

Presented by
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MOBILE DEVICE FUNDAMENTALS



Wireless Devices – Mobility Categories

Stationary Devices



Wireless Scale

Somewhat Mobile Devices (SMD)



Manager Laptop

Highly Mobile Devices (HMD)



- **The most difficult WLAN to plan and implement is one with many highly mobile devices**

Device and Application Matrix

		Device Mobility Categories		
		Stationary Devices (SDs)	Somewhat Mobile Devices (SMDs)	Highly Mobile Devices (s)
Mobile Application Categories	Multi-Purpose Device	<ul style="list-style-type: none"> • PC 	<ul style="list-style-type: none"> • Laptop 	<ul style="list-style-type: none"> • Workstation on wheels • Smartphones and Tablets
	Single-Purpose Device	<ul style="list-style-type: none"> • Wireless scale • RFID reader 	<ul style="list-style-type: none"> • Barcode scanner • Point of Sale device 	<ul style="list-style-type: none"> • Handheld scanning terminal • Mobile printers • Vehicle-based data terminal • Robotic stock pickers • 802.11 RTLS Tag
	Voice Device	<ul style="list-style-type: none"> • IP desk phone • IP video camera 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • 802.11 voice handset • 802.11 voice badge

802.11n Client NICs

- 1x1 MIMO:1
 - Usually Atheros inside dual mode handhelds
 - iPhone4/4S, latest Android handsets
- 1x2 MIMO:1
 - Usually Broadcom and Intel inside netbooks
- 2x2 MIMO:2 (300 Mbps)
 - Usually Broadcom inside laptops, netbooks, Macs
- 2x3 MIMO:2 (300 Mbps)
 - Usually Intel 4965agn inside laptops
- 3x3 MIMO:2 (300/450 Mbps)
 - Atheros, Intel, Bcom for laptops



Six Design Pillars

1. Device Configuration

- Some device changes require corresponding changes to the WLAN infrastructure, e.g., basic rate support & DTIM.

2. Airtime Optimization

- Roaming devices are sensitive to RF congestion and inefficiencies. Improve performance using load balancing across APs & channels.

3. Roaming Optimization

- Roaming decisions can be influenced by optimizing data rates, output power, retry thresholds and by using the Handoff Assist feature.

4. IP Mobility Configuration

- Good IP mobility design is critical to environments. Selection of layer-2 (L2) or layer-3 (L3) roaming requires careful planning.

5. IP Multicast Optimization

- Reducing and optimizing multicast traffic over the air and on the wire is vital.

6. Interference Resistance

- Devices are likely to encounter and be impacted by adverse RF conditions.



Principle #1 – Device Configuration

Device

- Optimal device settings
- Shared or dedicated SSIDs
- Enable 802.11h
- Maximize battery life
- End-to-End QoS for voice devices
- Push-to-talk (PTT)
- Security and encryption
- Mobile device management (MDM)



Principle #2 – Airtime Optimization

Airtime

- RF Optimizations
 - Band steering
 - Spectrum load balancing
 - Airtime fairness
 - Mode-aware ARM
 - Voice/Video-aware ARM
 - Load-aware ARM
 - PS-aware ARM
- Reducing broadcasts and multicasts
- Limiting “Chatty” protocols
- AP capacity planning (voice devices)



Principle #3 – Roaming Optimization

- Ensuring complete Wi-Fi coverage
- VLAN pooling
- Fast roaming (802.11r & OKC)
- Device-specific roaming settings:
 - ARM power adjustments (match client and AP power)
 - Retry and failure settings (voice devices)

	PMK Cached				No PMK Cached		
	Intra-Controller Intra-VLAN	Intra-Controller Inter-VLAN	Inter-Controller Intra-VLAN	Inter-Controller Inter-VLAN	Intra-Controller Intra-VLAN	Intra-Controller Inter-VLAN	Inter-Controller Intra-VLAN
Min.	56 ms	62 ms	63 ms	56 ms	219 ms	223 ms	225 ms
Max.	86 ms	67 ms	70 ms	62 ms	257 ms	240 ms	240 ms
Avg.	68 ms	64 ms	66 ms	59 ms	231 ms	230 ms	233 ms

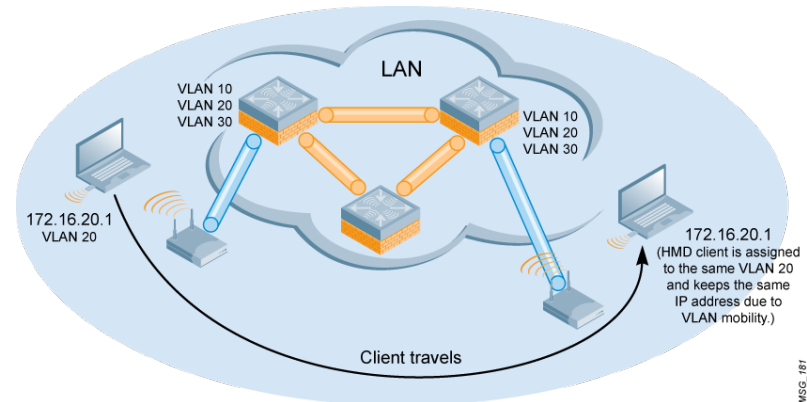
Cisco 7921g Roaming Performance (WPA2-AES Enterprise)



