Performance Protection for 802.11n

Tom Koenig
Business Development Manager Borderless Network, Cisco
Agenda

1. Market Transition to Mobile Tablets and Devices

2. Guidelines and Recommendations for Optimizing the WLAN for Rich Media on Mobile Devices

3. Enabling a Borderless Mobility Experience
Media Rich Mobile Tablets and Devices—Everyone’s Got One
Is Your Network Ready?

50% of Fortune 500 are testing or deploying iPads*

By 2015, tablets will constitute 50% of laptop sales**

Mobile Devices Drive New User Behaviors
Placing New Demands on the Wireless Network

New User Behaviors
- Making Video Calls from Conference Rooms
- Accessing Business Applications from Customer Locations (ERP)
- Using average of 2-3 mobile devices

New Network Demands
- Mission Critical Wireless Reliability
- Secure network connectivity on mobile devices
- High throughput, pervasive wireless coverage
Older 802.11a/b/g Networks Cannot Meet These New Demands

**Example:** 5Mbps high definition video scaling across 802.11a/g versus 802.11n

**802.11 a/g**
Usable bandwidth ~ 22 Mbps
Supports limited simultaneous Cius HD video sessions (~ 4)

**802.11n**
Usable bandwidth ~ 160 Mbps
Supports enterprise requirements for simultaneous, scalable Cius HD video sessions

802.11n Networks Can Offer up to 7X Throughput

802.11n Delivers Enterprise Class Application Performance for More Clients!
Agenda

1. Market Transition to Mobile Tablets and Devices

2. Guidelines and Recommendations for Optimizing the WLAN for Rich Media on Mobile Devices

3. Enabling a Borderless Mobility Experience
Design your Cisco 802.11n Network to Optimize Rich Media on Mobile Devices

Consider This Checklist:

- Start Migration to 802.11n to Enhance Network Performance
- Properly Configure for High Density Wireless Deployments
- Improve Reliability and Coverage with Cisco ClientLink
- Detect and Mitigate RF Interference with Cisco CleanAir
- Improve Video Applications with Cisco VideoStream
- Implement Cisco Radio Resource Management
- Improve Client Performance with Cisco Client Troubleshooting Tools
Step 1: Migrate to 802.11n to Enhance Network Performance

Challenge:
Scaling tablets and mobile devices accessing bandwidth intensive applications across the WLAN

Advantage:
- 802.11n optimizes high bandwidth data, voice and video applications on Wi-Fi enabled devices
  - 7x higher throughput
  - More reliable and predictable coverage
- Backwards compatibility with 802.11a/b/g clients

Primary 802.11n Components

Multiple Input Multiple Output (MIMO)
- Maximal Ratio Combining
- Beam forming
- Spatial multiplexing

40 MHz Channels
- Two adjacent 20 MHz channels are combined to create a single 40 MHz channel

Improved MAC Efficiency
- Packet aggregation
- Block Acknowledgements

Enables Throughput and Coverage Needed to Scale Mobile Devices
Step 2: Configure for High Density Wireless Deployments

Challenge:
Proper WLAN configuration to support Wi-Fi enabled devices in concentrated areas

Advantage:
These RF design best practices help fine tune the network in advance to accommodate high density areas

a. Assess Application Bandwidth Requirements
b. Understand Wireless Protocol Selection
c. Determine Required Number of AP Channels
d. Optimize the Installation

Efficient RF Design Improves Coverage for Mobile Devices in Concentrated Areas
Determine the bandwidth required for each user of the target application.

- Determine the minimum acceptable throughput applications require.
- Design for the highest bandwidth requirement.

- Multiply this number by the number of connections/seats that you need to support.

- This is the aggregate bandwidth you will require in your space.

Start by Understanding User Requirements for the Designed Space.
### Step 2b. Understand Protocol Selection 802.11 b/g/a/n and Duty Cycle—Important? Why?

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<th>Beacon Size (Bytes)</th>
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**Time µS**

Spectrum is a Shared Finite Resource—Manage to Optimize Device Performance
### Step 2c. Determine the Required Number of AP Channels

<table>
<thead>
<tr>
<th>Protocol</th>
<th>Data Rate (Mbps)</th>
<th>Aggregate Throughput (Mbps)</th>
<th>User Count</th>
<th>Average per user Throughput</th>
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<tr>
<td>802.11b</td>
<td>11</td>
<td>7.2</td>
<td>10</td>
<td>720Kbps</td>
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<td>802.11b</td>
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<td>7.2</td>
<td>20</td>
<td>360Kbps</td>
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<td>802.11b</td>
<td>11</td>
<td>7.2</td>
<td>30</td>
<td>240Kbps</td>
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<td>802.11b/g</td>
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<td>13</td>
<td>10</td>
<td>1.3Mbps</td>
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<td>13</td>
<td>20</td>
<td>650Kbps</td>
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<tr>
<td>802.11b/g</td>
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<td>430Kbps</td>
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<td>2.5Mbps</td>
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<td>1.25Mbps</td>
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<tr>
<td>802.11a</td>
<td>54</td>
<td>25</td>
<td>30</td>
<td>833Kbps</td>
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</table>

Only 3 non overlapping channels available in 2.4 GHz
5 GHz support will be critical to optimize capacity (22 channels US–adds 4)

Maximize AP Channel Usage to Increase Bandwidth Efficiency
Step 2d. Optimize the Installation

