

Wi-Fi Checklists



Introduction

Keith R. Parsons

110+ Certifications/Countries

CWNE #3 - Produce #WLPC

20+ Years WLAN Experience

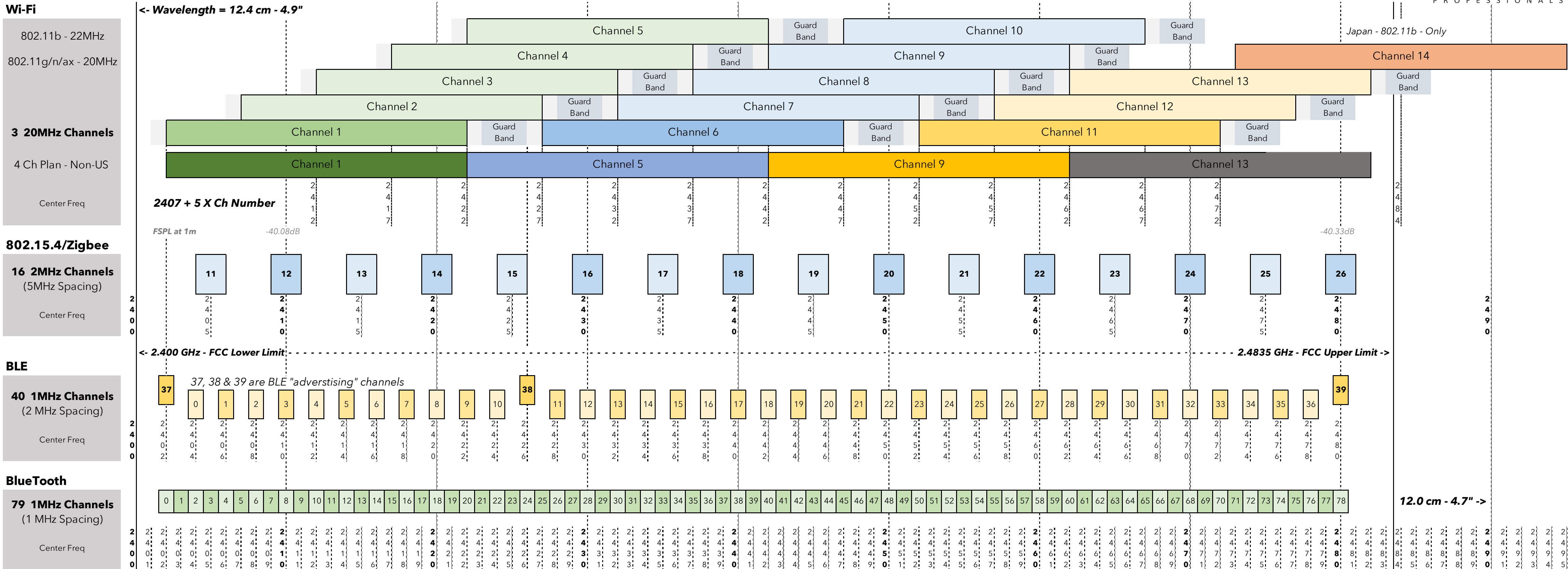


2.4 GHz Frequencies

Bluetooth, BLE, 802.15.4, 802.11



2.4GHz Unlicensed Spectrum



5 GHz Frequencies

802.11 n, ac, ax



5 GHz Channel Allocations

500 MHz

Frequency	5000 + 5 X Ch. Number				DFS Channels				DFS Channels																165 was ISM, now U-NII-3					Proposed						
Radio Band	U-NII-1				U-NII-2a				Past Proposal UNII-2b								U-NII-2c (Extended)								U-NII-3					UNII-4						
Center Freq	5.180	5.200	5.220	5.240	5.260	5.280	5.300	5.320	5.340	5.360	5.380	5.400	5.420	5.440	5.460	5.480	5.500	5.520	5.540	5.560	5.580	5.600	5.620	5.640	5.660	5.680	5.700	5.720	5.745	5.765	5.785	5.805	5.825	5.845	5.865	5.885
20 MHz	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96	100	104	108	112	116	120	124	128	132	136	140	144	149	153	157	161	165	169	173	177
40 MHz	38		46		54		62		70		78		86		94		102		110		118		126		134		142		151		159		167		175	
80 MHz	42				58				74				90				106				122				138				155					171		
160 MHz	50								82								114												163							
FCC - US	1,000 mW Tx Power Indoor & Outdoor No DFS needed				250 mw w/6dBi Indoor & Outdoor DFS Required				Not Currently Available for Unlicensed								250 mw w/6dBi Indoor & Outdoor DFS Required				120, 124, 128 US - Allowed				144 Now Allowed				1,000 mW Tx Power Indoor & Outdoor No DFS needed					Not Currently Available For Unlicensed		
ISED - Canada	FCC - Except Outdoor License Req. >200 mW				Same as FCC												Same as FCC				TDWR Not Allowed				Same as FCC				Canada PtP allows Higher EIRP							
ACMA - Australia	200 mW EIRP Indoor				200 mW EIRP - DFS & TPC 100 mW EIRP - DFS-Only Indoor												1,000 mW - DFS & TPC 500 mW - DFS-Only - No TPC Indoor/Outdoor				TDWR Not Allowed				1,000 mW - DFS & TPC 500 mW - DFS-Only Indoor/Outdoor				4,000 mW Tx Power Indoor & Outdoor No DFS needed							
ETSI - EU	100 mW No DFS/TPC Indoor				200 mW EIRP DFS/TPC Indoor												1,000 mW EIRP DFS/TPC Indoor/Outdoor								UK No 144				4,000 mW EIRP DFS/TPC - Outdoor Fixed Wireless Access							
	200 mW EIRP DFS/TPC - Indoor																				10-min TWDR Scan Time				25mW SRD				25mW - SRD - No DFS							
20 MHz	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96	100	104	108	112	116	120	124	128	132	136	140	144	149	153	157	161	165	169	173	177
Center Freq	5.180	5.200	5.220	5.240	5.260	5.280	5.300	5.320	5.340	5.360	5.380	5.400	5.420	5.440	5.460	5.480	5.500	5.520	5.540	5.560	5.580	5.600	5.620	5.640	5.660	5.680	5.700	5.720	5.745	5.765	5.785	5.805	5.825	5.845	5.865	5.885

