Wireless that works

How to interview potential suppliers

Vantage Point Network Systems

How to use this document

If you're implementing a wireless network, chances are you will interview more than one supplier for the job. Over the past twelve years we have built a successful business fixing other suppliers' mistakes – some costing hundreds of thousands of dollars – in warehouse, hospital, office and education environments. Here are the 5 RED ALERT areas:

1. A supplier with limited understanding of the complexities of your environment.
2. A supplier whose core business is selling hardware.
3. A supplier who has limited knowledge of WLAN and WAN integration.
4. A supplier who says you don't need a site survey.
5. A supplier who doesn't survey with the same equipment you will be using.

On the following pages we have outlined the critical areas of wireless your chosen supplier will need to know. Use this as a reference during the interview process to determine each supplier's level of expertise. Your final choice will make a difference between a system that works flawlessly, and one that will cause ongoing hard-to-remedy problems that result in frustration and dissatisfaction for users and management.

In your conversations with suppliers be sure they can answer any and all of your questions about everything from the science of RF (the driving force behind wireless) to the details of how they will perform site surveys and use that data to design your wireless system.

How much do they know about the science of RF?

Frequencies & Data Rates

- 802.11b = 2.4Ghz @ 11Mbps max data rate
- 802.11g = 2.4Ghz @ 54Mbps max data rate
- 802.11a = 5.0Ghz @ 54Mbps max data rate
- 802.11n = 2.4GHz & 5.0GHz @ 450Mbps max data rate

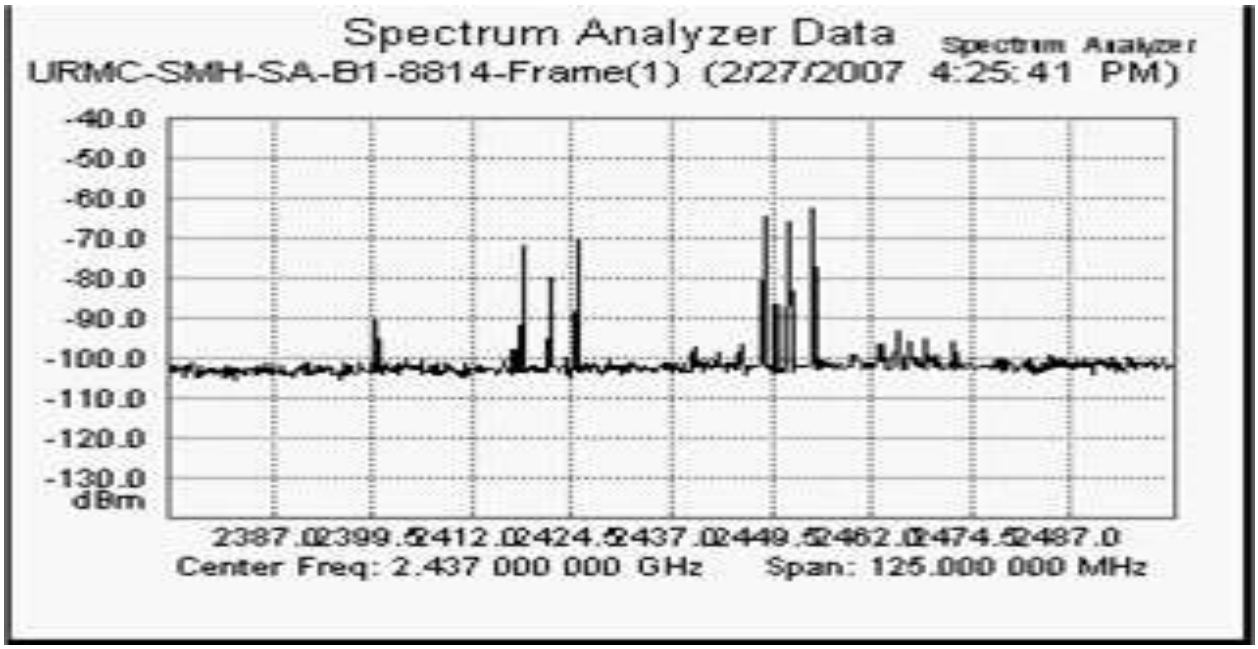
Key Wireless Terminology

- The Decibel (dB) – Power
- Receive Sensitivity – The ability to hear
- Transmit gain – The ability to talk
- Diversity – How many ears…
- MIMO – Multiple Input Multiple Output
- Antenna types (omni vs. directional)
- Front-to-Back ratio
- Noise Floor & interference
- Hidden Node
- RF absorption, reflection, multi-path

Can they provide spectrum analysis?

Spectrum Analysis / Site Surveys ⇨ Physical Design)

- Determine if there is broadband noise in the environment
- Determine sources of broadband noise or harmonic interference

