802.11n
The Next Generation Wireless Solutions

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Contents

1. Business Mobility Trends
2. 802.11n Technology Overview
3. Cisco Next Generation Wireless Solution Overview
4. Design and Deployment Guidelines
5. Summary
6. Q&A and Additional Resources

Business Mobility Trends

Proliferation of Wi-Fi Devices

Businesses deploying wireless pervasively

Expect wireless performance close to wired for business applications

Over 1.1 billion Wi-Fi clients will ship within the next 3 years

IDC

Business mobility delivered with next generation wireless

The Incoming Wave of Mobile Devices

Laptop/Tablet PC

Video Surveillance

Alarms, Bells, and Clocks

Learning & Entertainment

RFID Enabled Devices

Wireless Enabled Devices

Smart Phones

Billions of New Mobile Devices

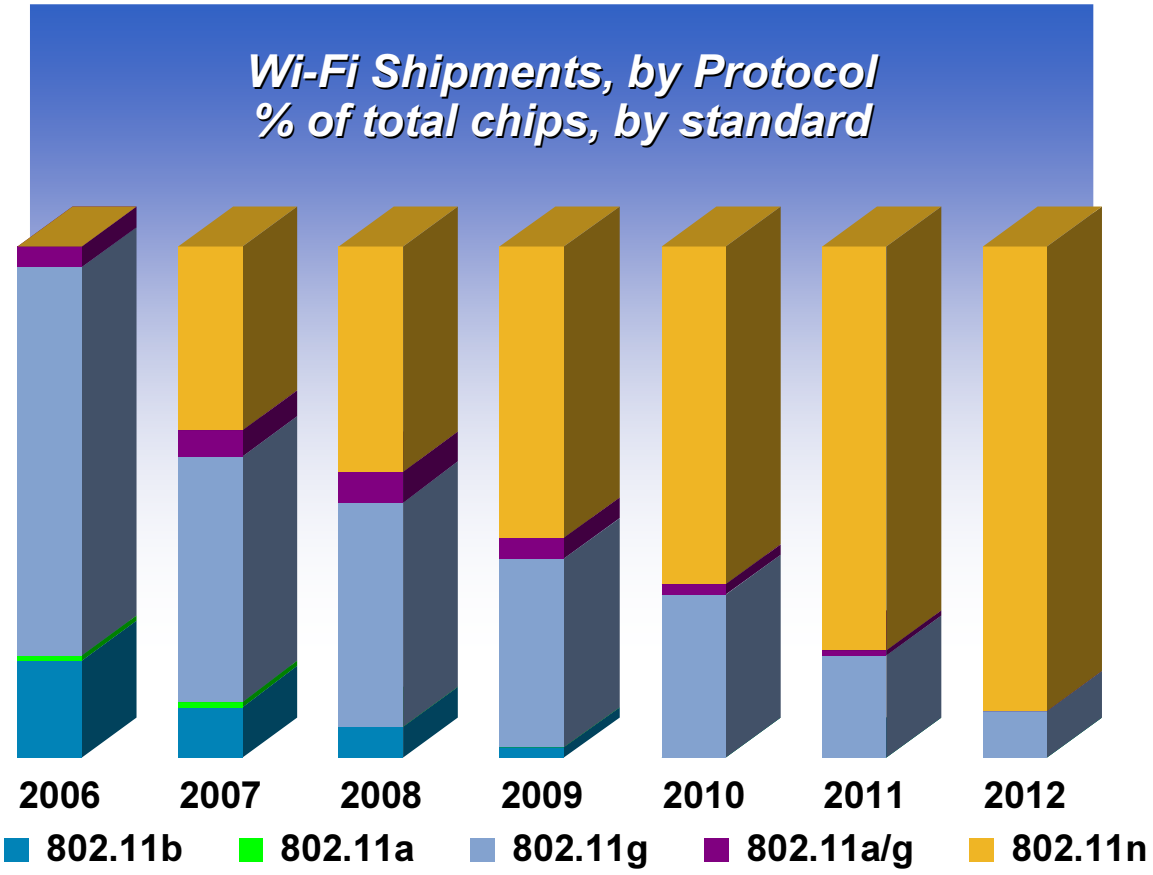
Look Mom, No Wires!

Born free.

The Client Drives the Migration

- Enterprise-class 802.11n clients widely available

  Laptop refresh cycle at 20% - 30% per year



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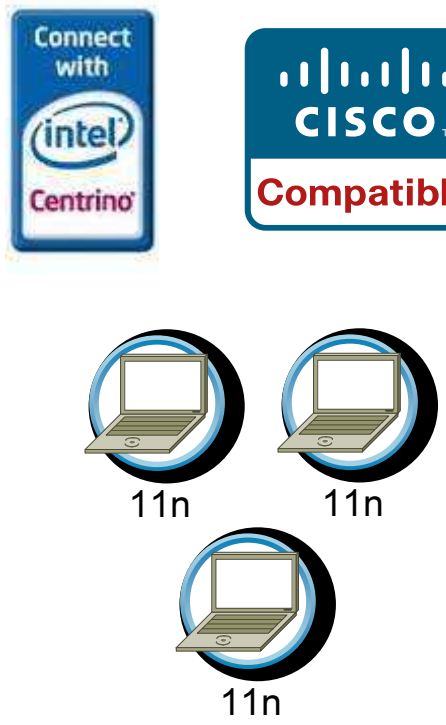
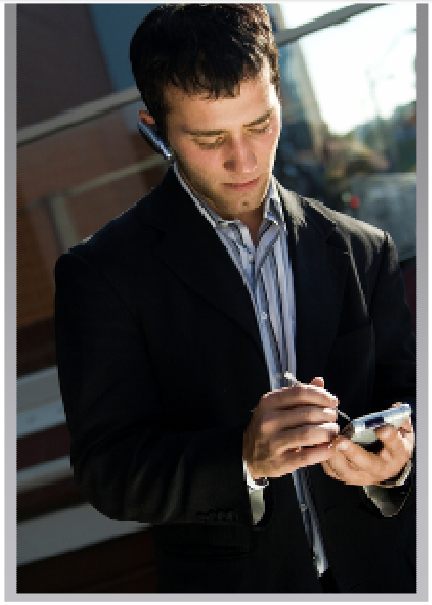


Wi-Fi **Challenges**

Collaborative Apps	High-Bandwidth Applications	Support of Mixed Client Environments	Challenging RF Environments




Business Ready Wireless Attributes

The diversity and growth of mobile applications is driving the need for increased wireless bandwidth

The introduction of real-time collaborative applications like voice and video requires low latency wireless connections

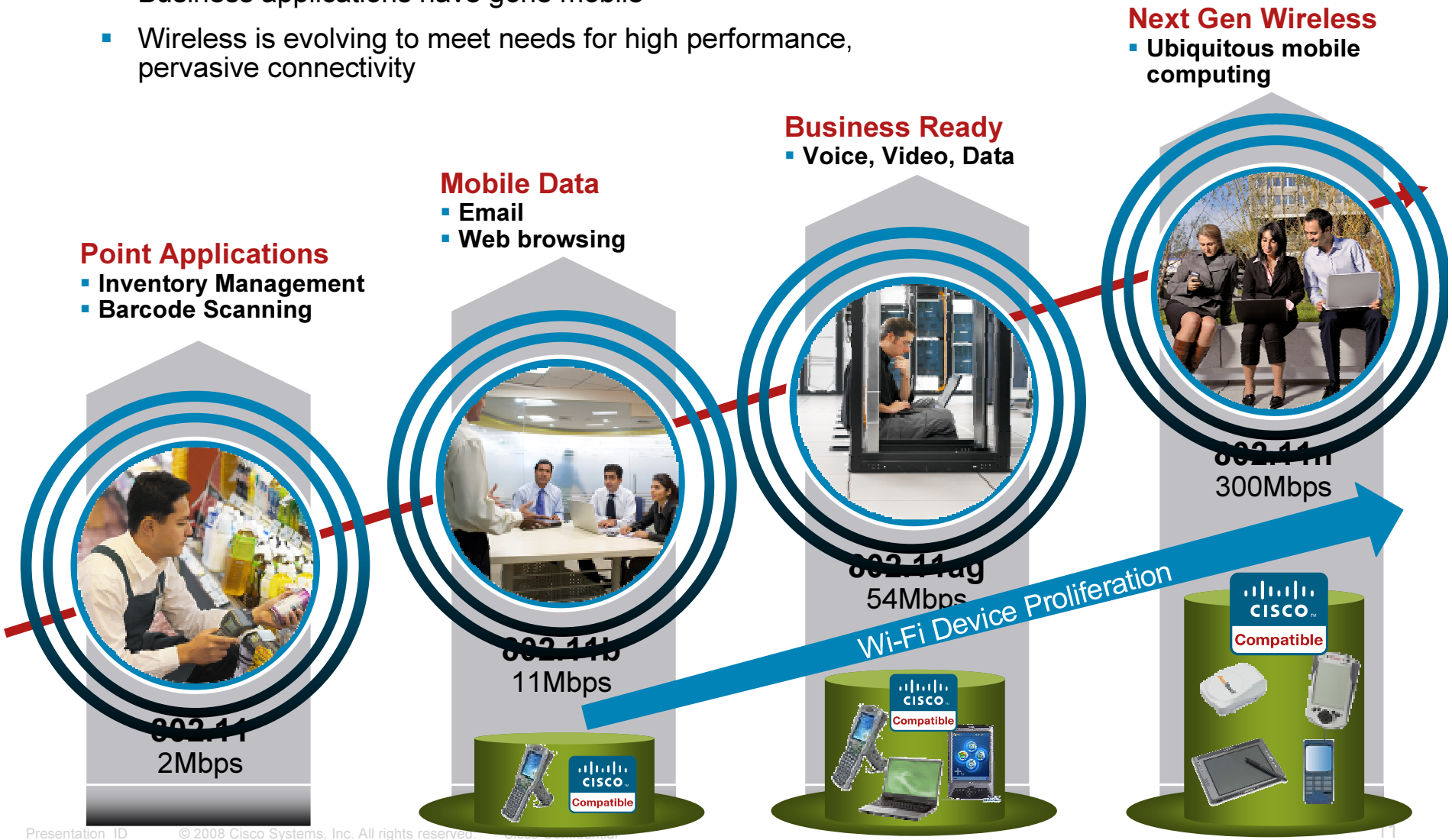
The increase in interference demands more predictable coverage to reduce dead spots for consistent connectivity

802.11n
solution

802.11n Technology Overview

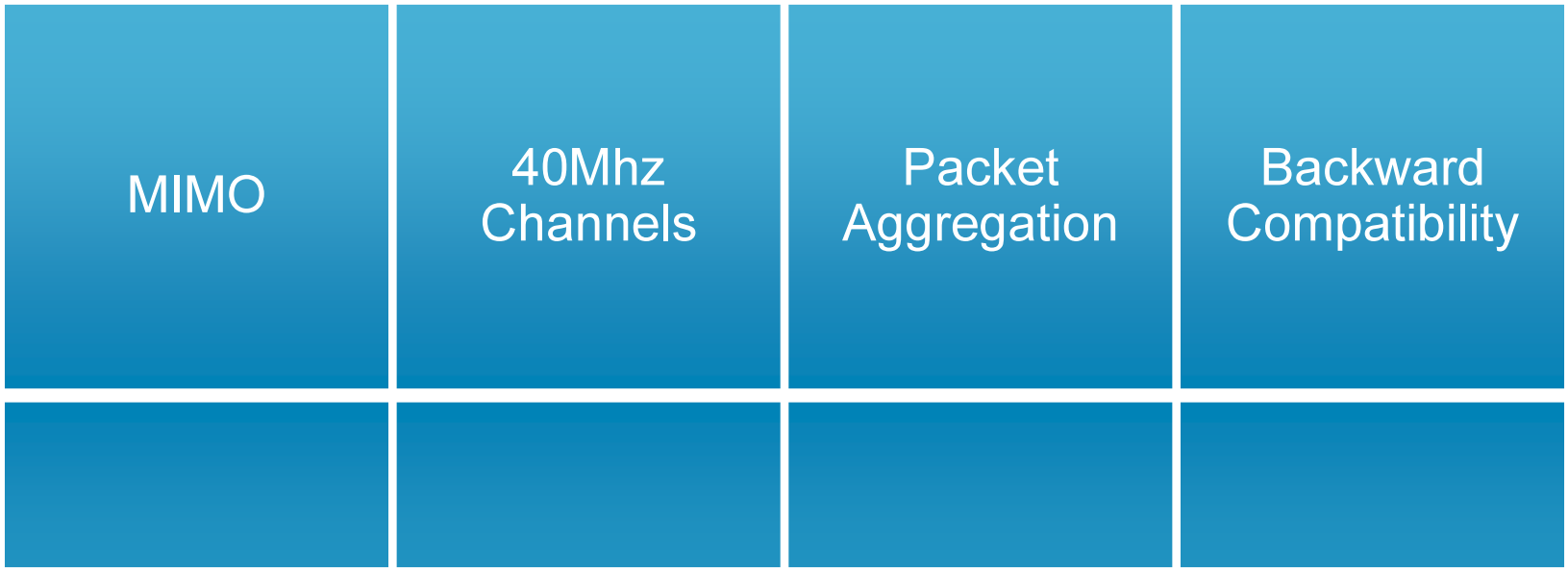
Wireless has Become Business Oxygen

- Business applications have gone mobile
- Wireless is evolving to meet needs for high performance, pervasive connectivity



Technical Elements of 802.11n

MIMO	40Mhz Channels	Packet Aggregation	Backward Compatibility

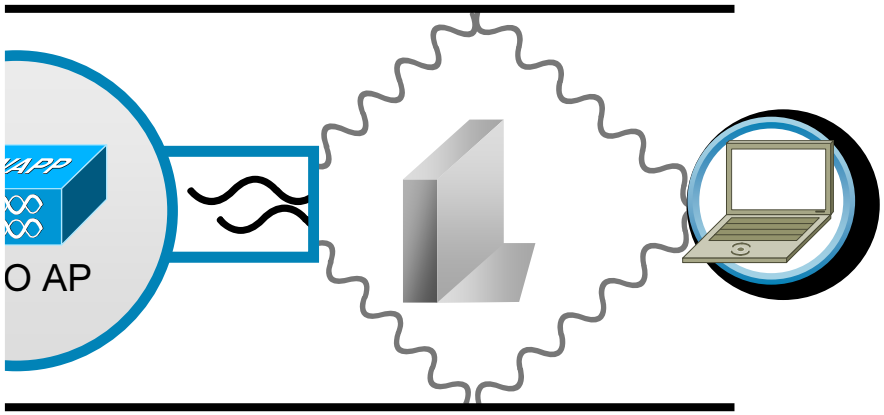


Aspects of 802.11n

MIMO	40Mhz Channels	Packet Aggregation	Backward Compatibility

MIMO (Multiple Input, Multiple Output)

Without MRC – Multiple Signals Sent; One Signal Chosen



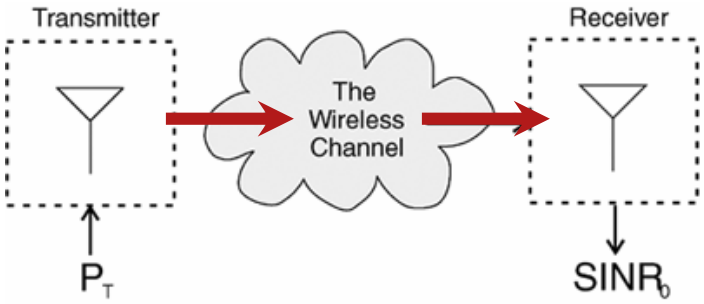
Performance

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

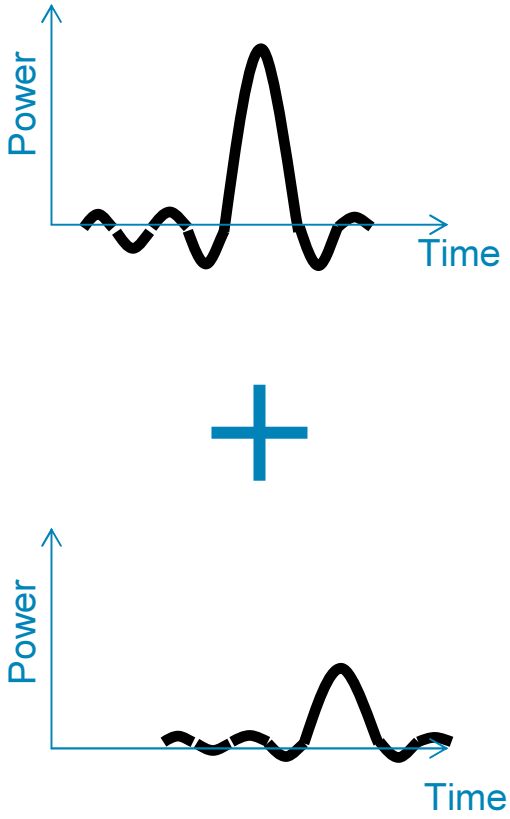
Beam Forming | Maximal Ratio Combining | Spatial Multiplexing

