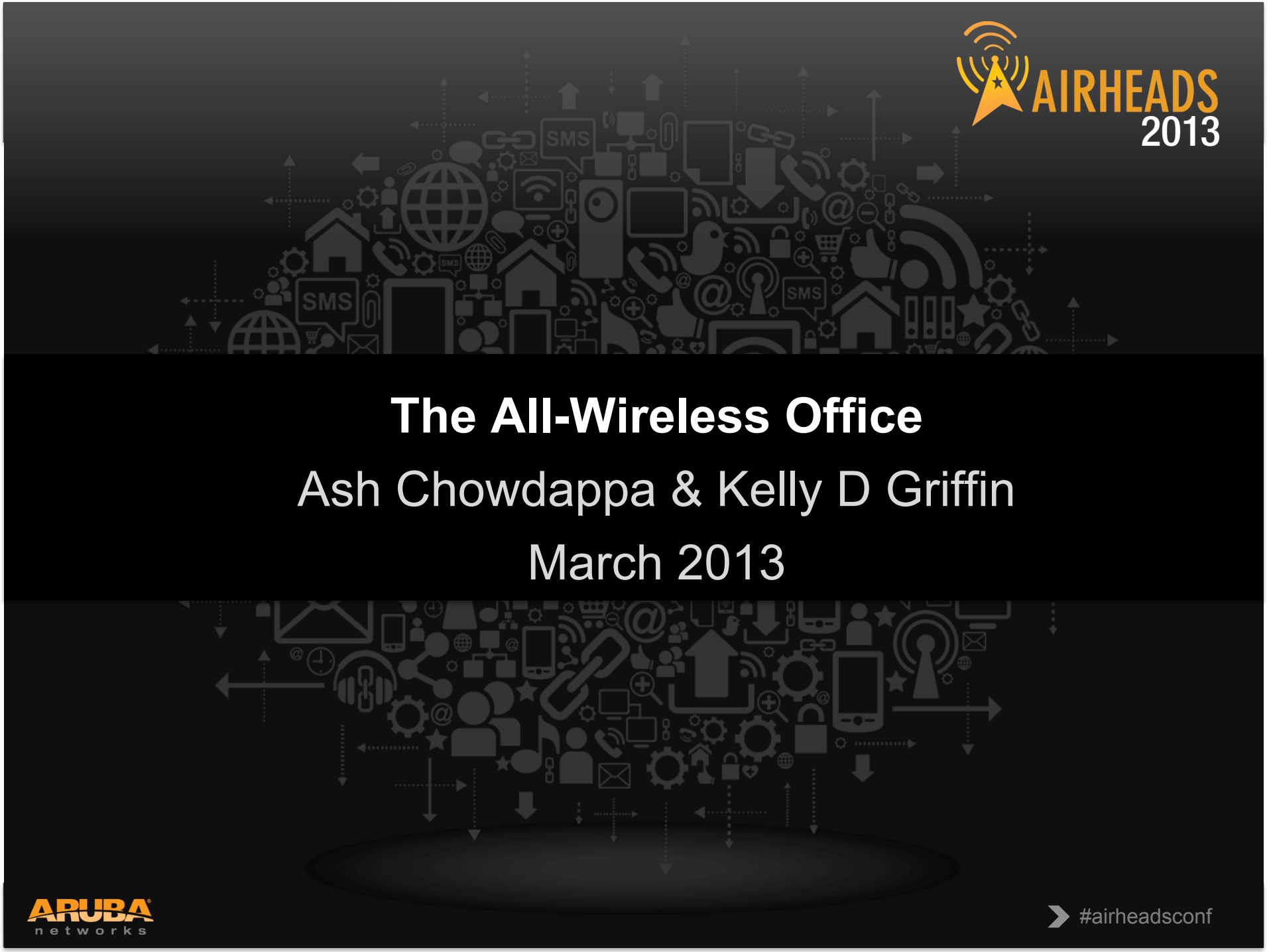

AIRHEADS
2013
The All-Wireless Office
Ash Chowdappa & Kelly D Griffin
March 2013
ARUBA
networks
#airheadsconf

Traditional Office

The New Normal - BYOD driving IT Cost Savings

End user devices are predominantly wireless

Enterprise Apps are increasingly cloud based, accessed wirelessly

Collaboration happens wirelessly

No separation of work and personal space

A Perfect Time to Rethink Networks

AIRHEADS 2013

Reduced IT budgets due to economic woes

+

Mobile Devices & Laptops outselling desktops in the enterprise

+

11n/11ac products allow for wired speeds wirelessly

abg WiFi n DRAFT CERTIFIED

Network Rightsizing

Evolution of the Wireless Workplace

AIRHEADS 2013

Fully Wired (Thru 2009)

