

A Vendor Neutral Approach to Wireless Management & Troubleshooting

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IT Professional Wi-Fi Trek 2016



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As an old saying goes.....

...To the man with a hammer, everything looks like a nail.



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Motivation – Why Multi-Vendor?

- Cost savings
 - Able to choose products that more specifically fit use case instead of more expensive fully featured product.
 - Lack of lock-in can be useful in negotiations on pricing
- M&A
 - Acquired company or leased facility may be running different vendor's product.
 - Project timeline or budget may not allow rapid integration
- Able to run trials with different vendors with pressure to go to one vendor.



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Typical Intel Office

- No Ethernet to desk.
- No physical VoIP or landline phone.
- VoIP application running on notebook PC.
- Conference calls on server based application
- Video projectors without cables
(<http://www.intel.com/content/www/us/en/support/software/software-applications/intel-unite-app.html?wapkw=intel+unite+app>)



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Lessons Learned

- VoIP latency through WLAN/LAN QoS configuration, including client
- Keep on top of wireless infrastructure issues for best call quality:
 - Mobility group
 - Spacing of access points
 - Number of users per AP.
 - Association to correct controllers.
 - Radio adjustment algorithm settings.



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Results

- Significantly reduced capital and expense run rate
 - Ethernet switchgear, hard phones, licensing
 - Cabling, office moves, etc.
- Enhanced user experience
 - Integrated Audio, chat, video, whiteboard
 - Able to move during session.
- Global webcast over WLAN



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Suggestions

- Download a demo copy of software under evaluation.
- Review this presentation as baseline for comparison.
- Test all features against your requirements during the trial period.



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Overview



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Overview

- Here is an example of a multivendor solution. Details are presented here to help provide a basis for comparison for other solutions.
- General categories for comparison:
 - Capacity management
 - Monitoring / Troubleshooting
 - Configuration management and software upgrades.



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What Are Your Requirements?

- Client troubleshooting
- Monitoring configurations tracking and history
- Reports
- Rogues
- OS upgrades



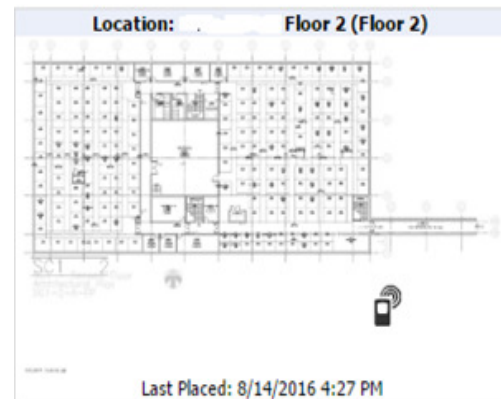
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Other Features – RFID Tags

- What is 'good enough' for a feature?
- A vendor specific solution may be accurate, but do you *need* it?

Tag Information			
Name:	-	MAC Address:	
Battery Level:	-	Vendor:	
Chirp Interval:	4 mins 35 secs		
First Seen:	8/16/2013 9:11 AM	Last Seen:	8/14/2016 4:27 PM
Notes:	-		



Detecting APs

AP/Device	Radio	Signal	SNR	First Seen	Last Seen
	802.11bgn	-89	2	8/14/2016 4:27 PM	8/14/2016 4:27 PM
	802.11bgn	-84	4	8/14/2016 4:13 PM	8/14/2016 4:27 PM

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Pro's of a Multi-Vendor Solution

- Not locked into one vendor, making it easier to select and integrate products.
- Ability to monitor and troubleshoot all wireless devices from the same system regardless of vendor.
- Easy for first level help desk people to get a basic idea as to the health of the wireless network without training on specific products.



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Con's of a Multi-Vendor Solution

- Not as closely integrated to any specific product line.
- Support staff can be disconnected from what is really going on.
- Vendor neutral monitoring can lag on proprietary features. (For example MIBs.)



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How Flexible is the Device Setup?

- SNMP version
- Polling interval
- Customizable polling

The screenshot displays a configuration interface for a device, divided into several sections:

- Basic:** Includes fields for Name, Missed SNMP Poll Threshold (set to 1), Regulatory Domain, Timezone, Allow One-to-One NAT (radio buttons for Yes/No), and Audit Configuration on Devices (radio buttons for Yes/No).
- SNMP Polling Periods:** A list of polling intervals for various services, such as Up/Down Status (5 minutes), AP Interface (10 minutes), Client Data (10 minutes), Thin AP Discovery (15 minutes), Device-to-Device Link (5 minutes), 802.11 Counters (15 minutes), Rogue AP and Device Location Data (30 minutes), and CDP Neighbor Data (30 minutes).
- SNMP Version:** A dropdown menu currently set to 2c.
- Offload WMS Database:** Radio buttons for Yes/No.
- GUI Config:** Radio buttons for Yes/No.
- Manage local configuration on controllers:** Radio buttons for Yes/No.
- Ignore Rogues Discovered by Remote APs:** Radio buttons for Yes/No.
- Delete Certificates On Controller:** Radio buttons for Yes/No.
- Archive Controller/Switch Backups:** Radio buttons for Yes/No.
- Automatic Authorization:** Includes settings for Add New Controllers and Autonomous Devices Location, Current Global Setting for Controllers, Add New Thin APs Location, and Current Global Setting for Thin APs.
- Maintenance Windows:** An 'Add' button and a text field containing 'New AP Group Maintenance Window'.

At the bottom of the configuration area are buttons for 'Save', 'Save and Apply', and 'Revert'. A 'Notes' section is also present at the bottom left of the configuration area.

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Device Support

- Does the device list support all of your devices?
- Does the list support devices you are considering?
- Do wired supported devices need wired side info. for rogues?

