



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**

ORGANIZATION



TIME

■Source: *Apple Inc, Quarterly Financial Report, **The US PC Consumer Market in 2015 – Forrester Research

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!

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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

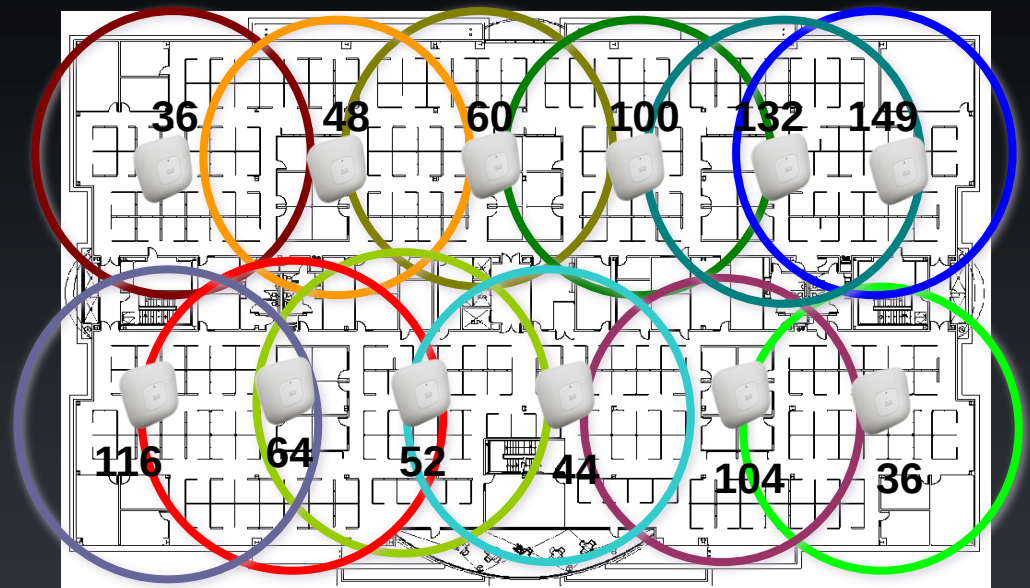
Challenge:

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

- Assess Application Bandwidth Requirements
- Understand Wireless Protocol Selection
- Determine Required Number of AP Channels
- Optimize the Installation



Efficient RF Design Improves Coverage for Mobile Devices in Concentrated Areas

Step 2a. Assess Application Bandwidth Requirements and Supported Protocols

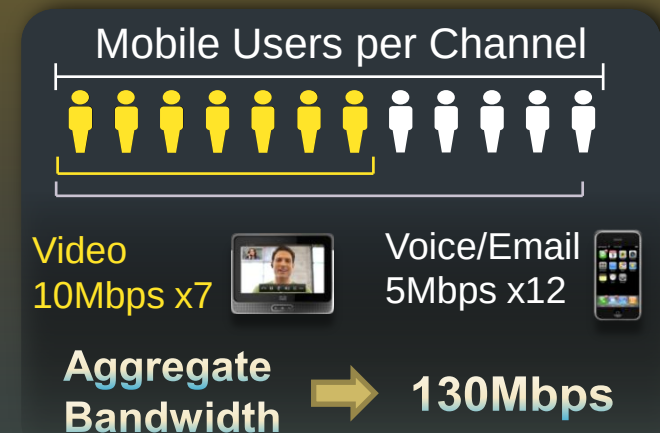
- Determine the bandwidth required for each user of the target application

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

Protocol	Throughput (Mbps)
802.11b	7.2
802.11b/g mix	13
802.11g	24
802.11a	25
802.11n	160



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?

