How difficult can it be to install a Wi-Fi network for a large enterprise?

18th of April 2017
1.30pm – 5.00pm
Dubai, United Arab Emirates (UAE)

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2017 BICSI Middle East & Africa Conference & Exhibition
Internet of Things - Data Centre, Wireless, Infrastructure
April 18, 33rd Floor,
Sheikh Rashid Tower, Dubai World Trade Centre, Dubai

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Synopsis

Many people install their own access point at home and perceive it is that easy to do the same at a large facility.

However in both environments Wi-Fi issues exist. In this workshop attendees will learn how to troubleshoot Wi-Fi networks, which advance tools exist and to get a better Wi-Fi experience!

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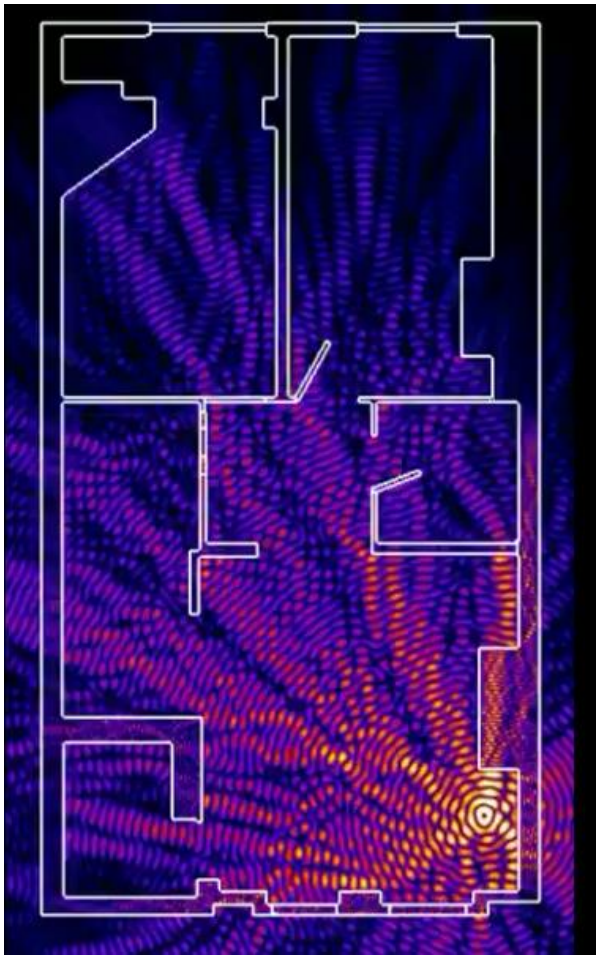
Agenda

- Home/residential networks
- Enterprise Level networks
- Troubleshooting Wi-Fi networks

Home/residential networks growing to cities

Example of Radio Frequency (RF) distribution in a home

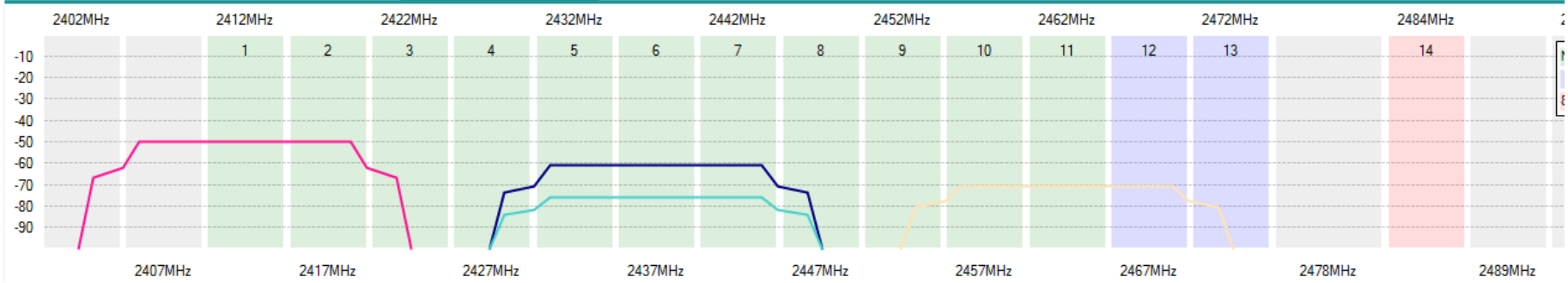
https://twitter.com/ThingsWork/status/834188228420857856/video/1



