## AP51xx>admin>passwd

### Description:

Changes the password for the admin login.

### Syntax:

**passwd** Changes the admin password for access point access. This requires typing the old admin password and entering a new password and confirming it. Passwords can be up to 11 characters. The access point CLI treats the following as invalid characters:

```
|  "  &  ,  \  '  <  >
```

In order to avoid problems when using the access point CLI, these characters should be avoided.

### Example:

```
admin>passwd

Old Admin Password:******
New Admin Password:******
Verify Admin Password:******

Password successfully updated
```

For information on configuring passwords using the applet (GUI), see *Setting Passwords on page 6-3*.

## AP51xx>admin>summary

### Description:

Displays the access point's system summary.

### Syntax:

**summary** Displays a summary of high-level characteristics and settings for the WAN, LAN and WLAN.

### Example:

```
admin>summary

AP-51xx firmware version              1.1.0.0-xxx
country code                          us
serial number                         00A0F8716A74

WLAN 1:
WLAN Name                               WLAN1
ESS ID                                  101
Radio                                   11a, 11b/g
VLAN                                    VLAN1
Security Ploicy                         Default
QoS Ploicy                              Default

LAN1 Name: LAN1
LAN1 Mode: enable
LAN1 IP: 0.0.0.0
LAN1 Mask: 0.0.0.0
LAN1 Mask: client

LAN2 Name: LAN2
LAN2 Mode: enable
LAN2 IP: 192.235.1.1
LAN2 Mask: 255.255.255.0
LAN2 Mask: client

-------------------------------------------------------------------------
WAN Interface  IP Address    Network Mask     Default Gateway  DHCP Client
-------------------------------------------------------------------------

enable         172.20.23.10  255.255.255.192  172.20.23.20     enable
```

For information on displaying a system summary using the applet (GUI), see *Basic Device Configuration on page 3-3*.

## AP51xx>admin>..

### Description:

Displays the parent menu of the current menu.

This command appears in all of the submenus under admin. In each case, it has the same function, to move up one level in the directory structure.

### Example:

```
admin(network.lan)>..
admin(network)>
```

## AP51xx>admin> /

### Description:

Displays the root menu, that is, the top-level CLI menu.

This command appears in all of the submenus under admin. In each case, it has the same function, to move up to the top level in the directory structure.

### Example:

```
admin(network.lan)>/
admin>
```

## AP51xx>admin>save

### Description:

Saves the configuration to system flash.

The save command appears in all of the submenus under admin. In each case, it has the same function, to save the current configuration.

### Syntax:

**save** Saves configuration settings. The save command works at all levels of the CLI. The save command must be issued before leaving the CLI for updated settings to be retained.

### Example:

```
admin>save
admin>
```

## AP51xx>admin>quit

### Description:

Exits the command line interface session and terminates the session.

The quit command appears in all of the submenus under admin. In each case, it has the same function, to exit out of the CLI. Once the quit command is executed, the login prompt displays again.

### Example:

```
admin>quit
```

# 8.3 Network Commands

## AP51xx>admin(network)>

### Description:

Displays the network submenu. The items available under this command are shown below.

| | |
|---|---|
| **lan** | Goes to the LAN submenu. |
| **wan** | Goes to the WAN submenu. |
| **wireless** | Goes to the Wireless Configuration submenu. |
| **firewall** | Goes to the firewall submenu. |
| **router** | Goes to the router submenu. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the current configuration to the system flash. |
| **quit** | Quits the CLI and exits the current session. |

### *8.3.1 Network LAN Commands*

## AP51xx>admin(network.lan)>

### Description:

Displays the LAN submenu. The items available under this command are shown below.

| | |
|---|---|
| **show** | Shows current access point LAN parameters. |
| **set** | Sets LAN parameters. |
| **bridge** | Goes to the mesh configuration submenu. |
| **wlan-mapping** | Goes to the WLAN/Lan/Vlan Mapping submenu. |
| **dhcp** | Goes to the LAN DHCP submenu. |
| **type-filter** | Goes to the Ethernet Type Filter submenu. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

For an overview of the LAN configuration options using the applet (GUI), see *Configuring the LAN Interface on page 5-1*.

## AP51xx>admin(network.lan)> show

### Description:

Displays the access point LAN settings.

### Syntax:

**show** Shows the settings for the access point LAN1 and LAN2 interfaces.

### Example:

```
admin(network.lan)>show

LAN On Ethernet Port              : LAN1
LAN Ethernet Timeout              : disable

802.1x Port Authentication:
      Username                    : admin
      Password                    : ********

** LAN1 Information **
LAN Name                          : LAN1
LAN Interface                     : enable
802.11q Trunking                  : disable

LAN IP mode                       : DHCP client
IP Address                        : 192.168.0.1
Network Mask                      : 255.255.255.255
Default Gateway                   : 192.168.0.1
Domain Name                       :
Primary DNS Server                : 192.168.0.1
Secondary DNS Server              : 192.168.0.2
WINS Server                       : 192.168.0.254

** LAN2 Information **
LAN Name                          : LAN2
LAN Interface                     : disable
802.11q Trunking                  : disable

LAN IP mode                       : DHCP server
IP Address                        : 192.168.1.1
Network Mask                      : 255.255.255.255
Default Gateway                   : 192.168.1.1
Domain Name                       :
```

```
Primary DNS Server                : 192.168.0.2
Secondary DNS Server              : 192.168.0.3
WINS Server                       : 192.168.0.255

admin(network.lan)>
```

For information on displaying LAN information using the applet (GUI), see *Configuring the LAN Interface on page 5-1*.

## AP51xx>admin(network.lan)> set

### Description:

Sets the LAN parameters for the LAN port.

### Syntax:

| | | | |
|---|---|---|---|
| **set** | **lan** | <mode> | Enables or disables the access point LAN interface. |
| | **name** | <idx-name > | Defines the LAN name by index. |
| | **ethernet-port-lan** | <idx> | Defines which LAN (LAN 1 or LAN 2) is active on the Ethernet port. |
| | **timeout** | <seconds> | Sets the interval (in seconds) the access point uses to terminate its LAN interface if no activity is detected for the specified interval. |
| | **trunking** | <mode> | Enables or disables 802.11q Trunking over the access point LAN port. |
| | **username** | <name> | Specifies the user name for 802.1x port authentication over the LAN interface. |
| | **passwd** | <password> | The 0-32 character password for the username for the 802.1x port. |
| | **ip-mode** | <ip> | Defines the access point LAN port IP mode. |
| | **ipadr** | <ip> | Sets the IP address used by the LAN port. |
| | **mask** | <ip> | Defines the IP address used for access point LAN port network mask. |
| | **dgw** | <ip> | Sets the Gateway IP address used by the LAN port. |
| | **domain** | <name> | Specifies the domain name used by the access point LAN port. |
| | **dns** | <ip> | Defines the IP address of the primary and secondary DNS servers used by the LAN port. |
| | **wins** | <ip> | Defines the IP address of the WINS server used by the LAN port. |

### Example:

```
admin(network.lan)>

admin(network.lan)>set lan 1 enable
admin(network.lan)>set name 1 engineering
admin(network.lan)>set ethernet-port-lan 1
admin(network.lan)>set timeout 45
admin(network.lan)>set trunking 1 disable
admin(network.lan)>set dns 1 192.168.0.1
admin(network.lan)>set dns 2 192.168.0.2
admin(network.lan)>set wins 1 192.168.0.254
admin(network.lan)>set trunking disable
admin(network.lan)>set username phil
admin(network.lan)>set passwd ea0258c1
```

### Related Commands:

| | |
|---|---|
| **show** | Shows the current settings for the access point LAN port. |

For information on configuring the LAN using the applet (GUI), see *Configuring the LAN Interface on page 5-1*.

### *8.3.1.1 Network LAN, Bridge Commands*

## AP51xx>admin(network.lan.bridge)>

### Description:

Displays the access point Bridge submenu.

| | |
|---|---|
| **show** | Displays the mesh configuration parameters for the access point's LANs. |
| **set** | Sets the mesh configuration parameters for the access point's LANs.. |
| **..** | Moves to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI and exits the session. |

For an overview of the access point's mesh networking options using the applet (GUI), see *Configuring Mesh Networking on page 9-1*.

## AP51xx>admin(network.lan.bridge)> show

### Description:

Displays the mesh bridge configuration parameters for the access point's LANs.

### Syntax:

**show** Displays the mesh bridge configuration parameters for the access point's LANs.

### Example:

```
admin(network.lan.bridge)>show

** LAN1 Bridge Configuration **
Bridge Priority              :32768
Hello Time (seconds)         :2
Message Age Time (seconds)   :20
Forward Delay Time (seconds) :15

Entry Ageout Time (seconds)  :300

** LAN2 Bridge Configuration **
Bridge Priority              :32768
Hello Time (seconds)         :2
Message Age Time (seconds)   :20
Forward Delay Time (seconds) :15

Entry Ageout Time (seconds)  :300
```

For an overview of the access point's mesh networking options using the applet (GUI), see *Configuring Mesh Networking on page 9-1*.

## AP51xx>admin(network.lan.bridge)> set

### Description:

Sets the mesh configuration parameters for the access point's LANs.

### Syntax:

| | | | | |
|---|---|---|---|---|
| **set** | **priority** | <LAN-idx> | <seconds> | Sets bridge priority time in seconds (0-65535) for specified LAN. |
| | **hello** | <LAN-idx> | <seconds> | Sets bridge hello time in seconds (0-10) for specified LAN. |
| | **msgage** | <LAN-idx> | <seconds> | Sets bridge message age time in seconds (6-40) for specified LAN. |
| | **fwddelay** | <LAN-idx> | <seconds> | Sets bridge forward delay time in seconds (4-30) for specified LAN. |
| | **ageout** | <LAN-idx> | <seconds> | Sets bridge forward table entry time in seconds (4-3600) for specified LAN. |

### Example:

```
admin(network.lan.bridge)>set priority 2 32768
admin(network.lan.bridge)>set hello 2 2
admin(network.lan.bridge)>set msgage 2 20
admin(network.lan.bridge)>set fwddelay 2 15
admin(network.lan.bridge)>set ageout 2 300

admin(network.lan.bridge)>show

** LAN1 Mesh Configuration **
Bridge Priority              :32768
Hello Time (seconds)         :2
Message Age Time (seconds)   :20
Forward Delay Time (seconds) :15

Entry Ageout Time (seconds)  :300

** LAN2 Mesh Configuration **
Bridge Priority              :32768
Hello Time (seconds)         :2
Message Age Time (seconds)   :20
Forward Delay Time (seconds) :15

Entry Ageout Time (seconds)  :300
```

For an overview of the access point's mesh networking options using the applet (GUI), see *Configuring Mesh Networking on page 9-1*.

### 8.3.1.2 Network LAN, WLAN-Mapping Commands

## AP51xx>admin(network.lan.wlan-mapping)>

### Description:

Displays the WLAN/Lan/Vlan Mapping submenu.

| | |
|---|---|
| **show** | Displays the VLAN list currently defined for the access point. |
| **set** | Sets the access point VLAN configuration. |
| **create** | Creates a new access point VLAN. |
| **edit** | Edits the properties of an existing access point VLAN. |
| **delete** | Deletes a VLAN. |
| **lan-map** | Maps access point existing WLANs to an enabled LAN. |
| **vlan-map** | Maps access point existing WLANs to VLANs. |
| **..** | Moves to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI and exits the session. |

For an overview of the access point's VLAN configuration options using the applet (GUI), see *Configuring VLAN Support on page 5-4*.

## AP51xx>admin(network.lan.wlan-mapping)> show

### Description:

Displays the VLAN list currently defined for the access point.. These parameters are defined with the set command.

### Syntax:

| | | |
|---|---|---|
| **show** | **name** | Displays the existing list of VLAN names. |
| | **vlan-cfg** | Shows WLAN-VLAN mapping and VLAN configuration. |
| | **lan-wlan** | Displays a WLAN-LAN mapping summary. |
| | **wlan** | Displays the WLAN summary list. |

### Example:

```
admin(network.lan.wlan-mapping)>show name

--------------------------------------------------------------------------------
Index     VLAN ID   VLAN Name
--------------------------------------------------------------------------------

1         1         VLAN_1
2         2         VLAN_2
3         3         VLAN_3
4         4         VLAN_4

admin(network.lan.wlan-mapping)>show vlan-cfg

Management VLAN Tag     :1
Native VLAN Tag         :2
WLAN                    :WLAN1
mapped to VLAN          :VLAN 2
VLAN Mode               :static

admin(network.lan.wlan-mapping)>show lan-wlan

WLANs on LAN1:
              :WLAN1
              :WLAN2
              :WLAN3
WLANs on LAN2:
```

```
admin(network.lan.wlan-mapping)>show wlan

WLAN1:
WLAN Name               :WLAN1
ESSID                   :101
Radio                   :
VLAN                    :
Security Policy         :Default
QoS Policy              :Default
```

For information on displaying the VLAN screens using the applet (GUI), see *Configuring VLAN Support on page 5-4*.

## AP51xx>admin(network.lan.wlan-mapping)> set

### Description:

Sets VLAN parameters for the access point.

### Syntax:

| | | | |
|---|---|---|---|
| **set** | **mgmt- tag** | <id> | Defines the Management VLAN tag (1-4095). |
| | **native-tag** | <id> | Sets the Native VLAN tag (1-4095). |
| | **mode** | <wlan-idx> | Sets WLAN VLAN mode (WLAN 1-16) to either dynamic or static. |

### Example:

```
admin(network.lan.wlan-mapping)>set mgmt-tag 1
admin(network.lan.wlan-mapping)>set native-tag 2
admin(network.lan.wlan-mapping)>set mode 1 static

admin(network.lan.wlan-mapping)>show vlan-cfg

Management VLAN Tag     :1
Native VLAN Tag         :2
WLAN                    :WLAN1
mapped to VLAN          :VLAN 2
VLAN Mode               :static
```

For information on configuring VLANs using the applet (GUI), see *Configuring VLAN Support on page 5-4*.

## AP51xx>admin(network.lan.wlan-mapping)> create

### Description:

Creates a VLAN for the access point.

### Syntax:

| | | | |
|---|---|---|---|
| **create** | **vlan-id** | <id> | Defines the VLAN ID (1-4095). |
| | **vlan-name** | <name> | Specifies the name of the VLAN (1-31 characters in length). |

### Example:

```
admin(network.lan.wlan-mapping)>
admin(network.lan.wlan-mapping)>create 5 vlan-5
```

For information on creating VLANs using the applet (GUI), see *Configuring VLAN Support on page 5-4*.

## AP51xx>admin(network.lan.wlan-mapping)> edit

### Description:

Modifies a VLAN's name and ID.

### Syntax:

| | | | |
|---|---|---|---|
| **edit** | **name** | <name> | Modifies an exisiting VLAN name (1-31 characters in length) |
| | **id** | <id> | Modifies an existing VLAN ID (1-4095) characters in length). |

For information on editing VLANs using the applet (GUI), see *Configuring VLAN Support on page 5-4*.

## AP51xx>admin(network.lan.wlan-mapping)> delete

### Description:

Deletes a specific VLAN or all VLANs.

### Syntax:

| | | |
|---|---|---|
| **delete** | <VLAN id> | Deletes a specific VLAN ID (1-16). |
| | **all** | Deletes all defined VLANs. |

For information on deleting VLANs using the applet (GUI), see *Configuring VLAN Support on page 5-4*.

## AP51xx>admin(network.lan.wlan-mapping)> lan-map

### Description:

Maps an access point VLAN to a WLAN.

### Syntax: ..

**lan-map** <wlan name> <lan name> Maps an existing WLAN to an enabled LAN. All names and IDs are case-sensitive.

```
admin(network.lan.wlan-mapping)>lan-map wlan1 lan1
```

For information on mapping VLANs using the applet (GUI), see *Configuring VLAN Support on page 5-4*.

## AP51xx>admin(network.lan.wlan-mapping)> vlan-map

### Description:

Maps an access point VLAN to a WLAN.

### Syntax:

**vlan-map** <wlan name> <vlan name> Maps an existing WLAN to an enabled LAN. All names and IDs are case-sensitive.

```
admin(network.lan.wlan-mapping)>vlan-map wlan1 vlan1
```

For information on mapping VLANs using the applet (GUI), see *Configuring VLAN Support on page 5-4*.

### *8.3.1.3 Network LAN, DHCP Commands*

## AP51xx>admin(network.lan.dhcp)>

### Description:

Displays the access point DHCP submenu. The items available are displayed below.

| | |
|---|---|
| **show** | Displays DHCP parameters. |
| **set** | Sets DHCP parameters. |
| **add** | Adds static DHCP address assignments. |
| **delete** | Deletes static DHCP address assignments. |
| **list** | Lists static DHCP address assignments. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI and exits the session. |

## AP51xx>admin(network.lan.dhcp)> show

### Description:

Shows DHCP parameter settings.

### Syntax:

**show** Displays DHCP parameter settings for the access point. These parameters are defined with the set command.

### Example:

```
admin(network.lan.dhcp)>show
**LAN1 DHCP Information**
DHCP Address Assignment Range:
     Starting IP Address  : 192.168.0.100
     Ending IP Address    : 192.168.0.254

Lease Time           : 86400

**LAN2 DHCP Information**
DHCP Address Assignment Range:
     Starting IP Address  : 192.168.0.100
     Ending IP Address    : 192.168.0.254

Lease Time           : 86400
```

For information on configuring DHCP using the applet (GUI), see *Configuring the LAN Interface on page 5-1*.

## AP51xx>admin(network.lan.dhcp)> set

### Description:

Sets DHCP parameters for the LAN port.

### Syntax:

| | | | | | |
|---|---|---|---|---|---|
| **set** | **range** | <LAN-idx> | <ip1> | <ip2> | Sets the DHCP assignment range from IP address <ip1> to IP address <ip2> for the specified LAN. |
| | **lease** | <LAN-idx> | <lease> | | Sets the DHCP lease time <lease> in seconds (**1**-**999999**) for the specified LAN. |

### Example:

```
admin(network.lan.dhcp)>set range 1 192.168.0.100 192.168.0.254
admin(network.lan.dhcp)>set lease 1 86400

admin(network.lan.dhcp)>show
**LAN1 DHCP Information**
DHCP Address Assignment Range:
     Starting IP Address  : 192.168.0.100
     Ending IP Address    : 192.168.0.254

Lease Time           : 86400
```

For information on configuring DHCP using the applet (GUI), see *Configuring the LAN Interface on page 5-1*.

## AP51xx>admin(network.lan.dhcp)> add

### Description:

Adds static DHCP address assignments.

### Syntax:

**add** <LAN-idx> <mac> <ip> Adds a reserved static IP address to a MAC address for the specified LAN.

### Example:

```
admin(network.lan.dhcp)>add 1 00A0F8112233 192.160.24.6
admin(network.lan.dhcp)>add 1 00A0F1112234 192.169.24.7
admin(network.lan.dhcp)>list 1

--------------------------------------------------------------------------------
Index    MAC Address      IP Address
--------------------------------------------------------------------------------

1       00A0F8112233    192.160.24.6
2       00A0F8112234    192.169.24.7
```

For information on adding client MAC and IP address information using the applet (GUI), see *Configuring Advanced DHCP Server Settings on page 5-11*.

## AP51xx>admin(network.lan.dhcp)> delete

### Description:

Deletes static DHCP address assignments.

### Syntax:

| | | | |
|---|---|---|---|
| **delete** | <LAN-idx> | <entry> | Deletes the static DHCP address entry for the specified LAN. |
| | <LAN-idx> | **all** | Deletes all static DHCP addresses. |

### Example:

```
admin(network.lan.dhcp)>list 1

-------------------------------------------------------------------------
Index   MAC Address     IP Address
-------------------------------------------------------------------------

1       00A0F8112233    10.1.2.4
2       00A0F8102030    10.10.1.2
3       00A0F8112234    10.1.2.3
4       00A0F8112235    192.160.24.6
5       00A0F8112236    192.169.24.7

admin(network.lan.dhcp)>delete 1

-------------------------------------------------------------------------
index   mac address     ip address
-------------------------------------------------------------------------

1       00A0F8102030    10.10.1.2
2       00A0F8112234    10.1.2.3
3       00A0F8112235    192.160.24.6
4       00A0F8112236    192.169.24.7

admin(network.lan.dhcp)>delete 1 all

-------------------------------------------------------------------------
index   mac address     ip address
-------------------------------------------------------------------------
```

For information on deleting client MAC and IP address information using the applet (GUI), see *Configuring Advanced DHCP Server Settings on page 5-11*.

## AP51xx>admin(network.lan.dhcp)> list

### Description:

Lists static DHCP address assignments.

### Syntax:

**list** <LAN-idx> Lists the static DHCP address assignments for the specified LAN.

### Example:

```
admin(network.lan.dhcp)>list 1

-------------------------------------------------------------------------------
Index   MAC Address     IP Address
-------------------------------------------------------------------------------

1       00A0F8112233    10.1.2.4
2       00A0F8102030    10.10.1.2
3       00A0F8112234    10.1.2.3
4       00A0F8112235    192.160.24.6
5       00A0F8112236    192.169.24.7

admin(network.lan.dhcp)>
```

For information on listing client MAC and IP address information using the applet (GUI), see *Configuring Advanced DHCP Server Settings on page 5-11*.

### *8.3.1.4 Network Type Filter Commands*

## AP51xx>admin(network.lan.type-filter)>

### Description:

Displays the access point Type Filter submenu. The items available under this command include:

| | |
|---|---|
| **show** | Displays the current Ethernet Type exception list. |
| **set** | Defines Ethernet Type Filter parameters. |
| **add** | Adds an Ethernet Type Filter entry. |
| **delete** | Removes an Ethernet Type Filter entry. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

## AP51xx>admin(network.lan.type-filter)> show

### Description:

Displays the access point's current Ethernet Type Filter configuration.

### Syntax:

**show** <LAN-idx> Displays the existing Type-Filter configuration for the specified LAN.

### Example:

```
admin(network.lan.type-filter)>show 1

Ethernet Type Filter mode              : allow
-------------------------------------------------------------------------------
index                   ethernet type
-------------------------------------------------------------------------------
1                       8137
```

For information on displaying the type filter configuration using the applet (GUI), see *Setting the Type Filter Configuration on page 5-13*.

## AP51xx>admin(network.lan.type-filter)> set

### Description:

Defines the access point Ethernet Type Filter configuration.

### Syntax:

| | | | | |
|---|---|---|---|---|
| **set** | **mode** | <LAN-idx> | **allow** or **deny** | Allows or denies the access point from processing a specified Ethernet data type for the specified LAN. |

### Example:

```
admin(network.lan.type-filter)>set mode 1 allow
```

For information on configuring the type filter settings using the applet (GUI), see *Setting the Type Filter Configuration on page 5-13*.

## AP51xx>admin(network.lan.type-filter)> add

### Description:

Adds an Ethernet Type Filter entry.

### Syntax:

| | | | |
|---|---|---|---|
| **add** | <LAN-idx> | <type> | Adds entered Ethernet Type to list of data types either allowed or denied access point processing permissions for the specified LAN. |

### Example:

```
admin(network.lan.type-filter)>

admin(network.wireless.type-filter)>add 1 8137
admin(network.wireless.type-filter)>add 2 0806
admin(network.wireless.type-filter)>show 1

Ethernet Type Filter mode              : allow
-------------------------------------------------------------------------
index                  ethernet type
-------------------------------------------------------------------------
1                      8137
2                      0806
3                      0800
4                      8782
```

For information on configuring the type filter settings using the applet (GUI), see *Setting the Type Filter Configuration on page 5-13*.

## AP51xx>admin(network.lan.type-filter)> delete

### Description:

Removes an Ethernet Type Filter entry individually or the entire Type Filter list.

### Syntax:

| | | | |
|---|---|---|---|
| **delete** | <LAN-idx> | <index> | Deletes the specified Ethernet Type index entry (1 through 16). |
| | <LAN-idx> | **all** | Deletes all Ethernet Type entries currently in list. |

### Example:

```
admin(network.lan.type-filter)>delete 1 1
admin(network.lan.type-filter)>show 1

Ethernet Type Filter mode              : allow
-------------------------------------------------------------------------------
index                  ethernet type
-------------------------------------------------------------------------------
1                      0806
2                      0800
3                      8782

admin(network.lan.type-filter)>delete 2 all
admin(network.lan.type-filter)>show 2

Ethernet Type Filter mode              : allow
-------------------------------------------------------------------------------
index                  ethernet type
-------------------------------------------------------------------------------
```

For information on configuring the type filter settings using the applet (GUI), see *Setting the Type Filter Configuration on page 5-13*.

## 8.3.2 Network WAN Commands

### AP51xx>admin(network.wan)>

#### Description:

Displays the WAN submenu. The items available under this command are shown below.

| | |
|---|---|
| **show** | Displays the access point WAN configuration and the access point's current PPPoE configuration. |
| **set** | Defines the access point's WAN and PPPoE configuration. |
| **nat** | Displays the NAT submenu, wherein Network Address Translations (NAT) can be defined. |
| **vpn** | Goes to the VPN submenu, where the access point VPN tunnel configuration can be set. |
| **content** | Displays the Outbound Content Filtering submenu, where data types can be included/excluded from access point throughput. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the current configuration to the access point system flash. |
| **quit** | Quits the CLI and exits the current session. |

For an overview of the WAN configuration options using the applet (GUI), see *Configuring WAN Settings on page 5-14*.

## AP51xx>admin(network.wan)> show

### Description:

Displays the access point WAN port parameters.

### Syntax:

**show** Shows the general IP parameters for the WAN port along with settings for the WAN interface..

### Example:

```
admin(network.wan)>show

Status                          : enable
WAN DHCP Client Mode            : disable
IP address                      : 0.0.0.0
Network Mask                    : 0.0.0.0
Default Gateway                 : 10.10.1.1
Primary DNS Server              : 0.0.0.0
Secondary DNS Server            : 0.0.0.0

WAN IP 2                        : disable
WAN IP 3                        : disable
WAN IP 4                        : disable
WAN IP 5                        : disable
WAN IP 6                        : disable
WAN IP 7                        : disable
WAN IP 8                        : disable

PPPoE Mode                      : enable
PPPoE User Name                 : JohnDoe
PPPoE Password                  : *******
PPPoE keepalive mode            : enable
PPPoE Idle Time                 : 600
PPPoE Authentication Type       : chap
PPPoE State

admin(network.wan)>
```

For an overview of the WAN configuration options available using the applet (GUI), see *Configuring WAN Settings on page 5-14*.

## AP51xx>admin(network.wan)> set

### Description:

Defines the configuration of the access point WAN port.

### Syntax:

| | | | | |
|---|---|---|---|---|
| **set** | **wan** | **enable**/**disable** | | Enables or disables the access point WAN port. |
| | **dhcp** | **enable**/**disable** | | Enables or disables WAN DHCP Client mode. |
| | **ipadr** | <idx> | <a.b.c.d> | Sets up to 8 (using <indx> from **1** to **8**) IP addresses <a.b.c.d> for the access point WAN interface. |
| | **mask** | <a.b.c.d> | | Sets the subnet mask for the access point WAN interface. |
| | **dgw** | <a.b.c.d> | | Sets the default gateway IP address to <a.b.c.d>. |
| | **dns** | <idx> | <a.b.c.d> | Sets the IP address of one or two DNS servers, where <indx> indicates either the primary (**1**) or secondary (**2**) server, and <a.b.c.d> is the IP address of the server. |
| | **pppoe** | **mode** | **enable**/**disable** | Enables or disables PPPoE. |
| | | **user** | <name> | Sets PPPoE user name. |
| | | **passwd** | <password> | Defines the PPPoE password. |
| | | **ka** | **enable**/**disable** | Enables or disables PPPoE keepalive. |
| | | **idle** | <time> | Sets PPPoE idle time. |
| | | **type** | <auth-type> | Sets PPPoE authentication type. |

### Example:

```
admin(network.wan)>

admin(network.wan)>set dhcp disable
admin(network.wan)>set ipadr 157.169.22.5
admin(network.wan)>set dgw 157.169.22.1
admin(network.wan)>set dns 1 157.169.22.2
admin(network.wan)>set mask 255.255.255.000
admin(network.wan)>set pppoe mode enable
admin(network.wan)>set pppoe type chap
admin(network.wan)>set pppoe user jk
admin(network.wan)>set pppoe passwd @#$goodpassword%$#
admin(network.wan)>set pppoe ka enable
admin(network.wan)>set pppoe idle 600
```

For an overview of the WAN configuration options available using the applet (GUI), see *Configuring WAN Settings on page 5-14*.

### 8.3.2.1 Network WAN NAT Commands

## AP51xx>admin(network.wan.nat)>

### Description:

Displays the NAT submenu. The items available under this command are shown below.

| | |
|---|---|
| **show** | Displays the access point's current NAT parameters for the specified index. |
| **set** | Defines the access point NAT settings. |
| **add** | Adds NAT entries. |
| **delete** | Deletes NAT entries. |
| **list** | Lists NAT entries. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

For an overview of the NAT configuration options available using the applet (GUI), see *Configuring Network Address Translation (NAT) Settings on page 5-19*.

## AP51xx>admin(network.wan.nat)> show

### Description:

Displays access point NAT parameters.

### Syntax:

**show** <idx> Displays access point NAT parameters for the specified NAT index.

### Example:

```
admin(network.wan.nat)>show 2

WAN IP Mode                          : disable
WAN IP Address                       : 157.235.91.2
NAT Type                             : 1-to-many
One to many nat mapping              : LAN1 LAN2
Inbound Mappings                     : Port Forwarding

unspecified port forwarding mode     : enable
unspecified port fwd. ip address     : 111.223.222.1

admin(network.wan.nat)>
```

For an overview of the NAT options available using the applet (GUI), see *Configuring Network Address Translation (NAT) Settings on page 5-19*.

## AP51xx>admin(network.wan.nat)> set

### Description:

Sets NAT inbound and outbound parameters.

### Syntax:

| | | | | |
|---|---|---|---|---|
| **set** | **type** | <index> | <type> | Sets the type of NAT translation for WAN address index <idx> (**1-8**) to <type> (none, 1-to-1, or 1-to-many). |
| | **ip** | <index> | <ip> | Sets NAT IP mapping associated with WAN address <idx> to the specified IP address <ip>. |
| | **inb** | **enable/disable** | <ip> | Sets inbound NAT parameters. |
| | **outb** | <ip> | <map> | Sets outbound NAT parameters. |
| | **mode** | <index> | **enable/disable** | Enable or disable the Unspecified Port Forwarding mode for the designated NAT index. |
| | **unspec-ip** | <index> | <ip> | Forward unspecified ports for the defined NAT index to the defined IP address. |

### Example:

```
admin(network.wan.nat)>set type 1-to-many
admin(network.wan.nat)>set ip 157.235.91.2
admin(network.wan.nat)>set mode 2 disable
admin(network.wan.nat)>set unspec-ip 2 111.223.222.1

admin(network.wan.nat)>show 2

WAN IP Mode                        : disable
WAN IP Address                     : 157.235.91.2
NAT Type                           : 1-to-many
One to many nat mapping            : LAN1 LAN2
Inbound Mappings                   : Port Forwarding

unspecified port forwarding mode   : enable
unspecified port fwd. ip address   : 111.223.222.1
```

For an overview of the NAT options available using the applet (GUI), see *Configuring Network Address Translation (NAT) Settings on page 5-19*.

## AP51xx>admin(network.wan.nat)> add

### Description:

Adds NAT entries.

### Syntax:

**add** <idx> <name> <tran> <port1> <port2> <ip> <dst_port>

Sets an inbound network address translation (NAT) for WAN address <idx>, where <name> is the name of the entry (1 to 7 characters), <tran> is the transport protocol (one of **tcp**, **udp**, **icmp**, **ah**, **esp**, **gre**, or **all**), <port1> is the starting port number in a port range, <port2> is the ending port number in a port range, <ip> is the internal IP address, and <dst_port> is the (optional) internal translation port.

### Example:

```
admin(network.wan.nat)>add 1 indoors udp 20 29 10.10.2.2

admin(network.wan.nat)>list 1
-------------------------------------------------------------------------
index   name    prot   start port   end port   internal ip     translation port
-------------------------------------------------------------------------
1       indoor  udp    20           29         10.10.2.2       0
```

### Related Commands:

| | |
|---|---|
| **delete** | Deletes one of the inbound NAT entries from the list. |
| **list** | Displays the list of inbound NAT entries. |

For an overview of the NAT options available using the applet (GUI), see *Configuring Network Address Translation (NAT) Settings on page 5-19*.

## AP51xx>admin(network.wan.nat)> delete

### Description:

Deletes NAT entries.

### Syntax:

| | | | |
|---|---|---|---|
| **delete** | <idx> | <entry> | Deletes a specified NAT index entry <entry> associated with the WAN. |
| | <idx> | **all** | Deletes all NAT entries associated with the WAN. |

### Example:

```
admin(network.wan.nat)>list 1
-------------------------------------------------------------------------------
index   name    prot   start port   end port   internal ip     translation port
-------------------------------------------------------------------------------
1       special tcp    20           21         192.168.42.16   21

admin(network.wan.nat)>delete 1 1
        ^
admin(network.wan.nat)>list 1
-------------------------------------------------------------------------------
index   name    prot   start port   end port   internal ip     translation port
-------------------------------------------------------------------------------
```

### Related Commands:

| | |
|---|---|
| **add** | Adds entries to the list of inbound NAT entries. |
| **list** | Displays the list of inbound NAT entries. |

For an overview of the NAT options available using the applet (GUI), see *Configuring Network Address Translation (NAT) Settings on page 5-19*.

## AP51xx>admin(network.wan.nat)> list

### Description:

Lists access point NAT entries for the specified index.

### Syntax:

**list** <idx> Lists the inbound NAT entries associated with WAN port.

### Example:

```
admin(network.wan.nat)>list 1
-------------------------------------------------------------------------------
index   name    Transport  start port   end port   internal ip     translation
port
-------------------------------------------------------------------------------
1       special tcp        20           21         192.168.42.16   21
```

### Related Commands:

**delete** Deletes inbound NAT entries from the list.
**add** Adds entries to the list of inbound NAT entries.

For an overview of the NAT options available using the applet (GUI), see *Configuring Network Address Translation (NAT) Settings on page 5-19*.

