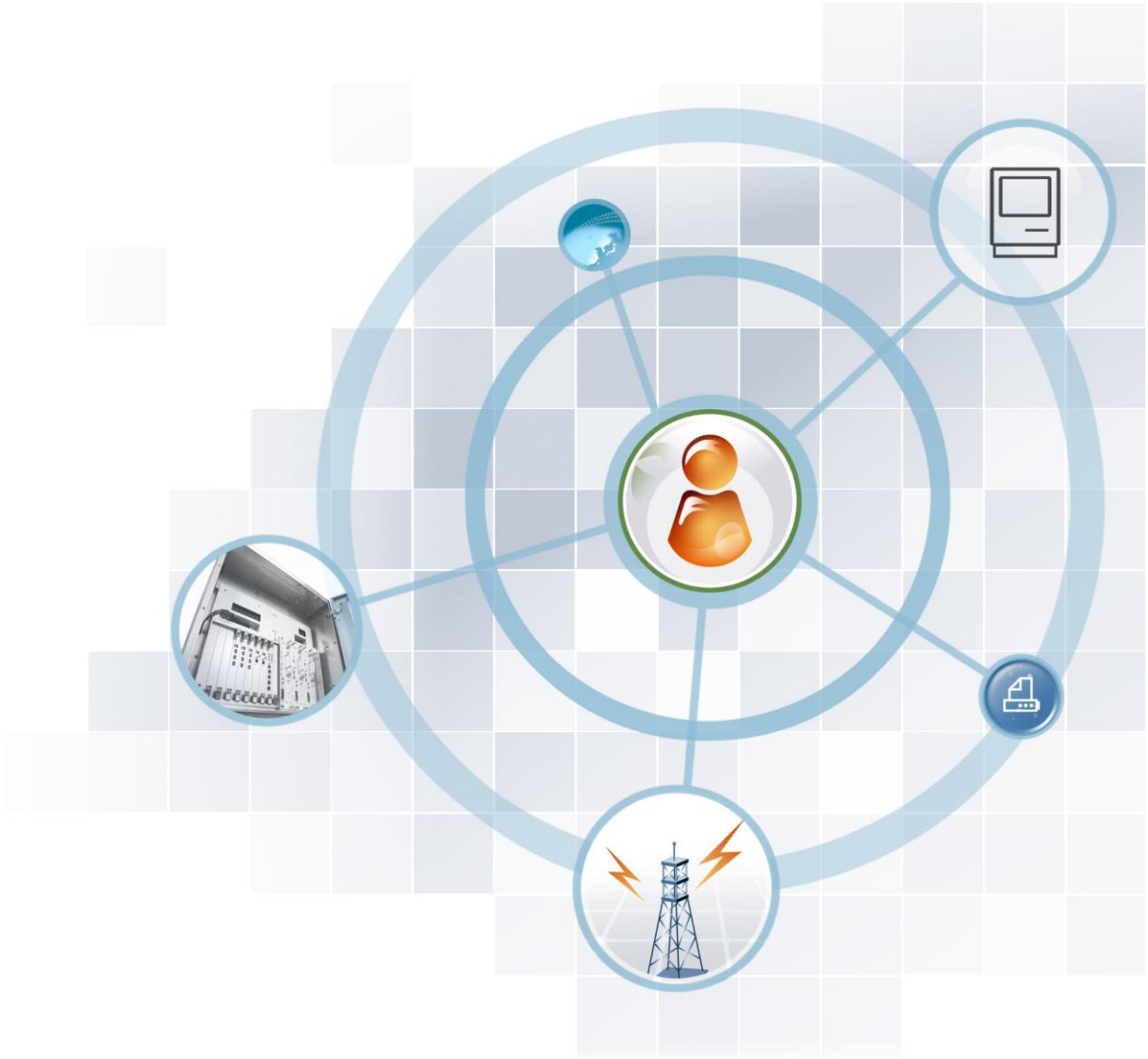
# WE Standalone AP

## User Manual



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# Revision History

| Version | Date | note |
|---|---|---|
| 0.1 | 2014. 3.2 | First draft<br>(supplement the existing manual for CLI mode) |
| 0.2 | 2014.04.28 | Added Firewall & NAT configuration |
| 0.3 | 2014.05.02 | Added LAN interface & DHCP configuration |
| 0.4 | 2014.08.27 | Modified figure 29 |
| 1.0 | 2014.08.28 | Modified Version |

# Contents

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# 1. Standalone mode Summary

## 1.1 Stand-alone mode Summary

Samsung WE AP is basically connected to APC (AP Controller) and controlled. Gen erally, it is managed through the AP WEB, WEM server or CLI of APC and offers various services in the Wireless Enterprise environment. In this case, the own setti ng information is not stored separately, and if the APC is disconnected or restarted, all settings (such as the wireless settings information) except the network informat ion is automatically deleted.

To provides the services in difficult situations to connect APC such as small (1~2) site, self-testing or pilot test, Samsung WE AP separately provides the Stand-alone mode, and own setting functions by connecting to the CLI and WEB server, which enable it to offer basic wireless services(In this mode, storing configuration inform ation). At the present time (at the time of this document production), the basic wire less functions and network features are provided, and it is expected to improve the system gradually such as adding NAT and DHCP server features.

## 1.2 System Preferences

### 1.2.1 Connect using CLI

The method to connect WE AP using the CLI is as follows:

- Connect directly to the console port of the system.
- SSH Connection through the Ethernet port(50022 port)

When WE AP boot is complete, log in to the system with the following method:

1) The initial connection ID: ‘root’, password: ‘samsung’ to log in.

```
Connected to 100.100.100.110.
Escape character is '^]'.
Login: root
Password:
SAMSUNG ELECTRONICS CO., LTD. Login
```

```
AP_3F05#
```

## 1.2.2 Setting the Stand-alone Mode

AP is basically set to the " APC Linkage Mode" , so you can set up the " Stand-al one mode" (or change the Stand-alone mode to the Normal mode) through the foll owing commands.

- system standalone enable: Set to operate in Stand-alone mode
- system standalone disable: Set to operate in Normal mode

```
AP# system standalone
     Usage: AP/ system/standalone <enable|disable >
AP# system standalone enable
AP# reset_code: 80

URGENT: broadcast message from ghost:
System going down IMMEDIATELY!

       ...  ...
```

If it is the package that does not support the Stand-alone mode, perform the upgra de first with the following command. (For the more details of instructions, see Sect ion 5.6 upgrade.)
In the APC linkage mode, the upgrade command will fail when APC is not connecte d, so you should perform the upgrade after entering the following command.

- upgrade cwl-chk disable: Set to upgrade regardless of the APC connection st ate.

```
AP_3F05# upgrade cwl-chk disable
 capwap-link-check disabled...
AP_3F05# upgrade ftp 100.100.100.2 samsung samsung weafama.img.ham
AP_3F05#

============================================================
FTP Upgrade Start....
server-ip[100.100.100.2], img-name[weafama.img.ham], port-no[21]
============================================================

Please wait until upgrade has completed...

It will take less than a minute...
       ...  ...
```

Reboot the system automatically when the enable state in stand-alone mode is cha nged.

In order to set/inquiry AP through the WEB connection, the Stand-alone mode must be enabled. Before setting the stand-alone mode or after that and rebooting the system, you can access WEB after you have finished the network setting through the CLI.

### Default Set of the Standalone Mode

| Classification | Initial value |
|---|---|
| WLAN Setting | SSID: SEC_WE_AP (Open mode, 2.4G/5G) |
| DNS Setting | 168.126.63.1 (KT DNS Server)<br>164.124.101.2 (Dacom DNS Server) |
| NTP Setting | time.bora.net |


If APC linkage mode is changed to the Stand-alone mode, DB settings can be left in the previous mode (If the remote AP (Set for branch office) is changed to the stand-alone mode). In this case, you must change it to the initial value of the stand-alone mode by a factory reset. (If you change the stand-alone mode to the normal mode, it will be automatically initialized.) Network information is retained after initialization.


A default ID of AP is ‘root’ with administrative privileges, and the password is set to ‘samsung’.The password of account can be modified through the menu after the WEB access. If you perform a factory reset, your password will change to ‘samsung’ again.

## 1.2.3 AP CLI Basic Usage

CLI is a text-based interface that can change and inquire the setting of the system. Multiple users can change the settings using the CLI on the same system at the same time, and the commands that permission is allowed can be performed because the per-user permissions are set. Various commands are provided for each functions of the system, and for more detailed information, you can see appendix 'CLI commands'.

### Command Help

CLI provides help for all the commands. To get help for any commands or parameters, enter '?'. Based on the characters you entered, it shows the help about commands and parameters that can be entered after that.

| Classification | Description |
|---|---|
| ? | Print out the list of commands and help in current level |
| Command? | Print out the parameters needed to commands and help |

Examples are as follows.

```
AP_3F05/config#
      802.11a+                Radio interface 802.11an
      802.11bg+               Radio interface 802.11bgn
      wlan+                    Config BSS
      network+                 Configure network
AP_3F05/config#
```

### Auto-complete Commands Feature

Using the TAB key in the CLI, auto-complete command feature is supported. Just type the first few letters of the command, press the TAB key, and then it will show a list of commands that begin the letters you entered, or the remaining letters are automatically entered if the command start with these letters is only one.
Below is an example: Input '80', press the TAB key, check the list, input 'a', press the TAB key again, and finally " 802.11a" is inputted.

```
AP_3F05/config# 80
```

[Press the TAB key]

```
AM_AP_Test_1/config# 802.11
      802.11a+
      802.11bg+
```

[Input ' a' and press the TAB key again]

```
AP_3F05/config# 802.11a
```

### Command Error

If the command which is not supported by the system is entered, an error message is printed.

```
AP_3F05/config# 802.11ag
     AP_3F05/config/802.11ag : unknown command.
```

If the parameter which is not supported in the command is entered, an error messa ge to fit the occasion is printed.

```
AP_3F05/config/802.11a# tx_power -1
ERROR: invalid argument: -1
AP_3F05/config/802.11a#
```

### Command Mode

If you enter the ‘exit’ command, it moves to the top of the command mode.

# 1.3 Using Web UI

## 1.3.1 Connect using Web UI

In order to set the AP through the Web access, the IP address of the AP's Ethernet port has to be set. After running the Web browser and connecting to the IP address of the AP system's Ethernet port, then login page is displayed as shown below. Log in as the initial 'root' account.


**Figure 1. Web UI Access Window**

## 1.3.2 AP WEB Main Window

AP WEB Main window is the first screen after it is connected to the APC, and it consists of menu bar, sub-menu, and detailed window for each menu.

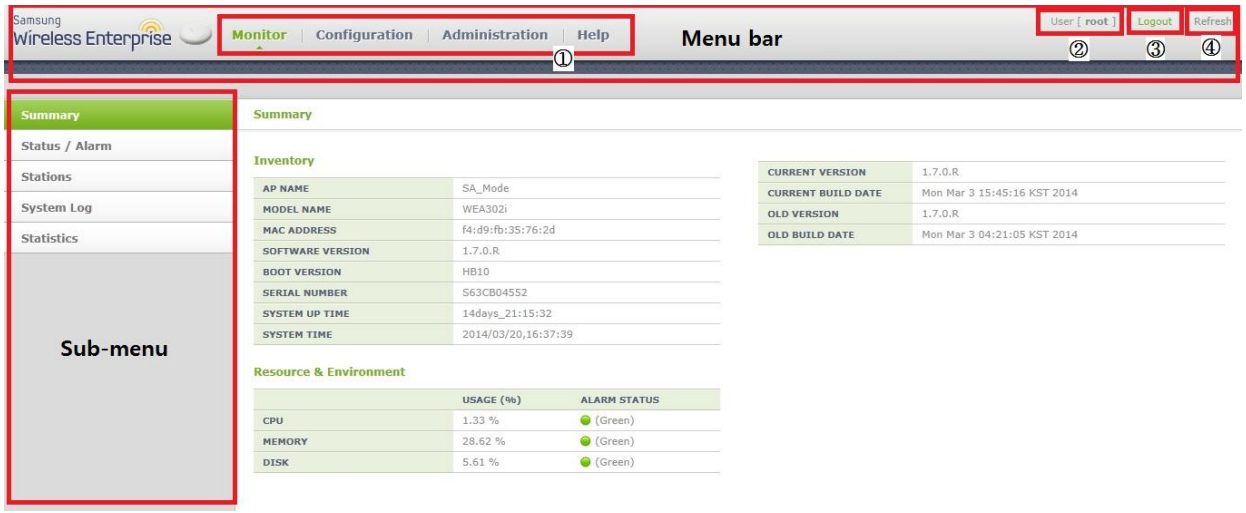



**Figure 2. AP WEB Main Window**

### Menu bar

Bar consists of the following items.

- ①: Provides itemized settings in detail or the lookup functions. When you select each item, the Sub-menu appears.
- ②: Account changes (change password) function is provided.
- ③: Log out of the WEB.
- ④: Refresh the screen.

### Sub-menu

Each detailed menu about Monitor, Configuration, Administrator, and Help in the menu bar is provided.

## 1.3.3 Change the Account Password

In order to change the password for connecting to the CLI features/Web UI, you fo llow a procedure.

Select <User> from the menu bar in <AP WEB Main Window>.
You can change the password for the default account (root) when connecting to AP WEB.

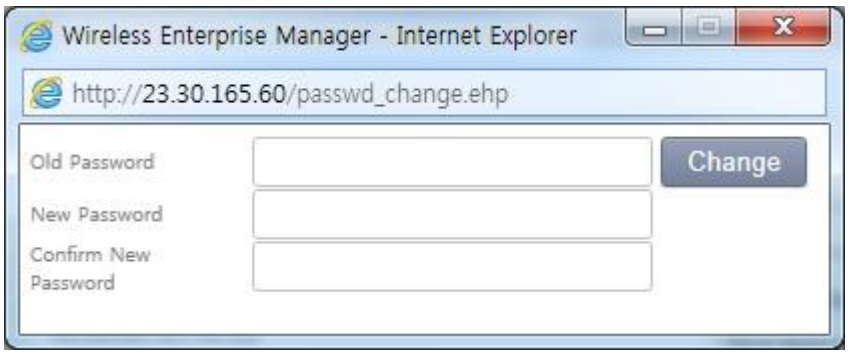



**Figure 3. Change a user account password dialog box**

## 1.3.4 WEB Sub-menu Configuration

WEB UI consists of the following server menu.

- Monitor menu: Operational status of the system can be accessed.(Status, ala rm, statistics)
- Configuration menu: Change the detail settings of the system for each functi on.
- Administration menu: System-wide command is performed.
- Other help menu: It will be linked with this manual.

<table>
<tr><th>Monitor</th><th colspan="3">Configuration</th><th>Administration</th></tr>
<tr><td>summary</td><td colspan="3">General</td><td>DB Backup/Restore</td></tr>
<tr><td>status/Alarm</td><td rowspan="3">WLANs</td><td rowspan="3">Enable/Disable/Add/ Delete</td><td>General</td><td>Reboot</td></tr>
<tr><td>System Log</td><td>Security</td><td>Factory Reset</td></tr>
<tr><td>Statistics</td><td>Advanced</td><td>Package Upgrade</td></tr>
<tr><td rowspan="7"></td><td rowspan="6">Radio</td><td rowspan="3">802.11a/n/ac</td><td>General</td><td>Tech Support</td></tr>
<tr><td>QoS</td><td></td></tr>
<tr><td>802.11n/ac</td><td></td></tr>
<tr><td rowspan="3">802.11b/g/n</td><td>General</td><td></td></tr>
<tr><td>QoS</td><td></td></tr>
<tr><td>802.11n</td><td></td></tr>
<tr><td colspan="3">DNS/NTP</td><td></td></tr>
<tr><td colspan="3">RADIUS</td><td></td></tr>
</table>

# 2. Network Settings

In this chapter, it will describe how to set up the network functions which WE AP provides.

To check the current network settings, use the show command, as shown below.

```
AP_3F05/config# show network summary
Name ..................................... br0
Mode ..................................... Static
MAC ...................................... F4:D9:FB:35:C3:23
IP address ............................... 10.251.194.166
Subnet Mask .............................. 255.255.255.0
Gateway address .......................... 10.251.194.1
PHY Status ............................... UP
Interface Status ......................... UP
DNS Count ................................ 1
DNS1 ..................................... 192.168.10.12
NTP Mode ................................. OFF
NTP Count ................................ 0
TimeZone ................................. Asia/Seoul
```

## 2.1 WAN Interface Setting

Perform the WE AP's WAN port setting.

### 2.1.1 Setting using CLI

To set the interface of WAN port, you should input ‘ network’ ‘ interface’ com mand in the config directory and enter the interface configuration menu.

```
AP_3F05/config#
      802.11an+
      802.11bgn+
      wlan+
      network+
      radius+
AP_3F05/config# network interface
AP_3F05/config/network/interface#
      address
      dhcp
```

Interface-related CLI commands are as follows:

[address]

This command sets the staticIP address.

- address <IPADDR> <NETMASK> <GATEWAY>

```
AP_3F05/config/network/interface# address 100.100.100.110 255.255.255.0 100.100.100.1
AP_3F05/config/network/interface#
```

[dhcp]

This command sets the dynamic IP address using DHCP. ip address dhcp

- dhcp

```
AP_3F05/config/network/interface# dhcp
AP_3F05/config/network/interface#
```

[show summary]

Check the current configuration of the interface.

- show summary

```
AP_3F05/config/network/interface# show summary
Name ..................................... br0
Mode ..................................... Static
MAC ...................................... F4:D9:FB:24:CE:00
IP address ............................... 100.100.100.110
Subnet Mask .............................. 255.255.255.0
Gateway address .......................... 100.100.100.1
PHY Status ............................... UP
Interface Status ......................... UP
AP_3F05/config/network/interface#
```

## 2.1.2 Setting using Web UI

Select <Configuration> from <WEB Main Window> menu, and in the sub-menu, select <General> → <General>.


**Figure 4. Interface Settings Window**

# 2.2 LAN Interface Setting

Perform the WE AP’s LAN interface setting.

