Public Access: The Haunted Network!

Just kidding!

Fundamentals of Hotel and MTU WiFi Deployments

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Who am I and why should you listen to me?

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What is the purpose of this session?

- **To provide insight into the challenges of creating a large public shared-access network**
- **Avoid common and obvious (to me) mistakes**
- **Target audience:**
  - **Cherries or experienced WISPs getting into Hotel and other public access venues**
  - **If you have done a few large installations there may still be some handy tips, but you'll have to pluck them out.**

What will I cover?

- **Selecting hardware**
- **Deploying hardware**
- **Managing large public access networks**
- **Any questions**

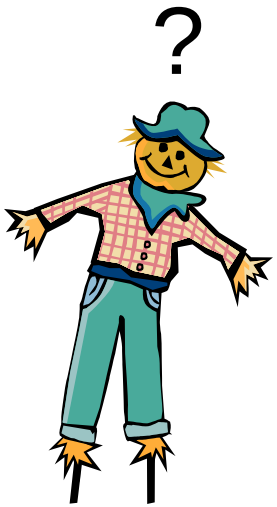
What do I mean by MTU Networks?

- **Multi-tenant units**
  - **Like a Dorm**
- **Hospitality**
  - **Like a Hotel**
- **WISP Networks at a multi-residence business**
  - **Like a Trailer Park**

What do these have is common?

- **No control over client configuration**
  - **Not like an enterprise where IT can order everyone around**

- **Generate new or enhance existing revenue**
  - **Not like a home network on channel 6 with no WEP and the default admin password.**



Selecting Hardware

- **The Challenge is finding hardware that is just right**

Hardware Commodities

- **Antennas**
  - **Just read the spec.**
  - **Don’t be lazy and use all omni-directionals**
- **Cat5 Cables**
  - **Buy a spool and make your own**
- **Routers and switches**
  - **Your Controller will do basic NAT routing**
  - **You will need 4-12+ switch ports for APs**
  - **A PoE Master Switch is a good option**
- **PCU**
- **A single source is useful for when the pieces do not get along**

Hardware Access Points and Controllers

- **Access Points (APs) and Controllers provide and manage the public access network in the hotel**
- **APs broadcast the 802.11b signal**
  - **You want them to be dumb but not too dumb**
- **What is a Controller?**
  - **The brains of the operation. Sometimes called a Gateway, Subscriber Unit, Smart AP, etc., etc.**
- **APs and Controllers will be the most significant installation cost**

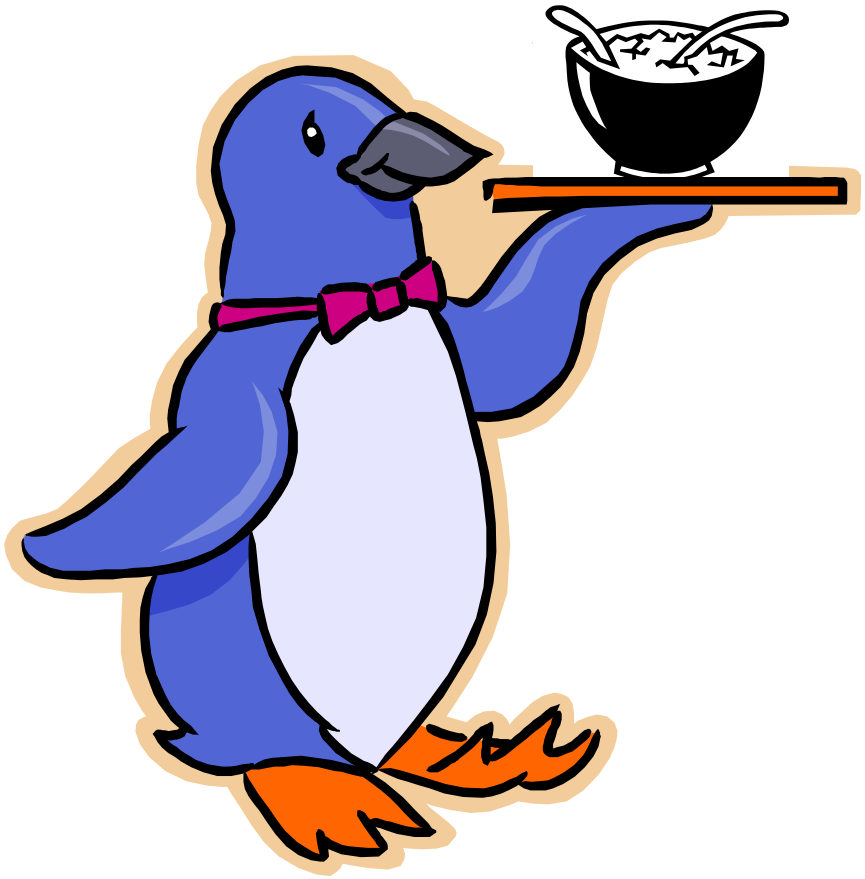
Enterprise Hardware

Enterprise Hardware is too hot

- **Enterprise Too Hot**
  - **As in “too expensive” and too hard to manage**
- **AP**
  - **You’ll pay for stuff you probably can’t use**
    - **VPN Termination, LEAP, PEAP, VoIP**
  - **Client isolation via VLAN requires more VLAN hardware**
  - **Not tamper proof, and you provide your own enclosure outside.**
  - **You can build a really nice public network with these.**
- **Controller**
  - **No Auto-IP, SMTP, branding, local accounts**
  - **Again, you will pay for things you can’t use**

- **Expect to pay $400+ for the AP, $2500+ for a controller**
  - **You’ll need an AMP too, or a giant antenna**

SOHO Hardware



SOHO Hardware is too cold

- **SOHO Too Cold**
  - **As in, not enough features**
- **AP**
  - **The Price is right!**
  - **No Telnet, SNMP, RADIUS, Branding, Auto-IP, SMTP, Client Isolation, or anything good really**
  - **OK for REALLY FREE, as in free for the neighborhood**
  - **Cheap plastic is not going to survive long**
- **Controller**
  - **No such thing**
- **You are screwed if you put these in and have to support the customer and clients. Save yourself!**

Public Access Hardware

Public Access Hardware is just right

- There are a few specialized manufacturers who make hardware for public access
- Public Access APs
  - Weather and Tamper proof
  - 200mW is a ‘nice’ power level
  - Smart enough for 802.1x, WEP, WPA, but not too smart
- Public Access Controllers
  - Solves those email and configuration problems
  - Flexible authentication and branding options
  - Lots of other stuff you need for public access
- What don’t you get
  - Enterprise features like PEAP, VLAN, and so forth

Why go with a single source

- One vendor to abuse
- PoE hardware doesn't always get along
  - It has that pesky PoE algorithm component
- Wireless Distribution/Repeater hardware does not always get along
  - Different chip sets don't get along, and some vendors customize the standard protocols (Cisco!)
  - Even firmware revisions of the same hardware can clash
- Consider cost vs. benefit
  - You can get bits and pieces cheaper, but how much cheaper?

Deploying Hardware

- **The Challenge is guaranteeing a minimum level of service**

- **Tricks: By “tricks” I mean nasty surprises, not clever ideas!**
- **Treats are just treats**

Your hardware is just right, so now what?

