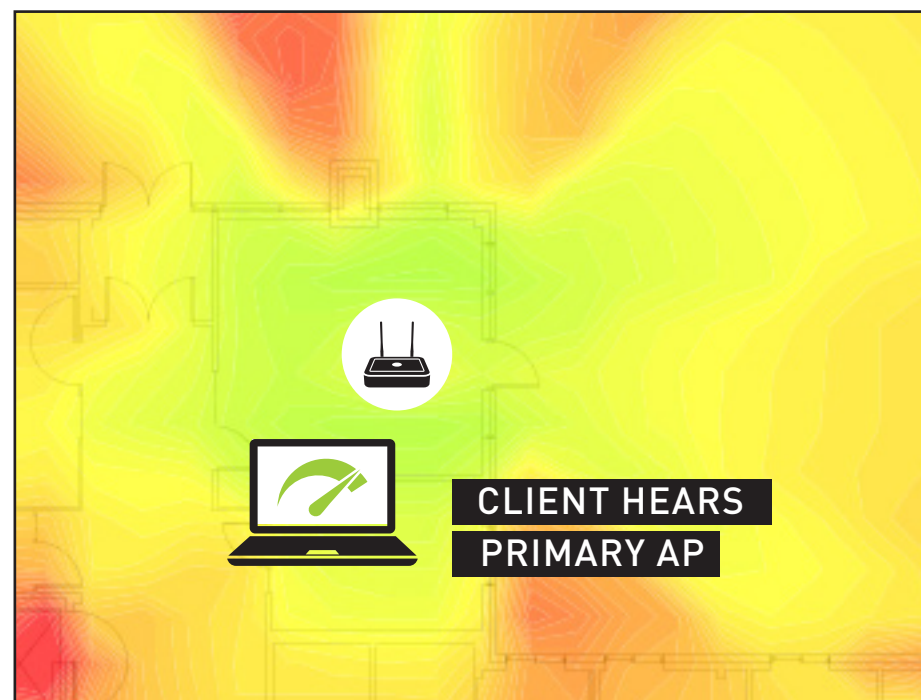


Wi-Fi Design



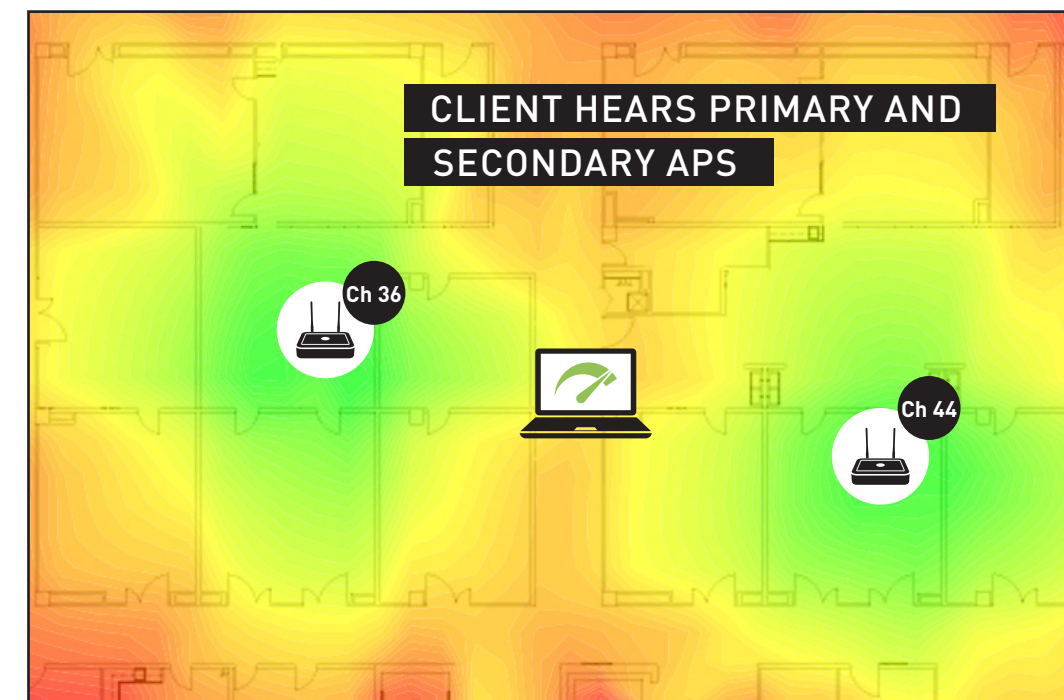
CRITICAL DESIGN ASPECTS

1. Primary Coverage Goal



- OBJECTIVES**
- ▶ Provide Wi-Fi service in all required locations
 - ▶ High quality signal strength
 - ▶ Maintain high data rates
- RESULTS**
- ▶ Improve airtime efficiency
 - ▶ Improve density handling