## 2.2.1 Setting using CLI

To set the interface of LAN, you shourd input ‘network’, ‘local_interface’ command in the config directory and enter the interface menu.

```
AP_3F05/config#
AP_3F05/config# network local_interface
AP_3F05/config/network/ local_interface#
      address
```

Interface-related CLI comands are as follows.

[address]

This command sets the staticIP address.

- address <IPADDR> <NETMASK>

```
AP_3F05/config/network/interface# address 192.168.100.1 255.255.255.0
AP_3F05/config/network/interface#
```

[show summary]

Check the current configuration of the interface.

- show summary

```
AP_3F05/config/network/local_interface# show summary
IP address ..................................... 192.168.100.1
Subnet Mask .................................... 255.255.255.0
AP_3F05/config/network/interface#
```

## 2.2.2 Setting using Web UI

Select <Configuration> from <WEB Main Window> menu, and in the sub-menu, select <General> → <LAN>.

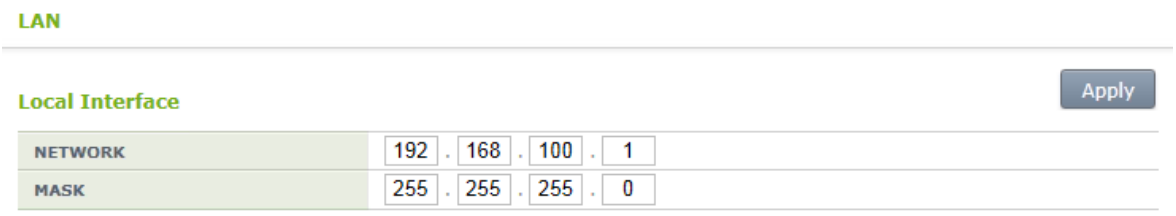



**Figure 5. LAN Interface Setting Window**

# 2.3 DHCP Server Setting

Perform the WE AP's DHCP server setting.

## 2.3.1 Setting using CLI

To set the DHCP server, you should input ‘ network’ , ‘ dhcp_server’ commandin the config directory and enter the dhcp_server configuration menu.

```
AP_3F05/config#
AP_3F05/config# network dhcp_server
AP_3F05/config/network/dhcp_server#
      enable
      range
      lease
      domain
      dns
      ntp
      fixed_address
      commit
```

DHCP server-related CLI commands are as follows

[enable]

This command is run or stop the DHCP server

- enable

```
AP_3F05/config/network/dhcp_server# enable
AP_3F05/config/network/dhcp_server# no enable
```

[range]

This command sets the range of DHCP server’ s pool

- range <START-RANGE> <END-RANGE>

```
AP_3F05/config/network/dhcp_server# range 192.168.100.1 192.168.100.100
AP_3F05/config/network/dhcp_server#
```

[lease]

This command sets lease time of DHCP server’ s pool

- lease <SECOND>

```
AP_3F05/config/network/dhcp_server# lease 86400
AP_3F05/config/network/dhcp_server#
```

[domain]

This command sets domain name of DHCP server

- domain <DOMAIN-NAME>

```
AP_3F05/config/network/dhcp_server# domain www.samsung.com
AP_3F05/config/network/dhcp_server#
```

### [dns]

This command sets DNS server infomration of DHCP server's pool

- dns <IP> (IP) (IP)

```
AP_3F05/config/network/dhcp_server# dns 192.168.1.1
AP_3F05/config/network/dhcp_server# dns 192.168.1.1 192.168.1.2
AP_3F05/config/network/dhcp_server# dns 192.168.1.1 192.168.1.2 192.168.1.3
```

### [ntp]

This command sets NTP server infomration of DHCP server's pool

- ntp <IP> (IP) (IP)

```
AP_3F05/config/network/dhcp_server# ntp 192.168.1.1
AP_3F05/config/network/dhcp_server# ntp 192.168.1.1 192.168.1.2
AP_3F05/config/network/dhcp_server# ntp 192.168.1.1 192.168.1.2 192.168.1.3
```

### [fixed_address]

This command sets fixed address of DHCP server's pool.

- fixed_address <MAC> <IP>

```
AP_3F05/config/network/dhcp_server# fixed_address 00:00:00:00:00:00
192.168.100.2
AP_3F05/config/network/dhcp_server#
```

### [commit]

This command sets DHCP server's setting to be applied.
Changed settings are not applied until perform commit command.

- commit

```
AP_3F05/config/network/dhcp_server# commit
AP_3F05/config/network/dhcp_server#
```

### [show summary]

Check the current configuration of the DHCP server.

- show summary

```
AP_3F05/config/network/dhcp_server# show summary
[Dhcp Server Configuration]
Status ..................................... enable
Network .................................... 192.168.5.0
Subnet ..................................... 255.255.255.0
Range ...................................... 192.168.5.1 ~ 255.255.255.0
Lease ...................................... 86400
Gateway .................................... 192.168.5.1
```

```
Domain ....................................
DNS Server ..................................... 1.1.1.1 0.0.0.0 0.0.0.0
NTP Server ..................................... 0.0.0.0 0.0.0.0 0.0.0.0
[Fixed Address]
00:00:00:00:00:11 .............................. 192.168.5.5
AP_3F05/config/network/interface#
```

## 2.3.2 Setting using Web UI

Select <Configuration> from <WEB Main Window> menu, and in the sub-menu, select <General> → <LAN>.

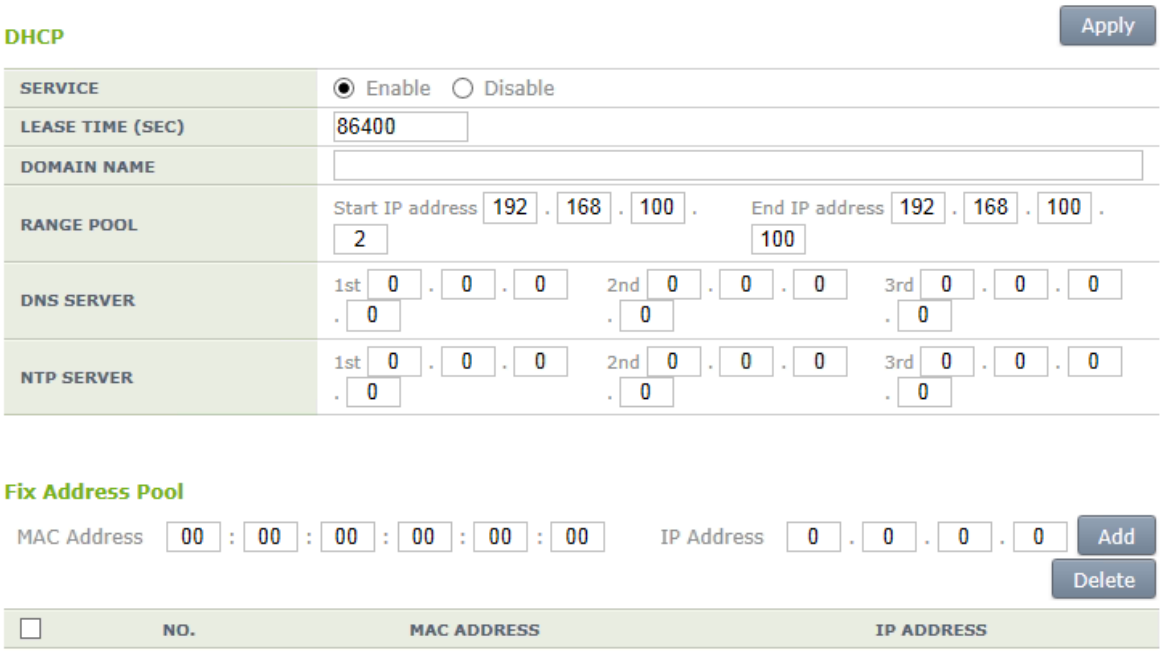



**Figure 6. DHCP Server setting window**

# 2.4 DNS Configuration Management

DNS is the network service that interprets a domain or host name to IP address. A P gets IP information about the domain or host through the specified DNS.

## 2.4.1 Setting using CLI

1) Add a DNS server.

```
AP_3F05/config/network# dns
      add
      delete
AP_3F05/config/network# dns add 10.32.193.11
Add dns(10.32.193.11)
AP/config/network#
```

2) Delete the DNS server.

- dns delete all: Delete all DNS servers.
- dns delete <DNS>: Delete the corresponding DNS server.

```
AP_3F05/config/network# dns
      add
      delete
AP_3F05/config/network# dns delete all
Delete dns(all)
AP/config/network#
```

## 2.4.2 Setting using Web UI

Select <Configuration> from <WEB Main Window> menu, and select <DNS/NTP> → < DNS Client> in the sub-menu.


**Figure 7. DNS Settings**

# 2.5 NTP Configuration Management

WE AP does not have a separate clock chip, and only if you set the NTP, UTC (C oordinated Universal Time) information is received from the NTP server to synchro nize with the local time. NTP (Network Time Protocol) is the protocol used to sync hronize time which is received from the specified server with the local time.

## 2.5.1 Setting using CLI

[NTP Setting]

Time server which is referenced when the NTP client is working can be used base d on domain name or IP address. However, if it works based on domain name, DN S server should be set.

3) Move to the NTP menu of the CLI.

```
AP_3F05/config/network/ntp#
     enable
     disable
     interval
     server
AP_3F05/config/network/ntp#
```

4) Make the NTP client enable/disable.

- enable: To enable the NTP time synchronization.
- disable: To disable the NTP time synchronization.

5) Set an interval of the NTP client.

- interval[INTERVAL]: Interval setting

| Parameter | Description |
|---|---|
| INTERVAL | Interval(Range: 4~14) |

6) Set the server to which the NTP client will refer.

- Server [SERVER] | [SERVER] [INTERVAL]: Set the server to which you refer.

```
AP_f4d9fb37a8e7/config/network/ntp# server time.bora.net 4
AP_f4d9fb37a8e7/config/network/ntp#
```

7) Set the time zone

- timezone[TIMEZONE]: Set timezone

```
AP_f4d9fb37a8e7/config/network# timezone Seoul
```

```
AP_f4d9fb37a8e7/config/network#
```

* See Appendix B for detailed supported cities.

## 2.5.2 Setting using Web UI

Select <Configuration> from the <WEB Main Window> menu, and in the sub-menu, select <DNS/NTP> → <NTP>.

Add/delete the NTP servers to get contact information.


**Figure 8. NTP Server Setting Menu**

Set the Time Zone you wish.

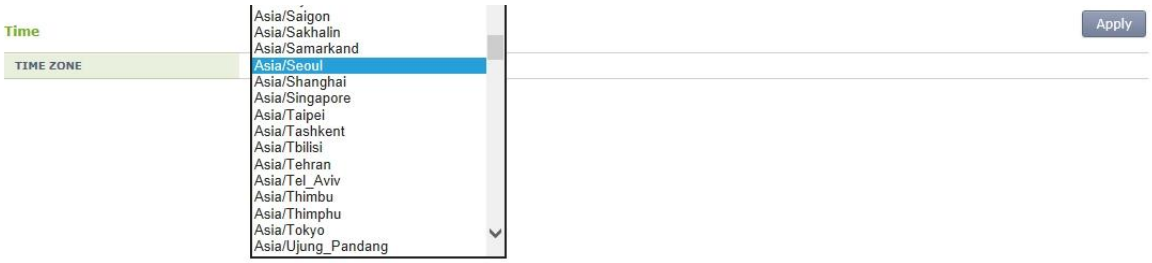



**Figure 9. Time Zone Setting Menu**

# 3. Wireless Radio Settings

This chapter describes the method for managing 802.11a, 802.11bg and 802.11n devices of the W-EP AP. 802.11n devices support 2.4 GHz and 5 GHz radio bands and high data processing speed.

## 3.1 General Radio Configuration

General Radio configuration for 802.11a/b/g is below.

1) At the CLI, enter the radio you want to set. You can select either '802.11a' or '802.11bg' radio mode.

The following example shows an approach to 802.11a.

```
AP_3F05# config 802.11a
AP_3F05/config/802.11a#
      admin
      channel+
      tx_power
      phy_type
      beacon_period
      max_radio_clients
      data_rate+
      11n_configuration+
      rate_control+
      mac_operation+
      edca+
      cca_threshold
AP_3F05/config/802.11a#
```

2) View the current radio general configuration.

```
AP_3F05/config/802.11a# show summary
-------------------<<< Radio General summary >>>--------------------
Admin State ..................................... up
PHY type ........................................ IEEE 802.11an
Channel type .................................... auto
current channel ................................. 36
TX power ........................................ 17 dBm
beacon period ................................... 100 TUs
Allowed max clients per radio ................... 127
Country string .................................. KR
CCA threshold ................................... -68dBm
```

```
AP_3F05/config/802.11a#
```

Look up the radio information by WEB UI.

Select <Configuration> from the <WEB Main Window> menu, and in the sub-menu, select <Radio> → <802.11a/n or 8021.11b/g/n> → <General >.

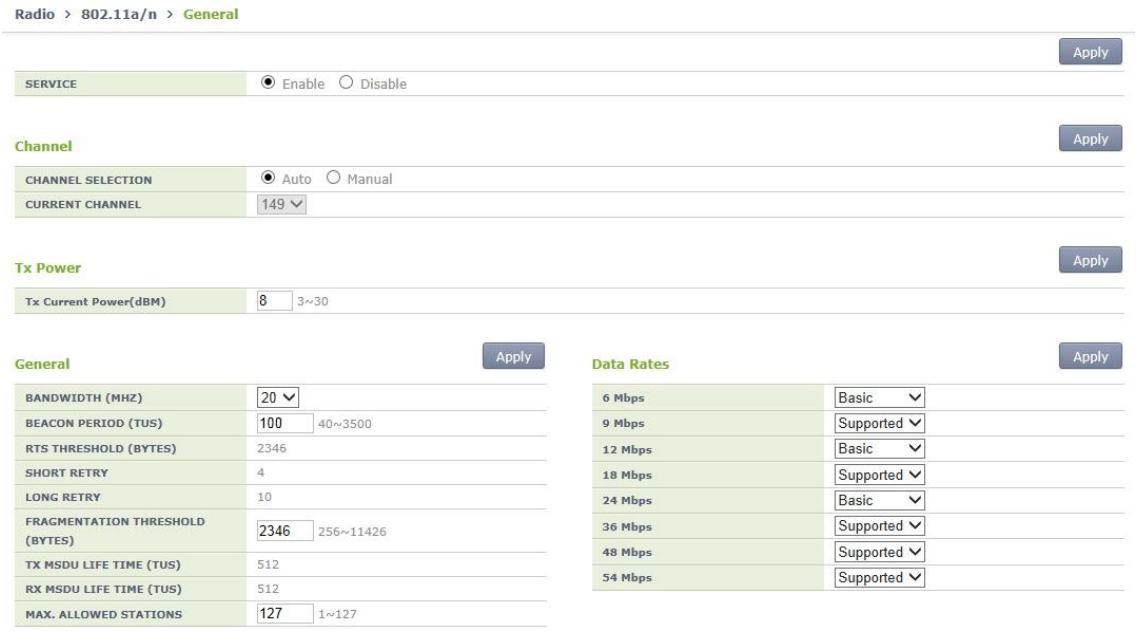



**Figure 10. Radio Configuration General Menu**

[Tip] Check the information of the current station connected to the radio with the following "show station" command.

```
AP_3F05# config 802.11a
AP_3F05/config/802.11a# station
WLAN  AID  MAC Address       RSSI  SNR  EAPOL
-----------------------------------------------
   1    1  CC:F9:E8:A4:91:87   -39   53    0
AP_3F05/config/802.11a#
```

3) Set enable/disable for the radio.

```
AP_3F05/config/802.11a# admin
      enable
      disable
AP_3F05/config/802.11a# admin enable
Set AdminState of General to Up in Radio_1.conf
AP_3F05/config/802.11a#
```

[WEB Setting]
<Radio> → <802.11a/n or 8021.11b/g/n> → <General >


**Figure 11. Radio Enable/Disable Menu**

4) Set the radio attribute to support 802.11n mode or not.
- 802.11a

```
AP_3F05/config/802.11a# phy_type
     Usage: AP_3F05/config/802.11a/phy_type <phy_type(an|a|bgn|bg)>
AP_3F05/config/802.11a# phy_type an
Set PhyType of General to 72 in Radio_1.conf
AP_3F05/config/802.11a#
```

- 802.11bg

```
AP_3F05/config/802.11bg# phy_type
     Usage: AP_3F05/config/802.11bg/phy_type <phy_type(bgn|bg)>
AP_3F05/config/802.11bg# phy_type bgn
Set PhyType of General to 112 in Radio_2.conf
AP_3F05/config/802.11bg#
```

[WEB Setting]
<Radio> → <802.11a/n or 8021.11b/g/n> → <OPERATIONAL TYPE >

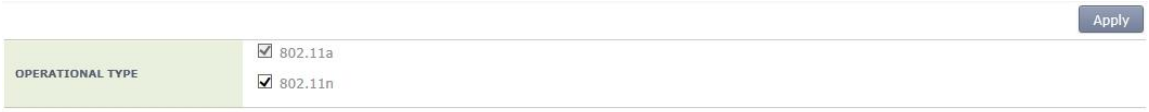



**Figure 12. Radio Operation Mode Setting Menu**

5) Set channels of the radio.

- channel auto: Set the channel to be automatically selected according to the ambient channels.
- channel manual[CHANNEL]: Set the channel to be fixed.

| Parameter | Description |
|---|---|
| CHANNEL | Channel setting<br>- A range of 802.11a: 36~165<br>- A range of 802.11bg: 1~14 |

-auto configuration

```
AP_3F05/config/802.11a# channel auto
Set CurrentChannel of OfdmControl to 0(auto) in Radio_1.conf
```

```
Set PrimaryChannel of HtConfiguration to 0(auto) in Radio_1.conf
AP_3F05/config/802.11a#
```

- manual configuration

```
AP_3F05/config/802.11a# channel manual 149
Set CurrentChannel of OfdmControl to 149 in Radio_1.conf
Set PrimaryChannel of HtConfiguration to 149 in Radio_1.conf
AP_3F05/config/802.11a#
```

[WEB Setting]
Select <Radio> → <802.11a/n or 8021.11b/g/n> → <General> -> Channel.