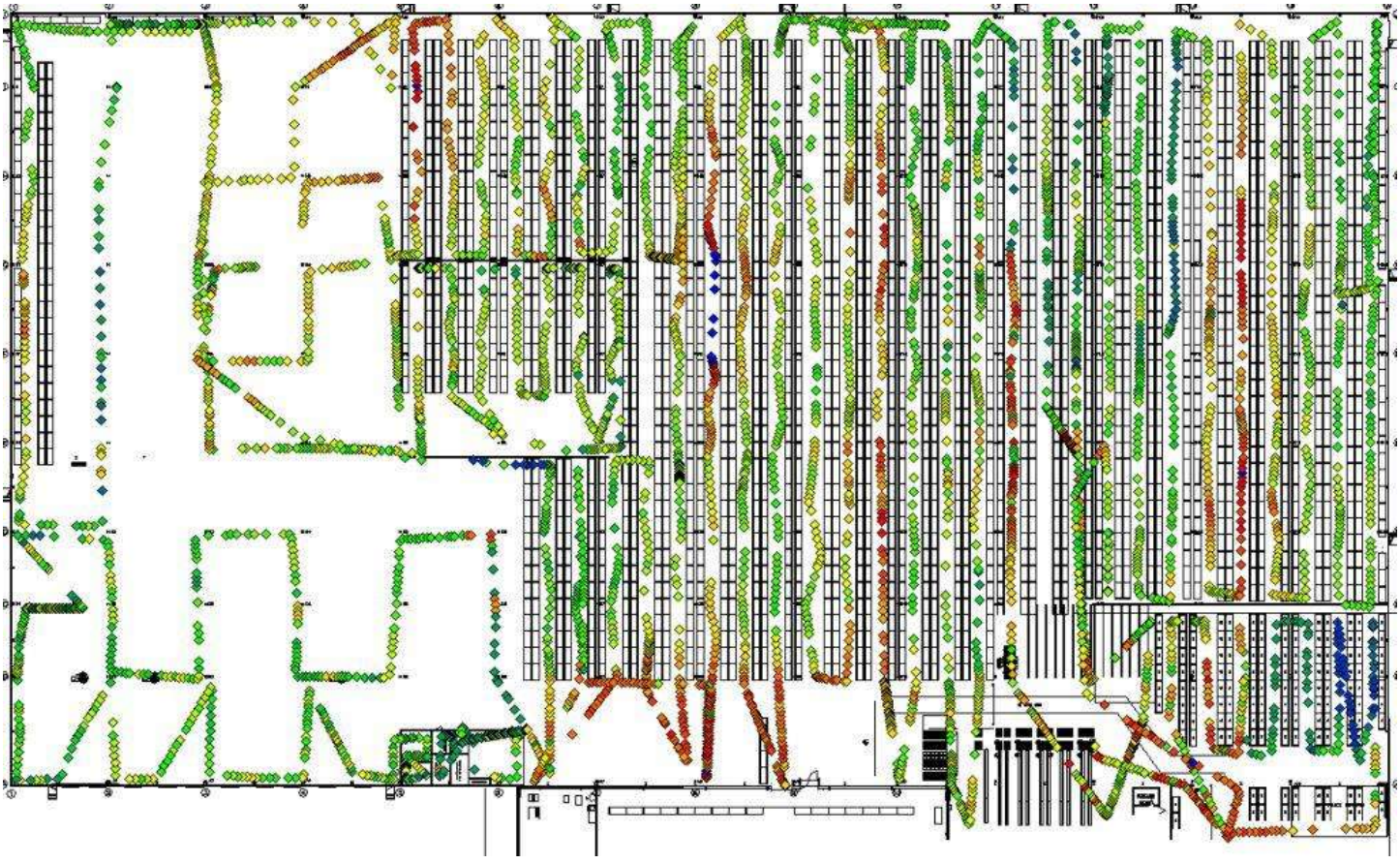


Do they know how to engineer so you have no dead zones?

Extensive data collection required – bread crumb trail of the surveyor

- True RF signal strength requires careful and extensive data collection to eliminate coverage holes that come from unexpected physical obstructions (i.e. re-enforced concrete walls with dry wall covering, lead-lined walls for testing, x-ray rooms, etc.)

- Collecting data points in every corner of every room provides seamless coverage for roaming with mobile devices.

