

I'm Dreaming of a Wireless Building

AIA Convention presentation

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Presented by Elert & Associates

Frank Dolejsi – Minnesota Bureau of Criminal Apprehension (BCA)

Mark Hoekstra – Skyline Exhibits

Wendy Chretien – E&A

Dave Kaun – E&A



Agenda

- 15 minutes – Wireless tech primer
- 15-20 minutes – BCA case study
- 15-20 minutes – Skyline case study
- 20-30 minutes – Wireless design considerations
- 15 minutes – Q & A

Demand for Wireless

- Wireless Internet access
- Cell phone users
- Police, Fire and other 1st Responders
- Building support and Maintenance staff
- Get rid of wires

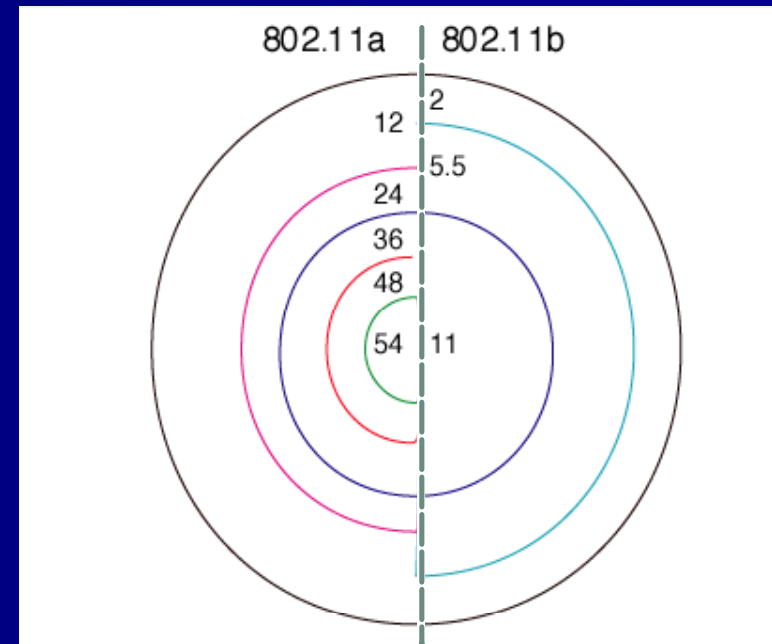
Terms

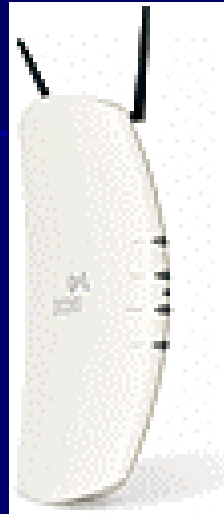


- WLAN
- 802.11 ("b" "a" and "g")
- Wi-Fi
- AP (Access Point)
- Interface
- Client
- DAS (In-building repeater)

802.11b, a & g comparison

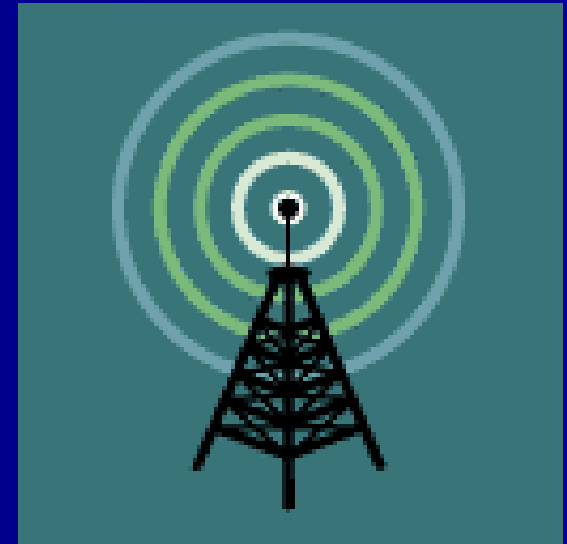
- Shared medium
- Throughput (speed)
- Frequencies
 - Interference
 - Multiple modes
- Coverage area
- Home vs. enterprise products

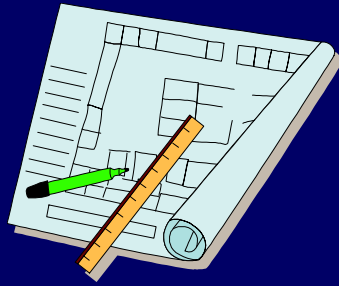




Other in-building wireless technologies to consider

- Paging
- Cellular voice
- Public Safety communications
- Two-way radio (internal)





Elements in building design

- Open areas/ "cube farms"
- User density and mobility
- Cable pathways/risers
- Telecom room space – esp. for DAS repeater equipment

MN BCA Forensic Science Laboratory Saint Paul, Minnesota



Frank Dolejsi
Director

Why Wireless?

