

# Inleiding Avans Hogeschool

Tilburg



Breda



's-Hertogenbosch



Avans scoort hoog op o.a.:

- Modern onderwijs
- Hoge kwaliteit opleidingen
- Goed studieklimaat
- Begeleiding
- Docenten

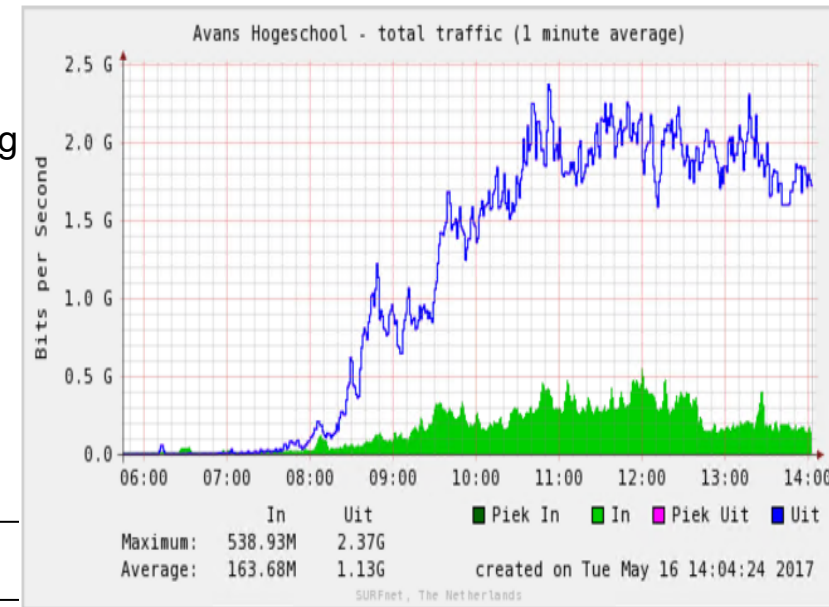


## Kengetallen

- 29000 studenten
- 2800 medewerkers
- 54 opleidingen

## Kengetallen Wi-Fi

- 16000 devices simultaan
- 30000 unieke devices per dag
- 1000 AP's
- 3 controller clusters



# Selectie nieuwe Wireless oplossing

Trapeze / Juniper WLAN niet langer doorontwikkeld

Proprietary and Confidential

June 23, 2014

Kees Pronk  
Avans Hogeschool  
Hogeschoollaan 1  
4818 CR Breda  
The Netherlands

Dear Kees Pronk:

Please be advised that Juniper will continue to embrace the WLA, WLC, Ringmaster and Smartpass products on our price list through the 31st of December 2015 at a minimum, and Juniper will continue to support and maintain these products, including bug fixes and maintenance releases, in accordance with our standard support policies considering the notes below:



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# Selectie nieuwe Wireless oplossing

POC met 2 overgebleven vendors

**aruba**  
a Hewlett Packard  
Enterprise company



**CISCO**



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# Selectie nieuwe Wireless oplossing

## Overview



- Learning center Juniper APs (21) were replaced with Wi-Fi from Cisco and Aruba
- Tested over multiple weeks. Observed performance differences between networks and configurations.

- Juniper (-n, current network)

- WLA-532 APs
- SW version 8.0.3.17

```
set radio-profile avans_a
set radio-profile avans_a beacon-interval 300
set radio-profile avans_a rf-scanning mode passive
set radio-profile avans_a rf-scanning channel-scope operating
set radio-profile avans_a dfs-channels enable
set radio-profile avans_a 11n channel-width-na 20MHz
set radio-profile avans_a service-profile AvansWlan
set radio-profile avans_a service-profile Secure-802.1X
set radio-profile avans_a service-profile Avans802.1x
set radio-profile avans_a auto-tune channel-set band 11a channel 36,40,44,48,52,56,60,64,100,104,108,112,116,120,124,128,132,136,140
set radio-profile avans_a_HT
```

- Aruba (-ac)

