Design and Deployment of Enterprise Wireless

Aleksandar Stepančev, astepanc@cisco.com

EN PSS SEE

11/2015
Unified Access: Wireless Deployment Options

Cisco Cloud Networking

Cloud Managed

- Common OS
- Lean IT
- Mid-Market / Distributed Enterprise

Cisco Unified Access: 1 Architecture, 4 Deployment Modes

- Authoritative
- Distributed enterprises

- Intended for static installations
- SP Hotspots

- Aironet Access Points
  - 11ac: 3700 / 2700
  - 11n: 1600 / 700
- Catalyst Switches
  - 3850 / 3650
  - 2960-X
- Controllers
  - N / A

- Centralized
- Premise-based controller
- [Traditional Overlay Model]
- [Highly Scalable]

- 8510 / 5760 / 5508 / WiSM2 / 2504 / vWLC

- Converged
- Common OS
- Consistent Wired/Wireless
- Highest performance

- 11ac: 3700 / 2700
- 11n: 1600 / 700
- Catalyst Switches
  - 6800/4500/3850/3650
  - 4500-X / 2960-X
- Controllers
  - 5760 external MC

- Dashboard

- Catalyst Switches

- 3850 / 3650
- 2960-X
- Controllers
- N / A
## Expanded WLAN Controller Portfolio

### Large Campus and Service Provider

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>APs</th>
<th>Clients</th>
<th>Bandwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td>5508</td>
<td>25 to 1000 APs</td>
<td>12,000</td>
<td>60 Gbps</td>
<td></td>
</tr>
<tr>
<td>WISM2</td>
<td>300 to 1000 APs</td>
<td>15,000</td>
<td>20 Gbps</td>
<td></td>
</tr>
<tr>
<td>5520</td>
<td>10-1500 APs</td>
<td>20,000</td>
<td>20 Gbps</td>
<td></td>
</tr>
<tr>
<td>8510</td>
<td>100 to 6000 APs</td>
<td>64,000</td>
<td>10 Gbps</td>
<td></td>
</tr>
<tr>
<td>8540</td>
<td>NEW</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Small Campus and Branch (Controller on Premise)

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>APs</th>
<th>Clients</th>
<th>Bandwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td>2500</td>
<td>5 to 75 APs</td>
<td>1000</td>
<td>1 Gbps</td>
<td></td>
</tr>
<tr>
<td>Catalyst 3650</td>
<td>1-50 APs per switch/stack Directly connected APs</td>
<td>1000 clients per stack</td>
<td>40 Gbps per switch</td>
<td></td>
</tr>
<tr>
<td>Catalyst 3850</td>
<td>1-100 APs per stack</td>
<td>2000 clients per stack</td>
<td>40 Gbps per switch</td>
<td></td>
</tr>
<tr>
<td>Catalyst 4500-E SUP</td>
<td>1-100 APs per SUP Indirectly connected APs</td>
<td>6000 clients per stack</td>
<td>500 Mbps</td>
<td></td>
</tr>
<tr>
<td>Flex 75</td>
<td>NEW</td>
<td>300 to 6000 APs</td>
<td>64,000 clients</td>
<td>1 Gbps</td>
</tr>
</tbody>
</table>

### Branch (Controller in the Cloud)

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>APs</th>
<th>Clients</th>
<th>Bandwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual WLC</td>
<td>5 to 200 APs</td>
<td>6000 clients</td>
<td>500 Mbps</td>
<td></td>
</tr>
</tbody>
</table>
Capture the 802.11ac Transition: Improve Wireless Performance Everywhere

**Indoor**

**1700**
802.11ac
3x3:2 | MDR: 867

**2700**
802.11ac | HDX
3x4:3 | MDR: 1.3Gbps.

**3600**
802.11n w/ 802.11ac Module
3x4:3 | MDR: 1.3Gbps.

Same Price as competitors Entry 802.11ac with Better Coverage

**Indoor**

**3700**
802.11ac | HDX | Modular
3x4:3 | MDR: 1.3Gbps.

**Outdoor**

**1570**
802.11ac | HDX
3x4:3 | MDR: 1.3Gbps.

**Indoor**

**MR34 & MR32**
802.11ac
3x3:3 | MDR: 1.75Gbps

**MR72**
802.11ac
3x3:3 | MDR: 1.75Gbps
How 802.11ac Wave 2 Works
How 802.11ac Wave 2 Works

80% speed boost compared to Wave 1, thanks to:

- Multi-User MIMO (MU-MIMO)
- Wider RF Channels
- Four Spatial Streams
How 802.11ac Wave 2 Works

Multi-User MIMO (MU-MIMO)

Clients get on and off the network quicker, allowing more clients to be served.
How 802.11ac Wave 2 Works

<table>
<thead>
<tr>
<th>BW (MHz)</th>
<th># Spatial Streams</th>
<th>MCS (QAMr5/6)</th>
<th>PHY Rate (Mbps)</th>
<th>MAC Throughput (Mbps)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>3</td>
<td>256</td>
<td>1300</td>
<td>845</td>
</tr>
<tr>
<td>80</td>
<td>4</td>
<td>256</td>
<td>1733</td>
<td>1126</td>
</tr>
<tr>
<td>160</td>
<td>1</td>
<td>64</td>
<td>650</td>
<td>422</td>
</tr>
<tr>
<td>160</td>
<td>1</td>
<td>256</td>
<td>780</td>
<td>507</td>
</tr>
<tr>
<td>160</td>
<td>1</td>
<td>256</td>
<td>866</td>
<td>563</td>
</tr>
<tr>
<td>160</td>
<td>2</td>
<td>64</td>
<td>1300</td>
<td>845</td>
</tr>
<tr>
<td>160</td>
<td>2</td>
<td>256</td>
<td>1560</td>
<td>1014</td>
</tr>
<tr>
<td>160</td>
<td>2</td>
<td>256</td>
<td>1732</td>
<td>1126</td>
</tr>
<tr>
<td>160</td>
<td>3</td>
<td>64</td>
<td>1950</td>
<td>1268</td>
</tr>
<tr>
<td>160</td>
<td>3</td>
<td>256</td>
<td>2340</td>
<td>1521</td>
</tr>
<tr>
<td>160</td>
<td>3</td>
<td>256</td>
<td>2600</td>
<td>1690</td>
</tr>
</tbody>
</table>

Potential throughput at 160-MHz channel widths:

- Multi-user MIMO (MU-MIMO)
- Wider RF channels

* Based on 65% MAC utilization
How 802.11ac Wave 2 Works

- Multi-user MIMO (MU-MIMO)
- Wider RF channels
- Four spatial streams

Access point transmits “abcdefghijkl” to client

Wi-Fi client receives “abcdefghijkl” through four streams of
Four spatial streams support using single-user MIMO

Ceiling
Object
Wall
Next-Generation Wave 2 802.11ac Access Point

- Next-generation 4x4 MIMO: 4 spatial streams (SS) Wave 2 802.11ac access points
- Dual radio, 802.11ac Wave 2, 80 MHz
- 5 GHz: 4x4 supporting
  - 3 SS MU-MIMO
  - 4 SS SU-MIMO
  - 1.7 Gbps Max 5-GHz PHY
  - 2.0 Gbps Max Aggregate PHY
- 2 times Gigabit Ethernet and USB 2.0
- Internal and external antenna models

Cisco Aironet® 1850

Gigabit Wi-Fi has fully arrived
Cisco Aironet® 1830 Series with 802.11ac Wave 2 MU-MIMO

- Next-generation 3x3 MIMO: 2 spatial streams (SS)
- **Wave 2** 802.11ac access points
- Dual radio, 802.11ac Wave 2, 80 MHz
- 5 GHz: 3x3 supporting
  - 2 SS SU/MU-MIMO
  - 870 Mbps Max 5-GHz PHY
  - 1 Gbps Max Aggregate PHY
- 1 x Gigabit Ethernet and USB 2.0
- Internal antenna model
Simple by Design: Mobility Express
Optimized for Small Scale Wi-Fi implementations

1. Simple 3-step over-the-air setup
2. Simple clustered management
3. Cisco® Aironet® 1830 and 1850 Series 802.11ac Wave 2
Mobility Express: Fast IT
Deploy in Minutes

Fast IT

Connect Via Any Wireless Device

Enable Multiple APs Simultaneously with Setup Wizard

Access Management Dashboard: Operate, Monitor, and Troubleshoot
Mobility Express: Zero Compromise
Large Enterprise Features optimized for Small Scale implementations

Optimized Wi-Fi Environment
Streamline deployments with out of the box best practice configuration

Analytics Dashboard
Better decisions with Access Point, Client, and Application Visibility

Cisco Advanced Functionality
Cisco Large Enterprise DNA applied to enhance Small Scale implementations
Mobility Express: Investment Protection

