Balajee Krishnamurthy
Aruba Networks
March 2012

VOICE AND VIDEO OVER WI-FI

Agenda

- Multimedia over WLAN Challenges
- Generic Design Recommendations for Multimedia
- Aruba Enablers for Voice
- Aruba Enablers for Multicast Video
- Enterprise Application – Collaboration & VDI

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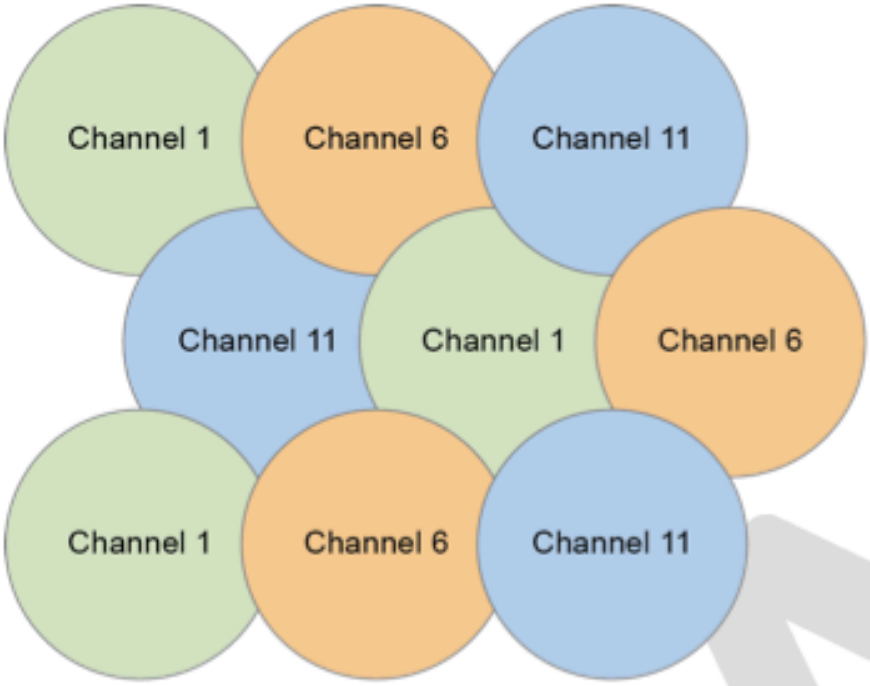
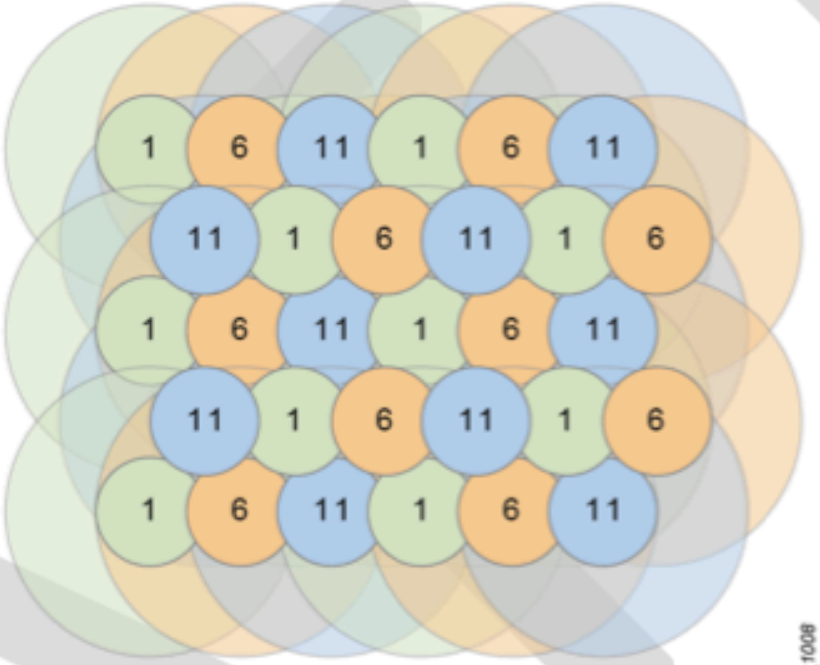
RF Challenges: Capacity, not Coverage



Coverage design with 7.2 Mb/s cell edge



Capacity design with 216.7 Mb/s cell edge

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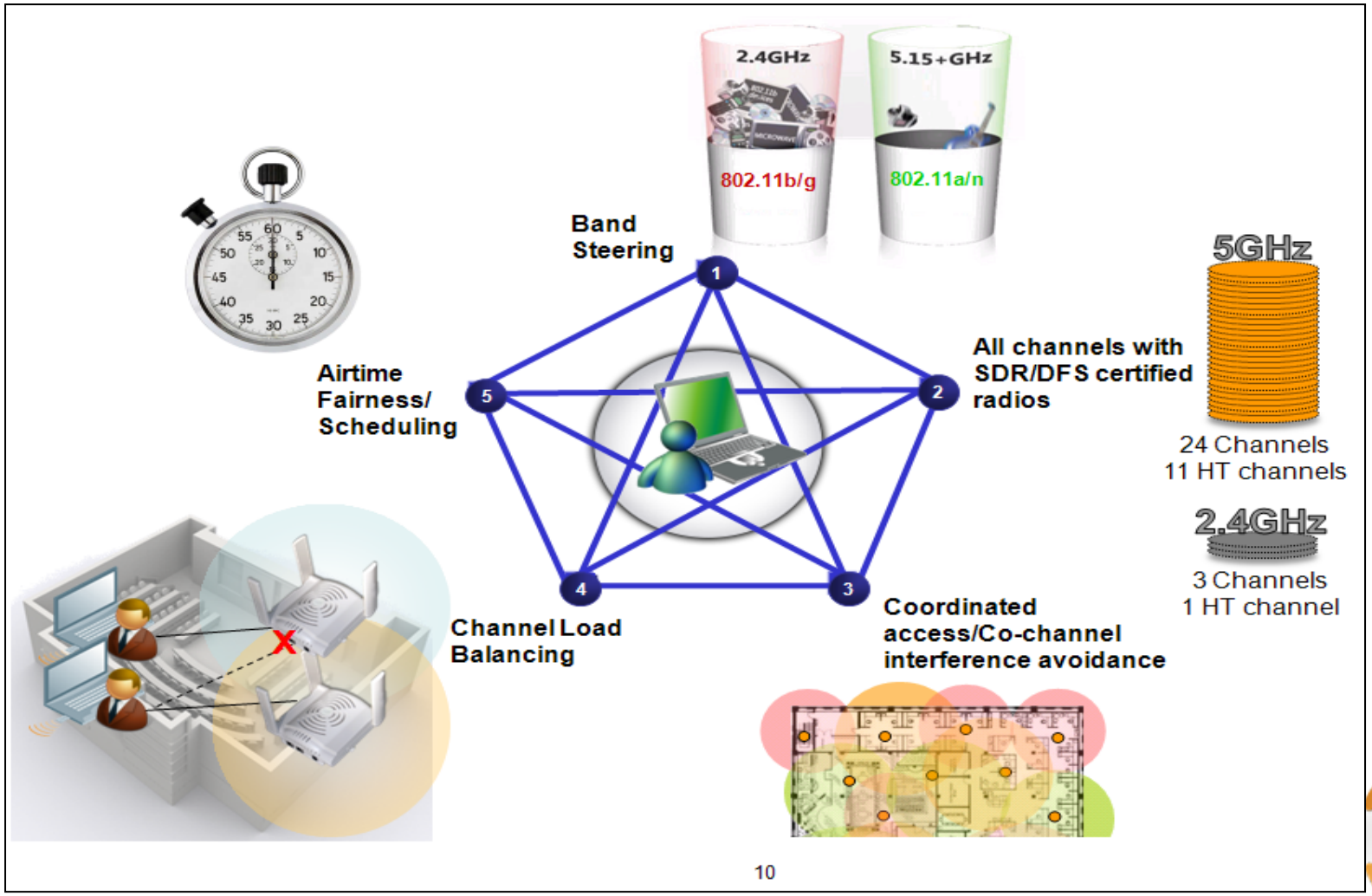
RF Challenges: Assured Bandwidth



