

Application Note



Product: Ascom FreeNET VoWiFi

Purpose: Configuration Guide for Cisco Aironet 1100, 1200, 1300 Series Access Points (Autonomous mode)

Date: November 6th, 2007

Introduction

This document outlines the necessary steps and guidelines to optimally configure the Cisco Aironet 1100, 1200, 1300 Series Access Points (Autonomous mode) with the Ascom FreeNET VoWiFi system.

This guide should be used in conjunction with the appropriate Cisco configuration guide(s) and is intended for someone knowledgeable on the configuration of Cisco WLAN systems and Ascom FreeNET VoWiFi systems.

The steps, screen shots, and command line syntax depicted throughout this document are based upon model number AIR-AP1242AG-A-K9 access point (AP) with system software version 12.3(11)JA4.

Product Summary and Network Topology

| | |
|------------------------|--|
| Manufacturer | Cisco Systems, Inc. www.cisco.com |
| Products | 1100, 1200, 1300 Series AP (Autonomous mode) |
| Product sw version | 12.3(11)JA4 |
| I75 Handset sw version | 1.4.21 |
| Radio | 802.11b/g |
| Encryption | WEP, TKIP, AES-CCMP |
| Authentication | PSK, 802.1X, CCKM |
| Quality of Service | WMM, U-APSD, DSCP, CoS (802.1p/q), TSPEC |
| Other IEEE Standards | 802.11d |

Please visit www.ascomwireless.com/pd to obtain the latest software or contact Ascom Technical Support at 1-877-71ASC0M and follow the software upgrade procedure outlined in the appropriate product manual.



The Ascom i75 VoWiFi handset has tested compatible with Cisco Compatible Extension, (CCX) version 2.

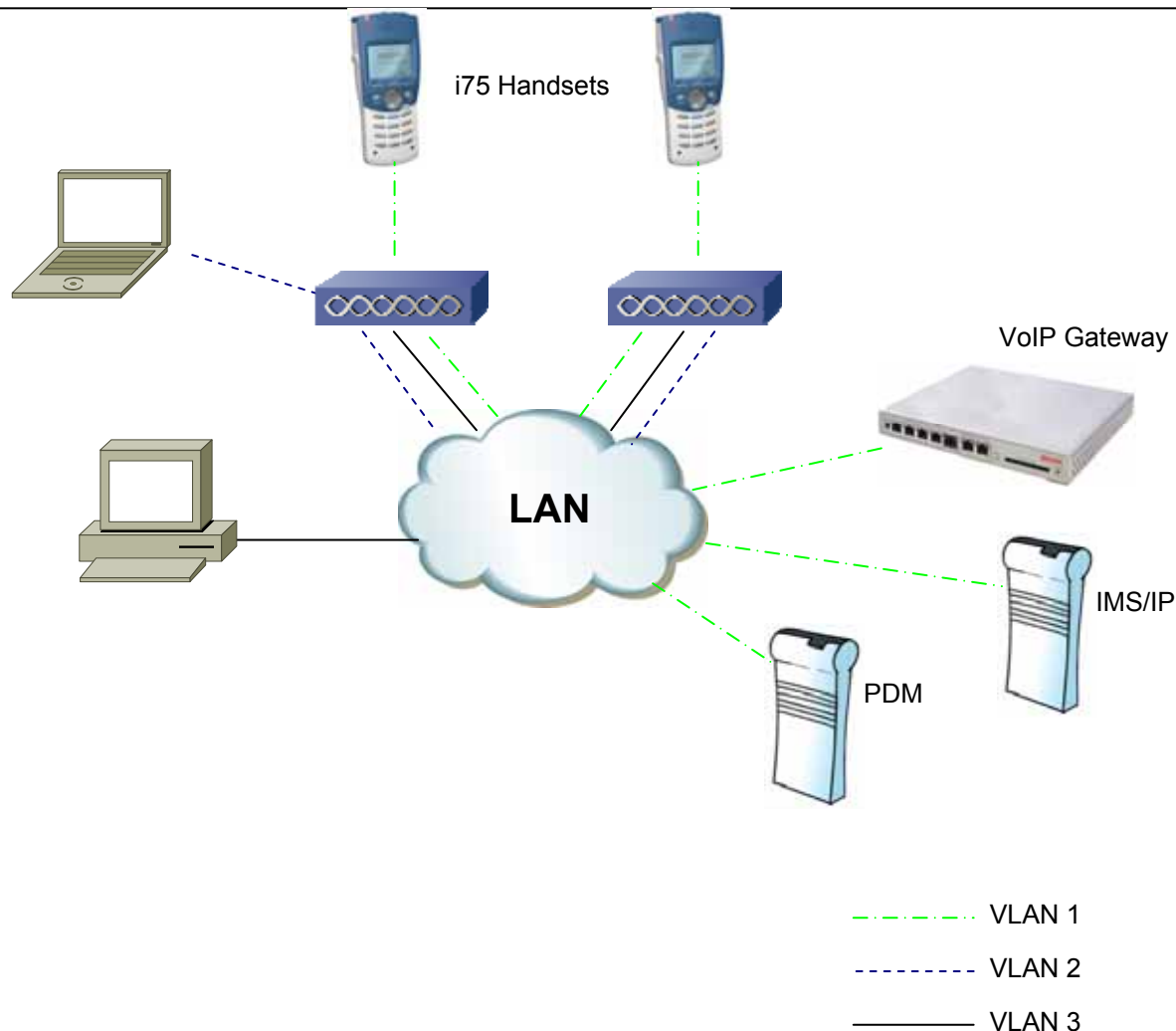
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WLAN/LAN Preparations

