- EN 300 328 - Technical requirements for 2.4 GHz radio equipment
- EN 301 489-1 / EN 301 489-17 - EMC requirements for radio equipment

Countries of Operation & Conditions of Use in the European Community

This device is intended to be operated in all countries of the European Community. Requirements for indoor vs. outdoor operation, license requirements and allowed channels of operation apply in some countries as described below:

Note: The user must use the configuration utility provided with this product to ensure the channels of operation are in conformance with the spectrum usage rules for European Community countries as described below.

- This device requires that the user or installer properly enter the current country of operation in the command line interface as described in the user guide, before operating this device.
- This device will automatically limit the allowable channels determined by the current country of operation. Incorrectly entering the country of operation may result in illegal operation and may cause harmful interference to other systems. The user is obligated to ensure the device is operating according to the channel limitations, indoor/outdoor restrictions and license requirements for each European Community country as described in this document.
- This device employs a radar detection feature required for European Community operation in the 5 GHz band. This feature is automatically enabled when the country of operation is correctly configured for any European Community country. The presence of nearby radar operation may result in temporary interruption of operation of this device. The radar detection feature will automatically restart operation on a channel free of radar.
- The 5 GHz Turbo Mode feature is not allowed for operation in any European Community country. The current setting for this feature is found in the 5 GHz 802.11a Radio Settings Window as described in the user guide.
- The 5 GHz radio's Auto Channel Select setting described in the user guide must always remain enabled to ensure that automatic 5 GHz channel selection complies with European requirements. The current setting for this feature is found in the 5 GHz 802.11a Radio Settings Window as described in the user guide.
- This device is restricted to *indoor* use when operated in the European Community using the 5.15 - 5.35 GHz band: Channels 36, 40, 44, 48, 52, 56, 60, 64. See table below for allowed 5 GHz channels by country.
- This device may be operated *indoors or outdoors* in all countries of the European Community using the 2.4 GHz band: Channels 1 - 13, except where noted below.
    - In Italy the end-user must apply for a license from the national spectrum authority to operate this device outdoors.

- In Belgium outdoor operation is only permitted using the 2.46 - 2.4835 GHz band: Channel 13.
- In France outdoor operation is only permitted using the 2.4 - 2.454 GHz band: Channels 1 - 7.

Operation Using 5 GHz Channels in the European Community

The user/installer must use the provided configuration utility to check the current channel of operation and make necessary configuration changes to ensure operation occurs in conformance with European National spectrum usage laws as described below and elsewhere in this document.

Allowed 5GHz Channels in Each European Community Country

Allowed Frequency Bands	Allowed Channel Numbers	Countries
5.15 - 5.25 GHz*	36, 40, 44, 48	Austria, Belgium
5.15 - 5.35 GHz*	36, 40, 44, 48, 52, 56, 60, 64	France, Switzerland, Liechtenstein
5.15 - 5.35* & 5.470 - 5.725 GHz	36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140	Denmark, Finland, Germany, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, U.K.
5 GHz Operation Not Allowed	None	Greece

* Outdoor operation is not allowed using 5.15-5.35 GHz bands (Channels 36 - 64).

Declaration of Conformity in Languages of the European Community

English	Hereby, EdgeCore, declares that this Radio LAN device is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Finnish	Valmistaja EdgeCore vakuuttaa täten että Radio LAN device tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
Dutch	Hierbij verklaart EdgeCore dat het toestel Radio LAN device in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG Bij deze EdgeCore dat deze Radio LAN device voldoet aan de essentiële eisen en aan de overige relevante bepalingen van Richtlijn 1999/5/EC.
French	Par la présente EdgeCore déclare que l'appareil Radio LAN device est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE
Swedish	Härmed intygar EdgeCore att denna Radio LAN device står I överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.
Danish	Undertegnede EdgeCore erklærer herved, at følgende udstyr Radio LAN device overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF
German	Hiermit erklärt EdgeCore, dass sich dieser/diese/dieses Radio LAN device in Übereinstimmung mit den grundlegenden Anforderungen und den anderen relevanten Vorschriften der Richtlinie 1999/5/EG befindet". (BMWi) Hiermit erklärt EdgeCore die Übereinstimmung des Gerätes Radio LAN device mit den grundlegenden Anforderungen und den anderen relevanten Festlegungen der Richtlinie 1999/5/EG. (Wien)

Greek	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ EdgeCore ΔΗΛΩΝΕΙ ΟΤΙ Radio LAN device ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ
Italian	Con la presente EdgeCore dichiara che questo Radio LAN device è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
Spanish	Por medio de la presente Manufacturer declara que el Radio LAN device cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE
Portuguese	Manufacturer declara que este Radio LAN device está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.

Safety Compliance

Power Cord Safety

Please read the following safety information carefully before installing the Bridge:

WARNING: Installation and removal of the unit must be carried out by qualified personnel only.

- The unit must be connected to an earthed (grounded) outlet to comply with international safety standards.
- Do not connect the unit to an A.C. outlet (power supply) without an earth (ground) connection.
- The appliance coupler (the connector to the unit and not the wall plug) must have a configuration for mating with an EN 60320/IEC 320 appliance inlet.
- The socket outlet must be near to the unit and easily accessible. You can only remove power from the unit by disconnecting the power cord from the outlet.
- This unit operates under SELV (Safety Extra Low Voltage) conditions according to IEC 60950. The conditions are only maintained if the equipment to which it is connected also operates under SELV conditions.
-
- The PoE (Power over Ethernet), which is to be interconnected with other equipment that must be contained within the same building including the interconnected equipment’s associated LAN connections.