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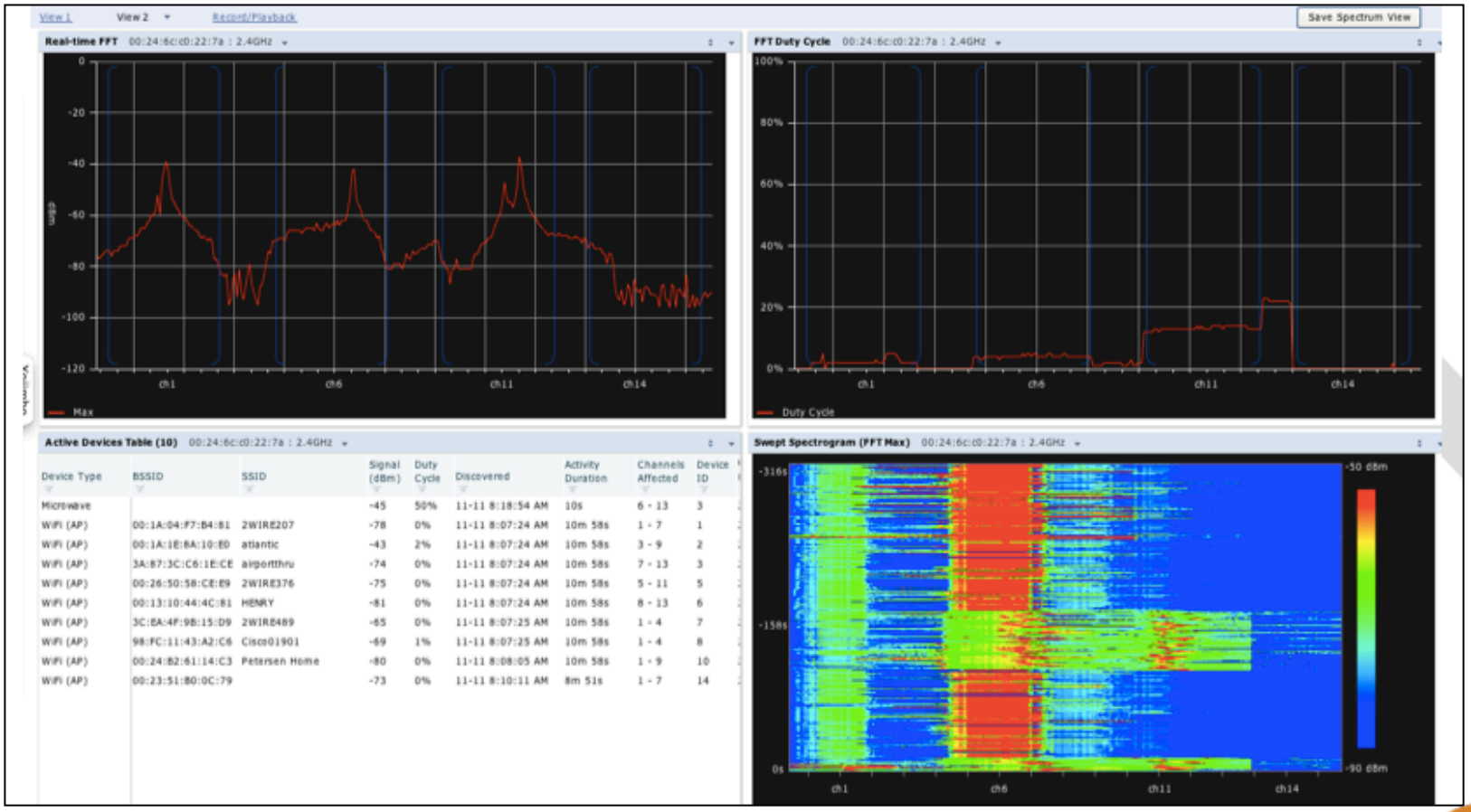
RF Challenges: Interference Avoidance



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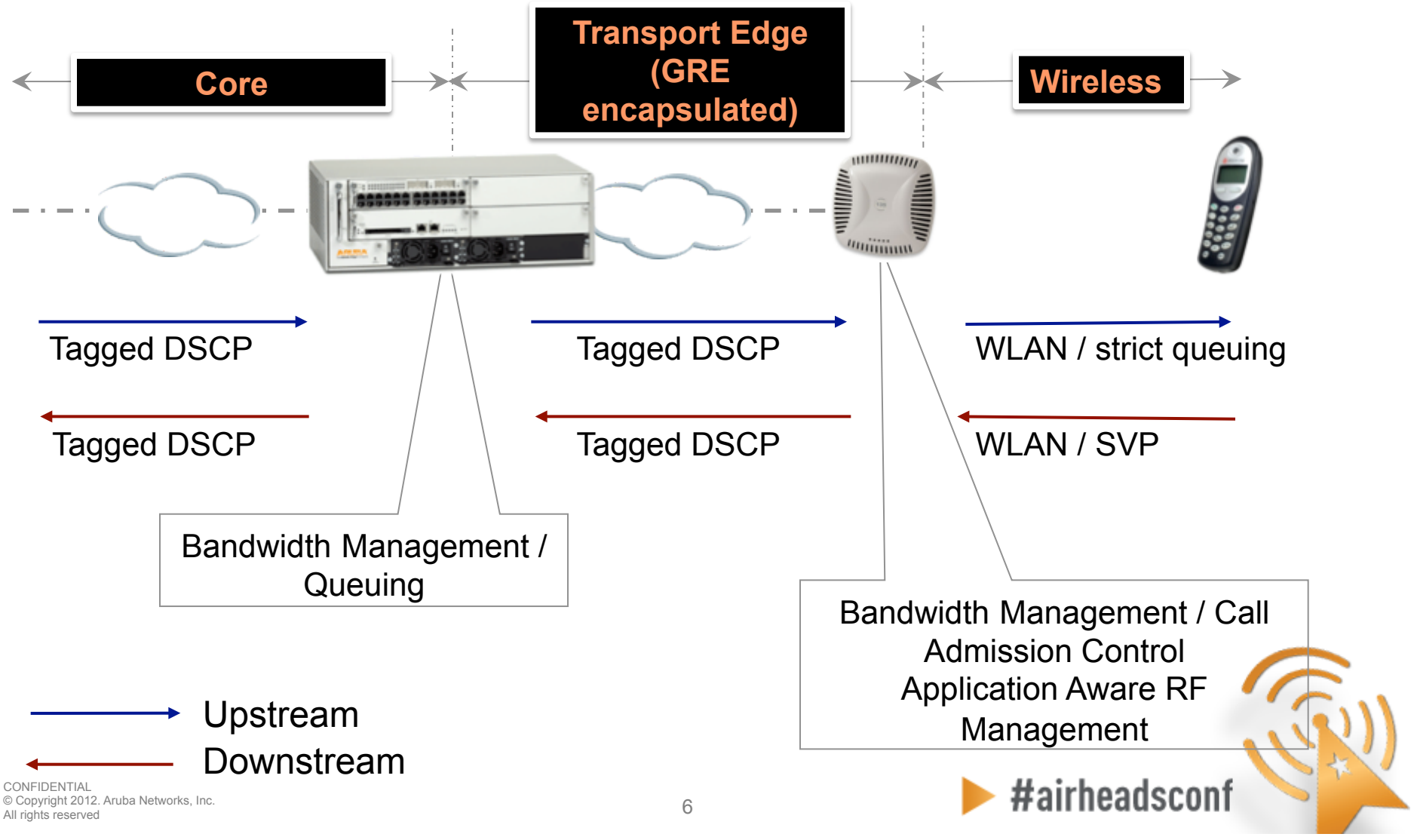
End-to-End QoS: Introduction



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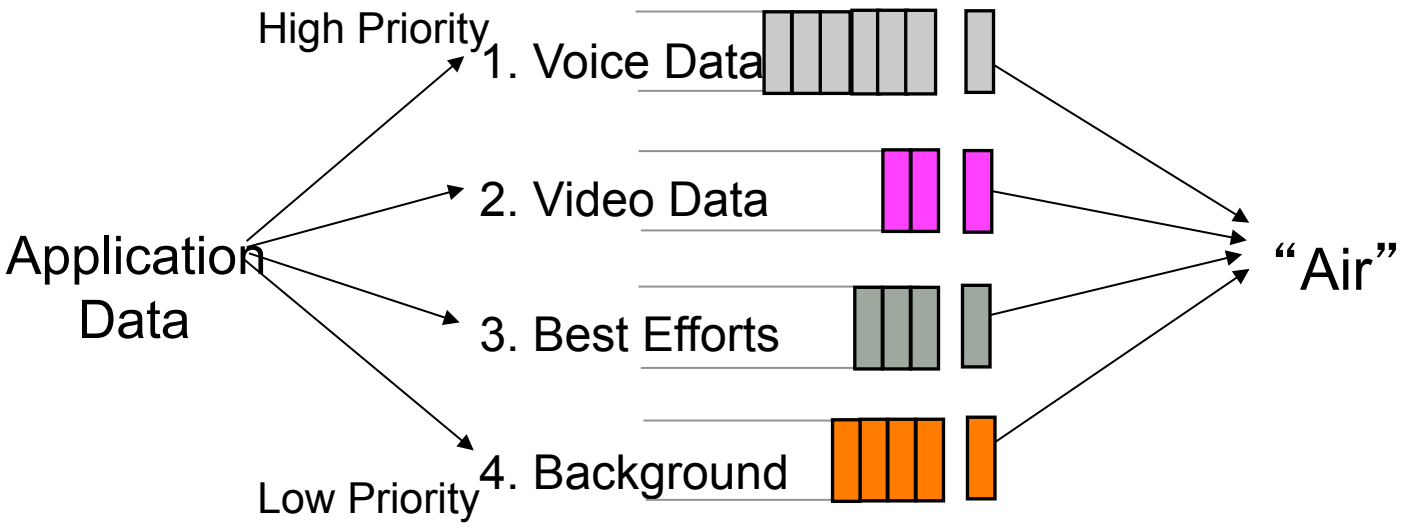
End-to-End QoS: WMM Support



1. WMM Specifies how priority queues map to DSCP and dot1P tags
2. Different access categories, different contention parameters
3. 4 queues per radio; 8 queues total; supported on all APs
4. Voice and video gets priority over data