1. The APs in the system should be operational and accessible on the network.
2. The appropriate edge and core switches and routers should be operational and configured appropriately based upon the configuration dependencies outlined in this document.
3. The routing and VLAN configurations should be operational and configured appropriately based upon the configuration dependencies outlined in this document.
4. The requirements for VoIP and VoWiFi outlined by the LAN/WLAN vendor and Ascom should be according to specification. See the FreeNET VoWiFi System Planning Guide for additional details.



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Network Interface – Radio Configuration

1. Connect and login to the AP via a web browser by navigating to the IP address of the particular AP(s).
2. Navigate to Network Interfaces → Radio0-802.11G and click on the Settings tab.
3. Ensure that the radio is enabled (see figure 1).

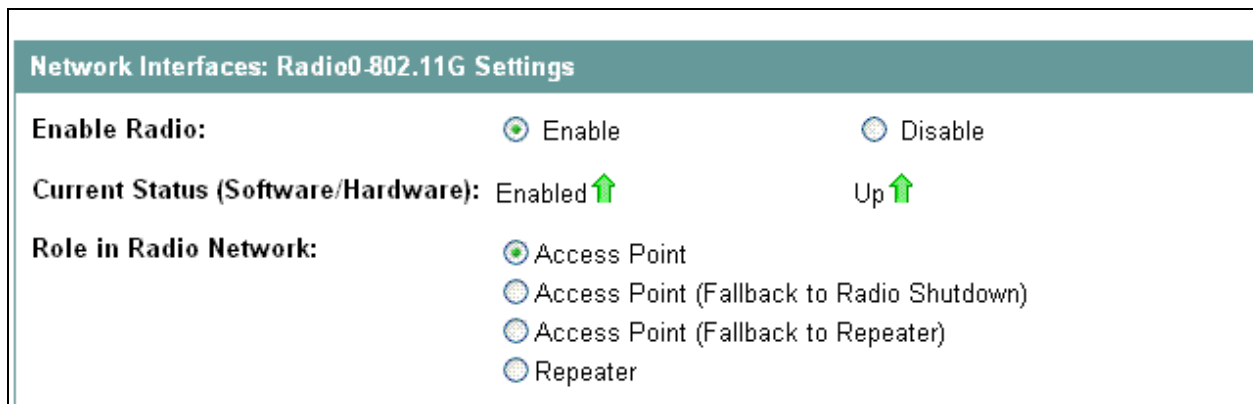


Figure 1

4. For optimum performance, set the data rates as illustrated in figure 2. This will only allow 802.11g client devices from accessing the network and will configure the AP to transmit broadcast/multicast and control frames at 12Mb/sec or lower. If 802.11b client devices are needed, then set the data rates as illustrated in figure 3 (default).

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Data Rates:

| | | | |
|--------------|--|---|-------------------------------|
| 1.0Mb/sec | <input checked="" type="radio"/> Require | <input type="radio"/> Enable | <input type="radio"/> Disable |
| 2.0Mb/sec | <input checked="" type="radio"/> Require | <input type="radio"/> Enable | <input type="radio"/> Disable |
| 5.5Mb/sec | <input checked="" type="radio"/> Require | <input type="radio"/> Enable | <input type="radio"/> Disable |
| * 6.0Mb/sec | <input checked="" type="radio"/> Require | <input type="radio"/> Enable | <input type="radio"/> Disable |
| * 9.0Mb/sec | <input checked="" type="radio"/> Require | <input type="radio"/> Enable | <input type="radio"/> Disable |
| 11.0Mb/sec | <input checked="" type="radio"/> Require | <input type="radio"/> Enable | <input type="radio"/> Disable |
| * 12.0Mb/sec | <input checked="" type="radio"/> Require | <input type="radio"/> Enable | <input type="radio"/> Disable |
