HALLWAY ACCESS POINT REDESIGN

CWNE TECHNICAL ESSAY

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PROBLEM:

Hospital customer was getting ready to implement a VoWLAN nurse call solution in a newly built OB area. The access point placements had been developed by the internal facilities staff with no RF design experience. Customer engaged us to evaluate the AP placements before the new area came online.

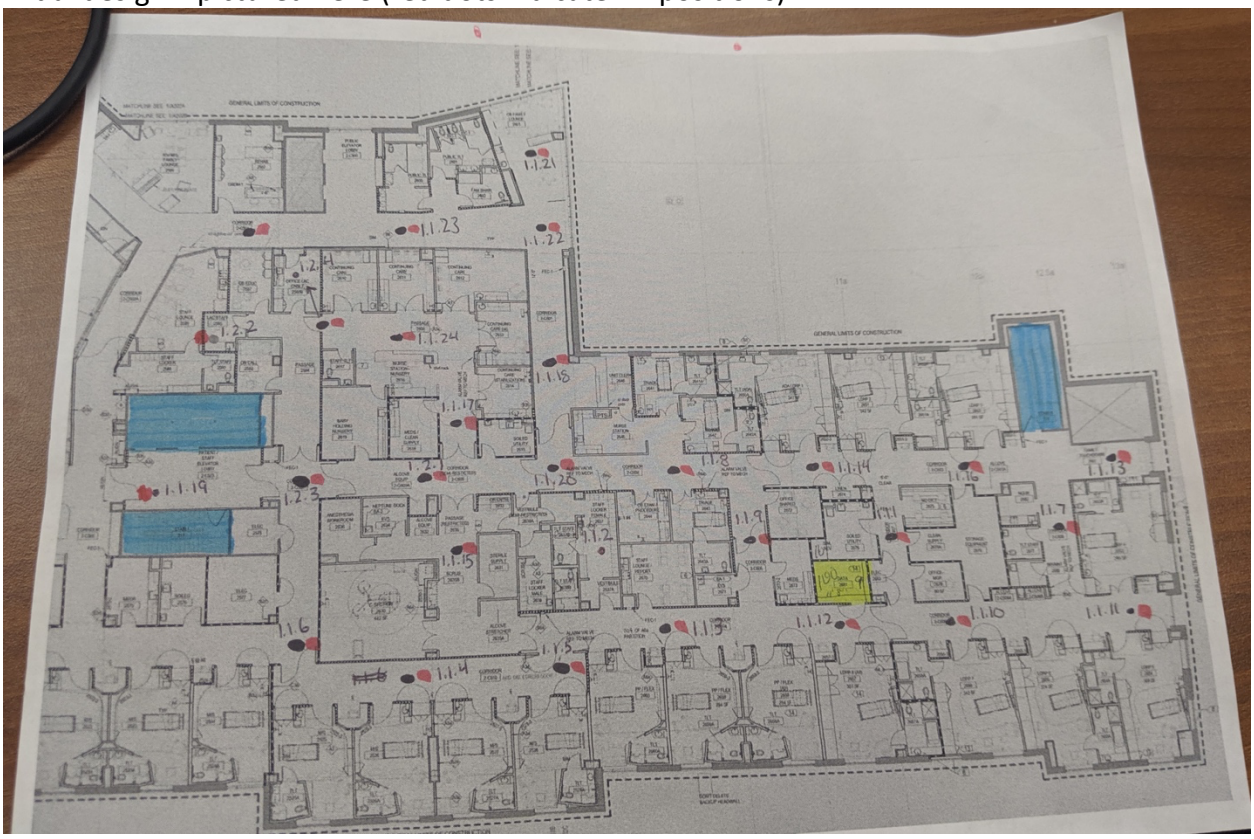
MY ROLE:

Consultant working for a regional VAR.

ANALYSIS AND TROUBLESHOOTING:

The customer in this case was a regional hospital that had decided to roll-out a Voice over WLAN (VoWLAN) nurse call system with the initial test area being a newly built OB. At the same time the customer was in the beginning stages of moving from a Meraki wireless infrastructure to a traditional Cisco wireless controller deployment. This new OB would be the first area to be converted to the new Cisco equipment. Prior to engaging our services, the customer had moved ahead with cabling, hanging, and lighting APs according to the design done by the Facilities department.

