



AIRHEADS

LAS VEGAS 2012

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- ▶ **DISCUSS:** [#airheadsconf](https://twitter.com/hashtag/airheadsconf)

Presented by
Ken Peredia
Aruba Networks
March 2012



RF TROUBLESHOOTING



Back to Basics



Essential Elements of Healthy RF



Signal Strength

Low Interference



Good Noise Floor

Channel Utilization



► #airheadsconf



What Affects Signal Strength?

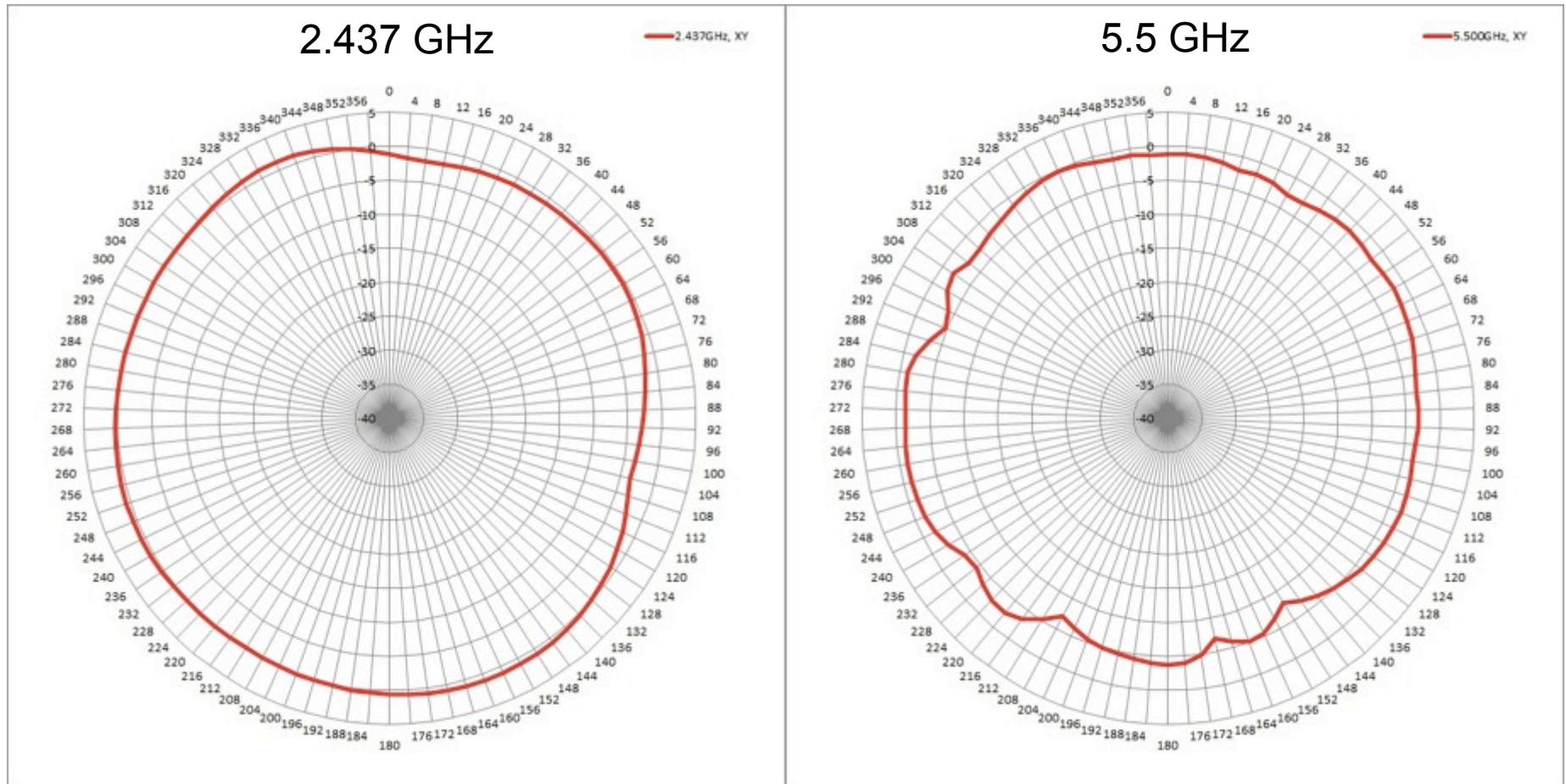
- **AP Characteristics**

- Number and type of Radios (a/b/g/n)
- Max Tx Power
- Receive Sensitivity
- Number of Spatial Streams
- Antenna – Internal/External
- Antenna Pattern
- Number of clients supported

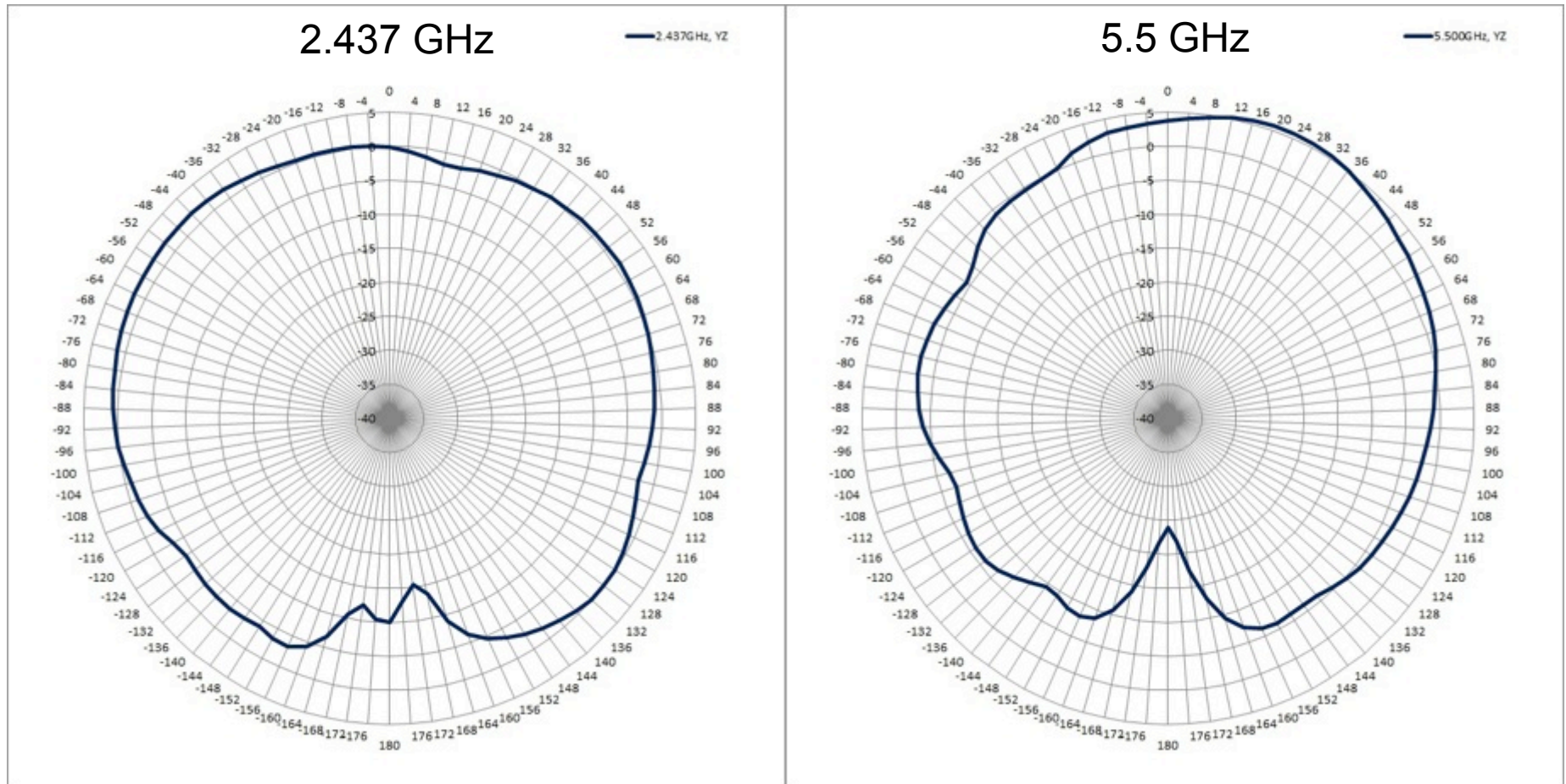
APs are not created equal
Choose the right AP for the occasion