| * 18.0Mb/sec | <input type="radio"/> Require | <input checked="" type="radio"/> Enable | <input type="radio"/> Disable |
| * 24.0Mb/sec | <input type="radio"/> Require | <input checked="" type="radio"/> Enable | <input type="radio"/> Disable |
| * 36.0Mb/sec | <input type="radio"/> Require | <input checked="" type="radio"/> Enable | <input type="radio"/> Disable |
| * 48.0Mb/sec | <input type="radio"/> Require | <input checked="" type="radio"/> Enable | <input type="radio"/> Disable |
| * 54.0Mb/sec | <input type="radio"/> Require | <input checked="" type="radio"/> Enable | <input type="radio"/> Disable |

* OFDM Rates

Figure 2

Data Rates:

| | | | |
|--------------|--|---|-------------------------------|
| 1.0Mb/sec | <input checked="" type="radio"/> Require | <input type="radio"/> Enable | <input type="radio"/> Disable |
| 2.0Mb/sec | <input checked="" type="radio"/> Require | <input type="radio"/> Enable | <input type="radio"/> Disable |
| 5.5Mb/sec | <input checked="" type="radio"/> Require | <input type="radio"/> Enable | <input type="radio"/> Disable |
| * 6.0Mb/sec | <input type="radio"/> Require | <input checked="" type="radio"/> Enable | <input type="radio"/> Disable |
| * 9.0Mb/sec | <input type="radio"/> Require | <input checked="" type="radio"/> Enable | <input type="radio"/> Disable |
| 11.0Mb/sec | <input checked="" type="radio"/> Require | <input type="radio"/> Enable | <input type="radio"/> Disable |
| * 12.0Mb/sec | <input type="radio"/> Require | <input checked="" type="radio"/> Enable | <input type="radio"/> Disable |
| * 18.0Mb/sec | <input type="radio"/> Require | <input checked="" type="radio"/> Enable | <input type="radio"/> Disable |
| * 24.0Mb/sec | <input type="radio"/> Require | <input checked="" type="radio"/> Enable | <input type="radio"/> Disable |
| * 36.0Mb/sec | <input type="radio"/> Require | <input checked="" type="radio"/> Enable | <input type="radio"/> Disable |
| * 48.0Mb/sec | <input type="radio"/> Require | <input checked="" type="radio"/> Enable | <input type="radio"/> Disable |
| * 54.0Mb/sec | <input type="radio"/> Require | <input checked="" type="radio"/> Enable | <input type="radio"/> Disable |

* OFDM Rates

Figure 3



The Ascom i75 VoWiFi handset has tested compatible with Cisco Compatible Extension, (CCX) version 2.

