Quality of Experience Over Wi-Fi

Jason Byrne – Director Product Management
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Trends in Communications

• Wired → wireless,

• Cellular → Wi-Fi.

By 2017, 60% of Cellular traffic will be offloaded to Wi-Fi.

Wi-Fi has become the medium of choice. 2/3 of US consumers prefer Wi-Fi to Cellular. – Deloitte
Wi-Fi....it's a Home Thing

- 70% of Consumer View Netflix over WiFi
- 80% of Consumer View YouTube over WiFi

TV
- TV Everywhere content grew 246% last year.

Mobile
- 70% of Smartphone Wi-Fi traffic is between 4pm-7am

- 81% of users have technology-related issues,
  - Loading/buffering (24%) and crashing/freezing (23%).

81%

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What are the Issues

- Radio Interference
- Wi-Fi Radio Interference
- Insufficient Wi-Fi Network Range & Power
- Login / Connectivity Issues
Home Standards Progressing

Current Best Practices

Uncharacterized Wi-Fi environment

Use of Rudimentary Tools.
Still Results in Increased Costs

- 30-40% Are Wi-Fi Issues
- High % Cause Truck Rolls
- Repeat Truck Rolls

Money Spent Fixing Wi-Fi in North America
Times are Changing

Time for a Paradigm Shift?

Network Viewpoint

RF Only
Times are Changing
The 800 lb Gorilla

### Interference

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<th>802.11 Interference</th>
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<td>• <strong>Adjacent Channel</strong> Interference – The Worst kind.</td>
<td>• Easy to miss unless sweep is done for an extended time</td>
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| • **Co-channel** interference.  
  • Try to keep at least 20dB between the RSSI levels of the networks | • **Microwave @ 25ft** from AP or client, found to degrade throughput by 64% |

Other items:  
Cordless phones, Bluetooth devices, wireless video cameras, outdoor microwave links, wireless game controllers, Zigbee devices, fluorescent lights.
It's not all Signal Strength

Signal Strength $\neq$ Good User Experience

Signal Strength is an unreliable measure
Don’t Use Range Extenders

Use 2 x AP’s on same channel & SSID
High Gain Antenna

**PROS**
- Increases Coverage on the same Floor.

**CONS**
- Reduces coverage on other floors
No Two Applications Are the Same

Average Number of Apps / US Phone

33

8 Million
iOS Apps downloaded every day

Each Device is running Multiple different Apps
Number Of Devices

Average home has 7 Wi-Fi connected devices

Use More than One Connected Device
No Two Devices are the Same
Dimensions Of Wi-Fi Quality Of Experience

- Applications
- Number of Devices in the Home
- Different Types of Devices
- Congestion
- Interference
- Signal Strength

More Real World
Whole-Home Wi-Fi

Simultaneous Stress Testing
Identify The Optimal

Optimal Channel

• More AP’s isn't always bad.
  • Almost all Apps imply it is.
• What are they doing is more important

Optimal AP Location

• Not enough time for site Survey
• Use Multi-dimensional tools for fast accurate location.

Need More Intelligence in Optimal decisions
Multi-Dimensional Testing

- **Identify the Congestion anywhere** in the home
  - Use a Congestion Heat Map

- **Identify the Interference anywhere** in the Home
  - Use an Interference Heat Map

- **Identify Signal Strength anywhere** in the home

- **Pick an Application, will it Work anywhere**
  - See if HD-Streaming will work everywhere

Gain Confidence in your Findings
Summary

• Wi-Fi will be the primary network, and its all about the Video
  • Current Best-Practices are costing $Millions
    • Use Multi-Dimensional Testing
    • Speak the Language of the Customer

Introduce Real World measurements to Save Money
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