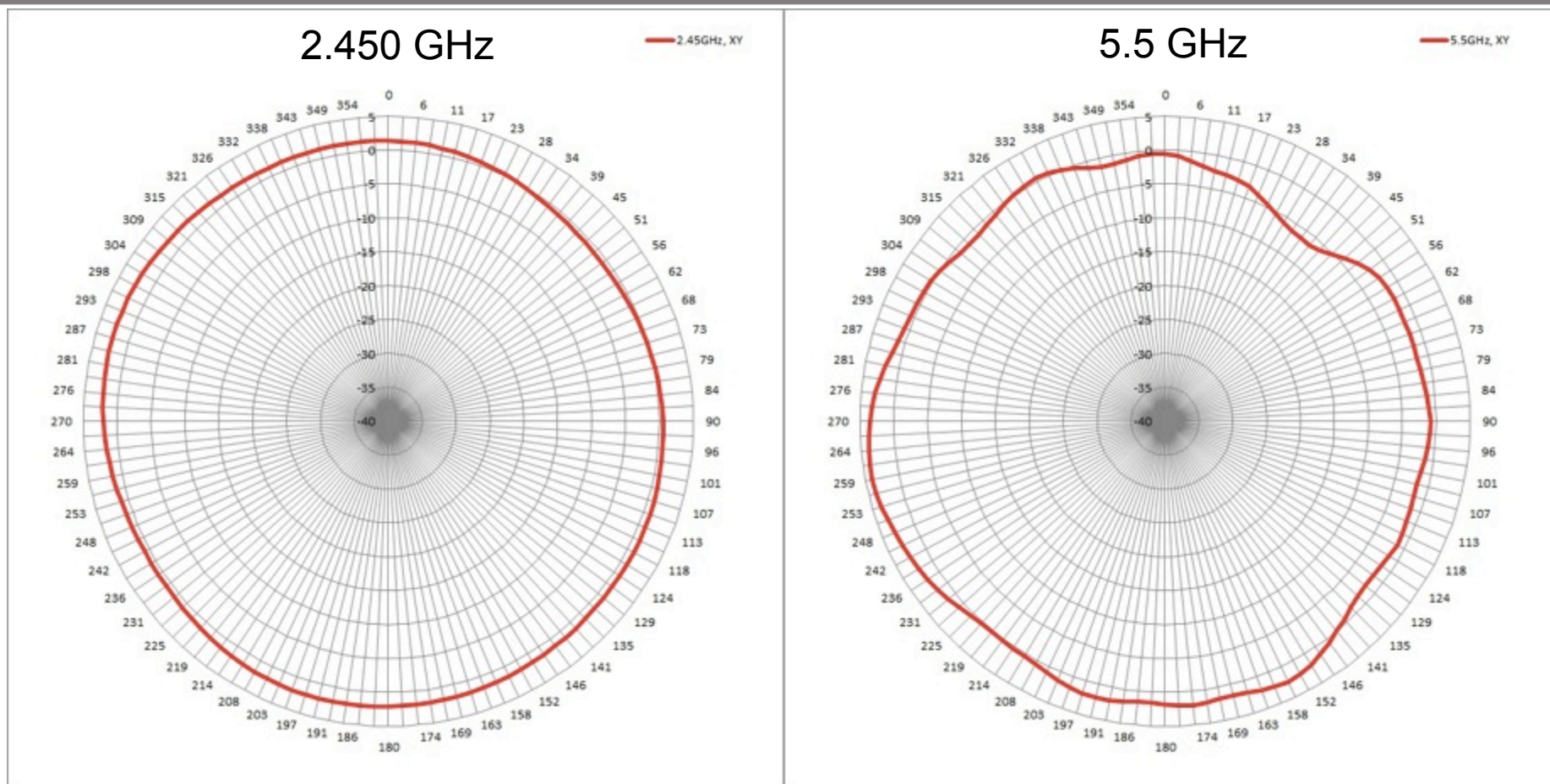
AP-93 Antenna Pattern, H-plane



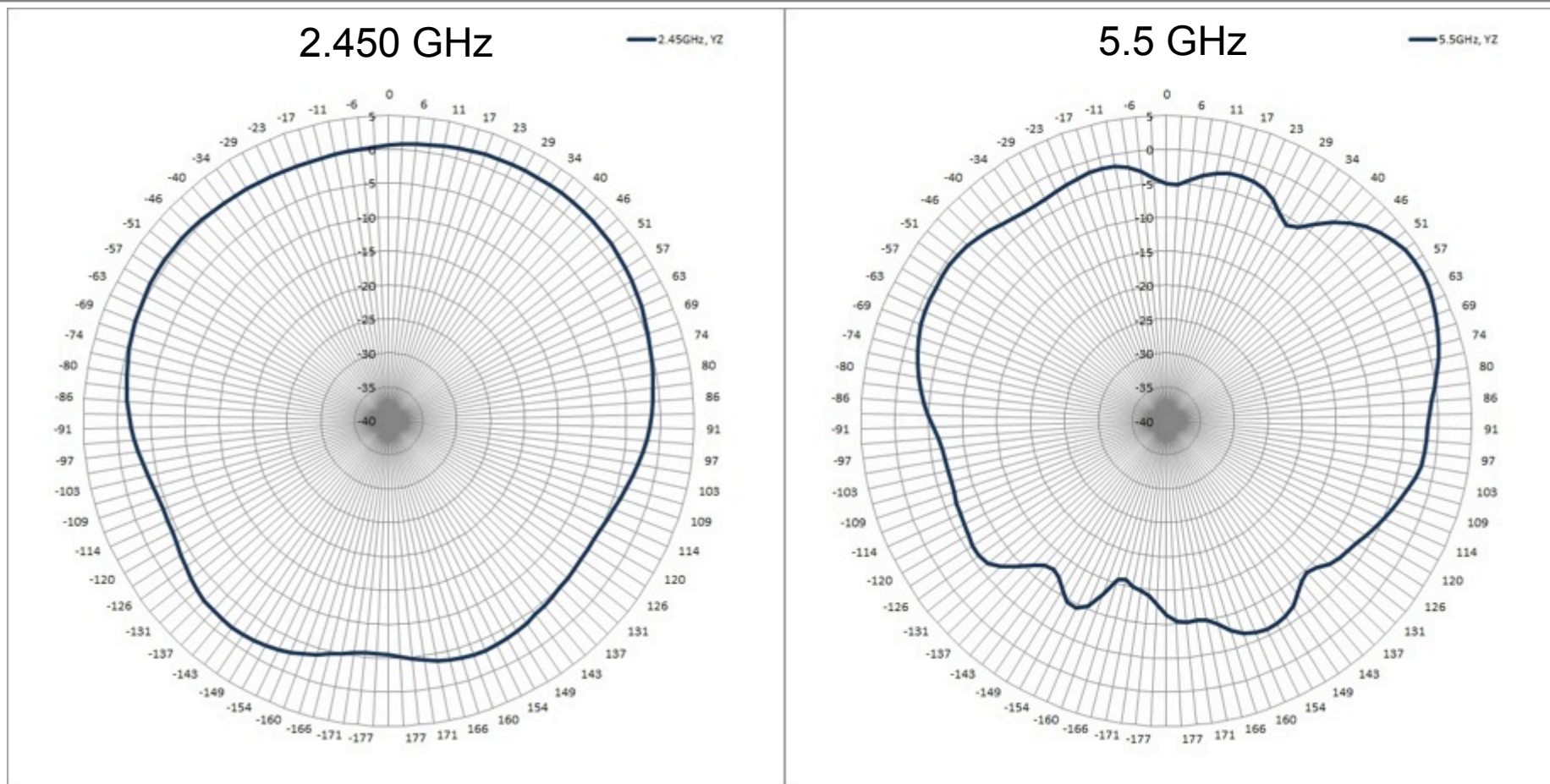
AP-93 Antenna Pattern, E-plane



AP-105 Antenna Pattern, H-plane

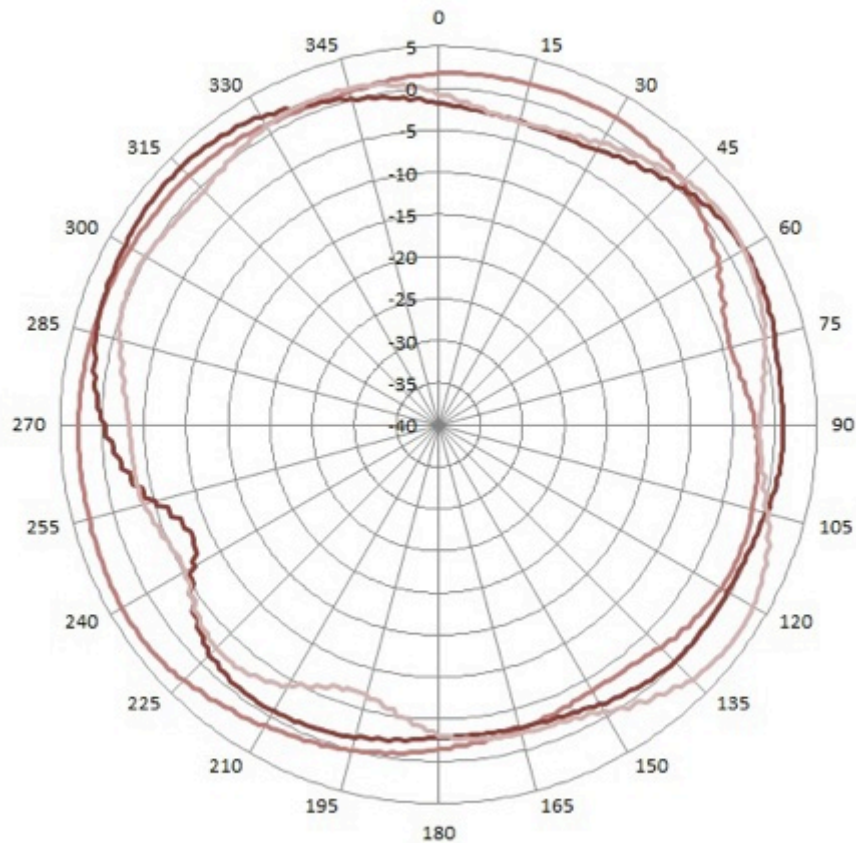


AP-105 Antenna Pattern, E-plane

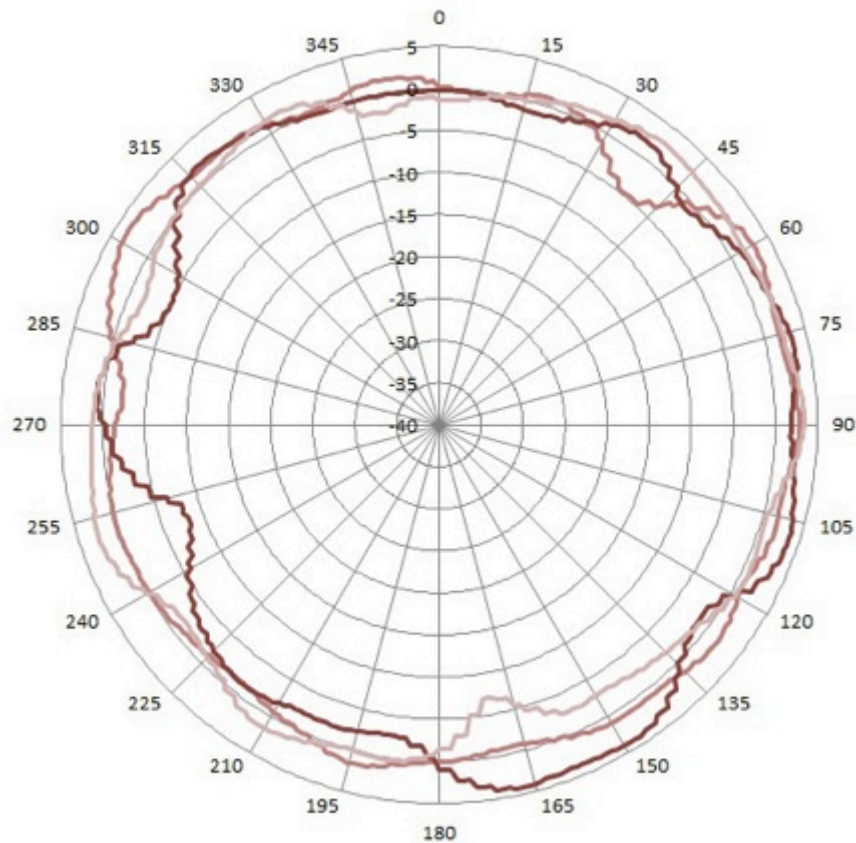


AP-135 Antenna Pattern, H-plane

2.450 GHz

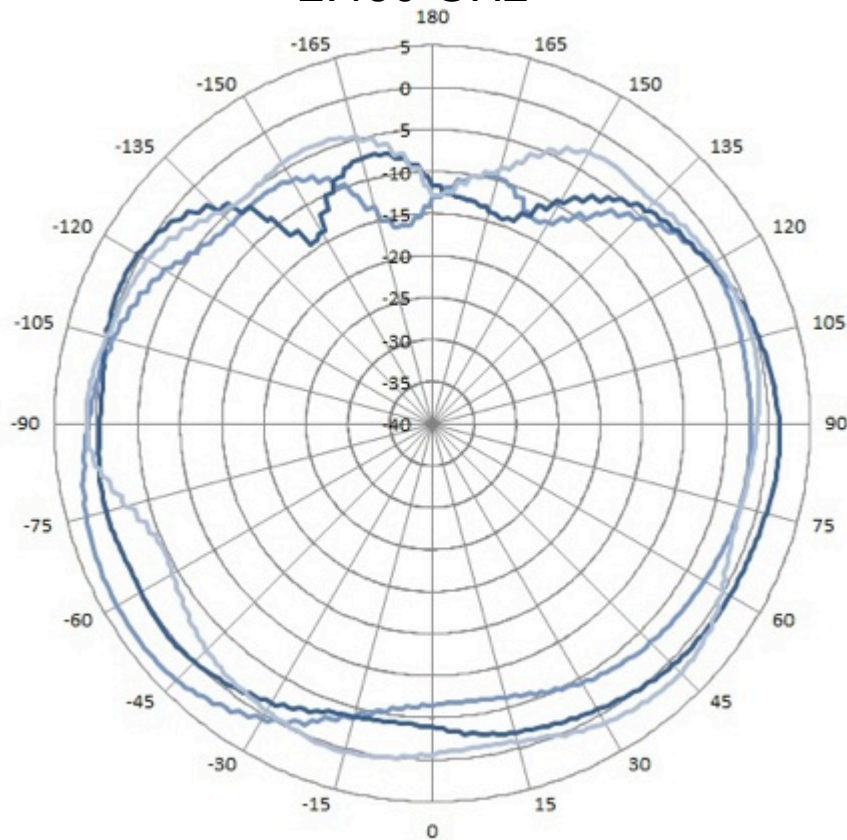


5.5 GHz

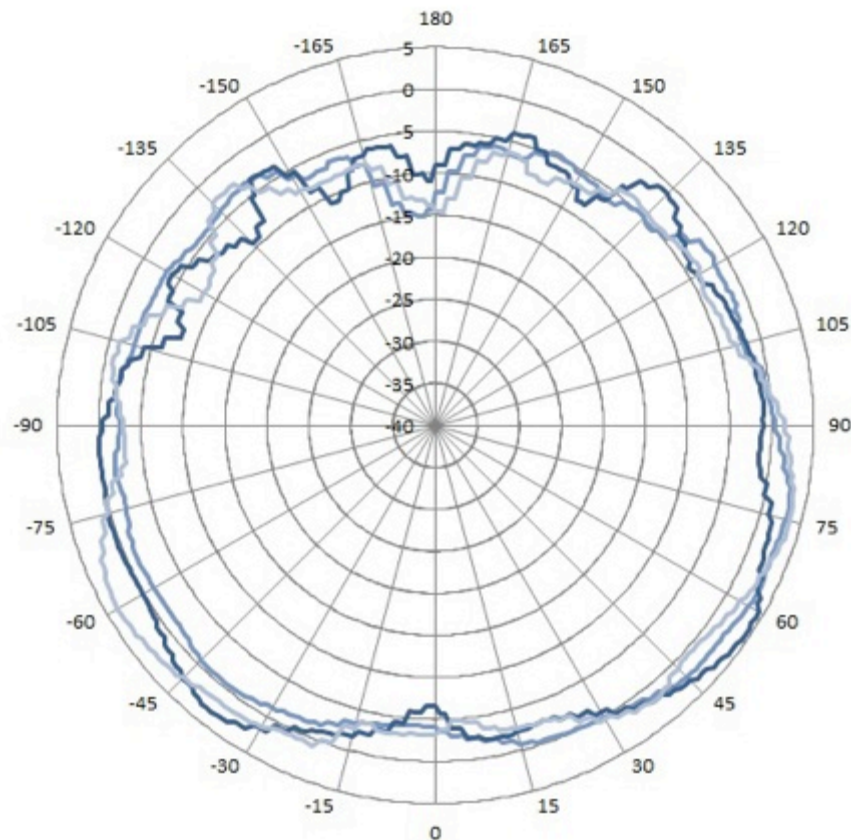


AP-135 Antenna Pattern, E-plane

2.450 GHz



5.5 GHz



What Affects Signal Strength?

AP Radiated Power (EIRP)

= Radio Transmit Power (dBm)

+ Transmit Antenna Gain (dBi)

Antenna is **PASSIVE** – Does Not **ADD** energy
Higher Gain just means energy more focused
Not always a good thing

- AP Regulatory Domain
- Country Code
- Radio Band (2.4GHz/5GHz)
- Channel (different channel has different allowed Max EIRP)

What Affects Signal Strength?

- **Attenuation (Path Loss)**
 - Distance from AP/Line-of-sight
 - Building materials (walls, windows, partitions)
 - Furniture
 - People

Client Received Power (dBm)

= Radiated Power/EIRP (dBm)

- Path Loss (dB)

+ Receiver Antenna Gain (dBi)

Attenuation of Common Building Material

| Material | 2.4GHz | 5.0GHz |
|--------------------------------------|--------|---------|
| Brick 3.5" | 6 dB | 10 dB |
| Bullet-Proof Glass 1" | 10 dB | 20 dB |
| Concrete Wall 18" | 18 dB | 30 dB |
| Concrete Wall 8" | 10 dB | 13 dB |
| Cubical Wall (Fabric) 2.25" | 1 dB | 2 dB |
| Exterior Double Pane Coated Glass 1" | 13 dB | 20 dB |
| Fabric, blinds, ceiling tiles | ~1 dB | ~1.5 dB |
| Glass/Window (not tinted) | 2-3 dB | 6-8 dB |
| Hollow Wood Door 1.75 | 4 dB | 7 dB |
| Interior drywall | 3-4 dB | 3-5 dB |

Attenuation of Common Building Material

| Material | 2.4GHz | 5.0GHz |
|--|--------|--------|
| Interior Office Door w/Window 1.75"/0.5" | 4 dB | 6 dB |
| Interior Office Window 1" | 3 dB | 6 dB |
| Interior Solid Wall 5" | 14 dB | 16 dB |
| Marble 2" | 6 dB | 10 dB |
| Safety Glass-Wire 0.25" | 3 dB | 2 dB |
| Safety Glass-Wire 1.0" | 13 dB | 18 dB |
| Solid Wood Door 1.75" | 6 dB | 10 dB |
| Steel Fire/Exit Door 1.75" | 13 dB | 25 dB |
| Steel Fire/Exit Door 2.5" | 19 dB | 32 dB |
| Steel Rollup Door 1.5" | 11 dB | 19 dB |

Noise, Interference, and SNR



Noise & Interference

.... Signals are **corrupted** so they don't make sense to the receiver ...

- **Noise**

- **Random** 'background' that has got mixed up with your signal. Usually doesn't vary too much over time.

- **Interference**

- **Additional** signals are added to the one you want. Can be intermittent or persistent.

Source of Interference

802.11 Source

- Your own APs (over-designed)
- Somebody else's APs (neighbor)
- Municipal Wi-Fi Network
- iPhone Personal Hotspots
- Clients connected to other's APs
- Faulty Clients

Non 802.11 Source

- Blue-tooth (headset, keyboards, mouse, modem)
- Microwave Oven
- Cordless phones, mouse
- Very strong out-of-band source (GSM tower)
- Baby monitor
- WiMax (2.5GHz)
- ZigBee (802.15.4)
- Video or security cameras
- Faulty anything



Signal to Noise Ratio (SNR)

SNR is not actually a ratio

SNR = Signal (Received Power) – Noise floor

Assume:

Signal received is -65 dB; Noise floor is -90 dB

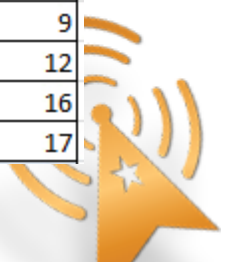
SNR = -65 – (-90) = 25

A minimum of 25-30 is essential to decode high 11n data rate

Why SNR is Important

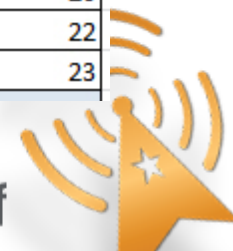
SNR determines the ability of wireless devices to demodulate data rates

| AP-104 AND AP-105 RF PERFORMANCE TABLE | | | | | | | |
|--|------------|-------------------------------------|-------------------------|-----------------|-------------------------------------|-------------------------|--------------|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | Subcarrier | Max tX Power per Active tX chain | rX sensitivity (dbm) | SNR (NF 100) | Max tX Power per Active tX chain | rX sensitivity (dbm) | SNR (NF 100) |
| | Modulation | 2.4 GHz | | | 5 GHz | | |
| 802.11b | | | | | | | |
| 1 Mbps | BPSK | 20 | -96 | 4 | | | |
| 2 Mbps | QPSK | 20 | -96 | 4 | | | |
| 5.5 Mbps | CCK | 20 | -94 | 6 | | | |
| 11 Mbps | CCK | 20 | -93 | 7 | | | |
| 802.11a/g | | | | | | | |
| 6 Mbps | BPSK | 20 | -96 | 4 | 20 | -96 | 4 |
| 9 Mbps | BPSK | 20 | -96 | 4 | 20 | -96 | 4 |
| 12 Mbps | QPSK | 20 | -96 | 4 | 20 | -96 | 4 |
| 18 Mbps | QPSK | 20 | -95 | 5 | 20 | -95 | 5 |
| 24 Mbps | 16-QAM | 20 | -92 | 8 | 20 | -91 | 9 |
| 36 Mbps | 16-QAM | 19 | -89 | 11 | 19 | -88 | 12 |
| 48 Mbps | 64-QAM | 18 | -85 | 15 | 18 | -84 | 16 |
| 54 Mbps | 64-QAM | 17 | -83 | 17 | 17 | -83 | 17 |



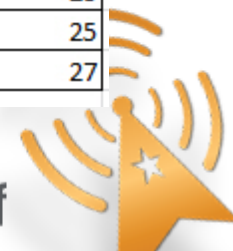
Why SNR is Important

| AP-104 AND AP-105 RF PERFORMANCE TABLE | | | | | | | |
|--|------------|------------------|----------------|--------------|------------------|----------------|--------------|
| | | | | | | | |
| | | | | | | | |
| | | Max tX Power per | rX sensitivity | | Max tX Power per | rX sensitivity | |
| | Subcarrier | Active tX chain | (dbm) | SNR (NF 100) | Active tX chain | (dbm) | SNR (NF 100) |
| | Modulation | 2.4 GHz | | | 5 GHz | | |
| 802.11n HT20 | | | | | | | |
| MCS0 | BPSK | 20 | -96 | 4 | 20 | -96 | 4 |
| MCS1 | QPSK | 20 | -95 | 5 | 20 | -94 | 6 |
| MCS2 | QPSK | 20 | -93 | 7 | 20 | -92 | 8 |
| MCS3 | 16-QAM | 20 | -90 | 10 | 20 | -89 | 11 |
| MCS4 | 16-QAM | 19 | -87 | 13 | 19 | -86 | 14 |
| MCS5 | 64-QAM | 18 | -82 | 18 | 18 | -82 | 18 |
| MCS6 | 64-QAM | 17 | -81 | 19 | 17 | -80 | 20 |
| MCS7 | 64-QAM | 15 | -80 | 20 | 15 | -79 | 21 |
| MCS8 | BPSK | 20 | -95 | 5 | 20 | -95 | 5 |
| MCS9 | QPSK | 20 | -93 | 7 | 20 | -92 | 8 |
| MCS10 | QPSK | 20 | -91 | 9 | 20 | -90 | 10 |
| MCS11 | 16-QAM | 20 | -87 | 13 | 20 | -87 | 13 |
| MCS12 | 16-QAM | 19 | -84 | 16 | 19 | -84 | 16 |
| MCS13 | 64-QAM | 18 | -81 | 19 | 18 | -80 | 20 |
| MCS14 | 64-QAM | 17 | -80 | 20 | 17 | -78 | 22 |
| MCS15 | 64-QAM | 15 | -77 | 23 | 15 | -77 | 23 |



Why SNR is Important

| AP-104 AND AP-105 RF PERFORMANCE TABLE | | | | | | | |
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SNR and 11n

802.11n data rates are dependent not only on SNR, but on error rates and the ability to support multiple spatial streams in the environment

A rough guideline is that a minimum SNR of 25 dB is necessary to demodulate higher 802.11n data rates

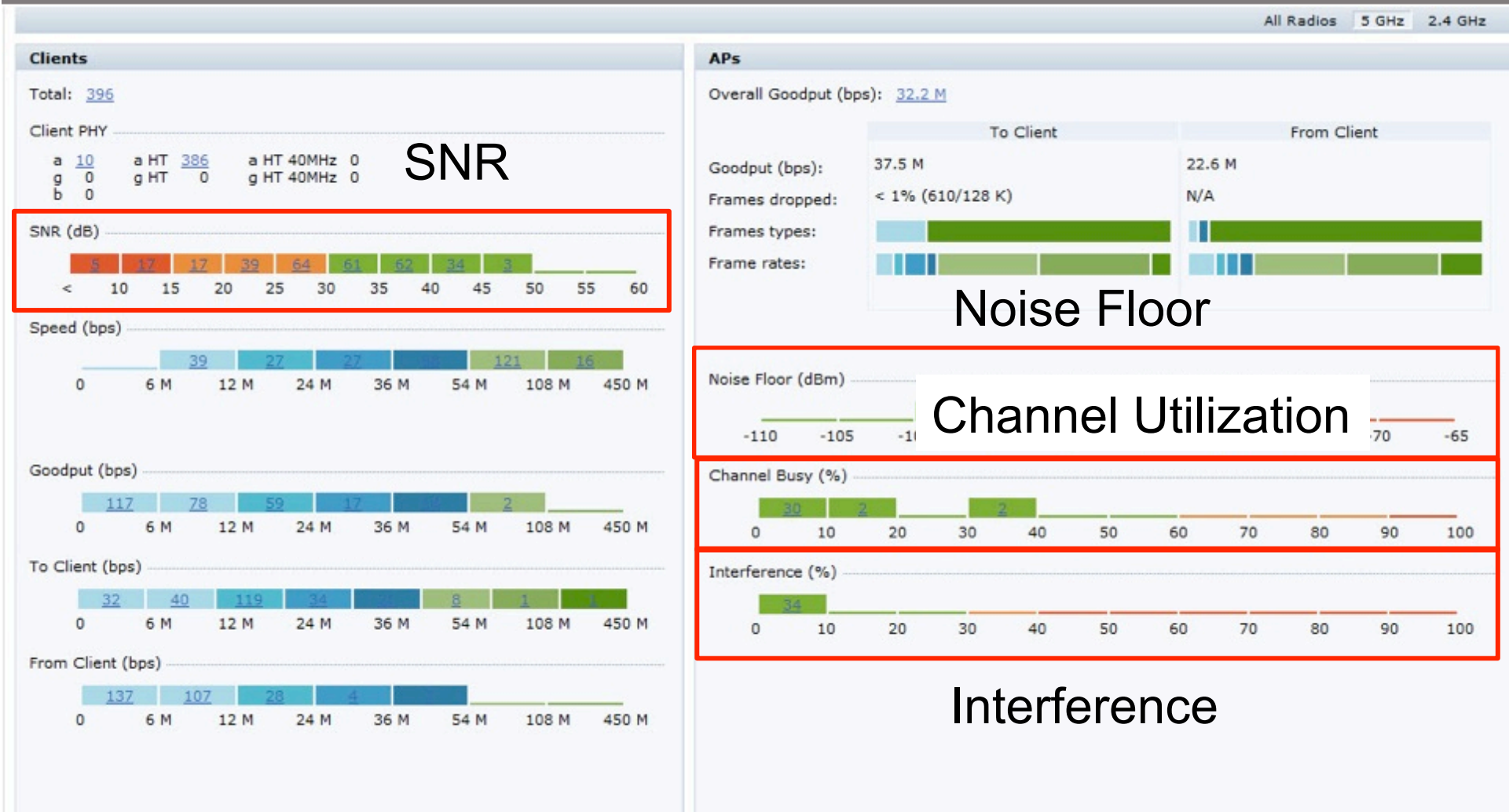
Tools of the Trade



WLAN Engineer Toolkit

- **Network Management/Monitoring Platform**
- **Spectrum Analysis**
- **Site-Survey**
- **Understanding Client NIC**
- **Performance Testing**
- **Packet Capture**
- **Command Line Interface (CLI)**

ArubaOS Dashboard - Performance



AOS RF Dashboard – Usage



AOS RF Dashboard – Security

ARUBA networks MOBILITY CONTROLLER | [Monitoring > Security Summary](#)

Dashboard | Monitoring | Configuration | Diagnostics | Maintenance | Plan | Last updated: 08:05:23 pm | ? | [Logout admin](#)

Performance
Usage
> Security
Potential Issues
WLANs
Access Points
Clients

Discovered APs & Clients

| AP Classification | Active APs | Associated Clients |
|--------------------|---------------------|---------------------|
| Rogue | 0 | 0 |
| Suspected Rogue | 9 | 4 |
| Interfering | 35 | 67 |
| Neighbor | 0 | 0 |
| Valid | 192 | 57 |
| Manually Contained | 0 | 0 |
| Total | 236 | 128 |

Events

| | | Last 4 hrs | Last 24 hrs | All |
|-------------|----------------|--------------------|---------------------|-----------------------|
| Containment | Infrastructure | 0 | 0 | 0 |
| | Client | 0 | 0 | 0 |
| | Total | 0 | 0 | 0 |
| Detection | Low | 0 | 0 | 0 |
| | Med | 28 | 72 | 669 |
| | High | 34 | 64 | 334 |
| | Total | 62 | 136 | 1,003 |

Discovered Access Points: Active = Yes, AP Classification = Rogue

[Locate](#)
[Contain Manually](#)
[Reclassify](#)
[Delete](#)
[Export](#)

| BSSID | Band | PHY Type | SSID | Channel | Clients | AP Classification | Encryption | Marked to Contain |
|----------------------|------|----------|------|---------|---------|-------------------|------------|-------------------|
| - No matches found - | | | | | | | | |

AOS RF Dashboard – Potential Issues



MOBILITY CONTROLLER | [Monitoring > Potential Issues](#)

Dashboard

Monitoring

Configuration

Diagnostics

Maintenance

Plan

Last updated: 08:05:56 pm

Performance

Usage

Security

> **Potential Issues**

WLANs

Access Points

Clients

Potential Issues

Clients with potential issues: [11 out of 21](#)