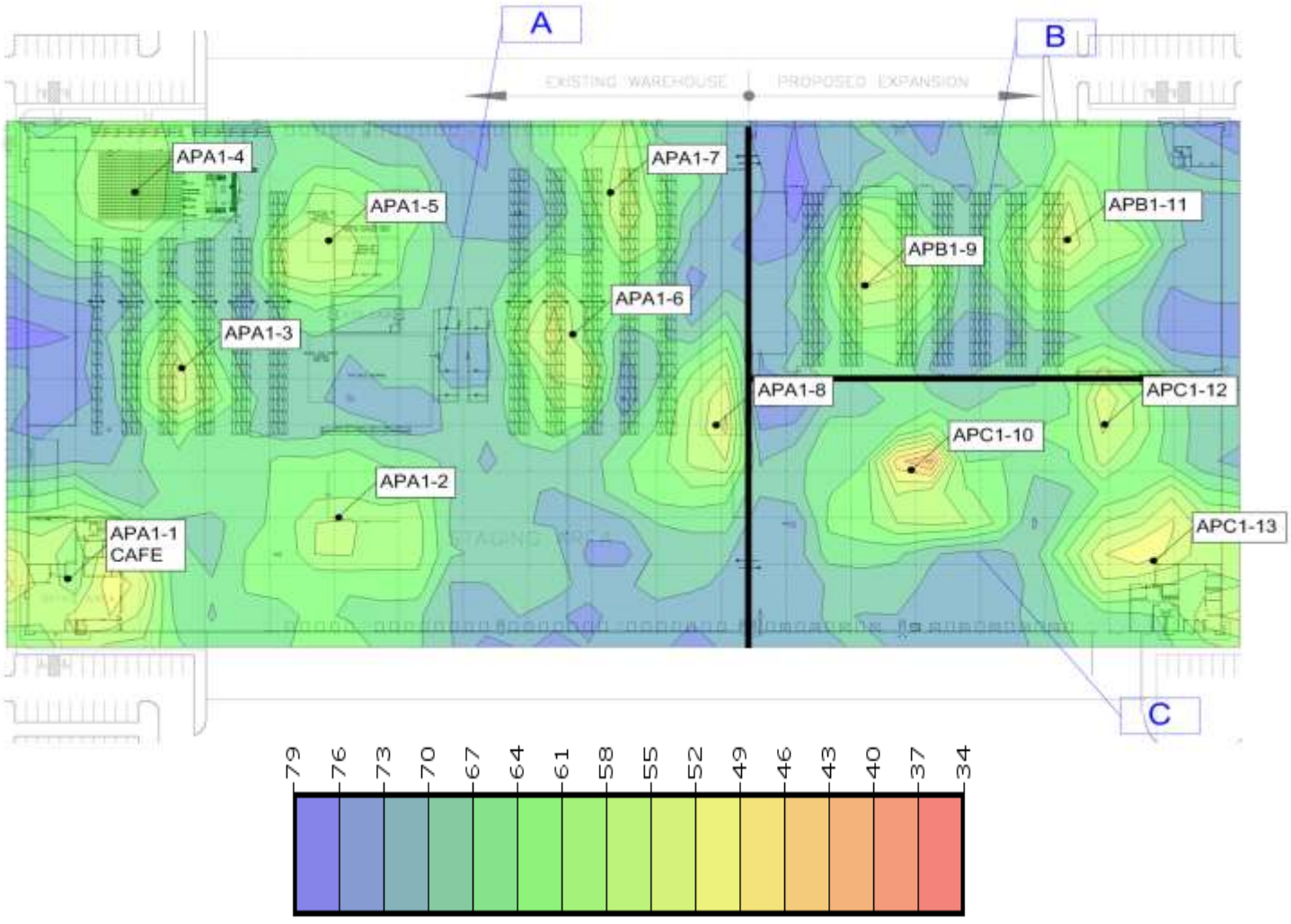


What tools and settings will they use for your site survey?

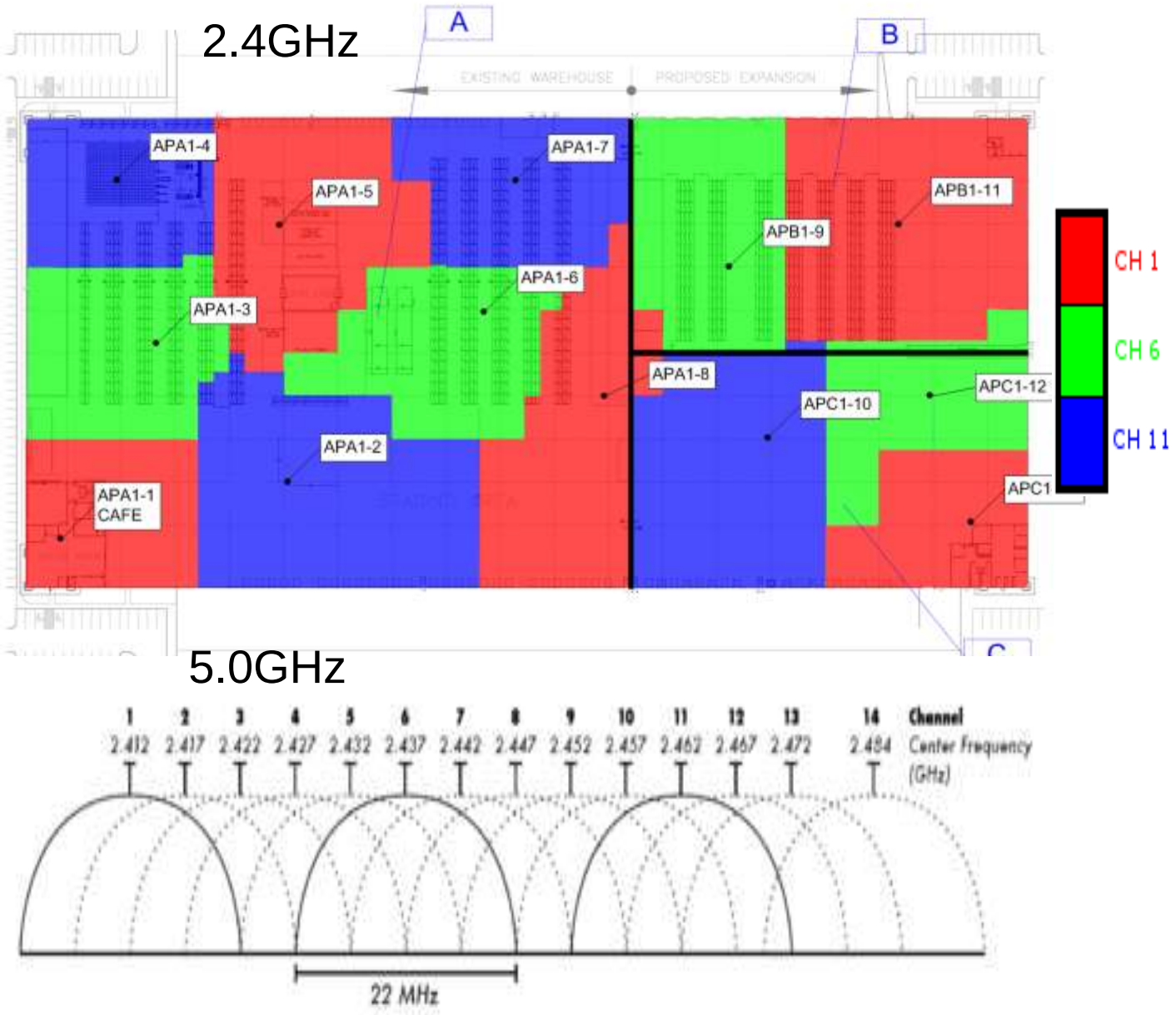
- Survey at appropriate radio power for 2.4GHz or 5.0Ghz
- Survey with equipment you will implement
- Determine correct antenna choices during survey
- Determine non-overlapping channels for minimal channel interference

Each of the above steps is required to determine the actual RF propagation and signal-to-noise ratio in a facility.

RF Site Survey – Ekahau Heat Map



How much do they know about channel selection?