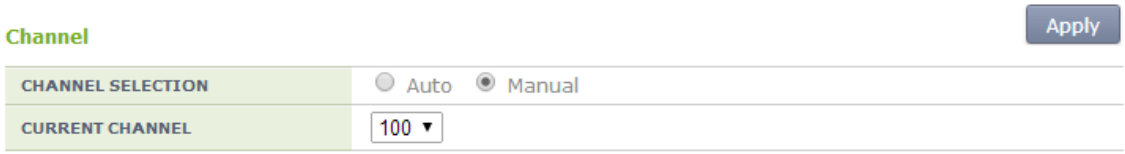



**Figure 13. Radio Channel Configuration Menu**

6) Set TX power of the radio.

- txPower [POWER]: Set TX power

| Parameter | Description |
|---|---|
| POWER(dBm) | TX power value(range: 2~30) |

```
AP_3F05/config/802.11a# tx_power 30
Set TxPower of WtpTxPower to 30 in Radio_1.conf
AP_3F05/config/802.11a#
```

[WEB Setting]
Select <Radio> → <802.11a/n or 8021.11b/g/n> → <General> -> Tx Power


**Figure 14. Radio Tx Power Configuration Menu**

7) Set the beacon period and limited number of users of the radio

- beacon_period [PERIOD]

| Parameter | Description |
|---|---|
| PERIOD | beacon period(range: 100~3000) |

```
AP_3F05/config/802.11a# beacon_period 100
Set BeaconPeriod of General to 100 in Radio_1.conf
AP_3F05/config/802.11a#
```

- max_radio_clients [MAXCLIENT]

| Parameter | Description |
|---|---|
| MAXCLIENT | The maximum number of clients radio allowed (range: 1~127) |

```
AP_3F05/config/802.11a# max_radio_clients 127
Set MaxClients of General to 127 in Radio_1.conf
AP_3F05/config/802.11a#
```

[WEB Setting]
Select <Radio> → <802.11a/n or 8021.11b/g/n> → <General> -> General

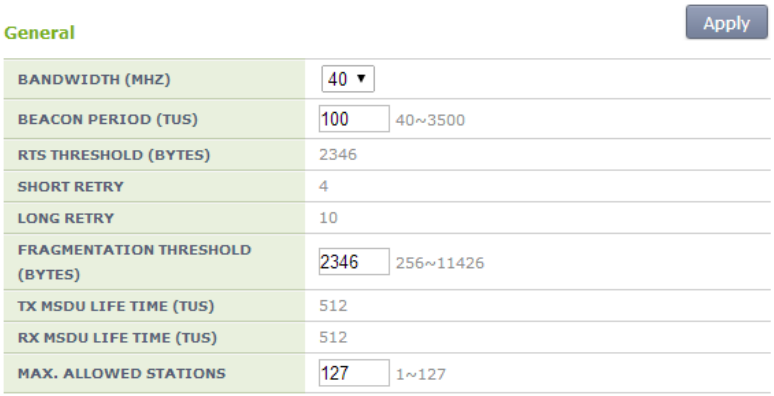



**Figure 15. Radio Configuration General Menu**

8) Set CCA threshold value of the radio.

- cca_threshold [threshold]: Set CCA threshold value.

| Parameter | Description |
|---|---|
| CCA threshold (dB) | threshold value(range: 0~255) |

```
AP_3F05/config/802.11a# cca_threshold 28
```

```
Set CcaThreshold of OfdmControl to 28 in Radio_1.conf
AP_3F05/config/802.11a#
```

# 3.2 Radio Data Rate Configuration

Enter the data_rate menu of the radio.

The following shows one example to enter the data_rate menu in 802.11a.

```
AP_3F05/config/802.11a# data_rate
AP_3F05/config/802.11a/data_rate#
     basic_rate
     rx_rate
AP_3F05/config/802.11a/data_rate#
```

1) View the data rate configuration of the current radio.

```
AP_3F05/config/802.11a/data_rate# show summary
--------------------<<< Radio Rate summary >>>--------------------
24.0 Mbps ..................................... basic rate
36.0 Mbps ..................................... supported rate
48.0 Mbps ..................................... supported rate
54.0 Mbps ..................................... supported rate
AP_3F05/config/802.11a/data_rate#
```

2) Set the current radio's data rate which can be supported

- rx_rate [RATE] [RATE……]: Set the data rate can be supported (The change of the mode does not occur, and if it is basic mode previously, the basic mode is maintained.)

| Parameter | Description |
|---|---|
| RATE | Data rate<br>– A range of 802.11a: 6, 9, 12, 18, 24, 36, 48, and 54 Mbps<br>– A range of 802.11b/g: 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48, or 54 Mbps |

```
AP_3F05/config/802.11a/data_rate# rx_rate 12 24 36 48 54
Set Rate1 of DataRate to 24 in Radio_1.conf
Set Rate2 of DataRate to 176 in Radio_1.conf
Set Rate3 of DataRate to 72 in Radio_1.conf
Set Rate4 of DataRate to 96 in Radio_1.conf
Set Rate5 of DataRate to 108 in Radio_1.conf
Set NumRates of DataRate to 5 in Radio_1.conf
AP_3F05/config/802.11a/data_rate#
```

3) Set the basic mode rate of the current radio.

- basic_rate [RATE] [RATE……]: Set the basic data rat (Previous basic rate which is not contained in the list is automatically changed to the supported rate.)

```
AP_3F05/config/802.11a/data_rate# basic_rate 12 24
Set Rate1 of DataRate to 152 in Radio_1.conf
Set Rate2 of DataRate to 176 in Radio_1.conf
Set Rate3 of DataRate to 72 in Radio_1.conf
Set Rate4 of DataRate to 96 in Radio_1.conf
Set Rate5 of DataRate to 108 in Radio_1.conf
Set NumRates of DataRate to 5 in Radio_1.conf
AP_3F05/config/802.11a/data_rate#
```

[WEB Setting]
Select <Radio> → <802.11a/n or 8021.11b/g/n> → <General> -> Data Rates


**Figure 16. Radio Data Rates Configuration Menu**

# 3.3 Radio Rate Control Configuration

Enter the rate_control menu of the radio.

The following shows one example to enter the rate_control menu in 802.11a.

```
AP_3F05/config/802.11a# rate_control
AP_3F05/config/802.11a/rate_control#
      ac_vo+
      ac_vi+
AP_3F05/config/802.11a/rate_control#
```

4) View the rate control configuration of the current radio.

```
AP_3F05/config/802.11a/rate_control# show summary
-------------------<<< Rate Control Summary >>>-------------------
Video Max Rate ................................. not enabled
Voice Max Rate ................................. 39000 Kbps
AP_3F05/config/802.11a/rate_control#
```

5) Set the current radio's data rate which can be supported

- ac_vo max_rate [MAC_RATE]: The maximum supported rate of the AC voice
- ac_vi max_rate [MAC_RATE]: The maximum supported rate of the AC vedio

| Parameter | Description |
|---|---|
| MAC_RATE(kbps) | The maximum rate (range 0~600000) |

```
AP_3F05/config/802.11a/rate_control# ac_vo max_rate 39000
WWB_EDCA_AC_VO, rate=39000
Set VoMaxRate of RateControl to 39000 in Radio_1.conf
AP_3F05/config/802.11a/rate_control#
```

```
AP_3F05/config/802.11a/rate_control# ac_vi max_rate 0
WWB_EDCA_AC_VI, rate=0
Set ViMaxRate of RateControl to 0 in Radio_1.conf
AP_3F05/config/802.11a/rate_control#
```

# 3.4 HT Configuration(802.11n)

HT (802.11n) settings are as follows.

The following shows one example to enter the configuration menu in 802.11n.

```
AP_3F05/config/802.11a# 11n_configuration
AP_3F05/config/802.11a/ 11n_configuration#
      40mhz_operation+
      guard_interval+
      beamforming+
      spatial_stream
      coexistence+
      ldpc+
      mcs
      ampdu+
      amsdu+
```

```
AP_3F05/config/802.11a/11n_configuration#
```

1) View the HT configuration of the current radio.

```
AP_3F05/config/802.11a/11n_configuration# show summary
---------------<<< HT Configuration summary >>>---------------
40MHz operation ................................ not enabled
Guard interval ................................. 0.4us
Beamforming .................................... enabled
HT protection .................................. non-member protection
Spatial streams enabled ........................ 2
20/40MHz Co-existence .......................... enabled
LDPC ........................................... enabled
A-MPDU option .................................. enabled
A-MSDU option .................................. not enabled
AP_3F05/config/802.11a/11n_configuration#
```

2) Set enable/disable of the 40MHz operation.

- 40mhz_operation enable: Support 40MHz operation.
- 40mhz_operation disable: Do not support 40MHz operation.

```
AP_3F05/config/802.11a/11n_configuration# 40mhz_operation disable
Set 40mhzOperation of HtConfiguration to 0 in Radio_1.conf
AP_3F05/config/802.11a/11n_configuration#
```

3) Set the regular/short guard interval.

- guard_interval regular: Do not use short guard interval
- guard_interval short: Set the short guard interval

```
AP_3F05/config/802.11a/11n_configuration# guard_interval short
Set 20mhzShortGi of HtConfiguration to 1 in Radio_1.conf
Set 40mhzShortGi of HtConfiguration to 1 in Radio_1.conf
AP_3F05/config/802.11a/11n_configuration#
```

4) Set enable/disable of the beamforming.

- beamforming enable: Support beamforming
- beamforming disable: Do not support beamforming

```
AP_3F05/config/802.11a/11n_configuration# beamforming disable
Set Beamforming of HtConfiguration to 0 in Radio_1.conf
AP_3F05/config/802.11a/11n_configuration#
```

5) Set the number of spatial streams.

- spatial_stream [NUM]: Set the number of spatial streams

| Parameter | Description |
|---|---|
| NUM | The number of spatial streams (range: 1~3) |

```
AP_3F05/config/802.11a/11n_configuration# spatial_stream 3
Set SpatialStream of HtConfiguration to 3 in Radio_1.conf
AP_3F05/config/802.11a/11n_configuration#
```

6) Set MCS index.

- mcs [INDEX] [INDEX ……]: Set MCS index

| Parameter | Description |
|---|---|
| INDEX | MCS index (range: 0~23) |

```
AP_3F05/config/802.11a/11n_configuration# mcs 3 4 5 6 7 8 9 10 11 12 13 14 15
Set RxMcs of HtMcsConfiguration to f8ff0000000000000000000000000000 in Radio_1.conf
AP_3F05/config/802.11a/11n_configuration#
AP_3F05/config/802.11a/11n_configuration#
AP_3F05/config/802.11a/11n_configuration#
```

* You can access the mcs index set information through the “show mcs” comman d below.

```
AP_3F05/config/802.11a/11n_configuration# show mcs
MCS 3 ..................................... enabled
MCS 4 ..................................... enabled
MCS 5 ..................................... enabled
MCS 6 ..................................... enabled
MCS 7 ..................................... enabled
MCS 8 ..................................... enabled
MCS 9 ..................................... enabled
MCS 10 .................................... enabled
MCS 11 .................................... enabled
MCS 12 .................................... enabled
MCS 13 .................................... enabled
MCS 14 .................................... enabled
MCS 15 .................................... enabled
```

7) . Set enable/disable of A-MPDU

- ampdu enable: Support A-MPDU
- ampdu disable: Do not support A-MPDU

```
AP_3F05/config/802.11a/11n_configuration# ampdu enable
Set Ampdu of HtConfiguration to 1 in Radio_1.conf
AP_3F05/config/802.11a/11n_configuration#
```

8) Set enable/disable of A-MSDU

- amsdu enable: Support A-MSDU
- amsdu disable: Do not support A-MSDU

```
AP_3F05/config/802.11a/11n_configuration# amsdu disable
Set Amsdu of HtConfiguration to 0 in Radio_1.conf
AP_3F05/config/802.11a/11n_configuration#
```

[WEB Setting]
Select <Radio> → <802.11a/n or 8021.11b/g/n> → <802.11n>

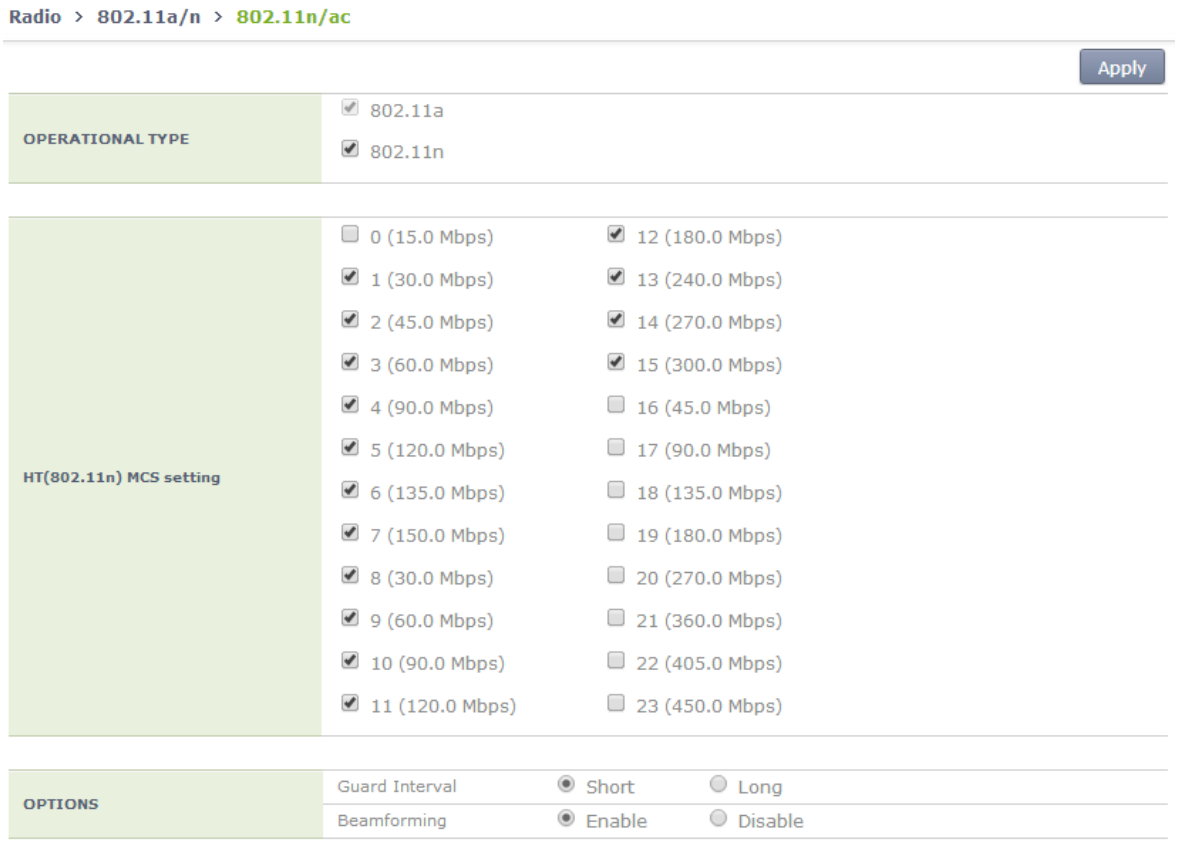



**Figure 17. Radio 802.11n Configuration Menu**

# 3.5 EDCA Configuration(QoS)

In the wireless section, QoS is probabilistically provided by changing EDCA parame ters.
EDCA(QoS) settings are as follows.
Enter the edca menu of the radio. (The following is one example to enter the edca menu in 802.11a)

```
AP_3F05/config/802.11a# edca
AP_3F05/config/802.11a/edca#
     ap+
     sta+
AP_3F05/config/802.11a/edca# ap
```

## 3.5.1 WTP EDCA Configuration

Enter the edca menu of the WTP.

```
AP_3F05/config/802.11a/edca# ap
AP_3F05/config/802.11a/edca/ap#
     ac_vo+
     ac_vi+
     ac_be+
     ac_bk+
AP_3F05/config/802.11a/edca/ap#
```

1) View the WTP EDCA configuration of the current radio.

```
|-------------------<<< WTP EDCA Param Summary >>>-----------------------------|
|-------------------|--------------|--------------|--------------|--------------|
| WTP               | AC_BE        | AC_BK        | AC_VI        | AC_VO        |
|-------------------|--------------|--------------|--------------|--------------|
| CWmin             | 15           | 15           | 7            | 3            |
| CWmax             | 1023         | 1023         | 15           | 7            |
| AIFS              | 3            | 7            | 1            | 1            |
| TxopLimit         | 0            | 0            | 3008         | 1504         |
| MsduLifetime      | 500          | 500          | 500          | 500          |
|-------------------|--------------|--------------|--------------|--------------|
|-------------------|--------------|--------------|--------------|--------------|
|                   | 802.1q/DSCP  | 802.1q/DSCP  | 802.1q/DSCP  | 802.1q/DSCP  |
|-------------------|--------------|--------------|--------------|--------------|
| QoS mapping       |    1 /  8    |    0 /  0    |    4 / 26    |    6 / 46    |
|-------------------|--------------|--------------|--------------|--------------|
```

2) Set CWmin value.
Move to the menu of AC you want to change. (The following is an example of changing to AC_VO.)

```
AP_3F05/config/802.11a/edca/ap#
     ac_vo+
     ac_vi+
     ac_be+
     ac_bk+
AP_3F05/config/802.11a/edca/ap# ac_vo
AP_3F05/config/802.11a/edca/ap/ac_vo#
```

The following command is used to change the value.

- cwmin [NUM]: Set cwmin value

| Parameter | Description |
|---|---|
| NUM | CWmin value (range: 0~255) |

```
AP_3F05/config/802.11a/edca/ap/ac_vo# cwmin 3
Set VoCwMin of WtpEdcaParam to 3 in Radio_1.conf
AP_3F05/config/802.11a/edca/ap/ac_vo#
```

3) Set CWmax value.
4) Move to the menu of AC you want to change. (The following is an example of changing to AC_VI.)

```
AP_3F05/config/802.11a/edca/ap#
      ac_vo+
      ac_vi+
      ac_be+
      ac_bk+
AP_3F05/config/802.11a/edca/ap# ac_vi
AP_3F05/config/802.11a/edca/ap/ac_vi#
```

The following command is used to change the value.