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- Set the default radio channel to either 1, 6, or 11 (see figure 4).

The screenshot shows a configuration window with two sections. The first section, 'Default Radio Channel:', has a dropdown menu currently set to 'Channel 11 - 2462 MHz'. To the right of the dropdown, the text 'Channel 11 2462 MHz' is displayed. The second section, 'Least Congested Channel Search: (Use Only Selected Channels)', contains a list of 11 channels with their corresponding frequencies: Channel 1 - 2412 MHz, Channel 2 - 2417 MHz, Channel 3 - 2422 MHz, Channel 4 - 2427 MHz, Channel 5 - 2432 MHz, Channel 6 - 2437 MHz, Channel 7 - 2442 MHz, Channel 8 - 2447 MHz, Channel 9 - 2452 MHz, Channel 10 - 2457 MHz, and Channel 11 - 2462 MHz.

Figure 4

- For dense AP deployments, it might be necessary to adjust the transmit power of the AP and associated clients. This is highly dependant on the RF design for each particular deployment.
Note: It's important that the AP power and all associated client(s) power are symmetrical. Also, in order to dynamically adjust the client's transmit power, ensure that aironet extensions are enabled (see figure 5).

The screenshot shows a configuration window with four rows of radio button options. The first row is 'CCK Transmitter Power (mW):' with options 1, 5, 10, 20, 30 (selected), 50, 100, and Max. The second row is 'OFDM Transmitter Power (mW):' with options 1, 5, 10, 20, 30 (selected), and Max. To the right of this row is a blue link labeled 'Power Translation Table (mW/dBm)'. The third row is 'Client Power Local:' with 'Enable' (selected) and 'Disable' options. The fourth row is 'Limit Client Power (mW):' with options 1, 5, 10, 20, 30 (selected), 50, 100, and Max.

Figure 5

- Set World Mode Multi-Domain Operation to dot11d and set the Country Code to United States (see figure 6).
Note: If dot11d is not enabled, you must manually configure the regulatory domain parameter in each handset.

The screenshot shows a configuration window with two rows. The first row is 'World Mode Multi-Domain Operation:' with three radio button options: 'Disable', 'Legacy', and 'Dot11d' (selected). The second row is 'Country Code:' with a dropdown menu set to 'United States' and two checkboxes: 'Indoor' (checked) and 'Outdoor' (unchecked).

Figure 6

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8. Set Aironet Extensions to Enable (see figure 7).

Aironet Extensions: Enable Disable

Figure 7

9. Set the Beacon Period to 100 and the DTIM to 5 (see figure 8). The DTIM period set to 5 will allow maximum battery conservation without impacting QoS.

| | | | |
|--------------------------|--|--------------------------|--|
| Beacon Period: | <input type="text" value="100"/> (20-4000 Kusec) | Data Beacon Rate (DTIM): | <input type="text" value="5"/> (1-100) |
| Max. Data Retries: | <input type="text" value="64"/> (1-120) | RTS Max. Retries: | <input type="text" value="64"/> (1-120) |
| Fragmentation Threshold: | <input type="text" value="2346"/> (256-2346) | RTS Threshold: | <input type="text" value="2347"/> (0-2347) |

Figure 8

10. Verify that Public Secure Packet Forwarding (PSPF) is disabled on the Ascom voice VLAN (see figure 9). If enabled, the access point will not allow two STAs to communicate with each other (e.g. RTP traffic for voice communication is blocked).

