Trådløse netværk
- Mere end et Access punkt

Cisco EXPO 2009

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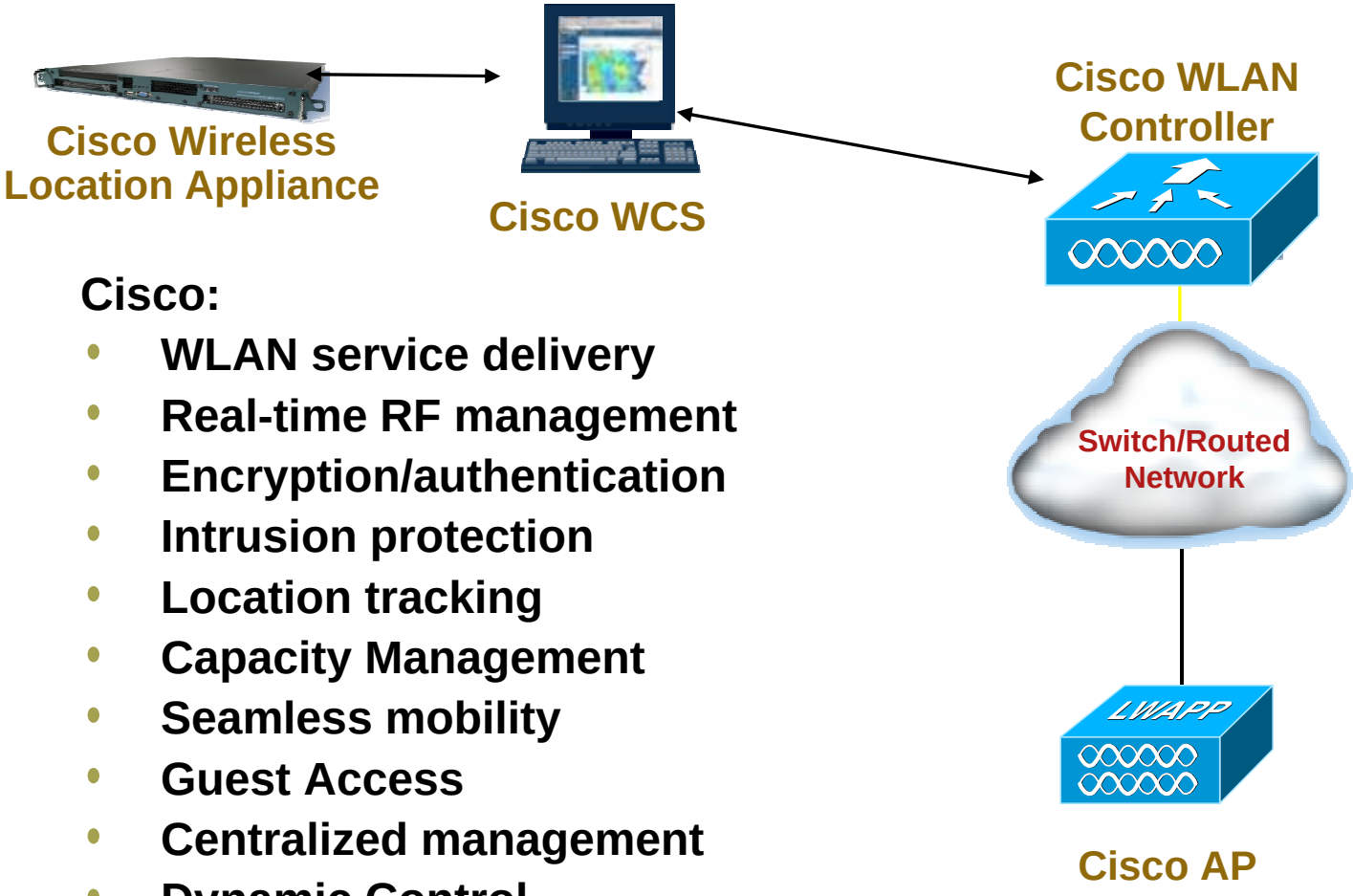
Agenda

- Cisco Unified Wireless
- 802.11n Technical Update
- 802.11n Deployment Guidelines
- 802.11n Product Selection
- OfficeExtend – 6.1 Feature

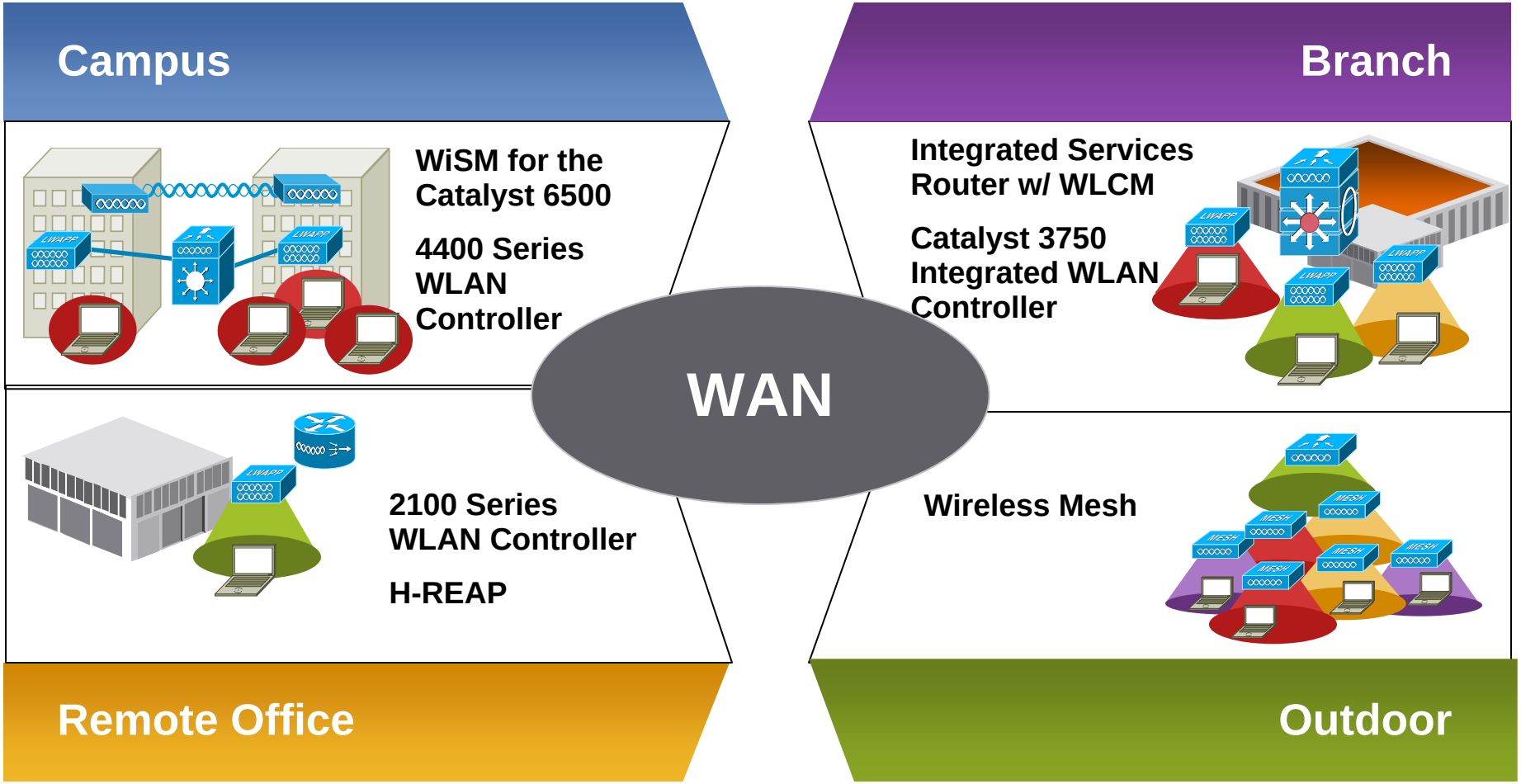
A Unified WLAN System



Cisco:

- **WLAN service delivery**
- **Real-time RF management**
- **Encryption/authentication**
- **Intrusion protection**
- **Location tracking**
- **Capacity Management**
- **Seamless mobility**
- **Guest Access**
- **Centralized management**
- **Dynamic Control**

Flexible Architecture: Pervasive Wireless



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802.11n Drivers

Wireless Refresh and Expansion

11n provides investment protection for refresh and new installations

3-4 year laptop refresh cycle

Bandwidth Intensive and Real-time Applications

Real-time collaborative applications like voice and video require reliable coverage for low latency

Synchronous apps that require a pulse demand predictable performance.

Flexibility and Cost Efficiency

Save time and money by avoiding labor intensive moves adds and changes.

Save in cabling costs for new or unwired buildings

What Painpoints Does 802.11n Solve?

Better end-user experience for data, voice and video

- Throughput—Up to 6 times greater than existing networks
- Reliability—Fewer packet retries
- Predictability—Consistent coverage and throughput
- Compatibility—Backwards support for 802.11a/b/g clients
- Future-Proofing—Guaranteed Interoperability –Tested/Validated

Technical Elements of 802.11n

MIMO	40Mhz Channels	Packet Aggregation	Backward Compatibility

MIMO

40Mhz Channels

Packet Aggregation

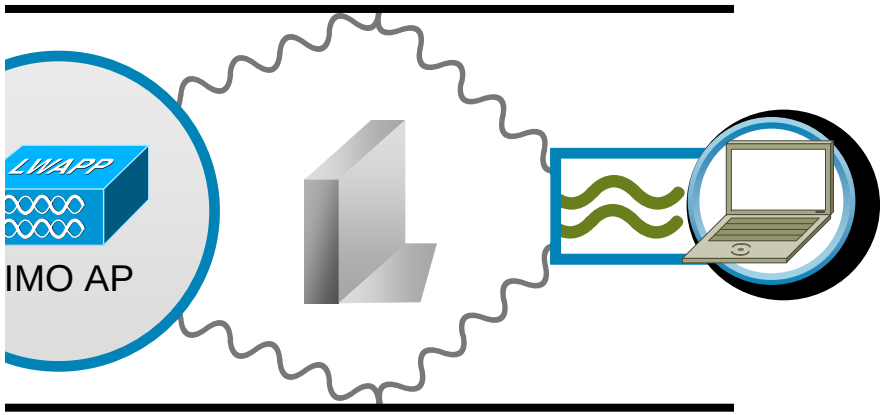
Backward Compatibility

Aspects of 802.11n

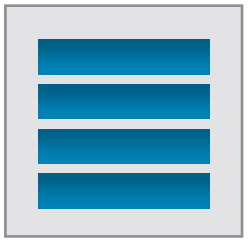
MIMO | 40Mhz Channels | Packet Aggregation | Backward Compatibility

MIMO (Multiple Input, Multiple Output)

With Beam Forming — Without Beam Forming — Transmissions Arrive In Phase, Increasing Signal Strength