NETWORKS

Home Groups APs/Devices Clients Reports System **Device Se**

Discover Add Upload Firmware & Files

Select the type of device to add:

Aruba Device [Import Devices via CSV](#)

- Brocade
 - Brocade Switch
- Cisco
 - Cisco Aironet 4800
 - Cisco Aironet 340 VxWorks
 - Cisco Aironet 350 VxWorks
 - Cisco Aironet 1200 VxWorks
 - Cisco Catalyst Switch
 - Cisco IOS AP
 - Cisco WLC
- Custom Device
 - Custom Device
- D-Link
 - D-Link Switch
- Dell
 - Dell Controller
 - Dell Force10 Switch
- Enterasys
 - Enterasys RBT8100
 - Enterasys RBT8200

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Account View Configuration Options

- Can you toggle items on and off?
- Can you rearrange the list in order of importance to you?

Overview RF Performance RF Capacity Search Documentation User Info

Top Header Stats

Filter Level For Rogue Count: Rogue

Customize Header Columns:

Stats:

- Yes No
- New Devices
- Up (Wired & Wireless)
- Up (Wired)
- Up (Wireless)
- Down (Wired & Wireless)
- Down (Wired)
- Down (Wireless)
- Mismatched
- Rogues
- Clients
- VPN Sessions
- VPN Users
- Alerts
- Severe Alerts

Select All - Unselect All

Include Device Types in Header Stats:

- Fat APs
- Thin APs
- Controllers
- Switches
- Others

Select All - Unselect All

Severe Alert Threshold: Normal

Search Preferences

Search Method: Active + historical clients +

Display Preferences

Default Number of Records per List: 10 records per page

Reset List Preferences: Reset

Console Refresh Rate: 5 minutes

Idle Timeout (5 mins to 480 mins): 60

Default Client Chart Mode: Max

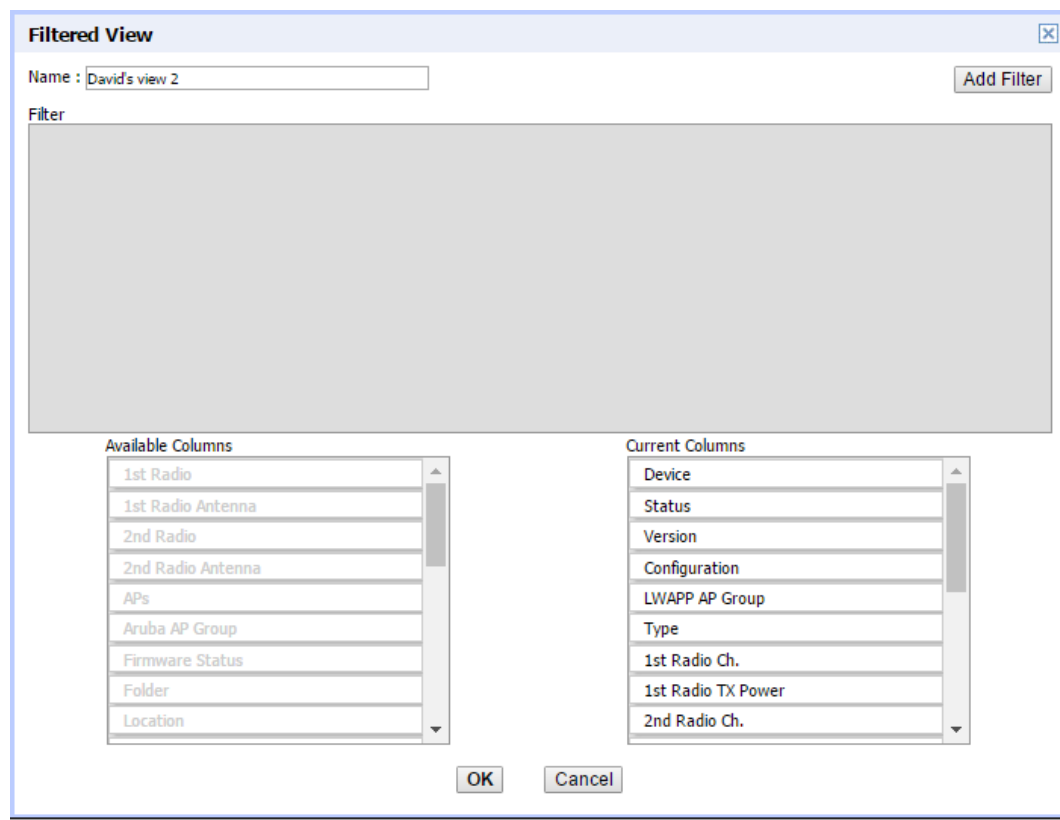
Save Revert

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Filtered View – Configuration Options

- How can devices be grouped?
 - Multiple View
 - Common Configuration
 - Arbitrary
- Options for a hierarchy?



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Is 'View Export' Option Available?



Having the ability to export and manipulate is very useful




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Default View Customization


- Can the default view be customized?
- If so, what are the options?
- Can you rearrange portions of the screen?

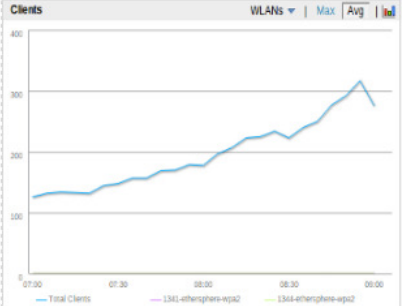
Drag widgets from the Available Widgets list to the canvas on the right.
The title bar of a widget will be green when the layout is valid or red when invalid. Remove widgets by clicking the  icon.