France and Peru only
This unit cannot be powered from IT[†] supplies. If your supplies are of IT type, this unit must be powered by 230 V (2P+T) via an isolation transformer ratio 1:1, with the secondary connection point labelled Neutral, connected directly to earth (ground).

[†] Impédance à la terre

Important! Before making connections, make sure you have the correct cord set. Check it (read the label on the cable) against the following:

Power Cord Set	
U.S.A. and Canada	The cord set must be UL-approved and CSA certified. The minimum specifications for the flexible cord are: - No. 18 AWG - not longer than 2 meters, or 16 AWG. - Type SV or SJ - 3-conductor The cord set must have a rated current capacity of at least 10 A The attachment plug must be an earth-grounding type with NEMA 5-15P (15 A, 125 V) or NEMA 6-15P (15 A, 250 V) configuration.
Denmark	The supply plug must comply with Section 107-2-D1, Standard DK2-1a or DK2-5a.
Switzerland	The supply plug must comply with SEV/ASE 1011.

Power Cord Set	
U.K.	The supply plug must comply with BS1363 (3-pin 13 A) and be fitted with a 5 A fuse which complies with BS1362. The mains cord must be <HAR> or <BASEC> marked and be of type HO3VVF3GO.75 (minimum).
Europe	The supply plug must comply with CEE7/7 (“SCHUKO”). The mains cord must be <HAR> or <BASEC> marked and be of type HO3VVF3GO.75 (minimum). IEC-320 receptacle.

Veuillez lire à fond l'information de la sécurité suivante avant d'installer le Bridge:

AVERTISSEMENT: L’installation et la dépose de ce groupe doivent être confiés à un personnel qualifié.

- Ne branchez pas votre appareil sur une prise secteur (alimentation électrique) lorsqu'il n'y a pas de connexion de mise à la terre (mise à la masse).
- Vous devez raccorder ce groupe à une sortie mise à la terre (mise à la masse) afin de respecter les normes internationales de sécurité.
- Le coupleur d’appareil (le connecteur du groupe et non pas la prise murale) doit respecter une configuration qui permet un branchement sur une entrée d’appareil EN 60320/IEC 320.
- La prise secteur doit se trouver à proximité de l’appareil et son accès doit être facile. Vous ne pouvez mettre l’appareil hors circuit qu’en débranchant son cordon électrique au niveau de cette prise.
- L’appareil fonctionne à une tension extrêmement basse de sécurité qui est conforme à la norme IEC 60950. Ces conditions ne sont maintenues que si l’équipement auquel il est raccordé fonctionne dans les mêmes conditions.

France et Pérou uniquement:
Ce groupe ne peut pas être alimenté par un dispositif à impédance à la terre. Si vos alimentations sont du type impédance à la terre, ce groupe doit être alimenté par une tension de 230 V (2 P+T) par le biais d’un transformateur d’isolement à rapport 1:1, avec un point secondaire de connexion portant l’appellation Neutre et avec raccordement direct à la terre (masse).

Cordon électrique - Il doit être agréé dans le pays d’utilisation	
Etats-Unis et Canada:	Le cordon doit avoir reçu l’homologation des UL et un certificat de la CSA. Les spécifications minimales pour un cable flexible sont AWG No. 18, ou AWG No. 16 pour un cable de longueur inférieure à 2 mètres. - type SV ou SJ - 3 conducteurs Le cordon doit être en mesure d’acheminer un courant nominal d’au moins 10 A. La prise femelle de branchement doit être du type à mise à la terre (mise à la masse) et respecter la configuration NEMA 5-15P (15 A, 125 V) ou NEMA 6-15P (15 A, 250 V).
Danemark:	La prise mâle d’alimentation doit respecter la section 107-2 D1 de la norme DK2 1a ou DK2 5a.
Suisse:	La prise mâle d’alimentation doit respecter la norme SEV/ASE 1011.
Europe	La prise secteur doit être conforme aux normes CEE 7/7 (“SCHUKO”) LE cordon secteur doit porter la mention <HAR> ou <BASEC> et doit être de type HO3VVF3GO.75 (minimum).

Bitte unbedingt vor dem Einbauen des Bridge die folgenden Sicherheitsanweisungen durchlesen (Germany)**:**

WARNUNG: Die Installation und der Ausbau des Geräts darf nur durch Fachpersonal erfolgen.

- Das Gerät sollte nicht an eine ungeerdete Wechselstromsteckdose angeschlossen werden.
- Das Gerät muß an eine geerdete Steckdose angeschlossen werden, welche die internationalen Sicherheitsnormen erfüllt.
- Der Gerätestecker (der Anschluß an das Gerät, nicht der Wandsteckdosenstecker) muß einen gemäß EN 60320/IEC 320 konfigurierten Geräteeingang haben.
- Die Netzsteckdose muß in der Nähe des Geräts und leicht zugänglich sein. Die Stromversorgung des Geräts kann nur durch Herausziehen des Gerätenetzkabels aus der Netzsteckdose unterbrochen werden.
- Der Betrieb dieses Geräts erfolgt unter den SELV-Bedingungen (Sicherheitskleinstspannung) gemäß IEC 60950. Diese Bedingungen sind nur gegeben, wenn auch die an das Gerät angeschlossenen Geräte unter SELV-Bedingungen betrieben werden.