- cwmax [NUM]: Set cwmax value

| Parameter | Description |
|---|---|
| NUM | CWmax value(range: 0~32767) |

```
AP_3F05/config/802.11a/edca/ap/ac_vi# cwmax 15
Set ViCwMax of WtpEdcaParam to 15 in Radio_1.conf
AP_3F05/config/802.11a/edca/ap/ac_vi#
```

5) Set AIFS value.
6) Move to the menu of AC you want to change. (The following is an example of changing to AC_BK.)

```
AP_3F05/config/802.11a/edca/ap#
      ac_vo+
      ac_vi+
      ac_be+
      ac_bk+
AP_3F05/config/802.11a/edca/ap# ac_bk
AP_3F05/config/802.11a/edca/ap/ac_bk#
```

The following command is used to change the value.

- aifsn [NUM]: Set AIFS value

| Parameter | Description |
|---|---|
| NUM | AIFS value (range: 1~15) |

```
AP_3F05/config/802.11a/edca/ap/ac_bk# aifsn 7
Set BkAifsn of WtpEdcaParam to 7 in Radio_1.conf
AP_3F05/config/802.11a/edca/ap/ac_bk#
```

7) Set TxopLimit value.
8) Move to the menu of AC you want to change. (The following is an example of changing to AC_BE.)

```
AP_3F05/config/802.11a/edca/ap#
     ac_vo+
     ac_vi+
     ac_be+
     ac_bk+
AP_3F05/config/802.11a/edca/ap# ac_be
AP_3F05/config/802.11a/edca/ap/ac_be#
```

The following command is used to change the value.

- txop_limit [LIMIIT]: Set TxopLimit value

| Parameter | Description |
|---|---|
| LIMIIT | TxopLimit value (range: 0~65535) |

```
AP_3F05/config/802.11a/edca/ap/ac_be# txop_limit 0
Set BeTxopLimit of WtpEdcaParam to 0 in Radio_1.conf
AP_3F05/config/802.11a/edca/ap/ac_be#
```

9) Set MSDU Lifetime value
Move to the menu of AC you want to change. (The following is an example of changing to AC_VO.)

```
AP_3F05/config/802.11a/edca/ap#
     ac_vo+
     ac_vi+
     ac_be+
     ac_bk+
AP_3F05/config/802.11a/edca/ap# ac_vo
```

The following command is used to change the value.

- msdu_lifetime [TIME]: Set MSDU Lifetime value

| Parameter | Description |
|---|---|
| TIME | MSDU Lifetime value (range: 0~7fffffff) |

```
AP_3F05/config/802.11a/edca/ap/ac_vo# msdu_lifetime 500
Set VoMsduLifetime of WtpEdcaParam to 500 in Radio_1.conf
AP_3F05/config/802.11a/edca/ap/ac_vo#
```

## 3.5.2 Station EDCA Configuration

Enter the edca menu of the station.

```
AP_3F05/config/802.11a/edca#
      ap+
      sta+
AP_3F05/config/802.11a/edca# sta
AP_3F05/config/802.11a/edca/sta#
      ac_vo+
      ac_vi+
      ac_be+
      ac_bk+
AP_3F05/config/802.11a/edca/sta#
```

1) View the station EDCA's configuration of the current radio. Move to the menu of AC you want to change ➔ Select and change the parameter you want. (It is the same as the method of setting EDCA.)

```
AP_3F05/config/802.11a/edca/sta# show summary
|-------------------<<< Station EDCA Param Summary >>>--------------------------|
|-------------------|--------------|--------------|--------------|--------------|
| WTP               | AC_BE        | AC_BK        | AC_VI        | AC_VO        |
|-------------------|--------------|--------------|--------------|--------------|
| CWmin             | 15           | 15           | 7            | 3            |
| CWmax             | 1023         | 1023         | 15           | 7            |
| AIFS              | 3            | 7            | 2            | 2            |
| TxopLimit         | 0            | 0            | 3008         | 1504         |
| MsduLifetime      | 500          | 500          | 500          | 500          |
|-------------------|--------------|--------------|--------------|--------------|
AP_3F05/config/802.11a/edca/sta#
```

## 3.5.3 EDCA Configuration using WEB UI

Select <Radio> → <802.11a/n or 8021.11b/g/n> → <QoS>

In WEB UI, EDCA parameter configuration for each access category is not offered.

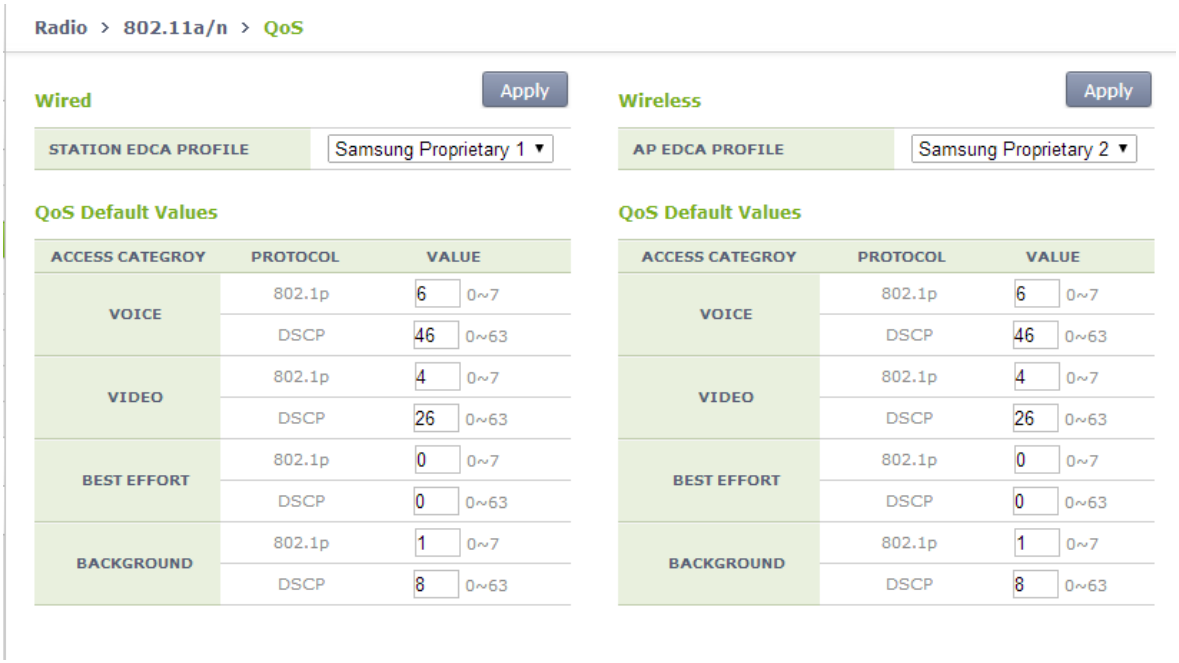



**Figure 18. Radio QoS Configuration Menu**

# 3.6 Setting MAC Operation Parameter

Enter the mac_operation menu of the radio.

The following shows one example to enter the mac_operation menu in 802.11a.

```
AP_3F05/config/802.11a# mac_operation
AP_3F05/config/802.11a/mac_operation#
      retry_limit+
      threshold+
      msdu_lifetime+
AP_3F05/config/802.11a/mac_operation#
```

1) View the current radio's Mac operation parameter configuration.

```
AP_3F05/config/802.11a/mac_operation# show summary
-------------------<<< Mac Operation Summary >>>--------------------
Max Tx MSDU lifetime ............................ 512 TUs
Max Rx MSDU lifetime ............................ 512 TUs
short retry limit ............................... 4
long retry limit ................................ 10
RTS threshold ................................... 2346
fragmentation threshold ......................... 2346
AP_3F05/config/802.11a/mac_operation#
```

2) Set retry limit of the radio.

- retry_limit short [LIMIT]: short retry limit
- retry_limit long [LIMIT]: long retry limit

| Parameter | Description |
|---|---|
| LIMIT | Retry limit (range : 1~255) |

```
AP_3F05/config/802.11a/mac_operation# retry_limit short 4
Set ShortRetryLimit of MacOperation to 4 in Radio_1.conf
AP_3F05/config/802.11a/mac_operation#
```

3) Set RTS threshold and fragmentation threshold of the radio.

- threshold rts [THRESHOLD]: Set RTS threshold
- threshold fragment [THRESHOLD]: Set fragmentation threshold

| Parameter | Description |
|---|---|
| THRESHOLD | A range of RTS threshold : 256~2346<br>A range of fragmentation threshold : 256~2346 |

```
AP_3F05/config/802.11a/mac_operation# threshold fragment 2346
Set FragmentationThreshold of MacOperation to 2346 in Radio_1.conf
AP_3F05/config/802.11a/mac_operation#
```

4) Set MSDU lifetime of the radio.

- msdu_lifetime tx [TUs]: Set Max Tx MSDU lifetime
- msdu_lifetime rx [TUs]: Set Max Rx MSDU lifetime

| Parameter | Description |
|---|---|
| TUs | Range : 1~65535 |

```
AP_3F05/config/802.11a/mac_operation# msdu_lifetime tx 512
Set TxMsduLifetime of MacOperation to 512 in Radio_1.conf
AP_3F05/config/802.11a/mac_operation#
```

[WEB Setting]

Select <Radio> → <802.11a/n or 8021.11b/g/n> → <General> -> General

In WEB UI, functions that change retry limit and MSDU lifetime are not offered.

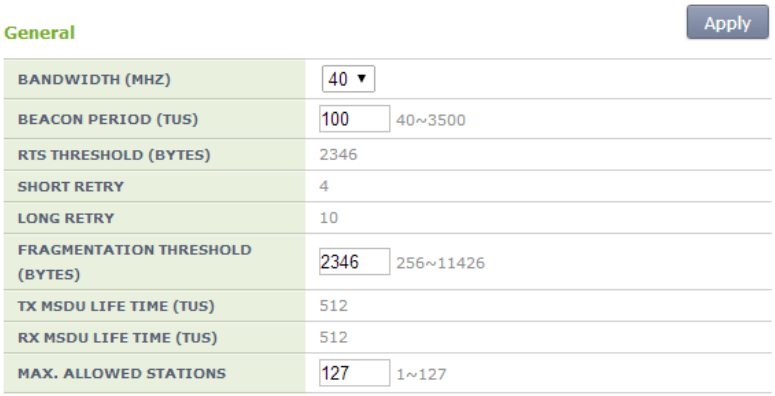



**Figure 19. Radio MAC Configuration (General) Menu**

# 4. WLAN Management

In this chapter, it will explain how to create and set WLAN, which is the most basic for the wireless LAN services of WE AP.

## 4.1 WLAN Create/Delete

To use WLAN service, the SSID (Service Set Identifier) should be specified basically.

Enter the wlan menu of the CLI.

```
AP_3F05/config#
      802.11a+
      802.11bg+
      wlan+
      network+
AP_3F05/config# wlan
AP_3F05/config/wlan#
```

1) You can check the information of the current specified wlan by the TAB key or ?(help).

```
AP_3F05/config/wlan#
      create                    add VAP
      delete                    delete VAP
      bss_1_1+                  BSS(1, 1)
      bss_2_1+                  BSS(2, 1)
      bss_1_2+                  BSS(1, 2)
      bss_2_2+                  BSS(2, 2)
```

[Tip] You can check the information of the current connected station with the following “show station” command.

```
AP_3F05/config/wlan# show bss_2_1 station
AID  MAC Address       RSSI  SNR  EAPOL
---------------------------------------
  1  CC:F9:E8:A4:91:87   -38   54    0
```

[Tip] You can check the WLAN-VLAN mapping information by the following command.

```
AP_3F05/config/wlan# show vlan-mapping
 RADIO ID | WLAN ID | VLAN ID
----------+---------+---------
        2 |       1 |     100
        1 |       1 |     100
```

2) Create WLAN

- create [ WLAN_ID][SSID]: Create bss

| Parameter | Description |
|---|---|
| SSID | SSID(Service Set Identifier) |
| WLAN_ID | ID of WLAN (range: 1~16) |

```
AP_3F05/config/wlan# create
     Usage: AP_3F05/config/wlan/create <wlan_id> <ssid>
AP_3F05/config/wlan# create 5 uready_service
Select Radio-Area((1)5G, (2)2.4G, (3)5G/2.4G) :
```

- Select radio area of the WLAN. (5G, 2.4G, or simultaneous use of 5G/2.4G) The following shows one example to enter the mac_operation menu in 802.11a.

  * The following shows one example to select the simultaneous use of 5G/2.4G.

```
Select Radio-Area((1)5G, (2)2.4G, (3)5G/2.4G) : 3
bss_1_5 is created
bss_2_5 is created
AP_3F05/config/wlan#
```


From bss_x_y shown in the instructions and help, x means the radio area of corresponding bss. (1 is 5G, and 2 is 2.4G.)

3) Delete WLAN

- delete [ WLAN_ID]: Delete bss

| Parameter | Description |
|---|---|
| WLAN_ID | ID of WLAN (range: 1~16) |

```
AP_3F05/config/wlan# delete 5
bss_1_5 is deleted
bss_2_5 is deleted
AP_3F05/config/wlan#
```

4) Check the status of the current WLAN

- show status: View the status of the current WLAN

```
AP_3F05/config/wlan# show summary
BSS_1_1         Status: Started
                BSSID: F4:D9:FB:35:C3:42   SSID: "BRANCH_TEST_HAM_PSK"
                IEEE 802.11an     Channel: 161    TX Power: 17 dBm
                Max rate: 144.0 Mbps

BSS_1_2         Status: Started
                BSSID: F4:D9:FB:35:C3:43   SSID: "BRANCH_TEST_HAM_1X"
                IEEE 802.11an     Channel: 161    TX Power: 17 dBm
                Max rate: 144.0 Mbps
…
```

## WLAN Create/Delete using WEB UI

Select <Configuration> from <WEB Main Window> menu, and in the sub-menu, select <WLANs>.

1) Inquire WLAL

Select WLAN which you want to inquire and change, and perform enable/disable/delete.

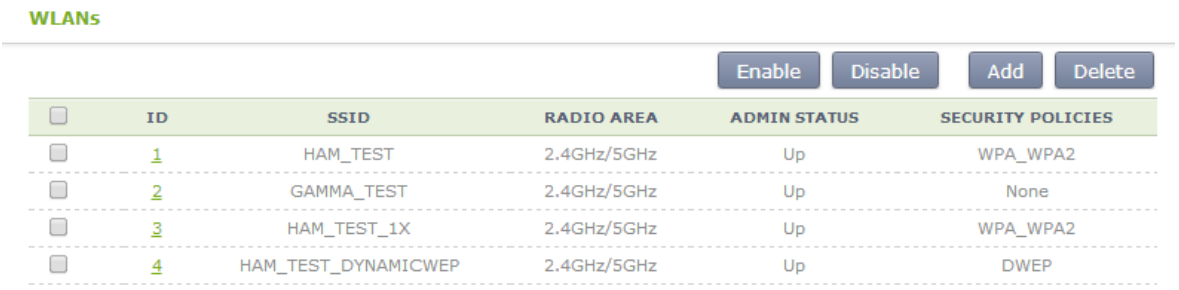



**Figure 20. WLAN Configuration – Check the WLAN List**

2) Create WLAN

Select the ID of WLAN you want to create, input SSID, and choose the radio area.


**Figure 21. WLAN Configuration – WLAN Creation Menu**


According to the radio area of WLAN specified in CLI, bss is generated for each of the radio. If they are specified to be used simultaneously, when you change the settings in the individual bss menu, the change will be applied all concurrently, and when deleting they will be deleted at the same time. When you add/delete WLAN, all WLAN services will be automatically restarted, and at this point, existing terminals which are connected will be released.

# 4.2 WLAN Additional Setting

Each wireless terminal can receive differentiated services according to the WLAN s ettings.

1) Select and enter the appropriate bss. (The following is an example to select bs s_q1_1 in wlan menu.)

```
AP_3F05/config/wlan#
      create
      delete
      bss_1_1+
      bss_2_1+
      bss_1_2+
      bss_2_2+
AP_3F05/config/wlan# bss_1_1
AP_3F05/config/wlan/bss_1_1#
      start
      stop
      ssid
      hidden_ssid+
      default_qos
      security
      idle_timeout
      wmm+
      vlan
      dtim
      max_bss_clients
      ampdu+
AP_3F05/config/wlan/bss_1_1#
```

2) View the current settings information of the currently established WLAN.

```
AP_3F05/config/wlan/bss_1_1# show summary
-----------------<<< WLAN General Config Summary >>>-----------------
WLAN ID ..................................... 1
Running State ............................... up
Default QoS ................................. AC_BE
SSID ........................................ HAM_TEST
BSSID ....................................... F4:D9:FB:24:CE:02
Station Idle Timeout ........................ 300 sec
DTIM Period ................................. 1
QoS Option(WMM) ............................. enabled
```

```
Allowed max clients per bss ..................... 127
A-MPDU option ................................... enabled
Auth Key Management ............................. WPA-EAP
IEEE 802.1X Authorization ....................... Enabled
Pairwise Cipher for WPA ......................... CCMP TKIP
Pairwise Cipher for RSN/WPA2 .................... CCMP TKIP
WPA/IEEE 802.11i ................................ WPA/RSN(WPA2)
AP_3F05/config/wlan/bss_1_1#
```

3) Start/stop the WLAN service.

- start: Start the WLAN service
- stop: Stop the WLAN service

```
AP_3F05/config/wlan/bss_1_1# start
AP_3F05/config/wlan/bss_1_1# stop
AP_3F05/config/wlan/bss_1_1#
```

4) Change the name of SSID.

- ssid [SSID]: Change the SSID(Service Set Identifier)

| Parameter | Description |
|---|---|
| SSID | SSID(Service Set Identifier) |

```
AP_3F05/config/wlan/bss_1_1# ssid HAM_TEST2
set bsss_1_1 ssid to HAM_TEST2
set bsss_2_1 ssid to HAM_TEST2
AP_3F05/config/wlan/bss_1_1#
```

5) Change the SSID hidden setting.