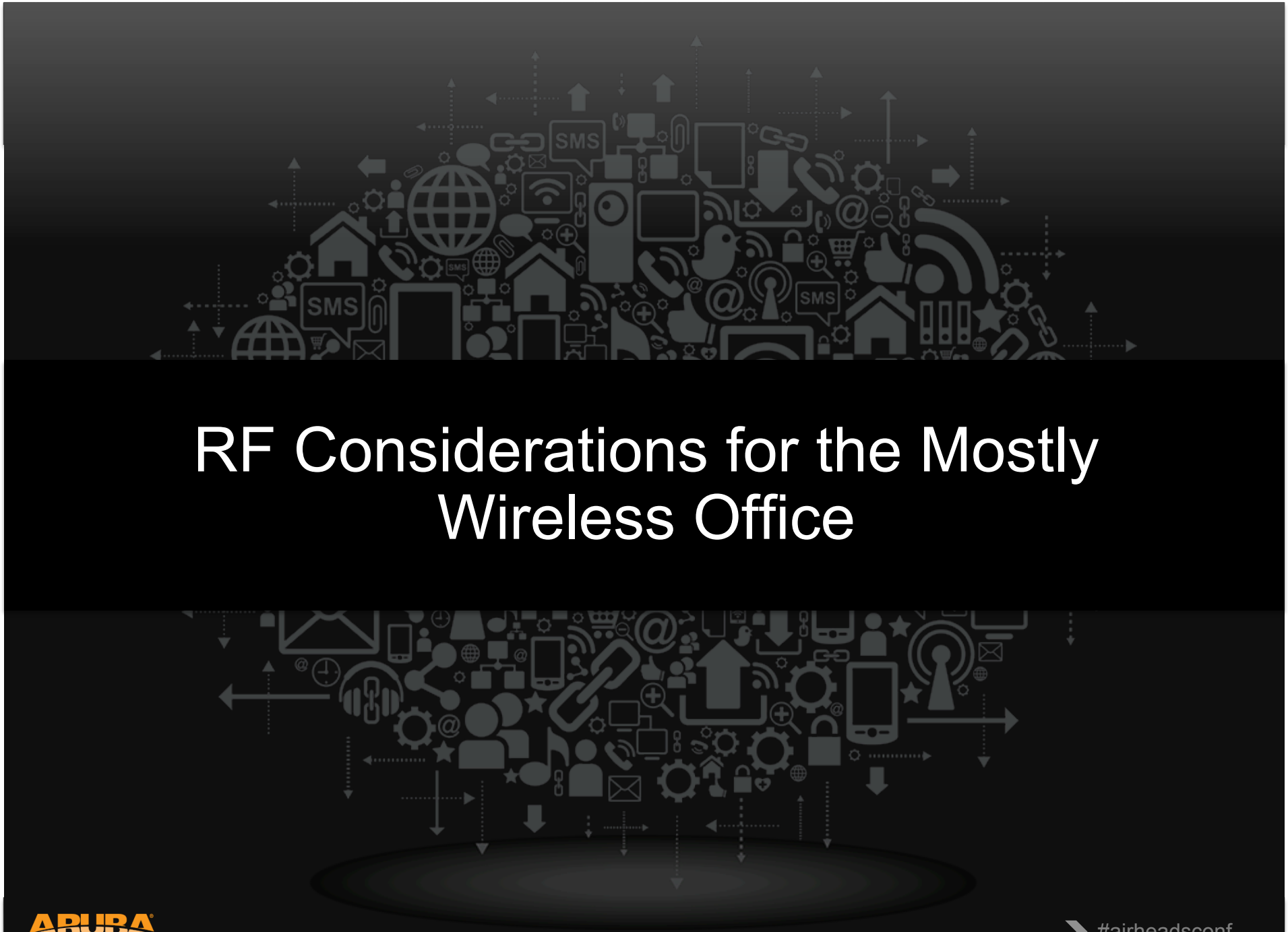
1. Predominantly a,b/g
2. Common areas
3. "Basic coverage"

Mostly Wireless "Right Sized" Network (2010 – 2015)

1. Predominantly .11n
2. 1st generation .11ac in play
3. "Mission critical" WLANs built for "capacity" and "density"

All Wireless (2015+)

1. Predominantly .11ac
2. Gigabit wireless with 2nd generation .11ac
3. .11ad in play
4. "Smart" devices based on interop "standards"