- Interactions between labs
- Interactions with evidence reception
- Interactions with law enforcement
- Multiple labs and offices
- Interactions with county attorneys

Wireless Phones in a Lab Setting

- Mitel voice over IP system
 - With Symbol wireless handsets



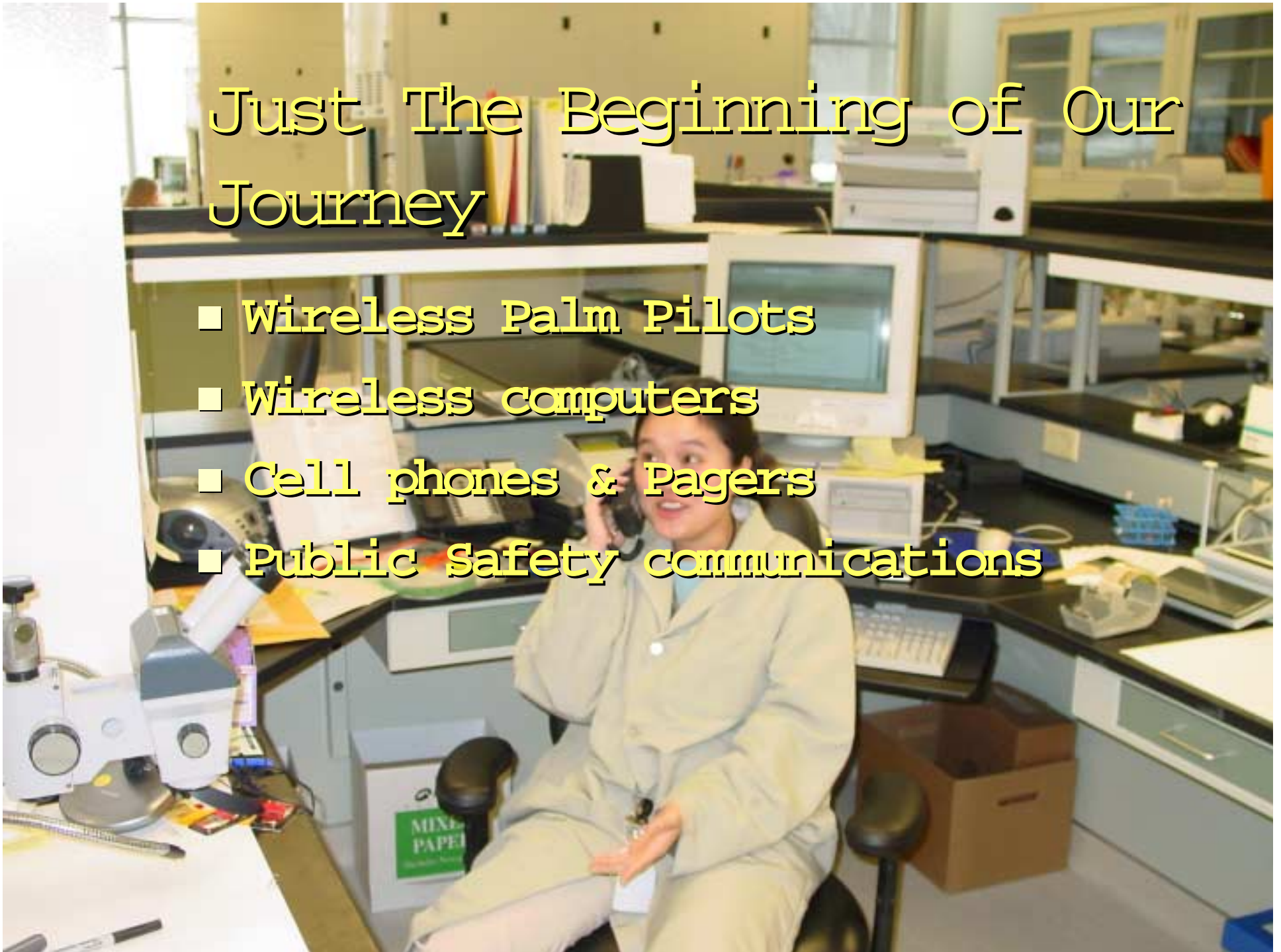
Lessons To Be Learned

- **Wireless phones as a primary device**
- **Interferences**
 - analog wireless telephones
 - wireless barcode readers



Just The Beginning of Our Journey

- Wireless Palm Pilots
- Wireless computers
- Cell phones & Pagers
- Public Safety communications



Skyline[®]

Skyline Exhibits, Inc.

