False God of dB...

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In the Wireless LAN world we have started to worship in front of the False God of dB. Books, white papers, study guides, and design manuals have touted the value of the RSSI (Signal) so much we have begun to use this as a sole way of designing and evaluating our Wireless Networks. RSSI is a false god and we need to mature and move past having 'Signal' be our main goal in WLAN designs!

Signal is Immensely Important!

I'm not in the least bit saying Signal levels – RSSI – is not terribly important in our WLAN designs. It is **critical** – **required** and even **mandatory**. But it alone is not sufficient.

To give an analogy of a wired network. Connectivity – the ability for the copper pairs to conduct electricity at a certain level is paramount on getting wired networks to work.

RSSI (Signal Strength) is mandatory. Without it, nothing works.

RSSI (Signal Strength) is to a Wireless LAN what connectivity is to a Cat6 cable. It is a base level requirement. Without it, nothing works.

Compared with Category 6 Cabling

But just as connectivity in a Cat6 cable isn't the only factor to determine if a cable run meets the design characteristics, RSSI (signal strength) isn't the only factor to determine if a wireless network meets its design characteristics.

Cat6 cable actually means cable that meets the Category 6 physical requirements as defined by the TIA/EIA organization. Including not only connectivity, but near-side crosstalk, far-side crosstalk, pin-outs, cable twist ratios, etc.

In a wireless LAN design we require a certain level of signal strength, but that alone is not sufficient. In our industry we have yet to find a group to take on the responsibility of defining the specifications for a 'Voice-Grade' WLAN or a 'Video-Grade' WLAN, let alone even a generic 'Data-Grade' Wireless LAN. We are still in the early stages, and each vendor is defining their own specifications.

WLAN Design Specifications

I've started a project, working with other CWNEs to develop a WLAN Design Matrix to help codify and analyze the various vendor's recommendations for Wireless LANs.

In this early stage of that process we have already defined nearly one hundred unique identifiers and specifications collected from the various WLAN Vendors.

RSSI is merely the baseline of signal strength. There are many more categories of WLAN requirements.

Of course the first one is always 'RSSI' – or Signal Strength. But that is merely the baseline. On top of the Signal Strength there are many more categories of WLAN requirements.

Some vendors require an 'Overlap' (see other article on the fallacy of channel overlap)

Other vendors specify the co-channel interference at very specific levels.

Still others also add data rate support, number of devices per AP, minimum MCS requirement, and many many more.

Some of the requirements are based on designs for the STAs, or clients. Others are specifications for the Access Points and cabling.

Together all these requirements must be met in order to properly deliver the Wireless LAN that will work with the vendor's devices.

Do you know all the design specs for your vendor's products?

How can you tell if your wireless LAN meets those specs?

Car Analogy

In my consulting practice, and WLAN training classes I like to give the following analogy concerning the design of wireless LANs.

White working on a consulting gig with the Auto industry in Detroit – I was frustrated with their lack of understanding why their wireless LAN originally designed for data, and that worked very well with data was failing so miserably as a VoIP network.

My answer to them led to this analogy.

If you were an automobile designer and your bosses came to you and asked for a vehicle. Vehicle defined as a system of wheels, engine, seats, frame, and shell. They asked for a vehicle to be designed that

could carry two adults, travel at freeway speeds, and carry a 2200lb payload. You'd answer that's pretty easy, I'll build you a truck! The truck would meet all their design specs and everyone would be happy.

If later, they came and asked for you to design a vehicle that could do a sub-5 second 0-60mph, with great cornering characteristics, and had a very low drag coefficient. Well then, you'd design for them a little light-weight, high powered, sports car. All would be pleased.

Then finally they come and request a vehicle that can easily carry seven adults and their luggage, with lots of cup holders, easy entry/reentry. You'd give them a Mini-Van. Again, all would be pleased.

The problem happens then the truck owner thinks since he already has a vehicle, it ought to go 0-60mph in 4.2 seconds. Almost as an afterthought the person who purchased a truck asked you to make his truck become a racecar. Sure, it is possible… but at a very high cost. You could take out the old engine and replace it with a much stronger one, but since the truck was originally designed for carrying a heavy payload, it is built with a heavy suspension and dual-I-beam construction. In order to get it to have a fast race time, you'd also have to replace many of the 'guts' with carbon fiber composite parts! Even then, it wouldn't be a good truck, or a good racecar.

Certified Magazine Readers

Sometimes our bosses are like the bosses in the above vehicle analogy. They have read something in a magazine about Wireless LANs doing Voice over IP, or Video, or Location Tracking. And so come to us asking to simply 'add' this feature to the existing wireless LAN.

Many of the design characteristics of these services require, indeed demand, mutually exclusive design goals!

VoIP might be the racecar design, it doesn't carry a lot of payload, yet needs to have very high tolerance and characteristics for the small set of data it does carry.

Web Surfing and large file transfers are more concerned with the size of the 'pipe' and can easily live with retries and temporary changes in the quality of the 'pipe'.

RFID tagging and location tracking needs to have lots of access points and in certain locations to support accurate triangulation, but those extra APs can cause more co-channel interference and make larger collision domains, thus lowering throughput.

Just because your boss read in a magazine about another company's fast racecar, doesn't mean your company's truck will be a good vehicle to use for drag racing!

Know Your Design Requirements

My clients constantly amaze me when I ask them to define for me the design requirements of their WLAN devices.

If you don't know what you are designing your Wireless LAN for, how can you know when you've achieved the proper WLAN design?

They don't know what the design characteristics are!

If you don't know what you are designing your Wireless LAN for, how can you know when you've achieved the proper WLAN design?

In the automobile industry no designer would willingly take on the job of designing a 'Vehicle' – not knowing the other characteristics.

In the wired network world, no 'cable-puller' would start pulling barbed-wire to each desktop! Barbed wire will easily meet the 'connectivity' goal – but obviously not any of the other Cat6 specs!

But somehow in the wireless LAN world we allow ourselves to do just that. We design wireless LANs without specific design goals, we design for only 'coverage' or RSSI. Then we later wonder why the wireless LAN doesn't work…

If you don't know the specific design parameters your client stations need/require, your wireless LAN will NEVER meet those goals!

Conclusions

Yes, Yes, Yes, and Yes… RSSI is VERY IMPORTANT! But is it NOT the ONLY goal you should be designing for.

You don't design wired networks with 'barbed-wire' – don't design your wireless LANs with ONLY RSSI!

Wireless LAN Training/Consulting
Keith R. Parsons, CWNE #3
Managing Director
Institute for Network Professionals
281 South Vineyard Road - #104
Orem, UT 84058-2005
+1 801 223 9444 - office
keith@inpnet.org
http://WirelessLANProfessionals.com
http://twitter.com/keithrparsons