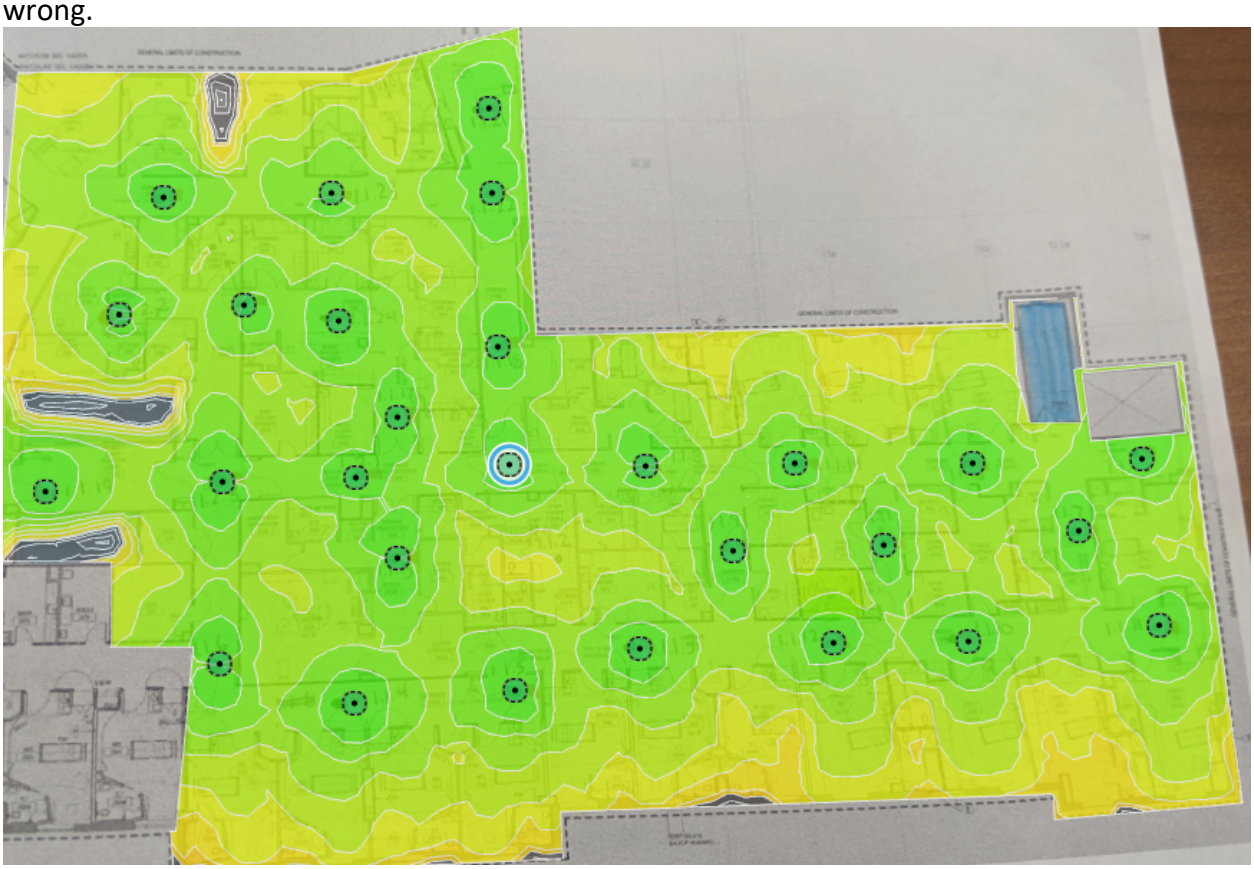
In the initial meeting with the customer we reviewed the requirements as well as the initial design – pictured here (red dots indicate AP positions):