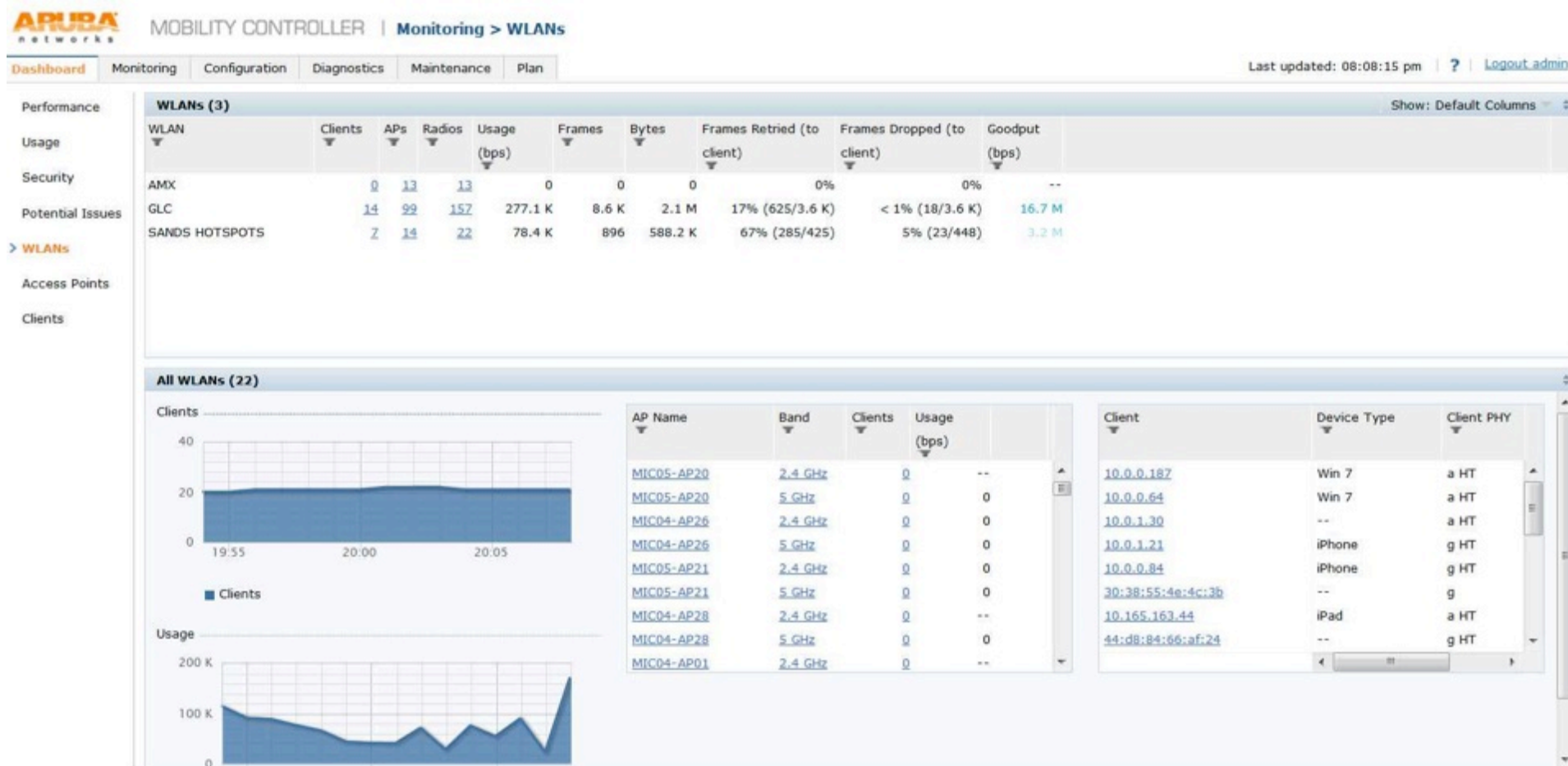
Radios with potential issues: [25 out of 198](#)

| | 2.4 GHz | 5 GHz |
|-------------|-------------------|-------------------|
| Low SNR | 0 | 1 |
| Low speed | 0 | 1 |
| Low goodput | 5 | 6 |

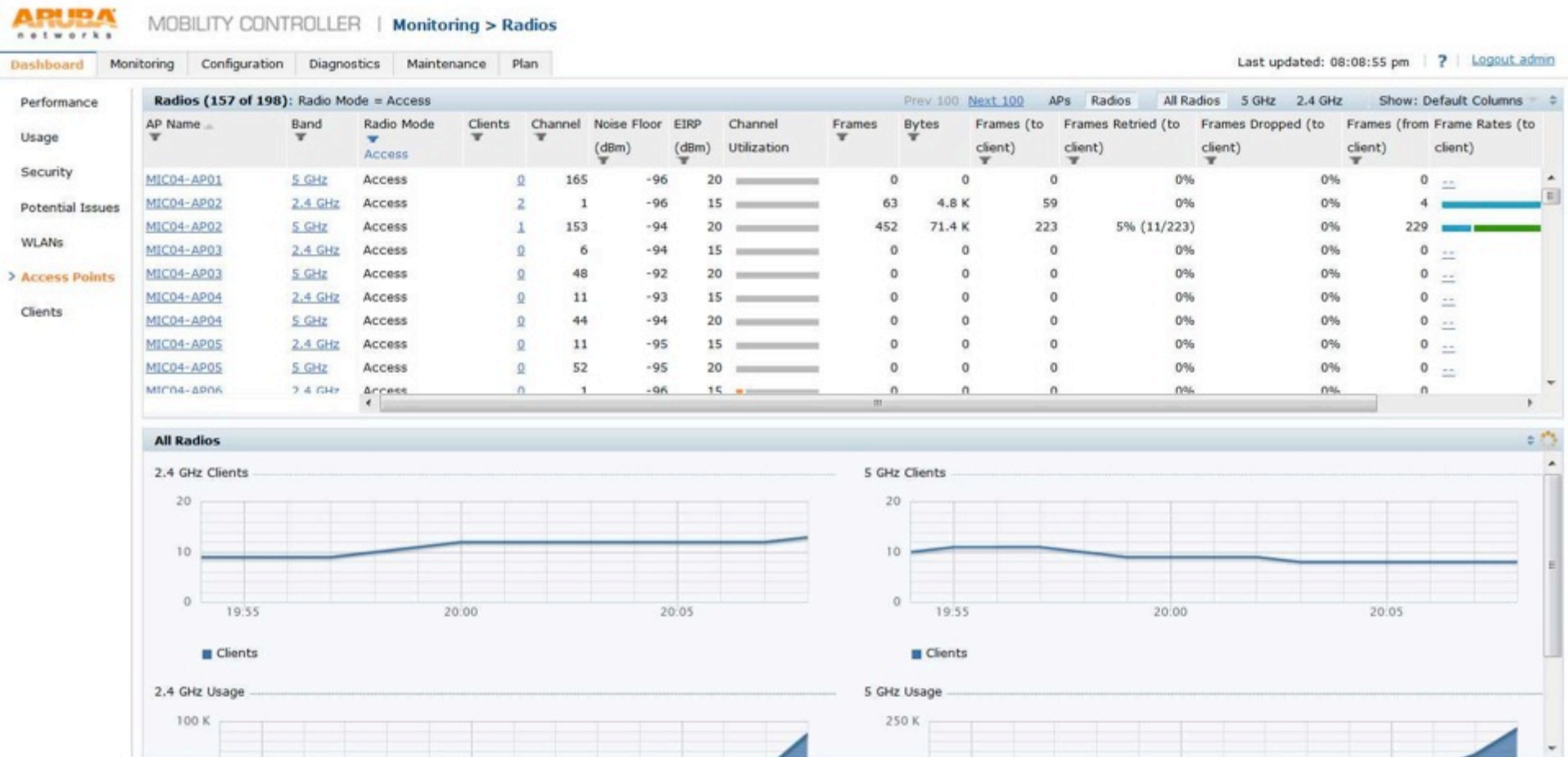
| | 2.4 GHz | 5 GHz |
|-------------------------|--------------------|-------------------|
| High noise floor | 0 | 0 |
| Busy channel | 0 | 0 |
| High interference | 12 | 0 |
| Low goodput | 8 | 6 |
| High client association | 0 | 0 |



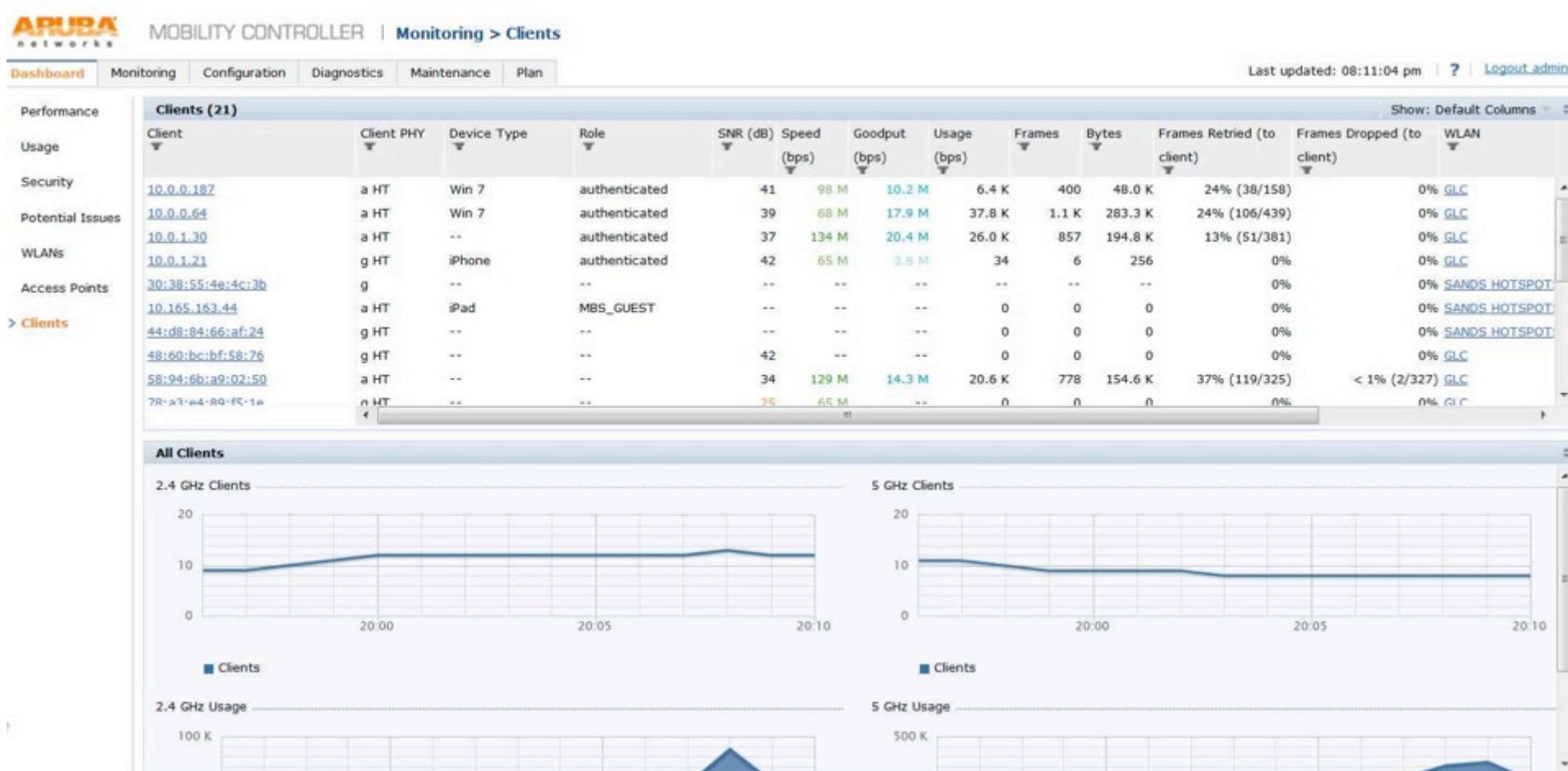
AOS RF Dashboard – WLAN



AOS RF Dashboard – Access Points



AOS RF Dashboard – Clients



RF Health report

ARUBA networks

New Devices: 35 Up: 563 Wired: 34 Down: 191 Wired: 5

Rogue: 1 Clients: 221 Alerts: 22

Log out peter

Search

Home Groups APs/Devices Clients **Reports** System Device Setup AMP Setup RAPIDS VisualRF

Generated Definitions **Detail**

1344 RF health report for Group Ethersphere-lms3

2/26/2012 5:00 AM to 2/27/2012 5:00 AM
Generated on 2/27/2012 5:01 AM

XML (XHTML) export
CSV export
Email this report
Print report

Most Noise (5 GHz)

| Rank ▲ | Device | Average Noise (dBm) | Channel Changes | Average Channel Busy (%) | Number of Clients | Usage (bps) | Location |
|--------|--------------------------------------|---------------------|-----------------|--------------------------|-------------------|-------------|----------|
| 1 | ITC | -87.00 | 14 | 7.87 | 0 | 0.00 | - |
| 2 | 72C | -87.50 | 11 | 7.87 | 0 | 0.00 | - |
| 3 | 140C | -88.00 | 15 | 6.69 | 0 | 0.00 | - |
| 4 | 24C | -89.50 | 18 | 6.69 | 0 | 0.00 | - |
| 5 | 167C | -89.50 | 12 | 3.54 | 0 | 0.00 | - |
| 6 | 1341-AP35 | -89.50 | 0 | 2.36 | 1 | 0.00 | - |
| 7 | 41C | -90.00 | 181 | 6.30 | 0 | 0.00 | - |
| 8 | AL21 (1344-1-al21.arubanetworks.com) | -90.00 | 37 | 1.18 | 0 | 0.00 | - |
| 9 | 175C | -90.00 | 20 | 4.33 | 0 | 0.00 | - |
| 10 | 1344-2-184C | -90.00 | 0 | 3.94 | 0 | 0.00 | - |
| 11 | 196C | -90.00 | 0 | 3.94 | 0 | 0.00 | - |
| 12 | 78C | -90.00 | 17 | 4.72 | 0 | 0.00 | - |
| 13 | 1263 | -90.00 | 0 | 32.68 | 0 | 0.00 | - |
| 14 | 03C | -91.00 | 29 | 6.69 | 0 | 0.00 | - |
| 15 | 1344-2-12C | -91.50 | 55 | 5.12 | 1 | 0.00 | - |

Most Noise (2.4 GHz)

| Rank ▲ | Device | Average Noise (dBm) | Channel Changes | Average Channel Busy (%) | Number of Clients | Usage (bps) | Location |
|--------|------------|---------------------|-----------------|--------------------------|-------------------|-------------|----------|
| 1 | 175C | -86.00 | 5 | 15.75 | 0 | 0.00 | - |
| 2 | ITC | -87.00 | 7 | 41.73 | 0 | 0.00 | - |
| 3 | 196C | -89.00 | 0 | 33.46 | 0 | 0.00 | - |
| 4 | 140C | -90.50 | 1 | 55.91 | 0 | 0.00 | - |
| 5 | 1344-2-92C | -91.50 | 2 | 50.39 | 0 | 0.00 | TAC |
| 6 | 78C | -92.00 | 1 | 38.98 | 0 | 0.00 | - |
| 7 | 1344-2-12C | -91.50 | 55 | 5.12 | 1 | 0.00 | - |



Channel utilization trigger

Channel Utilization Trigger

Type:

Channel Utilization

Severity:

Normal

Duration:
e.g. '15 minutes', '75 seconds', '1 hr 15 mins'

5 minutes

Conditions



Matching conditions:

☒ All ☐ Any

Available Conditions: Interference (%), Radio Type, Time Busy (%), Time Receiving (%), Time Transmitting (%)

Add

New Trigger Condition

| Option | Condition | Value | |
|------------------|-----------|-------|--|
| Time Busy (%) | >= | 75 |  |
| Interference (%) | >= | 30 |  |

Trigger Restrictions

Folder:

Sunnyvale HQ

Include Subfolders:

☒ Yes ☐ No

Group:

- All Groups -

Alert Notifications

Additional Notification Options:

☐ Email
☐ NMS

Add NMS servers on the [AMP Setup NMS page](#)

Logged Alert Visibility:

By Role

Suppress Until Acknowledged:

☒ Yes ☐ No

Save

Cancel

AirWave – AP Monitoring

Home Groups **APs/Devices** Clients Reports System Device Setup AMP Setup RAPIDS VisualRF

List Monitor Manage Audit Compliance New Up Down Mismatched Ignored

Device Info

Status: Up (OK)

Configuration: **Mismatched** (The settings on the device do not match the desired configuration policy.)

Controller: [ethersphere-lms3](#)

Aruba AP Group: [Corp1344-AM](#)

Upstream Device: [1344-1-AP-alpha-sw1](#)

Upstream Port: [gigabitethernet0/0/15](#)

Type: Aruba AP 135

Remote Device: No

Last Contacted: 2/28/2012 9:43 AM

Uptime: 2 days 8 hrs 12 mins

LAN MAC Address: D8:C7:C8:C0:C7:BC

Serial: AX0025566

IP Address: 10.6.66.71

Clients: 5

Usage: 19.06 Kbps

Quick Links:

[Open controller web UI...](#)

[Run a command...](#)

Notes:

Radios

| Index ▲ | Name | MAC Address | Clients | Usage (Kbps) | Channel | Tx Power | Antenna Type | Role | Active SSIDs |
|---------|-----------|-------------------|---------|--------------|---------|----------|--------------|-----------------------|----------------------|
| 1 | 802.11bgn | D8:C7:C8:8C:7B:C0 | 0 | 0.00 | 1 | 0 dBm | Internal | AirMonitor and Access | - |
| 2 | 802.11an | D8:C7:C8:8C:7B:D0 | 4 | 19.06 | 149 | 12 dBm | Internal | Access | ARUBA-VISITOR, et... |

Wired Interfaces

| Name ▲ | MAC Address | Clients | Admin Status | Operational Status | Type | Duplex | Aruba Port Mode | Input Capacity | Output Capacity |
|--------|-------------------|---------|--------------|--------------------|-----------------|--------|-----------------|----------------|-----------------|
| Enet0 | D8:C7:C8:C0:C7:BC | 0 | Up | Up | gigabitEthernet | Full | N/A | 1000 Mbps | 1000 Mbps |
| Enet1 | D8:C7:C8:C0:C7:BD | 0 | Up | Down | gigabitEthernet | Half | Active Standby | 10 Mbps | 10 Mbps |

View Device Events

Clients on 1344-1-AL25 Last 2 hours



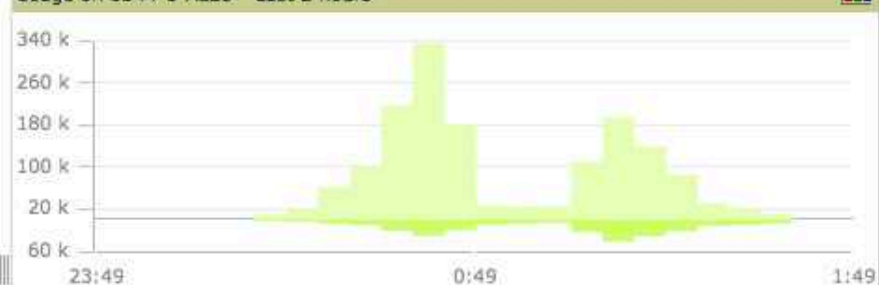
[Show All](#)

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Maximum Average

0 clients 0 clients

Usage on 1344-1-AL25 Last 2 hours



[Show All](#)

Avg In (Radio 11)

Maximum Average

0 bps 0 bps

Radio Details



[New Devices: 35](#)
[Up: 561](#)
[Wired: 34](#)
[Down: 193](#)
[Wired: 5](#)
[Rogue: 1](#)
[Clients: 219](#)
[Alerts: 22](#)

[Log out peter](#)

205c

[Home](#)
[Groups](#)
[APs/Devices](#)
[Clients](#)
[Reports](#)
[System](#)
[Device Setup](#)
[AMP Setup](#)
[RAPIDS](#)
[VisualRF](#)

[List](#)
[Monitor](#)
[Manage](#)
[Audit](#)
[Compliance](#)
[New](#)
[Up](#)
[Down](#)
[Mismatched](#)
[Ignored](#)

AP Monitoring | Radio Statistics

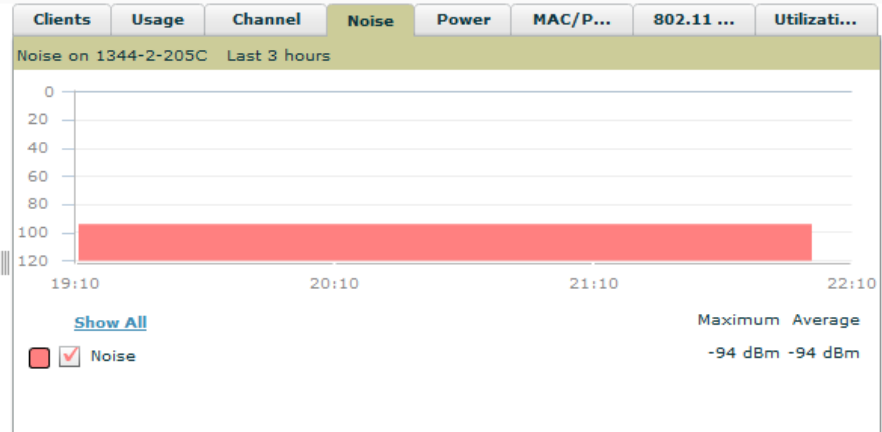
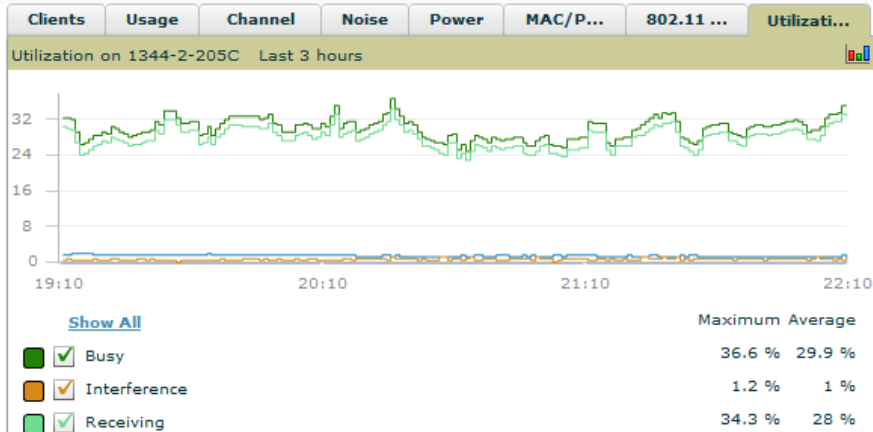
[Help](#)