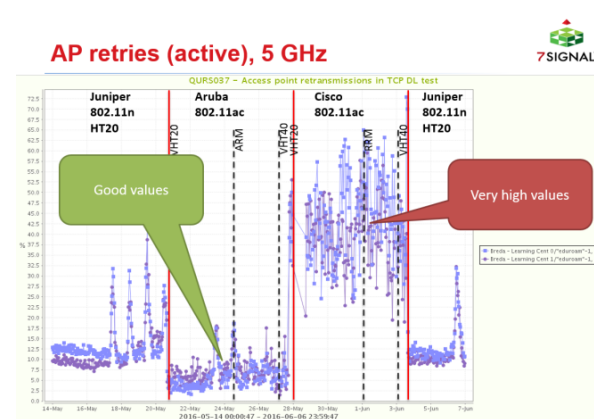
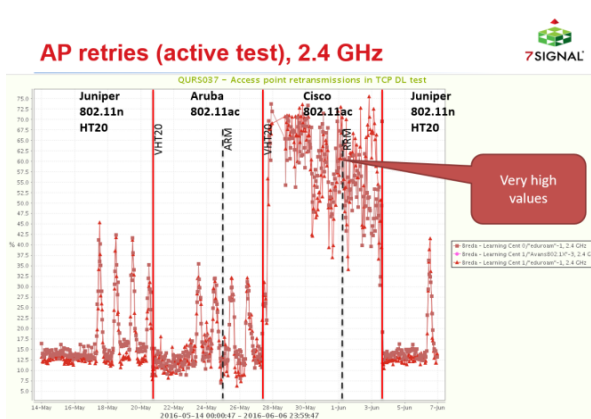
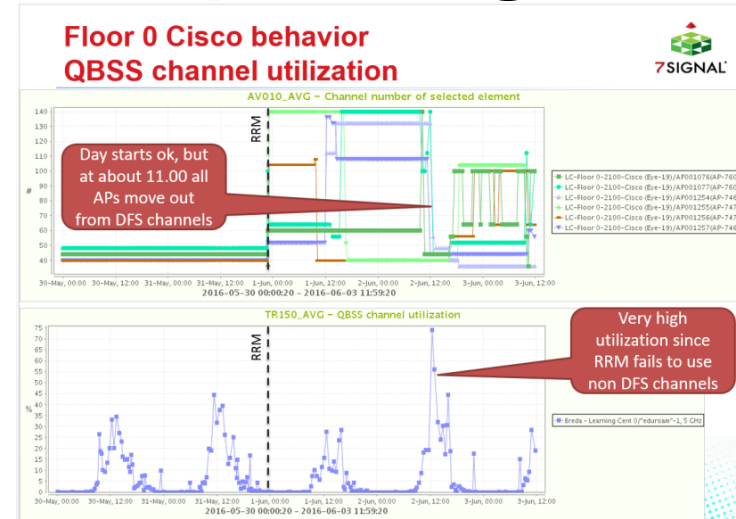
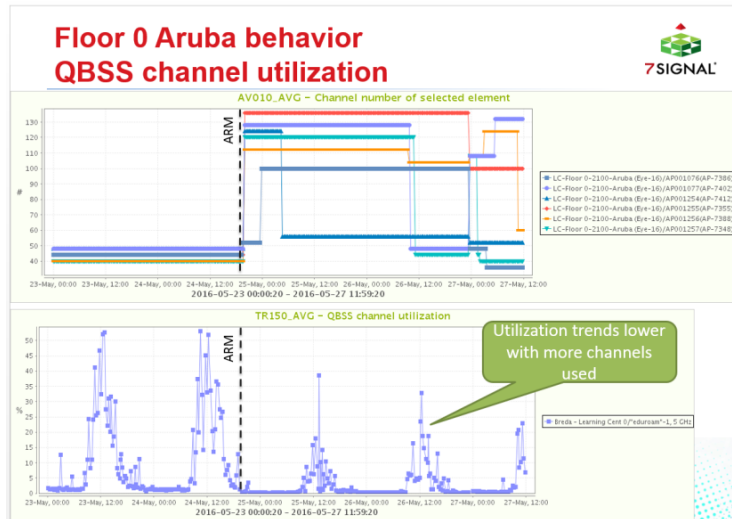
- Floor 0 had 7 model AP 215s because no 802.3at PoE is available
- Floor 1 and 2 (no Eyes in floor 2) run both 7 AP225s
- SW version 6.4.3.7

- Cisco (-ac)

- Floor 0 had 7 model AP 2700
- Floors 1 and 2 run both 7 AP 3700
- SW version 8.1.131.0