Stromkabel**. Dies muss von dem Land, in dem es benutzt wird geprüft werden:**	
U.S.A und Kanada	Der Cord muß das UL gepruft und war das CSA beglaubigt. Das Minimum spezifikation fur der Cord sind: - Nu. 18 AWG - nicht mehr als 2 meter, oder 16 AWG. - Der typ SV oder SJ - 3-Leiter Der Cord muß haben eine strombelastbarkeit aus wenigstens 10 A Dieser Stromstecker muß hat einer erdschluss mit der typ NEMA 5-15P (15A, 125V) oder NEMA 6-15P (15A, 250V) konfiguration.
Danemark	Dieser Stromstecker muß die ebene 107-2-D1, der standard DK2-1a oder DK2-5a Bestimmungen einhalten.
Schweiz	Dieser Stromstecker muß die SEV/ASE 1011Bestimmungen einhalten.
Europe	Das Netzkabel muß vom Typ HO3VVF3GO.75 (Mindestanforderung) sein und die Aufschrift <HAR> oder <BASEC> tragen. Der Netzstecker muß die Norm CEE 7/7 erfüllen (”SCHUKO”).

Caution: Exposure to Radio Frequency Radiation

This device generates and radiates radio-frequency energy. In order to comply with FCC radio-frequency exposure guidelines for an uncontrolled environment, this equipment must be installed and operated while maintaining a minimum body to antenna distance of 20 cm (approximately 8 in.).

The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada’s website www.hc-sc.gc.ca/rpb.

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

This product must maintain a minimum body to antenna distance of 20 cm. Under these conditions this product will meet the Basic Restriction limits of 1999/519/EC [Council Recommendation of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz)].

US – Radio Frequency Requirements

This device must not be co-located or operated in conjunction with any other antenna or transmitter.

This device is for indoor use only when using channels 36, 40, 44 or 48 in the 5.15 to 5.25 GHz frequency range.

High power radars are allocated as primary users of the 5.25 to 5.35 GHz and 5.65 to 5.85 GHz bands. These radar stations can cause interference with and/or damage this device.

US Federal Communications Commission (FCC) EMC Compliance

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

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

The user may find the following booklet prepared by the Federal Communications Commission helpful:

> The Interference Handbook
> This booklet is available from the U.S. Government Printing Office, Washington, D.C. 20402. Stock No. 004-000-0034504.

3Com is not responsible for any radio or television interference caused by unauthorized modification of the devices included with this 3Com Outdoor 11a Building to Building Bridge and 11bg Access Point,Model WL-546 (3CRWEASYA73), or the substitution or attachment of connecting cables and equipment other than specified by 3Com.

The correction of interference caused by such unauthorized modification, substitution or attachment will be the responsibility of the user.

Changes or modifications not expressly approved by 3Com could void the user’s authority to operate this equipment.

US Manufacturer’s FCC Declaration of Conformity

3Com Corporation
350 Campus Drive
Marlborough, MA 01752-3064, USA
(508) 323-5000

Date: May 1, 2006

Declares that the Product:

Brand Name: 3Com Corporation
Model Number: WL-546
Equipment Type: Wireless 8760 Dual Radio 11a/b/g PoE Access Point

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.

3Com Wireless 8760 Dual Radio 11a/b/g PoE Access Point
Model WL-546

Industry Canada – RF Compliance

This device complies with RSS 210 of Industry Canada.

Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of this device.

L ‘ utilisation de ce dispositif est autorisée seulement aux conditions suivantes: (1) il ne doit pas produire de brouillage et (2) l’ utilisateur du dispositif doit étre prêt à accepter tout brouillage radioélectrique reçu, même si ce brouillage est susceptible de compromettre le fonctionnement du dispositif.

The term "IC" before the equipment certification number only signifies that the Industry Canada technical specifications were met.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than that required for successful communication. To prevent radio interference to the licensed service, this device is intended to be operated indoors and away from windows to provide maximum shielding. Equipment (or its transmit antenna) that is installed outdoors is subject to licensing.

Pour empecher que cet appareil cause du brouillage au service faisant l'objet d'une licence, il doit etre utilize a l'interieur et devrait etre place loin des fenetres afin de Fournier un ecram de blindage maximal. Si le matriel (ou son antenne d'emission) est installe a l'exterieur, il doit faire l'objet d'une licence.

High power radars are allocated as primary users of the 5.25 to 5.35 GHz and 5.65 to 5.85 GHz bands. These radar stations can cause interference with and/or damage this device.

This device must not be co-located or operated in conjunction with any other antenna or transmitter.

Industry Canada – Emissions Compliance Statement

This Class B digital apparatus complies with Canadian ICES-003.

Avis de Conformité à la Réglementation d’Industrie Canada

Cet appareil numérique de la classe B est conform à la norme NMB-003 du Canada.

Safety Compliance Notice

This device has been tested and certified according to the following safety standards and is intended for use only in Information Technology Equipment which has been tested to these or other equivalent standards:

- UL Standard 60950-1
- CAN/CSA C22.2 No. 60950-1
- IEC 60950-1
- EN 60950-1

EU Compliance

Usage restrictions apply.
See documentation

This equipment may be operated in

AT	BE	CY	CZ	DK	EE	FI	FR
DE	GR	HU	IE	IT	LV	LT	LU
MT	NL	PL	PT	SK	SI	ES	SE
GB	IS	LI	NO	CH	BG	RO	TR

Intended use: IEEE 802.11a/b/g radio LAN device

NOTE: To ensure product operation is in compliance with local regulations, select the country in which the product is installed.