- **Please do a site survey!**
  - **At least survey the WiFi environment**
- **Get a spectrum analyzer too.**
  - **Get a cheap one on ebay if you must**
- **Check out one of WispCon's fine site survey tutorials!**
- **If you are flush, there are some cool virtual site survey tools**
- **Don't be lazy. Going back to fill in dead spots is going to kill your bottom line.**

How many APs do you need?

Some AP/building material rules of thumb:

- **West Coast = Steel or wood frame construction**
  - **You can cover about 15 rooms per high-power AP**
- **East Coast = Brick or concrete**
  - **You can cover 10 rooms or less per high-power AP**
- **Of course, only your site-surveyor knows for sure**
- **Battling dead spots costs far more than a few $200 APs**
  - **Err on the conservative side**

Building coverage treats

If you have a long thin building . . . With good size windows . . .

- **Try shooting the signal in from the outside!**
  - **This can be good for resorts with views**
- **Don’t get too excited . . .**
  - **If you need a tower or rights to mount surrounding buildings, this may not save you any money**
  - **Watch out for dead spots**
- **Combine indoor and outdoor coverage for maximum efficiency**
  - **Those indoor/outdoor APs really come in handy!**
  - **You have to cover the pool in any case . . .**

Building coverage tricks

- **Tall truss construction buildings from the 70s may have sheetmetal under the concrete floors**
  - **You AP is not getting through that.**

- **High power Omnis in the corner**
  - **If you stick a 12db omni against the wall you may get horrendous multipath reflections and end up worse off**

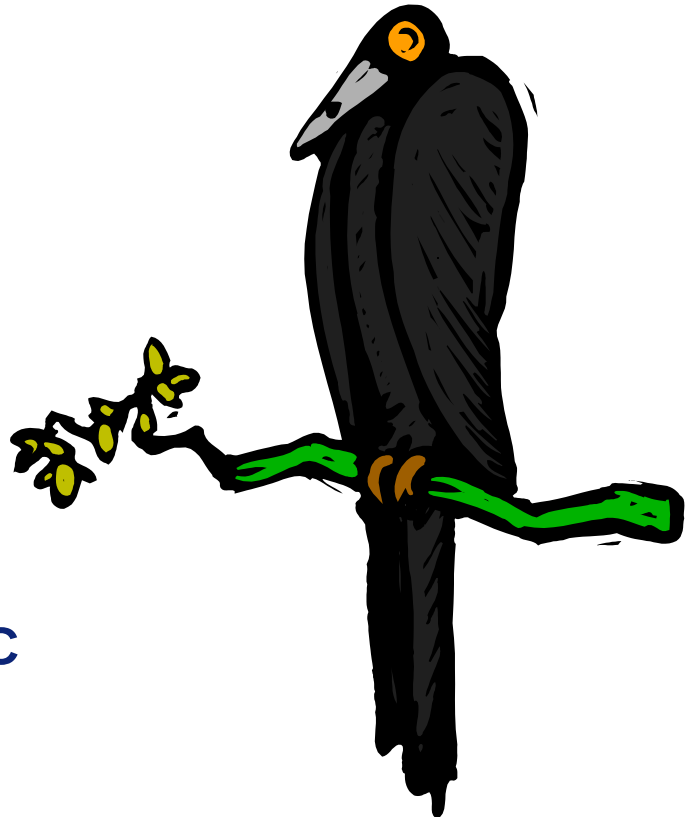
Interference Treats: The fantastic four

- **Channel 1, 6, 11 have no interference**
  - **But some configurations require more channels**
- **Channel 1, 4, 8, 11**
  - **Interference is not linear, it follows a bell-like curve**
  - **Adding this extra channel only adds about 3% interference/noise**
  - **Customers cause more than 3% walking down the hallway**
- **In our experience Channel 1 works better outdoors**
  - **This is Voodoo with no scientific explanation**
- **Just because you don't see a SSID doesn't mean that channel isn't occupied**
  - **Do a site survey, dammit! Do it! Do it!**
  - **Or just try some different channels.**

Interference Tricks

- **Every SOHO AP in the world in on Channel 6**
- **RSSI is the AP/Clients guess at the signal quality**
  - **This accuracy of this guess varies from ‘pretty good’ to ‘WRONG’**
  - **Only a spectrum analyzer knows the truth**
- **Just because you don’t see a SSID doesn’t mean that channel isn’t occupied**
  - **Do a site survey, dammit! Do it! Do it!**
  - **Or just try some different channels.**

PoE



Shall your network maven install AC power on each floor?

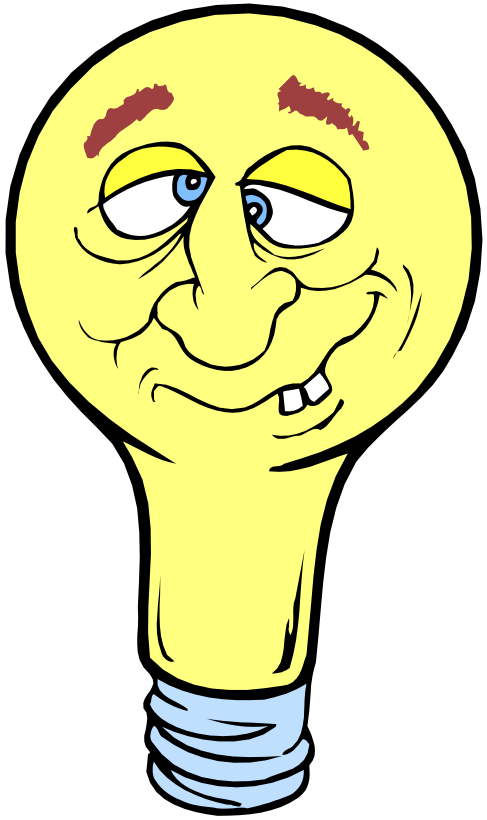
Qouth the Maven, “Nevermore!”

Power over Ethernet

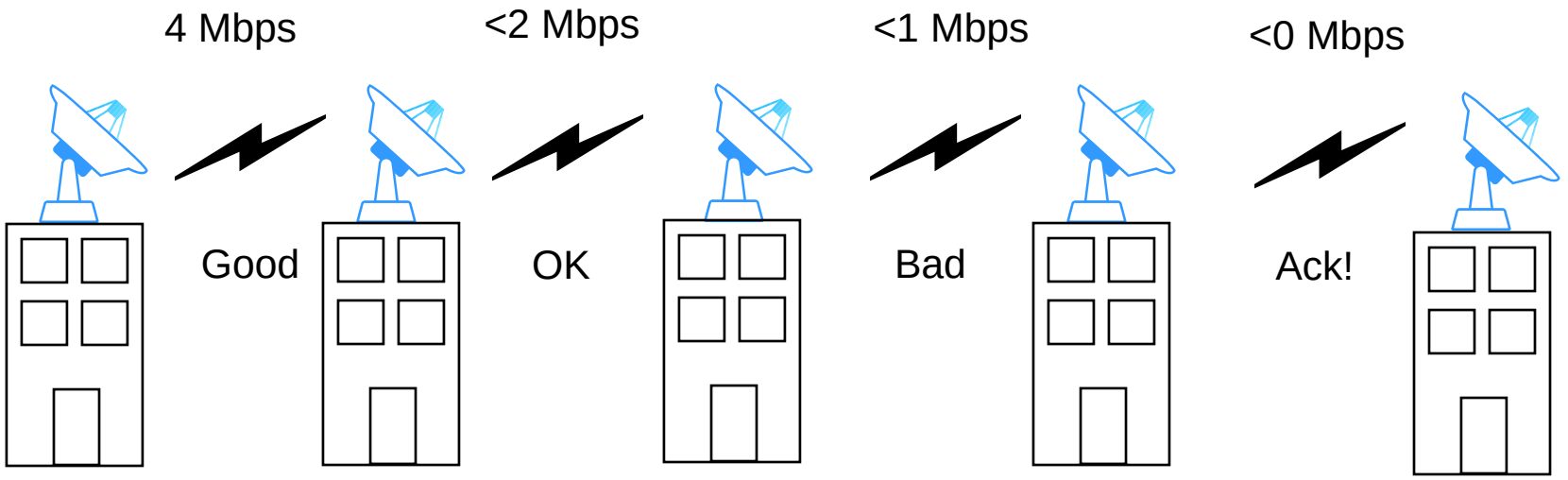
- **Power over Ethernet (PoE) is a huge money saver**
- **You can run power and data 300 feet, maybe farther**
  - **Works outdoors too!**
- **PoE injectors and splitters do not always get along, so this is a good place to single source the hardware**
- **A PoE master switch does both injection and switching**

