“Wireless”

Presented by Anyware Network Solutions

for the Colorado Springs Cisco User Group

January 16, 2002
Agenda

- Wireless
  - Standards
  - Technologies
  - Markets
- Wireless Solutions
  - Cisco Product Family
    - Outdoor Point-to-Point
    - Indoor Infrastructure
  - Netmotion
    - Mobile IP
  - Spectralink
    - Voice
- Wireless Services
  - Site Surveys
  - Installations
Standards

- IEEE 802.11
  - Governs network & radio protocol and specification
  - 802.11: 2Mbps 2.4GHz FHSS and DSSS
    - Proprietary silicon, no compatibility
  - 802.11b (HR): 11Mbps 2.4GHz DSSS
    - Intersil, Lucent
    - Compatibility with other 802.11b products
  - 802.11a: next-generation, 54Mbps in 5.x GHz band
    - Atheos, Radiata (Cisco), Cambridge
    - Not compatible with 802.11b
    - Less distance, more power needed
    - OFDM
    - 8 clear channels with 52 sub channels
  - 802.11g: next-generation next-year (2003), 54Mbps in 2.4GHz
    - TI, Intersil, Radiata
    - Compatible with 802.11b
Standards

- IEEE 802.11 con’t
  - WECA: Wireless Ethernet Compatibility Alliance
    - Non-profit established in 1999
    - Currently 36 member companies
    - Wi-Fi interoperability certification
  - Wi-Fi™
    - Wireless Fidelity seal of approval
    - Branding for IEEE 802.11b HR 11Mbps WLANs
Standards

- **OpenAir**
  - Pre-802.11 WLAN “spec” driven by Proxim
  - 1.6Mbps over 2.4GHz FHSS
  - Waning interest because of performance
  - WLIF: Wireless LAN Interoperability Forum

- **Bluetooth**
  - De facto standard for ad-hoc PAN
  - 1Mbps over 2.4GHz Hybrid DSSS/FHSS, cable replacement
  - Small, low-cost radios for mobile PCs, phones, PDAs, etc.
  - Short range: ~30 feet
  - Bluetooth SIG
    - Industry group from telecom, computing, and networking industries
    - Driving development bringing it to market
Standards

- HomeRF
  - SWAP (Shared Wireless Access Protocol)
    - Ad-hoc or managed network, 127 nodes (max)
  - 1-2 Mbps over 2.4GHz FHSS, data & voice
  - Short range: ~100 feet
  - No roaming
  - HRFWG (Home RF Working Group)
    - Industry group from personal computer, consumer electronics, and silicon industries
    - Driving development; bringing it to market
Market Positioning

- **.11b summary:**
  - Lowest acquisition cost
  - Large installed base of .11b
  - Interoperability

- **.11a summary:**
  - Higher data rates
  - Greater capacity (more channels)
  - Emerging products
2.4 GHz Spread Spectrum

- Unlicensed
  - Regulated
  - Open to market
- Industrial, Scientific & Medical (ISM) Band
- In the band
  - Newer cordless phones
  - Microwave ovens
  - Networking
  - Consumer Products
- WLAN
  - 1 – 11 Mbps
  - Up to 1000 feet
- WWAN
  - 1.5 – 11 Mbps
  - Up to 30 miles
Direct Sequence

- Direct Sequence (DSSS)
  - Max data rate: 11Mbps Half Duplex
  - Security: PW, WEP standard privacy, Radius authentication, LEAP
  - Noise immunity: Good
  - Range: 300ft @ 11Mbps indoor
  - 20mi @ 11Mbps outdoor
- 11 channels, 3 non overlapping
  - Scalable
    - Rate management
    - Up to 3 AP’s
  - Aggregate of 33Mbps

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Frequency Hopping

- Frequency Hopping (FHSS)
  - Max data rate: 2 – 3 Mbps
  - Security: PW, Encryption
  - Noise immunity: Excellent, 70+ hops, 1MHz channels
  - Range: 200ft @ 2 – 3 Mbps indoor
  - 3mi @ 2 – 3 Mbps outdoor