<- Wavelength 5.8cm - 2.3"

Wavelength 5.1cm - 2.0" ->

Free Space Path Loss 1m

-45.74	-45.77	-45.80	-45.84	-45.87	-45.90	-45.94	-45.97	-46.00	-46.03	-46.07	-46.10	-46.13	-46.16	-46.19	-46.23	-46.26	-46.29	-46.32	-46.35	-46.38	-46.41	-46.44	-46.48	-46.51	-46.54	-46.57	-46.60	-46.64	-46.67	-46.70	-46.73	-46.76	-46.79	-46.82	-46.84
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6GHz

6 GHz Channel Allocations

FCC - USA		1.2 Gigahertz of Spectrum															Wavelength 4.2cm - 1.6" ->																																																																																			
Low Power Indoor		5dBm/MHz - Net EIRP 18dBm = LPI															UNII-6															UNII-7															UNII-8																																																					
Qty	Radio Band	Center Freq															Center Freq															Center Freq															Center Freq																																																					
59	20 MHz	1	5	9	13	17	21	25	29	33	37	41	45	49	53	57	61	65	69	73	77	81	85	89	93	97	101	105	109	113	117	121	125	129	133	137	141	145	149	153	157	161	165	169	173	177	181	185	189	193	197	201	205	209	213	217	221	225	229	233	237	241	245	249	253	257	261	265	269	273	277	281	285	289	293	297	301	305	309	313	317	321	325	329	333	337	341	345	349	353	357	361	365	369	373	377	381	385	389	393
29	40 MHz	3		11		19		27		35		43		51		59		67		75		83		91		99		107		115		123		131		139		147		155		163		171		179		187		195		203		211		219		227																																										
14	80 MHz	7				23				39				55				71				87				103				119				135				151				167				183				199				215				231																																										
7	160 MHz	15								47								79								111								143								175								207																																																		
3	320 MHz	31																95																159																231																																																		
Preferred Scanning Channels		5, 21, 37, 53, 69, 85, 101, 117, 133, 149, 165, 181, 197, 213, 229															101, 117, 133, 149, 165, 181, 197, 213, 229															133, 149, 165, 181, 197, 213, 229															197, 213, 229																																																					
Free Space Path Loss at 1m		-46.95, -46.98, -47.01, -47.03, -47.06, -47.09, -47.12, -47.15, -47.18, -47.21, -47.23, -47.26, -47.29, -47.32, -47.35, -47.37, -47.40, -47.43, -47.46, -47.48, -47.51, -47.54, -47.57, -47.59															-47.62, -47.65, -47.67, -47.70, -47.73, -47.75, -47.78, -47.81, -47.83, -47.86, -47.89, -47.91, -47.94, -47.97, -47.99, -48.02, -48.04, -48.07, -48.09, -48.12, -48.14, -48.17, -48.20, -48.22, -48.25, -48.27, -48.30, -48.32, -48.35, -48.37, -48.40, -48.42, -48.44, -48.47, -48.49																																																																																			

Standard Power AP		36dBm with Automated Frequency Coordination (AFC)															UNII-6															UNII-7															UNII-8																																																					
Qty	Radio Band	Center Freq															Center Freq															Center Freq															Center Freq																																																					
59	20 MHz	1	5	9	13	17	21	25	29	33	37	41	45	49	53	57	61	65	69	73	77	81	85	89	93	97	101	105	109	113	117	121	125	129	133	137	141	145	149	153	157	161	165	169	173	177	181	185	189	193	197	201	205	209	213	217	221	225	229	233	237	241	245	249	253	257	261	265	269	273	277	281	285	289	293	297	301	305	309	313	317	321	325	329	333	337	341	345	349	353	357	361	365	369	373	377	381	385	389	393
29	40 MHz	3		11		19		27		35		43		51		59		67		75		83		91		99		107		115		123		131		139		147		155		163		171		179		187		195		203		211		219		227																																										
14	80 MHz	7				23				39				55				71				87				103				119				135				151				167				183				199				215				231																																										
7	160 MHz	15								47								79								111								143								175								207																																																		
3	320 MHz	31																95																159																231																																																		

Very Low Power AP		25mW/14dBm															UNII-6															UNII-7															UNII-8																																																					
		Still under review by the FCC for inclusion in the United States																																																																																																		
Qty	Radio Band	Center Freq															Center Freq															Center Freq															Center Freq																																																					
59	20 MHz	1	5	9	13	17	21	25	29	33	37	41	45	49	53	57	61	65	69	73	77	81	85	89	93	97	101	105	109	113	117	121	125	129	133	137	141	145	149	153	157	161	165	169	173	177	181	185	189	193	197	201	205	209	213	217	221	225	229	233	237	241	245	249	253	257	261	265	269	273	277	281	285	289	293	297	301	305	309	313	317	321	325	329	333	337	341	345	349	353	357	361	365	369	373	377	381	385	389	393
29	40 MHz	3		11		19		27		35		43		51		59		67		75		83		91		99		107		115		123		131		139		147		155		163		171		179		187		195		203		211		219		227																																										
14	80 MHz	7				23				39				55				71				87				103				119				135				151				167				183				199				215				231																																										
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3	320 MHz	31																95																159																231																																																		

Client Devices 6dB Below AP Peak

ETSI - EU		500 Megahertz of Spectrum																																																											
Radio Band		5dBm/MHz - Net EIRP 18dBm = LPI															25mW/14dBm = VLP																																												
Qty	Radio Band	Center Freq															Center Freq																																												
24	20 MHz	1	5	9	13	17	21	25	29	33	37	41	45	49	53	57	61	65	69	73	77	81	85	89	93	97	101	105	109	113	117	121	125	129	133	137	141	145	149	153	157	161	165	169	173	177	181	185	189	193	197	201	205	209	213	217	221	225	229	233	
12	40 MHz	3		11		19		27		35		43		51		59		67		75		83		91		99		107		115		123		131		139		147		155		163		171		179		187		195		203		211		219		227			
6	80 MHz	7				23				39				55				71				87				103				119				135				151				167				183				199				215				231			
3	160 MHz	15								47								79								111								143								175								207											

Zoom in on Details

6 GHz Channel Allocations

FCC - USA

<- Wavelength 5.1cm - 2.0"