Cesky [Czech]	3Com Coporation tímto prohlašuje, že tento RLAN device je ve shode se základními požadavky a dalšími príslušnými ustanoveními smernice 1999/5/ES.
Dansk [Danish]	Undertegnede 3Com Corporation erklærer herved, at følgende udstyr RLAN device overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF.
Deutsch [German]	Hiermit erklärt 3Com Corporation, dass sich das Gerät RLAN device in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 1999/5/EG befindet.
Eesti [Estonian]	Käesolevaga kinnitab 3Com Corporation seadme RLAN device vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.
English	Hereby, 3Com Corporation, declares that this RLAN device is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Español [Spanish]	Por medio de la presente 3Com Corporation declara que el RLAN device cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE.
Français [French]	Par la présente 3Com Corporation déclare que l'appareil RLAN device est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE.
Italiano [Italian]	Con la presente 3Com Corporation dichiara che questo RLAN device è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
Latviski [Latvian]	Ar šo 3Com Corporation deklare, ka RLAN device atbilst Direktivas 1999/5/EK butiskajam prasibam un citiem ar to saistitajiem noteikumiem.
Lietuviu [Lithuanian]	Šiuo 3Com Corporation deklaruoja, kad šis RLAN device atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.
Nederlands [Dutch]	Hierbij verklaart 3Com Corporation dat het toestel RLAN device in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG.
Malti [Maltese]	Hawnhekk, 3Com Corporation, jiddikjara li dan RLAN device jikkonforma mal-htigijiet essenzjali u ma provvedimenti ohrajn relevanti li hemm fid-Dirrettiva 1999/5/EC.
Magyar [Hungarian]	Alulírott, 3Com Corporation nyilatkozom, hogy a RLAN device megfelel a vonatkozó alapvetõ követelményeknek és az 1999/5/EC irányelv egyéb elõírásainak.
Polski [Polish]	Niniejszym 3Com Corporation oswiadcza, ze RLAN device jest zgodny z zasadniczymi wymogami oraz pozostalymi stosownymi postanowieniami Dyrektywy 1999/5/EC.
Português [Portuguese]	3Com Corporation declara que este RLAN device está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.
Slovensko [Slovenian]	3Com Corporation izjavlja, da je ta RLAN device v skladu z bistvenimi zahtevami in ostalimi relevantnimi dolocili direktive 1999/5/ES.

Slovensky [Slovak]	3Com Corporation týmto vyhlasuje, že RLAN device splna základné požiadavky a všetky príslušné ustanovenia Smernice 1999/5/ES.
Suomi [Finnish]	3Com Corporation vakuuttaa täten että RLAN device tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.

A copy of the signed Declaration of Conformity can be downloaded from the Product Support web page for the 3Com Outdoor 11a Building to Building Bridge and 11bg Access Point, Model WL-546 (3CRWEASYA73) at http://www.3com.com.

Also available at http://support.3com.com/doc/WL-546_EU_DOC.pdf

EU – Restrictions for Use in the 2.4GHz band

This device may be operated indoors or outdoors in all countries of the European Community using the 2.4GHz band: Channels 1 – 13, except where noted below.

- In Italy the end-user must apply for a license from the national spectrum authority to operate this device outdoors.
- In Belgium outdoor operation is only permitted using the 2.46 – 2.4835 GHz band: Channel 13.
- In France outdoor operation is only permitted using the 2.4 – 2.454 GHz band: Channels 1 – 7.

EU – Restrictions for Use in the 5GHz band

Allowed Frequency Bands	**Allowed Channel Numbers**	**Countries**
5.15-5.35GHz	36, 40, 44, 48, 52, 56, 60, 64	Czech Republic, France
5.15-5.35 & 5.470-5.725GHz	36, 40, 44, 48, 52, 56, 60, 64, 100, 104, 108, 112, 116, 120, 124, 128, 132, 136, 140	Austria, Belgium, Bulgaria, Cyprus, Denmark, Estonia, Finland, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, U.K.

- This device may be not be operated outdoors when using the bands 5150-5350MHz (Channels 36, 40, 44, 48, 52, 56, 50, 64).
- In Italy the end-user must apply for a license from the national spectrum authority to operate this device outdoors.
- To remain in conformance with European spectrum usage laws for Wireless LAN operation, the above 5GHz channel limitations apply. The user should check the current channel of operation. If operation is occurring outside of the allowable frequencies as listed above, the user must cease operating the Managed Access Point at that location and consult the local technical support staff responsible for the wireless network.
- The 5GHz Turbo mode feature is not allowed for operation in any European Community country.
- This device must be used with the radar detection feature required for European Community operation in the 5GHz bands. This device will avoid operating on a channel occupied by any radar system in the area. The presence of nearby radar operation may result in temporary interruption in communications of this device. The Access Point’s radar detection feature will automatically restart operation on a channel free of radar. You may consult with the local technical support staff responsible for the wireless network to ensure the Access Point device(s) are properly configured for European Community operation.

Brazil RF Compliance

Este equipamento opera em caráter secundário, isto é, nao tem direito a proteçao contra interferencia prejudicial, mesmo de estaçoes do mesmo tipo, e nao causar interferencia a sistema operando em caráter primário.

Korea RF Compliance

This device may cause radio interference during its operation. Therefore service in relation to human life security is not available.

C CABLES AND PINOUTS

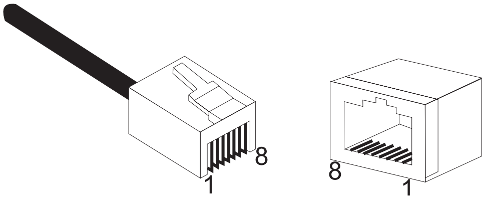
TWISTED-PAIR CABLE ASSIGNMENTS

For 10/100BASE-TX connections, a twisted-pair cable must have two pairs of wires. Each wire pair is identified by two different colors. For example, one wire might be green and the other, green with white stripes. Also, an RJ-45 connector must be attached to both ends of the cable.