HALLWAY



Performance

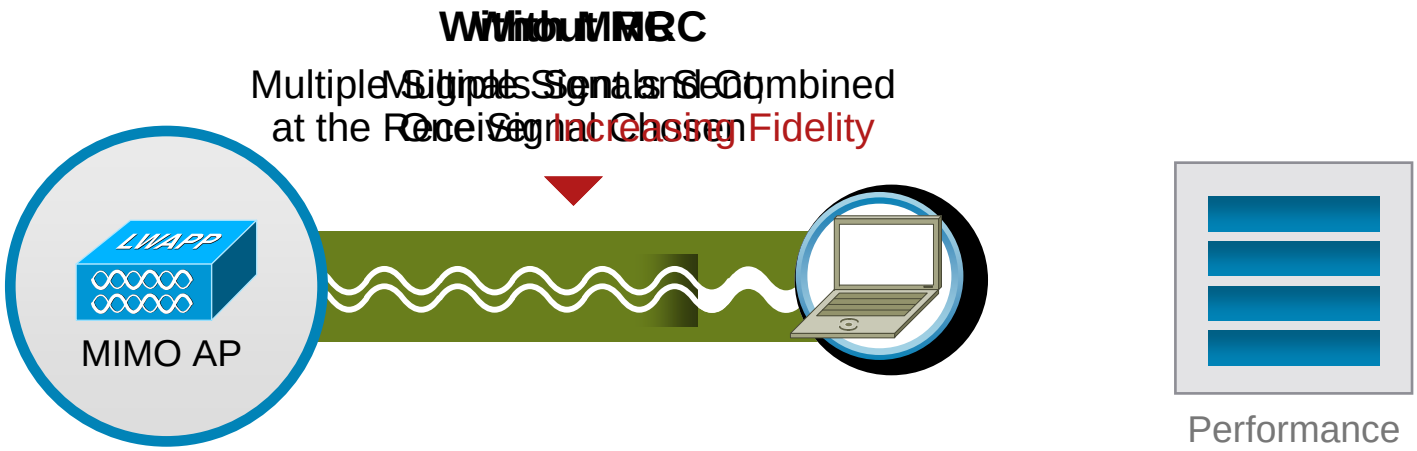
Performed by Transmitter (Talk Better)	Ensures Signal Received in Phase	Increases Receive Sensitivity	Works with non-MIMO and MIMO Clients

Beam Forming | Maximal Ratio Combining | Spatial Multiplexing

Aspects of 802.11n

40Mhz Channels | Packet Aggregation | Backward Compatibility

MIMO (Multiple Input, Multiple Output)



Performed by Receiver (Hear Better)	Combines Multiple Received Signals	Increases Receive Sensitivity	Works with non-MIMO and MIMO Clients

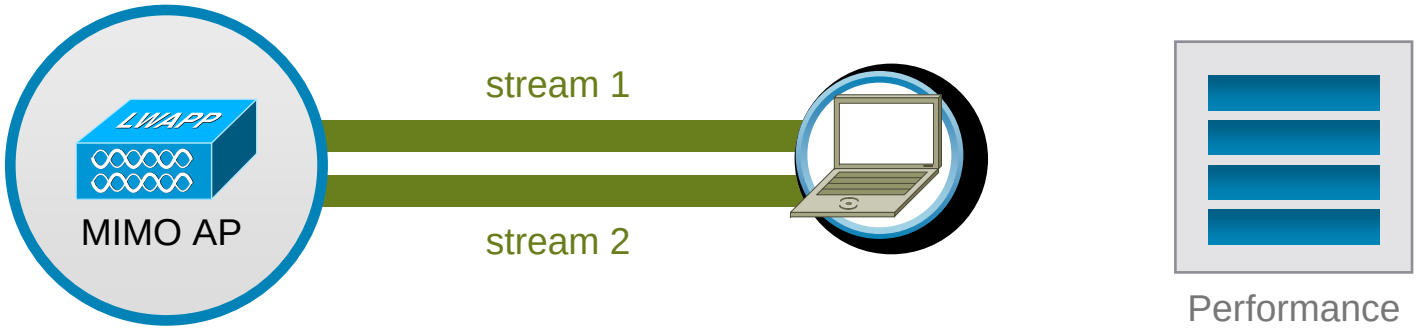
Beam Forming | Maximal Ratio Combining | Spatial Multiplexing

Aspects of 802.11n

40Mhz Channels | Packet Aggregation | Backward Compatibility

MIMO (Multiple Input, Multiple Output)

Information Is Split and Transmitted on Multiple Streams



Transmitter and Receiver Participate	Concurrent Transmission on Same Channel	Increases Bandwidth	Requires MIMO Client

Beam Forming Maximal Ratio Combining Spatial Multiplexing

Aspects of 802.11n

MIMO | 40Mhz Channels | Packet Aggregation | Backward Compatibility

40Mhz Channels

Moving from 2 to 4 Lanes

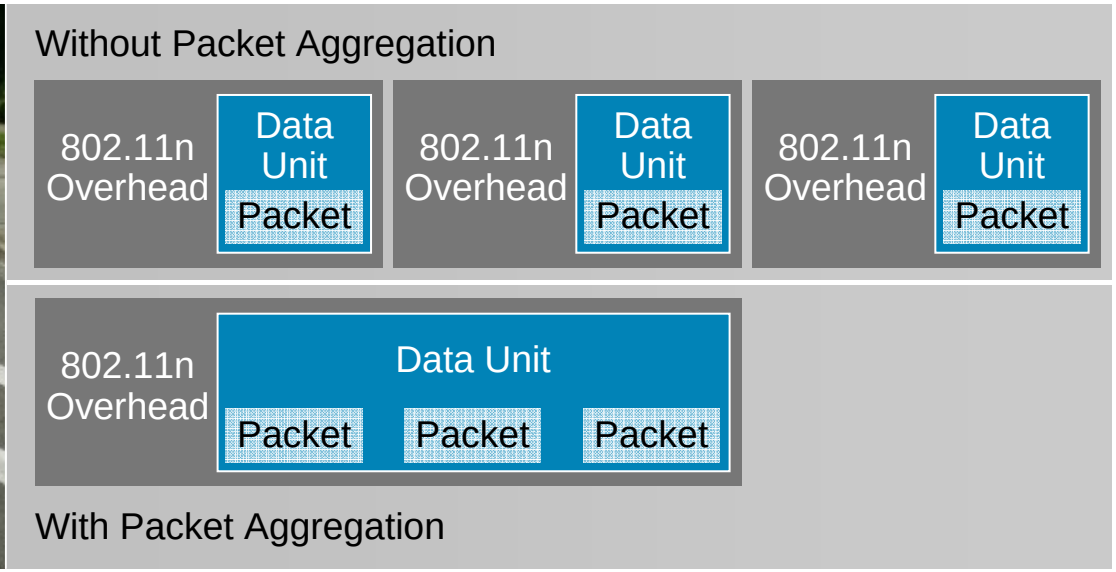
- 40-MHz = 2 aggregated 20-MHz channels—takes advantage of the reserved channel space through bonding to gain more than double the data rate of 2 20-MHz channels

Aspects of 802.11n

MIMO | 40Mhz Channels | Packet Aggregation | Backward Compatibility

Packet Aggregation

Carpooling Is More Efficient Than Driving Alone



Aspects of 802.11n

MIMO	40Mhz Channels	Packet Aggregation	Backward Compatibility

Backward Compatibility

2.4GHz

5GHz

11n Operates in Both Frequencies

802.11ABG Clients Interoperate with 11n AND Experience Performance Improvements

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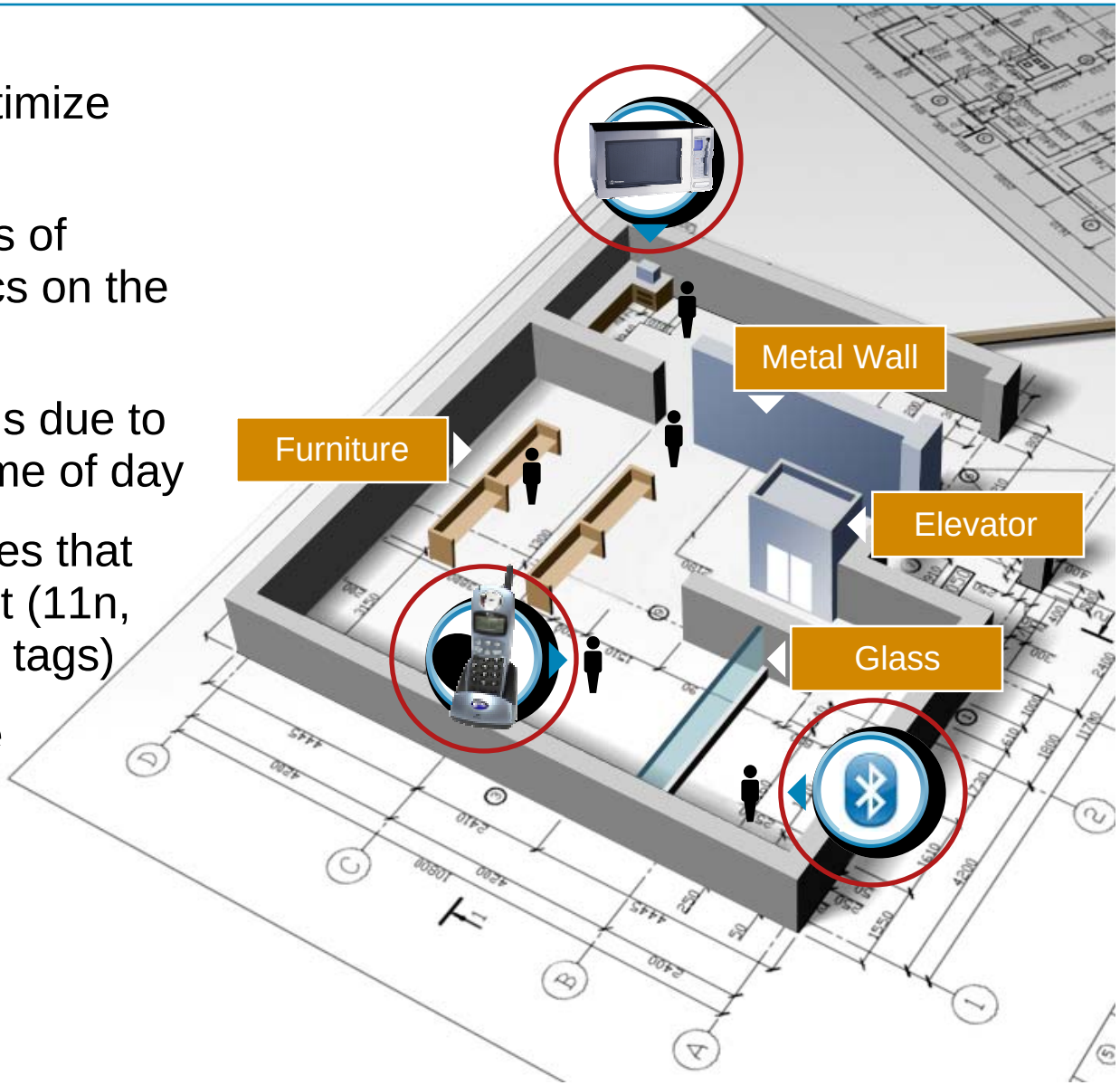
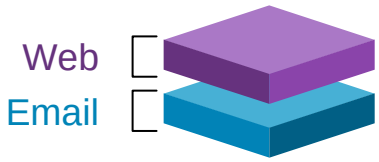
Site Survey Prepares for 802.11n