### *8.3.2.2 Network WAN, VPN Commands*

## AP51xx>admin(network.wan.vpn)>

### Description:

Displays the VPN submenu. The items available under this command include:

| | |
|---|---|
| **add** | Adds VPN tunnel entries. |
| **set** | Sets key exchange parameters. |
| **delete** | Deletes VPN tunnel entries. |
| **list** | Lists VPN tunnel entries |
| **reset** | Resets all VPN tunnels. |
| **stats** | Lists security association status for the VPN tunnels. |
| **ikestate** | Displays an Internet Key Exchange (IKE) summary. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

For an overview of the VPN options available using the applet (GUI), see *Configuring VPN Tunnels on page 6-33*.

## AP51xx>admin(network.wan.vpn)> add

### Description:

Adds a VPN tunnel entry.

### Syntax:

**add** <name> <LAN idx> <LWanIP> <RSubnetIP> <RSubnetMask <RGatewayIP>

Creates a tunnel <name> (1 to 13 characters) to gain access through local WAN IP <LWanIP> from the remote subnet with address <RSubnetIP> and subnet mask <RSubnetMask> using the remote gateway <RGatewayIP>.

### Example:

```
admin(network.wan.vpn)>add 2 SJSharkey 209.235.44.31 206.107.22.46
255.255.255.224 206.107.22.1
If tunnel type is Manual, proper SPI values and Keys must be configured after
adding the tunnel

admin(network.wan.vpn)>
```

For information on configuring VPN using the applet (GUI), see *Configuring VPN Tunnels on page 6-33*.

## AP51xx>admin(network.wan.vpn)> set

### Description:

Sets VPN entry parameters.

### Syntax:

| | | | | | |
|---|---|---|---|---|---|
| **set** | **type** | <name> | <tunnel type> | | Sets the tunnel type <name> to **Auto** or **Manual** for the specified tunnel name. |
| | **authalgo** | <name> | <authalgo> | | Sets the authentication algorithm for <name> to (**None**, **MD5**, or **SHA1**). |
| | **authkey** | <name> | <dir> <authkey> | | Sets the AH authentication key (if type is Manual) for tunnel <name> with the direction set to **IN** or **OUT,** and the manual authentication key set to <authkey>. (The key size is **32** hex characters for MD5, and **40** hex characters for SHA1). |
| | **esp-type** | <name> | <esptype> | | Sets the Encapsulating Security Payload (ESP) type. Options include **None**, **ESP**, or **ESP-AUTH**. |
| | **esp-encalgo** | <name> | <escalgo> | | Sets the ESP encryption algorithm. Options include **DES**, **3DES**, **AES128**, **AES192**, or **AES256**). |
| | **esp-enckey** | <name> | <dir> <enckey> | | Sets the Manual Encryption Key in ASCII for tunnel <name> and direction **IN** or **OUT** to the key <enc-key>. The size of the key depends on the encryption algorithm.<br>- 16 hex characters for DES<br>- 48 hex characters for 3DES<br>- 32 hex characters for AES128<br>- 48 hex characters for AES192<br>- 64 hex characters for AES256 |
| | **esp-authalgo** | <name> | <authalgo> | | Sets the ESP authentication algorithm. Options include **MD5** or **SHA1**. |
| | **esp-authkey** | <name> | <dir> <authkey> | | Sets ESP Authentication key <name> either for **IN** or **OUT** direction to <auth-key>, an ASCII string of hex characters. If authalgo is set to **MD5**, then provide 32 hex characters. If authalgo is set to **SHA1**, provide 40 hex characters. |
| | **spi** | <name> | <algo> <dir> | <value> | Sets 6 character **IN**(bound) or **OUT**(bound) for **AUTH** (Manual Authentication) or **ESP** for <name> to <spi> (a hex value more than 0xFF) <value>. |
| | **usepfs** | <name> | <mode> | | Enables or disables Perfect Forward Secrecy for <name>. |

| | | | | |
|---|---|---|---|---|
| **salife** | <name> | <lifetime> | | Defines the name of the tunnnel <name> the Security Association Life Time <300-65535> applies to in seconds. |
| **ike** | **opmode** | <name> | <opmode> | Sets the Operation Mode of IKE for <name> to **Main** or **Aggr**(essive). |
| | **myidtype** | <name> | <idtype> | Sets the Local ID type for IKE authentication for <name> (1 to 13 characters) to <idtype> (**IP**, **FQDN**, or **UFQDN**). |
| | **remidtype** | <name> | <idtype> | Sets the Remote ID type for IKE authentication for <name> (1 to 13 characters) to <idtype> (**IP**, **FQDN**, or **UFQDN**). |
| | **myiddata** | <name> | <idtype> | Sets the Local ID data for IKE authentication for <name> to <idtype>. This value is not required when the ID type is set to IP. |
| | **remiddata** | <name> | <idtype> | Sets the Local ID data for IKE authentication for <name> to <idtype>. This value is not required when the ID type is set to IP. |
| | **authtype** | <name> | <authtype> | Sets the IKE Authentication type for <name> to <authtype> ( **PSK** or **RSA**). |
| | **authalgo** | <name> | <authalgo> | Sets the IKE Authentication Algorithm for <name> to **MD5** or **SHA1**. |
| | **phrase** | <name> | <phrase> | Sets the IKE Authentication passphrase for <name> to <phrase>. |
| | **encalgo** | <name> | <encalgo> | Sets the IKE Encryption Algorithm for <name> to <encalgo> (one of **DES**, **3DES**, **AES128**, **AES192**, or **AES256**). |
| | **lifetime** | <name> | <lifetime> | Sets the IKE Key life time in seconds for <name> to <lifetime>. |
| | **group** | <name> | <group> | Sets the IKE Diffie-Hellman Group for <name> to either **G768** or **G1024**. |

For information on configuring VPN using the applet (GUI), see *Configuring VPN Tunnels on page 6-33*.

## AP51xx>admin(network.wan.vpn)> delete

### Description:

Deletes VPN tunnel entries.

### Syntax:

| | | |
|---|---|---|
| **delete** | **all** | Deletes all VPN entries. |
| | <name> | Deletes VPN entries <name>. |

### Example:

```
admin(network.wan.vpn)>list
-------------------------------------------------------------------------
Tunnel Name   Type    Remote IP/Mask     Remote Gateway  Local WAN IP
-------------------------------------------------------------------------
Eng2EngAnnex  Manual  192.168.32.2/24    192.168.33.1    192.168.24.198
SJSharkey     Manual  206.107.22.45/27   206.107.22.2    209.235.12.55

admin(network.wan.vpn)>delete Eng2EngAnnex
admin(network.wan.vpn)>list
-------------------------------------------------------------------------
Tunnel Name   Type    Remote IP/Mask     Remote Gateway  Local WAN IP
-------------------------------------------------------------------------
SJSharkey     Manual  206.107.22.45/27   206.107.22.2    209.235.12.55

admin(network.wan.vpn)>
```

For information on configuring VPN using the applet (GUI), see *Configuring VPN Tunnels on page 6-33*.

## AP51xx>admin(network.wan.vpn)> list

### Description:

Lists VPN tunnel entries.

### Syntax:

| | | |
|---|---|---|
| **list** | <cr> | Lists all tunnel entries. |
| | <name> | Lists detailed information about tunnel named <name>. Note that the <name> must match case with the name of the VPN tunnel entry |

### Example:

```
admin(network.wan.vpn)>list
-------------------------------------------------------------------------
Tunnel Name   Type    Remote IP/Mask     Remote Gateway  Local WAN IP
-------------------------------------------------------------------------
Eng2EngAnnex  Manual  192.168.32.2/24    192.168.33.1    192.168.24.198
SJSharkey     Manual  206.107.22.45/27   206.107.22.2    209.235.12.55

admin(network.wan.vpn)>list SJSharkey
-------------------------------------------------------------------------
Detail listing of VPN entry:
-------------------------------------------------------------------------
Name                     : SJSharkey
Local Subnet             : 1
Tunnel Type              : Manual
Remote IP                : 206.107.22.45
Remote IP Mask           : 255.255.255.224
Remote Security Gateway  : 206.107.22.2
Local Security Gateway   : 209.239.160.55
AH Algorithm             : None
Encryption Type          : ESP
Encryption Algorithm     : DES
ESP Inbound SPI          : 0x00000100
ESP Outbound SPI         : 0x00000100
```

For information on displaying VPN information using the applet (GUI), see *Viewing VPN Status on page 6-47*.

## AP51xx>admin(network.wan.vpn)> reset

### Description:

Resets all of the access point's VPN tunnels.

### Syntax:

**reset** Resets all VPN tunnels.

### Example:

```
admin(network.wan.vpn)>reset

VPN tunnels reset.

admin(network.wan.vpn)>
```

For information on configuring VPN using the applet (GUI), see *Configuring VPN Tunnels on page 6-33*.

## AP51xx>admin(network.wan.vpn)> stats

### Description:

Lists statistics for all active tunnels.

### Syntax:

**stats** Display statistics for all VPN tunnels.

### Example:

```
admin(network.wan.vpn)>stats
-------------------------------------------------------------------------------
Tunnel Name   Status     SPI(OUT/IN)       Life Time        Bytes(Tx/Rx)
-------------------------------------------------------------------------------
Eng2EngAnnex  Not Active
SJSharkey     Not Active
```

For information on displaying VPN information using the applet (GUI), see *Viewing VPN Status on page 6-47*.

## AP51xx>admin(network.wan.vpn)> ikestate

### Description:

Displays statistics for all active tunnels using Internet Key Exchange (IKE).

### Syntax:

**ikestate** Displays status about Internet Key Exchange (IKE) for all tunnels. In particular, the table indicates whether IKE is connected for any of the tunnels, it provides the destination IP address, and the remaining lifetime of the IKE key.

### Example:

```
admin(network.wan.vpn)>ikestate
-------------------------------------------------------------------
Tunnel Name   IKE State            Dest IP         Remaining Life
-------------------------------------------------------------------
Eng2EngAnnex  Not Connected        ----            ---
SJSharkey     Not Connected        ----            ---

admin(network.wan.vpn)>
```

For information on configuring IKE using the applet (GUI), see *Configuring IKE Key Settings on page 6-43*.

### 8.3.3 Network Wireless Commands

## AP51xx>admin(network.wireless)

### Description:

Displays the access point wireless submenu. The items available under this command include:

| | |
|---|---|
| **wlan** | Displays the WLAN submenu used to create and configure up to 16 WLANs per access point. |
| **security** | Displays the security submenu used to create encryption and authentication based security policies for use with access point WLANs. |
| **acl** | Displays to the *Access Control List* (ACL) submenu to restrict or allow MU access to access point WLANs. |
| **radio** | Displays the radio configuration submenu used to specify how the 802.11a or 802.11b/g radio is used with specific WLANs. |
| **qos** | Displays the *Quality of Service* (QoS) submenu to prioritize specific kinds of data traffic within a WLAN. |
| **bandwidth** | Displays the Bandwidth Management submenu used to configure the order data is processed by an access point radio. |
| **rogue-ap** | Displays the Rogue-AP submenu to configure devices located by the access point as friendly or threatening for interoperablity. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

### *8.3.3.1 Network WLAN Commands*

## AP51xx>admin(network.wireless.wlan)>

### Description:

Displays the access point wireless LAN (WLAN) submenu. The items available under this command include:

| | |
|---|---|
| **show** | Displays the access point's current WLAN configuration. |
| **create** | Defines the parameters of a new WLAN. |
| **edit** | Modifies the properties of an existing WLAN. |
| **delete** | Deletes an existing WLAN. |
| **hotspot** | Displays the WLAN hotspot menu. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

For an overview of the Wireless configuration options available to the using the applet (GUI), see *Enabling Wireless LANs (WLANs) on page 5-22*.

## AP51xx>admin(network.wireless.wlan)> show

### Description:

Displays the access point's current WLAN configuration.

### Syntax:

| | | | |
|---|---|---|---|
| **show** | **summary** | | Displays the current configuration for existing WLANs. |
| | **wlan** | <number> | Displays the configuration for the requested WLAN (WLAN 1 through 16). |

### Example:

```
admin(network.wireless.wlan)>show summary

WLAN1
WLAN Name                          : Lobby
ESSID                              : 101
Radio                              : 11a, 11b/g
VLAN                               :
Security Policy                    : Default
QoS Policy                         : Default

admin(network.wireless.wlan)>show wlan 1

ESS Identifier                     : 101
WLAN Name                          : Lobby
802.11a Radio                      : available
802.11b/g Radio                    : not available
Client Bridge Mesh Backhaul        : available
Hotspot                            : not available
Maximum MUs                        : 127
Security Policy                    : Default
MU Access Control                  : Default
Kerberos User Name                 : 101
Kerberos Password                  : ********
Disallow MU to MU Communication    : disable
Use Secure Beacon                  : disable
Accept Broadcast ESSID             : disable
QoS Policy                         : Default
```

For information on displaying WLAN infromation using the applet (GUI), see *Enabling Wireless LANs (WLANs) on page 5-22*.

## AP51xx>admin(network.wireless.wlan)> create

### Description:

Defines the parameters of a new WLAN.

### Syntax:

**create**

| | | | |
|---|---|---|---|
| **show** | **wlan** | <number> | Displays newly created WLAN and policy number. |
| **set** | **ess** | <essid> | Defines the ESSID for a target WLAN. |
| | **wlan-name** | <name> | Determines the name of this particlular WLAN (1-32). |
| | **11a** | <mode> | Enables or disables access to the access point 802.11a radio. |
| | **11bg** | <mode> | Enables or disables access to the access point 802.11b/g radio. |
| | **mesh** | <mode> | Enables or disables the Client Bridge Mesh Backhaul option. |
| | **hotspot** | <mode> | Enables or disables the Hotspot mode. |
| | **max-mu** | <number> | Defines the maximum number of MU able to operate within the WLAN (default = 127 MUs). |
| | **security** | <name> | Sets the security policy to the WLAN (1-32). |
| | **acl** | <name> | Sets the MU ACL policy to the WLAN (1-32). |
| | **passwd** | <ascii string> | Defines a Kerberos password used if the WLAN's security policy uses a Kerberos server-based authentication scheme. |
| | **no-mu-mu** | <mode> | Enables or disables MUs associated to the same WLAN to not communicate with each other. |
| | **sbeacon** | <mode> | Enables or disables the AP-51xx from transmitting the ESSID in the beacon. |
| | **bcast** | <mode> | Enables or disables the access point from accepting broadcast IDs from MUs. Broadcast IDs are transmitted without security. |
| | **qos** | <name> | Defines the index name representing the QoS policy used with this WLAN. |
| **add-wlan** | | | Apply the changes to the modified WLAN and exit. |
| **..** | | | Disregard the changes to the modified WLAN and exit. |

### Example:

```
admin(network.wireless.wlan.create)>show wlan

ESS Identifier                    :
WLAN Name                         :
802.11a Radio                     : available
802.11b/g Radio                   : not available
Client Bridge Mesh Backhaul       : not available
Hotspot                           : not available
Maximum MUs                       : 127
Security Policy                   : Default
MU Access Control                 :
Kerberos User Name                : Default
Kerberos Password                 : ********
Disallow MU to MU Communication   : disable
Use Secure Beacon                 : disable
```

```
Accept Broadcast ESSID            : disable
QoS Policy                        : Default

admin(network.wireless.wlan.create)>show security
-------------------------------------------------------------------------
Secu Policy Name      Authen      Encryption      Associated WLANs
-------------------------------------------------------------------------
1 Default             Manual      no encrypt      Front Lobby
2 WEP Demo            Manual      WEP 64          2nd Floor
3 Open                Manual      no encrypt      1st Floor

admin(network.wireless.wlan.create)>show acl
-------------------------------------------------------------------------
ACL Policy Name           Associated WLANs
-------------------------------------------------------------------------
1 Default                 Front Lobby
2 Admin                   3rd Floor
3 Demo Room               5th Floor

admin(network.wireless.wlan.create)>show qos
-------------------------------------------------------------------------
QOS Policy Name           Associated WLANs
-------------------------------------------------------------------------
1 Default                 Front Lobby
2 Voice                   Audio Dept
3 Video                   Video Dept
```

For information on creating a WLAN using the applet (GUI), see *Creating/Editing Individual WLANs on page 5-24*.

## AP51xx>admin(network.wireless.wlan)> edit

### Description:

Edits the properties of an existing WLAN policy.

### Syntax:

| | | |
|---|---|---|
| **edit** | <index> | Edits the properties of an existing WLAN policy. |
| | **show** | Displays the WLANs pamaters and summary. |
| | **set** | Edits the same WLAN parameters that can be modified using the create command. |
| | **change** | Completes the WLAN edits and exits the CLI session. |
| | **..** | Cancel the WLAN edits and exit the CLI session. |

For information on editing a WLAN using the applet (GUI), see *Creating/Editing Individual WLANs on page 5-24*.

## AP51xx>admin(network.wireless.wlan)> delete

### Description:

Deletes an existing WLAN.

### Syntax:

| | | |
|---|---|---|
| **delete** | <wlan-name> | Deletes a target WLAN by name supplied. |
| | **all** | Deletes all WLANs defined. |

For information on deleting a WLAN using the applet (GUI), see *Creating/Editing Individual WLANs on page 5-24*.

## AP51xx>admin(network.wireless.wlan.hotspot)>

### Description:

Displays the Hotspot submenu. The items available under this command include:

| | |
|---|---|
| **show** | Show hotspot parameters. |
| **redirection** | Goes to the hotspot redirection menu. |
| **radius** | Goes to the hotspot Radius menu. |
| **white-list** | Goes to the hotspot white-list menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |

For information on configuring the Hotspot options available to the using the applet (GUI), see *Configuring WLAN Hotspot Support on page 5-39*.

## AP51xx>admin(network.wireless.wlan.hotspot)> show

### Description:

Displays the current access point Rogue AP detection configuration.

### Syntax:

| | | | |
|---|---|---|---|
| **show** | **hotspot** | <idx> | Shows hotspot parameters per wlan index (1-16). |

### Example:

```
admin(network.wireless.wlan.hotspot)>show hotspot 1

WLAN1
Hotspot Mode                    : enable
Hotspot Page Location           : default
External Login URL              : www.sjsharkey.com
External Welcome URL            :
External Fail URL               :

Primary Server Ip adr           :157.235.21.21
Primary Server Port             :1812
Primary Server Secret           :******
Secondary Server Ip adr         :157.235.32.12
Secondary Server Port           :1812
Secondary Server Secret         :******
Accounting Mode                 :disable
Accounting Server Ip adr        :0.0.0.0
Accounting Server Port          :1813
Accounting Server Secret        :********
Accoutning Timeout              :10
Accoutning Retry-count          :3

Whitelist Rules?
-------------------------------------------------------------------------
            Idx             IP Address
-------------------------------------------------------------------------
            1               157.235.121.12
```

For information on configuring the Hotspot options available to the access point using the applet (GUI), see *Configuring WLAN Hotspot Support on page 5-39*.

## AP51xx>admin(network.wireless.wlan.hotspot)> redirection

### Description:

Goes to the hotspot redirection menu.

### Syntax:

| | | |
|---|---|---|
| **redirection set** | <page-loc> | Sets the hotspot http-re-direction by index (1-16) for the specified URL. |
| | <exturl> | Shows hotspot http-redirection details for specifiec index (1-16) for specified page (login, welcome, fail) and target URL.. |
| **show** | | Shows hotspot http-redirection details. |
| **save** | | Saves the updated hotspot configuration to flash memory. |
| **quit** | | Quits the CLI session. |
| **..** | | Goes to the parent menu. |
| **/** | | Goes to the root menu. |

### Example:

```
admin(network.wireless.wlan.hotspot)>set page-loc 1 www.sjsharkey.com
admin(network.wireless.wlan.hotspot)>set exturl 1 fail www.sjsharkey.com
```

For information on configuring the Hotspot options available to the access point using the applet (GUI), see *Configuring WLAN Hotspot Support on page 5-39*.

## AP51xx>admin(network.wireless.wlan.hotspot)> radius

### Description:

Goes to the hotspot Radius menu.

### Syntax:

| | |
|---|---|
| **set** | Sets the Radius hotspot configuration. |
| **show** | Shows Radius hotspot server details. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |

For information on configuring the Hotspot options available to the access point using the applet (GUI), see *Configuring WLAN Hotspot Support on page 5-39*.

## AP51xx>admin(network.wireless.wlan.hotspot.radius)> set

### Description:

Sets the Radius hotspot configuration.

### Syntax:

| | | | | | |
|---|---|---|---|---|---|
| **set** | **server** | <idx> | <srvr_type> | <ipadr> | Sets the Radius hotpost server IP address per wlan index (1-16) |
| | **port** | <idx> | <srvr_type> | <port> | Sets the Radius hotpost server port per wlan index (1-16) |
| | **secret** | <idx> | <srvr_type> | <secret> | Sets the Radius hotspot server shared secret password. |
| | **acct-mode** | <idx> | <mode> | | Sets the Radius hotspot server accounting mode (enable/disable) |
| | **acct-server** | <idx> | <ipadr> | | Sets the Radius hotspot accounting server IP address per wlan index (1-16). |
| | **acct-port** | <idx> | <port> | | Sets the Radius hotspot accounting server port per wlan index (1-16). |
| | **acct-secret** | <idx> | <secret> | | Sets the Radius hotspot server shared secret password per wlan index (1-16). |
| | **acct-timeout** | <idx> | <timeout> | | Sets the Radius hotspot server accounting timeout period in seconds (1-25). |
| | **acct-retry** | <idx> | <retry_count> | | Sets the Radius hotspot server accounting accounting retry interval (1-10). |

### Example:

```
admin(network.wireless.wlan.hotspot.radius)>set server 1 primary 157.235.121.1
admin(network.wireless.wlan.hotspot.radius)>set port 1 primary 1812
admin(network.wireless.wlan.hotspot.radius)>set secret 1 primary sjsharkey
admin(network.wireless.wlan.hotspot.radius)>set acct-mode 1 enable
admin(network.wireless.wlan.hotspot.radius)>set acct-server 1 157.235.14.14
admin(network.wireless.wlan.hotspot.radius)>set acct-port 1 1812
admin(network.wireless.wlan.hotspot.radius)>set acct-secret londonfog
admin(network.wireless.wlan.hotspot.radius)>set acct-timeout 1 25
admin(network.wireless.wlan.hotspot.radius)>set acct-retry 1 10
```

For information on configuring the Hotspot options available to the access ointusing the applet (GUI), see *Configuring WLAN Hotspot Support on page 5-39*.

## AP51xx>admin(network.wireless.wlan.hotspot.radius)> show

### Description:

Shows Radius hotspot server details.

### Syntax:

| | | | |
|---|---|---|---|
| **show** | **radius** | <idx> | Displays Radius hotspot server details per index (1-16) |

### Example:

```
admin(network.wireless.wlan.hotspot.radius)>show radius 1

Primary Server Ip adr            : 157.235.12.12
Primary Server Port              : 1812
Primary Server Secret            : ******
Secondary Server Ip adr          : 0.0.0.0
Secondary Server Port            : 1812
Primary Server Secret            : ******
Accounting Mode                  : enable
Accounting Server Ip adr         : 157.235.15.16
Accounting Server Port           : 1812
Accounting Server Secret         : ******
Accounting Timeout               : 10
Accounting Retry-count           : 3
```

For information on configuring the Hotspot options available to the access point using the applet (GUI), see *Configuring WLAN Hotspot Support on page 5-39*.

## AP51xx>admin(network.wireless.wlan.hotspot)> white-list

### Description:

Goes to the hotspot white-list menu.

### Syntax:

| | | | |
|---|---|---|---|
| **white-list** | **add** | <rule> | Adds hotspot whitelist rules by index (1-16) for specified IP address. |
| | **clear** | | Clears hotspot whitelist rules for specified index (1-16). |
| | **show** | | Shows hotspot whitelist rules for specified index (1-16). |
| | **save** | | Saves the updated hotspot configuration to flash memory. |
| | **quit** | | Quits the CLI session. |
| | **..** | | Goes to the parent menu. |
| | **/** | | Goes to the root menu. |

### Example:

```
admin(network.wireless.wlan.hotspot.whitelist)>add rule 1 157.235.21.21
admin(network.wireless.wlan.hotspot.whitelist)>show white-rule 1

--------------------------------------------------------------------------------
Idx                                     IP Address
--------------------------------------------------------------------------------
1                                       157.235.21.21
```

For information on configuring the Hotspot options available to the access point using the applet (GUI), see *Configuring WLAN Hotspot Support on page 5-39*.

### 8.3.3.2 Network Security Commands

## AP51xx>admin(network.wireless.security)>

### Description:

Displays the access point wireless security submenu. The items available under this command include:

| | |
|---|---|
| **show** | Displays the access point's current security configuration. |
| **create** | Defines the parameters of a security policy. |
| **edit** | Edits the properties of an existing security policy. |
| **delete** | Removes a specific security policy. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

For information the security configuration options available to the access point using the applet (GUI), see *Configuring Security Options on page 6-2*.

## AP51xx>admin(network.wireless.security)> show

### Description:

Displays the access point's current security configuration.

### Syntax:

| | | | |
|---|---|---|---|
| **show** | **summary** | | Displays list of existing security policies (1-16). |
| | **policy** | <id> | Displays the specified security policy <id>. |

### Example:

```
admin(network.wireless.security)>show summary

-------------------------------------------------------------------
Secu Policy Name      Authen      Encryption      Associated WLANs
-------------------------------------------------------------------
1 Default             Manual      no encrypt      Lobby
2 WEP Demo            Manual      WEP 64          2nd Floor
3 Open                Manual      no encrypt      1st Floor

admin(network.wireless.security)>show policy 1

Policy Name                     : Default
Authentication                  : Manual Pre-shared key/No Authentication

Encryption type                 : no encryption
```

### Related Commands:

**create** Defines security parameters for the specified WLAN.

For information displaying existing WLAN security settings using the applet (GUI), see *Enabling Authentication and Encryption Schemes on page 6-5*.

## AP51xx>admin(network.wireless.security)> create

### Description:

Defines the parameter of access point security policies.

**Syntax:**

| | | | | | |
|---|---|---|---|---|---|
| **create** | | | | | Defines the parameters of a security policy. |
| | **show** | | | | Displays new or existing security policy parameters. |
| | **set** | **sec-name** | <name> | | Sets the name of the security policy. |
| | | **auth** | <authtype> | | Sets the authentication type for WLAN <idx> to <type> (**none**, **eap**, or **kerberos**).<br><br>*Note: Kerberos parameters are only in affect if "kerberos" is specified for the authentication method (set auth <type>).* |
| | | **kerb** | **realm** | <name> | Sets the Kerberos realm. |
| | | | **server** | <sidx> <ip> | Sets the Kerberos server <sidx> (**1**-primary, **2**-backup, or **3**-remote) to KDC IP address. |
| | | | **port** | <sidx> <port> | Sets the Kerberos port to <port> (KDC port) for server <ksidx> (**1**-primary, **2**-backup, or **3**-remote).<br><br>*Note: EAP parameters are only in affect if "eap" is specified for the authentication method (set auth <type>).* |
| | | **eap** | **server** | <sidx> <ip> | Sets the radius server (**1**-primary or as **2**-secondary) IP address <ip>. |
| | | | **port** | <sidx> <port> | Sets the radius server <sidx> (**1**-primary or **2**-secondary) <port> (1-65535). |
| | | | **secret** | <sidx> <secret> | Sets the EAP shared secret <secret> (**1**-**63** characters) for server <sidx> (**1**-primary or **2**-secondary). |
| | | | **reauth** | **mode** <mode> | Enables or disables EAP reauthentication. |
| | | | | **period** <time> | Sets the reauthentication period <period> in seconds (**30**-**9999**). |

| | | | | |
|---|---|---|---|---|
| | | **retry** | <number> | Sets the maximum number of reauthentication retries <retry> (**1**-**99**). |
| | **accounting** | **mode** | <mode> | Enable or disable Radius accounting. |
| | | **server** | <ip> | Set external Radius server IP address. |
| | | **port** | <port> | Set external Radius server port number. |
| | | **secret** | <secret> | Set external Radius server shared secret password. |
| | | **timeout** | <period> | Defines MU timout period in seconds (1-255). |
| | | **retry** | <number> | Sets the maximum number of MU retries to <retry> (**1**-**10**). |
| | | **syslog** | <mode> | Enable or disable syslog messages. |
| | | **ip** | <ip> | Defines syslog server IP address. |
| | **adv** | **mu-quiet** | <time> | Set the EAP MU/supplicant quiet period to <time> seconds (**1**-**65535**). |
| | | **mu-timeout** | <timeout> | Sets the EAP MU/supplicant timeout in seconds (**1**-**255**). |
| | | **mu-tx** | <time> | Sets the EAP MU/supplicant TX period <time> in seconds (**1**-**65535**). |
| | | **mu-retry** | <count> | Sets the EAP maximum number of MU retries to <count> (**1**-**10**). |
| | | **svr-timeout** | <time> | Sets the server timeout <time> in seconds (**1**-**255**). |
| | | **svr-retry** | <count> | Sets the maximum number of server retries to <count> (**1**-**255**). |
| | | | | *Note: The WEP authentication mechanism saves up to four different keys (one for each WLAN). It is not requirement to set all keys, but you must associate a WLAN with the same keys.* |
| **enc** | <idx> | <type> | | Sets the encryption type to <type> (one of **none**, **wep40**, **wep104**, **keyguard**, **tkip**, or **ccmp**) for WLAN <idx>. |

| | | | | |
|---|---|---|---|---|
| **wep-keyguard** | **passkey** | <passkey> | | The passkey used as a text abbreviation for the entire key length (**4-32**). |
| | **index** | <key index> | | Selects the WEP/KeyGuard key (from one of the four potential values of <key index> (**1-4**). |
| | **hex-key** | <kidx> | <key string> | Sets the WEP/KeyGuard key for key index <kidx> (**1-4**) for WLAN <kidx> to <key string>. |
| | **ascii-key** | <kidx> | <key string> | Sets the WEP/KeyGuard key for key index <kidx> (**1-4**) for WLAN <kidx> to <key string>. |
| | | | | *Note: TKIP parameters are only affected if "tkip" is selected as the encryption type.* |
| **tkip** | **rotate-mode** | <mode> | | Enables or disabled the broadcast key. |
| | **interval** | <time> | | Sets the broadcast key rotation interval to <time> in seconds (**300-604800**). |
| | **type** | <key type> | | Sets the TKIP key type. |
| | **key** | <256 bit key> | | Sets the TKIP key to <256 bit key>. |
| | **phrase** | <ascii phrase> | | Sets the TKIP ASCII pass phrase to <ascii phrase> (8-63 characters). |
| **ccmp** | **rotate-mode** | <mode> | | Enables or disabled the broadcast key. |
| | **interval** | <time> | | Sets the broadcast key rotation interval to <time> in seconds (**300-604800**). |
| | **type** | <key type> | | Sets the CCMP key type. |
| | **phrase** | <ascii phrase> | | Sets the CCMP ASCII pass phrase to <ascii phrase> (8-63 characters). |
| | **key** | <256 bit key> | | Sets the CCMP key to <256 bit key>. |
| | **mixed-mode** | <mode> | | Enables or disables mixed mode (allowing WPA-TKIP clients). |

| | | | |
|---|---|---|---|
| | **preauth** | <mode> | Enables or disables preauthentication (fast roaming). |
| **add-policy** | | | Adds the policy and exits. |
| **..** | | | Disregards the policy creation and exits the CLI session. |

For information on configuring the encryption and authentication options available to the access point using the applet (GUI), see *Configuring Security Options on page 6-2*.

## AP51xx>admin(network.wireless.security.edit)>

### Description:

Edits the properties of a specific security policy.

### Syntax:

| | | |
|---|---|---|
| **show** | | Displays the new or modified security policy parameters. |
| **set** | <index> | Edits security policy parameters. |
| **change** | | Completes policy changes and exits the session. |
| **..** | | Cancels the changes made and exits the session. |

### Example:

```
admin(network.wireless.security)>edit 1
admin(network.wireless.security.edit)>show

Policy Name                     : Default
Authentication                  : Manual Pre-shared key/No Authentication

Encryption type                 : no encryption
```

For information on configuring the encryption and authentication options available to the access point using the applet (GUI), see *Configuring Security Options on page 6-2*.

## AP51xx>admin(network.wireless.security)> delete

### Description:

Deletes a specific security policy.

### Syntax:

| | | |
|---|---|---|
| **delete** | <sec-name> | Removes the specified security policy for the list supported. |
| | <all> | Removes all security policies except the default policy. |

For information on configuring the encryption and authentication options available to the access point using the applet (GUI), see *Configuring Security Options on page 6-2*.

### *8.3.3.3 Network ACL Commands*

## AP51xx>admin(network.wireless.acl)>

### Description:

Displays the access point Mobile Unit *Access Control List* (ACL) submenu. The items available under this command include:

| | |
|---|---|
| **show** | Displays the access point's current ACL configuration. |
| **create** | Creates an MU ACL policy. |
| **edit** | Edits the properties of an existing MU ACL policy. |
| **delete** | Removes an MU ACL policy. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

## AP51xx>admin(network.wireless.acl)> show

### Description:

Displays the access point's current ACL configuration.

### Syntax:

| | | | |
|---|---|---|---|
| **show** | **summary** | | Displays the list of existing MU ACL policies. |
| | **policy** | <index> | Displays the requested MU ACL index policy. |

### Example:

```
admin(network.wireless.acl)>show summary
-------------------------------------------------------------------
ACL Policy Name            Associated WLANs
-------------------------------------------------------------------
1 Default                  Front Lobby
2 Admin                    Administration
3 Demo Room                Customers

admin(network.wireless.acl)>show policy 1

Policy Name                      : Front Lobby
Policy Mode                      : allow

-------------------------------------------------------------------------
index                  start mac                  end mac
-------------------------------------------------------------------------
1                      00A0F8348787               00A0F8348798
```

For information on configuring the ACL options available to the access point using the applet (GUI), see *Configuring a WLAN Access Control List (ACL) on page 5-30*.

## AP51xx>admin(network.wireless.acl)> create

### Description:

Creates an MU ACL policy.

### Syntax:

| | | | | |
|---|---|---|---|---|
| **create** | **show** | | <acl-name> | Displays the parameters of a new ACL policy. |
| | **set** | **acl-name** | <index> | Sets the MU ACL policy name. |
| | | **mode** | <acl-mode> | Sets the ACL mode for the defined index (1-16). Allowed MUs can access the access point managed LAN. Options are **deny** and **allow**. |
| | **add-addr** | <mac1> or <mac1> <mac2> | | Adds specified MAC address to list of ACL MAC addresses. |
| | **delete** | <index> | <all> | Removes either a specified ACL index or all ACL entries. |
| | **add-policy** | | | Completes the policy creation and exits the CLI. |
| | **..** | | | Cancels the creation of the ACL and exits the CLI. |

### Example:

```
admin(network.wireless.acl.create)>show

Policy Name                         : Front Lobby
Policy Mode                         : allow

-------------------------------------------------------------------------
index                   start mac                   end mac
-------------------------------------------------------------------------
1                       00A0F8334455                00A0F8334455
2                       00A0F8400000                00A0F8402001


admin(network.wireless.acl.create)>set acl-name engineering
admin(network.wireless.acl.create)>set mode deny
admin(network.wireless.acl.create)>add-addr 00A0F843AABB
admin(network.wireless.acl.create)>add-policy
```

For information on configuring the ACL options available to the access point using the applet (GUI), see *Configuring a WLAN Access Control List (ACL) on page 5-30*.

