[ ]

# INTEROPERABILITY REPORT

## Ascom i62

## Meru Networks AP300

System manager version 5.0-87

i62 version 2.5.7

Ascom, Gothenburg

Dec 2011

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# INTRODUCTION

This document describes necessary steps and guidelines to optimally configure the Meru Networks WLAN platform with Ascom i62 VoWiFi handsets.

The guide should be used in conjunction with both Meru Networks and Ascoms configuration guide(s).

## About Ascom

Ascom Wireless Solutions (www.ascom.com/ws) is a leading provider of on-site wireless communications for key segments such as hospitals, manufacturing industries, retail and hotels. More than 75,000 systems are installed at major companies all over the world. The company offers a broad range of voice and professional messaging solutions, creating value for customers by supporting and optimizing their Mission-Critical processes. The solutions are based on VoWiFi, IP-DECT, DECT, Nurse Call and paging technologies, smartly integrated into existing enterprise systems. The company has subsidiaries in 10 countries and 1,200 employees worldwide. Founded in the 1950s and based in Göteborg, Sweden, Ascom Wireless Solutions is part of the Ascom Group, listed on the Swiss Stock Exchange.

## About Meru Networks

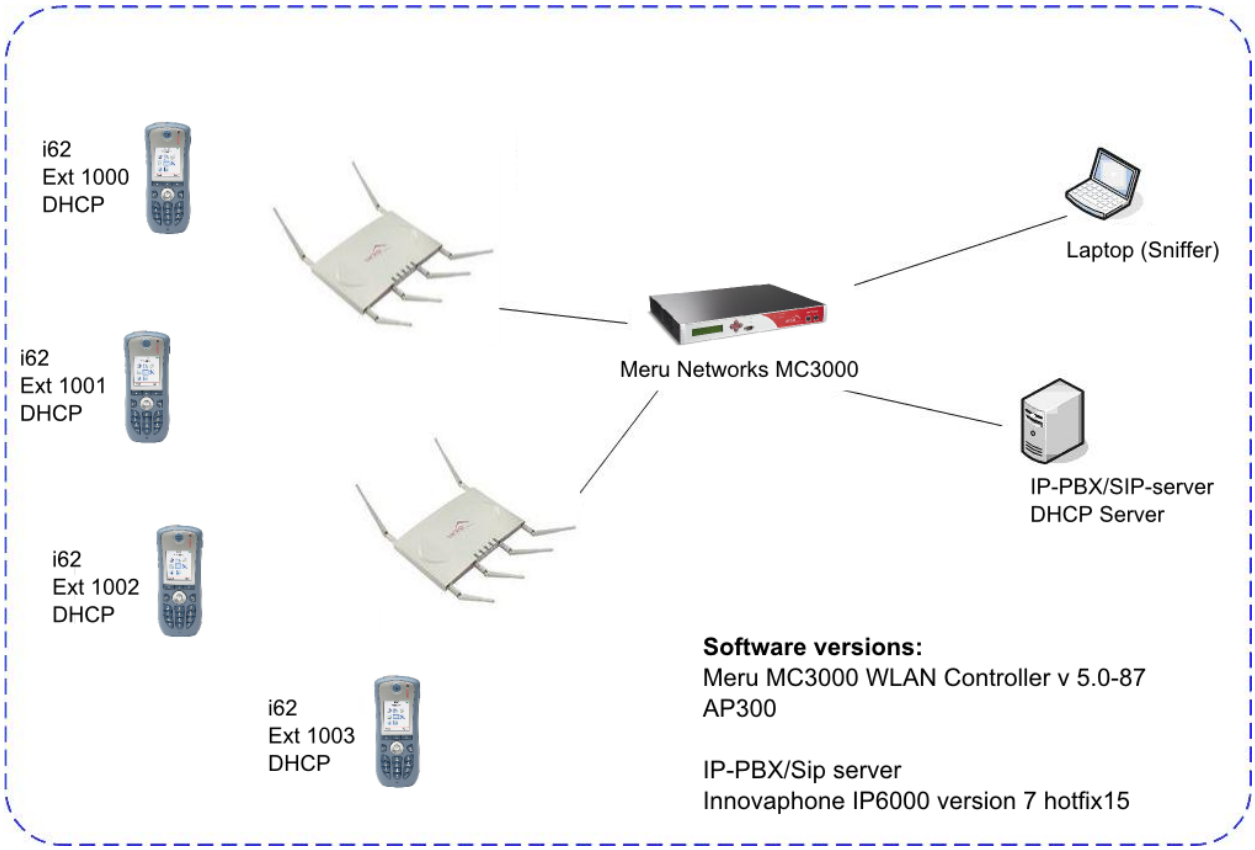
Founded in 2002, Meru Networks provides a virtualized wireless LAN solution that cost-effectively optimizes the enterprise network to deliver the performance, reliability, predictability and operational simplicity of a wired network, with the advantages of mobility. Meru's solution represents an innovative approach to wireless networking that utilizes virtualization technology to create an intelligent and self-monitoring wireless network, and enables enterprises to migrate their business-critical applications from wired networks to wireless networks, and become all-wireless enterprises. Meru's solutions have been adopted in all major industry vertical markets, including Fortune 500 enterprises, healthcare, education, retail, manufacturing, hospitality and government. Meru is headquartered in Sunnyvale, Calif., and has operations in the Americas, Europe, the Middle East and Asia Pacific. For more information, visit www.merunetworks.com or call (408) 215-5300.

## SITE INFORMATION

**Test Site:**
Morrisville
598 Airport blvd, NC 27560
USA

**Participants:**
Karl-Magnus Olsson, Ascom HQ

## TEST TOPOLOGY



## SUMMARY

Please refer to Appendix B for detailed results.

### WLAN Controller Features

| High Level Functionality | Result |
|---|---|
| Association, Open with No Encryption | OK |
| Association, WPA-PSK, TKIP | OK |
| Association, WPA2-PSK, TKIP / AES Encryption | OK |
| Association, PEAP-MSCHAPv2 Auth., TKIP Encryption | OK |
| Association, PEAP-MSCHAPv2 Auth., AES Encryption | OK |
| Association, Multiple ESSIDs | OK |
| Beacon Interval and DTIM Period | OK |
| Preauthentication | No roaming by handset* |
| PMKSA Caching | No roaming by handset* |
| WPA2-opportunistic/proactive Key Caching | No roaming by handset* |
| WMM Prioritization | OK |
| Active Mode (load test) | OK** |
| 802.11 Power-save mode | OK** |
| 802.11 Power-save mode (load test) | OK |
| 802.11e U-APSD | OK |
| 802.11e U-APSD (load test) | OK |

*) Not applicable due to the system architecture (virtual cell).
**) i62 must be configured to use U-APSD to work with AP300.