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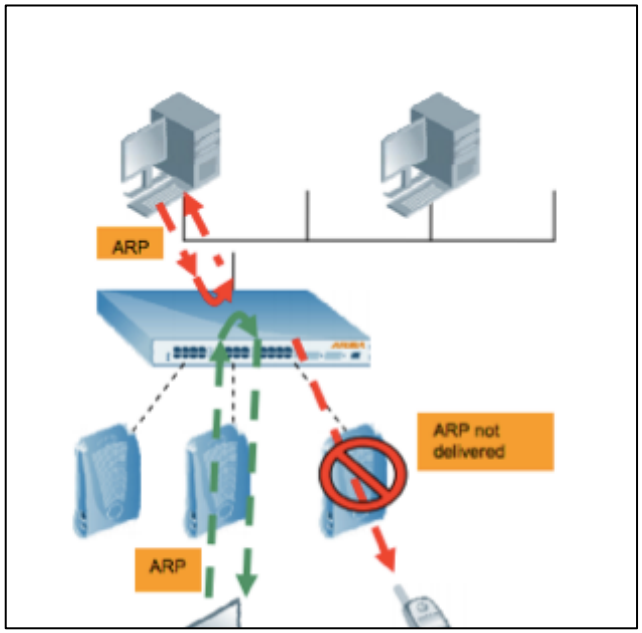
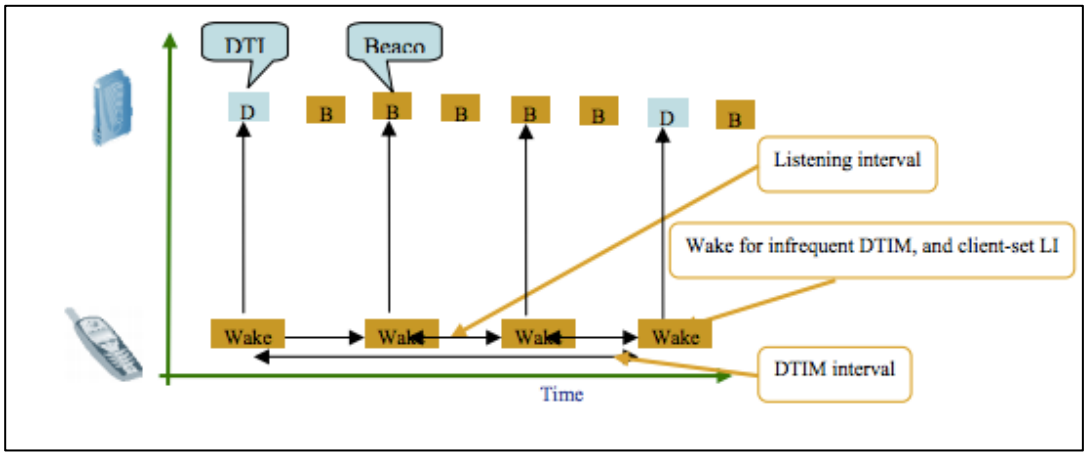
Client Battery Life Challenges





1. WMM UAPSD support – increased power saving, increased cell capacity
2. Distribute TIM so that clients need not receive every beacon frame (~100 ms)
3. With Proxy ARP controller responds to ARP requests enabling clients to sleep longer
4. Traffic filtering at the AP to avoid extraneous multicast/broadcast frames

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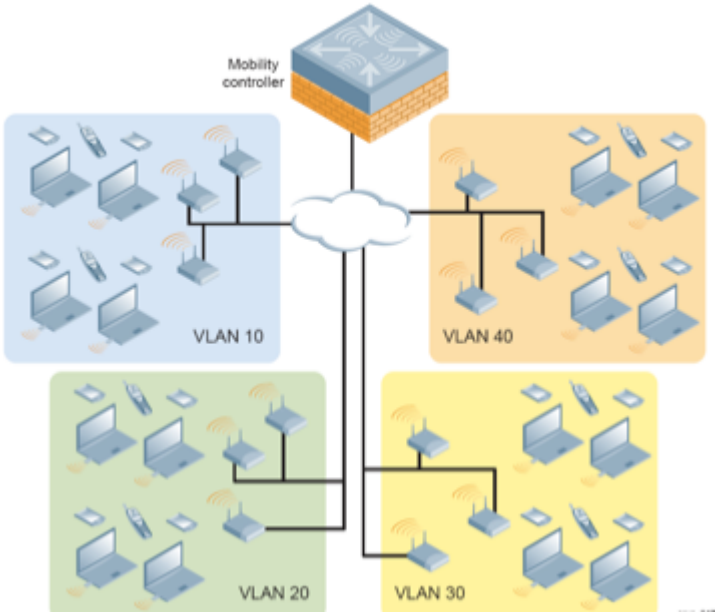
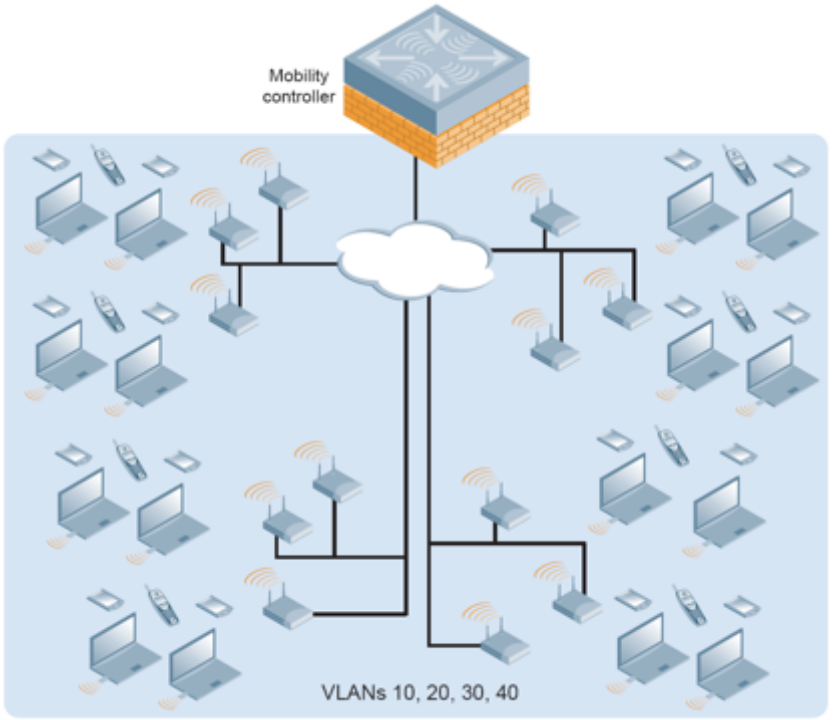
Scaling Challenges: VLAN Pooling





1. Aruba VLAN Pooling allows a set of VLANs to be assigned to a designated group of users
2. Can use VLANs that already exist in the enterprise
3. Enables IP address and session persistence

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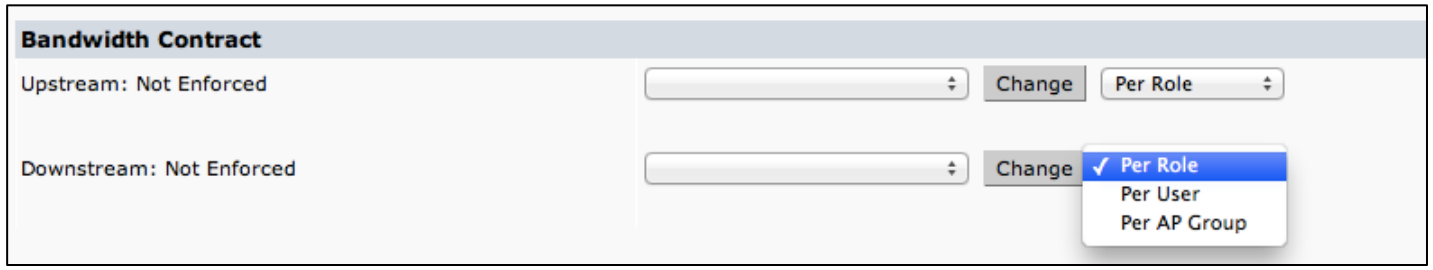
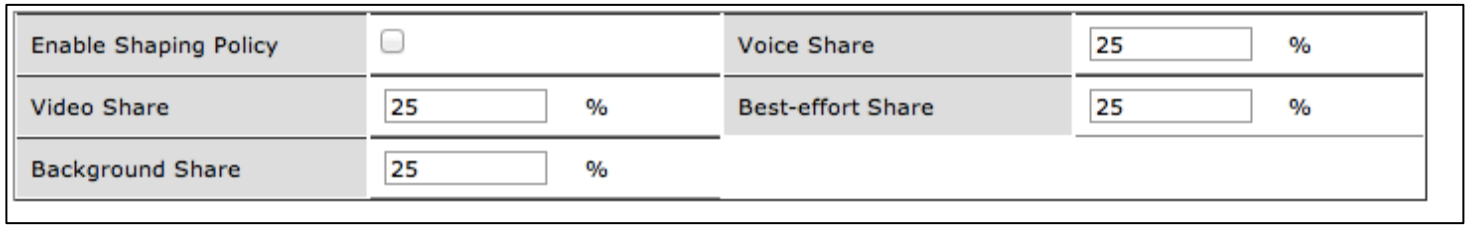
Bandwidth Management

