"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

WiFi™
The Standard for
Wireless Fidelity

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
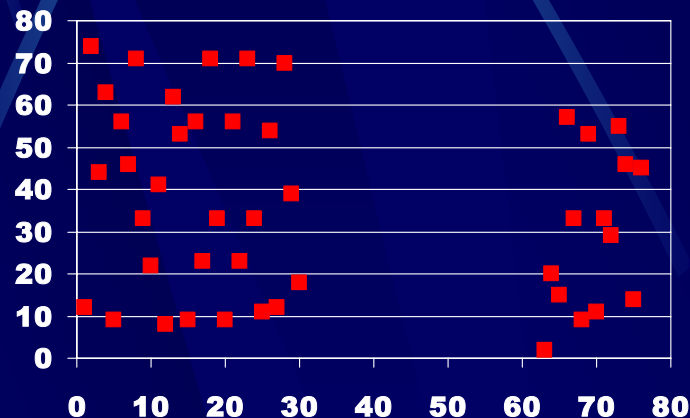   - Up to 3 AP's
  - Aggregate of 33Mbps
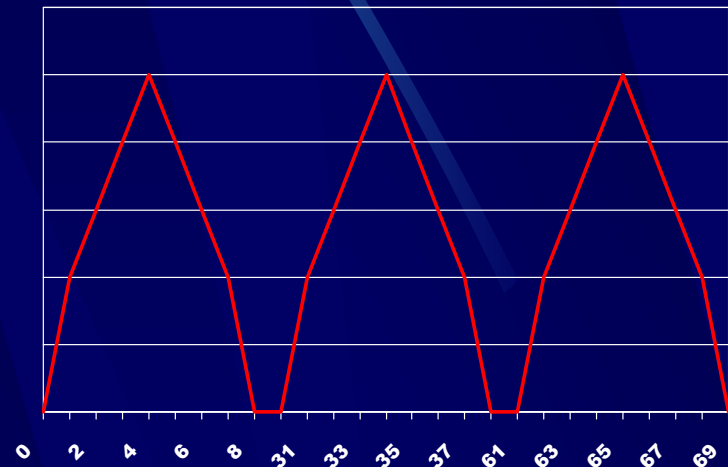
Frequency Hopping

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

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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
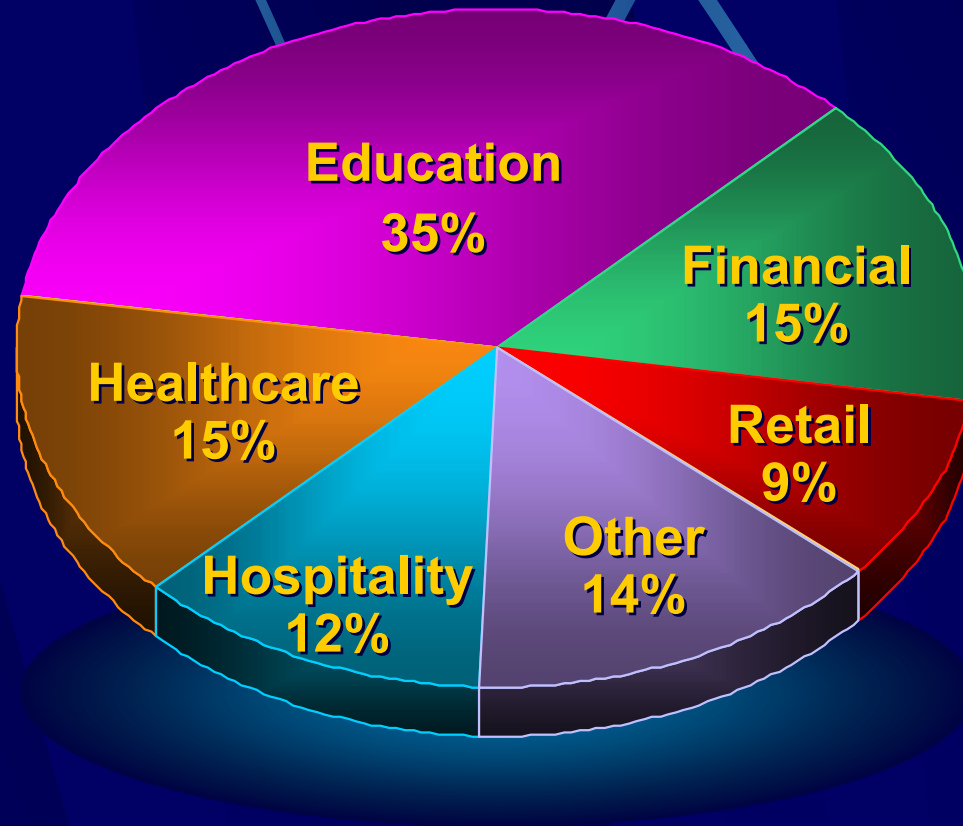- WWAN range: Up to 20 miles