Monitoring 802.11bgn radio for AP 1344-2-205C

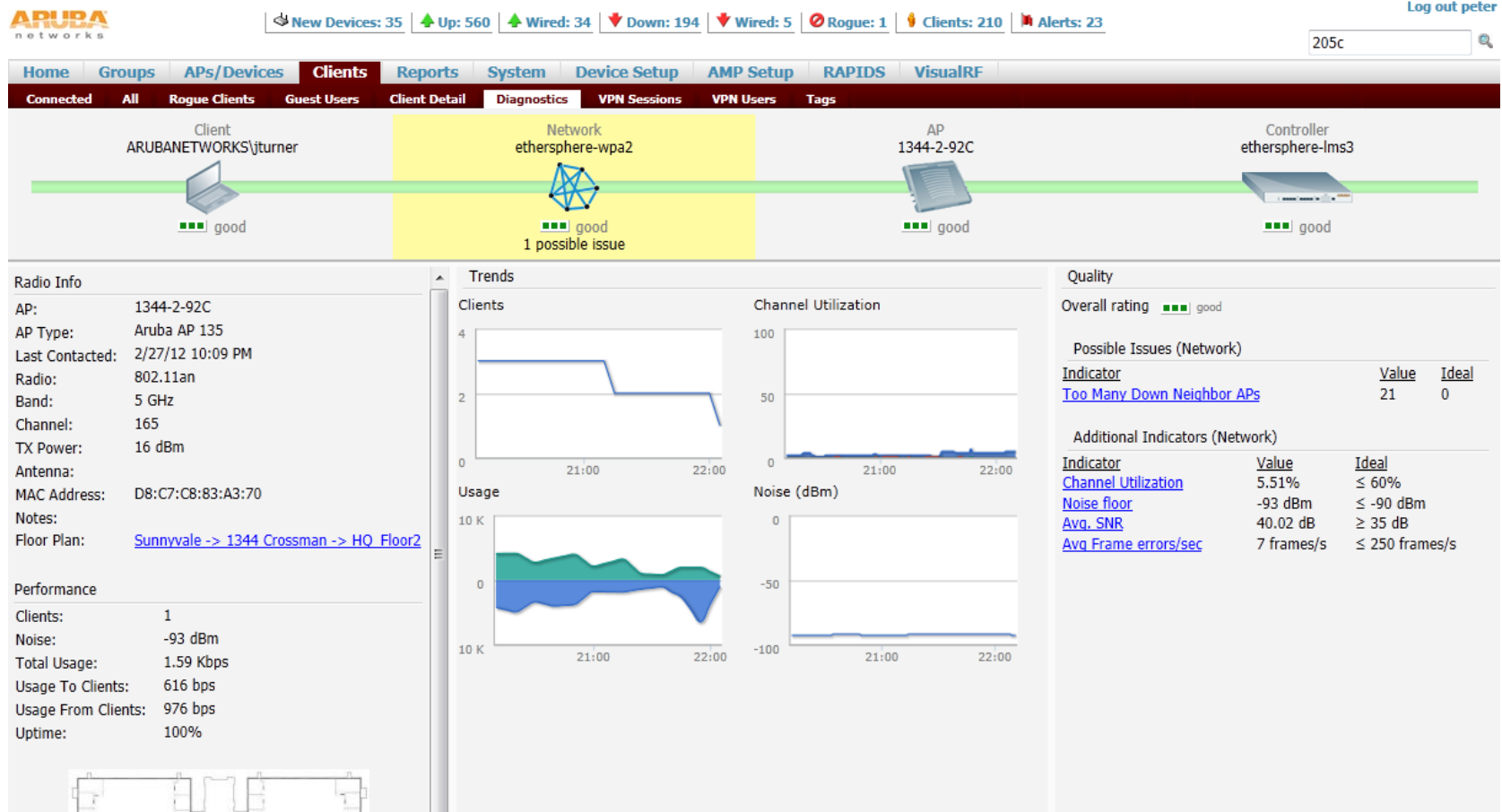
Run a command...

802.11 Radio Counters Summary (frames/sec)

| | Current | Last Hour | Last Day | Last Week |
|------------|---------|-----------|----------|-----------|
| Unacked | 4 | 4 | 58 | 54 |
| Retries | 0 | 0 | 17 | 19 |
| Failures | 4 | 4 | 8 | 7 |
| Dup Frames | 0 | 0 | 0 | 0 |
| FCS Errors | 5 | 5 | 34 | 54 |



Client Diagnostics



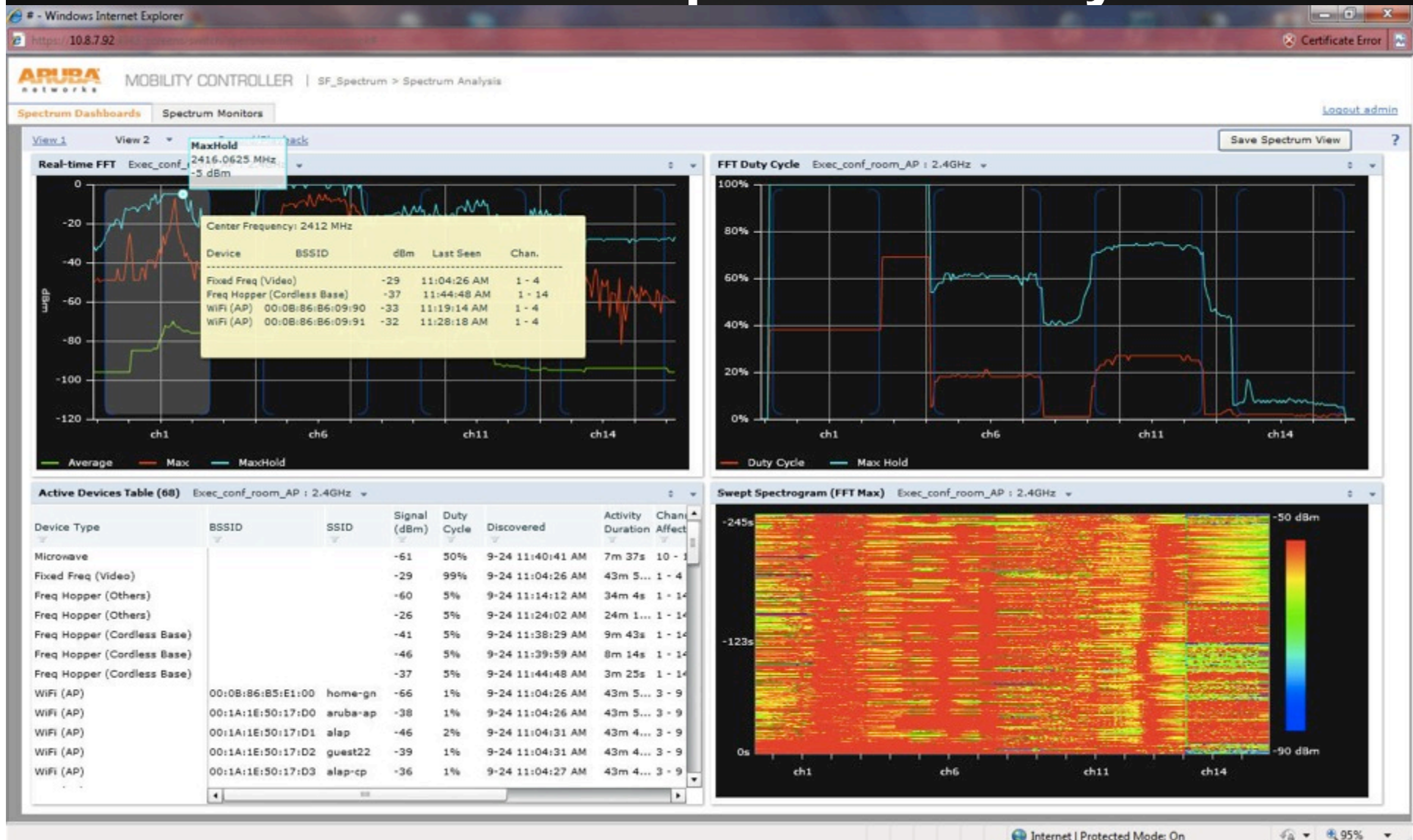
Spectrum Analysis



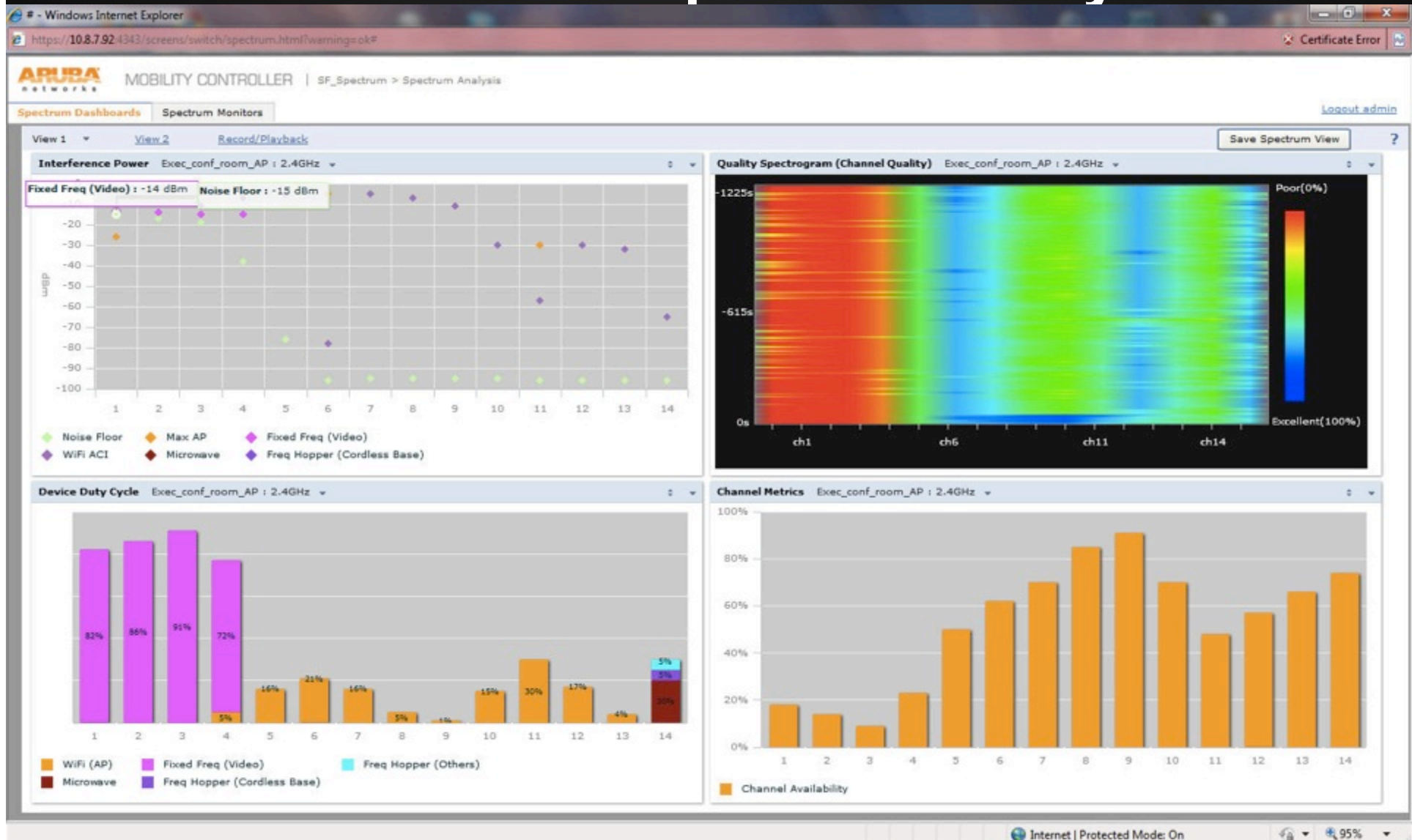
Spectrum Analysis

- **Aruba AP in Spectrum Mode**
- **Aruba AP in Hybrid Spectrum Mode**
 - AP-9x/10x/13x
 - Software configurable
- **Dedicated Spectrum Analysers**
 - Fluke Networks – AirMagnet Spectrum XT
 - Metageek – Wi-Spy
 - Others
- **Airwave VisualRF**

Wireless Tools – Spectrum Analysis



Wireless Tools – Spectrum Analysis



Wireless Tools – Visual RF



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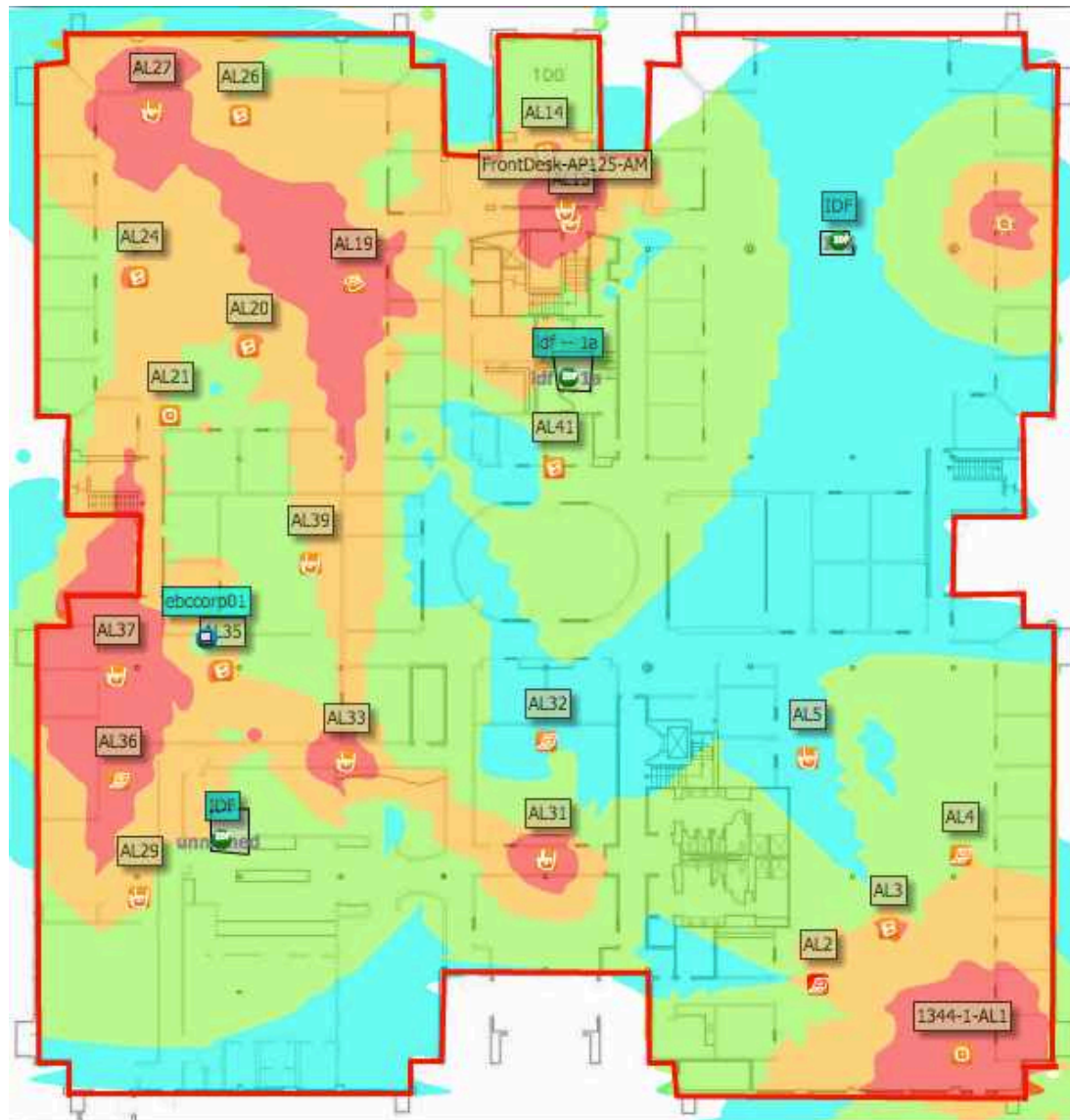
► #airheadsconf