- 83 1MHz channels
  - Scalable
    - Up to 15 AP’s
2.4 GHz Futures

- Technical issues
  - Saturation, Interference
  - Population of multiple vendors
- 802.11g 2.4GHz
  - Higher Data Rates 54Mbps
  - Compatible with 802.11b
  - IEEE Working Group still defining standard
    - 2003 product release
    - New Radios
5.x GHz

- Unlicensed National Information Infrastructure (U-NII) Band
- In the band
  - New generation high-speed wireless data networks
  - 802.11a OFDM
- WLAN data rate: 54Mbps with 802.11a
- WWAN data rate: Up to 480 Mbps
- WWAN range: Up to 20 miles
WLAN is Taking Off

Enterprise WLAN End-Use Revenues

US$M

Source: Cahners In-Stat Group, 2001

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Key Verticals Adopting Wireless

Wi-Fi 2001 estimates

- Education: 35%
- Financial: 15%
- Healthcare: 15%
- Hospitality: 12%
- Other: 14%
- Retail: 9%

Source: Cahner’s In-Stat Group 2001
Wireless Market Segments

Wireless WAN
- 2.4 GHz 802.11b ISM
- or
- 5.x GHz UNII

Wireless LAN
- 802.11b
- 802.11a
- 802.11g
- HiperLAN2
- HomeRF
- Bluetooth

Wireless Handhelds
- Palm
- Spectralink
Building to Building

Leased Lines
T1 (1.544 Mbps) = 2% of 100BaseT Capacity
DS-3 (45 Mbps) = 45% of 100BaseT Capacity

Leased Lines can be Bottlenecked
Cisco Aironet 350 Series WLAN Product Family

Key Benefits
- Highest Security
  - Centralized User Authentication
- Cost of Ownership
  - In-line Power
  - 100mW Radio
  - 10/100BaseT Uplink
- High Performance and Reliability
  - Frequency Agility
- Scalability, Manageability
  - Load Balancing and hot standby

Wireless Bridge
Access Point
Plenum Access Point
PCI Client Adapter
PC Card Client Adapter
Workgroup Bridge
Cisco Aironet 350 Client Adapters

- PCMCIA card for Laptops and PDAs
- PCI adapter for Desktops
- Driver Support
  - Windows XP (Cisco Drivers built in)
  - Windows 95, 98, 2000
  - Windows NT 4.0
  - Windows CE
  - Linux
  - Mac OS 9
- Also supports Novell Netware Clients
- Utilities include user configuration and site survey tool for simple installation and upgrade
Cisco Aironet Security

- **802.11b Access Control**
  - Service Set Identifier (SSID) “RF” password
  - Wired Equivalent Privacy (WEP)
    - Encryption
    - Hardware Accelerators in Cisco’s family, reduces overhead and performance degradation
    - Open and Shared Key Authentication

- **Cisco Wireless Extensible Authentication Protocol (LEAP)**
  - Extension to Remote Access Dial In User Services (RADUIS)
  - Based on 802.1x proposed standard (Cisco, Microsoft, etc.)
  - Mutual Authentication
  - Dynamic WEP key for current log in session
Cisco Aironet Security

Figure 1: With the Cisco security solution, authentication is based on username and password, and each user gets a unique, session-based encryption key.
NetMotion Mobility

- Seamless Network Roaming
  - Between subnets
  - Across network types (LAN, WLAN, WWAN)

- Application Session Persistence
  - Keeps sessions active
  - Maintains data integrity

- Security
  - Authentication
  - Encryption (DES, Triple-DES, etc)
  - Works with 3rd party VPNs

- Flexible Implementation
  - Works with all wireless hardware components and existing infrastructure
SpectraLink Voice Priority (SVP)

- Ensures wireless Quality of Service (QoS)
  - Defacto industry standard for 802.11b wireless LANs
  - Minimizes voice latency by guaranteeing channel access
  - Allows bandwidth reservation for wireless data
  - Implemented in AP, Wireless Telephones, and NetLink SVP Server

- NetLink SVP Server
  - Dedicated network appliance
  - Provides SVP encapsulation of voice packets to allow prioritization in access points
  - Supports 60 simultaneous calls, approximately 300 users