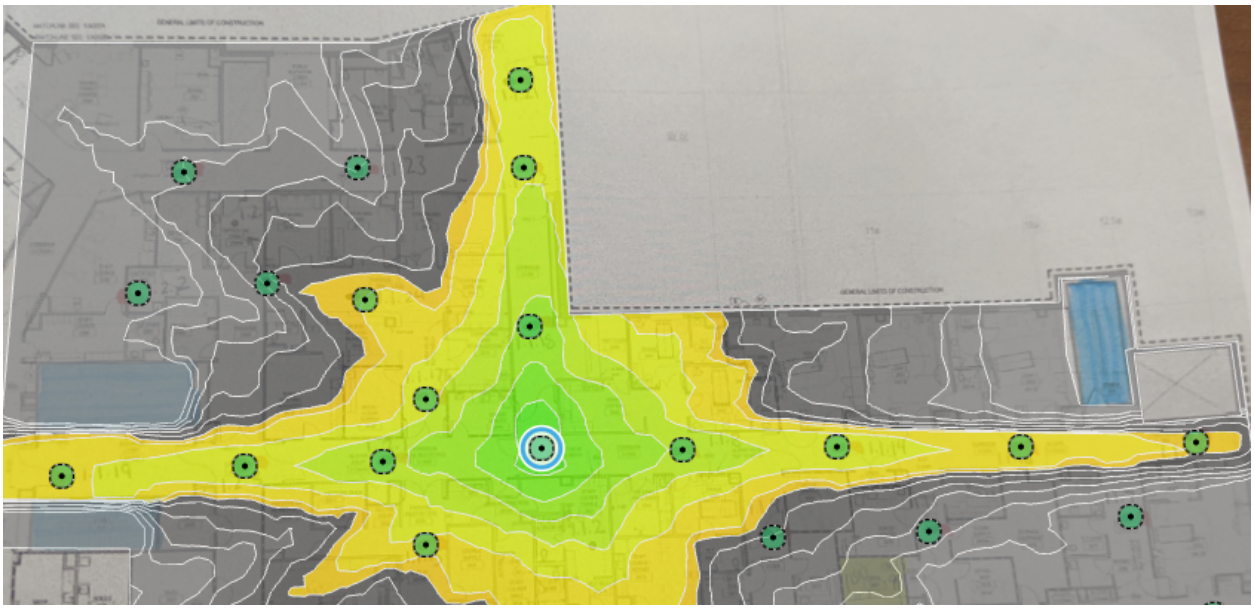
The obvious immediate concern that I noted was that all of the APs were placed in the hallway. My next concern was the amount of APs deployed (28 APs in a ~20k sqft area) especially considering the RF characteristics of a hallway deployment with ceiling-mounted, omni-directional antennas.

This customer had recently purchased Ekahau site survey and planning software so I used this opportunity to provide education to their staff on the issues that their design could have due to their placement choices. The first thing step was to mock-up some designs in Ekahau: one with the hallway deployment and one with a more suitable design with APs in rooms. **Note: the following examples are mock-ups quickly developed and presented for educational purposes during the initial onsite sit down.**

The first mock-up I presented to the customer was all APs in their current position with a 14dbm power level. The initial reaction from the customer was confusion as the design showed lots of green and no areas of poor coverage and they did not understand what was wrong.