Services: VLAN

Global VLAN Properties

Current Native VLAN: Management VLAN 1

Assigned VLANs

| | | |
|--|--|---|
| Current VLAN List | Create VLAN | Define SSIDs |
| <input type="text" value="< NEW >"/> <input type="text" value="VLAN 6"/> <input type="button" value="Delete"/> | VLAN ID: <input type="text" value="6"/> (1-4094) VLAN Name (optional): <input type="text"/> | <input type="checkbox"/> Native VLAN <input type="checkbox"/> Enable Public Secure Packet Forwarding |

Figure 9



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Security

The Ascom i75 handset can utilize various security settings dependant on the need of the facility. The following section is segmented based upon the desired security setting.

1. Navigate to Security → SSID Manager and create a new ESSID and assign it to the Ascom voice VLAN (see figure 10).

Current SSID List

| | | |
|---------|-------------|---|
| < NEW > | SSID: | aws-voice |
| rtplan6 | VLAN: | G [VLANG] Define VLANs |
| | Backup 1: | |
| | Backup 2: | |
| | Backup 3: | |
| | Interface: | <input checked="" type="checkbox"/> Radio0-802.11G <input type="checkbox"/> Radio1-802.11A |
| | Network ID: | (0-4096) |

Delete

Figure 10

2. Set the desired authentication method as described below.
3. Set the desired encryption method as described below.
4. With a multiple SSID configuration, in order to ensure that the Ascom voice SSID is broadcasted set SSID as Guest Mode and Set Data Beacon Rate (DTIM) value to 5 (see figure 11).

Multiple BSSID Beacon Settings

Multiple BSSID Beacon

- Set SSID as Guest Mode
- Set Data Beacon Rate (DTIM): 5 (1-100)

Figure 11

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5. With a single BSSID broadcast configuration, in order to ensure that the Ascom voice SSID is broadcasted set the Beacon Mode to Single BSSID and select Set Single Guest Mode SSID to the Ascom voice ESSID created in step 1 (see figure 12)

The screenshot shows the 'Guest Mode/Infrastructure SSID Settings' configuration page. It includes the following fields and options:

- Set Beacon Mode:** Radio buttons for 'Single BSSID' (selected) and 'Multiple BSSID'.
- Set Single Guest Mode SSID:** A dropdown menu with 'aws-voice' selected.
- Set Infrastructure SSID:** A dropdown menu with '< NONE >' selected.
- Force Infrastructure Devices to associate only to this SSID:** An unchecked checkbox.

Figure 12

Authentication Methods

Open Authentication

1. Navigate to Security → SSID Manager and select the Ascom voice VLAN.
2. Enable Open Authentication and select <NO ADDITION> (see figure 13).

The screenshot shows the 'Authentication Settings' configuration page. It includes the following sections and fields:

- Methods Accepted:**
 - Open Authentication: < NO ADDITION >
 - Shared Authentication: < NO ADDITION >
 - Network EAP: < NO ADDITION >
- Server Priorities:**
 - EAP Authentication Servers:**
 - Use Defaults [Define Defaults](#)
 - Customize
 - Priority 1: < NONE >
 - Priority 2: < NONE >
 - Priority 3: < NONE >
 - MAC Authentication Servers:**
 - Use Defaults [Define Defaults](#)
 - Customize
 - Priority 1: < NONE >
 - Priority 2: < NONE >
 - Priority 3: < NONE >

Figure 13



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802.1X Authentication

1. Navigate to Security → SSID Manager and select the Ascom voice SSID.
2. Enable Network EAP and select <NO ADDITION> (see figure 14).
3. Please verify that your authentication server settings are configured properly.