Implementation Rules

- Per role-based bandwidth contract
- Per user-based bandwidth contract



- Per SSID-based bandwidth contract



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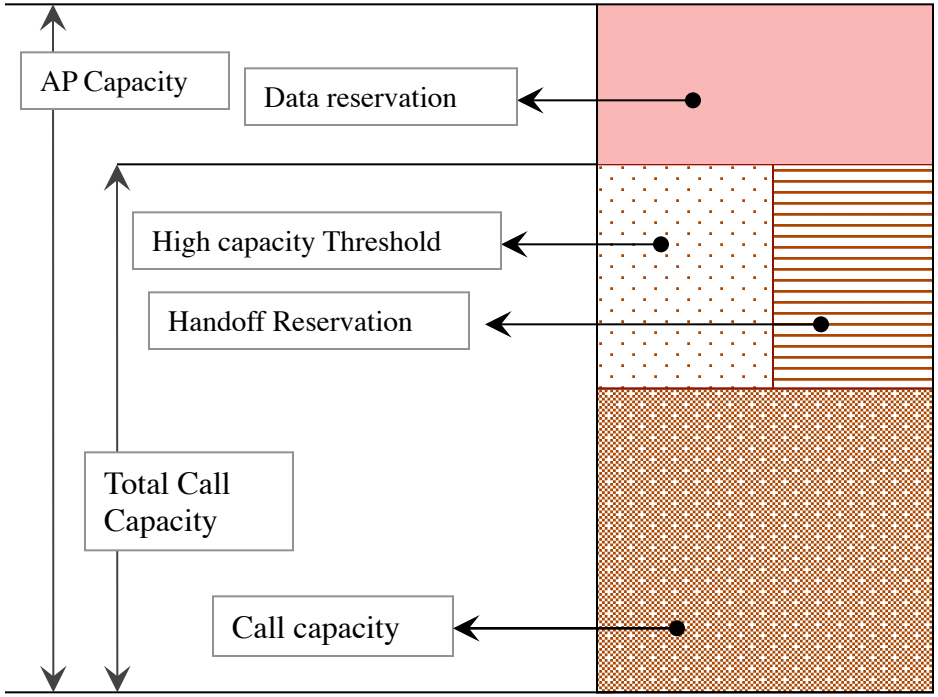
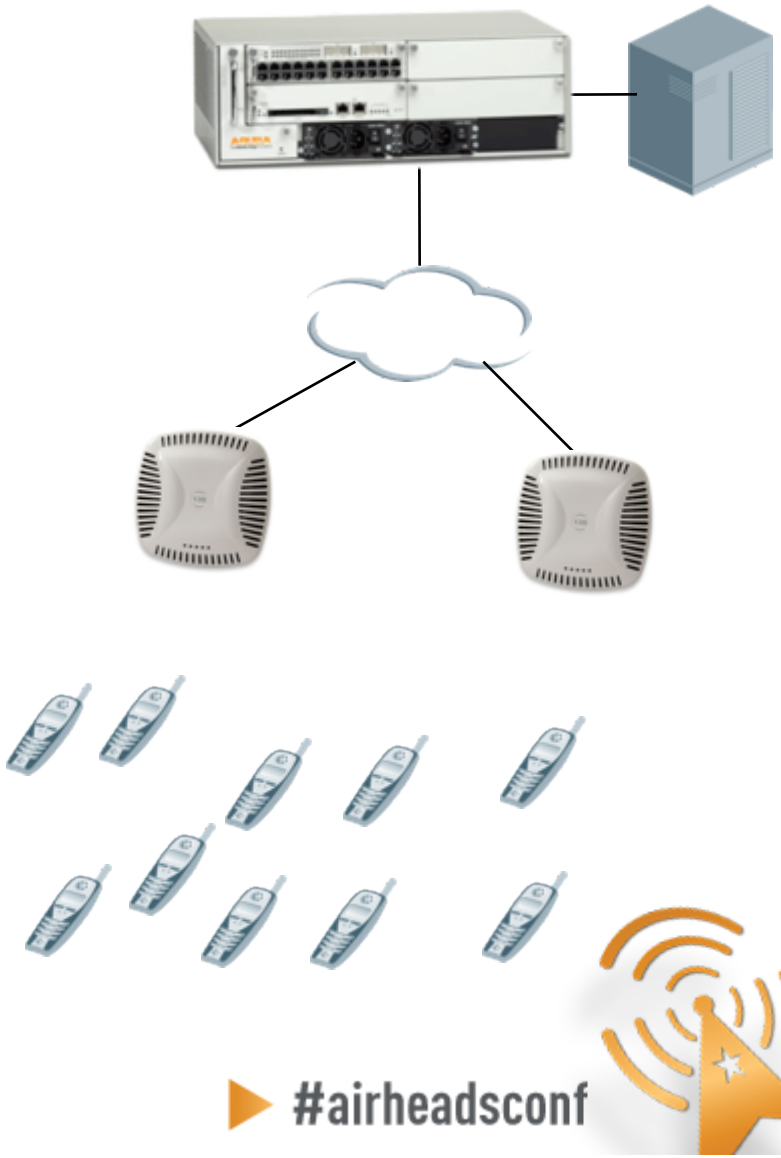
Bandwidth Management: Call Admission Control

Example : Configured Max calls per AP = 6

High capacity threshold = 2

Handoff threshold = 2





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Call Admission Control - Example

Example : Configured Max calls per AP = 6

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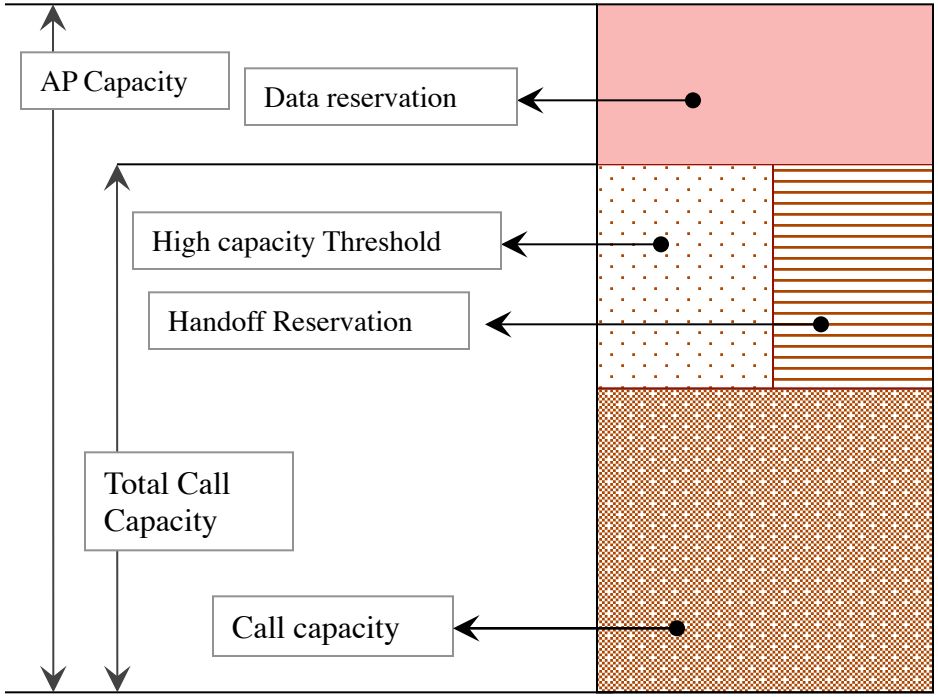
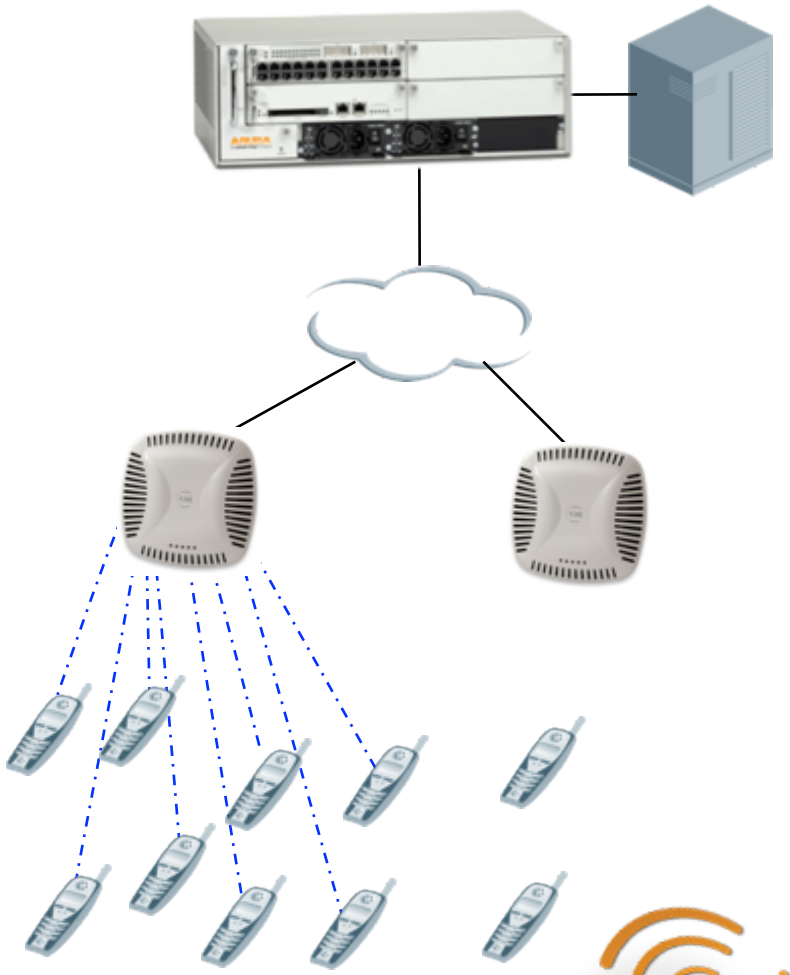
Handoff threshold = 2