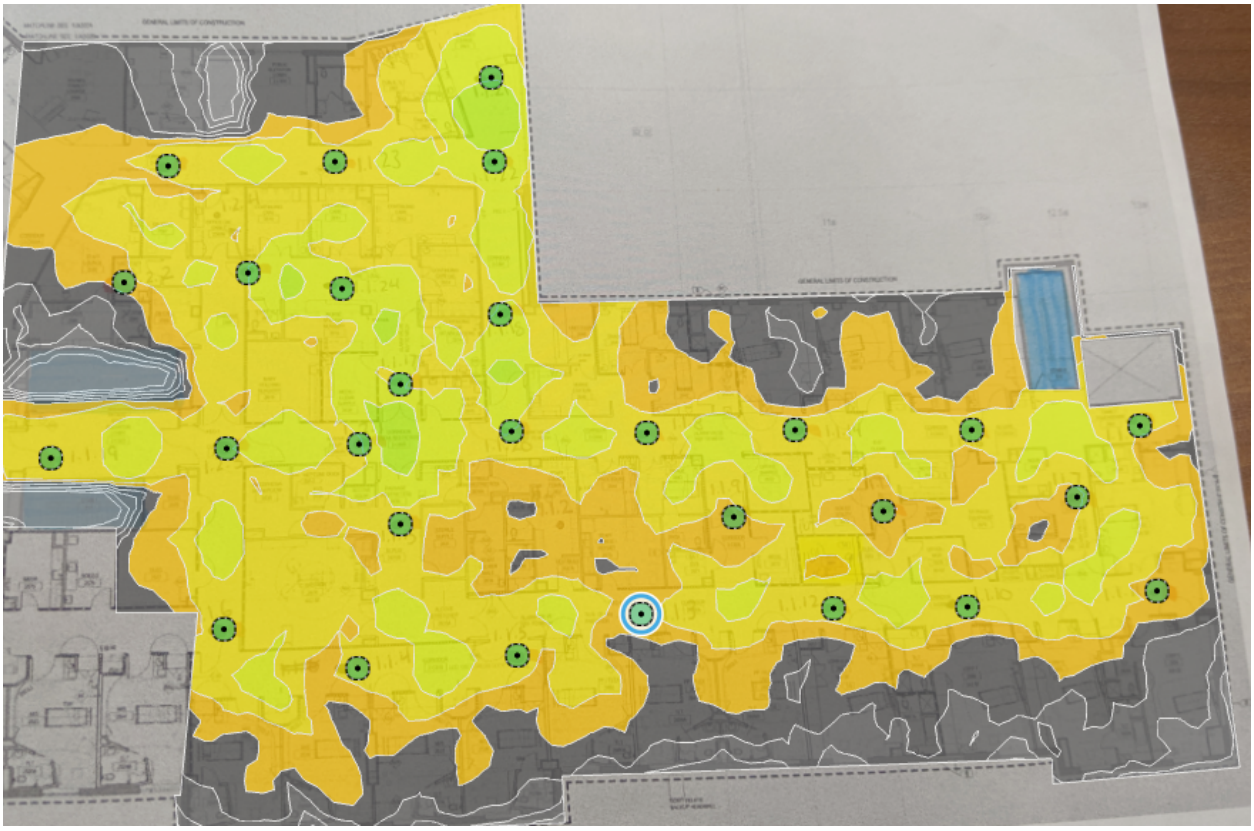


I next showed them the coverage from a single hallway AP:



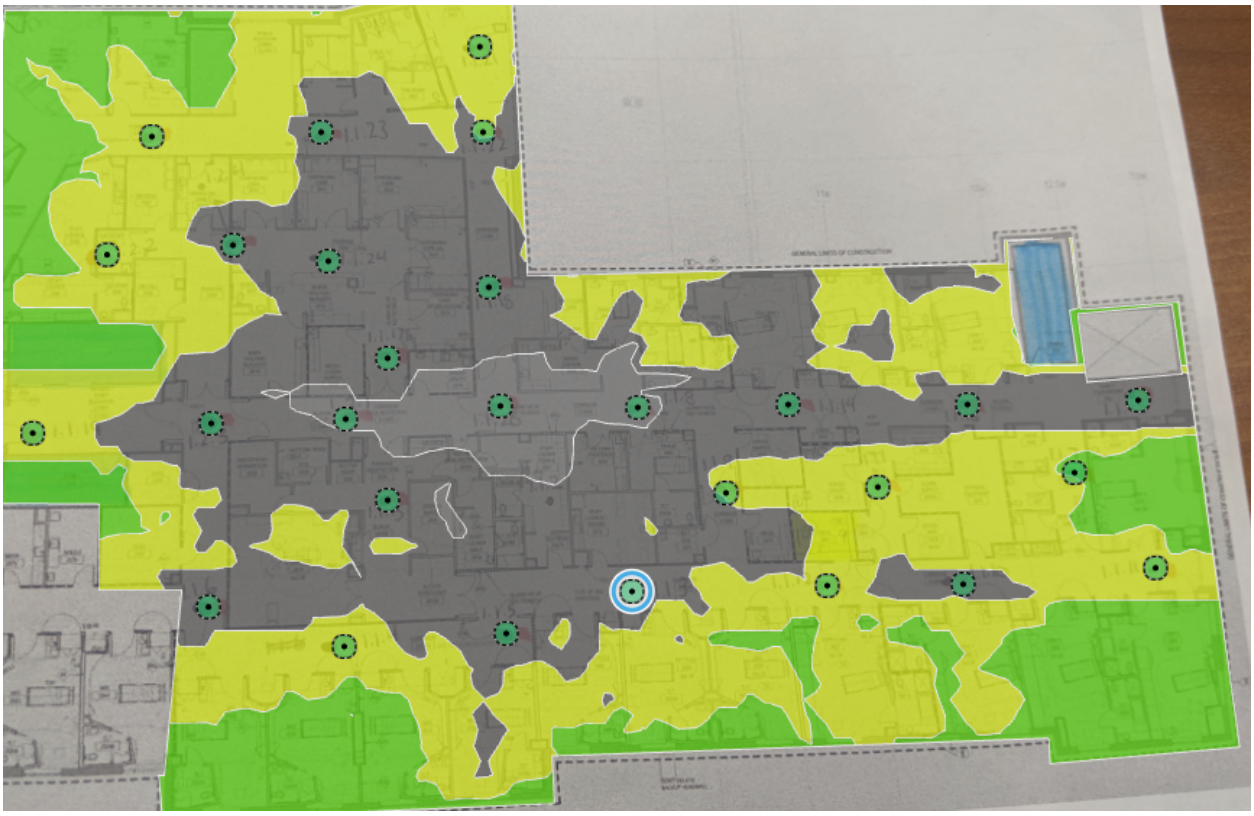
At this point I discussed why having a single AP covering an entire 225 foot long hallway could cause issues with their new VoWLAN devices. I explained how in this scenario you could easily run into bidirectional communication issues due to a client at the end of the hall being able to hear the furthest AP at a signal strong enough not to trigger the client's roaming algorithm but the AP being then unable to hear the client transmissions consistently due to less capable radio hardware and/or lower transmit power on the client.