# Selectie nieuwe Wireless oplossing



# Design Avans Aruba WLAN

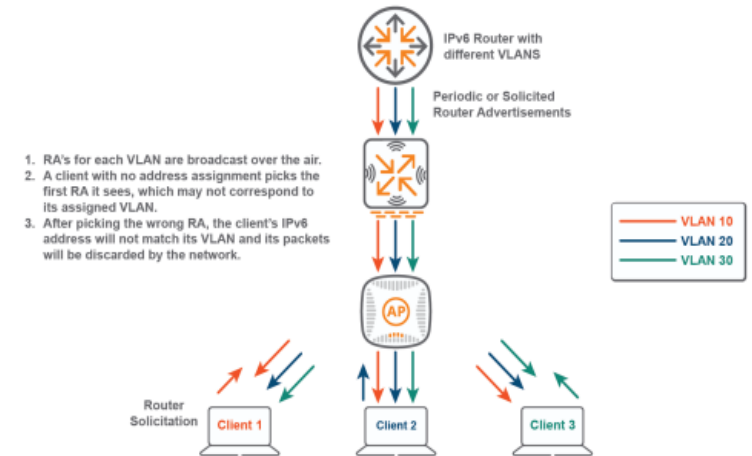
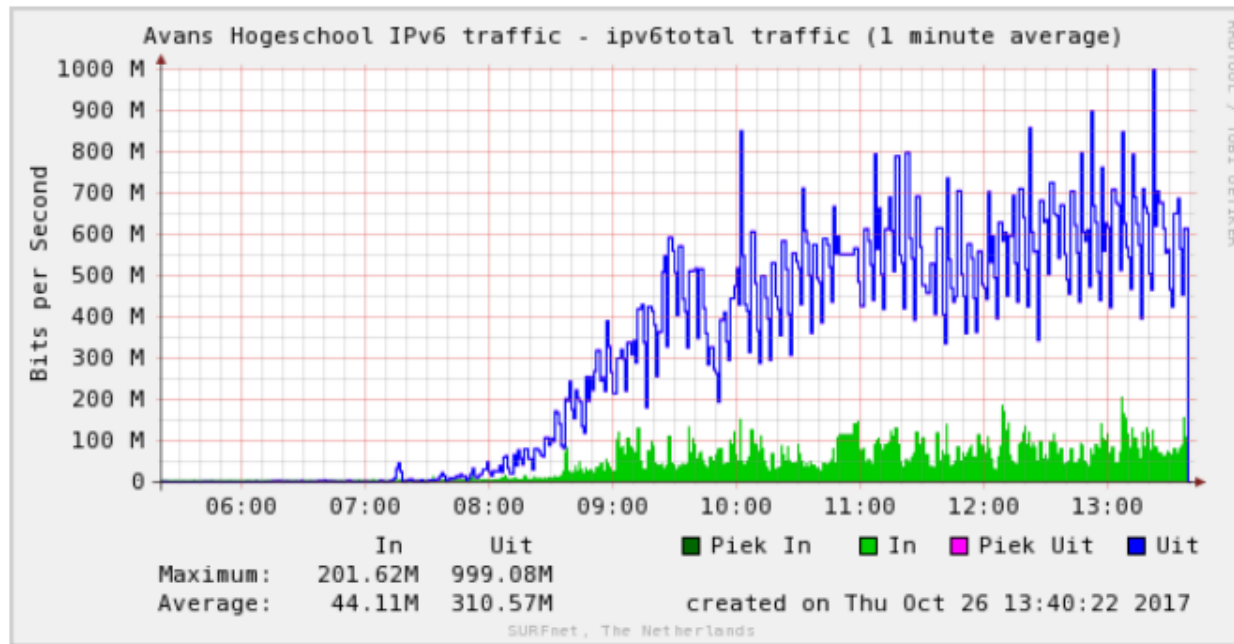
- Capaciteit
- 20 MHz
- Data rates 12(B),18,24(B),36,48,54
- Min 6 dB verschil tussen 2.4GHz en 5GHz
- Max 3 SSID's
- 4 kanalen plan voor 2.4GHz waar mogelijk
- ARM zoveel mogelijk gebruikt
- 802.11k Quiet IE (tip)

| Session Data by Connection Mode |          |           |              |
|---------------------------------|----------|-----------|--------------|
| CONNECTION MODE                 | SESSIONS | CLIENTS ▼ | % OF CLIENTS |
| 802.11ac                        | 62977    | 12617     | 44.98%       |
| 802.11n (2.4 GHz)               | 35914    | 11585     | 41.30%       |
| 802.11n (5 GHz)                 | 18670    | 3546      | 12.64%       |
| 802.11a                         | 221      | 213       | 0.76%        |
| 802.11g                         | 97       | 90        | 0.32%        |