- hidden_ssid enable: SSID is set to the hidden mode
- hidden_ssid disable: The hidden mode of SSID is cleared

```
AP_3F05/config/wlan/bss_1_1# hidden_ssid
     enable
     disable
AP_3F05/config/wlan/bss_1_1# hidden_ssid disable
set bsss_1_1 SsidHiddenMode to 0
set bsss_2_1 SsidHiddenMode to 0
AP_3F05/config/wlan/bss_1_1#
```

If SSID is set to the hidden mode, when other devices perform a search the SSID i s not found.

6) Change the QoS default configuration.

- default_qos [AC]: Set the default QoS to AC.

| Parameter | Description |
|---|---|
| AC | Background/Besteffort/ video/ voice |

```
AP_3F05/config/wlan/bss_1_1# default_qos Besteffort
set bsss_1_1 DefaultQosPolicy to 2
set bsss_2_1 DefaultQosPolicy to 2
AP_3F05/config/wlan/bss_1_1#
```

7) Set Station Idle Timeout value.

- idle_timeout [TIME]: Set Station Idle Timeout value

| Parameter | Description |
|---|---|
| TIME | Station Idle Timeout (range: 30~3600sec, Based on the user input, it will be changed and stored in 15 seconds.) |

```
AP_3F05/config/wlan/bss_1_1# idle_timeout 300
set bsss_1_1 StaIdleTimeout to 300
set bsss_2_1 StaIdleTimeout to 300
AP_3F05/config/wlan/bss_1_1#
AP_3F05/config/wlan/bss_1_1# idle_timeout 314
ERROR: Idle Timeout(315 secs) will be set by 15secs instead of input value 314 sec
set bsss_1_1 StaIdleTimeout to 315
set bsss_2_1 StaIdleTimeout to 315
AP_3F05/config/wlan/bss_1_1#
```

8) Set the DTIM Period.

- DTIM Period [DTIM]: Set the DTIM Period value

| Parameter | Description |
|---|---|
| DTIM | DTIM Period (range: 1~255) |

```
AP_3F05/config/wlan/bss_1_1# dtim 2
set bsss_1_1 DtimPeriod to 2
set bsss_2_1 DtimPeriod to 2
AP_3F05/config/wlan/bss_1_1#
```

9) Set QoS Option(WMM).

- wmm enable: Set QoS Option(WMM)
- wmm disable: Clear QoS Option(WMM)

```
AP_3F05/config/wlan/bss_1_1# wmm enable
set bsss_1_1 QosOption to 1
set bsss_2_1 QosOption to 1
AP_3F05/config/wlan/bss_1_1#
```

10) Set the maximum clients per BSS.

- max_bss_clients [NUM]: NUM is set to the maximum number of clients of each BSS.

| Parameter | Description |
|---|---|
| NUM | max client per BSS (range: 1~127) |

```
AP_3F05/config/wlan/bss_1_1# max_bss_clients 126
set bsss_1_1 MaxClients to 126
set bsss_2_1 MaxClients to 126
AP_3F05/config/wlan/bss_1_1#
```

11) Set whether to use A-MPDU option.

- ampdu enable: A-MPDU is used for the BSS.
- ampdu disable: A-MPDU is not used for the BSS.

```
AP_3F05/config/wlan/bss_1_1# ampdu enable
set bsss_1_1 HtAmpdu to 1
set bsss_2_1 HtAmpdu to 1
AP_3F05/config/wlan/bss_1_1#
```

12) Set the VLAN ID used in WLAN.

- vlan [VLAN_ID]

| Parameter | Description |
|---|---|
| VLAN_ID | VLAN ID (range: 0~4096)<br>If it is set to 0, VLAN is not used. |

```
AP_3F05/config/wlan/bss_1_1# vlan 0
set bsss_1_1 VlanId to 0
set bsss_2_1 VlanId to 0
AP_3F05/config/wlan/bss_1_1#
```

### Change the WLAN configuration using WEB UI

Select <Configuration> from <WEB Main Window> menu, select <WLANs> in the sub-menu, and select WLAN you want to change.

1) Change the default settings
You can change SSID, Hidden SSID setting, and the maximum number of the cli ents per radio. Changing radio area is not allowed. If you want to change it, yo

u should delete the corresponding WLAN and create new one.

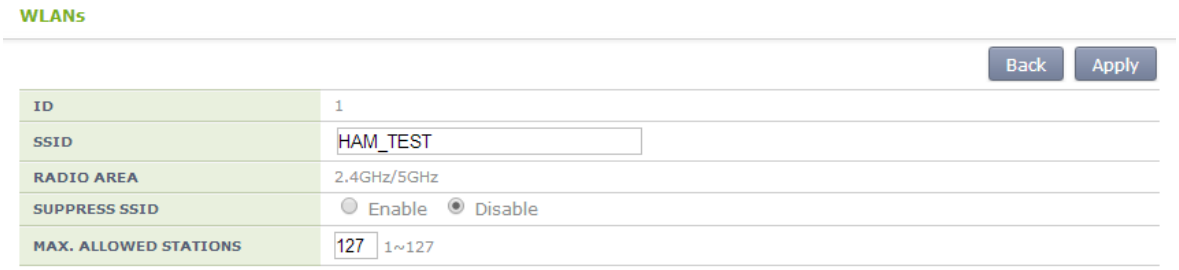



**Figure 22. WLAN Default Settings Menu**

2) Changed advanced settings

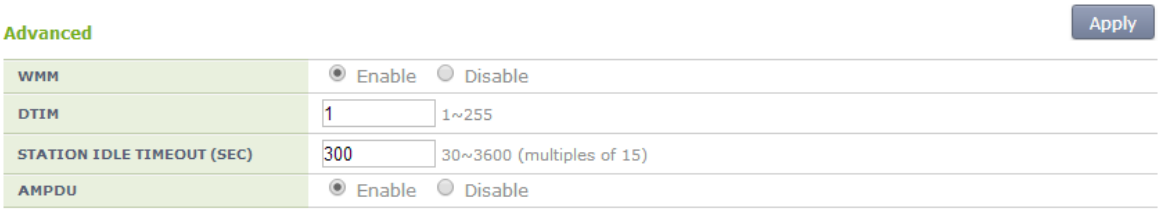



**Figure 23. WLAN Configuration – Advanced Settings Menu**

# 4.3 WLAN Security and Authentication

Samsung WE AP supports the security and authentication function specified on the wireless LAN security standard based on IEEE 802.11, and the main mechanism is as follows:

- WEP(Wired Equivalent Privacy)s
- WPA1(Wi-Fi Protected Access Version 1), WPA2(Wi-Fi Protected Access Version 2)
  - Authentication methods: PSK, 802.1X
  - Encryption methods: TKIP, AES-CCMP

If you add a new WLAN, the WLAN security settings are initially inactive, so the operator must set the desired security features.

## 4.3.1 WLAN Security Menu Entry/Inquiry

If you select security settings, the currently set information of WLAN is automatically shown. Below is an example of the initialization of the security features of wlan 1.

1) If you choose “security”, it shows current security settings and checks whether to modify or not to the user.

```
AP_3F05/config/wlan/bss_1_1#
     start
     stop
     ssid
     hidden_ssid+
     default_qos
     security
     idle_timeout
     wmm+
     vlan
     dtim
     max_bss_clients
     ampdu+
AP_3F05/config/wlan/bss_1_1# security
SSID ..................................... HAM_TEST
Auth Key Management ...................... WPA-PSK
WPA ASCII Passphrase ..................... qwer1234
IEEE 802.1X Authorization ................ Disabled
Pairwise Cipher for WPA .................. CCMP TKIP
Pairwise Cipher for RSN/WPA2 ............. CCMP TKIP
WPA/IEEE 802.11i ......................... WPA/RSN(WPA2)
-----------------------------------------------------------------
Change security settings ? (y/n) :
```

2) If the user chooses to change, the user will select the following settings through

the menu for each step.

| Item | | Description |
|---|---|---|
| L2 SECURITY TYPE | | Layer2 security features type<br>- None: Deactivate the security features (Select it if you want th reset the WLAN security functions)<br>- Static WEP: Static WEP security features<br>- WPA + WPA2: WPA/WPA2 PSK/802.1x security features<br>- Dynamic WEP |
| WPA POLICY | WPA | Activate the WPA Version 1 features if you select it |
| | ENCRYPTION TYPE | Encryption scheme<br>- TKIP: TKIP scheme<br>- CCMP: AES-CCMP scheme<br>- Both: TKIP, AES-CCMP scheme |
| WPA2 POLICY | WPA | Activate the WPA Version 2 features if you select it |
| | ENCRYPTION TYPE | Encryption scheme<br>- TKIP: TKIP scheme<br>- CCMP: AES-CCMP scheme<br>- Both: TKIP, AES-CCMP scheme |
| AUTH KEY MGMT | PSK/802.1x | Authentication key management scheme<br>- PSK: PSK(Shared Key) authentication scheme<br>- 802.1x: 802.1x authentication scheme through the RADIUS server |
| AUTH KEY MGMT | PSK FORMAT | PSK key input method<br>- ASCII: ASCII string<br>- HEX: Hexadecimal value |
| | PSK KEY | PSK key<br>8~63 ASCII string<br>64-character hexadecimal value |
| STATIC WEP | WEP KEY FORMAT | Key input format<br>- ASCII: ASCII string<br>- HEX: Hexadecimal value |
| | WEP KEY SIZE | Length of the key<br>- 40: 40 bits (5 bytes)<br>- 104: 104 bits(13 bytes) |
| | WEP KEY INDEX | Key index (1~4) |
| | WEP KEY | Key value |

## 4.3.2 WLAN Security Setting

1) WPA + WPA2 Setting

- L2 Security type is selected to WPA + WPA2 (4).

```
Change security settings ? (y/n) :
**********************************************
```

```
(0) None
(1) Static WEP
(2) 802.1x(Dynamic WEP)
(3) WPA + WPA2
***********************************************
Select (0~3) : 3
```

- Set the WPA Policy and Encryption type.

```
Select (0~4) : 4
***********************************************
WPA Policy (0:no, 1:yes) : 1
***********************************************
(0) TKIP
(1) CCMP
(2) Both
***********************************************
Select (0~2) : 2
***********************************************
```

- Set the WPA2 Policy and Encryption type.

```
***********************************************
WPA2 Policy (0:no, 1:yes) : 1
***********************************************
(0) TKIP
(1) CCMP
(2) Both
***********************************************
Select (0~2) : 2
```

- Select Auth Key Management method.

• Set PSK method

```
***********************************************
(0) PSK
(1) 802.1x
***********************************************
Select (0~1) : 0
***********************************************
(0) ASCII passphrase
(1) hex format
***********************************************
Select (0~1) : 0
***********************************************
ASCII passphrase(8..63 characters) that will be converted to PSK
Enter: qwer1234
Hapd_SaveDbForSecurityConf(radio=1, wlan=1)
Hapd_SaveDbForRSNCipherSuite(radio=1, wlan=1)
Hapd_SaveDbForSecurityConf(radio=2, wlan=1)
Hapd_SaveDbForRSNCipherSuite(radio=2, wlan=1)
AP_3F05/config/wlan/bss_1_1#
```

- Set 802.1x method

```
***********************************************
(0) PSK
(1) 802.1x
***********************************************
Select (0~1) : 1
***********************************************
ASCII passphrase(8..63 characters) that will be converted to PSK
Enter: qwer1234
Hapd_SaveDbForSecurityConf(radio=1, wlan=1)
Hapd_SaveDbForRSNCipherSuite(radio=1, wlan=1)
Hapd_SaveDbForSecurityConf(radio=2, wlan=1)
Hapd_SaveDbForRSNCipherSuite(radio=2, wlan=1)
AP_3F05/config/wlan/bss_1_1#
```

2) Set Static WEP

-L2 Security type is selected to Static WEP (1).

```
***********************************************
(0) None
(1) Static WEP
(2) 802.1x(Dynamic WEP)
(3) Static WEP + 802.1x(Dynamic WEP)
(4) WPA + WPA2
***********************************************
Select (0~4) : 1
***********************************************
WEP key index (0~3) : 1
***********************************************
WEP key- quoted string/unquoted hexa digits, 5/13 chars, or 10/26 digits
ex)"vwxyz", 123456789a
Enter: "12345"
hostapd_config_read_wep:len=7, keyidx=1, val="12345"
Hapd_SaveDbForSecurityConf(radio=1, wlan=1)
Hapd_SaveDbForRSNCipherSuite(radio=1, wlan=1)
Hapd_SaveDbForSecurityConf(radio=2, wlan=1)
Hapd_SaveDbForRSNCipherSuite(radio=2, wlan=1)
AP_3F05/config/wlan/bss_1_1#
```


When you set WEP key, you must use quotation marks to distinguish strings. In the case of hexadecimal numbers, you don't use quotation marks.

### Change WLAN settings using WEB UI

Select <Configuration> from <WEB Main Window> menu, select <WLANs> in the sub-menu, and choose WLAN you want to change.

- After select L2 Security type(Open/Static WEP/ Dynamic WEP /WPA+ WPA2), set the items. (For the details, see how to set CLI)

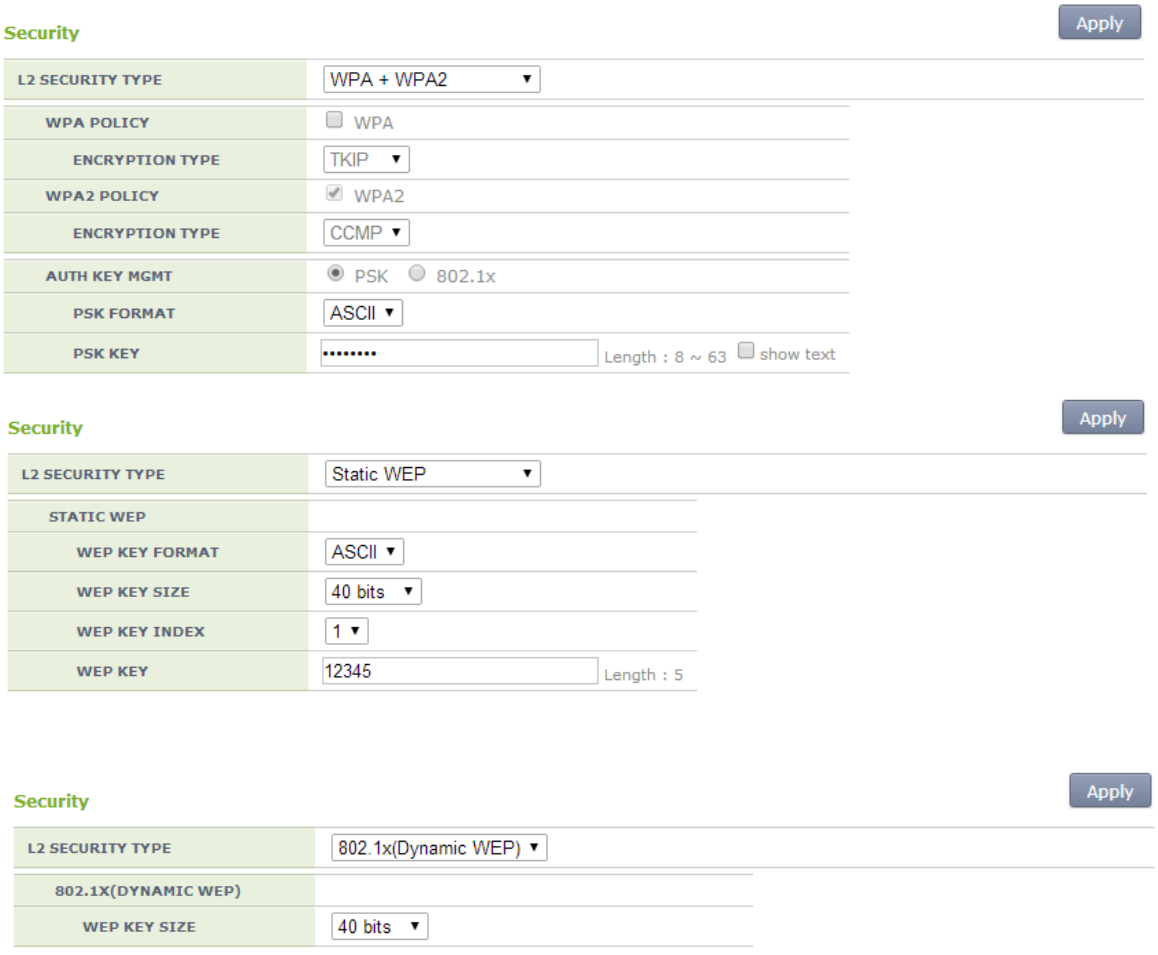



**Figure 24. WLAN Security Settings Menu**

TIP

If the security settings of WLAN are changed, all WLAN services will be automatically restarted. At this point, existing terminals which are connected will be released.

## 4.3.3 Authentication Server(Radius Server) Setting

WE AP offers security and authentication features interworking with the Wireless LAN external radius server and local radius server. If you use internal server, you should import internal subscriber information via ftp. If both internal and external radius server are enabled, external server has high priority.

| Item | | Description |
|---|---|---|
| INTERNAL SERVER | Enable/ Disable | Enable the local authentication function or not<br>– Enable: Activate the local authentication function<br>– Disable: Deactivate the local authentication function |
| | Import | Import the internal subscriber information for local authentication via ftp |
| EXTERNAL SERVER | Enable/ Disable | Set the external authentication server<br>– Enable: Configure the external authentication server<br>– Disable: Delete the external authentication server |

Enter the radius menu of the CLI.

```
AP/config#
      802.11a+
      802.11bg+
      wlan+
      network+
      radius+
AP/config# radius
AP/config/radius#
```

1) View the currently set radius information

```
AP/config/radius# show summary
-------------------<<< Radius server summary >>>--------------------
Local Auth Server ............................... Disabled
External server configuration
auth_server_addr ................................ 10.10.10.5
auth_server_port ................................ 1812
auth_server_shared_secret ....................... hamhamham
AP/config/radius#
```

2) Change the internal radius server setting.