Same Access Point hardware regardless of where the WLAN Controller function is located – Access Point, Appliance, Switch, Router, Virtual Machine, etc.
Simple By Design: Deploy in Minutes

WLAN Express Setup Wizard

- Amplified User Interface
- Over-The-Air no cable needed
- Basic Employee and a Guest WLAN

Cisco’s Best Practices ON by default

- Radio Resource Management
- Internet only Guest Access Controls
- Application Visibility
- Mean Air and intrusion detection
- and Select
- Client Profiling
- Best practice default settings

Built-in Analytics Dashboard
Simple By Design: Highly Intuitive

- Simple Screens
- Large Icons/Fonts
- Focus on Basic Features
- Guided/Intuitive
Simple By Design: Mobile Application
Configure Wireless, View Key Performance Indicators & Analytics

ACCESS POINT DETAILS

ACCESS POINT HEALTH

ROGUE DETECTION

CLIENT & APPLICATION VISIBILITY

INTERFERENCE DETECTION

APPLICATION VISIBILITY AND LOCAL CLIENT PROFILING
Cisco Aironet Indoor Access Points Portfolio

Industry’s Best 802.11ac Series Access Points

**Enterprise Class**

**1700**

- 802.11ac W1
- 370 Mbps PHY
- 3x3:2SS
- CleanAir Express
- Tx Beam Forming
- 2 GbE Ports

**Enterprise Class**

**1830/50**

- 802.11ac W2
- 2.0 Gbps PHY
- 4x4:4SS
- Spectrum Analysis*
- Tx Beam Forming
- 2 GbE Ports, USB 2.0

**Mission Critical**

**2700**

- 802.11ac W1, 1.3 Gbps PHY
- 3x4:3SS
- HDX: High Density Experience
- CleanAir 80 MHz
- ClientLink 3.0
- 2 GbE Ports

**Mission Critical**

**3700**

- 802.11ac W1, 1.3 Gbps PHY
- 4x4:3SS
- HDX: High Density Experience
- CleanAir 80 MHz
- ClientLink 3.0
- StadiumVision
- Modularity: Security, 3G Small Cell, or Wave 2 802.11ac

*New*
Cisco Innovation update
High Density Experience (HDX)
Enables full use of Gigabit speed with excellent user experience

- Turbo Performance
  Improved client experience
- Optimized Roaming
  Improved client and network performance
- Cisco CleanAir® 80Mhz
  Mitigates radio interference
- Cisco ClientLink 3.0
  Improves Client throughput/even for legacy devices
- Enhanced Air Time Fairness
  Air time allocated per SSID. Better control over how air time is shared

Cisco is the ONLY SOLUTION with High-Density Experience (HDX)
Cisco Innovation update
Introducing the Hyperlocation module

- High accuracy
- Reduced BLE deployment size
- BLE and Wi-Fi visibility
- Faster refresh rates
- Improved security coverage
How CMX Works
Built on Cisco Unified Access

Access Points

Controller (Virtual/Physical)

MSE (Virtual/Physical)

Device-based Discovery

Location Data

Application Data

Mobile Application Server

Analytics Data

Depending on Application Layer
CMX Connect: Guest Access made easy

Location specific custom guest access
Portal and post-auth URL on per site basis

Multiple access methods
Web passthrough, social media or SMS

Customized access and promotion
Proximity-based landing pages and video

Understand who is in your location
Enhanced analytics

Multi-language support
User-friendly
ian purchases the
Big Buy app
Bian walks into the venue. Presence detected.
Welcome back Brian. What would you like to find today?
Wireless onboarding
Concierge services offered
Searches for product
All serves necessary components and provides indoor map.
scans nearby inventory and completes purchase through app.
Identifies promotional items based on profile/history.
Thank you for shopping with us Brian.
We hope you found everything you need.
Cisco Meraki: Bringing the cloud to Enterprise Networks
Cloud Managed Wireless

Key Features

Centralized Management
- Rapid Deployment with Self-Provisioning
- Control Applications, Users, Devices
- Automatic Monitoring and Alerts

Enterprise security and guest access
- Air Marshal™ wireless intrusion prevention
- Secure guest access
- 802.1x / Active Directory integration
- Dedicated Security Radio

Automatic RF optimization
- AutoRF™ cloud-based performance tuning
- High performance mesh routing
- Dedicated Radio for Monitoring

BYOD control
- CMX Location Analytics
- Built in MDM
- Automatic device identification
- Bonjour Gateway