1.2 Gigahertz of

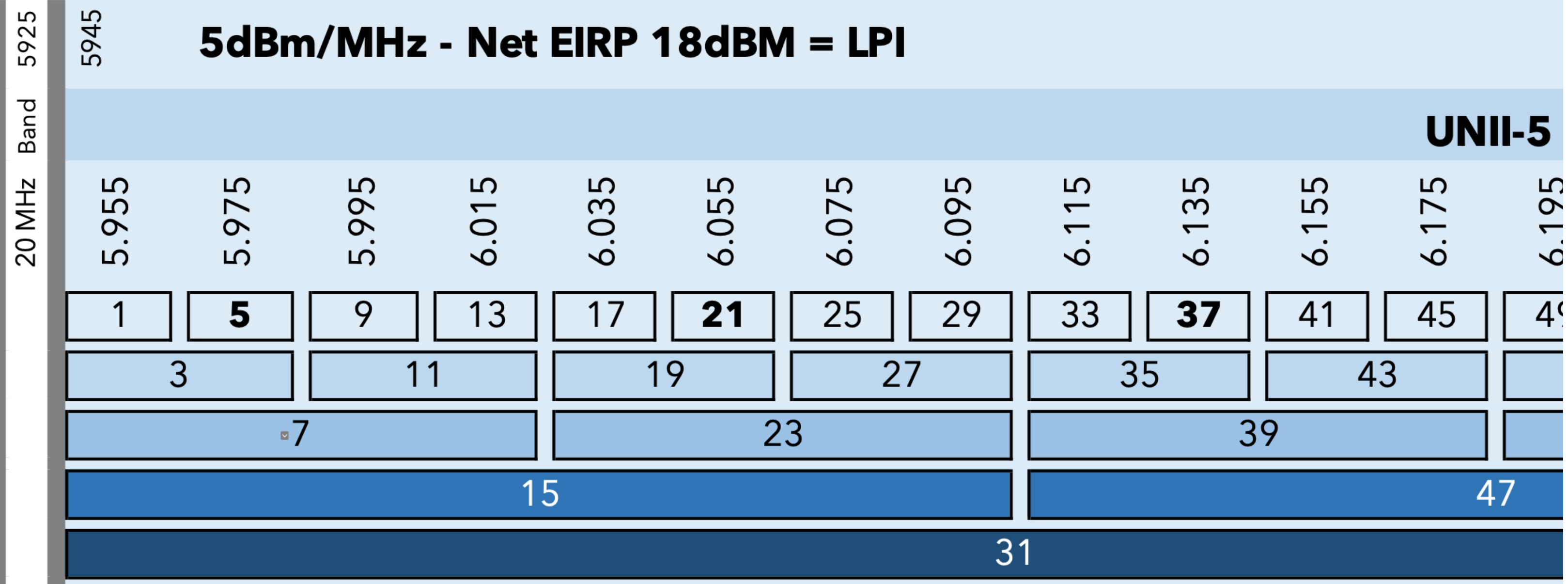
Low Power Indoor

Radio Band

Center Freq

Qty

59	20 MHz
29	40 MHz
14	80 MHz
7	160 MHz
3	320 MHz

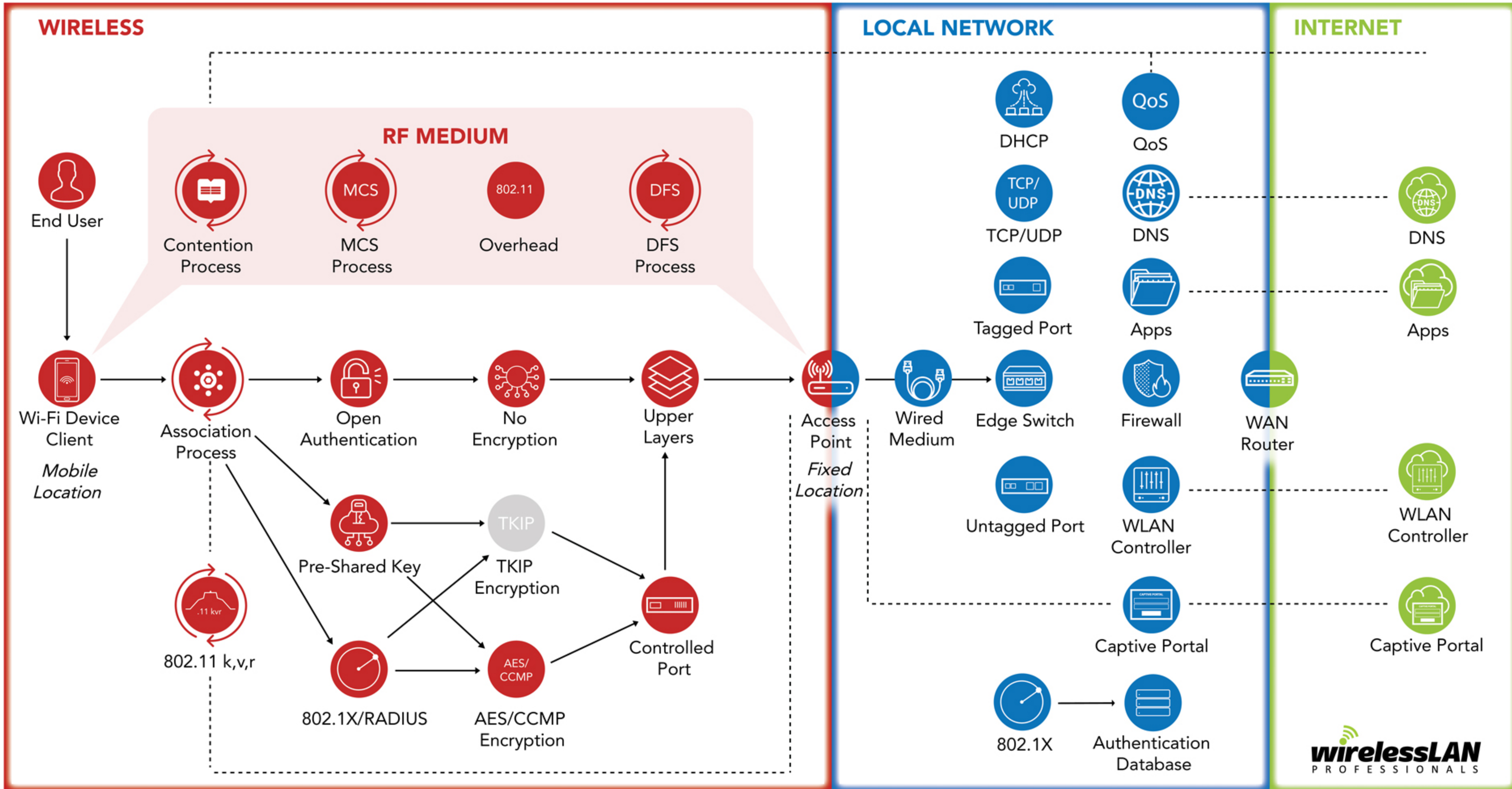


Preferred Scanning Channels
In **BOLD** (PSC)