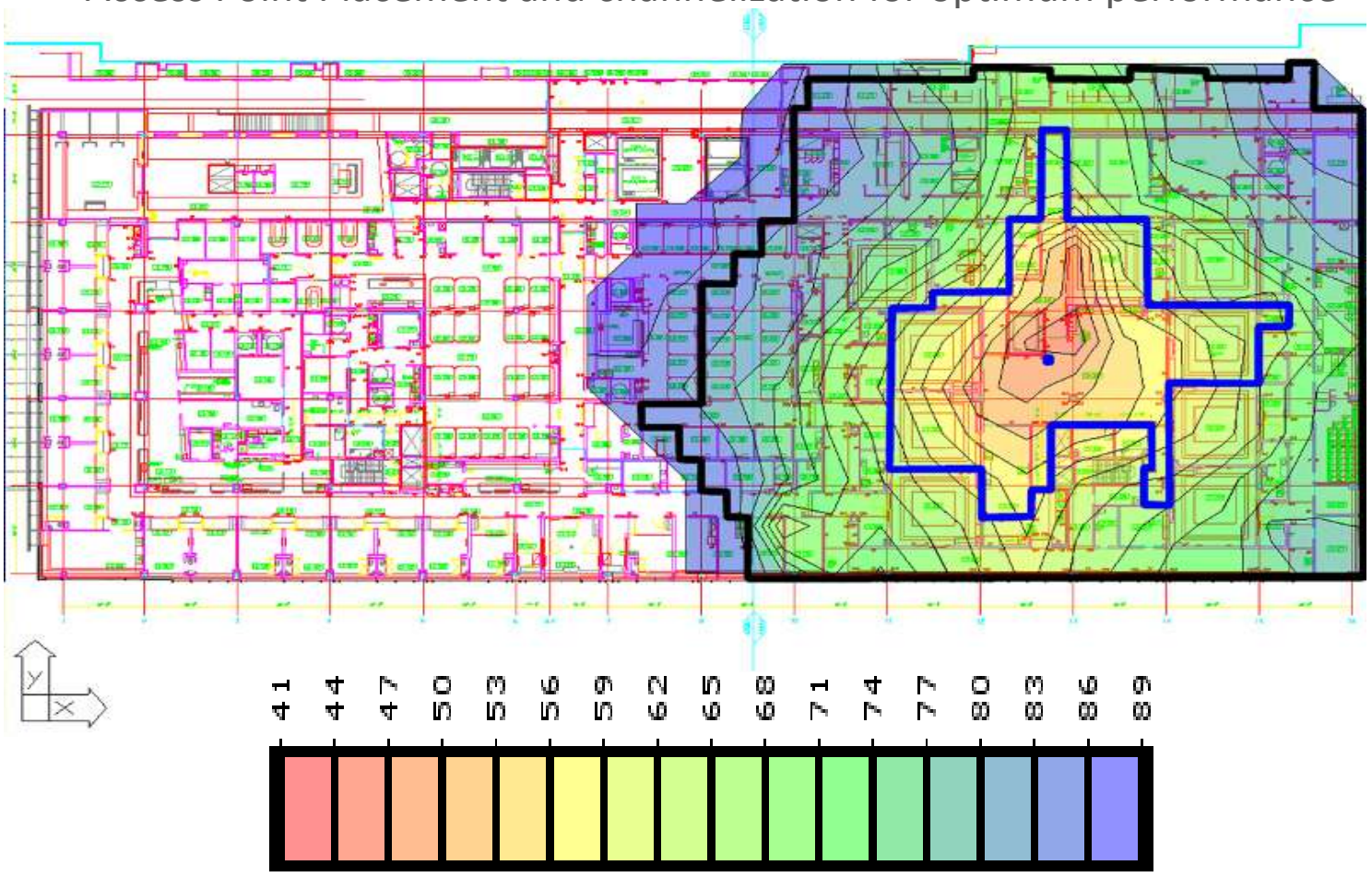


- Only three non-overlapping channels in 2.4GHz

- 5.0Ghz has 21 non-overlapping channels today and will soon have 23. Far fewer interferers in 5.0Ghz

What will they tell you based on site survey results?

Access Point Placement and channelization for optimum performance



- What does the black line represent?
- What does the blue line represent?
- Where should the next AP be placed?
- What type of Antenna should be used?
- What is the appropriate radio power setting?

How does Voice & RTLS influence signal strength requirements?

When the job is done, will your verification look like this?

Voice & RTLS Quality WLAN RF Propagation Maps

-80.0..-77.0	-77.0..-74.0	-74.0..-71.0	-71.0..-68.0	-68.0..-65.0
-65.0..-62.0	-62.0..-59.0	-59.0..-56.0	-56.0..-53.0	-53.0..-50.0
-50.0..-47.0	-47.0..-44.0	-44.0..-41.0	-41.0..-38.0	-38.0..-35.0

What's wrong with this picture?