Authentication Settings

Methods Accepted:

Open Authentication: < NO ADDITION >

Shared Authentication: < NO ADDITION >

Network EAP: < NO ADDITION >

Server Priorities:

EAP Authentication Servers

Use Defaults [Define Defaults](#)

Customize

Priority 1: < NONE >

MAC Authentication Servers

Use Defaults [Define Defaults](#)

Customize

Priority 1: < NONE >

Figure 14

Encryption Methods

WEP (see figure 15)

1. Navigate to Security → Encryption Manager.
2. Select the Ascom voice VLAN.
3. Select WEP Encryption and select Mandatory.
4. Select the appropriate transmit key and select the appropriate key size.
5. Enter the appropriate encryption key.



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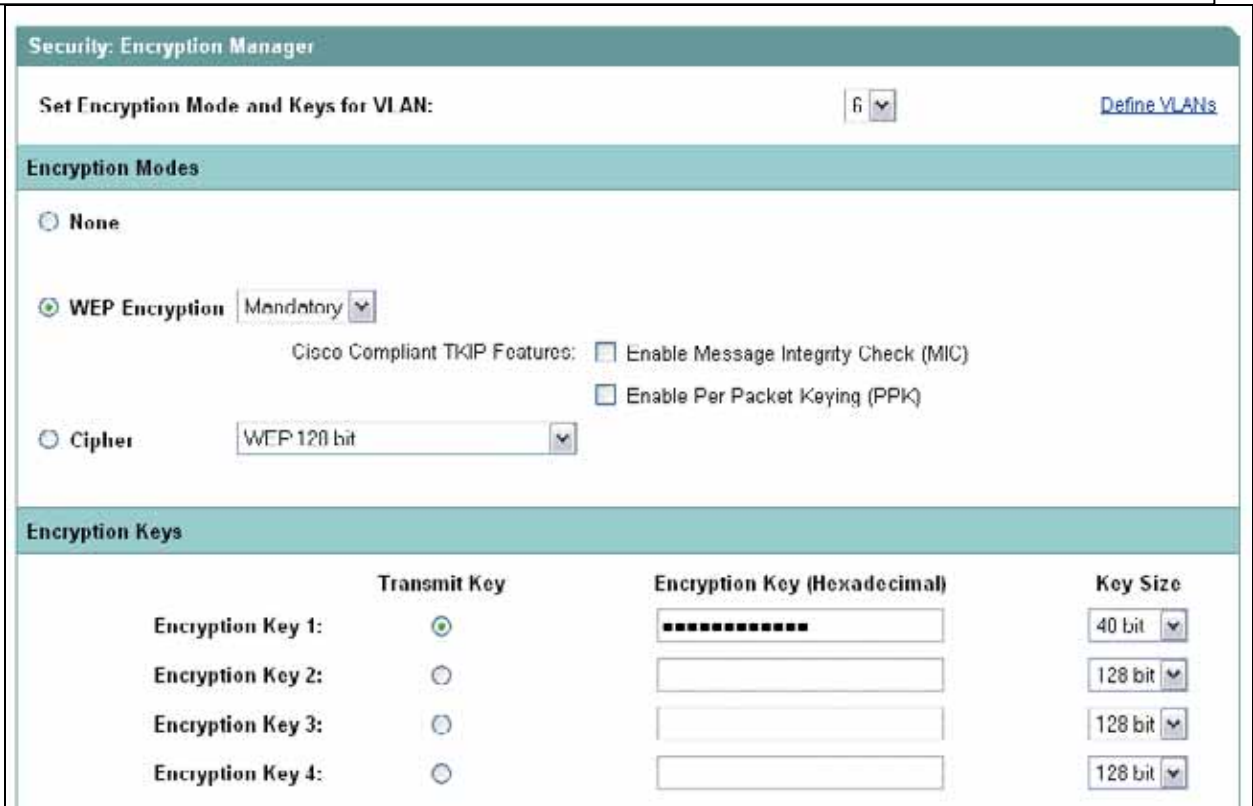


Figure 15

TKIP

1. Navigate to Security → Encryption Manager.
2. Select the Ascom voice VLAN.
3. Select Cipher and select TKIP (see figure 16).