802.11n Operation

SISO and Multipath

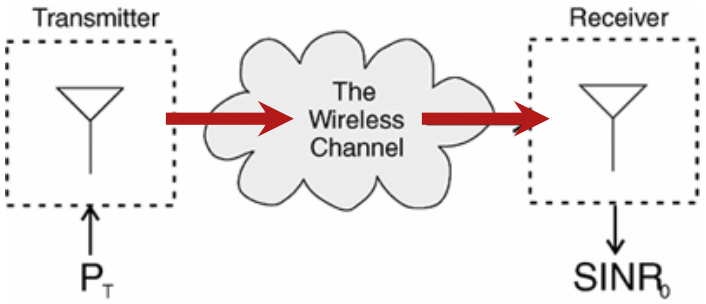


Single Input Single Output (SISO)



802.11n Operation

SISO and Multipath



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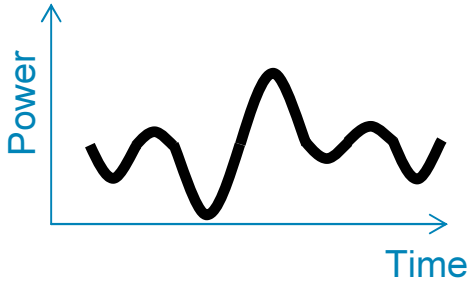
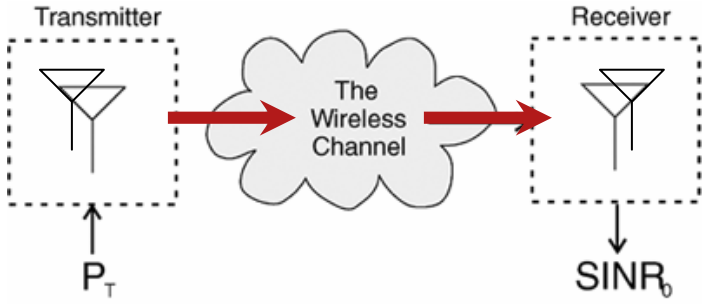


Inter-Symbol Interference

802.11n Operation

Traditional Antenna Diversity

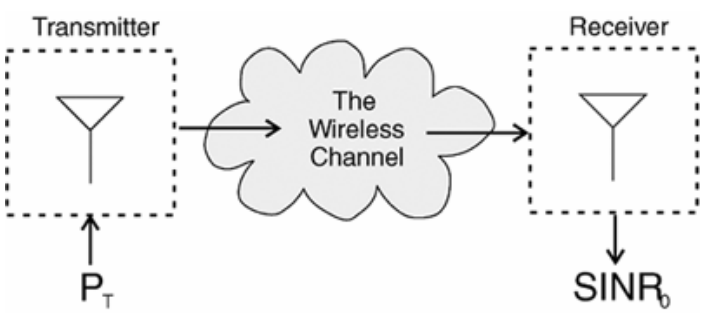
- Two antennas
- Switch from one antenna to other
- Mitigates effects of multipath
- Improve reception



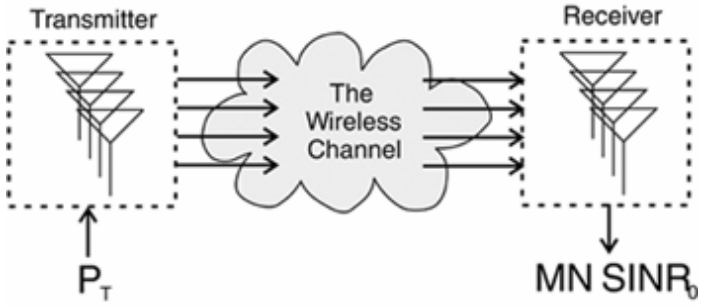
SISO with Antenna Diversity

Evolution to MIMO Technology

Single Input Single Output (SISO)



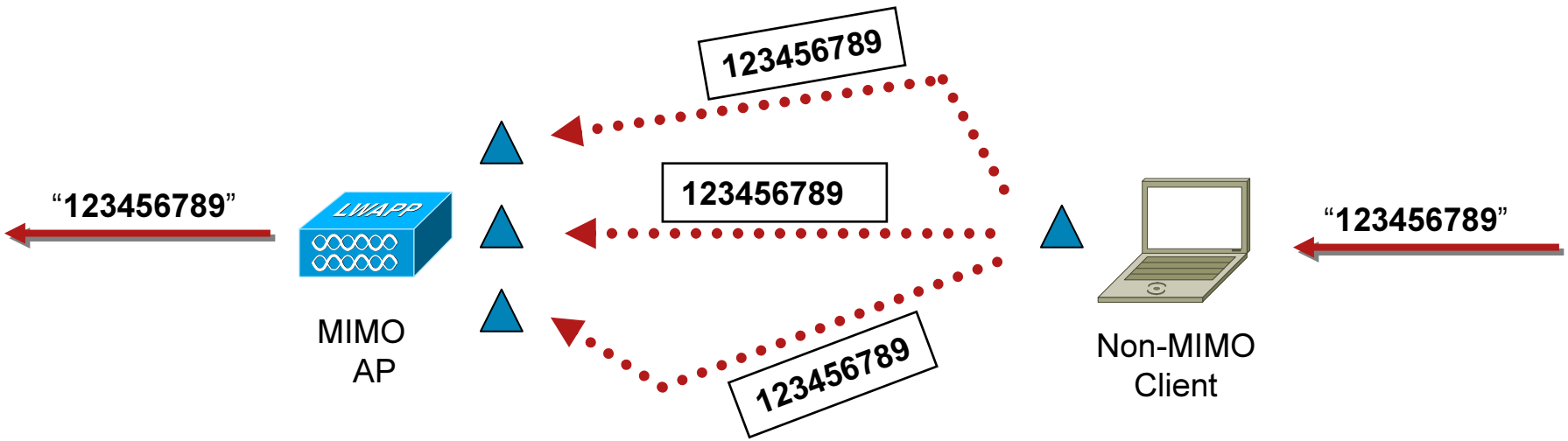
Multiple Input Multiple Output (MIMO)



802.11n Operation

Maximal Ratio Combining

- Performed by receiver
- Combines multiple received signals
- Increases receive sensitivity

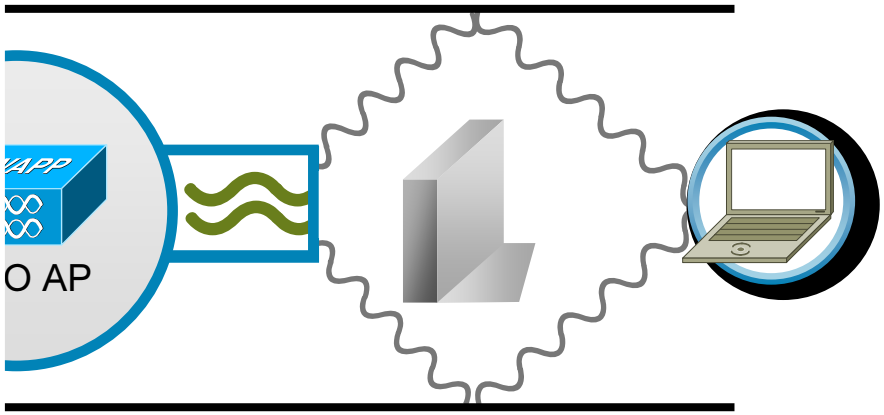


Aspects of 802.11n

40Mhz Channels | Packet Aggregation | Backward Compatibility

MIMO (Multiple Input, Multiple Output)

With MRC – Multiple Signals Sent and Combined at the Receiver Increasing Fidelity



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Beam Forming | Maximal Ratio Combining | Spatial Multiplexing

Aspects of 802.11n

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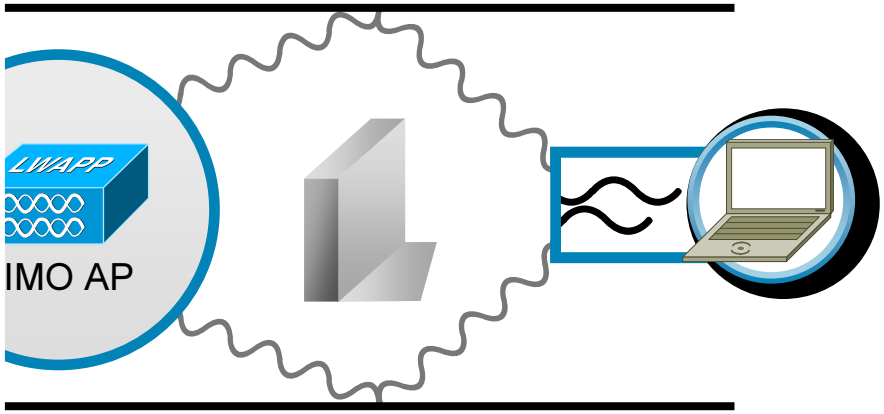
MIMO (Multiple Input, Multiple Output)

Without Beam Forming Transmissions Arrive out of Phase



Performance

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

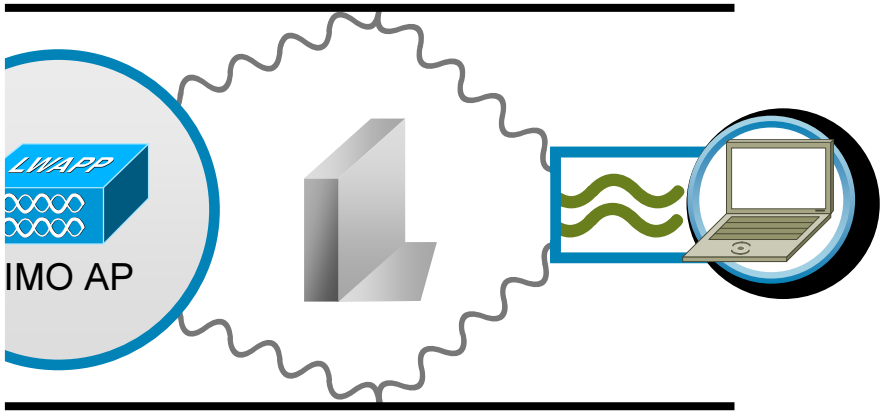
Beam Forming Maximal Ratio Combining Spatial Multiplexing

Aspects of 802.11n

40Mhz Channels | Packet Aggregation | Backward Compatibility

MIMO (Multiple Input, Multiple Output)

With Beam Forming Transmissions Arrive in Phase, Increasing Signal Strength



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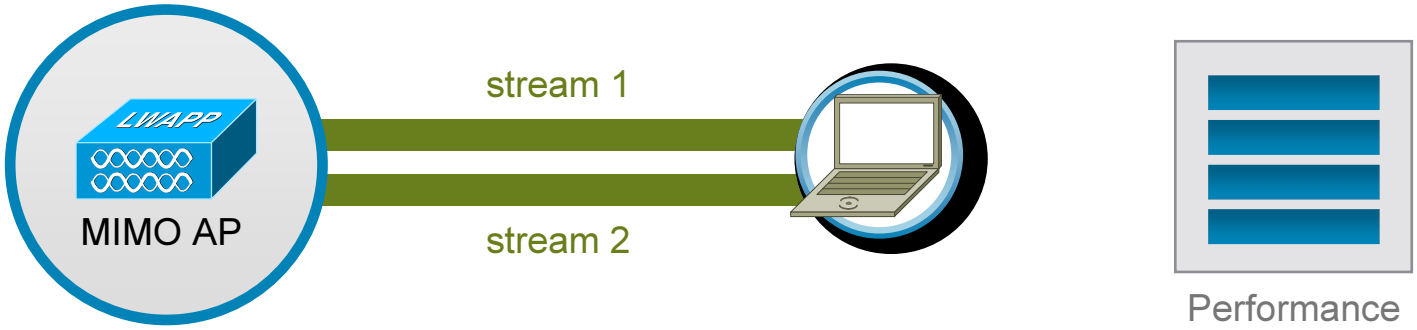
Beam Forming | Maximal Ratio Combining | Spatial Multiplexing

Aspects of 802.11n

40Mhz Channels | Packet Aggregation | Backward Compatibility

MIMO (Multiple Input, Multiple Output)

Information Is Split and Transmitted on Multiple Streams



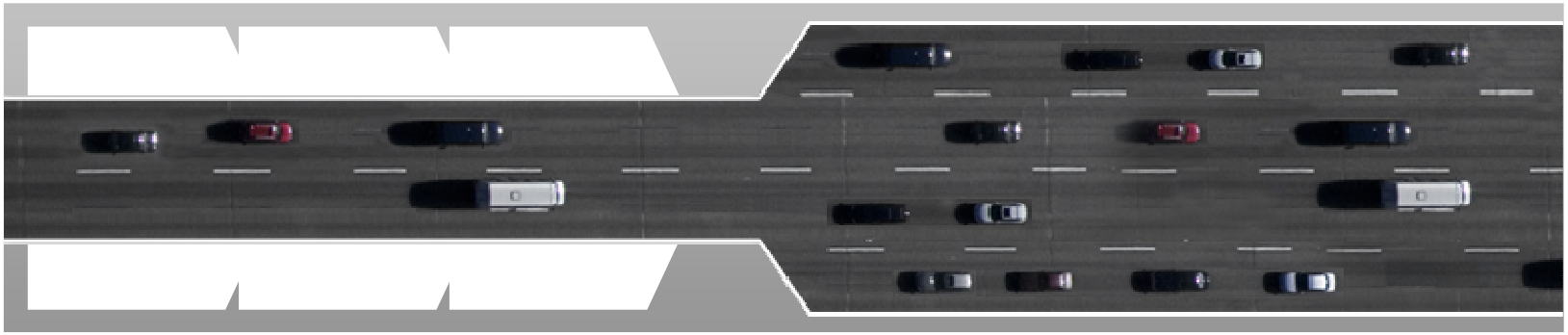
Transmitter and Receiver Participate	Concurrent Transmission on Same Channel	Increases Bandwidth	Requires MIMO Client
Beam Forming	Maximal Ratio Combining	Spatial Multiplexing	

Aspects of 802.11n

MIMO | 40Mhz Channels | Packet Aggregation | Backward Compatibility

40Mhz Channels

Moving from 2 to 4 Lanes



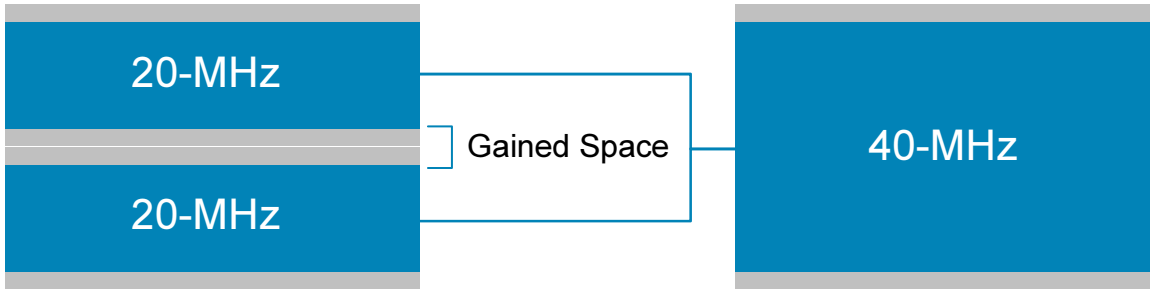
- 40-MHz = 2 aggregated 20-MHz channels—takes advantage of the reserved channel space through bonding to gain more than double the data rate of 2 20-MHz channels