CAUTION*: Each wire pair must be attached to the RJ-45 connectors in a specific orientation.*

CAUTION*: DO NOT plug a phone jack connector into a power injector RJ-45 port. Use only twisted-pair cables with RJ-45 connectors that conform with FCC standards.*

The following figure illustrates how the pins on the RJ-45 connector are numbered. Be sure to hold the connectors in the same orientation when attaching the wires to the pins.



10/100BASE-TX Pin Assignments

Use unshielded twisted-pair (UTP) or shielded twisted-pair (STP) cable for RJ-45 connections: 100-ohm Category 3 or better cable for 10 Mbps connections, or 100-ohm Category 5 or better cable for 100 Mbps connections. Also be sure that the length of any twisted-pair connection does not exceed 100 meters (328 feet).

The RJ-45 Input port on the power injector is wired with MDI pinouts. This means that you must use crossover cables for connections to PCs or servers, and straight-through cable for connections to switches or hubs. However, when connecting to devices that support automatic MDI/MDI-X pinout configuration, you can use either straight-through or crossover cable.

10/100BASE-TX MDI and MDI-X Port Pinouts

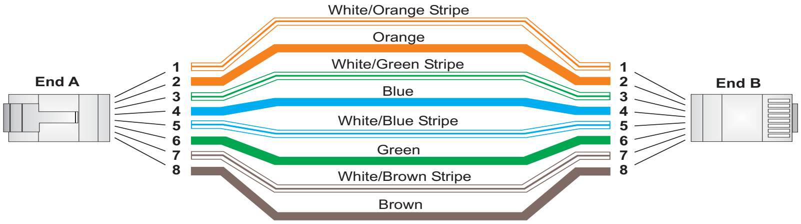
Pin	MDI-X Signal Name	MDI Signal Name
1	Receive Data plus (RD+)	Transmit Data plus (TD+)
2	Receive Data minus (RD-)	Transmit Data minus (TD-)
3	Transmit Data plus (TD+)	Receive Data plus (RD+)
6	Transmit Data minus (TD-)	Receive Data minus (RD-)
4,5,7,8	Not used	Not used

Note: The “+” and “-” signs represent the polarity of the wires that make up each wire pair.

STRAIGHT-THROUGH WIRING

Because the 10/100 Mbps Input port on the power injector uses an MDI pin configuration, you must use “straight-through” cable for network connections to hubs or switches that only have MDI-X ports. However, if the device to which you are connecting supports automatic MDI/MDI-X operation, you can use either “straight-through” or “crossover” cable.

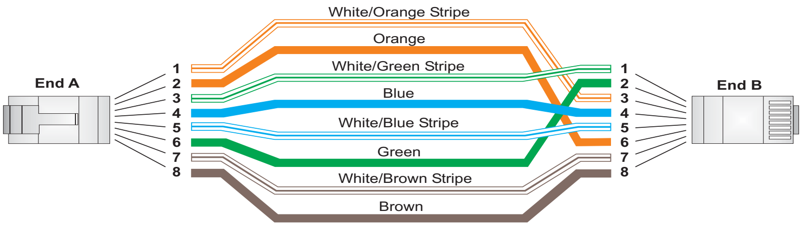
EIA/TIA 568B RJ-45 Wiring Standard
10/100BASE-TX Straight-through Cable



Crossover Wiring

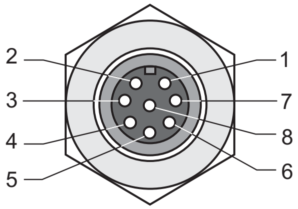
Because the 10/100 Mbps port on the power injector uses an MDI pin configuration, you must use “crossover” cable for network connections to PCs, servers or other end nodes that only have MDI ports. However, if the device to which you are connecting supports automatic MDI/MDI-X operation, you can use either “straight-through” or “crossover” cable.

EIA/TIA 568B RJ-45 Wiring Standard
10/100BASE-TX Crossover Cable



8-PIN DIN CONNECTOR PINOUT

The Ethernet cable from the power injector connects to an 8-pin DIN connector on the wireless bridge. This connector is described in the following figure and table.



8-Pin DIN Ethernet Port Pinout

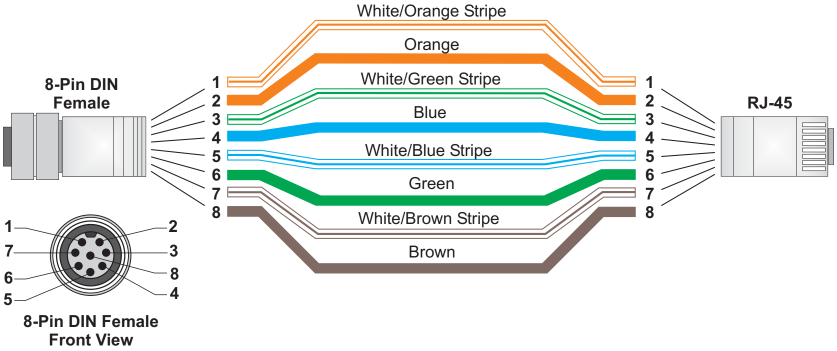
Pin	Signal Name
1	Transmit Data plus (TD+)
2	Transmit Data minus (TD-)
3	Receive Data plus (RD+)
4	+48 VDC power
5	+48 VDC power
6	Receive Data minus (RD-)
7	Return power
8	Return power

Note: The "+" and "-" signs represent the polarity of the wires that make up each wire pair.