- Recommended to optimize 11n deployment
- Survey reveals effects of building characteristics on the wireless spectrum
- Measure RF variations due to human activity and time of day
- Survey with client types that you plan to implement (11n, 11abg, VoIP, location tags)
- Spectrum intelligence to detect interference

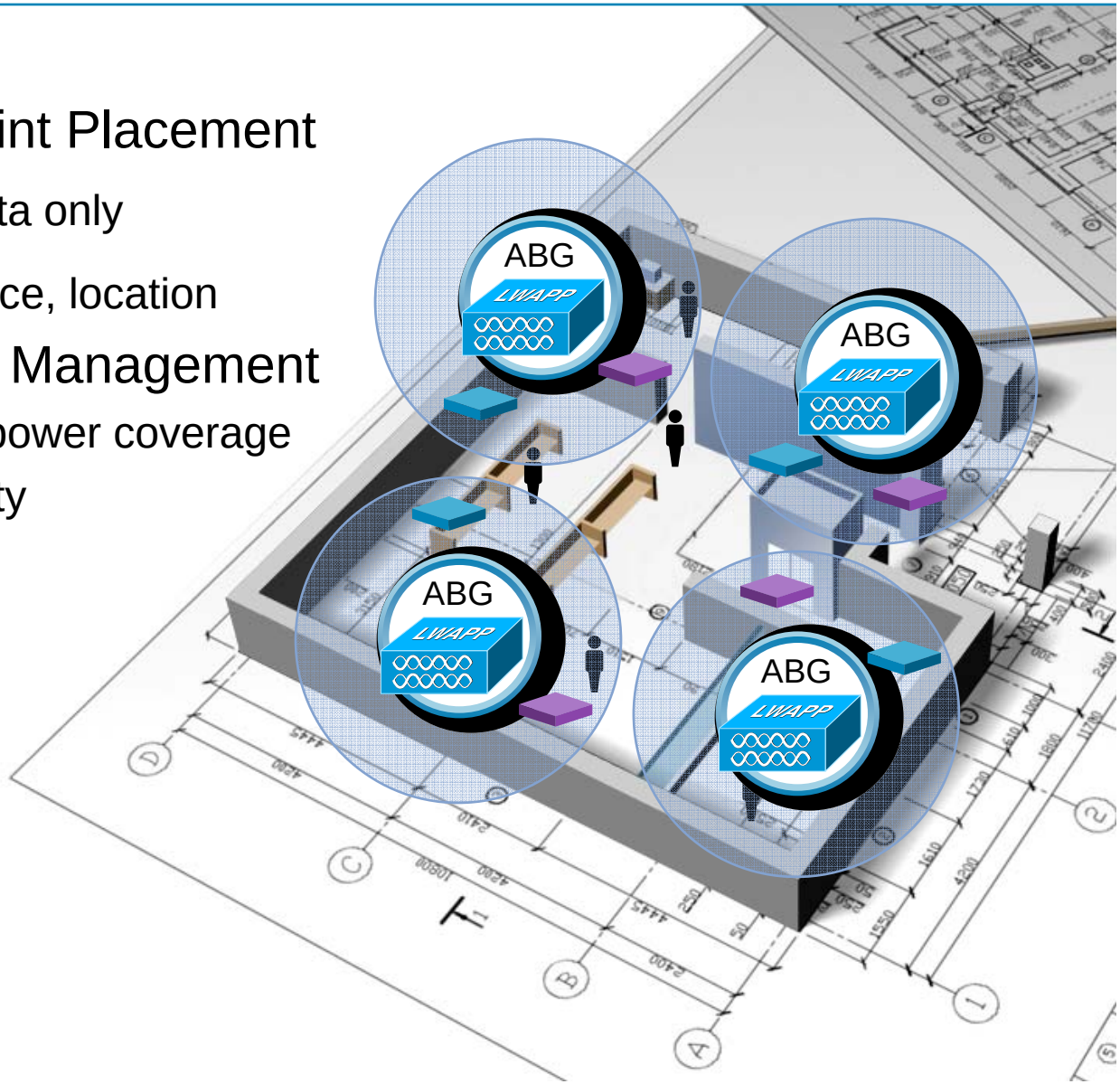


Access Point Placement

- ABG Access Point Placement
  - 1 per 500 m^2 for data only
  - 1 per 300 m^2 for voice, location
- Radio Resource Management
  - Adaptive channel / power coverage
  - Operational simplicity

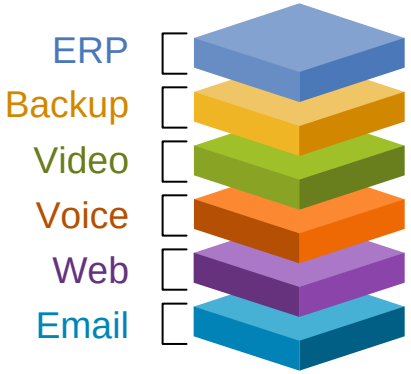


Several Supported Apps



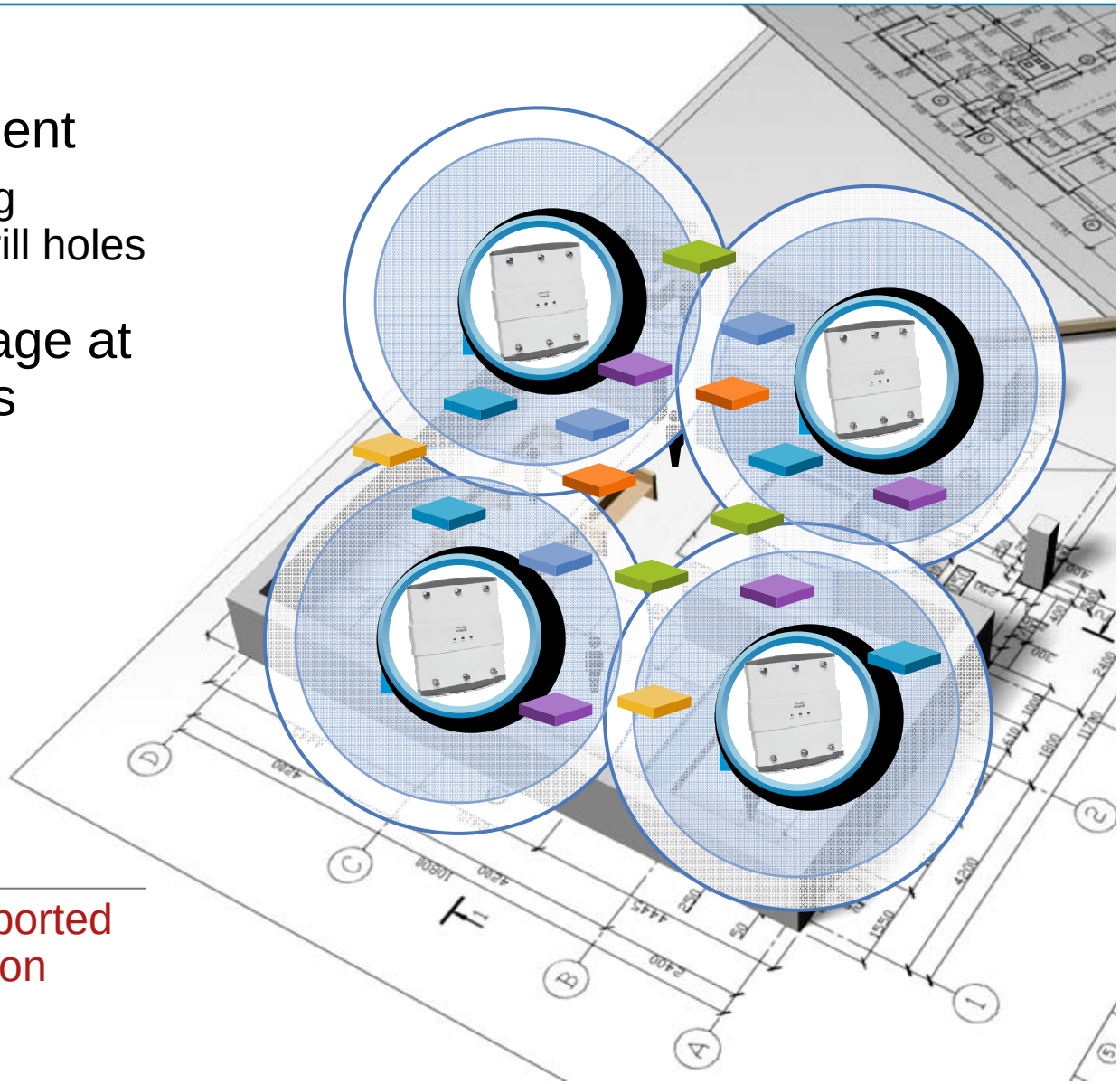
Access Point Placement

- 1 for 1 replacement
  - 1250 reuses existing Cisco AP bracket drill holes
- Improved coverage at higher data rates



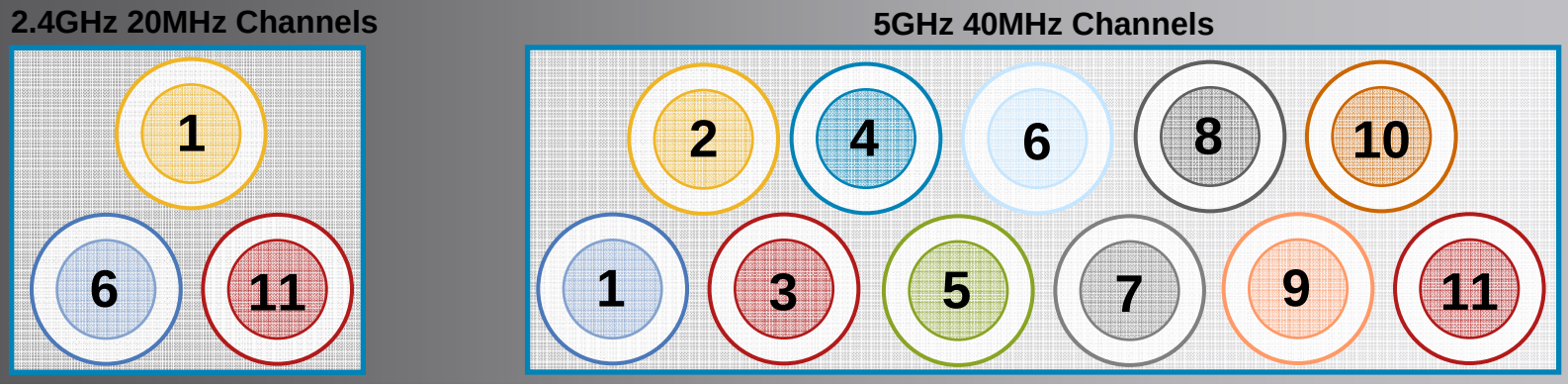
Supported Apps

More Applications Supported at Any Given Location



Effective Frequency Use—5GHz and 2.4GHz
Create a 5GHz Strategy

- 5GHz Recommended for 802.11n
  - More available spectrum—greater number of channels
  - Benefits from 40MHz channels, although 20MHz still works well
  - Many 11n devices only support 40MHz in 5GHz, although Cisco supports 40MHz in both 2.4GHz and 5GHz
- 2.4GHz still benefits from MIMO and packet aggregation
  - Ideal for legacy apps (handhelds, scanners, med. applications)