Aspects of 802.11n

MIMO | 40Mhz Channels | Packet Aggregation | Backward Compatibility

40Mhz Channels

Moving from 2 to 4 Lanes



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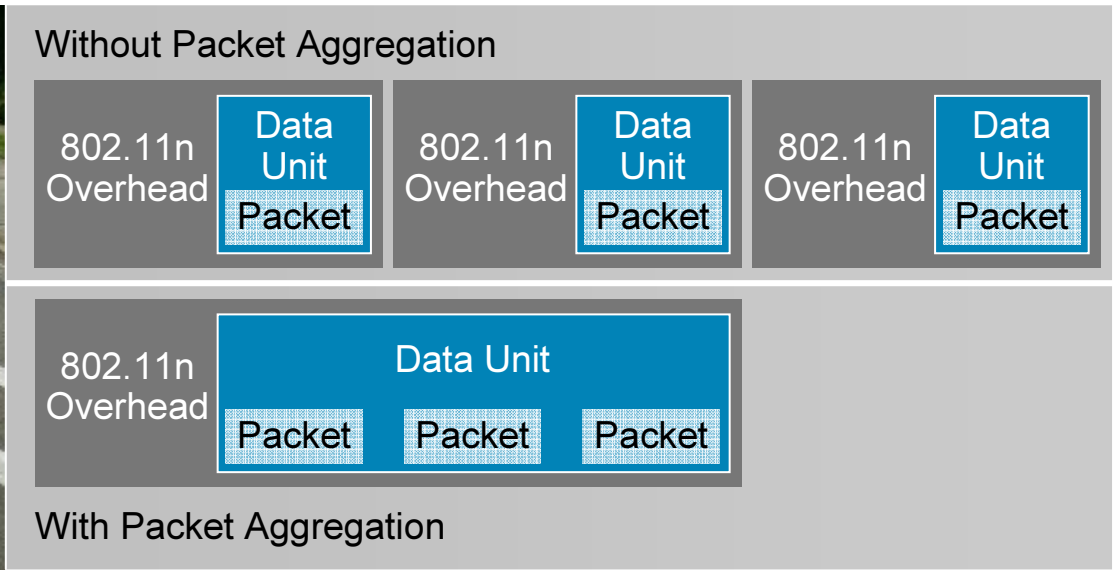
Aspects of 802.11n

MIMO | 40Mhz Channels | Packet Aggregation | Backward Compatibility

Packet Aggregation

Carpooling Is More Efficient Than Driving Alone



Aspects of 802.11n

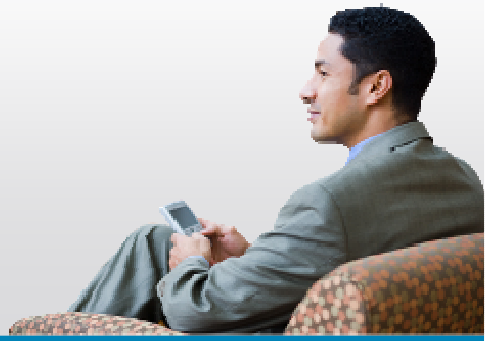
MIMO	40Mhz Channels	Packet Aggregation	Backward Compatibility

Backward Compatibility

2.4GHz

5GHz

11n Operates in Both Frequencies

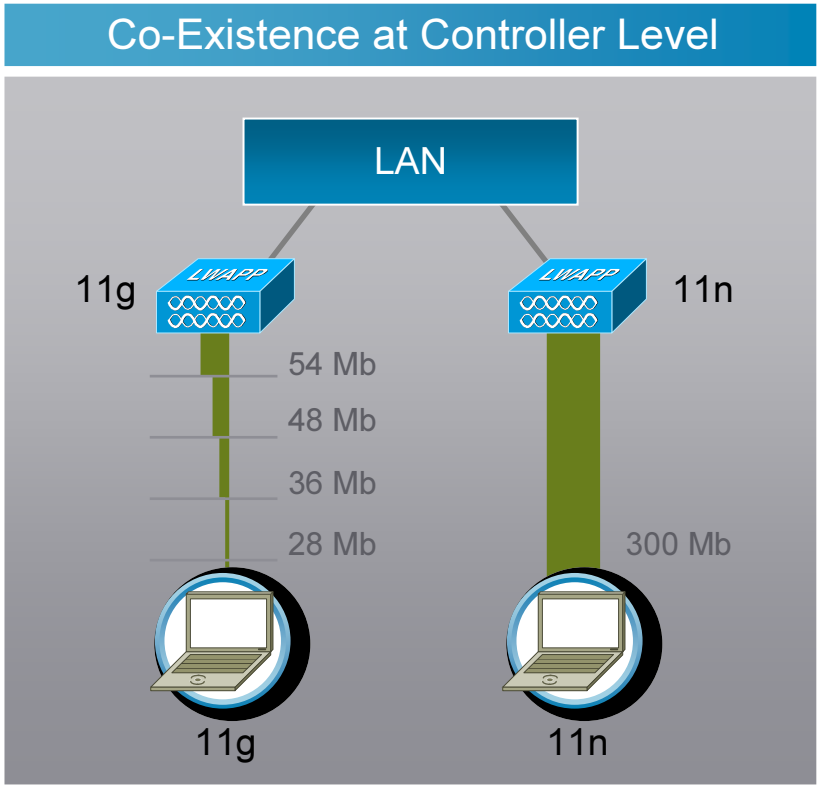


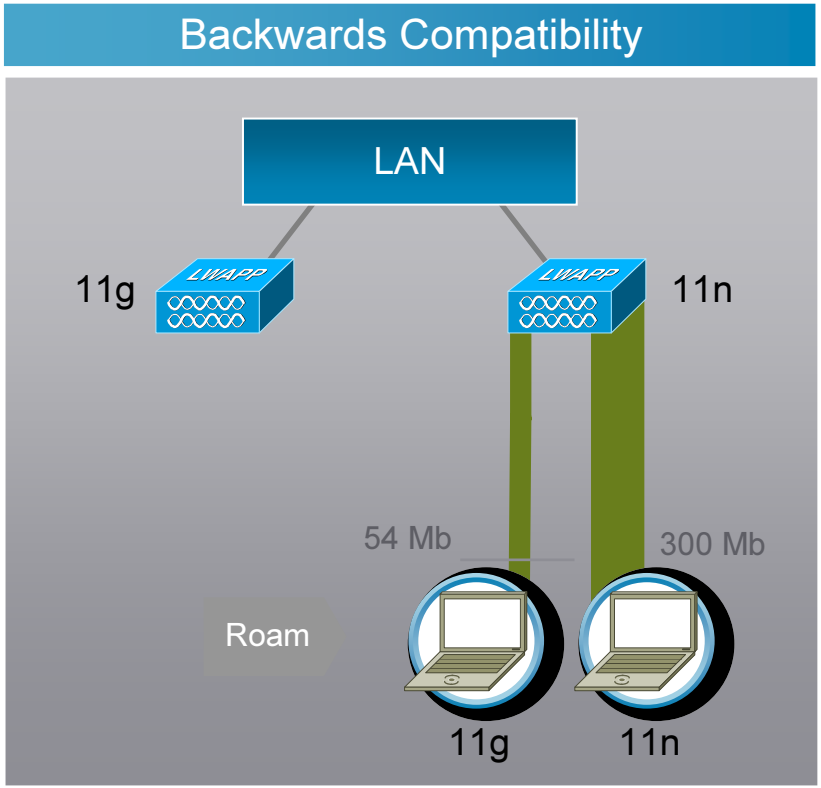
802.11ABG Clients Interoperate with 11n AND Experience Performance Improvements

Backward Compatibility & Co-Existence

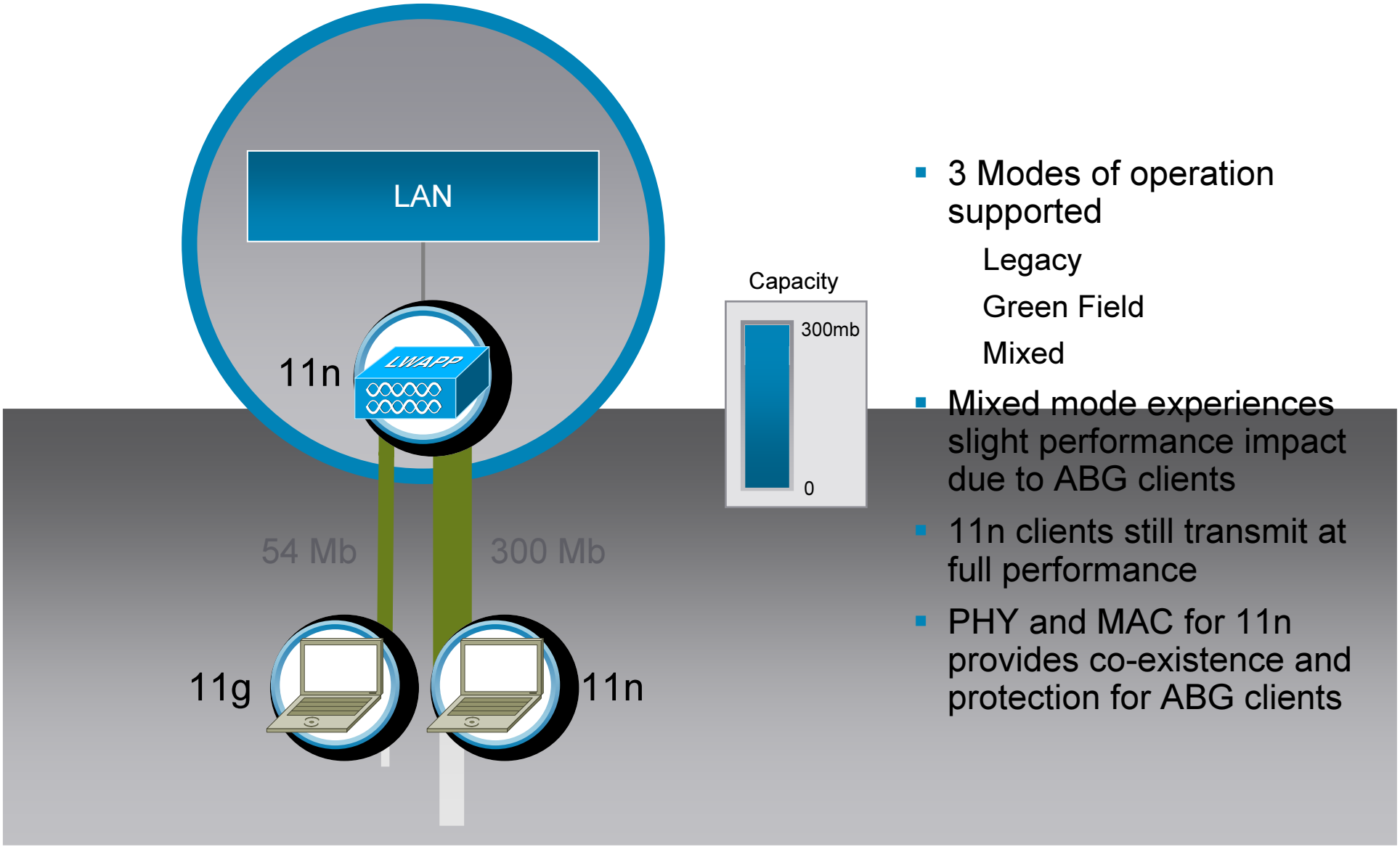
- Co-existence of ABG/N APs
- Benefits of 11n accrue to ABG clients

  MIMO benefits ABG clients on the AP receive side from MRC





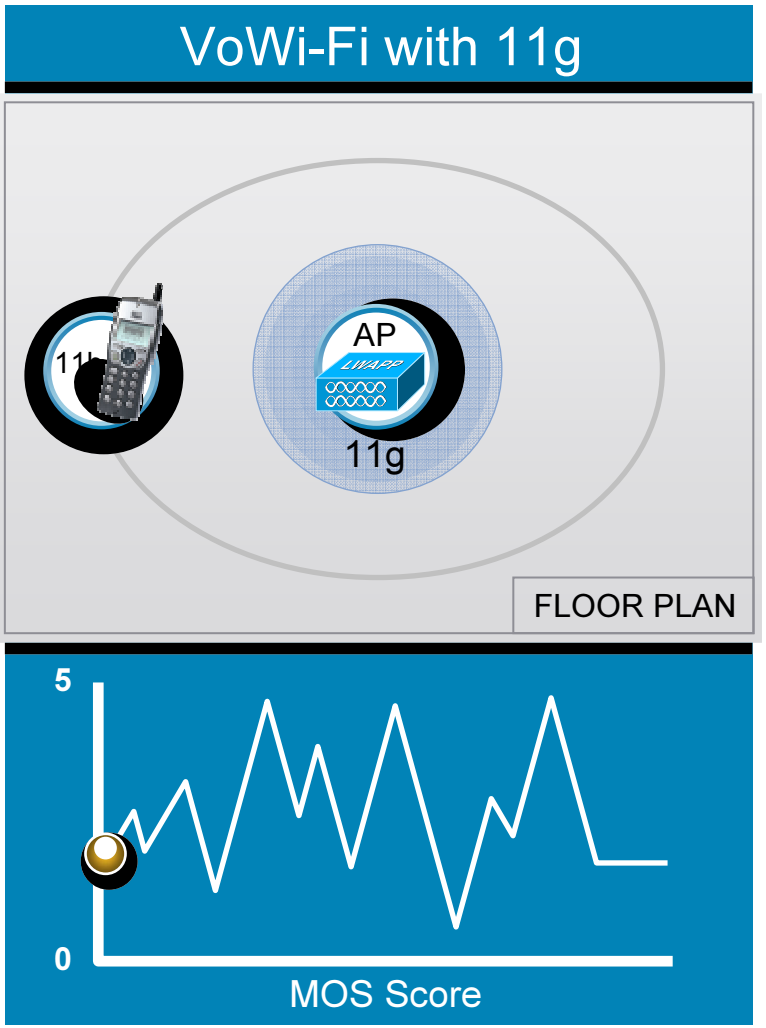
Mixed Mode Performance

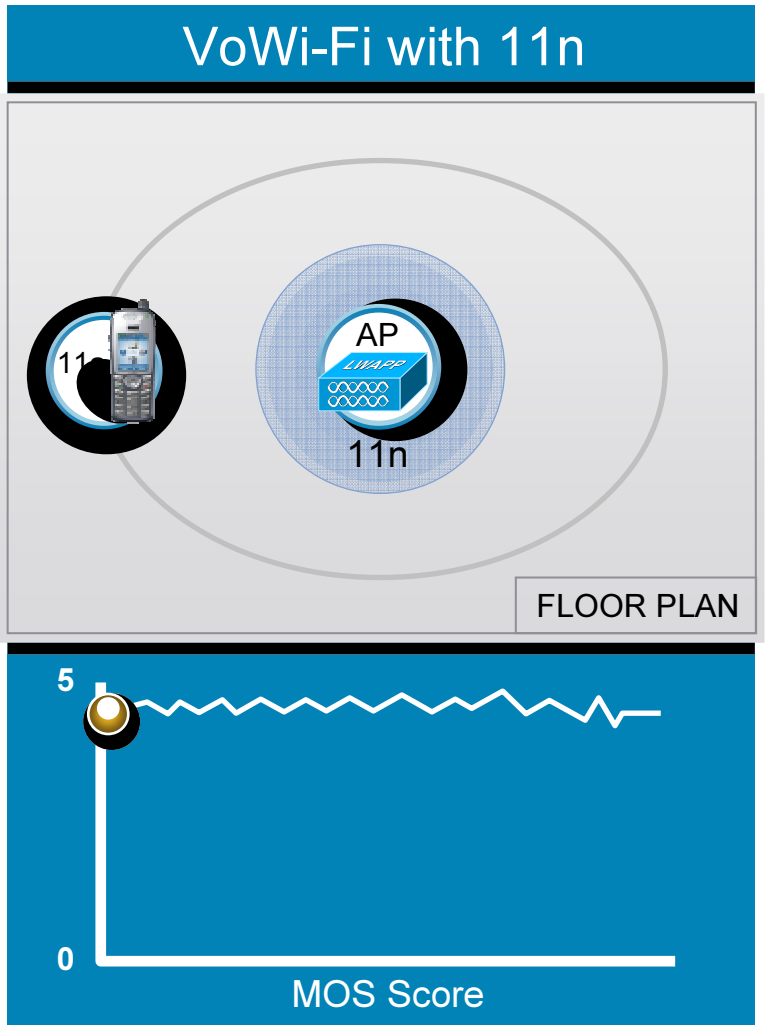


- 3 Modes of operation supported
  - Legacy
  - Green Field
  - Mixed
- Mixed mode experiences slight performance impact due to ABG clients
- 11n clients still transmit at full performance
- PHY and MAC for 11n provides co-existence and protection for ABG clients