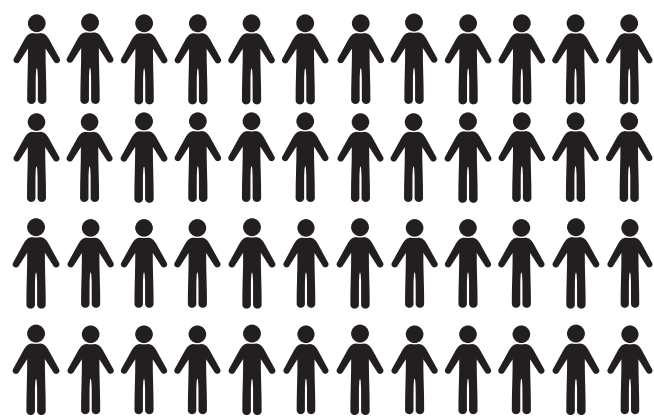
2. Secondary Coverage Goal



- OBJECTIVE**
- ▶ Provide coverage for 2 APs in each location
- RESULTS**
- ▶ Improve client roaming
 - ▶ Low latency roaming for real-time application
 - ▶ Redundancy for AP failure

3. Capacity Plan

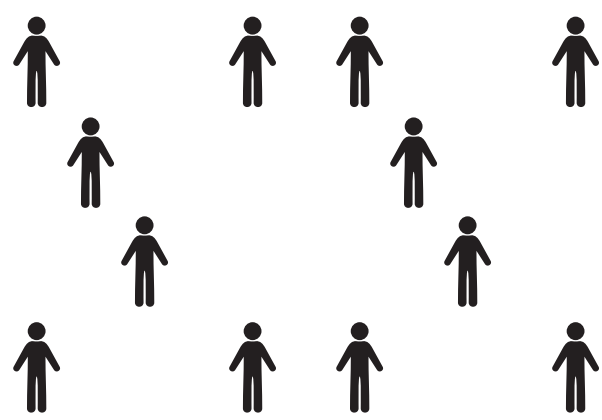
High Client Density



- CONSIDERATIONS**
- ▶ More spectrum in 5 GHz provides up to 8x the capacity of 2.4 GHz
 - ▶ Understand client mix
 - ▶ Client offered load / SLA
 - ▶ Model airtime demand
 - ▶ Understand airtime saturation limits (80% BE, 50% BE/VO/VI, 35% VO)

- RESULTS**
- ▶ Optimal number of APs
 - ▶ Proper client distribution between 5 GHz and 2.4 GHz
 - ▶ Leave idle airtime for growth