Available Widgets

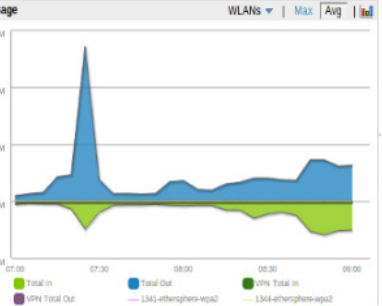
- Monitoring and Config Pie Charts
- RAPIDS: Acknowledged
- RAPIDS: Classification Pie
- RAPIDS: Classification Summary
- IDS Events
- RAPIDS: OS Pie
- RAPIDS: OS Summary
- Top Folders By 2.4GHz Radio Client Count
- Clients By AOS Device Type
- Clients By Device Type
- Clients By Device Mfr
- Clients By Device Model
- Clients By Device OS
- Clients By Device OS Detail
- Clients By Network Vendor
- Clients By Mfr & Model


Client/Usage Graphs

Clients | WLANs ▾ | Max | Avg | 




Usage | WLANs ▾ | Max | Avg | 




Top Folders By 2.4GHz Radio 




Folder	Count
Top > Paris	43
Top > HQ RAP	38
Top > HQ Cisco	35
Top > San Francisco	25
Top > Sunnyvale HQ	25
Top > San Mateo	19
Top > HQ Aruba	13
Top > New York	9
Top > Chicago	7
Top	1

Top Folders By 5GHz Radio Client 

Folder	Count
Top > Paris	43
Top > HQ RAP	38
Top > HQ Cisco	35
Top > San Francisco	25
Top > Sunnyvale HQ	25
Top > San Mateo	19
Top > HQ Aruba	13
Top > New York	9
Top > Chicago	7
Top	1

Alert Summary 

Type	Last 2 Hours	Last Day	Total	Last Event
AMP Alerts	0	0	0	-
IDS Events	0	0	0	-
Incidents	0	0	0	-
RADIUS Authentication Issues	0	0	0	-

Top Folders By AP Usage  **Top Clients By Total Traffic**  **Top Folders By 5GHz Radio** 

Folder	Username	MAC Address	Bandwidth	Folder
Top > Paris				Top > Paris

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Example: Default Screen Views

2.4GHz Radios with > 50% Channel Usage		5GHz Radios with > 31 Clients		Alert Summary				
Folder	Radios	Folder	Radios	Type ▲	Last 2 Hours	Last Day	Total	Last Event
	1		2	Alerts	7	496	3498	7/23/2016 1:39 PM
			2	IDS Events	0	0	0	-
			2	RADIUS Authentication Issues	16	936	11560	7/23/2016 3:11 PM
			1					
			1					

APs with Usage > 57.59 Mbps		Top Clients By Total Traffic			5GHz Radios with > 50% Channel Usage	
Folder	APs	Username	MAC Address	Traffic	Folder	Radios
	1			28.73 GiB		1
	1			27.97 GiB		
	1			23.68 GiB		
	1			20.85 GiB		
	1			20.46 GiB		
	1			18.11 GiB		
				14.57 GiB		
				14.54 GiB		
				12.79 GiB		
				12.35 GiB		

- High channel Utilization
- Top talkers

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Upgrades

- Why upgrade this way?
 - Only see OS versions compatible with the hardware.
 - OS version option in drop down menu instead of copy/paste
 - Integrated tftp/ftp server
- **Caution:** Is a configuration pushed from the wireless management server to the wireless device in the process?

Desired Version

Choose the desired firmware version to be applied to
Upload firmware files on the Device Setup [Upload Firmware & Files](#) page.

Update List of Aruba Image Versions:

Current Version: 7.6.130.0 (BOOT: 1.0.16)

Desired Version:

Firmware Upgrade Job Options

Job name:

Reboot now: Yes No

Serve firmware files from this interface:

Failure Notification Options

To be notified when upgrades fail and when a job is stopped, enter email addresses of the form user@domain.
Separate multiple addresses by spaces, commas, or semicolons.

Email Recipients:

Sender Address:

Start or Schedule Firmware Upgrade Job:

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Clients



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AP Client Diagnostic Detail

NETWORKS Search

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

Overview Connected All Rogue Clients Client Detail **Diagnostics** VPN Sessions VPN Users Tags

host/ Client Network AP Controller

good good good good

Device Info

Name: [redacted]

Device Type: [redacted]

Status: Up

Last Contacted: 3 minutes ago

IP Address: [redacted]

Aruba AP Group: [redacted]

Notes:

Floor Plan: [redacted]

Switch Port: [redacted]

Performance

Clients: 2

Total Usage: 544 bps

Usage From Clients: 320 bps

Usage To Clients: 224 bps

Uptime (%): 100%

Trends

Clients

Usage

Quality

Overall rating good

Indicators within the ideal range: 6

Match Events

Event Time	From AP	To AP
No rows available.		

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Client Detail

Username	AP/Device	SSID	Auth. Type	Association Time	Total Data Used	Avg. Speed	Connection Mode	Duration
			WPA2 (EAP-TLS)	6/18/16, 4:18 PM	37.1 GB	0 bps	11n 5 GHz	1 day 19 hours 1 minute
			WPA2 (EAP-TLS)	6/15/16, 10:32 AM	596 GB	0 bps	11n 5 GHz	3 days 5 hours 40 minutes
			Authenticated by AP	6/15/16, 10:06 AM	2.22 GB	0 bps	11n 5 GHz	20 minutes
			WPA2 (EAP-TLS)	5/30/16, 7:52 PM	6.1 TB	0 bps	11n 5 GHz	15 days 14 hours 8 minutes
			Authenticated by AP	5/30/16, 7:39 PM	0 B	0 bps	11n 5 GHz	10 minutes
			Authenticated by AP	5/28/16, 11:15 PM	261 MB	0 bps	11n 5 GHz	1 day 20 hours 23 minutes
			WPA2 (EAP-TLS)	5/28/16, 10:35 PM	200 KB	0 bps	11n 5 GHz	30 minutes
			WPA2 (EAP-TLS)	5/28/16, 10:04 PM	603 KB	0 bps	11n 5 GHz	30 minutes
			WPA2 (EAP-TLS)	5/28/16, 9:35 PM	471 KB	0 bps	11n 5 GHz	28 minutes
			WPA2 (EAP-TLS)	5/28/16, 6:23 PM	29.1 MB	0 bps	11n 5 GHz	3 hours 10 minutes
			WPA2 (EAP-TLS)	5/27/16, 9:04 AM	198 MB	0 bps	11n 5 GHz	1 day 9 hours 19 minutes
			WPA2 (EAP-TLS)	5/26/16, 10:50 PM	54.5 MB	0 bps	11n 5 GHz	10 hours 13 minutes
			WPA2 (EAP-TLS)	5/21/16, 10:22 PM	1.54 GB	0 bps	11n 5 GHz	5 days 0 hours 27 minutes
			Authenticated by AP	5/21/16, 9:19 PM	9.47 MB	0 bps	11n 5 GHz	1 hour 0 minutes
			WPA2 (EAP-TLS)	5/14/16, 1:05 AM	3.14 GB	0 bps	11n 5 GHz	7 days 20 hours 6 minutes
			Authenticated by AP	5/13/16, 8:35 PM	44.9 MB	0 bps	11n 5 GHz	4 hours 30 minutes
			WPA2 (EAP-TLS)	5/13/16, 9:34 AM	729 MB	0 bps	11n 5 GHz	11 hours 0 minutes
			WPA2 (EAP-TLS)	5/13/16, 12:03 AM	76.5 MB	0 bps	11n 5 GHz	9 hours 22 minutes
			WPA2 (EAP-TLS)	5/12/16, 12:23 PM	93 MB	0 bps	11n 5 GHz	11 hours 37 minutes
			WPA2 (EAP-TLS)	5/11/16, 1:41 PM	169 MB	0 bps	11n 5 GHz	22 hours 36 minutes
			WPA2 (EAP-TLS)	5/11/16, 11:33 AM	84.3 MB	0 bps	11n 5 GHz	2 hours 5 minutes
			WPA2 (EAP-TLS)	5/9/16, 1:46 PM	2.71 GB	0 bps	11n 5 GHz	1 day 21 hours 25 minutes
			WPA2 (EAP-TLS)	5/4/16, 6:55 PM	8.23 GB	0 bps	11n 5 GHz	4 days 18 hours 29 minutes
			WPA2 (EAP-TLS)	5/4/16, 5:56 AM	162 MB	0 bps	11n 5 GHz	12 hours 58 minutes
			WPA2 (EAP-TLS)	5/3/16, 8:39 PM	40.9 MB	0 bps	11n 5 GHz	9 hours 17 minutes