Free Space Path Loss at 1m

-46.95 **-46.98** -47.01 -47.03 -47.06 **-47.09** -47.12 -47.15 -47.18 **-47.21** -47.23 -47.26 -47.29

Wi-Fi Troubleshooting Framework



Potential Wireless LAN Troubleshooting Causes

Wired/Wireless	Location	Potential Issues
1	Wireless End User	Skills, Knowledge Perceptions, Device on/off, Understanding of Concepts & Device capabilities, Wi-Fi vs Cellular
2	<i>Mobile</i> Wi-Fi Client Device	Drivers, Radio Capabilities, Profiles, Supported PHY, QoS, Power Save, Applications, Location, Vendor IE Support, Chipset Behavior, Roaming Algorithms, Auto-Negotiated MCS, MDM, Protection
3	RF Media	RSSI, SNR, SNiR, Primary & Secondary Coverage, CCI/ACI, Retry Rates, Average MCS, Jitter, Latency, Consistency, Regulatory Domains, Non-Wi-Fi Interference, Spectrum Analysis
4	Per Frame Tx Contention Process	Preamble Detect, Energy Detect, Triggers, NAV Timers, TxOP, AIFS, Random Slots, QoS, WMM, Duration ID, Ch Capacity, Non-Wi-Fi Inteference
5	Per Frame Tx MCS Process	Per Frame Decisions - Modulation Technique, Coding Technique, Ch Width, Guard Interval, Spatial Streams, Tx Power, ACK vs No ACK, TX decides
6	Per Time DFS Process	802.11 is NOT primary User - AP Scans for 60-Seconds, AP Enabled, Continuous Scanning, If RADAR detected, send CSA, Change to new CH, After 30-min can return, after 60-second scan
7	Per Frame Tx Single Frame on RF	Overhead to delivery IP Payload - AIFS, CW, BPSK Preamble, RTS, SIFS, Preamble BPSK, CTS, SIFS, Preamble, Preamble VHT, Header MBR, Payload PHY rate, CRC, SIFS, Preamble, ACK
8	Per Timers Association Process	Beacon, Probe Request, Probe Reponse, Authentication Request, Authentication Response, Association Request, Association Response, Decide on which AP by: RSSI, SNR, Auth Method, Encrypt Method, Channel Switch Announcement, Error Ratios, MCS/Data Rates Supported, Heuristics, Internal Lists, De-Authentication, Dis-Associate, 802.11 k, v, r, MBR, Proprietary Methods!
9	802.11 k, v, r	AP's try to influence the roaming decisions via 'standard' modes
10	Per Changes Authentication Process	Open, Pre-Shared Key, 802.1X RADIUS, PSK includes Exchange of 4-Way Handshake to trigger Encryption Keys, 802.1X EAP Exchange, ending in 4-Way Handshake
11	Encryption Process	None, TKIP, AES/CCMP, Punishment for using TKIP, Confusion with Wi-Fi Alliance naming - WPA2 PSK... is PSK-WPA2
12	From LAN Upper Layers	DHCP, IP, DNS, VLAN, Subnet Mask, Default Gateway, Captive Portal
13	Controlled Port	AP Controls which 802.11 Frames can cross Wireless to Wired Boundary
14	<i>Fixed</i> Access	Configurations, SSIDs, Minimum Basic Rates, Supported PHY Rates, Band Steering, Client Control, Radio Capabilities, Tx Rates, Client Isolation, Roaming, QOS
	Point	PoE, Antenna Pattern, Mounting, 1GB backhaul limit, AP Locations, Physcial Layer Issues, Firmware Revisions, Custom Configurations, RRM/ARM, Proprietary
15	Local Network Wired Medium	EIATIA 568A/B, Category Mismatch, Validation Tests, Grounding, other issues
16	Edge Switch	VLANs, Port Speeds, PoE, Configurations, QoS, End-to-End?, COS vs DSCP
17	Local Network	Distributed vs Centralized Forwarding, ACLs, VLANs, QoS, Tunnels, Layers, NAT
18	TCP/UDP	Following all TCP issues as well as UDP reasons for using each
19	Quality of Service	Tagged Port vs Untagged Port, DSCP, WMM Categories, End-to-End QoS
20	Applicatons	MTU, TCP Window, Round Trip Time, Processing Time, TCP Retransmission times
21	DHCP Server	Lease Durations, Configurations, Broadcast Storms, Latency, Performance, Address Pool Scopes, Scalability, DHCP Options, Auto Renew
22	DNS	Configuration, Scalability, Security, Accuracy, Customization, Control, Blacklists
23	802.1X/RADIUS	Configuration, Ports, Ranges, Licensing Issues, EAP types, Custom VSA, Scalability, Resouces, Certificate Issues, Fast/Secure Roaming types
24	Active Directory	Accounts, Credentials, EAP Compatibility, Custom RADIUS Attributes
25	Controller Functions	Code Versions, Bugs, Configurations, Local vs Cloud, Licensing Issues, Distributed vs Centralized Forwarding, VLAN choices
26	Firewall	Firewall Rules, Capacity, Compatibility, Rate Limiting, Bandwidth Shaping
27	WAN Router	Size of Internet Pipe, Inernet Destination Issues, Costs, Availability, Consistency
28	Internet Internet Connection	Bandwidth Throttling, Jitter, Latency
29	Captive Portal	Security, Client Issues, Privacy, Friction, Triggers, Certificates, DNS, Captive Portal Location, Control, Monetization, Legal, MiFi