WLAN is Taking Off

Enterprise WLAN End-Use Revenues
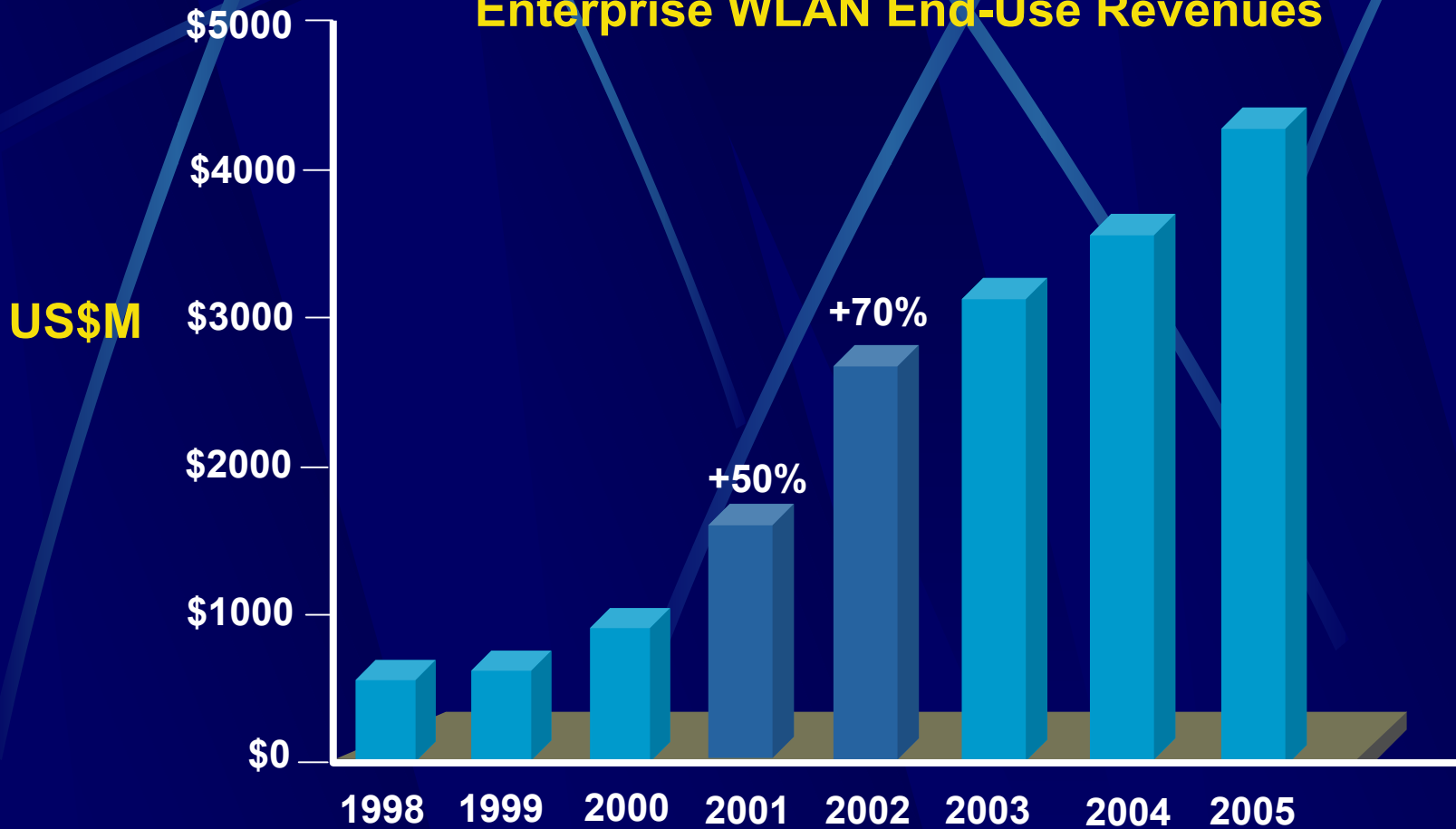
Key Verticals Adopting Wireless