“I’m going to save tons with 100% repeaters!”

- **Wireless Repeating Blows**
- **Wireless Bridging or Wireless Distribution System (WDS) sounds fantastic**
  - **You can run a WiFi backbone with no cabling!**
- **But WDS has some serious limitations**
  - **Everyone downstream from the 10/100 ethernet hard connection shares that 11Mbps (really you’re getting 4Mbps)**
- **Used appropriately, WDS is an excellent technology**

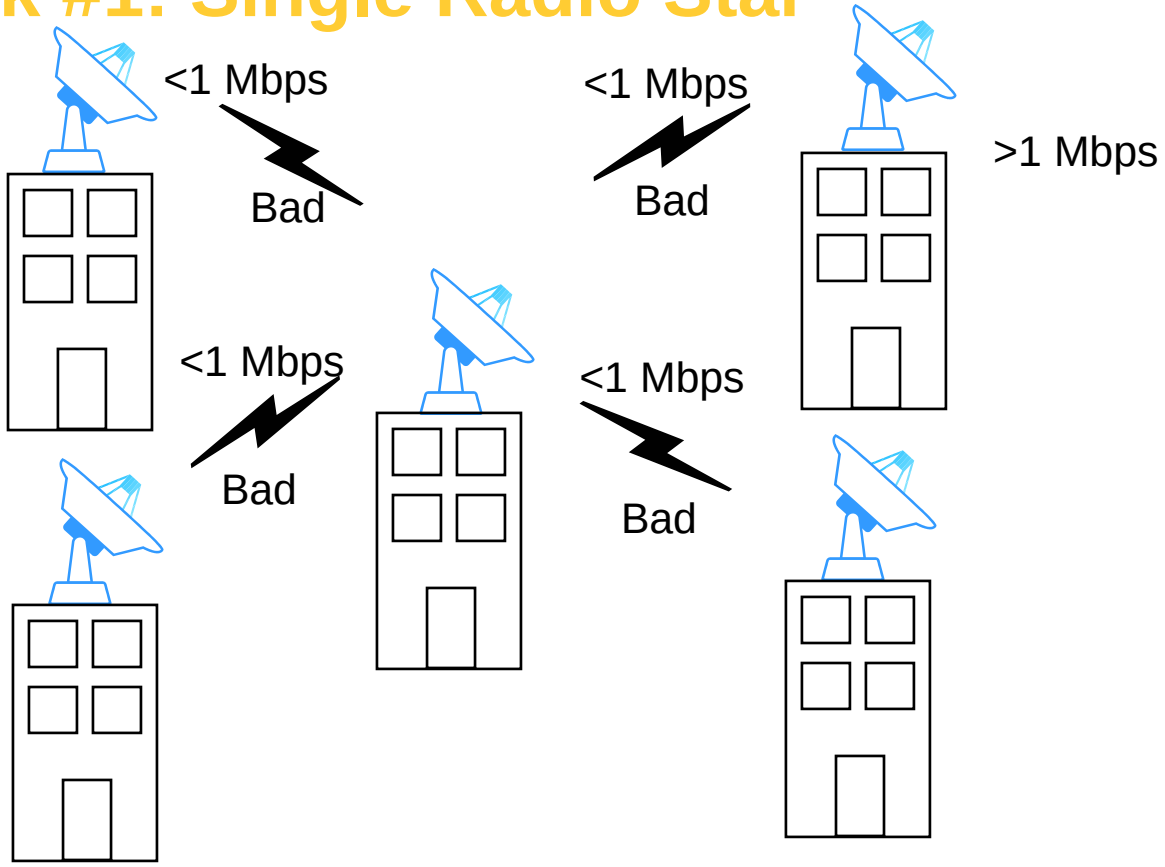


Repeater Trick #1: Daisy Chaining Repeaters



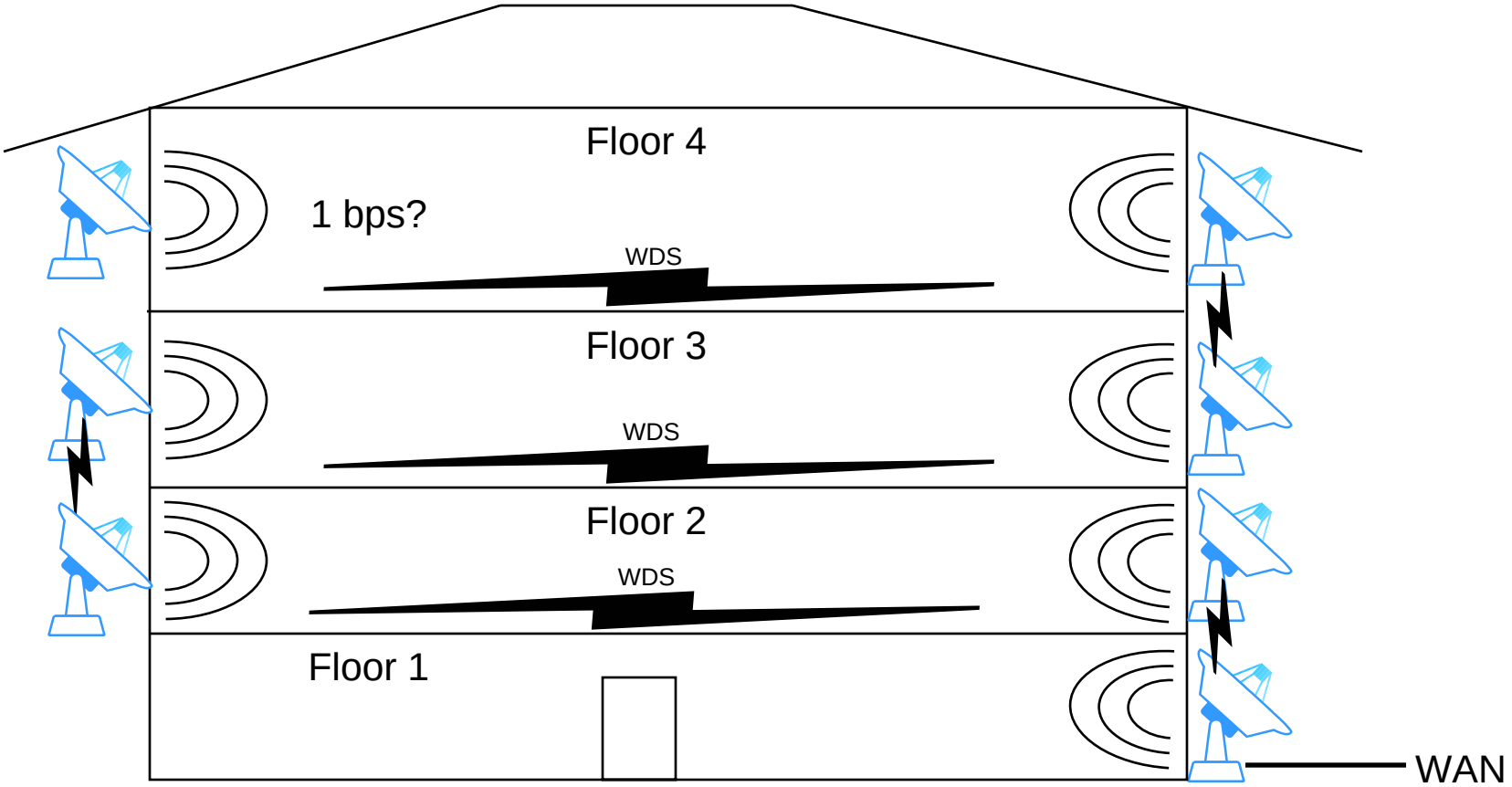
- **Each hop more than halves your bandwidth**
- **Two hops is probably OK**
- **This is an area where .g and .a can help**
  - **.a is especially good because it does not take up a channel**