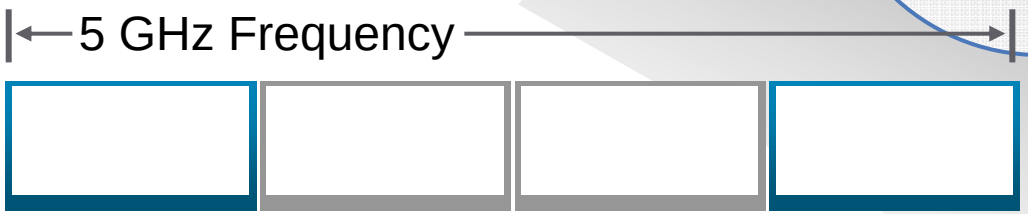
5GHz Dynamic Frequency Selection

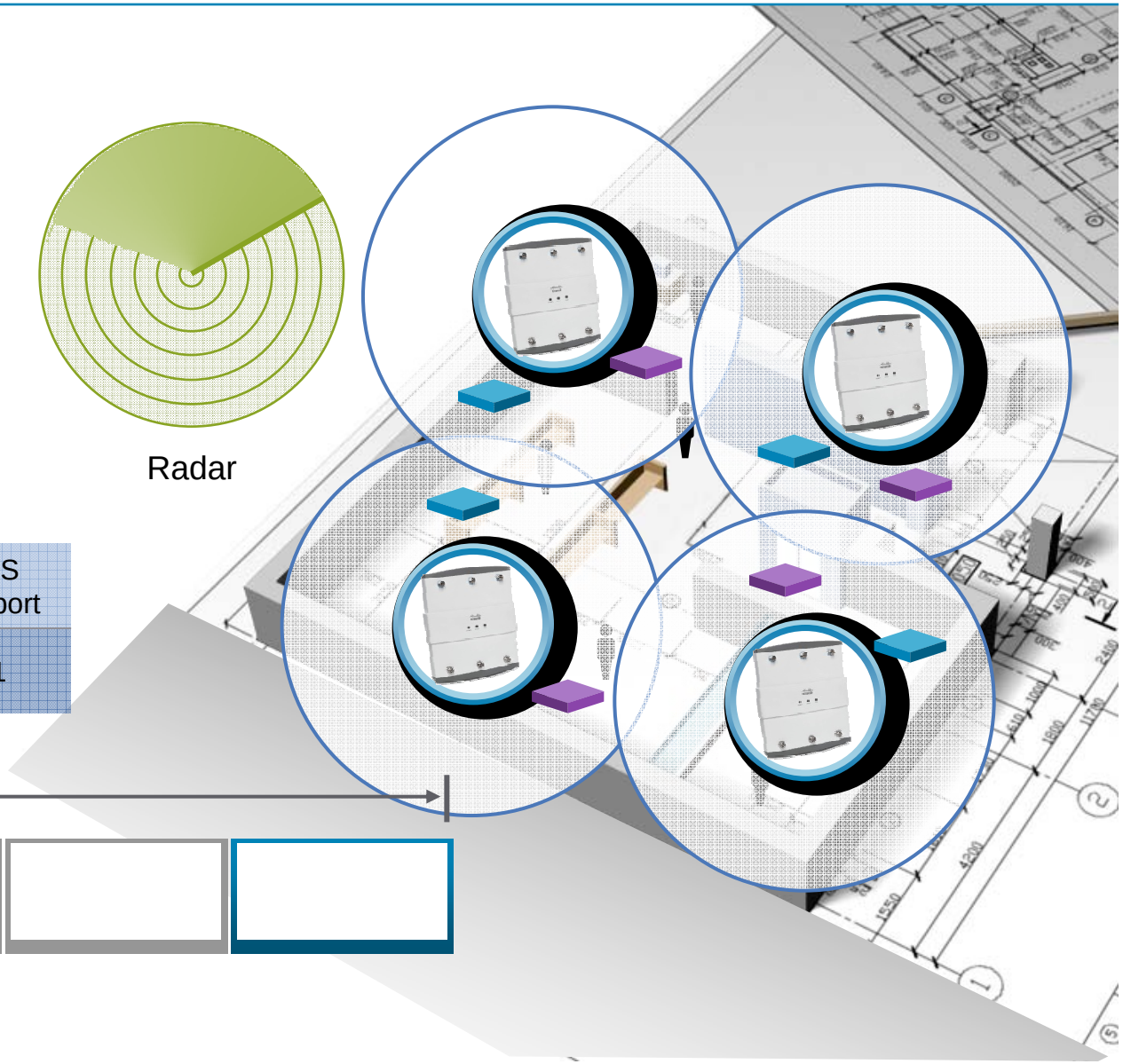
When Radar Is Present

APs Shift Channels—Results in Lower Available Channels and Loss of UNI 2 and UNI 2e Bands

Radar

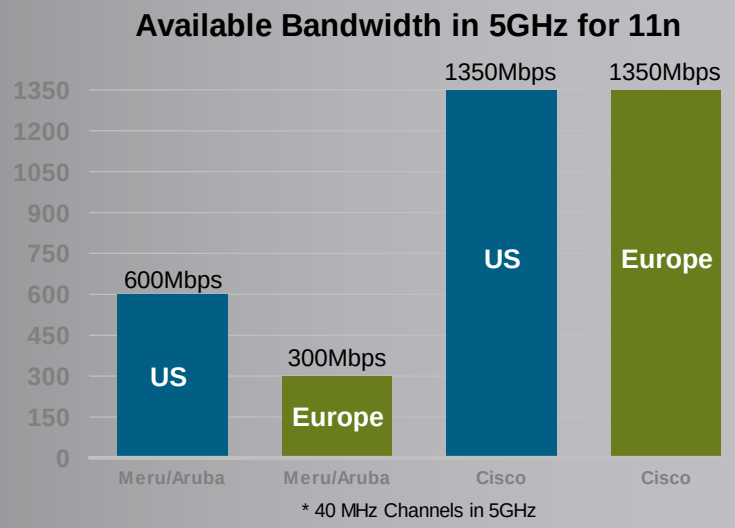
Available 40MHz Channels	No DFS Support	DFS Support
	4	11





DFS and Available Bandwidth

- Full DFS support is required for complete use of channels in 5GHz
- Limited DFS support directly impacts available bandwidth
- Limited bandwidth restricts application support and negates investment in 11n

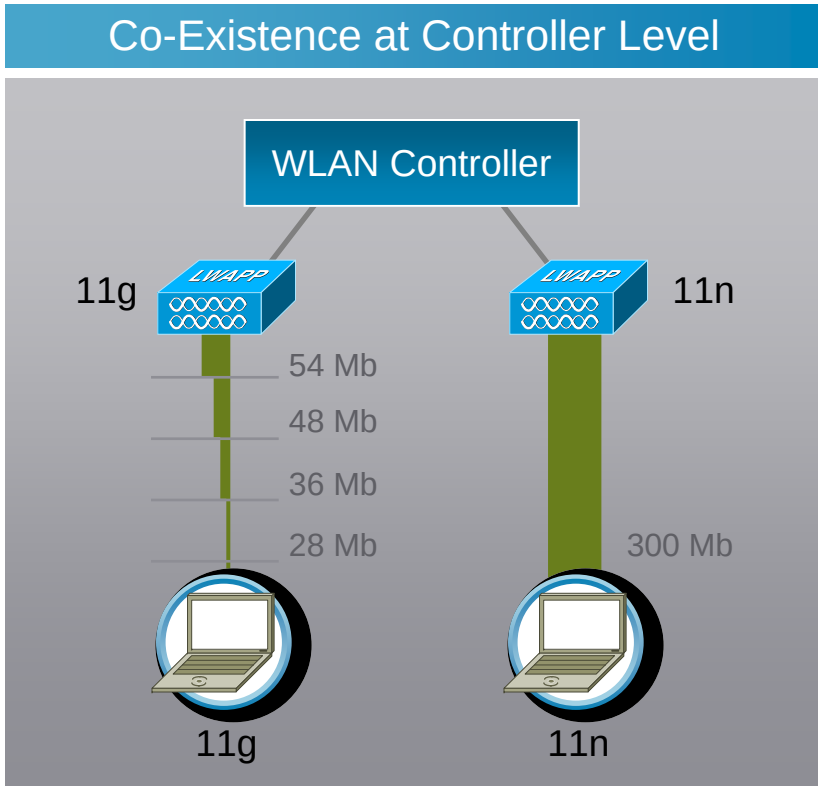


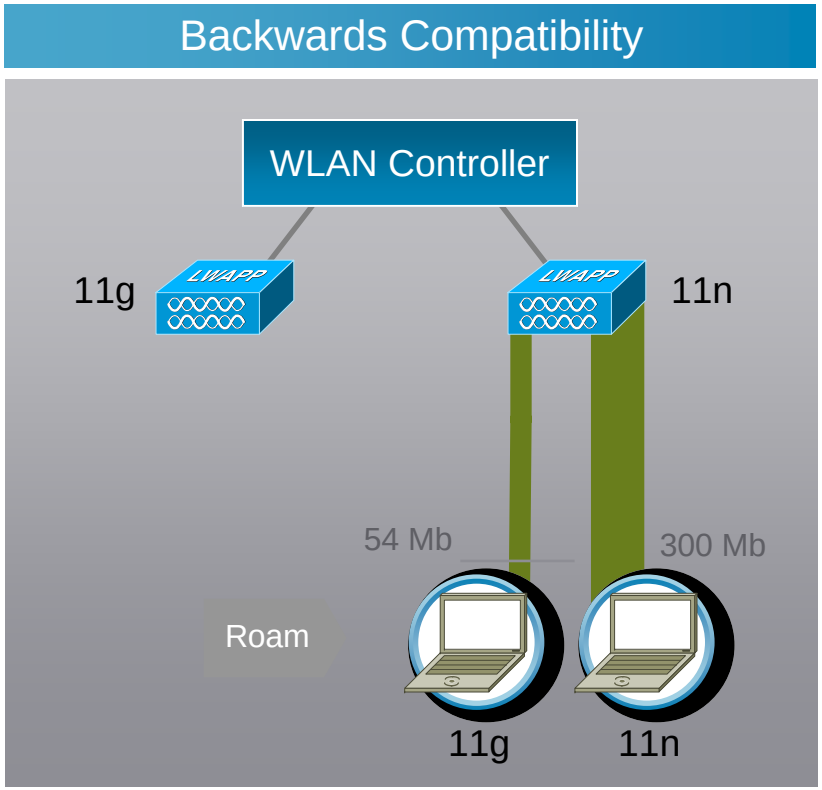
Available Channels per Region		Theoretical	Cisco	Meru/Aruba
United States	11n 5GHz 20MHz	24	21	8
	11n 5GHz 40MHz	11	9	4
Europe	11n 5GHz 20MHz	19	19	4
	11n 5GHz 40MHz	9	9	2