Wi-Fi 2001 estimates

Education 35%

Financial 15%

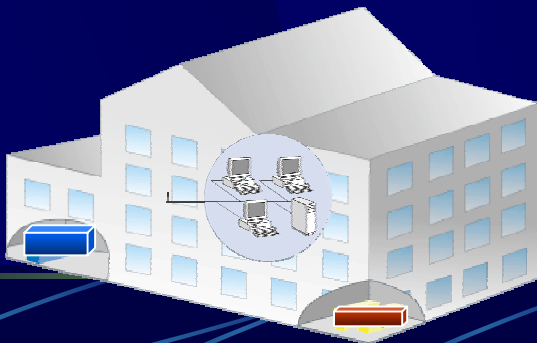Retail 9%

Other 14%

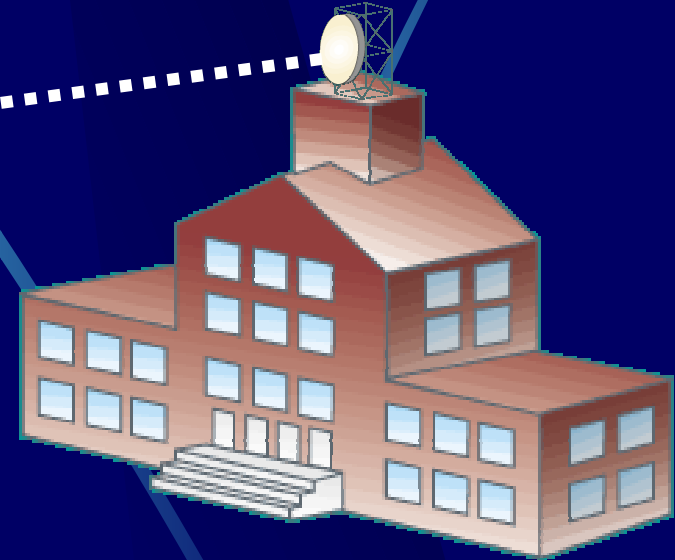Hospitality 12%

Healthcare 15%

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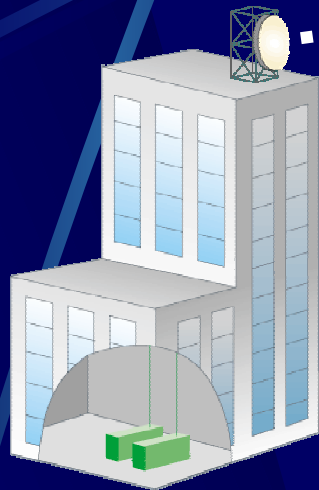
Wireless WAN
2.4 GHz 802.11b ISM
or
5.x GHz UNII

