IDEA 2.0

Unified Wireless Network Site Survey Principles

Session objectives

At the end of this session, you should be able to:

- **Better understand complex RF design principles**
- **Better understand the purpose of a site survey**
- **Increase error free design velocity**

Agenda

- The Five Elements of Propagation
- Principles of Optimal RF Coverage
- Multipath Distortion
- Design Elements
- Site Survey Principles - Guidelines

The Five Elements of Propagation

- Frequency
- Transmitter Power
- Gain
- Environment
- Modulation complexity

The first principle of optimal RF coverage
A Quiet Background

The Problem:

A quiet background is the foundation of a reliable, resilient high performance RF Link. Design objective <95 dBm

Relevance:

High noise floors and unstable noise floors usually affect clients first and AP's second.

The Tweak:

1. **Most background is from native radios using omni's. Default with 50mW of power and 6.5 dBi patches for 80% of your coverage. This often drop noise by 15~20 dBm**
2. **If possible, get all WLAN's under one operational umbrella – or optimize the disparate systems to minimize degradation**
3. **Elevation and antenna pointing – both in azimuth and downtilt.**

The second principle of optimal RF coverage
Correct Power Levels

The problem:

It's about getting groups of electrons on target – not spraying the maximum amount of electrons in a room

Relevance:

Gain is often a better tool than maximum power

The Tweak:

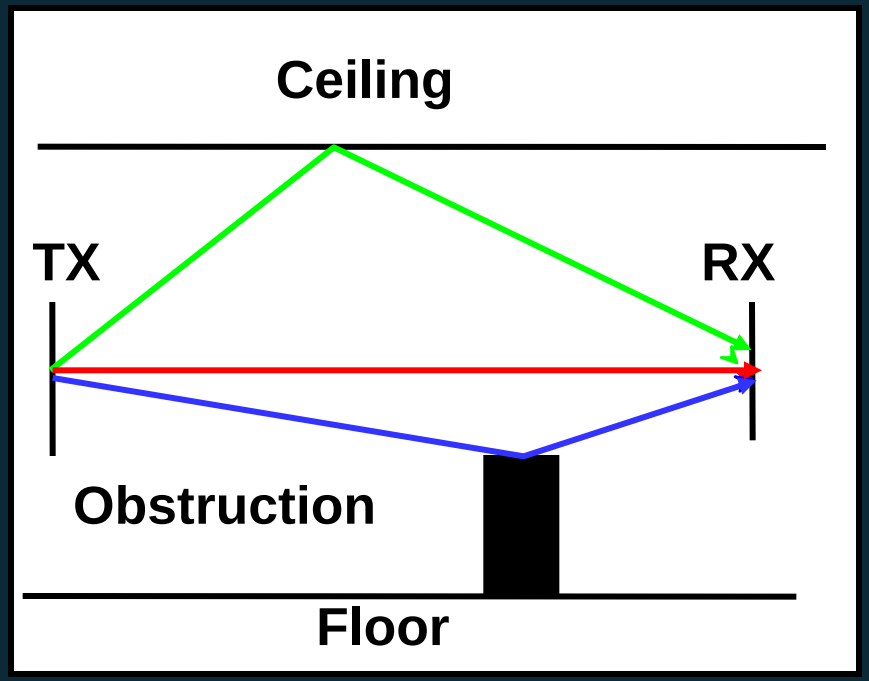
1. **Design elegance is a function of using the least amount of power – not the most**
2. **Cover where you should, and only where you should**