Generations of IEEE 802.11

Year	Years	IEEE Name	WFA	# MCS	Modulation	Max Mod	Max	SS	Bands	Max Ch	20MHz	2.4GHz	5GHz	6GHz	Total BW	
1997		802.11	DSSS	2	FHSS/DSSS		2Mb	N/A	2.4GHz	22MHz	3	3			80MHz	
1999	2	802.11 a	OFDM	11	OFDM	QPSK	54Mb	N/A	5GHz	20MHz	9		9		180MHz	
1999	0	802.11 b	HR	4	DSSS	64 QAM	11Mb	N/A	2.4GHz	22Mhz	3	3			80MHz	
2003	4	802.11 g	ERP	11	OFDM	65 QAM	54Mb	N/A	2.4GHz	20MHz	3	3			80MHz	
2009	6	802.11 n	HT	Wi-Fi 4	77	OFDM	66 QAM	600Mb	4	2.4GHz & 5GHz	40MHz	28	3	25		580MHz
2013	4	802.11 ac	VHT	Wi-Fi 5	624	OFDM	256 QAM	1.73Gb	8	5GHz	80MHz	25		25		500MHz
2019	6	802.11 ax	HE	Wi-Fi 6	1,728	OFDMA	1024 QAM	9.6Gb	8	2.4GHz & 5GHz	160MHz	28	3	25		580MHz
2021	2	802.11 ax	HE	Wi-Fi 6E	1,728	OFDMA	1024 QAM	9.6Gb	8	2.4GHz, 5GHz, 6GHz	160MHz	87	3	25	59	1780MHz
2023	2	802.11 be	EHT	Wi-Fi 7	4,032	OFDMA	4096 QAM	46Gb	16	2.4GHz, 5GHz, 6GHz	320MHz	87	3	25	59	1780MHz

Modulation & Coding Scheme - MCS

802.11n, 802.11ac, and 802.11ax

MCS Index



MCS Index			Spatial Streams	Modulation	Coding	OFDM (Prior 11ax)								OFDM (802.11ax)											
HT	VHT	HE				20MHz		40MHz		80MHz		160MHz		20MHz			40MHz			80MHz			160MHz		
						0.8µs GI	0.4µs GI	0.8µs GI	0.4µs GI	0.8µs GI	0.4µs GI	0.8µs GI	0.4µs GI	0.8µs GI	1.6µs GI	3.2µs GI	0.8µs GI	1.6µs GI	3.2µs GI	0.8µs GI	1.6µs GI	3.2µs GI	0.8µs GI	1.6µs GI	3.2µs GI
0	0	0	1	BPSK	1/2	6.5	7.2	13.5	15	29.3	32.5	58.5	65	8.6	8.1	7.3	17.2	16.3	14.6	36	34	30.6	72.1	68.1	61.3
1	1	1		QPSK	1/2	13	14.4	27	30	58.5	65	117	130	17.2	16.3	14.6	34.4	32.5	29.3	72.1	68.1	61.3	144.1	136.1	122.5
2	2	2		QPSK	3/4	19.5	21.7	40.5	45	87.8	97.5	175.5	195	25.8	24.4	21.9	51.6	48.8	43.9	108.1	102.1	91.9	216.2	204.2	183.8
3	3	3		16-QAM	1/2	26	28.9	54	60	117	130	234	260	34.4	32.5	29.3	68.8	65	58.5	144.1	136.1	122.5	288.2	272.2	245
4	4	4		16-QAM	3/4	39	43.3	81	90	175.5	195	351	390	51.6	48.8	43.9	103.2	97.5	87.8	216.2	204.2	183.8	432.4	408.3	367.5
5	5	5		64-QAM	2/3	52	57.8	108	120	234	260	468	520	68.8	65	58.5	137.6	130	117	288.2	272.2	245	576.5	544.4	490
6	6	6		64-QAM	3/4	58.5	65	121.5	135	263.3	292.5	526.5	585	77.4	73.1	65.8	154.9	146.3	131.6	324.3	306.3	275.6	648.5	612.5	551.3
7	7	7		64-QAM	5/6	65	72.2	135	150	292.5	325	585	650	86	81.3	73.1	172.1	162.5	146.3	360.3	340.3	306.3	720.6	680.6	612.5
	8	8		256-QAM	3/4	78	86.7	162	180	351	390	702	780	103.2	97.5	87.8	206.5	195	175.5	432.4	408.3	367.5	864.7	816.7	735
	9	9		256-QAM	5/6	N/A	N/A	180	200	390	433.3	780	866.7	114.7	108.3	97.5	229.4	216.7	195	480.4	453.7	408.3	960.8	907.4	816.7
		10		1024-QAM	3/4									129	121.9	109.7	258.1	243.8	219.4	540.4	510.4	459.4	1080.9	1020.8	918.8
		11	1024-QAM	5/6									143.4	135.4	121.9	286.8	270.8	243.8	600.5	567.1	510.4	1201	1134.3	1020.8	
8	0	0	2	BPSK	1/2	13	14.4	27	30	58.5	65	117	130	17.2	16.3	14.6	34.4	32.5	29.3	72.1	68.1	61.3	144.1	136.1	122.5
9	1	1		QPSK	1/2	26	28.9	54	60	117	130	234	260	34.4	32.5	29.3	68.8	65	58.5	144.1	136.1	122.5	288.2	272.2	245
10	2	2		QPSK	3/4	39	43.3	81	90	175.5	195	351	390	51.6	48.8	43.9	103.2	97.5	87.8	216.2	204.2	183.8	432.4	408.3	367.5
11	3	3		16-QAM	1/2	52	57.8	108	120	234	260	468	520	68.8	65	58.5	137.6	130	117	288.2	272.2	245	576.5	544.4	490
12	4	4		16-QAM	3/4	78	86.7	162	180	351	390	702	780	103.2	97.5	87.8	206.5	195	175.5	432.4	408.3	367.5	864.7	816.7	735
13	5	5		64-QAM	2/3	104	115.6	216	240	468	520	936	1040	137.6	130	117	275.3	260	234	576.5	544.4	490	1152.9	1088.9	980
14	6	6		64-QAM	3/4	117	130	243	270	526.5	585	1053	1170	154.9	146.3	131.6	309.7	292.5	263.3	648.5	612.5	551.3	1297.1	1225	1102.5
15	7	7		64-QAM	5/6	130	144.4	270	300	585	650	1170	1300	172.1	162.5	146.3	344.1	325	292.5	720.6	680.6	612.5	1441.2	1361.1	1225
	8	8		256-QAM	3/4	156	173.3	324	360	702	780	1404	1560	206.5	195	175.5	412.9	390	351	864.7	816.7	735	1729.4	1633.3	1470
	9	9		256-QAM	5/6	N/A	N/A	360	400	780	866.7	1560	1733.3	229.4	216.7	195	458.8	433.3	390	960.8	907.4	816.7	1921.6	1814.8	1633.3
		10		1024-QAM	3/4									258.1	243.8	219.4	516.2	487.5	438.8	1080.9	1020.8	918.8	2161.8	2041.7	1837.5
		11	1024-QAM	5/6									286.8	270.8	243.8	573.5	541.7	487.5	1201	1134.3	1020.8	2402	2268.5	2041.7	
16	0	0	3	BPSK	1/2	19.5	21.7	40.5	45	87.8	97.5	175.5	195	25.8	24.4	21.9	51.6	48.8	43.9	108.1	102.1	91.9	216.2	204.2	183.8
17	1	1		QPSK	1/2	39	43.3	81	90	175.5	195	351	390	51.6	48.8	43.9	103.2	97.5	87.8	216.2	204.2	183.8	432.4	408.3	367.5
18	2	2		QPSK	3/4	58.5	65	121.5	135	263.3	292.5	526.5	585	77.4	73.1	65.8	154.9	146.3	131.6	324.3	306.3	275.6	648.5	612.5	551.3
19	3	3		16-QAM	1/2	78	86.7	162	180	351	390	702	780	103.2	97.5	87.8	206.5	195	175.5	432.4	408.3	367.5	864.7	816.7	735
20	4	4		16-QAM	3/4	117	130	243	270	526.5	585	1053	1170	154.9	146.3	131.6	309.7	292.5	263.3	648.5	612.5	551.3	1297.1	1225	1102.5
21	5	5		64-QAM	2/3	156	173.3	324	360	702	780	1404	1560	206.5	195	175.5	412.9	390	351	864.7	816.7	735	1729.4	1633.3	1470