- internal enable: Activate the local authentication function
- internal disable: Deactivate the local authentication function

```
AP/config/radius# internal enable
Set LocalAuthServerEnable of General to 1 in Radius.conf
AP/config/radius# Reading topology file /configs/hostapd/ap_wlan.conf ...
 ieee80211_ioctl_siwmode: imr.ifm_active=328320, new mode=3, valid=1
```

```
IEEE 802.11F (IAPP) using interface br0
 ieee80211_ioctl_siwmode: imr.ifm_active=393856, new mode=3, valid=1
 ieee80211_ioctl_siwmode: imr.ifm_active=393856, new mode=3, valid=1
l2_packet_receive - recvfrom: Network is down
l2_packet_receive - recvfrom: Network is down
l2_packet_receive - recvfrom: Network is down
```

1) Import the user DB for local authentication. To apply to the received file ('FILE NAME') in the current system, perform the command as follows.

-internal import [FILENAME][SERVER][ID][PASSWD]

| Parameter | Description |
|---|---|
| FILENAME | Remote DB file name which will be imported |
| SERVER | Server address to access FTP(IP or URL) |
| ID | FTP login ID |
| PASSWD | FTP login password |

```
AP/config/radius# internal import_user
     Usage: AP/config/radius/internal/import_user <filename><server><id><passwd>
AP/config/radius# internal import_user ham.csv 172.30.1.2 ycham xxxxx
--11:43:47--  ftp://ycham:*password*@172.30.1.2/ham.csv
          => `/tmp/ham.csv'
Connecting to 172.30.1.2:21... connected.
Logging in as ycham ... Logged in!
==> SYST ... done.    ==> PWD ... done.
==> TYPE I ... done.  ==> CWD not needed.
==> PORT ... done.    ==> RETR ham.csv ... done.

    [ <=>                                ] 70          --.--K/s

11:43:47 (670.19 KB/s) - `/tmp/ham.csv' saved [70]

username  = ham
username  = lee
username  = na
Total : 5 users

Import completed
AP/config/radius# Reading topology file /configs/hostapd/ap_wlan.conf ...
 ieee80211_ioctl_siwmode: imr.ifm_active=328320, new mode=3, valid=1
IEEE 802.11F (IAPP) using interface br0
 ieee80211_ioctl_siwmode: imr.ifm_active=393856, new mode=3, valid=1
 ieee80211_ioctl_siwmode: imr.ifm_active=393856, new mode=3, valid=1
l2_packet_receive - recvfrom: Network is down
l2_packet_receive - recvfrom: Network is down
l2_packet_receive - recvfrom: Network is down
```

3) Change the setting of the external radius server.

- external enable <server><port><secret>: Activate the external server

- external disable: Deactivate the external server

```
AP/config/radius# external server 100.100.100.2 1812 hamhamham
Set RadiusServerNum of General to 1 in Radius.conf
Set ServerType1 of General to 1 in Radius.conf
Set SrvIpAddr1 of General to 100.100.100.2 in Radius.conf
Set AuthPort1 of General to 1812 in Radius.conf
Set SrvKey1 of General to hamhamham in Radius.conf
AP_f4d9fb37a8e7/config/radius# Reading topology file /configs/hostapd/ap_wlan.conf ...
…
```

### Change WLAN settings using WEB UI

Select <Configuration> from <WEB Main Window> menu, and select <RADUIS> in the sub-menu.

1) Set the internal server
   - ■ Set internal server enable/disable.
   - ■ Provide functions that import/export the user DB from/to PC.
     - – Use csv file format(id/password are seperated by ‘ ,’ ) in import/export feature.

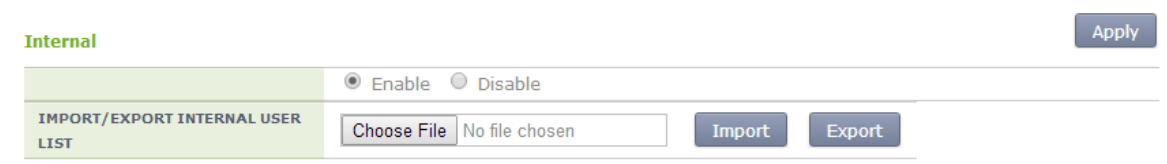



**Figure 25. Internal Radius Server Settings Menu**

2) External server Setting
   - ■ Change the external radius server setting.


**Figure 26. External Radius Server Settings Menu**

TIP

If the radius server settings are changed, all WLAN services will be automatically restarted. At this point, existing terminals which are connected will be released. If the

external server is set up with the local authentication, firstly it will try to authenticate through the external server, and when the authentication is failed due to timeout, it will perform the local authentication.

# 5. Security

In this chaptuer, it will explain how to configure the packet filter and the port forwardin g.

## 5.1 Packet Filter

WE AP suports the packet filter to permit or deny traffic. The packet filter protects the WE AP and wireless terminals from unexpected access from the Internet.

To configure packet filter and rule, enter the packetfilter menu of the CLI.

```
AP# config packetfilter
      create                  Create the packetfilter
      delete                  Delete the packetfilter
      rule+                   Packet Fiter Rule
      wlan                    Configure the packetfilter to wlan interface
      system                  Configure the packetfilter to AP system
AP# config packetfilter
AP/config/packetfilter#
```

1) create the packet filter

- create [ PACKETFILTER_NAME]: create the packet filter

| Parameter | Description |
|---|---|
| PACKETFILTER_NAME | the name of the packet filter |

```
AP/config/packetfilter# create
      Usage: AP/config/packetfilter/create <packetfilter name>
AP/config/packetfilter# create filter1
```

2) delete the packet filter

- delete [ PACKETFILTER_NAME]: delete the packet filter

| Parameter | Description |
|---|---|
| PACKETFILTER_NAME | the name of the packet filter |

```
AP/config/packetfilter# delete
      Usage: AP/config/packetfilter/delete <packetfilter name>
```

```
AP/config/packetfilter# delete filter1
```

3) create the rule of the packet filter

- rule add <PACKETFILTER_NAME> <RULE_ID> <ACTION> <PROTOCOL> <SOURCE_NET> <SOURCE MASK> <SOURCE PORT START> <SOURCE PORT_END> <DESTINATION_NET> <DESTINATION_MASK> < DESTINATION_PORT_START> <DESTINATION_PORT_END> : [ PACKETFILTER_NAME]: create the rule of the packet filter
-

| Parameter | Description |
|---|---|
| PACKETFILTER_NAME | Name of the packet filter to create |
| RULE_ID | Rule Identifier (range: 1~1026) |
| ACTION | Action ( permit , deny) |
| PROTOCOL | Name or number of an Internet protocol (tcp/udp/icmp/esp/ah/any 1~1024) |
| SOURCE_NET | Source network address (IP Subnet) |
| SOURCE_MASK | Source network mask (IP Subnet Mask) |
| SOURCE_PORT_START | source start port (range: 1 ~ 65535) |
| SOURCE_PORT_END | Source end port (range: 1 ~ 65535) |
| DESTINATION_NET | Destination network address (IP Subnet) |
| DESTINATION_MASK | Destination network mask (IP Subnet Mask) |
| DESTINATION_PORT_START | Destination start port (range: 1 ~ 65535) |
| DESTINATION_PORT_END | Destination end port (range: 1 ~ 65535) |

```
AP/config/packetfilter# rule add
     Usage: AP/config/packetfilter/add <name> <rule index> <action> <protocol> <src
net> <src mask> <sport start> <sport end> <dst net> <dst mask> <dport start> <dport
end>
AP/config/packetfilter# rule add filter1 40 deny 6 0.0.0.0 0.0.0.0 1 65535 0.0.0.0
0.0.0.0 80 80
AP/config/packetfilter# rule add filter1 50 permit 6 192.168.100.0 255.255.255.0 1
65535 0.0.0.0 0.0.0.0 8080 8080
```

4) modify the rule of the packet filter

- rule modify <PACKETFILTER_NAME> <RULE_ID> <ACTION> <PROTOCOL> <SOURCE_NET> <SOURCE MASK> <SOURCE PORT START> <SOURCE PORT_END> <DESTINATION_NET> <DESTINATION_MASK> < DESTINATION_PORT_START> <DESTINATION_PORT_END> : [ PACKETFILTER_NAME]: modify the rule of the packet filter

| Parameter | Description |
|---|---|
| PACKETFILTER_NAME | Name of the packet filter to modify |
| RULE_ID | Rule Identifier (range: 1~1026) |
| ACTION | Action ( permit , deny) |
| PROTOCOL | Name or number of an Internet protocol<br>(tcp/udp/icmp/esp/ah/any<br>1~1024) |
| SOURCE_NET | Source network address (IP Subnet) |
| SOURCE_MASK | Source network mask (IP Subnet Mask) |
| SOURCE_PORT_START | source start port (range: 1 ~ 65535) |
| SOURCE_PORT_END | Source end port (range: 1 ~ 65535) |
| DESTINATION_NET | Destination network address (IP Subnet) |
| DESTINATION_MASK | Destination network mask (IP Subnet Mask) |
| DESTINATION_PORT_START | Destination start port (range: 1 ~ 65535) |
| DESTINATION_PORT_END | Destination end port (range: 1 ~ 65535) |

```
AP/config/packetfilter# rule add filter1 50 permit 6 192.168.100.0 255.255.255.0 1
65535 100.100.100.100 255.255.255.255 8088 8088
```

5) delete the packet filter

- rule delete [ PACKETFILTER_NAME] [RULE_ID]: delete the packet fitler

| Parameter | Description |
|---|---|
| PACKETFILTER_NAME | Name of packet filter to delete |
| RULE_ID | Rule Identifier |

```
AP/config/packetfilter# rule delete
     Usage: AP/config/packetfilter/delete <name> <rule-index>
AP/config/packetfilter# rule delete packetfilter1 50
```

6) apply the packet filter to WLAN

- wlan [RADIO_ID] [WLAN_ID] [ PACKETFILTER_NAME] : apply the packet filter to WLAN

| Parameter | Description |
|---|---|
| RAIDIO_ID | radio ID ID(rnage: 1~2) |
| WLAN_ID | wlan id to apply the packet filter (range: 1~16) |
| PACKETFILTER_NAME | name of packet filter |

```
AP/config/packetfilter# wlan
     Usage: AP/config/packetfilter/wlan <radio_id> <wlan_id> <packetfilter name>
```

```
AP/config/packetfilter# wlan 1 1 packetfilter2
AP/config/packetfilter# no wlan 1 1 packetfilter2
```

7) apply the packet filter to AP

- system [ PACKETFILTER_NAME] : apply the packet filter to AP system

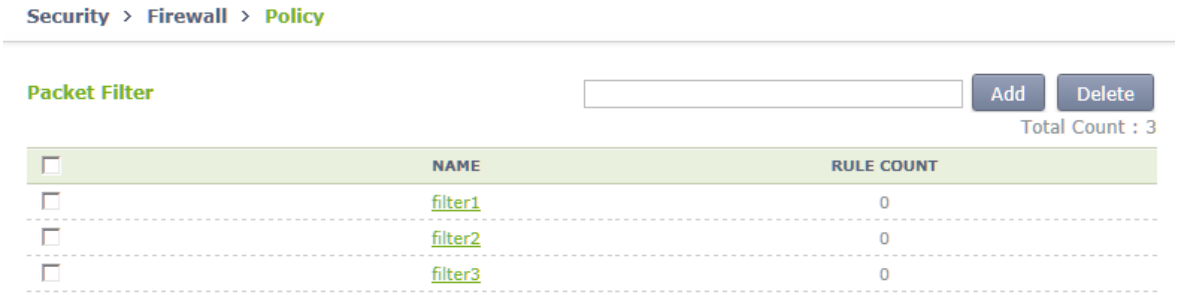
| Parameter | Description |
|---|---|
| PACKETFILTER_NAME | the name of packet filter to apply to the AP system. |

```
AP/config/packetfilter# system
     Usage: AP/config/packetfilter/system <packetfilter name>
AP/config/packetfilter# system packetfilter3
```

### Create/Delete the packet filter using WEB UI

Select <Configuration> from <WEB Main Window> menu, select <Security> in the sub-menu.

1) Create/Delete the packet filter




2) Append/Delete the rule of the packet filter

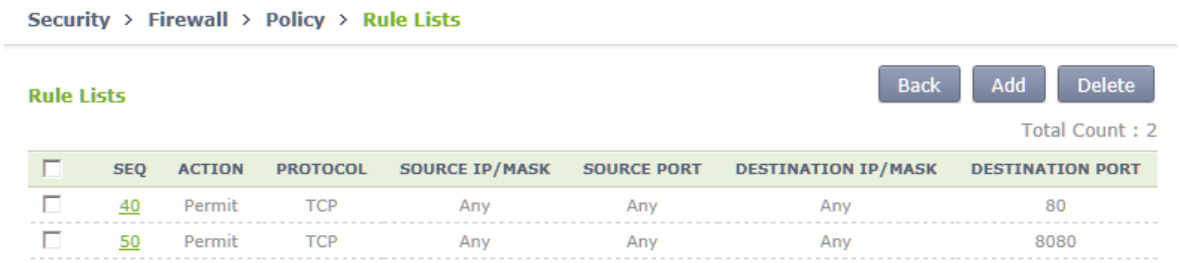



**Figure 27. Packet Filter List**

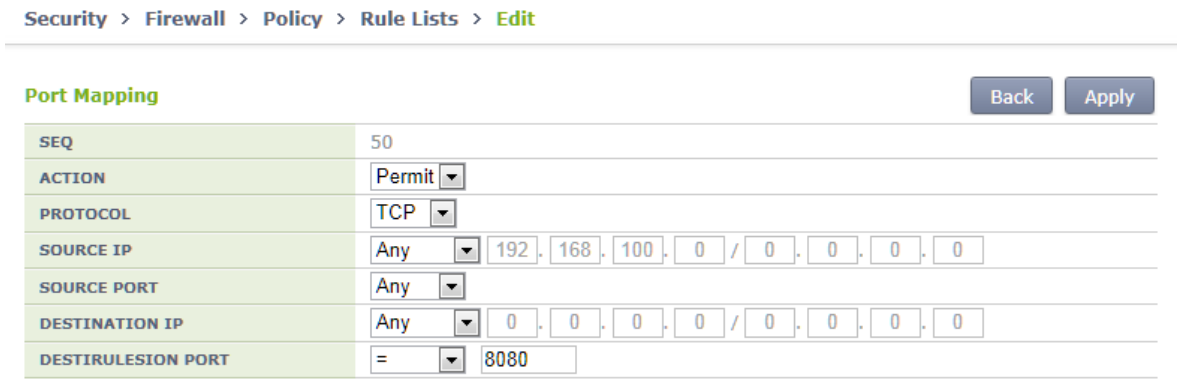



**Figure 28. The Rule of Packet Filter Configuration**

3) Apply the packet filter to the WLAN

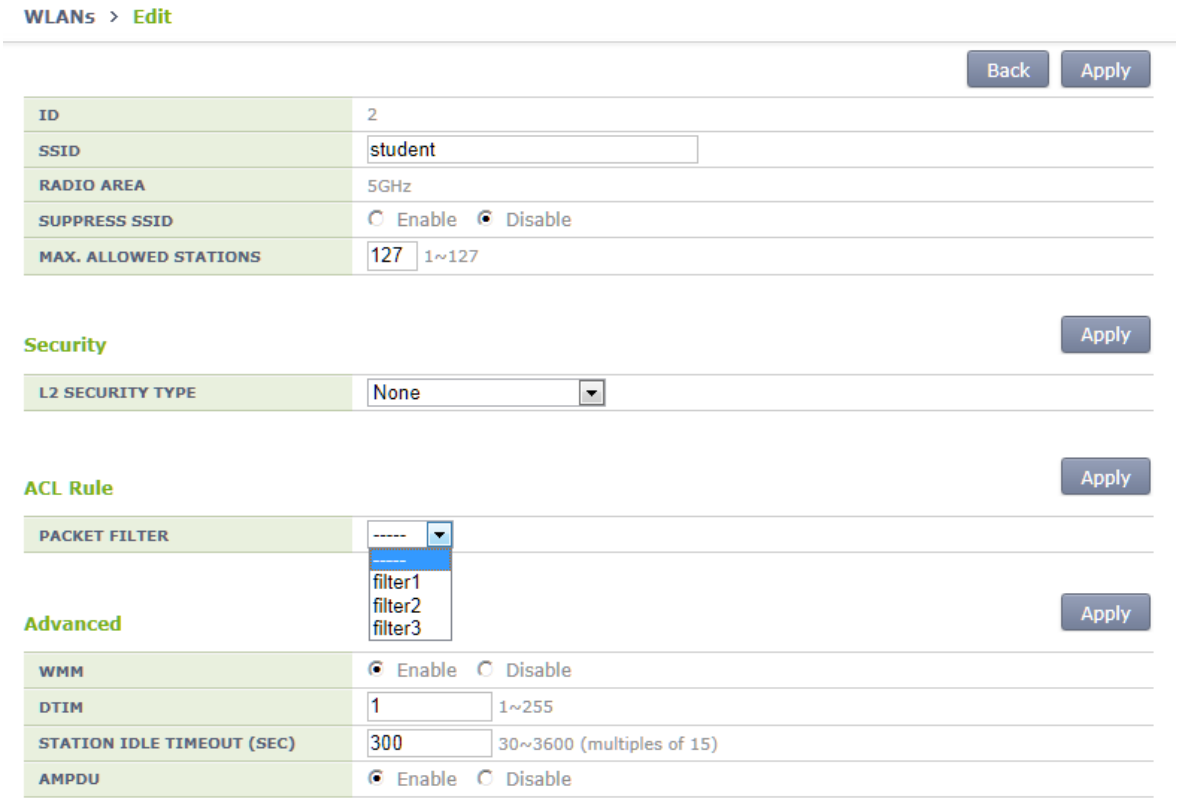



**Figure 29. Packet Filter WALN Menu**

4) Apply the packet filter to the AP system

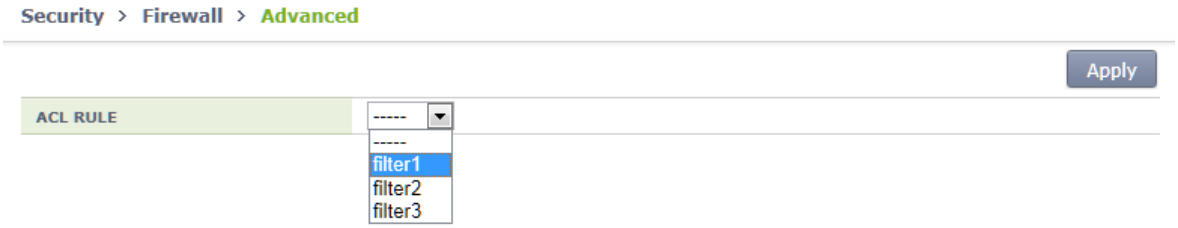



**Figure 30. Advance Packet Filter Menu**

# 5.2 Port Forwarding

WE AP supports the port forwarding to allow Internet computers to connect to a your computer in a private WLAN.

