Building the Mobile Business with the Cisco Unified Wireless Network

Putting Business in Motion

Carlos Alcantara
Wireless Systems Engineer
caalcant@cisco.com
The Mobility Choice
Legacy Products or Strategic Platform?

IT has a clear choice:
Invest in an application-ready mobility platform; or buy legacy Wi-Fi products

Legacy Wi-Fi
- Access points & controllers
- Limited integration with broader mobility & wired network
- Closed-system services
- Costly to operate and maintain
- Limited services and application support

Mobility Platform
- True mobility network
- Unified mobility experience
- Integrated wired and wireless services
- Saves time, money and energy
- Open mobility application ecosystem
Business Mobility Challenges

1.1 Billion New Wi-Fi Devices by 2011

65% of Enterprises Consider it a Priority to Provide More Mobility for Employees

Wave of Devices

Managing Disparate Networks

Deploying Applications

Ethernet Wi-Fi Cellular RFID WiMAX
Invest in a Mobility Platform
The Right Choice to Meet Business Challenges

Investment Protection

Total Cost of Ownership

Application Aware

Mobility Platform

Legacy WiFi Systems

Simplified Integration

Applications benefit from network intelligence

End-to-End Security

Mobility Platform
Best of Breed Architecture; End-to-End Mobility Value Chain
Cisco Motion: End-to-End Mobility Value Chain

A Mobility Network is more than APs and Controllers

- Best of Breed Wireless Infrastructure
- Simplified Client Management & Troubleshooting
- Open Architecture Designed for Mobility Applications
Challenges for Wireless Deployment
Building a Business Class Network – Wired and Wireless

Lack of Resources to Manage the RF
The Radio Frequency Is Unpredictable
Wireless Doesn’t Scale or Deliver the Uptime We Need
Managing wireless devices is costly

Only Cisco Extends Wired Experience to Wireless Performance
Scalable, Application Ready Wireless
Industry Leader in 802.11n

- More Predictable Coverage
- Up to 9x Faster
- More Video
- Greater Device Density

M-DRIVE

1250 Series
1140 Series

Most Deployed #1 market share
Wi-Fi Alliance testbed
Connect with Centrino Certified
Seamless Integration to Existing Network
Sleek Design for any Environment
11n Performance with Standard PoE
Introducing Cisco M-Drive Technology
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
- Better coverage than APs using off-the-shelf silicon
- Full scalability through optimal 5GHz spectrum use with DFS

### 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
Technical Elements of 802.11n

- MIMO
- 40Mhz Channels
- Packet Aggregation
- Backward Compatibility
Aspects of 802.11n

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

- **40Mhz Channels**
  - Transmissions are in Phase, Increasing Signal Strength

- **Packet Aggregation**
  - Without Beam Forming, Transmissions Arrive out of Phase
  - With Beam Forming, Transmissions Arrive in Phase, Increasing Signal Strength

- **Backward Compatibility**
  - Works with non-MIMO and MIMO Clients

**Spatial Multiplexing**

**Maximal Ratio Combining**

**Beam Forming**
Aspects of 802.11n

40Mhz Channels  Packet Aggregation  Backward Compatibility

MIMO (Multiple Input, Multiple Output)

**MIMO AP**

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

**Beam Forming**

**Maximal Ratio Combining**

Performed by Receiver (Hear Better)

Combines Multiple Received Signals

Increases Receive Sensitivity

Works with non-MIMO and MIMO Clients

Spatial Multiplexing
Aspects of 802.11n

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

<table>
<thead>
<tr>
<th>MIMO</th>
<th>40Mhz Channels</th>
<th>Packet Aggregation</th>
<th>Backward Compatibility</th>
</tr>
</thead>
</table>

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

### Carpooling Is More Efficient Than Driving Alone

<table>
<thead>
<tr>
<th>Without Packet Aggregation</th>
<th>With Packet Aggregation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>802.11n Overhead</strong></td>
<td><strong>802.11n Overhead</strong></td>
</tr>
<tr>
<td>Data Unit Packet</td>
<td>Data Unit Packet</td>
</tr>
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</table>

**Packet Aggregation**
Aspects of 802.11n

MIMO
40Mhz Channels
Packet Aggregation
Backward Compatibility

Backward Compatibility

2.4GHz
11n Operates in Both Frequencies
5GHz

802.11ABG Clients Interoperate with 11n AND Experience Performance Improvements
Cisco M-Drive with ClientLink
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
ClientLink uses Beam Forming to Direct Signal to Improve Performance and Coverage for 802.11a/g Devices