DSSS	Beacon Size (Bytes)				
	100	200	250	300	350
1	896	1696	2096	2496	2896
2	496	896	1096	1296	1496
5.5	241	387	460	532	605
11	169	241	278	314	351

OFDM	Beacon Size (Bytes)				
	100	200	250	300	350
6	153	287	353	420	487
12	87	153	187	220	253
24	53	87	103	120	137
54	35	50	57	64	72
130	26	32	35	38	42
300	23	25	27	28	29

Time μ S

Spectrum is a Shared Finite Resource—Manage to Optimize Device Performance

Step 2c. Determine the Required Number of AP Channels

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

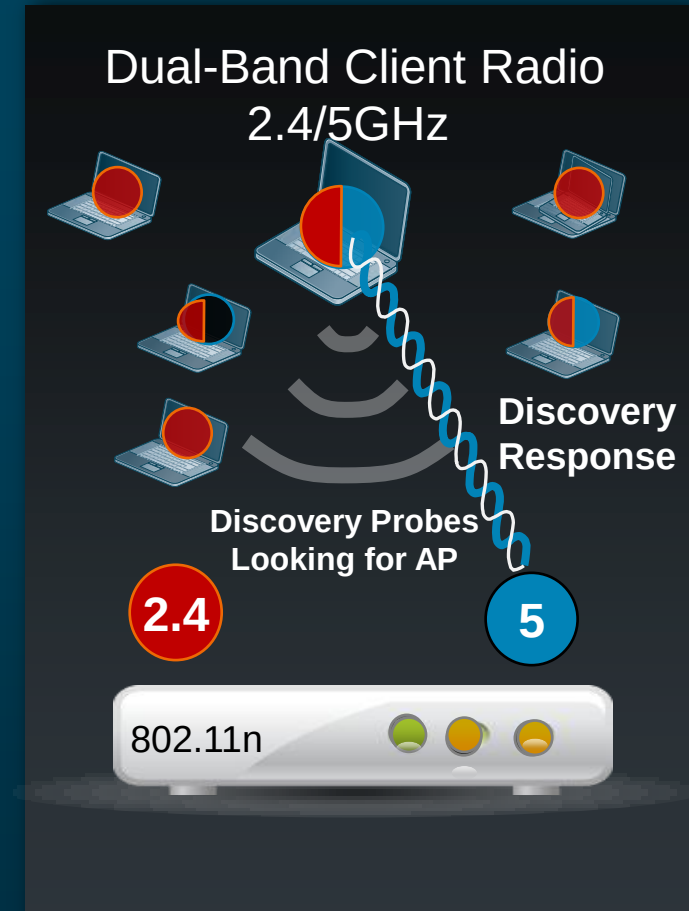
Only 3 non overlapping channels available in 2.4 GHz

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)

	CISCO			Others		LINKSYS®
	\$1,495 \$1,295	\$1,195 \$995	\$795 \$495	\$995	\$695	\$180
	3500	1260 1140	1040	XX	YY	E3000
Durability						
AP shell design for durability & heat-dissipation	Sealed metal shell			Vented plastic		
Durable antenna connectors	Rugged RP-TNC		n/a	weak	n/a	n/a
Expanded flash for multiple software images and future features	32MB	32MB	32MB	16MB	16MB	8MB
Voice/Video Optimized						
Voice Optimization – Client/AP power coordination (DTPC), Load aware admission control (CAC), Seamless QoS	☒	☒	☒	☐	☐	☐
Fast Voice Roaming (CCKM) – broad industry support	☒	☒	☒	☐	☐	☐
AP Horsepower for scalable VideoStream processing (CPU/RAM)	☒	☒	☐	☐	☐	☐
Max Capacity and Reliable Coverage						
Increased 5 GHz channel capacity with Radar Avoidance (DFS)	☒	☒	☒	☒	☐	☐
Improved reliability and throughput with ClientLink	☒	☒	☐	☐	☐	☐
Simultaneous Interference Self Healing & Troubleshooting with CleanAir	☒	☐	☐	☐	☐	☐
Proven Security						
Hardware encryption for line-rate secure tunnels	☒	☒	☒	☒	☐	☐
CAPWAP – Industry approved and scrutinized	☒	☒	☒	☐	☐	☐