Voice over 802.11n

802.11abg Performance Still Benefits from MIMO





802.11n Operation

Data Rates

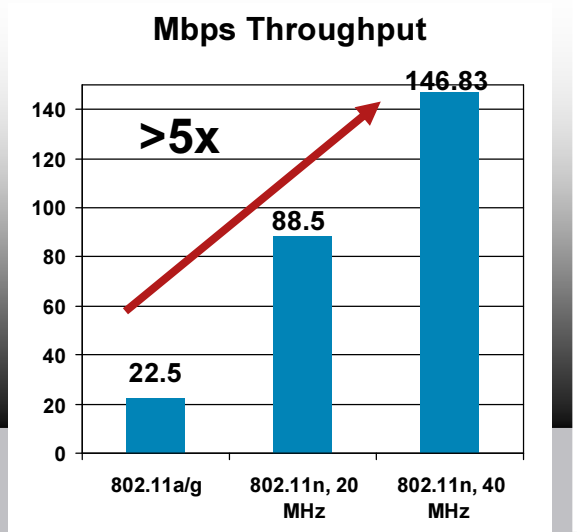
	20 MHz Channel		40 MHz Channel	
	1 Stream	2 Streams	1 Stream	2 Streams
802.11b 2.4 GHz	1, 2, 5.5, 11			
802.11a 5 GHz	6, 9, 12, 18, 24, 36, 48, 54			
802.11g 2.4 GHz	1, 2, 6, 9, 12, 18, 24, 36, 48, 54			
802.11n GI = 800 ns 2.4 GHz	6.5, 13, 19.5, 26, 39, 52, 58.5, 65	13, 26, 39, 52, 78, 104, 117, 130		
802.11n GI = 800 ns 5 GHz	6.5, 13, 19.5, 26, 39, 52, 58.5, 65	13, 26, 39, 52, 78, 104, 117, 130	13.5, 27, 40.5, 54, 81, 108, 121.5, 135	27, 54, 81, 108, 162, 216, 243, 270
802.11n GI = 400 ns 2.4 & 5 GHz	7.2, 14.4, 21.7, 28.9, 43.3, 57.8, 65, 72.2	14.4, 28.9, 43.3, 57.8, 86.7, 115.6, 130, 144.4	15, 30, 45, 60, 90, 120, 135, 150	30, 60, 90, 120, 180, 240, 270, 300

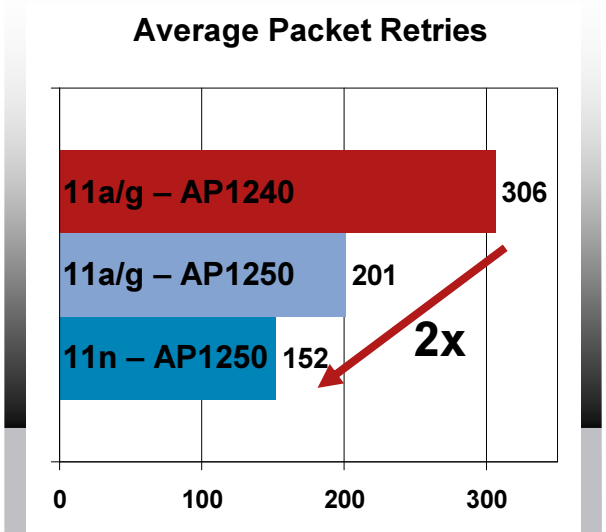
= optional capabilities

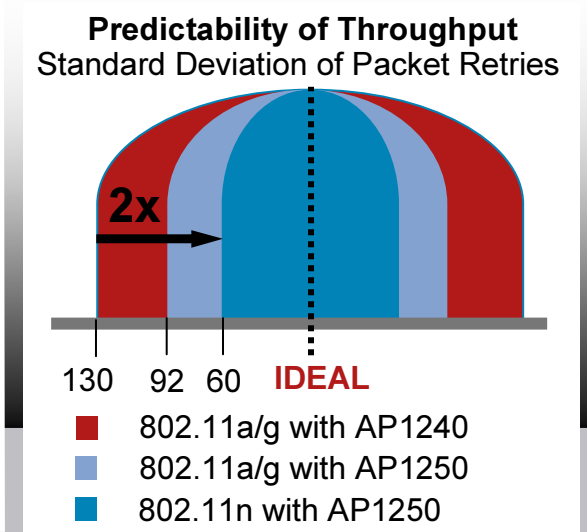
** With 4 streams, 40 MHz channel width and GI of 400 ns, 600 Mbps is achievable.

802.11n
It's About a Whole Lot More Than Speed

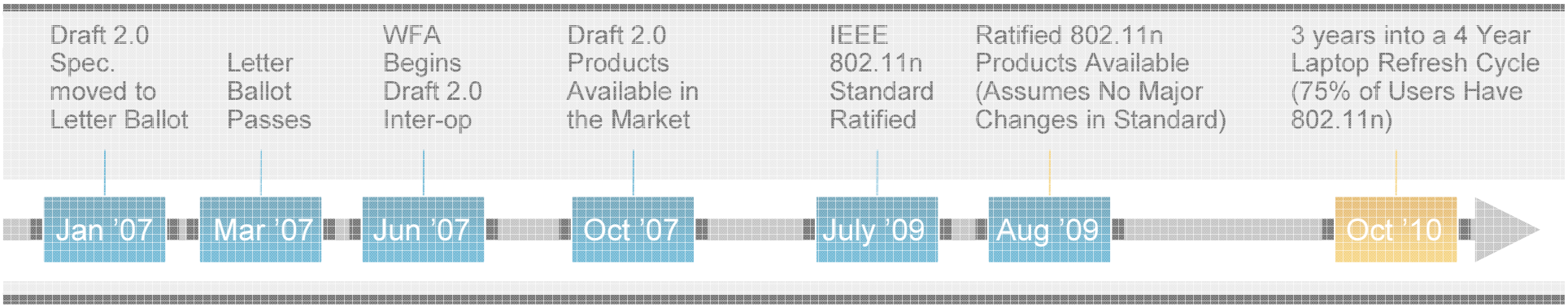
Throughput	Reliability	Predictability
5x more throughput	2x more reliable	2x more predictable
Enhanced file transfer and download speeds for large files	Lower latency for mobile unified communications	More consistent coverage and throughput for mobile applications







IEEE and the Wi-Fi Alliance



While changes to the standard are unlikely to require any hardware modifications to the existing Cisco AP, the platform **is modular** to ensure investment protection

802.11n
Cisco Next Generation Wireless Solution

The Aironet 1250 Series Access Point

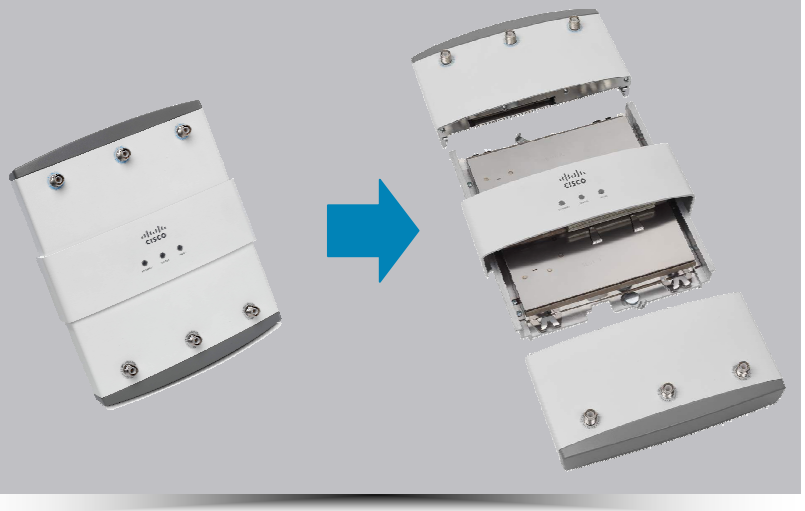
- Industry's first Wi-Fi Certified 802.11n draft 2.0 access point
- Modular platform
  - Field upgradeable radio modules/future technologies
- Higher speed WLAN technologies
  - Faster CPU to handle higher data throughput
  - Increased memory for expanded feature set
  - 10/100/1000 Ethernet port
- Available in Unified (LWAPP) and Standalone versions

Modular Platform

- Support for modular 802.11n draft 2.0 radios in 2.4Ghz and 5Ghz
- Field upgradeability helps ensure investment protection
- Platform for future RF technology innovations
- Flexible deployment options

Industry First Modular Wi-Fi Certified 802.11n Draft 2.0 Access Point

Modularity



Antennas for Aironet 1250 Series

- Omnidirectional
  - Single enclosure with 3 antenna elements
    - 2.4 GHz 3dBi (AIR-ANT2430V-R)
    - 5 GHz 4 dBi (AIR-ANT5140V-R)

- Dipoles
  - New dipole without hinge (gray)
    - 2.4 GHz 2.2 dBi (AIR-ANT2422DG-R)
    - 5 GHz 3.5 dBi (AIR-ANT5135DG-R)
  - Also supports existing dipoles with hinge (black & white)

- Blue dot indicates 5 GHz

Flexible Power Options

Aironet 1250

Full 802.11n requires more than standard 802.3af Power over Ethernet

Standard 802.3af PoE

- Full 11a/b/g performance
- Reduced 11n performance (maximum PHY data-rate 157.5 Mbps/radio)

Cisco Enhanced PoE

- Industry only single port PoE solution
- Catalyst switch family – 3750, 3560, 4500, 6500
- Full 11n performance

Power Injector

- Maintains existing switch infrastructure
- Delivers full 18 watts power

Local AC Power

- Power from any local power outlet

AP1250 Dual Radio Powering Options

Power Mode	802.3af	Cisco Enhanced PoE
Max Power at PSE	15.4 W	16.8-20 W
# of radios supported	1 or 2	2
MIMO Mode (Tx x Rx)	1 radio: 2x3 2 radios: 1x3[1]	2x3
Dual radio Limitations[1]	No MCS 8-15 data rates in 2.4 & 5GHz (maximum PHY data-rate 157.5 Mbps/radio)	1:1 replacement of legacy APs[2] ensures maximum performance and functionality. (Max PHY data-rate 300 Mbps per radio)
Catalyst Switch Support	Any 802.3af switch	3560E, 3750-E 4500E: X4648-E, X4648+E 6500: X6148 / X6148A / X6548

[1] Limitations are only applicable to dual radio configurations. In single radio configurations, full capabilities are available for all power options.

[2] If AP density is lower than one AP per 5,000 sq feet (data only) OR one AP per 3,000 sq feet (for voice, location); then additional power source may be needed

A Power Injector and Power Supply are also available as powering options

Cisco Enhanced PoE - Recommended

	Supported Switches	Software Release	Notes
Cat3K	3750E: WS-C3750E-24PD-S WS-C3750E-24PD-E WS-C3750E-48PD-S WS-C3750E-48PD-E WS-C3750E-48PD-SF WS-C3750E-48PD-EF 3560E: WS-C3560E-24PD-S WS-C3560E-24PD-E WS-C3560E-48PD-S WS-C3560E-48PD-E WS-C3560E-48PD-SF WS-C3560E-48PD-EF	12.2(44)SE Released Feb 2008	▪Supports 2 radio 11n mode ▪Switch power supply must be correctly sized for PoE load
Cat4K	4500E Linecards: WS-X4648-RJ45V-E WS-X4648-RJ45V+E	12.2(44)SG Estimated Apr 08	▪Supports 2 radio 11n mode ▪No limitations on the number of AP1250s that can be used with a card or chassis ▪Chassis power supply must be correctly sized for PoE load
Cat6K	Linecards: WS-X6148A-GE-45AF WS-X6148-GE-45AF WS-X6548-GE-45AF PoE daughter cards: WS-F6K-48-AF= WS-F6K-GE48-AF=	12.2(33)SX H2 Estimated Apr 08	▪Supports 2 radio 11n mode ▪Recommend 1:1 replacement of 802.11a/b/g to 802.11n ▪No limitations on the number of AP1250s that can be used with a card or chassis ▪Chassis power supply must be correctly sized for PoE load

Technical Summary

Radio Band	Data rates	# of Transmitters	Cyclic Shift Diversity (CSD)	EIRP Maximum Transmit Power (dBm)*			
				2 Radios			1 Radio
				802.3af Mode (15.4 W)	ePoE Power Optimized Mode (16.8 W)	ePoE Mode (20 W)	All Modes (15.4 W)
2.4 GHz	802.11b	1	n/a	20	20	20	20
	802.11g	1	n/a	17	17	17	17
	802.11n MCS 0-7	1 2	Disabled Enabled (default)	17 Disabled	17 14 (11 per Tx)	17 20 (17 per Tx)	17 20 (17 per Tx)
	802.11n MCS 8-15	2	n/a	Disabled	14 (11 per Tx)	20 (17 per Tx)	20 (17 per Tx)
5 GHz	802.11a	1	n/a	17	17	17	17
	802.11n MCS 0-7	1 2	Disabled Enabled (default)	17 Disabled	17 20 (17 per Tx)	17 20 (17 per Tx)	17 20 (17 per Tx)
	802.11n MCS 8-15	2	n/a	Disabled	20 (17 per Tx)	20 (17 per Tx)	20 (17 per Tx)

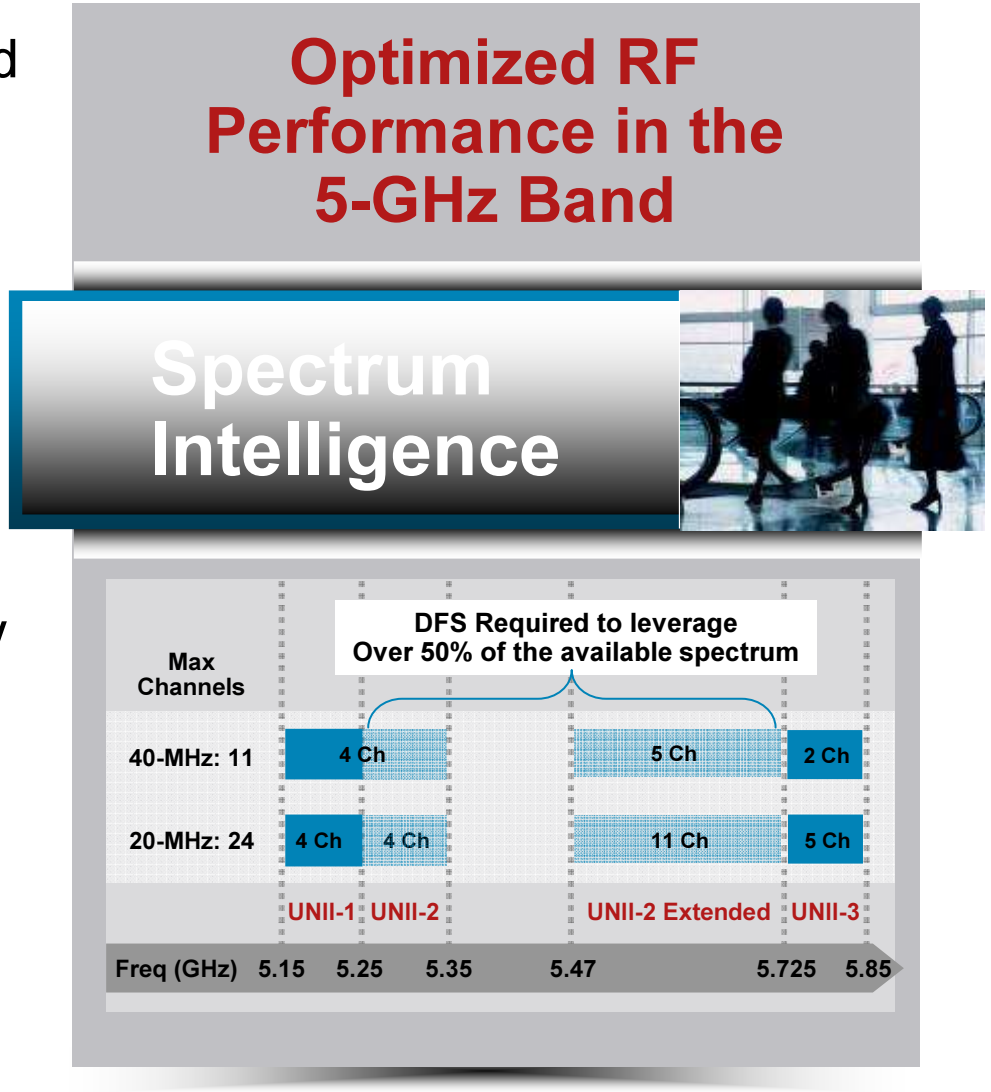
* Maximum transmit power will vary by channel according to regulations per country