- Innovation delivered from Cisco AP silicon
- Not available in off-the-shelf access points
Performance Benefits of ClientLink
Miercom Testing Validation

ClientLink Benefits

- Improves throughput for existing 802.11a/g devices
  - Extends useful life of older devices, saving upgrade costs
- Increases overall wireless system channel capacity
  - Faster 11a/g transactions open airtime to increase 11n performance
- Reduction in Coverage Holes for 11a/g devices
  - Higher data rates with fewer dropped packets

Miercom Testing Results

- Up to 65% increase in throughput for 11a/g devices
- Up to 27% Improvement in Channel Capacity
- Fewer coverage holes in dynamic RF environments
Detect and Mitigate RF Interference
Cisco M-Drive Technology

Comprehensive Detection of Microwaves, Bluetooth, Cordless Phones, Wireless Cameras, RF Jammers, etc
Automate Channel Assignment
Cisco M-Drive Technology

AP Channel Changed to Avoid Co-Channel Interference

Lowers the amount of time IT resources spend to maintain the wireless network
Automate Coverage Hole Removal
Cisco M-Drive Technology

System Fills Coverage Hole by Increasing Transmit Power of Neighboring APs

Delivers a more reliable, resilient wireless network
Automated Client Load Balancing
Cisco M-Drive Technology

Access Point At Capacity
No Bandwidth for Additional Call

Additional Device Load Balanced to Neighboring AP

Maintains Application Performance by Sharing Network Capacity
Comprehensive, Integrated Wireless Security
Automated Air Monitoring Mitigates Threats

How Do I...

- Protect my wired and wireless network from attacks over the airwaves?
- Gain visibility into my RF spectrum?
- Ensure compliance and protect my RF assets?

- Man-in-the-Middle Hacker Attacks
- DoS Attacks
- Non-802.11 Devices
- Rogue APs

Integrating the best features:

- Lower Capex
- Ease of Management
- Lowest TCO
- Reduced Training

Adaptive wIPS—Best of Both

- Depth of Protection
- Flexibility and Scalability with MSE
- Collaborative Wired and Wireless Security

Best of Breed

- Functionality to address latest threats
- New feature adaptability
## Over-the-Air Attack Techniques and Tools

### Examples of Attacks Detected

#### Network Profiling and Reconnaissance
- Honeypot AP
- Netstumbler
- Kismet
- Wellenreiter
- Excessive device error
- Excessive multicast/broadcast

#### Authentication and Encryption Cracking
- Dictionary attacks
- AirSnarf
- Hotspotter
- WEPCrack
- ASLEAP
- EAP-based attacks
- CoWPAtty
- Chop-Chop
- Airkrack
- Airsnort
- PSPF violation
- WEP Attack
- Illegal frame types
- Excessive association retries
- Excessive auth retries
- LEAPCracker

#### Man-in-the-Middle
- MAC/IP Spoofing
- Fake AP
- Evil Twin AP
- ARP Request Replay Attack
- Fake DHCP server
- Pre-standard APs (a,b,g,n)

#### Denial of Service
- Malformed 802.11 frames
- FATA-Jack, AirJack
- Fragmentation attacks
- Excessive authentication
- De-auth attacks
- Association attacks
- CTS attacks
- RTS attacks
- Excessive device bandwidth
- EAPOL attacks
- Probe-response
- Resource management
- RF Jamming
- Michael
- Queensland
- Virtual carrier
- Big NAV
- Power-save attacks
- Microwave interference
- Bluetooth interference
- Radar interference
- Other non-802.11 interference
- Device error-rate exceeded
- Interfering APs
- Co-channel interference
- VoWLAN-based attacks
- Excessive roaming
Cisco Unified Wireless Network
Industry’s Most Flexible Architecture

“Wide variety of WLAN products to service a broad set of needs (indoor, outdoor, industrial, carpeted); wide variety of form factors and price points.” – Gartner WLAN Magic Quadrant
Simple Intuitive Management
Centralized RF and System Management

Can I see how good my wireless coverage is?
Can I detect interference from cordless phones and microwaves?
Can I ensure my network is voice ready?
Can I locate rogue access points?
Can I determine my wireless PCI compliance?
Can I assess the security health of my wireless?
Cisco Motion: End-to-End Mobility Value Chain

Applications Run with the Network, Not Just Over It

- Best of Breed Wireless Infrastructure
- Simplified Client Management & Troubleshooting
- Open Architecture Designed for Mobility Applications
Simple Mobile Device Connectivity
Cisco Compatible Clients