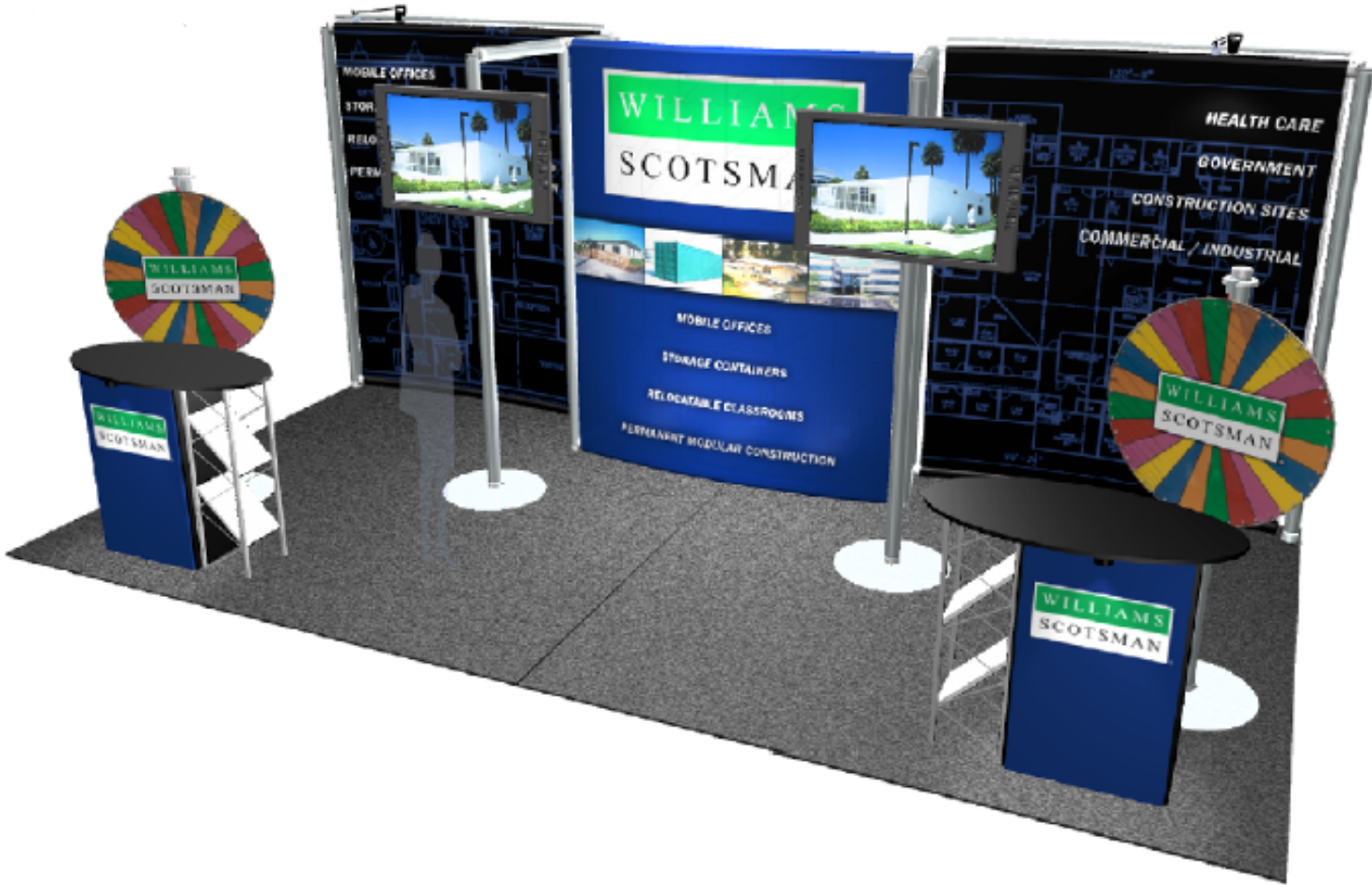
- Marketing Communications
- Tradeshow & Event Exhibits
- Design, Manufacture, Rent & Service
- 24 Years Old
- 138 Offices in 43 Countries

