IMPERIAL NETWORK SOLUTIONS

Wi-Fi the Wrong Way

When You Don't Have the Luxury of Deploying Wi-Fi the "Right" Way

Jason D. Hintersteiner, CWNE #171, CWNT

President and Chief Technical Officer

@EmperorWiFi

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Happy 2018

But The World's Still Designing Like It's 1999

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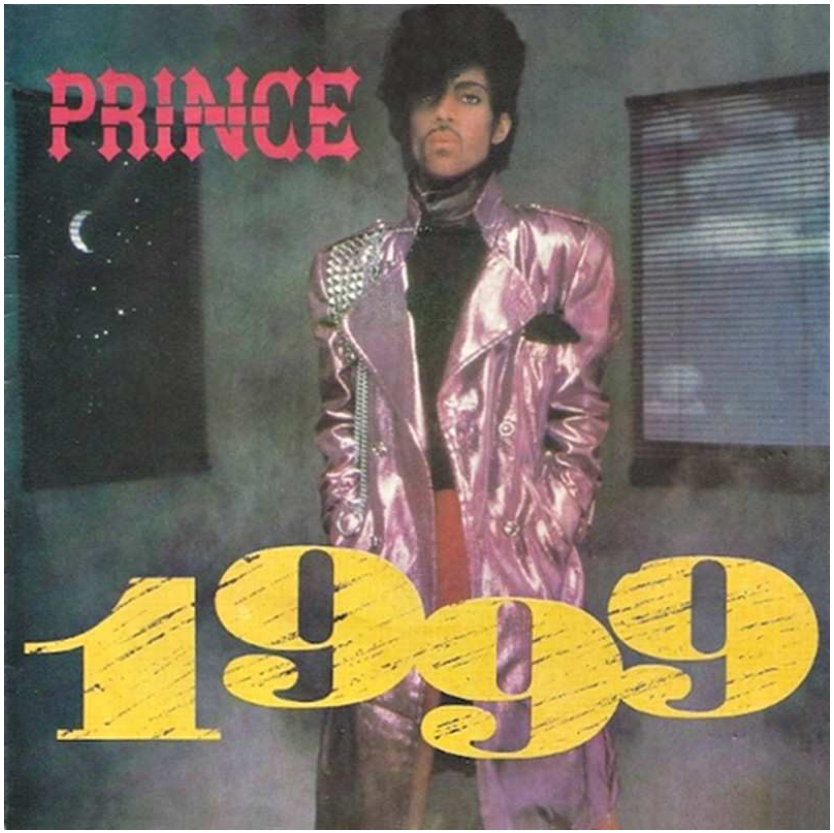
- Industry invested over 20 years telling everyone how "easy" Wi-Fi is
- Demands on our networks have increased
  - "Nice-to-have" is now "mission critical"
  - "Design for Coverage" is now "Design for Capacity"
- Wi-Fi technology is more complex
  - Increased sensitivity to bad settings and placement
  - Good Wi-Fi design becomes critical



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It's Easy to Deploy the Wrong Way

But It Isn't Just out of Ignorance

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- Industry resources out there for Wi-Fi engineers
  - CWNP®
  - Blogs
  - Conferences
  - Vendor Best Practices
  - Vendor-specific certifications
  - WLA: Wireless LAN Association

https://localtvktvi.files.wordpress.com/2014/07/wrong-way-cArash-web-generic1.jpg?quality=85&strip=all&w=400&h=225&crop=1

- No excuse for ignorance in 2018
- But even experts *still* deploy the wrong way. Why?

Sometimes, we are FORCED to...

Systems Engineering

Distinguishing Requirements and Constraints

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- **Requirements:** *What* the network has to achieve
  - **Usage:** What devices are using the network? How are they connecting? How are they authenticated?
  - **Coverage:** What areas of the facility need coverage, and at what quality (signal strength)?
  - **Capacity:** What is the quantity of simultaneous devices? What are the areas of high client density?
  - **Control:** What are the ways the network needs to be managed and monitored?
  - **Integration:** What is providing power and backhaul?

Requirements are solution-neutral and independent of each other.

Systems Engineering
Distinguishing Requirements and Constraints

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- **Constraints:** What the design has to *work around*
  - Limited budget
  - Limited time to implement
  - Aesthetics
  - External RF environment (noise)
  - Limitations in running Ethernet cabling
  - Dictates to use particular AP vendors / models
  - Lack of information about / access to the facility

http://www.philenews.com/temp/images/1500x3000/cache_1500x3000_Analog_medium_433753_297049_2792017.JPG

Constraints are solution-dependent and highly coupled to each other and to requirements.