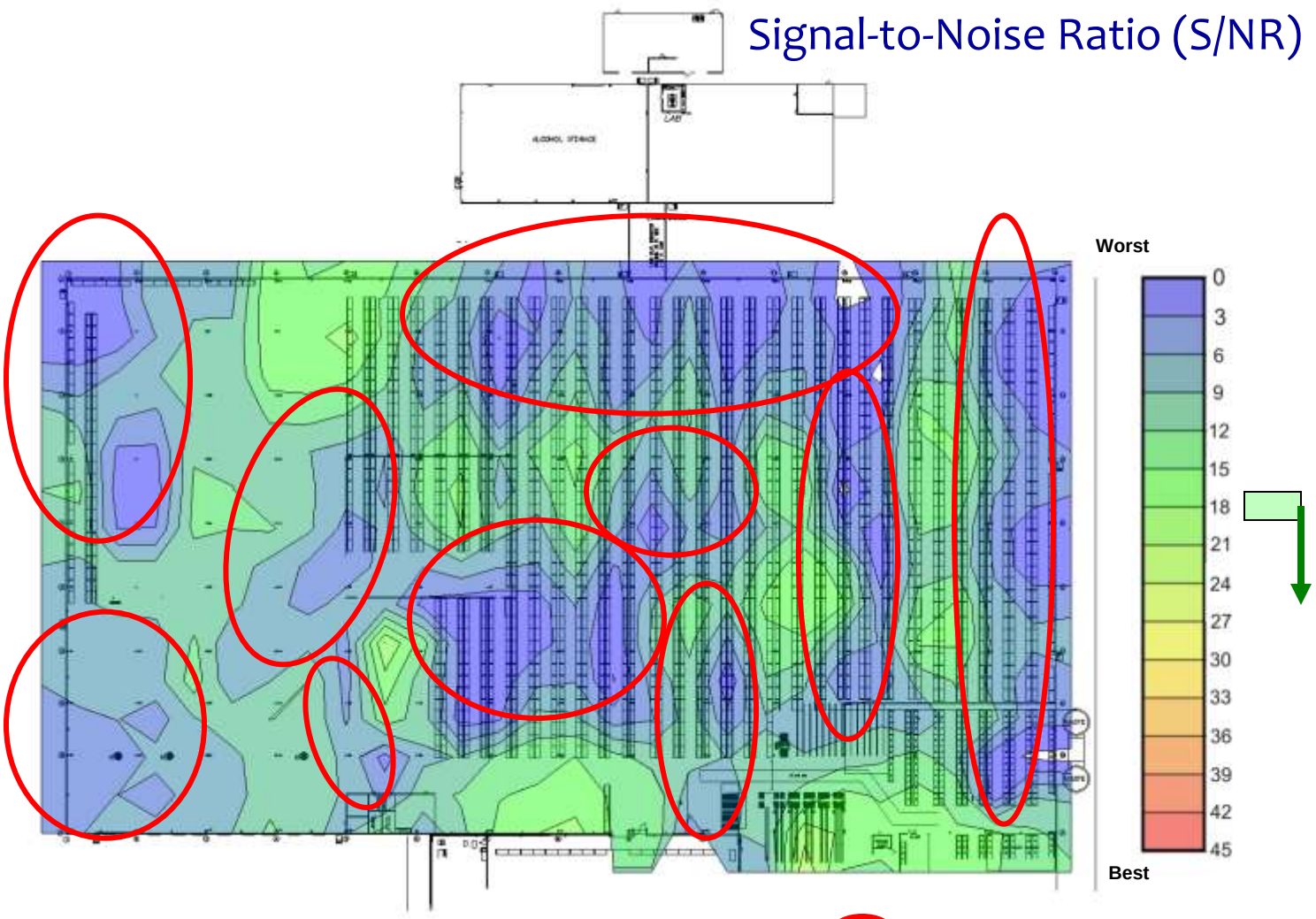
Classic wireless network problems:

- Too many access points
- Too close together
- Running at too high a power
- Wrong Antenna types
- On the wrong channels

This RF propagation map is from a real customer who called us out of desperation.

"Can you fix this mess?"

Signal-to-Noise Ratio (S/NR)



0.0..3.0	3.0..6.0	6.0..9.0	9.0..12.0	12.0..15.0
15.0..18.0	18.0..21.0	21.0..24.0	24.0..27.0	27.0..30.0
30.0..33.0	33.0..36.0	36.0..39.0	39.0..42.0	42.0..45.0

Represent areas with very low (≤ 6) Signal-to-Noise Ratio (S/NR): the noise (interference) level is far too close to the valid signal level for reliable data communications. Minimum SN/R level of **18** or more is recommended to achieve reliable communications.

Are you buying the equipment you need?

Bill Of Materials – Procurement

- Site Survey provides Bill-of-Materials for infrastructure hardware
- No guesswork
- Detailed, accurate, and procurement ready

Example:

WLAN Bill-of-Materials

Cisco LWAPP APs (LAPs):

Item	Qty	Cisco P/N	Description	$ List (Ea.)	List $ Total
1.	80	AIR-LAP1242AG-A-K9	Cisco Aironet 1242AG - Wireless AP - 802.11a/b/g	$999.00	$79,920.00
2.	80	S114RK9W-12418JA	Cisco 1240 Series IOS WLAN LWAPP RECOVERY	-	-
3.	2	CON-SNT-LAP1242N	Cisco SMARTnet - Replacement - 1 year - 8x5 - NBD	$104.00	$208.00
4.	80	24PT60-10D	VPN Systems 2.4 GHz Patch Antenna	$399.00	$31,920.00
5.	80	55PT60-10D	VPN Systems 5 GHz Patch Antenna	$399.00	$31,920.00
6.	80	AIR-PWRINJ3	Cisco AP1242 Power Injector	$59.00	$4,720.00
7.	80	AIR-PWR-A	Cisco Power Injector Power Supply	$39.00	$3,120.00
8.			Total: (Not Including Freight)		$148,688.00

Cisco Wireless LAN Controller (WLC):

Item	Qty	Cisco P/N	Description	$ List (Ea.)	$ Total
9.	3	AIR-CT5508-50	802.11n Controller, Up to 50 Lightweight APs	$22,495.00	$67,485.00
10.	3	CON-SNT-CT0850	Cisco SmartNet, 8x5xNBD for 5508-50 WLAN Ctrlr	$1,800.00	$5,400.00
11.	6	GLC-T=	Cisco SFP (mini-GBIC) transceiver module	$395.00	$2,370.00
12.			Total: (Not Including Freight)		$72,885.00

Cisco Wireless Control System (WCS)*:

Item	Qty	Cisco P/N	Description	$ List (Ea.)	$ Total
13.	1	WCS-STANDARD-K9	WCS Top Level SKU for AP Capacity Options	-	-
14.	1	WCS-PLUS-100	Cisco WCS w/PLUS License, Up to 100 APs, License Onl	$12,995.00	$12,995.00
15.	1	CON-SAU-WCSP50	Annual SW App Supt & Upg - Cisco WCS w/PLUS	$2,495.00	$2,495.00
16.			Total: (Not Including Freight)		$15,490.00
	*	Requires Customer-Provided, Specific-Configuration Win2K3 Server.			
17.					$237,063.00