Mirage Popup Exhibit



Skyline

Williams Scotsman



Versalux



Skyline

DOMCO

DOMCO
THE DOMCO TARKETT GROUP



10x20 Inliten
10x30 Inliten w/ mirage

Skyline
exhibits • graphics • services

Skyline

International Design Center

- **Back in 1998...**
 - Five Locations in Suburb of Minneapolis/St. Paul
 - 350 Employees
 - Accelerating growth
 - Collaboration difficulties mounting
- **New Facility**
 - 280,000 ft² facility to consolidate operations
 - Wide-open environment inside
 - Mimic tradeshow environment
 - Focus on collaboration
 - Reconfigurable facility
 - Mobile work force



Mobile Phones

take one (October 1998)

- Process
 - Hired experts to help with RFP
 - Most vendors cautious about a wide-open facility
 - Choices
 - Most seasoned vendor who was less sure about facility
 - Previous vendor who was confident about their technology
- Results
 - Technology failed
 - Antenna handoff problems

Lessons Learned

Selecting a Platform

- Ask a lot of questions, then ask more
- Visit largest installation
- Understand handset limitations
- Test, Test, Test
- Don't over deploy wireless phones

- Explicit performance guarantees
- Phase in the wireless deployment
- Tie payment milestones to performance

- **Process**
 - Used Elert & Associates' expertise again
 - Industry standard platform
 - Vendor accountability
 - Deployed in phases
- **Results**
 - Technology met expectations
 - Short tuning period that lasted about 1 month
 - Started with 100 phones, increased to 125

- New wireless computer technologies
- Wireless remote-controlled cameras

Robo-Customer

Ethernet
enabled camera

High gain
antenna

802.11b
Ethernet
repeater

UPS



Mobile employees



Skyline

System Commonalities

- Symbol Access Points & phones
- Cisco network
- Mitel VoIP
- Ardent Partners (local vendor/VAR)
- Elert & Associates

In-Building Wireless

- Will wireless replace wired communications (completely)?
- Can wireless ever reach wired throughput and security?
- Will local codes require support for First Responders?

The Wireless Spectrum

Infrared Light

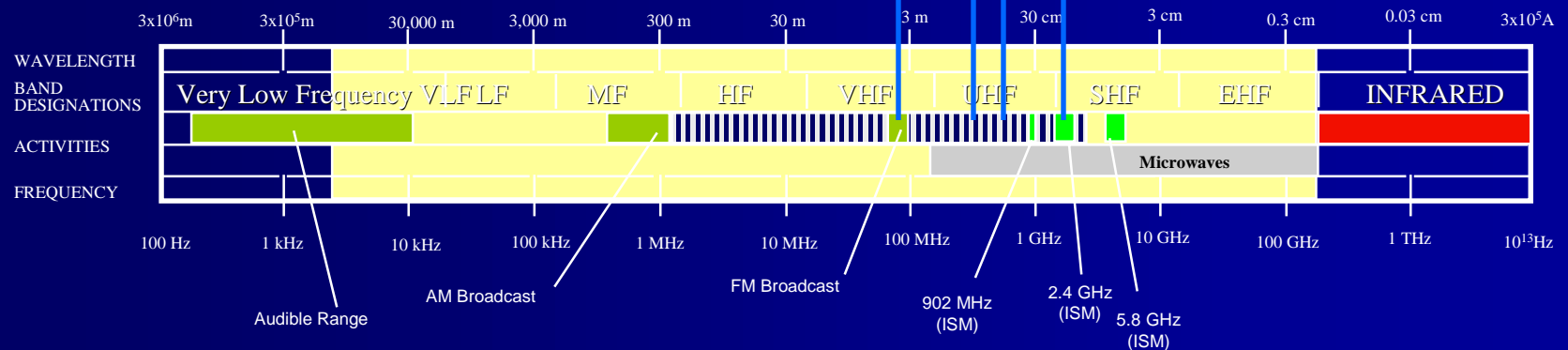
Narrowband

Spread Spectrum

- Typically Line-of-site
- Short Range Connectivity
- In Room Application
- High Data Rate Potential