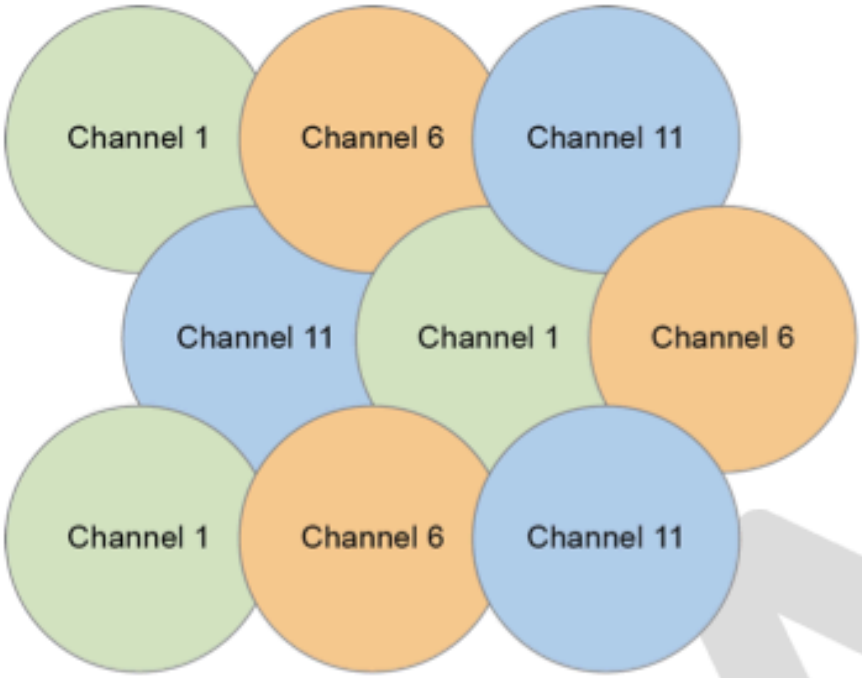
RF Considerations for the Mostly Wireless Office

Plan for pervasive 802.11n, consider . 11ac for late CY 2013/2014

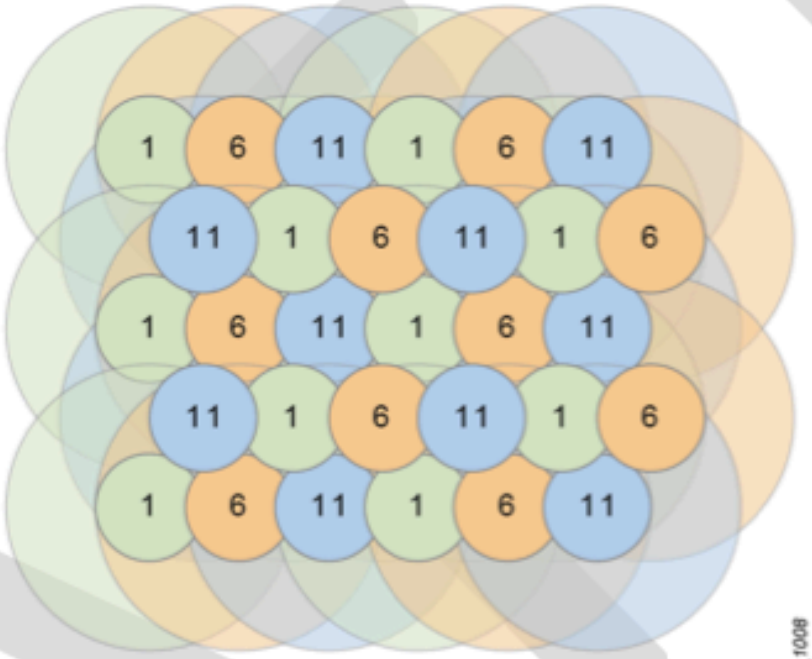
Standard	Goodput for TCP traffic (approximate)
802.11g	25
802.11a	25
802.11n (HT 20 MHz 1SS MCS 7)	35
802.11n (HT 20 MHz 2SS MCS 15)	80
802.11n (HT 40 MHz 2SS MCS 15)	150
802.11n (HT 40 MHz 3SS MCS 23)	230
802.11n (HT 20 MHz 3SS MCS 23)	140
802.11ac (VHT 40Mhz 3SS)	350

- **Channel is the bottleneck, plan for it**
- **Understand device profiles – what, how many,**
- **1SS vs. 2SS vs. 3SS**
- **11n vs. guess what "11ac"**

