WLAN Product Update

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Agenda

- WLAN Technologies
- 1200 Series Dual mode product
- 1100 Series and Software enhancements
- Product Positioning
WLAN Technologies
# Wireless LAN Technologies

## The Laws of Radio Dynamics:

<table>
<thead>
<tr>
<th></th>
<th>802.11b</th>
<th>802.11a</th>
<th>802.11g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Band</td>
<td>2.4 GHz</td>
<td>5 GHz</td>
<td>2.4 GHz</td>
</tr>
<tr>
<td>Availability</td>
<td>Worldwide</td>
<td>N.A. and AP</td>
<td>Worldwide</td>
</tr>
<tr>
<td>Maximum Data Rate</td>
<td>11 Mbps</td>
<td>54 Mbps</td>
<td>54 Mbps</td>
</tr>
</tbody>
</table>
Unlicensed Spectrum Overview

- Various unlicensed frequency bands
- Mobile—low data rate
- Fixed—high data rate
- Spread spectrum
- Residential, SOHO, and small/medium business
- Multi-sectored node sites
- Up to 6 miles in multipoint, 15 miles in point-to-point

MTU

U-NII

ISM

900 MHz 26 MHz Channel

2.4 GHz 83.5 MHz Channel

802.11x WLAN

U-NII

5.15-5.35 GHz 200 MHz Channel

5.7 GHz 100 MHz Channel

Next Generation WLAN

Broadband Wireless
Comparing the Technologies
Understanding the 5 GHz Spectrum

<table>
<thead>
<tr>
<th>5GHz UNII Band</th>
<th>5.15</th>
<th>5.25</th>
<th>5.35</th>
<th>5.470</th>
<th>5.725</th>
<th>5.825</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNII-1</td>
<td>4 Ch</td>
<td>4 Ch</td>
<td></td>
<td>11 Ch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UNII-2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4 Ch</td>
<td></td>
</tr>
<tr>
<td>UNII-3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>800mW</td>
</tr>
</tbody>
</table>

**FCC and IC**

- **12 Channels**
  - (*Can Use Up to 6dBi Gain Antenna*)
  - UNII-1: 40mW
  - UNII-2: 200mW
  - UNII-3: 800mW

**Europe**

- **19 Channels**
  - (*Assumes No Antenna Gain*)
  - 200mW
  - 1W

**UNII-1**: Indoor Use, Antenna Must Be Fixed to the Radio
**UNII-2**: Indoor/Outdoor Use, Fixed or Remote Antenna
**UNII-3**: Outdoor Bridging Only

*If You Use a Higher Gain Antenna, You Must Reduce the Transmit Power Accordingly
IC/FCC 5 GHz specifications

IC/FCC regulations for UNII-1 and UNII-2

- 50 mW UNII-1 vs. 40 mW (2.5 mW/MHz) 802.11a
- 250 mW UNII-2 vs. 200 mW (12.5 mW/MHz) 802.11a
- If the radio can Tx @ UNII-1 band then it must adhere to UNII-1 emissions @ UNII-2 band
- If the radio can Tx @ UNII-1 band then it must use the UNII-1 antenna for UNII-2 band
- UNII-1 is indoors only!! UNII-2 is indoor or outdoors
- Transmit power UNII-1 17dBm, UNII-2 24dBm
802.11a - 5 GHz/54Mbps

- Ratified as Standard in September, 1999
- Provides similar technology to HyperLAN2
- Data rates to 54 Mbps defined
- Provides 8 indoor WLAN channels
- Regulation differ extensively across countries
Characteristics of 802.11a

• Orthogonal Frequency Division Multiplexing (OFDM)
  Data rates supported: 54, 48, 36, 24, 12, and 6 Mbps
  Can “downshift” to lower data rates for longer range
  802.11a will have greater avg. throughput than 802.11g since 802.11a has no backward compatibility requirement

• Worldwide compatibility issues for 5 GHz band
  Cisco’s 802.11a is currently approved for indoor AP use in these countries:
  www.cisco.com/go/aironet/compliance
  Effort underway to allow 802.11a operation in European countries
  Long-term: Worldwide usage with adoption of Transmit Power Control (TPC) and Dynamic Frequency Selection (DFS) per 802.11h standard