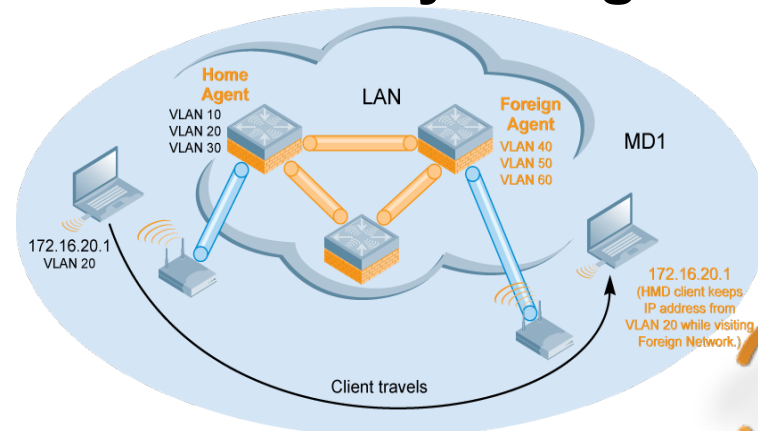
Principle #4 – IP Mobility Configuration

- Layer 2 mobility
 - Client maintains IP address as it roams and is assigned address from same IP subnet
- Layer 3 mobility
 - User roams from AP-Subnet A to an AP-Subnet B
 - Layer 3 network address must change to maintain L3 connectivity on Subnet B
 - Aruba L3 Mobility allows the roaming client to maintain the same IP address
- Choosing between L2 or L3 mobility

L2 Mobility design



L3 Mobility design



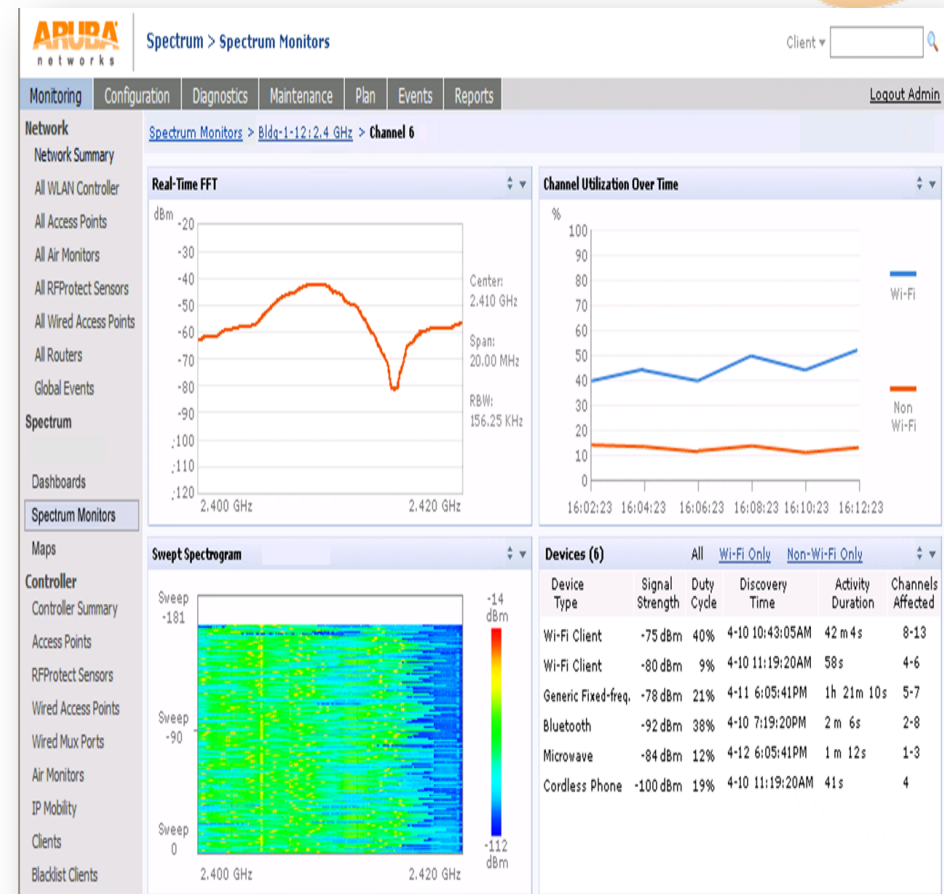
Principle #5 – IP Multicast Optimization

- Effects of multicast: reduce multicast traffic over the air and the wire to improve channel efficiency
- IGMP snooping/proxy to eliminate unnecessary data replication and controller processing
- Multicast rate optimization to increase lowest base rate
- Dynamic multicast optimization (DMO) to convert multicast frames with unicast headers
- Use of ToS/QoS on controller and wired infrastructure, port-based session ACL or user
- Block mDNS (if not required) with user roles
- Use bandwidth contracts to protect unicast traffic

Principle #6 – Interference Resistance

Interference

- FHSS and non-802.11 interference
 - Noise immunity
- Fixed frequency interference
- 802.11 co-channel (CCI) and adjacent channel interference (ACI)
 - RX sensitivity channel reuse
- Aruba Spectrum Analyzer





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