| Client Session Summary            |            |
|-----------------------------------|------------|
| Sessions:                         | 117879     |
| Unique clients:                   | 19087      |
| Guest sessions:                   | 0          |
| Unique APs:                       | 933        |
| Avg session duration:             | 34 mins    |
| Total traffic (MB):               | 2893331.06 |
| Total traffic In (MB):            | 2329222.19 |
| Total traffic Out (MB):           | 564108.87  |
| Avg traffic per session (MB):     | 24.54      |
| Avg traffic in per session (MB):  | 19.76      |
| Avg traffic out per session (MB): | 4.79       |
| Avg traffic per client (MB):      | 151.59     |
| Avg traffic in per client (MB):   | 122.03     |
| Avg traffic out per client (MB):  | 29.55      |
| Avg bandwidth per client (Kbps):  | 89.26      |
| Avg signal quality:               | 34.68      |
| Avg signal (dBm):                 | -64.22     |

# Design Avans Aruba WLAN

Avans Hogeschool IPv6



## Single VLAN architecture for wireless LAN

<http://community.arubanetworks.com/t5/Validated-Reference-Design/Single-VLAN-Architecture-for-WLAN/ta-p/257196>

| results for <b>avans.nl</b> |                                                                                                            | ★★★★★                                                                                                                                                                                 |  |  |  |  |
|-----------------------------|------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
|                             | IPv4                                                                                                       | IPv6                                                                                                                                                                                  |  |  |  |  |
| DNS servers                 | 85.17.179.88<br>192.87.36.2<br>192.87.106.101<br>192.87.130.249<br>195.169.124.71<br>195.176.255.9         | 2001:610:0:800c:195:169:124:71<br>2001:610:1:800a:192:87:106:101<br>2001:610:3:200a:192:87:36:2<br>2001:610:1a0:1530:192:87:130:249<br>2001:620:0:9::1103<br>2001:1af8:4300:a004:c::1 |  |  |  |  |
| IPv6-only DNS               |                                                                                                            | Works                                                                                                                                                                                 |  |  |  |  |
| Mail exchangers             | 192.87.102.74<br>194.171.167.216<br>195.169.124.156<br>192.87.102.74<br>194.171.167.216<br>195.169.124.156 | 2001:610:0:800e:195:169:124:154<br>2001:610:1:40aa:194:171:167:216<br>2001:610:1:80ab:192:87:102:74<br>2001:610:1:40aa:194:171:167:216<br>2001:610:1:80ab:192:87:102:74               |  |  |  |  |
| avans.nl                    | 192.87.130.83                                                                                              | 2001:610:1a0:1530:192:87:130:83                                                                                                                                                       |  |  |  |  |
| www.avans.nl                | 192.87.130.83                                                                                              | 2001:610:1a0:1530:192:87:130:83                                                                                                                                                       |  |  |  |  |

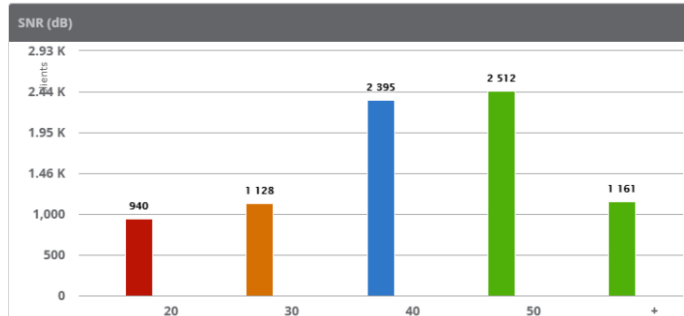
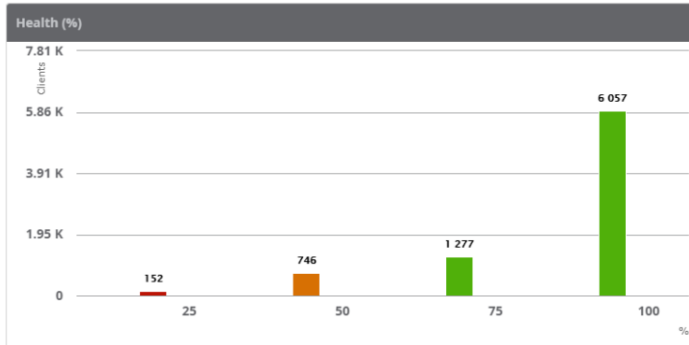
avans.nl is ready for IPv6.