Plan for Capacity & Density, " NOT" Coverage



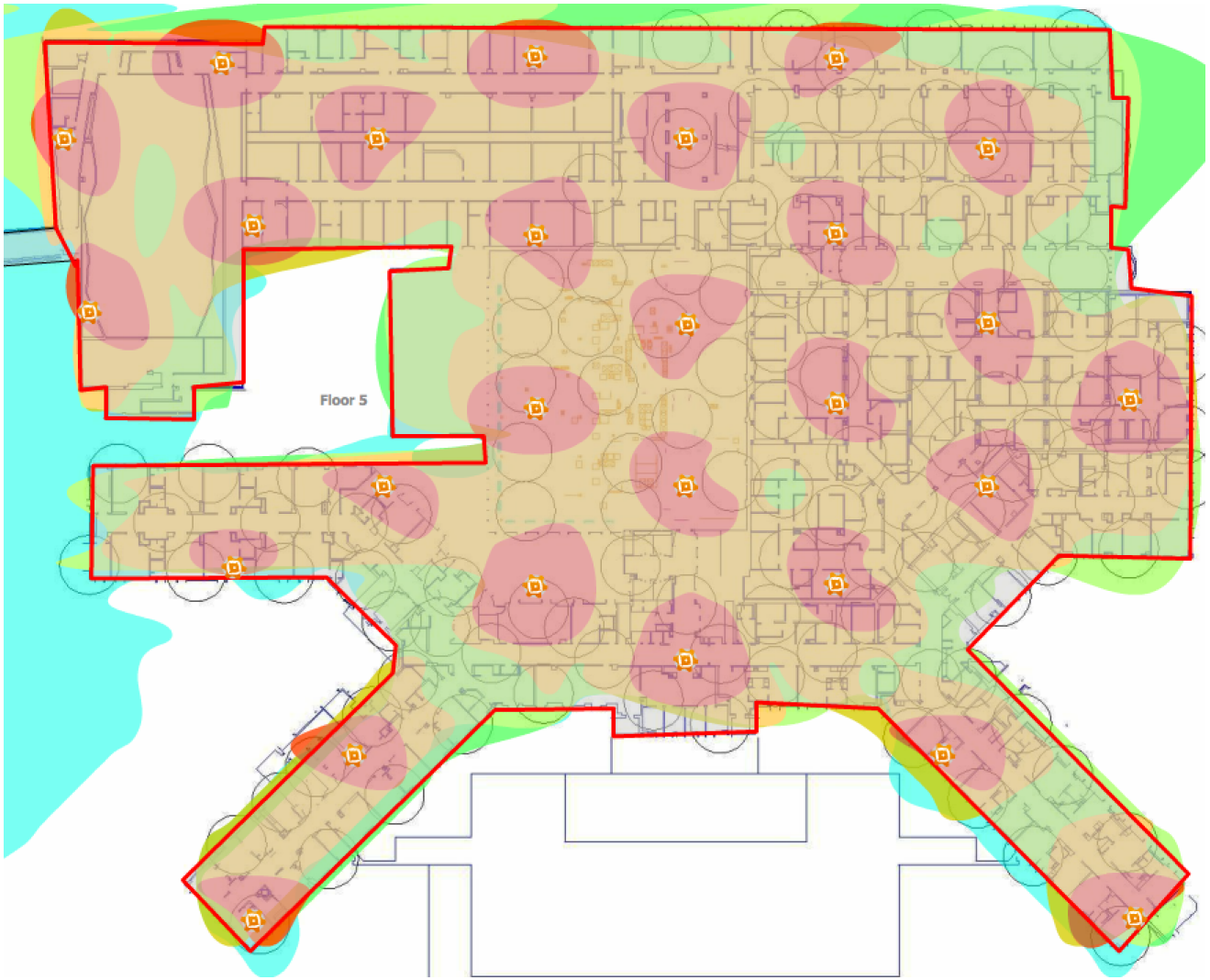
Coverage design with 7.2 Mb/s cell edge



Capacity design with 216.7 Mb/s cell edge

arun_1008

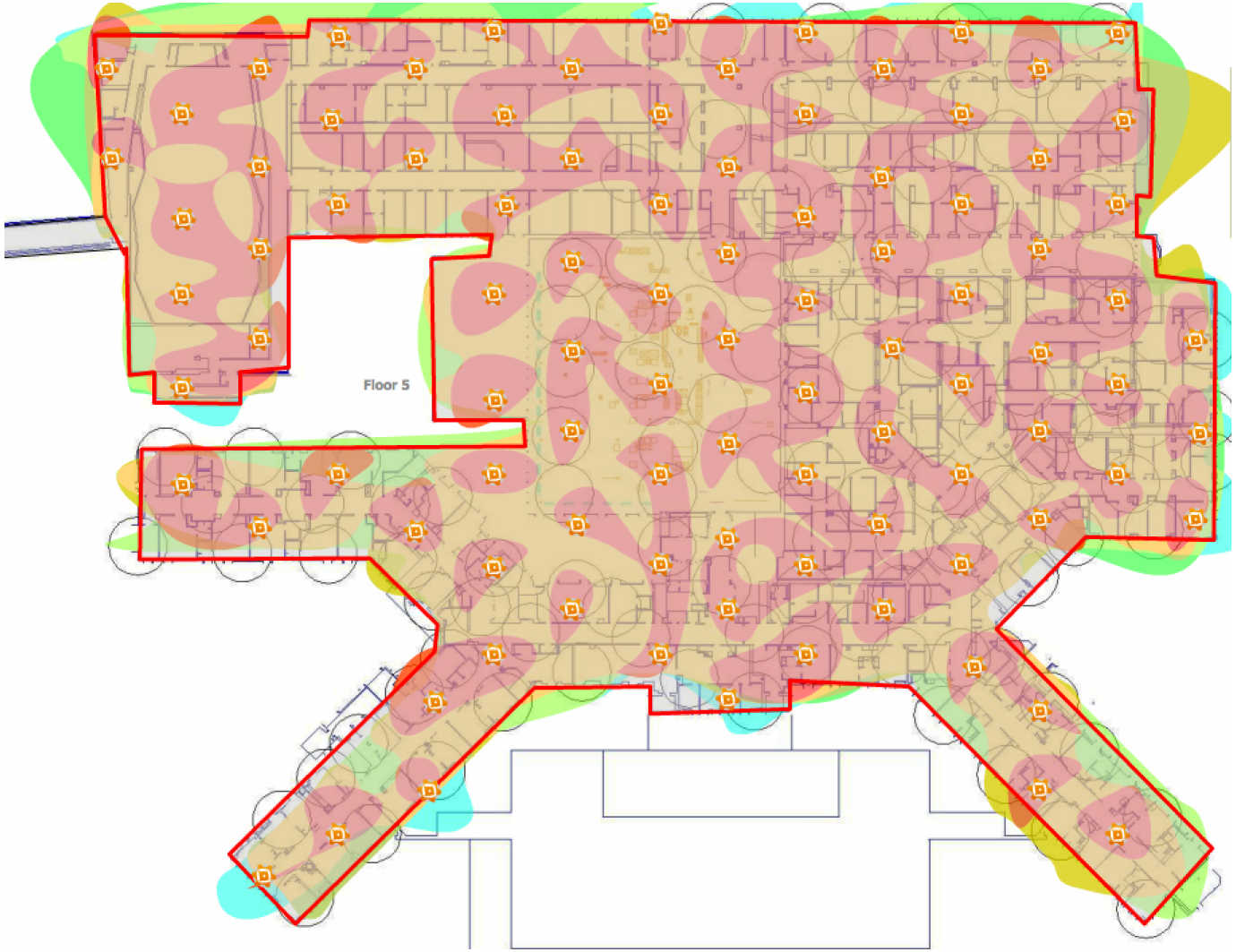
Traditional “low density” coverage



Coverage Model

- Designed to obtain minimum signal level throughout area.
- Typically used for office space with walls and doors
- Laptops are main wireless clients