Connect Securely

- Single interface for authentication and encryption, centralized provisioning

Optimize

- Dynamically adjust device behavior to suit the application
- Load balancing, quality of service, location

Troubleshoot

- Central client connection diagnostics and problem resolution avoids “needle in a haystack”
Simple Mobile Device Connectivity
Cisco Compatible Clients

Only Cisco

Pre-tested to work with Cisco
(90% Devices Support Cisco Compatible Extensions (CCX))

Performs joint vendor compatibility testing
(Intel, Apple, Nokia, RIM)

Offers a unified client for connection services
with VPN, NAC and supplicant

Reduces helpdesk costs with centralized client troubleshooting
Cisco Motion: End-to-End Mobility Value Chain

Applications Run with the Network, Not Just Over It

Best of Breed Wireless Infrastructure

Simplified Client Management & Troubleshooting

Open Architecture Designed for Mobility Applications
Cisco Motion: 4\textsuperscript{th} Generation Architecture
From Connectivity to Control to Applications

- Separation of control and services
- Centralized Services
- Services Oriented
- Open Architecture
- Industry Solutions
- Partner Eco-System
Legacy Wi-Fi Networks
Integration Complexity

Limited Synergies between Network Services

Apps and Services Delivered in Silos

Applications
- Location
- WIPS
- Handoff
- Service “n”

No Common Service Delivery—Some Delivered from the Controller

WLAN Controller

Management

No Integration with Alternative Access Networks

Ethernet

Wi-Fi

WiMax Cellular
Mobility Services Architecture
Open Platform Designed for Applications

- Applications
- Applications
- Applications
- Applications

- Centralized Services
- Location
- WIPS
- Handoff
- Service “n”

- Open API
- Apps Source Intelligence from the MSE via Open API

- Mobility Services Engine
- MSE

- NMSP

- Open Protocols
- Unify Networks

- Controller
- Ethernet
- Wi-Fi (LWAPP)
- WiMax Cellular

- Centralized Services and Network Management
Existing Controllers Can’t Scale Mobility Services

- Multiple mobility services
- Modular operating system
- “Right sized” CPU, memory, storage
- Centralize for initial scale
- Evolution path to distributed scale
Mobility Services Rich Architecture
Scalable, Integrated Services Platform

Context-Aware
Optimize Business Process with Context Such as Location and Telemetry
Greater Location Scalability than Competitive Offerings

Adaptive Wireless IPS
Mitigate Wireless Threats with Integrated Intrusion Prevention
Industry’s Only Integrated Wired and Wireless IPS Solution

Mobile Intelligent Roaming
Handoff of Mobility Applications Across Public and Private Networks
Network Intelligence Delivers a More Consistent and Reliable Hand-Off

Secure Client Manager
Simplify Provisioning, Securing and Management of Mobile Devices
Only Mobility Solution to Effectively Address the Complexity of Device Management

Industry Exclusive
Drastically Lower Operational Cost Without the Integration Challenges of Legacy Wi-Fi Systems
Context Aware Mobility

- Mobility Services Engine
  - Context Aware Software
- Context Aware Engine for Tags
- Engine for Clients
- Passive RFID via Partners (Future)
- TDoA Receivers
- CUWN
- Choke Points
- CUWN
- Mobile or Fixed RFID Readers
- Wi-Fi Tags
- Wi-Fi Clients
- Passive RFID Tags

In close proximity
Passive RFID

- Campus Wi-Fi (TDoA, Chokepoint)
- Building Wi-Fi (RSSI, Chokepoint)
# Context Aware Mobility Use Cases

## Healthcare
- Nurses and Physician schedule
- Emergency Room minimum attendance
- Inventory management of medical equipment
- Alerts when equipment leaving building or bad conditions

## Manufacturing
- Final goods inventory
- Emergency evacuation
- Tracking pallets on the factory floor
- Locating Work in Process (WIP) parts for assembly

## Education
- Classroom attendance
- Emergency evacuation
- Enhance learning with context-based applications
- Quickly locate faculty and staff on campus
- Track the unauthorized movement of campus property such as TV’s, computers and lab equipment

## Retail
- Tracking pallets in the warehouse
- Locate sales associate
- Information on demand
- Location aware promotions
- Ensure that perishable goods are kept in the right condition or alert
Mobile Intelligent Roaming

- **Enterprise-grade** notification that can be sent to a Mobile Gateway or to a Roaming Client from various partners for network assisted intelligent roaming