### Roaming

| High Level Functionality | Result |
|---|---|
| Roaming, Open with No Encryption | OK* |
| Roaming, WPA-PSK, TKIP Encryption | OK* |
| Roaming, WPA2-PSK, AES Encryption | OK* |
| Roaming, PEAP-MSCHAPv2 Auth, AES Encryption | OK* |

* ) No roaming by handset. Therefore no roaming times presented.

## Known issues

- The handset will attempt to use U-APSD even if it is not announced by the system (U-APSD turned off). The solution is to ensure that the system and client configuration match.
  **Solved in i62 version 2.5.7. Refer to NCR 16717.**

- The handset and system must be configured to use U-APSD. This due to a limitation in the access point as it will not acknowledge PS-POLL frames.

***For additional information regarding known issues please contact intop@ascom.se***

## General Conclusions

The result of the verified test areas, such as authentication, association, handover and load tests, produced in general very good test result. Due to Merus single channel architecture no traditional roaming is made which makes the roaming seamless.

**Due to a limitation in the Meru AP300 chipset no acknowledge will be sent from the system on PS-Poll frames. The system and Ascom i62 MUST for that reason be configured to use U-APSD to work with AP300.**

Using U-APSD increases the talk time dramatically from approximately 4hours to up to 14hours.

Note. Unless the parameter “Expedited Forwarding Override” is used the i62 have to mark voice packets with DSCP 48 in order for appropriate mapping in the “air” (UP=6).

Please refer to Merus documentation for information regarding co-existence and between different access point models within the same wireless network.

For more information about Meru Networks’s WiFi technology, refer to their white paper “Virtual Cells: The Only Scalable Multi-Channel Deployment” at the following URL:
http://www.merunetworks.com/pdf/whitepapers/Virtual_Cells_WP4_0705.pdf

## TEST RESULTS

### Ascom WLAN Infrastructure Verification – VoWiFi

*Software Versions:*

- Meru Networks MC3000 WLAN Controller, version 5.0-87
- AP300 Access Point
- Ascom i62, v 2.5.7

*Signaling Protocol:*

- SIP, Innovaphone IP6000 used as SIP server

*Configuration of WLAN System:*

- Beacon Interval: 100ms
- DTIM Period: 5
- 802.11bgn
- 802.11an
- WMM/ U-APSD Enabled (See appendix A for QoS profiles)
- 802.11d Regulatory Domain: World mode

*Ascom i62 Configuration:*

- World Mode Regulatory Domain set to World mode.
- IP DSCP for Voice: 0xC0 (48) – Class Selector 6
- IP DSCP for Signaling: 0x68 (26) – Assured Forwarding 31

.

Keep in mind that security options and power save modes were adjusted according to requirements in individual test cases. Please refer to appendix A for information regarding device configuration.

## *Test Areas*

**Association and Authentication: 100% pass (9/9)**

- Only security settings available through the web GUI were tested.
- Note that WEP in hex must be entered on the controller with 0x before the key.
- PMKSA caching and WPA2-opportunistic/proactive key caching not really relevant in virtual cell environment (no roaming decisions taken by handset unless handover to another virtual cell on a different channel)

**Power Save: 100 % pass (3/3)**

- Ascom i62 needs to mark voice with DSCP 0xC0/48 (CS6) to facilitate correct QoS mapping in the “air” (UP=6)
- Due to a limitation in the Meru AP300 chipset no acknowledge will be sent from the system on PS-Poll frames. The system and Ascom i62 MUST for that reason be configured to use U-APSD to work with AP300. AP200 is not affected.

**QOS: 100% pass (4/4)**

- WMM has to be enabled on controller.
- Loadtest done with iPerf and IxChariot. No noticeable degeneration of voice quality.

**“Maximum Number of Calls”: 100% pass (3/3)**

- 18active calls per single radio verified.

**Roaming and Handover Times: 100% pass (4/4)**

- AP-to-AP handovers handled entirely by controller
- PMKSA caching and WPA2-opportunistic/proactive key caching not really relevant in virtual cell environment.
- Roaming with 802.11a/n and 802.11b/g/n passed

**Battery Lifetime: 100% Pass (3/3)**

- ~14hrs battery lifetime with ongoing call in U-APSD mode.
- 80hrs standby time

* ) Note that figures are “Up to” values which have been measured in a lab environment. There are a number of different variables that affects both standby time and talk time.

**Stability: 100% Pass (2/2)**

- Stable call for the duration of >24 hours in U-APSD mode.
- Stability verified both with 2,4 and 5 GHz radio.

Please keep in mind that metrics do NOT account for untested cases.