Example of 2.4 GHz at DWTC Apartments

SSID	MAC Address	RSSI	Chan	802.11	Max Speed	WEP	WPA	WPA2	WPS	Vendor	First
DTCHA - EmiratesWifi	64:70:02:A2:FF:4F	-50	1	b, g, n	144.4 Mbps	Open				TP-LINK TECHNOLOGIE	12:20:02
DTCHA - EmiratesWifi	64:70:02:A3:00:BF	-61	6	b, g, n	144.4 Mbps	Open				TP-LINK TECHNOLOGIE	12:20:02
DTCHA - EmiratesWifi	64:70:02:A0:C3:11	-76	6	b, g, n	144.4 Mbps	Open				TP-LINK TECHNOLOGIE	12:20:07
DTCHA - EmiratesWifi	64:70:02:A3:06:F9	-73	11	b, g, n	144.4 Mbps	Open				TP-LINK TECHNOLOGIE	12:20:07
DTCHA - EmiratesWifi	64:70:02:A3:00:27	-71	11	b, g, n	144.4 Mbps	Open				TP-LINK TECHNOLOGIE	12:20:02
DTCHA - EmiratesWifi	64:70:02:A2:FF:50	-67	36	a, n	216.7 Mbps	Open				TP-LINK TECHNOLOGIE	12:20:01
[Hidden]	84:D4:7E:05:94:95	-84	132+128	n, ac	1170.45 Mbps			PSK-CCMP		Aruba Networks	12:20:18
DWTC-Micros	84:D4:7E:05:94:93	-84	132+128	n, ac	1170.45 Mbps			PSK-CCMP		Aruba Networks	12:20:23
@DWTC Free Wifi	84:D4:7E:05:94:96	-83	132+128	n, ac	1170.45 Mbps	Open				Aruba Networks	12:20:23
DWTC_Exhibitor_Internet	84:D4:7E:05:94:90	-83	132+128	n, ac	1170.45 Mbps	Open				Aruba Networks	12:20:02
[Hidden]	84:D4:7E:05:94:94	-83	132+128	n, ac	1170.45 Mbps	Open				Aruba Networks	12:20:02
5GHz Exhibitor Internet	84:D4:7E:05:94:91	-83	132+128	n, ac	1170.45 Mbps	Open				Aruba Networks	12:20:07
[Hidden]	84:D4:7E:05:5A:B4	-82	132+128	n, ac	1170.45 Mbps	Open				Aruba Networks	12:20:28
DWTC_Exhibitor_Internet	84:D4:7E:05:5A:B0	-81	132+128	n, ac	1170.45 Mbps	Open				Aruba Networks	12:20:28
5GHz Exhibitor Internet	84:D4:7E:05:5A:B1	-82	132+128	n, ac	1170.45 Mbps	Open				Aruba Networks	12:20:28
DWTC-Corp	84:D4:7E:05:5A:B2	-82	132+128	n, ac	1170.45 Mbps			MGT-CCMP		Aruba Networks	12:20:28

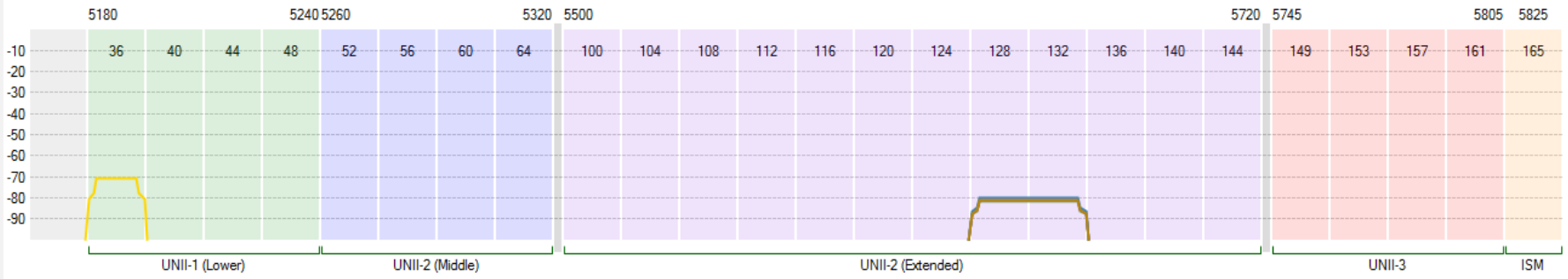
Signal Strength | Network Quality | 2.4GHz APs Channels | 5GHz APs Channels