I also took this chance to demonstrate how their RRM configuration was affecting AP coverage in this deployment. On their wireless controller their Transmit Power Control constraints were set to the Cisco default of a low of -10 to a high of 30dbm. I ran the **show advanced 802.11a txpower** command to determine what the APs were currently transmitting at. Due to the hallway design and default TPC settings all of the APs were at the lowest or 2nd lowest power levels. I adjusted the mock-up to show all of the APs at a 3dbm transmit power to show them what the coverage was actually like. Since secondary coverage is very important to ensuring good voice roaming, I showed them what that coverage would look like with very low TX power on the APs. The pictured visualization has a -70dbm cutoff for the secondary coverage.



I explained that because of the combination of the hallway deployment and extremely low transmit power we were seeing issues with adequate secondary coverage in the patient rooms where good secondary coverage is vital.

The final hallway design visualization I shared with the customer was Channel Interference with a modeled 14dbm transmit power (bottom end of vendor design requirements) while only using the eight vendor-recommended 5Ghz channels (UNII-1/3). I showed how much of the floorplan would have more than 3 APs heard on the same channel at a signal level of -85 dbm.



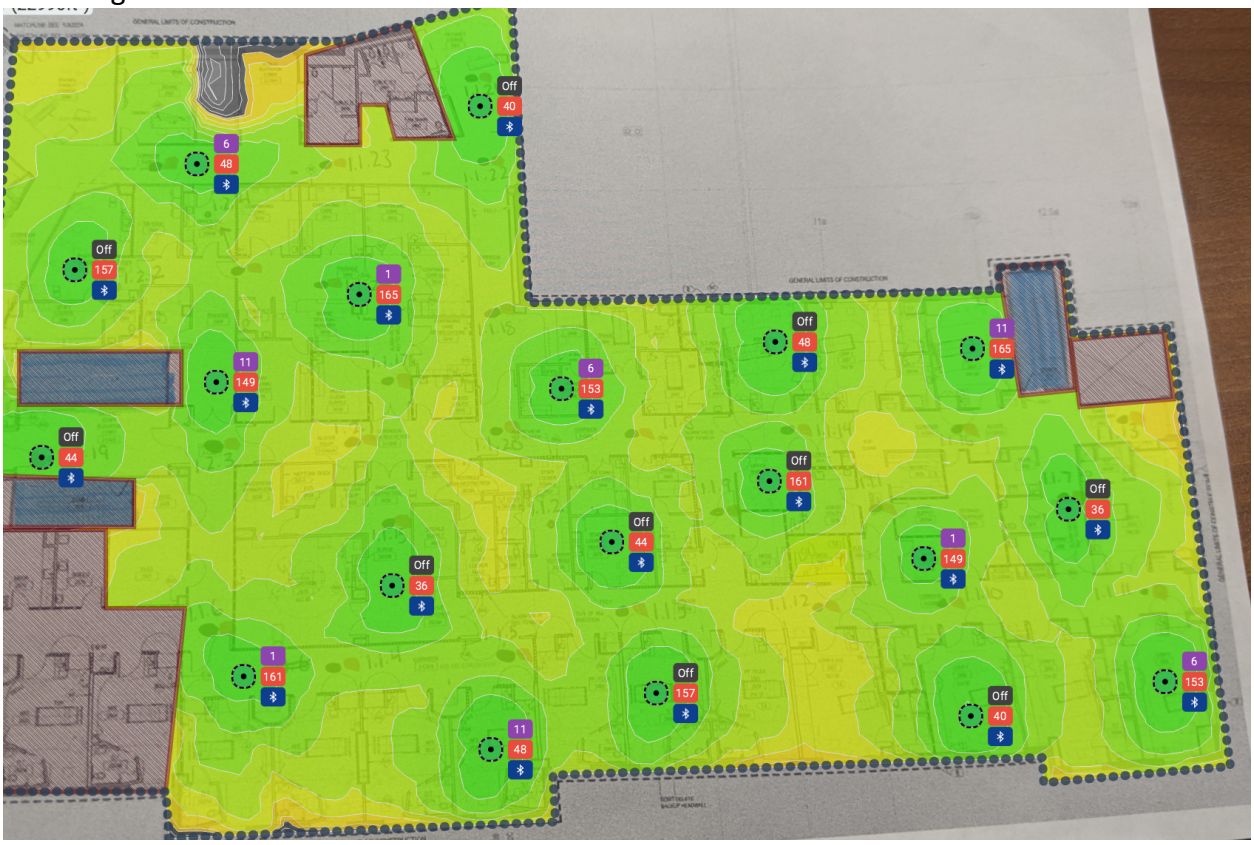
I took the opportunity to give a high-level explanation on co-channel interference and how it affects the contention process – in particular the significance of energy detect and signal detect thresholds.