## AP51xx>admin(network.wireless.acl.edit)>

### Description:

Edits the properties of an existing MU ACL policy.

### Syntax:

| | |
|---|---|
| **show** | Displays MU ACL policy and its parameters. |
| **set** | Modifies the properties of an existing MU ACL policy. |
| **add-addr** | Adds an MU ACL table entry. |
| **delete** | Deletes an MU ACL table entry, including starting and ending MAC address ranges. |
| **change** | Completes the changes made and exits the session. |
| **..** | Cancels the changes made and exits the session. |

For information on configuring the ACL options available to the access point using the applet (GUI), see *Configuring a WLAN Access Control List (ACL) on page 5-30*.

## AP51xx>admin(network.wireless.acl)> delete

### Description:

Removes an MU ACL policy.

### Syntax:

| | | |
|---|---|---|
| **delete** | <acl name> | Deletes a partilcular MU ACL policy. |
| | **all** | Deletes all MU ACL policies. |

For information on configuring the ACL options available to the access point using the applet (GUI), see *Configuring a WLAN Access Control List (ACL) on page 5-30*.

### *8.3.3.4 Network Radio Configuration Commands*

## AP51xx>admin(network.wireless.radio)>

### Description:

Displays the access point Radio submenu. The items available under this command include:

| | |
|---|---|
| **show** | Summarizes access point radio parameters at a high-level. |
| **set** | Defines the access point radio configuration. |
| **radio1** | Displays the 802.11b/g radio submenu. |
| **radio2** | Displays the 802.11a radio submenu. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

## AP51xx>admin(network.wireless.radio)> show

### Description:

Displays the access point's current radio configuration.

### Syntax:

**show** Displays the access point's current radio configuration.

### Example:

```
admin(network.wireless.radio)>show

Radio Configuration

Radio 1
Name                              : Radio 1
Radio Mode                        : enable
RF Band of Operation              : 802.11b/g (2.4 GHz)

Wireless AP Configuration:
  Base Bridge Mode                : enable
  Max Wireless AP Clients         : 6
  Client Bridge Mode              : disable
  Clitn Bridge WLAN               : WLAN1

Radio 2
Name                              : Radio 2
Radio Mode                        : enable
RF Band of Operation              : 802.11a (5 GHz)

Wireless AP Configuration:
  Base Bridge Mode                : enable
  Max Wireless AP Clients         : 5
  Client Bridge Mode              : disable
  Client Bridge WLAN               : WLAN1
```

For information on configuring the Radio Configuration options available to the access point using the applet (GUI), see *Setting the WLAN's Radio Configuration on page 5-44*.

## AP51xx>admin(network.wireless.radio)> set

### Description:

Enables an access point Radio and defines the RF band of operation.

### Syntax:

| | | | |
|---|---|---|---|
| **set** | **11a** | <mode> | Enables or disables the access point's 802.11a radio. |
| | **11bg** | <mode> | Enables or disables the access point's 802.11b/g radio. |
| | **mesh-base** | <mode> | Enables or disables base bridge mode. |
| | **mesh-max** | | Sets the maximum number of wireless bridge clients. |
| | **mesh-client** | <mode> | Enables or Disables client bridge mode. |
| | **mesh-wlan** | <name> | Defines the client bridge WLAN name. |

### Example:

```
admin(network.wireless.radio)>set 11a disable
admin(network.wireless.radio)>set 11bg enable
admin(network.wireless.radio)>set mesh-base enable
admin(network.wireless.radio)>set mesh-max 11
admin(network.wireless.radio)>set mesh-client disable
admin(network.wireless.radio)>set mesh-wlan wlan1
admin(network.wireless.radio)>show

Radio Configuration

Radio 1
Name                                : Radio 1
Radio Mode                          : enable
RF Band of Operation                : 802.11b/g (2.4 GHz)

Wireless AP Configuration:
  Base Bridge Mode                  : enable
  Max Wireless AP Clients           : 11
  Client Bridge Mode                : disable
  Clitn Bridge WLAN                 : WLAN1
```

For information on configuring the Radio Configuration options available to the access point using the applet (GUI), see *Setting the WLAN's Radio Configuration on page 5-44*.

## AP51xx>admin(network.wireless.radio.radio1)>

### Description:

Displays a specific 802.11b/g radio submenu. The items available under this command include:

### Syntax:

| | |
|---|---|
| **show** | Displays 802.11b/g radio settings. |
| **set** | Defines specific 802.11b/g radio parameters. |
| **advanced** | Displays the Adavanced radio settings submenu. |
| **mesh** | Goes to the Wireless AP Connections submenu. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

For information on configuring Radio 1 Configuration options available to the access point using the applet (GUI), see *Setting the WLAN's Radio Configuration on page 5-44*.

## AP51xx>admin(network.wireless.radio.radio1)> show

### Description:

Displays specific 802.11b/g radio settings.

### Syntax:

| | | |
|---|---|---|
| **show** | **radio** | Displays specific 802.11b/g radio settings. |
| | **qos** | Displays specific 802.11b/g radio WMM QoS settings. |

### Example:

```
admin(network.wireless.radio.radio1)>show radio

Radio Setting Information

Placement                          : indoor
MAC Address                        : 00A0F8715920
Radio Type                         : 802.11b/g
ERP Protection                     : Off

Channel Setting                    : user selection
Antenna Diversity                  : full
Power Level                        : 5 dbm (4 mW)

802.11b/g mode                     : B-Only
Basic Rates                        : 1 2 5.5 11
Supported Rates                    : 1 2 5.5 11

Beacon Interval                    : 100 K-usec
DTIM Interval per BSSID
                    1              : 10 beacon intvls
                    2              : 10 beacon intvls
                    3              : 10 beacon intvls
                    4              : 10 beacon intvls

short preamble                     : disable
RTS Threshold                      : 2341 bytes
```

```
admin(network.wireless.radio.radio1)>show qos

Radio QOS Parameter Set              11g-default
-------------------------------------------------------------------------
Access Category      CWMin      CWMax      AIFSN      TXOPs (32 usec) TXOPs ms
-------------------------------------------------------------------------
Background           15         1023       7          0               0.000
Best Effort          15         63         3          31              0.992
Video                7          15         1          94              3.008
Voice                3          7          1          47              1.504
```

For information on configuring the Radio 1 Configuration options available to the access point using the applet (GUI), see *Configuring the 802.11a or 802.11b/g Radio on page 5-47*.

## AP51xx>admin(network.wireless.radio.802-11bg)> set

### Description:

Defines specific 802.11b/g radio parameters.

### Syntax:

| | | |
|---|---|---|
| **set** | **placement** | Defines the access point radio placement as indoors or outdoors. |
| | **ch-mode** | Determines how the radio channel is selected. |
| | **channel** | Defines the actual channel used by the radio. |
| | **antenna** | Sets the radio antenna power |
| | **power** | Defines the radio antenna power transmit level. |
| | **bg-mode** | Enables or disables 802-11bg radio mode support. |
| | **rates** | Sets the supported radio transmit rates. |
| | **beacon** | Sets the beacon interval used by the radio. |
| | **dtim** | Defines the DTIM interval (by index) used by the radio. |
| | **preamble** | Enables or disables support for short preamble for the radio. |
| | **rts** | Defines the RTS Threshold value for the radio. |
| | **qos** | Defines the cwmin, cwmax, aifsn and txops levels for the QoS policy used for the radio. |
| | **qos param-set** | Defines the data type proliferating the mesh network. When set to a value other then manual, editing the access category values is not necessary. Options include; 11g-default, 11b-default, 11g-wifi, 11b-wifi, 11g-voice, 11b-voice or manual (for advanced users). |

### Example:

```
admin(network.wireless.radio.802-11bg)>set placement indoor
admin(network.wireless.radio.802-11bg)>set ch-mode user
admin(network.wireless.radio.802-11bg)>set channel 1
admin(network.wireless.radio.802-11bg)>set antenna full
admin(network.wireless.radio.802-11bg)>set power 4
admin(network.wireless.radio.802-11bg)>set bg-mode enable
admin(network.wireless.radio.802-11bg)>set rates
admin(network.wireless.radio.802-11bg)>set beacon 100
admin(network.wireless.radio.802-11bg)>set dtim 1 40
admin(network.wireless.radio.802-11bg)>set preamble disable
admin(network.wireless.radio.802-11bg)>set rts 2341
admin(network.wireless.radio.802-11bg)>set qos cwmin 125
admin(network.wireless.radio.802-11bg)>set qos cwmax 255
admin(network.wireless.radio.802-11bg)>set qos aifsn 7
admin(network.wireless.radio.802-11bg)>set qos txops 0
admin(network.wireless.radio.802-11bg)>set qos param-set 11g-default
```

For information on configuring the Radio 1 Configuration options available to the access point using the applet (GUI), see *Configuring the 802.11a or 802.11b/g Radio on page 5-47*.

## AP51xx>admin(network.wireless.radio.802-11bg.advanced)>

### Description:

Displays the advanced submenu for the 802.11b/g radio. The items available under this command include:

### Syntax:

| | |
|---|---|
| **show** | Displays advanced radio settings for the 802.11b/g radio. |
| **set** | Defines advanced parameters for the 802.11b/g radio. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

## AP51xx>admin(network.wireless.radio.802-11bg.advanced)> show

### Description:

Displays the BSSID to WLAN mapping for the 802.11b/g radio.

### Syntax:

| | | |
|---|---|---|
| **show** | **advanced** | Displays advanced settings for the 802.11b/g radio. |
| | **wlan** | Displays WLAN summary list for the 802.11b/g radio. |

### Example:

```
admin(network.wireless.radio.802-11bg.advanced)>show advanced

--------------------------------------------------------------------------------
      WLAN      BSS ID      BC/MC Cipher      Status      Message
--------------------------------------------------------------------------------

      Lobby     1           Open              good        configuration is ok
      HR        2           Open              good        configuration is ok
      Office    3           Open              good        configuration is ok

--------------------------------------------------------------------------------
      BSSID      Primary WLAN
--------------------------------------------------------------------------------

      1          Lobby
      2          HR
      3          Office

admin(network.wireless.radio.802-11bg.advanced)>show wlan

WLAN 1:
WLAN name                     : WLAN1
ESS ID                        : 101
Radio                         : 11a,11b/g
VLAN                          :
Security Policy               : Default
QoS Policy                    : Default
```

For information on configuring Radio 1 Configuration options available to the access point using the applet (GUI), see *Configuring the 802.11a or 802.11b/g Radio on page 5-47*.

## AP51xx>admin(network.wireless.radio.802-11bg.advanced)> set

### Description:

Defines advanced parameters for the target 802.11b/g radio.

### Syntax:

| | | | | |
|---|---|---|---|---|
| **set** | **wlan** | <wlan-name> | <bssid> | Defines advanced WLAN to BSSID mapping for the target radio. |
| | **bss** | <bss-id> | <wlan name> | Sets the BSSID to primary WLAN definition. |

### Example:

```
admin(network.wireless.radio.802-11bg.advanced)>set wlan demoroom 1
admin(network.wireless.radio.802-11bg.advanced)>set bss 1 demoroom
```

For information on configuring Radio 1 Configuration options available to the access point using the applet (GUI), see *Configuring the 802.11a or 802.11b/g Radio on page 5-47*.

## AP51xx>admin(network.wireless.radio.radio2)>

### Description:

Displays a specific 802.11a radio submenu. The items available under this command include:

### Syntax:

| | |
|---|---|
| **show** | Displays 802.11a radio settings |
| **set** | Defines specific 802.11a radio parameters. |
| **advanced** | Displays the Advanced radio settings submenu. |
| **mesh** | Goes to the Wireless AP Connections submenu. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

## AP51xx>admin(network.wireless.radio.802-11a)> show

### Description:

Displays specific 802.11a radio settings.

### Syntax:

| | | |
|---|---|---|
| **show** | **radio** | Displays specific 802.11a radio settings. |
| | **qos** | Displays specific 802.11a radio WMM QoS settings. |

### Example:

```
admin(network.wireless.radio.802-11a)>show radio

Radio Setting Information

Placement                          : indoor
MAC Address                        : 00A0F8715920
Radio Type                         : 802.11a

Channel Setting                    : user selection
Antenna Diversity                  : full
Power Level                        : 5 dbm (4 mW)

Basic Rates                        : 6 12 24
Supported Rates                    : 6 9 12 18 24 36 48 54

Beacon Interval                    : 100 K-usec
DTIM Interval per BSSID
                     1             : 10 beacon intvls
                     2             : 10 beacon intvls
                     3             : 10 beacon intvls
                     4             : 10 beacon intvls

RTS Threshold                      : 2341 bytes
```

```
admin(network.wireless.radio.802-11a)>show qos

Radio QOS Parameter Set:               11a default
-------------------------------------------------------------------------
Access Category      CWMin      CWMax      AIFSN      TXOPs (32 sec)  TXOPs ms
-------------------------------------------------------------------------
Background           15         1023       7          0               0.000
Best Effort          15         63         3          31              0.992
Video                7          15         1          94              3.008
Voice                3          7          1          47              1.504
```

For information on configuring Radio 2 Configuration options available to the access point using the applet (GUI), see *Configuring the 802.11a or 802.11b/g Radio on page 5-47*.

## AP51xx>admin(network.wireless.radio.802-11a)> set

### Description:

Defines specific 802.11a radio parameters.

### Syntax:

| | | |
|---|---|---|
| **set** | **placement** | Defines the access point radio placement as indoors or outdoors. |
| | **ch-mode** | Determines how the radio channel is selected. |
| | **channel** | Defines the actual channel used by the radio. |
| | **antenna** | Sets the radio antenna power. |
| | **power** | Defines the radio antenna power transmit level. |
| | **rates** | Sets the supported radio transmit rates. |
| | **beacon** | Sets the beacon interval used by the radio. |
| | **dtim** | Defines the DTIM interval (by index) used by the radio. |
| | **rts** | Defines the RTS Threshold value for the radio. |
| | **qos** | Defines the cwmin, cwmax, aifsn and txops levels for the QoS policy used for the radio. |
| | **qos param-set** | Defines the data type proliferating the WLAN used with the mesh network. When set to a value other then manual, editing the access category values is not necessary. Options include; 11g-default, 11b-default, 11g-wifi, 11b-wifi, 11g-voice, 11b-voice or manual (for advanced users). |

### Example:

```
admin(network.wireless.radio.802-11a)>

admin(network.wireless.radio.802-11a)>set placement indoor
admin(network.wireless.radio.802-11a)>set ch-mode user
admin(network.wireless.radio.802-11a)>set channel 1
admin(network.wireless.radio.802-11a)>set antenna full
admin(network.wireless.radio.802-11a)>set power 4
admin(network.wireless.radio.802-11a)>set rates
admin(network.wireless.radio.802-11a)>set beacon 100
admin(network.wireless.radio.802-11a)>set dtim 1 10
admin(network.wireless.radio.802-11a)>set rts 2341
admin(network.wireless.radio.802-11a)>set qos cwmin 125
admin(network.wireless.radio.802-11a)>set qos cwmax 255
admin(network.wireless.radio.802-11a)>set qos aifsn 7
admin(network.wireless.radio.802-11a)>set qos txops 0
admin(network.wireless.radio.802-11bg)>set qos param-set 11a-default
```

For information on configuring the Radio 2 Configuration options available to the access point using the applet (GUI), see *Configuring the 802.11a or 802.11b/g Radio on page 5-47*.

## AP51xx>admin(network.wireless.radio.802-11a.advanced)>

### Description:

Displays the advanced submenu for the 802-11a radio. The items available under this command include:

### Syntax:

| | |
|---|---|
| **show** | Displays advanced radio settings for the 802-11a radio. |
| **set** | Defines advanced parameters for the 802-11a radio. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

## AP51xx>admin(network.wireless.radio.802-11a.advanced)> show

### Description:

Displays the BSSID to WLAN mapping for the 802.11a radio.

### Syntax:

| | | |
|---|---|---|
| **show** | **advanced** | Displays advanced settings for the 802.11a radio. |
| | **wlan** | Displays WLAN summary list for 802.11a radio. |

### Example:

```
admin(network.wireless.radio.802-11a.advanced)>show advanced

-------------------------------------------------------------------------------
      WLAN      BSS ID      BC/MC Cipher      Status      Message
-------------------------------------------------------------------------------

      Lobby     1           Open              good        configuration is ok
      HR        2           Open              good        configuration is ok
      Office    3           Open              good        configuration is ok

-------------------------------------------------------------------------------
      BSSID      Primary WLAN
-------------------------------------------------------------------------------

      1          Lobby
      2          HR
      3          Office

admin(network.wireless.radio.802-11bg.advanced)>show wlan

WLAN 1:
WLAN name                    : WLAN1
ESS ID                       : 101
Radio                        :
VLAN                         :
Security Policy              : Default
QoS Policy                   : Default
```

For information on configuring the Radio 2 Configuration options available to the access point using the applet (GUI), see *Configuring the 802.11a or 802.11b/g Radio on page 5-47*.

## AP51xx>admin(network.wireless.radio.802-11a.advanced)> set

### Description:

Defines advanced parameters for the target 802..11a radio.

### Syntax:

| | | | | |
|---|---|---|---|---|
| **set** | **wlan** | <wlan-name> | <bssid> | Defines advanced WLAN to BSSID mapping for the target radio. |
| | **bss** | <bss-id> | <wlan name> | Sets the BSSID to primary WLAN definition. |

### Example:

```
admin(network.wireless.radio.802-11a.advanced)>set wlan demoroom 1
admin(network.wireless.radio.802-11a.advanced)>set bss 1 demoroom
```

For information on configuring Radio 2 Configuration options available to the access point using the applet (GUI), see *Configuring the 802.11a or 802.11b/g Radio on page 5-47*.

### *8.3.3.5 Network Quality of Service (QoS) Commands*

## AP51xx>admin(network.wireless.qos)>

### Description:

Displays the access point *Quality of Service* (QoS) submenu. The items available under this command include:

| | |
|---|---|
| **show** | Displays access point QoS policy information. |
| **create** | Defines the parameters of the QoS policy. |
| **edit** | Edits the settings of an existing QoS policy. |
| **delete** | Removes an existing QoS policy. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

## AP51xx>admin(network.wireless.qos)> show

### Description:

Displays the access point's current QoS policy by summary or individual policy.

### Syntax:

| | | | |
|---|---|---|---|
| **show** | **summary** | | Displays all exisiting QoS policies that have been defined. |
| | **policy** | <index> | Displays the configuration for the requested QoS policy. |

### Example:

```
admin(network.wireless.qos)>show summary

-------------------------------------------------------------------------
QOS Policy Name            Associated WLANs
-------------------------------------------------------------------------
1 Default                  101
2 IP Phones                Audio Dept
3 Video                    Vidio Dept

admin(network.wireless.qos)>show policy 1

Policy Name                          IP Phones
Support Legacy Voice Mode            disable
Multicast (Mask) Address 1           01005E000000
Multicast (Mask) Address 2           09000E000000
WMM QOS Mode                         disable
```

For information on configuring the WLAN QoS options available to the access point using the applet (GUI), see *Setting the WLAN Quality of Service (QoS) Policy on page 5-33*.

## AP51xx>admin(network.wireless.qos.create)>

### Description:

Defines an access point QoS policy.

### Syntax:

| | | | | |
|---|---|---|---|---|
| **show** | | | | Displays QoS policy parameters. |
| **set** | **qos-name** | <index> | | Sets the QoS name for the specified index entry. |
| | **vop** | <index> | | Enables or disables support (by index) for legacy VOIP devices. |
| | **mcast** | <mac> | | Defines primary and secondary Multicast MAC address. |
| | **wmm-qos** | <index> | | Enables or disables the QoS policy index specified. |
| | **param-set** | <set-name> | | Defines the data type used with the qos policy and mesh network. When set to a value other then manual, editing the access category values is not necessary. Options include; 11g-default, 11b-default, 11g-wifi, 11b-wifi, 11g-voice, 11b-voice or manual for advanced users). |
| | **cwmin** | <access category> | <index> | Defines Minimum Contention Window (CW-Min) for specified access categoiry and index. |
| | **cwmax** | <access category> | <index> | Defines Maximum Contention Window (CW-Max) for specified access categoiry and index. |
| | **aifsn** | <access category> | <index> | Sets Arbitrary Inter-Frame Space Number (AIFSN) for specified access categoiry and index. |
| | **txops** | <access category> | <index> | Configures Opportunity to Transmit Time (TXOPs Time) for specified access categoiry and index. |
| | **default** | | <index> | Defines CWMIN, CWMAX, AIFSN and TXOPs default values. |
| **add-policy** | | | | Completes the policy edit and exits the session. |
| **..** | | | | Cancels the changes and exits. |

For information on configuring the WLAN QoS options available to the access point using the applet (GUI), see *Setting the WLAN Quality of Service (QoS) Policy on page 5-33*.

## AP51xx>admin(network.wireless.qos.edit)>

### Descripton:

Edits the properties of an existing QoS policy.

### Syntax:

| | | | | |
|---|---|---|---|---|
| **show** | | | | Displays QoS policy parameters. |
| **set** | **qos-name** | <index> | | Sets the QoS name for the specified index entry. |
| | **vop** | <index> | | Enables or disables support (by index) for legacy VOIP devices. |
| | **mcast** | <mac> | | Defines primary and secondary Multicast MAC address. |
| | **wmm-qos** | <index> | | Enables or disables the QoS policy index specified. |
| | **param-set** | <set-name> | | Defines the data type used with the qos policy and mesh network. When set to a value other then manual, editing the access category values is not necessary. Options include; 11g-default, 11b-default, 11g-wifi, 11b-wifi, 11g-voice, 11b-voice or manual for advanced users). |
| | **cwmin** | <access category> | <index> | Defines Minimum Contention Window (CW-Min) for specified access categoiry and index. |
| | **cwmax** | <access category> | <index> | Defines Maximum Contention Window (CW-Max) for specified access categoiry and index. |
| | **aifsn** | <access category> | <index> | Sets Arbitrary Inter-Frame Space Number (AIFSN) for specified access categoiry and index. |
| | **txops** | <access category> | <index> | Configures Opportunity to Transmit Time (TXOPs Time) for specified access categoiry and index. |
| | **default** | | <index> | Defines CWMIN, CWMAX, AIFSN and TXOPs default values. |
| **change** | | | | Completes the policy edit and exits the session. |
| **..** | | | | Cancels the changes and exits. |

For information on configuring the WLAN QoS options available to the access point using the applet (GUI), see *Setting the WLAN Quality of Service (QoS) Policy on page 5-33*.

## AP51xx>admin(network.wireless.qos)> delete

### Description:

Removes a QoS policy.

### Syntax:

| | | |
|---|---|---|
| **delete** | <qos-name><br><all> | Deletes the specified QoS polciy index, or all of the policies. |

For information on configuring the WLAN QoS options available to the access point using the applet (GUI), see *Setting the WLAN Quality of Service (QoS) Policy on page 5-33*.

### *8.3.3.6 Network Bandwith Management Commands*

## AP51xx>admin(network.wireless.bandwidth)>

### Description:

Displays the access point Bandwidth Management submenu. The items available under this command include:

| | |
|---|---|
| **show** | Displays Bandwidth Management information for how data is processed by the access point. |
| **set** | Defines Bandwidth Management parameters for the access point. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

## AP51xx>admin(network.wireless.bandwidth)> show

### Description:

Displays the access point's current Bandwidth Management configuration.

### Syntax:

**show** Displays the current Bandwidth Management configuration for defined WLANs and how they are weighted.

### Example:

```
admin(network.wireless.bandwidth)>show

Bandwidth Share Mode              : First In First Out
```

For information on configuring the Bandwidth Management options available to the access point using the applet (GUI), see *Configuring Bandwidth Management Settings on page 5-55*.

## AP51xx>admin(network.wireless.bandwidth)> set

### Description:

Defines the access point Bandwidth Management configuration.

### Syntax:

| | | | |
|---|---|---|---|
| **set** | **mode** | <bw-mode> | Defines bandwidth share mode of First In First Out <fifo>, Round Robin <rr> or Weighted Round Robin <wrr> |
| | **weight** | <num> | Assigns a bandwidth share allocation for the WLAN <index 1-16 > when Weighted Round Robin <wrr> is selected. The weighting is from 1-10. |

For information on configuring the Bandwidth Management options available to the access point using the applet (GUI), see *Configuring Bandwidth Management Settings on page 5-55*.

### *8.3.3.7 Network Rogue-AP Commands*

## AP51xx>admin(network.wireless.rogue-ap)>

### Description:

Displays the Rogue AP submenu. The items available under this command include:

| | |
|---|---|
| **show** | Displays the current access point Rogue AP detection configuration. |
| **set** | Defines the Rogue AP detection method. |
| **mu-scan** | Goes to the Rogue AP mu-uscan submenu. |
| **allowed-list** | Goes to the Rogue AP Allowed List submenu. |
| **active-list** | Goes the Rogue AP Active List submenu. |
| **rogue-list** | Goes the Rogue AP List submenu. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

## AP51xx>admin(network.wireless.rogue-ap)> show

### Description:

Displays the current access point Rogue AP detection configuration.

### Syntax:

**show** Displays the current access point Rogue AP detection configuration.

### Example:

```
admin(network.wireless.rogue-ap)>show

MU Scan                          : disable
MU Scan Interval                 : 60 minutes
On-Channel                       : disable
Detector Radio Scan              : enable

Auto Authorize Symbol APs        : disable

Approved APs age out              : 0 minutes
Rogue APs age out                 : 0 minutes
```

For information on configuring the Rogue AP options available to the access point using the applet (GUI), see *Configuring Rogue AP Detection on page 6-52*.

## AP51xx>admin(network.wireless.rogue-ap)> set

### Description:

Defines the access point ACL rogue AP method.

### Syntax:

| | | | |
|---|---|---|---|
| **set** | **mu-scan** | <mode> | Enables or disables to permit MUs to scan for rogue APs. |
| | **interval** | <minutes> | Define an interval for associated MUs to beacon in attempting to locate rogue APs. Value not available unless mu-scan is enabled. |
| | **on-channel** | <mode> | Enables or disables on-channel detection. |
| | **detector-scan** | <mode> | Enables or disables AP detector scan (dual-radio model only). |
| | **symbol-ap** | <mode> | Enables or disables the Authorize Any AP with a Symbol MAC address option. |
| | **applst-ageout** | <minutes> | Sets the approved AP age out time. |
| | **roglst-ageout** | <minutes> | Sets the rogue AP age out time. |

### Example:

```
admin(network.wireless.rogue-ap)>

admin(network.wireless.rogue-ap)>set mu-scan enable
admin(network.wireless.rogue-ap)>set interval 10
admin(network.wireless.rogue-ap)>set on-channel disable
admin(network.wireless.rogue-ap)>set detector-scan disable
admin(network.wireless.rogue-ap)>set symbol-ap enable
admin(network.wireless.rogue-ap)>set applst-ageout 10
admin(network.wireless.rogue-ap)>set roglst-ageout 10

admin(network.wireless.rogue-ap)>show

MU Scan                          : enable
MU Scan Interval                 : 10 minutes
On Channel                       : disable
Detector Radio Scan              : disable
Detector Radio Band              : none

Auto Authorize Symbol APs        : enable

Approved AP age out              : 10 minutes
Rogue AP age out                 : 10 minutes
```

For information on configuring the Rogue AP options available to the access point using the applet (GUI), see *Configuring Rogue AP Detection on page 6-52*.

## AP51xx>admin(network.wireless.rogue-ap.mu-scan)>

### Description:

Displays the Rogue-AP mu-scan submenu.

### Syntax:

| | |
|---|---|
| **show** | Displays all APs located by the MU scan. |
| **start** | Initiates scan immediately by the MU. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

## AP51xx>admin(network.wireless.rogue-ap.mu-scan)> start

### Description:

Initiates an MU scan from a user provided MAC address.

### Syntax:

| | | |
|---|---|---|
| **start** | <mu-mac> | Initiates MU scan from user provided MAC address. |

For information on configuring the Rogue AP options available to the access point using the applet (GUI), see *Configuring Rogue AP Detection on page 6-52*.

## AP51xx>admin(network.wireless.rogue-ap.mu-scan)> show

### Description:

Displays the results of an MU scan.

### Syntax:

**show** Displays all APs located by the MU scan.

For information on configuring the Rogue AP options available to the access point using the applet (GUI), see *Configuring Rogue AP Detection on page 6-52*.

## AP51xx>admin(network.wireless.rogue-ap.allowed-list)>

### Description:

Displays the Rogue-AP allowed-list submenu.

| | |
|---|---|
| **show** | Displays the rogue AP allowed list |
| **add** | Adds an AP MAC address and ESSID to the allowed list. |
| **delete** | Deletes an entry or all entries from the allowed list. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

## AP51xx>admin(network.wireless.rogue-ap.allowed-list)> show

### Description:

Displays the Rogue AP allowed List.

### Syntax:

**show** Displays the rogue-AP allowed list.

### Example:

```
admin(network.wireless.rogue-ap.allowed-list)>show

-------------------------------------------------------------------------------
index            ap                 essid
-------------------------------------------------------------------------------

1          00:A0:F8:71:59:20        *
2          00:A0:F8:33:44:55        101
3          00:A0:F8:40:20:01        Marketing
```

For information on configuring the Rogue AP options available to the access point using the applet (GUI), see *Configuring Rogue AP Detection on page 6-52*.

## AP51xx>admin(network.wireless.rogue-ap.allowed-list)> add

### Description:

Adds an AP MAC address and ESSID to existing allowed list.

### Syntax:

| | | |
|---|---|---|
| **add** | <mac-addr><br><ess-id> | Adds an AP MAC address and ESSID to existing allowed list.<br>Use a "*" for any ESSID. |

### Example:

```
admin(network.wireless.rogue-ap.allowed-list)>add 00A0F83161BB 103
admin(network.wireless.rogue-ap.allowed-list)>show

--------------------------------------------------------------------------------
index            ap                  essid
--------------------------------------------------------------------------------

1          00:A0:F8:71:59:20         *
2          00:A0:F8:33:44:55         101
3          00:A0:F8:40:20:01         Marketing
4          00:A0:F8:31:61:BB         103
```

For information on configuring the Rogue AP options available to the access point using the applet (GUI), see *Configuring Rogue AP Detection on page 6-52*.

## AP51xx>admin(network.wireless.rogue-ap.allowed-list)> delete

### Description:

Deletes an AP MAC address and ESSID to existing allowed list.

### Syntax:

| | | |
|---|---|---|
| **delete** | <idx><br><all> | Deletes an AP MAC address and ESSID (or all addresses) from the allowed list. |

For information on configuring the Rogue AP options available to the access point using the applet (GUI), see *Configuring Rogue AP Detection on page 6-52*.

### *8.3.4 Network Firewall Commands*

## AP51xx>admin(network.firewall)>

### Description:

Displays the access point firewall submenu. The items available under this command include:

| | |
|---|---|
| **show** | Displays the access point's current firewall configuration. |
| **set** | Defines the access point's firewall parameters. |
| **access** | Enables/disables firewall permissions through the LAN and WAN ports. |
| **advanced** | Displays interoperaility rules between the LAN and WAN ports. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

## AP51xx>admin(network.firewall)> show

### Description:

Displays the access point firewall parameters.

### Syntax:

**show** Shows all access point's firewall settings.

### Example:

```
admin(network.firewall)>show

Firewall Status                   : disable
NAT Timeout                       : 10 minutes

Configurable Firewall Filters:

ftp bounce attack filter          : enable
syn flood attack filter           : enable
unaligned ip timestamp filter     : enable
source routing attack filter      : enable
winnuke attack filter             : enable
seq num prediction attack filter  : enable
mime flood attack filter          : enable
max mime header length            : 8192 bytes
max mime headers                  : 16 headers
```

For information on configuring the Firewall options available to the access point using the applet (GUI), see *Configuring Firewall Settings on page 6-25*.

## AP51xx>admin(network.firewall)> set

### Description:

Defines the access point firewall parameters.

### Syntax:

| | | | |
|---|---|---|---|
| **set** | **mode** | <mode> | Enables or disables the firewall. |
| | **nat-timeout** | <interval> | Defines the NAT timeout value. |
| | **syn** | <mode> | Enables or disables SYN flood attack check. |
| | **src** | <mode> | Enables or disables source routing check. |
| | **win** | <mode> | Enables or disables Winnuke attack check. |
| | **ftp** | <mode> | Enables or disables FTP bounce attack check. |
| | **ip** | <mode> | Enables or disables IP unaligned timestamp check. |
| | **seq** | <mode> | Enables or disables sequence number prediction check. |
| | **mime** | **filter** | Enables or disables MIME flood attack check. |
| | **len** | <length> | Sets the max header length in bytes as specified by <length> (with value in range **256** - **34463**). |
| | **hdr** | <count> | Sets the max number of headers as specified in <count> (with value in range **12** - **34463**). |

### Example:

```
admin(network.firewall)>set mode enable
admin(network.firewall)>set ftp enable
admin(network.firewall)>set ip enable
admin(network.firewall)>set seq enable
admin(network.firewall)>set src enable
admin(network.firewall)>set syn enable
admin(network.firewall)>set win enable
admin(network.firewall)>show

Firewall Status                   : enable
Override LAN to WAN Access        : disable

Configurable Firewall Filters

ftp bounce attack filter          : enable
syn flood attack filter           : enable
unaligned ip timestamp filter     : enable
source routing attack filter      : enable
winnuke attack filter             : enable
seq num prediction attack filter  : enable
mime flood attack filter          : enable
max mime header length            : 8192
max mime headers                  : 16
```

## AP51xx>admin(network.firewall)> access

### Description:

Enables or disables firewall permissions through LAN to WAN ports.