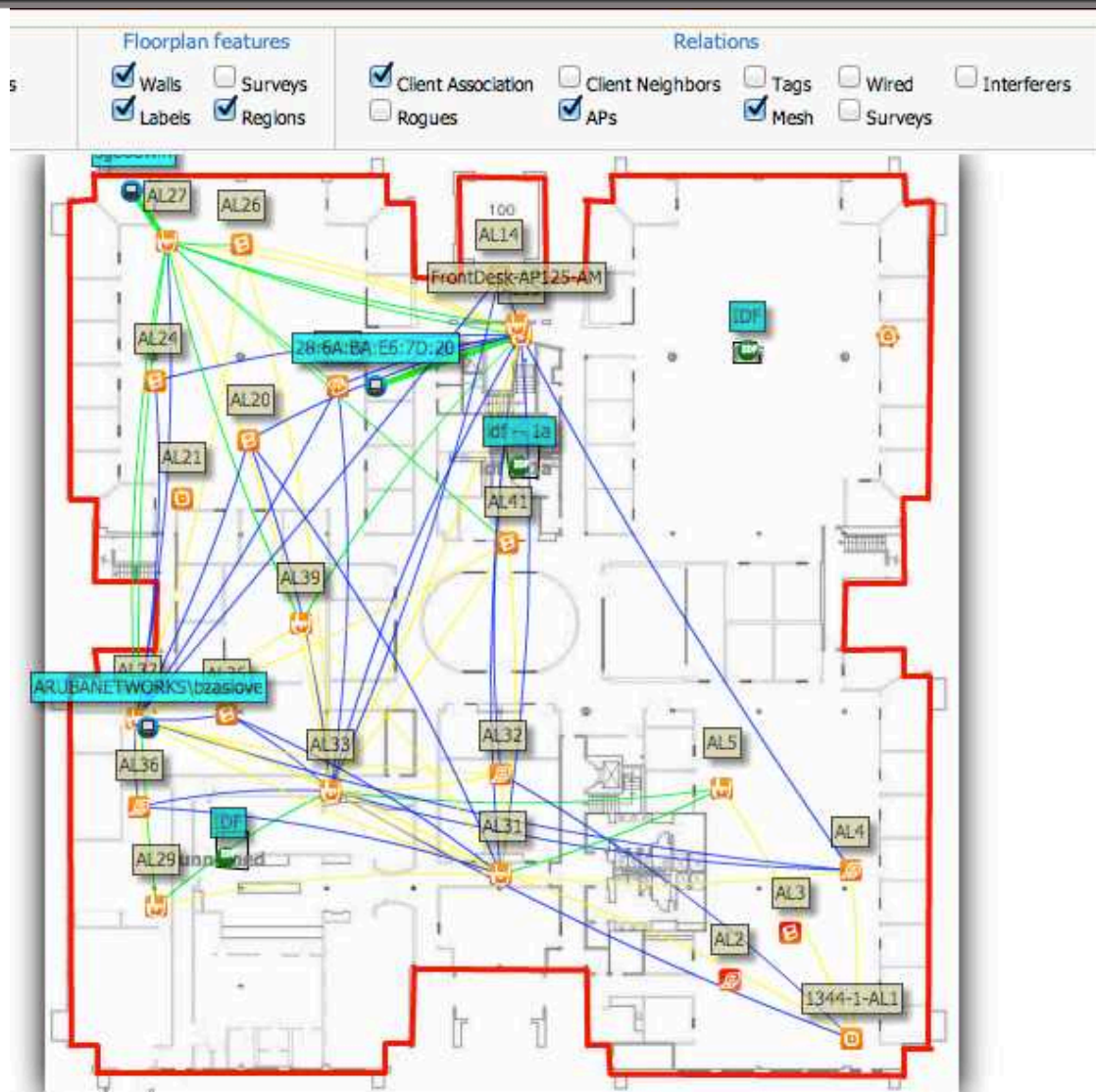
Wi-Fi Heatmap & Site-Survey



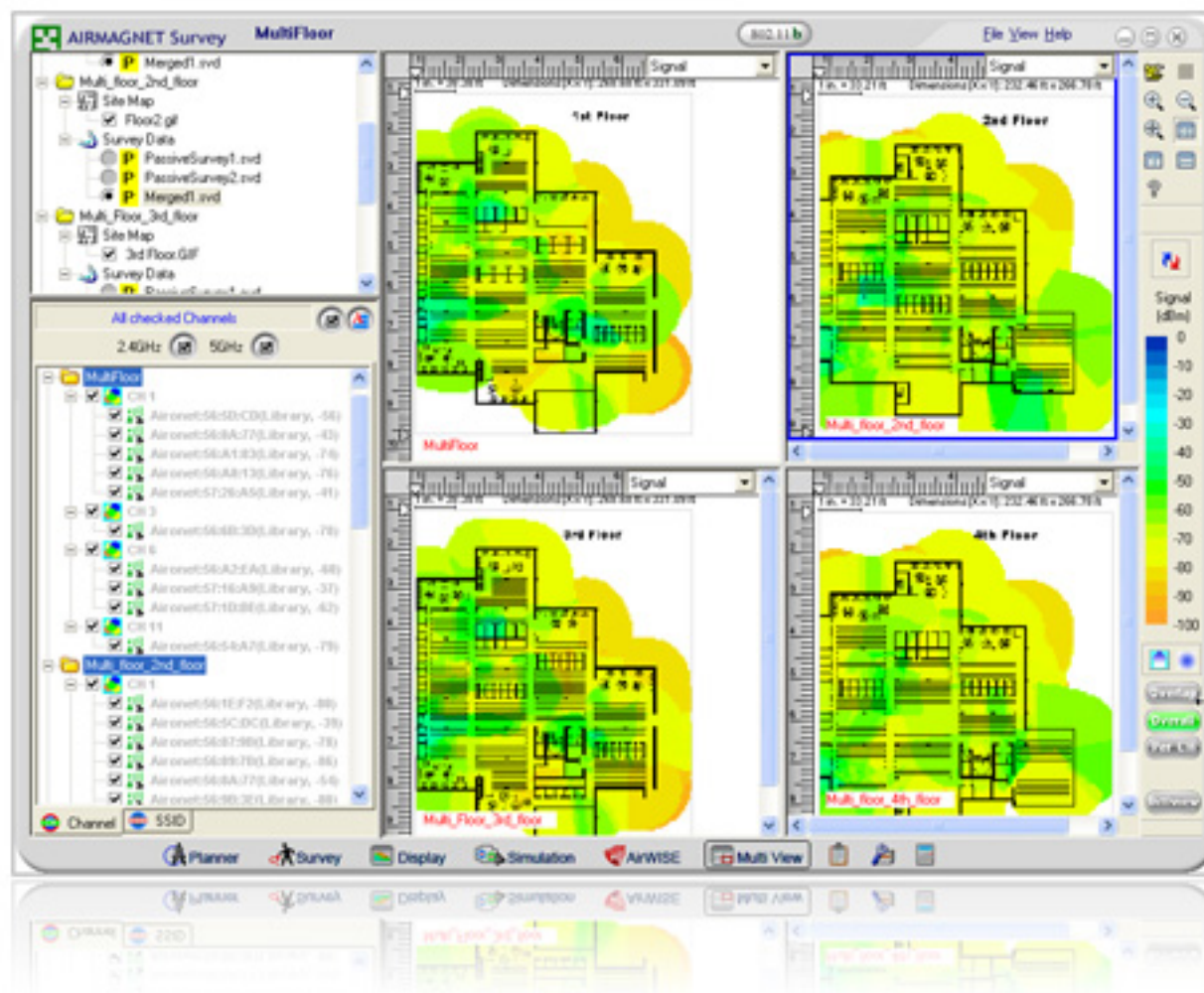
Heatmap (AirWave VisualRF)



Airwave (Client Association)



Site-Survey (AirMagnet Survey Pro)



Takes two to Tango

Understanding the client NIC

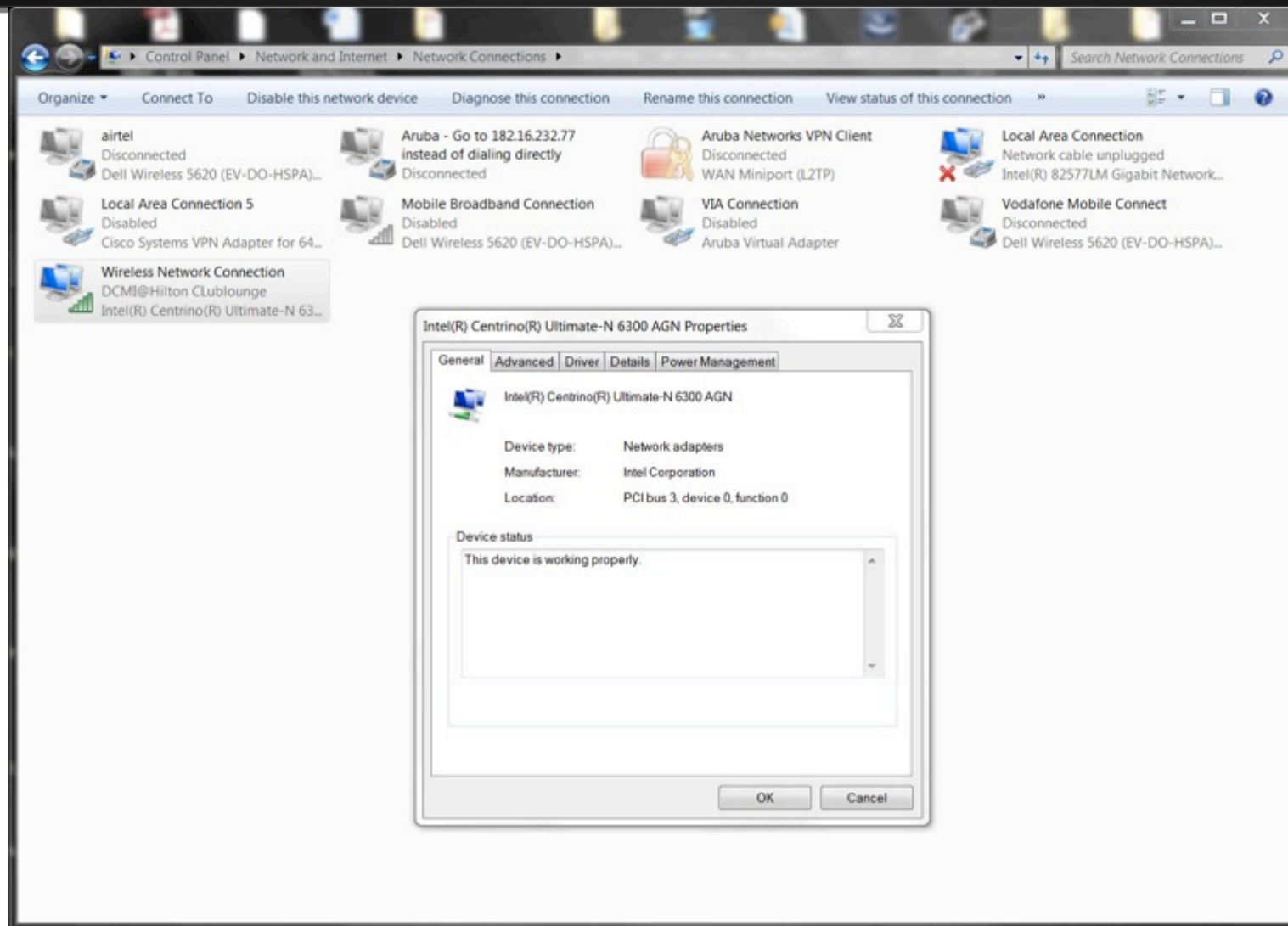


Understanding the Client NIC

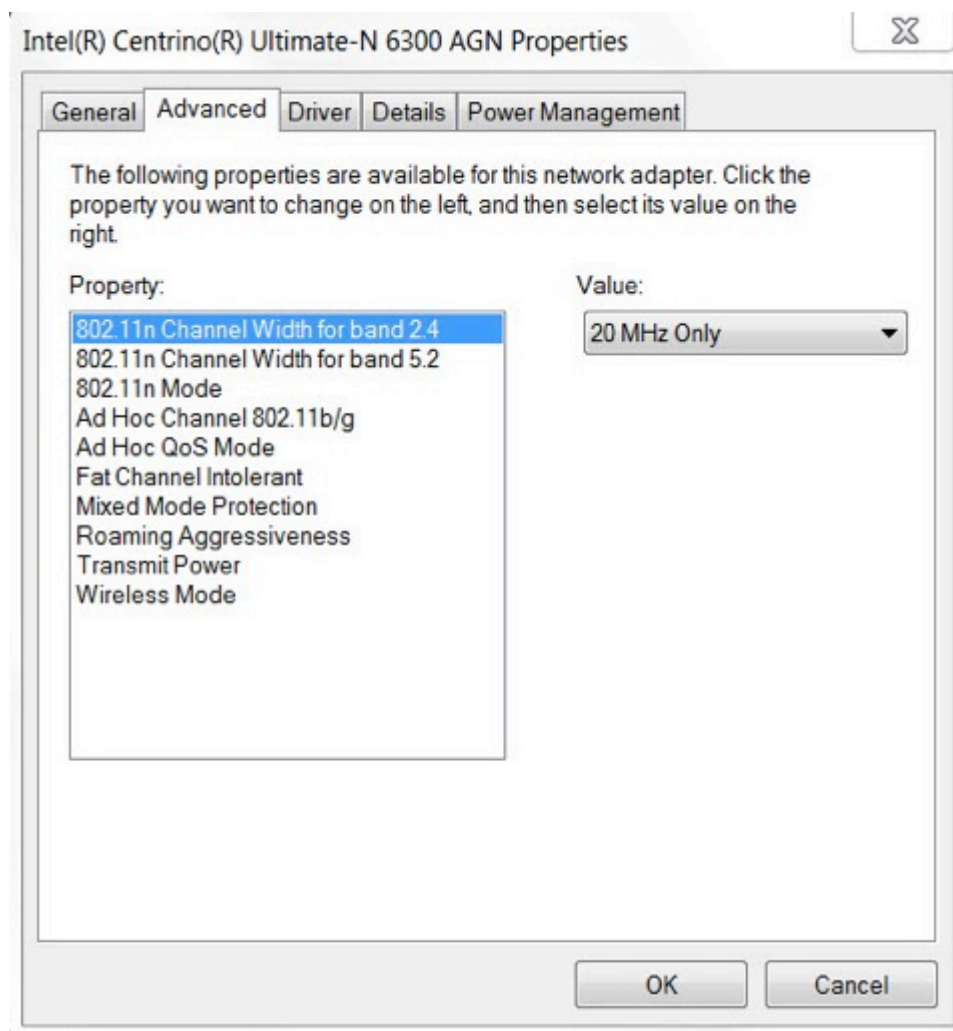
- **Client devices have different characteristics and capabilities**
 - Is it 802.11a, 802.11g, b/g/n, a/b/g/n?
 - If the client supports 11n, is it one spatial stream, 2 spatial streams, or 3 spatial streams?
 - Is the wireless NIC using the latest driver?
 - Smartphones often use lower transmit power to save battery
 - SNR works in **both directions**—the client needs sufficient SNR to demodulate 802.11 data rates—noise close to the client can hurt performance
 - Sometimes, the client can hear the AP, but the AP cannot hear the client

Win7 OS

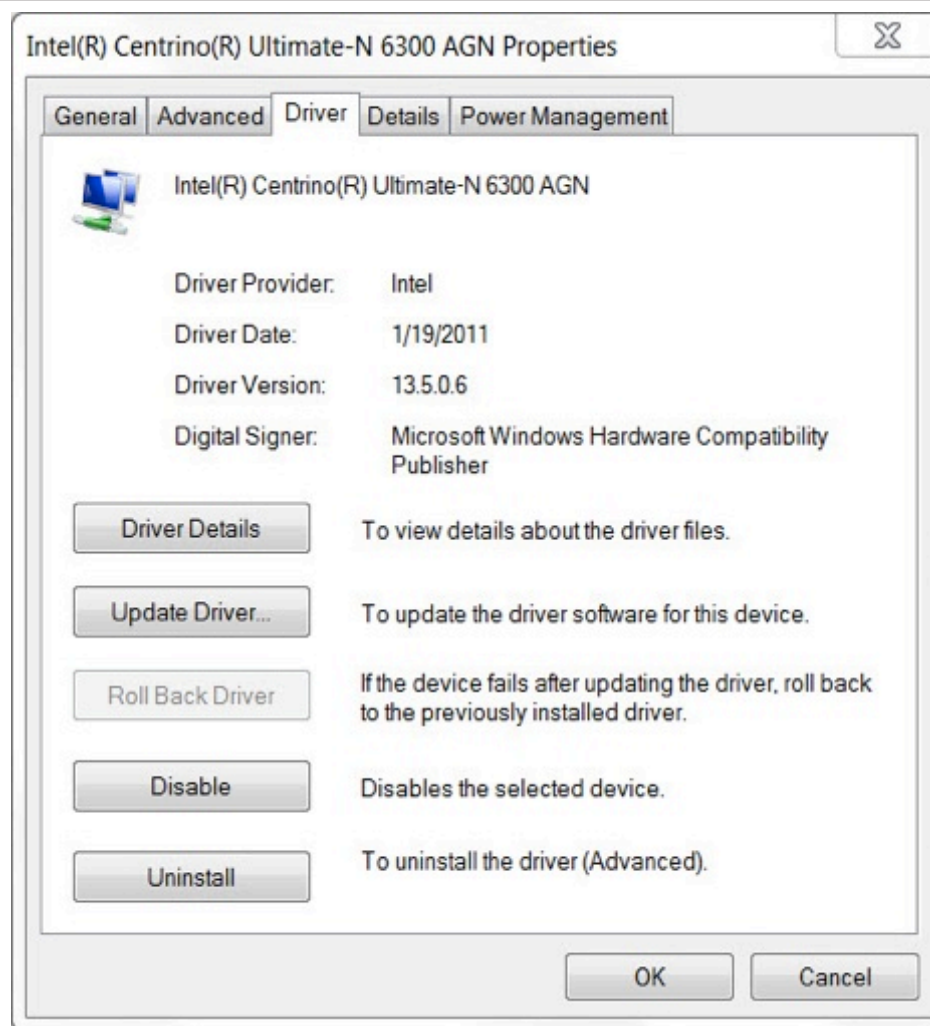
Wireless NIC Details



Wireless NIC Details Cont.



Wireless NIC Details Cont.



Wireless NIC Details Cont.

```
C:\Users\kperedia.ARUBANETWORKS>netsh wlan show driver

Interface name: Wireless Network Connection

Driver                : Intel(R) Centrino(R) Ultimate-N 6300 AGN
Vendor                : Intel Corporation
Provider              : Intel
Date                  : 10/27/2011
Version               : 14.3.0.6
INF file              : C:\Windows\INF\oem63.inf
Files                 : 4 total
                       C:\Windows\system32\DRIVERS\NETwNs64.sys
                       C:\Windows\system32\NETwNc64.dll
                       C:\Windows\system32\NETwNw64.dll
                       C:\Windows\system32\drivers\vwifibus.sys

Type                  : Native Wi-Fi Driver
Radio types supported : 802.11a 802.11b 802.11g
FIPS 140-2 mode supported : Yes
Hosted network supported : Yes
Authentication and cipher supported in infrastructure mode:
Open                  None
Open                  WEP-40bit
Open                  WEP-104bit
Open                  WEP
Shared                WEP-40bit
Shared                WEP-104bit
Shared                WEP
WPA-Enterprise        TKIP
WPA-Enterprise        CCMP
WPA-Personal          TKIP
WPA-Personal          CCMP
WPA2-Enterprise        TKIP
WPA2-Enterprise        CCMP
WPA2-Personal          TKIP
WPA2-Personal          CCMP
Open                  Vendor defined
Authentication and cipher supported in ad-hoc mode:
Open                  None
Open                  WEP-40bit
Open                  WEP-104bit
Open                  WEP
Shared                WEP-40bit
Shared                WEP-104bit
Shared                WEP
WPA2-Personal          CCMP
```



Wireless NIC Connectivity (Windows 7)

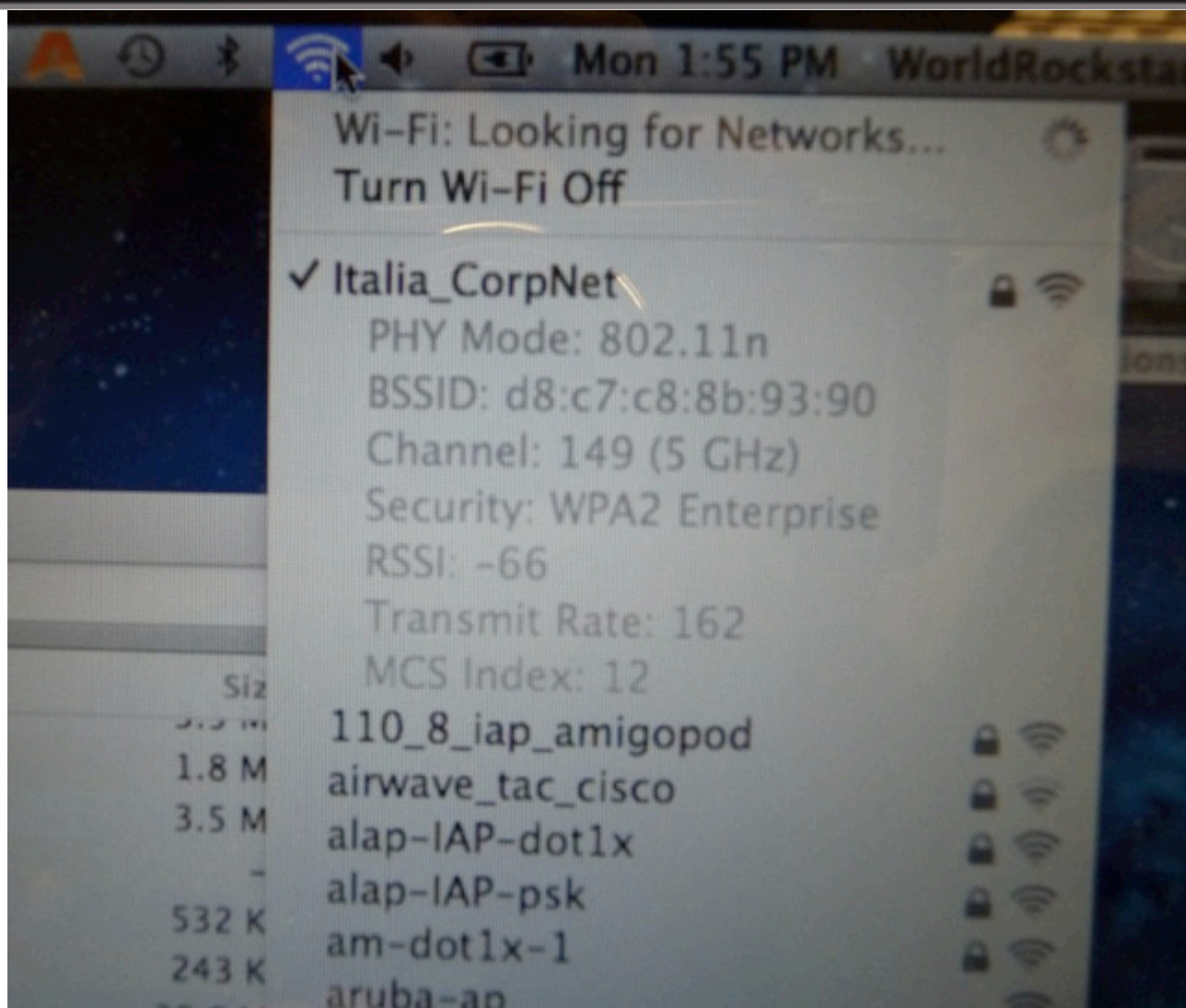
```
C:\Users\kperedia.ARUBANETWORKS>netsh wlan show interface

There is 1 interface on the system:

Name                           : Wireless Network Connection
Description                     : Intel(R) Centrino(R) Ultimate-N 6300 AGN
GUID                           : 988c7779-aeb4-41d1-af4f-c9af8d2d92b9
Physical address                : 24:77:03:3b:aa:d0
State                           : connected
SSID                           : Roppongi Des
BSSID                           : 00:07:ab:77:a7:9f
Network type                    : Infrastructure
Radio type                      : 802.11g
Authentication                  : WPA2-Personal
Cipher                          : CCMP
Connection mode                 : Profile
Channel                         : 4
Receive rate (Mbps)            : 72
Transmit rate (Mbps)           : 72
Signal                          : 99%
Profile                         : Roppongi Des
Hosted network status          : Not available
```