To configure the port-forwarding, enter the nat menu of the CLI.

1) Create the NAT rule of the port forwarding

- add <RULE_ID> <PROTOCOL> <SOURCE_NET> <SOURCE MASK> <SOURCE PORT START> <SOURCE PORT_END> < DESTINATION_PORT_START> DESTINATION_PORT_END> <TARGET_ADDRESS> <TARGET_PORT_START> <TARGET_PORT_END>: Create the port forwarding
-

| Parameter | Description |
|---|---|
| RULE_ID | the ID of port-forwarding rule to create (range: 1~1026) |
| PROTOCOL | protocol (tcp/udp/icmp/esp/ah/any 1~1024) |
| SOURCE_NET | source network address (IP Subnet) |
| SOURCE_MASK | source network mask (IP Subnet Mask) |
| SOURCE_PORT_START | source start port (range: 1 ~ 65535) |
| SOURCE_PORT_END | source end port (range: 1 ~ 65535) |
| DESTINATION_PORT_START | destination start port (range: 1 ~ 65535) |
| DESTINATION_PORT_END | destination end port (range: 1 ~ 65535) |
| TARGET_ADDRESS | private IP Address (IP Address) |
| TARGET_PORT_START | Inner target start port(range: 1 ~ 65535) |
| TARGET _PORT_END | Inner target end port(range: 1 ~ 65535) |

```
AP/config/nat/port-forward#
     add                       add new port forward rule
     delete                    delete port forward rule
     modify                    modify port forward rule
AP/config/nat/port-forward# add
     Usage: AP/config/nat/port-forward/add <rule index> <protocol> <src net> <src
mask> <sport start> <sport end> <dport start> <dport end> <target-ip> <target port
start> <target port end>
AP/config/nat/port-forward# add 10 tcp 0.0.0.0 0.0.0.0 1 65535 21 21 192.168.100.5 21
21
AP/config/nat/port-forward# add 20 udp 100.100.100.0 255.255.255.0 1 65535 6000 6001
192.168.100.2 6000 6001
```

2) Modify the rule of port-forwarding

- modify <RULE_ID> <PROTOCOL> <SOURCE_NET> <SOURCE MASK> <SOURCE PORT START> <SOURCE PORT_END> < DESTINATION_PORT_START> DESTINATION_PORT_END> <TARGET_ADDRESS> <TARGET_PORT_START> <TARGET_PORT_END>: modify the rule of port-forwarding
-

| Parameter | Description |
|---|---|
| RULE_ID | the ID of port-forwarding rule to modify (range: 1~1026) |
| PROTOCOL | protocol (tcp/udp/icmp/esp/ah/any 1~1024) |
| SOURCE_NET | source network address (IP Subnet) |
| SOURCE_MASK | source network mask (IP Subnet Mask) |
| SOURCE_PORT_START | source start port (range: 1 ~ 65535) |
| SOURCE_PORT_END | source end port (range: 1 ~ 65535) |
| DESTINATION_PORT_START | destination start port (range: 1 ~ 65535) |
| DESTINATION_PORT_END | destination end port (range: 1 ~ 65535) |
| TARGET_ADDRESS | private IP Address (IP 주소) |
| TARGET_PORT_START | Inner target start port(range: 1 ~ 65535) |
| TARGET _PORT_END | Inner target end port(range: 1 ~ 65535) |
| RULE_ID | the ID of port-forwarding rule to create (range: 1~1026) |

```
AP/config/nat/port-forward# modify
     Usage: AP/config/nat/port-forward/modify <rule index> <protocol> <src net> <src
mask> <sport start> <sport end>  <dport start> <dport end> <target-ip> <target port
start> <target port end>
AP/config/nat/port-forward# modify 10 tcp 0.0.0.0 0.0.0.0 1 65535 21 21 192.168.100.8
21 21
```

3) delete the rule of port-forwarding

- delete [RULE_ID]: delete the rule of port-forwarding

| Parameter | Description |
|---|---|
| RULE_ID | the ID of the rule of delete |

```
AP/config/nat/port-forward# delete
     Usage: AP/config/nat/port-forward/delete <rule-index>
AP/config/nat/port-forward# delete 10
```

4) display the rule list of the port-forewarding

```
AP# show config nat port-forward
-------------------------------------------------------------------------------------
------------------------------
                      Source                Source    Destination Target        Target
Id   Proto      IP Address/Network Mask      Port Range  Port Range Address
Port Range
-------------------------------------------------------------------------------------
------------------------------
10      6          0.0.0.0/0.0.0.0             1-65535     21-21    192.168.100.5
21-21
20      17    100.100.100.0/255.255.255.0       1-65535   6000-6001  192.168.100.2
6000-6001
-------------------------------------------------------------------------
total port mapping rule count:2
AP#
```

## Create/Delete the port-forwarding using WEB UI

Select <Configuration> from <WEB Main Window> menu, select <Security> in the sub-menu, and select <NAT> sub-menu.

1) Add the port-forwarding

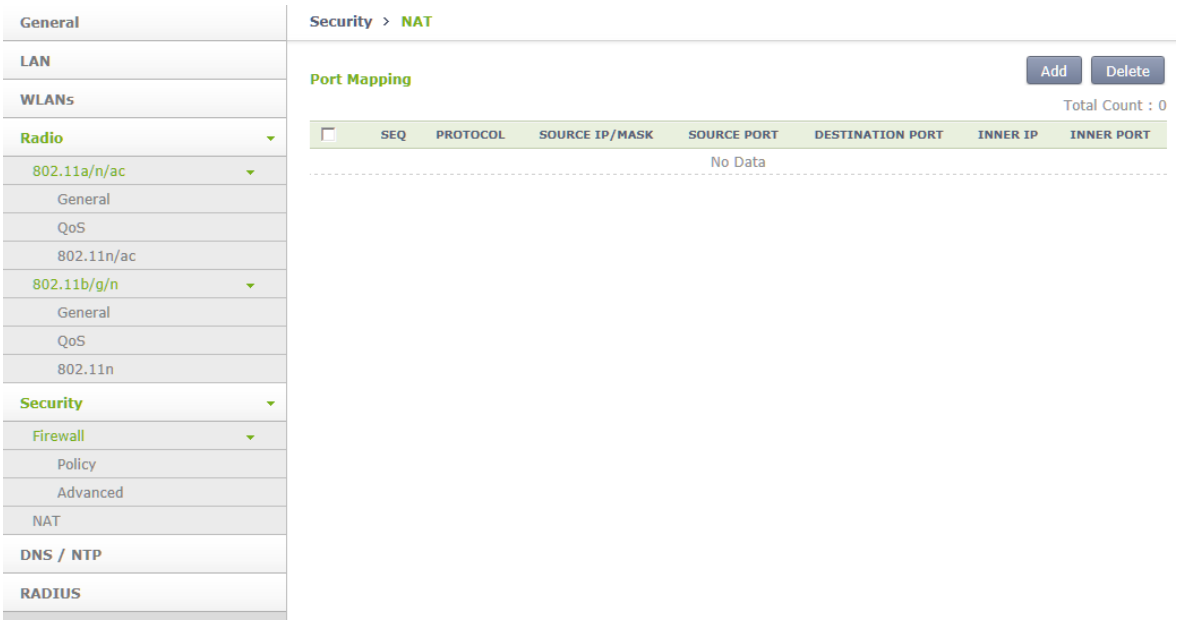



**Figure 31. NAT Port forwarding List**

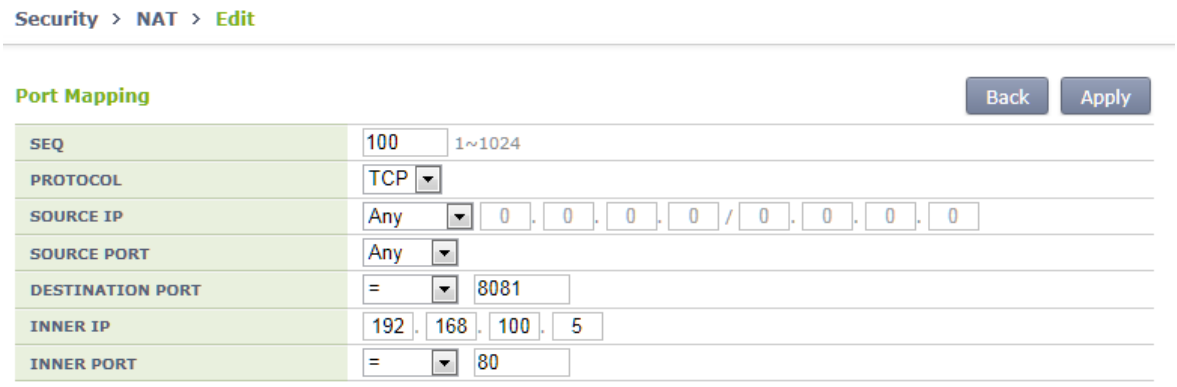



**Figure 32. Port Forwarding Rule Configuration**

# 6. System Management

## 6.1 System Information Inquiry

You can check the system status, terminals access information, system log, and sta tistics, and summary information such as system version, memory, disk, and CPU i nformation by WEB UI.

Select <Monitor> from <WEB Main Window> menu, and select <Summary> in the sub -menu. It provides a summary of the system information.


**Figure 33. System Information Inquiry Window**

You can check a version of WE AP using 'version' command in CLI.

Instruction execution result is as follows.

```
AP_3F05 # show version

BOOT VER   : FL27
MODEL NAME : WEA302i
VER        : 1.4.9.T2
DATE       : Wed Nov 6 10:04:55 KST 2013
```

```
SERIAL     : S123456789


AP_3F05 #
```

# 6.2 Country Setting

Set the country of the system.

- country [COUNTRY_STRING]

| Parameter | Description |
|---|---|
| COUNTRY_STRING | Regional specified strings<br>(KR/US/AU …) |

```
AP/system# country
     Usage: AP/system/country <country_string>
AP/system# country KR
Set CountryString of General to KR in Radio_1.conf
Set CountryString of General to KR in Radio_2.conf
AP/system#
```

If you set the country, the available channels and maximum transmission power per channel are automatically limited.

[WEB Setting]
Select <Configuration> → <General> → <Country>.

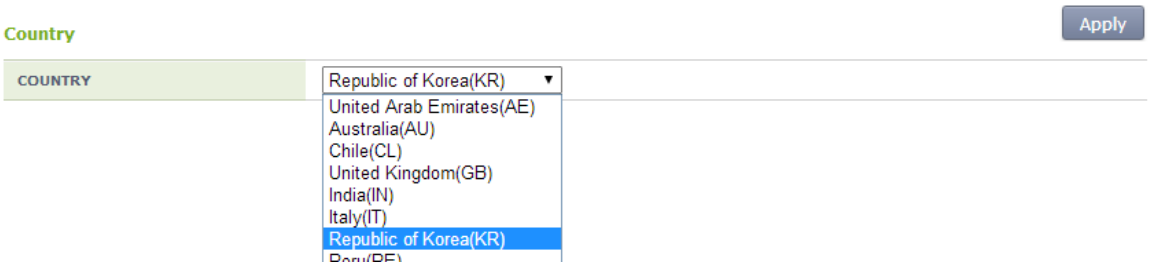



**Figure 34. System Country Setting Menu**

# 6.3 Crash Information Inquiry

If the fatal problem is happened in the system platform during the operation, the im portant system information is stored at that time and is provided for the post mort em analysis. Crash information contains the CDR(Crash Detect and Report) informat ion that contains the context about the status of crash, and the core dump informat

ion that contains the memory dump about the crash status of the user process.

It provides the following functions for the CDR information management.

- Inquire the CDR history information
- Export the CDR history information

### [Summarize and inquire the CDR history information]

If you try to inquire a summary of the entire history information about all restarts i ncluding the restarts due to the system crash, you need to input the 'show crash s ummary' command.

- show crash summary

```
AP_3F05/system# show crash summary
================================================================================
ID   EVENT_NAME       EVENT_DESCRIPTION         CRASH_TIME
================================================================================
0615 SYS_RESTART      CLI[woamx] reboot CLI command      15:21:33, Sep 29 2013
0614 SYS_RESTART      WOAM[woamx] config change          14:10:51, Sep 29 2013
0606 HW_RESET         reason: 6                          00:00:01, Jan 01 1970
0602 SYS_RESTART      …
AP_3F05/system#
```

### [Inquire the detailed CDR history information]

In order to confirm the detailed CDR history information, you need to perform the 'show crash info [id/all]' command. You can inquire the main information that conta ins the kernel log before restarting the system due to the fatal crash. Each parame ter is described below.

- show crash info [DATA]

| Parameter | Description |
|---|---|
| DATA | Select the crash information (id/all)<br>– id: The specific CDR ID value you want to inquire<br>– all: Inquire all the CDR history |

If you do not enter any parameters, it inquires the most recent restart information.

```
AP_3F05/system# show crash info

################################################################################

[CRASH SUMMARY]================================================================
ID       : 0615
EVENT NAME: SYS_RESTART
EVENT DESC: CLI[woamx] reboot CLI command
CRASH TIME: 15:21:33, Sep 29 2013
```

```
[SYSTEM INFO]============================================================

# BOOT information
BOARD_REV=5
BOARD_ID=1027
POWER_ON_BOOT=112
BOOT_KEY=0
…
…
```

[Export the CDR history information]

Crash information of the system can be generated as a text file for the post mortem analysis.

If the 'crash export' command is entered, the system crash information can be exported to the ramdisk as a text file.

- crash export

```
AP_3F05/system# crash export 0615
/tmp/crash/cdr-0615-SYS_RESTART-15_21_33_09-29-2013.txt created
AP_3F05/system#
```

[Collect Tech-support using WEB]

Select <Administration> → <Tech support> → <download>.

You can bring the message log that contains the CDR information occurred during the operation of AP, and the core information of S/W application into the PC. The gathered information can be used for the technical assistance.


**Figure 35. System Tech-support Collect Menu**

# 6.4 Configuration Management

WE AP provides the following functions for the configuration management.

- Import/export configuration information currently being operated.

- System initialization

1) To transmit the configuration information being operated in the system to the outside, the command is performed as follows. When performing the corresponding command, a file is generated with inputted 'FILENAME' by compressing the configuration information

-export [FILENAME][SERVER][ID][PASSWD]

| Parameter | Name |
|---|---|
| FILENAME | DB filename to be created when you export |
| SERVER | FTP server address (IP or URL) |
| ID | FTP login ID |
| PASSWD | FTP login password |

```
AP_3F05/system# export ap_test.apd 100.100.100.2 samsung samsung
BSS_1_1.conf
BSS_2_1.conf
Capwap.conf
Discovery.conf
Network.conf
Radio_1.conf
Radio_2.conf
Radius.conf
Sniffer.conf
System.conf
Tasks-monitor-nocal.conf
Tasks-repeater.conf
Tasks-sniffer.conf
/root
--13:49:32-- `/tmp/ap_test.apd '
    => ftp://samsung:xxxxx@100.100.100.2:21/ap_test.apd
Connecting to 100.100.100.2:21... connected!
Logging in as samsung ... Logged in!
Length: 26,112

13:49:32 (ap_test.apd) - `10.81M/s' [26112]

FINISHED --13:49:32--
Transfered 26,112 bytes in 1 file at 563.8K/s
Configuration is successfully exported
AP_3F05/ system#
```

2) To apply the file ('FILENAME') received from external to the current system, perform the following command.

-import [FILENAME][SERVER][ID][PASSWD]

| Parameter | Description |
|---|---|
| FILENAME | DB filename to import |
| SERVER | FTP server address (IP or URL) |

| | |
|---|---|
| ID | FTP login ID |
| PASSWD | FTP login password |

```
AP_3F05/ system# import ap_test.apd 100.100.100.2 samsung samsung
--14:35:44--  ftp://samsung:*password*@100.100.100.2/ap_test.db
          => `/tmp/ap_test.apd'
Connecting to 100.100.100.2:21... connected.
Logging in as samsung ... Logged in!
==> SYST ... done.    ==> PWD ... done.
==> TYPE I ... done.  ==> CWD not needed.
==> PORT ... done.    ==> RETR ap_test.apd ... done.

    [ <=>                                                                 ]
26,112       --.--K/s

14:35:44 (95.05 MB/s) - `/tmp/ap_test.apd' saved [26112]

BSS_1_1.conf
BSS_2_1.conf
Capwap.conf
Discovery.conf
Network.conf
Radio_1.conf
Radio_2.conf
Radius.conf
Sniffer.conf
System.conf
Tasks-monitor-nocal.conf
Tasks-repeater.conf
Tasks-sniffer.conf
/root
Configuration is successfully imported
System will be rebooted

URGENT: broadcast message from root:
System going down IMMEDIATELY!

        ... for maintenance; bounce, bounce ...
```

[Import/export DB using WEB]

Select <Administration> → <DB Backup/Restore>.

If you choose a backup, it brings the current system configuration information to th e PC.

If you choose a restore, the DB file is selected in the PC, transmitted to the syste m and restored. After the restore, the system will be automatically restarted.