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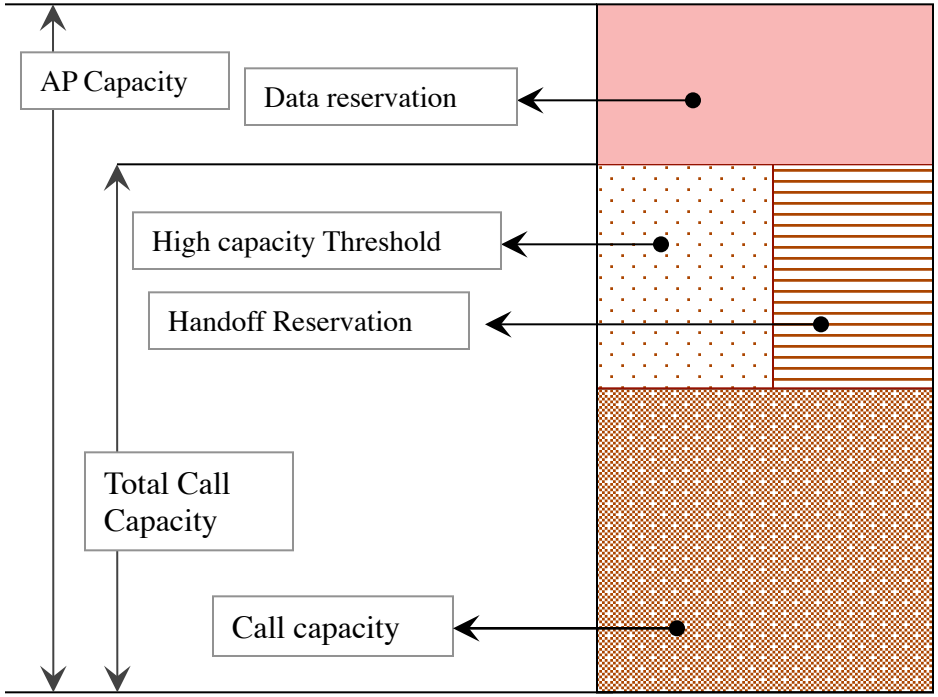
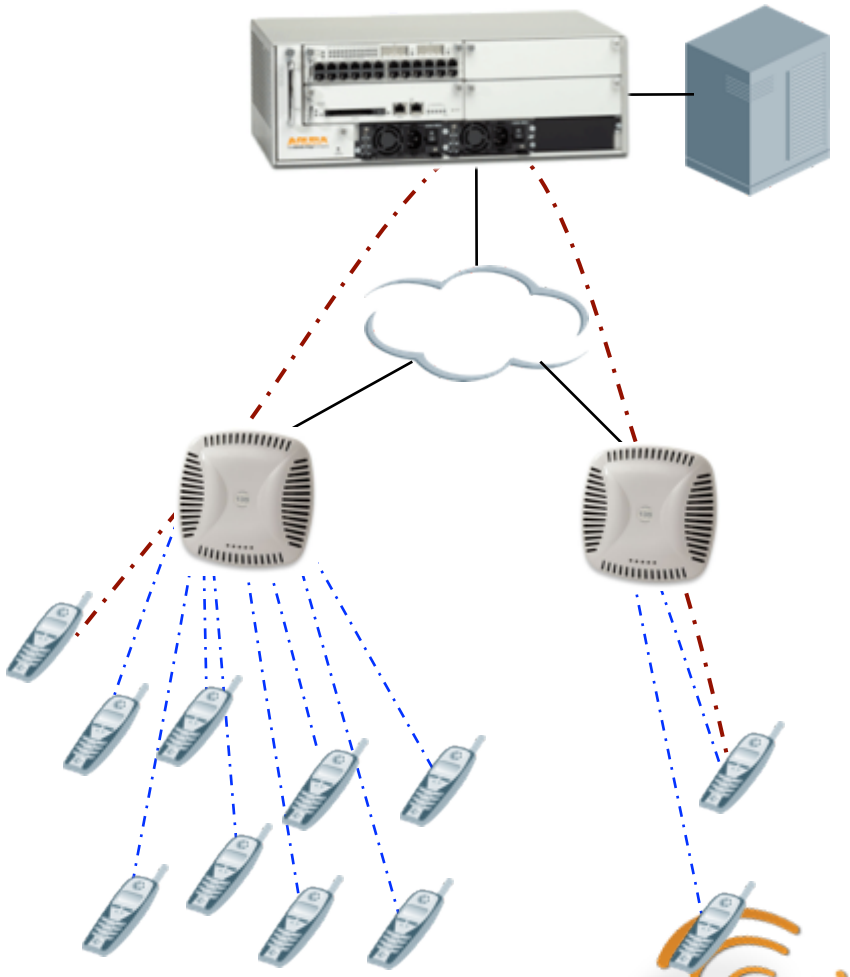
Call Admission Control - Example

Example : Configured Max calls per AP = 6

High capacity threshold = 2

Handoff threshold = 3





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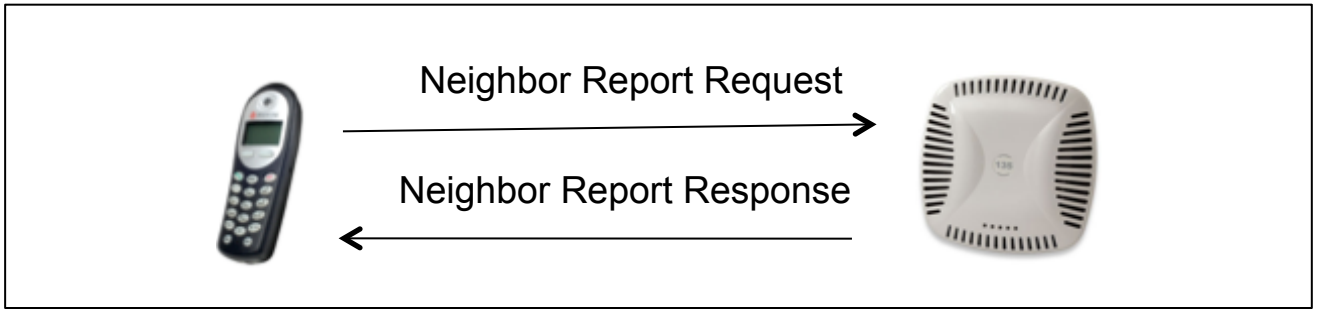
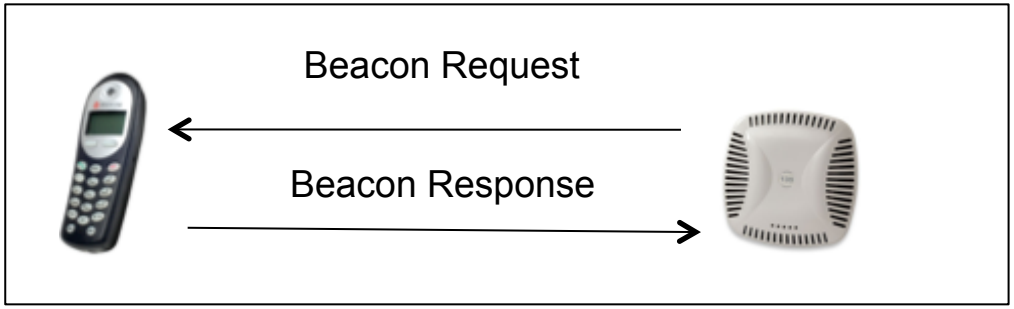
Mobility & Roaming: Enterprise Voice Certification (Co-operative Client Control)

1. **Real time data collection with 802.11k**

   - Neighbor Report (What is the AP seeing over the air)



   - Beacon Report (What is client seeing over the air)



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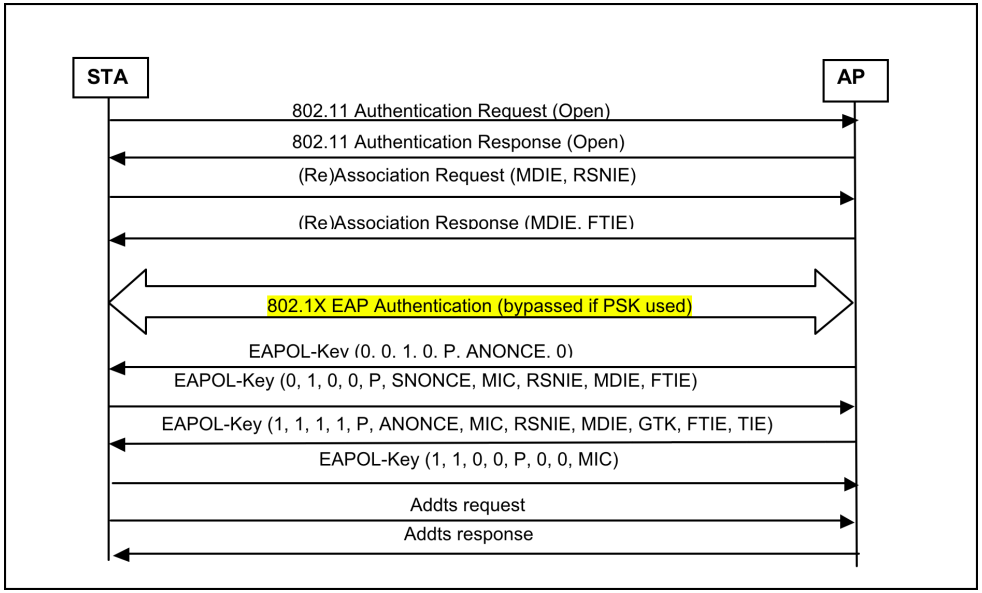
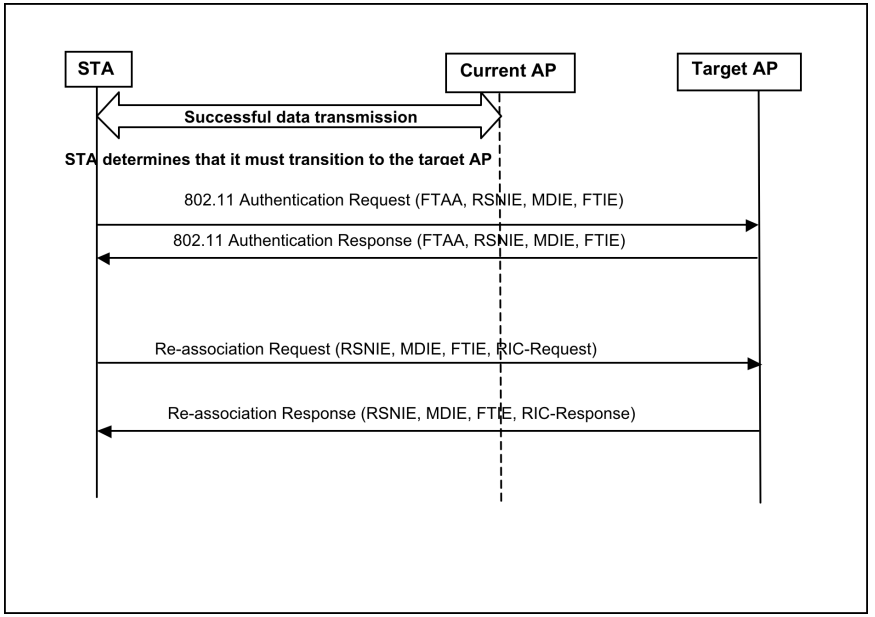
Mobility & Roaming: Enterprise Voice Certification