WDS Trick #1: Single Radio Star



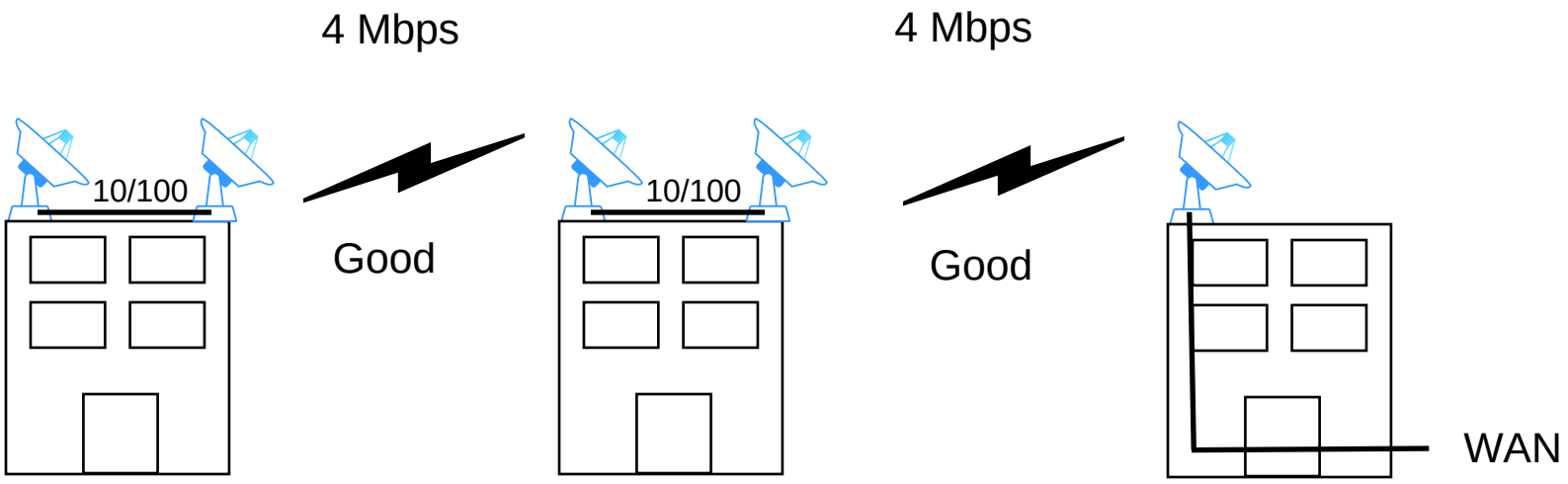
- **You can establish six WDS links from one radio, but please don't**
  - **With .a or .g this might be OK.**

WDS Trick #2: The All Wireless Hotel!



- **Even with all wireless bridges the latency would be deadly**
- **At least it's cheap to put in . . .**

WDS Treat: Dedicated links



- **Dedicate a radio to each WDS Link**
  - **For the star, you would have 4 radios in the middle**
- **You can get dual-radio Aps that are good for this**
- **Using .a or .g, you can create a nice backbone!**
  - **Bad news: Your All Wireless Hotel is still not going to work because of the latency and administrative overhead**
- **Don’t let clients on the backbone radio!**

