

Wi-Fi
CONTROL  **RUGGED**
POWER



VALUEPOINT NETWORKS



The Speaker

- 20 years in Networking
- First Half doing Integration
- Second Half on Products
- 5 years building Wi-Fi

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The Audience

- WISPs
- Systems Integrators
- You want to build a Muni network,
or you have an RFP

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Goals for Presentation

- Provide real world examples
- Tips and strategies for your Muni network

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Wi-Fi is the New Last Mile

- Access
- CPE
- WDS



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Small vs. med vs. large city

- Big cities are getting press, small cities are getting going.



Los Angeles



Santa Barbara



Centerbrook, CT

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Small City

- Last mile is the only mile.

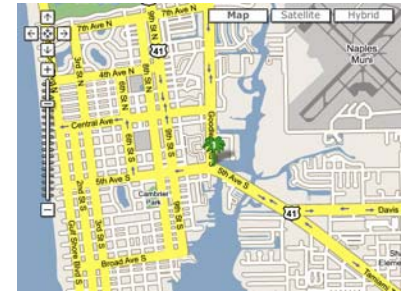


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Case Study: Naples, Florida

- Five 200 MW Radios cover downtown
- One Single and Two Dual Radio APs
- Survived Hurricane Charley

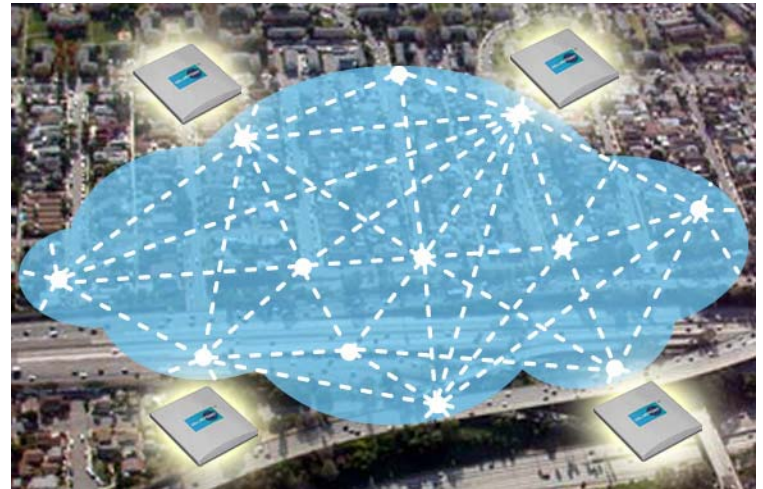


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Large city

- Wi-Fi domains around a mesh
- AP/mesh router combo

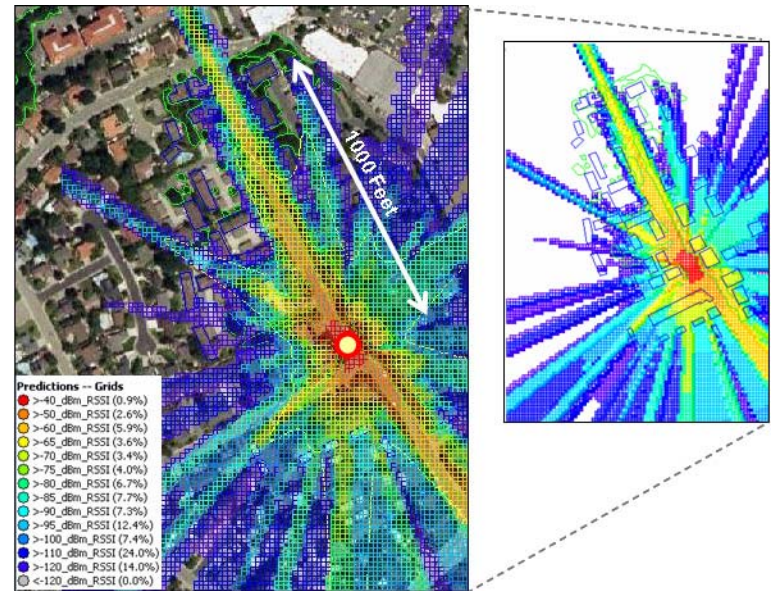


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Coverage strategies

- What does the RFP say?
- Blanket
- Busy commercial districts
- City government and parks
- Public safety



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Public Safety Spectrum

- 4.9 GHz
- Wi-Fi – Public safety bridge
- Upgrade existing locations

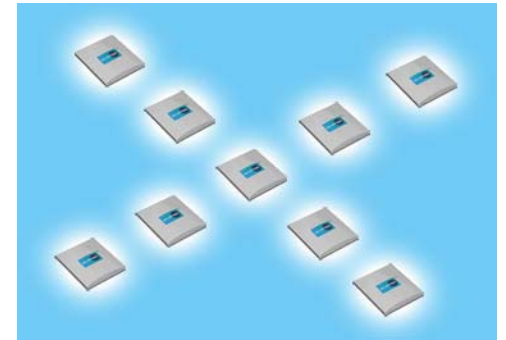


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Wireless Distribution System (WDS)