The handover delay from one AP to the other is reduced significantly; security and QoS states synchronized before roam

1. Minimize delay in a clients transition from one BSS to another
2. Establishment of Security and QoS states at the target AP prior to/during association
3. Reduces handover delays to up to 50 ms, enhances voice performance
4. Requires support on the WLAN and the client side

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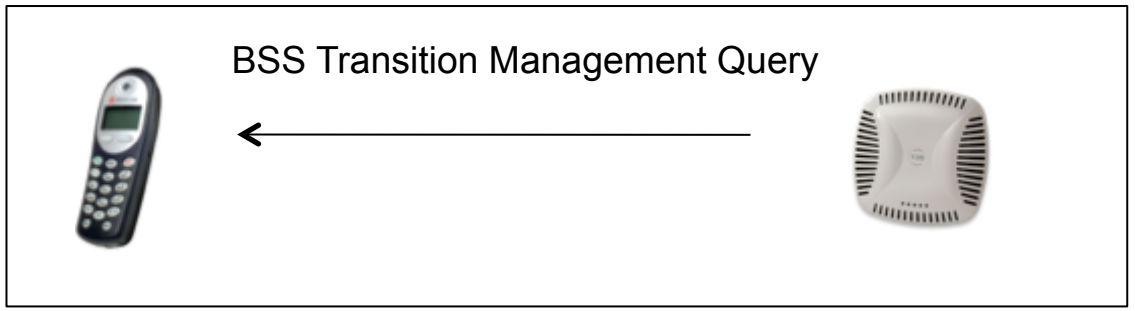
Mobility & Roaming: Enterprise Voice Certification



With 802.11v, AP encourages clients to roam to the best AP utilizing information from 11k, 11r

- Encouraging the AP to to a BSS transition
- Uses the system level view obtained by the beacon and neighbor reports from 11k
- Helps in admission control
- Requires WLAN and client support

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Mobility & Roaming: Fast Roaming Enablers

	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

1. **Security determines handover performance**
   1. Need 802.1X security with PSK speed
   2. Use WPA2 with 802.1X and opportunistic key caching (OKC) in centralized-controller WLAN; 11k/11r (future)
2. **Session awareness for L3 roaming, voice aware dot1x re-rekeying**

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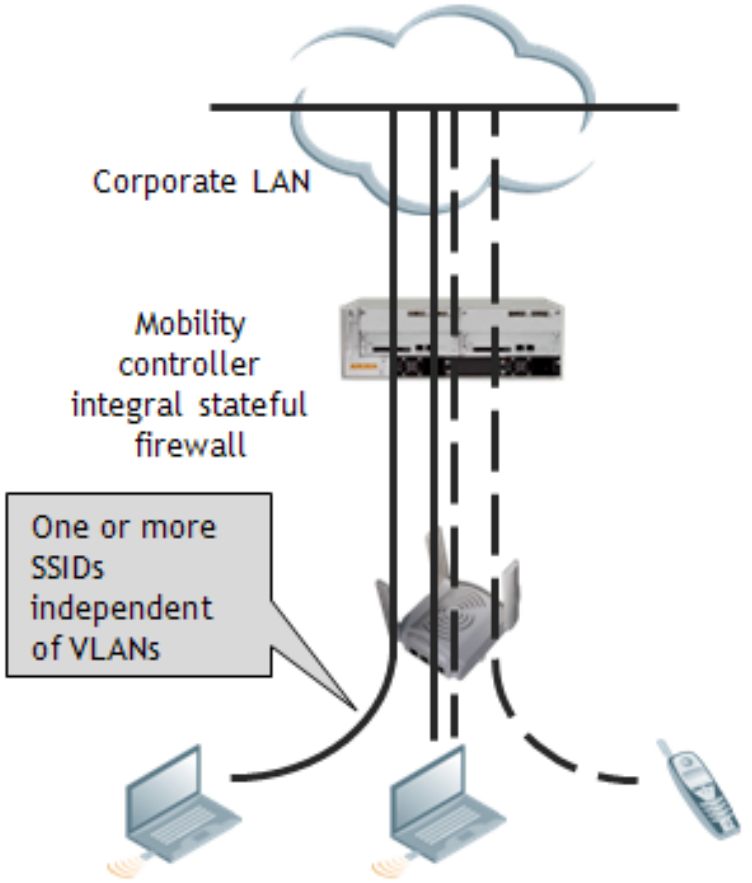
ALGs: Voice Separation by Firewall

1. ALG support for most common voice protocols
2. ALGs include - SIP, SCCP, H323, NOE, Vocera etc.
3. Constantly adding newer ALGs



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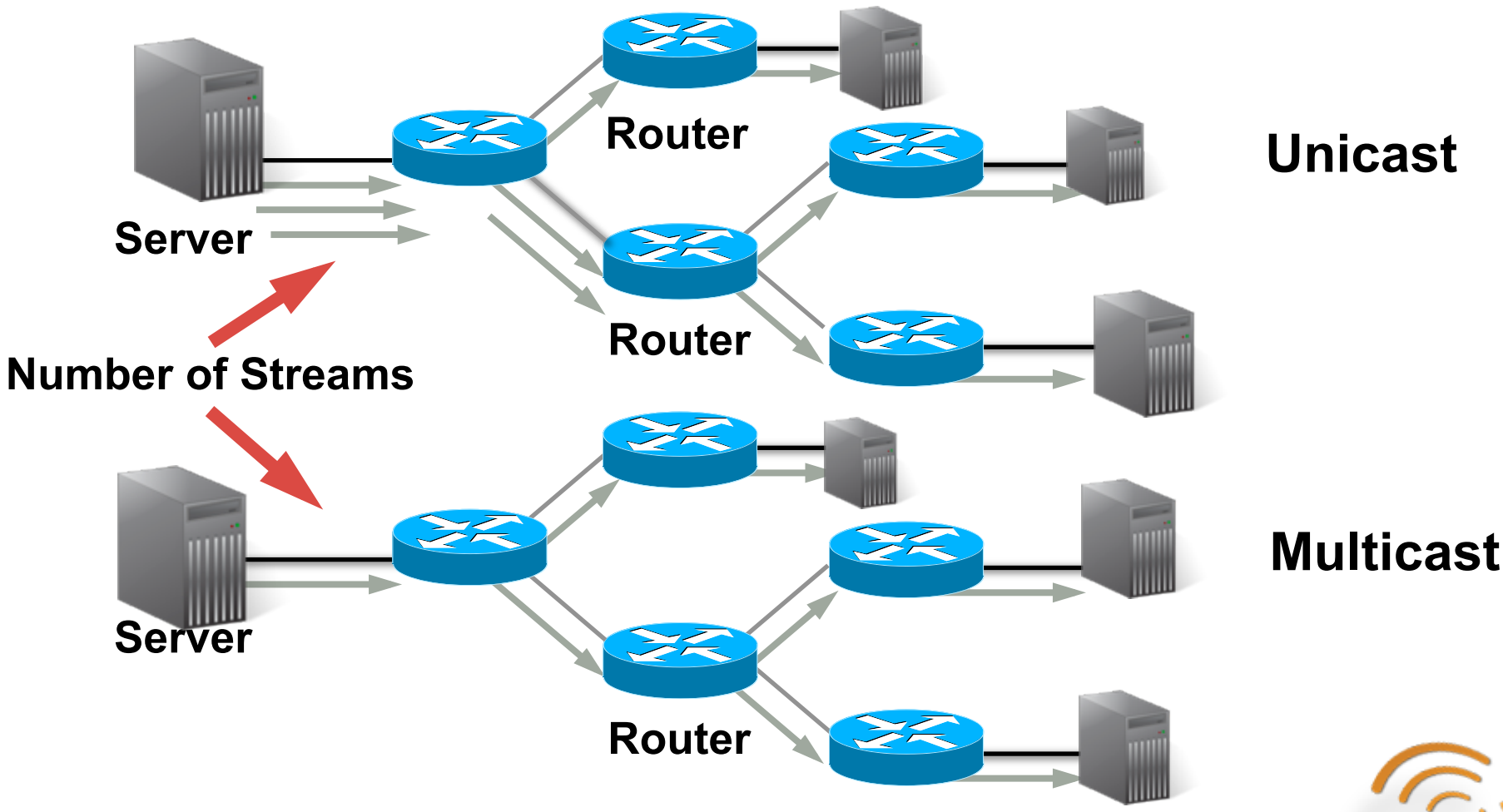
Introduction: Multicast vs. Unicast



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Multicast – Why and Why not?