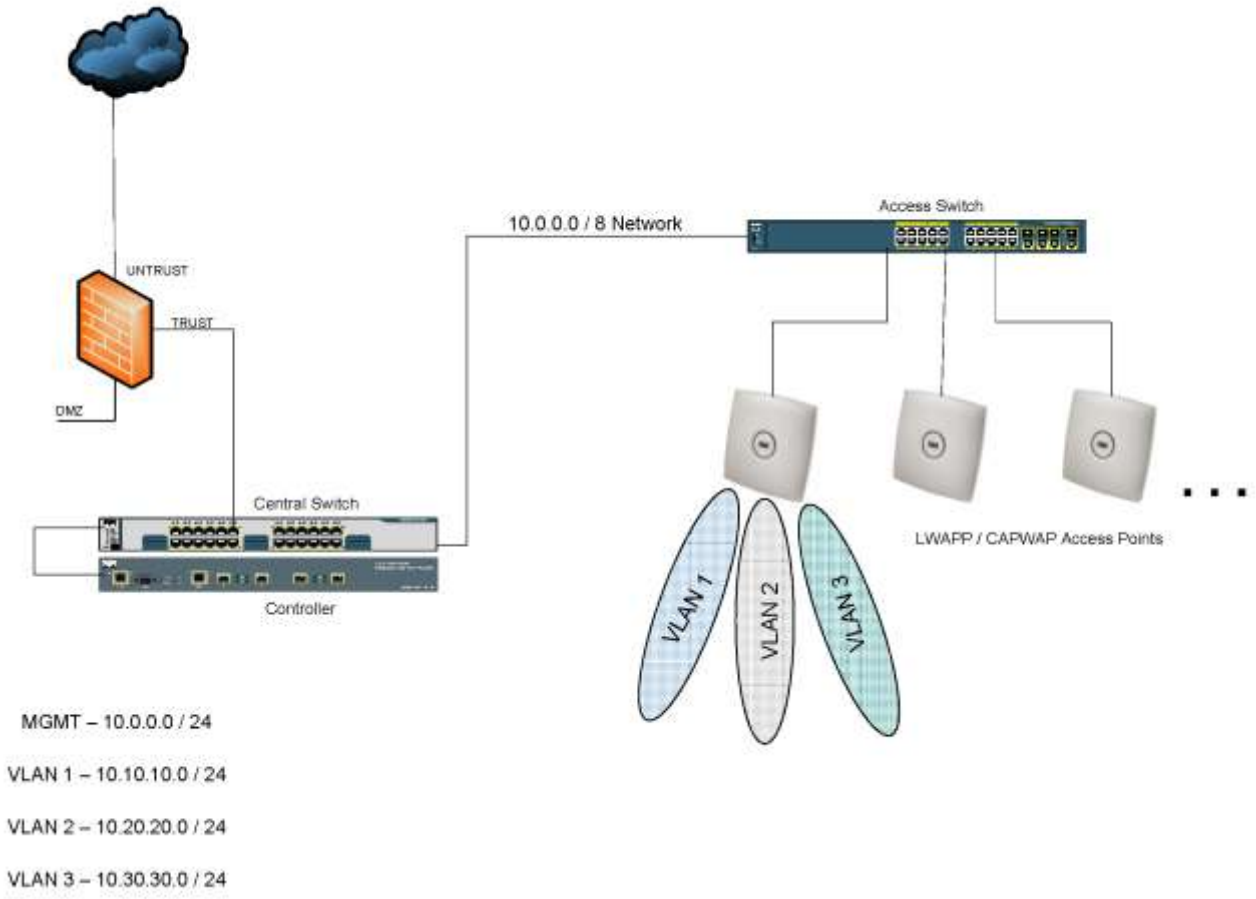
One of our Fortune 500 customers installed 43 APs based on the hardware supplier's very inaccurate site survey. They paid us to come in and once again, "fix the mess."

Our site survey results showed they needed 12, not 43 APs. After we improved wireless performance by 100%, they hired us to survey and do WLAN design for their remaining five warehouse facilities located around the country.

Do they offer logical network design services?

Logical Design / WLAN Controller Configuration

- Necessary prerequisite to a good detailed network node design
- Provides the wired LAN to wireless LAN integration strategy
- Determines WLAN Controller, WCS, and AP configurations



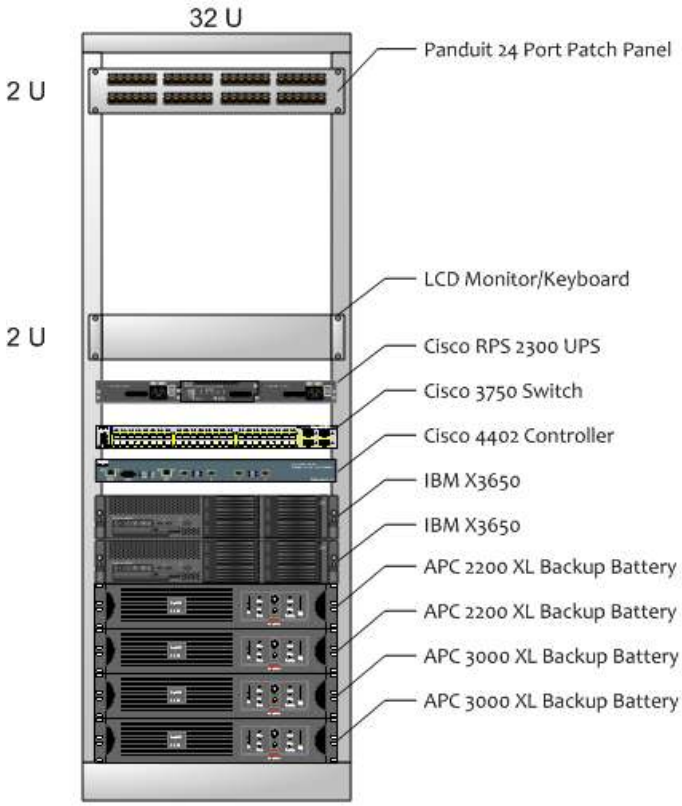
Determine physical LAN requirements

- Review current wired LAN logical network design, make necessary changes
- Enough switch ports for APs?
- PoE Power-over-Ethernet
- Plan VLANs for wireless traffic
- WAN connections between facilities