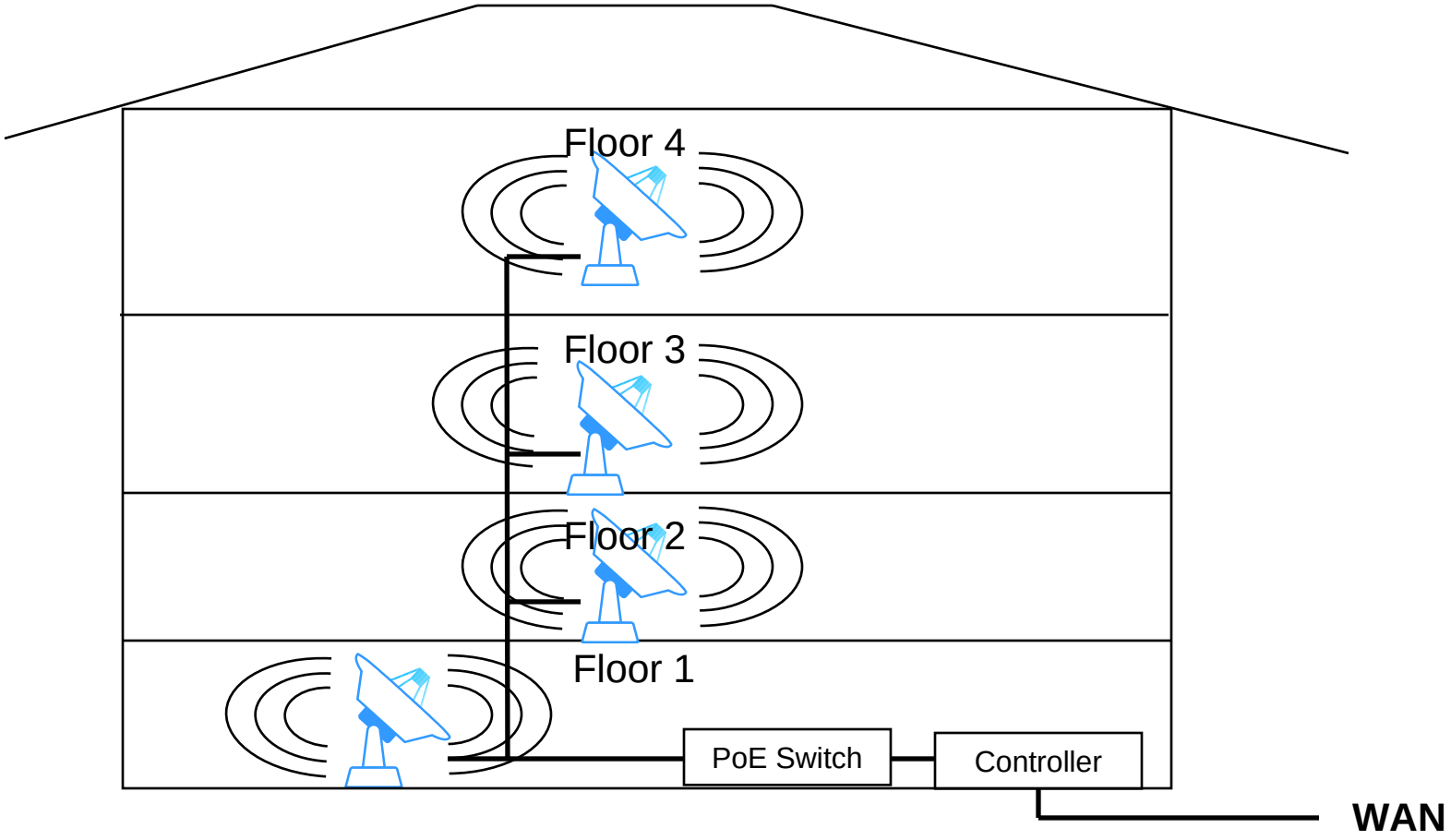
The long and winding hall

- A typical hotel hallway is too long to cover with one AP
  - If you want to get into the rooms that is . . .
- Two directionals are called for
  - A 12dbi patch plus a 200mW AP is a very good and compact solution
    - It’s FCC compliant too!
- You can get a cool AP that goes in the middle with two opposing Antennas
- Consider .a backhaul if you are using WDS and are low on channels

What does it all mean?

- **Let’s synthesize everything we have covered into some venues .**

No-tell Motel: The obvious



- **East coast, 4 story concrete with plaster interior**
- **Single Cat5 backbone, single AP design**

No-tell Motel Tricks and Treats

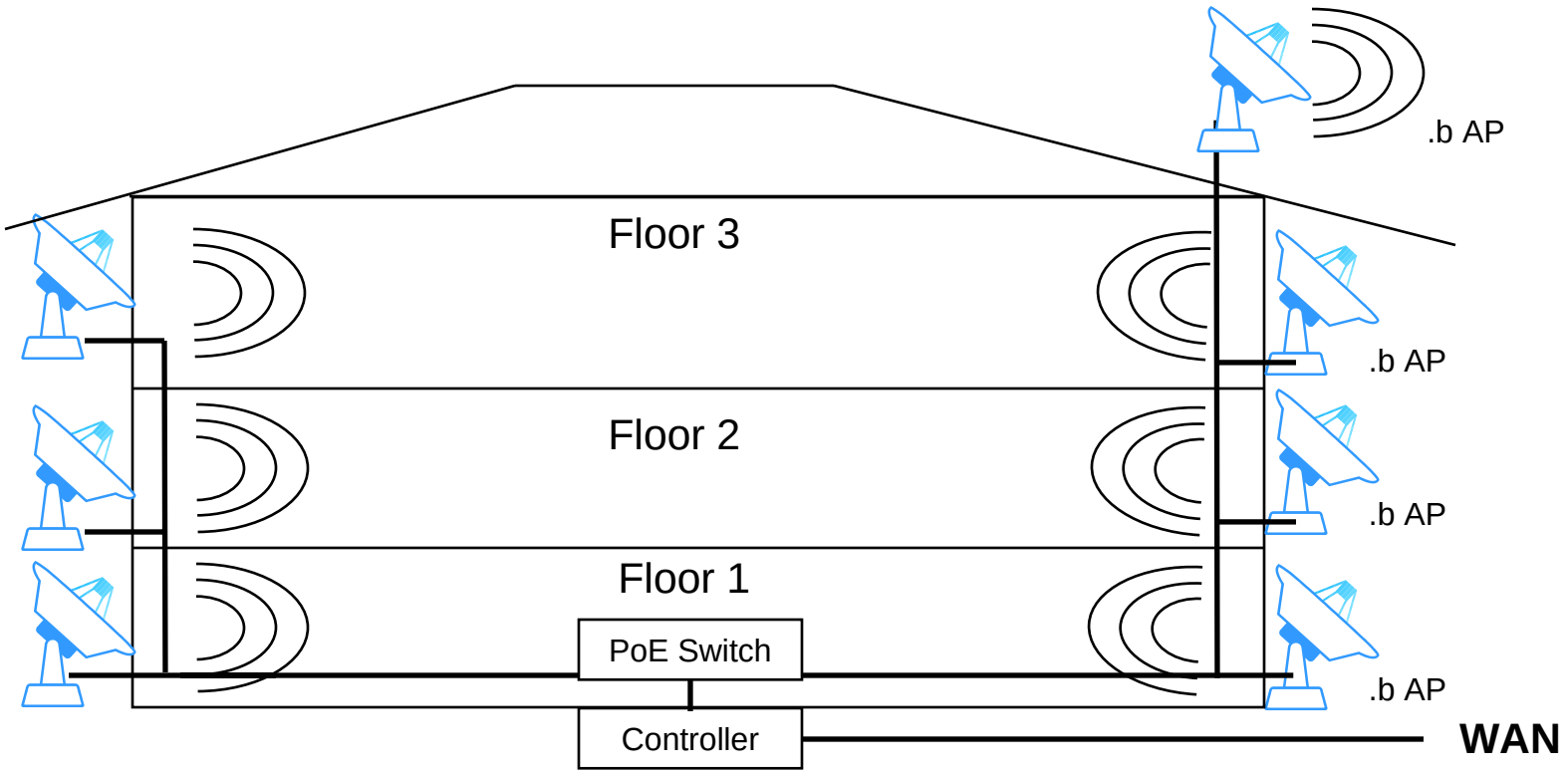
- **Treats**
  - **Simple installation**
  - **Simple configuration**
  - **Low hardware cost**

- **Tricks**
  - **Dead spots at ends of hallways**
  - **Cable runs require conduits or drilling**
    - **Don’t assume the venue owner can or will give you conduit access**

- **Shopping List**

- **4 802.11b APs**
- **4 8db omni antennas**
- **8 port PoE master switch**
- **1 Network Controller**
- **Pigtails, cat5, etc.**