Wireless LAN
802.11b
802.11a
802.11g
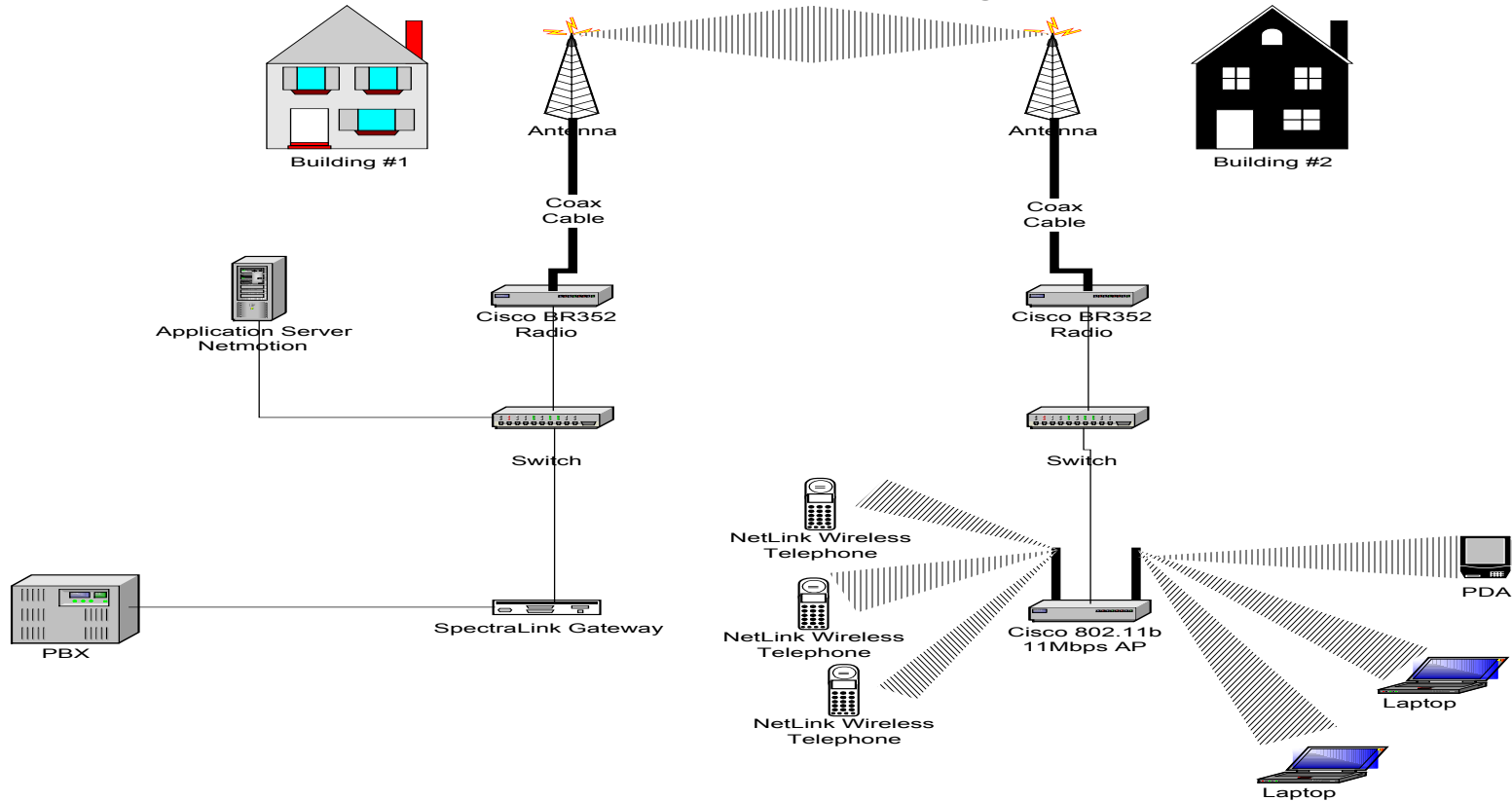HiperLAN2
HomeRF
Bluetooth

**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

Server

Router

Router

Server

Local Area Network
(Typically 100 Mbps)

Local Area Network
(Typically 100 Mbps)