Over-Constrained

When There are Too Many Constraints

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- Constraints drive the design, not the requirements
- Satisfying the constraints become an end in and of itself
- It becomes impossible to satisfy all of the requirements properly

http://heeyfashion.com/wp-content/uploads/2015/07/suspenders-belt.png

The over-constrained scenario is the common one, not the outlier. So how do we design in this case?

Designing with Over-Constraints

The Fundamentals are Still… Fundamental

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- There are four design parameters (i.e. knobs we can turn) in a Wi-Fi design
  - AP Make / Model / Antenna
  - Location of APs
  - Channel (per band per AP)
  - Transmit Power (per band per AP)
- These parameters are not independent, but require iteration
- Over-constraints generally limit your degrees of freedom for at least one, if not more, of these parameters

https://www.stevenjohnson.com/pics/chanalyst01.jpg

Designing with Over-Constraints

Common Constraint #1: Location

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- You cannot put the AP where you want
  - Limitation in Ethernet cabling
  - Aesthetics
- Recommended Solutions:
  - **Directional Antennas:** Focus the coverage in particular areas to punch through walls and/or stretch the signal further
  - **Mesh:** Use mesh-capable APs for applications driven by coverage and not performance
  - **Wireless Backhaul:** Use point-to-(multi)point links to act as a "wireless wire"

https://ih1.redbubble.net/image.120448670.2222/flat,800x800,075,f.jpg

Designing with Over-Constraints

Common Constraint #2: Budget

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- You don't have the money
  - Lack of access to do pre-deployment or post-deployment site surveys
  - May need to go with less / less expensive APs
- Recommended Solutions:
  - **Predictive Modeling:** Often "good enough", but the quality of the output is driven by the quality of the information provided by / about the property
  - **Be Wary of "Leading Edge":** 802.11n or 802.11ac wave 1 is still quite adequate for most deployments
  - **Mix-and-Match:** Use higher end APs in capacity-driven areas (e.g. conference halls) and lower end APs in coverage-driven areas (e.g. guest rooms)

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Designing with Over-Constraints

Common Constraint #3: Radio Resource Mgmt

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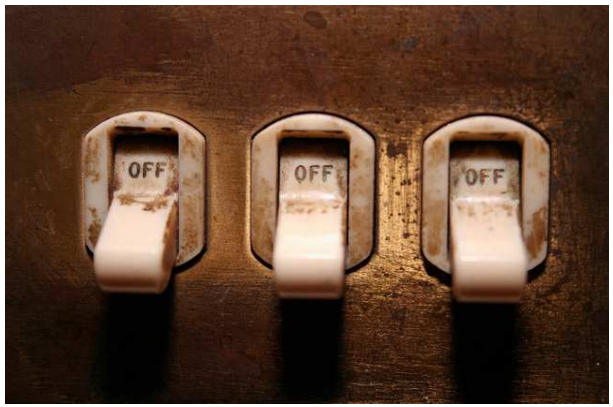
- Installers are happy to cede half of their design flexibility (channel & transmit power) to software algorithms
- Every vendor does RRM differently (some better than others)
- RRM usually breaks down in complex scenarios
- Recommended Solution: ***Turn RRM Off!***
  - **Static Channels:** Impose a static channel scheme using non-overlapping channels in an alternating pattern. Accommodate external sources of interference. Let external networks adapt to you.
  - **Static Transmit Power:** Turn down the power. Ensure ≥ 6 dB offset between 2.4 GHz & 5 GHz for equal coverage area



https://ecokids.ca/wp-content/uploads/2015/08/old-light-switches-1150733-639x426.jpg

Designing with Over-Constraints

It Can Be Done

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- Over-constrained scenarios are commonplace
- We usually don't have the luxury of deploying Wi-Fi the "right way"
- You can still create good Wi-Fi designs
  - Understand your requirements and constraints
  - Think creatively – don't over-constrain yourself
  - Pick the right APs for the job
  - Use all of the design knobs available to you
  - Acknowledge that the "right way" may not apply

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Crafting the Wi-Fi to Grow Your Empire!

Thank You!

Jason D. Hintersteiner, CWNE #171, CWNT

President and Chief Technical Officer

@EmperorWiFi

https://www.linkedin.com/in/emperorwifi