8-Pin DIN to RJ-45 Cable Wiring

To construct an extended Ethernet cable to connect from the power injector’s RJ-45 Output port to the wireless bridge’s 8-pin DIN connector, follow the wiring diagram below. Use Category 5 or better UTP or STP cable, maximum length 100 m (328 ft), and be sure to connect all four wire pairs.

***NOTE**: To construct a reliable Ethernet cable, always use the proper tools or ask a professional cable supplier to construct the cable.*



D SPECIFICATIONS

GENERAL SPECIFICATIONS

MAXIMUM CHANNELS

802.11a:

US & Canada: 13 (normal mode), 5 (turbo mode)
Japan: 4 (normal mode), 1 (turbo mode)
ETSI: 11 channels (normal mode), 4 (turbo mode)
Taiwan: 8 (normal mode), 3 (turbo mode)

802.11b/g:

FCC/IC: 1-11
ETSI: 1-13
France: 10-13
MKK: 1-14
Taiwan: 1-11

MAXIMUM CLIENTS

64 per VAP interface

OPERATING RANGE

See “Operating Range” on page 6

DATA RATE

802.11a:
Normal Mode: 6, 9, 12, 18, 24, 36, 48, 54 Mbps per channel
Turbo Mode: 12, 18, 24, 36, 48, 54, 96, 108 Mbps per channel
802.11g: 6, 9, 11, 12, 18, 24, 36, 48, 54 Mbps per channel
802.11b: 1, 2, 5.5, 11 Mbps per channel

Modulation Type

802.11a: BPSK, QPSK, 16-QAM, 64-QAM
802.11g: CCK, BPSK, QPSK, OFDM
802.11b: CCK, BPSK, QPSK

Network Configuration

Bridge Mode:
Point-to-point and point-to-multipoint
Access Point Mode:
Infrastructure

Operating Frequency

802.11a:
5.15 ~ 5.25 GHz (lower band) US/Canada, Japan
5.25 ~ 5.35 GHz (middle band) US/Canada
5.725 ~ 5.825 GHz (upper band) US/Canada
5.50~ 5.70 GHz Europe
5.25 ~ 5.35 GHz (middle band) Taiwan
5.725 ~ 5.825 GHz (high band) Taiwan
802.11b:
2.4 ~ 2.4835 GHz (US, Canada, ETSI)
2.4 ~ 2.497 GHz (Japan)
2.400 ~ 2.4835 GHz (Taiwan)

Power Injector

Input: 100-240 VAC, 47-63 Hz, 1.5 A
Output: 48 VDC, 1.2 A
Bridge Power (DC)
Input voltage: 48 volts, 1.2 A, 30 watts maximum

Physical Size

19.8 x 19.8 x 6.33 cm (7.8 x 7.8 x 2.49 in)

PoE (DC)

Input voltage: 48 volts, 0.2 A, 12.96 watts

***NOTE**: Power can also be provided to the access point through the Ethernet port based on IEEE 802.3af Power over Ethernet (PoE) specifications. When both PoE is provided and the adapter is plugged in, AC power will be turned off.*

Weight

4.8kg (10.58 lbs)

LED Indicators

PWR (Power), Link (Ethernet Link/Activity), 11a and 11g (Wireless Link/Activity)

Network Management

Web-browser, RS232 console, Telnet, SSH, SNMP

Temperature

Operating: 0 to 50 °C (32 to 122 °F)
Storage: 0 to 70 °C (32 to 158 °F)

Humidity

15% to 95% (non-condensing)

Compliances

FCC Class B (US)
ICES-003 (Canada)
RTTED 1999/5/EC
VCCI (Japan)
RCR STD-33A

Radio Signal Certification

FCC Part 15C 15.247, 15.207 (2.4 GHz)
FCC part 15E 15.407 (5 GHz)
RSS-210 (Canada)
EN 301.893, EN 300.328, EN 301.489-1, EN 301.489-17
MPT RCR std.33 (D33 1~13 Channel, T66 Channel 14)

Safety

cCSAus(CSA 22.2 No. 60950-1 & UL60950-1)
EN60950-1 (TÜV/GS), IEC60950-1 (CB)

Standards

IEEE 802.3 10BASE-T, IEEE 802.3u 100BASE-TX,
IEEE 802.11a, b, g

SENSITIVITY

IEEE 802.11a	Sensitivity (GHz - dBm)			
Modulation/Rates	**5.15-5.250**	**5.25-5.350**	**5.50-5.700**	**5.725-5.825**
BPSK (6 Mbps)	-88	-88	-88	-88
BPSK (9 Mbps)	-87	-87	-87	-87
QPSK (12 Mbps)	-86	-86	-86	-86
QPSK (18 Mbps)	-84	-84	-84	-84
16 QAM (24 Mbps)	-82	-81	-81	-81
16 QAM (36 Mbps)	-80	-79	-78	-78
64 QAM (48 Mbps)	-73	-73	-73	-73
64QAM(54 Mbps)	-70	-70	-69	-67

IEEE 802.11g	
Data Rate	**Sensitivity (dBm)**
6 Mbps	-88
9 Mbps	-87
12 Mbps	-86
17 Mbps	-85
24 Mbps	-81
36 Mbps	-77
48 Mbps	-72
54 Mbps	-70

