Wi-Fi® In-premise Problems

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MoCA® Makes Wi-Fi™ Better
What are Premises?

The following are considered to be premises.

- **Single family unit (SFU)**
  - Generally a single building with one family.
  - Others that can be treated as an SFU:
    - A duplex, triplex, etc (two or more families in a single building)
  - Interior generally wood studs with drywall and wood floors.
  - Problem units can have plaster walls, metal studs, concrete floors, etc.

- **Multiple dwelling Unit (MDU)**
  - Generally apartments, condominiums, townhomes.
  - Can be single to many stories tall.
  - Interior can be wood studs with drywall to concrete floors and walls.

- **Small to medium business (SMB)**
  - Can be a single building to a strip mall business to one or two stories in a skyscraper.
  - Interior can be wood studs with drywall to metal studs with cubicles to concrete floor and walls.
  - Institutions not considered for this discussion (schools, hospitals, nursing homes, jails, etc.)
Not all Premises are Created Equal

- There will always be premises that are problems.
- There are too many variables to come up with a one size fits all solution for Wi-Fi.
- You need a tool box available so that you can pick the correct tool for the situation.
  - “I suppose it is tempting, if the only tool you have is a hammer, to treat everything as if it were a nail.“
  Abraham Maslow
Culprit in Wi-Fi Failures: Chicken Wire

By Geoffrey A. Fowler
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• Two things beloved by San Francisco resident Galen Pewtherer that just couldn't get along: his Edwardian-style house and wireless Internet access.

• In 2008, Mr. Pewtherer tried to replace his old-fashioned cable Internet connection with a Wi-Fi network that he could share with other tenants in his building. "It turned out to be impossible," says the 38-year-old program manager at Cisco Systems Inc. "We couldn't get signal in or out of one room."

• That is because Mr. Pewtherer's 80-year-old building in the Mission District, like thousands of other old homes in the Bay Area, was built with the technological equivalent of kryptonite in its walls: chicken wire. **Metal wiring inside old plaster walls blocks wireless signals**, frustrating San Francisco residents as wireless-equipped devices like iPhones and laptops proliferate.
Premises Construction Issues

- Examples of materials which impede RF signals
  - Plaster walls w/metal backing
    - Drywall was invented in 1916.
    - Didn’t really catch on till post-WW2, hence most older homes have RF resistant plaster walls.
  - Concrete walls/floors/ceilings
    - Generally found in a business premise but sometimes in residential homes (especially w/heated floors as heated floors usually include pipes filled with water).
    - Some building have firewalls which can impede RF signals.
  - Mirrors
    - Mirrors have metal backings, a Wi-Fi signal’s kryptonite.
    - Some premises have a lot of mirrors.
  - Energy Efficient Windows
    - Uses transparent metallic films.
    - Can impede outside use.
  - Metal Window Blinds
    - Can impede outside use.
  - Cubicle Walls
    - Generally consists of cloth over metal frame.
Premises Environment

- The location of a premise can impede or degrade Wi-Fi operation
  - Outside interference
    - Radar
    - Microwaves (not just microwave ovens but also general microwave communication)
    - Other ISM band users
    - Electrical noise (harmonics)
  - Wi-Fi congestion
    - Typically in an MDU or business environment
    - Airtime hogs
    - Hidden nodes
Possible Current Solutions (What tools are available)

- **Wireless Solution – Run a Wi-Fi Mesh**
  - Runs into same problems w/premise construction & environment
  - Usually contributes to making congestion even worse

- **Wired Solution – Wi-Fi Extender with wired backbone**
  - **Ethernet**
    - If it’s there, but usually not in many SFUs and MDUs, more prevalent in SMBs
    - Premise could be rewired but that’s expensive
    - Up to 2.5 Gbps possible but typically 1 Gbps
    - Ethernet switch required for > 2 connections
    - Privacy – data on the wire is in the clear
  - **MoCA**
    - If coax currently exists, then excellent solution
    - For cable operators, best solution since coax usually exists
    - Up to 2.5 Gbps (MoCA 2.5), 1 Gbps (MoCA 2.0 bonded)
    - Compatible with cable and satellite systems
      - MoCA band D is > 1 GHz
      - MoCA Band E is 500 – 600 MHz
    - Already deployed in many cable systems
    - No external switches required (mesh solution) for up to 16 connections
    - Privacy – data on the wire encrypted (if enabled)
    - POE (Point of Entry) filter recommended
Possible Current Solutions (continued)

- **Wired Solutions**
  - **PowerLine**
    - US homes wired with two different circuits (240 VAC split to 120 VAC)
      - Powerline uses ground wire to cross the circuits
    - Not simple for pre-1960s premises
      - Unless premise rewired, usually no ground wire is present
      - A bridge can be installed but needs certified electrician
    - Generally can get up to 200 Mbps
  - **G.hn**
    - Not commonly used in the cable industry
    - Coax version not compatible with cable TV signals
    - Can get up to 2 Gbps