- **Cisco Partners** could be
  - Service Providers lacking Enterprise Network Visibility
  - Device Manufacturers willing to increase the dual-mode phone users’ experience
  - 3rd party vendors mobilizing enterprise unified communications
Adaptive Wireless IPS

**Increasing Risk of Threats**
- RF Jamming
- DoS Attacks
- Rogue Access Points
- RF Interference
- Malicious Hacking

**Detected, Analyze and Mitigate RF Based Attacks**

**Use Existing Unified Wireless Network Infrastructure**

**Wired and Wireless Security Integration**

**Regulatory Compliance and Reporting**

**Business Requirements**
- Protect Sensitive Corporate Data
- Achieve Compliance
- Manage RF as an Asset
- Single Infrastructure to Manage

**Wireless Network Protection**

**Businesses Require Visibility Into Their Wireless Environment for Protection Against a Growing Number of Wireless Threats; Proactive Defense Is Critical for Minimizing Legal Liability, Protecting Brand Reputation and Meeting Regulatory Compliance Requirements**
### Wireless Rogue/IPS: Overlay Vs. Cisco

*Changing the Assumptions for wIPS Deployment*

<table>
<thead>
<tr>
<th>Feature</th>
<th>Traditional Overlay wIDS</th>
<th>Cisco Adaptive wIPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full 802.11 Attack Detection</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Forensics &amp; Reporting</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Detects non-802.11 Wireless &amp; Malware Attacks</td>
<td>NO</td>
<td>YES – Via wired IPS collaboration and Spectrum Intelligence</td>
</tr>
<tr>
<td>Leverages WLAN Equipment/Infrastructure</td>
<td>NO – Stand-alone equipment</td>
<td>YES – wIPS runs on WLAN equipment</td>
</tr>
<tr>
<td>Integrated in WLAN Management</td>
<td>NO – Separate NMS, no policy/reporting synchronization</td>
<td>YES – Single NMS interface for entire WLAN and wIPS operations</td>
</tr>
<tr>
<td>Uses WLAN APs and Software</td>
<td>NO – Requires separate sensor software/APs</td>
<td>YES – Integrated directly into Cisco’s Unified Wireless Network</td>
</tr>
<tr>
<td>Flexible Deployment: wIPS-Dedicated or Dual WLAN/wIPS</td>
<td>NO – wIPS-only service</td>
<td>YES – May be deployed as wIPS-only or WLAN+wIPS on same gear</td>
</tr>
<tr>
<td>Infrastructure Collaboration</td>
<td>NO – Overlay wIPS only sees RF-environment</td>
<td>YES – Analyzes both wired &amp; RF segments of the WLAN network</td>
</tr>
<tr>
<td>Works Over Very Low-Bandwidth Links</td>
<td>NO – Server-centric model requires greater data backhaul</td>
<td>YES – Pre-processing at APs minimizes data backhaul</td>
</tr>
<tr>
<td>Simplified wIPS Licensing</td>
<td>NO – Per-feature licensing</td>
<td>YES – Single license for all features</td>
</tr>
<tr>
<td>Multi-Function wIPS Server</td>
<td>NO – Location, etc. require additional servers</td>
<td>YES – MSE runs all mobility services</td>
</tr>
</tbody>
</table>
Secure Client Manager Solution Overview

- Compliment existing software/device management systems (Altiris, SMS, IBM Tivoli, OMA-DM, etc.)
- Augment Cisco or 3rd Party end-to-end management framework

- Target solution gaps by providing management tool for 802.1X capable devices:
  - Inventory/device classification
  - Bootstrap authorization
  - Credential provisioning
  - Packaging for distribution of Unified Client components
  - Unified client log collection and parsing
  - Unified client license management
Evaluate Operational Costs
Overlay Wi-Fi versus Mobility Platform

TCO increases exponentially with each new service

TCO decreases due to simplicities from services integration

“....an instrument designed to destroy competitors by making any slight technology advantages they might have meaningless because the company ensures that IT managers focus on what Cisco always emphasizes: value and total cost of ownership.”

Stan Schatt
ABI
Tested, Validated Mobility Solutions
Mobility Solutions that Work!