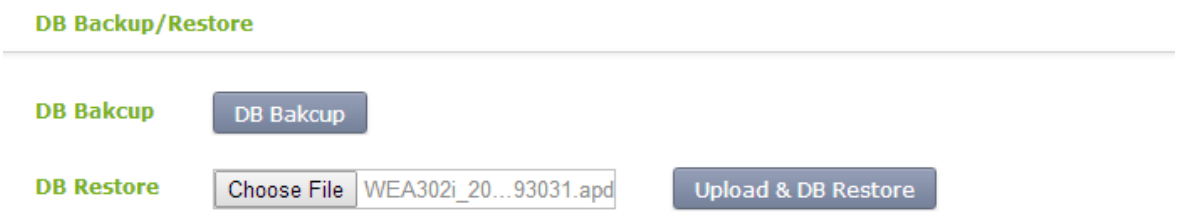



**Figure 36. System DB Backup/Restore Menu**

TIP

When the DB is imported, the name of the DB must have '.apd' extension. Because when operating it prevents from importing the wrong file by the operator's mistake. In order to import the file, you must check the extension of the DB is '.apd'.

TIP

When you export/import DB, it does not backup/restore the user's root password information. This is to prevent the case that you cannot login by the operation mistake. If you cannot remember your password which you set at the time of the backup because it has been a long time since the backup, you cannot log in the system.

3) To initialize the currently being operated configuration information to the status at the time of the factory, you should perform the following commands.

- factory reset: Reset the configuration information except IP information
- factory reset ip: Reset all the configuration information including IP
-

```
WE AP# AP_3F05/ system# factory reset
System was reset without network informations
AP_3F05/config# *2013-10-01 15:12:24 #ap-NOT: CAPWAP State Changed
AP_f4:d9:fb:24:ce:00 Notice Run -> Idle

*2013-10-01 15:12:24 #ap-MAJ: AP Down AP_f4:d9:fb:24:ce:00 Declare  DN
(mac=f4:d9:fb:24:ce:00),Location=""
*2013-10-01 15:12:24 #ap-MAJ: Disk Usage High AP_f4:d9:fb:24:ce:00 Clear
usage=84.93%,threshold=70%,cause=AP,Location=""

URGENT: broadcast message from ghost:
System going down IMMEDIATELY!

       ...  ...
```

[Initialize DB using WEB]
Select <Administration> → <Factory Reset>.
You can initialize DB with keeping IP information same as CLI, or you can initialize the entire DB information. After initialization, the system will be automatically rest arted.

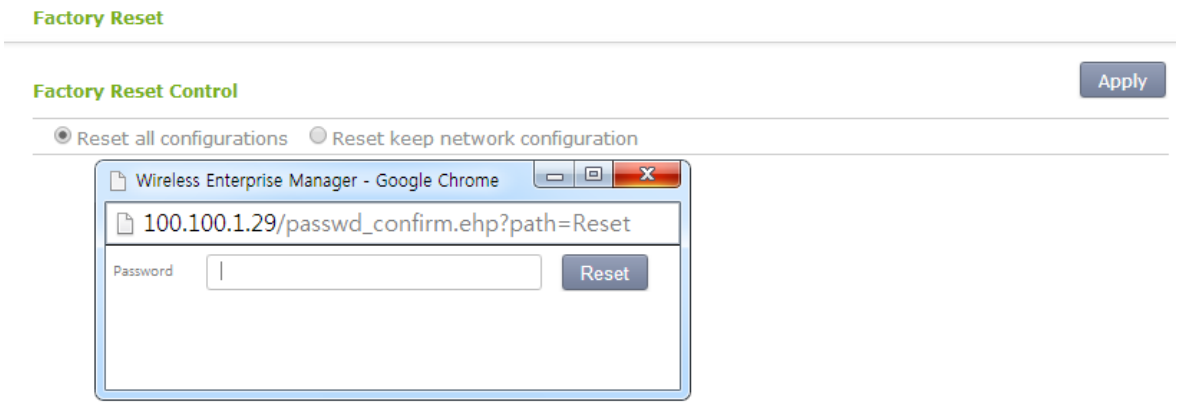



**Figure 37. System Factory Reset Menu**

# 6.5 System Restart

The command which can reboot the system is provided.
Reboot the system by using the 'reboot' command.

```
AP_3F05# system
      country
      import
      export
      factory+
      crash+
      reboot
AP_3F05# system reboot
URGENT: broadcast message from ghost:
System going down IMMEDIATELY!
```

[Reboot the system using WEB]
Select <Administration> → <Reboot>.

# 6.6 Upgrade

When a new version of the package is deployed, WE AP provides the upgrade function that can be applied to the system.

1) Use the following command and apply the new package on your system.

-upgrade ftp [SERVER][ID][PASSWD][FILENAME]

| Parameter | Description |
|---|---|
| SERVER | FTP server address (IP or URL) |
| ID | FTP login ID |
| PASSWD | FTP login password |
| FILENAME | DB file name which will be created during export |

```
AP_3F05# upgrade ftp 100.100.100.2 samsung samsung weafama.img.ham
AP_3F05#

============================================================
FTP Upgrade Start....
server-ip[100.100.100.2], img-name[weafama.img.ham], port-no[21]
============================================================

Please wait until upgrade has completed...

It will take less than a minute...

=======================================
Running Image Ver. Info.
---------------------------------------
MODEL_NAME=wea302
FAMILY_NAME=weafama
VERSION=1.4.6.T1
DATE=Tue Oct 1 14:11:16 KST 2013
=======================================


=====================================================
Image HDR Info : Upgrade Image which is copied to Ram
-----------------------------------------------------
 MODEL   = wea302
 FAMILY  = weafama
 VERSION = 1.4.6.T1
 DATE    = Tue Oct 1 14:11:16 KST 2013
 SIZE    = 37203968
 CRC     = 7a7466de
=====================================================


FAMILY NAME Matched Case!!


** Current Active Bank #0 **
```

```
upgrade_package --> Written Bank Info[1] / Image Name[weafama.img.ham] --> Result[0]


##### ROOTFS1 Version Info Update #####
=======================================================
Image HDR Info : Upgrade Image which is written to Flash
-------------------------------------------------------
MODEL_NAME=wea302

MODEL_FAMILY=weafama

VERSION=1.4.6.T1

DATE=Tue Oct 1 14:11:16 KST 2013

=======================================================



UPGRADE Post-Processing script is copied successfully !!


[UBoot-INFORMATION In Upgrade Package]
=============================================
 MODEL   = wea302
 FAMILY  = weafama
 VERSION = FL27
 SIZE    = 524288
 CHKSUM  = 42e78979
=============================================

running_uboot_version --> FL27

upgrade_uboot_version --> FL27

--> Upgrade UBoot image version is NOT greater than the Running one...
--> Skip UBoot Upgrade...


Bank Change Info  0 ---> 1

### Upgrade Completed !! ###

AP should be rebooted by using cli command or pushing reset button...
```

2) When the upgrade is complete, the system must be rebooted in order to apply the package.

```
AP_3F05# system reboot
URGENT: broadcast message from ghost:
System going down IMMEDIATELY!
```

3) After rebooting the system, verify that the new package was applied on the sys tem.

```
AP_3F05# show version

BOOT VER   : FL27
MODEL NAME : WEA302i
VER        : 1.4.6.T1
DATE       : Tue Oct 1 14:11:16 KST 2013
SERIAL     : S123456789

AP_3F05#
```

[Package upgrade using WEB]
Select <Administration> → <Package Upgrade>.
Choose the upgrade package stored in the PC and perform the command. After co mpleting the upgrade, the system will be automatically restarted.

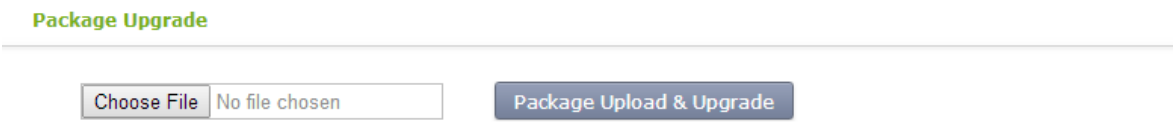



**Figure 38. Package Upgrade Menu**

# 6.7 Utility – ping

Use ping when you need to check the status of the network connection.

- ping[IP_ADDRESS]

# ANNEX A. CLI Command Structure

CLI command structure is as follows:

| Level 1 | Level 2 | Level 3 | Level 4 | Level 5 |
|---|---|---|---|---|
| Version(show) | | | | |
| config | 802.11a/bg | summary(show) | | |
| | | station(show) | | |
| | | admin | enable/disable | |
| | | channel | auto/manual | |
| | | tx_power | | |
| | | phy_type | | |
| | | beacon_period | | |
| | | max_radio_clients | | |
| | | data_rate | summary(show) | |
| | | | basic_rate | |
| | | | rx_rate | |
| | | 11n_configuration | summary(show) | |
| | | | 40mhz_operation | enable/disable |
| | | | guard_interval | regular/short |
| | | | beamforming | enable/disable |
| | | | spatial_stream | <num spatial stream> |
| | | | coexistence | enable/disable |
| | | | ldpc | enable/disable |
| | | | mcs | <mcs_bitmap> |
| | | | ampdu | enable/disable |
| | | | amsdu | enable/disable |
| | | mac_operation | summary(show) | |
| | | | msdu_lifetime | tx |
| | | | | rx |
| | | | retry_limit | short |
| | | | | long |
| | | | threshold | rts |
| | | | | fragment |

| | | | | |
|---|---|---|---|---|
| | | rate_control | summary(show) | |
| | | | ac_vo | max_rate |
| | | | ac_vi | max_rate |
| | | edca/ap | summary(show) | |
| | | | ac_vo | aifsn |
| | | | | cwmin |
| | | | | cwmax |
| | | | | txop_limit |
| | | | | msdu_lifetime |
| | | | ac_vi | aifsn |
| | | | | cwmin |
| | | | | cwmax |
| | | | | txop_limit |
| | | | | msdu_lifetime |
| | | | ac_be | aifsn |
| | | | | cwmin |
| | | | | cwmax |
| | | | | txop_limit |
| | | | | msdu_lifetime |
| | | | ac_bk | aifsn |
| | | | | cwmin |
| | | | | cwmax |
| | | | | txop_limit |
| | | | | msdu_lifetime |
| | | edca/sta | summary(show) | |
| | | | ac_vo | aifsn |
| | | | | cwmin |
| | | | | cwmax |
| | | | | txop_limit |
| | | | | msdu_lifetime |
| | | | ac_vi | aifsn |
| | | | | cwmin |
| | | | | cwmax |
| | | | | txop_limit |
| | | | | msdu_lifetime |
| | | | ac_be | aifsn |
| | | | | cwmin |

| | | | | |
|---|---|---|---|---|
| | | | | cwmax |
| | | | | txop_limit |
| | | | | msdu_lifetime |
| | | | ac_bk | aifsn |
| | | | | cwmin |
| | | | | cwmax |
| | | | | txop_limit |
| | | | | msdu_lifetime |
| | | cca_threshold | | |
| | wlan | summary(show) | | |
| | | station (show) | | |
| | | create | | |
| | | delete | | |
| | | bss_X_X (Constitute that created bss are only shown, and represent each WLAN as 5G/2.4G pair type for profiling.) | summary(show) | |
| | | | status(show) | |
| | | | stop | |
| | | | start | |
| | | | ssid | |
| | | | hidden_ssid | |
| | | | default_qos | |
| | | | security | |
| | | | idle_timeout | |
| | | | wmm | |
| | | | vlan | |
| | | | dtim | |
| | | | max_bss_clients | |
| | | | ampdu | |
| | network | interface | summary(show) | |
| | | | address | |
| | | | dhcp | |
| | | dns | add | |
| | | | delete | |
| | | ntp | enable | |
| | | | interval | |
| | | | server | |
| | | timezone | | |
| | radius | summary(show) | | |

| | | | | |
|---|---|---|---|---|
| | | internal | enable/disable | |
| | | | Import_user | |
| | | external | enable/disable | |
| debug | status(show) | | | |
| | tech-support | | | |
| system | country | | | |
| | import | | | |
| | export | | | |
| | factory | reset | | |
| | crash | | | |
| | reboot | | | |
| | apmode(hidden) | | | |
| upgrade | ftp/sftp | | | |
| Ping | | | | |

# ANNEX B. Timezone Setting

| Area | City |
|---|---|
| Africa | Abidjan Bamako Brazzaville Conakry El_Aaiun Kampala Libreville Malabo Monrovia Ouagadougou Tunis Accra Bangui Bujumbura Dakar Freetown Khartoum Lome Maputo Nairobi Porto-Novo Windhoek Addis_Ababa Banjul Cairo Dar_es_Salaam Gaborone Kigali Luanda Maseru Ndjamena Sao_Tome Algiers Bissau Casablanca Djibouti Harare Kinshasa Lubumbashi Mbabane Niamey Timbuktu Asmera Blantyre Ceuta Douala Johannesburg Lagos Lusaka Mogadishu Nouakchott Tripoli |
| America | Adak Boa_Vista Costa_Rica Glace_Bay Iqaluit Mendoza North_Dakota Rosario Tijuana Anchorage Bogota Cuiaba Godthab Jamaica Menominee Panama Santiago Toronto Anguilla Boise Curacao Goose_Bay Jujuy Merida Pangnirtung Santo_Domingo Tortola Antigua Buenos_Aires Danmarkshavn Grand_Turk Juneau Mexico_City Paramaribo Sao_Paulo Vancouver Araguaina Cambridge_Bay Dawson Grenada Kentucky Miquelon Phoenix Scoresbysund Virgin Argentina Campo_Grande Dawson_Creek Guadeloupe Knox_IN Moncton Port-au-Prince Shiprock Whitehorse Aruba Cancun Denver Guatemala La_Paz Monterrey Port_of_Spain St_Johns Winnipeg Asuncion Caracas Detroit Guayaquil Lima Montevideo Porto_Acre St_Kitts Yakutat Atikokan Catamarca Dominica Guyana Los_Angeles Montreal Porto_Velho St_Lucia Yellowknife Atka Cayenne Edmonton Halifax Louisville Montserrat Puerto_Rico St_Thomas Bahia Cayman Eirunepe Havana Maceio Nassau Rainy_River St_Vincent Barbados Chicago El_Salvador Hermosillo Managua New_York Rankin_Inlet Swift_Current Belem Chihuahua Ensenada Indiana Manaus Nipigon Recife Tegucigalpa Belize Coral_Harbour Fort_Wayne Indianapolis Martinique Nome Regina Thule Blanc-Sablon Cordoba Fortaleza Inuvik Mazatlan Noronha Rio_Branco Thunder_Bay |
| America/Argentina | Buenos_Aires Catamarca ComodRivadavia Cordoba Jujuy La_Rioja Mendoza Rio_Gallegos San_Juan Tucuman Ushuaia |
| America/Indiana | Indianapolis Knox Marengo Petersburg Vevay Vincennes |
| America/Kentucky | Louisville Monticello |
| America/North_Dakota | Center New_Salem |
| Antarctica | Casey Davis DumontDUrville Mawson McMurdo Palmer Rothera South_Pole Syowa Vostok |
| Arctic | Longyearbyen |
| Asia | Aden Baghdad Choibalsan Dubai Jakarta Krasnoyarsk Manila Pyongyang Saigon Tbilisi Ulan_Bator Almaty Bahrain Chongqing Dushanbe Jayapura Kuala_Lumpur Muscat Qatar Sakhalin Tehran Urumqi Amman Baku Chungking Gaza Jerusalem Kuching Nicosia Qyzylorda Samarkand Tel_Aviv Vientiane Anadyr Bangkok Colombo Harbin Kabul Kuwait Novosibirsk Rangoon Seoul Thimbu Vladivostok Aqtau Beirut Dacca Hong_Kong Kamchatka Macao Omsk Riyadh Shanghai |

| | |
|---|---|
| | Thimphu Yakutsk Aqtobe Bishkek Damascus Hovd Karachi Macau Oral Riyadh87 Singapore Tokyo Yekaterinburg Ashgabat Brunei Dhaka Irkutsk Kashgar Magadan Phnom_Penh Riyadh88 Taipei Ujung_Pandang Yerevan Ashkhabad Calcutta Dili Istanbul Katmandu Makassar Pontianak Riyadh89 Tashkent Ulaanbaatar |
| Atlantic | Azores Bermuda Canary Cape_Verde Faeroe Jan_Mayen Madeira Reykjavik South_Georgia St_Helena Stanley |
| Australia | ACT Brisbane Canberra Darwin LHI Lord_Howe NSW Perth South Tasmania West Adelaide Broken_Hill Currie Hobart Lindeman Melbourne North Queensland Sydney Victoria Yancowinna |
| Brazil | Acre DeNoronha East West |
| Canada | Atlantic Central East-Saskatchewan Eastern Mountain Newfoundland Pacific Saskatchewan Yukon |
| Chile | Continental EasterIsland |
| Europe | Amsterdam Bratislava Dublin Jersey Luxembourg Moscow Riga Skopje Uzhgorod Warsaw Andorra Brussels Gibraltar Kaliningrad Madrid Nicosia Rome Sofia Vaduz Zagreb Athens Bucharest Guernsey Kiev Malta Oslo Samara Stockholm Vatican Zaporozhye Belfast Budapest Helsinki Lisbon Mariehamn Paris San_Marino Tallinn Vienna Zurich Belgrade Chisinau Isle_of_Man Ljubljana Minsk Podgorica Sarajevo Tirane Vilnius Berlin Copenhagen Istanbul London Monaco Prague Simferopol Tiraspol Volgograd |
| Indian | Antananarivo Chagos Christmas Cocos Comoro Kerguelen Mahe Maldives Mauritius Mayotte Reunion |
| Mexico | BajaNorte BajaSur General |
| Mideast | Riyadh87 Riyadh88 Riyadh89 |
| Pacific | Apia Efate Funafuti Guam Kosrae Midway Noumea Ponape Samoa Truk Auckland Enderbury Galapagos Honolulu Kwajalein Nauru Pago_Pago Port_Moresby Tahiti Wake Chatham Fakaofo Gambier Johnston Majuro Niue Palau Rarotonga Tarawa Wallis Easter Fiji Guadalcanal Kiritimati Marquesas Norfolk Pitcairn Saipan Tongatapu Yap |
| US | Alaska Aleutian Arizona Central East-Indiana Eastern Hawaii Indiana-Starke Michigan Mountain Pacific Samoa |