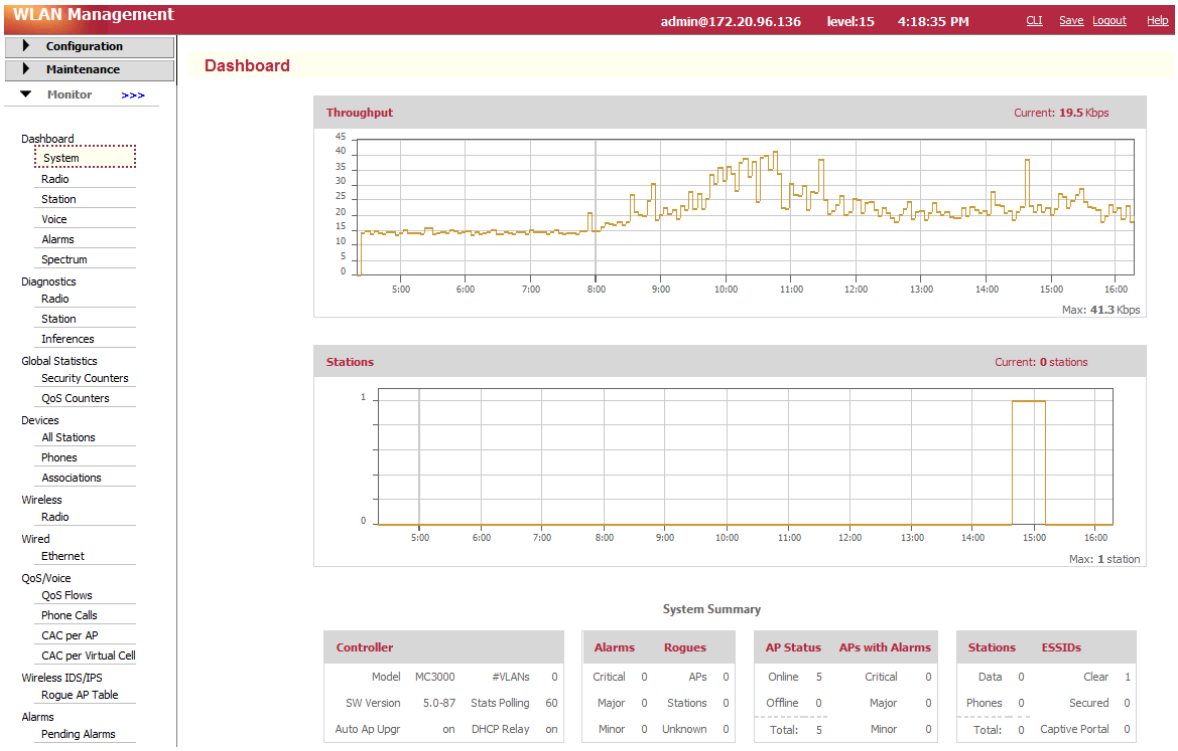
# APPENDIX A: TEST CONFIGURATIONS

Meru Networks MC3000 WLAN Controller and AP300 Access Points. Version 5.0-87

In the following chapter you will find screenshots and explanations of basic settings in order to get a Meru WLAN system to operate with an Ascom i62. Please note that security settings were modified according to requirements in individual test cases.

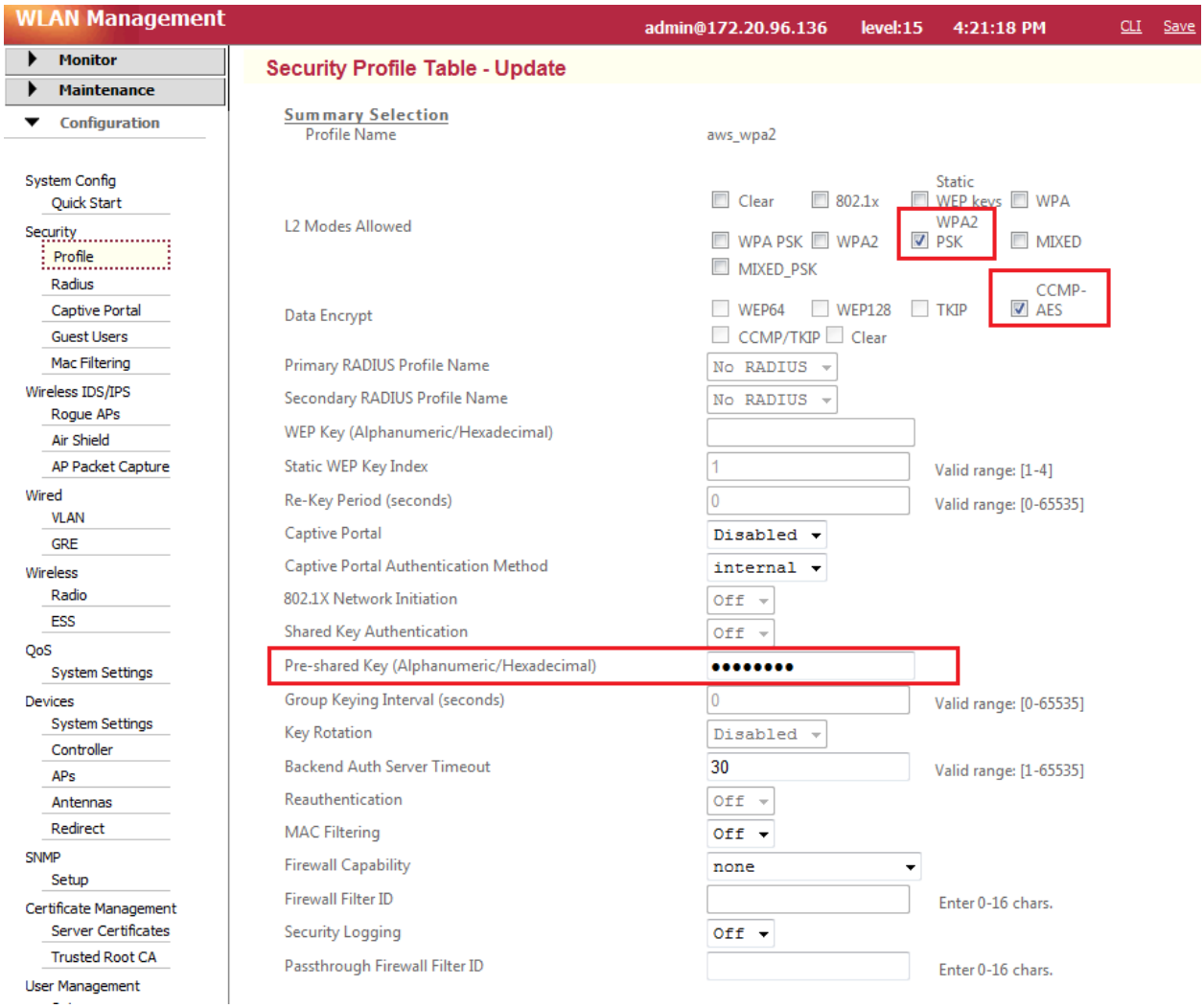
The configuration file is found at the bottom of this chapter.