- Augment or replace mesh
- Extends backbone to hard-to-reach locales
- “Wireless Ethernet”: not repeating means manageable overhead



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Case Study: Philadelphia

- WDS combined with Canopy
- 285 mW b Dual Radio APs
- Each configured as Dual Repeater
- 450 ft Radius limited by Indoor CPEs
- Covers 50 square with 265 nodes

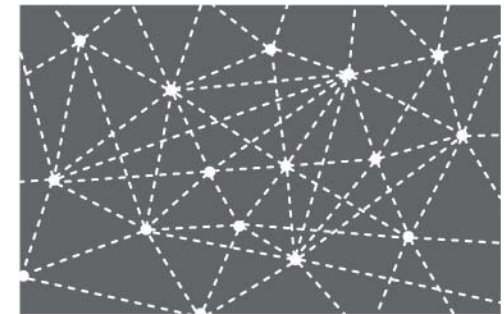


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Mesh

- Mesh node
- Secure backhaul
- Mitigates system outages
- Need alternate LOS paths, raises cost
- Easy to go crazy and overuse

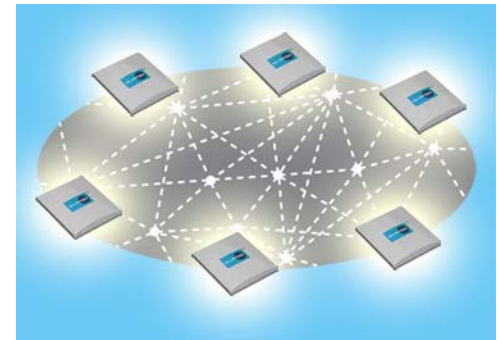


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Using APs with Mesh

- Co-locate APs with mesh nodes
- AP= Access, Mesh = backbone
- AP = WDS extensions



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Case Study: Mountain View and San Francisco, CA

- Node: 1 Mesh + 1 AP on light pole
- 285 MW AP + 7 dBi omni
- 802.1x Indoor CPE
- CPE limits distance to 450 ft.
- Took same model to Muni



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Spectrums

- a, b, b/g, 4.9 GHz
- a, b, b/g are uncontrollable
- a: underutilized, good backhaul, less range

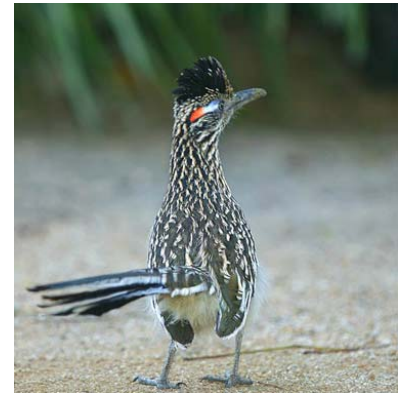


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b or b/g ?

- What does the RFP say?
- b: bread and butter. Best client coverage
- g: goes away quickly. (after 100-200 ft). Good for dense users close to AP
- g: with high power and high gain antennas is good for high speed backhaul



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Site Survey

- Choose channel **with the weakest signals**, *not* the least crowded
- Look for non Wi-Fi spectrum
Spectrum Analyzer required
- Survey landscape for obstructions and trees

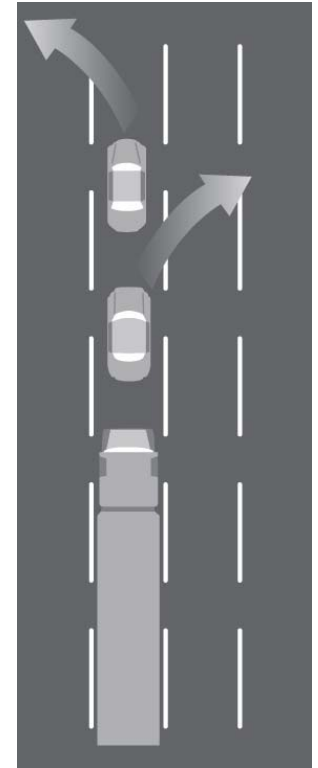


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Home APs

- Low power compared to you
- Plant your Flag on one channel and commit and commit
- Weaker networks will relocate or be stomped

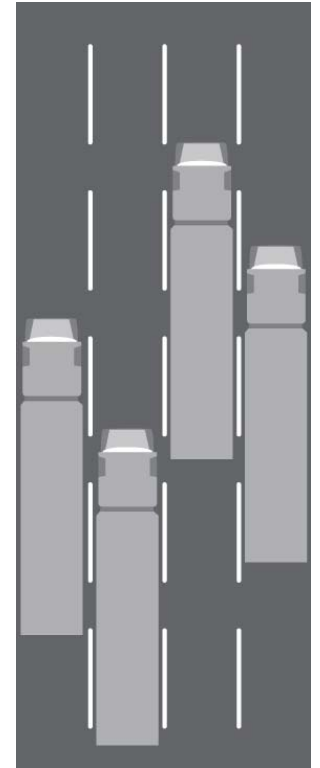


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Business APs

- Watch out for other big signals
- Don't put your flag on their flagpole
- Downtowns can be crowded, but usually weak signals
- Ignore weak signals (-75 dB)



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Case Study: Palo Alto, CA.