Aironet Access Point Portfolio

	AP 1130 	AP 1240 	AP 1250 
Modular Platform	No	No	**Yes**
Data Uplink (Mbps)	10/100	10/100	**10/100/1000**
Power Requirement	802.3af (11.1 W)	802.3af (12.95 W)	**802.3af* 802.3at* (18 W)**
Installation	Standard	Rugged	**Rugged**
Antennas	Internal	External	**External**
Wi-Fi 802.11n draft 2.0 Certified	No	No	**Yes**
DRAM	32 MB	32 MB	**64 MB**
Flash	16 MB	16 MB	**32 MB**

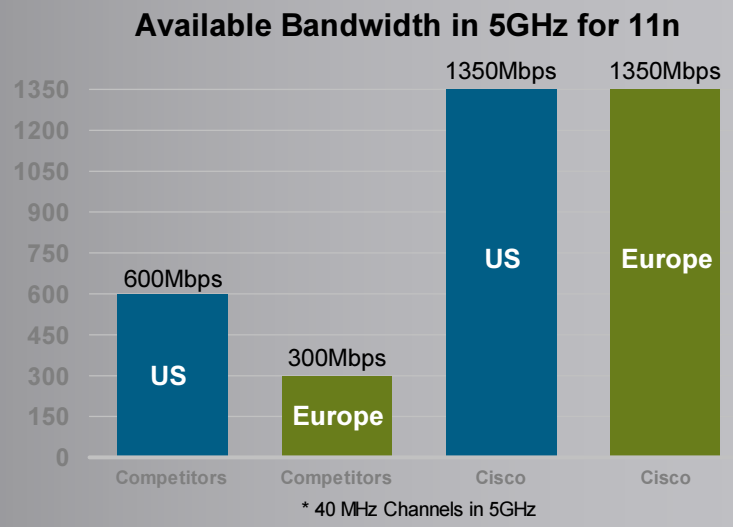
Spectrum Intelligence

- Robust DFS Support required for global deployment across all 5-GHz channels
  - Performance degradation without DFS support
- The full benefit of 802.11n is realized in 5-GHz
  - Deploy 40-Mhz in 5-GHz
- Superior Dynamic Frequency Selection (DFS) support maximizes use of 5-GHz channels
- Spectrum intelligence integration into WCS



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

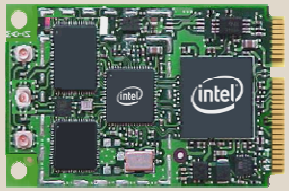


Available Channels per Region		Theoretical	Cisco	Competitors
United States	11n 5GHz 20MHz	24	21	8
	11n 5GHz 40MHz	11	9	4
Europe	11n 5GHz 20MHz	19	19	4
	11n 5GHz 40MHz	9	9	2

Tested, Validated Interoperability

- 1250 is the first Wi-Fi CERTIFIED 802.11n draft 2.0 access point
- 1250 selected for the Wi-Fi Alliance interoperability test bed
  - Broad interoperability testing—all products receiving certification will be tested with the 1250
  - Only AP vendor selected—the rest are silicon manufacturers
- Cisco participated in the 802.11n plug fests from the beginning
  - Worked with all of the major silicon vendors to resolve issues
  - Only enterprise wireless vendor to attend
- Cisco and Intel are performing joint interoperability testing to ensure optimal performance and compatibility between infrastructure and client

Cisco and Intel Collaboration



Real World Testing for Enterprise Usage Models

Cisco and Intel Collaboration

- **802.11n technology is the latest milestone in our ongoing collaboration to deliver the best mobile solutions for the enterprise.**
- **Jointly invested in extensive testing to optimize end-to-end performance on Intel wireless with the Cisco Unified Wireless Network.**
- **Extensive 802.11n compatibility testing**
  - **Intel's test facility simulating real enterprise environment**
  - **Application-level performance testing versus standards compliance**
- **Broader test effort in place to closely tie in our development and validation teams**
  - **Mix of Intel clients validated with the Cisco Unified Wireless Network**

Market success

- 1st to market!
- Most flexible powering options in the industry
- 25,000 AP1250's shipped in the last 4 months
- Customer Success stories – Duke, Concordia, Oriental Hotel, Berkeley and more to come…
- 2nd Maintenance Release –Tried, Tested and Deployed!
- Close partnerships with Intel and Apple

Aironet 1250 Proven Scalability

- CeBit
  - 320 APs covering 500,000 square meters
  - 1000+ simultaneous users
- South By Southwest music industry conference
  - 86 APs
  - 1659 simultaneous users(98 clients per AP)
  - PDA's, iPhones, Nokia N95, MacBooks other notebooks
- Cisco Networkers Feb 08
  - 240,000 square feet area covered by 30 APs

The Classroom of the Future
Duke University

Cisco Aironet 1250 Series

Business Challenge

- Expand educational applications in the classroom
- Continue to attract new students through a reputation for innovation and progressiveness
- Wireless bandwidth to accommodate new applications

Deployment Overview

- Deployed in Epworth hall for improved coverage and throughput
- Mix of laptops – existing ABG and N
- Real-world throughput rates of 130mbps
- Deployment moving into the 1000s of access points – campus wide coverage over the coming months

Duke UNIVERSITY

"The network must evolve to address our users' needs, and 802.11n is an obvious choice to support the growth in high-bandwidth applications."

Kevin Miller
Associate Director
Communications Infrastructure
Duke University

Campus Wide Mobility

Concordia University of Montreal

Cisco Aironet 1250 Series

Concordia UNIVERSITY

Business Challenge

- Montreal, Canada University with 40,000 students
- Enable high density wireless access using 802.11n for bandwidth intensive applications
- Provide reliable coverage and greater performance for 802.11a/b/g clients with 802.11n MIMO technology
- Prepare campus for future 802.11n clients
- Deliver VoWLAN for dual-mode phones and Seamless Mobile Collaboration (SMC)

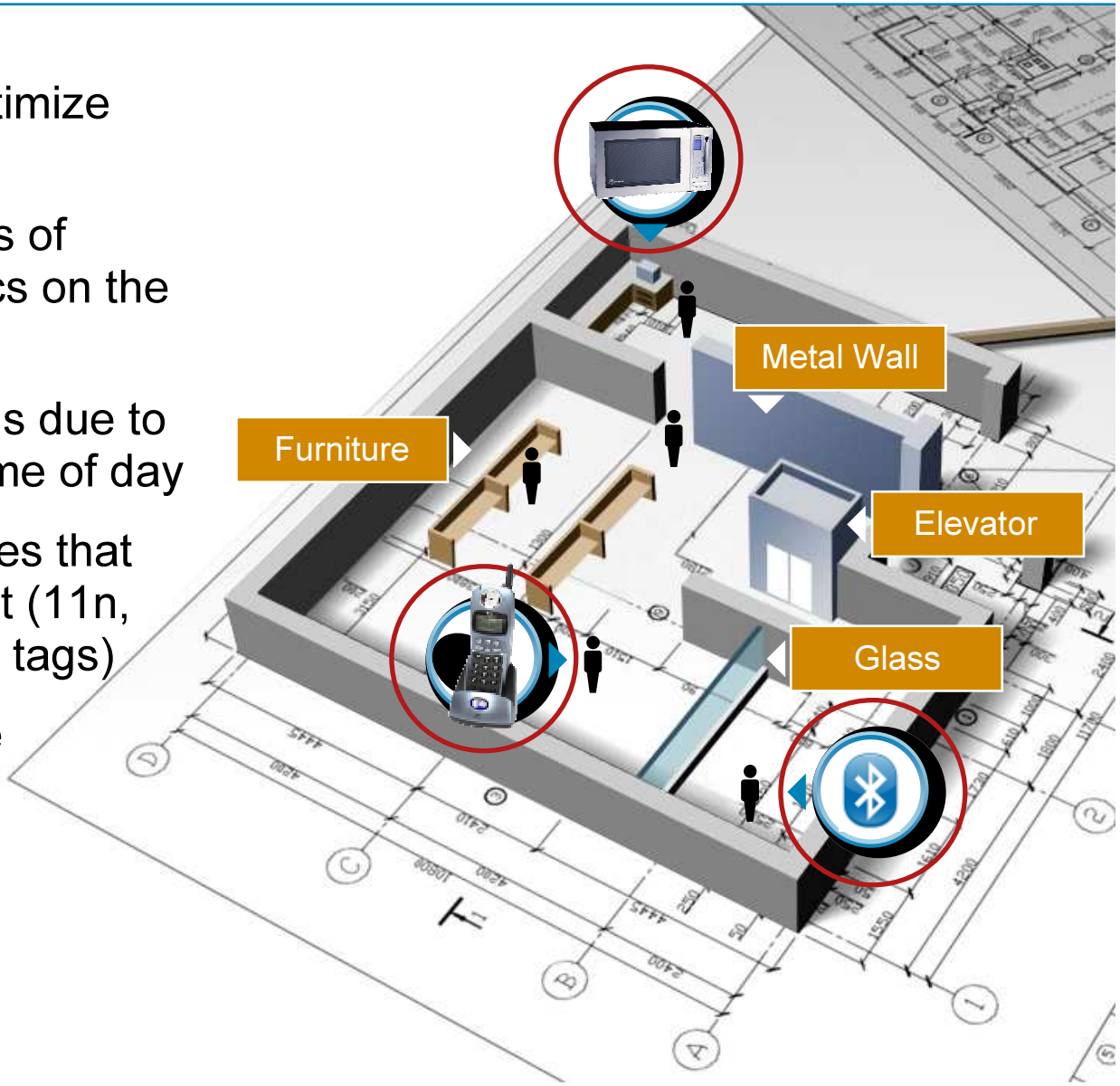
Deployment Overview

- Deploying 60+ 802.11n access points by Jan 1st 2008
- On-going migration of 300+ standalone access points to the Unified architecture and Cisco Aironet 1250 Series
- Modularity of Cisco's 802.11n solution future proofs the network

802.11n Design and Deployment Guidelines

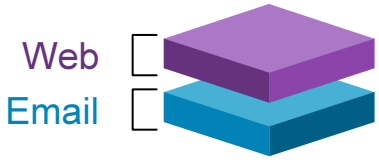
Site Survey Prepares for 802.11n

- 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

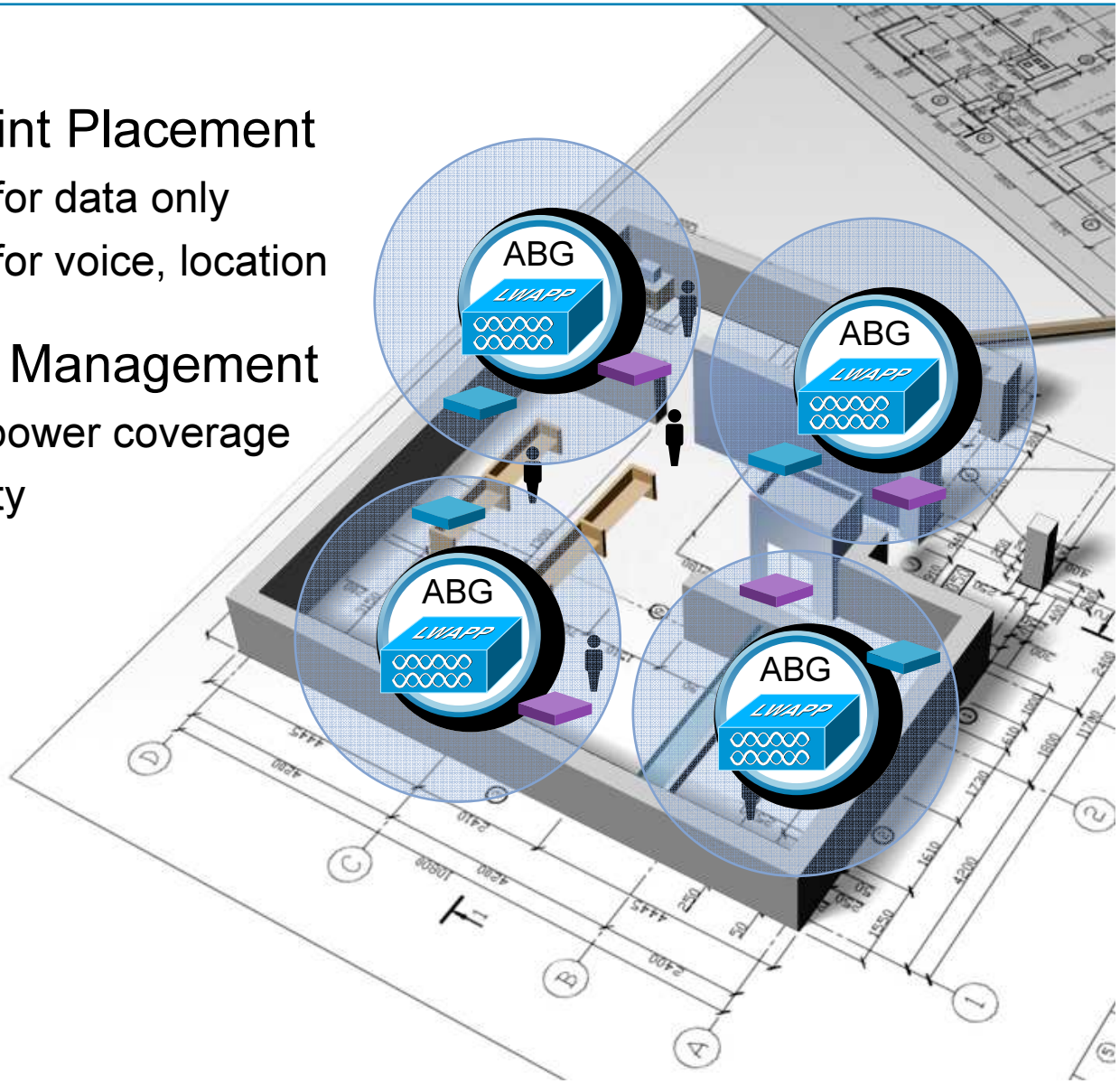


Access Point Placement

- ABG Access Point Placement
  - 1 per 5,000 sq feet for data only
  - 1 per 3,000 sq feet for voice, location
- Radio Resource Management
  - Adaptive channel / power coverage
  - Operational simplicity