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# Operations Avans Aruba WLAN

## Clients

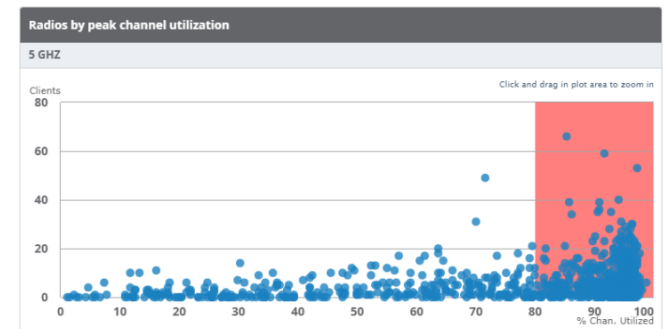
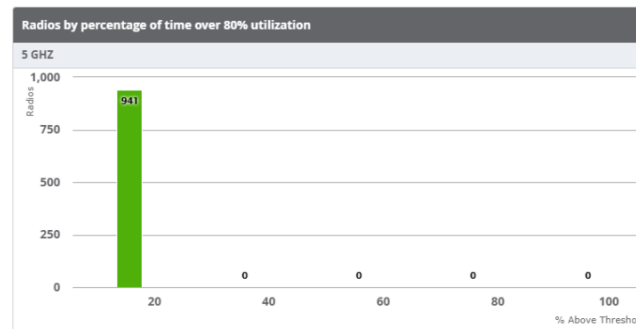
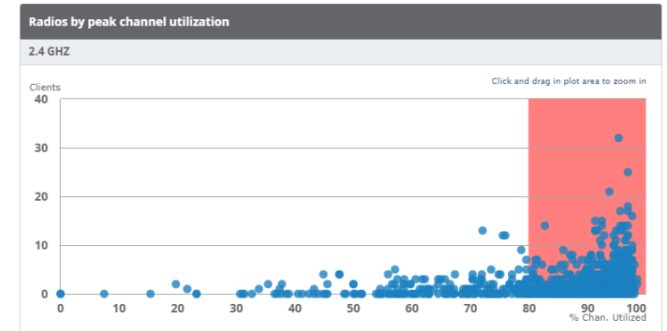
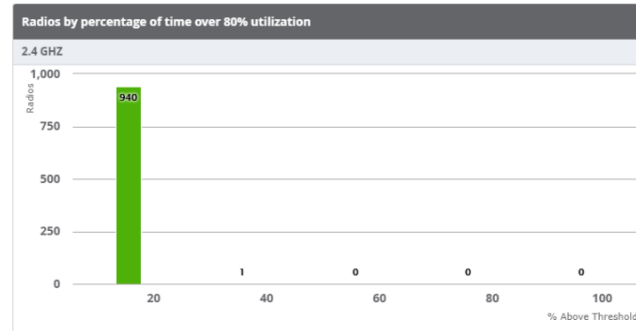
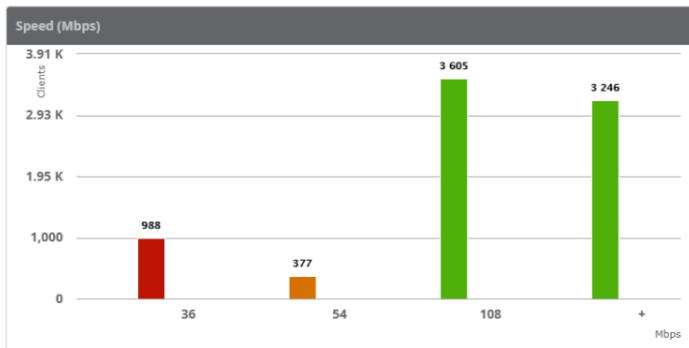
Folder ▾ Top ?



## Radios

( 10/19/2017 4:21 AM CEST to 10/26/2017 4:21 AM CEST )

Folder ▾ Top ?