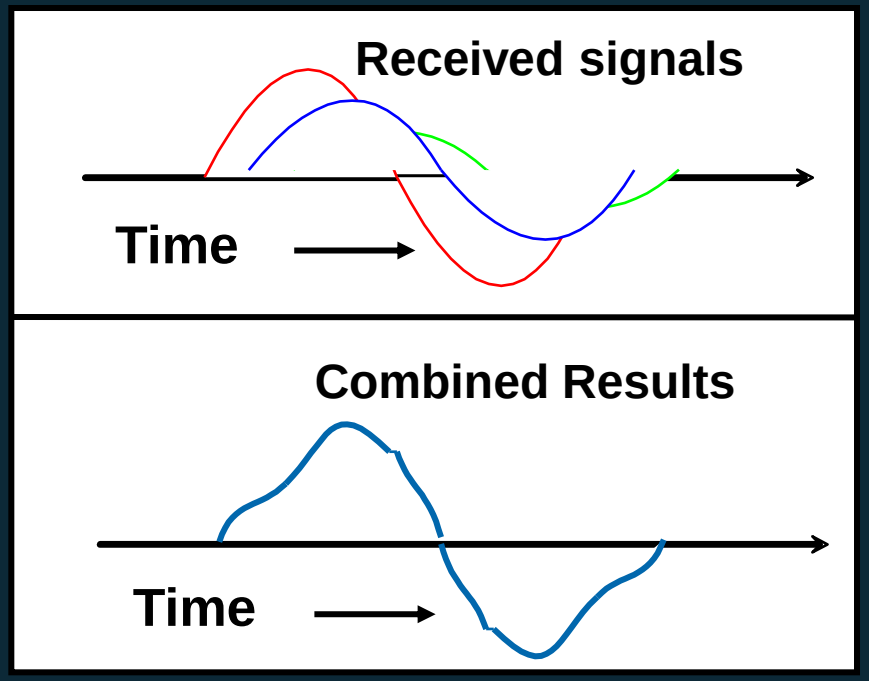
The Third Principle: Signal Stability Counts

The problem:

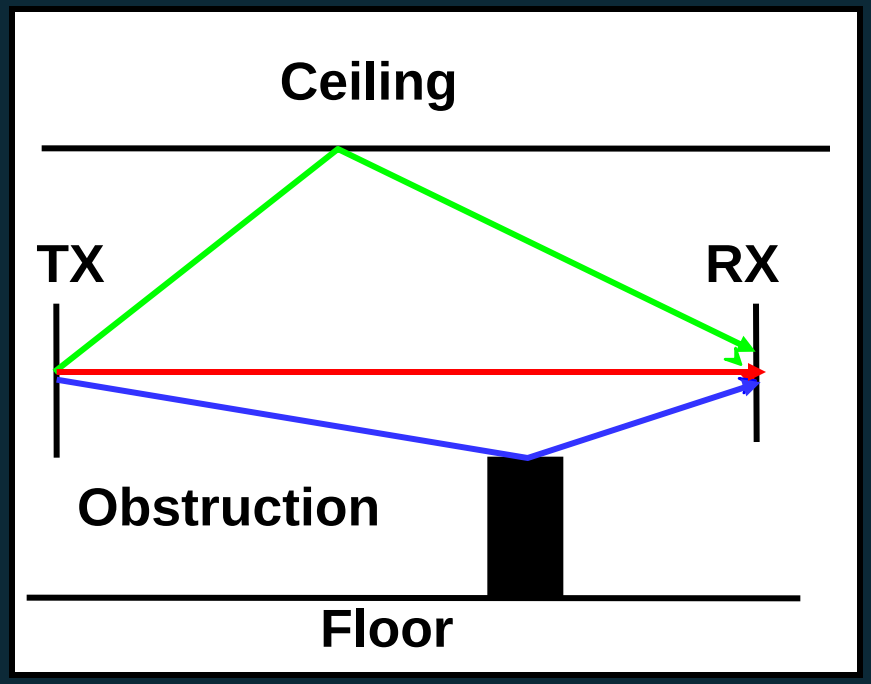
Stable cell edges generally mean stable cell interiors. Power stability results in more resilient links and reduced battery consumption by clients.