MacOS

Wireless NIC Connectivity (MacOS)



Wireless NIC Connectivity (MacOS)

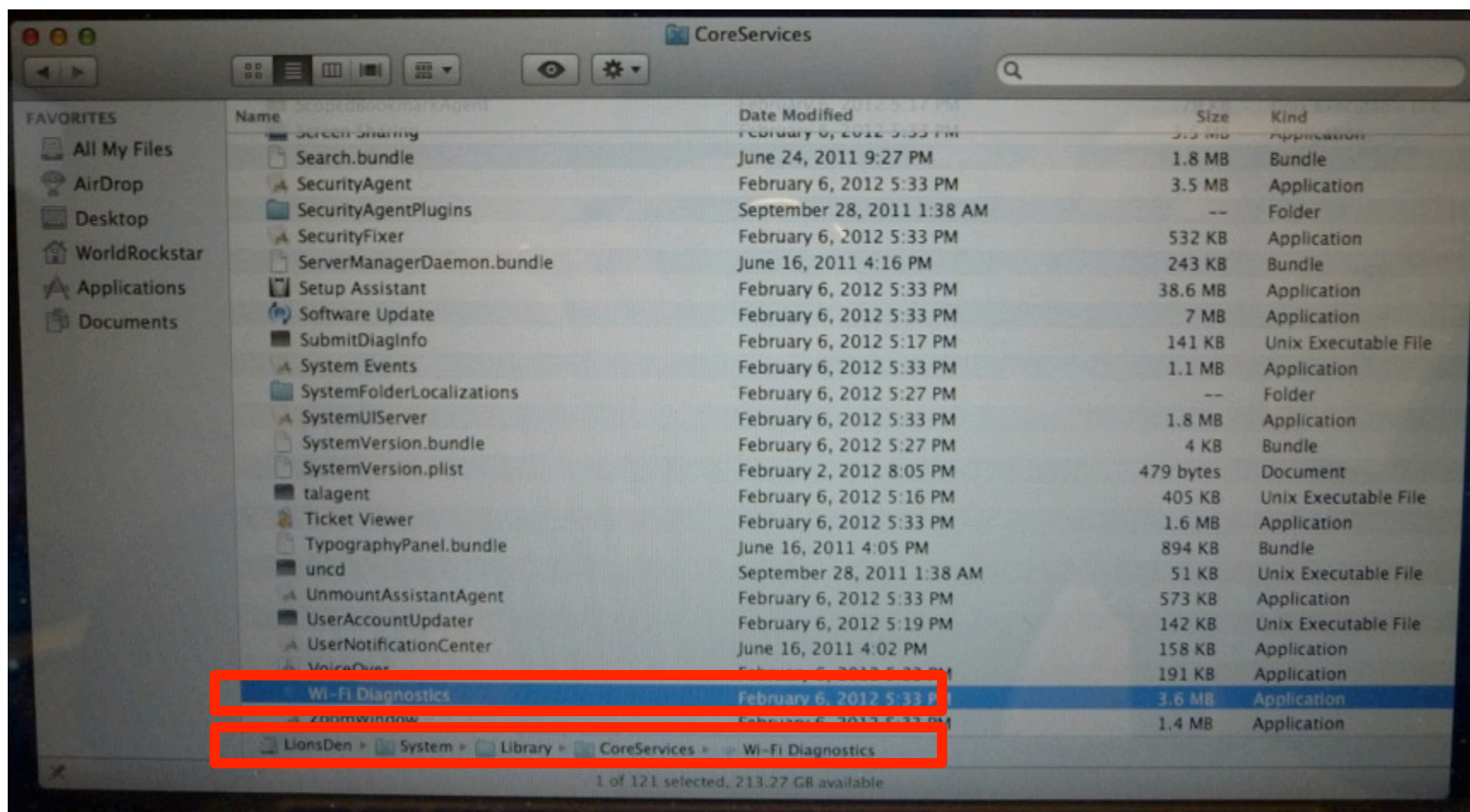
- **\$ sudo ln -sf /System/Library/PrivateFrameworks/Apple80211.framework/Versions/A/Resources/airport /usr/sbin/airport**

```
$ airport -I
agrCtlRSSI: -57
agrExtRSSI: 0
agrCtlNoise: -89
agrExtNoise: 0
state: running
op mode: station
lastTxRate: 243
maxRate: 300
lastAssocStatus: 0
802.11 auth: open
link auth: wpa2
BSSID: d8:c7:c8:80:1d:f0
SSID: Italia_CorpNet
MCS: 14
channel: 44,1
```

Wireless Diagnostics (MacOS)

- **Turn on logging**
 - `sudo /usr/libexec/airportd debug +alluserland +alldriver +allvendor`
 - When issue happens send the kernel.log file (that is located in /var/log directory) to TAC plus system profiler
- **Export System Profiler**

Wireless Diagnostics (MacOS Lion)



Wireless Diagnostics (MacOS Lion)



ios



iOS Diagnostics (IPCU)



The screenshot shows a web browser window with the address bar displaying `http://support.apple.com/kb/DL1466`. The browser's menu bar includes File, Edit, View, Favorites, Tools, and Help. The status bar shows 'Safe Web' and 'Identity Safe'. The page header features the Apple logo and navigation links for Store, Mac, iPod, iPhone, iPad, iTunes, and Support. The main content area is titled 'iPhone Configuration Utility 3.5 for Windows' and includes a download icon, an image of an iPhone, and a description of the utility. A right-hand sidebar provides additional details such as version, post date, download ID, file size, system requirements, and supported languages.

iPhone Configuration Utility 3.5 for Windows

 **Download**

About iPhone Configuration Utility 3.5 for Windows

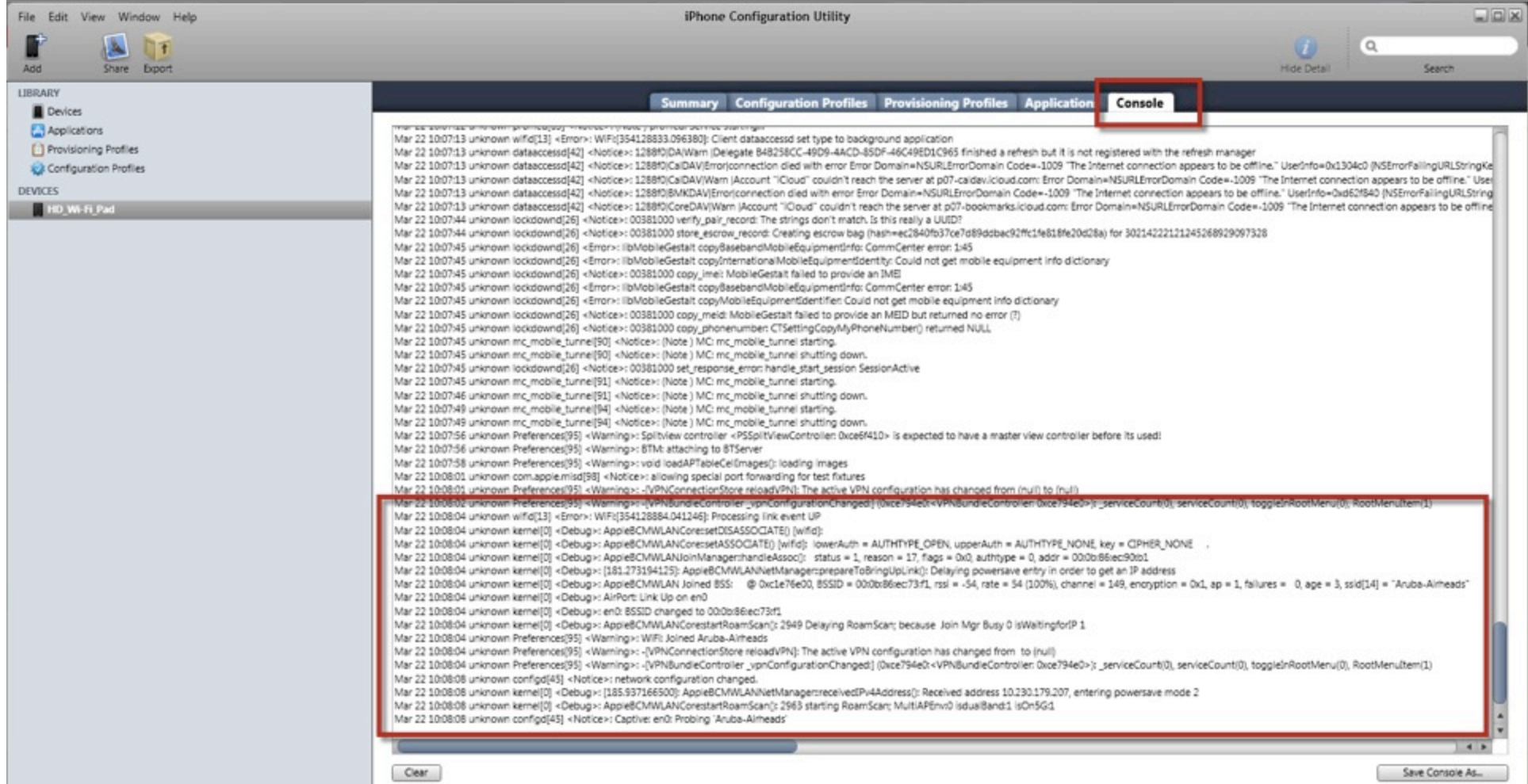
iPhone Configuration Utility lets you easily create, maintain, encrypt, and install configuration profiles, track and install provisioning profiles and authorized applications, and capture device information including console logs.

Configuration profiles are XML files that contain device security policies, VPN configuration information, Wi-Fi settings, APN settings, Exchange account settings, mail settings, and certificates that permit iPhone and iPod touch to work with your enterprise systems.

Version: 3.5
Post Date: March 07, 2012
Download ID: DL1466
File Size: 40.58 MB
System Requirements
Windows XP SP3
Windows Vista SP1
Windows 7
.NET 3.5 SP1
Supported Languages
Deutsch, English, Français, 日本語, Español, Italiano, Nederlands

Languages
English ▼

iOS Diagnostics (IPCU)



Android

Android Diagnostics (Aruba Utility)



Performance Testing



Performance Testing

When testing, it is best to do **wired** to **wireless** client testing.

This allows testing the performance of the wireless LAN, and not depending on Internet access and limited bandwidth.

Pure performance can be measured.

Performance Testing

- **iperf/jperf**
- **ixChariot**
- **Veriwave – WaveDeploy**

- **iperf (Traffic flow is from client to server)**
 - Server (receiver)
 - `iperf -s -w 512k -i 1`
 - Client (sender)
 - `iperf -c <Server IP> -w 512k -i 1 -t 60 -P 4`

Performance Testing

- **Our Aruba QA team quickly ran chariot tcp performance test against an iPad1, iPad2 and iPad3 on our AP-135 inside a RF chamber.**
 - The following are the results of that test. All ipads were running iOS 5.1 version. Please note they currently only support 20MHz 1ss and no sgi so maximum PHY data rate is 65 Mbps. Please note upstream is lower than expected on our system with this specific test.

| TYPE | Downstream | Upstream | Comments |
|-------|------------|----------|--|
| IPAD1 | 27+ | 10+ | No upstream aggregation. Most robust downstream rate is 52. 65 is not robust; Chipset 4329 |
| IPAD2 | 37+ | 14+ | No upstream aggregation. Most robust downstream rate is 58.5. 65 is not robust. Chipset 4329 |
| IPAD3 | 46+ | 46+ | 65mbps is robust in upstream and downstream. upstream aggregation is enabled. Chipset 4330 |



Packet Capture



Packet Capture

- **Local Packet Capture**
 - Tools running on laptop (Omnipeek/Wireshark)
 - You have to be where the problem is
- **Remote Packet Capture**
 - Use Aruba AP as remote agent
 - Anywhere with network access to AP
- **Session and port Mirroring**

Advanced RF Troubleshooting with CLI



Running Controller CMD from AWMS

Device Info

Status: Up (OK)
Configuration: **Mismatched** (The settings on the device do not match the desired configuration policy.)

Controller: [ethersphere-lms3](#) Aruba AP Group: corp1344 Upstream Device: [1344-1-AP-alpha-sw1](#) Upstream Port: [gigabitethernet0/0/35](#)
Type: Aruba AP 135 Remote Device: No Last Contacted: 2/23/2012 2:22 AM Uptime: 4 days 16 hrs 9 mins
LAN MAC Address: D8:C7:C8:C0:B4:C6 Serial: AX0023139
IP Address: 10.6.66.32 Clients: 2 Usage: -
Quick Links: [Open controller web UI...](#) [Run a command...](#)
Notes:

Radios

| Index | Name | MAC Address | Clients | Usage (Kbps) | Channel | Tx Power | Antenna Type | Role | Active SSIDs |
|-------|---------------------------|-------------------|---------|--------------|---------|----------|--------------|--------|----------------------|
| 1 | 802.11bgn | D8:C7:C8:8B:4C:60 | 0 | 0.00 | 1 | 20 dBm | Internal | Access | ARUBA-VISITOR, et... |
| 2 | 802.11an | D8:C7:C8:8B:4C:70 | 2 | 0.00 | 149 | 20.5 dBm | Internal | Access | ARUBA-VISITOR, et... |

Wired Interfaces

| Name | MAC Address | Clients | Admin Status | Operational Status | Type | Duplex | Aruba Port Mode | Input Capacity | Output Capacity |
|-------|-------------------|---------|--------------|--------------------|-----------------|--------|-----------------|----------------|-----------------|
| Enet0 | D8:C7:C8:C0:B4:C6 | 0 | Up | Up | gigabitEthernet | Full | N/A | 1000 Mbps | 1000 Mbps |
| Enet1 | D8:C7:C8:C0:B4:C7 | 0 | Up | Down | gigabitEthernet | Half | Active Standby | 10 Mbps | 10 Mbps |

Useful AOS CLI (run from AirWave)

Monitoring **AL21 (1344-1-al21.arubanetworks.com)** in group **Ethersphere-lms3** in folder **Top > Sunnyvale HQ** Poll Control

This Device is in monitor-only-with-firmware-upgrades mode.

Device Info

Status: Up (OK)
Configuration: **Mismatched** (The settings on the device do not match the desired configuration policy.)
Controller: **ethersphere-lms3**
Type: Aruba AP 135
LAN MAC Address: D8:C7:C8:C0:B4:C6
IP Address: 10.6.66.32
Quick Links: Open controller web UI...
Notes:

Aruba AP Group: corp1344
Remote Device: No
Serial: AX0023139
Clients: 2
Upstream Device: 1344-1-A
Last Contacted: 2/23/201
Usage: -

Radios

| Index | Name | MAC Address | Clients |
|-------|-----------|-------------------|---------|
| 1 | 802.11bgn | D8:C7:C8:8B:4C:60 | 0 |
| 2 | 802.11an | D8:C7:C8:8B:4C:70 | 2 |

Wired Interfaces

| Name | MAC Address | Clients | Admin Sta |
|-------|-------------------|---------|-----------|
| Enet0 | D8:C7:C8:C0:B4:C6 | 0 | Up |
| Enet1 | D8:C7:C8:C0:B4:C7 | 0 | Up |

✓ Run a command...

- show ap association ap-name "1344-1-AL21"
- show ap debug counters ap-name "1344-1-AL21"
- show ap debug client-table ap-name "1344-1-AL21"
- show datapath session ap-name "1344-1-AL21" table
- show datapath session ap-name "1344-1-AL21" counters
- show ap debug bandwidth-management ap-name "1344-1-AL21"
- show ap tech-support ap-name "1344-1-AL21"
- show ap arm bandwidth-management ap-name "1344-1-AL21"
- show ap arm state ap-name "1344-1-AL21"
- show ap arm scan-times ap-name "1344-1-AL21"
- show ap arm rf-summary ap-name "1344-1-AL21"



Advanced CLI Examples

Verify All Known APs are UP

```
(Aruba3600_Milano) #  
(Aruba3600_Milano) #  
(Aruba3600_Milano) #  
(Aruba3600_Milano) #  
(Aruba3600_Milano) #  
(Aruba3600_Milano) #show ap active
```

Active AP Table

| Name | Group | IP Address | 11g Clients | 11g Ch/EIRP/MaxEIRP | 11a Clients | 11a Ch/EIRP/MaxEIRP | AP Type | Flags | Uptime | Outer IP |
|---------|-------------------|------------|-------------|---------------------|-------------|----------------------|---------|-------|--------------|----------|
| AP135-5 | Castello_APs | 10.8.7.59 | 0 | AP:HT:1/9/20 | 0 | AP:HT:153-/18/20.5 | 135 | A | 27m:12s | N/A |
| AP135-2 | Castello_APs | 10.8.7.106 | 0 | AP:HT:11/9/20 | 0 | AP:HT:157+/18/20.5 | 135 | A | 27m:8s | N/A |
| AP135-3 | Castello_APs | 10.8.7.67 | 0 | AP:HT:11/9/20 | 0 | AP:HT:153-/20.5/20.5 | 135 | A | 27m:7s | N/A |
| AP135-4 | Castello_APs | 10.8.7.115 | 0 | AP:HT:11/15/20 | 0 | AP:HT:44+/16/16 | 135 | A | 26m:48s | N/A |
| AP135-1 | Spectrum_Monitors | 10.8.7.70 | 0 | Spectrum | 0 | Spectrum | 135 | A | 1d:6h:31m:3s | N/A |
| AP135-6 | Castello_APs | 10.8.7.73 | 0 | AP:HT:1/15/20 | 0 | AP:HT:149+/20.5/20.5 | 135 | A | 27m:11s | N/A |

Flags: a = Reduce ARP packets in the air; A = Enet1 in active/standby mode;
B = Battery Boost On; C = Cellular; D = Disconn. Extra Calls On;
d = Drop Mcast/Bcast On; E = Wired AP enabled; K = 802.11K Enabled; n = Don't convert IPv6 Mcast RA to Ucast
L = Client Balancing Enabled; M = Mesh; N = 802.11b protection disabled;
P = PPPOE; R = Remote AP; X = Maintenance Mode;
1 = 802.1x authenticated AP; F = AP failed 802.1x authentication; 2 = Using IKE version 2;

Channel followed by "*" indicates channel selected due to unsupported configured channel.
"Spectrum" followed by "^" indicates Local Spectrum Override in effect.