### Syntax:

| | |
|---|---|
| **show** | Displays LAN to WAN access rules. |
| **set** | Sets LAN to WAN access rules. |
| **add** | Adds LAN to WAN exception rules. |
| **delete** | Deletes LAN to WAN access exception rules. |
| **list** | Displays LAN to WAN access exception rules. |
| **..** | Goes to parent menu |
| **/** | Goes to root menu. |
| **save** | Saves configuration to system flash. |
| **quit** | Quits and exits the CLI session. |

### Example:

```
admin(network.firewall)>set override disable
admin(network.firewall)>access
admin(network.firewall.lan-wan-access)>set rule allow
admin(network.firewall.lan-wan-access)>list

-------------------------------------------------------------------------------
index      from      to      name      prot      start port      end port
-------------------------------------------------------------------------------

1          lan       wan     HTTP      tcp       80              80
2          lan       wan     abc       udp        0              0
3          lan       wan     123456    ah        1440            2048
4          lan       wan     654321    tcp       2048            2048
5          lan       wan     abc       ah        100             1000
```

For information on configuring the Firewall options available to the access point using the applet (GUI), see *Configuring Firewall Settings on page 6-25*.

## AP51xx>admin(network.firewall)> advanced

### Description:

Displays whether an access point firewall rule is intended for inbound traffic to an interface or outbound traffic from that interface..

### Syntax:

| | |
|---|---|
| **show** | Shows advanced subnet access parameters. |
| **set** | Sets advanced subnet access parameters. |
| **import** | Imports rules from subnet access. |
| **inbound** | Goes to the Inbound Firewall Rules submenu. |
| **outbound** | Goes to the Outbound Firewall Rules submenu. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to flash memory. |
| **quit** | Quits and exits the CLI session. |

### Example:

```
admin(network.firewall)>set override enable
admin(network.firewall)>advanced
admin(network.firewall.adv-lan-access)>inbound
admin(network.firewall.adv-lan-access.inb)>list
------------------------------------------------------------------------------
Idx  SCR IP-Netmask  Dst IP-Netmask  TP  SPorts  DPorts  Rev  NAT  Action
------------------------------------------------------------------------------
1    1.2.3.4         2.2.2.2         all 1:      1:      0.0.0.0   deny
     255.0.0.0       255.0.0.0           65535   65535   nat port 33
2    33.3.0.0        10.10.1.1       tcp 1:      1:      11.11.1.0 allow
     255.255.255.0   255.255.255.0       65535   65535   nat port 0
```

For information on configuring the Firewall options available to the access point using the applet (GUI), see *Configuring Firewall Settings on page 6-25*.

## *8.3.5 Network Router Commands*

### AP51xx>admin(network.router)>

#### Description:

Displays the router submenu. The items available under this command are:

| | |
|---|---|
| **show** | Displays the existing access point router configuration. |
| **set** | Sets the RIP parameters. |
| **add** | Adds user-defined routes. |
| **delete** | Deletes user-defined routes. |
| **list** | Lists user-defined routes. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

## AP51xx>admin(network.router)> show

### Description:

Shows the access point route table.

### Syntax:

**show** Shows the access point route table.

### Example:

```
admin(network.router)>show routes
-------------------------------------------------------------------------------
index  destination      netmask          gateway          interface   metric
-------------------------------------------------------------------------------
1      192.168.2.0      255.255.255.0    0.0.0.0          lan1        0
2      192.168.1.0      255.255.255.0    0.0.0.0          lan2        0
3      192.168.0.0      255.255.255.0    0.0.0.0          lan1        0
4      192.168.24.0     255.255.255.0    0.0.0.0          wan         0
5      157.235.19.5     255.255.255.0    192.168.24.1     wan         1
```

For information on configuring the Router options available to the access point using the applet (GUI), see *Configuring Router Settings on page 5-57*.

## AP51xx>admin(network.router)> set

### Description:

Shows the access point route table.

### Syntax:

| | | |
|---|---|---|
| **set** | **auth** | Sets the RIP authentication type. |
| | **dir** | Sets RIP direction. |
| | **id** | Sets MD5 authetication ID. |
| | **key** | Sets MD5 authetication key. |
| | **passwd** | Sets the password for simple authentication. |
| | **type** | Defines the RIP type. |
| | **dgw-iface** | Sets the default gateway interface. |

For information on configuring the Router options available to the access point using the applet (GUI), see *Configuring Router Settings on page 5-57*.

## AP51xx>admin(network.router)> add

### Description:

Adds user-defined routes.

### Syntax:

| | | | | | | |
|---|---|---|---|---|---|---|
| **add** | <dest> | <netmask> | <gw> | <iface> | <metric> | Adds a route with destination IP address <dest>, IP netmask <netmask>, destination gateway IP address <gw>, interface LAN1, LAN2 or WAN <iface>, and metric set to <metric> (**1**-**15**). |

### Example:

```
admin(network.router)>add 192.168.3.0 255.255.255.0 192.168.2.1 LAN 1 1

admin(network.router)>list
-------------------------------------------------------------------------
index  destination      netmask          gateway          interface   metric
-------------------------------------------------------------------------
1      192.168.3.0      255.255.255.0    192.168.2.1      lan1        1
```

For information on configuring the Router options available to the access point using the applet (GUI), see *Configuring Router Settings on page 5-57*.

## AP51xx>admin(network.router)> delete

### Description:

Deletes user-defined routes.

### Syntax:

| | | |
|---|---|---|
| **delete** | <idx> | Deletes the user-defined route <idx> (**1**-**20**) from list. |
| | **all** | Deletes all user-defined routes. |

### Example:

```
admin(network.router)>list
-------------------------------------------------------------------------
index  destination      netmask          gateway          interface   metric
-------------------------------------------------------------------------
1      192.168.2.0      255.255.255.0    192.168.0.1      lan1        1
2      192.168.1.0      255.255.255.0    0.0.0.0          lan2        0
3      192.168.0.0      255.255.255.0    0.0.0.0          lan2        0

admin(network.router)>delete 2
admin(network.router)>list
-----------------------------------------------------------------
index destination netmask gateway interface metric
-----------------------------------------------------------------
1      192.168.2.0      255.255.255.0    0.0.0.0          lan1        0
2      192.168.0.0      255.255.255.0    0.0.0.0          lan1        0

admin(network.router)>
```

For information on configuring the Router options available to the access point using the applet (GUI), see *Configuring Router Settings on page 5-57*.

## AP51xx>admin(network.router)> list

### Description:

Lists user-defined routes.

### Syntax:

**list** Displays a list of user-defined routes.

### Example:

```
admin(network.router)>list

-------------------------------------------------------------------------
index  destination      netmask          gateway          interface   metric
-------------------------------------------------------------------------
1      192.168.2.0      255.255.255.0    192.168.0.1      lan1        1
2      192.168.1.0      255.255.255.0    0.0.0.0          lan2        0
3      192.168.0.0      255.255.255.0    0.0.0.0          lan1        0
```

For information on configuring the Router options available to the access point using the applet (GUI), see *Configuring Router Settings on page 5-57*.

# 8.4 System Commands

## AP51xx>admin(system)>

### Description:

Displays the System submenu. The items available under this command are shown below.

| | |
|---|---|
| **restart** | Restarts the access point. |
| **show** | Shows access point system parameter settings. |
| **set** | Defines access point system parameter settings. |
| **debug** | Accesses access point password-protected debug information. |
| **lastpw** | Displays last debug password. |
| **exec** | Goes to a Linux command menu. |
| **access** | Goes to the access point access submenu where access point access methods can be enabled. |
| **cmgr** | Goes the Certificate Manager submenu. |
| **snmp** | Goes to the SNMP submenu. |
| **ntp** | Goes to the Network Time Protocol submenu. |
| **logs** | Displays the log file submenu. |
| **config** | Goes to the configuration file update submenu. |
| **fw-update** | Goes to the firmware update submenu. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

## AP51xx>admin(system)>restart

### Description:

Restarts the access point access point.

### Syntax:

**restart** Restarts the access point.

### Example:

```
admin(system)>restart

*********************************WARNING************************************
** Unsaved configuration changes will be lost when the access point is reset.
** Please be sure to save changes before resetting.
****************************************************************************

Are you sure you want to restart the access point? (yes/no):

access point Boot Firmware Version 1.1.0.0-xxx
Copyright(c) Symbol Technologies Inc. 2006. All rights reserved.

Press escape key to run boot firmware ........

Power On Self Test

testing ram              : pass
testing nor flash        : pass
testing nand flash       : pass
testing ethernet         : pass
```

For information on restarting the access point using the applet (GUI), see *Configuring System Settings on page 4-2*.

## AP51xx>admin(system)>show

### Description:

Displays high-level access point system information.

### Syntax:

**show** Displays access point system information.

### Example:

```
admin(system)>show

system name                          : BldgC
system location                      : Atlanta Field Office
admin email address                  : johndoe@mycompany.com
system uptime                        : 0 days 4 hours 41 minutes
access point firmware version            : 1.1.0.0-30D
country code                         : us
serial number                        : 05224520500336

admin(system)>
```

For information on displaying System Settings using the applet (GUI), see *Configuring System Settings on page 4-2*.

## AP51xx>admin(system)>set

### Description:

Sets access point system parameters.

### Syntax:

| | | | |
|---|---|---|---|
| **set** | **name** | <name> | Sets the access point system name to <name> (1 to 59 characters). The access point does not allow intermediate space characters between characters within the system name. For example, “AP51xx sales” must be changed to “AP51xxsales” to be a valid system name. |
| | **loc** | <loc> | Sets the access point system location to <loc> (1 to 59 characters). |
| | **email** | <email> | Sets the access point admin email address to <email> (1 to 59 characters). |
| | **cc** | <code> | Sets the access point country code using two-letters <code>. |

### Example:

```
admin(system)>show

system name                          : AP51xx
system location                      : San Jose Engineering
admin email address                  : SJSharkey@symbol.com
system uptime                        : 0 days 4 hours 33 minutes
access point firmware version            : 1.1.0.0-30D
country code                         : us
```

For information on configuring System Settings using the applet (GUI), see *Configuring System Settings on page 4-2*. Refer to *Appendix A* for information on the two-character country codes.

## 8.4.1 System Debug and Last Password Commands

## AP51xx>admin(system)>debug

### Description:

Accesses access point debug information. This information is designed for field service use only, and should not be used by unqualified personnel.

### Example:

```
admin(system)>debug

Debug Password:

access point MAC Address is 00:A0:F8:71:6A:74
Last Password was symbol12
```

## AP51xx>admin(system)>lastpw

### Description:

Displays the last debug password.

```
admin(system)>lastpw

access point MAC Address is 00:A0:F8:71:6A:74
Last Password was symbol12
Current password used 0 times, valid 4 more time(s)
```

## *8.4.2 System Access Commands*

### AP51xx>admin(system)>access

#### Description:

Displays the access point access submenu.

| | |
|---|---|
| **show** | Displays access point system access capabilities. |
| **set** | Goes to the access point system access submenu. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the current configuration to the access point system flash. |
| **quit** | Quits the CLI and exits the current session. |

## AP51xx>admin(system.access)>set

### Description:

Defines the permissions to access the access point applet, CLI, SNMP as well as defining their timeout values.

### Syntax:

| | | | |
|---|---|---|---|
| **set** | **applet** | | Defines the applet HTTP/HTTPS access parameters. |
| | **app-timeout** | <minutes> | Sets the applet timeout. Default is 300 Mins. |
| | **cli** | | Defines CLI Telnet access parameters. |
| | **ssh** | | Sets the CLI SSH access parameters. |
| | **auth-timout** | <seconds> | Disables the radio interface if no data activity is detected after the interval defined. Default is 120 seconds. |
| | **inactive-timeout** | <minutes> | Inactivity interval resulting in the AP terminating its connection. Default is 120 minutes. |
| | **snmp** | | Sets SNMP access parameters. |
| | **admin-auth** | **local/ RADIUS** | Designates a Radius server is used in the authentication verification. |
| | **server** | <ip> | Specifies the IP address the Remote Dial-In User Service (RADIUS) server. |
| | **port** | <port#> | Specifies the port on which the RADIUS server is listening. Default is 1812. |
| | **secret** | <pw> | Defines the shared secret password for RADIUS server authentication. |

For information on configuring access point access settings using the applet (GUI), see *Configuring Data Access on page 4-5*.

## AP51xx>admin(system.access)>show

### Description:

Displays the current access point access permissions and timeout values.

### Syntax:

**show** Shows all of the current system access settings for the access point..

### Example:

```
admin(system.access)>show

------------------------------From LAN1-------From LAN2-------From WAN
applet http access from lan    enable          enable          enable
applet http access from wan    enable          enable          enable
cli telnet access              enable          enable          enable
cli ssh access                 enable          enable          enable
snmp access                    enable          enable          enable

http/s timeout                                : 0
ssh server authetnication timeout             : 120
ssh server inactivity timeout                 : 120
admin authetnication mode                     : local


Related Commands:
```

**set** Defines the access point system access capabilities and timeout values.

For information on configuring access point access settings using the applet (GUI), see *Configuring Data Access on page 4-5*.

## *8.4.3 System Certificate Management Commands*

### AP51xx>admin(system)>cmgr

#### Description:

Displays the Certificate Manager submenu. The items available under this command include:

| | |
|---|---|
| **genreq** | Generates a Certificate Request. |
| **delself** | Deletes a Self Certificate. |
| **loadself** | Loads a Self Certificate signed by CA. |
| **listself** | Lists the self certificate loaded. |
| **loadca** | Loads trusted certificate from CA. |
| **delca** | Deletes the trusted certificate. |
| **listca** | Lists the trusted certificate loaded. |
| **showreq** | Displays a certificate request in PEM format. |
| **delprivkey** | Deletes the private key. |
| **listprivkey** | Lists names of private keys. |
| **expcert** | Exports the certificaqte file. |
| **impcert** | Imports the certificate file. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

## AP51xx>admin(system.cmgr)> genreq

### Description:

Generates a certificate request.

### Syntax:

**genreq** <IDname> <Subject> [-ou <OrgUnit>] [-on <OrgName>] [-cn <City>] [-st <State>] . . .
. . . [-p <PostCode>] [-cc <CCode>] [-e <Email>] [-d <Domain>] [-i <IP>] [-sa <SAlgo>]

Generates a self-certificate request for a Certification Authority (CA), where:

| | |
|---|---|
| <IDname> | The private key ID Name (up to 7 chars) |
| <Subject> | Subject Name (up to 49 chars) |
| -ou <OrgUnit> | Organization Unit (up to 49 chars) |
| -on <OrgName> | Organization Name (up to 49 chars) |
| -cn <City> | City Name of Organization (up to 49 chars) |
| -st <State> | State Name (up to 49 chars) |
| -p <PostCode> | Postal code (9 digits) |
| -cc <CCode> | Country code (2 chars) |
| -e <Email> | E-mail Address (up to 49 chars) |
| -d <Domain> | Domain Name (up to 49 chars) |
| -i <IP> | IP Address (a.b.c.d) |
| -sa <SAlgo> | Signature Algorithm (one of **MD5-RSA** or **SHA1-RSA** |
| -k <KSize> | Key size in bits (one of **512**, **1024**, or **2048**) |

*Note: The parameters in [square brackets] are optional. Check with the CA to determine what fields are necessary. For example, most CAs require an email address and an IP address, but not the address of the organization.*

### Example:

```
admin(system.cmgr)>genreq MyCert2 MySubject -ou MyDept -on MyCompany

 Please wait. It may take some time...
Generating the certificate request
Retreiving the certificate request
The certificate request is
-----BEGIN CERTIFICATE REQUEST-----
MIHzMIGeAgEAMDkxEjAQBgNVBAoTCU15Q29tcGFueTEPMA0GA1UECxMGTXlEZXB0
MRIwEAYDVQQDEwlNeVN1YmplY3QwXDANBgkqhkiG9w0BAQEFAANLADBIAkEAtKcX
plKFCFAJymTFX71yuxY1fdS7UEhKjBsH7pdqnJnsASK6ZQGAqerjpKScWV1mzYn4
1q2+mgGnCvaZUlIo7wIDAQABoAAwDQYJKoZIhvcNAQEEBQADQQCClQ5LHdbG/C1f
Bj8AszttSo/bA4dcX3vHvhhJcmuuWO9LHS2imPA3xhX/d6+Q1SMbs+tG4RP0lRSr
iWDyuvwx
-----END CERTIFICATE REQUEST-----
```

For information on configuring certificate management settings using the applet (GUI), see *Managing Certificate Authority (CA) Certificates on page 4-8*.

## AP51xx>admin(system.cmgr)> delself

### Description: )

Deletes a self certificate.

### Syntax:

| | | |
|---|---|---|
| **delself** | <IDname> | Deletes the self certificate named <IDname>. |

### Example:

```
admin(system.cmgr)>delself MyCert2
```

For information on configuring self certificate settings using the applet (GUI), see *Creating Self Certificates for Accessing the VPN on page 4-10*.

## AP51xx>admin(system.cmgr)> loadself

### Description:

Loads a self certificate signed by the Certificate Authority.

### Syntax:

**loadself** <IDname> Load the self certificate signed by the CA with name <IDname>.

For information on configuring self certificate settings using the applet (GUI), see *Creating Self Certificates for Accessing the VPN on page 4-10*.

## AP51xx>admin(system.cmgr)> listself

### Description:

Lists the loaded self certificates.

### Syntax:

**listself** Lists all self certificates that are loaded.

For information on configuring self certificate settings using the applet (GUI), see *Creating Self Certificates for Accessing the VPN on page 4-10*.

## AP51xx>admin(system.cmgr)> loadca

### Description:

Loads a trusted certificate from the Certificate Authority.

### Syntax:

**loadca** Loads the trusted certificate (in PEM format) that is pasted into the command line.

For information on configuring certificate settings using the applet (GUI), see *Importing a CA Certificate on page 4-8*.

## AP51xx>admin(system.cmgr)> delca

### Description:

Deletes a trusted certificate.

### Syntax:

| | | |
|---|---|---|
| **delca** | <IDname> | Deletes the trusted certificate. |

For information on configuring certificate settings using the applet (GUI), see *Importing a CA Certificate on page 4-8*.

## AP51xx>admin(system.cmgr)> listca

### Description:

Lists the loaded trusted certificate.

### Syntax:

**listca** Lists the loaded trusted certificates.

For information on configuring certificate settings using the applet (GUI), see *Importing a CA Certificate on page 4-8*.

## AP51xx>admin(system.cmgr)> showreq

### Description:

Displays a certificate request in PEM format.

### Syntax:

**showreq** <IDname> Displays a certificate request named <IDname> generated from the genreq command.

For information on configuring certificate settings using the applet (GUI), see *Importing a CA Certificate on page 4-8*.

## AP51xx>admin(system.cmgr)> delprivkey

### Description:

Deletes a private key.

### Syntax:

| | | |
|---|---|---|
| **delprivkey** | <IDname> | Deletes private key named <IDname>. |

For information on configuring certificate settings using the applet (GUI), see *Creating Self Certificates for Accessing the VPN on page 4-10*.

## AP51xx>admin(system.cmgr)> listprivkey

### Description:

Lists the names of private keys.

### Syntax:

**listprivkey** Lists all private keys.

For information on configuring certificate settings using the applet (GUI), see *Importing a CA Certificate on page 4-8*.

## AP51xx>admin(system.cmgr)> expcert

### Description:

Exports the certificaqte file.

### Syntax:

**expcert** Exports the certificaqte file.

For information on configuring certificate settings using the applet (GUI), see *Importing a CA Certificate on page 4-8*.

## AP51xx>admin(system.cmgr)> impcert

### Description:

Imports the target certificate file.

### Syntax:

**impcert** Imports the target certificate file.

For information on configuring certificate settings using the applet (GUI), see *Importing a CA Certificate on page 4-8*.

### *8.4.4 System SNMP Commands*

## AP51xx>admin(system)> snmp

### Description:

Displays the SNMP submenu. The items available under this command are shown below.

| | |
|---|---|
| **access** | Goes to the SNMP access submenu. |
| **traps** | Goes to the SNMP traps submenu. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

### *8.4.4.1 System SNMP Access Commands*

## AP51xx>admin(system.snmp.access)

### Description:

Displays the SNMP Access menu. The items available under this command are shown below.

| | |
|---|---|
| **show** | Shows SNMP v3 engine ID. |
| **add** | Adds SNMP access entries. |
| **delete** | Deletes SNMP access entries. |
| **list** | Lists SNMP access entries. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

## AP51xx>admin(system.snmp.access)> show

### Description:

Shows the SNMP v3 engine ID.

### Syntax:

**show** **eid** Shows the SNMP v3 Engine ID.

### Example:

```
admin(system.snmp.access)>show eid

access point snmp v3 engine id          : 000001846B8B4567F871AC68

admin(system.snmp.access)>
```

For information on configuring SNMP access settings using the applet (GUI), see *Configuring SNMP Access Control on page 4-22*.

## AP51xx>admin(system.snmp.access)> add

### Description:

Adds SNMP access entries for specific v1v2 and v3 user definitions.

### Syntax:

**add acl** <ip1> <ip2> Adds an entry to the SNMP access control list with <ip1> as the starting IP address and <ip2> and as the ending IP address.

**v1v2c** <comm> <access> <oid>

Adds an SNMP v1/v2c configuration with <comm> as the community (1-31 characters), the read/write access set to **ro** (read only) or **rw** (read/write), and the Object Identifier <oid> (a string of 1-127 numbers separated by dot, such as 2.3.4.5.6).

**v3** <user> <access> <oid> <sec>
<auth> <pass1> <priv> <pass2>

Adds an SNMP v3 user definition with the username <user> (1 to 31 characters), access set to **ro** (read only) or **rw** (read/write), the object ID set to <oid> (1 to 127 chars in dot notation, such as 1.3.6.1), the security type <sec> set to one of **no auth**, **authnopriv**, or **auth/priv**.

The following parameters must be specified if <sec> is not **none**:
- Authentication type <auth> set to **md5** or **sha1**
- Authentication password <pass1> (8 to 31 chars)

The following parameters must be specified if <sec> is set to **auth/priv**:
- Privacy algorithm set to **des** or **aes**
- Privacy password <pass2> (8 to 31 chars)

For information on configuring SNMP access settings using the applet (GUI), see *Configuring SNMP Access Control on page 4-22*.

## AP51xx>admin(system.snmp.access)> delete

### Description:

Deletes SNMP access entries for specific v1v2 and v3 user definitions.

### Syntax:

| | | | |
|---|---|---|---|
| **delete** | **acl** | <idx> | Deletes entry <idx> (1-10) from the access control list. |
| | | **all** | Deletes all entries from the access control list. |
| | **v1v2c** | <idx> | Deletes entry <idx> (1-10) from the v1/v2 configuration list. |
| | | **all** | Deletes all entries from the v1/v2 configuration list. |
| | **v3** | <idx> | Deletes entry <idx> (1-10) from the v3 user definition list. |
| | | **all** | Deletes all entries from the v3 user definition list. |

### Example:

```
admin(system.snmp.access)>list acl
-------------------------------------------------------------------------------
index  start ip         end ip
-------------------------------------------------------------------------------
1      209.236.24.1     209.236.24.46

admin(system.snmp.access)>delete acl all
admin(system.snmp.access)>list acl
-------------------------------------------------------------------------------
index  start ip         end ip
-------------------------------------------------------------------------------
```

For information on configuring SNMP access settings using the applet (GUI), see *Configuring SNMP Access Control on page 4-22*.

## AP51xx>admin(system.snmp.access)> list

### Description:

Lists SNMP access entries.

### Syntax:

| | | | |
|---|---|---|---|
| **list** | **acl** | | Lists SNMP access control list entries. |
| | **v1v2c** | | Lists SNMP v1/v2c configuration. |
| | **v3** | <idx> | Lists SNMP v3 user definition with index <idx>. |
| | | **all** | Lists all SNMP v3 user definitions. |

### Example:

```
admin(system.snmp.access)>list acl
-----------------------------------------------------------------
index  start ip         end ip
-----------------------------------------------------------------
1      209.236.24.1     209.236.24.46

admin(system.snmp.access)>list v1v2c
-----------------------------------------------------------------
index  community        access         oid
-----------------------------------------------------------------
1      public           read only      1.3.6.1
2      private          read/write     1.3.6.1

admin(system.snmp.access)>list v3 2

index                          : 2
username                       : judy
access permission              : read/write
object identifier              : 1.3.6.1
security level                 : auth/priv
auth algorithm                 : md5
auth password                  : ********
privacy algorithm              : des
privacy password               : *******
```

For information on configuring SNMP access settings using the applet (GUI), see *Configuring SNMP Access Control on page 4-22*.

### *8.4.4.2 System SNMP Traps Commands*

## AP51xx>admin(system.snmp.traps)

### Description:

Displays the SNMP traps submenu. The items available under this command are shown below.

| | |
|---|---|
| **show** | Shows SNMP trap parameters. |
| **set** | Sets SNMP trap parameters. |
| **add** | Adds SNMP trap entries. |
| **delete** | Deletes SNMP trap entries. |
| **list** | Lists SNMP trap entries. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

## AP51xx>admin(system.snmp.traps)> show

### Description:

Shows SNMP trap parameters.

### Syntax:

| | | |
|---|---|---|
| **show** | **trap** | Shows SNMP trap parameter settings. |
| | **rate-trap** | Shows SNMP rate-trap parameter settings. |

### Example:

```
admin(system.snmp.traps)>show trap

SNMP MU Traps
     mu associated                     : enable
     mu unassociated                   : disable
     mu denied association             : disable
     mu denied authentication          : disable

SNMP Traps
     snmp authentication failure       : disable
     snmp acl violation                : disable

SNMP Network Traps
     physical port status change       : enable
     denial of service                 : enable
     denial of service trap rate limit : 10 seconds

SNMP System Traps
     system cold start                 : disable
     system config changed             : disable
     rogue ap detection                : disable
     ap radar detection                : disable
     wpa counter measure               : disable
     mu hotspot status                 : disable
     vlan                              : disable
     lan monitor                       : disable
```

For information on configuring SNMP traps using the applet (GUI), see *Enabling SNMP Traps on page 4-24*.

## AP51xx>admin(system.snmp.traps)> set

### Description:

Sets SNMP trap parameters.

### Syntax:

| | | | | | |
|---|---|---|---|---|---|
| **set** | **mu-assoc** | **enable**/**disable** | | | Enables/disables the MU associated trap. |
| | **mu-unassoc** | **enable**/**disable** | | | Enables/disables the MU unassociated trap. |
| | **mu-deny-assoc** | **enable**/**disable** | | | Enables/disables the MU association denied trap. |
| | **mu-deny-auth** | **enable**/**disable** | | | Enables/disables the MU authentication denied trap. |
| | **snmp-auth** | **enable**/**disable** | | | Enables/disables the authentication failure trap. |
| | **snmp-acl** | **enable**/**disable** | | | Enables/disables the SNMP ACL violation trap. |
| | **port** | **enable**/**disable** | | | Enables/disables the physical port status trap. |
| | **dos-attack** | **enable**/**disable** | | | Enables/disables the denial of service trap. |
| | **interval** | <rate> | | | Sets denial of service trap interval. |
| | **cold** | **enable**/**disable** | | | Enables/disables the system cold start trap. |
| | **cfg** | **enable**/**disable** | | | Enables/disables a configuration changes trap. |
| | **rogue-ap** | **enable**/**disable** | | | Enables/disables a trap when a rogue-ap is detected. |
| | **ap-radar** | **enable**/**disable** | | | Enables/disables the AP Radar Detection trap. |
| | **wpa-counter** | **enable**/**disable** | | | Enables/disables the WPA counter measure trap. |
| | **hotspot-mu-status** | **enable**/**disable** | | | Enables/disables the hotspot mu status trap. |
| | **vlan** | **enable**/**disable** | | | Enables/disables VLAN traps. |
| | **lan-monitor** | **enable**/**disable** | | | Enables/disables LAN monitor traps. |
| | **rate** | <rate> | <scope> | <value> | Sets the particular <rate> to monitor to <value> given the indicated <scope>. See table below for information on the possible values for <rate>, <scope>, and <value>. |
| | **min-pkt** | <pkt> | | | Sets the minimum number of packets required for rate traps to fire (**1**-**65535**). |

For information on configuring SNMP traps using the applet (GUI), see *Configuring Specific SNMP Traps on page 4-27*.

## AP51xx>admin(system.snmp.traps)> add

### Description:

Adds SNMP trap entries.

### Syntax:

**add v1v2** <ip> <port> <comm> <ver>
Adds an entry to the SNMP v1/v2 access list with the destination IP address set to <ip>, the destination UDP port set to <port>, the community string set to <comm> (1 to 31 characters), and the SNMP version set to <ver>.

**v3** <ip> <port> <user> <sec> <auth> <pass1> <priv> <pass2>
Adds an entry to the SNMP v3 access list with the destination IP address set to <ip>, the destination UDP port set to <port>, the username set to <user> (1 to 31 characters), and the authentication type set to one of **none**, **auth**, or **auth/priv**.

The following parameters must be specified if <sec> is not **none**:
Authentication type <auth> set to **md5** or **sha1**
Authentication password <pass1> (8 to 31 chars)

The following parameters must be specified if <sec> is set to **auth/priv**:
Privacy algorithm set to **des** or **aes**
Privacy password <pass2> (8 to 31 chars)

### Example:

```
admin(system.snmp.traps)>add v1v2 203.223.24.2 333 mycomm v1
admin(system.snmp.traps)>list v1v2c
-------------------------------------------------------------------------
index   dest ip          dest port      community        version
-------------------------------------------------------------------------
1       203.223.24.2     333            mycomm           v1

admin(system.snmp.traps)>add v3 201.232.24.33 555 BigBoss none md5
admin(system.snmp.traps)>list v3 all

index                          : 1
destination ip                 : 201.232.24.33
destination port               : 555
username                       : BigBoss
security level                 : none
auth algorithm                 : md5
auth password                  : ********
privacy algorithm              : des
privacy password               : ********
```

For information on configuring SNMP traps using the applet (GUI), see *Configuring SNMP RF Trap Thresholds on page 4-29*.

## AP51xx>admin(system.snmp.traps)> delete

### Description:

Deletes SNMP trap entries.

### Syntax:

| | | | |
|---|---|---|---|
| **delete** | **v1v2c** | <idx> | Deletes entry <idx> from the v1v2c access control list. |
| | | **all** | Deletes all entries from the v1v2c access control list. |
| | **v3** | <idx> | Deletes entry <idx> from the v3 access control list. |
| | | **all** | Deletes all entries from the v3 access control list. |

### Example:

```
admin(system.snmp.traps)>delete v1v2 all
```

For information on configuring SNMP traps using the applet (GUI), see *Configuring SNMP Settings on page 4-17*.

## AP51xx>admin(system.snmp.traps)> list

### Description:

Lists SNMP trap entries.

### Syntax:

| | | | |
|---|---|---|---|
| **list** | **v1v2c** | | Lists SNMP v1/v2c access entries. |
| | **v3** | <idx> | Lists SNMP v3 access entry <idx>. |
| | | **all** | Lists all SNMP v3 access entries. |

### Example:

```
admin(system.snmp.traps)>add v1v2 203.223.24.2 162 mycomm v1
admin(system.snmp.traps)>list v1v2c
-------------------------------------------------------------------------
index   dest ip          dest port      community        version
-------------------------------------------------------------------------
1       203.223.24.2     162            mycomm           v1

admin(system.snmp.traps)>add v3 201.232.24.33 555 BigBoss none md5
admin(system.snmp.traps)>list v3 all

index                           : 1
destination ip                  : 201.232.24.33
destination port                : 555
username                        : BigBoss
security level                  : none
auth algorithm                  : md5
auth password                   : ********
privacy algorithm               : des
privacy password                : ********
```

For information on configuring SNMP traps using the applet (GUI), see *Configuring SNMP RF Trap Thresholds on page 4-29*.

## *8.4.5 System Network Time Protocol (NTP) Commands*

### AP51xx>admin(system)> ntp

#### Description:

Displays the NTP menu. The correct network time is required for numerous functions to be configured accuaretly on the access point.

#### Syntax:

-

| | |
|---|---|
| **show** | Shows NTP parameters settings. |
| **date-zone** | Show date, time and time zone. |
| **zone-list** | Displays list of time zones. |
| **set** | Sets NTP parameters. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to system flash. |
| **quit** | Quits the CLI. |

## AP51xx>admin(system.ntp)> show

### Description:

Displays the NTP server configuration.

### Syntax:

**show** Shows all NTP server settings.

### Example:

```
admin(system.ntp)>show

current time (UTC)                : 2006-07-31 14:35:20

Time Zone:

ntp mode                          : enable
preferred Time server ip          : 203.21.37.18
preferred Time server port        : 123
first alternate server ip         : 203.21.37.19
first alternate server port       : 123
second alternate server ip        : 0.0.0.0
second alternate server port      : 123
synchronization interval          : 15 minutes
```

For information on configuring NTP using the applet (GUI), see *Configuring Network Time Protocol (NTP) on page 4-31*.

## AP51xx>admin(system.ntp)> date-zone

### Description:

Show date, time and time zone.

### Syntax:

**date-zone** Show date, time and time zone.

### Example:

```
admin(system.ntp)>date-zone

Date/Time          : Sat 1970-Jan-03 20:06:22 +0000 UTC

Time Zone          :
```

## AP51xx>admin(system.ntp)> zone-list

### Description:

Displays an extensive list of time zones for countries around the world.

### Syntax:

**zone-list** Displays list of time zones for every known zone.

### Example:

```
admin(system.ntp)> zone-list
```

## AP51xx>admin(system.ntp)> set

### Description:

Sets NTP parameters for access point clock synchronization.

### Syntax:

| | | | |
|---|---|---|---|
| **set** | **mode** | <ntp-mode> | Enables or disables NTP. |
| | **server** | <idx> <ip> | Sets the NTP sever IP address. |
| | **port** | <idx> <port> | Defines the port number. |
| | **intrvl** | <period> | Defines the clock synchronization interval used between the access point and the NTP server in minutes (15 - 65535). |
| | **time** | <time> | Sets the current system time. [yyyy] - year, [mm] - month, [dd] - day of the month, [hh] - hour of the day, [mm] - minute, [ss] second, [zone -idx] Index of the zone. |
| | **zone** | <zone> | Defines the time zone (by index) for the target country. |

### Example:

```
admin(system.ntp)>set mode enable
admin(system.ntp)>set server 1 203.21.37.18
admin(system.ntp)>set port 1 123
admin(system.ntp)>set intrvl 15
admin(system.ntp)>set zone 1
```

For information on configuring NTP using the applet (GUI), see *Configuring Network Time Protocol (NTP) on page 4-31*.