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Wireless Client Troubleshooting

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

Overview Connected All Rogue Clients Client Detail **Diagnostics** VPN Sessions VPN Users Tags

Client: host/ [redacted] good

Network: [redacted] good

AP: [redacted] good

Controller: [redacted] good

Device Info

Username: host/ [redacted]
Device Name: [redacted]
Device Type: Intel Corporate
MAC Address: [redacted]
Role:
Notes:

Current Association

Connection Mode: 11ac 5GHz
Duration: 15 hours 26 minutes
IP Address: [redacted]
Hostname: [redacted]
Usage: 180 bps
Security Mode: WPA2
Cipher: AES
Auth type: EAP
VLAN:
Forward Mode:
Floor Plan: [redacted]
SNR (dB): 38
SSID: [redacted]

Charts UCC

Usage

Signal & Noise (dBm)

Health

SNR (dB)

Quality

Overall rating: good
Indicators with no data
Indicators within the ideal range: 2

Match Events

Event Time	From AP	To AP
No rows available.		



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Client Detail

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

Overview Connected All Rogue Clients **Client Detail** Diagnostics VPN Sessions VPN Users Tags

Detail for: **mac address**

Device Info

Username: [redacted]
First Seen: 5/14/2015 2:12 PM on [redacted] for 10 mins
Last Seen: 5/8/2016 6:08 PM on [redacted] for 15 hrs 48 mins
Device Type: Intel Corporate
Network Interface Vendor: Intel Corporate
AOS Device Type: -
Aruba HTTP Fingerprint: -
Classification:
Watched Client: Yes No
Notes: [text area]
[Show additional properties](#)

Current Association

Username: [redacted]
Role: -
Signal Quality: -
Association: 5/8/2016 2:19 AM
Duration: 15 hrs 48 mins
Mode: 802.11ac
Usage: 22.22 Kbps
SSID: -
Ch. BW: -
LAN IP 1: -
Auth Type: EAP
Cipher: AES
Source: Poll
AP/Device: [redacted]
Controller: [redacted]
Group: [redacted]
Folder: [redacted]
AP/Device Location: default location
Radio: 802.11ac
VLAN: [redacted]
Forward Mode: -
LAN Hostname 1: [redacted]
Auth Time: 15 hrs 48 mins
Security Mode: WPA2

Time Range: 2h 1d 1w 1y Custom

Signal Quality

Sources | Max | Avg | [bar chart]