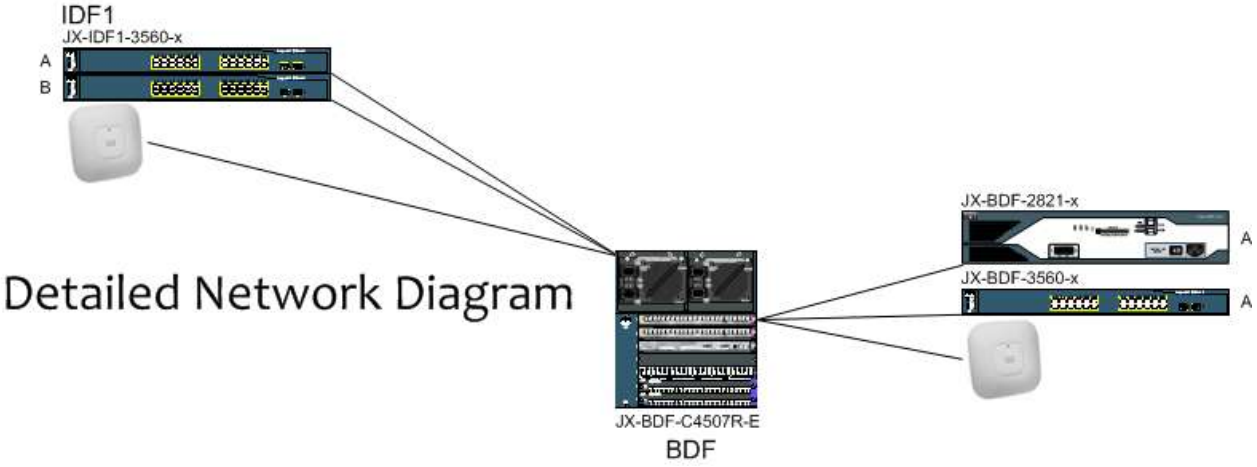
Do they recommend prototyping your system?

Internal Lab Prototype

- Provides validation of logical design
- Creates 'Golden' configuration for staging and AP birthing
- Ensures integration with wired LAN
- Reduces risk



Detailed Rack Diagram



Detailed Network Diagram

Will they stage your system (birth the APs)?

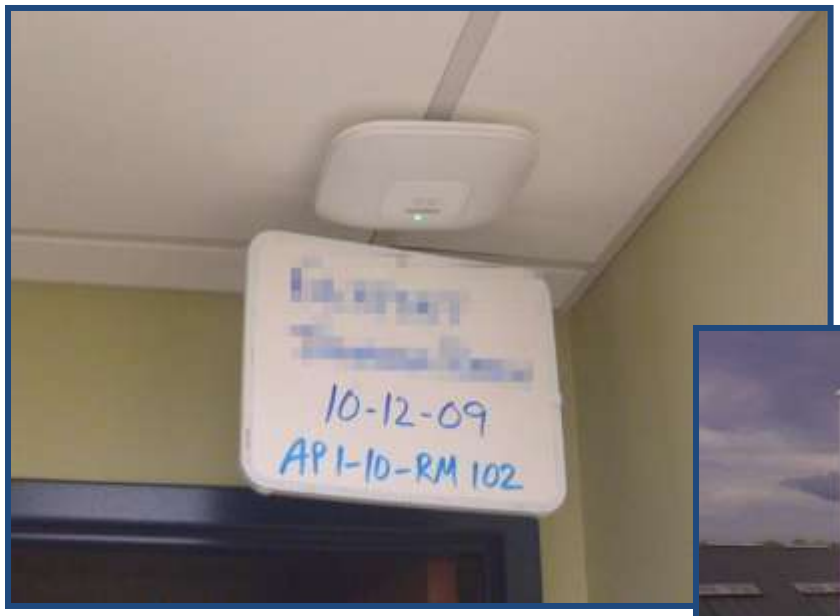
System Staging – A big job

- Unpack equipment and dispose of dunage
- Set-up staging process to ‘Birth’ & configure APs
- Label & document
- Kit and assemble APs and antennas in enclosure
- Bundle by facility to be delivered for installation

Do they offer installation services?