## *8.4.6 System Log Commands*

### AP51xx>admin(system)> logs

#### Description:

Displays the access point log submenu. Logging options include:

#### Syntax:

| | |
|---|---|
| **show** | Shows logging options. |
| **set** | Sets log options and parameters. |
| **view** | Views system log. |
| **delete** | Deletes the system log. |
| **send** | Sends log to the designated FTP Server. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves configuration to system flash. |
| **quit** | Quits the CLI. |

## AP51xx>admin(system.logs)> show

### Description:

Displays the current access point logging settings.

### Syntax:

**show** Displays the logging options.

### Example:

```
admin(system.logs)>show

log level                       : L6 Info
syslog server logging           : enable
syslog server ip address        : 192.168.0.102
```

For information on configuring logging settings using the applet (GUI), see *Logging Configuration on page 4-34*.

## AP51xx>admin(system.logs)> set

### Description:

Sets log options and parameters.

### Syntax:

| | | | |
|---|---|---|---|
| **set** | **level** | <level> | Sets the level of the events that will be logged. All events with a level at or above <level> (L0-L7) will be saved to the system log.<br>L0:Emergency<br>L1:Alert<br>L2:Critical<br>L3:Errors<br>L4:Warning<br>L5:Notice<br>L6:Info *(default setting)*<br>L7:Debug |
| | **mode** | <mode> | Enables or disables syslog server logging. |
| | **ipadr** | <ip> | Sets the external syslog server IP address to <ip> (a.b.c.d). |

For information on configuring logging settings using the applet (GUI), see *Logging Configuration on page 4-34*.

## AP51xx>admin(system.logs)> view

### Description:

Displays the access point system log file.

### Syntax:

**view** Displays the entire access point system log file.

### Example:

```
admin(system.logs)>view

Jan  7 16:14:00 (none) syslogd 1.4.1: restart (remote reception).
Jan  7 16:14:10 (none) klogd: :ps log:fc: queue maintenance
Jan  7 16:14:41 (none) klogd: :ps log:fc: queue maintenance
Jan  7 16:15:43 (none) last message repeated 2 times
Jan  7 16:16:01 (none) CC:   4:16pm  up 6 days, 16:16, load average: 0.00, 0.01,
 0.00
Jan  7 16:16:01 (none) CC:   Mem:        62384        32520        29864
    0            0
Jan  7 16:16:01 (none) CC: 0000077e  0012e95b 0000d843 00000000 00000003 0000121
e 00000000 00000000  0037ebf7 000034dc 00000000 00000000 00000000
Jan  7 16:16:13 (none) klogd: :ps log:fc: queue maintenance
Jan  7 16:16:44 (none) klogd: :ps log:fc: queue maintenance
Jan  7 16:17:15 (none) klogd: :ps log:fc: queue maintenance
Jan  7 16:17:15 (none) klogd: :ps log:fc: queue maintenance
```

For information on configuring logging settings using the applet (GUI), see *Logging Configuration on page 4-34*.

## AP51xx>admin(system.logs)> delete

### Description:

Deletes the log files.

### Syntax:

| | |
|---|---|
| **delete** | Deletes the access point system log file. |

### Example:

```
admin(system.logs)>delete
```

For information on configuring logging settings using the applet (GUI), see *Logging Configuration on page 4-34*.

## AP51xx>admin(system.logs)> send

### Description:

Sends log and core file to an FTP Server.

### Syntax:

**send** Sends the system log file via FTP to a location specified with the set command. Refer to the command set under the AP51xx>admin(config) command for information on setting up an FTP server and login information.

### Example:

```
admin(system.logs)>send

File transfer                    : [ In progress ]
File transfer                    : [ Done ]

admin(system.logs)>
```

For information on configuring logging settings using the applet (GUI), see *Logging Configuration on page 4-34*.

### 8.4.7 System Configuration-Update Commands

## AP51xx>admin(system.config)>

### Description:

Displays the access point configuration update submenu.

### Syntax:

| | |
|---|---|
| **default** | Restores the default access point configuration. |
| **partial** | Restores a partial default access point configuration. |
| **show** | Shows import/export parameters. |
| **set** | Sets import/export access point configuration parameters. |
| **export** | Exports access point configuration to a designated system. |
| **import** | Imports configuration to the access point. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the configuration to access point system flash. |
| **quit** | Quits the CLI. |

## AP51xx>admin(system.config)> default

### Description:

Restores the full access point factory default configuration.

### Syntax:

**default** Restores the access point to the original (factory) configuration.

### Example:

```
admin(system.config)>default

Are you sure you want to default the configuration? <yes/no>:
```

For information on importing/exporting access point configurations using the applet (GUI), see *Importing/Exporting Configurations on page 4-36*.

## AP51xx>admin(system.config)> partial

### Description:

Restores a partial factory default configuration. The access point's LAN, WAN and SNMP settings are uneffected by the partial restore.

### Syntax:

**default** Restores a partial access point configuration.

### Example:

```
admin(system.config)>partial

Are you sure you want to partially default the access point? <yes/no>:
```

For information on importing/exporting access point configurations using the applet (GUI), see *Importing/Exporting Configurations on page 4-36*.

## AP51xx>admin(system.config)> show

### Description:

Displays import/export parameters for the access point configuration file.

### Syntax:

**show** Shows all import/export parameters.

### Example:

```
admin(system.config)>show

cfg filename                    : cfg.txt
cfg filepath                    :
ftp/tftp server ip address      : 192.168.0.101
ftp user name                   : myadmin
ftp password                    : ********
```

For information on importing/exporting access point configurations using the applet (GUI), see *Importing/Exporting Configurations on page 4-36*.

## AP51xx>admin(system.config)> set

### Description:

Sets the import/export parameters.

### Syntax:

| | | | |
|---|---|---|---|
| **set** | **file** | <filename> | Sets the configuration file name (1 to 39 characters in length). |
| | **path** | <path> | Defines the path used for the configuration file upload. |
| | **server** | <ipaddress> | Sets the FTP/TFTP server IP address. |
| | **user** | <username> | Sets the FTP user name (1 to 39 characters in length). |
| | **passwd** | <pswd> | Sets the FTP password (1 to 39 characters in length). |

### Example:

```
admin(system.config)>set server 192.168.22.12
admin(system.config)>set user myadmin
admin(system.config>set passwd georges

admin(system.config)>show

cfg filename                    : cfg.txt
cfg filepath                    :
ftp/tftp server ip address      : 192.168.22.12
ftp user name                   : myadmin
ftp password                    : *******
```

For information on importing/exporting access point configurations using the applet (GUI), see *Importing/Exporting Configurations on page 4-36*.

## AP51xx>admin(system.config)> export

### Description:

Exports the configuration from the system.

### Syntax:

| | | |
|---|---|---|
| **export** | **ftp** | Exports the access point configuration to the FTP server. Use the set command to set the server, user, password, and file name before using this command. |
| | **tftp** | Exports the access point configuration to the TFTP server. Use the set command to set the IP address for the TFTP server before using the command. |
| | **terminal** | Exports the access point configuration to a terminal. |

### Example:

Export FTP Example:

```
admin(system.config)>set server 192.168.22.12
admin(system.config)>set user myadmin
admin(system.config)>set file config.txt
admin(system.config)>set passwd

admin(system.config)>export ftp

Export operation                : [ Started ]
Building configuration file     : [ Done ]
File transfer                   : [ In progress ]
File transfer                   : [ Done ]
Export Operation                : [ Done ]
```

Export TFTP Example:

```
admin(system.config)>set server 192.168.0.101
admin(system.config)>set file config.txt
admin(system.config)>export tftp

Export operation                : [ Started ]
Building configuration file     : [ Done ]
File transfer                   : [ In progress ]
File transfer                   : [ Done ]
Export Operation                : [ Done ]
```

**CAUTION** Make sure a copy of the access point's current configuration is exported (to a secure location) before exporting the access point's configuration, as you will want a valid version available in case errors are encountered with the configuration export.

For information on importing/exporting access point configurations using the applet (GUI), see *Importing/Exporting Configurations on page 4-36*.

## AP51xx>admin(system.config)> import

### Description:

Imports the access point configuration to the access point. Errors could display as a result of invaid configuration parameters. Correct the sepcified lines and import the file again until the import operation is error free.

### Syntax:

| | | |
|---|---|---|
| **import** | **ftp** | Imports the access point configuration file from the FTP server.<br>Use the set command to set the server, user, password, and file. |
| | **tftp** | Imports the access point configuration from the TFTP server.<br>Use the set command to set the server and file. |

### Example:

Import FTP Example

```
admin(system.config>set server 192.168.22.12
admin(system.config>set user myadmin
admin(system.config)>set file config.txt
admin(system.config)>set passwd mysecret
admin(system.config)>import ftp
Import operation : [ Started ]
File transfer : [ In progress ]
File transfer : [ Done ]
Import operation : [ Done ]
```

Import TFTP Example

```
admin(system.config)>set server 192.168.0.101
admin(system.config)>set file config.txt
admin(system.config)>import tftp
Import operation : [ Started ]
File transfer : [ In progress ]
File transfer : [ Done ]
Import operation : [ Done ]
```

**CAUTION** A single-radio model access point cannot import/export its configuration to a dual-radio model access point. In turn, a dual-radio model access point cannot import/export its configuration to a single-radio access point.

**CAUTION** Symbol discourages importing a 1.0 baseline configuration file to a 1.1 version access point. Similarly, a 1.1 baseline configuration file should not be imported to a 1.0 version access point. Importing configuration files between different version access point's results in broken configurations, since new features added to the 1.1 version access point cannot be supported in a 1.0 version access point.

For information on importing/exporting access point configurations using the applet (GUI), see *Importing/Exporting Configurations on page 4-36*.

### *8.4.8 Firmware Update Commands*

## AP51xx>admin(system)>fw-update

### Description:

Displays the firmware update submenu. The items available under this command are shown below.

**NOTE** The access point must complete the reboot process to successfully update the device firmware, regardless of whether the reboot is conducted uing the GUI or CLI interfaces.

| | |
|---|---|
| **show** | Displays the current access point firmware update settings. |
| **set** | Defines the access point firmware update parameters. |
| **update** | Executes the firmware update. |
| **..** | Goes to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the current configuration to the access point system flash. |
| **quit** | Quits the CLI and exits the current session. |

## AP51xx>admin(system.fw-update)>show

### Description:

Displays the current access point firmware update settings.

### Syntax:

**show** Shows the current system firmware update settings for the access point.

### Example:

```
admin(system.fw-update)>show

automatic firmware upgrade                : enable
automatic config upgrade                  : enable
automatic upgrade interface               : WAN

firmware filename                         : APFW.bin
firmware path                             : /tftpboot/
ftp/tftp server ip address                : 168.197.2.2
ftp user name                             : pkeegan
ftp password                              : *******
```

For information on updating access point device firmware using the applet (GUI), see *Updating Device Firmware on page 4-40*.

## AP51xx>admin(system.fw-update)>set

### Description:

Defines access point firmware update settings and user permissions.

### Syntax:

| | | | |
|---|---|---|---|
| **set** | **fw-auto** | <mode> | When enabled, updates device firmware each time the firmware versions are found to be different between the access point and the specified firmware on the remote system. |
| | **cfg-auto** | <mode> | When enabled, updates device configuration file each time the confif file versions are found to be different between the access point and the specified LAN or WAN interface. |
| | **iface** | <wan/lan1/lan2> | Defines the target interface for version updates if the fw-auto and/or cfg-auto options are enabled. |
| | **file** | <name> | Defines the firmware file name (1 to 39 characters). |
| | **path** | <path> | Specifies a path for the file (1 to 39 characters).. |
| | **server** | <ip> | The IP address for the FTP/TFTP server used for the firmware and/or config file update. |
| | **user** | <name> | Specifies a username for FTP server login (1 to 39 characters).. |
| | **passwd** | <password> | Specifies a password for FTP server login (1 to 39 characters).. Default is symbol. |

For information on updating access point device firmware using the applet (GUI), see *Updating Device Firmware on page 4-40*.

## AP51xx>admin(system.fw-update)>update

### Description:

Executes the access point firmware update over the WAN or LAN port using either ftp or tftp.

### Syntax:

| | | |
|---|---|---|
| **update** | <mode><iface> | Defines the ftp ot tftp mode used to conduct the firmware update. Specifies whether the update is executed over the access point's WAN, LAN1 or LAN2 interface <iface>. |

**NOTE** The access point must complete the reboot process to successfully update the device firmware, regardless of whether the reboot is conducted uing the GUI or CLI interfaces.

For information on updating access point device firmware using the applet (GUI), see *Updating Device Firmware on page 4-40*.

# 8.5 Statistics Commands

## AP51xx>admin(stats)

### Description:

Displays the access point statistics submenu. The items available under this command are:

| | |
|---|---|
| **show** | Displays access point WLAN, MU, LAN and WAN statistics. |
| **send-cfg-ap** | Sends a config file to another access point within the known AP table. |
| **send-cfg-all** | Sends a config file to all access points within the known AP table. |
| **clear** | Clears all statistic counters to zero. |
| **flash-all-leds** | Starts and stops the flashing of all access point LEDs. |
| **echo** | Defines the parameters for pinging a designated station. |
| **ping** | Iniates a ping test. |
| **..** | Moves to the parent menu. |
| **/** | Goes to the root menu. |
| **save** | Saves the current configuration to system flash. |
| **quit** | Quits the CLI. |

## AP51xx>admin(stats)> show

### Description:

Displays access point system information.

### Syntax:

| | | |
|---|---|---|
| **show** | **wan** | Displays stats for the access point WAN port. |
| | **lan** | Displays stats for the access point LAN port |
| | **stp** | Displays LAN Spanning Tree Status |
| | **wlan** | Displays WLAN status and statistics summary. |
| | **s-wlan** | Displays status and statistics for an individual WLAN |
| | **radio** | Displays a radio statistics transmit and receive summary. |
| | **s-radio** | Displays radio statistics for a single radio |
| | **retry-hgram** | Displays a radio's retry histogram statistics. |
| | **mu** | Displays all mobile unit (MU) status. |
| | **s-mu** | Displays status and statistics for an individual MU. |
| | **auth-mu** | Displays single MU Authentication statistics. |
| | **wlap** | Displays Wireless Bridge Statistics statistics summary. |
| | **s-wlap** | Displays single Wirless Bridge statistics. |
| | **known-ap** | Displays a Known AP summary. |

For information on displaying WAN port statistics using the applet (GUI), see *Viewing WAN Statistics on page 7-2*.

For information on displaying LAN port statistics using the applet (GUI), see *Viewing LAN Statistics on page 7-6*.

For information on displaying Wireless statistics using the applet (GUI), see *Viewing Wireless Statistics on page 7-11*.

For information on displaying individual WLAN statistics using the applet (GUI), see *Viewing WLAN Statistics on page 7-13*.

For information on displaying Radio statistics using the applet (GUI), see *Viewing Radio Statistics Summary on page 7-17*.

For information on displaying MU statistics using the applet (GUI), see *Viewing MU Statistics Summary on page 7-23*.

For information on displaying Mesh statistics using the applet (GUI), see *Viewing the Mesh Statistics Summary on page 7-29*.

For information on displaying Known AP statistics using the applet (GUI), see *Viewing Known Access Point Statistics on page 7-30*.

## AP51xx>admin(stats)> send-cfg-ap

### Description:

Copies the access point's configuration to another access point within the known AP table.

### Syntax:

| | | |
|---|---|---|
| **send-cfg-ap** | <index> | Copies the access point's configuration to the access points within the known AP table. Mesh configuration<br>attributes do not get copied using this command and must be configured manually. |

### Example:

```
admin(stats)>send-cfg-ap 2
admin(stats)>
```

**NOTE** The send-cfg-ap command copies all existing configuration parameters except Mesh settings, LAN IP data, WAN IP data and DHCP Server parameter information.

For information on copying the access point config to another access point using the applet (GUI), see *Viewing Known Access Point Statistics on page 7-30*.

## AP51xx>admin(stats)> send-cfg-all

### Description:

Copies the access point's configuration to all of the access points within the known AP table.

### Syntax:

**send-cfg-all** Copies the access point's configuration to all of the access points within the known AP table.

### Example:

```
admin(stats)>send-cfg-all
admin(stats)>
```

**NOTE** The send-cfg-all command copies all existing configuration parameters except Mesh settings, LAN IP data, WAN IP data and DHCP Server parameter information.

For information on copying the access point config to another access point using the applet (GUI), see *Viewing Known Access Point Statistics on page 7-30*.

## AP51xx>admin(stats)> clear

### Description:

Clears the specified statistics counters to zero to begin new data calculations.

### Syntax:

| | | |
|---|---|---|
| **clear** | **wan** | Clears WAN statistics counters. |
| | **lan** | Clears LAN statistics counters. |
| | **all-rf** | Clears all RF data. |
| | **all-wlan** | Clears all WLAN summary information. |
| | **wlan** | Clears individual WLAN statistic counters. |
| | **all-radio** | Clears access point radio summary information. |
| | **radio1** | Clears statistics counters specific to radio1. |
| | **radio2** | Clears statistics counters specific to radio2. |
| | **all-mu** | Clears all MU statistic counters. |
| | **mu** | Clears MU statistics counters. |
| | **known-ap** | Clears Known AP statistic counters. |

## AP51xx>admin(stats)> flash-all-leds

### Description:

Starts and stops the illumination of a specified access point's LEDs.

### Syntax:

| | | |
|---|---|---|
| **flash-all-leds** | <index> | Defines the Known AP index number of the target AP to flash. |
| | <stop/start> | Begins or terminates the flash activity. |

### Example:

```
admin(stats)>

admin(stats)>flash-all-leds 1 start
Password ********
admin(stats)>flash-all-leds 1 stop
admin(stats)>
```

For information on flashing access point LEDs using the applet (GUI), see *Viewing Known Access Point Statistics on page 7-30*.

## AP51xx>admin(stats)> echo

### Description:

Defines the echo test values used to conduct a ping test to an associated MU.

### Syntax:

| | |
|---|---|
| **show** | Shows the Mobile Unit Statistics Summary. |
| **list** | Defines echo test parameters and result. |
| **set** | Determines echo test packet data. |
| **start** | Begins echoing the defined station. |
| **..** | Goes to parent menu. |
| **/** | Goes to root menu. |
| **quit** | Quits CLI session. |

For information on MU Echo and Ping tests using the applet (GUI), see *Pinging Individual MUs on page 7-27*.

## AP51xx>admin.stats.echo)> show

### Description:

Shows Mobile Unit Statistics Summary.

### Syntax:

**show** Shows Mobile Unit Statistics Summary.

### Example:

```
admin(stats.echo)>show

-------------------------------------------------------------------------
Idx    IP Address    MAC Address      WLAN    Radio    T-put    ABS    Retries
-------------------------------------------------------------------------
1      192.168.2.0   00:A0F8:72:57:83 demo    11a
```

## AP51xx>admin.stats.echo)> list

### Description:

Lists echo test parameters and results.

### Syntax:

**list** Lists echo test parameters and results.

### Example:

```
admin(stats.echo)>list

Station Address             : 00A0F8213434
Number of Pings             : 10
Packet Length               : 10
Packet Data (in HEX)        : 55

admin(stats.echo)>
```

For information on MU Echo and Ping tests using the applet (GUI), see *Pinging Individual MUs on page 7-27*.

## AP51xx>admin.stats.echo)>set

### Description:

Defines the parameters of the echo test.

### Syntax:

| | | | |
|---|---|---|---|
| **set** | **station** | <mac> | Defines MU target MAC address. |
| | **request** | <num> | Sets number of echo packets to transmit (1-539). |
| | **length** | <num> | Determines echo packet length in bytes (1-539). |
| | **data** | <hex> | Defines the particular packet data. |

For information on MU Echo and Ping tests using the applet (GUI), see *Pinging Individual MUs on page 7-27*.

## AP51xx>admin.stats.echo)> start

### Description:

Initiates the echo test.

### Syntax:

**start** Initiates the echo test.

### Example:

```
admin(stats.echo)>start

admin(stats.echo)>list

Station Address             : 00A0F843AABB
Number of Pings             : 10
Packet Length               : 100
Packet Data (in HEX)        : 1

Number of MU Responses      : 2
```

For information on MU Echo and Ping tests using the applet (GUI), see *Pinging Individual MUs on page 7-27*.

## AP51xx>admin(stats)> ping

### Description:

Defines the ping test values used to conduct a ping test to an AP with the same ESSID.

### Syntax:

| | | |
|---|---|---|
| **ping** | **show** | Shows Known AP Summary details. |
| | **list** | Defines ping test packet length. |
| | **set** | Determines ping test packet data. |
| | **start** | Begins pinging the defined station. |
| | **..** | Goes to parent menu. |
| | **/** | Goes to root menu. |
| | **quit** | Quits CLI session. |

For information on Known AP tests using the applet (GUI), see *Pinging Individual MUs on page 7-27*.

## AP51xx>admin.stats.ping)> show

### Description:

Shows Known AP Summary Details.

### Syntax:

**show** Shows Known AP Summary Details.

### Example:

```
admin(stats.ping)>show
-------------------------------------------------------------------------
Idx    IP Address    MAC Address        MUs      KBIOS      Unit Name
-------------------------------------------------------------------------
1      192.168.2.0   00:A0F8:72:57:83   3        0          access point
```

## AP51xx>admin.stats.ping)> list

### Description:

Lists ping test parameters and results.

### Syntax:

**list** Lists ping test parameters and results.

### Example:

```
admin(stats.ping)>list

Station Address             : 00A0F8213434
Number of Pings             : 10
Packet Length               : 10
Packet Data (in HEX)        : 55

admin(stats.ping)>
```

For information on Known AP tests using the applet (GUI), see *Pinging Individual MUs on page 7-27*.

## AP51xx>admin.stats.ping)> set

### Description:

Defines the parameters of the ping test.

### Syntax:

| | | |
|---|---|---|
| **set** | **station** | Defines the AP target MAC address. |
| | **request** | Sets number of ping packets to transmit (1-539). |
| | **length** | Determines ping packet length in bytes (1-539). |
| | **data** | Defines the particular packet data. |

### Example:

```
admin(stats.ping)>set station 00A0F843AABB
admin(stats.ping)>set request 10
admin(stats.ping)>set length 100
admin(stats.ping)>set data 1

admin(stats.ping)>
```

For information on Known AP tests using the applet (GUI), see *Pinging Individual MUs on page 7-27*.

## AP51xx>admin.stats.echo)> start

### Description:

Initiates the ping test.

### Syntax:

**start** Initiates the ping test.

### Example:

```
admin(stats.ping)>start

admin(stats.ping)>list

Station Address             : 00A0F843AABB
Number of Pings             : 10
Packet Length               : 100
Packet Data (in HEX)        : 1

Number of AP Responses      : 2
```

For information on Known AP tests using the applet (GUI), see *Pinging Individual MUs on page 7-27*.

# 9

# Configuring Mesh Networking

## 9.1 Mesh Networking Overview

An AP-51xx can be configured in two modes to support the new mesh networking functionality. The access point can be set to a client bridge mode and/or a base bridge mode (which accepts connections from client bridges). Base bridge and client bridge mode can be used at the same time by an individual access point to optimally bridge traffic to other members of the mesh network and service associated MUs.

An access point in client bridge mode scans to locate other access points using the WLAP client's ESSID. Then it is required to go through the association and authentication process to establish wireless connections with the located devices. This association process is identical to the access point's current MU association process. Once the association and authentication process is complete, the wireless client adds the connection as a port on its bridge module. This causes the client bridge to begin forwarding packets to the base bridge node. The base bridge realizes it is talking to a wireless client bridge. It then adds that connection as a port on its own bridge module. The two bridges at that point are communicating using the *Spanning Tree Protocol* (STP).

access points configured as both a base and a client bridge function as *repeaters* to transmit data with associated MUs in their coverage area (client bridge mode) as well as forward traffic to other access points in the mesh network (base bridge mode). The number of access points and their intended function within the mesh network dictate whether they should be configured as base bridges, client bridges or both (repeaters). For a use case on how access points are configured in respect to a fictional business need, see *Usage Scenario - Trion Enterprises on page 9-19*.

The spanning tree determines the path to the root and detects if the current connection is part of a network loop with another connection in the system. Each bridge can be configurable so the administrator can control the spanning tree to define the root bridge and what the forwarding paths are. Once the spanning tree converges, both access points begin learning which destinations reside on which side of the network. This allows them to forward traffic intelligently.

After the client bridge establishes at least one wireless connection (if configured to support mobile users), it begins beaconing and accepting wireless connections. If configured as both a client bridge and a base bridge, it begin accepting client bridge connections. Therefore, the mesh network could connect simultaneously to different networks in a manner whereby a network loop is not created and then the connection is not blocked. Once the client bridge establishes at least one wireless connection, it begins establishing other wireless connections as it finds them available. Thus, the client bridge is able to establish simultaneous redundant links.

A mesh network must use one of the two access point LANs. If intending to use the access point for mesh networking support, Symbol recommends configuring at least one WLAN (of the 16 WLANs available) specifically for mesh networking support.

The client bridge creates up to three connections if it can find base bridges for connection. If the connections are redundant (on the same network), then one connection will be forwarding and the others blocked. However, if each of the connections links to a different wired network, then none are redundant and all are forwarding. Thus, the bridge automatically detects and disables redundant connections, but leaves non-redundant connections forwarding. This gives the user the freedom to configure their topology in a variety of ways without limitations. This is important when configuring multiple access points for base bridge support in areas like a shipping yard where a large radio coverage area is required. For more information on configuring the access point in respect to specific usage scenarios, see *Usage Scenario - Trion Enterprises on page 9-19***.**

**NOTE** Since each access point can establish up to 3 simultaneous wireless connections, some of these connections could be redundant. If this is the case, the STP algorithm defines which links are the redundant links and disables those links from forwarding.

If an access point is configured as a base bridge (but not as a client bridge) it operates normally at boot time. The base bridge supports connections made by other client bridges.

The dual-radio model access point affords users better optimization of the mesh networking feature by enabling the access point to transmit to other mesh network members using one independent radio and transmit with associated MUs using the second independent radio. A single-radio access point has its channel utilization and throughput degraded in a mesh network, as the AP's single radio must process both mesh network traffic with other access points and MU traffic with its associated devices.

**CAUTION** Only Symbol AP-5131 or AP-5181 model access points can be used as base bridges, client bridges or repeaters within an access point supported mesh network. If utilizing a mesh network, Symbol recommends considering a dual-radio model to optimize channel utilization and throughput.

## *9.1.1 The AP-51xx Client Bridge Association Process*

An access point in client bridge mode performs an active scan to quickly create a table of the access points nearby. The table contains the access points matching the ESS of the client bridge AP's WLAN. The table is used to determine the best access point to connect to (based on signal strength, load and the user's configured preferred connection list).

The association and authentication process is identical to the MU association process. The client access point sends 802.11 authentication and association frames to the base access point. The base access point responds as if the client is an actual mobile unit. Depending on the security policy, the two access point's engage in the normal handshake mechanism to establish keys.

After device association, the two access points are connected and the system can establish the bridge and run the spanning tree algorithm. In the meantime, the access point in client bridge mode continues to scan in the background attempts to establish an association with other access points using the same ESS on the same channel.

**CAUTION** An access point is Base Bridge mode logs out whenever a Client Bridge associates to the Base Bridge over the LAN connection. This problem is not experienced over the access point's WAN connection. If this situation is experienced, log-in to the access point again.

The access point in client bridge mode attempts to establish up to 3 simultaneous wireless connections. The second and third connections are established in the background while the system is running. The first connection needs to be established before the system starts bridging traffic.

The dual-radio model access point affords users better optimization of the mesh networking feature by allowing the access point to transmit to other access points (in base or client bridge mode) using one independent radio and transmit with its associated MUs using the second independent radio. A single-radio access point has its channel utilization and throughput degraded in a mesh network, as the access point's single radio must process both mesh network traffic with other access points and MU traffic with its associated devices.

## *9.1.2 Spanning Tree Protocol (STP)*

The access point performs mesh networking using STP as defined in the 802.1d standard.

**NOTE** The Symbol AP-4131 access point uses a non-standard form of 802.1d STP, and is therefore not compatible as a base bridge or client bridge within an access point managed network.

Once device association is complete, the client and base bridge exchange *Configuration Bridge Protocol Data Units* (BPDUs) to determine the path to the root. STP also determines whether a given port is a redundant connection or not.

## *9.1.3 Defining the Mesh Topology*

When a user wants to control how the spanning tree determines client bridge connections, they need to control the mesh configuration. The user must be able to define one node as the root. Assigning a base bridge the lowest bridge priority defines it as the root.

**NOTE** Symbol recommends using the **Mesh STP Configuration** screen to define a base bridge as a root. Only advanced users should use the Advanced Client Bridge Settings screen's Preferred List to define the mesh topology, as omitting a bridge from the preferred list could break connections within the mesh network.

The access point can manipulate the path cost assigned to a bridge connection based on that connection's RSSI. This results in the spanning tree selecting the optimal path for forwarding data when redundant paths exist. However, this can be overridden using the preferred list. When using the

preferred list, the user enters a priority for each bridge, resulting in the selection of the forwarding link.

Limit the wireless client's connections to reduce the number of hops required to get to the wired network. Use each radio's "preferred" base bridge list to define which access points the client bridge connects to. For more information, see *Configuring Mesh Networking Support on page 9-6*.

### *9.1.4 Mesh Networking and the AP-51xx's Two Subnets*

The access point now has a second subnet on the LAN side of the system. This means wireless clients communicating through the same radio can reside on different subnets. The addition of this feature adds another layer of complexity to the access point's mesh networking functionality.

With a second LAN introduced, the LAN's Ethernet port (and any of the 16 WLANs) could be assigned to one of two different subnets. From a layer 2 perspective, the system has two different bridge functionalities, each with its own STP. The WLAN assignment controls the subnet (LAN1 or 2) upon which a given connection resides. If WLAN2 is assigned to LAN1, and WLAN2 is used to establish a client bridge connection, then the mesh network connection resides on LAN1.

Therefore, (depending upon the WLAN-to-LAN mapping), the access point could have multiple mesh connections on either LAN1 or LAN2.

### *9.1.5 Normal Operation*

Once the mesh network is defined, all normal access point operations are still allowed. MUs are still allowed to associate with the access point as usual. The user can create WLANs, security polices and VLANs as with any other access point. DHCP services function normally and all layer 3 communications are allowed.

WNMP is used to send information about each mesh network so information can be displayed to the user from any access point on the system. WNMP messages are AP-AP info messages used to send system status.

### *9.1.6 Impact of Importing/Exporting Configurations to a Mesh Network*

When using the access point's Configuration Import/Export screen to migrate an access point's configuration to other access points, mesh network configuration parameters will get sent or saved

to other access points. However, if using the Known AP Statistics screen's Send Cfg to APs functionality, "auto-select" and preferred list" settings do not get imported.

**CAUTION** When using the Import/Export screen to import a mesh supported configuration, do not import a base bridge configuration into an existing client bridge, as this could cause the mesh configuration to break.

## 9.2 Configuring Mesh Networking Support

Configuring the access point for Mesh Bridging support entails:

- *Setting the LAN Configuration for Mesh Networking Support*
- *Configuring a WLAN for Mesh Networking Support*
- *Configuring the Access Point Radio for Mesh Support*.

### *9.2.1 Setting the LAN Configuration for Mesh Networking Support*

At least one of the two access point LANs needs to be enabled and have a mesh configuration defined to correctly function as a base or client bridge within a mesh network. This section describes the configuration activities required to define a mesh network's LAN configuration.

As the *Spanning Tree Protocol* (STP) mentions, each mesh network maintains hello, forward delay and max age timers. The base bridge defined as the root imposes these settings within the mesh network. The user does not necessarily have to change these settings, as the default settings will work. However, Symbol encourages the user to define an access point as a base bridge and root (using the base bridge priority settings within the Bridge STP Configuration screen). Members of the mesh network can be configured as client bridges or additional base bridges with a higher priority value.

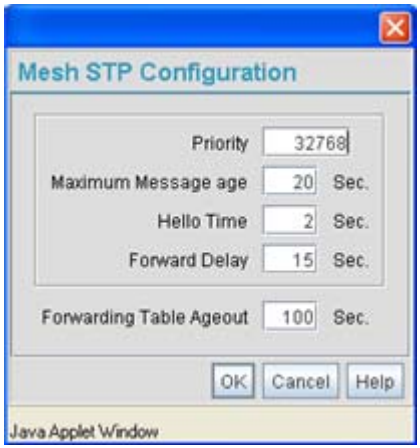
**NOTE** For an overview on mesh networking and some of the implications on using the feature with the access point, see *Configuring Mesh Networking on page 9-1*.

To define a LAN's Mesh STP Configuration:

1. Select **Network Configuration -> LAN** from the AP-5131 menu tree.
2. Enable the LAN used to support the mesh network.

Verify the enabled LAN is named appropriately in respect to its intended function in supporting the mesh network.

3. Select **Network Configuration -> LAN -> LAN1 or LAN2** from the AP-5131 menu tree.
4. Click the **Mesh STP Configuration** button on the bottom off the screen.
5. Define the properties for the following parameters within the mesh network:




*Priority*

Set the **Priority** as low as possible for a to force other devices within the mesh network to defer to this client bridge as the bridge defining the mesh configuration (commonly referred to as the root). Symbol recommends assigning a Base Bridge AP with the lowest bridge priority so it becomes the root in the STP. If a root already exists, set the Bridge Priorities of new APs accordingly so the root of the STP doesn't get altered. Each access point starts with a default bridge priority of 32768.

*Maximum Message age*

The **Maximum Message age** timer is used with the Message Age timer. The Message Age timer is used to measure the age of the received protocol information recorded for a port, and to ensure the information is discarded when it exceeds the value set for the Maximum Message age timer.

| | |
|---|---|
| *Hello Time* | The **Hello Time** is the time between each bridge protocol data unit sent. This time is equal to 2 seconds (sec) by default, but you can tune the time to be between 1 and 10 sec. If you drop the hello time from 2 sec to 1 sec, you double the number of bridge protocol data units sent/received by each bridge. The 802.1d specification recommends the Hello Time be set to a value less than half of the Max Message age value. |
| *Forward Delay* | The **Forward Delay** is the time spent in the listening and learning state. This time is equal to 15 sec by default, but you can tune the time to be between 4 and 30 sec. The 802.1d specification recommends the Forward Delay be set to a value greater than half the Max Message age timeout value. |
| *Forwarding Table Ageout* | The Forwarding Table Parameter value defines the length of time an entry will remain in the a bridge's forwarding table before being deleted due to lack of activity. If the entry replenishments a destination generating continuous traffic, this timeout value will never be invoked. However, if the destination becomes idle, the timeout value represents the length of time that must be exceeded before an entry is deleted from the forwarding table. |

6. Click **OK** to return to either the LAN1 or LAN2 screen where updates to the Mesh STP Configuration can be saved by clicking the **Apply** button.
7. Click **Cancel** to discard the changes made to the Mesh STP Configuration and return to the LAN1 or LAN2 screen. Once the Mesh STP Configuration is defined, the access point's radio can be configured for base and/or client bridge support.