- Specific Frequencies
- Individual User License
- Low Data Rates

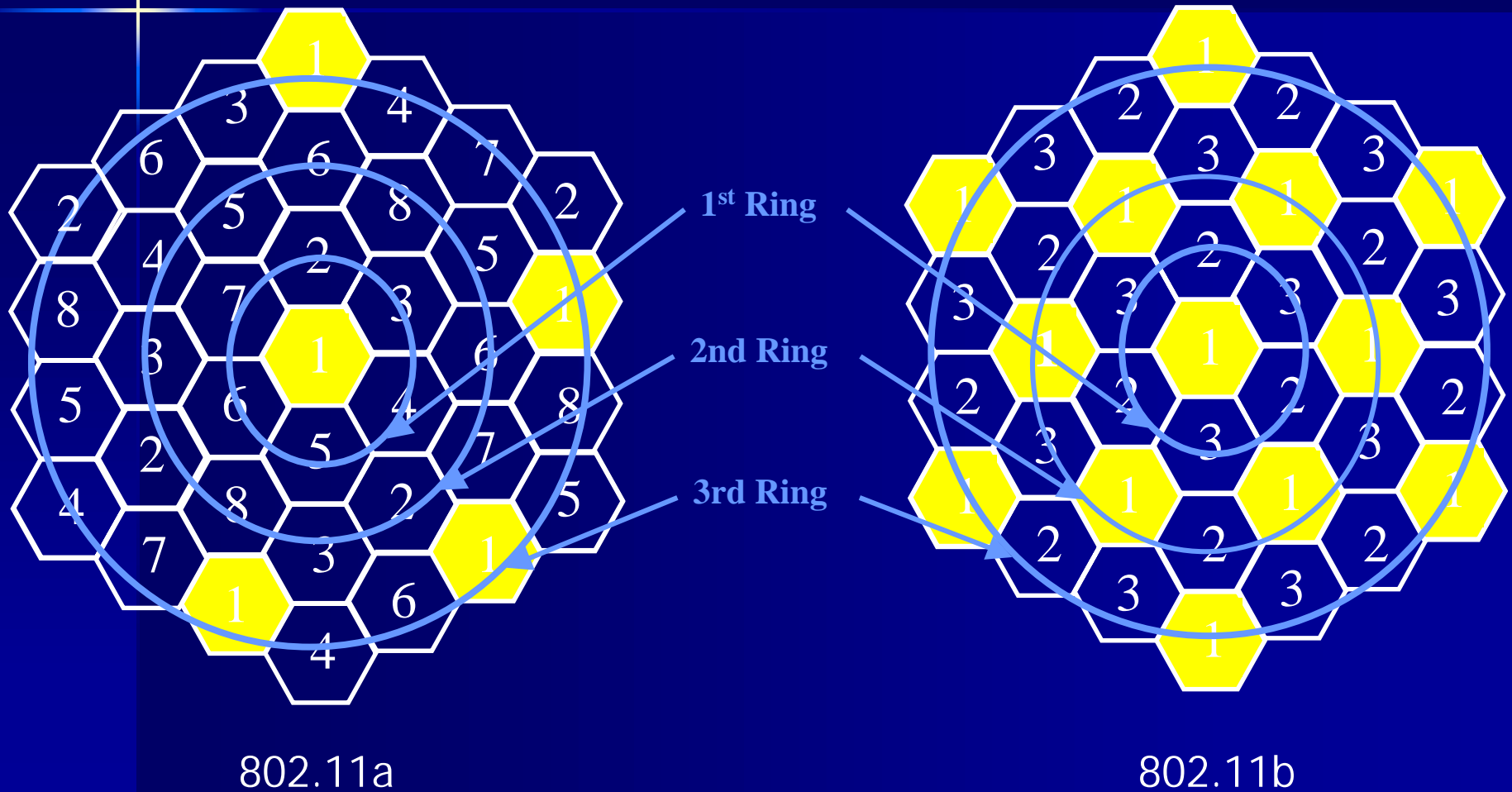
- Interference Resistance
- Secure
- License Free Use