Leased Lines can be Bottlenecked
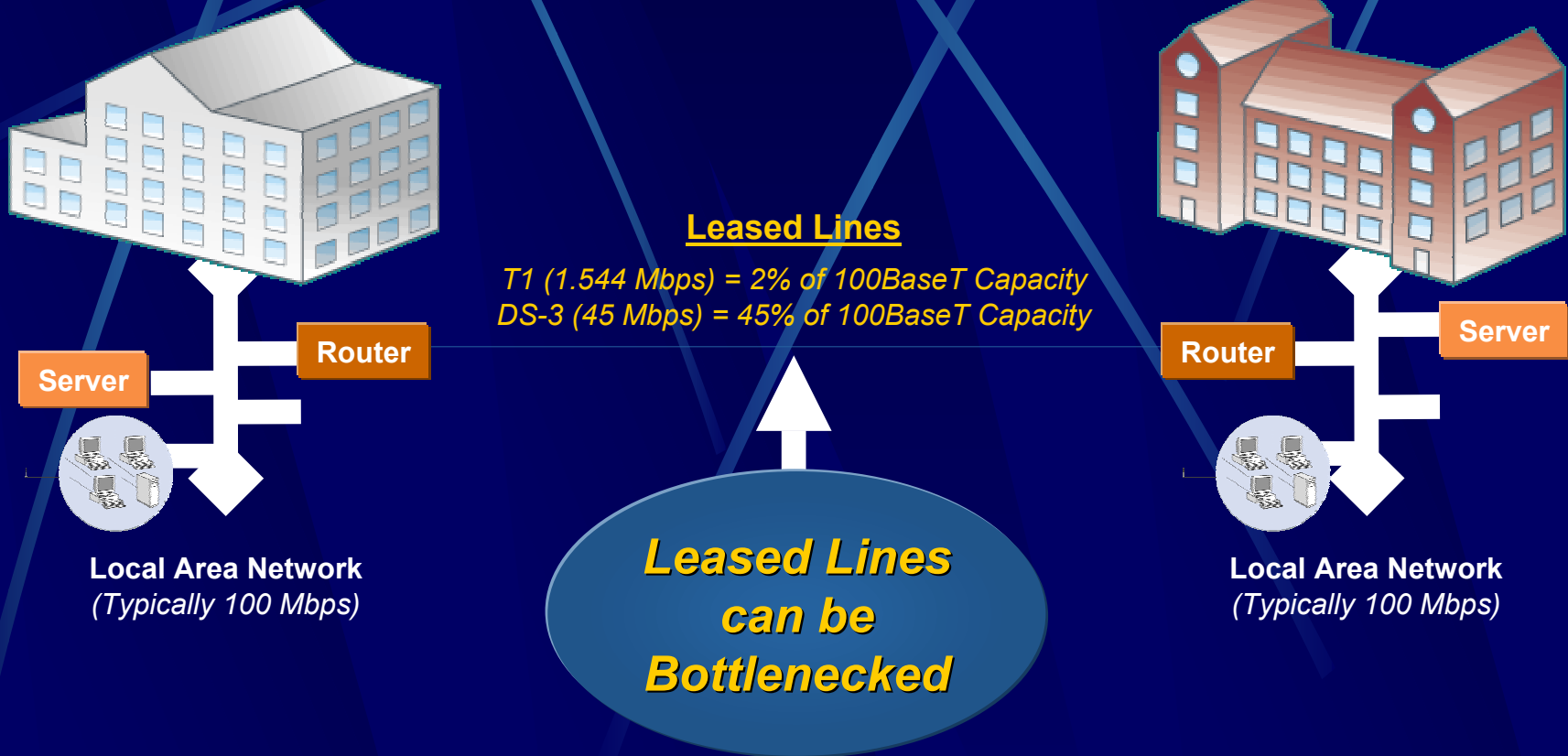
Cisco 11Mbps 802.11b Bridge Link