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4. Navigate to Security → SSID Manager.
5. Select the Ascom voice ESSID.
6. Set Key Management to Mandatory and select WPA (see figure 17).

Authenticated Key Management

Key Management: Mandatory CCKM WPA

WPA Pre-shared Key: [Masked Key] ASCII Hexadecimal

Figure 17

7. For PSK: Enter the Appropriate WPA Pre-shared Key and select ASCII.
8. For 802.1X: Leave WPA Pre-shared Key empty. To improve client roaming/reassociation time when utilizing 802.1X, enable CCKM.

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AES-CCMP

1. Navigate to Security → Encryption Manager.
2. Select the Ascom voice VLAN.
3. Select Cipher and select AES CCMP (see figure 18).

Security: Encryption Manager

Set Encryption Mode and Keys for VLAN: 6

Encryption Modes

None

WEP Encryption

Cisco Compliant TKIP Features: Enable Message Integrity Check (MIC)
 Enable Per Packet Keying (PPK)

Cipher

Figure 18

4. Navigate to Security → SSID Manager.
5. Select the Ascom voice ESSID.
6. Set Key Management to Mandatory and select WPA (see figure 19).

Authenticated Key Management

Key Management: CCKM WPA

WPA Pre-shared Key: ASCII Hexadecimal

Figure 19

7. For PSK: Enter the Appropriate WPA Pre-shared Key and select ASCII.
8. For 802.1X: Leave WPA Pre-shared Key empty. To improve client roaming/reassociation time when utilizing 802.1X, enable CCKM.

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Quality of Service

1. Navigate to Services → QoS and select the QoS Policies tab.
2. Create a new policy for Ascom voice as depicted in figure 20.

Services: QoS Policies

Create/Edit Policies

Create/Edit Policy: ascomvoice

Policy Name: ascomvoice

Classifications:

- DSCP Expedited Forwarding - COS Voice < 10ms Latency (6)
- DSCP Best Effort - COS Best Effort (0)

Delete Classification

Match Classifications:

IP Precedence: Routine (0)

IP DSCP: Expedited Forwarding (0-63)

Apply Class of Service

Best Effort (0) Add

Voice <10ms Latency (6) Add

Figure 20

3. Apply the Ascom voice policy for the Ascom voice VLAN on the 802.11g radio interface (see figure 21).

| Apply Policies to Interface/ VLANs | | |
|------------------------------------|--------------|----------------|
| VLAN 6 | FastEthernet | Radio0-802.11G |
| Incoming | < NONE > | ascomvoice |
| Outgoing | < NONE > | ascomvoice |

Apply Cancel

Figure 21



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- Click on the Radio Access Categories tab and click the Optimized Voice button to automatically configure the access category values and packet handling parameters for voice optimization (see figure 22). Click Apply to save changes. Please note: this configuration is mandatory in order for the VoWiFi handsets to function properly with U-APSD enabled.

| Access Category | | Background (CoS 1-2) | Best Effort (CoS 0,3) | Video (CoS 4-5) | Voice (CoS 6-7) |
|--|--------|----------------------|-----------------------|-----------------|-----------------|
| Min Contention Window (2 ^x -1; x can be 0-10) | AP | 6 | 4 | 3 | 2 |
| | Client | 8 | 6 | 4 | 2 |
| Max Contention Window (2 ^x -1; x can be 0-10) | AP | 10 | 6 | 5 | 4 |
| | Client | 10 | 10 | 6 | 4 |
| Fixed Slot Time (0-20) | AP | 10 | 3 | 3 | 1 |
| | Client | 12 | 5 | 5 | 2 |
| Transmit Opportunity (0-65535 μS) | AP | 0 | 0 | 0 | 0 |
| | Client | 0 | 0 | 0 | 0 |

Figure 22

- Click on the Advanced tab and disable QoS Element for Wireless Phones (see figure 23). This is currently not utilized by the Ascom VoWiFi System.