RESOLUTION:

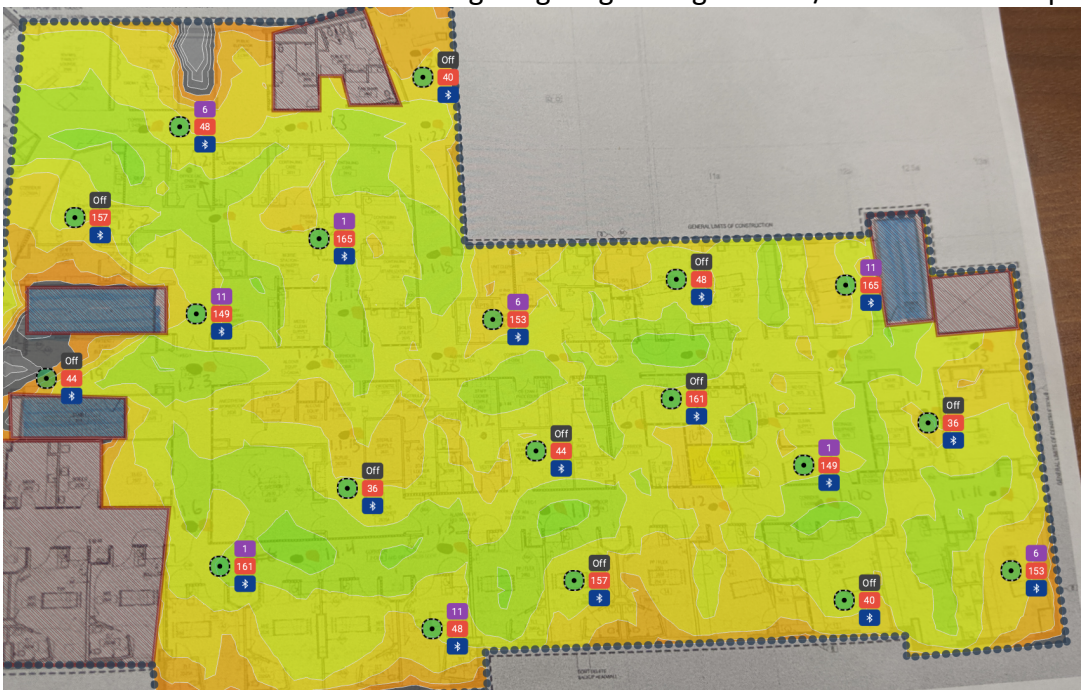
After explaining to the customer why their current hallway deployment was an ineffective choice – particularly for VoWLAN -- they agreed to look at a different proposed design. **NOTE – the proposed changes below were quickly mocked up for educational purposes. A full design was submitted at a later date.**

The mocked-up redesign moved most APs into rooms where possible as well as removing 9 APs from the original design.