Cisco Aironet 350 Series WLAN Product Family

Wireless Bridge

Access Point

Plenum Access Point

BUYER'S GUIDE
Wireless LAN access points

PCI Client Adapter

PC Card Client Adapter

Workgroup Bridge

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

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.
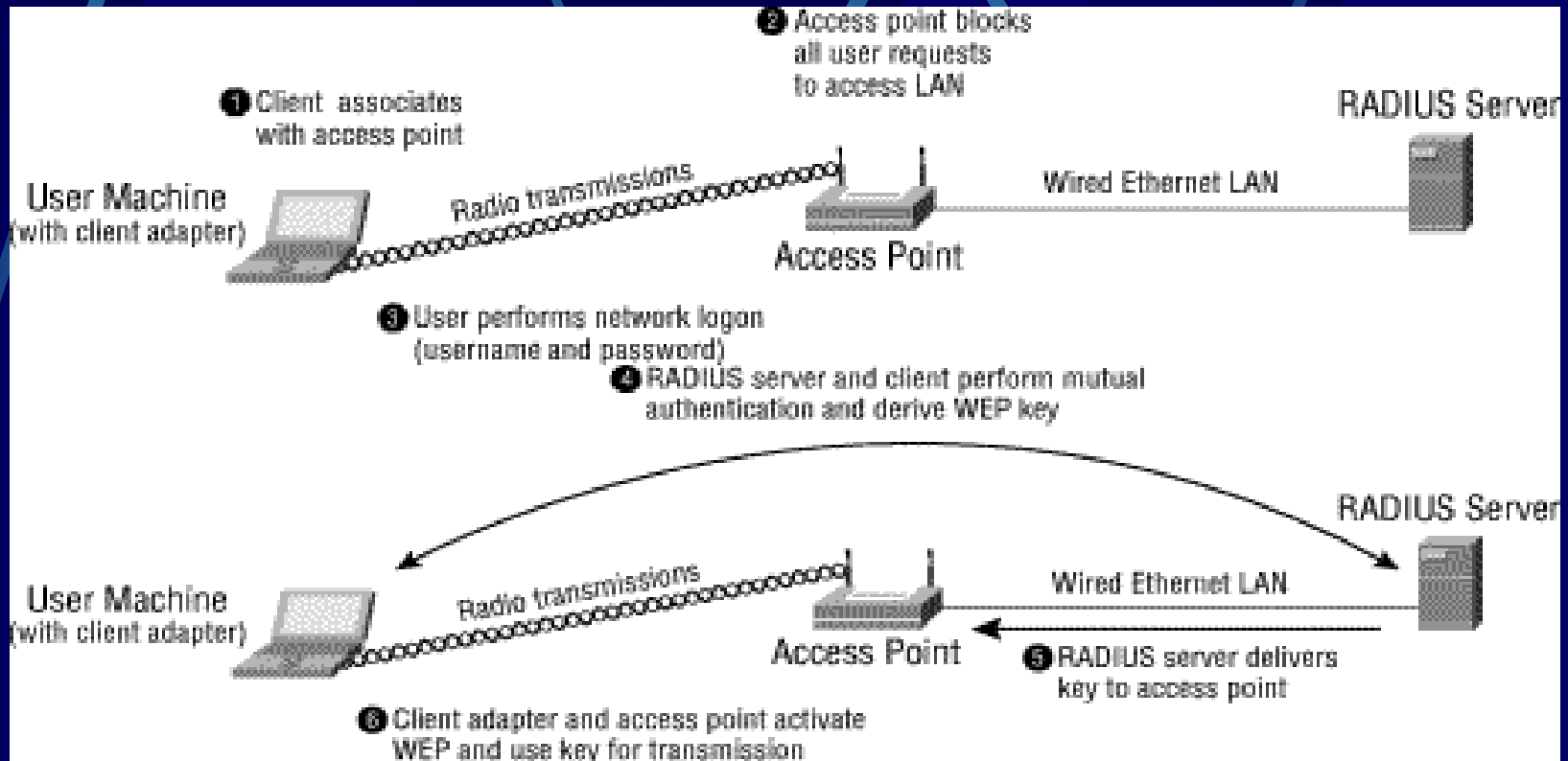
NetMotion Mobility

- 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

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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