Why Checklists?



Boeing Model 299 (B-17 Flying Fortress)

“Too much airplane for one man to fly...”

On the morning of October 30, 1935, a crew of five got aboard the Model 299 for test flight. They pointed the plane down the runway, accelerated, and headed up into the sky. But they forgot to release a new safety device called a “gust lock,” which prevented flaps from being damaged by wind while the plane was parked.

“As the plane was climbing without any control, it stalled ... it crashed and burned,” Lombardi said. “The airplane was gone, and, sadly, Boeing lost their most experience test pilot Les Tower, so this was an incredible tragedy.”



Today - US Air Force F-16

One of my son's experiences



Ejection Seat Lever - SAFE



Past - Complications in Surgery

How smart people still make mistakes

In the fall of 1999, the Institute of Medicine released "*To Err is Human: Building a Safer Health System*," a sobering report on the safety of the American healthcare industry. The publication revealed between 44,000 and 98,000 patients died each year in the United States because of preventable medical errors, with an estimated cost between \$17 billion and \$29 billion per year."

**1/3 Fewer Deaths
after using checklist!**



WHO Surgical Safety Checklist published in 2008 to increase the safety of patients undergoing surgery.

The checklist serves to remind surgical team members of important items to be performed before, during and after the surgical procedure. It is an extremely affordable and sustainable tool for reducing deaths from surgery.

Studies have shown the checklist to reduce the rate of deaths and surgical complications by as much as one-third in hospitals where it is used.

Today - Surgical Suite Checklists

Another son's experiences

Surgical Safety Checklist

PRE-PROCEDURE CHECK-IN (In pre-op holding with OR Nurse and Anesthetist)	PRE-INCISION CHECKLIST (In OR with Surgeon, Tech, OR Nurse, Anesthetist)	DEBRIEFING (In OR before Patient and Surgeon leave room)
Has the patient confirmed his/her identity (x2), site, procedure, and consent(s)? <input type="checkbox"/> Yes	<u>OR Nurse:</u> Do all team members know one-another's name and role? <input type="checkbox"/> Yes <input type="checkbox"/> No – Each team member introduces him/herself by name and role.	OR Nurse verbally confirms: <input type="checkbox"/> Name of procedure <input type="checkbox"/> Completion of sponge, needle, and instrument counts. <input type="checkbox"/> Specimen labeling
Is the site marked? <input type="checkbox"/> Yes <input type="checkbox"/> Not Applicable Is the H&P updated or written within 24 hours? <input type="checkbox"/> Yes <input type="checkbox"/> Progress note written for inpatient	<u>Confirmation/Time-Out</u> Confirm: OR Nurse: <input type="checkbox"/> Patient identity (x2) Anesthetist: <input type="checkbox"/> Allergies Surgeon: <input type="checkbox"/> Procedure and site of incision	Anesthetist verbally confirms: <input type="checkbox"/> Estimated blood loss <input type="checkbox"/> Concerns for recovery and post-op management of patient: _____ _____
Does the patient have a: <ul style="list-style-type: none"> Known allergy? <input type="checkbox"/> No <input type="checkbox"/> Yes Difficult airway or aspiration risk? <input type="checkbox"/> No <input type="checkbox"/> Yes, and equipment available Risk of greater than 500 mL blood loss (7 mL/kg in peds)? <input type="checkbox"/> No <input type="checkbox"/> Yes, and two IVs/CVC planned: _____ 	<u>Antibiotic Check (Anesthetist):</u> <ul style="list-style-type: none"> Has antibiotic prophylaxis been given within the last 60 minutes (or 120 minutes for vancomycin and fluoroquinolones)? <input type="checkbox"/> Yes <input type="checkbox"/> Not applicable Has antibiotic prophylaxis been started over 30 minutes ago (for orthopedic cases): <input type="checkbox"/> Yes <input type="checkbox"/> Not applicable 	Surgeon verbally confirms: <input type="checkbox"/> Wound classification
Anesthesia considerations: <ul style="list-style-type: none"> Has a beta-blocker been given? <input type="checkbox"/> Not applicable <input type="checkbox"/> Yes Has VTE prophylaxis been given/placed? <input type="checkbox"/> Not applicable <input type="checkbox"/> Yes 	<u>Critical Events Review:</u> Surgeon reviews: <ul style="list-style-type: none"> <input type="checkbox"/> Are there any critical or non-routine steps? <input type="checkbox"/> How long will the case take? <input type="checkbox"/> What is the anticipated blood loss? 	All team members: <input type="checkbox"/> What areas for improvement were identified? _____ _____ _____ _____ _____ _____ _____



What took our industry so long?