• 5 GHz band has more channels than 2.4 GHz band
  UNII-1 + UNII-2 = 8 non-overlapping channels (vs. 3 channels for 2.4GHz)

• 5 GHz band subject to less interference than 2.4 GHz ISM band
  However, 2.4 GHz interference not a major problem in most business environments
802.11a UNII-1 & UNII-2 ISM Channels

HIGH-SPEED PHYSICAL LAYER IN THE 5 GHz BAND

Lower and Middle U-NII Bands: 8 Carriers in 200 MHz / 20 MHz Spacing

Upper U-NII Bands: 4 Carriers in 100 MHz / 20 MHz Spacing
802.11b- 2.4Ghz/11Mb

- 11 Mbps 2.4 GHz
- 14 defined Channels
- Power levels
  - 36 dBm EIRP-IC/FCC
  - 20 dBm EIRP-ETSI
- Virtually approved for world wide use.
IEEE 802.11g
Standard for Higher Rate (20+ Mbps) Extensions in the 2.4GHz Band

- Provides **higher data rates @ 2.4 GHz**
- **Similar speeds as** 802.11a
- **Backward compatible** with 11 Mbps (802.11b)
- **Same modulation as** 802.11a—**OFDM**
- **Estimated to complete specification in early 2003**
802.11h
Spectrum Managed 802.11a

- Still in Draft mode
- Dynamic Frequency Selection (DFS)
  Enables transmitter to move to another channel when it encounters other RF on its channel.
- Transmit Power Control (TPC)
  Provides minimum required transmitter power for EACH user
  Provides minimal interference to any other users or system
- Required for ETSI for 5 GHz
  Europe/Asia/South America and others
**Dual Mode products**

- Dual Band Access points are available now
- Must provide processor power to grow
- Provides access and coverage for both 2.4 and 5Ghz clients simultaneously.
- Can be used to increase aggregate bandwidth per cell
Cisco’s WLAN Product Evolution

340 Series
- 30 mW radio
- AC powered

350 Series
- 100 mW radio
- In-line powered
- Improved motherboard
- Plenum ratable

1100 and 1200 Series
- Modular design
- 802.11a and/or b radios
- .11g radios shortly
- AC powered or in-line
- Plenum ratable
AP1200 Series
Performance

- **802.11b radio**
  
  Same radio performance as the 350 Series AP
  
  100 mW radio
  
  Built-in RP-TNC connectors for diversity
  
  Wide range of Cisco 2.4 GHz antennas offered

- **802.11a radio**
  
  Delivers up to 54 Mbps, the next generation of performance
  
  Can run in dual mode capacity with the 802.11b radio
  
  Innovative antenna design to fit deployment needs
Investment Protection
Hardware Features

- Modular platform for single or dual band operation
- Processor: 282 MIPS @ 200 MHz
- SDRAM: 16 MB
- Flash: 8 MB
- Field upgradable radios
Investment Protection
Dual band capabilities

• Module slot for 802.11a radio
• Will be able to run both 802.11b and 802.11a simultaneously
802.11a 5 GHz Access Point Radio Module

- 5 GHz – UNII 1 and UNII 2 indoor compliant
- Most regulatory agencies require the radio, antenna, and AP to be a single unit
- 40 mW radio
- Data rates 54 mbps to 6 mbps
- Two 5 GHz diversity antennas
Investment Protection
Mounting

- Mounting bracket separate from AP
- Kensington lock port
- Pad lock holes lock-in AP to mounting bracket as well as the 802.11a module
- AP when attached to mounting bracket hides the mounting screws for enhanced security
Flexibility

• Rugged design and plenum rated
  – Max operating temperatures: -20 to +55ºC

• Multiple mounting options: wall, ceiling, desktop. Secure with cable lock or padlock.