## *9.2.2 Configuring a WLAN for Mesh Networking Support*

Each access point comprising a particular mesh network is required to be a member of the same WLAN. Therefore, each base bridge, client bridge or repeater within the mesh network must use the same WLAN in order to share the same ESSID, radio designation, security policy, MU ACL and Quality of Service policy. If intending to use the access point for mesh networking support, Symbol recommends configuring at least one WLAN (of the 16 WLANs available) specifically for mesh networking support.

To define the attributes of the WLAN shared by the members of the mesh network:

1. Select **Network Configuration -> Wireless** from the AP-5131 menu tree.

The **Wireless Configuration** screen displays with those existing WLANs displayed within the table.

2. Select the **Create** button to configure a new WLAN specifically to support mesh networking.

   An existing WLAN can be modified (or used as is) for mesh networking support by selecting it from the list of available WLANs and clicking the **Edit** button.


3. Assign an **ESSID** and **Name** to the WLAN that each access point will share when using this WLAN within their mesh network.

Symbol recommends assigning a unique name to a WLAN supporting a mesh network to differentiate it from WLANs defined for non mesh support. The name assigned to the WLAN is what is selected from the **Radio Configuration** screen for use within the mesh network.

**NOTE** It is possible to have different ESSID and WLAN assignments within a single mesh network (one set between the Base Bridge and repeater and another between the repeater and Client Bridge). However, for ease of management and to not waste network bandwidth, Symbol recommends using the same ESSID across the entire mesh network.

4. Use the **Available On** checkboxes to specify the access point radio(s) used with the target WLAN within the mesh network.

   The Available On checkboxes are for making this WLAN available for base bridges or repeaters to connect to. The Available On checkbox should only be selected for a mesh WLAN if this target access point is to be configured as a base bridge or repeater on the radio. If the WLAN is to be defined for client bridge support only, the Available On checkbox should not be selected. Instead, it only needs to have the Enable Client Bridge Backhaul option selected.

5. Use the **Maximum MUs** field to define the number of MUs allowed to associate with this WLAN. This number should be defined based on the number of client bridge and repeaters within this mesh network. This value can be increased as the mesh network grows and devices are added.

   Only advanced users should define the number of devices allowed to associate with the WLAN, as setting the value too low could restrict devices from joining an expanding mesh network, and setting it too high could prohibit other WLANs from granting access to the all the devices needed.

6. Select the **Enable Client Bridge Backhaul** checkbox to make this WLAN available in the **Mesh Network Name** drop-down menu within the **Radio Configuration** screen. Only WLANs defined for mesh networking support should have this checkbox selected, in order to keep the list of WLANs available (within the Radio Configuration screen) restricted to just WLANs configured specifically with mesh attributes.

7. Refer to the **Security Policy** drop-down menu to select the security policy used within this WLAN and mesh network.

   A security policy for a mesh network should be configured carefully since the data protection requirements within a mesh network differ somewhat compared to a typical wireless LAN. **No Encryption** is a bad idea in a mesh network, since mesh networks

are typically not guest networks, wherein public assess is more important than data protection. Symbol also discourages user-based authentication schemes such as Kerberos and 802.1x EAP, as these authentication schemes are not supported within a mesh network.

If none of the existing policies are suitable, select the **Create** button to the right of the **Security Policy** drop-down menu and configure a policy suitable for the mesh network. For information on configuring a security using the authentication and encryption techniques available to the access point, see *Enabling Authentication and Encryption Schemes on page 6-5*.

8. ACL policies should be configured to allow or deny a range of MAC addresses from interoperating with the WLAN used with the mesh network. ACLs should be defined based on the client bridge and repeater (an access point defined as both a base and client bridge) association requirements within the mesh network.

   For information on defining an ACL for use with the WLAN assigned to the mesh network, see *Configuring a WLAN Access Control List (ACL) on page 5-30*.

**NOTE** The **Kerberos User Name** and **Kerberos Password** fields can be ignored, as Kerberos is not supported as a viable authentication scheme within a mesh network.

9. Select the **Disallow MU to MU Communication** checkbox to restrict MUs from interacting with each other both within this WLAN, as well as other WLANs.

   Selecting this option could be a good idea, if restricting device “chatter” improves mesh network performance. If base bridges and client bridges are added at any given time to extent the coverage are of a mesh network, the data going back and forth amongst just those radios could be compromised by network interference. Adding mesh device traffic could jeopardize network throughput. If however, MU to MU communication is central to the organization (for example, scanners sharing data entry information) then this checkbox should remain unselected.

10. Select the **Use Secure Beacon** checkbox to not transmit the AP- 5131's ESSID amongst the access points and devices within the mesh network. If a hacker tries to find an ESSID via an MU, the AP- 5131's ESSID does not display since the ESSID is not in the beacon. Symbol recommends keeping the option enabled to reduce the likelihood of hacking into the WLAN.
11. Select the **Accept Broadcast ESSID** checkbox to associate an MU that has a blank ESSID (regardless of which ESSID the access point is currently using). Traffic within a mesh network probably consists of known devices, so you may want to leave the checkbox unselected and configure each MU with an ESSID. The default is selected. However, for WLANs used within a mesh network, Symbol recommends unselecting this option as it would prevent the AP from answering to blank ESSID probes from other mobile units.
12. If there are certain requirements for the types of data proliferating the mesh network, select an existing policy or configure a new QoS policy best suiting the requirements of the mesh network. To define a new QoS policy, select the **Create** button to the right of the Quality Of Service Policy drop-down menu.

    For detailed information on configuring a QoS policy, see *Setting the WLAN Quality of Service (QoS) Policy on page 5-33*.
13. Click **Apply** to save the changes made to the mesh network configured WLAN.

    An access point radio is now ready to be configured for use with this newly created mesh WLAN.

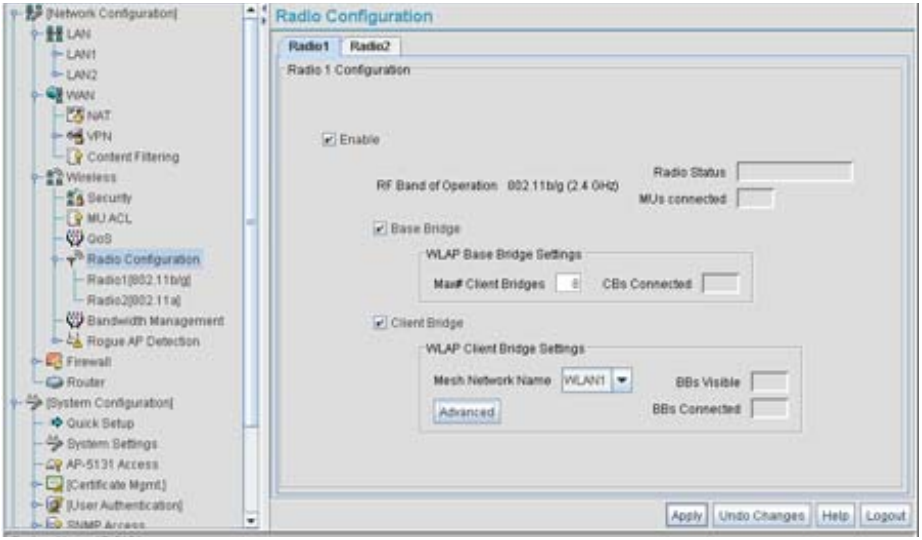
### *9.2.3 Configuring the Access Point Radio for Mesh Support*

An access point radio intended for use within a mesh network requires configuration attributes unique from a radio intended for non-mesh support.This section describes how to configure an access point radio for mesh network support.

To configure the access point radio for mesh networking support:

**NOTE** The dual-radio model access point affords users better optimization of the mesh network feature by allowing the access point to transmit to other access points (in base or client bridge mode) using one independent radio and transmit with its associated devices using the second independent radio. A single-radio access point has its channel utilization and throughput degraded in a mesh network, as the AP's single radio must process both mesh network traffic with other access points and MU traffic with its associated devices.

1. Select **Network Configuration** -> **Wireless** -> **Radio Configuration** from the AP-5131 menu tree.




2. Enable the radio(s) using the **Enable** checkbox(es) for both Radio 1 and Radio 2.

   Refer to **RF Band of Operation** parameter to ensure you are enabling the correct 802.11a or 802.11b/g radio. After the settings are applied within this Radio Configuration screen, the **Radio Status** and **MUs connected** values update. If this is an existing radio within a mesh network, these values update in real-time.

**CAUTION** If a radio is disabled, be careful not to accidentally configure a new WLAN, expecting the radio to be operating when you have forgotten it was disabled.

3. Select the **Base Bridge** checkbox to allow the access point radio to accept client bridge connections from other access points in client bridge mode. The base bridge is the acceptor of mesh network data from those client bridges within the mesh network and never the initiator.

**CAUTION** A problem could arise if a Base Bridge's Indoor channel is not available on an Outdoor Client Bridge's list of available channels. As long as an Outdoor Client Bridge has the Indoor Base Bridge channel in its available list of channels, it can associate to the Base Bridge.

4. If the Base Bridge checkbox has been selected, use the **Max# Client Bridges** parameter to define the client bridge load on a particular base bridge.

   The maximum number of client bridge connections per access point radio is 12, with 24 representing the maximum for dual-radio models.

**CAUTION** An access point in Base Bridge mode logs out whenever a Client Bridge associates to the Base Bridge over the LAN connection. This problem is not experienced over the access point's WAN connection. If this situation is experienced, log-in to the access point again.

   Once the settings within the Radio Configuration screen are applied (for an initial deployment), the current number of client bridge connections for this specific radio displays within the **CBs Connected** field. If this is an existing radio within a mesh network, this value updates in real-time.

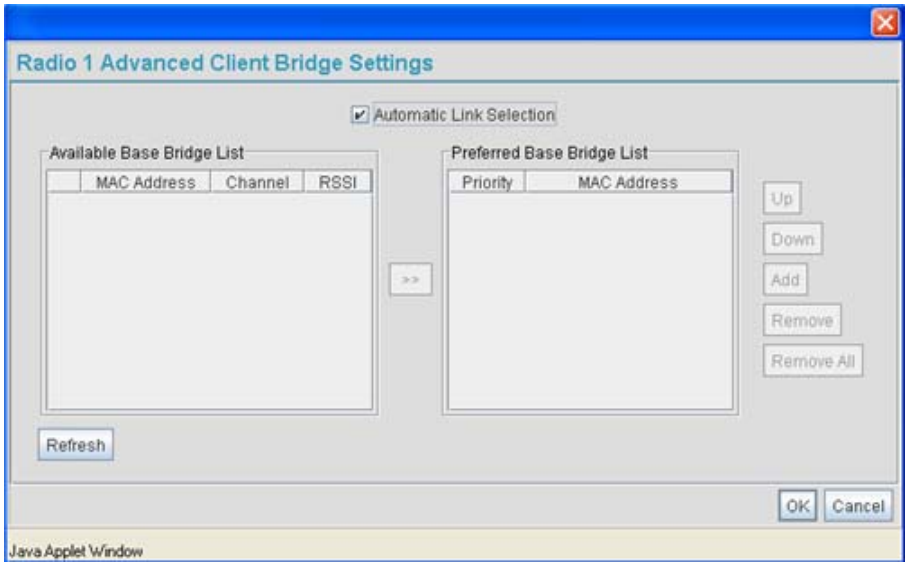
5. Select the **Client Bridge** checkbox to enable the access point radio to initiate client bridge connections with other mesh network supported access points radios on the same WLAN.

If the Client Bridge checkbox has been selected, use the **Mesh Network Name** drop-down menu to select the WLAN (ESS) the client bridge uses to establish a wireless link. The default setting, is (WLAN1). Symbol recommends creating (and naming) a WLAN specifically for mesh networking support to differentiate the Mesh supported WLAN from non-Mesh supported WLANs. For more information, see *Configuring a WLAN for Mesh Networking Support on page 9-8*

Once the settings within the Radio Configuration screen are applied (for an initial deployment), the current number of base bridges visible to the radio displays within the **BBs Visible** field, and the number of base bridges currently connected to the radio displays within the **BBs Connected** field. If this is an existing radio within a mesh network, these values update in real-time.

**NOTE** Ensure you have verified the radio configuration for both Radio 1 and Radio 2 before saving the existing settings and exiting the Radio Configuration screen.v

6. Click the **Advanced** button to define a prioritized list of access points to define mesh connection links.




7. Select the **Automatic Link Selection** checkbox to allow the access point to select the links used by the client bridge to populate the mesh network. Selecting this checkbox prohibits

the user from selecting the order base bridges are added to the mesh network when one of the three associated base bridges becomes unavailable.

**NOTE** Auto link selection is based on the RSSI and load. The client bridge will select the best available link when the **Automatic Link Selection** checkbox is selected. Symbol recommends you do not disable this option, as (when enabled) the access point will select the best base bridge for connection.

8. Refer to the **Available Base Bridge List** to view devices located by the access point using the WLAN selected from the Radio Configuration screen. Refer the following for information on located base bridges:

   *MAC* — The MAC field displays the factory set hard-coded MAC address that serves as a device identifier.

   *RSSI* — The *Relative Signal Strength Indicator* (RSSI) displays the located device's signal strength with the associated access point in client bridge mode. Use this information as criteria on whether to move a particular device from the available list to the preferred list.

   *CHANN* — The CHANN displays the name of the channel that both the access point and base bridge use. A client bridge can only connect to access points (Base Bridges) on the same channel. If the user selects multiple base bridges on different channels, the access point will only be able to connect to those bridges on the same channel and the others will not be able to join this particular mesh network.

9. Click **Refresh** at any time to update the list of available Base Bridge devices available to the access point.
10. Use the **>>** button to move a selected base bridge MAC address from Available Base Bridge List
11. Refer to the **Preferred Base Bridge List** for a prioritized list of base bridges the mesh network's client bridge uses to extend the mesh network's coverage area and potentially provide redundant links. If a device does not appear on the Available Base Bridge List, there is no" way it can be moved to Preferred Base Bridge List as the device has not yet been "seen." However, if you know the MAC Address corresponding to that Base Bridge, you can add that to the Preferred List using the add button.

12. Highlight a MAC address from the Preferred Base Bridge List and click the **Up** button to assign that device's MAC address a higher priority and a greater likelihood of joining the mesh network if an association with another device is lost.

    If a MAC address is not desirable as others but still worthy of being on the preferred list, select it, and click the **Down** button to decrease its likelihood of being selected as a member of the mesh network.

13. If a device MAC address is on the Preferred Base Bridge List and constitutes a threat as a potential member of the mesh network (poor RSSI etc.), select it and click the **Remove** button to exclude it from the preferred list.

    If all of the members of the Preferred Base Bridge List constitute a risk as a member of the mesh network, click the **Remove All** button. This is not recommended unless the preferred list can be re-populated with more desirable device MAC addresses from the Available Base Bridge List.

14. Click **Ok** to return to the Radio Configuration screen. Within the Radio Configuration screen, click **Apply** to save any changes made within the Advanced Client Bridge Settings screen.
15. Click **Cancel** to undo any changes made within the Advanced Client Bridge Settings screen. This reverts all settings for the screen to the last saved configuration.
16. Click **Apply** to save any changes to the Radio Configuration screen. Navigating away from the screen without clicking Apply results in all changes to the screens being lost.

**CAUTION** When defining a Mesh configuration and changes are saved, the mesh network temporarily goes down. The mesh network is unavailable because the access point radio goes down when applying the changes. This can be problematic for users making changes within a deployed mesh network. If updating the mesh network using a LAN connection, the access point applet loses connection and the connection must be re-instated. If updating the mesh network using a WAN connection, the access point applet does not lose connection, but the mesh network is unavailable until the changes have been applied.

17. Click **Undo Changes** (if necessary) to undo any changes made. Undo Changes reverts the settings displayed on the Radio Configuration screen to the last saved configuration.
18. Click **Logout** to securely exit the AP-5131 Symbol Access Point applet. A prompt displays confirming the logout before the applet is closed.

    Once the target radio has been enabled from the **Radio Configuration** screen, configure the radio's properties by selecting it from the AP-5131 menu tree.

For additional information on configuring the access point's radio, see *Configuring the 802.11a or 802.11b/g Radio on page 5-47*. For fictional use case involving an access point mesh network deployment within a shipping and receiving yard, see *Usage Scenario - Trion Enterprises on page 9-19*.

# 9.3 Usage Scenario - Trion Enterprises

Trion Enterprises is a new shipping and receiving company. Trion wants to create an outdoor wireless coverage area (in addition to its indoor wireless infrastructure) that can expand as they grow their business. As Trion expands the wireless coverage area within their shipping yard, they will need additional access points configured as either base or client bridges or repeaters (access points configured as both base and client bridges) to support the growing number of MUs, and forward data traffic to the client bridges on the outer areas of the mesh network. The MUs within the shipping and receiving area consist primarily of Symbol bar code scanners (to monitor Trion's inventory coming and going) as well as PDAs doing data entry.

**NOTE** The information presented within this use case is centered around the configuration of the mesh networking feature exclusively. It is assumed the access points used by Trion Enterprises are completely configured (beyond the mesh networking functionality) before being deployed in their shipping yard.

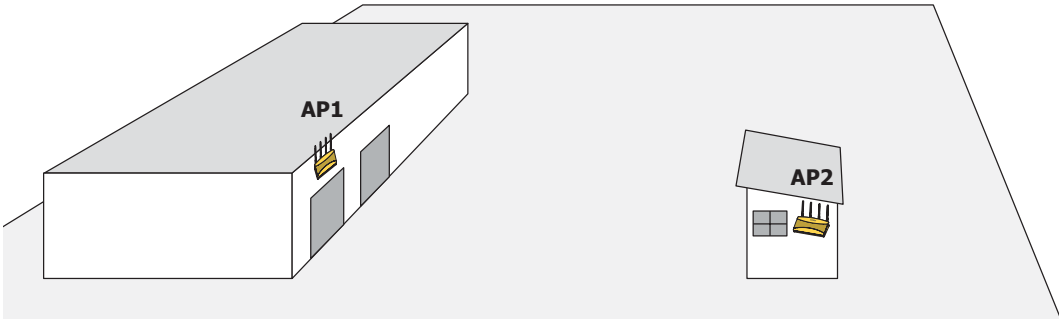
## *9.3.1 Trion's Initial Deployment*

Trion's initial requirement is to configure a "point-to-point" mesh network consisting of two access points (AP1 and AP2). AP1 is to be physically connected to a pole inside the entrance to the shipping and receiving area with antennas oriented outward into the shipping yard. AP1 is intended to be a base bridge with no coverage for MUs within the shipping yard. AP2 is intended to be a client bridge associated to AP1 and be placed on a wall of a receiving shack (a remote building in the shipping yard) with antennas oriented into the shipping yard. AP2 also is also connected to a Symbol ES3000 wireless switch providing connectivity (on its own local subnet) to laptops within the receiving shack. AP1 and AP2 will be configured identically unless noted.

**NOTE** To optimize Trion's mesh network, the IT team decides to create a mesh WLAN to strictly support the base bridge, client bridge and repeater traffic within the mesh network. This is the configuration described in this use case. However, to optimally support the MU traffic within the shipping yard, the Trion team should create a separate (non-mesh) WLAN to support the MU traffic proliferating the shipping yard. To configure the separate (non mesh) WLAN, the IT team follows the instructions in *Creating/Editing Individual WLANs on page 5-24*.

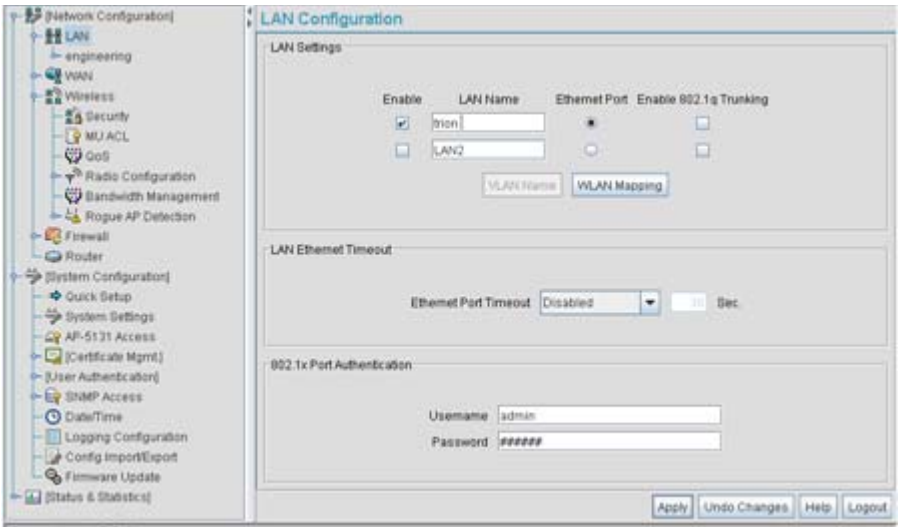
To configure Trion's initial deployment, the IT Team does the following:

1. The Trion IT department verifies connectivity with both of the access points following the instructions in *Testing Connectivity on page 3-11*.
2. The Trion IT Department installs the AP1 on a wall with the antennas orienting outward into the shipping and receiving yard. The team then installs the AP2 on a wall on the receiving shack in the shipping yard.




The Trion IT department follows the instructions in *Wall Mounted Installations on page 2-14* to install AP1 and AP2.

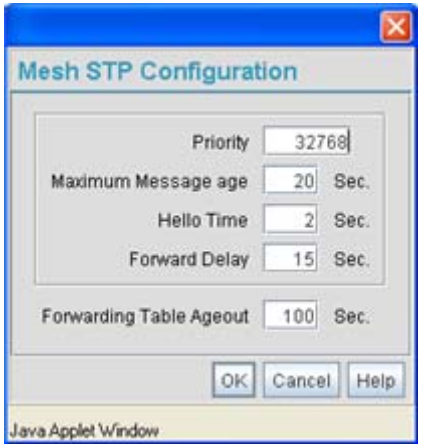
3. The Trion IT department selects **Network Configuration -> LAN** from the AP-5131 menu tree.



4. The Trion IT department verifies the LAN used to support the mesh network is enabled for both AP1 and AP2, (by selecting the **Enable** checkbox).

**NOTE** In this fictional mesh network deployment for Trion Enterprises, AP1 and AP2 should both have the access point's Ethernet Port mapped to the mesh LAN. However, there are some scenarios when this is not necessary. For example, when the Ethernet is not connected, or is being used for some other purpose such as routing traffic to the WAN connection.

5. The Trion IT department then selects **Network Configuration -> LAN -> trion** from the AP-5131 menu tree.
6. The IT team selects the **Mesh STP Configuration** button on the bottom off the screen.




7. The Trion IT department sets the **Priority** setting to 1 (for AP1) in order for future members of the mesh network to defer to AP1 as the AP defining the mesh network configuration (setting this value to 1 AP1 to what is commonly referred to as the root).

**NOTE** AP1 and AP2 have been configured identically up to this point. However, only AP1 is assigned a priority of 1 within the Bridge STP Configuration screen. AP2 is set to a lower priority (100) to keep AP1 as the root.

The IT team leaves the **Maximum Message age** timer at the 20 sec default interval. This setting controls the maximum length of time that passes before a bridge port saves its configuration information. The **Hello Time** (the time between each bridge protocol data unit sent) is also unchanged from 2 second default interval. The IT team also leaves the **Forward Delay** (the time the access point LAN is spent in a listening and learning state) to the factory

default of 15 seconds. Since only one additional access point is to be added to this point-to-point mesh network, the **Forwarding Table Ageout** value is also unchanged from its 100 second default setting.

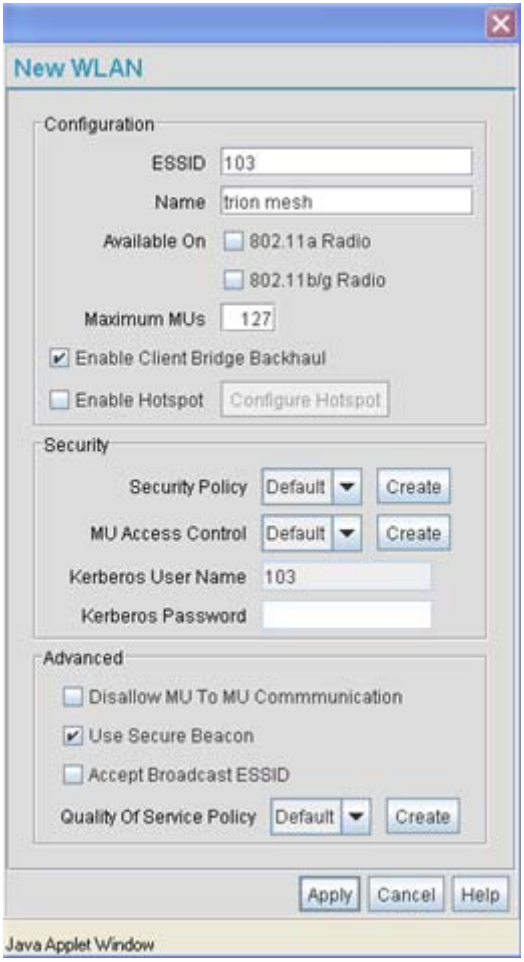
8. The team clicks **OK** from within the Bridge STP Configuration screen and **Apply** from within the trion (LAN1) screen to save the settings. This step is repeated for AP2.

   The Trion IT team now intends to create a WLAN (to use with the trion LAN) that can be dedicated to their mesh network within the shipping yard.

9. Select **Network Configuration -> Wireless** from the AP-5131 menu tree.

   The **Wireless Configuration** screen displays with those existing WLANs displayed within the table. This is Trion's first deployment for this new dual-radio access point, upon reviewing the Wireless Page they determine the existing default WLAN should be left as is and a new WLAN should be created that can be dedicated to the mesh network supporting the shipping yard.

10. The team selects the **Edit** button to revise (and rename) the existing WLAN specifically to support mesh networking.




11. The Trion IT team assigns the WLAN a unique ESSID (103) used by each new base bridge, client bridge and repeater joining the mesh network.
12. The team assigns the name of "**trion mesh**" to the WLAN so it will not be confused with other WLANs used in other areas of the Trion facility. This name also serves to associate the name of the WLAN with its intended mesh network utilization of data. entry within the shipping yard

13. For AP1 the team selects the 802.11a checkbox. Enabling the 802.11a radio for the mesh WLAN and configuring a separate WLAN for MU traffic (using the 802.11b/g radio), allows the team the best channel utilization and throughput available since the 802.11a radio can be dedicated strictly to communications within the mesh network and the 802.11b/g radio can be dedicated to servicing the 802.11b/g MUs supporting the shipping and receiving yard.

    For AP2, neither the 802.11a or 802.11b/g checkboxes are selected (see the screen displayed above). Only the **Enable Client Bridge Backhaul** checkbox needs to be selected for AP2 (as AP2 will be used as a client bridge).

14. The team does not want any MUs connecting to the mesh WLAN, only the client bridges comprising the mesh network. Therefore, the team leaves the **Maximum MUs** field as is, and will use the Radio Configuration page to control the number of client bridge connections.

15. The team verifies the **Enable Client Bridge Backhaul** checkbox is selected for AP2 to ensure the WLAN is available in the **Mesh Network Name** drop-down menu.

    Unlike the user-based Kerberos authentication scheme used within the Trion Administrative office and the 802.1x EAP scheme used in the Finance department, the IT Team wants to configure a security scheme for the WLAN that emphasizes security for the data proliferating the shipping yard, not its user base, as users may come and go whereas the data traffic within the shipping yard remains continuous.

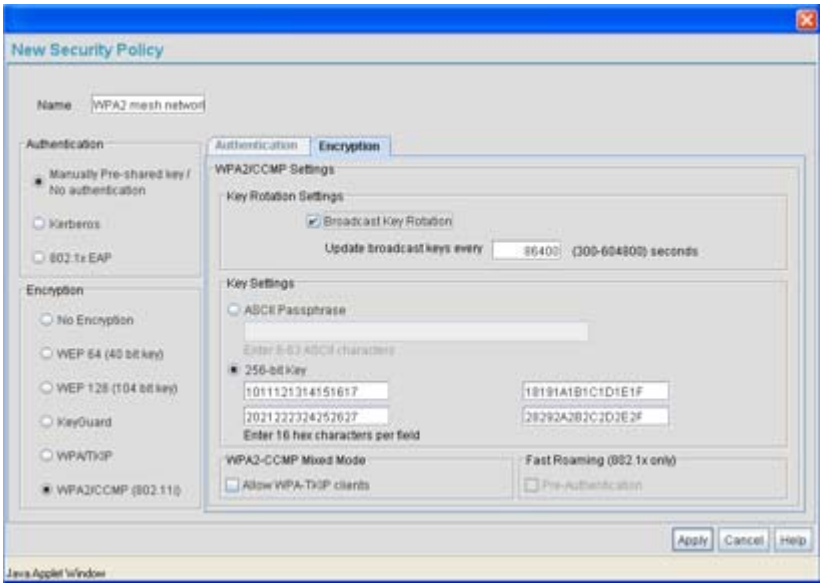
16. The IT Team selects the **Create** button to the right of the **Security Policy** drop-down menu.

    The New Security Policy screen displays with no authentication or encryption options selected.

17. The IT Team selects the **WPA2/CCMP** radio button.

    The **WPA2/CCMP Settings** field displays within the New Security Policy screen.

18. The IT Team assigns a name of "**WPA2 mesh network**" to not only define the security scheme used, but associate this policy with its intended use for the shipping and receiving mesh network.

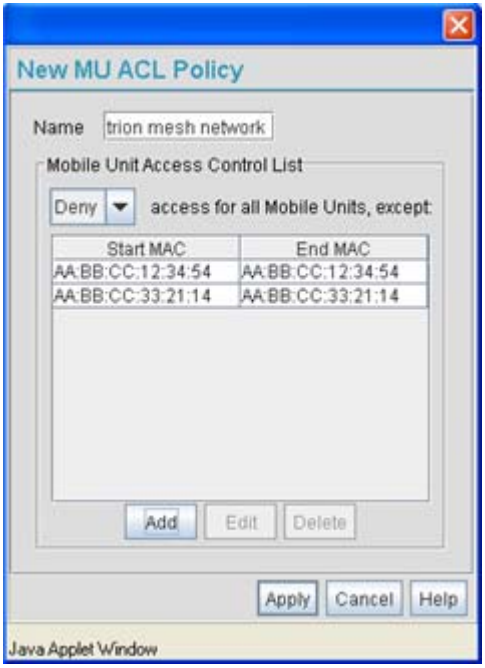



19. The **Broadcast Key Rotation** checkbox is selected, as the IT team plans to change the keys from time to time (for security purposes) and wants these keys to be broadcasted using the default interval 86400 seconds.
20. The IT team does not want to use a passphrase to represent the 256-bit keys, so the **256-bit Key** checkbox is selected, and the team enters 16 hexadecimal characters into each of the four fields displayed. Once completed the Apply button is selected and the access point applet returns to the WLAN screen.
21. The team leaves the **Allow WPA-TKIP** clients and **Pre-Authentication c**heckboxes unselected.

    Since the Trion Shipping and Receiving yard is considered a secure wireless network with MU traffic comprised of known 802.11b/g MUs with fixed MAC addresses, the IT team wants to create an ACL that excludes all MU traffic except the known range of Trion Enterprises deployed MAC addresses.
22. From back at the Edit WLAN screen, the IT team selects the **Create** button (to the right of the **MU Access Contro**l drop-down menu.

    The **New MU ACL Policy** screen displays with no existing MAC address ranges.

23. The IT team assigns the name of "**trion mesh network**" to the ACL to eliminate any confusion with the ACLs intended function



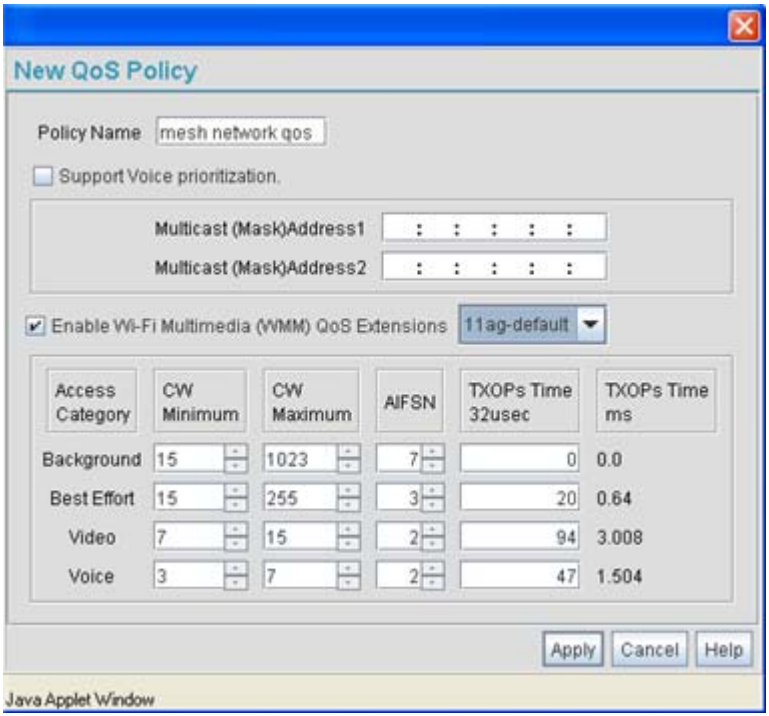

24. Since the range of client bridge MAC addresses for the shipping yard mesh network is known to the IT Team, they select the **Deny** drop-down menu option, as the team wants to deny access to all MAC addresses except their own known range of device MAC addresses.
25. The IT team then selects the **Add** button and enters the base bridge MAC address that will be granted access to the access point managed WLAN. Once completed, the **Apply** button is selected and the access point applet returns to the WLAN screen.

**NOTE** If the Trion IT team puts the client bridge addresses into the ACL, they should also put the access point's BSS ID into the ACL since there is no way to know ahead of time which BSS the client bridge will use for association.

Now a QoS policy needs to be defined for the shipping and receiving mesh network WLAN. The IT Team envisions little if any video or voice traffic within the shipping yard as the MUs within primarily scan bar codes and upload data.