## General settings

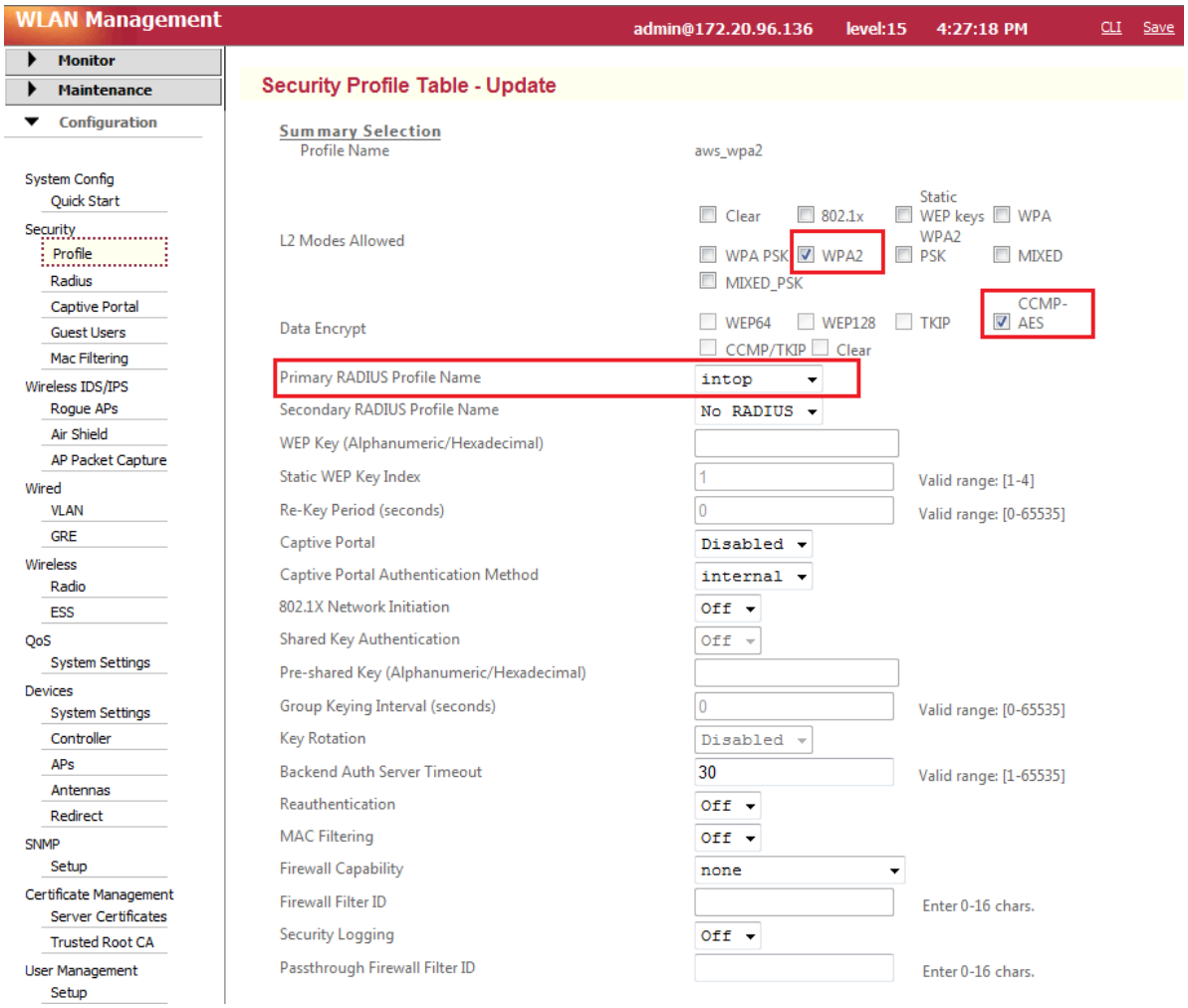



System overview

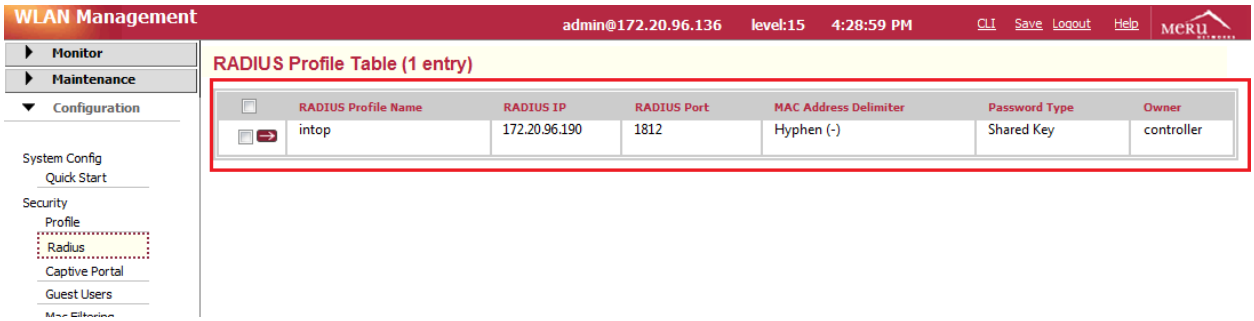
## Security settings




Security profile WPA2-PSK, AES/CCMP encryption. TKIP encryption is supported in “mixed mode”