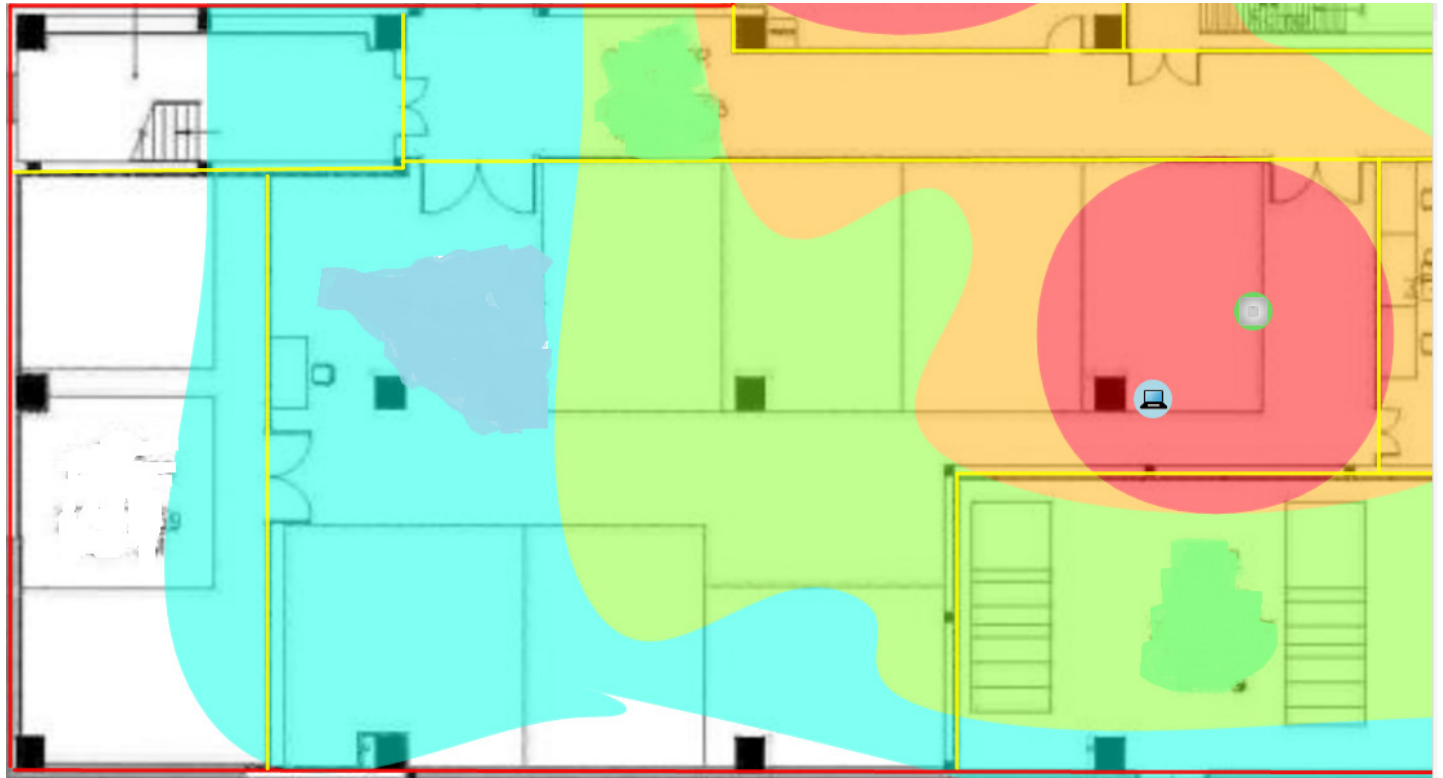
Usage

Sources | Max | Avg | [bar chart]

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Heatmap: Myth vs. Reality



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Map-Based Troubleshooting

Overlays Display Edit

Type

Heatmap Voice Speed Ch. Utilization

Sensor Coverage Wired Range Health

Floors

Current Above Below

Frequencies

5 GHz 2.4 GHz

Preferences [X]

Configure preferences for: APs

Usage (kbps 5 min avg) 68 159

of Clients per Radio 6 12

% Uptime last 24 hrs 99 98

AP Location Good Suspect

Radio Status Up Down

AP Status Up Down

Show Channel In Label Icon Size: Tiny

Show Transmit Power in Label

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Map of APs with Channel Information



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Client Signal Data

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

Floor Plans Import

Overlays Display Edit

Type				Floors	Frequencies
<input type="checkbox"/> Heatmap	<input type="checkbox"/> Voice	<input type="checkbox"/> Speed	<input type="checkbox"/> Ch. Utilization	<input checked="" type="checkbox"/> Current	<input checked="" type="checkbox"/> 5 GHz
<input type="checkbox"/> Sensor Coverage	<input type="checkbox"/> Wired Range	<input type="checkbox"/> Health		<input type="checkbox"/> Above	<input checked="" type="checkbox"/> 2.4 GHz
				<input type="checkbox"/> Below	

Preferences [X]

Configure preferences for: Clients

Usage (kbps 5 min avg) 10 25

Signal Strength (dBm) -10 -65

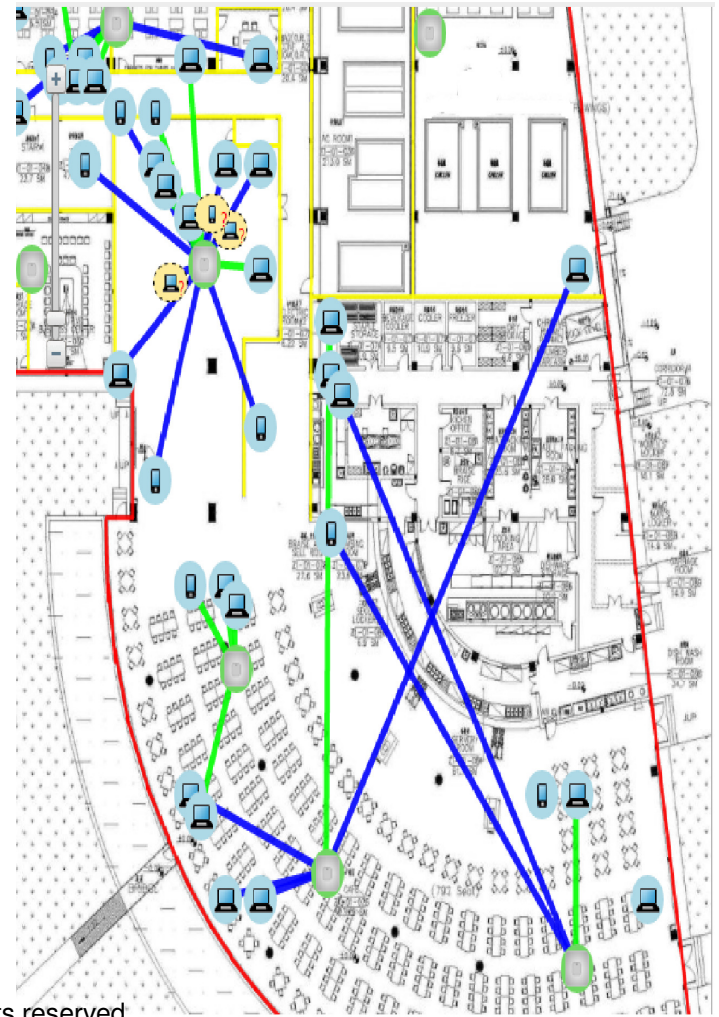
Show clients with invalid signal

Icon Size: Tiny

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Roaming with Sticky Clients



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Integrated Troubleshooting May Vary by Vendor

The screenshot displays a network management interface for a device. The top section, titled "Device Info", shows the device status as "Up (OK)" and provides various configuration details such as firmware, upstream device, controller role, type, LAN MAC address, location, IP address, VPN sessions (0), and quick links. A "Run command..." dropdown menu is open, listing troubleshooting categories and specific commands:

- Authentication and Dot1x Troubleshooting**
 - show aaa authentication-server all
 - show aaa authentication-server radius statistics
 - show dot1x counters
 - show auth-tracebuf
 - show debug
- Airgroup**
 - show airgroupservice
 - show airgroup servers
- AP Details**
 - show ap active
 - show ap association
 - show ap bss-table
 - show ap database long
 - show ap debug counters
 - show ap essid
 - show ap blacklist-clients
- User Details**
 - show user-table

Below the device info, there are three charts: "Clients" (line graph), "WLANs" (line graph with Max and Avg indicators), and "Usage" (stacked bar chart). The interface also includes a "Licenses" link and a "VPN Usage" section.