- Investment protection
  - NetLink IP Wireless Telephones can be upgraded to support 802.11e QoS standard when available
  - NetLink SVP Server is not required with 802.11e implementation
SpectraLink NetLink IP Wireless Telephones

- Integrated workplace mobility for Cisco CallManager
  - Skinny Client Control Protocol support
- Converged voice and data on 802.11b wireless LANs
  - Compatible with Cisco Aironet access points
- Lightweight, durable handset designed for the workplace
- Excellent voice quality
  - SpectraLink Voice Priority
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CallManager Configuration

Phone Button Template Configuration

Phone Button Template: Spectralink (used by 5 phone(s))
Status: Ready
New Copy Update Delete Restart Devices Cancel

Button template for 12 S, 12 SP, 12 SP+ (12 buttons)
Button Template Name: Netlink IP Wireless Telephone

<table>
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<th>Button Feature</th>
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<th>Label</th>
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NetLink WTS Architecture

- Existing Telephone System
- Admin Terminal
- Telephone Lines
- Desksets
- Ethernet LAN
- WLAN Client
- Cisco 802.11b AP352 Access Points
- Telephony Gateway
- NetLink Wireless Telephone System
- Wireless Telephones

Anyware Network Solutions
LinkPlus Switch interfaces

- Avaya Definity, Merlin Legend/Magix
- Comdial DX, DXP, FX
- Executone IDS
- Fujitsu F9600
- Inter-Tel Axxess, Axxent, Eclipse
- Mitel SX series
- NEC NEAX 2000, 2400
- Nortel Meridian 1, Norstar, BCM
- Panasonic DBS
- Siemens Rolm CBX, Hicom 150/300
- Toshiba Strata DK

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Anyware’s Site Surveys

- Indoor
  - Customer Interview
    - Needs analysis
    - Applications, performance, coverage
    - Today and future
  - Signal Strength Analysis for required coverage zones
  - Determine AP location based on cabling and power
  - Create Survey report detailing:
    - AP Location
    - Coverage Zones
    - Cable routing
    - Equipment list
Anyware’s Site Surveys

- **Outdoor**
  - Customer Interview
    - Needs analysis
    - Applications, performance, facility location
    - Roof rights, building covenants
    - Today and the future
    - Distance
  - Verify LOS
  - Antenna mounting locations
  - Cable runs
    - Roof penetration
  - Radio Location
  - GPS and physical address
Anyware’s Site Surveys

- RF path analyses
  - Fresnel zone
  - Multi path
  - Fade margin
  - Antenna configurations
    - Polarizations, gain, types (omni, directional, patch..)
    - Wind loads
  - Cable length and type
Anyware’s Site Surveys

- Site Survey and configuration tools
Anyware’s Site Surveys

- Signal strength analysis
  - Spectrum analysis
    - Sweep for 2.4GHz and 5.x GHz signals
  - Radio signal analysis
    - Over five miles
    - Near LOS
Wireless Services: A necessary part for success

- Site Surveys
  - Indoor/Outdoor
- RF engineering and design
- Installation
- Training
- Maintenance
Outdoor Wireless Bridge Services

- Determine wireless bridge requirements
- GPS analysis to determine gross LOS
- On-site physical site survey to determine:
  - LOS & Fresnel zone
  - Correct component selection
  - Equipment mounting options
  - Cabling requirements & options
- On-site RF site survey to determine:
  - RF noise in area using spectrum analyzer
  - Correct component configuration
  - Viability of wireless link
- Path loss calculations to verify link viability
- Report outlining survey results, recommendations & limitations
- Installation, configuration & testing
- System maintenance

Indoor Wireless LAN Services

- Determine wireless LAN requirements
- On-site RF site survey to determine:
  - Wireless signal coverage
  - Correct component selection
  - Radio equipment placement
  - Correct component configuration
- Report outlining survey results, recommendations & limitations
- WLAN installation, configuration & testing
- WLAN system maintenance

Education and consulting
Wireless data network design
System installation & configuration
Wireless equipment sales
Project management
System maintenance

Wireless data network design
System installation & configuration
Wireless equipment sales
Project management
System maintenance

Turnkey Wireless Design and Installations