Hotel California: maximum service level



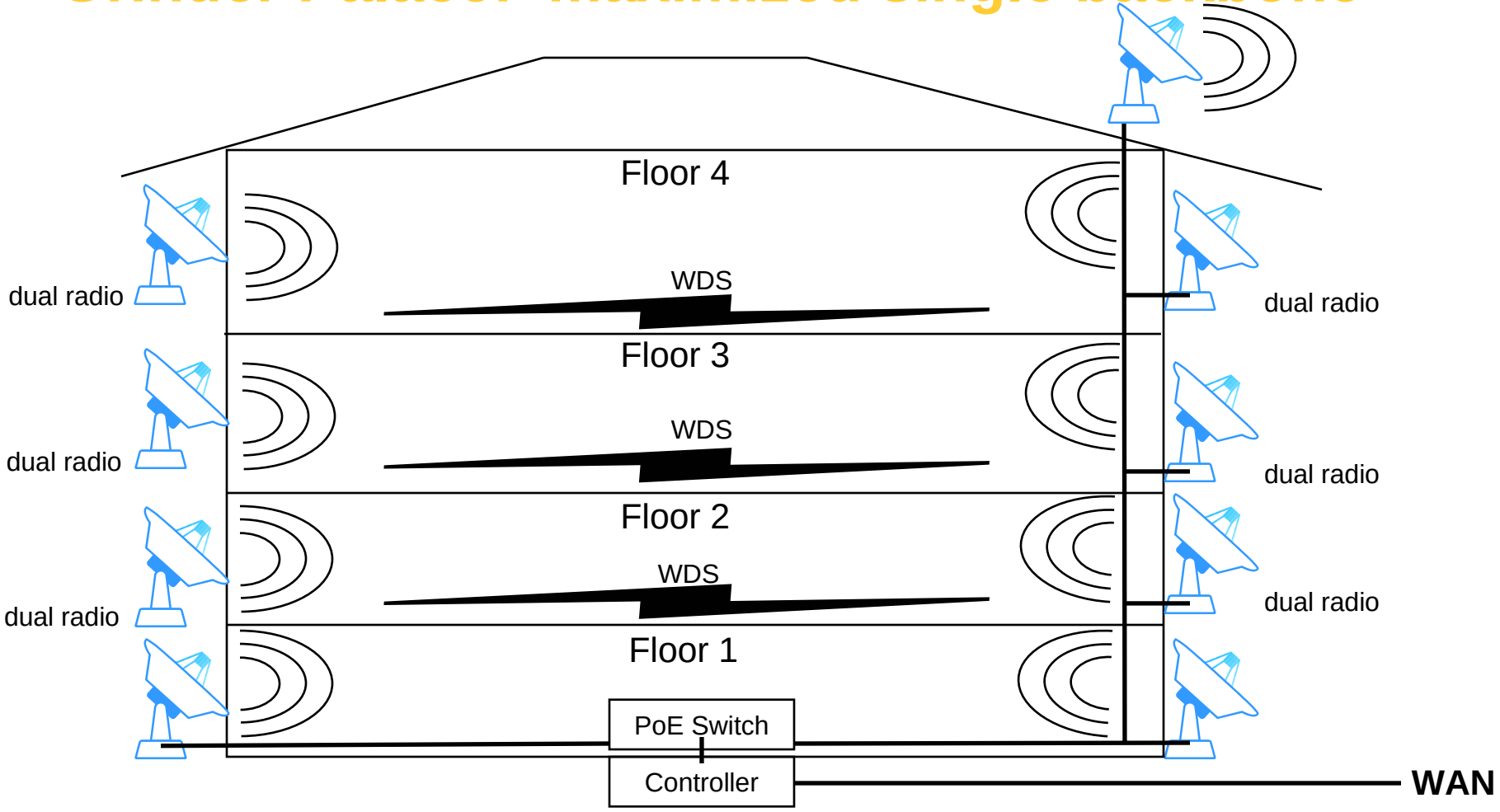
- **West coast, 3 story all concrete**
- **Double Cat5, double AP design**
- **Pool coverage included using outdoor AP**

Hotel California Tricks and Treats

- **Treats**
  - **No dead spots**
  - **Excellent throughput**
  - **Integrated Antennas in APs can reduce cost and complexity**
  - **Pool and cabana coverage too!**
- **Tricks**
  - **Higher hardware cost**
  - **Double cable runs**
  - **Interference between floors makes 4 channels desirable**
- **Shopping List**

- **7 802.11b APs**
  - **Integrated 12db patch antennas**
- **8 port PoE master switch**
- **1 Network Controller**
- **Pigtails, cat5, etc.**

Grinder Palace: maximized single backbone



- **West Coast steel frame, 4 floors**
- **Single Cat5 backbone plus WDS**
- **My personal favorite**

Grinder Palace Tricks and Treats

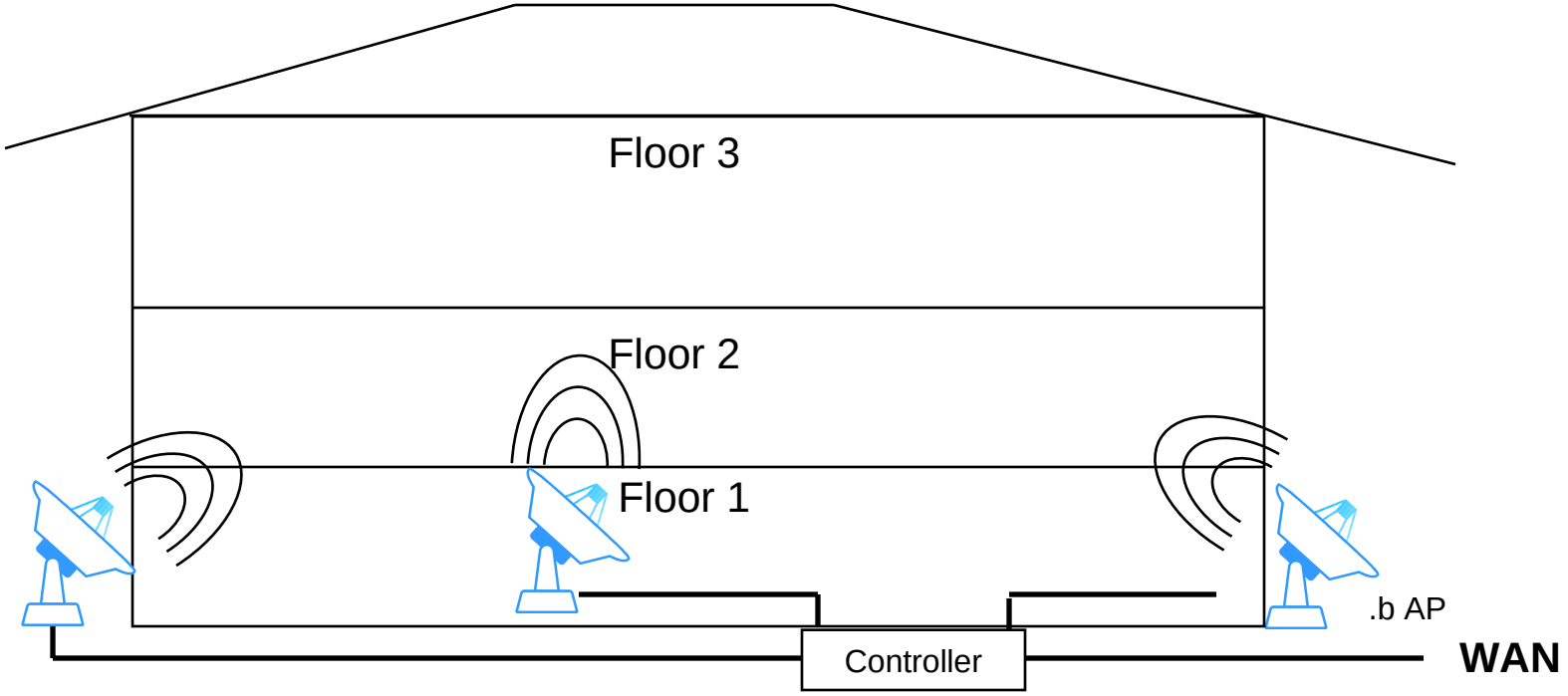
- **Treats**
  - **Like double backbone, no dead spots and excellent throughput**
  - **Dual Radio APs reduce cost and complexity**
  - **Reduced cable run cost (can be a lifesaver at 1k/floor)**

- **Tricks**
  - **Higher hardware cost**
  - **Complex configuration**
    - **Definitely need 4 channels.**