CallManager Configuration

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NetLink WTS Architecture

Ethernet LAN

Admin
Terminal

WLAN Client

**Cisco 802.11b AP352
Access Points**

Existing
Telephone
System

Telephone
Lines

**Telephony
Gateway**

**Wireless
Telephones**

Desksets

**NetLink Wireless Telephone
System**
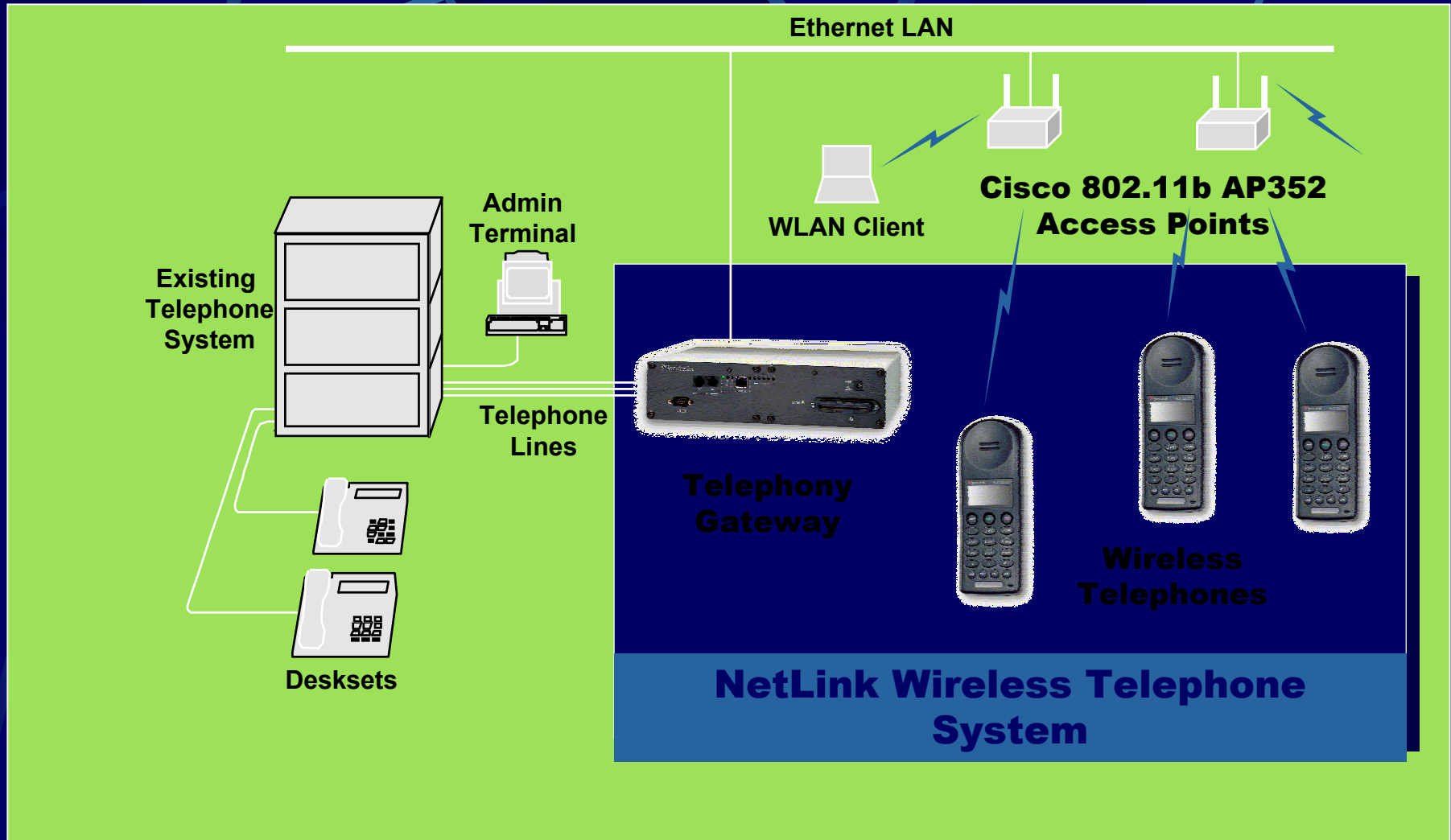
LinkPlus Switch interfaces

- 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
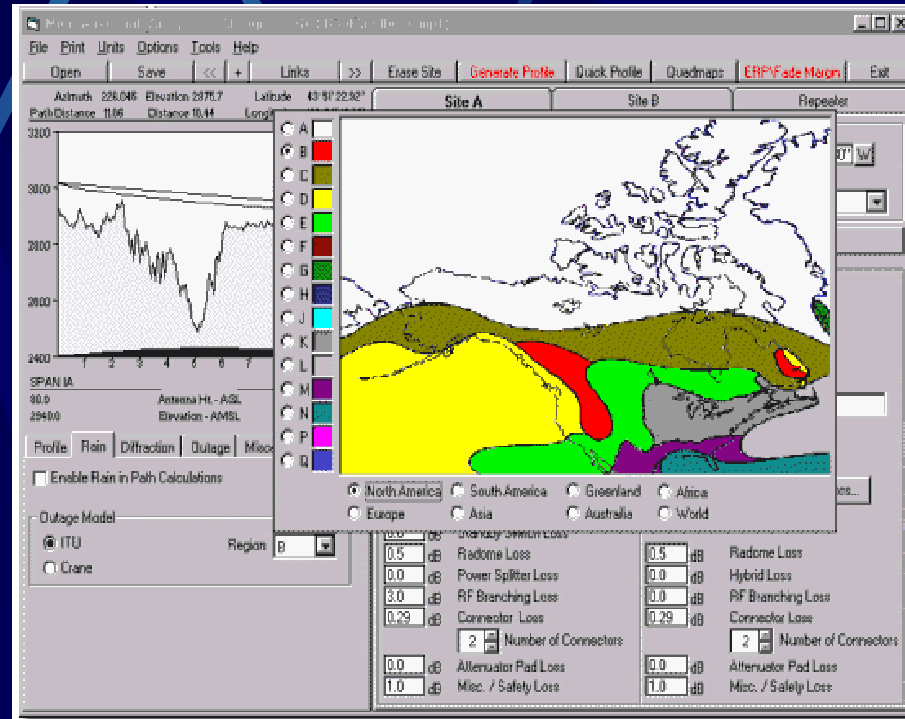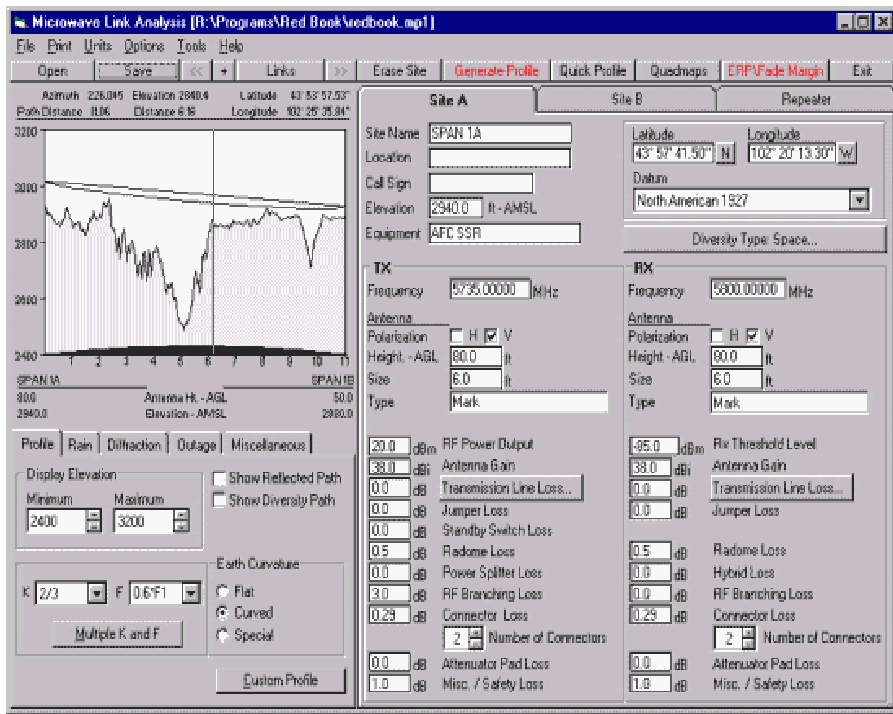