- Configure 2.4 GHz for 20MHz and three non–overlapping channels / cells
  
  Provides greater flexibility for access point placement for optimal coverage and capacity

- Disable lower data rates in 2.4GHz

- Encourage clients to use 5-GHz by enabling Cisco BandSelect

  BandSelect directs clients to 5 GHz optimizing RF usage
  - Better usage of the higher capacity 5GHz band
  - Frees up 2.4 GHz for single band clients

- Leverage Dynamic Frequency Selection (DFS Channels)

  UNII-2 Extended Bands are supported by Cisco Cius, Apple iPad, and select Intel radios

Cisco Provides Features that Encourage Efficient Spectrum Utilization
## Cisco’s Custom Design Advantages (vs ODM model)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Others</th>
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<tbody>
<tr>
<td><strong>Durability</strong></td>
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<tr>
<td>AP shell design for durability &amp; heat-dissipation</td>
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<td>Durable antenna connectors</td>
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<td>Expanded flash for multiple software images and future features</td>
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<td><strong>Voice/Video Optimized</strong></td>
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<tr>
<td>Voice Optimization – Client/AP power coordination (DTPC), Load</td>
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<td>aware admission control (CAC), Seamless QoS</td>
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<td>Fast Voice Roaming (CCKM) – broad industry support</td>
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<td>AP Horsepower for scalable VideoStream processing (CPU/RAM)</td>
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<tr>
<td><strong>Max Capacity and Reliable Coverage</strong></td>
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<tr>
<td>Increased 5 GHz channel capacity with Radar Avoidance (DFS)</td>
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<tr>
<td>Improved reliability and throughput with ClientLink</td>
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<tr>
<td>Simultaneous Interference Self Healing &amp; Troubleshooting with CleanAir</td>
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<tr>
<td><strong>Proven Security</strong></td>
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<td>Hardware encryption for line-rate secure tunnels</td>
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<td>CAPWAP – Industry approved and scrutinized</td>
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Step 3: Improve Reliability and Coverage with Cisco ClientLink

Challenge:
802.11a/g Client Connection Not Optimized, Creating Coverage Holes

Advantage:
ClientLink uses Beam Forming to Direct Signal to Improve Performance and Coverage for 802.11a/g Devices

Without ClientLink and Beam Forming
802.11a/g
Existing 802.11n Solutions Beam Strength Not Directed to Client

With ClientLink and Beam Forming
802.11a/g
Up to 65% Increase in Throughput
Up to 27% Improvement in Channel Capacity

Increases Overall Wireless System Capacity in Mixed Client Environment
Step 4: Detect and Mitigate RF Interference with Cisco CleanAir

- Classification processed on Access Point
- Interference impact and data sent to WLC for real-time action
- WCS and MSE store data for location, history, and troubleshooting

Cisco CleanAir Technology integrates interference information from the AP into the entire system.
Step 5: Improve Video Applications with Cisco VideoStream Technology

Challenge:
Delivering high quality multicast video on mobile devices at scale

Advantage:
Provides HD multicast video by protecting QoS of all streams with Prioritization and RRC

Reliable Multicast

Stream Prioritization

Resource Reservation Control

Efficiently Scales Enterprise-Class Video Collaboration on Mobile Devices

Challenge:
Simplifying RF Management to improve coverage and network performance

Advantage:
Automates RF Management
- Access point channel assignments and output power
- Coverage hole compensation
Enables full RF visibility
- Access points at maximum power
- Configuration mismatches
- Channel changes/change reason

Provides Quick Assessment and Adjustment of RF Environment for Enhanced Connectivity
Step 7: Analyze Client Performance Issues with Cisco WCS Troubleshooting Tools

Challenge:
Analyzing and avoiding client performance issues

Advantage:
Provides step-by-step method to analyze client connection and performance problems:
- Authentication key mismatches
- Wrong credentials
- Policy manager state
- DHCP/IP addressing
- Trending analysis

Step 2: Voice Configuration Audit
Diagnostic Tool That Speeds Resolution of Client Performance Trouble Tickets
Agenda

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2. Guidelines and Recommendations for Optimizing the WLAN for Rich Media on Mobile Devices

3. Enabling a Borderless Mobility Experience
Demand for Borderless Mobility Experience Across On-Premise and On-Demand Networks
Deliver Anywhere Productivity and Collaboration to Any Tablet or Mobile Device

Challenge:

- Extending collaborative applications across multiple mobile devices (Cisco Cius, Apple iPad, Apple iPhone, Blackberry etc)
  - Cisco WebEx Meeting Center with High Quality Video
  - Cisco Mobile Voice Applications

Advantage:

- Pervasive, high performance wireless coverage and reliable connectivity for enhanced mobile collaboration experience
- Increased employee productivity and satisfaction
Cisco’s Borderless Networks Solutions Prepare Your Enterprise Network for Mobile Devices

Provide mission critical 802.11n wireless networks protected from wireless interference using Cisco CleanAir technology

Eliminate dead coverage zones with more bars in more places using Cisco ClientLink technology

Provide scalable delivery of high bandwidth video applications with Cisco VideoStream technology

Enable users to securely connect to the corporate network through their mobile devices with Cisco AnyConnect

Drive improved productivity through the extension of Cisco Collaboration applications on tablets and mobile devices
Get Started Now with 802.11n

Prepare your network to support tablets and mobile devices

Learn more at www.cisco.com/go/wireless
THE FUTURE OF BUSINESS IS MOBILE

Borderless Mobility Enables the Anytime, Anywhere Experience