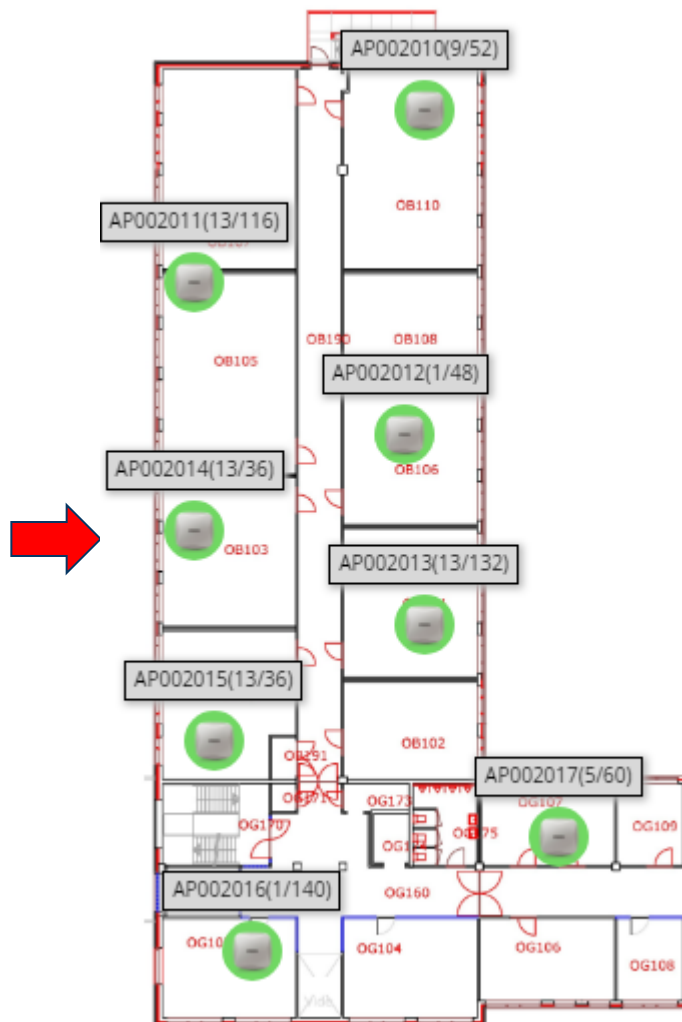
Fysieke server specs voor  
Airwave :-)

16 Cores, 128GB RAM, 600 GB  
SSD in RAID

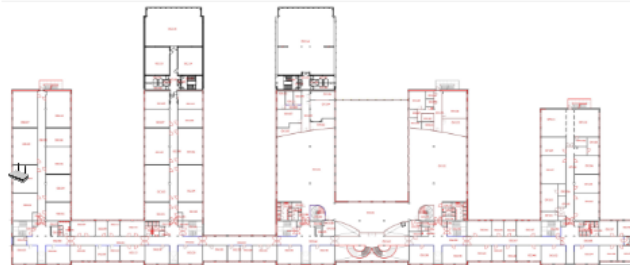
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# Operations Avans Aruba WLAN



LOCATION: AVANS > OWB215 > 1E ETAGE (FLOOR 3)



1-50 ▾ of 256 AP Neighbors Page 1 ▾ of 6 > > | Choose columns Export CSV

RF Neighbors

| AP/DEVICE           | 1ST RADIO CH. | 1ST RADIO SIGNAL ▾ | 2ND RADIO CH. | 2ND RADIO SIGNAL | RAPIDS CLASSIFICATION |
|---------------------|---------------|--------------------|---------------|------------------|-----------------------|
| Cisco-Link-DB:45:17 | 1             | 41                 | -             | -                | Suspected Rogue       |
| Locally Ad-37:C6:E8 | 11            | 40                 | -             | -                | Suspected Rogue       |
| AP002013            | 13            | 29                 | 132           | 29               | AMP AP                |
| AP002015            | 13            | 28                 | 36            | 34               | AMP AP                |
| AP002006            | 1             | 28                 | 52            | 26               | AMP AP                |
| zte corpor-80:91:72 | 8             | 26                 | -             | -                | Suspected Rogue       |
| AP002800            | 13            | 25                 | 108           | 20               | AMP AP                |
| AP002011            | 13            | 24                 | 116           | 25               | AMP AP                |
| Sitecom Eu-AA:DC:FC | 11            | 24                 | -             | -                | Suspected Rogue       |
| Sitecom Eu-AA:DC:FC | 11            | 23                 | -             | -                | Suspected Rogue       |
| Ruckus Wir-26:DA:98 | 11            | 22                 | 108           | 13               | Suspected Rogue       |
| Ruckus Wir-26:DA:98 | 11            | 22                 | 108           | 14               | Suspected Rogue       |
| Unknown-29:CC:64    | 6             | 20                 | -             | -                | Suspected Rogue       |
| Sitecom Eu-3B:8C:BD | 11            | 19                 | 36            | 9                | Suspected Rogue       |
| zte corpor-23:EF:F9 | 3             | 18                 | -             | -                | Suspected Rogue       |
| Routerboar-21:F8:C7 | 1             | 18                 | -             | -                | Suspected Rogue       |
| Maestronic-00:1F:79 | 1             | 18                 | -             | -                | Suspected Rogue       |
| Technicolo-48:BD:BE | 10            | 17                 | -             | -                | Suspected Neighbor    |