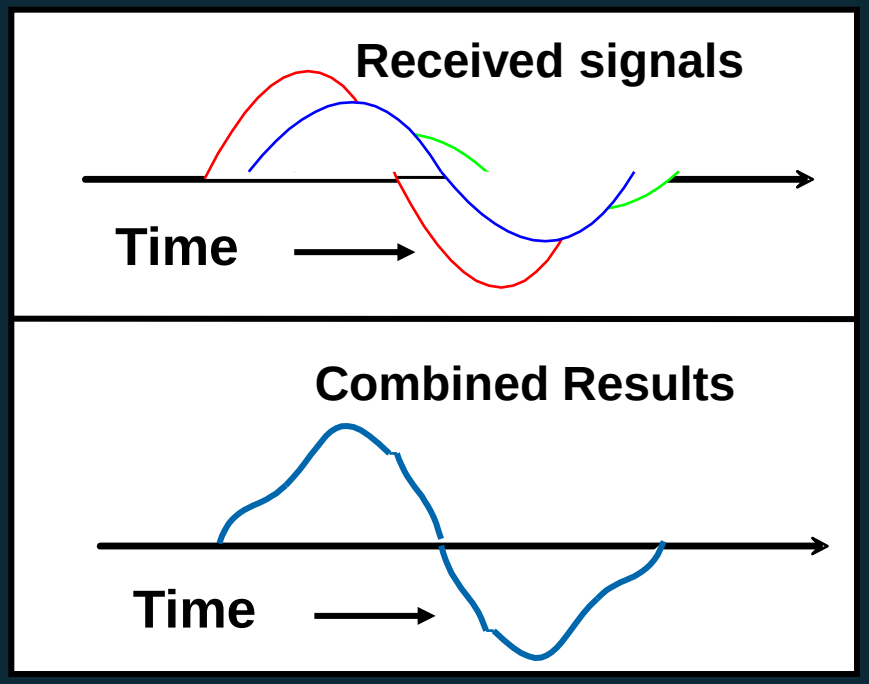
Multipath Distortion





Multipath Distortion





Multipath (cont.)

- Multipath signals can cause high RF signal strength, but poor signal quality levels

- Bottom line:
  - Low RF signal strength does not mean poor communications
  - Low signal quality DOES mean poor communications

Design Elements

The Problem:

Designs have five essential phases.

Relevance:

Review your design internally, then with customer.

The Tweak:

1. **Establish design principles. Ie. AP's spacing, general elevation path redundancy, cubic coverage, perimeter and nulls**
2. **Establish elevation assets and downtilt**
3. **Grid first, fine tune second – WCS works very well for this.**
4. **Interlock the -65 dBm cell edges**
5. **Audit point selection (the design checksum)**

Design Elements – The Long View

The Problem:

Design for the mid point of the project life

Relevance:

Client count, traffic and latency tend to become more challenging over time

The Tweak:

1. **Design for voice, video and location**
2. **Optimal node density rather than scatter AP's due to budget constraint.**
3. **Most projects are deployed in phases – if budget is minimal, cover most important areas first, others later.**