A Story of Four Wi-Fi Checklists

Me - *"Our industry is full of super-smart, cocky, engineers..."*

Pilot Son - *"Have you never met a fighter pilot?"*

RN Son - *"Have you never met a surgeon?"*



How to NOT have a Wireless Problem

20+ years of using this checklist for installing Access Points



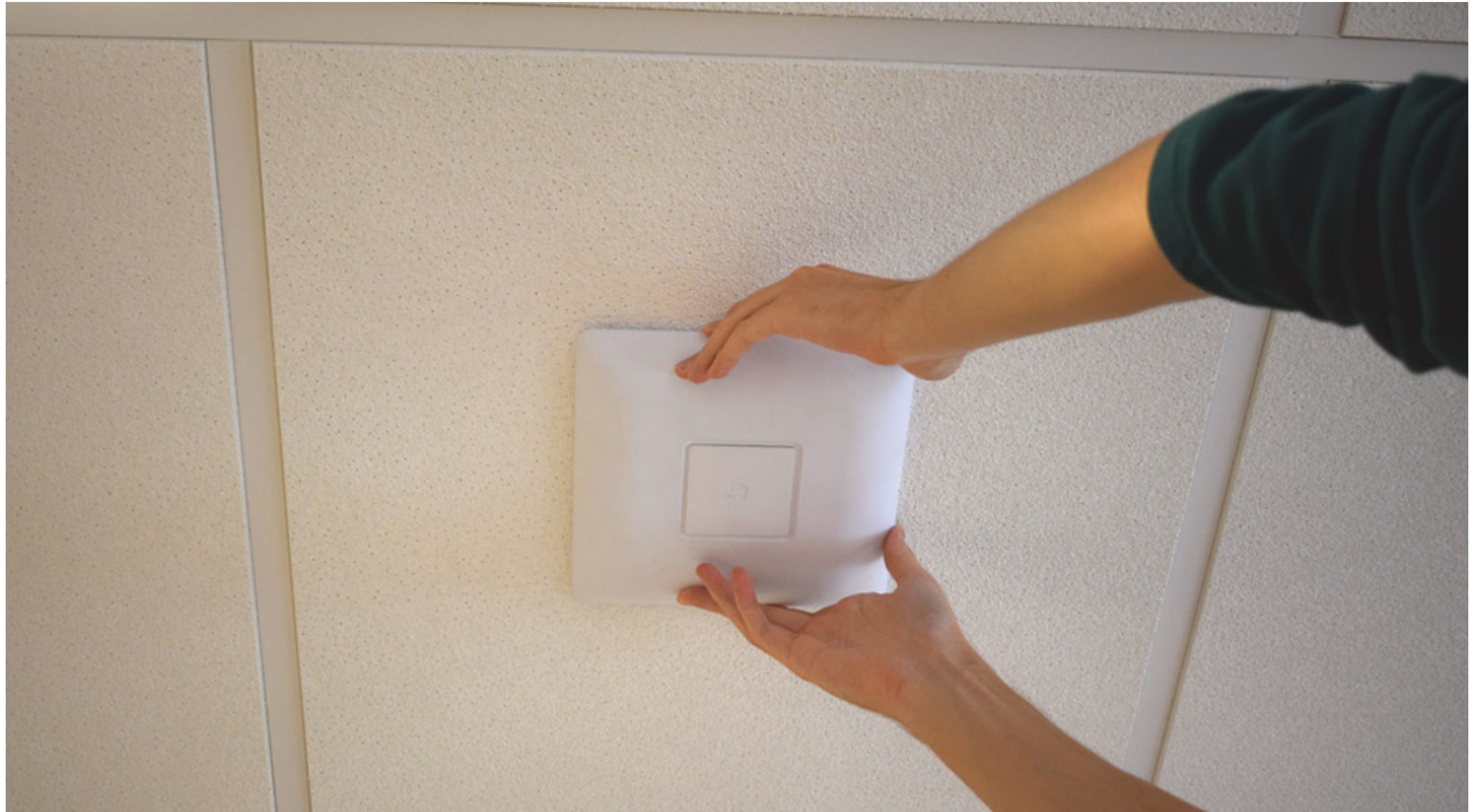
- Caveat: This may not work with your own hardware rollout procedures...
- This HAS worked in hundreds of rollouts where we had control over the process
 1. Network Designed & Wi-Fi Design - location of cable drops per AP
 2. Rack, Stack, and Configure Switches FIRST
 3. Let the cable installers do their job
 4. Then run this checklist as part of the AP installation process

BEFORE installing Access Points

Check the cable plant and the switch configurations **FIRST**

1	Cable meets or exceeds Cat5e specs	<input checked="" type="checkbox"/>	
2	Total cable distance w/patch cords <100m	<input checked="" type="checkbox"/>	
3	PoE meets AP's specific requirements	<input checked="" type="checkbox"/>	
4	Check 802.3 af, at, or bt	<input checked="" type="checkbox"/>	
5	Confirm DHCP address & VLAN	<input checked="" type="checkbox"/>	
6	Confirm Correct VLAN assignment	<input checked="" type="checkbox"/>	
7	Confirm Access or Trunk Port as Required	<input checked="" type="checkbox"/>	
8	Confirm Default Gateway	<input checked="" type="checkbox"/>	
9	Ping Default Gateway	<input checked="" type="checkbox"/>	
10	Confirm Target IP Addresses Reachable	<input checked="" type="checkbox"/>	
11	Confirm DNS Reachable	<input checked="" type="checkbox"/>	
12	Confirm Target DNS Addresses Reachable	<input checked="" type="checkbox"/>	
13	Management VLAN Assigned & Available	<input checked="" type="checkbox"/>	

INSTALL Access Points



"It Depends"

The bane of Wi-Fi engineers...