# Testing Avans Aruba WLAN

## Channel Changes: 2.4 GHz

155701

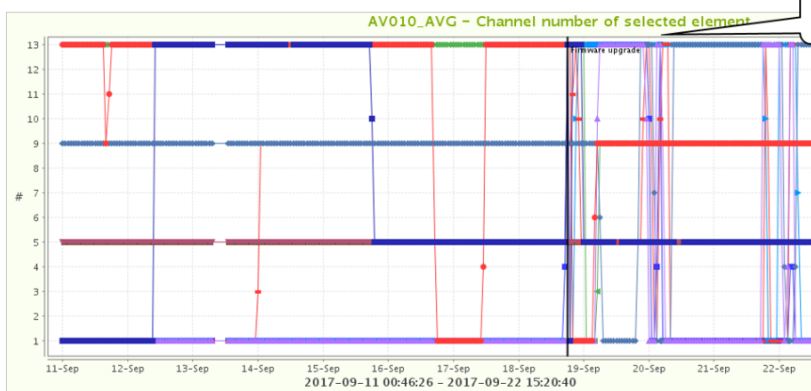
**Symptom:** False RADAR events detected on APs for Cascade radios. Improvements to the wireless drivers resolved the issue.  
**Scenario:** This issue occurred due to the inherent multipath effects of a reflective environment that created false signals which approximated to a RADAR signal. This issue was observed in 300 Series access points running ArubaOS 6.5.1.1 or later versions.

AP-Wireless

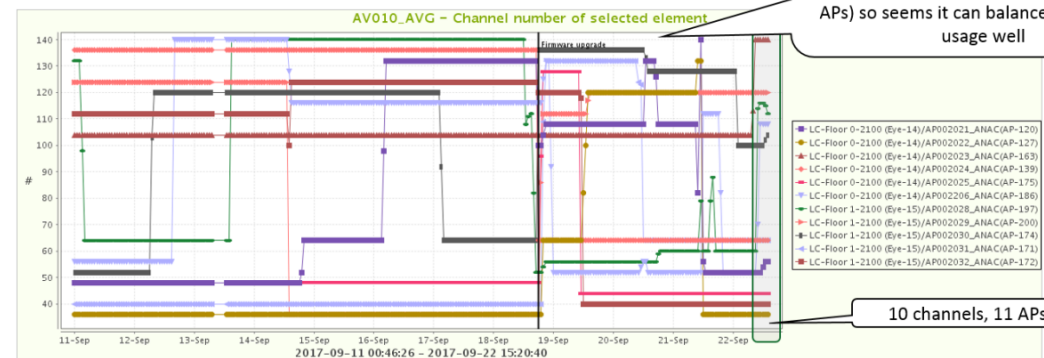
300 Series  
access  
points

ArubaOS 6.5.1.1

ArubaOS  
6.5.3.1



## Channel Changes: 5GHz



Test met AP-2XX series en 6.5.X firmware upgrade.

AP-3xx series heeft geen DFS issues meer met 6.5.3.1, AP-2XX nu juist weer wel.