Benifits

- Efficiency – reduced network traffic, reduced server and CPU load
- Performance – eliminates traffic redundancy
- Application – enabled distributed applications for different verticals

Challenges

- Best effort Delivery, no QoS guarantees – poor quality, drops are to be expected
- No error correction – fire and forget
- Sent out at low control rates; 1 MB for b/g, 6 Mb for a

Impact

- ***Does not utilize 802.11 N High Throughput data rates***
- ***Heavy utilization of channel due to high rate of very slow packets***
- ***Video delivery is not reliable causing poor Quality of Experience***

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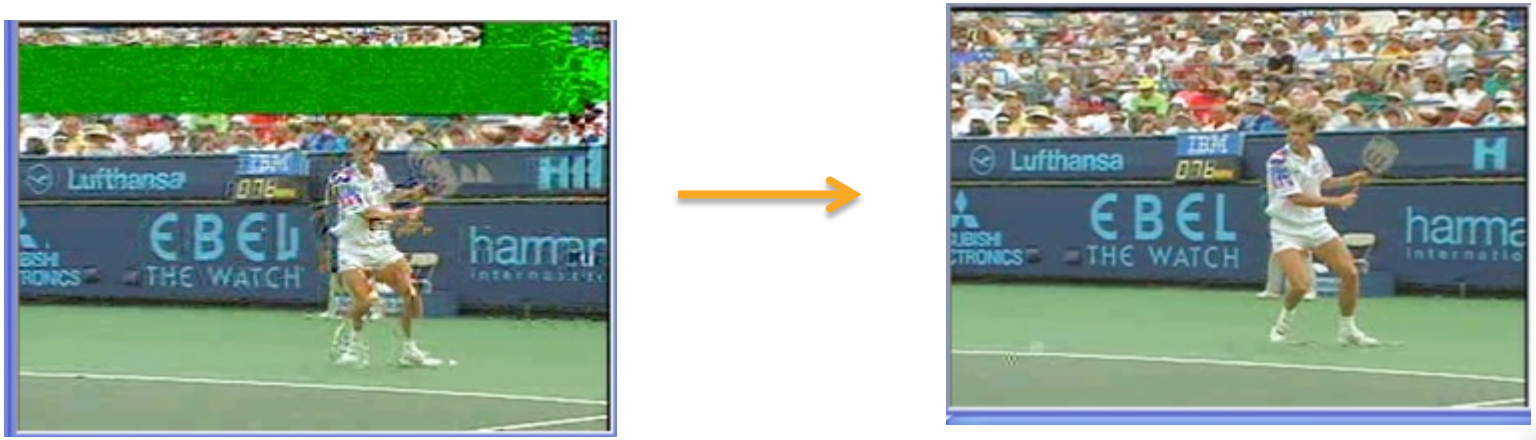
Cure to Video over WLAN Challenges

1. Wired Optimization
2. Wireless Optimization
3. Video Detection & Traffic Prioritization
4. Video Transport Optimization
5. Active Network and RF Client Control



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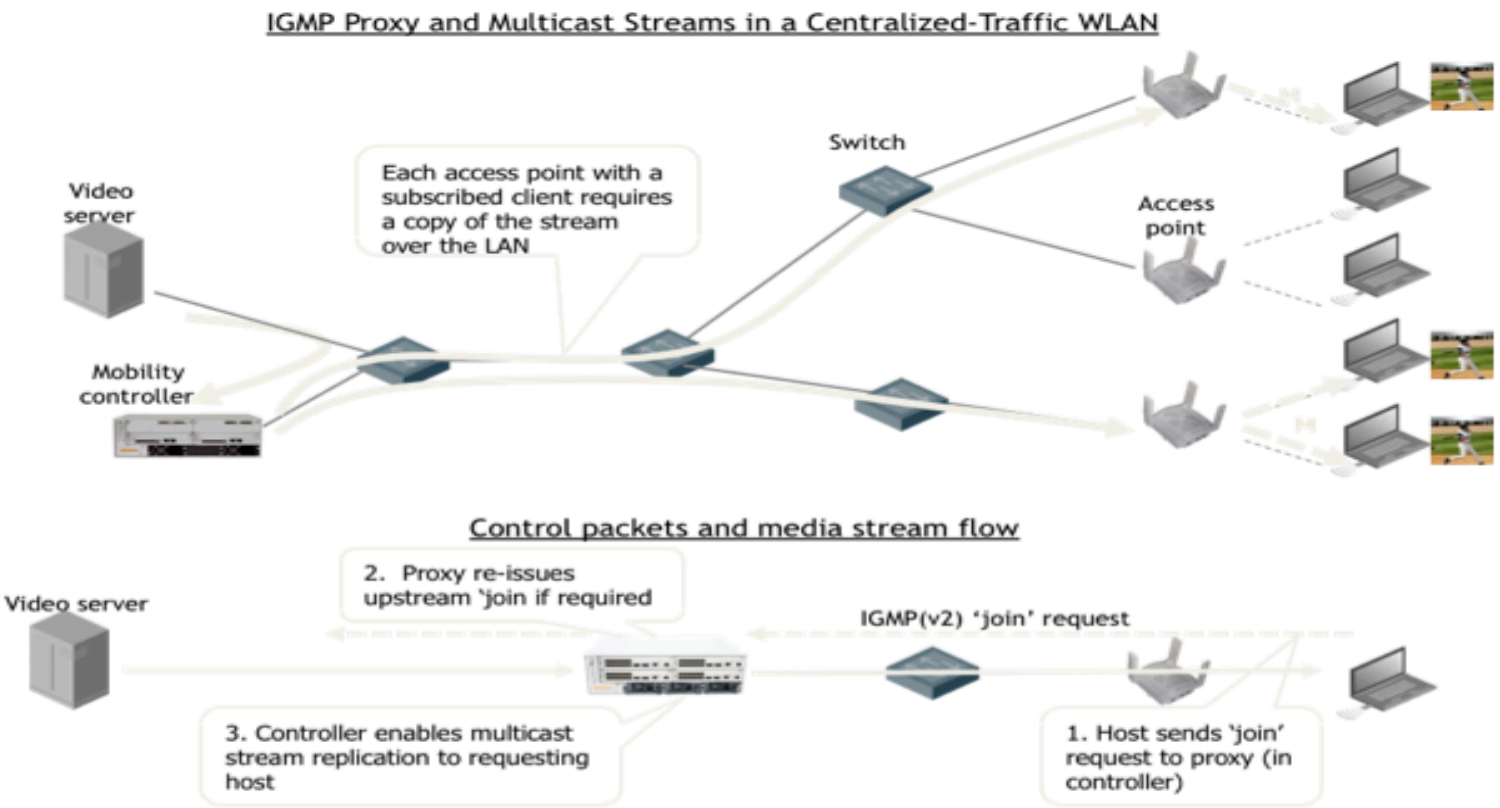
Wired Optimization with IGMP Proxy



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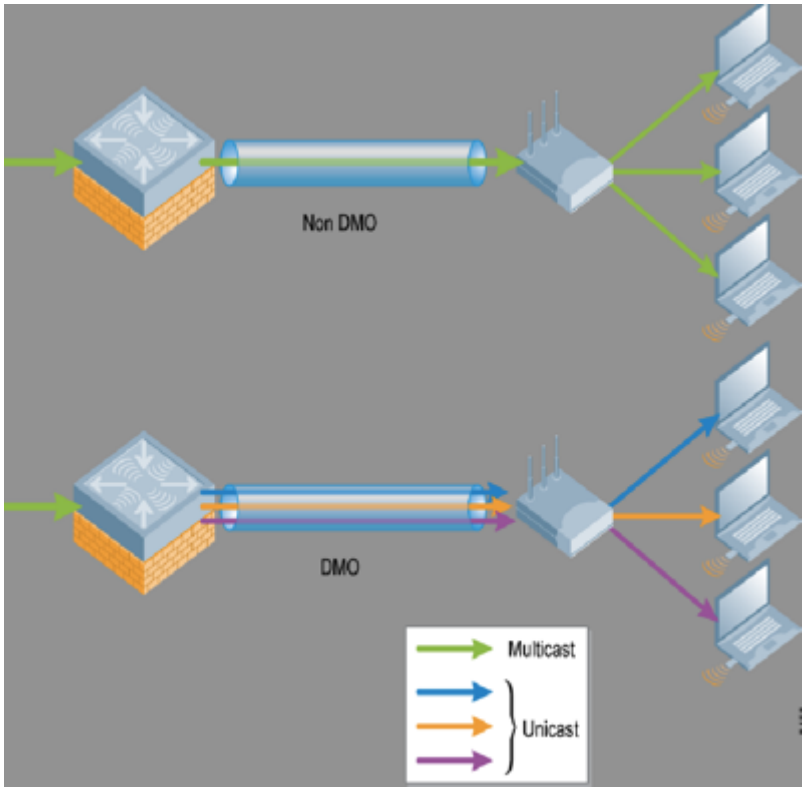
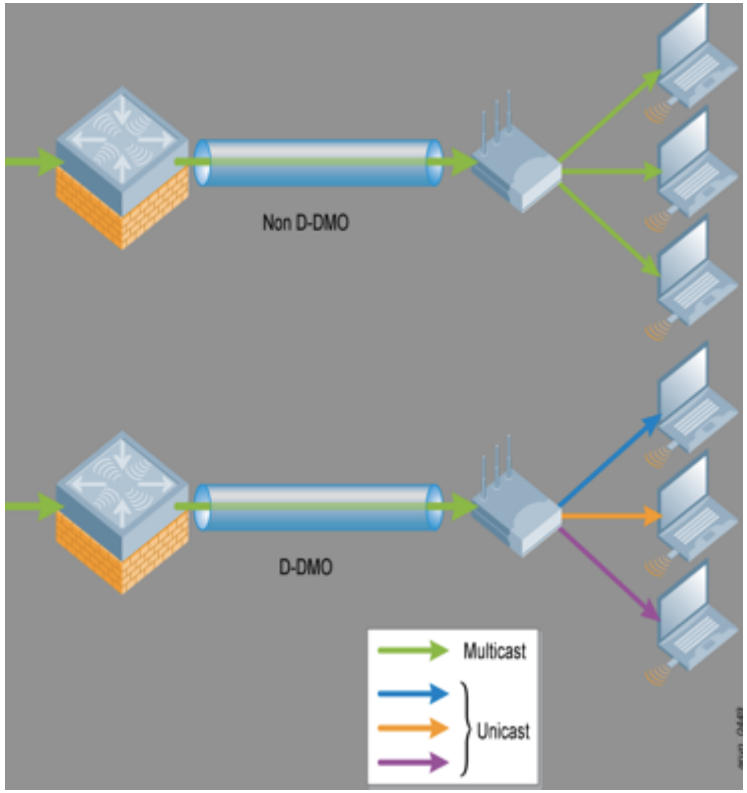
Aruba Video Optimization – Multicast to Unicast Conversion