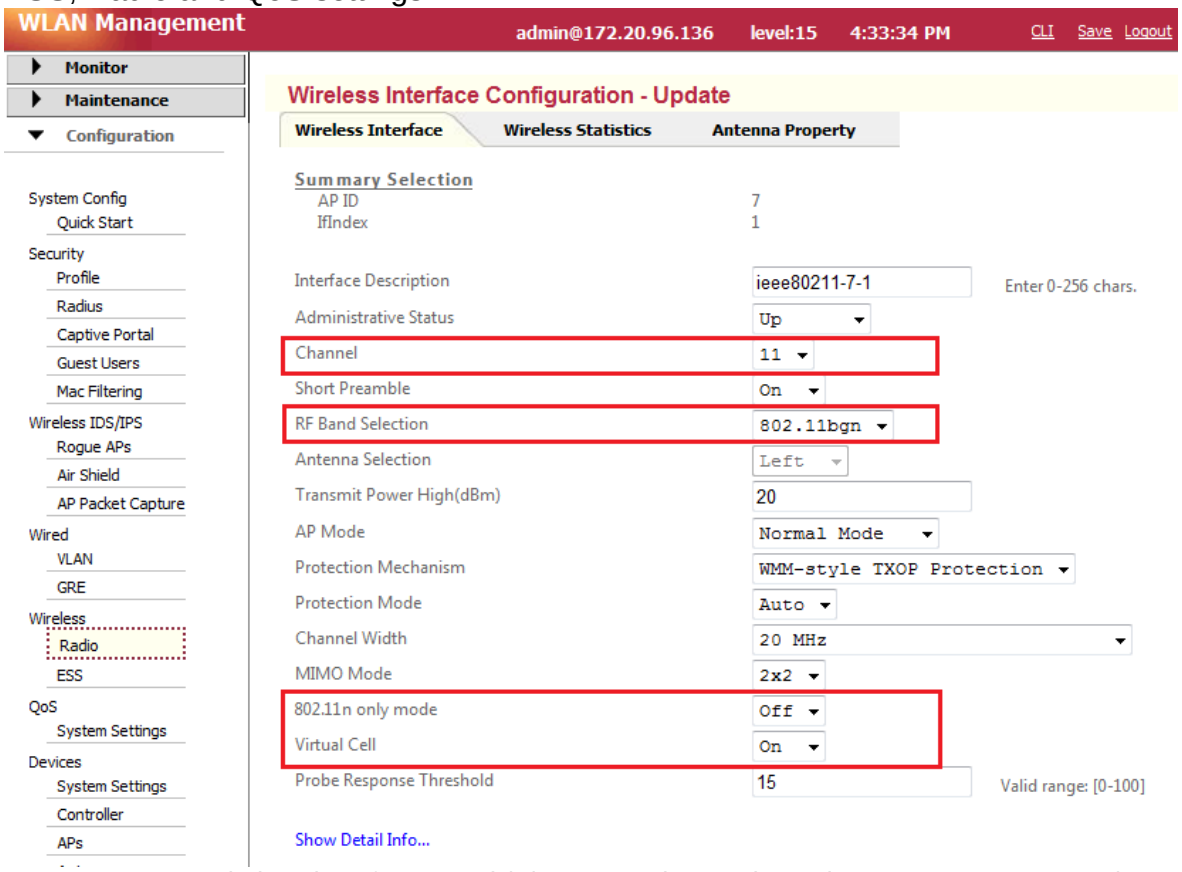

Security profile WPA2-Enterprise, AES-CCMP encryption Primary RADIUS Profile Name “intop” refers to the Radius profile set up in the controller. See radius profile below for additional details.




Configuration of Radius profile.

Radius profile configuration . Note that the profile “intop” , the RADIUS IP and the secret must correspond to the authentication server running in the network.

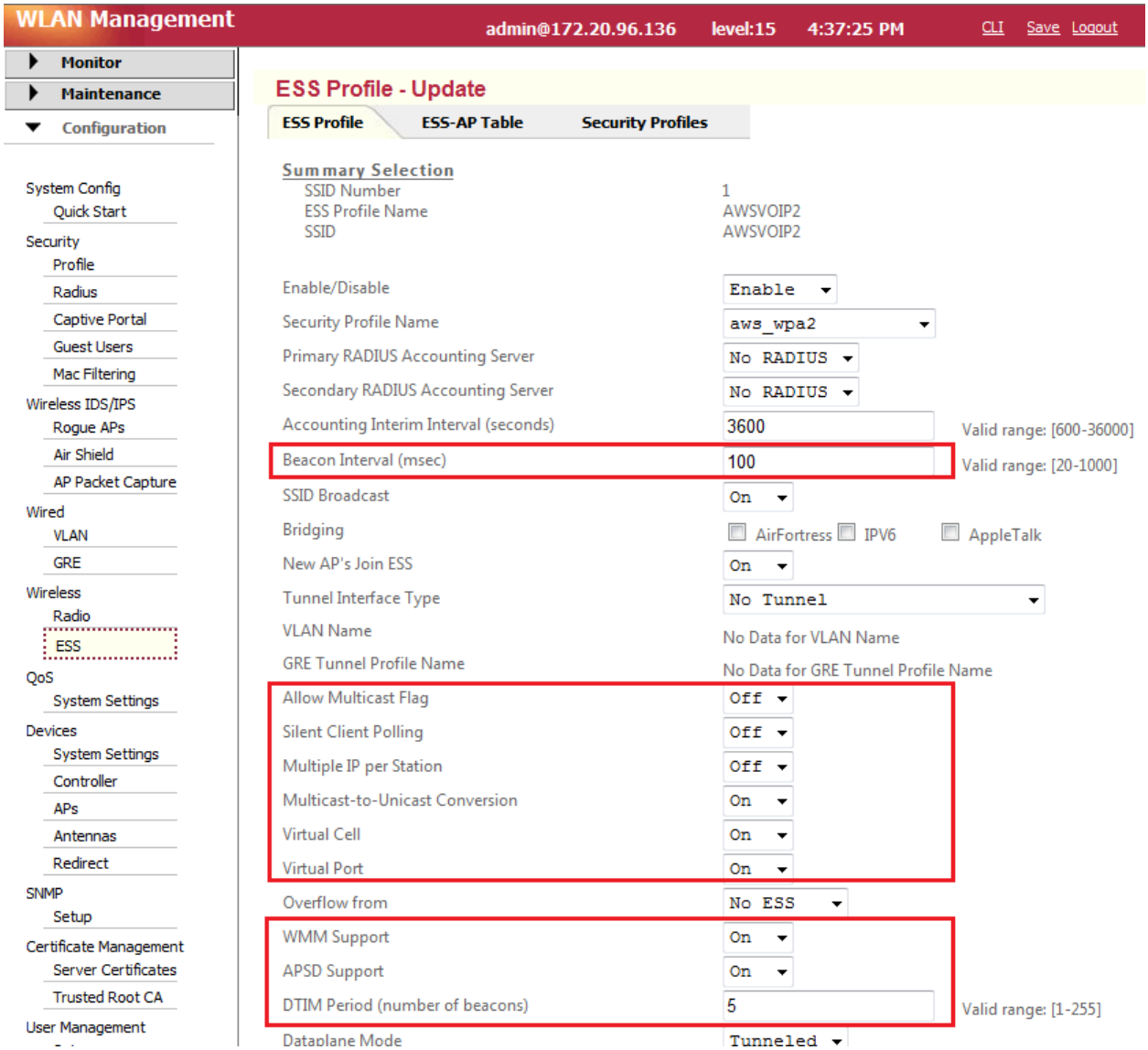
## ESS, Radio and QoS settings




Ascom recommended settings for 802.11b/g/n are to only use channel 1, 6 or 11. For 802.11a/n use channels according to the infrastructure manufacturer and country regulations.