Example of 5GHz at DWTC Apartments

SSID	MAC Address	RSSI	Chan	802.11	Max Speed	WEP	WPA	WPA2	WPS	Vendor	First	L
DTCHA - EmiratesWifi	64:70:02:A3:00:27	-67	11	b, g, n	144.4 Mbps	Open				TP-LINK TECHNOLOGIE	12:20:02	00:0
DTCHA - EmiratesWifi	64:70:02:A2:FF:50	-71	36	a, n	216.7 Mbps	Open				TP-LINK TECHNOLOGIE	12:20:01	00:0
[Hidden]	84:D4:7E:05:94:95	-84	132+128	n, ac	1170.45 Mbps			PSK-CCMP		Aruba Networks	12:20:18	00:0
DWTC-Micros	84:D4:7E:05:94:93	-84	132+128	n, ac	1170.45 Mbps			PSK-CCMP		Aruba Networks	12:20:23	00:0
@DWTC Free Wifi	84:D4:7E:05:94:96	-83	132+128	n, ac	1170.45 Mbps	Open				Aruba Networks	12:20:23	00:0
DWTC_Exhibitor_Internet	84:D4:7E:05:94:90	-83	132+128	n, ac	1170.45 Mbps	Open				Aruba Networks	12:20:02	00:0
[Hidden]	84:D4:7E:05:94:94	-82	132+128	n, ac	1170.45 Mbps	Open				Aruba Networks	12:20:02	00:0
5GHz Exhibitor Internet	84:D4:7E:05:94:91	-82	132+128	n, ac	1170.45 Mbps	Open				Aruba Networks	12:20:07	00:0
[Hidden]	84:D4:7E:05:5A:B4	-81	132+128	n, ac	1170.45 Mbps	Open				Aruba Networks	12:20:28	00:0
DWTC_Exhibitor_Internet	84:D4:7E:05:5A:B0	-81	132+128	n, ac	1170.45 Mbps	Open				Aruba Networks	12:20:28	00:0
5GHz Exhibitor Internet	84:D4:7E:05:5A:B1	-80	132+128	n, ac	1170.45 Mbps	Open				Aruba Networks	12:20:28	00:0
DWTC-Corp	84:D4:7E:05:5A:B2	-80	132+128	n, ac	1170.45 Mbps			MGT-CCMP		Aruba Networks	12:20:28	00:0
DWTC-Micros	84:D4:7E:05:5A:B3	-82	132+128	n, ac	1170.45 Mbps			PSK-CCMP		Aruba Networks	12:20:28	00:0
DTCHA - EmiratesWifi	64:70:02:A3:00:29	-76	11	b, g, n	144.4 Mbps	Open				TP-LINK TECHNOLOGIE	12:20:55	00:0
[Hidden]	84:D4:7E:05:5A:B5	-80	132+128	n, ac	1170.45 Mbps			PSK-CCMP		Aruba Networks	12:21:11	00:0
@DWTC Free Wifi	84:D4:7E:05:5A:B6	-81	132+128	n, ac	1170.45 Mbps	Open				Aruba Networks	12:21:11	00:0

Signal Strength | Network Quality | 2.4GHz APs Channels | 5GHz APs Channels



But Spectrum and Channel planning
is not the only item that need to be covered…

- Channel utilization / non Wi-Fi activity
- Protocols / communication / technology
- Services running on top of the network

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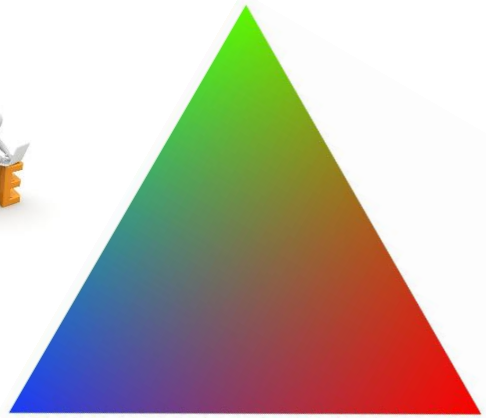
Wi-Fi Services and Security Impact

End-User experience using Wi-Fi Services

1. Service Availability



2. Service Performance

3. Service Security

Wireless Service overview of “Configuration Items”

- Good/Bad (Rogue) clients
- Roaming
- Low/High Density
- Smartphones/Tablets/Laptops

- Internet of Things (IoT)

- Wireless
- Access Points
- Rogue APs
- Tethering / IoT

- Cabling

- Infrastructure Devices
- Switches, Routers, Firewalls

- Content Servers
- Identity Management
- Mobile Device Management
- Logging

- Wireless Controllers
- Cooperative Controllers
- Wireless Network Management Systems
- Cloud based systems

- Facility Management
- Racks, DataCenter
- Power, Temperature, etc.