Dynamic Multicast Optimization (Conversion at the WLAN Controller)



Distributed Dynamic Multicast Optimization (Conversion at the AP)

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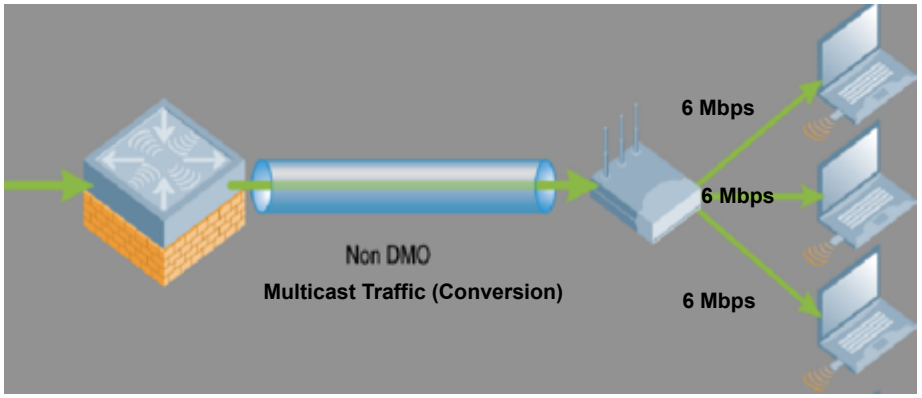
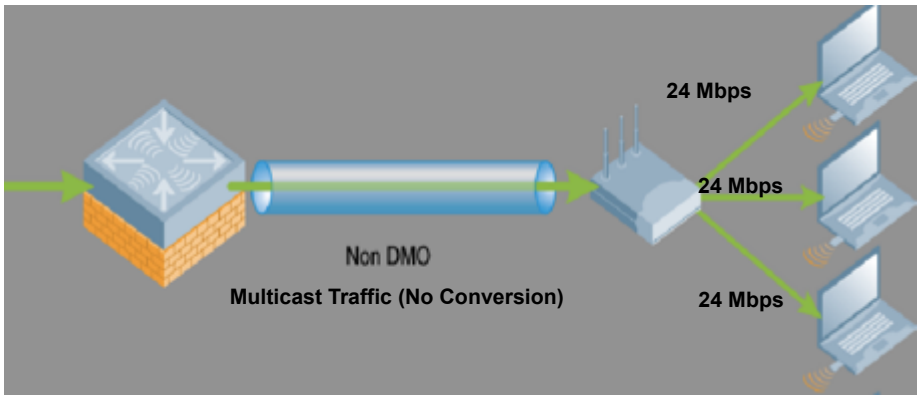
Aruba Video Optimization – Multicast Rate Optimization





Without any special tuning, multicast packet will be sent at either ‘basic rate’ or ‘support rate’ whichever is lower. For example, if I have the following:

```
802.11a Basic Rates                18 24
802.11a Transmit Rates             6 9 12 18 24 36 48 54
```

Multicast/Broadcast packet will be sent at 6 Mbps since it’s the lowest of all rates. This applies to ‘N’ as well.

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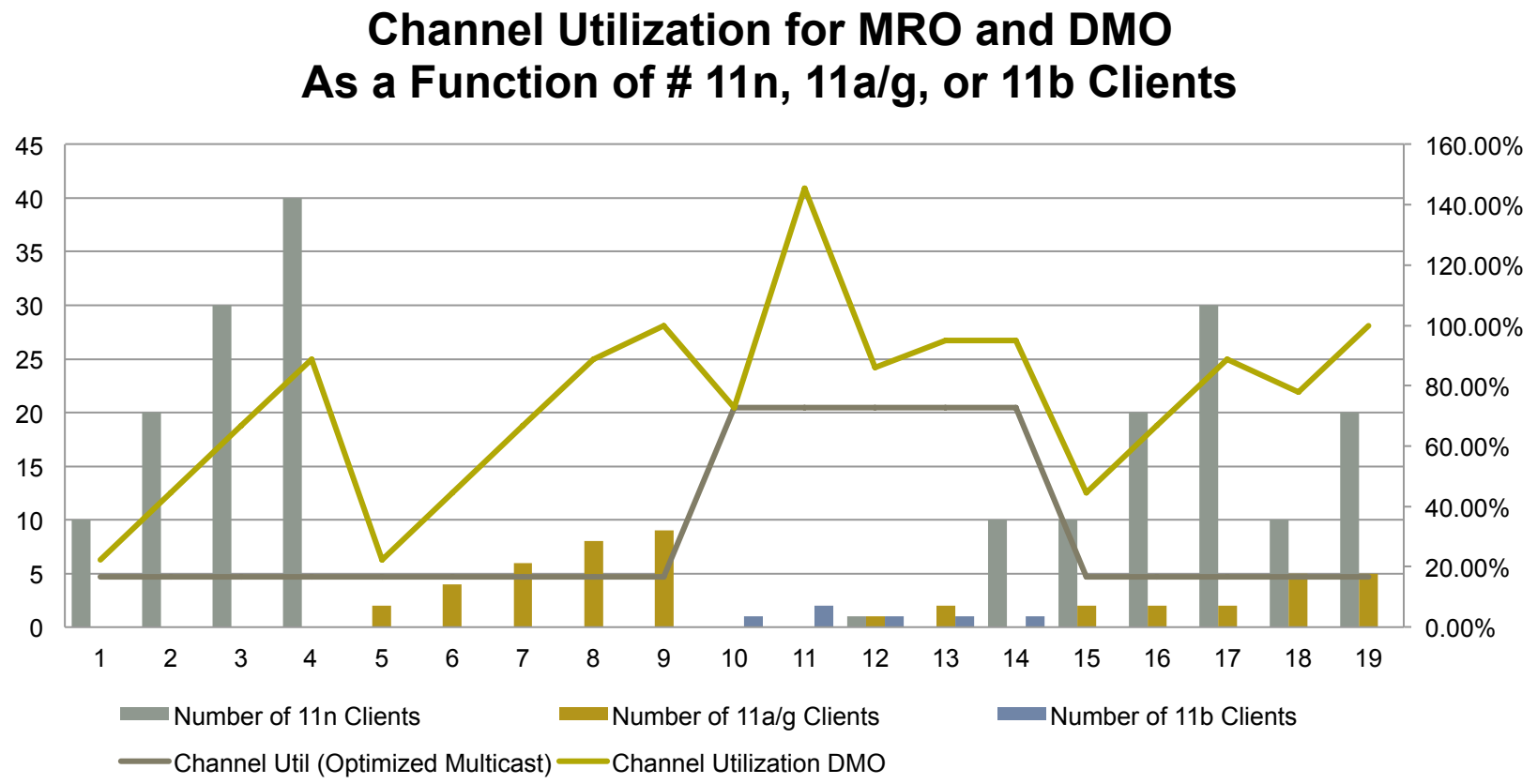
Scaling Criteria for Video over Wi-Fi



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Media Classification

- To detect a Media flow type where the Signaling is encrypted
- Methods developed for identifying voice and video for
  - Microsoft OCS
  - Apple FaceTime
- After classification apply appropriate service to flow
- When identified tag the frame for transport
- Media Classification assumes data immediately follows signaling

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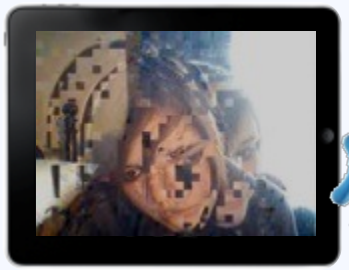
Business Critical Apps: Citrix

Before: All traffic receives Static QoS



App: Unknown??
QoS: Static

ICA

- Enforce QoS
- ICA Visibility

After: QoS based on traffic type

ICA

App: EMR
QoS: Highest (VI)

App: Video
QoS: High (VO)

App: File Sharing
QoS: Low (BE)

WAN

Aruba
Access
Network

- Classify ICA
- Tag QoS

DATACENTER

NetScaler

XenDesktop
XenApp
Farm

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