Site Surveys

1. A site survey is not a design mechanism – it's an audit mechanism.

2. There are three audits per major project:

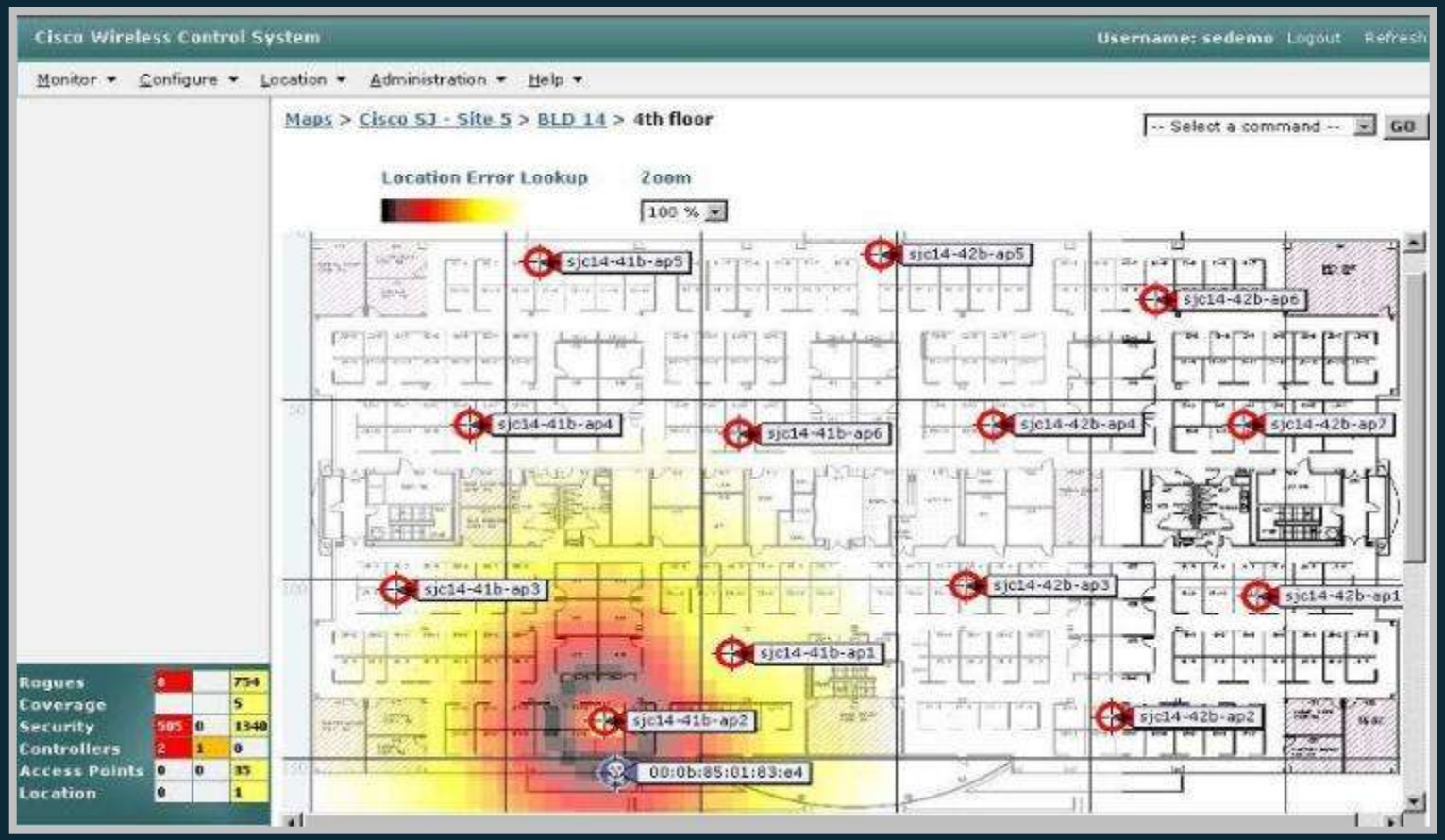
   - A quick sweep to characterize anomalies
   - Design audit
   - Post deployment audit