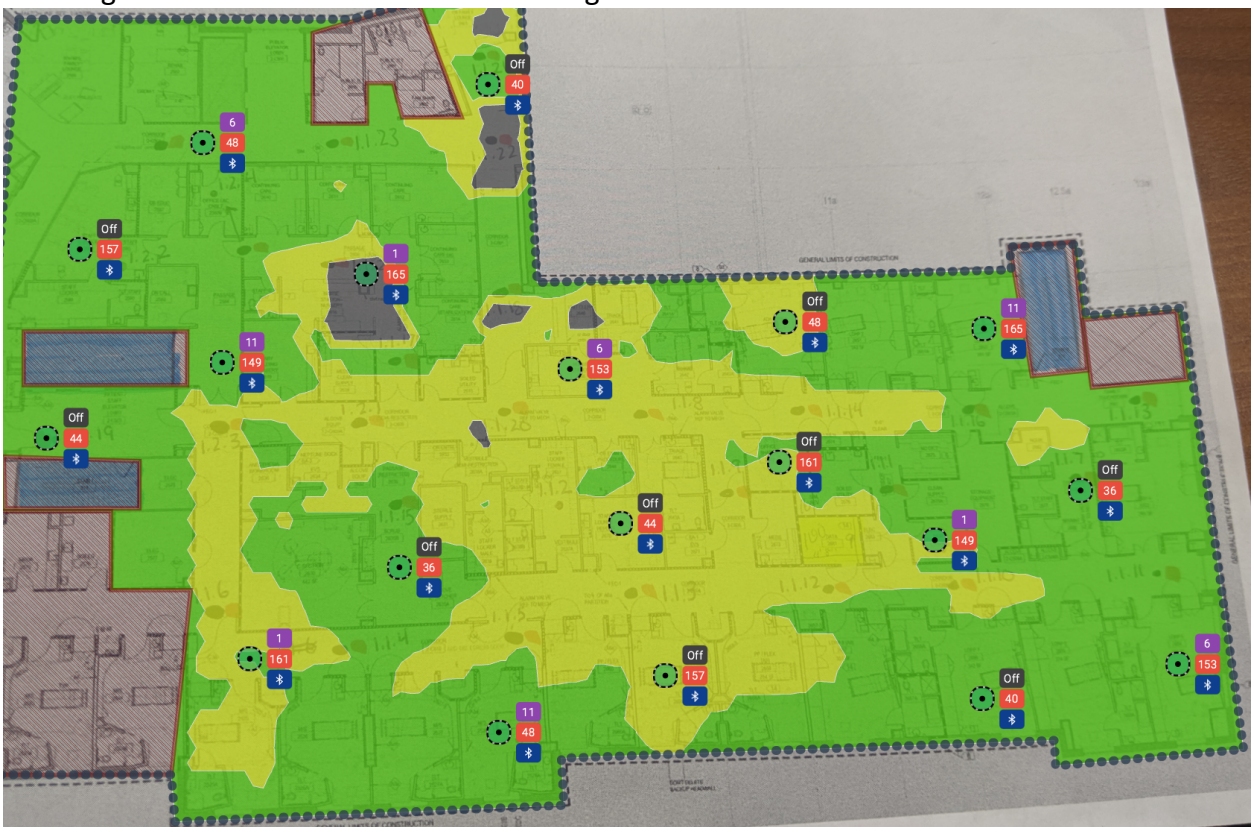
I first showed them that the primary coverage was still good throughout the floor despite removing those 9 APs:



I then showed them how the Secondary Coverage would be improved with the moving of APs into the rooms combined with configuring a tight range of min/max AP transmit power (14-17):



Finally, I demonstrated how the channel interference would be much improved by both reducing the number of APs as well as moving APs into rooms to reduce the effective cell size:



After explaining and visually demonstrating the issues with a hallway deployment and then repeating the process with a proper design I was able to convince the customer that they should invest the time and some additional cost to properly redesign the deployment. This process was much more effective by being able to utilize a visual tool such as Ekahau. In a short amount of time I was able to convey the difference between a poor design and a design that adheres closer to best practices.