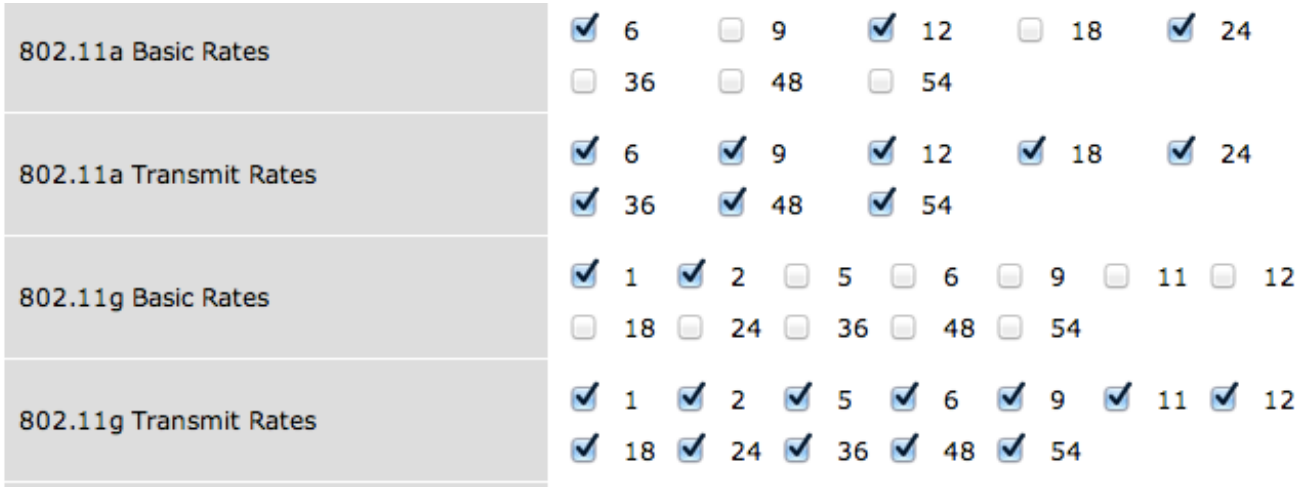
“High density” coverage for AWO



Capacity Model

- Designed to obtain minimum signal level and maximum clients per radio
- Used for HD and cubicle areas
- Multiple wireless clients per user design

Influence of Data Rates on Bandwidth



- **Disable lower data rates**
- **The denser the APs, the higher the required data rate**

Channel Re-use

MCS Index 1/2/3 spatial stream	Modulation	Minimum Sensitivity 20 MHz	Required SNR (dB)
0/8/16	BPSK 1/2	-82	1/4/7
1/9/17	QPSK 1/2	-79	4/7/10
2/10/18	QPSK 3/4	-77	6.5/9.5/12.5
3/11/19	16 QAM 1/2	-74	9.75/12.75/15
4/12/20	16 QAM 3/4	-70	13/16/19
5/13/21	64 QAM 2/3	-66	17.25/20.75/23.75
6/14/22 (802.11a/g)	64 QAM 3/4	-65	18.75/21.75/24.75
7/15/23	64 QAM 5/6	-64	19.75/22.75/25.75

- The question is – how many channels can I get in the coverage area
- Co-channel and Adjacent Channel interference from Client Radios will be the single biggest obstacle

What type of Apps are on your network ?

Personal Apps	Throughput
FaceTime	400 Kbps
AirPlay Video	1 Mbps
Netflix	1.5 Mbps*
Pandora	150 Kbps
YouTube	500 Kbps
Skype	500 Kbps
HTTP	500 Kbps

Corporate Apps	Throughput
Lync Desktop Sharing	1.5 Mbps
SIP Softphone	90 Kbps
Citrix Internet + Office	150 Kbps
Webex iPad Desktop Share	250 Kbps
WebEx High Quality Video	1.5 Mbps
GoToMeeting Desktop Share	500 Kbps
Desktop Backup	10 – 50 Mbps
Printing	1 Mbps

- **You might have to support more than one app ☺**
  - Mix of personal and corporate applications
- **Design for the highest bandwidth demand that you intend to support**
- **Multiply this number by the number of connections that you need to support**

Today's WLANs are Mission Critical

Security

- User, Device, Application traffic segmentation. WIDS/WIPS

Ease of RF & Network Mgmt

- Optimum use of 802.11 spectrum and automatic Wi-Fi channel management
- End to End visibility, Proactive Mgmt