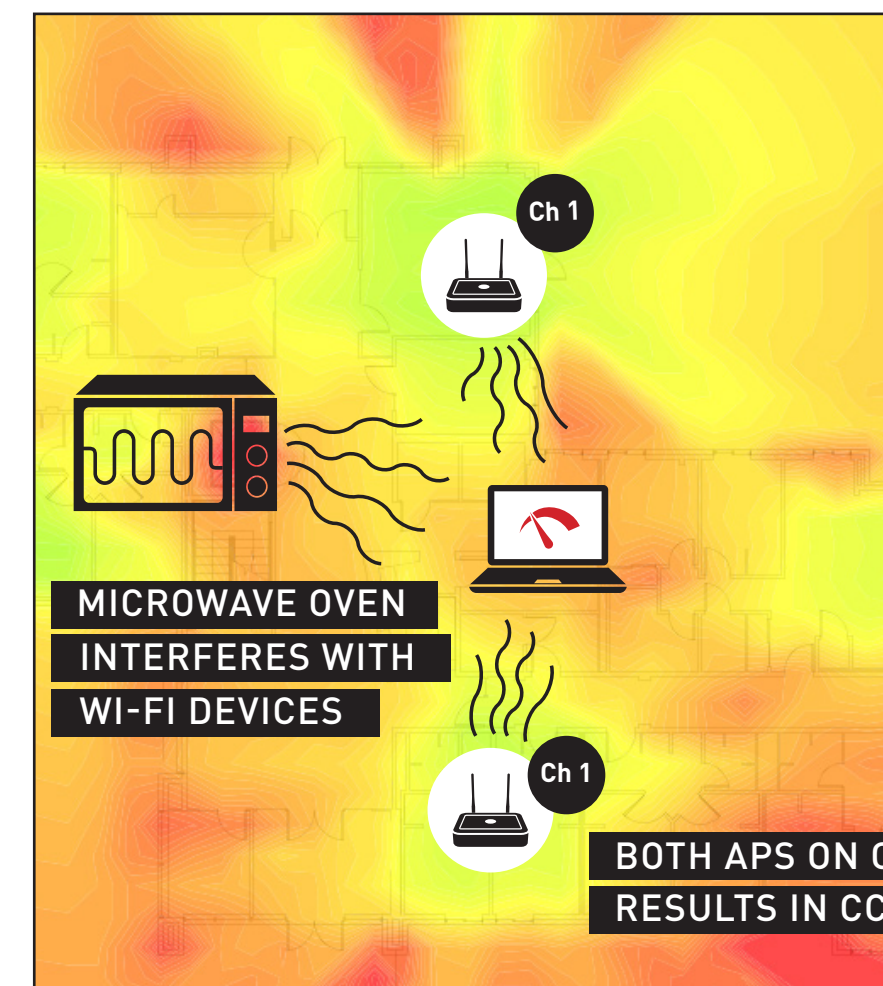
Low Client Density



Client Device Efficiency



4. Minimize Interference



- OBJECTIVES**
- ▶ Isolate APs on same channel
 - ▶ Reduce shared airtime
 - ▶ Limit contention domains
 - ▶ Eliminate external interference
- RESULTS**
- ▶ Minimize co-channel interference (CCI) and adjacent channel interference (ACI) between APs on the same or overlapping channels
 - ▶ Ideally, only one AP audible on each channel in a physical location
 - ▶ Ideally, remove sources of external RF interference or avoid impacted channels if they cannot be removed

RF DESIGN PROCESS

1. GATHER REQUIREMENTS

- ▶ Blueprints / CAD drawings
- ▶ Coverage areas
- ▶ Facility layouts & construction materials
- ▶ Client number and mix
- ▶ Client density distribution
- ▶ Critical applications / business process



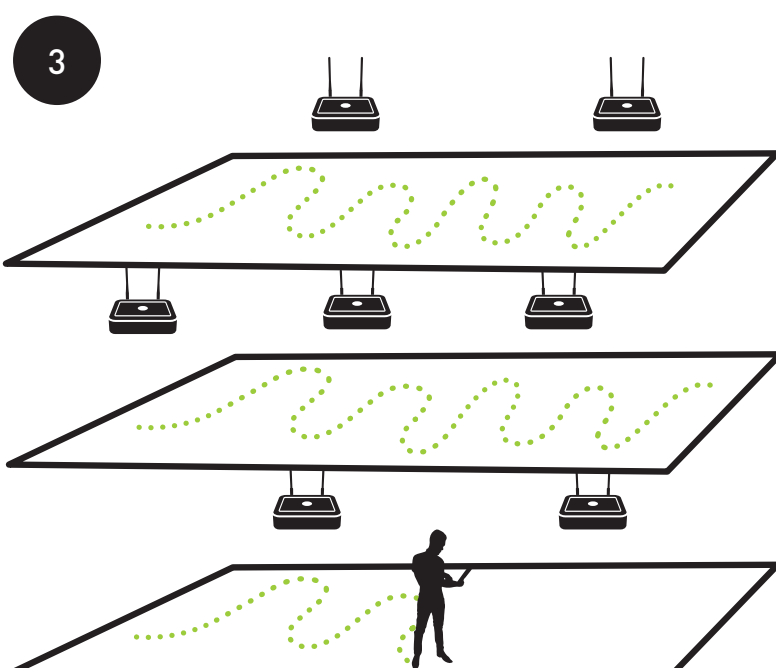
2. PRE - INSTALLATION DESIGN

- ▶ Predictive modeling
- ▶ Wall attenuation measurements
- ▶ "AP on a stick" measurement
- ▶ Wired network integration



3. POST INSTALLATION VALIDATION

- ▶ RF site survey (passive / active / spectrum)
- ▶ RF tuning channel and power plans
- ▶ Association and authentication tests
- ▶ Roaming tests
- ▶ Spectrum analysis



HIGH PERFORMANCE WI-FI TIPS & TRICKS

- Design for 5 GHz as Primary
 - ▶ The 5 GHz band provides 8 times the capacity of 2.4 GHz
- Define Coverage Goal(s)
 - ▶ Too aggressive can lead to co-channel interference
 - ▶ Too conservative can lead to poor client performance
- Place APs Where Users Are Located
 - ▶ In-room placement is best for client performance
 - ▶ Avoid hallways, if possible, unless required for voice roaming
- Tailor Coverage to the Facility
 - ▶ Leverage RF obstructions for frequency re-use
 - ▶ Consider proper antennas and orientation for signal propagation
- Fine Tune AP Power Levels
 - ▶ Align with on-site signal measurements of RF propagation
 - ▶ Align with AP density and frequency re-use requirements
- Disable 2.4 GHz Radios if Necessary
 - ▶ There are fewer available channels in 2.4 GHz
 - ▶ Disabling radios can prevent co-channel interference and shared capacity between clients
 - ▶ Some APs allow switching 2.4GHz radio to 5GHz
- Design and Validate with Representative Client Devices
 - ▶ Spot-check with actual client devices to ensure the design matches actual client performance
 - ▶ Alternatively, measure with a standard RF site survey adapter and compensate the signal based on actual client device characteristics
- Higher AP Density Requires Smaller Channel Widths
 - ▶ Reduces co-channel interference and shared capacity between clients
 - ▶ Reduces client contention and improves network stability
- Disable Low Data Rates to Improve Performance
 - ▶ 802.11b clients can significantly impact network performance
 - ▶ Reduces overhead from management frames and broadcast/multicast traffic
- Minimize the Number of SSIDs
 - ▶ Network overhead increases with each SSID defined