IEEE 802.11b	
Data Rate	**Sensitivity (dBm)**
1 Mbps	-93
2 Mbps	-90
5.5 Mbps	-90
11 Mbps	-87

TRANSMIT POWER

IEEE 802.11a	Maximum Output Power (GHz - dBm)			
Data Rate	**5.15-5.250**	**5.25-5.350**	**5.50-5.700**	**5.725-5.825**
6 Mbps	17	17	17	17
9 Mbps	17	17	17	17
12 Mbps	17	17	17	17
8 Mbps	17	17	17	17
24 Mbps	17	17	17	17
36 Mbps	17	17	17	17
48 Mbps	17	17	17	17
54 Mbps	12	17	17	16

IEEE 802.11g	Maximum Output Power (GHz - dBm)		
Data Rate	**2.412**	**2.417~2.467**	**2.472**
6 Mbps	20	20	18
9 Mbps	20	20	18
12 Mbps	20	20	18
18 Mbps	20	20	18
24 Mbps	20	20	18
36 Mbps	18	19	17
48 Mbps	17	16	15
54 Mbps	15	14	13

IEEE 802.11b	Maximum Output Power (GHz - dBm)		
Data Rate	**2.412**	**2.417~2.467**	**2.472**
1 Mbps	15	16	15
2 Mbps	15	16	15
5.5 Mbps	15	16	15
11 Mbps	15	16	15

Operating Range

Important Notice

Maximum distances posted below are actual tested distance thresholds. However, there are many variables such as barrier composition and construction and local environmental interference that may impact your actual distances and cause you to experience distance thresholds far lower than those posted below.

802.11a Wireless Distance Table

	Speed and Distance Ranges									
Environment	108 Mbps	72 Mbps	54 Mbps	48 Mbps	36 Mbps	24 Mbps	18 Mbps	12 Mbps	9 Mbps	6 Mbps
Outdoors[1]	30 m 99 ft	40 m 131 ft	85 m 279 ft	250 m 820 ft	310 m 1016 ft	400 m 1311 ft	445 m 1459 ft	455 m 1492 ft	465 m 1525 ft	510 m 1672 ft
Indoors[2]	15 m 49.5 ft	20 m 66 ft	25 m 82 ft	35 m 115 ft	40 m 131 ft	45 m 148 ft	50 m 164 ft	55 m 180 ft	66 m 216 ft	70 m 230 ft

802.11g Wireless Distance Table

	Speed and Distance Ranges											
Environment	54 Mbps	48 Mbps	36 Mbps	24 Mbps	18 Mbps	12 Mbps	11 Mbps	9 Mbps	6 Mbps	5 Mbps	2 Mbps	1 Mbps
Outdoors[1]	82 m 269 ft	100 m 328 ft	300 m 984 ft	330 m 1082 ft	350 m 1148 ft	450 m 1475 ft	470 m 1541 ft	485 m 1590 ft	495 m 1623 ft	510 m 1672 ft	520 m 1705 ft	525 m 1722 ft
Indoors[2]	20 m 66 ft	25 m 82 ft	35 m 115 ft	43 m 141 ft	50 m 164 ft	57 m 187 ft	66 m 216 ft	71 m 233 ft	80 m 262 ft	85 m 279 ft	90 m 295 ft	93 m 305 ft

802.11b Wireless Distance Table

	Speed and Distance Ranges			
Environment	11 Mbps	5.5 Mbps	2 Mbps	1 Mbps
Outdoors[1]	300 m 984 ft	465 m 1525 ft	500 m 1639 ft	515 m 1689 ft
Indoors[2]	60 m 197 ft	70 m 230 ft	83 m 272 ft	85 m 279 ft

***NOTE**:* Outdoor Environment: A line-of-sight environment with no interference or obstruction between the access point and clients.

***NOTE**:* Indoor Environment: A typical office or home environment with floor to ceiling obstructions between the access point and clients.

GLOSSARY

10BASE-T

IEEE 802.3 specification for 10 Mbps Ethernet over two pairs of Category 3 or better UTP cable.

100BASE-TX

IEEE 802.3u specification for 100 Mbps Fast Ethernet over two pairs of Category 5 or better UTP cable.

Access Point

An internetworking device that seamlessly connects wired and wireless networks. Access points attached to a wired network, support the creation of multiple radio cells that enable roaming throughout a facility.

Ad Hoc

A group of computers connected as an independent wireless network, without an access point.

Advanced Encryption Standard (AES)

An encryption algorithm that implements symmetric key cryptography. AES provides very strong encryption using a completely different ciphering algorithm to TKIP and WEP.

Authentication

The process to verify the identity of a client requesting network access. IEEE 802.11 specifies two forms of authentication: open system and shared key.

Backbone

The core infrastructure of a network. The portion of the network that transports information from one central location to another central location where it is unloaded onto a local system.

Basic Service Set (BSS)

A set of 802.11-compliant stations and an access point that operate as a fully-connected wireless network.

Beacon

A signal periodically transmitted from the access point that is used to identify the service set, and to maintain contact with wireless clients.

Broadcast Key

Broadcast keys are sent to stations using 802.1X dynamic keying. Dynamic broadcast key rotation is often used to allow the access point to generate a random group key and periodically update all key-management capable wireless clients.

CSMA/CA

Carrier Sense Multiple Access with Collision Avoidance.

Dynamic Host Configuration Protocol (DHCP)

Provides a framework for passing configuration information to hosts on a TCP/IP network. DHCP is based on the Bootstrap Protocol (BOOTP), adding the capability of automatic allocation of reusable network addresses and additional configuration options.