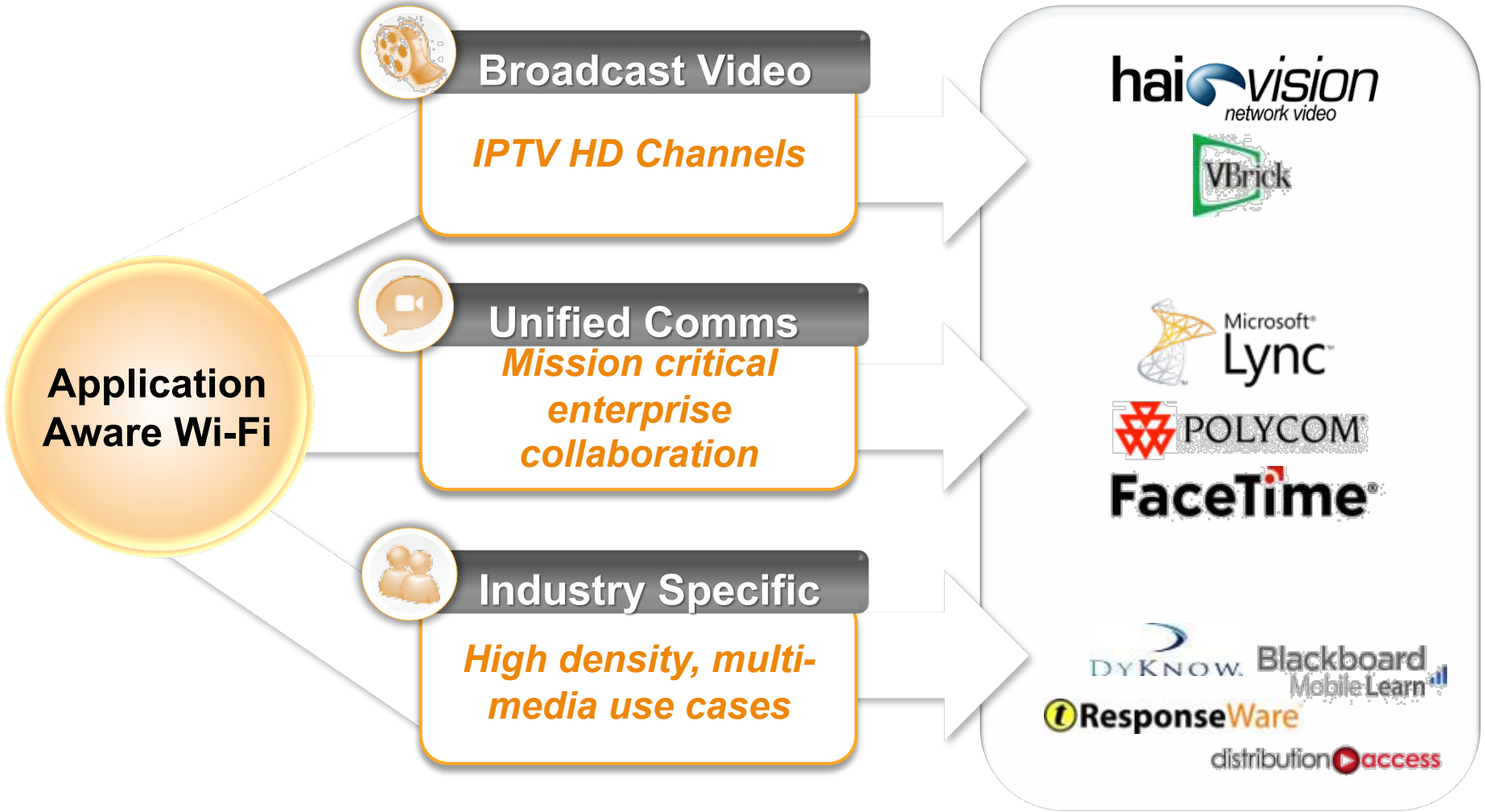
SLA Guarantee

- Predictable performance for all clients across all APs and Wi-Fi channels

Quality of Service

- Application awareness for delay sensitive applications

Summary: Multimedia-Grade Wi-Fi is a Reality Today



Office of the Future

AIRHEADS 2013

99% Mobile

- All Wireless
- Personalized for Each User

Is AWO The Next Enterprise IT Revolution ?

ALWAYS ON

Elimination of wired desk phones, "assigned" workspace

"Hoteling" and "Flex" office space

"Always On" high availability WLANs

New Wave of Cost Savings & Productivity Gains

Key requirements for the All Wireless Office

All-Wireless

99.999%

Speeds and Feeds - Connectivity Standards & Use cases

Technology	Spectrum	Max data rate	Max range (ft)	Key use cases
802.11n	2.4 or 5Ghz	600Mbps/ Radio (4 streams)	200 - 250ft	Wi-Fi client access, connectivity
802.11ac	5Ghz	7Gbps	200 - 250ft	Wi-Fi client access, connectivity
802.11ad	60Ghz	7Gbps	30ft	High bandwidth, short range video streaming. For ex. Wireless display monitors, projectors.
802.11mc	2.4 or 5Ghz	NA	NA	Fine Timing Measurement extension for accurate location tracking
Ultra Wide Band	3.1 to 10.6Ghz	1Gbps	50 – 100ft	Accurate location tracking