Collapsing Building Blocks to Industry Mobility Solutions

<table>
<thead>
<tr>
<th>People Formatting</th>
<th>Mobile Intelligent Roaming</th>
<th>Closest Available Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>People Tracking Application</td>
<td>Unified Communication Application</td>
<td>Asset Tracking Application</td>
</tr>
<tr>
<td>Cisco Mobility Service Engine (Open API)</td>
<td>Information System</td>
<td></td>
</tr>
<tr>
<td>Cisco Unified Wireless Network</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Solution Testing

The Cisco Developer Network removes the risk of deploying multi-vendor mobility solutions

Only Cisco has the market presence to develop a complete eco-system of mobility application partners
Cisco Developer Network
Validated Solutions across Applications, Networks, Devices

“This is the way solutions should be built in this industry.”
—Ken Dulaney, Gartner

3 Types of Devices Tested
1 Network to Manage
1 Network Appliance
3 Solutions Tested
Each Application has to Integrate with a Single Unified Open API

Ecosystem Partners

Nokia  Aeroscout  Intermec  Agito Networks  Motion Computing  Intellidot Corporation  OAT
Cisco Motion Application: Asset Tracking
Context-Aware and Unified Communications

Simplified Interface for Administrators and Employees

Solution Components – Cisco Better Together
Unified Wireless Network with Context-Aware, Unified Communications

Where is the LCD Projector?

LCD Projector is in Room 312

Text to Speech
Cisco Motion Application: Mobile UC
Mobile Intelligent Roaming and Unified Communications

Solution Elements – Cisco Better Together
MSE with Context Aware and Mobile Intelligent Roaming,
third party hand-off server, dual-mode phone
Cisco Motion Application: Physical Security
Mobile Video and Location

Real-time visibility of indoor and outdoor areas with wireless video surveillance

Cisco Architectural Advantage – Vision of Cisco Better Together
Mobility, UC, Data Center, Physical Security and Advanced Services
Delivering Business Mobility
The Cisco Unified Wireless Network

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

Access Points
- Indoor and Outdoor
- Modular, 802.11a/b/g/n

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

Wired Network Services
- Unified Security and Management 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

90% of laptops Cisco compatible
Secure Services Client (CSSC)
Indoor and Outdoor
Modular, 802.11a/b/g/n
Centralized management
Flexible, scalable (1000s of APs)
Radio resource management
Unified Security and Management services
Mobile Unified Communications
Guest Access
Security
Spectrum Intelligence
Voice
Context-Aware
Mobile Intelligent Roaming
The ROI of Mobility: Cisco on Cisco

- Cisco embarked on a program to deliver pervasive wireless connectivity
- 45% of Cisco’s employees use the wireless network for primary access
- First quarter the network optimization resulted in over 30% OpEx saving
- Service-impacting incidents were reduced by 90% with automated self-healing
- Additional cost decreases with improved employee productivity

### Cisco Employee Productivity

95% of 7,000 Employees Surveyed Gained at Least 1 Hour per Week of Productive Time by Using the WLAN

<table>
<thead>
<tr>
<th>Avg. Cost of Work Hour</th>
<th>$75</th>
</tr>
</thead>
<tbody>
<tr>
<td>63% of Employees Surveyed</td>
<td>6,650</td>
</tr>
<tr>
<td>Hours/Year Gained</td>
<td>50</td>
</tr>
<tr>
<td>Annual Productivity Improvement</td>
<td>$24,937,500</td>
</tr>
</tbody>
</table>
Proven Wireless Track Record

- **WLAN Market Leader** in Gartner Magic Quadrant 2008
- 65% WLAN Market share
  - Public company with 8 times revenues of next competitor
- **Over 6 million** access points sold
- Use Cisco WLAN Solutions:
  - 96% of the Fortune 1000
  - 9 of 10 Fortune 100 Financial Services
  - 98% of Fortune 100 Retail
  - 9 of 10 Fortune 100 Manufacturing
  - 8 of 10 Fortune 100 Energy
  - 9 of 10 Top 300 Hospitals
Why Cisco?
Work, Live, Learn and Play

- Cisco Motion:
  Platform for true mobility applications;
  not controllers and APs that only deliver wireless connectivity

- Superior ROI, simplified deployment
  35% lower TCO vs. overlay WLAN

- Innovative new capabilities allowing customers to realize a fully leveraged WLAN investment

- End-to-end, single source UC + wireless

- Thousands of trained Cisco WLAN experts
  Newly announced CCNA and CCIE Wireless track

- Global support organization
  24-hour, global access to a team of expert engineers
  120 countries geographic coverage

- 12-month deferred financing or leasing available
Summary

Putting Business in Motion

Unified Wireless Network

Evolve to a Mobility Services Architecture

Cisco as a Trusted Partner
Si desean conocer más acerca de esta solución y desean ser contactados por favor, enviar un mail a ventasmexico@cisco.com

No olviden llenar la encuesta que se les presentará al salir de la sesión