***Note: If using channels where DFS is mandatory roaming for 802.11an, performance will be degraded due passive scan only. Ascom strongly recommends avoiding the use of DFS channels.***

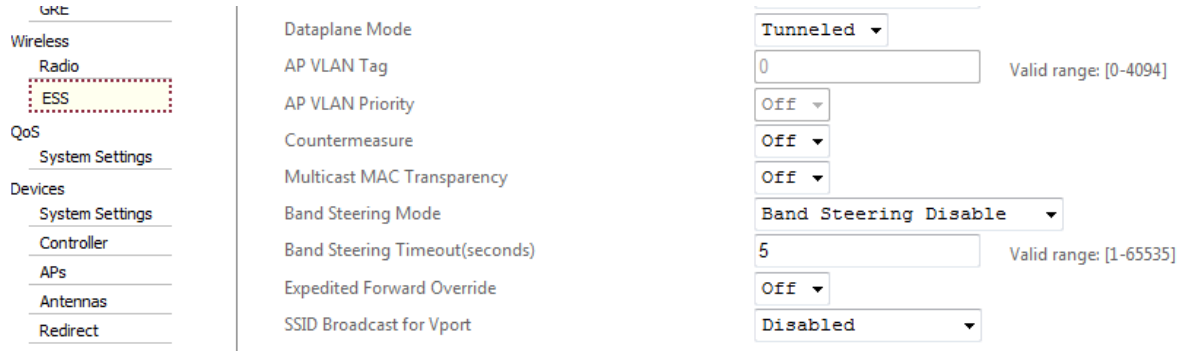
***Note for 802.11an: Using 40 MHz channels will reduce the number of non DFS channels to 2 in ETSI regions.***




ESS settings. Since multicast applications are usually not expected in WLANs, where Ascom VoWIFI handsets are deployed, the “Allow Multicast Flag” should be set to “OFF”. WMM and U-APSD should be turned on for optimal performance. Set DTIM Period of 5 and a DTIM interval of 100ms. These values are recommended in order to allow maximum battery conservation without impacting the quality.

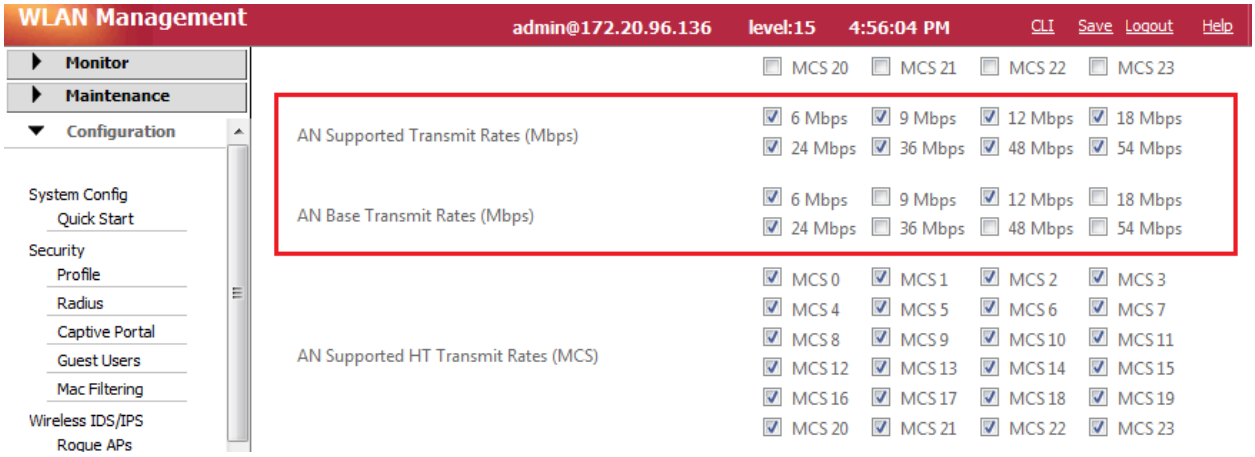
Silent Client polling is enabled by default in the system for AP300 in 5.0 releases. ON or OFF in the ESSID will not have effect for AP300. Silent client polling ensures that the client sends ACK frames for NULL or QoS NULL. Meru system uses the ACK packets received from station to fill in RSSI values into frame reports sent to the controller. This helps he controller to keep track of “silent” devices such as a handset in power save.

**Note. The default polling interval is if 4000ms by default. It has been discovered that this interval is too high for a silent client such as a phone. Ascom and Meru therefore recommend that this interval is decreased to 1400ms. This settinghas to be done by a Meru technician. Please contact Ascom or Meru for additional information.**