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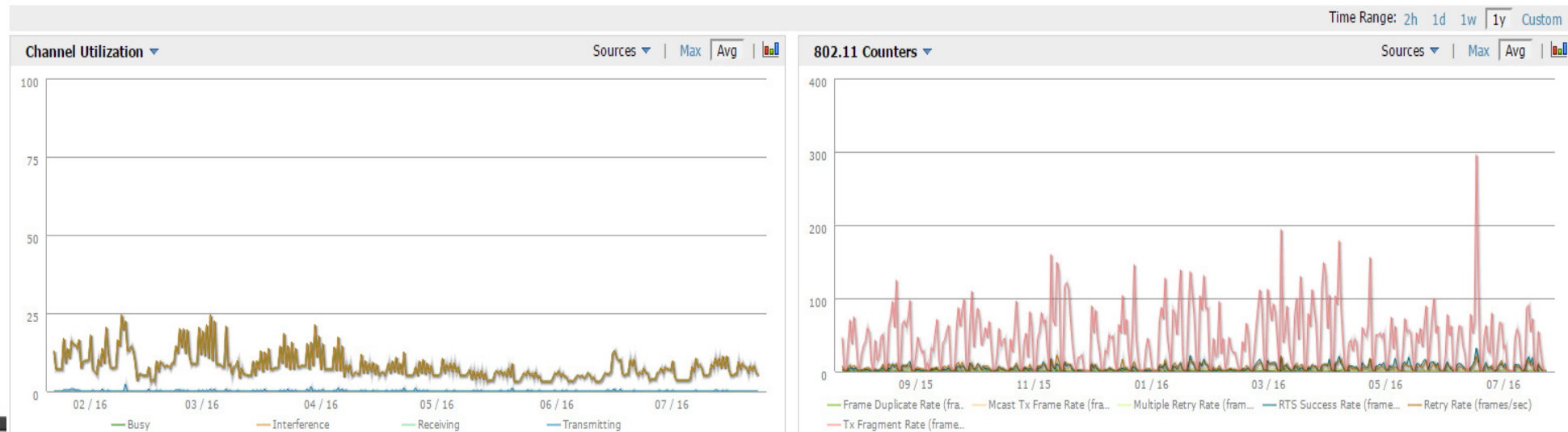
AP Radio Metrics

AP Monitoring | Radio Statistics

Monitoring 802.11ac radio for AP

802.11 Radio Counters Summary (frames/sec)

	Current	Last Hour	Last Day	Last Week
Unacked	0	0	0	12
Retries	0	0	0	78
Failures	0	0	0	5
Dup Frames	0	0	0	0
FCS Errors	0	0	0	95



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Rogues



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Rogues

- Can gather wired information across multiple vendors
- Watch out for licensing.
 - To save money you can put the licenses on the distribution devices then just trace the access switch.



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Rogue Configuration

- Can You:
 - Configure by signal strength?
 - Exclude remote AP discovered rogues?
 - Match closeness?
 - Age out time (over weekend events)?
- Can the monitoring system declassify certain devices no longer deemed rogue?

Basic Configuration

ARP IP Match Timeout (1-168 hours):

Export Threshold:

Wired-to-Wireless MAC Address Correlation (0-8 bits):
 Discovered BSSIDs and LAN MAC addresses which are within this bitmask will be combined into one device. 4 requires all but the last digit match (aa:bb:cc:dd:ee:fX). 8 requires all but the last two digits match (aa:bb:cc:dd:ee:XX).

Wireless BSSID Correlation (0-8 bits):
 Similar BSSIDs will be combined into one device when they fall within this bitmask. Setting this value too high may result in identifying two different physical devices as the same rogue. Note: When you change this value, will not immediately combine (or un-combine) rogue records. Changes will occur during subsequent processing of discovery events.

Delete Rogues not detected for (0-180 days, zero disables):
 Cannot be larger than the rogue discovery event expiration (180) configured on the Setup page, unless that value is set to 0.

Automatically OS scan rogue devices: Yes No

Wired-to-Wireless Time Correlation Window (minutes, zero disables):
 Detected Wirelessly and on LAN rules will only match if wireless and LAN discovery events occur within this time window.

Classification Options

Acknowledge Rogues by Default: Yes No

Manually Classifying Rogues Automatically Acknowledges Them: Yes No

Containment Options

Manage rogue AP containment:
 When enabled, will manage the classification of rogue APs on Cisco WLC and Aruba controllers to match the classification of those rogues in RAPIDS, including the "Contain" classification. Yes No

Manage rogue AP containment in monitor-only mode:
 Containment updates will always be pushed to devices running WMS Offload, regardless of this setting. Yes No

Maximum number of APs to contain a rogue:
 The maximum number of APs that will contain a rogue on Cisco WLC controllers.

Filtering Options

Ignore Ad-hoc Rogues: Yes No

Ignore Rogues by Signal Strength: Yes No

Ignore Rogues Discovered by Remote APs:
 Discovery events from Offload will always be processed, regardless of this setting. Yes No

Ignore IDS Events from Remote APs: Yes No

Ignore Events from VLAN(s):
 MAC addresses seen on these VLANs will not be used for Rogue detection or Upstream Device determination.