• Flexible power options: Inline power from 48V power capable switch, Power injector OR local power supply
Flexibility
Field Upgradeable

- Both the 2.4 GHz and 5 GHz radios are field upgradable
1200 Series Components

AP1200 + MP20B + RM20A =

A user configurable access point capable of simultaneous 802.11a and 802.11b support.
Other Key Features

Console port

- Not using non-standard DB-9 console port
- Using standard Cisco rollover cable for console
- Port is RJ45 connector, without the LEDs
Other Key Features
In-line power

- New power injector works on both 350 and 1200
- 350 power injector will not work with 1200
- 3524 powered switch will power a single radio on the 1200, but not 2 radios at the same time
Clients for Use with Cisco Aironet 1200 Series Access Point

- In a break with past part numbering practices, we will no longer have client part numbers that “align” with AP part numbers.
  - Recognizes that 802.11 market has matured
  - The only “alignment” is based on protocol (.11a, .11b)
  - e.g. all 802.11b clients will work with all 802.11b AP’s

- The AP1200 works with the following Cisco clients:
  - AIR-PCM352 (802.11b, PCMCIA)
  - AIR-MPI350 (802.11b, Mini-PCI)
  - AIR-WGB350 (802.11b, Workgroup Bridge)
  - AIR-PCI352 (802.11b, PCI Adapter)
  - AIR-CB20A (802.11a, CardBus)
5 GHz NIC Main Features

- Rate Shifting
  6, 9, 12, 18, 24, 36, 48, or 54.
- Fixed Data Rates
  User configurable option
- 5 dBi Patch Antenna
- CardBus interface
5 GHz NIC Additional Features

- WEP 128 Encryption in hardware
- 802.1x Support
  - LEAP, EAP-TLS, PEAP, EAP-TTLS
- 3 Transmit power settings: 20mW, 10mW, 5mW
Cisco Aironet 1200 Series Target Markets

• Flagship of product line

• Enterprise market >1000 employees

• Specialty applications
  When external antennas needed
  When extreme temperature range is required

• Vertical markets
  Healthcare and Higher Education
  Budget, bandwidth requirements

• Any company requiring greater than 11 Mbps for their applications
Range Comparisons

2.4Ghz/100mW
- 11 Mbps 140 Ft
- 5.5 Mbps 180 Ft
- 2 Mbps 250 Ft
- 1 Mbps 350 Ft

5Ghz/40mW
- 54 Mbps @40–60 Ft
- 48 Mbps @ 70–90 Ft
- 36 Mbps @ 90–110 Ft
- 24 Mbps @ 110–125 Ft
- 18 Mbps @ 125–135 Ft
- 12 Mbps @ 135–145 Ft
- 9 Mbps @145–155 Ft
- 6 Mbps @ 155–165 Ft

Ranges Using 2.2dBi Dipole Antenna on AP, and Standard PC Card Style Radio
AP1100 Series
Enterprise WLAN Requirements

- **Scalable**
  - Support for any type roll out plan
  - Support for any size deployment

- **Affordable**
  - High value with low upfront cost
  - Low total cost of ownership (training, manageability)
  - Investment protection

- **Enterprise-class features**
  - Intelligent services expected on *wired* LANs; delivered on wireless LANs

- **Secure**
  - Wireless data protection equal to, if not greater than wired LANs

- **Easy-to-use**
  - Straight-forward deployment
  - Intuitive and familiar interfaces
Cisco Aironet 1100 Series Access Point

- **Scalable**
  Fully functional access point ideal for all enterprise deployments without expensive controllers

- **Affordable**
  Lowest priced upgradable Cisco Aironet access point protects customer investment

- **Enterprise-class features**
  End-to-end intelligent networking extended to WLAN

- **Secure**
  Enterprise-class interoperable security for WLAN

- **Easy-to-use**
  Intuitive installation and set up for rapid deployment

*Intelligent enterprise services at a lower total cost*
Cisco Aironet 1100 Series Access Point

Scalability

- **Autonomous functionality, management, and security**
  Stand alone intelligent WLAN solutions scale as your network requirements grow

- **Enterprise management for large scale deployments**
  Remote configuration and firmware upgrade support
  - BOOTP, DHCP, Telnet, FTP, TFTP for centralized management
  - SNMP – compliant network management software support
  - MIB I and MIB II support for high integration with existing network management tools
  - Integrated into CiscoWorks – CiscoView, Resource Manager Essentials (RME) and Campus Manager
Cisco Aironet 1100 Series Access Point