Step 3: Improve Reliability and Coverage with Cisco ClientLink

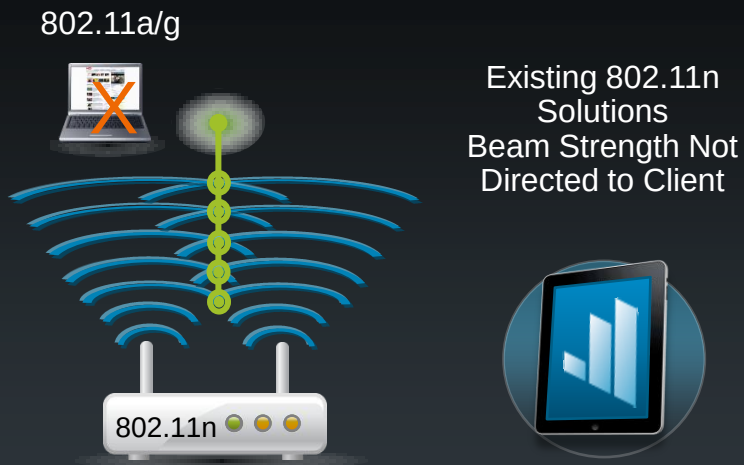
Challenge:

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

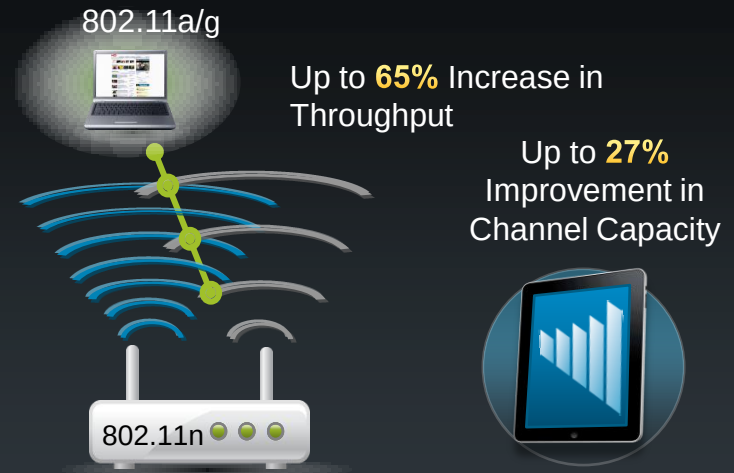
Advantage:

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

Without ClientLink and Beam Forming



With ClientLink and Beam Forming



Increases Overall Wireless System Capacity in Mixed Client Environment

Step 4: Detect and Mitigate RF Interference with Cisco CleanAir



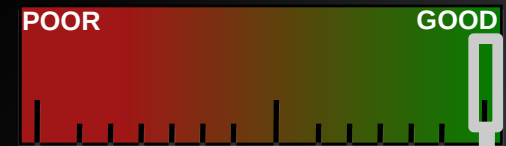
Locate
WCS, MSE

Mitigate
Wireless LAN Controller

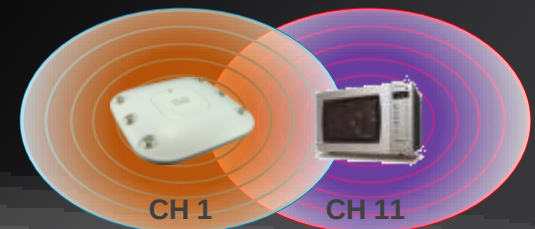
- Classification processed on Access Point
- Interference impact and data sent to WLC for real-time action
- WCS and MSE store data for location, history, and troubleshooting



Visualize and Troubleshoot



Maintain Air Quality



Cisco
CleanAir

Cisco CleanAir Technology integrates interference information from the AP into the entire system.