Application Visibility and Control
- Deep Packet Inspection
- Traffic Shaping
- Cloud-Based Application Signatures
New Meraki Wireless Portfolio

**Indoor APs**
- **MR18**: 2 Stream Triple-Radio 802.11a/b/g/n, 600 Mbit/s
- **MR26**: 3 Stream Triple-Radio 802.11a/b/g/n, 900 Mbit/s
- **MR32**: 2 Stream Triple-Radio 802.11ac, 1.2 Gbit/s
- **MR36**: 3 Stream Triple-Radio 802.11ac, 1.75 Gbit/s

**Outdoor APs**
- **MR62**: Single-Radio 802.11b/g/n, 300 Mbit/s
- **MR66**: Dual-Radio 802.11a/b/g/n, 600 Mbit/s
- **MR67**: 2 Stream Triple-Radio 802.11ac, 1.2 Gbit/s
- **MR72**: NEW 3 Stream Triple-Radio 802.11ac, 1.75 Gbit/s
Bluetooth and Beacons

Bluetooth Low Energy (BLE) is a form of Bluetooth designed for very low power
- Found in many consumer devices: smartphones, headsets, fitness trackers, etc.

Beacons use BLE for location services like asset tracking, mobile commerce, and in-building navigation
- iBeacon is Apple’s BLE trademark

Fast becoming the opt-in alternative to WiFi or location services

**MR32, MR72: Integrated Bluetooth to drive location trends**
Cisco Meraki MR34

802.11ac with Application QoS
For increased throughput and density

Dedicated Security Radio
3rd radio for Air Marshal and RF management

Built for Cloud Management
Seamless deployment, fully integrated features

The most advanced cloud-managed access point
IEEE 802.11ac with application QoS

- 3 stream, dual concurrent radios with 1.75 Gbps aggregate radio rate for high throughput and density
- Layer 7 application fingerprinting classifies and controls evasive, encrypted, and P2P traffic
  - Inspects packets and applies policies at full 802.11ac speed
  - Prioritize business apps, real-time traffic
  - Limit recreational, bandwidth-hungry apps
- User and device fingerprinting for identity-based QoS policies
- Airtime fairness algorithms for high-density networks
- Cloud-based signature updates respond to new apps

Supported Standards:
- 802.11g
- 802.11n
- 802.11ac
Radio dedicated to scanning and protecting RF environment
  – Instantly detects and mitigates interference, vulnerabilities, and attacks on all channels
  – 3rd radio enables full-time scanning with full-performance client access on 2.4 GHz and 5 GHz radios

Deeply-integrated with cloud-based software solutions: Air Marshal (security), Auto RF (performance)

No added cost or complexity
  – Typical deployments: radio operates in background (zero-config)
  – Power users: rich tools available for security and RF management
  – No added cost: no extra hardware, software, or licenses
Protect network with dedicated scanning radio linked to powerful cloud-based software

Detects and classifies nearby APs using rich heuristics

Identifies vulnerabilities and attacks:
- Unmanaged / insecure APs plugged into LAN
- Malicious rogues spoofing WLAN
- Packet floods, malicious broadcasts

Contains rogue APs, blocking clients from associating
Scans all channels for interference, tuning performance with cloud intelligence

Optimized for mixed 802.11ac and 802.11n environments

Cloud-based engine analyzes RF data, optimizes channels and power across network

Responds automatically to challenging or dynamic RF environments

Auto RF: Zero-config optimization for dynamic environments
Streamlined migration from 802.11 a/b/g/n

Plug-and-play deployment: MR34 automatically connects to Meraki cloud, appears in dashboard, downloads configuration, and self-optimizes

Unified cloud management across 802.11ac and mixed 802.11ac / 802.11n networks
Consistent policies and tools across all Meraki APs
Seamless client roaming between .11ac and .11n access points
Easily supplement 802.11n networks with MR34s in high-density or performance critical areas
Upgrade legacy APs with zero configuration
Deploy at remote sites without on-site IT

802.11ac features with legacy 802.3af PoE
3rd radio deactivated under 802.3af; Air Marshal & Auto RF operate in background opportunistic mode
CPU clock speed lowered, 2.4 GHz client-serving radio uses two spatial streams (5 GHz still uses three)
Full 3rd radio functionality with 802.3at PoE+ (standard on all Cisco Meraki PoE switches)
Part of a complete solution

- Multi-site management
- User fingerprints
- Real-time control
- Instant search
- Location analytics
- Application QoS
- Same out-of-the-box feature set as other Meraki MR wireless APs
Thank You