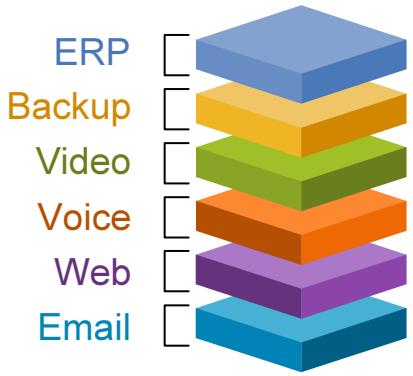


Several Supported Apps



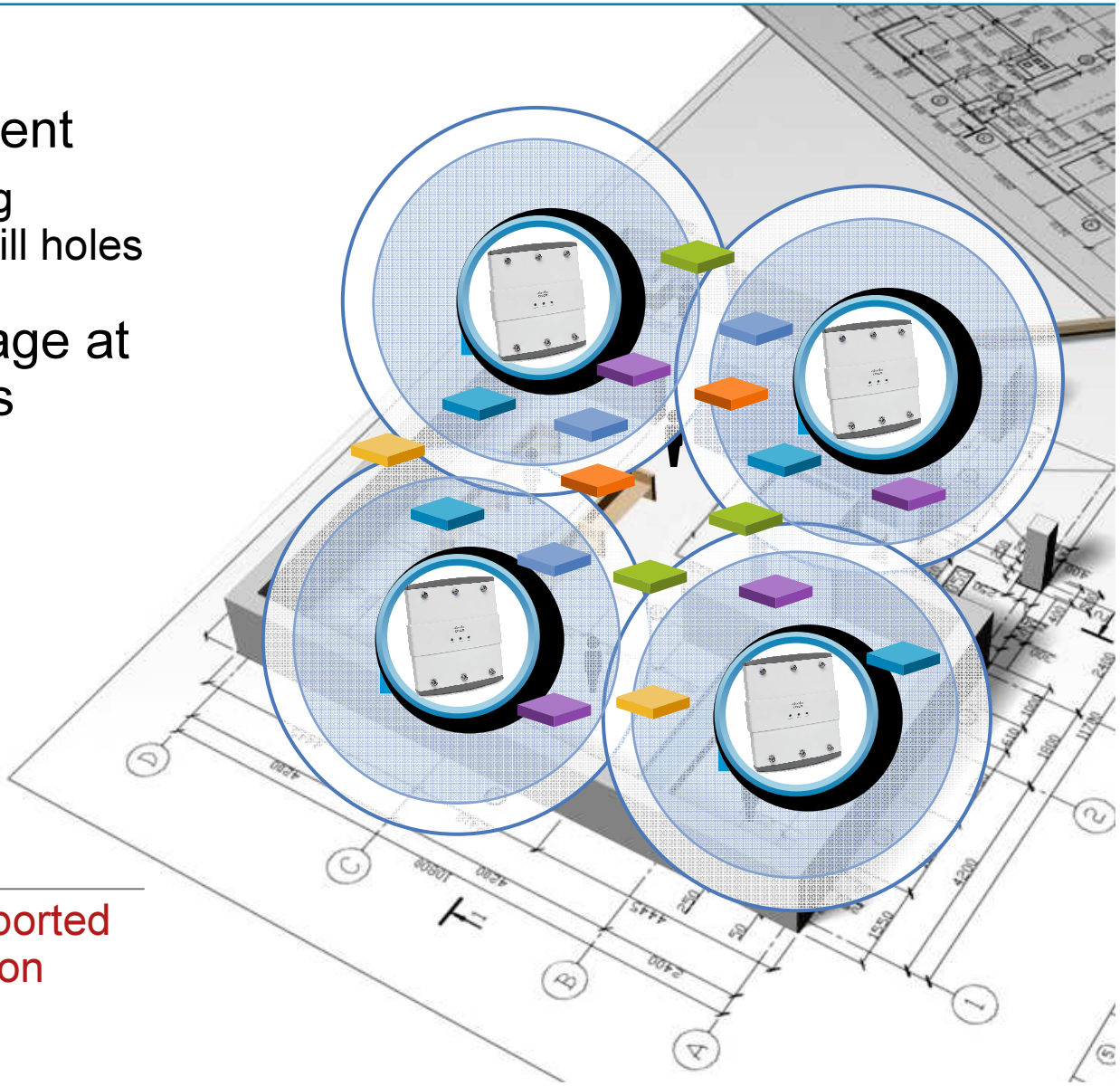
Access Point Placement

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



Supported Apps

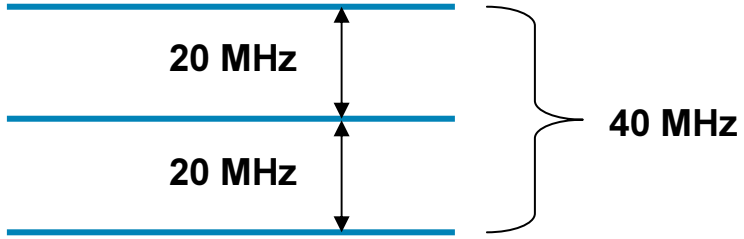
More Applications Supported at Any Given Location

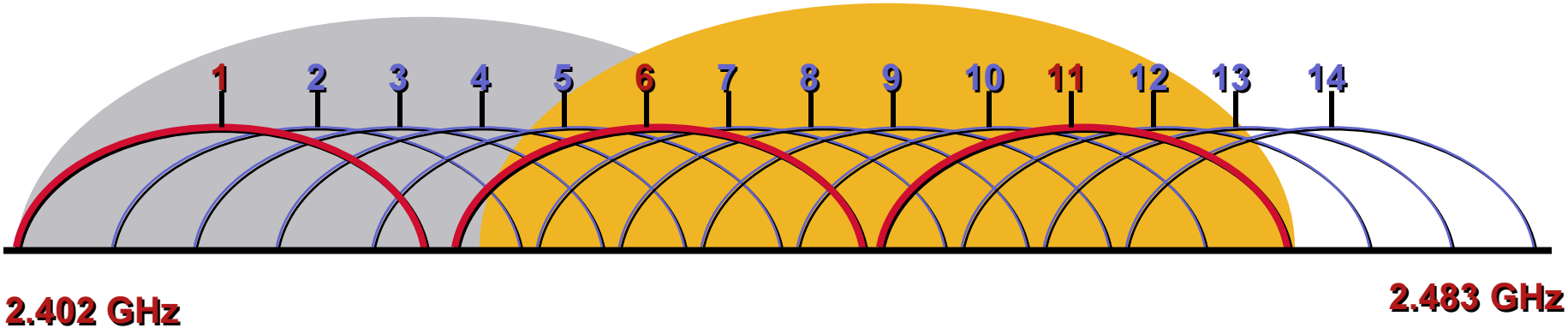


802.11n Operation

Channel Bonding at 2.4 GHz

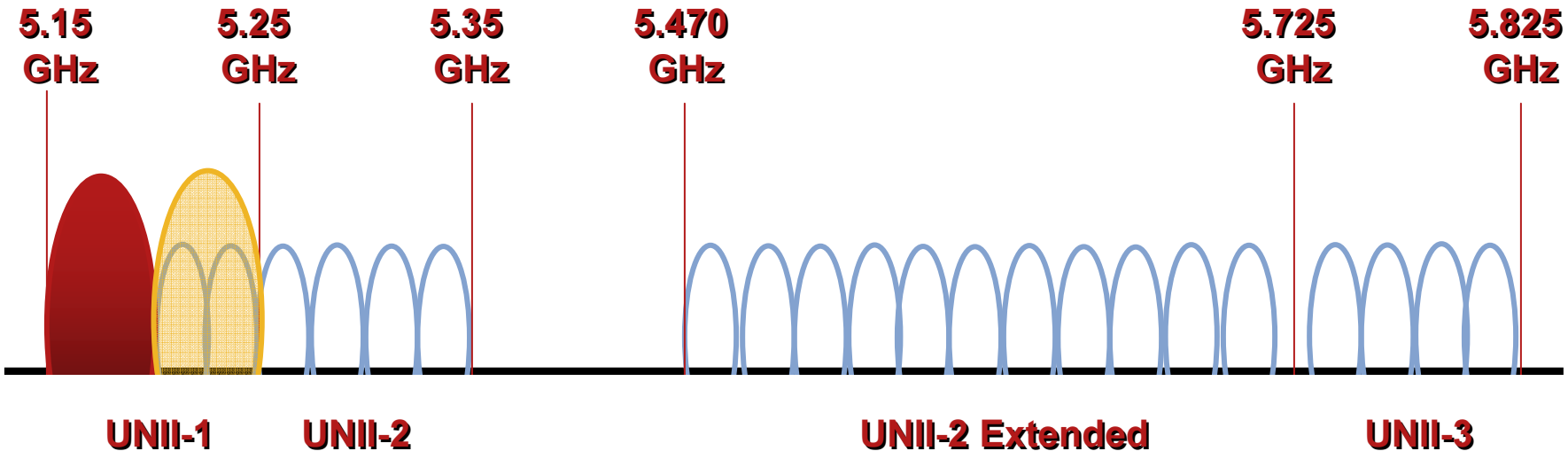
Wider channels equate to more BW per AP (not per physical location)





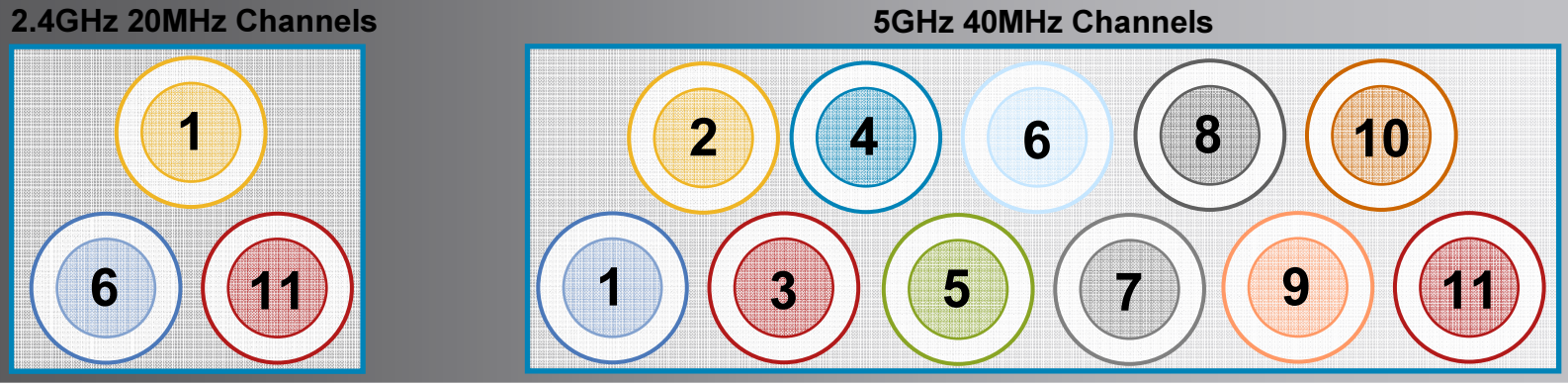
802.11n Operation

Channel Bonding at 5 GHz



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)



802.11n Design and Deployment Guidelines

Distributed vs. Centralized WLAN Architecture

Distributed WLAN Architecture

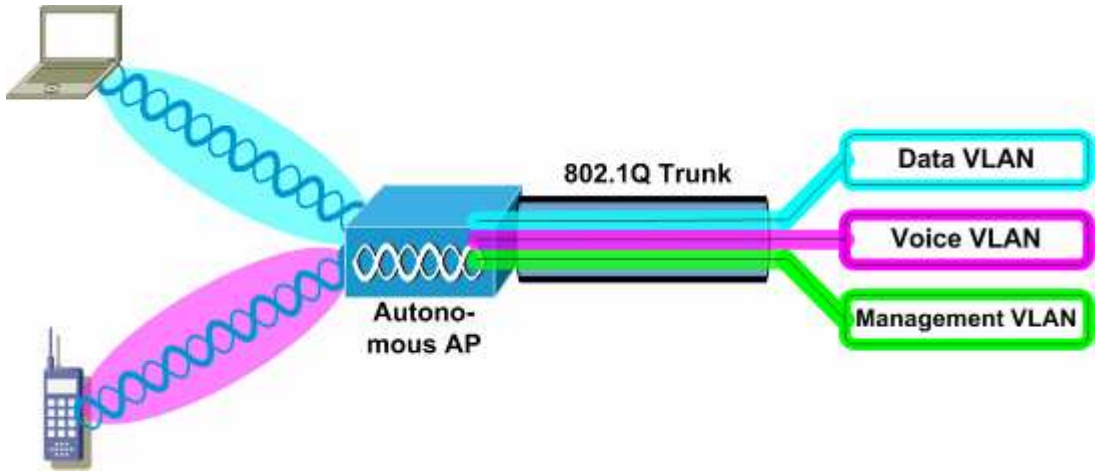
- All processing happens at edge device

  802.11 functionality implemented locally

- All data traffic bridged locally (802.1q)

  APs act as 802.1Q translational bridge, putting client traffic on local VLANs

- Each AP is an intelligent network access device



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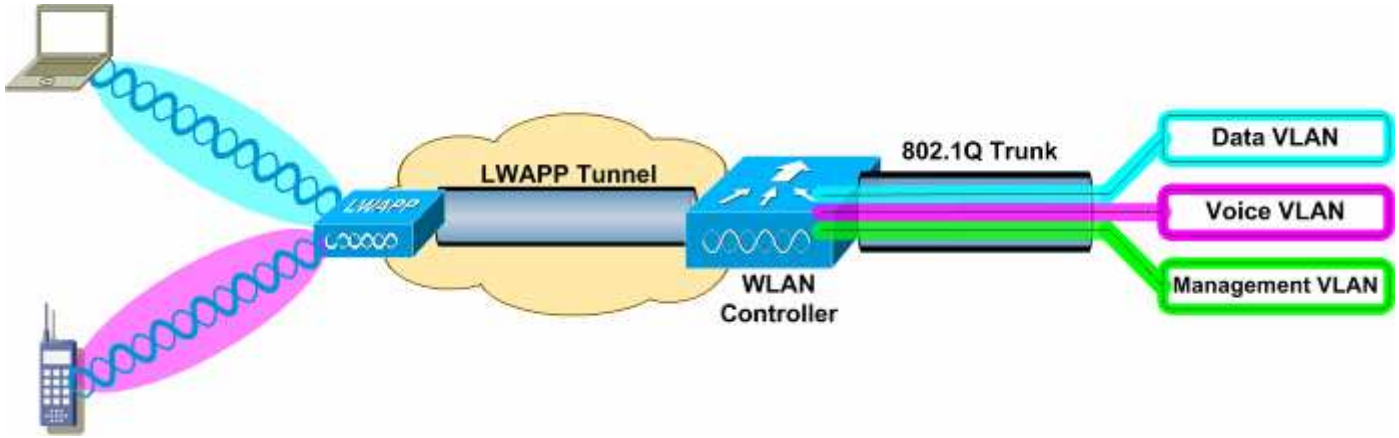
- All data traffic bridged locally (802.1q)
  - APs act as 802.1Q translational bridge, putting client traffic on local VLANs
- Each AP is an intelligent network access device

Centralized WLAN Architecture

- Processing split between APs and Controllers
  - 802.11 functionality shared
- Data traffic is bridged at the controller
- Central Management – AP is essentially a remote RF interface
- APs unusable without a controller



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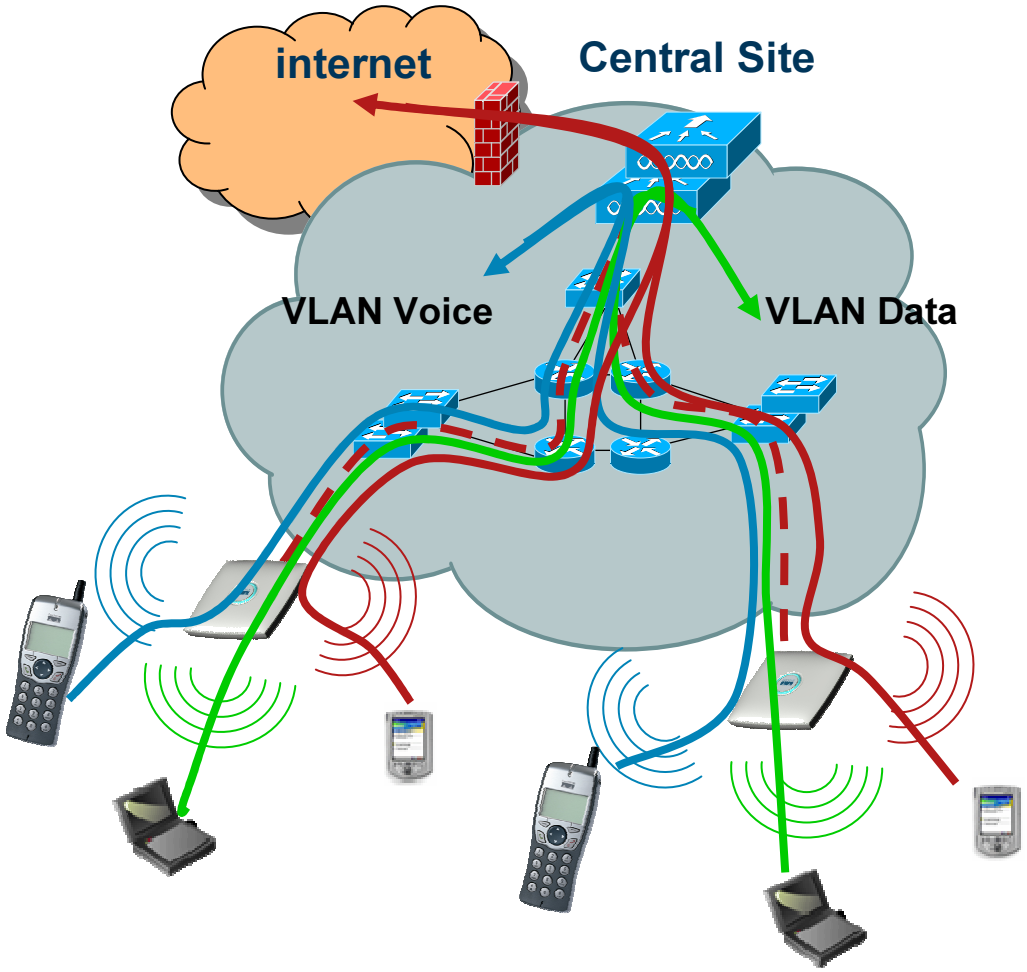
802.11n Design and Deployment Guidelines