- **Shopping List**

- **6 802.11b dual radio APs**
- **15 12db patch antennas**
- **8 port PoE master switch**
- **3 802.11b APs**
- **1 Network Controller**

Super Econo Six: WiFi on the cheap



- **West coast, 3 story steel frame**
- **No backbone, 1st floor APs only**

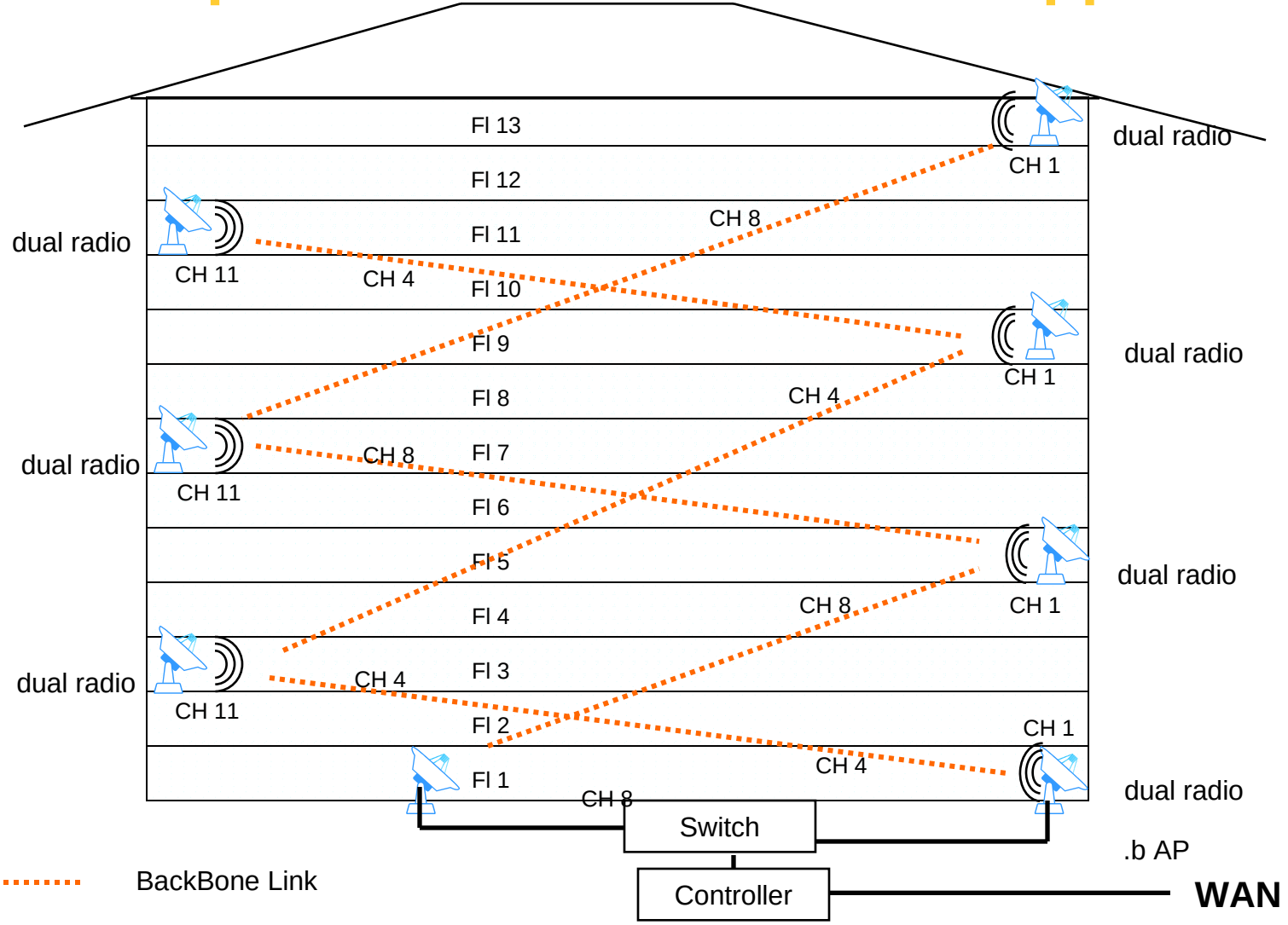
Super Econo Six Tricks and Treats

- **Treats**
  - **Lowest possible hardware cost**
  - **Throughput good if clients get signal**
  - **Simple setup with no cable runs**

- **Tricks**
  - **Dead spots likely**
  - **No PoE, so Need AC drops for APs**
  - **Not recommended, but sometimes you gotta honor your lowball bid**

- **Shopping List**
  - **3 802.11b APs**
  - **3 12db+ patch antennas**
  - **1 Network Controller**

The People's Glorious Dorm: The Zipper!



- **West coast, 13 floor concrete monstrosity**

The Zipper Explained

- This crazy design is not for the faint for heart!
- Backbone is 18db panels
  - Alternating sides eliminates need to split antenna signals
- Can it really work?
  - Well, the backbone works . . .
  - Expect dead spots, especially for weak clients like PDA
- We don’t really recommend this, but it illustrates some ideas

People's Glorious Dorm Tricks and Treats

- **Treats**
  - **Insanely low hardware cost for this structure**
  - **Crazy design will impress other WISPs**

- **Tricks**
  - **Dead spots likely**
  - **Configuration very complex**
  - **Not recommended, but sometimes you gotta honor your lowball bid**

- **Shopping List**

- **7 802.11b Dual Radio APs**
- **7 12db+ patch antennas**
- **8 18db path antennas**
- **1 802.11b AP**
- **1 Network Controller**
- **Dumb switch**

What's in the public access bag?

Tricks and treats (more tricks, really)

Things clients do at your hotspot

Surf the Internet

Things clients do at your hotspot

Read Email

Things clients do at your hotspot

Mischief

Things clients won’t do

- **Configure anything**
- **Install anything**
- **Refrain from complaining about ‘free’ service not working**
  - **Heaven forbid they are a paying subscriber**

What about YOUR customer

- **Your customer is a hotel owner, marina operator, university, or so forth.**
- **They want people to know it's their network**
  - **Maybe a branded splash page**
  - **Some ads even?**
- **The bellhop is not going to be fixing people's laptops**
- **Billing options**
  - **Some like it prepaid, some like it "free", some like it on a credit card**
- **They want to say "this is a secure network" with a straight face**

Finally, the public access requirements

- **802.11b**
- **Support-free**
- **Branded**
- **User Authentication**
- **Security Fig Leaf**

Public access requirements: 802.11b

- We need 802.11b and some kind of WAN connection, duh!
- What about 802.11g? .g rules!
  - .b is fine today, next year put in .g when prices are down and more clients are using it, particularly Centrino.
  - .g only helps when you have a strong signal, so unless you are putting APs in every room, clients are not going to get 54Mbps
- What about 802.11a? .a also rules!
  - .a is for enterprise, forget it.
    - OK, it's good for backhaul, more on that later

Public access requirements: Support

- **Support will eat your profits and enrage your “service oriented” customers**
- **Therefore: You must eliminate support**
- **Address any problems transparently, or you are going to pay!**

Support headache #1: Misconfigured clients

- **Misconfigured clients are inevitable, so the network must be self-configuring**
- **Enterprise users have various annoying settings**
  - **HTTP proxies, static addresses, and other fascist IT ploys**
- **Heaven knows what home users have done to their system**
  - **Could be any strange combination of settings**
- **You need a technology that ignores clients settings and provides network access anyway**
  - **“Auto-IP” for static or misconfigured client IP settings**
  - **“Auto-Proxy” for clients with HTTP Proxies configured**

Support headache #2: Email

- **In their hatred of Spam, many SMTP servers will not accept mail from a public/unknown network**
- **This means: Clients sent email will be rejected with an unfriendly message**
- **This is especially true of DSL-based services**
  - **Cable is often OK, since the SMTP Server uses authentication**
- **You need to capture client email and redirect it to your own SMTP server**

Chilling tales of public access

"Once there was a cursed free WiFi network, and all who logged on with a Static IP address were doomed to wander forever on the LAN with no internet access. Those with DHCP had HTTP Proxies and forever heard the mournful words "Cannot find server or DNS error". Worst of all, the lucky few with perfect settings were silenced for all time because their company SMTP server would not accept email from outside the enterprise network.