Site Surveys – Complex Areas

1. Even the most complex sites have no more then five propagation type areas

2. Apply design principle to each area type, ie, cages, open spaces, dynamic environments etc.

Access Point Location



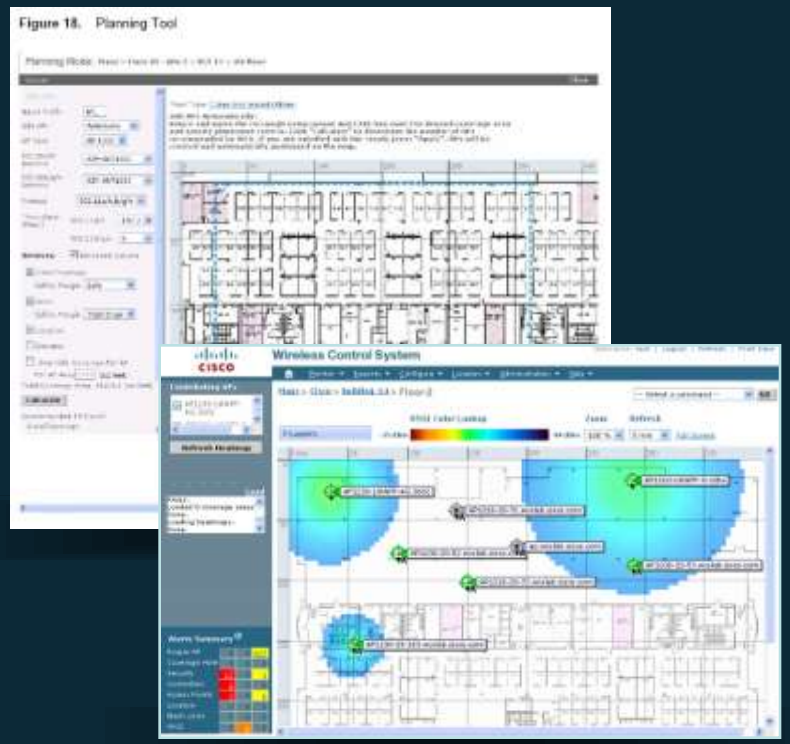
Ease of Design and Implementation

Cisco's Wireless Control System (WCS)

Provides an Easy-to-Use Graphical Interface and Automates Design and Management Functions

WCS Includes RF Prediction Tools to Assist in Designing a WLAN

- **Hierarchical maps: import graphic floor plans**
- **Suggested AP placement**
- **Interference identification**
- **Configuration templates**
- **View performance and coverage estimates**



Interference Detection and Mitigation

The Problem:

Interference comes from both 802.11 and non 802.11 sources.

Relevance:

Interference is primarily an issue at the receiver.

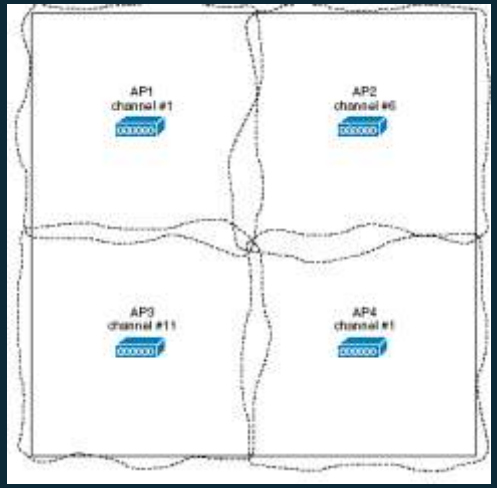
The Tweak:

1. **Sweep for interference sources at L2 and at L1, also with Cognio**
2. **Directional antennas with downtilt and mid power settings prevent a lot of problems**
3. **Important to take control or understand all radiating elements in the area**
4. **Some types of interference con't be mitigated at source – design around it. Easiest approach: decrease cell size until design goals achieved**

Channel and Data Rate Selection

- Channel selection depends on the frequencies that are permitted for a particular region.

- The channels should be allocated to the coverage cells as follows: •Overlapping cells should use nonoverlapping channels.
- Where channels must be re-used in multiple cells, those cells should have minimal overlap with each other.



Important Guidelines

- A complete mapping of the RF environment should be obtained using a site survey
- Any pre-existing RF interference should be removed or documented
- Access points should be deployed starting from the building perimeter and working inward
- Access point density should be one per every 3000 square feet
- Wireless coverage should be pervasive throughout the campus and should include all building locations, such as stairways, lobbies, walkways, parking areas, and balconies
- Switch ports should filter out unnecessary broadcast traffic and regulate traffic to the access points
- Network capacity should be designed to limit access points to seven (7) voice clients per access point

Q & A

LOGICOM

CISCO
Authorized
Distributor