Backward Compatibility & Co-Existence

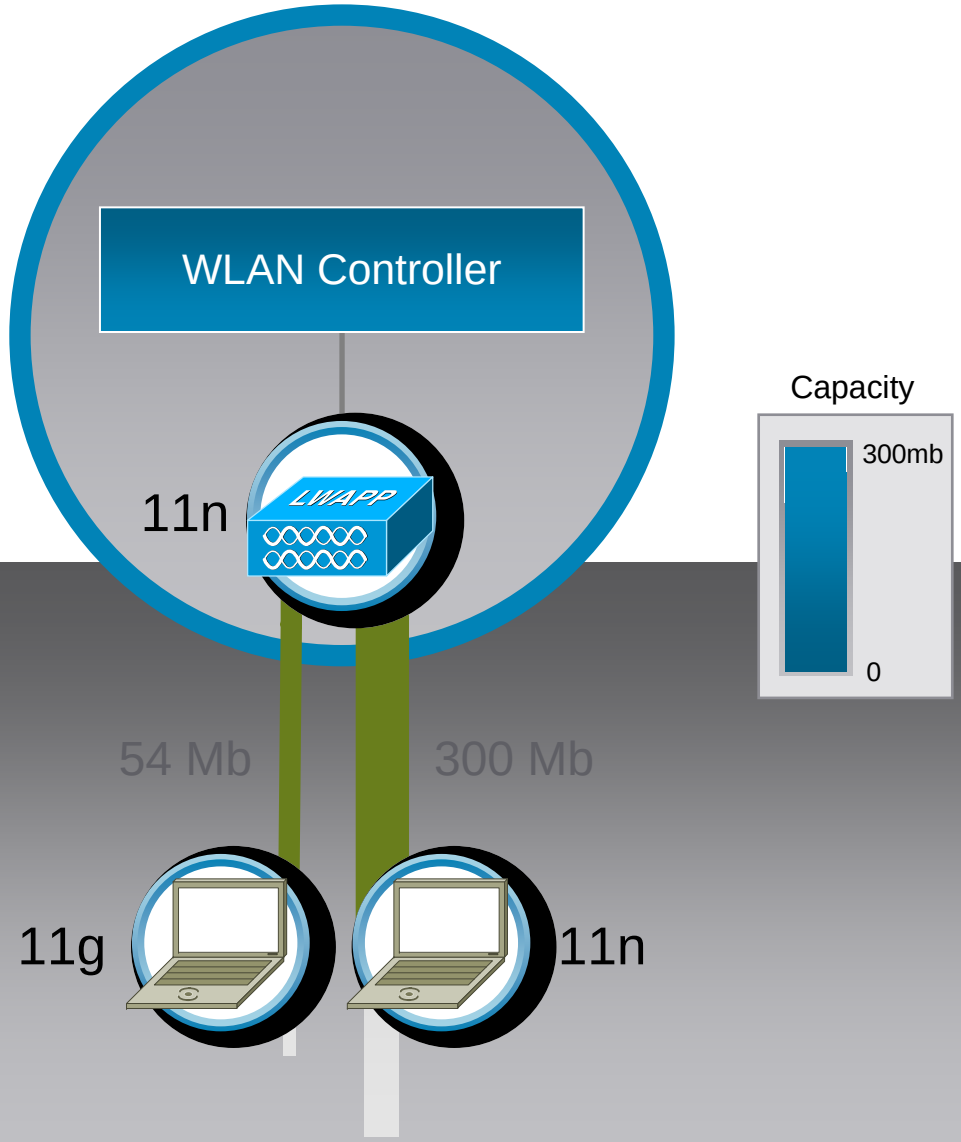
- Co-existence of ABG/N APs
- Benefits of 11n accrue to ABG clients

  MIMO benefits ABG clients on the AP receive side from MRC



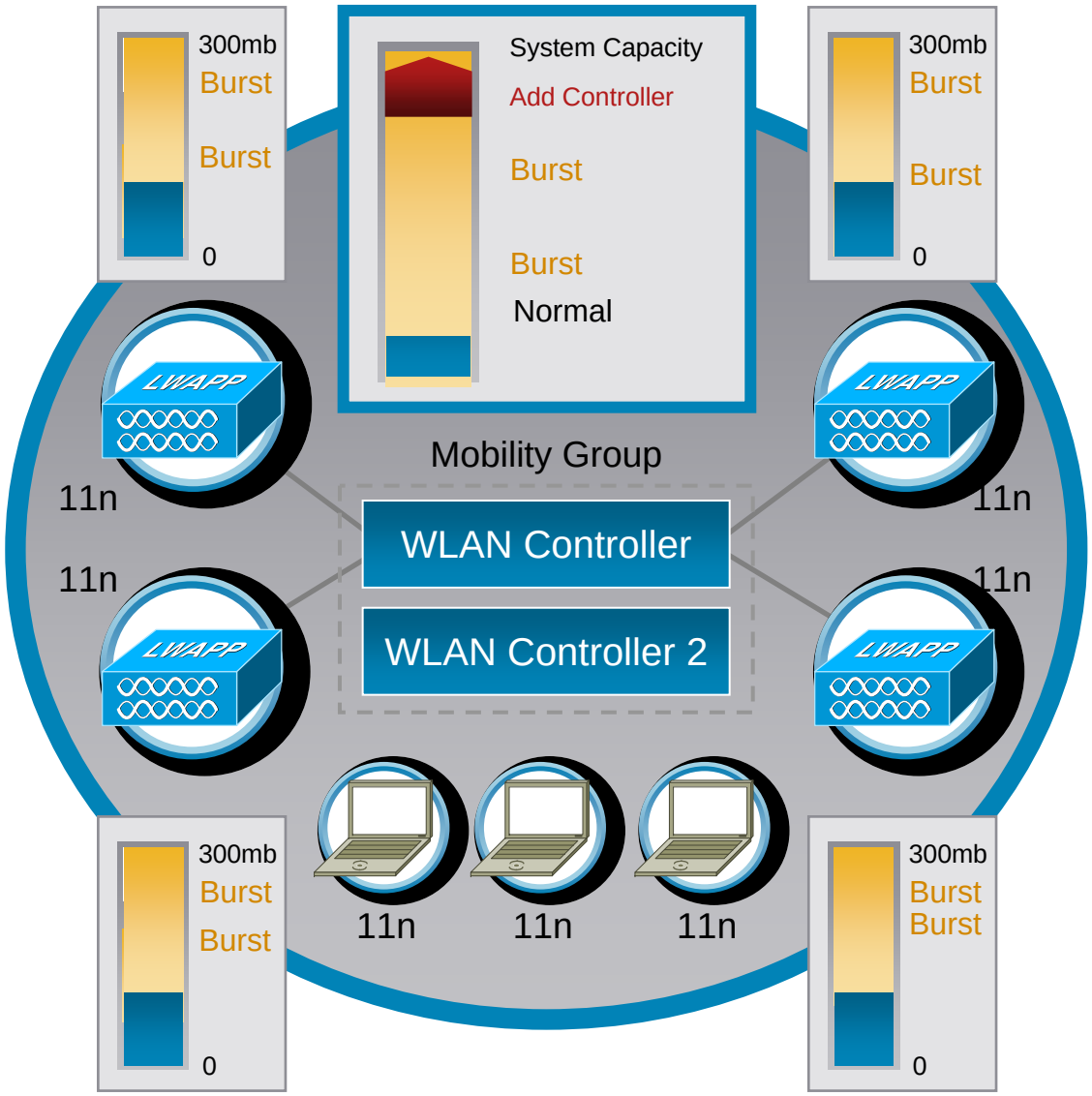


Mixed Mode Performance



- 3 Modes of operation supported
  - Legacy
  - Green Field
  - Mixed
- Mixed mode experiences slight performance impact due to ABG clients
- 11n clients still transmit at full performance
- PHY and MAC for 11n provides co-existence and protection for ABG clients

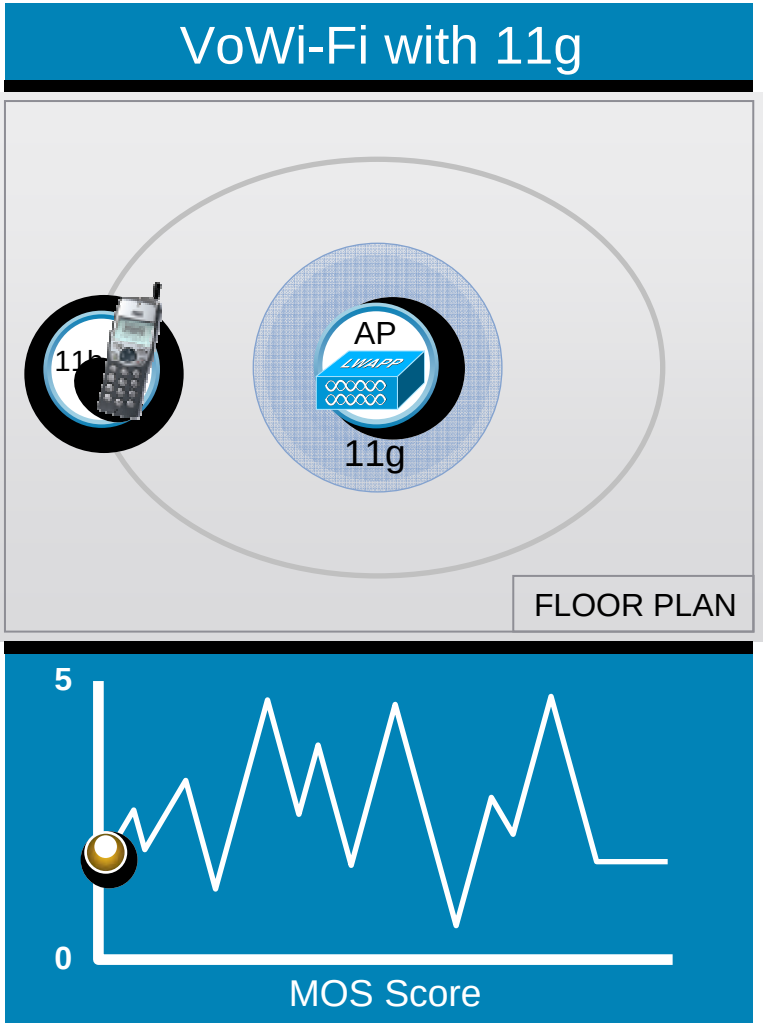
Network Capacity and Scalability



- Plan for system level capacity, not per AP capacity
- Additional controller increases capacity and improves availability
- Typical Ethernet network oversubscription is 20:1
- With 1250 APs at full capacity, Cisco WLAN controllers reach 12:1

Voice over 802.11n

802.11abg Performance Still Benefits from MIMO



A Higher MOS Score Delivers Better Voice Quality

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Delivering Business Mobility

The Cisco Unified Wireless Network

Client
- 90% of laptops Cisco compatible
- Secure Services Client (CSSC)

Access Points
- Indoor and Outdoor
- 802.11a/b/g/n
- Only 802.11n Draft 2 support with PoE

Wireless LAN Controllers and Management
- Centralized management
- Flexible, scalable (1000s of APs)
- Radio resource management

Wired Network Services
- Unified Security and Manage-ment services
- Mobile Unified Communications

Mobility Services
- Mobility Services Engine

Guest Access

Security

Spectrum Intelligence

Voice

Context-Aware

Mobile Intelligent Roaming

Unified Wired and Wireless Network

Device | **Access** | **Control and Visibility** | **Service and Performance** | **Mobile Applications**