- Wireless Skills
- Business Skills
- Alignment of Skills

Wireless Service: Availability, Performance, Security and Management

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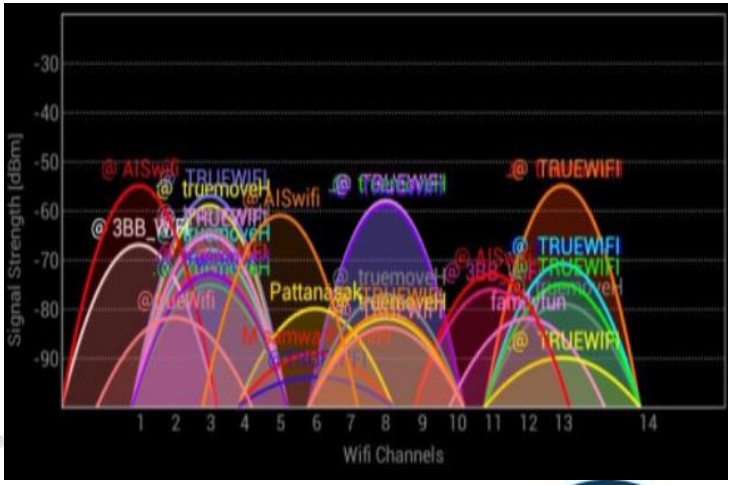
Troubleshooting / analyzing Wi-Fi networks

- Connectivity / availability
- Performance
- Security

Workshop 1

Wireless Reconnaissance

Example of Tools:	Dongle requirements:
Apple	built-in
• WiFi Scanner	
Windows	built-in adapter
• Metageek inSSIDer	
• Acrylic WiFi	
Android	built-in adapter
• WiFi Analyser	



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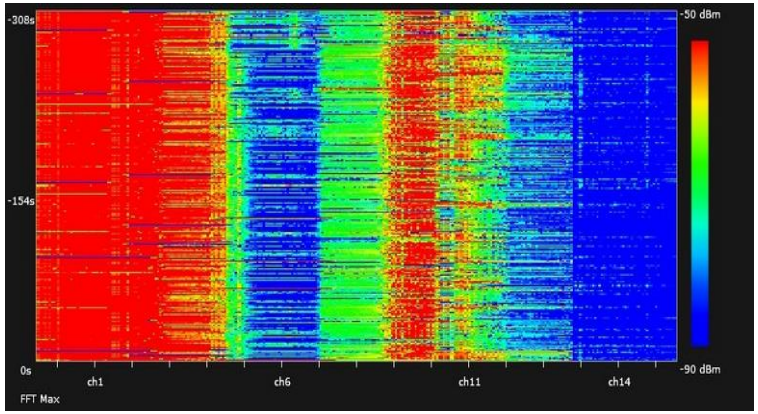
Workshop 2

Wireless Spectrum Analysis

Note: some Enterprise solutions can use the "Sensor-mode" on the AP to do Remote Spectrum Analysis



Example of Tools: requirements:	Dongle
Apple iPad/iPhone	
• WiPry (Oscium) 2.4GHz +5 GHz	WiPry dongle
Windows	
• Metageek Chanalyser	WiSpy dongle
• Netscout/Spectrum XT	SpectrumXT
• Cisco Cognio SpectrumExpert (3500)	Use a Cisco AP
• Integrated in Site Survey Software	
• Ekahau,Tamosoft, Netscout	
Android	
• WiPry	
RF Explorer 6G Combo	