Encryption

Data passing between the access point and clients can use encryption to protect from interception and evesdropping.

Extended Service Set (ESS)

More than one wireless cell can be configured with the same Service Set Identifier to allow mobile users can roam between different cells with the Extended Service Set.

Extensible Authentication Protocol (EAP)

An authentication protocol used to authenticate network clients. EAP is combined with IEEE 802.1X port authentication and a RADIUS authentication server to provide “mutual authentication” between a client, the access point, and the a RADIUS server

Ethernet

A popular local area data communications network, which accepts transmission from computers and terminals.

File Transfer Protocol (FTP)

A TCP/IP protocol used for file transfer.

Hypertext Transfer Protocol (HTTP)

HTTP is a standard used to transmit and receive all data over the World Wide Web.

IEEE 802.11a

A wireless standard that supports high-speed communications in the 5 GHz band using Orthogonal Frequency Division Multiplexing (OFDM). The standard supports data rates of 6, 12, 24, and 54 Mbps.

IEEE 802.11b

A wireless standard that supports wireless communications in the 2.4 GHz band using Direct Sequence Spread Spectrum (DSSS). The standard provides for data rates of 1, 2, 5.5, and 11 Mbps.

IEEE 802.11g

A wireless standard that supports wireless communications in the 2.4 GHz band using using Orthogonal Frequency Division Multiplexing (OFDM). The standard provides for data rates of 6, 9, 11, 12, 18, 24, 36, 48, 54 Mbps. IEEE 802.11g is also backward compatible with IEEE 802.11b.

IEEE 802.1X

Port Authentication controls access to the switch ports by requiring users to first enter a user ID and password for authentication.

Infrastructure

An integrated wireless and wired LAN is called an infrastructure configuration.

Inter Access Point Protocol (IAPP)

A protocol that specifies the wireless signaling required to ensure the successful handover of wireless clients roaming between different 802.11f-compliant access points.

Local Area Network (LAN)

A group of interconnected computer and support devices.

MAC Address

The physical layer address used to uniquely identify network nodes.

Network Time Protocol (NTP)

NTP provides the mechanisms to synchronize time across the network. The time servers operate in a hierarchical-master-slave configuration in order to synchronize local clocks within the subnet and to national time standards via wire or radio.

Open System

A security option which broadcasts a beacon signal including the access point’s configured SSID. Wireless clients can read the SSID from the beacon, and automatically reset their SSID to allow immediate connection to the nearest access point.

Orthogonal Frequency Division Multiplexing (ODFM)

OFDM/ allows multiple users to transmit in an allocated band by dividing the bandwidth into many narrow bandwidth carriers.

Power over Ethernet (PoE)

A specification for providing both power and data to low-power network devices using a single Category 5 Ethernet cable. PoE provides greater flexibility in the locating of access point’s and network devices, and significantly decreased installation costs.

RADIUS

A logon authentication protocol that uses software running on a central server to control access to the network.

Roaming

A wireless LAN mobile user moves around an ESS and maintains a continuous connection to the infrastructure network.

RTS Threshold

Transmitters contending for the medium may not be aware of each other. RTS/CTS mechanism can solve this “Hidden Node Problem.” If the packet size is smaller than the preset RTS Threshold size, the RTS/CTS mechanism will NOT be enabled.

Service Set Identifier (SSID)

An identifier that is attached to packets sent over the wireless LAN and functions as a password for joining a particular radio cell; i.e., Basic Service Set (BSS).

Session Key

Session keys are unique to each client, and are used to authenticate a client connection, and correlate traffic passing between a specific client and the access point.

Shared Key

A shared key can be used to authenticate each client attached to a wireless network. Shared Key authentication must be used along with the 802.11 Wireless Equivalent Privacy algorithm.

Simple Network Management Protocol (SNMP)

The application protocol in the Internet suite of protocols which offers network management services.

Simple Network Time Protocol (SNTP)

SNTP allows a device to set its internal clock based on periodic updates from a Network Time Protocol (NTP) server. Updates can be requested from a specific NTP server, or can be received via broadcasts sent by NTP servers.

Temporal Key Integrity Protocol (TKIP)

A data encryption method designed as a replacement for WEP. TKIP avoids the problems of WEP static keys by dynamically changing data encryption keys.

Trivial File Transfer Protocol (TFTP)

A TCP/IP protocol commonly used for software downloads.

Virtual Access Point (VAP)

Virtual AP technology multiplies the number of Access Points present within the RF footprint of a single physical access device. With Virtual AP technology, WLAN users within the device’s footprint can associate with what appears to be different access points and their associated network services. All the services are delivered using a single radio channel, enabling Virtual AP technology to optimize the use of limited WLAN radio spectrum.

Virtual LAN (VLAN)

A Virtual LAN is a collection of network nodes that share the same collision domain regardless of their physical location or connection point in the network. A VLAN serves as a logical workgroup with no physical barriers, and allows users to share information and resources as though located on the same LAN.

Wi-Fi Protected Access

WPA employs 802.1X as its basic framework for user authentication and dynamic key management to provide an enhanced security solution for 802.11 wireless networks.

Wired Equivalent Privacy (WEP)

WEP is based on the use of security keys and the popular RC4 encryption algorithm. Wireless devices without a valid WEP key will be excluded from network traffic.

WPA Pre-shared Key (PSK)

PSK can be used for small office networks that may not have the resources to configure and maintain a RADIUS server, WPA provides a simple operating mode that uses just a pre-shared password for network access.