Anyware's Site Surveys

- 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
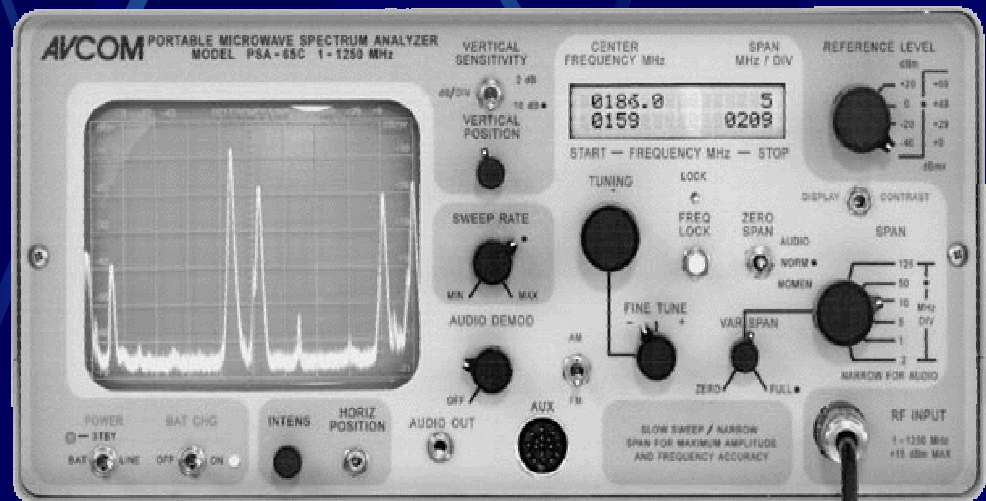 - Cable length and type

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

Anyware Network Solutions

Complete Wireless Networking Services

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

Turnkey
Wireless Design and Installations

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

anyware
network solutions

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