Physical Installation

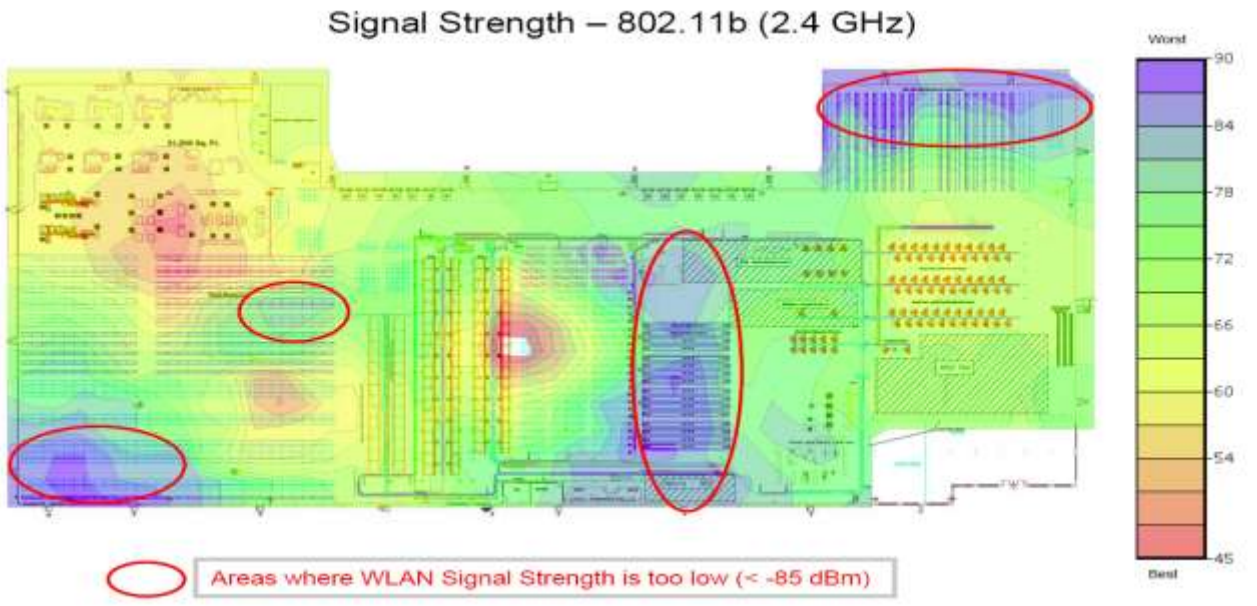
- Facilities, cable/electrical contractor
- Ensure that APs are installed in appropriate locations
- Make certain that controller is aware of AP once installed

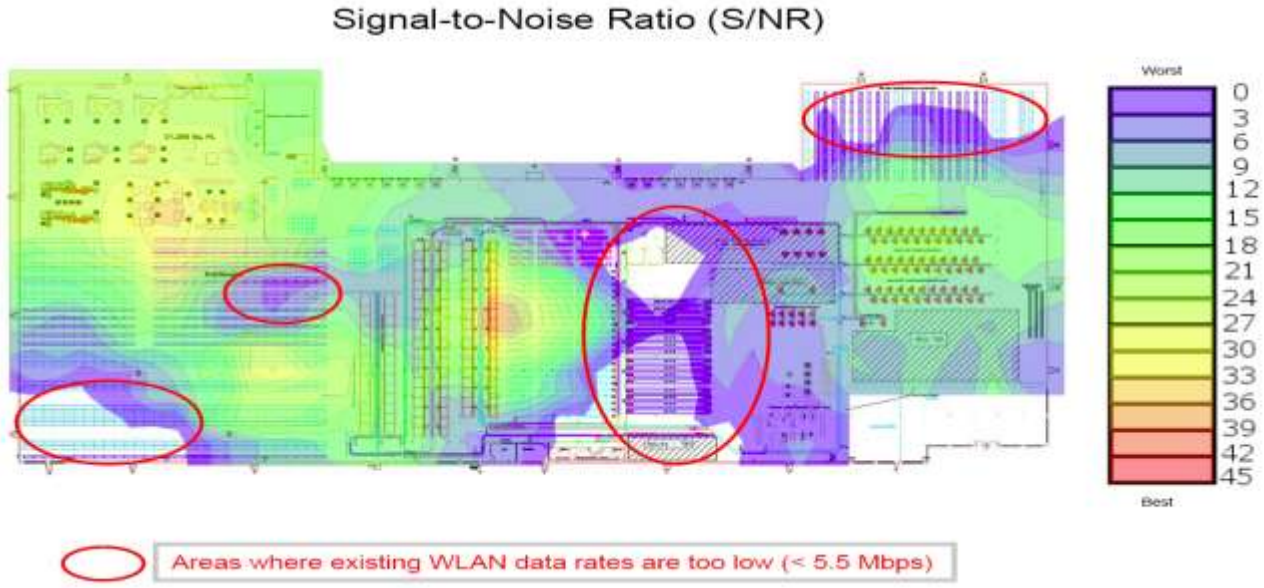


Will you get a validation of your system?

Why you need on-site testing and validation

- Ensures that hardware was installed properly
- Validates WLAN readiness
- Becomes the 'As Built' of the production WLAN
- Important IT support tool
- Verifies that implementation meets the design requirements





Do they provide wireless services from start to finish?

0. Wireless Assessment
1. Wireless Requirements Workshop ⇨ Req. Specification
2. Spectrum Analysis / Site Surveys ⇨ Physical Design
3. Bills-of-Material ⇨ Procurement
4. Logical Design (Visio) ⇨ L2/L3 Configuration
5. Internal Laboratory Prototype
6. Lightweight AP 'Birthing' (Staging)
7. On-site Installation
8. On-site Test & Verification
9. Training & Knowledge Transfer

About Vantage Point Network Systems

We deliver a variety of professional services to design, test, and deploy world class wireless mobile computing and data collection solutions. Our professional services delivery relies on a disciplined and proven methodology that we have refined through years of experience.

Our strong relationships with our business partners enable us to provide best-in-class software and hardware products to create comprehensive business solutions for our customers. We gather information from you through a systematic requirements analysis, and apply that to a series of analytics which results in an effective, integrated set of deliverables.

We have a skilled and truly dedicated technical staff, committed to your success. Customers value us for our practical nature, and attention to detail. We quite often develop lasting personal relationships with our customers and partners because of our personable style, and genuine commitment to success.

Our expertise includes :

- ❑ Designing and implementing the latest converged wireless services
- ❑ Trouble shooting existing wireless networks
- ❑ Bar Code systems design and implementation for:

  Manufacturing

  Warehousing

  Inventory management

  Health care

  Field services

VANTAGE POINT NETWORK SYSTEMS, INC.

Scott Edwards, Director of Sales
(585) 624-8365 x 113
SEdwards@VPNSystems.com

Edward W. Suor, Managing Director
(585) 624-8365 x 113
SEdwards@VPNSystems.com