Num APs:6

```
(Aruba3600_Milano) #
```



Verify All Known SSIDs are Broadcasting

```
(Aruba3600_Milano) #show ap bss-table
```

```
fm (forward mode): T-Tunnel, S-Split, D-Decrypt Tunnel, B-Bridge (s-standard, p-persistent, b-backup, a-always)
```

```
Aruba AP BSS Table
```

| bss | ess | s/p | ip | phy | type | ch/EIRP/max-EIRP | cur-cl | ap name | in-t(s) | tot-t | mtu | acl-state | acl | fm |
|-------------------|------------------|-----|------------|------|----------|------------------|--------|---------|---------|---------------|------|-----------|-----|----|
| d8:c7:c8:88:d1:e0 | Italia_CorpNet | 1/3 | 10.8.7.115 | g-HT | ap | 11/15/20 | 0 | AP135-4 | 0 | 31m:43s | 1500 | - | 52 | T |
| d8:c7:c8:88:d1:e1 | Italia_CorpGuest | 1/3 | 10.8.7.115 | g-HT | ap | 11/15/20 | 0 | AP135-4 | 0 | 8s | 1500 | - | 56 | T |
| d8:c7:c8:80:1d:f0 | | 1/3 | 10.8.7.70 | a-HT | Spectrum | ??/? | 0 | AP135-1 | 0 | 1d:6h:36m:35s | 1500 | - | 1 | Bs |
| d8:c7:c8:87:ee:10 | Italia_CorpNet | 1/3 | 10.8.7.73 | a-HT | ap | 149+/20.5/20.5 | 0 | AP135-6 | 0 | 32m:17s | 1500 | - | 52 | T |
| d8:c7:c8:80:1d:e0 | | 1/3 | 10.8.7.70 | g-HT | Spectrum | ??/? | 0 | AP135-1 | 0 | 1d:6h:36m:35s | 1500 | - | 1 | Bs |
| d8:c7:c8:87:d8:b0 | Italia_CorpNet | 1/3 | 10.8.7.59 | a-HT | ap | 153-/18/20.5 | 0 | AP135-5 | 0 | 32m:17s | 1500 | - | 52 | T |
| d8:c7:c8:87:ef:10 | Italia_CorpNet | 1/3 | 10.8.7.67 | a-HT | ap | 153-/20.5/20.5 | 0 | AP135-3 | 0 | 32m:14s | 1500 | - | 52 | T |
| d8:c7:c8:8b:93:90 | Italia_CorpNet | 1/3 | 10.8.7.106 | a-HT | ap | 40-/16/16 | 0 | AP135-2 | 0 | 31m:48s | 1500 | - | 52 | T |
| d8:c7:c8:87:ee:00 | Italia_CorpNet | 1/3 | 10.8.7.73 | g-HT | ap | 1/15/20 | 0 | AP135-6 | 0 | 32m:17s | 1500 | - | 52 | T |
| d8:c7:c8:87:ee:01 | Italia_CorpGuest | 1/3 | 10.8.7.73 | g-HT | ap | 1/15/20 | 0 | AP135-6 | 0 | 8s | 1500 | - | 56 | T |
| d8:c7:c8:88:d1:f0 | Italia_CorpNet | 1/3 | 10.8.7.115 | a-HT | ap | 40-/16/16 | 0 | AP135-4 | 0 | 31m:43s | 1500 | - | 52 | T |
| d8:c7:c8:87:d8:a0 | Italia_CorpNet | 1/3 | 10.8.7.59 | g-HT | ap | 1/12/20 | 0 | AP135-5 | 0 | 32m:17s | 1500 | - | 52 | T |
| d8:c7:c8:87:d8:a1 | Italia_CorpGuest | 1/3 | 10.8.7.59 | g-HT | ap | 1/12/20 | 0 | AP135-5 | 0 | 8s | 1500 | - | 56 | T |
| d8:c7:c8:87:ef:00 | Italia_CorpNet | 1/3 | 10.8.7.67 | g-HT | ap | 11/9/20 | 0 | AP135-3 | 0 | 32m:14s | 1500 | - | 52 | T |
| d8:c7:c8:87:ef:01 | Italia_CorpGuest | 1/3 | 10.8.7.67 | g-HT | ap | 11/9/20 | 0 | AP135-3 | 0 | 8s | 1500 | - | 56 | T |
| d8:c7:c8:8b:93:80 | Italia_CorpNet | 1/3 | 10.8.7.106 | g-HT | ap | 11/9/20 | 0 | AP135-2 | 0 | 31m:48s | 1500 | - | 52 | T |
| d8:c7:c8:8b:93:81 | Italia_CorpGuest | 1/3 | 10.8.7.106 | g-HT | ap | 11/9/20 | 0 | AP135-2 | 0 | 7s | 1500 | - | 56 | T |

```
Channel followed by "*" indicates channel selected due to unsupported configured channel.
```

```
"Spectrum" followed by "^" indicates Local Spectrum Override in effect.
```

```
Num APs:17
```

```
Num Associations:0
```

```
(Aruba3600_Milano) #
```



Check Device's 802.11 status

```
(ethersphere-lms3) #show ap association client-mac 00:26:bb:1c:0c:db
```

```
Flags: W: WMM client, A: Active, K: 802.11K client, B: Band Steerable
```

```
PHY Details: HT: High throughput; 20: 20MHz; 40: 40MHz  
<n>ss: <n> spatial streams
```

Association Table

| Name | ssid | mac | auth | assoc | aid | l-int | ssid | vlan-id | tunnel-id | phy | assoc. time | num assoc | Flags |
|-----------|-------------------|-------------------|------|-------|-----|-------|------------------|---------|-----------|----------------|-------------|-----------|-------|
| 1341-AP09 | d8:c7:c8:89:72:92 | 00:26:bb:1c:0c:db | y | y | 15 | 10 | ethersphere-wpa2 | 651 | 0x1195 | a-HT-20sg1-2ss | 11h:34m:0s | 1 | WAB |

00:26:bb:1c:0c:db-d8:c7:c8:89:72:92 Stats

| Parameter | Value |
|-------------------------------------|-----------|
| Channel | 161 |
| Channel Frame Retry Rate(%) | 0 |
| Channel Frame Low Speed Rate(%) | 0 |
| Channel Frame Non Unicast Rate(%) | 0 |
| Channel Frame Fragmentation Rate(%) | 0 |
| Channel Frame Error Rate(%) | 11 |
| Channel Bandwidth Rate(kbps) | 0 |
| Channel Noise | 92 |
| Client Frame Retry Rate(%) | 0 |
| Client Frame Low Speed Rate(%) | 0 |
| Client Frame Non Unicast Rate(%) | 0 |
| Client Frame Fragmentation Rate(%) | 0 |
| Client Frame Receive Error Rate(%) | 0 |
| Client Bandwidth Rate(kbps) | 0 |
| Client Tx Packets | 285366 |
| Client Rx Packets | 165644 |
| Client Tx Bytes | 23194081 |
| Client Rx Bytes | 232608911 |
| Client SNR | 18 |

```
(ethersphere-lms3) #
```


View Device's 802.11 Performance

- show ap debug client-table ap-name <ap name>

```
(ethersphere-lms3) #show ap debug client-table ap-name 1341-AP09
```

Client Table

| MAC | ESSID | BSSID | HT_State | PS_State | Tx_Pkts | Rx_Pkts | PS_Qlen | Tx_Retries | Tx_Rate | Rx_Rate | Last_ACK_SNR | Last_Rx_SNR |
|-------------------|-------------------|-------------------|----------|------------|---------|---------|---------|------------|---------|---------|--------------|-------------|
| 00:26:bb:1c:0c:db | ethersphere-wpa2 | d8:c7:c8:89:72:92 | WSSM | Power-save | 165593 | 323235 | 0 | 3330 | 130 | 117 | 35 | 25 |
| e0:f8:47:0e:6b:64 | ethersphere-wpa2 | d8:c7:c8:89:72:92 | AwSSMBB | Awake | 4 | 163017 | 0 | 0 | 130 | 216 | 36 | 36 |
| ec:55:f9:c7:2a:9b | ethersphere-cpass | d8:c7:c8:89:72:83 | WSSM | Power-save | 6 | 145 | 0 | 3 | 43 | 1 | 41 | 38 |

UAPSD:(VO,VI,BK,BE,Max SP,Q Len)

HT Flags: A - LDPC Coding; W - 40Mhz; S - Short GI HT40; s - Short GI HT20

D - Delayed BA; G - Greenfield; R - Dynamic SM PS

Q - Static SM PS; N - A-MPDU disabled; B - TX STBC

b - RX STBC; M - Max A-MSDU; I - HT40 Intolerant

```
(ethersphere-lms3) #
```

View Device's 802.11 Performance

```
(ethersphere-lms3) #show ap ht-rates bssid d8:c7:c8:89:72:92
```

```
AP "1341-AP09" Radio 0 BSSID d8:c7:c8:89:72:92 High-throughput Rates (Mbps)
```

| MCS | Streams | 20 MHz | 20 MHz SGI | [40 MHz] | [40 MHz SGI] |
|-----|---------|--------|------------|----------|--------------|
| 0 | 1 | 6.5 | 7.2 | [13.5] | [15.0] |
| 1 | 1 | 13.0 | 14.4 | [27.0] | [30.0] |
| 2 | 1 | 19.5 | 21.7 | [40.5] | [45.0] |
| 3 | 1 | 26.0 | 28.9 | [54.0] | [60.0] |
| 4 | 1 | 39.0 | 43.3 | [81.0] | [90.0] |
| 5 | 1 | 52.0 | 57.8 | [108.0] | [120.0] |
| 6 | 1 | 58.5 | 65.0 | [121.5] | [135.0] |
| 7 | 1 | 65.0 | 72.2 | [135.0] | [150.0] |
| 8 | 2 | 13.0 | 14.4 | [27.0] | [30.0] |
| 9 | 2 | 26.0 | 28.9 | [54.0] | [60.0] |
| 10 | 2 | 39.0 | 43.3 | [81.0] | [90.0] |
| 11 | 2 | 52.0 | 57.8 | [108.0] | [120.0] |
| 12 | 2 | 78.0 | 86.7 | [162.0] | [180.0] |
| 13 | 2 | 104.0 | 115.6 | [216.0] | [240.0] |
| 14 | 2 | 117.0 | 130.0 | [243.0] | [270.0] |
| 15 | 2 | 130.0 | 144.4 | [270.0] | [300.0] |
| 16 | 3 | 19.5 | 21.7 | [40.5] | [45.0] |
| 17 | 3 | 39.0 | 43.3 | [81.0] | [90.0] |
| 18 | 3 | 58.5 | 65.0 | [121.5] | [135.0] |
| 19 | 3 | 78.0 | 86.7 | [162.0] | [180.0] |
| 20 | 3 | 117.0 | 130.0 | [243.0] | [270.0] |
| 21 | 3 | 156.0 | 173.3 | [324.0] | [360.0] |
| 22 | 3 | 175.5 | 195.0 | [364.5] | [405.0] |
| 23 | 3 | 195.0 | 216.7 | [405.0] | [450.0] |

```
Range for 20 MHz: 6.5 - 216.7 Mbps
```

```
Items enclosed in [ ] are disabled.
```

```
(ethersphere-lms3) #
```

Check 802.11 and non-802.11 Interference

```
(ethersphere-lms3) #show ap arm rf-summary ap-name 1341-AP09
```

Channel Summary

| channel | retry | phy-err | mac-err | noise | cov-idx | intf_idx |
|---------|-------|---------|---------|-------|---------|-------------|
| 161 | 0 | 0 | 16 | 93 | 16/0 | 65/78//0/1 |
| 1 | 16 | 0 | 0 | 94 | 53/1 | 422/0//18/0 |
| 48 | 0 | 0 | 0 | 92 | 0/0 | 0/9//0/0 |
| 165 | 0 | 0 | 0 | 99 | 21/0 | 129/20//0/0 |
| 5 | 0 | 0 | 0 | 90 | 0/0 | 0/142//0/5 |
| 7 | 0 | 0 | 0 | 91 | 0/0 | 0/23//0/1 |
| 11 | 0 | 0 | 0 | 89 | 8/0 | 66/0//3/0 |
| 149 | 0 | 0 | 0 | 87 | 9/0 | 165/29//1/0 |
| 36 | 0 | 0 | 0 | 92 | 8/0 | 42/0//0/0 |
| 153 | 0 | 0 | 0 | 89 | 11/0 | 86/90//0/1 |
| 40 | 0 | 0 | 0 | 91 | 0/0 | 0/14//0/0 |
| 157 | 0 | 0 | 0 | 90 | 17/0 | 104/51//2/0 |
| 44 | 0 | 0 | 0 | 92 | 0/0 | 0/0//0/0 |

HT Channel Summary

| channel_pair | Pairwise_intf_index |
|--------------|---------------------|
| 1-5 | 587 |
| 7-11 | 93 |
| 149-153 | 372 |
| 36-40 | 56 |
| 157-161 | 301 |
| 44-48 | 9 |

```
Interface Name      :wifi0
Current ARM Assignment :161/15
Covered channels a/g :5/0
Free channels a/g    :0/0
ARM Edge State       :enable
Last check channel/pwr :7h:5m:1s/27s
Last change channel/pwr :7h:5m:1s/7h:5m:1s
Next Check channel/pwr :0s/6m:53s
```

```
Interface Name      :wifi1
Current ARM Assignment :1/9
Covered channels a/g :0/1
Free channels a/g    :0/0
```

Advanced RF Troubleshooting

- **General AP/Client**

- show ap active [ap-name] <AP name>
- show ap bss-table [ap-name] <AP name>
- show ap association [ap-name] <AP name>
- show ap association client-mac <client MAC>
- show ap debug client-table ap-name <AP name>
- show ap debug client-table ap-name <AP name> | include <client MAC>
- show ap debug client-stats <client MAC> advanced
- show ap remote debug mgmt-frames client-mac <client MAC>
- show ap remote debug mgmt-frames ap-name <AP name>

Advanced RF Troubleshooting Cont.

- **ARM**

- show ap monitor ap-list ap-name <AP name>
- show ap arm rf-summary ap-name <AP name>
- show ap arm history ap-name <AP name>
- show ap arm scan-times ap-name <AP name>
- show ap arm state ap-name <AP name>

- **RF**

- show ap debug radio-stats ap-name <AP name> radio [0 or 1] advanced

Advanced RF Troubleshooting Cont.

- **User**

- show user [IP address or client MAC]
- show user-table verbose
- show auth-tracebuf [client MAC or count]
- show datapath session table <user IP address>

- **System**

- show ap debug system-status ap-name <AP name>
- show ap tech-support ap-name <AP name>
- show ap spectrum tech-support ap-name <AP name>
- show tech-support
- tar logs tech-support

What To Do Before You Call TAC? (to help resolve problems faster)



What to do before you call TAC?

- **Provide the Aruba WLAN Controller logs and output of show tech-support**
 - CLI Example:
 - tar logs tech-support
 - copy flash: logs.tar tftp:<tftp server IP address> <file name>
- **If this information is not available, then at a minimum, please provide:**
 - ArubaOS Version (including build number)
 - Controller Model
 - Client Type
 - Radio band and Channel width
 - ESSID Opmode
- **Provide the Syslog Server file of the Aruba WLAN Controller at the time of the problem.**
 - If no Syslog Server is available to capture log output from the Aruba WLAN Controller then please set one up as soon as possible since it is a highly suggested troubleshooting and monitoring best practice.



What to do before you call TAC? (cont'd)

- **State if this is a new or existing installation.**
 - This will help the support team to take different troubleshooting approaches depending on whether the customer has:
 - An outage in the network that worked in the past
 - A network configuration that has never worked
 - A brand new install
- **State if anything has recently changed in the network (external to Aruba) or if anything has recently changed in the Aruba WLAN Controller or AP configuration.**
- **If there was a configuration change then please list the exact configuration steps and commands used.**
- **State the date and time (if possible) when the problem first occurred**
- **Is the problem reproducible?**
 - If the problem is reproducible, please list the exact steps taken to recreate the problem



#airheadsconf



What to do before you call TAC? (cont'd)

- **Provide the wireless device's make, model number, and its OS version including any service packs or patches,**
- **Provide the Wireless LAN Card's make, model number, driver date, driver version, and configuration on the wireless device.**
- **Highly Useful Information:**
 - (Information below should be provided as an addition to the previous slides that contain critical Information needed)
 - Provide a detailed network topology (including all the devices in the network between the user and the Aruba WLAN Controller with IP addresses and Interface numbers if possible)
 - The diagram can be in format of Visio, PowerPoint, JPEG, TIF, etc. or it can even be hand written and then faxed to support "1-408-227-4550"
 - Provide any wired or wireless sniffer traces taken during the time of the problem.



► #airheadsconf



What to do before you call TAC? (cont'd)

- **Get the following log output during the problem IF Syslog server output can't be provided**
 - show log errorlog all
 - show log network all | include '<wireless device's mac address>'
 - show log security all | include '<wireless device's mac address>'
 - show log system all
 - show log user-debug all | include '<wireless device's mac address>'
 - show log user all | include '<wireless device's mac address>'
 - show log wireless all



What to do before you call TAC? (cont'd)

- **Provide customer site access information to the Aruba WLAN Controller if possible.**
 - This is another highly suggested troubleshooting best practice that should be implemented.
 - The customer site access should only be enabled when a problem occurs (or if Aruba support is monitoring the device).
 - The most common access given by customers is through Adobe Acrobat Connect or WebEx.
 - Otherwise customers will provide a VPN (PPTP, L2TP, SSL) connection that limits the support person to only have IP access to the Aruba WLAN Controller, AP, and AWMS.
 - Analog dialup or SSH access to the Aruba Controller are other access methods that the support person can use to reach the Aruba WLAN Controller too.





Coming Up:
Break
Deploying BYOD
Designing Outdoor Mesh Networks

▶ community.arubanetworks.com

▶ [#airheadsconf](https://twitter.com/airheadsconf)

Backup Slides

Remote Packet Capture with Aruba AP



Remote Packet Capture with Aruba AP

- Using any Aruba AP (AP or AM, CAP or RAP) to perform remote packet capture
- Wireshark 1.6 (or above) running on any computer
- **IP connectivity** between AP/AM and capturing computer

Setting Up Remote Packet Capture

Controller > Air Monitors

| Local Air Monitors | | | | | | | Search |
|-----------------------|-----------|------------|----------------|-----------|---------|--------------|------------------|
| | AM Name ▲ | AP Group ▲ | AM IP ▲ | AP Type ▲ | IPSEC ▲ | Uptime ▲ | |
| <input type="radio"/> | ap105-35 | am | 172.18.163.144 | 105 | Enable | 3d:0h:3m:44s | |
| 1 1-1 of 1 | | | | | | | 10 ▾ |
| Overview | | | | | | | Packet Capture |
| | | | | | | | Launch AirMagnet |

Monitoring > Air Monitor: 172.18.163.144 > Packet Capture


◀ Back

Search Result


| <input type="checkbox"/> | ID | Type | Radio | Channel | Packets | Status | Target | Filter |
|--------------------------|----|------|-------|---------|---------|--------|--------|--------|
|--------------------------|----|------|-------|---------|---------|--------|--------|--------|

None found.

Refresh Stop Delete Pause Resume New

New Raw Packet Capture  [Launch WildPackets](#)

Raw Packet Capture

☒  WildPackets ☐  Ethereal | Target IP: 172.18.164.171 | Port: 5000 | Channel: 6 ▾ | 802.11g ▾

Start Cancel

To send packets to WildPackets, you need to use Air Monitor IP Address 172.18.163.144.