- Several blocks of crowded Wi-Fi space including hotels, computer stores
- Site survey was crucial to optimize mitigating obstructions, interference and trees.
- Six 200mW Dual Radios covered 10 blocks, penetrates retail spaces.



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Be Strong...

- High power APs (at least 200mW)
- Directional antennas to high use areas
- Mount as high as possible



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..but Sensitive

- Client is weakest link
(ie PDAs and laptops)
- You need high receive sensitivity radio (-96 dB)
+ high gain antenna (12 dB+)

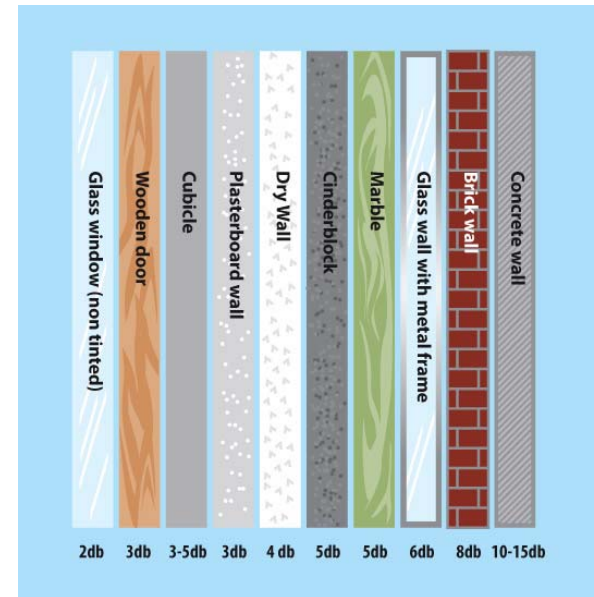


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Building Penetration

dB Loss a function of Material



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Power options

- Need 12 Watt +/- per AP or mesh device
- Light poles – need specific
- High power POE to exceed 100m
- Think about solar

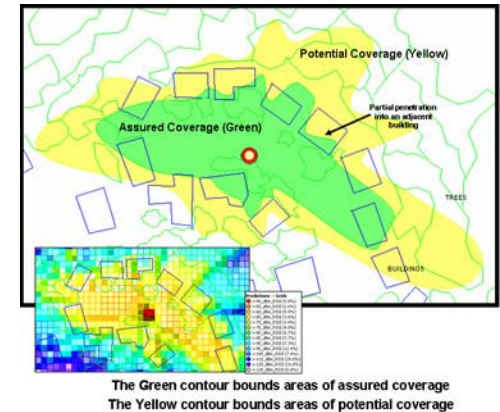


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In Muni, Coverage is Key

- Wi-Fi is in the Air
- Sensitivity + Gain = Coverage
- Use WDS to get around final obstacles
- Are you guaranteeing a service level?



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Branding

- Obvious advantage of deploying
- Portal page
- MultiSSID

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Hosted portal page

- Collect Information
- Advertisements
- Can be localized by zone
- Check your RFP (shared, legal, etc)
- Quality based on web designer



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Branding based on SSID

- Need Multi-SSID/VLAN APs
- VLAN backbone
- Different brandings based on VLAN
- Need VLAN switch/controller



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Security

- What does the RFP require
- Protecting the network is job one



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WEP and WPA

- WEP is fully supported by clients
- WPA is mostly supported
- A support burden
- Use it for administrators and privileged users
- Combine with M-SSID



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802.1x

- Even more complex than WEP
- Requires client software or CPE device
- WPA2/AES is just as good and easier

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Hard coded key in CPE

- WPA2/AES is “unbreakable”
- Add a private service for paying clients
- Use private M-SSID

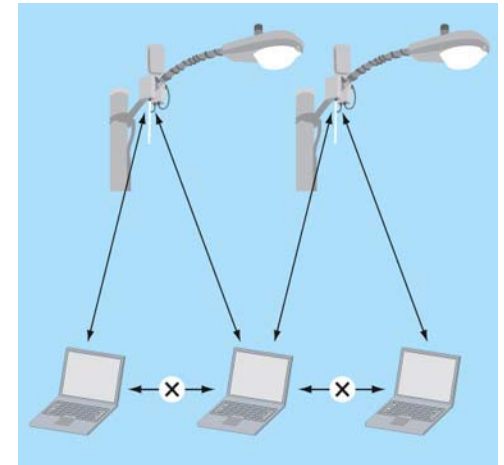


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Layer 2 Isolation

- Important to protect your network
- Keeps users from molesting each other



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Final Comments

- Coverage is Key. Wi-Fi is in the Air.
- Don't obsess over one technology. Choose what is most efficient for the Muni.
- Have a branding strategy and, if allowable, a follow on services strategy.

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