Cisco Aironet 1140 Series Access Point

Taking Business Mobility Mainstream

- **1140 Series Takes 802.11n Mainstream**
  - –Guaranteed Interoperability – Tested/Validated
  - –Most widely deployed technology in the industry
  - –Backwards compatible with A/B/G
- **Simple Deployment/Energy Efficient**
  - –Sleek design with integrated antennas
  - –High performance energy efficient 802.3af power
  - –10 AP Eco-pack—efficient, easy, eco-friendly
- **RF Excellence**
  - –Cisco M-Drive technology is a system-wide approach that manages corporate spectrum; improves wireless coverage, and increases system capacity and performance

6X performance of A/G

Cisco Next-Generation Wireless
Portfolio

- **Cisco Aironet 1140 Series**
  - Carpeted Indoor Environments
  - Easy to Deploy-Sleek design with integrated antennas
  - 802.11n performance with efficient 802.3af power
  - Blends seamlessly into the environment

- **Cisco Aironet 1250 Series**
  - Rugged Indoor Environments
  - Versatile RF coverage with external antennas
  - Flexible power options for optimal RF coverage

NEW FOR Q2CY2009

Cisco 5500 Series Wireless Controller

Key Benefits

- Deploy **mission critical wireless networks**:
  - Run high bandwidth applications over wireless
  - Improved mobility experience through larger mobility domains and faster roaming
  - Strong security via CAPWAP data encryption, and deeper and faster ACLs
  - Reduced downtime for network upgrades

Key Features

- Optimized for 802.11n speeds
- Scales up to 500 APs
- New flexible licensing for AP count and features
- OfficeExtend AP solution for mobile teleworker
- Faster AP joins and upgrades

Cisco 5500 Wireless Controller Features

	Scalability / Performance	Enhanced Mobility	Pay as you grow
Features	▪ 8GB throughput – cleartext and encrypted ▪ Up to 500 APs ▪ 50 AP concurrent upgrade / join	▪ 36,000 AP large mobility domain ▪ Cisco M-Drive Technology with ClientLink ▪ BandSelect ▪ VLANSelect	▪ AP count upgrade ▪ Plus feature package ▪ Demo license
Benefits	▪ Wire-like performance for bandwidth intensive apps ▪ *Reduced down-time* ▪ Improved manageability – fewer controllers to manage	▪ Fast mobility handoffs ▪ Improved performance for 802.11a/g ▪ Optimal RF and wired resource utilization ▪ Extensive client compatibility and predictable roaming	▪ Flexibility to invest as business needs grow ▪ Investment protection ▪ Lower entry level cost ▪ Try and buy

Cisco 5500 Wireless Controller Features

	Office Extend AP	Future Expansion	Green
Features	▪ Secure, simple, cost-effective mobile-teleworker solution ▪ Up to 500 OfficeExtend APs per controller ▪ Secure CAPWAP tunnel ▪ Supports UC wireless phones	▪ High speed expansion module ▪ WPLUS premium feature set	▪ Telecommute using OfficeExtend AP ▪ As low as 0.2W per AP power consumption ▪ Future EnergyWise integration
Benefits	▪ Reduced expenses via telecommuting ▪ Lower cellular charges ▪ Secure, remote deployments ▪ Instant remote Wi-Fi coverage with minimal configuration	▪ Investment protection ▪ More connectivity options ▪ Rapid deployment of future technologies ▪ Pay as you grow	▪ Lower OpEx on power ▪ Corporate Social Responsibility ▪ Reduced employee impact on environment

Introducing Cisco M-Drive Technology

New!

Simplifying the Adoption of 802.11n through RF Excellence

System-wide Feature of the Cisco Unified Wireless Network

Capacity and Coverage

- Increased system-wide capacity with ClientLink
- Consistent network transmit and receive for optimized rate vs range
- Full scalability through optimal 5GHz spectrum use

Optimized Client Connections

- Improved performance for existing 11a/g devices via ClientLink
- Automated client load balancing
- Extensive client compatibility and predictable roaming

Simplified Wireless Management

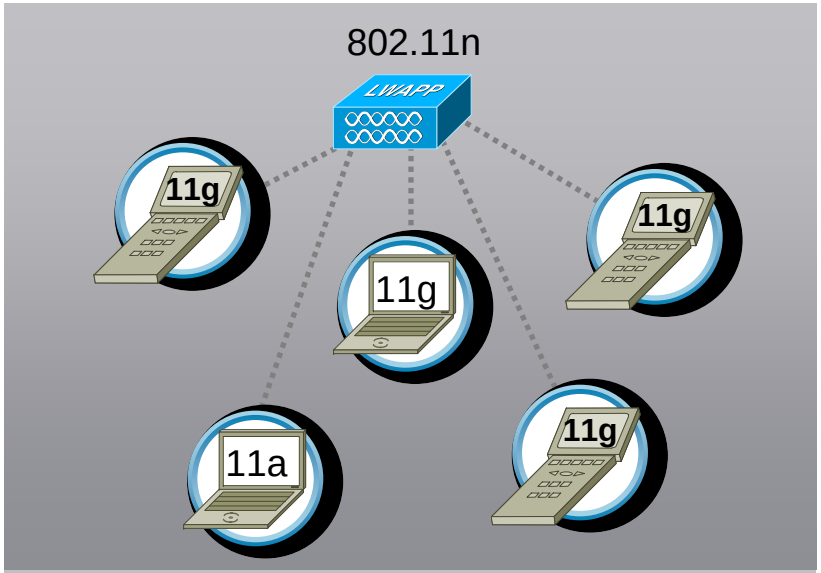
- Dynamic channel and power setting for 802.11n and 802.11abg
- Automated coverage hole detection and removal

Cisco M-Drive with ClientLink

New!

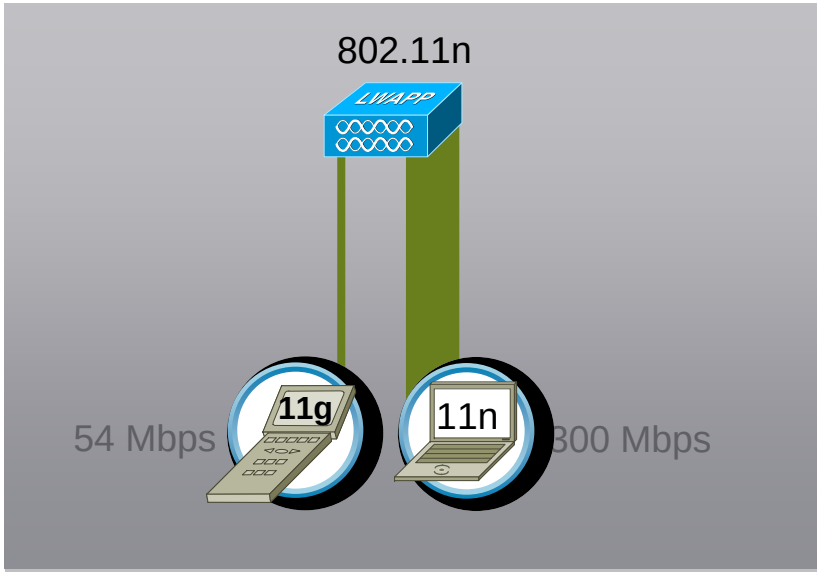
Protecting the Investment in Existing 11a/g Devices

Challenge #1:
Extending Useful Life of 11a/g Devices



11a/g devices reaching max. performance but too costly to upgrade

Challenge #2:
True Fairness for Mixed Device Networks

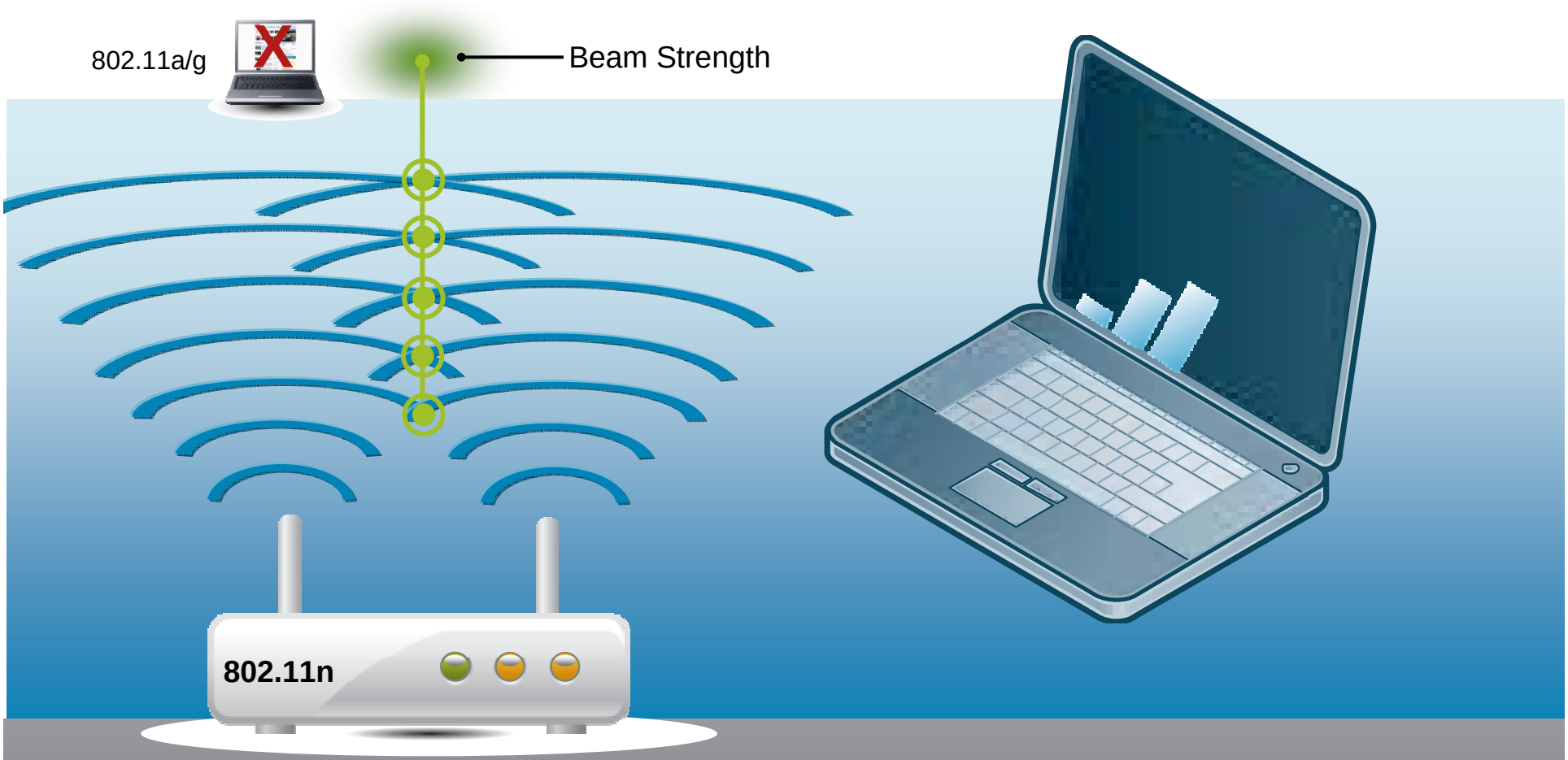


11a/g devices consume valuable “airtime”, reducing the performance of 11n devices