Why Migrate to Centralized WLAN Architecture

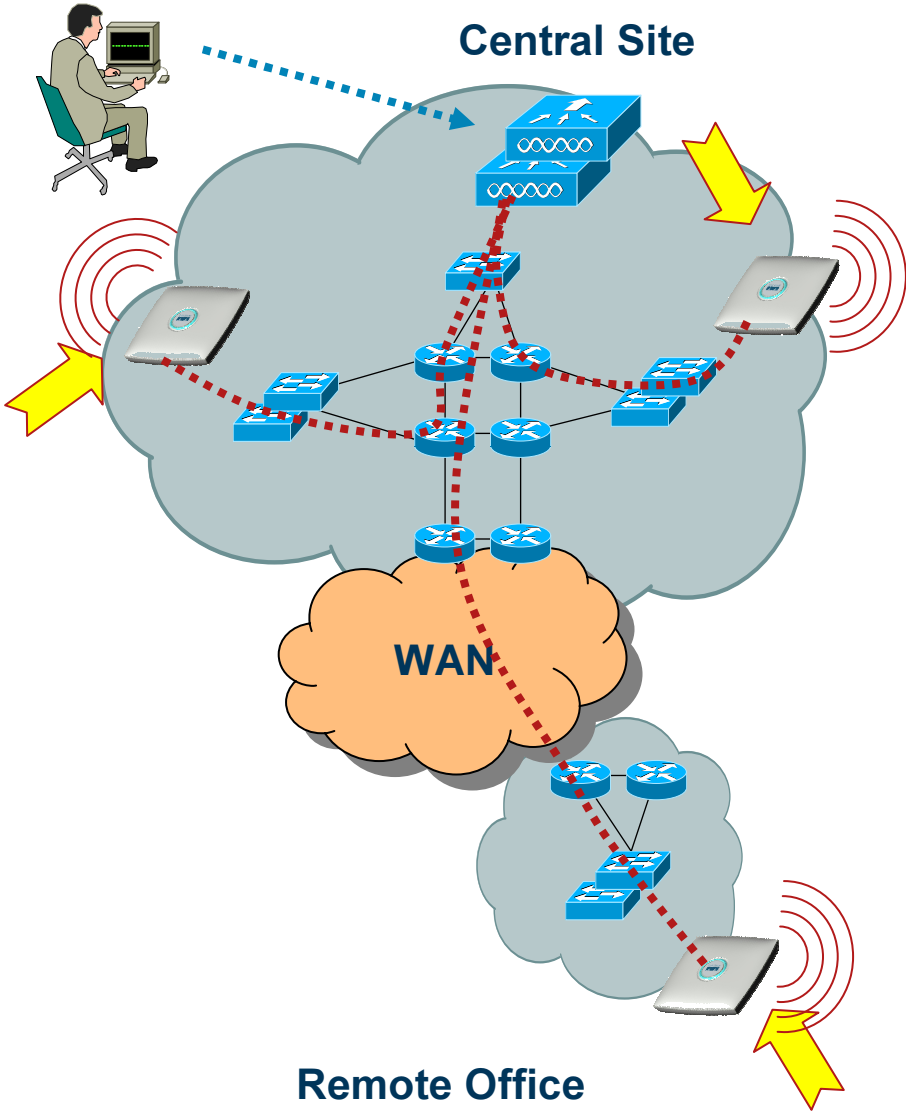
Centralized WLAN Architecture
Easy Deployment

- No need for initial AP configuration
  - Auto discovery
  - Auto update
  - Auto configuration
- Corporate Network
  - Strong Security
  - Access to corporate LAN
- Voice / IP Communication
  - Strong Security
  - Access to Voice VLAN
  - QoS
- Guest Network
  - No encryption
  - Internet Access
  - Path isolation with Corp. Net.



Centralized WLAN Architecture
Easy Management

- No direct AP management
- Single Management point
  - From a controller
  - From WCS
- Same action for each AP at the same time



Cisco Unified Wireless Network

Indoor Access Points

1130AG

1121BG

Indoor Rugged Access Points

1250 AGBN

1240AG

1230AG

Outdoor Access Points/Bridges

1500

1520

1400

1300

Access Points

Features

- Industry's best range and throughput
- Enterprise-class security
- Only 802.11n Draft 2 support with PoE
- Simultaneous air monitoring and traffic delivery
- Wide area networking for outdoor areas

Benefits

- Zero-touch management
- No dedicated air monitors
- Supports all deployment scenarios (indoor and outdoor)
- From secure coverage to advanced services

Cisco Unified Wireless Network

Wireless LAN Controllers

4400

2106

Catalyst 6500 Series Wireless Services Module (WiSM)

WiSM

Switch and Router Platforms

Integrated Services Routers WLCM

Catalyst 3750G Integrated WLC Switch

Network Unification

Features

- Enterprise scalability and reliability
- Real-time RF Management
- Multi-layered security
- Mobility management
- Standalone and integrated options

Benefits

- Up to 1800 APs per Cat 6K chassis
- Cost-effective solution for main, branch, and remote campuses as well as SMB
- Ideal for data, voice, and video
- Wired and wireless integration

Cisco Unified Wireless Network

Wireless Control System

Features

- Planning, configuration & monitoring
- Extensive Reporting
- Intuitive GUI and templates
- Hierarchical maps / Google Maps integration
- Advanced Client troubleshooting
- Policy based networking (QoS, security, RRM, etc.)
- Mobility Services – Voice, Location, Security and Guest
- Spectrum Intelligence
- Next Generation WLAN – 802.11n and wireless mesh
- Standalone (autonomous) access point monitoring
- Simplified standalone access point migration

Wireless LAN Mobility Services

Security

- Automatic, 24 x 7 security and compliance monitoring for breaches via wireless medium

Guest

- Guest networks for customers, partners and auditors
- Public access networks

Voice

- Real-time mobile voice communications
- Improved collaboration via mobile unified communications
- Faster customer service response

Location

- Asset management
- Location-based content distribution
- Streamlined workflow using historical location data

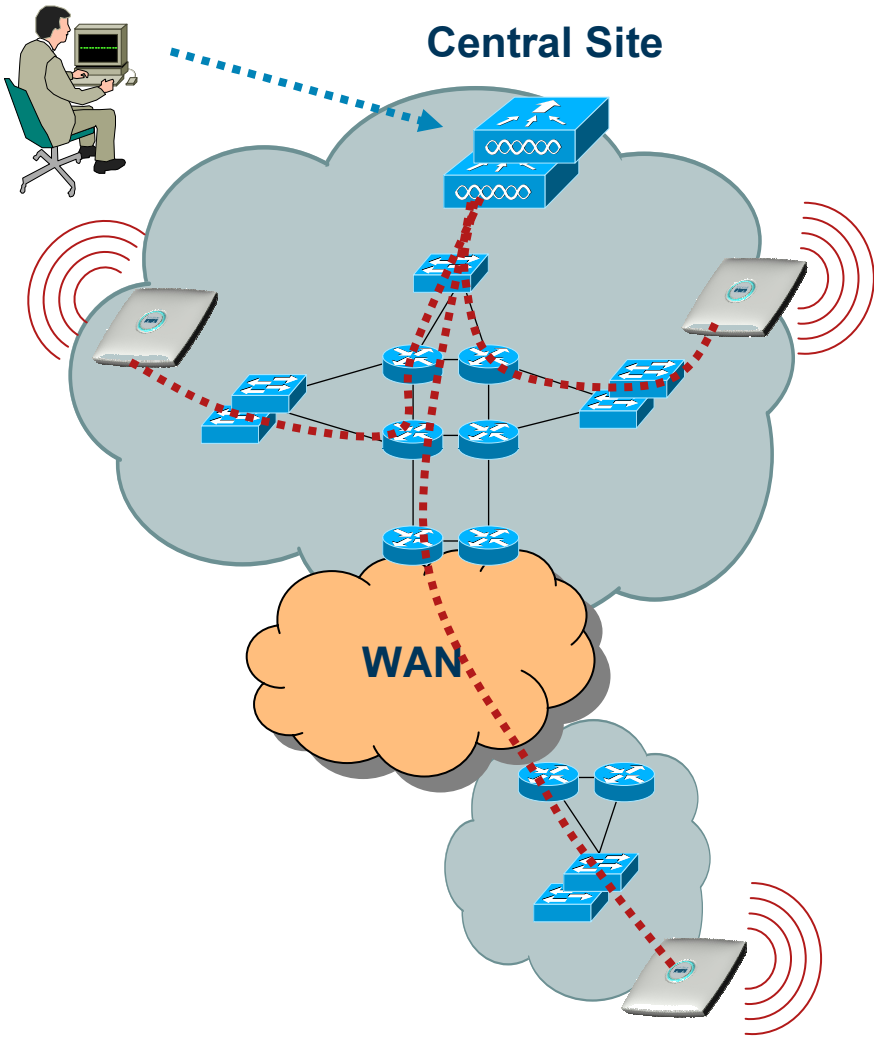
Pervasive Wireless Network

802.11n Design and Deployment Guidelines

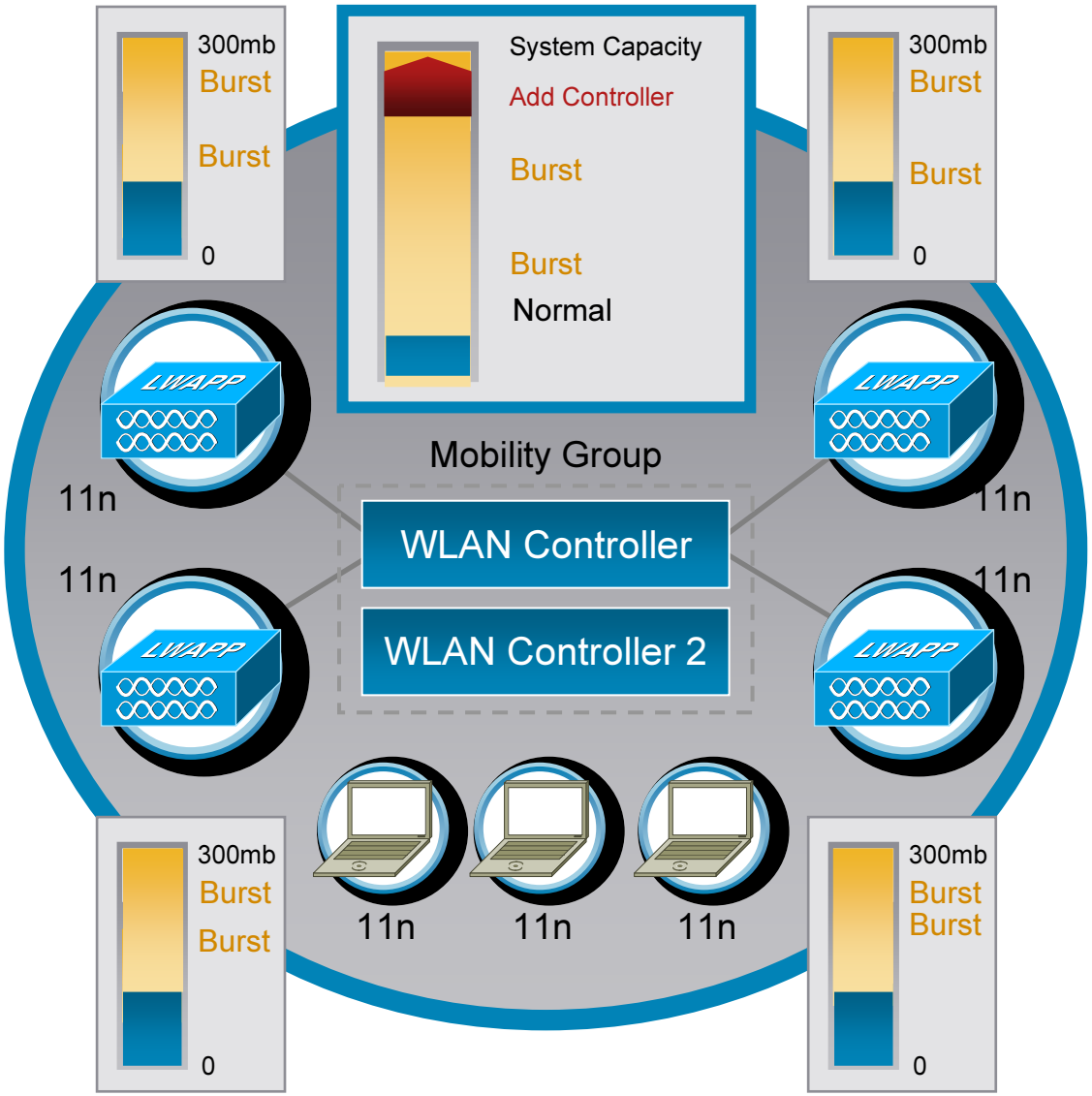
Hybrid Remote Edge Access Point (H-REAP)

Centralized WLAN Architecture

- All traffic is tunneled to the WLAN controller
- For remote offices, inefficient use of WAN resources
- For 802.11n access point, added load on the WLAN controller

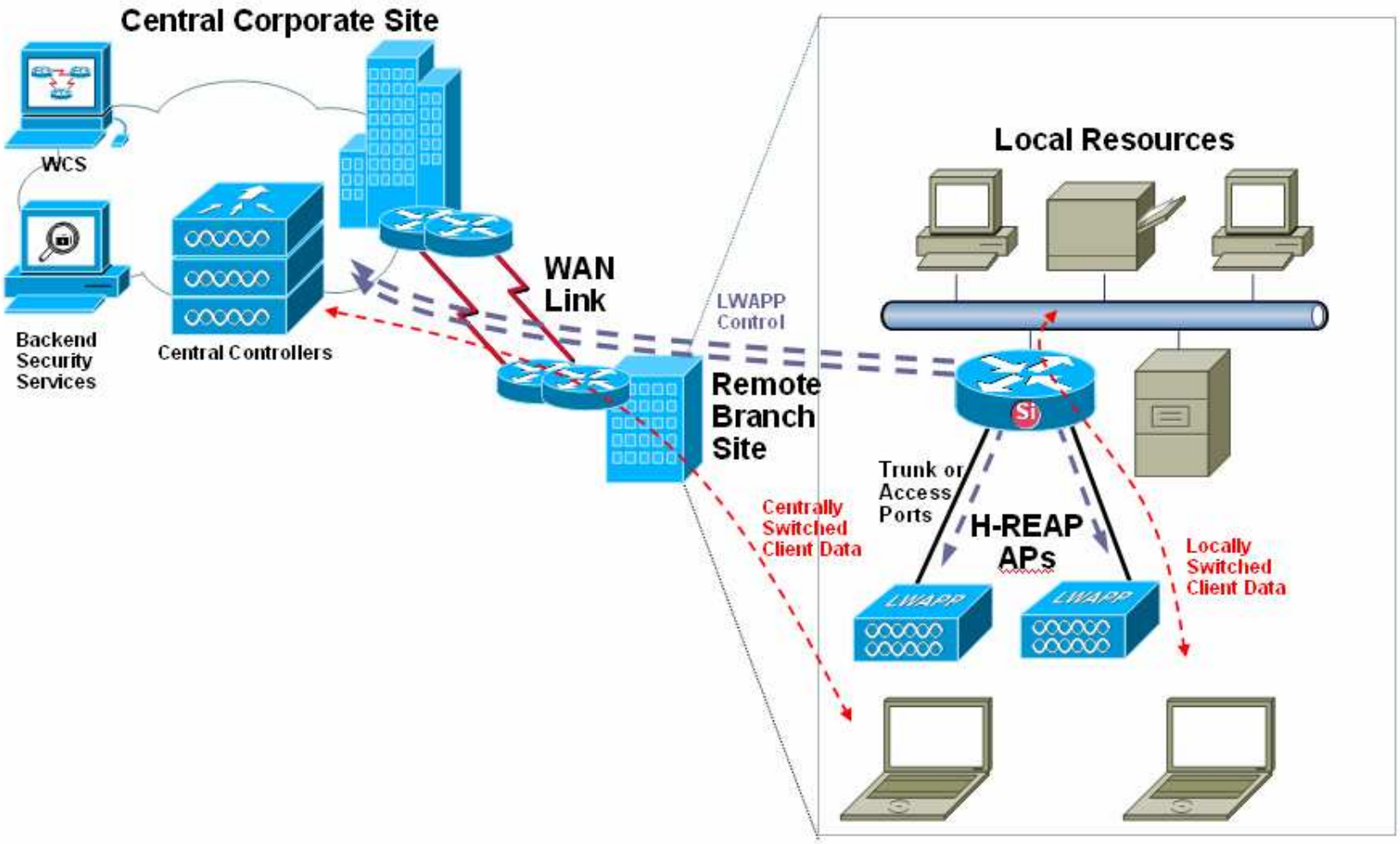


Network Capacity and Scalability



- 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

Hybrid Remote Edge Access Point (H-REAP)