Ignore Events from Interface Label(s):
 MAC addresses seen on interfaces with these labels will not be used for Rogue detection or Upstream Device determination.

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Triggered Alerts

- Faster hunting when you are playing cat and mouse with rogue AP.
(Rogue mac address shows up.)
- AP or radio down.
- Number of users per AP exceeds a threshold.
- Controller CPU utilization.



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General Trigger Types: Example

- Text or email
- Radio/AP, up/down, channel utilization
- Arbitrary or configuration group options

Trigger

Type: Device Down

Severity:

Limit by number of down events:

Send Alerts for Thin APs when Controller is Down:

Send Alerts when Upstream Device is Down:

Send Alerts on Reboot:
Include reboots detected by uptime reset or reboot count increase

Conditions

Matching conditions:

Available Conditions: Device Type, Minutes Down Thin

Add New Trigger Condition

Trigger Restrictions

Folder: Top

Include Subfolders: Yes No

Group: - All Groups -

Alert Notifications

Notes:

Additional Notification Options: Email NMS

Logged Alert Visibility: By Role

Suppress Until Acknowledged: Yes No

Add Cancel

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Trigger Classification & Response

- Can you customize trigger level?
- Options for scope of trigger?
- Email and logging server options?

The screenshot displays a configuration window for a trigger. The 'Trigger' section includes a dropdown for 'Type' (set to 'Client on Rogue AP') and a 'Severity' dropdown menu that is open, showing options: Major, Normal, Warning, Minor, Major (highlighted), and Critical. Below this is the 'Conditions' section, which shows 'Matching conditions:' and 'Available Conditions: Classification, Client'. An 'Add' button and 'New Trigger Condition' link are present. A table below has columns for 'Option', 'Condition', and 'Value', with 'Classification', '>=' (highlighted), and 'Valid' (with a trash icon) as the first row. The 'Trigger Restrictions' section includes 'Folder:' (set to 'Top'), 'Include Subfolders:' (radio buttons for Yes and No), and 'Group:' (set to '- All Groups -'). The 'Alert Notifications' section has a 'Notes:' text area and 'Additional Notification Options:' with checkboxes for 'Email' and 'MMS'. 'Logged Alert Visibility:' is set to 'By Role' and 'Suppress Until Acknowledged:' has radio buttons for 'Yes' and 'No'. 'Add' and 'Cancel' buttons are at the bottom.

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Client & Radius Triggered Alerts

- What are options for client alerts?
- Client alert for too many users per AP
- What are the radius alert options?

Trigger

Type: Device Down

Severity:

Limit by number of down events:

Send Alerts for Thin APs when Controller is Down:

Send Alerts when Upstream Device is Down:

Send Alerts on Reboot:
Include reboots detected by uptime reset or reboot count increase

Conditions

Matching conditions:

Available Conditions: Device Type, Minutes Down Thru

Add New Trigger Condition

Trigger Restrictions

Folder: Top

Include Subfolders: Yes No

Group: All Groups

Alert Notifications

Notes:

Additional Notification Options: Email NMS

Logged Alert Visibility: By Role

Suppress Until Acknowledged: Yes No

Add Cancel

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Useful Triggers to Configure

Type ▲	Trigger	Additional Notification Options
AP Usage	Usage \geq 50000 Kbps for 2 hr	NMS
Client Count	Client Count on Devices is at least 35 and for 1 hr	-
Device Down	Device Type is Access Point	NMS
Device Down	Device Type is Controller	NMS
Device RADIUS Authentication Issues	Count \geq 2 for 1 minute	NMS
Device Up	Device Type is Access Point	NMS
Device Up	Device Type is Controller	NMS
Disk Usage	Partition Percent Used \geq 95%	-
Radio Down	-	NMS
Radio Up	-	NMS
Rogue Device Classified	Threat Level \geq 9	NMS and Email



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Reports



IT Professional Wi-Fi Trek 2016



Reports

- What are the usage views by device?
- Device memory and CPU report options?
- LAN report options?

- [-] **Device Summary**
 - Most Utilized Folders by Maximum Concurrent Clients
 - Most Utilized Folders by Usage
 - Most Utilized by Maximum Concurrent Clients
 - Most Utilized by Usage
 - Least Utilized by Maximum Concurrent Clients
 - Least Utilized by Usage
 - Devices
- [+] **Device Uptime**
- [+] **IDS Events**
- [-] **Inventory**
 - Vendor Summary
 - Firmware Version Summary
 - Model/Firmware Version Summary
 - Bootloader Version Summary
 - Model/Bootloader Version Summary
 - Type Summary
 - Model Summary
 - Devices
- [+] **Match Event**
- [-] **Memory and CPU Utilization**
 - Top CPU Utilization by Device
 - Top Memory Usage by Device
 - CPU Utilization Details
 - Memory Usage Details
- [-] **Network Usage**
 - Usage
 - Client Count
 - Usage and Client Count by Folder
 - Usage by SSID
 - Total Usage
- [+] **New Clients**
- [+] **New Rogue Devices**
- [-] **Port Usage**
 - Summary
 - Folder Summary
 - Histogram
 - Most Utilized Switches
 - Most Utilized Ports
 - Switches
 - Ports

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Power or Channel Changes

channel changes report - daily for (Multiple...)