- ClientLink delivers the following benefits:
  1. Provides consistently higher throughput per 11a/g device
  2. Increases overall system capacity for both 11a/g and 11n devices
  3. Reduces coverage holes in challenging RF environments

Existing 802.11n Solutions

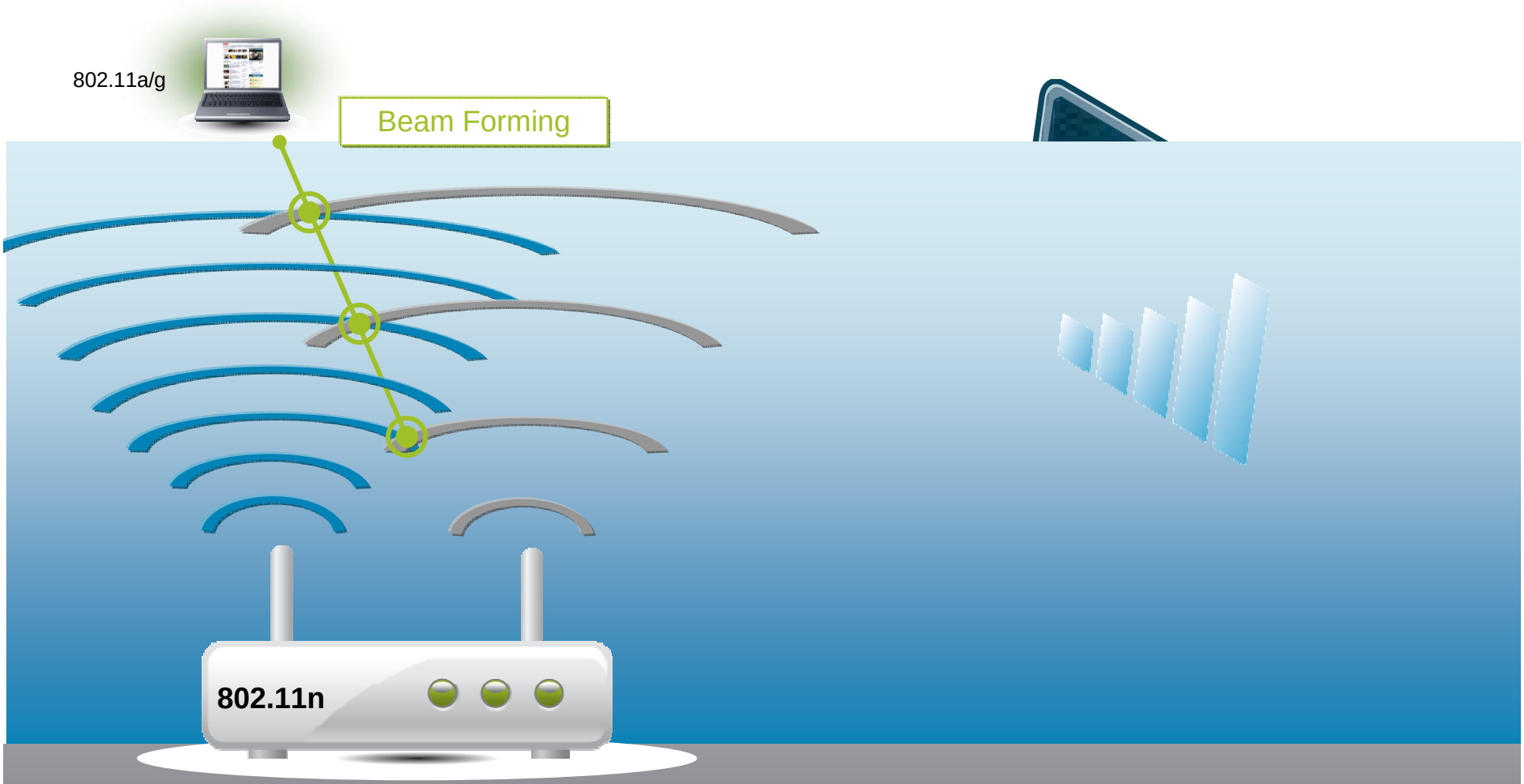
Beam Strength Not Directed to Client



802.11a/g Client Connection Not Optimized,
Creates Coverage Hole

Cisco M-Drive with ClientLink

Cisco Innovation: Beam Forming Intelligence



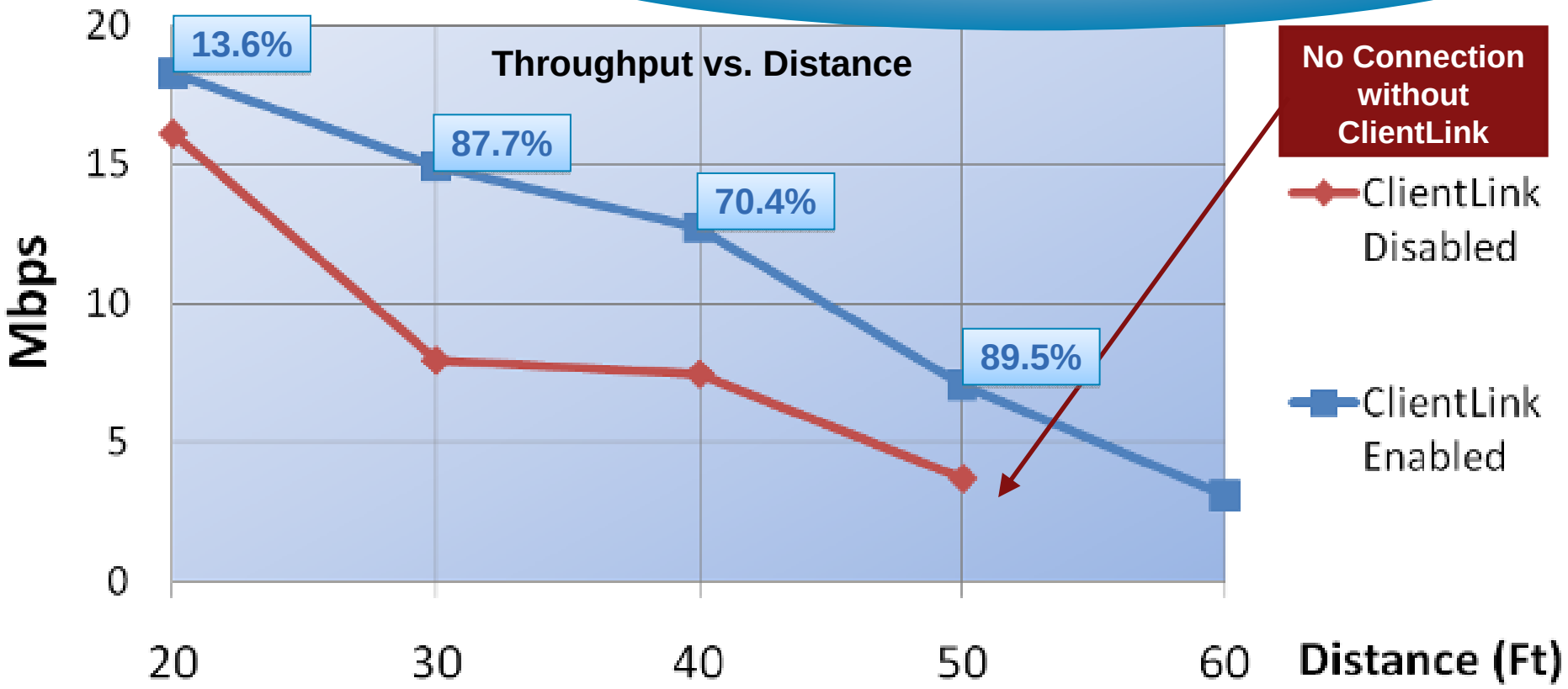
ClientLink uses Beam Forming to Direct Signal to Improve Performance and Coverage for 802.11a/g Devices

Benefit #1: Improves Throughput

ClientLink Offers Higher Throughput per 11a/g Device

Miercom

Up to 65% Increase in Throughput



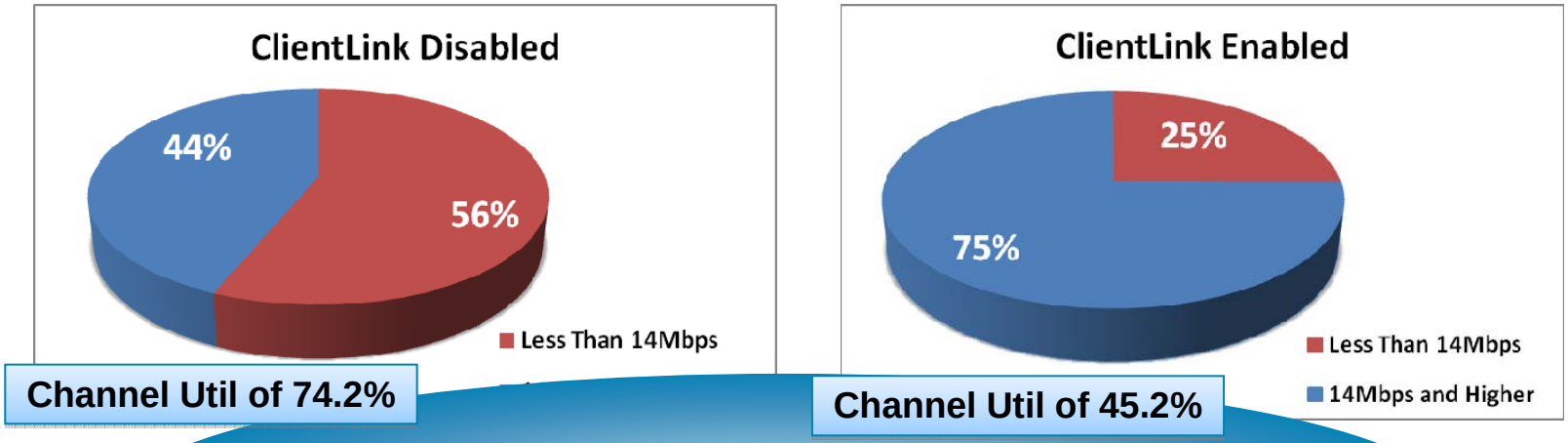
Test: 802.11a/g device with 802.11n network
Source: Miercom

Benefit #2: Greater System Capacity

Consistently Higher Throughput over Coverage Area

Miercom

Measuring throughput at 16 different locations



Up to 27% Improvement in Channel Capacity

- ClientLink allows clients to connect at consistently higher data rates. Faster data transmission, less retries = overall more efficient use of RF channel.
- Faster 11a/g transactions opens airtime for 11n devices, allowing them to also experience a performance improvement

Test: 802.11a/g device measured at 16 antenna orientations w/ 802.11n network
Source: Miercom