Step 5: Improve Video Applications with Cisco VideoStream Technology

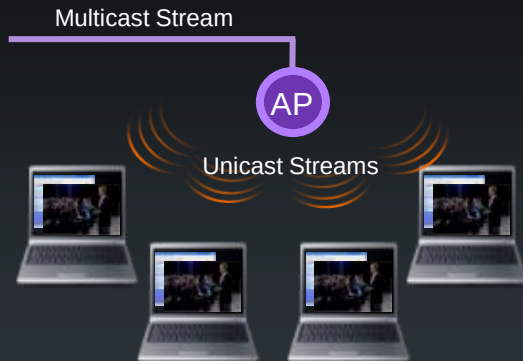
Challenge:

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

Step 6: Implement Cisco Radio Resource Management

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

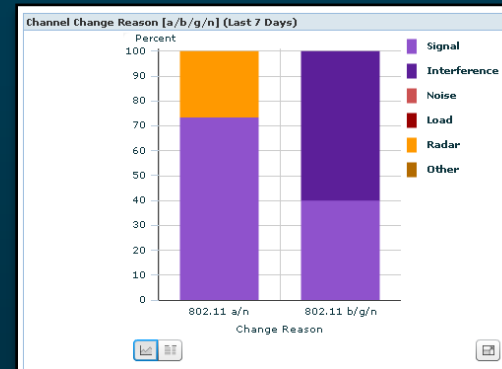
Channel changes/change reason

RRM

Monitor > RRM

RRM Statistics (Last 24 Hours)

Statistics	Value
Number of RF Groups	1
AP's at maximum power (a/n)	46.58 % (34 out of 73)
AP's at maximum power (b/g/n)	1.37 % (1 out of 73)
Total Configuration Mismatches	0



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

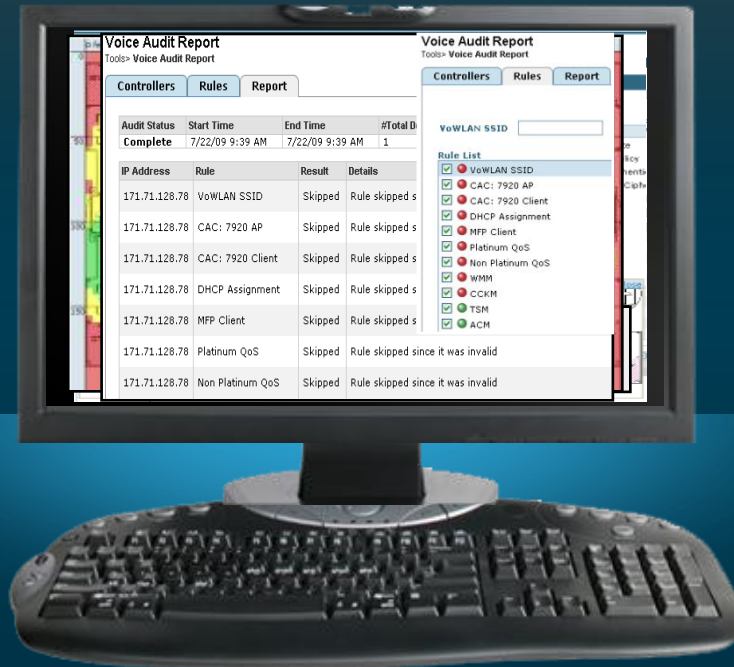
Wrong credentials

Policy manager state

DHCP/IP addressing

Trending analysis

Client Troubleshooting



Step 2: Voice Configuration Audit

Diagnostic Tool That Speeds Resolution of Client Performance Trouble Tickets

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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:

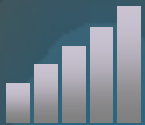
- Pervasive, high performance wireless coverage and reliable connectivity for enhanced mobile collaboration experience
- Increased employee productivity and satisfaction



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

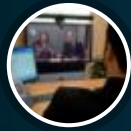
Get Started Now with 802.11n

Prepare your network to support tablets and mobile devices

Learn more at www.cisco.com/go/wireless



Meet User Demand for a Borderless Mobility Experience



THE FUTURE OF BUSINESS IS MOBILE

Borderless Mobility Enables
the Anytime, Anywhere
Experience





CISCO