Hybrid Remote Edge Access Point (H-REAP)

- Supported on 1130, 1240 and 1250 AP platforms
  - No more than 100ms roundtrip latency
  - 500 byte MTU minimum
  - ≥ 128 kbps WAN link
- Allows bridging/tagging of traffic locally (local switching) by WLAN
- Allows simultaneous tunneling of traffic to WLC (central switching) by WLAN
- “Connected Mode”—LWAPP Control centralized
- “Standalone Mode” (WAN outage)
  - Locally switched WLANs stay up
  - Some lost functionality

HREAP – Local 802.1X Auth Support

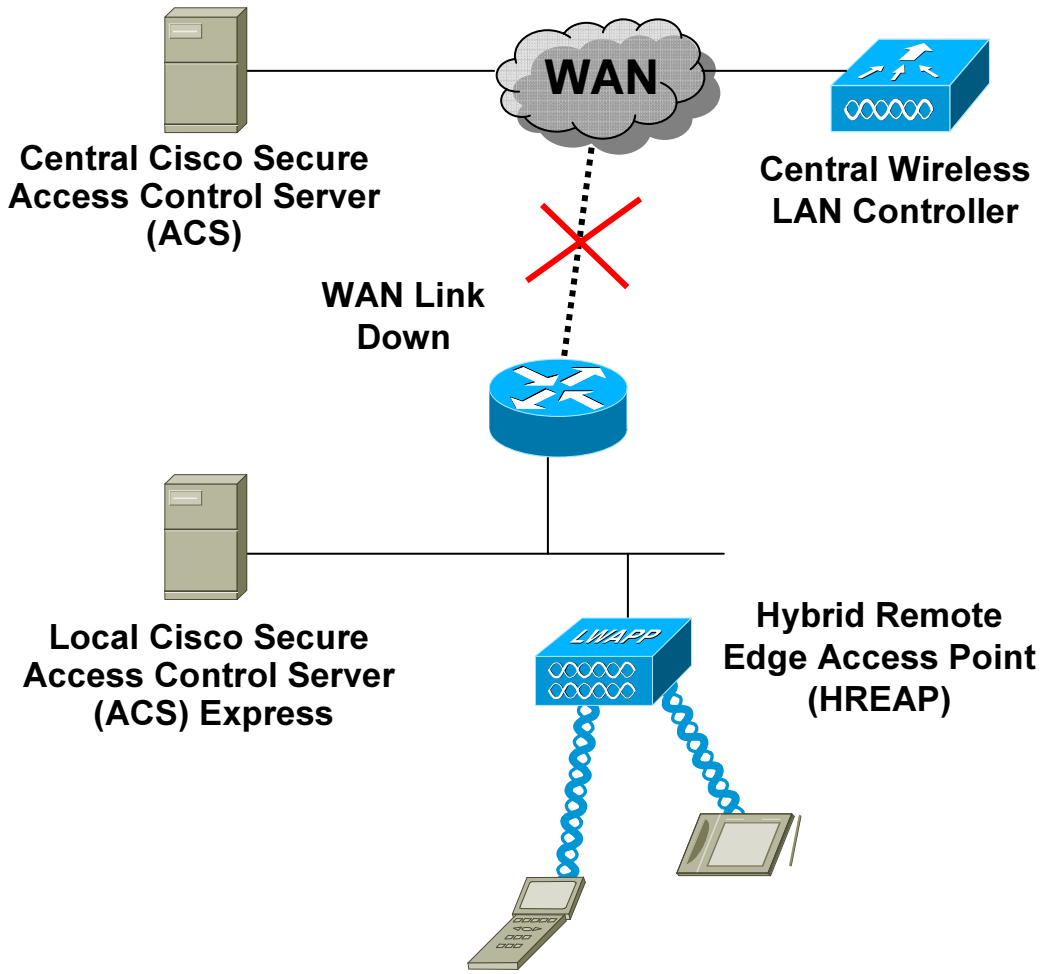
- **HREAP supports 802.1X authentication to a local "backup" AAA/RADIUS server**

  If WAN link to the centralized AAA/RADIUS server goes down, local authentication is performed

- **Benefits**

  Supports local client authentication by the HREAP and a local AAA/RADIUS server

  Both new clients joining the WLAN and existing clients that are re-authenticated can be authenticated locally via the HREAP



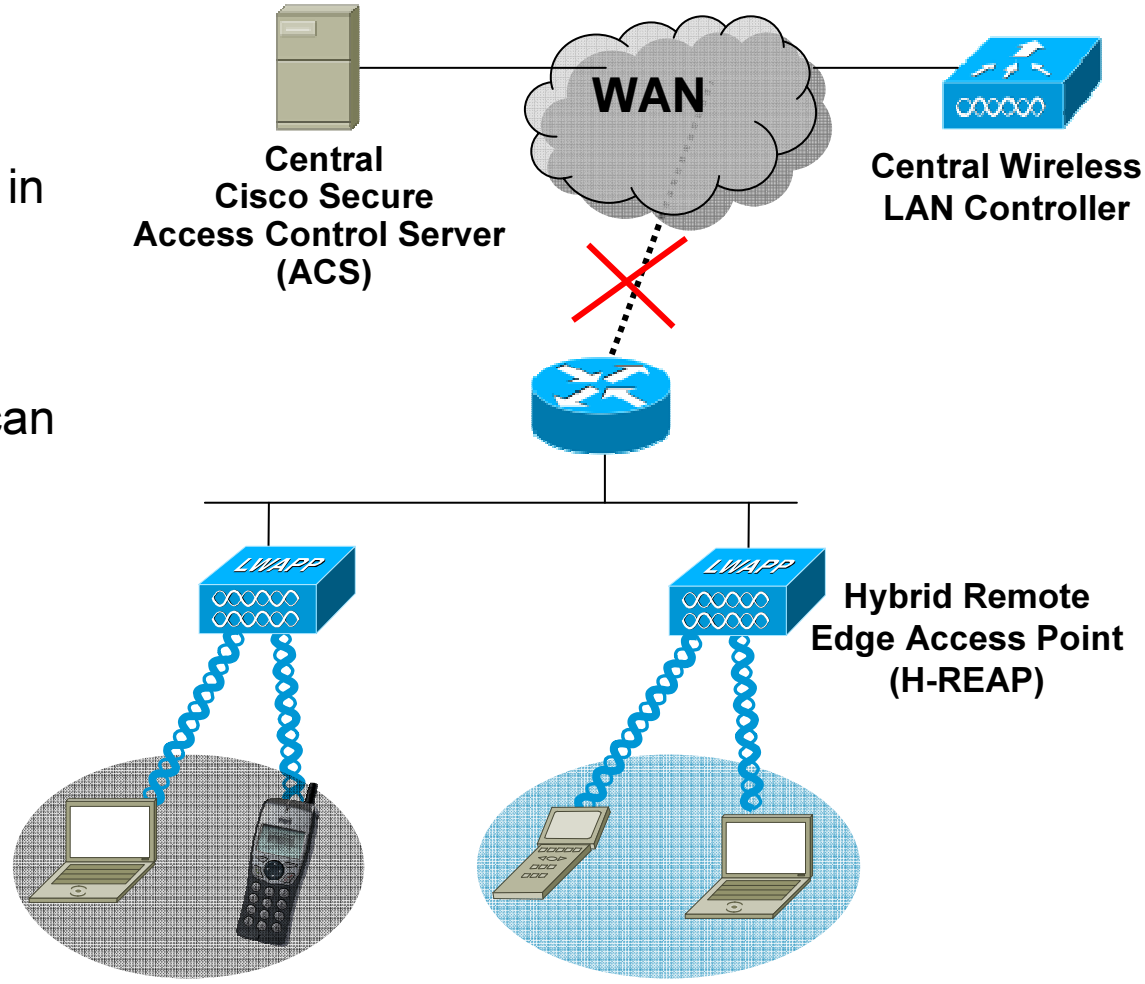
HREAP – Local 802.1x Auth Support on the AP

Features

- Allows H-REAP to do 802.1x authentication on the AP itself in standalone mode
- Uses a pre-configured list of usernames and passwords
- During WAN outage HREAP can authenticate users using the HREAP's RADIUS server

Benefits

- Ensure minimum service even during WAN outage
- No additional HW required for 802.1x authentication



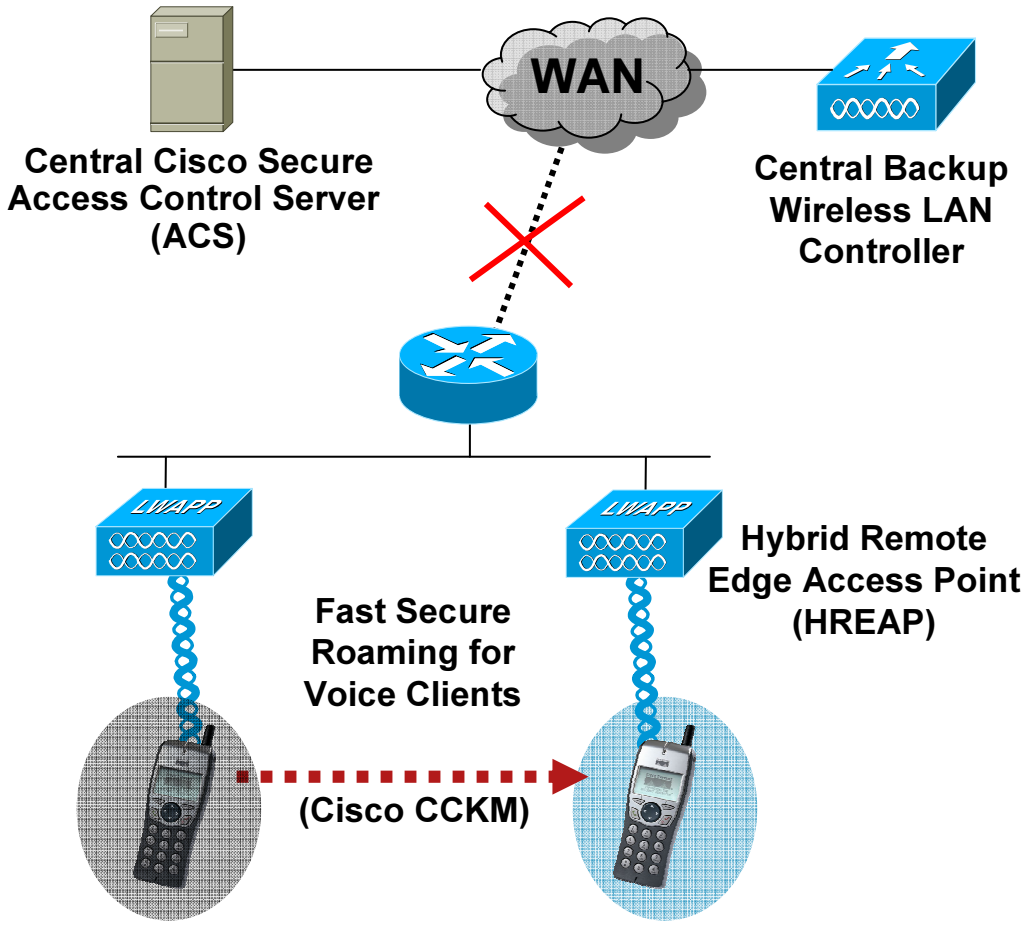
HREAP – CCKM Support

- **HREAP supports Layer 2 fast secure roaming**

  Cisco Centralized Key Management (CCKM) roaming on local controller if the WAN link connection is lost

- **Benefit**

  Roaming voice clients in remote locations and branch offices will stay connected even when the WAN link to the wireless LAN controller is lost



802.11n
Summary

Cisco Next Generation Wireless Solution

Aironet 1250 Series AP

First Wi-Fi Certified 802.11n Draft 2.0 Access Point

- Modular, field upgradeable
- Investment protection for future RF technologies

Catalyst Switches

Industry's Only 802.11n, Gigabit Power Over Ethernet Switch

- Will fully power AP1250 from a single GigE port
- Delivers full aggregation capacity for next generation throughput

Catalyst 6500 WiSM

Widest WLAN Controller Flexibility to Support Full 802.11n Capacity

- Support for 6 WiSMs per Catalyst 6509
- Scalable controller capacity up to 48Gbps

Cisco Next Generation Wireless Key Benefits

RF Leadership

- Industry's first enterprise draft 11n AP
- Enhanced reliability and predictability for existing 802.11a/b/g clients
- High throughput support for 802.11n draft 2.0 clients

Investment Protection

- Modularity provides investment protection
- Platform designed to support future advanced technologies
- Cisco Technology Migration Program

Interoperability

- Reference platform for the Wi-Fi Alliance 802.11n certification program
- Wi-Fi CERTIFIED 802.11n draft 2.0
- Intel Connect with Centrino certification
- Extensive testing in 802.11n plug fests

Unified Wireless + Wired

- Industry only end-to-end, unified wired and wireless solution
- Catalyst switches provide full power and aggregation capacity for next generation throughput
- Scalable controller capacity to 48Gbps

802.11n
Q&A and Additional Resources

Additional Resources

- Cisco Next Generation Wireless

  http://www.cisco.com/go/nextgen-wireless

- Cisco Aironet 1250 Series access point

  http://www.cisco.com/en/US/products/ps8382/index.html

- Cisco Unified Wireless Network

  http://www.cisco.com/en/US/netsol/ns340/ns394/ns348/ns337/networking_solutions_package.html

Free Wireless Evaluation Kits

http://www.rmkrpartner.com/cisco/wirelesseval/

Evaluation Homepage | Log In | Register | Cor

Business Strategies & Solutions GO

- Cisco Aironet 1130AG Series
- Cisco Aironet 1240AG Series
- Cisco Aironet 1300 Series Wireless Bridge
- Cisco Aironet 1400 Series Wireless Bridge
- Cisco Aironet Antennas and Accessories
- Cisco Aironet Wireless LAN Client Adapters
- Cisco 2100 Series Wireless LAN Controllers
- CiscoWorks Wireless LAN Solution Engine Express
- Cisco Spectrum Expert
- Cisco Aironet 1250 Series
- **Register for Test Drive**

Free Wireless Evaluation Kit

Discover how quickly and easily the Cisco wireless family of products can enhance your productivity and lower your costs. Take a test drive today on one of these popular Cisco wireless products:

Cisco 802.11n WLAN

Cisco WLAN

Cisco Aironet Wireless Bridge

Cisco 2100 Series Wireless LAN Controller Kit

CiscoWorks Wireless LAN Solution Engine Express