5/20/2016 6:00 PM to 5/21/2016 6:00 PM
Generated on 5/21/2016 6:05 PM

Most Channel Changes (5 GHz)

Rank ▲	Device	Channel Changes	Avg Noise (dBm)	Avg Channel Busy (%)	Clients	Usage	Location	Controller	Folder	Group
1		3	-99.50	3.94	0	48 bps				
2		2	-94.50	1.18	2	5.48 Kbps				
3		2	-98.00	2.76	0	1 bps				
4		2	-97.50	1.57	0	0 bps				
5		2	-99.00	4.72	0	15 bps				
6		2	-97.50	3.15	0	691 bps				
7		2	-98.00	3.54	0	244 bps				
8		1	-95.00	7.87	0	6.24 Kbps				
9		1	-97.50	1.97	0	0 bps				
10		1	-96.50	4.33	0	3.58 Kbps				
11		1	-97.00	7.48	1	54.66 Kbps				
12		1	-93.50	3.54	1	23.03 Kbps				
13		1	-96.00	1.57	0	0 bps				
14		1	-98.50	0.79	0	3 bps				
15		1	-96.50	3.94	0	0 bps				
16		1	-98.00	2.76	0	25 bps				
17		1	-99.00	4.72	2	796 bps				
18		1	-99.00	2.36	1	22.56 Kbps				
19		1	-97.00	0.79	1	160 bps				
20		1	-93.00	0.79	0	0 bps				
21		1	-96.50	2.36	0	0 bps				
22		1	-98.50	2.76	0	0 bps				
23		1	-96.50	1.97	1	17.49 Kbps				
24		1	-100.50	5.51	0	0 bps				
25		1	-99.00	2.76	0	7.04 Kbps				
26		1	-96.50	1.97	0	0 bps				
27		1	-97.50	1.97	0	0 bps				
28		1	-98.00	1.57	0	44.08 Kbps				
29		1	-93.00	1.97	0	0 bps				
30		1	-98.50	3.15	0	0 bps				

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Client & Usage Report

- Top 10 list by client count?
- Top 10 list by usage?
- What is in each top 10 list?

Most Utilized by Maximum Concurrent Clients

Rank ▲	AP/Device	Clients	Max Clients	Total Data	Avg Usage	Location	Controller	Folder	Group
1		781	197	212.43 GB	351.46 Kbps				
2		2049	175	126.26 GB	208.89 Kbps				
3		1495	166	65.38 GB	108.26 Kbps				
4		1297	144	101.13 GB	167.31 Kbps				
5		1217	144	18.64 GB	30.84 Kbps				
6		1286	132	30.10 GB	49.83 Kbps				
7		310	130	80.20 GB	132.68 Kbps				
8		763	127	21.34 GB	35.33 Kbps				
9		279	118	143.70 GB	237.93 Kbps				
10		697	117	186.28 GB	308.19 Kbps				

Most Utilized by Usage

Rank ▲	AP/Device	Clients	Max Clients	Total Data	Avg Usage	Location	Controller	Folder	Group
1		182	55	1.74 TB	2.88 Mbps				
2		334	47	1.51 TB	2.51 Mbps				
3		76	26	1.45 TB	2.40 Mbps				
4		127	14	1.39 TB	2.31 Mbps				
5		376	45	1.27 TB	2.11 Mbps				
6		112	9	1.25 TB	2.07 Mbps				
7		1267	29	1.20 TB	1.99 Mbps				
8		209	35	1.11 TB	1.84 Mbps				
9		300	8	925.81 GB	1.53 Mbps				
10		739	19	917.67 GB	1.52 Mbps				

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Reports

- For future installs and long term health. (Investigate trends)
- Seamless reporting regardless of vendor.
- Report types:
 - Usage by SSID
 - Maximum by concurrent clients.
 - Maximum by usage.
 - Power/channel changes
 - Good to have a option for maximum and average.



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RF Health Report Options

- 802.11 error counter report options?
- Power and channel change report options?
- Report option for noise and interference?

- [-] **RF Health**
 - Thresholds
 - Top Folders By Worst Client and Radio Statistics Combined 2.4 GHz and 5 GHz
 - Client and Radio Statistics by Folder - Combined 2.4 GHz and 5 GHz
 - Top Folders By Worst Client and Radio Statistics 2.4 GHz
 - Client and Radio Statistics by Folder - 2.4 GHz
 - Top Folders By Worst Client and Radio Statistics 5 GHz
 - Client and Radio Statistics by Folder - 5 GHz
 - Problem 5 GHz Radios
 - Problem 2.4 GHz Radios
 - Most Noise (5 GHz)
 - Most Noise (2.4 GHz)
 - Most Interfering Devices (5 GHz)
 - Most Interfering Devices (2.4 GHz)
 - Most Utilized by Channel Usage (5 GHz)
 - Most Utilized by Channel Usage (2.4 GHz)
 - Least Utilized by Channel Usage (5 GHz)
 - Least Utilized by Channel Usage (2.4 GHz)
 - Most MAC/Phy Errors (5 GHz)
 - Most MAC/Phy Errors (2.4 GHz)
 - Most Channel Changes (5 GHz)
 - Most Channel Changes (2.4 GHz)
 - Most Mode Changes (5 GHz)
 - Most Mode Changes (2.4 GHz)
 - Most Transmit Power Changes (5 GHz)
 - Most Transmit Power Changes (2.4 GHz)



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Report Types

- General categories of report?
- Report options for capacity planning?
- Specialized reports such as PCI?

The screenshot displays a web-based interface for configuring reports. It is divided into several sections:

- Report Definition:** Contains fields for 'Title' and 'Type'. The 'Type' dropdown is set to 'Custom', and a list of report categories is shown, with 'Capacity Planning' selected.
- Available Options:** A list of report widgets with expand/collapse icons, including Aruba License, Capacity Planning, Client Inventory, Client Session, Configuration Audit, Device Summary, Device Uptime, IDS Events, Inventory, Match Event, Memory and CPU Utilization, Network Usage, New Clients, New Rogue Devices, Port Usage, RADIUS Authentication Issues, RF Health, Rogue Clients, Rogue Containment Audit, and VPN Session.
- Report Restrictions:** Contains three dropdown menus for 'Group' (set to '-- All Groups --'), 'Folder' (set to '-- All Folders --'), and 'Filter by device type' (set to '-- All Device Types --').
- Scheduling Options:** Contains a 'Schedule:' field with radio buttons for 'Yes' and 'No', where 'No' is selected.

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Enterprise vs. Regional

- Enterprise console for big picture.
- How is the support team organized?
- Regional server grouped by similar time zone so can do maintenance.
- Regional support users can have their access restricted to a subset of the servers, even portions of servers.



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Enterprise Wide Console

- Enables a global view.
- Big picture for
 - Hardware deployed with software currently running.
 - License utilization.
 - Memory and CPU.
 - Uptime



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Questions?



Thank you



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