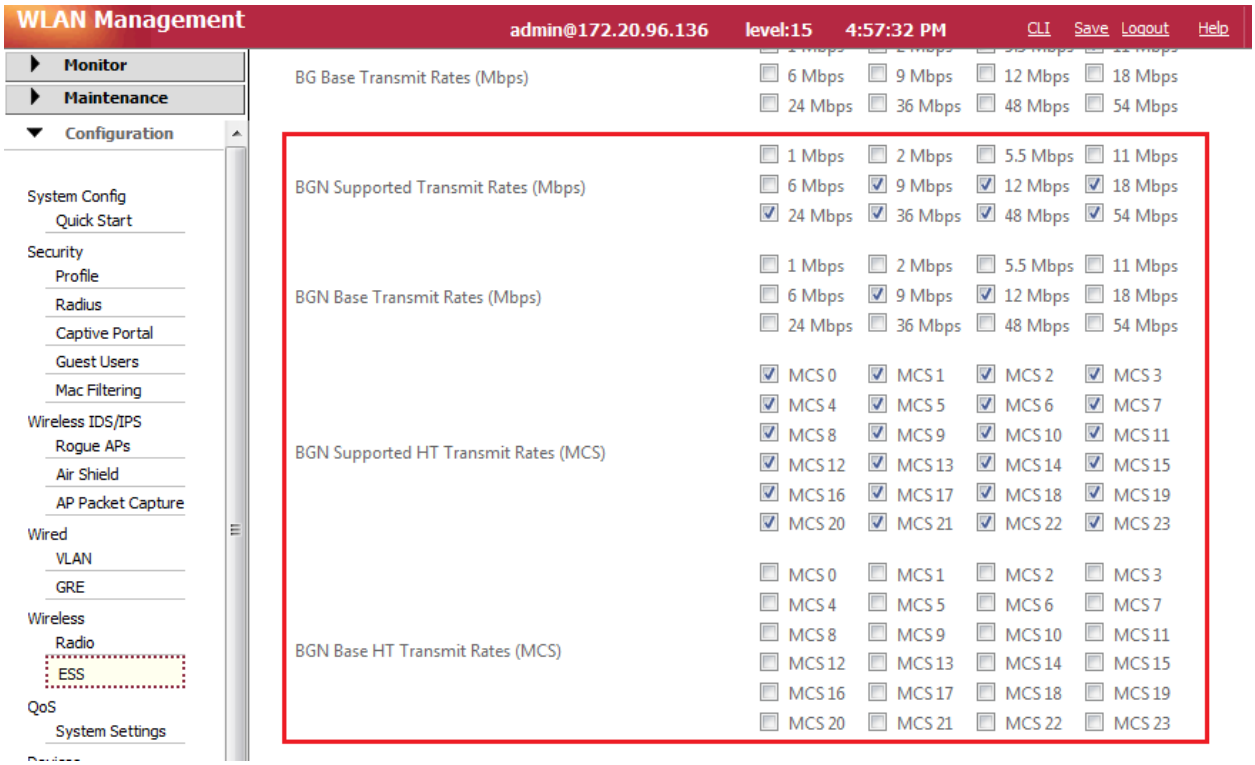



ESS settings continued. Ascom also recommends, especially as a precaution in WPA-PSK/TKIP environments, that "Enable Countermeasure" should be turned OFF.

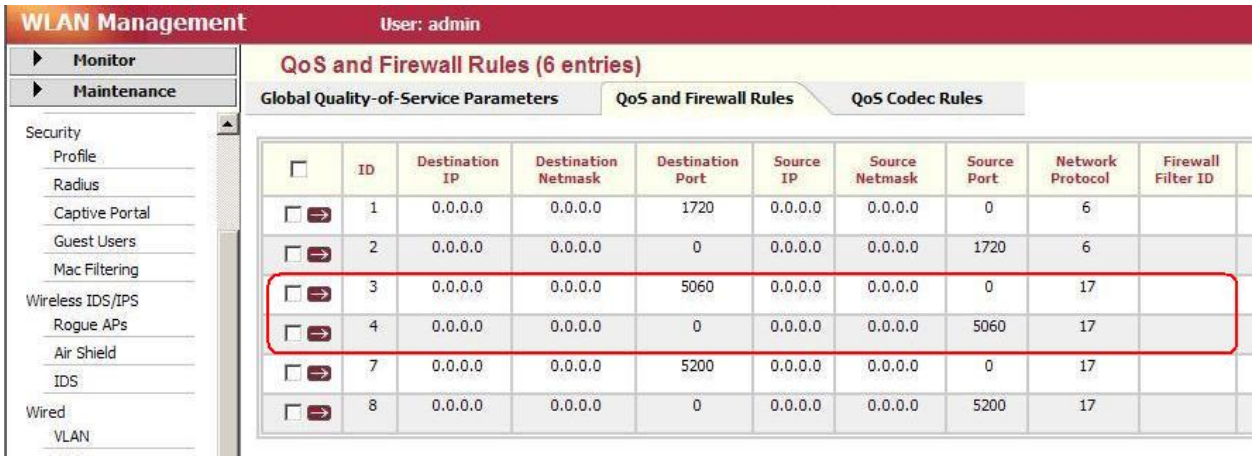
**Note. Expedited Forwarding Override will map DSCP 46 (EF) to the AC_VO**



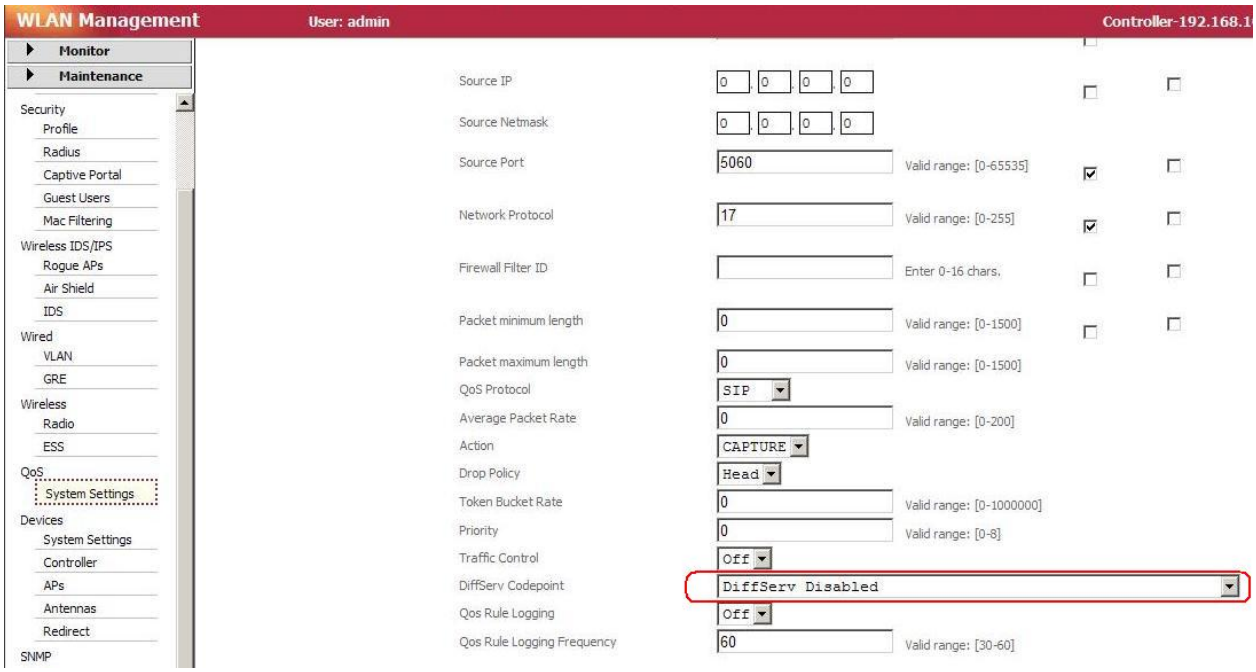

In a Meru environment, it is recommended that the data rates are advertised within the ESS per above for 802.11an (default).




In a Meru environment, it is recommended that the data rates are advertised within the ESS per above (802.11b/g/n). To further optimize performance it is recommended to disallow 802.11b clients to associate by setting 12Mbps rate to mandatory in the 802.11b/g/n data rate set.