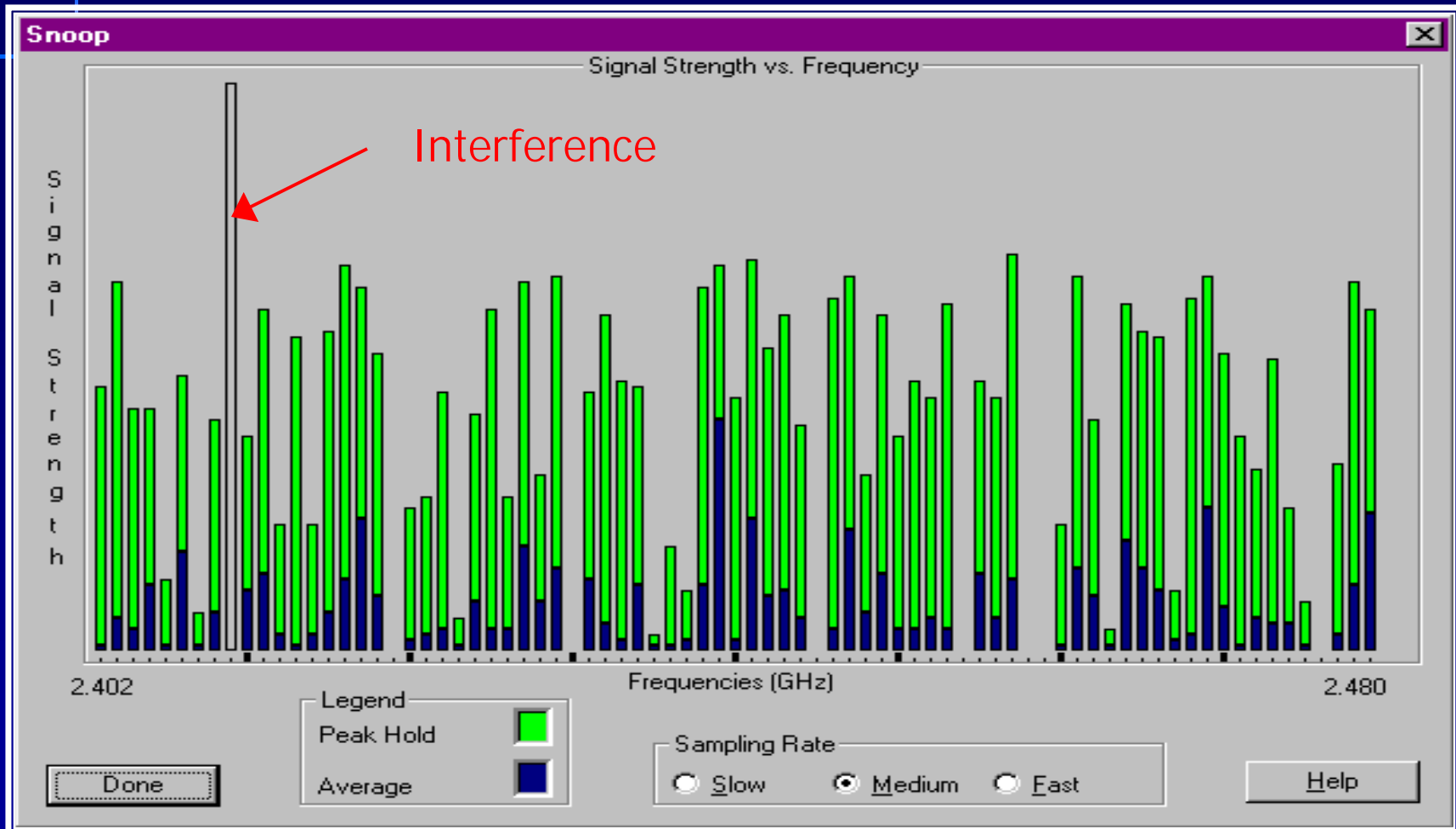
WLAN Planning Pitfalls

- Access Point quantities & placement
- Power availability
- Channel capacity vs. system growth
- Interference (known and unknown)
- Data & Voice issues
- Security concerns (802.1x)

