AIRHEADS
LAS VEGAS 2012

JOIN: community.arubanetworks.com
FOLLOW: @arubanetworks
DISCUSS: #airheadsconf
MOBILE DEVICE FUNDAMENTALS
## Mobile Device Fundamentals Topics

<table>
<thead>
<tr>
<th>Device Characteristics</th>
<th>WLAN Requirements</th>
<th>Aruba Design Pillars</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Portability</td>
<td>• Roaming</td>
<td>• Device Configuration</td>
</tr>
<tr>
<td>• Applications</td>
<td>• QOS and Access Control</td>
<td>• Airtime Optimization</td>
</tr>
<tr>
<td>• 802.11 support</td>
<td>• Speed and capabilities</td>
<td>• Roaming Optimization</td>
</tr>
<tr>
<td>• Management</td>
<td>• Security</td>
<td>• IP Mobility Configuration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• IP Multicast Optimization</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Interference Resistance</td>
</tr>
</tbody>
</table>
## WLAN Requirements for mobile devices

<table>
<thead>
<tr>
<th>Device Characteristic</th>
<th>Infrastructure Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portability</td>
<td>Roaming Support</td>
</tr>
<tr>
<td>Applications</td>
<td>QOS and Access Control</td>
</tr>
<tr>
<td>802.11 type</td>
<td>Speed and Capabilities</td>
</tr>
<tr>
<td>Management</td>
<td>Security</td>
</tr>
</tbody>
</table>
What is roaming?

- Client moving between APs in the same building
- Client associating to a new AP (BSS) using the same SSID

![Diagram](image-url)
Mobile device types - Portability

Stationary Devices

Somewhat Mobile Devices (SMD)

Highly Mobile Devices (HMD)

Characteristics

Increased need for Roaming Support

Wireless Scale

Laptop

#airheadsconf
HMD WLAN Roaming Challenges

- Continuous roaming
- Device is in use while roaming
- Roaming transitions should be undetectable to user
- APs must continually balance client load
- APs must provide consistent performance
- RF interference
Use of mobile devices

- Mobile Devices
- Multimedia
- Collaboration
- Virtual Desktops
## Mobile device types - Applications

<table>
<thead>
<tr>
<th>Mobile Application Categories</th>
<th>Stationary Devices (SDs)</th>
<th>Somewhat Mobile Devices (SMDs)</th>
<th>Highly Mobile Devices (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Multi-Purpose Device</strong></td>
<td>• PC</td>
<td>• Laptop</td>
<td>• Workstation on wheels</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Smartphones and Tablets</td>
</tr>
<tr>
<td><strong>Single-Purpose Device</strong></td>
<td>• Wireless scale</td>
<td>• Barcode scanner</td>
<td>• Handheld scanning</td>
</tr>
<tr>
<td></td>
<td>• RFID reader</td>
<td>• Point of Sale device</td>
<td>terminal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Mobile printers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Vehicle-based data</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>terminal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Robotic stock pickers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 802.11 RTLS Tag</td>
</tr>
<tr>
<td><strong>Voice Device</strong></td>
<td>• IP desk phone</td>
<td>• N/A</td>
<td>• 802.11 voice handset</td>
</tr>
<tr>
<td></td>
<td>• IP video camera</td>
<td></td>
<td>• 802.11 voice badge</td>
</tr>
</tbody>
</table>
Multipurpose device attributes affecting roaming

- Wireless Network Interface Card (NIC) chipset and radio
- NIC driver vendor and revision
- NIC antenna (single, dual, diversity)
- NIC wireless support (802.11a, b, g, n)
- Client Supplicant and WLAN software
- Operating system and network protocol stack
Application based QOS

Best Effort
- Web
- Email
- Print

High Priority
- Voice
- Video
- Multi-media
Mobile device 802.11 type

- 54 Mbps
  - 802.11a/g

- 150 Mbps
  - 1x2 MIMO:1

- 300 Mbps
  - 2x2 MIMO:2
  - 2x3 MIMO:2
  - 3x3 MIMO:2
Device management

Corporate Managed Device

Corporate Laptops

Non-Corporate Device

BYOD - Bring your own device
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, and retry thresholds.

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

- Optimal device settings
- Shared or dedicated SSIDs
- Enable 802.11h (DFS/TPC)
- 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

- 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 Caching results in 4x faster roaming speeds than Non-PMK Caching.
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
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

- 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 Monitor
THANK YOU!