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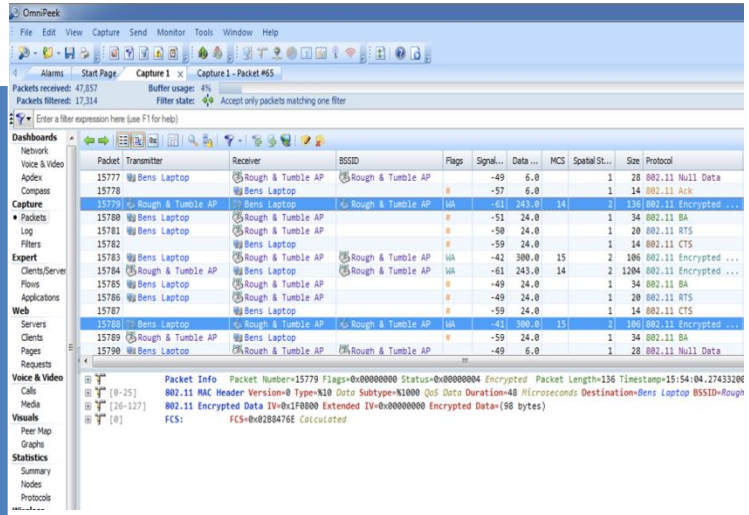
Workshop 3

Wireless Protocol Analysis

Note: some Enterprise solutions can use the "Sensor-mode" on the AP to do Remote Protocol Analysis

Example of Tools:	Dongle requirements:
Apple	
• MacOS X	built-in
Windows	
• Wireshark	AirPCAP dongle
• Savvius OmniPeek	Several (Atheros, etc.)
• Netscout AirMagnet WiFi Analyzer	Several (Atheros, etc.)
• TamoSoft CommView	Several (Atheros, etc.)
Android	
• ?	



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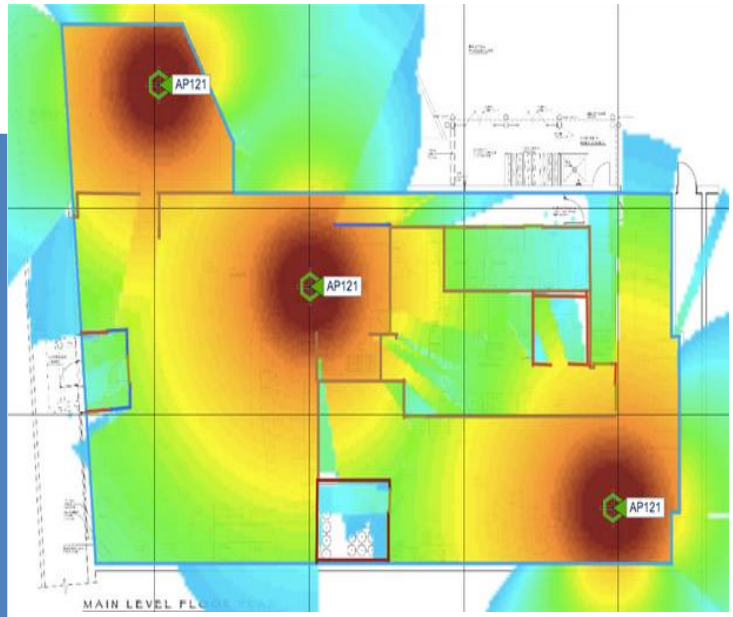
Workshop 4

Wireless Site Survey

Note: some Enterprise solutions can use the APs and "Sensors" to visualise the RF propagations on an map.



Example of Tools:	Dongle requirements:
Apple	
• ?	
Windows	
• Netscout AirMagnet Site SurveyPro	Several (Atheros, etc.)
• Ekahau Site Survey (ESS)	Several (Atheros, etc.)
• TamoGraph Site Survey	Several (Atheros, etc.)
• iBwave WiFi	Several
• VisiWave	Built-in
• Extreme Networks LAN Planner/AirDefense	Several (Atheros, etc.)
Android	
• Netscout – AirMapper	
• Ekahau	
• iBwave Mobile	

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Workshop 5

Wireless Security (Auditing / PenTest)

Example of Tools:	Dongle requirements:
Apple	
• ?	
Linux Tool-kits (LiveCDs)	
• Kali Linux (aka BackTrack)	Several (Atheros, Ralink)
• PenToo	Several (Atheros, Ralink)
• OSWA	Several (Atheros, Ralink)
Embedded	
• WiFi PineApple	

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Workshop 6

Enterprise Level Wireless Management

Service + Security + MDM (BYOD)