26. The team decides to leave the **Disallow MU to MU Communication** checkbox unselected for the WLAN, as the team considers all MU traffic within the secure shipping and receiving yard known and not a threat to the initial 2 AP mesh network deployment.
27. The team selects the **Use Secure Beacon** checkbox from the Edit WLAN screen to not transmit the AP- 5131's ESSID between AP1 and AP2. If a hacker tries to find an ESSID via an MU, the AP- 5131's ESSID does not display since the ESSID is not in the beacon.
28. The team does not select the **Accept Broadcast ESSID** checkbox from the Edit WLAN screen to associate MUs with a blank ESSID, as they do not want MUs randomly joining their carefully constructed mesh network.
29. From the Edit WLAN screen, the IT Team selects the **Create** button to the right of the Quality Of Service Policy drop-down menu.

    The **New QoS Policy** screen displays with no values selected.




30. The IT Team assigns the name of "**mesh network qos**" to the QoS policy to eliminate any confusion with the policy's intended function.

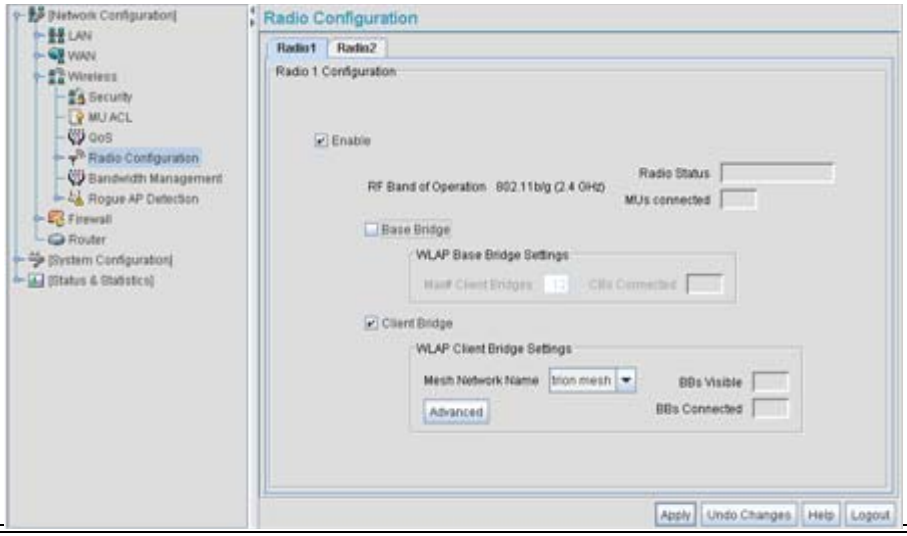
31. The IT Team does not plan on supporting any legacy 802.11b voice enabled devices, so they leave the **Support Voice prioritization** checkbox unselected.
32. The IT Team selects **11ag-default** from the drop-down menu to best describe the type of data proliferating the mesh network. With this setting selected, the Access Category settings do not need to be configured for the QoS policy.
33. The IT Team selects the **Enable Wi-Fi Multimedia (WMM) QoS Extensions** checkbox, and selects the **11ag-default** setting for the intended traffic within the WLAN. If multimedia or voice traffic would have proliferated the WLAN, the team would have selected 11ag-wifi or 11ag-voice. However, since simple data transfers are planned, the 11ag-default setting is appropriate.
34. The IT Team clicks **Apply** within both the New QoS Policy and Edit WLAN screen to save the settings to the mesh network WLAN. The configuration process is repeated and saved for AP2.

    The WLAN configuration has now been set similarly for both AP1 and AP2 (with the exception of the Priority setting within the Mesh STP Configuration screen). The team now needs to define the radio configuration for both AP1 and AP2.
35. The IT team selects **Network Configuration** -> **Wireless** -> **Radio Configuration** from the AP-5131 menu tree.

    The **Radio Configuration** screen displays.
36. For AP1, the IT Team enables both Radio 1 and Radio 2 and defines radio 1 as a base bridge.

    AP1 is intended to pass along mesh network data to AP2 (as well as other access points as they are added to the mesh network).

37. For AP2, the IT Team enables both Radio 1 and Radio 2 and defines radio 1 as a client bridge.




**NOTE** The Trion IT team is aware it is not a good idea to dedicate both radios (of a dual-radio model access point) to support mesh networking. They know it is possible to dedicate both radios of a single access point for mesh support, but the Trion team wants to dedicate the 802.11b/g radio for MU operation and the 802.11a radio for backhaul support. For AP2, the Trion team will create two connections to AP1 (one over the 802.11b/g radio and one over the 802.11a radio). The connection used for forwarding data for AP2 will be the 802.11b/g radio and the 802.11a radio will be dedicated for client bridge backhaul.

38. The IT Team leaves each radio's **Max # Client Bridge** setting at the default setting of 12. This ensures as client bridges are added to the growing mesh network they can be accounted for.
39. For AP1 and AP2, the IT Team uses the **Mesh Network Name** drop-down menu to assign the "**trion mesh**" WLAN to the radio 1 client bridge. This is the WLAN the AP1 and AP2 radios will use to interoperate with the mesh network devices populating the shipping yard.
40. The IT Team decides to not select the **Advanced** button within the AP1 and AP2 WLAP Client Bridge Settings field.

    For the next six months, Trion Enterprises' mesh network only consists of AP1 and AP2. AP1 has already been defined as the root bridge in the mesh network when it was assigned a Priority value of 1 within the Bridge STP Configuration screen.

41. The Trion IT Team clicks **Apply** within both the AP1 and AP2 Radio Configuration screens to complete the mesh network configuration of each AP1 and AP2 radio. The team does not worry about network disruption by applying the settings at this point, as AP1 and AP2 have not yet been deployed. However, in the future they are aware saving their mesh configuration will temporarily disrupt service within their mesh network.

**NOTE** With the mesh network configuration completed for AP1 and AP2, the Trion Enterprises IT team completes the configuration of the APs following the instructions in this *access point Product Reference Guide*. Later in the year Trion expects to grow their business to the point where 2 new client bridges are required to provide mesh networking to new areas of their shipping year. See,
*Adding 2 Client Bridges to Expand the Coverage Area on page 9-30*.

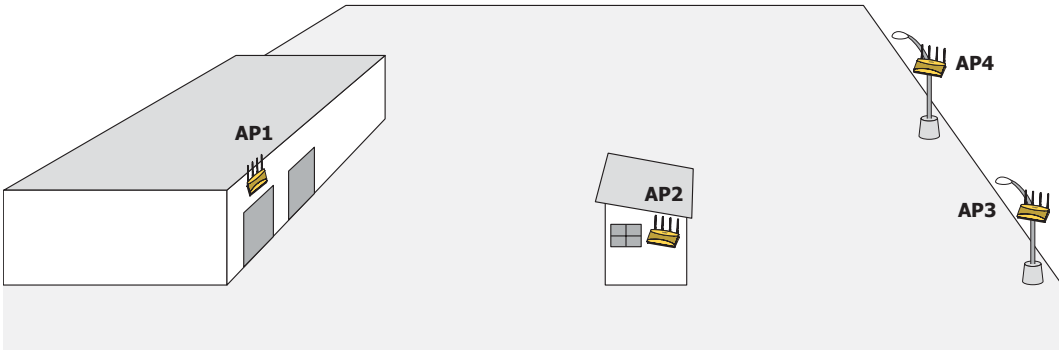
## 9.3.2 Adding 2 Client Bridges to Expand the Coverage Area

After a prosperous six months with their existing 2 access point mesh network, Trion Enterprises needs and approves the addition of two additional access points (AP3 and AP4) to be configured as repeaters (both client and base bridges). Configuring AP3 and AP4 as repeaters entails configuring an AP3 and an AP4 radio as both a client bridge and a base bridge.

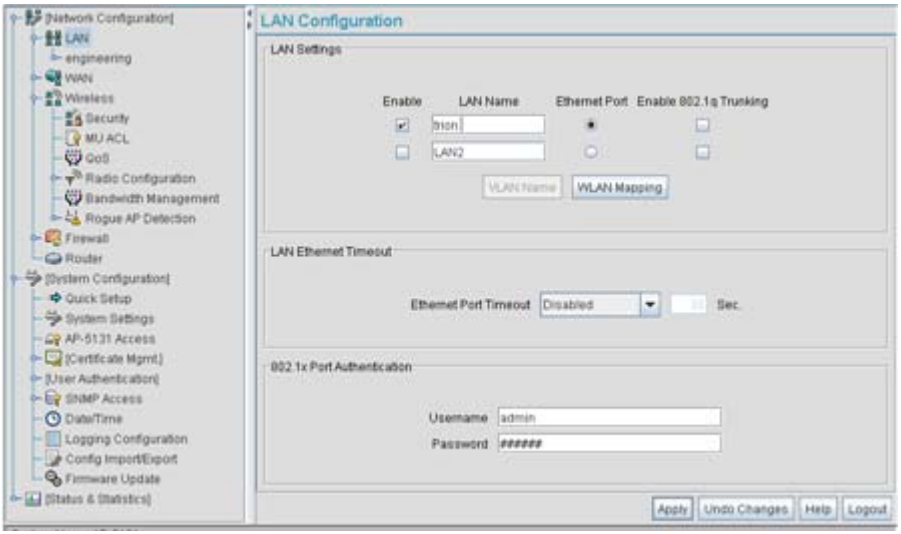
To configure AP3 and AP4 as repeaters, the IT Team does the following:

1. The Trion IT department verifies connectivity with AP3 and AP4 following the instructions in *Testing Connectivity on page 3-11*.
2. The Trion IT Department installs AP3 and AP4 on light poles (in the middle of the shipping yard) where power is available and a secure mesh network (AP1 and AP2) is already within

broadcast range (see the illustration below). The Trion IT department follows the instructions in *Wall Mounted Installations on page 2-14* to install AP3 and AP4.

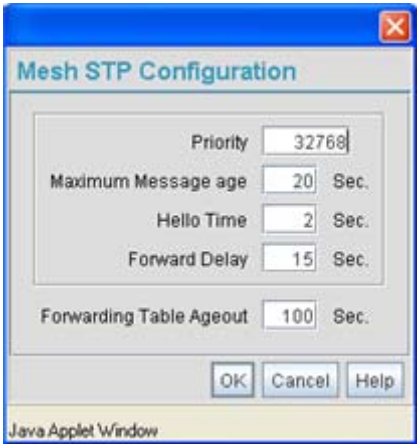



3. The Trion IT department selects **Network Configuration -> LAN** from the AP-5131 menu tree.




4. The Trion IT department verifies the LAN used to support the mesh network is enabled for both AP3 and AP4, (by selecting the **Enable** checkbox).
5. The Trion IT department then selects **Network Configuration -> LAN -> trion** from the AP-5131 menu tree.
6. The IT team selects the **Mesh STP Configuration** button on the bottom of the screen.

7. The Trion IT department leaves the **Priority** setting to at 32768 for AP3 and AP4 for both to defer to AP1 (which was assigned a priority of 1 for root designation) as the access point defining the mesh network configuration.




The remainder of the Mesh STP Configuration settings are left unchanged from their default values. The team clicks **OK** from within the Mesh STP Configuration screen and **Apply** from within the trion (LAN1) screen to save the settings.

The Trion IT team now intends to assign WLANs (to use with the trion LAN) that can be dedicated to their mesh network within the shipping yard.

8. The team selects **Network Configuration -> Wireless** from the AP-5131 menu tree.

   The **Wireless Configuration** screen displays with those existing WLANs displayed within the table. Since this is Trion's first deployment for AP3 and AP4, the IT department determines the existing default WLAN should be left as is, and a new WLAN should be configured closely resembling the mesh network WLAN defined for AP1 and AP2.

9. The team selects the **Edit** button to revise (and rename) the existing default WLAN to support mesh networking.


10. The Trion IT team assigns AP3 and AP4 an ESSID of 103. Therefore, AP1 and AP2 should be able to "see" AP3 and AP4 as soon as they are deployed.
11. The team assigns the name of "**trion mesh**" to the WLAN to be consistent with the WLAN supporting mesh networking on AP1 and AP2.
12. The team selects the 802.11a Radio checkbox for both AP3 and AP4. Like AP1, the 802.11b/g radios will be used to service MUs on a different WLAN, thus segregating MU traffic from the mesh traffic proliferating the 802.11a radio.

13. The team does not want any MUs connecting to the mesh WLAN, only the devices comprising the mesh network. Therefore, the team leaves the **Maximum MUs** field as is, and will use the Radio Configuration page to control the number of client bridge connections.
14. The team verifies the **Enable Client Bridge Backhaul** checkbox is selected for both AP3 and AP4 to ensure the WLAN is available in the **WLAN** drop-down menu within the **Radio Configuration** screen.
15. The IT team then verifies that steps 10 through 14 have been carried out identically for both AP3 and AP4.

    The IT team now needs to define a security policy for AP3 and AP4 complimentary with the policy created for AP1 and AP2 to both protect the data within the mesh network and ensure all 4 access points within the network can interact with one another.
16. The IT Team selects the **Create** button to the right of the **Security Policy** drop-down menu and defines a WPA2/CCMP supported security policy exactly like the one created for AP1 and AP2. For more information, see how the team defined the security policy starting on step 16 within *Trion's Initial Deployment on page 9-19*.

    It is assumed all of the existing MU traffic defined for AP1 and AP2 will also be used in the extended coverage area for AP3 and AP4 with no known additions to the MU traffic at this time. Thus the IT team refers to the ACL created for AP1 and AP2 and defines an ACL exactly like it for AP3 and AP4.
17. The team selects the **Create** button (to the right of the **MU Access Contro**l drop-down menu and defines an ACL policy like the one created for AP1 and AP2. The team also remembers to go to the AP1 ACL and add AP3 and AP4 to the list of devices allowed to connect to AP1.

    For more information, see how the team defined the ACL policy starting on step 22 within *Trion's Initial Deployment on page 9-19*.
18. The team decides to leave the **Disallow MU to MU Communication** checkbox unselected for the mesh WLAN for AP3 and AP4, as the team still considers all MU traffic within the shipping yard known and not a threat to the growing mesh network.
19. The team selects the **Use Secure Beacon** checkbox from the Edit WLAN screen to not transmit the AP- 5131's ESSID between APs 1 through 4. If a hacker tries to find an ESSID via an MU, the AP- 5131's ESSID does not display since the ESSID is not in the beacon.
20. The team does not select the **Accept Broadcast ESSID** checkbox, as they still do not want MUs randomly joining their carefully constructed mesh network.

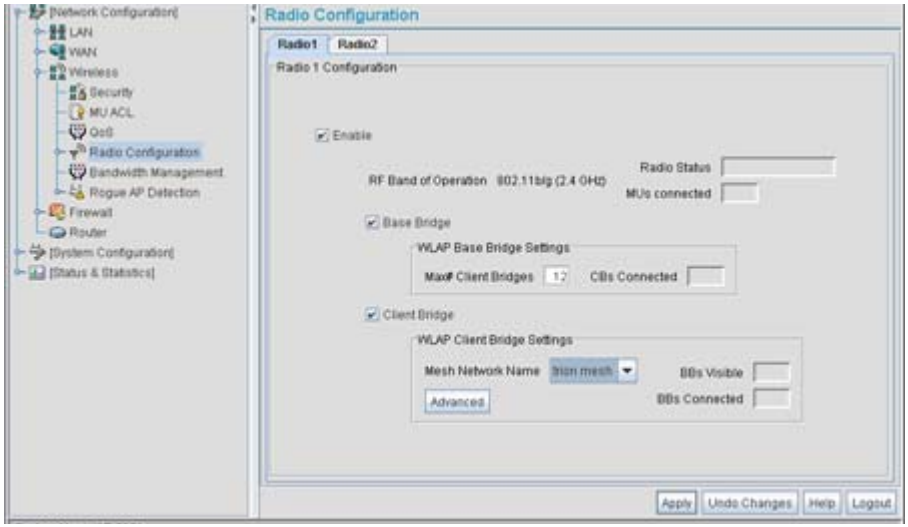
21. Now a QoS policy needs to be defined for the shipping and receiving mesh WLAN. The IT Team still envisions little (if any) video or voice traffic within the shipping as the MUs within primarily scan bar codes and upload data. This holds true for the QoS requirements for AP3 and AP4 as the required coverage area has grown, not the security, access permission or QoS considerations. For more information, see how the team defined the AP1 and AP2 QoS policy starting on step 25 within *Trion's Initial Deployment on page 9-19*.

    The WLAN configuration has now been set for both AP3 and AP4. The team now needs to define the radio configurations for AP3 and AP4.

22. The IT team selects **Network Configuration** -> **Wireless** -> **Radio Configuration** from the AP-5131 menu tree.

    The **Radio Configuration** screen displays.

23. For both AP3 and AP4, the IT Team enables Radio 1 and defines the radio as a repeater (enabling each radio as both a base and client bridge).




    Both AP3 and AP4 are intended to pass along mesh network back data to AP1 and support the 802. 11b/g MUs within the shipping yard.

24. The IT Team leaves each radio's **Max # Client Bridge** setting at the default setting of 12. This ensures as client bridges are added to the growing mesh network that they can be accounted for.

25. For both AP3 and AP4, the IT Team uses the **Mesh Network Name** drop-down menu to assign the "**trion mesh**" WLAN to radio 1. This is the WLAN the AP3 and AP4 radios will use to interoperate with the MUs populating the shipping yard.

26. As with AP1 and AP2, the IT Team decides to not select the **Advanced** button within the AP3 and AP4 WLAP Client Bridge Settings field.
27. The Trion IT Team clicks **Apply** within both the AP3 and AP4 Radio Configuration screens to complete the mesh network configuration of each AP3 and AP4 radio.

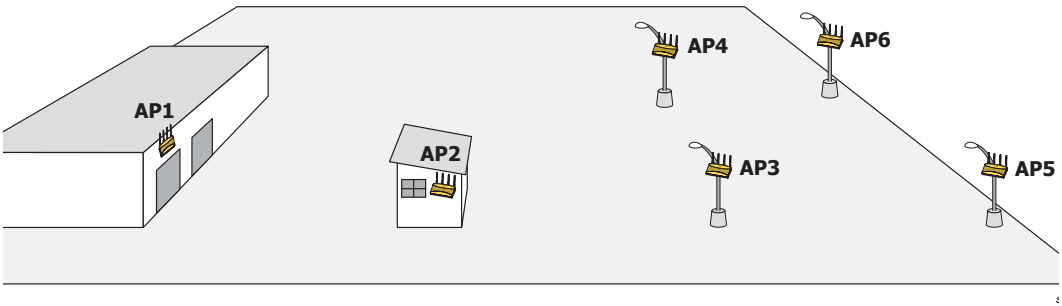
    For the next 9 months, the Trion Enterprises' mesh network consists of AP1 and AP2 and now AP3 and AP4 extending the mesh coverage range further into the shipping yard. AP1 is still the root bridge in the mesh network. The IT Team will appraise their mesh requirements in another 9 months and (if necessary) add additional access points and MUs to the mesh network.

### *9.3.3 Adding 2 More Client Bridges to the Trion Network*

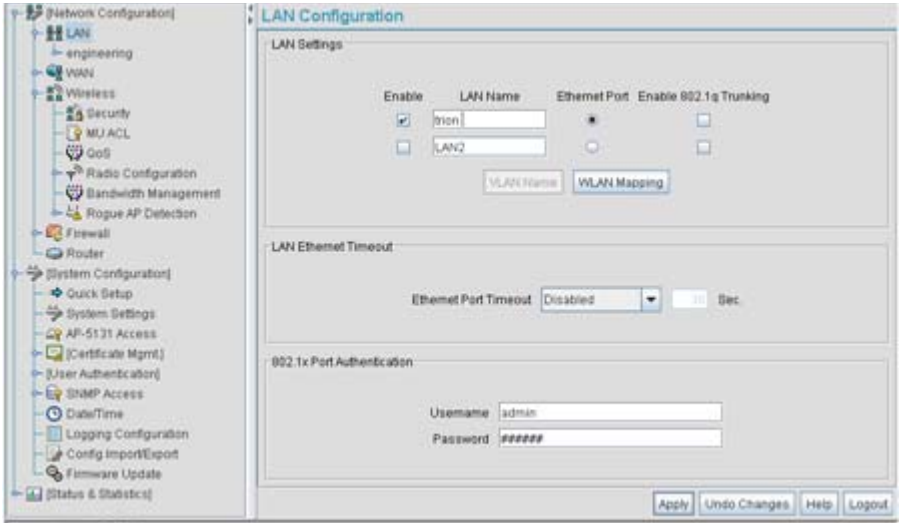
After an additional six months with their existing 4 access point mesh network, Trion Enterprises needs and approves the addition of two additional access points (AP5 and AP6) to be configured as client bridges. The team will configure AP5 and AP6 as client bridges and not base bridges or repeaters since Trion Enterprises does not plan to expand its shipping yard and the mesh network would have all the access points needed to support it. Thus, one AP5 and AP6 radio will be providing mesh coverage to the outer portion of the shipping yard without having to provide base bridge or repeater support to new members of the mesh network. The remaining AP5 and AP5 radio can support shipping yard MU traffic using a non-mesh WLAN.

To configure AP5 and AP6 as client bridges, the IT Team does the following:

1. The Trion IT department verifies connectivity with AP5 and AP6 following the instructions in *Testing Connectivity on page 3-11*.
2. The Trion IT Department installs AP5 and AP6 on light poles (in a new expanded are of the shipping yard) where power has been made available and a secure mesh network (APs 1-4) is within broadcast range (see the illustration below). The Trion IT department follows the instructions in *Wall Mounted Installations on page 2-14* to install AP5 and AP6.

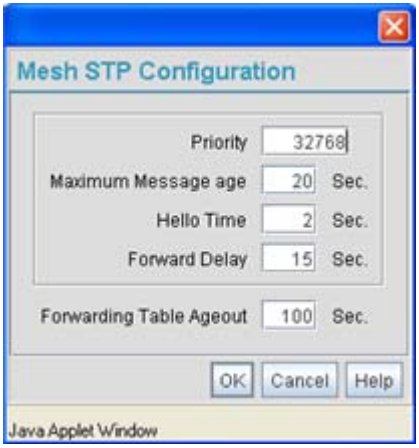


3. The Trion IT department selects **Network Configuration -> LAN** from the AP-5131 menu tree.




4. The Trion IT department verifies the LAN used to support the mesh network is enabled for both AP5 and AP6, (by selecting the **Enable** checkbox).
5. The Trion IT department then selects **Network Configuration -> LAN -> trion** from the AP-5131 menu tree.
6. The IT team selects the **Mesh STP Configuration** button on the bottom of the screen.

7. The Trion IT department leaves the **Priority** setting to at 32768 for AP5 and AP6 for both to defer to AP1 (which was assigned a priority of 1 for root designation) as the access point defining the mesh network configuration.




   The remainder of the Mesh STP Configuration settings are left unchanged from their default values. The team clicks **OK** from within the Mesh STP Configuration screen and **Apply** from within the trion (LAN1) screen to save the settings.

   The Trion IT team now intends to assign WLANs (to use with the trion LAN) that can be dedicated to their mesh network within the shipping yard.

8. The team selects **Network Configuration -> Wireless** from the AP-5131 menu tree.

   The **Wireless Configuration** screen displays with those existing WLANs displayed within the table. Since this is Trion's first deployment for AP5 and AP6, the IT department determines the existing default WLAN should be left as is, and a new WLAN should be configured resembling the mesh network WLAN defined for APs 1-4.

9. The team selects the **Edit** button to revise (and rename) the existing default WLAN to support mesh networking.


10. The Trion IT team assigns the WLAN an ESSID of 103 to be consistent with the trion mesh WLAN ESSID of the other four access points within the mesh network.
11. The team assigns the name of "**trion mesh**" to the WLAN to be consistent with the WLAN supporting mesh on APs 1-4.
12. The team selects the 802.11a Radio checkbox for both AP5 and AP6. The 802.11b/g radio on both AP5 and AP6 will be used to service MUs (on a different WLAN). Thus, MU traffic will be segregated from the mesh traffic proliferating each AP's 802.11a radio.

13. The team still does not want any MUs connecting to the mesh WLAN, only the devices comprising the mesh network. Therefore, the team leaves the **Maximum MUs** field as is, and will use the Radio Configuration page to control the number of client bridge connections within the mesh WLAN.
14. The team verifies the **Enable Client Bridge Backhaul** checkbox is selected for both AP5 and AP6 to ensure the WLAN is available in the **WLAN** drop-down menu within the **Radio Configuration** screen.
15. The IT team then verifies that steps 10 through 14 have been carried out identically for both AP5 and AP6.

    The IT team now needs to define a security policy for AP5 and AP4 complimentary with the policy created for APs 1-4.
16. The IT Team defines a WPA2/CCMP security policy exactly like the one created for APs 1-4. For more information, see how the team initially defined the security policy starting on step 16 within *Trion's Initial Deployment on page 9-19*.
17. Existing MU traffic within the mesh network will be used within the expanded shipping yard. Thus, the IT team refers to the ACLs created for APs 1-4 and defines an ACL exactly like it for AP5 and AP6. The team also remembers to go to the ACL for AP1, AP3 and AP4 and add AP5 and AP6 in order for each device in the mesh network to communicate with one another.

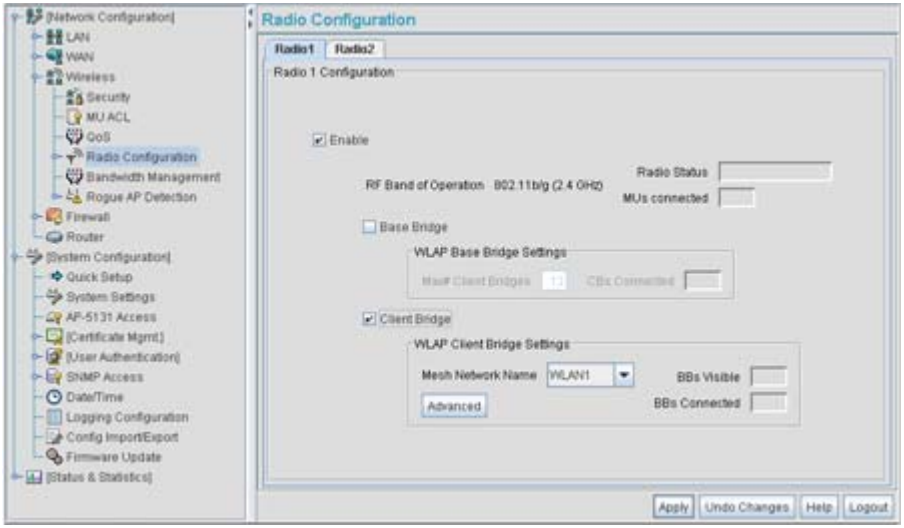
    For more information, refer to step 22 within *Trion's Initial Deployment on page 9-19*.
18. The team decides to leave the **Disallow MU to MU Communication** checkbox unselected for AP5 and AP6, as the team still considers all MU traffic within the shipping yard known and not a threat to the growing mesh network.
19. The team selects the **Use Secure Beacon** checkbox from the Edit WLAN screen to not transmit the AP- 5131's ESSID between APs 1 through 6. If a hacker tries to find an ESSID via an MU, the AP- 5131's ESSID does not display since the ESSID is not in the beacon.
20. The team does not select the **Accept Broadcast ESSID** checkbox, as they still do not want MUs randomly joining their carefully constructed mesh network.
21. The IT Team still envisions little (if any) video or voice traffic within the shipping as the MUs within primarily scan bar codes and upload data. This still holds true for the QoS requirements for AP5 and AP6, as the required coverage area has continued to grow, but not the security, access permissions or QoS considerations. For more information, see how the team defined the QoS policy for APs 1-4 starting on step 25 within *Trion's Initial Deployment on page 9-19*.

    The team now needs to define the radio configurations for AP5 and AP6.

22. The IT team selects **Network Configuration** -> **Wireless** -> **Radio Configuration** from the AP-5131 menu tree.

    The **Radio Configuration** screen displays.

23. For both AP5 and AP6, the IT Team enables Radio 1 and defines the radio as a client bridge.




24. For both AP5 and AP6, the IT Team uses the **Mesh Network Name** drop-down menu to assign the "**trion mesh**" WLAN to radio 1.

25. As with APs 1-4, the IT Team decides to not select the **Advanced** button within the WLAP Client Bridge Settings field.

26. The Trion IT Team clicks **Apply** within both the AP5 and AP6 Radio Configuration screens to complete the mesh network configuration of each AP5 and AP6 radio.

    For the foreseeable future, the Trion Enterprises' mesh network will consist of APs 1-6. AP1 remains the root bridge in the mesh network. If the physical radio coverage area requirements of the mesh network were to grow, AP5 and AP6 would have to be changed from client bridges to repeaters to associate with the new APs required to extent the coverage area. But for now, the 802.11a radio of both AP5 and AP6 can remain defined as a client bridge to support the outer fringes of the Trion Enterprises shipping yard.

# A Technical Specifications

This appendix provides technical specifications in the following areas:

- *Physical Characteristics*
- *Electrical Characteristics*
- *Radio Characteristics*
- *Antenna Specifications*
- *Country Codes*

# A.1 Physical Characteristics

## A.1.1 AP-5131 Physical Characteristics

The AP-5131 has the following physical characteristics:

| | |
|---|---|
| *Dimensions* | 5.32 inches long x 9.45 inches wide x 1.77 inches thick.<br>135 mm long x 240 mm wide x 45 mm thick. |
| *Housing* | Metal, Plenum Housing (UL2043) |
| *Weight* | 1.95 lbs/0.88 Kg (single-radio model)<br>2.05 lbs/0.93 Kg (dual-radio model) |
| *Operating Temperature* | -20 to 50° Celsius |
| *Storage Temperature* | -40 to 70° Celsius |
| *Altitude* | 8,000 feet/2438 m @ 28° Celsius (operating)<br>15,000 feet/4572 m @ 12° Celsius (storage) |
| *Vibration* | Vibration to withstand .02g²/Hz, random, sine, 20-2k Hz |
| *Humidity* | 5 to 95% (operating) 5 to 85% (storage) |
| *Electrostatic Discharge* | 15kV (air) @ 50% rh<br>8kV (contact) @ 50% rh |
| *Drop* | Bench drop 36 inches to concrete (excluding side with connectors) |

## *A.1.2 AP-5181 Physical Characteristics*

The AP-5181 has the following physical characteristics:

| | |
|---|---|
| *Dimensions* | TBD |
| *Housing* | TBD |
| *Weight* | TBD |
| *Operating Temperature* | 30 to 55° Celsius |
| *Storage Temperature* | 40 to 85° Celsius |
| *Altitude* | 8,000 feet/2438 m @ 28° Celsius (operating)<br>15,000 feet/4572 m @ 12° Celsius (storage) |
| *Vibration* | Vibration to withstand .02g²/Hz, random, sine, 20-2k Hz |
| *Humidity* | 5 to 95% (operating) 5 to 95% (storage) |
| *Electrostatic Discharge* | 15kV (air) @ 50% rh<br>8kV (contact) @ 50% rh |
| *Drop* | Bench drop 36 inches to concrete |
| *Wind Blown Rain* | 40 MPH @ 0.1inch/minute, 15 minutes |
| *Rain/Drip/Spill* | IPX5 Spray @ 4L/minute, 10 minutes |
| *Dust* | IP6X 20mb vacuum max, 2 hours, stirred dust,<br>.88g/m^3 concentration @ 35%RH |

## A.2 Electrical Characteristics

Both the AP-5131 and the AP-5181 access points have the following electrical characteristics:

**CAUTION** An AP-5181 model access point cannot use the AP-5131 recommended Symbol 48-Volt Power Supply (Part No. 50-24000-050). However, Symbol does recommend the AP-PSBIAS-5181-01R model power supply for use the AP-5181.

| | |
|---|---|
| *Operating Voltage* | 48Vdc (Nom) |
| *Operating Current* | 200mA (Peak) @ 48Vdc<br>170mA (Nom) @ 48Vdc |

## A.3 Radio Characteristics

The AP-5131 and AP-5181 access points have the following radio characteristics:

*Operating Channels*

802.11a radio - Channels 34-161 (5170-5825 MHz)

802.11b/g radio - Channels 1-13 (2412-2472 MHz)
802.11b/g radio - Channel 14 (2484 MHz Japan only)

*Actual operating frequencies depend on regulatory rules and certification agencies.*

*Receiver Sensitivity*

| 802.11a Radio | 802.11b/g Radio |
|---|---|
| 6 Mbps -88 | 11 Mbps -84 |
| 9 Mbps -87 | 5.5 Mbps -88 |
| 12 Mbps -85 | 2 Mbps -90 |
| 18 Mbps -81 | 1 Mbps -94 |
| 24 Mbps -79 | |
| 36 Mbps -75 | |
| 48 Mbps -70 | |
| 54 Mbps -68 | |

** all values in dBm*

| | |
|---|---|
| *Radio Data Rates* | 802.11a radio 6, 9, 12, 18, 24, 36, 48, and 54 Mbit/Sec<br>802.11g radio 6, 9, 12, 18, 24, 36, 48, and 54 Mbit/Sec<br>802.11b radio 1, 2, 5.5, 11 Mbps |
| *Wireless Medium* | Direct Sequence Spread Spectrum (DSSS)<br>Orthogonal Frequency Division Multiplexing (OFDM) |

# A.4 Antenna Specifications

The antenna suite differs between the AP-5131 and AP-5181 model access points. Ensure your have selected the correct model antenna before deploying the access point. For more information, see:

- *AP-5131 Antenna Specifications*
- *AP-5181 Antenna Specifications*

## *A.4.1 AP-5131 Antenna Specifications*

**CAUTION** Using an antenna other than the Dual-Band Antenna (Part No. ML-2452-APA2-01) could render the AP-5131's Rogue AP Detector Mode feature inoperable. Contact your Symbol sales associate for specific information.