802.11ad-2012 Very High Throughput 60GHz

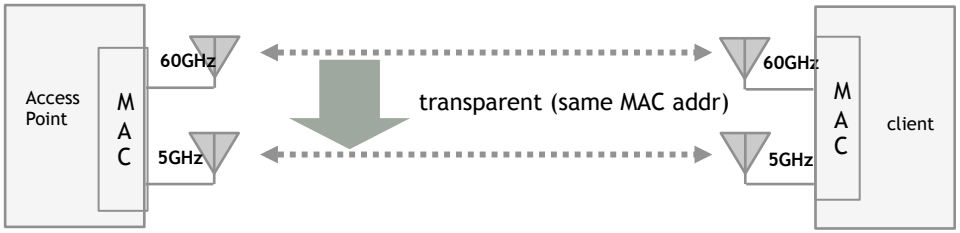
AIRHEADS 2013

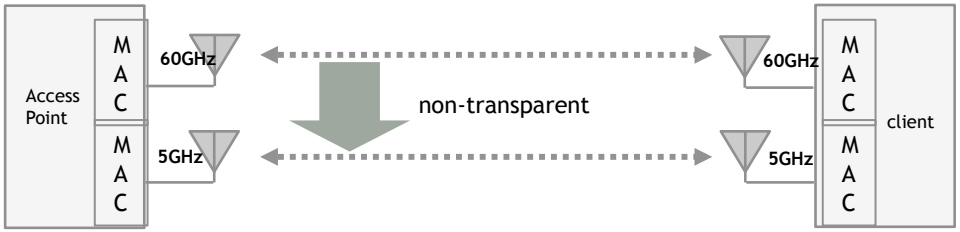
Requirements

Throughput > 1 Gbps @ 10 metres
Management plane from 802.11
Fast Session Transfer to 802.11n & ac
Coexistence with 802.15.3c (WPAN)

Applications

Room-scale uncompressed HD video
Set-top boxes & projection to TVs
DVRs, game consoles, other video
Rapid sync-&-go file transfer





MAC & PHY differ from other 802.11

Based on WiGig
PHY uses SC for 385 – 4620 Mbps
Or OFDM for 693 – 6756 Mbps
2.16 GHz channels
Beamforming required
Scheduled and contention access
Discovery with/out beamforming

Milestones

Jan 2009 IEEE task group started
Jul 2012 Final Approval for IEEE 802.11ad-2012
Jan 2013 WFA and WiGigAlliance consolidate activity
Dec 2013 WFA certification

Spectrum

Unlicensed
Worldwide spans 57 – 67 GHz
USA & Canada 57 – 64 GHz
Europe 57 – 67 GHZ
Japan 57 – 66 GHz

Client Interoperability Standards & Smart Apps

AIRHEADS 2013

Roaming, Performance

802.11r

Fast roaming

802.11k

AP <-> Client information exchange

802.11v

Directed handoff assist

Cross service provider interoperability, identity services

802.11u

Hotspot 2.0 potentially blurring the distinction between public hotspot/ private Guest WLAN

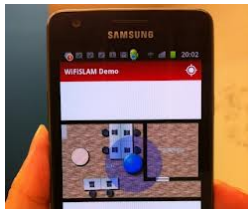
Cloud based 3rd party identity services

Management frame protection

Hotspot 2.0/Passpoint

Wi-Fi offload, Cross provider billing

Smart Apps for "location aware" matching of users, devices & services



Wireless Desktop Accessories

Dell Releases Wireless 802.11ad Dock With USB 3.0, Mutli-Display Support

Dell has launched a new docking station for its laptops. In an interesting twist, the dock connects to the computer over an 802.11ad "WiGig" link to provide up to 7Gbps bandwidth between the dock and laptop. The Dell Wireless D5000 docking station supports multi-display, USB 3.0, and audio output. According to Dell, it is the worlds first commercially available wireless dock.

The Wireless D5000 dock pairs with Dell's 1601 WiGig card, which is currently only available with Dell's Latitude 6430u laptop. Pairing is a simple matter of hitting the pairing button and hitting connect in Dell's Connection Manager software. A single USB 3.0 port and headphone jack are also available on the front of the device.

Dell Wireless Dock D5000

Path Leading to the "Always On" WLAN

Sub-second AP Failover

- AP's maintain active connection to both "primary" and "backup" controllers
- Rebuild state on backup if primary fails

Stateful control plane failover

- SSID "always on"
- Keys are cached across primary and backup
- Users are not required to re-associate or re-authentication

Stateful data plane failover

- Seamless, stateful transition of user data sessions
- Select user session state is maintained on both controllers


Traditional Office
Mobility Centric All Wireless Office
Static "One Size Fits All" Network
"Personalized" experience where Network adapts to different devices, apps & users

Get Ready For The All Wireless Office

AIRHEADS 2013

It is coming and it is INEVITABLE

Questions?

AIRHEADS
LAS VEGAS 2013

JOIN: community.arubanetworks.com

FOLLOW: @arubanetworks

DISCUSS: #airheadsconf