Quality of Service rules for SIP.

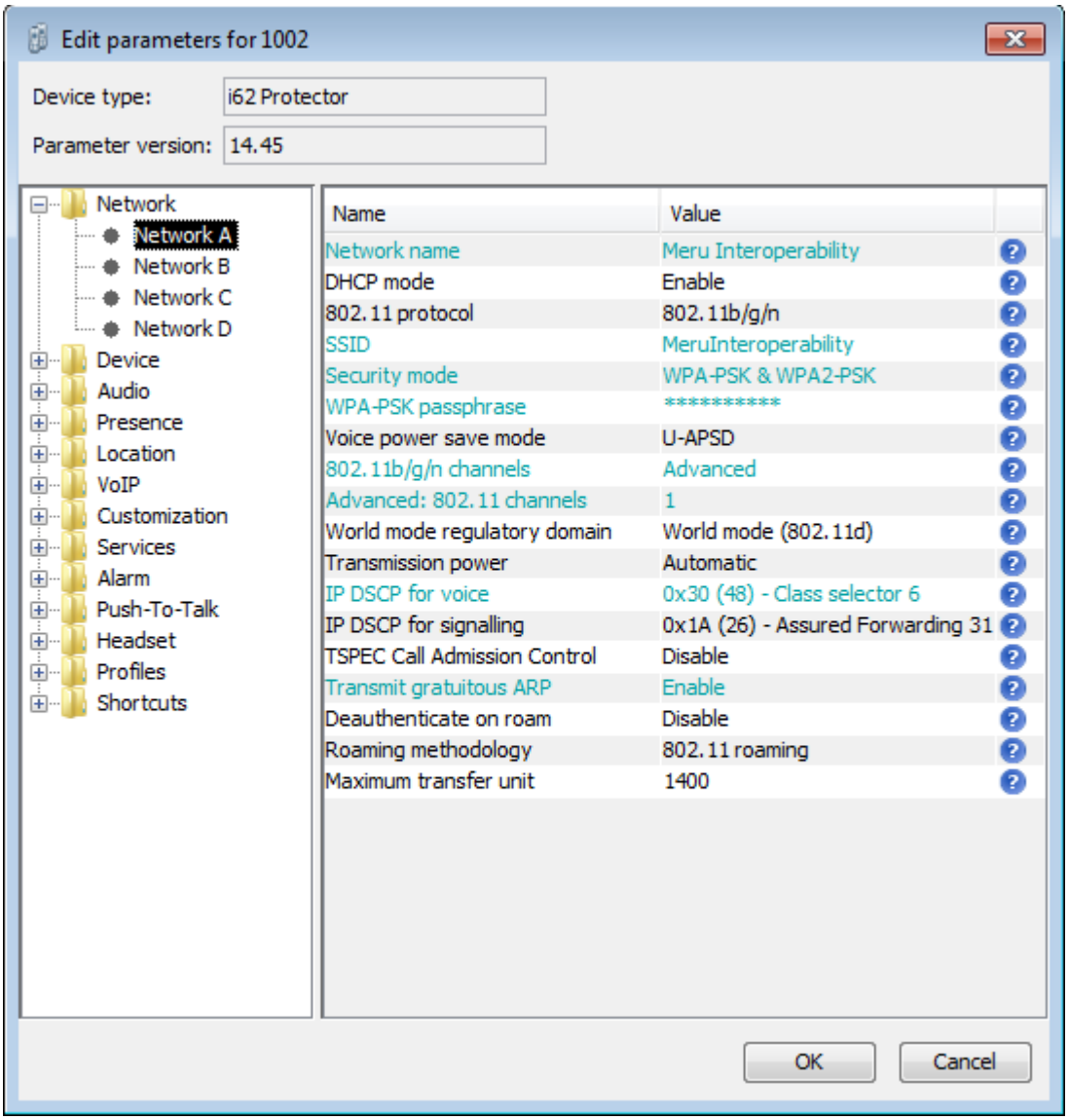



Configuration of “Diffserv Codepoint” (DSCP). Leaving “DiffServ Codepoint” disabled in an environment, where U-APSD has been implemented, implies that all Ascom VoIP devices must mark voice packets with DSCP 0xc0/48 (CS6), while ditto for signaling has to be DSCP 0x68/26 (AF31) or DSCP 0x00/00 (BE).

**Configuration:**

See attached file (cfg_meru.txt) for Meru MC3000 configuration.

## Ascom i62




Recommended i62 system settings. Security mode, encryption type and Voice power save mode may vary depending on site. In a Meru infrastructure only one channel is used, so the setting “802.11b/g/n or a/n channels’ may be changed to specify the correct channel.

**i62 configuration:**

See attached file (i62 Template.tpl) for i62 configuration.

## Innovaphone IP6000 (IP PBX & DHCP server)

The Innovaphone IP6000 was configured with a static IP address of 192.168.10.1. Signaling is less relevant here since testing homes in on interoperability in relation to the WLAN infrastructure and not features of the IP PBX. During the tests the IP6000 also was used as DHCP server.

**IP6000 configuration:**

See attached file (complete-IP6000-08-03-a6.txt) for IP6000 configuration.

## APPENDIX B: DETAILED TEST RECORDS

**AP300**

| | |
|---|---|
| Pass | 26 |
| Fail | 0 |
| Comments | 7 |
| Untested | 1 |
| Total | 34 |

See attached file (AP300WLANinteroperabilityTestReport.xls) for detailed test results.

## MISCELLANEOUS

Please refer to the test specification for WLAN systems on Ascom's interoperability web page for explicit information regarding each test case.

See URL (requires login):
https://www.ascom-ws.com/AscomPartnerWeb/en/startpage/Sales-tools/Interoperability

Document History

| Rev | Date | Author | Description |
|---|---|---|---|
| PA | 2010-09-04 | SEKMO | Draft |
| R1 | 2010-09-29 | SEKMO | Rev 1 |
| R2 | 2011-02-01 | SEKMO | Rev 2, Known issues section changed. Recommended ESS configuration (data rates) changed. |
| R3 | 2011-04-24 | SEKMO | Updated with Meru v 4.0-150 and i62 version 2.2.17 |
| P4 | 2011-12-02 | SEKMO | Updated with 5.0-87 specific information |
| R3 | 2011-12-15 | SEKMO | Minor changes after review. Rev 3 state |