And the IT manager had a hook for a hand!"

Public access requirements: Branding

- **Your customers want their name and message on the network**
  - **Use HTTP redirect or a “captured portal”**
- **They may want “terms of service” enforced as well**
  - **Requires redirection plus authentication**

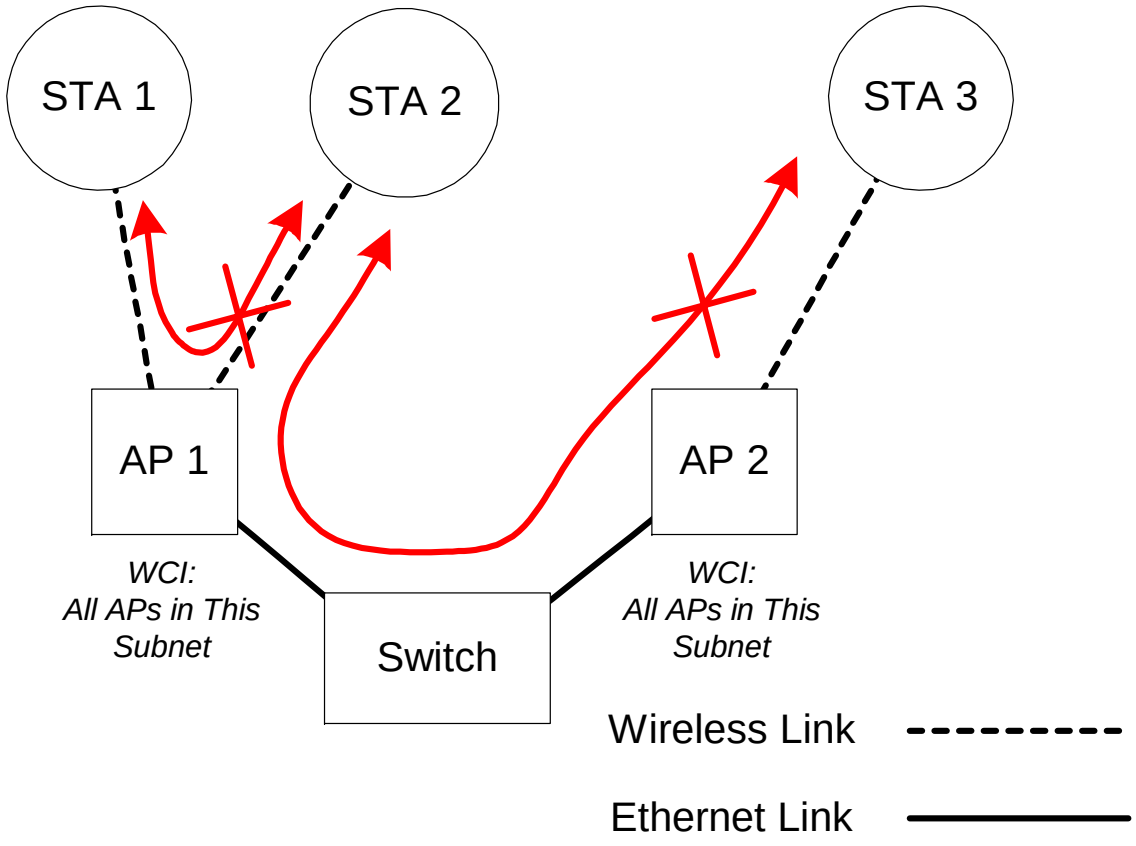
Public access requirements: Authentication

- **Any billing model relies on authentication**
  - **Duh!**
  - **Having both local and RADIUS authentication covers you bases**
- **“Free” access relies on authentication as well**
  - **Huh?!**
- **When your customer says “Free” he means “Free for paying guests/customers”**
  - **You can authenticate transparently based on MAC Address**
- **Authentication enforces terms of services as well**

Public access requirements: Security

- **But I need maximum, total, and impenetrable security!**
  - **Sounds fabulous, but how?**
- **WEP? WPA? 802.1x?**
  - **You can't configure the client**
  - **Revealing the key to the public makes it, uh, public**
- **PEAP or LEAP? Dream on . . .**
- **You need something simple and transparent**
  - **Layer-2/Wireless Client isolation . . .**
  - **VPN-passthrough**

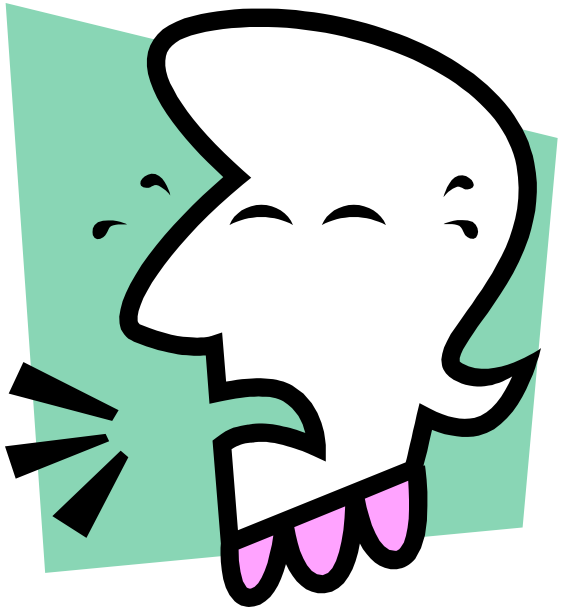
Wireless Client Isolation



- **Clients can't ping, hack, or otherwise annoy each other.**

And what do you want?

Don’t tell me what I want!



Fine. What does an integrator/WISP in your position GENERALLY want?

- **Low installation costs**
  - **Gotta weather those lowball bids**
- **Low ongoing costs**
  - **Too many support calls, or a truck roll, and you are in the red for the month**
  - **Remote management is a must**
- **Clients to refrain from stealing, unplugging, or resetting the hardware.**
  - **Need something rugged and inconspicuous**

Other useful things for public access

- **Your own Network Operations Center (NOC)**
  - **Billing and credit-card software**
  - **RADIUS AAA**
  - **Remote network management tools**
- **Printing**
  - **No drivers of course, so use a local or web-based print server**
- **VPN Termination**
  - **Could be a value-add for convention centers**

The ValuePoint Ad!

- **We just do public access hardware**
- **Check us out at www.valuepointnet.com**
- **Contact me sometime, I am always interested to hear where WiFi is going up**

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Any Questions?