Example of Tools:		
WLAN Management (or Cloud)	WIPS solutions	MDM (Mobile Dev. Mgmt)
• Cisco Prime / Cisco Meraki	Cisco Meraki (AirMarshall)	Mobile Iron
• HP IMC	Netscout AirMagnet Enterprise	Maas 360 (Fiberlink / IBM)
• HPE/Aruba AirWave	Mojo Networks WIPS	AirWatch (Vmware)
• Extreme Networks AirDefense	AirDefense WIPS	
• Mojo Networks		
• Ruckus		
• 7 Signals (Performance Mgmt)		

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Workshop 7

All the other configuration items part of a wireless service

Cabling
Power (PoE), UPS
Aircon
Switches, Routers, etc.
Firewalls
Applications
Databases

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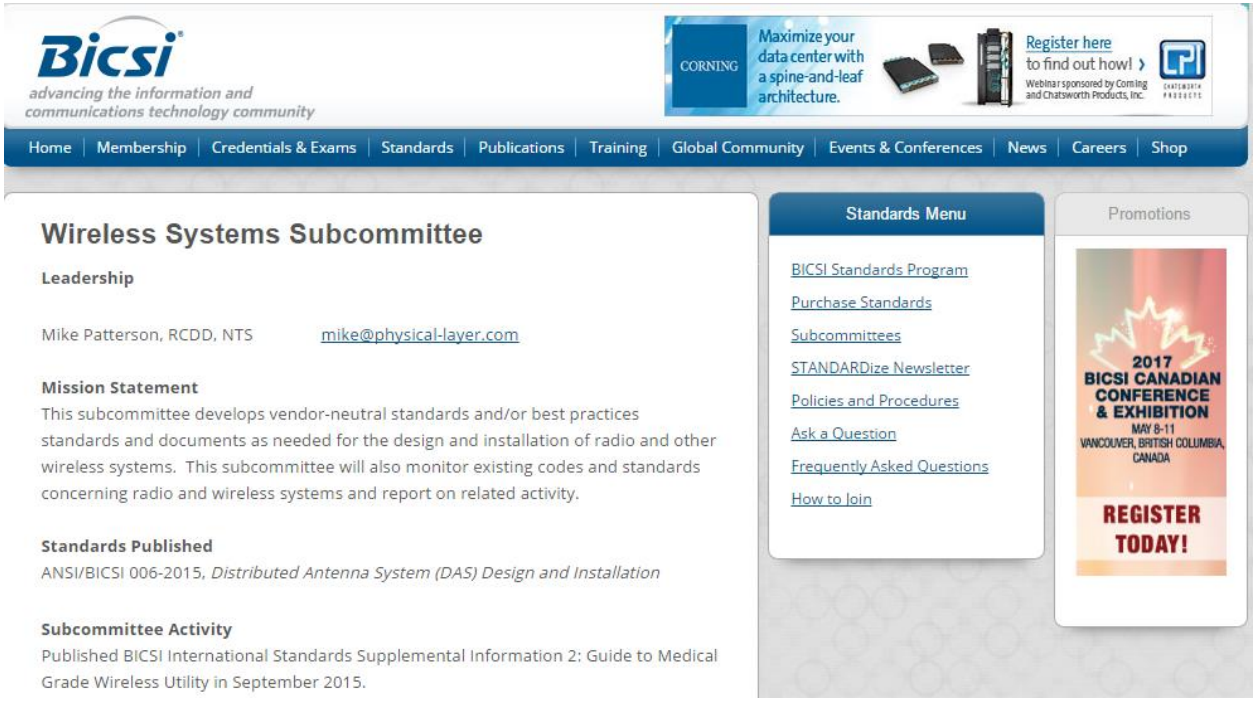
Approach

- Requirements (big list)
  - Coverage, Capacity, Devices, Security, Aesthetics, etc.
- Design
  - Many approaches, there is not 1 design fits all
- Installation
  - Who installs, which std they follow?
- Validation
  - Which thresholds to follow
- Operation / Management

BICSI Wireless Subcommittee

https://www.bicsi.org/double.aspx?l=5987



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Summary

- To design and implement Wi-Fi networks should not be underestimated
- Get (certified) Wi-Fi professionals involved who understand how Wi-Fi works and can help with design, coverage, performance and troubleshooting
- Educate/train installers how to mount Wi-Fi devices
- Get Security professionals involved to validate the security of these networks.
- 24x7 Wireless network management

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