WLAN Coverage



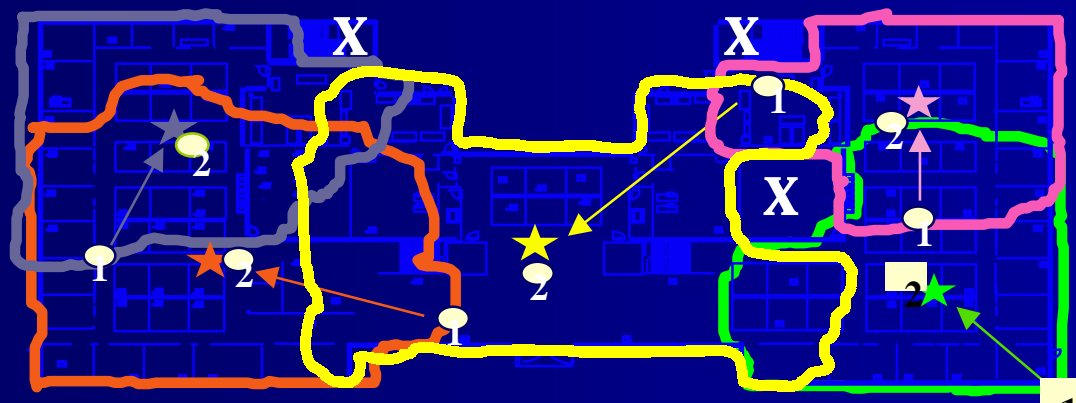
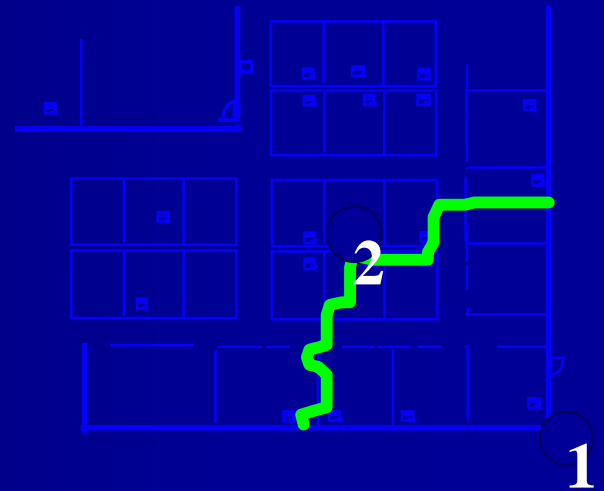
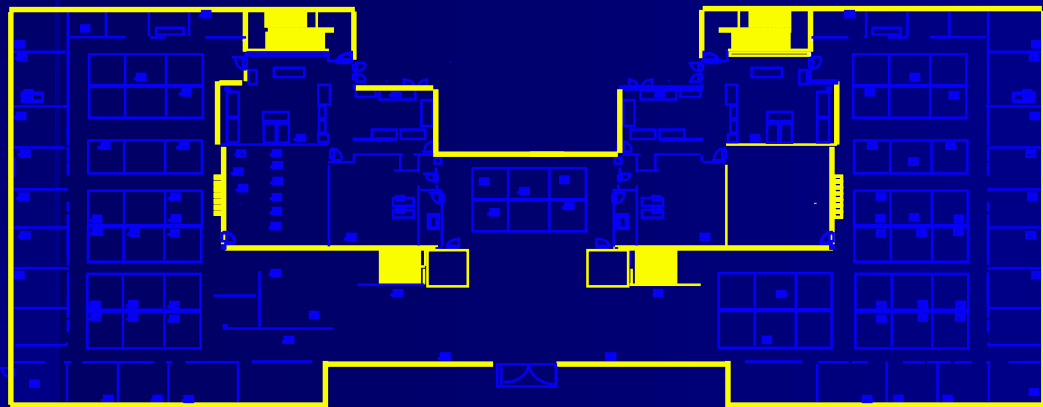
WLAN Interference



Wi-Fi Planning Steps

- Initial AP location selection
- Test and redesign per signal strength
- Test and redesign per signal strength
- Create a coverage map
- Assign frequencies to APs
- Audit: APs, frequency, location and coverage

Site Survey & AP Placement



Cellular/PCS/Paging

- 800, 900, 1900, 2100 MHz frequencies
- AMPS, TDMA, CDMA and GSM
- Exterior systems – base stations
- In-building access methods
- System loading
- Licensing and contractual issues
- Enhanced 911

Public Safety Radio

- VHF, UHF, 700, & 800 Bands
- Police, Fire and other first responders
- Regulations and codes
- Building owner responsibilities

Building Design Issues

- Shielding
- Signal absorption
- Multipath
- Occupant safety
- Site survey
- Antenna locations/visibility

Future Considerations

- Interference keeps increasing
- Ever changing & improving
 - Hardware vs. Software Defined
 - Cognitive Control
- Jurisdictional codes
- Sensor technology

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Questions ???

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