Investment protection

• Protects current client investment
  Single 802.11b radio standard

• Future-proof for tomorrow’s technologies
  Upgradable to 802.11g for higher performance and more robust AES security encryption (when available)

• Extra system capacity
  More than twice today’s current memory requirements for future enhancement support

• List Price of $599 USD
  Priced to fit most any enterprise budget
Cisco Aironet 1100 Series Access Point
Affordability

• Single 802.11b radio
  • Time-tested technology
  • Supports installed client-base

• Upgradable
  • Migration path to 802.11g for further investment return

• Extra system capacity
  • More than twice today’s current memory requirements for future enhancements
Cisco Aironet 1100 Series Access Point
Enterprise-class Features

- **Cisco IOS**
  - End-to-end intelligent network services
  - Familiar service configuration and network behavior

- **VLANs**
  - Network segmentation for flexible policy and service application

- **QoS**
  - End-to-end prioritization for applications such as voice and video

- **Proxy Mobile IP**
  - Seamless inter-subnet roaming
Cisco Aironet 1100 Series Access Point

Security

• Standards-based 40-bit 128-bit WEP
  For highest interoperability

• Cisco Wireless Security Suite
  Award-winning enterprise security
  802.1x, EAP-based mutual authentication
  Dynamic, per-user, per-session key rotation
  Pre-standard TKIP

• VLANs
  Differentiated access to support a non-deterministic client base
Cisco Aironet 1100 Series Access Point
Simplified Deployment

- Integrated diversity dipole antennas and flexible mounting system
  Supports installation in any orientation and location such as ceilings, walls, cubicles and desktops

- UL 2043 certified
  Allows for installation in plenum air spaces

- In-line Power
  Eliminates local AC power requirements for lower total cost of ownership
Cisco Aironet 1100 Series Access Point

Powering Options

- **Local Power**
  - Included 48VDC power supply

- **Inline Power**
  - Optional Power Injector (ordered separately)
    - AIR-PWRINJ2
  - Powering Switch
    - Catalyst 3524-PWR XL
    - Catalyst 4000 chassis and inline power line cards
    - Catalyst 6500 chassis and inline power line cards
  - Catalyst Inline Power Patch Panel
Bottom panel

- Local Power
- Auto-sensing 10/100 Mbps Ethernet port
- Kensington lock port
- Mode button
Note: Mixing configuration settings using the GUI and CLI may result in inconsistent behavior and so is not recommended.
User Access Verification

Username: Cisco
Password: 
AP1100>
AP1100>
AP1100>en
Password: 
AP1100#config terminal
Enter configuration commands, one per line. End with CNTL/Z. 
AP1100(config)#
A VLAN is a group of end stations with a common set of requirements, independent of their physical location. A VLAN has the same attributes as a physical LAN but allows you to group end stations even if they are not located physically on the same subnet.
# VLAN

## Wireless implementation

![](image)

<table>
<thead>
<tr>
<th>SSID</th>
<th>VLAN-id</th>
<th>Security Policy</th>
<th>Radius VLAN override (optional per user basis)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering</td>
<td>14</td>
<td>802.1x with Dynamic WEP + TKIP</td>
<td>yes</td>
</tr>
<tr>
<td>Marketing</td>
<td>24</td>
<td>802.1x with Dynamic WEP + TKIP</td>
<td>yes</td>
</tr>
<tr>
<td>HR</td>
<td>34</td>
<td>802.1x with Dynamic WEP + TKIP</td>
<td>no</td>
</tr>
<tr>
<td>Guest</td>
<td>44</td>
<td>Open/no WEP</td>
<td>no</td>
</tr>
</tbody>
</table>
Proxy Mobile IP- problem & solution

- Mobile IP was created to enable users to keep the same IP address while traveling to a different networks thus ensuring that a roaming user could continue communication without sessions or connections being dropped.

- Proxy Mobile IP was created to provide the exact same Mobile IP functionality to the users without them having to have any Mobile IP-capable software running on their client devices.

- Proxy Mobile IP software runs on the AP therefore it supports typical wireless clients.

- *Note:* Mixing Proxy Mobile IP configuration on VLANs is not supported at this time.
Proxy Mobile IP Topology

The AP is a wireless LAN Access Point that supports Proxy Mobile IP. It proxies on behalf of the Mobile Devices performing all the Mobile IP services for them.