Setting Up Remote Packet Capture

Monitoring > Air Monitor: 172.18.163.144 > Packet Capture

Search Result

| <input type="checkbox"/> | ID | Type | Radio | Channel | Packets | Status | Target | Filter |
|--------------------------|----|------|------------------|---------|---------|-------------|---------------------|--------|
| <input type="checkbox"/> | 1 | RAW | 80211b/g-HT-40 6 | | | in-progress | 172.18.164.171/5000 | |

Refresh

Stop

Delete

Pause

Resume

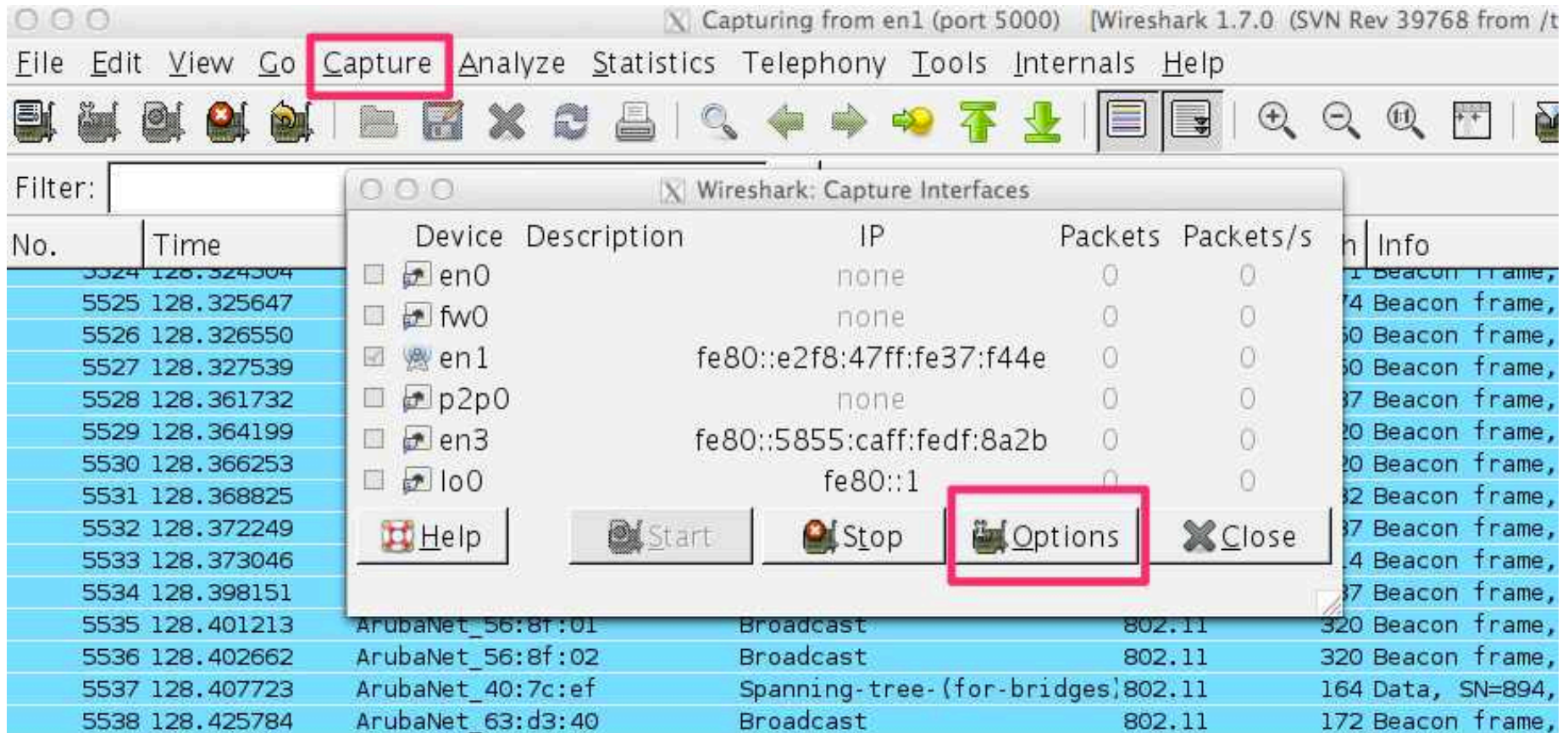
New

New Raw Packet Capture

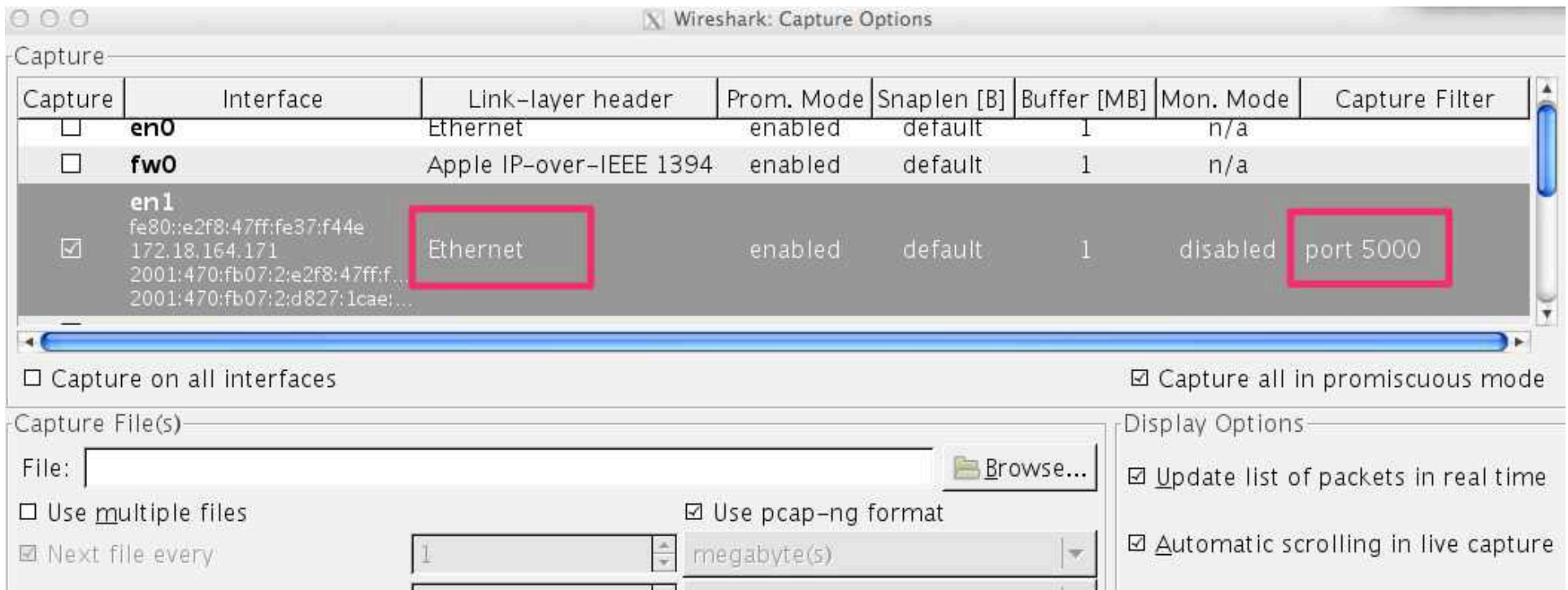


[Launch WildPackets](#)

Set-up computer as receiver

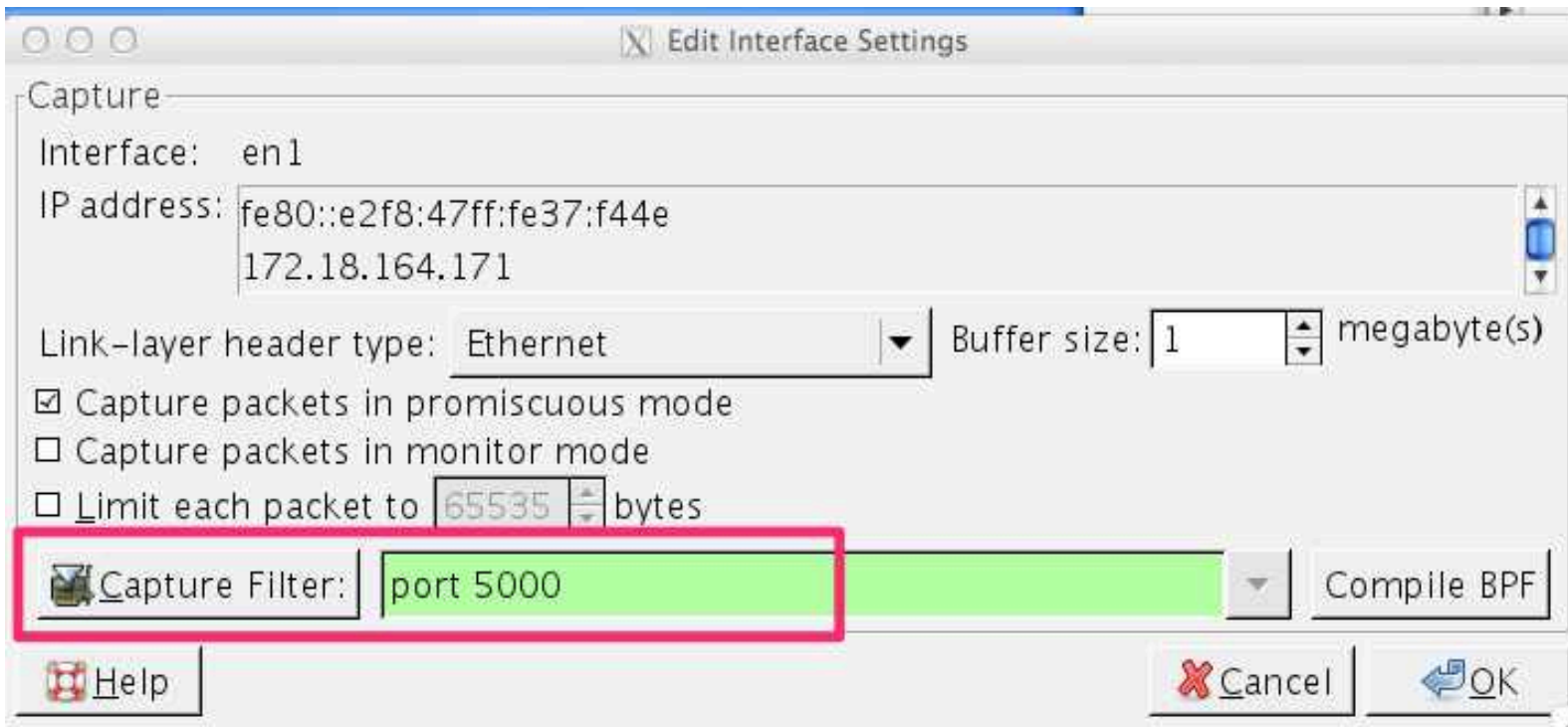


Set-up computer as receiver



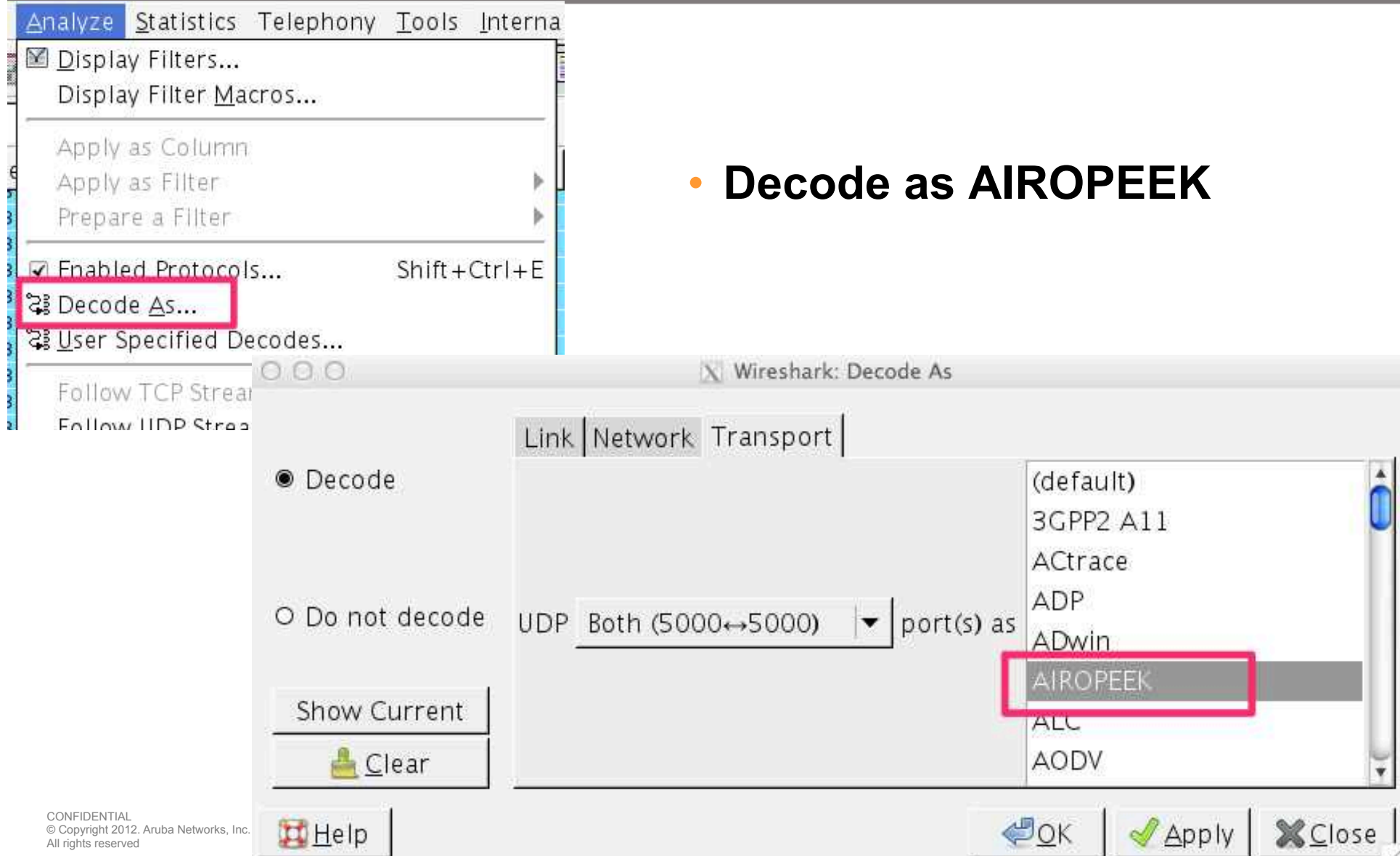
Set-up computer as receiver

- **Filter on traffic on port 5000**



Set-up computer as receiver

- Decode as AIROPEEK



Packet Capture

Wireshark 1.7.0 (SVN Rev 39768 from /trunk)

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: Expression... Clear Apply Save

| No. | Time | Source | Destination | Protocol | Length | Info |
|------|------------|-------------------|-----------------------------|----------|--------|---|
| 5519 | 128.313209 | ArubaNet_63:d3:43 | IntelCor_98:6a:b0 | 802.11 | 144 | Probe Response, SN=886, FN=0, Flags=.....C, BI=100, SSID=K- |
| 5520 | 128.313966 | ArubaNet_63:d3:44 | IntelCor_98:6a:b0 | 802.11 | 144 | Probe Response, SN=887, FN=0, Flags=.....C, BI=100, SSID=K- |
| 5521 | 128.319645 | ArubaNet_56:8f:01 | IntelCor_98:6a:b0 | 802.11 | 314 | Probe Response, SN=3624, FN=0, Flags=.....C, BI=100, SSID=e |
| 5522 | 128.322260 | ArubaNet_56:8f:02 | IntelCor_98:6a:b0 | 802.11 | 314 | Probe Response, SN=3597, FN=0, Flags=.....C, BI=100, SSID=e |
| 5523 | 128.323715 | ArubaNet_63:d3:40 | Broadcast | 802.11 | 172 | Beacon frame, SN=888, FN=0, Flags=.....C, BI=100, SSID=brid |
| 5524 | 128.324504 | ArubaNet_63:d3:41 | Broadcast | 802.11 | 171 | Beacon frame, SN=889, FN=0, Flags=.....C, BI=100, SSID=spli |
| 5525 | 128.325647 | ArubaNet_63:d3:42 | Broadcast | 802.11 | 174 | Beacon frame, SN=890, FN=0, Flags=.....C, BI=100, SSID=MTK- |
| 5526 | 128.326550 | ArubaNet_63:d3:43 | Broadcast | 802.11 | 150 | Beacon frame, SN=891, FN=0, Flags=.....C, BI=100, SSID=K-12 |
| 5527 | 128.327539 | ArubaNet_63:d3:44 | Broadcast | 802.11 | 150 | Beacon frame, SN=892, FN=0, Flags=.....C, BI=100, SSID=K-12 |
| 5528 | 128.361732 | ArubaNet_80:3b:a0 | Broadcast | 802.11 | 287 | Beacon frame, SN=2782, FN=0, Flags=.....C, BI=100, SSID=gue |
| 5529 | 128.364199 | ArubaNet_80:3b:a1 | Broadcast | 802.11 | 320 | Beacon frame, SN=2781, FN=0, Flags=.....C, BI=100, SSID=eth |
| 5530 | 128.366253 | ArubaNet_80:3b:a2 | Broadcast | 802.11 | 320 | Beacon frame, SN=2781, FN=0, Flags=.....C, BI=100, SSID=eth |
| 5531 | 128.368825 | ArubaNet_36:2b:e2 | Broadcast | 802.11 | 332 | Beacon frame, SN=3842, FN=0, Flags=.....C, BI=100, SSID=ins |
| 5532 | 128.372249 | ArubaNet_36:2b:e3 | Broadcast | 802.11 | 337 | Beacon frame, SN=3837, FN=0, Flags=.....C, BI=100, SSID=ins |
| 5533 | 128.373046 | ArubaNet_36:2b:e4 | Broadcast | 802.11 | 314 | Beacon frame, SN=3834, FN=0, Flags=.....C, BI=100, SSID=ins |
| 5534 | 128.398151 | ArubaNet_56:8f:00 | Broadcast | 802.11 | 287 | Beacon frame, SN=925, FN=0, Flags=.....C, BI=100, SSID=gues |
| 5535 | 128.401213 | ArubaNet_56:8f:01 | Broadcast | 802.11 | 320 | Beacon frame, SN=924, FN=0, Flags=.....C, BI=100, SSID=ethe |
| 5536 | 128.402662 | ArubaNet_56:8f:02 | Broadcast | 802.11 | 320 | Beacon frame, SN=924, FN=0, Flags=.....C, BI=100, SSID=ethe |
| 5537 | 128.407723 | ArubaNet_40:7c:ef | Spanning-tree-(for-bridges) | 802.11 | 164 | Data, SN=894, FN=0, Flags=p....F.C |
| 5538 | 128.425784 | ArubaNet_63:d3:40 | Broadcast | 802.11 | 172 | Beacon frame, SN=895, FN=0, Flags=.....C, BI=100, SSID=brid |
| 5539 | 128.426580 | ArubaNet_63:d3:41 | Broadcast | 802.11 | 171 | Beacon frame, SN=896, FN=0, Flags=.....C, BI=100, SSID=spli |

Frame 1: 76 bytes on wire (608 bits), 76 bytes captured (608 bits)

- Ethernet II, Src: ArubaNet_c0:6d:b6 (d8:c7:c8:c0:6d:b6), Dst: Apple_37:f4:4e (e0:f8:47:37:f4:4e)
- Internet Protocol Version 4, Src: 172.18.164.103 (172.18.164.103), Dst: 172.18.164.171 (172.18.164.171)
- User Datagram Protocol, Src Port: complex-main (5000), Dst Port: complex-main (5000)
- Airopeek encapsulated IEEE 802.11
- IEEE 802.11 Clear-to-send, Flags:C

Packet (beacon)

File Edit View Go Capture Analyze Statistics Telephony Tools Internals Help

Filter: Expression... Clear Apply Save

| No. | Time | Source | Destination | Protocol | Length | Info |
|------|------------|-------------------|-------------|----------|--------|---|
| 5524 | 128.324504 | ArubaNet_63:d3:41 | Broadcast | 802.11 | 171 | Beacon frame, SN=889, FN=0, Flags=.....C, BI=100, SSID=spli |
| 5525 | 128.325647 | ArubaNet_63:d3:42 | Broadcast | 802.11 | 174 | Beacon frame, SN=890, FN=0, Flags=.....C, BI=100, SSID=MTK- |
| 5526 | 128.326550 | ArubaNet_63:d3:43 | Broadcast | 802.11 | 150 | Beacon frame, SN=891, FN=0, Flags=.....C, BI=100, SSID=K-12 |
| 5527 | 128.327539 | ArubaNet_63:d3:44 | Broadcast | 802.11 | 150 | Beacon frame, SN=892, FN=0, Flags=.....C, BI=100, SSID=K-12 |
| 5528 | 128.361722 | ArubaNet_80:2b:20 | Broadcast | 802.11 | 287 | Beacon frame, SN=2782, FN=0, Flags=.....C, BI=100, SSID=Aruba |

Subtype: 0
Flags: 0x0
Duration: 0
Destination address: Broadcast (ff:ff:ff:ff:ff:ff)
Source address: ArubaNet_63:d3:42 (00:0b:86:63:d3:42)
BSS Id: ArubaNet_63:d3:42 (00:0b:86:63:d3:42)
Fragment number: 0
Sequence number: 890
Frame check sequence: 0x7fdb3303 [correct]

IEEE 802.11 wireless LAN management frame

- Fixed parameters (12 bytes)
 - Timestamp: 0x0000003c15338aa5
 - Beacon Interval: 0.102400 [Seconds]
 - Capabilities Information: 0x0431
- Tagged parameters (72 bytes)
 - Tag: SSID parameter set: MTK-test
 - Tag: Supported Rates 1(B), 2(B), 5.5, 11, 6, 9, 12, 18, [Mbit/sec]
 - Tag: DS Parameter set : Current Channel: 11
 - Tag: Traffic Indication Map (TIM): DTIM 0 of 0 bitmap
 - Tag: ERP Information
 - Tag: Extended Supported Rates 24, 36, 48, 54, [Mbit/sec]
 - Tag: RSN Information
 - Tag: Vendor Specific: AtherosC: Unknown

Starting PCAP from CLI

- **Example**

1. The AP-105 has an IP address of 172.18.163.144
2. There is a laptop with IP address 172.18.164.171 and has Wireshark 1.7.0 and listening on port 5000
3. The syntax specifies 1 for the last value because it is telling the AP to send the frames in AIROPEEK pcap format.

```
(Aruba3600) #pcap raw-start 172.18.164.144 172.18.164.171 5000 1  
pcap-id:1
```



Useful Wireshark Display Filters

- **Show only 802.11 traffic**
 - wlan
- **Show 802.11 traffic to/from a client**
 - wlan.addr==<mac address>
- **Hide (or show) beacon frames**
 - wlan.fc.type_subtype != 0x08 / wlan.fc.type_subtype == 0x08
- **Show management frames for a specific SSID**
 - wlan_mgt.ssid == "SSID_NAME"
- **Show everything except beacon and ACK frames**
 - (!wlan.fc.type_subtype == 0x08) && (!wlan.fc.type_subtype == 0x1d)