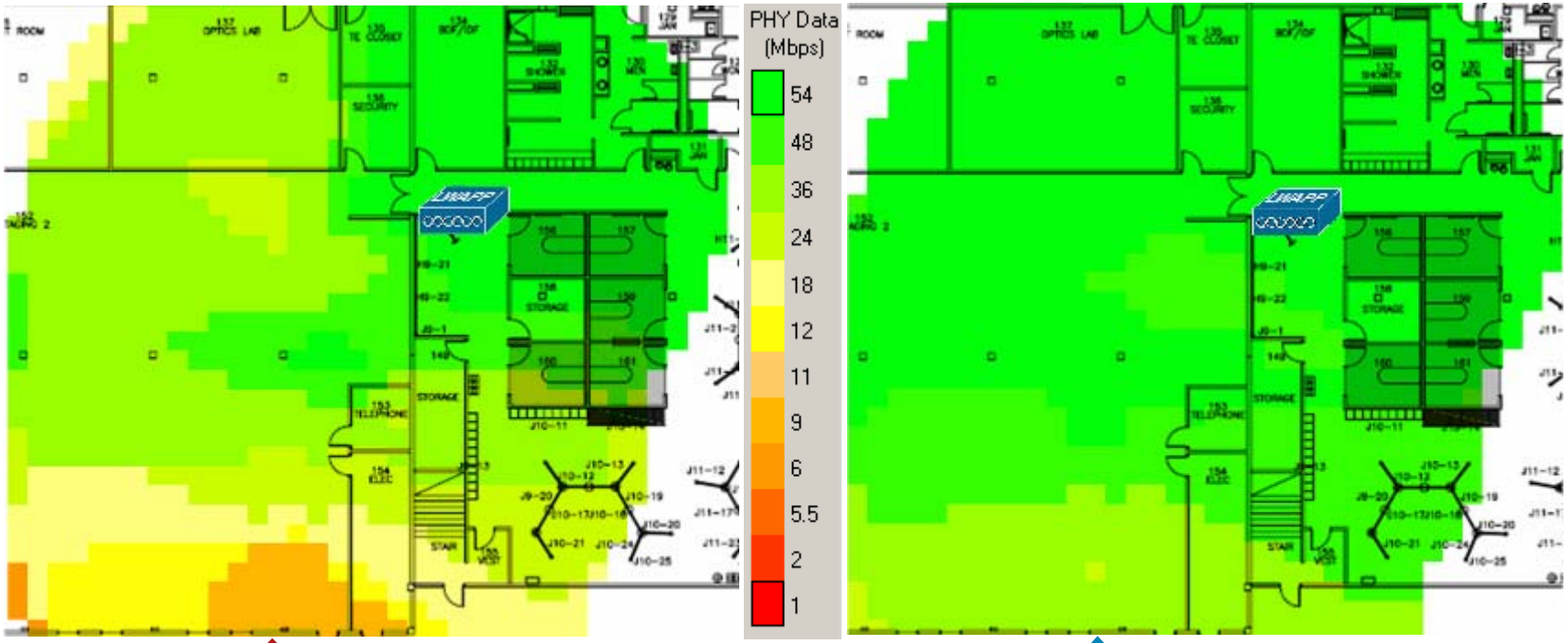
Benefit #3: Reduce Coverage Holes

ClientLink offers Higher PHY Data Rates

Miercom

ClientLink Disabled

ClientLink Enabled



Lower Data Rates

Higher Data Rates

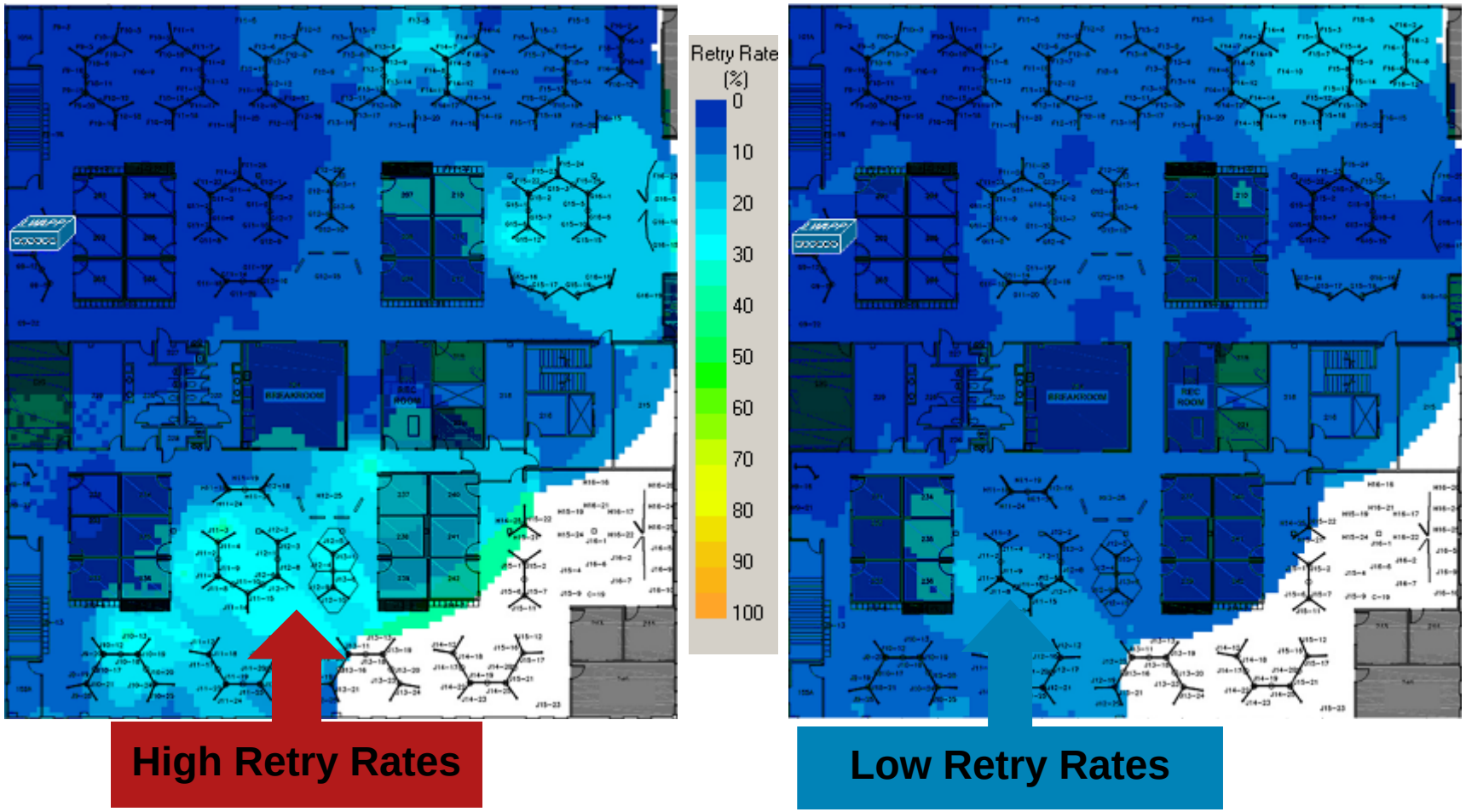
Source: Miercom; AirMagnet 6.0 Iperf Survey

Benefit #3: Reduce Coverage Holes (cont.)

ClientLink Delivers Lower Retry Rates

Miercom

ClientLink Disabled



ClientLink Enabled

Source: Miercom; AirMagnet 6.0 Iperf Survey

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OfficeExtend AP Highlights

OfficeExtend AP

1140 AP

1130 AP

5508 Wireless Controller

Key Benefits

- Secure, simple, cost-effective mobile teleworker solution enabling a consistent mobility experience
- Ease of deployment for IT; plug and play for end user
- 802.11n ready 1140 AP and 1130 AP supported

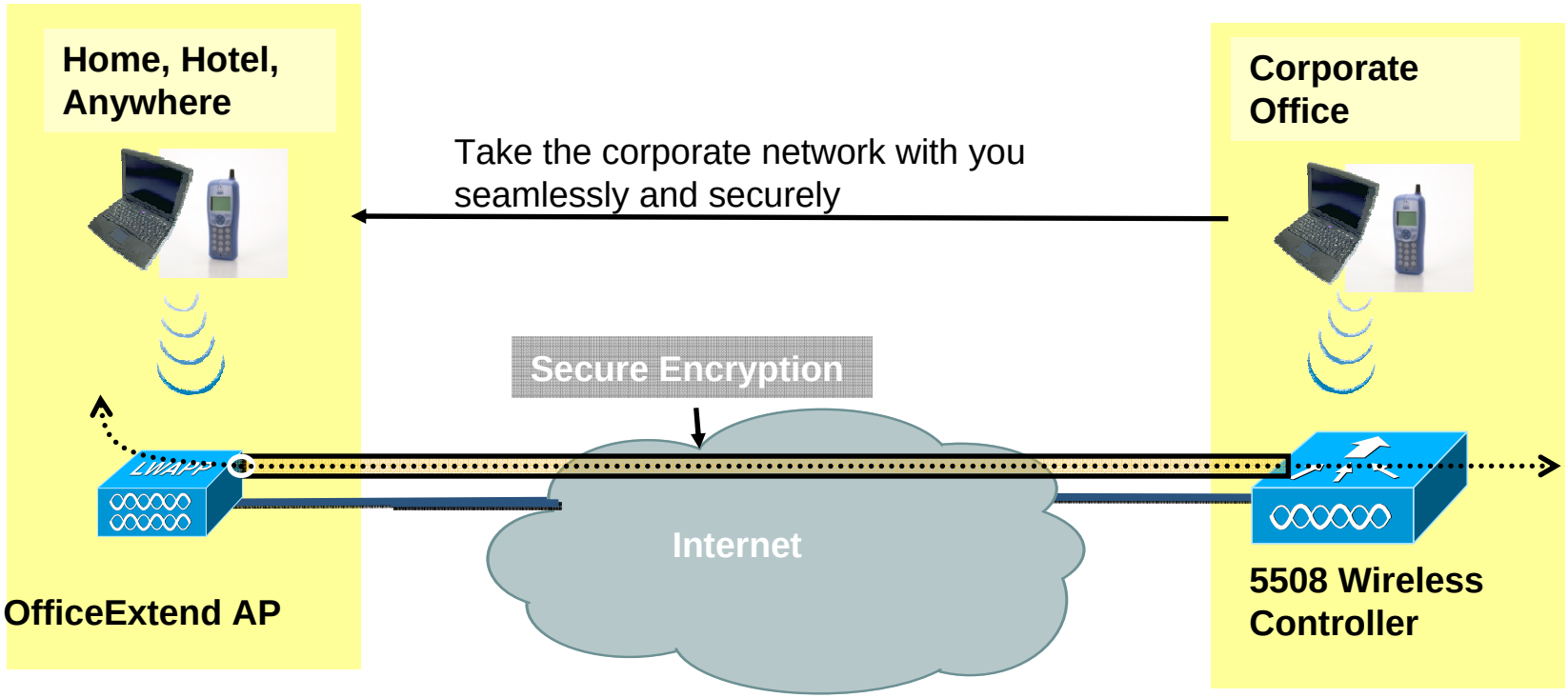
Features

- Scalable up to 500 APs per Wireless Controller
- WCS provisioning for mass deployment
- Personal SSID for non-corporate use
- Ease of deployment with no special configuration needed on the Wireless Controller
- Encryption of data at line rate, no encryption module needed
- Supports UC wireless phones

Solution Elements

- 5508 Wireless Controller
- 1130 AP; 1140 AP
- Management through WCS
- OfficeExtend AP is available with the WPlus software package

Office Extend AP Solution



Secure	⟷	**Secure DTLS VPN between AP and Corporate network over the WAN**
Simple	⟷	**AP can call home to automatically set up secure tunnel**
Cost Effective	⟷	**Reduce costs through telecommuting, reduced cell phone charges, and lower OpEx**