The Authoritative Access Point is an Access Point that keeps track of the Home Agent information (subnet map table) of all the Mobile Devices.

The Home Agent is a router on the home network serving as the anchor point for communication with the AP. It tunnels packets from a device on the Internet, to the roaming Mobile Device. A tunnel is established between the Home Agent and a reachable point for the Mobile Device in the foreign network.

The Foreign Agent is a router that may function as the point of attachment for the Mobile Device when it roams to a foreign network, delivering packets from the Home Agent to the Mobile Device.
Target Markets

• **Value line**
  Enterprise features at affordable price

• **Mid-Market 500-1000 employees**

• **Enterprise**
  Budgetary, branch offices

• **Verticals**
  healthcare, (satellite branches)
  Education (budgetary, ease of deployment)
## AP comparison

<table>
<thead>
<tr>
<th>Feature</th>
<th>350 Series</th>
<th>1100 Series</th>
<th>1200 Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>IOS</td>
<td>Q3CY03</td>
<td>X</td>
<td>Q1CY03</td>
</tr>
<tr>
<td>VxWorks</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Mobile IP</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>QoS support</td>
<td>Q4CY02</td>
<td>X</td>
<td>Q4CY02</td>
</tr>
<tr>
<td>VLAN support</td>
<td>Q4CY02</td>
<td>X</td>
<td>Q4CY02</td>
</tr>
<tr>
<td>.11a Capable</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>.11g Capable</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2.4 GHz Antenna</td>
<td>Removable</td>
<td>Fixed</td>
<td>Removable</td>
</tr>
</tbody>
</table>

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Product Positioning
Cisco’s 2-Tier AP Roadmap

Performance Line

Cisco Aironet 350 Series (.11b)
- Cisco Aironet 1200 Series Access Point
  - Built-in .11b module
- .11a AP Module with High Gain Antenna
  - .11a PC Card (Card Bus)
- Upgradable
  - .11g AP Module

Value Line

2001
- Cisco Aironet 1121 Series
  - Access Point
  - Built-in .11b module

2002

2003
- Cisco Aironet 350 Series (.11b)
## Cisco Aironet WLAN Access Point Comparison

<table>
<thead>
<tr>
<th>Cisco Aironet 1100 Series</th>
<th>Cisco Aironet 1200 Series</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intelligent Enterprise Services at a Lower Total Cost</strong></td>
<td><strong>Outstanding Enterprise Performance and Greatest Flexibility</strong></td>
</tr>
<tr>
<td>Single 802.11b radio (upgradable to 802.11g with AES)</td>
<td>Dual-mode 802.11a and 802.11b support (upgradable to 802.11g with AES)</td>
</tr>
<tr>
<td>Integrated diversity dipole antennas for simplified deployment</td>
<td>Two 2.4 GHz antenna connectors for high gain diversity antennas; integrated 5 GHz antennas</td>
</tr>
<tr>
<td>Indoor environmental specifications, durable plastic case</td>
<td>Industrial environmental specifications, rugged metal case</td>
</tr>
<tr>
<td>Extra memory and system capacity for future releases</td>
<td>Extra memory and system capacity for future releases</td>
</tr>
<tr>
<td>Inline and Local Power</td>
<td>Inline and Local Power</td>
</tr>
<tr>
<td>Cisco IOS-based operating system</td>
<td>Upgradable to Cisco IOS operating system</td>
</tr>
<tr>
<td>QOS, VLANs, and Proxy Mobile IP</td>
<td>Upgradable to QOS, VLANs, and Proxy Mobile IP</td>
</tr>
</tbody>
</table>
5 GHz Advantages

- Performance
- Capacity (# of channels)
- Scaleable (6-54 Mbps, many channels)
- Interference avoidance (Bluetooth resistant)
Market Positioning

• .11b is ideal for customers:
  – Requiring lowest acquisition cost
  – That have a large installed base of .11b
  – That have lots of roaming users (to other .11b sites)

• .11a is ideal for customers:
  – Requiring higher data rates
  – Requiring greater capacity (more channels)
  – Concerned about interference
  – With a small installed base of .11b