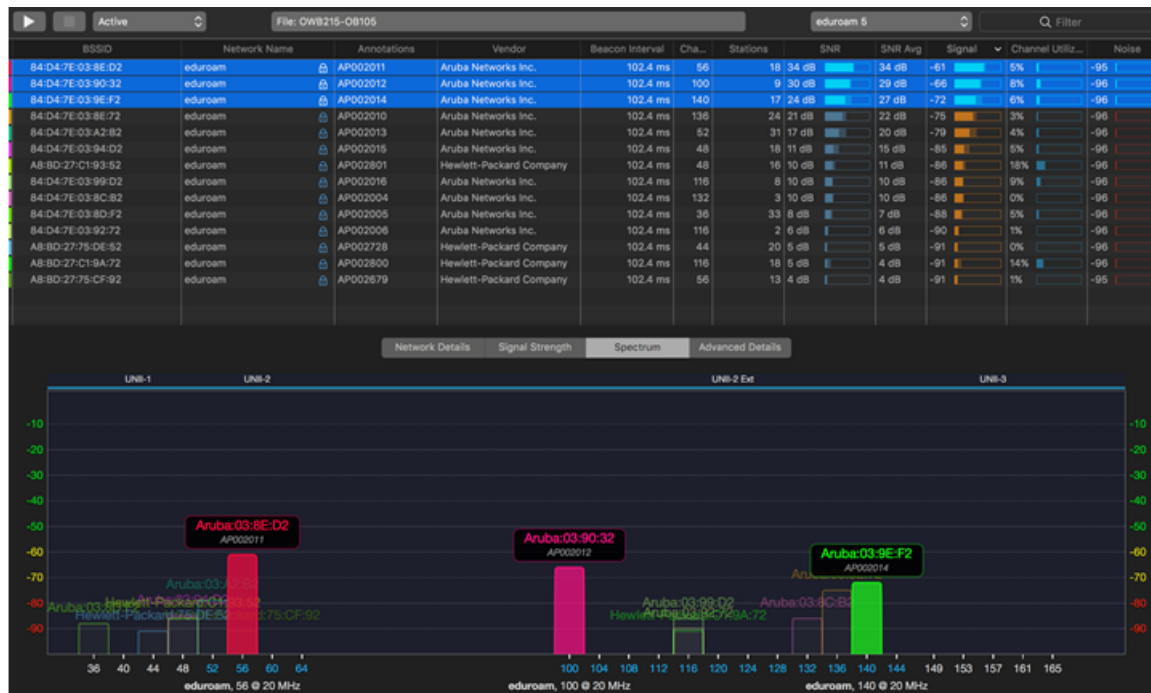
Volgende kandidaat : AOS 8.2.X



# My Wi-Fi goto tools

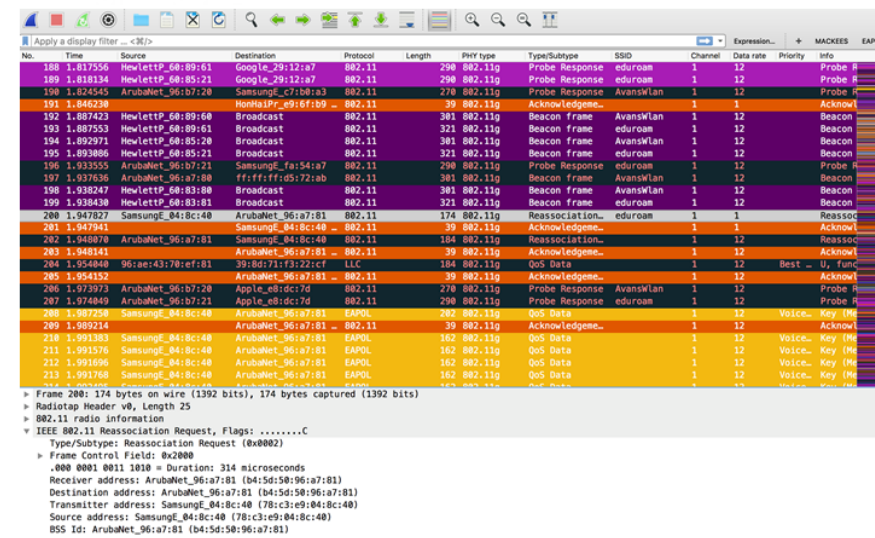
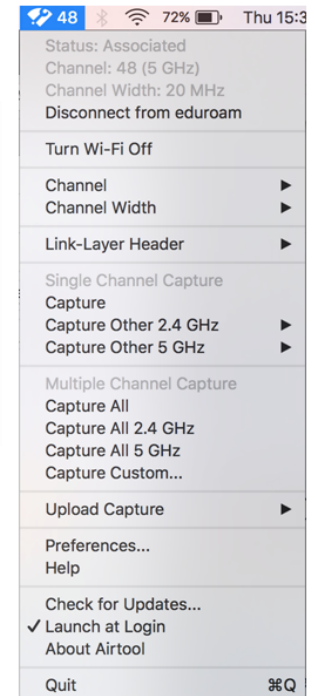
## WiFi Explorer

Pro version has many add ons including specan with for instance wispy dbx



## Airtool

Easy frame captures using your Mac's built-in Wi-Fi adapter.



**Kees Pronk**  
@rovinguser

People move, networks don't: info and comments on Wi-Fi | Avans network | trends in security, mobile computing and higher education. Occasional Tennis tweets  
eduroam.avans.nl

# Bedankt voor de aandacht !