### A.4.1.1 2.4 GHz Antenna Matrix

The following table describes each 2.4 GHz antenna approved for use with the AP-5131.

| Symbol Part Number | Antenna Type | Nominal Net Gain (dBi) |
|---|---|---|
| ML-2499-11PNA2-01R | Wide Angle Directional | 8.5 |
| ML-2499-HPA3-01R | Omni-Directional Antenna | 3.3 |
| ML-2499-BYGA2-01R | Yagi Antenna | 13.9 |
| ML-2452-APA2-01 | Dual-Band | 3.0 |

### A.4.1.2 5.2 GHz Antenna Matrix

The following table describes each 5.2 GHz antenna approved for use with the AP-5131.

| Symbol Part Number | Antenna Type | Nominal Net Gain (dBi) |
|---|---|---|
| ML-5299-WPNA1-01R | Panel Antenna | 13.0 |
| ML-5299-HPA1-01R | Wide-Band Omni-Directional Antenna | 5.0 |
| ML-2452-APA2-01 | Dual-Band | 4.0 |

### A.4.1.3 AP-5131 Additional Antenna Components

The following table lists the Symbol part number for various antenna accessories. This table also includes the loss for each accessory at both 2.4 and 5.2 GHz.

| Item | Symbol Part Number | Description | Loss (db) @ 2.4 GHz | Loss (db) @ 5.2 GHz |
|---|---|---|---|---|
| 72PJ | ML-1499-72PJ-01R | Cable Extension | 2.5 | |
| LAK1 | ML-1499-LAK1-01R | Lightning Arrestor+ | 0.75 | |
| LAK2 | ML-1499-LAK2-01R | Lightning Arrestor | 0.25 | |
| 10JK | ML-1499-10JK-01R | Jumper Kit | 0.75 | 1.6 |
| 25JK | ML-1499-25JK-01R | Jumper Kit | 1.9 | 3.5 |
| 50JK | ML-1499-50JK-01R | Jumper Kit | 3.75 | 6.6 |
| 100JK | ML-1499-100JK-01R | Jumper Kit | 7.5 | 12.8 |

### A.4.1.4 AP-5131 Antenna Accessory Connectors, Cable Type and Length

The following table describes each antenna accessory's connector and cable type, plus the length.

| Item | Connector1 | Connector2 | Length (meters) | Cable Type |
|---|---|---|---|---|
| 72PJ | RPBNC-F | RPBNC-M | 1.83 | RG-58 |
| LAK1 | RPBNC-F | N-F | 0.305 | RG-58 |
| LAK2 | N-F | N-M | | |
| 10JK | N-M | N-M | 3.05 | RG-8 |

| Item | Connector1 | Connector2 | Length (meters) | Cable Type |
|---|---|---|---|---|
| 25JK | N-M | N-M | 7.62 | RG-8 |
| 50JK | N-M | N-M | 15.24 | RG-8 |
| 100JK | N-M | N-M | 30.48 | RG-8 |

### *A.4.2 AP-5181 Antenna Specifications*

TBD

## A.5 Country Codes

The following list of countries and their country codes is useful when using the access point configuration file, CLI or the MIB to configure the access point:

| ***Country*** | ***Code*** | ***Country*** | ***Code*** |
|---|---|---|---|
| Argentina | AR | New Zealand | NZ |
| Australia | AU | Norway | NO |
| Austria | AT | Oman | OM |
| Bahrain | BH | Peru | PE |
| Belarus | BY | Philippines | PH |
| Belgium | BE | Poland | PL |
| Brazil | BR | Portugal | PT |
| Bulgaria | BG | Qatar | QA |
| Canada | CA | Romania | RO |
| Chile | CL | Russian Federation | RU |
| China | CN | Saudi Arabia | SA |
| Colombia | CO | Singapore | SG |
| Costa Rica | CR | Slovak Republic | SK |
| Croatia | HR | Slovenia | SI |
| Cypress | CY | South Africa | ZA |

| | | | |
|---|---|---|---|
| Czech Rep. | CZ | South Korea | KR |
| Denmark | DK | Spain | ES |
| Ecuador | EC | Sri Lanka | LK |
| Estonia | EE | Sweden | SE |
| Egypt | EG | Switzerland | CH |
| Finland | FI | Taiwan | TW |
| France | FR | Thailand | TH |
| Germany | DE | Turkey | TR |
| Greece | GR | Ukraine | UA |
| Hong Kong | HK | UAE | AE |
| Hungary | HU | United Kingdom | UK |
| Iceland | IS | USA | US |
| India | IN | Uruguay | UY |
| Indonesia | ID | Vietnam | VN |
| Ireland | IE | Venezuela | VE |
| Israel | IL | | |
| Italy | IT | | |
| Japan | JP | | |
| Jordan | JO | | |
| Kazakhanstan | KZ | | |
| Kuwait | KW | | |
| Latvia | LV | | |
| Liechtenstein | LI | | |
| Lithuania | LT | | |
| Luxembourg | LU | | |
| Malaysia | MY | | |
| Malta | MT | | |

| | |
|---|---|
| Mexico | MX |
| Morocco | MA |
| Nambia | NA |
| Netherlands | NL |

# B

# Usage Scenarios

This appendix provides practical usage scenarios for many of the access point's key features. This information should be referenced as a supplement to the information contained within this access point *Product Reference Guide*.

The following scenarios are described:

- *Configuring Automatic Updates using a DHCP or Linux BootP Server Configuration*
- *Configuring an IPSEC Tunnel and VPN FAQs*

## B.1 Configuring Automatic Updates using a DHCP or Linux BootP Server Configuration

This section provides specific details for configuring either a DHCP or Linux BootP Server to receive firmware or configuration file updates from an access point.

## B.1.1 Windows - DHCP Server Configuration

See the following sections for information on these DHCP server configurations in the Windows environment:

- *Embedded Options - Using Option 43*
- *Global Options - Using Extended/Standard Options*
- *DHCP Priorities*

### B.1.1.1 Embedded Options - Using Option 43

This section provides instructions for automatic update of firmware and configuration file via DHCP using extended options or standard options configured globally.

The setup example described in this section includes:

- 1 AP-5131 or AP-5181 model access point
- 1 Microsoft Windows DHCP Server
- 1 TFTP Server

Note the following caveats regarding this procedure before beginning:

- Ensure the LAN Interface is configured as a DHCP Client
- If the existing and update firmware files are the same, the firmware will not get updated.

To configure the DHCP Server for automatic updates:

1. Set the Windows DHCP Server and access point on the same Ethernet segment.
2. Configure the Windows based DHCP Server as follows:
   a. Highlight the Server Domain Name (for example, apfw.symbol.com). From the **Action** menu, select **Define Vendor Classes**.
   b. Create a new vendor class. For example, AP5131 Options.
   c. Enter the Vendor Class Identifier **SymbolAP.5131-V1-0**. Enter the value in ASCII format, the server converts it to hex automatically.
   d. From the **Action** menu, select **Set Predefined Options**.

e. Add the following 3 new options under AP5131 Options class:

| | ***Code*** | ***Data type*** |
|---|---|---|
| Access point TFTP Server IP Address<br>(Note: Use any one option) | 181<br>186 | IP address<br>String |
| Access point Firmware File Name | 187 | String |
| Access point Config File Name<br>(Note: Use any one option) | 129<br>188 | String<br>String |

f. Highlight **Scope Options** from the tree and select **Configure Options**.

g. Go to the **Advanced** tab. From under the Vendor Class Options, check all three options mentioned in the table above and enter a value for each option.

3. Copy the firmware and configuration files to the appropriate directory on the TFTP Server.

   By default, the auto update is enabled on the WAN Port (has to be DHCP Client).

4. Restart the access point.
5. While the access point boots, verify the access point:
   - Obtains and applies the expected IP Address from the DHCP Server
   - Downloads both the firmware and configuration files from the TFTP Server and updates both as needed.
   - Verify the file versions from the access point's **System Settings** screen.

### B.1.1.2 Global Options - Using Extended/Standard Options

The following are instructions for automatic firmware and configuration file updates via DHCP using extended options or standard options configured globally.

The setup example described in this section includes:

- 1 AP-5131 or AP-5181 model access point
- 1 Microsoft Windows DHCP Server
- 1 TFTP Server.

Note the following caveats regarding this procedure before beginning:

- For updates using the LAN Port, change the interface on the **Firmware Update** screen from WAN to LAN. Also ensure the LAN Interface is configured as a DHCP Client
- If the existing and update firmware files are the same, the firmware will not get updated.

To configure Global options using extended/standard options:

1. Set the Windows DHCP Server and access point on the same Ethernet segment.
2. Configure the Windows based DHCP Server as follows:
   a. Highlight the Server Domain Name (for example, apfw.symbol.com). From the **Action** menu, select **Set Predefined Options.**
   b. Add the following 3 new options under **DHCP Standard Options** class:

| ***Extended Options*** | ***Code*** | ***Data type*** |
|---|---|---|
| Access point TFTP Server IP Address | 181 | IP address |
| (Note: Use any one option) | 186 | String |
| Access Point Firmware File Name | 187 | String |
| Access Point Config File Name | 129 | String |
| (Note: Use any one option) | 188 | String |

| ***Standard Options*** | ***Code*** | ***Data type*** |
|---|---|---|
| Access point TFTP Server IP Address | 66 | String |
| Access point Firmware File Name | 67 | String |

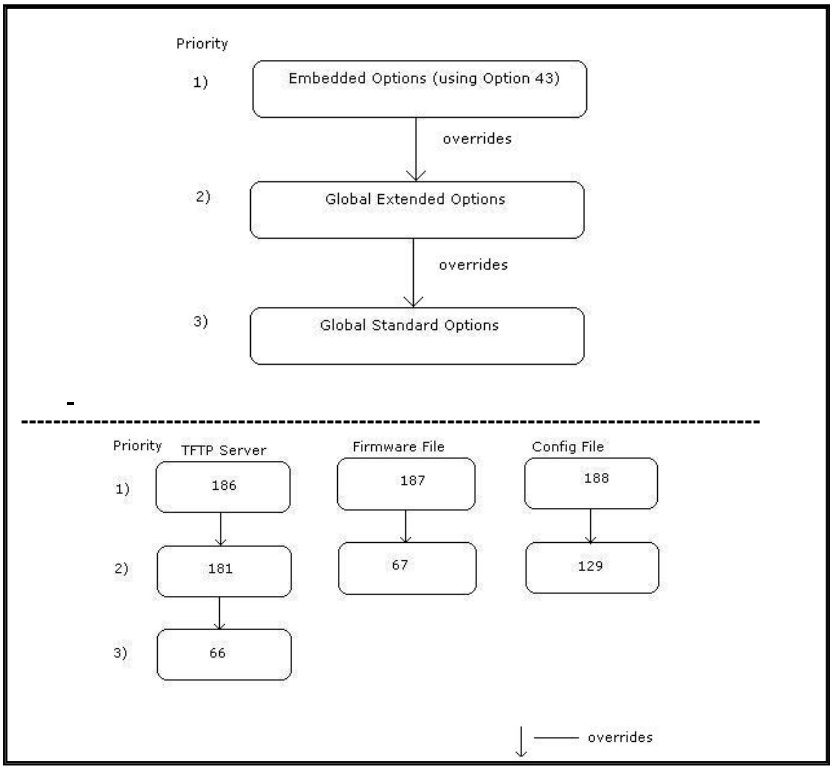
**NOTE** If using Standard Options and the configuration of the access point needs to be changed, use option 129 or 188 as specified in Extended Options table. Standard options 66 and 67 are already present in the DHCP Standard Options Class by default.

   c. Highlight **Scope Options** and select **Configure Options**.
   d. Under the **General** tab, check all 3 options mentioned within the Extended Options table and enter a value for each option.
3. Copy both the firmware and configuration files to the appropriate directory on the TFTP Server.
4. Restart the access point.
5. While the access point boots up, verify the access point:
   - Obtains and applies the expected IP Address from the DHCP Server
   - Downloads the firmware and configuration files from the TFTP Server and updates both as required.

- Verify the file versions within the access point's **System Settings** screen.

### B.1.1.3 DHCP Priorities

The following flowchart indicates the priorities used by the access point when the DHCP server is configured for options.




If the DHCP Server is configured for options 186 and 66 (to assign TFTP Server IP addresses) the access point uses the IP address configured for option 186. Similarly, if the DHCP Server is configured for options 187 and 67 (for the firmware file) the access point uses the file name configured for option 187. If the DHCP Server is configured for embedded and global options, the embedded options take precedence.

## B.1.2 Linux - BootP Server Configuration

See the following sections for information on these BootP server configurations in the Linux environment:

- *BootP Options*
- *BootP Priorities*

### B.1.2.1 BootP Options

This section contains instructions for the automatic update of the access point firmware and configuration file using a BootP Server.

The setup example described in this section includes:

- 1 AP-5131 or AP-5181 model access point
- 1 Linux/Unix BOOTP Server
- 1 TFTP Server.

Please note the following caveats regarding this procedure before beginning:

- The LAN Port needs to be configured as a BootP client.
- No BootP support is available on the WAN Port.
- If the existing and update firmware files are the same, the firmware will not get updated.

To configure BootP options using a Linux/Unix BootP Server:

1. Set the Linux/Unix BootP Server and access point on the same Ethernet segment.
2. Configure the bootptab file (/etc/bootptab) on the Linux/Unix BootP Server in any one of the formats that follows:

   **Using options 186, 187 and 188:**

```
AP-5131:ha=00a0f88aa6d8\          < LAN MAC Address>
        :sm=255.255.255.0\          <Subnet Mask>
        :ip=157.235.93.128\         <IP Address>
        :gw=157.235.93.2\           <gateway>
        :T186="157.235.93.250"\     <TFTP Server IP>
        :T187="apfw.bin"\           <Firmware file>
        :T188="cfg.txt":            <Configuration file>
```

**Using options 66, 67 and 129:**

```
AP-5131:ha=00a0f88aa6d8\            < LAN MAC Address>
        :sm=255.255.255.0\          <Subnet Mask>
        :ip=157.235.93.128\         <IP Address>
        :gw=157.235.93.2\           <gateway>
        :T66="157.235.93.250"\      <TFTP Server IP>
        :T67="apfw.bin"\            <Firmware file>
         :T129="cfg.txt":           <Configuration file>
```

**Using options sa, bf and 136:**

```
AP-5131:ha=00a0f88aa6d8\            < LAN MAC Address>
        :sm=255.255.255.0\          <Subnet Mask>
        :ip=157.235.93.128\         <IP Address>
        :gw=157.235.93.2\           <gateway>
        :sa=157.235.93.250\         <TFTP Server IP>
        :bf=/tftpboot/cfg.txt\      <Configuration file>
        :T136="/tftpboot/":         <TFTP root directory>
```

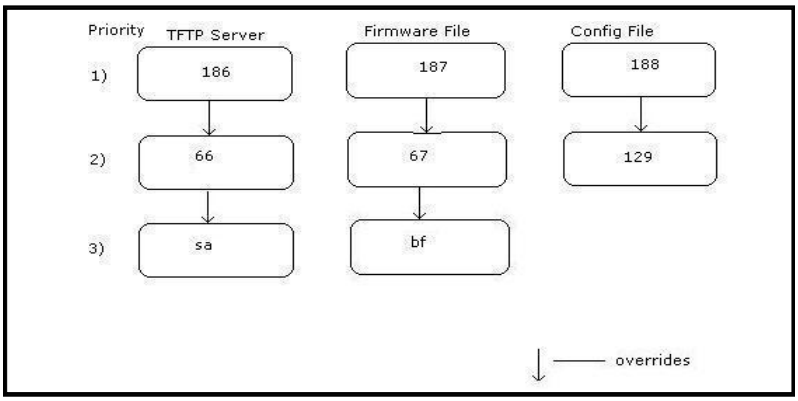
**NOTE** bf option prefixes a forward slash (/) to the firmware file name. This may not be supported on Windows based TFTP Servers.

3. Copy the firmware and configuration files to the appropriate directory on the TFTP Server.

   This has to be changed to the LAN Port. Additionally, the LAN Interface needs to be configured as a BootP Client.
4. Restart the access point.
5. While the access point boots, verify the access point:
   - Obtains and applies the expected IP Address from the BootP Server.
   - Downloads both the firmware and configuration files from the TFTP Server and updates them as required. Verify the file versions within the access point **System Settings** screen.

### B.1.2.2 BootP Priorities

The following flowchart displays the priorities used by the access point when the BootP server is configured for multiple options:




If the BootP Server is configured for options 186 and 66 (to assign TFTP server IP addresses) the access point uses the IP address configured for option 186. Similarly, if the BootP Server is configured for options 188 and 129 (for the configuration file) the access point uses the file name configured for option 188.

## B.2 Configuring an IPSEC Tunnel and VPN FAQs

The access point has the capability to create a tunnel between an access point and a VPN endpoint. The access point can also create a tunnel from one access point to another access point.

The following instruction assumes the reader is familiar with basic IPSEC and VPN terminology and technology.

- *Configuring a VPN Tunnel Between Two Access Points*
- *Configuring a Cisco VPN Device*
- *Frequently Asked VPN Questions*

### *B.2.1 Configuring a VPN Tunnel Between Two Access Points*

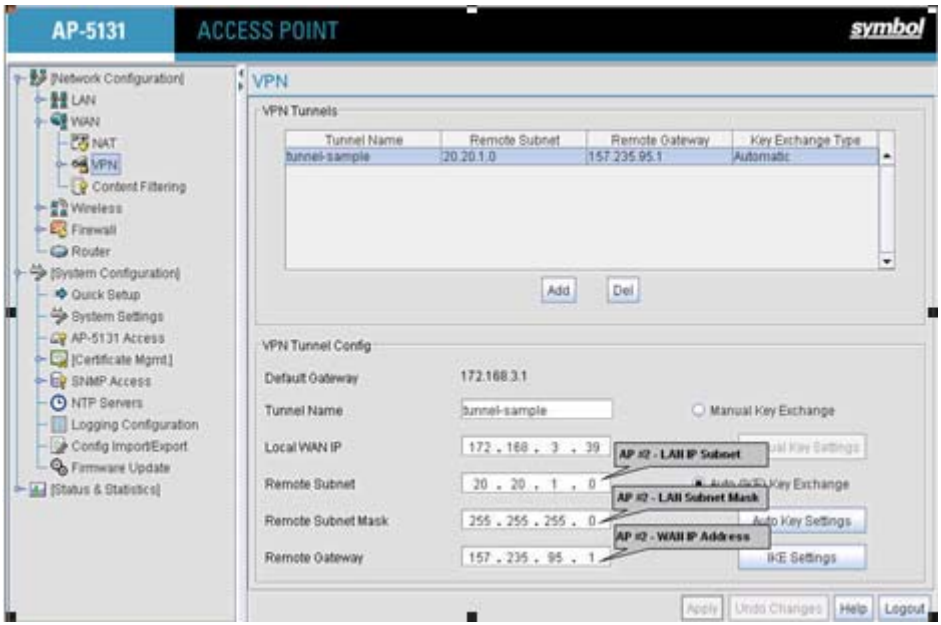
The access point can connect to a non-AP device supporting IPSec, such as a Cisco VPN device - labeled as "Device #2".

For this usage scenario, the following components are required:

- 2 AP-5131 or AP-5181 model access points
- 1 PC on each side of the access point's LAN.

To configure a VPN tunnel between two access points:

1. Ensure the WAN ports are connected via the internet.
2. On access point #1, select **WAN** -> **VPN** from the main menu tree.
3. Click **Add** to add the tunnel to the list.
4. Enter a tunnel name (tunnel names do not need to match).

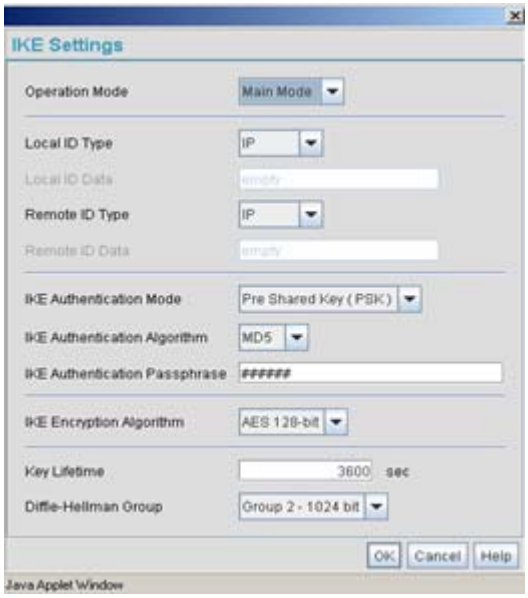



5. Enter the WAN port IP address of AP #1 for the **Local WAN IP**.
6. Within the **Remote Subnet** and **Remote Subnet Mask** fields, enter the LAN IP subnet and mask of AP #2 /Device #2.
7. Enter the WAN port IP address of AP #2/ Device #2 for a **Remote Gateway**.
8. Click **Apply** to save the changes.

**NOTE** For this example, Auto IKE Key Exchange is used. Any key exchange can be used, depending on the security needed, as long as both devices on each end of the tunnel are configured exactly the same.

9. Select the **Auto (IKE) Key Exchange** checkbox.
10. Select the **Auto Key Settings** button.

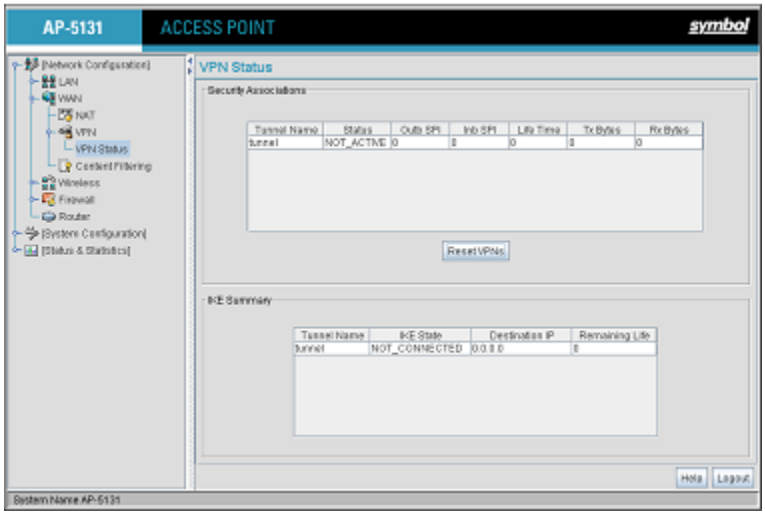

11. For the ESP Type, select **ESP with Authentication** and use **AES 128-bit** as the ESP Encryption Algorithm. Click **OK**.
12. Select the **IKE Settings** button.




13. Select **Pre Shared Key (PSK)** from the IKE Authentication Mode drop-down menu.
14. Enter a **Passphrase**. Passphrases must match on both VPN devices.

**NOTE** Ensure the IKE authentication Passphrase is the same as the Pre-shared key on the Cisco PIX device.

15. Select **AES 128-bit** as the IKE Encryption Algorithm.
16. Select **Group 2** as the Diffie -Hellman Group. Click **OK**. This will take you back to the VPN screen.
17. Click **Apply** to make the changes
18. Check the **VPN Status** screen. Notice the status displays "NOT_ACTIVE". This screen automatically refreshes to get the current status of the VPN tunnel. Once the tunnel is active, the IKE_STATE changes from NOT_CONNECTED to SA_MATURE.




19. On access point #2/ Device #2, repeat the same procedure. However, replace access point #2 information with access point #1 information.
20. Once both tunnels are established, ping each side of the tunnel to ensure connectivity.

## *B.2.2 Configuring a Cisco VPN Device*

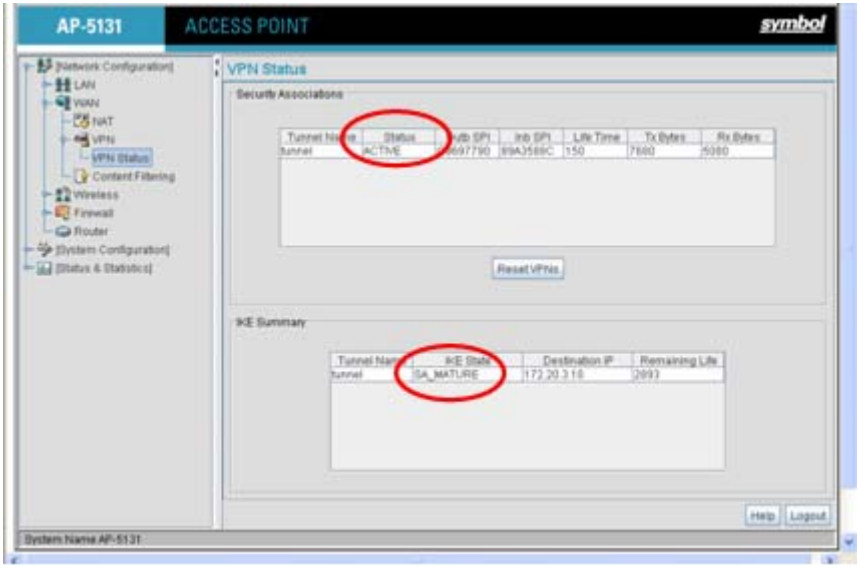
This section includes general instructions for configuring a Cisco PIX Firewall 506 series device.

For the usage scenario described in this section, you will require the following:

- 1 Cisco VPN device
- 1 PC connected to the LAN side of the access pointand the Cisco PIX.

**NOTE** The Cisco PIX device configuration should match the access point VPN configuration in terms of Local WAN IP (PIX WAN), Remote WAN Gateway (access point WAN IP), Remote Subnet (access point LAN Subnet), and the Remote Subnet Mask. The Auto Key Settings and the IKE Settings on the Cisco PIX should match the access point Key and IKE settings.

Below is how the access point VPN Status screen should look if the entire configuration is setup correctly once the VPN tunnel is active. The status field should display "ACTIVE".




## *B.2.3 Frequently Asked VPN Questions*

The following are common questions that arise when configuring a VPN tunnel using the access point.

- **Question 1: Does the access point IPSec tunnel support multiple subnets on the other end of a VPN concentrator?**

  **Yes.** The access point can access multiple subnets on the other end of the VPN Concentrator from the access point's Local LAN Subnet by:

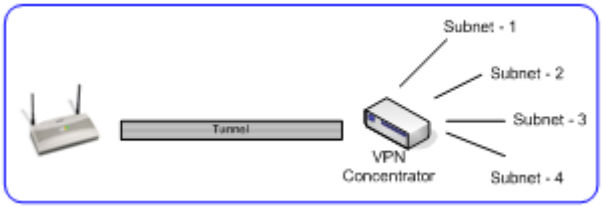
  - Creating multiple VPN Tunnels. The AP supports a maximum of 25 tunnels.
  - When using the Remote Subnet IP Address with an appropriate subnet mask, the AP can access multiple subnets on the remote end.

  For example: If creating a tunnel using 192.168.0.0/16 for the Remote Subnet IP address, the following subnets could be accessed:

  192.168.1.x

  192.168.2.x

  192.168.3.x, etc




- **Question 2: Even if a wildcard entry of "0.0.0.0" is entered in the Remote Subnet field in the VPN configuration page, can the AP access multiple subnets on the other end of a VPN concentrator for the APs LAN/WAN side?**

  **No.** Using a "0.0.0.0" wildcard is an unsupported configuration. In order to access multiple subnets, the steps in Question #1 must be followed.

- **Question 3: Can the AP be accessed via its LAN interface of AP#1 from the local subnet of AP#2 and vice versa?**

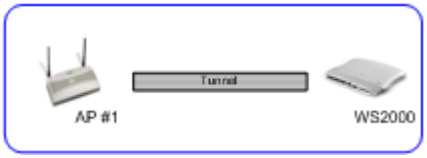
  **Yes.**


- **Question 4: Will the default "Manual Key Exchange" settings work without making any changes?**

  **No**. Changes need to be made. Enter Inbound and Outbound ESP Encryption keys on both APs. Each one should be of 16 Hex characters (depending on the encryption or authentication scheme used). The VPN tunnel can be established only when these corresponding keys match. Ensure the Inbound/Outbound SPI and ESP Authentication Keys have been properly specified.


- **Question 5: Can a tunnel between an access point and a WS2000 be established?**

**Yes.**




- **Question 6: Can an IPSec tunnel over a PPPoE connection be established - such as a PPPoE enabled DSL link?**

  **Yes**. The access point supports tunneling when using a PPPoE username and password.

- **Question 7: Can I setup an access point so clients can access both the WAN normally and only use the VPN when talking to specific networks?**

  **Yes**. Only packets that match the VPN Tunnel Settings will be sent through the VPN tunnel. All other packets will be handled by whatever firewall rules are set.

- **Question 8: How do I specify which certificates to use for an IKE policy from the access point certificate manager?**

  When generating a certificate to use with IKE, use one of the following fields: **IP address**, **Domain Name**, or **Email** address. Also, make sure you are using NTP when attempting to use the certificate manager. Certificates are time sensitive.

  Configure the following on the **IKE Settings** page:

  *Local ID type* refers to the way that IKE selects a local certificate to use.

  - IP - tries the match the local WAN IP to the IP addresses specified in a local certificate.
  - FQDN - tries to match the user entered local ID data string to the domain name field of the certificate.
  - UFQDN - tries to match the user entered local ID data string to the email address field of the certificate.

  *Remote ID type* refers to the way you identify an incoming certificate as being associated with the remote side.

  - IP - tries the match the remote gateway IP to the IP addresses specified in the received certificate.
  - FQDN - tries to match the user entered remote ID data string to the domain name field of the received certificate.

- UFQDN - tries to match the user entered remote ID data string to the email address field of the received certificate.


- **Question 9: I am using a direct cable connection between my two VPN gateways for testing and cannot get a tunnel established, yet it works when I set them up across another network or router. Why?**

  The packet processing architecture of the access point VPN solution requires the WAN default gateway to work properly. When connecting two gateways directly, you don't need a default gateway when the two addresses are on the same subnet. As a workaround, point the access point's WAN default gateway to be the other VPN gateway and vice-versa.

- **Question 10: I have setup my tunnel and the status still says 'Not Connected'. What should I do now?**

  VPN tunnels are negotiated on an "as-needed" basis. If you have not sent any traffic between the two subnets, the tunnel will not get established. Once a packet is sent between the two subnets, the VPN tunnel setup occurs.

- **Question 11: I still can't get my tunnel to work after attempting to initiate traffic between the two subnets. What now?**

  Try the following troubleshooting tips:

  - Verify you can ping each of the remote Gateway IP addresses from clients on either side. Failed pings can indicate general network connection problems.
  - Pinging the internal gateway address of the remote subnet should run the ping through the tunnel as well. Allowing you to test, even if there are no clients on the remote end.

- **Question 12: My tunnel works fine when I use the LAN-WAN Access page to configure my firewall. Now that I use Advanced LAN Access, my VPN stops working. What am I doing wrong?**

  VPN requires certain packets to be passed through the firewall. Subnet Access automatically inserts these rules for you when you do VPN. Advanced Subnet Access requires these rules to be in effect for each tunnel.

  - An 'allow' inbound rule.

    | | |
    |---|---|
    | Scr | <Remote Subnet IP range> |
    | Dst | <Local Subnet IP range> |
    | Transport | ANY |
    | Scr port | 1:65535 |
    | Dst port | 1:65535 |
    | Rev NAT | None |

  - An 'allow' outbound rule.

    | | |
    |---|---|
    | Scr | <Local Subnet IP range> |
    | Dst | <Remote Subnet IP range> |
    | Transport | ANY |
    | Scr port | 1:65535 |
    | Dst port | 1:65535 |
    | NAT | None |

  - For IKE, an 'allow' inbound rule.

| | |
|---|---|
| Scr | <Remote Subnet IP range> |
| Dst | <WAN IP address> |
| Transport | UDP |
| Scr port | 1:65535 |
| Dst port | 500 |
| Rev NAT | None |

These three rules should be configured above all other rules (default or user defined). When Advanced LAN Access is used, certain inbound/outbound rules need to be configured to control incoming/outgoing packet flow for IPSec to work properly (with Advanced LAN Access). These rules should be configured first before other rules are configured.

- **Question 13: Do I need to add any special routes on the access point to get my VPN tunnel to work?**

  **No**. However, clients could need extra routing information. Clients on the local LAN side should either use the access point as their gateway or have a route entry tell them to use the access point as the gateway to reach the remote subnet.

## B.3 Replacing an AP-4131 with an AP-5131 or AP-5181

The access point's modified default configuration enables an access point to not only operate in a single-cell environrment, but also function as a replacement for legacy Symbol AP-4131 model access points. You cannot port an access point's configuration file to an access point, but you can configure an access point similarly and provide an improved data rate and feature set.

An AP-4131 has only one LAN port and it is defaulted to DHCP/BOOTP enabled. The access point is optimized for single-cell deployment, so it should allow the customer to use an access point as a "drop-in" replacement for an existing AP-4131 deployment. However, to optimally serve as a replacement for existing AP-4131 deployments, the access point's "out-of-box" defaults are now set as follows:

- The access point's LAN1 port must default to DHCP client mode
- The access point's LAN2 port must default to DHCP server mode
- The access point's WAN port must default to Static mode.
- The default gateway now defaults to LAN1.

- The interface parameter has been removed from the Auto Update configuration feature.
- The WAN interface now has http/telnet/https/ssh connectivity enabled by default.

# C

# Customer Support

Symbol Technologies provides its customers with prompt and accurate customer support. Use the Symbol Support Center as the primary contact for any technical problem, question or support issue involving Symbol products.

If the Symbol Customer Support specialists cannot solve a problem, access to all technical disciplines within Symbol becomes available for further assistance and support. Symbol Customer Support responds to calls by email, telephone or fax within the time limits set forth in individual contractual agreements.

When contacting Symbol Customer Support, please provide the following information:

- serial number of unit
- model number or product name
- software type and version number.

### *North American Contacts*

Inside North America:

Symbol Technologies, Inc.
One Symbol Plaza Holtsville, New York 11742-1300
Telephone: 1-631-738-2400/1-800-SCAN 234
Fax: 1-631-738-5990

Symbol Support Center (for warranty and service information):

telephone: 1-800-653-5350
fax: (631) 738-5410
Email: *support@symbol.com*

### *International Contacts*

Outside North America:

Symbol Technologies
Symbol Place
Winnersh Triangle, Berkshire, RG41 5TP
United Kingdom
0800-328-2424 (Inside UK)
+44 118 945 7529 (Outside UK)

## *Web Support Sites*

### MySymbolCare

http://www.symbol.com/services/msc/msc.html

### Symbol Services Homepage

http://symbol.com/services

### Manual Updates

http://symbol.com/legacy_manuals/wire/accesspoints.html

### Symbol Developer Program

http://devzone.symbol.com

## *Additional Information*

Obtain additional information by contacting Symbol at:

1-800-722-6234, inside North America

+1-516-738-5200, in/outside North America

http://www.symbol.com/

# Index

## Numerics



## A

## B



## C



## D



## E



## F

## Q



## R



## S



## T



## V

## W

**Symbol Technologies, Inc.**
**One Symbol Plaza**
**Holtsville, New York 11742-1300**
**http://www.symbol.com**

**72E-92949-01**
**Revision 01 - November 2006**