Services: QoS Policies - Advanced

IP Phone

QoS Element for Wireless Phones : Enable Dot11e Disable

Figure 23



The Ascom i75 VoWiFi handset has tested compatible with Cisco Compatible Extension, (CCX) version 2.

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6. If applicable, click on the Advanced tab and select YES to map Ethernet packets with CoS 5 to CoS 6 (see figure 24).

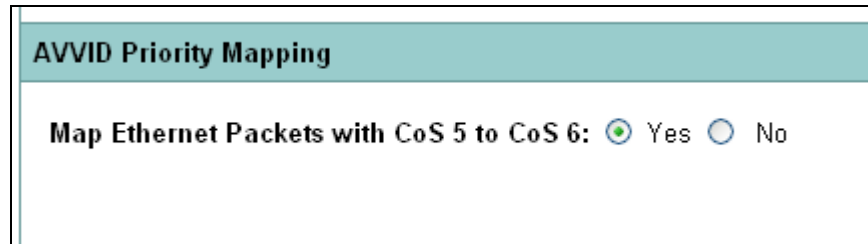


Figure 24

7. Click on the Advanced tab and enable WMM (see figure 25).

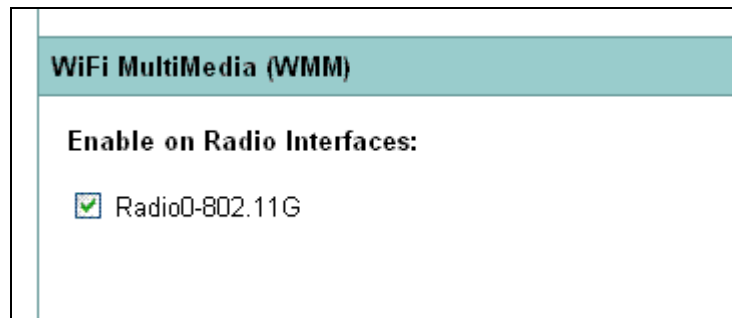


Figure 25

WMM Power Save (U-APSD)

In order for the Ascom VoWiFi system to properly operate with U-APSD enabled, there are a couple of important items that must be configured correctly.

- a. As previously stated, the Radio Access Categories must be configured for Voice Optimization (see figure 22 above).
- b. The handset's uplink and downlink packet categorization must be symmetrical (e.g. RTP packets on uplink and downlink mapped to user priority 6). This requires proper QoS configuration of the LAN/WLAN as stated above.

Call Admission Control, TSPEC

If call admission control is desired, follow the below steps to configure the access point(s) accordingly.

Note: The handset TSPEC Call Admission Control parameter must be enabled.

1. Navigate to Services → QoS and select the Radio Access Categories tab.
2. Under the Admission Control for Video and Voice section, enable admission control for Voice(CoS 6-7) and set the desired Max Channel and Roam Channel Capacity (%) values (see figure 26).

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Admission Control for Video and Voice

Video(CoS 4-5)

Admission Control

Voice(CoS 6-7)

Admission Control

Max Channel Capacity (%):

Roam Channel Capacity (%):

Figure 26

3. Navigate to Security → SSID Manager.
4. Select the Ascom voice ESSID
5. Ensure that Call Admission Control is enabled (see figure 27).

Call Admission Control: Enable Disable

Figure 27

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Related Documents

| | |
|--|------------|
| Configuration notes for Cisco 1200 series AP | TD 92423GB |
| System Description VoWiFi System | TD 92313GB |
| Function Description VoWiFi System | TD 92314GB |
| Considerations for Ascom VoWiFi System Planning | TD 92408GB |
| Configuration Manual i75 VoWiFi Handset | TD 92431GB |
| Installation & Operation Manual Portable Device Manager, Windows | TD 92325GB |
| Installation & Operation Manual Portable Device Manager, System | TD 92378GB |

Contact information

For any additional questions, please contact the Ascom Technical Assistance Center at 1-877-71-ASCOM, option 3.



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