IT DEPENDS



["it depends"]



Yes
 No
 It Depends



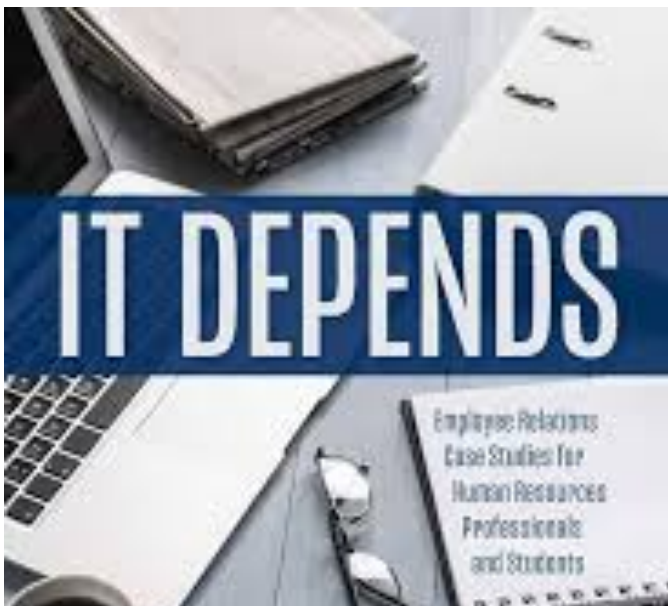
IT DEPENDS ON THE CONTEXT

"It Depends."



"It depends."™

THE ANSWER IS IT DEPENDS



Wi-Fi Checklist

Short Version

- Targeted at 80%-90% of use cases
- Green boxes are for variable metrics - use wisely
- If you have a reason to change... then change
- If not... use these as a great starting point



Wi-Fi Checklist

Top 25 Issues - Short Version



Items to Review and Report		2.4GHz		5GHz		6GHz			
1	1, 6, 11 Only	✓	Ch 1, 6, 11 Only	✗	Not Applicable in 5GHz	-	✗	Not Applicable in 6GHz	-
2	20 MHz Channels	✓	20MHz Channels Only	📶	Use		📶	Use	
3	40 MHz Channels	✗	No 40MHz Ch	📶	Check CCC		📶	Use	
4	80 MHz Channels	✗	Not Available in 2.4GHz	✗	Not Recommended		📶	Check CCC	
5	802.11 b (HR) - Rates Disabled	✓	1, 2, 5.5 & 11 OFF	✗	Not Applicable in 5GHz	-	✗	Not Applicable in 6GHz	-
6	802.11 k - Neighbor Report	✓	Recommended	✓	Recommended		✓	Recommended	
7	802.11 r - Fast Transition *^*	✓	Recommended	✓	Recommended		✓	Recommended	
8	802.11 v - Steering	✗	Not Recommended	✗	Not Recommended		✓	Recommended	

✓ Positive Response or should be turned ON

✗ Not Required or should be turned OFF

📶 This category may use a variable for the metric

XXX Metric used to measure this category - should be discussed and planned to meet site requirements































Wi-Fi Checklist

Supporting Notes

Items to Review and Report	Notes
1, 6, 11 Only	<i>Use 1, 6, 11 only unless strong reason to do otherwise</i>
20 MHz Channels	<i>Use only 20MHz channels in 2.4GHz</i>
40 MHz Channels	<i>Use the widest channel until you can't - you can't when you get CCC/CCI</i>
80 MHz Channels	<i>Use the widest channel until you can't - you can't when you get CCC/CCI</i>
802.11 b (HR) - Rates Disabled	<i>Turn off 1, 2, 5.5 and 11 to keep 802.11b clients OFF</i>
802.11 k - Neighbor Report	<i>AP's scan, then share results to clients with Neighbor Reports</i>
802.11 r - Fast Transition *^*	<i>Coupled with 802.11k allows for faster roaming - may cause issues with legacy devices</i>
802.11 v - Steering	<i>Aids in roaming, load balancing & band steering - but may cause issues in 2.4GHz and 5GHz with older devices</i>

Wi-Fi Checklist

Evaluation of Results

16	Interference - Co--Channel	 >-85dBm	1	 >-85dBm	1	 >-85dBm	1
17	Interference - Non-802.11	 >-96dBm	1	 >-96dBm	1	 >-96dBm	1
18	Minimum Basic Rates - Trim	 MBR>=12Mbps		 MBR>=12Mbps	1	 MBR>=12Mbps	1
19	OBSS - Primary/Secondary	 Do NOT have OBSS	1	 Do NOT have OBSS	0	 Do NOT have OBSS	1
20	PoE to Access Point - Requirements	 802.3 af - 15.4W	0	 802.3 at - 25.5W	1	 802.3 bt - 51W	1
21	PoE to AP's/PHY to AP's - Validate	 Confirm / Validate	1	 Confirm / Validate	1	 Confirm / Validate	1
22	Signal - Primary RSSI	 -67dBm	1	 -65dBm	1	 -65dBm	1
23	Signal - Secondary RSSI *^*	 -67dBm	1	 -65dBm	1	 -65dBm	1
24	SSID's - Across Bands	 Have 2.4GHz-only SSIDs	0	 Use w/RNR	1	 Use w/RNR	1
25	SSID's - Minimize Count	 <= 4	0	 <= 4	1	 <= 4	1

2.4 GHz Results 83%

5 GHz Results 87%

6 GHz Results 95%

Wi-Fi Checklist

Site _____
Date ___ / ___ / ___

Checklist to be used to quickly evaluate a Wi-Fi installation to a level of best practices. There will ALWAYS be situations where different metrics should be used. Please update green boxes for variable metrics for your specific requirements - Enter a 1 in the box for each item if it meets requirements, and a 0 if it does not.

Notes

- Positive Response or should be turned ON
- Not Required or should be turned OFF
- This category may use a variable for the metric
- XXX** Metric used to measure this category - should be discussed and planned to meet site requirements
- ^^*** - indicates some discussion in the community

Items to Review and Report	2.4GHz	5GHz	6GHz
1 1, 6, 11 Only	<input checked="" type="checkbox"/> Ch 1, 6, 11 Only	<input checked="" type="checkbox"/> Not Applicable in 5GHz -	<input checked="" type="checkbox"/> Not Applicable in 6GHz -
2 20 MHz Channels	<input checked="" type="checkbox"/> 20MHz Channels Only	<input type="checkbox"/> Use	<input type="checkbox"/> Use
3 40 MHz Channels	<input checked="" type="checkbox"/> No 40MHz Ch	<input type="checkbox"/> Check CCC	<input type="checkbox"/> Use
4 80 MHz Channels	<input checked="" type="checkbox"/> Not Available in 2.4GHz	<input checked="" type="checkbox"/> Not Recommended	<input type="checkbox"/> Check CCC
5 802.11 b (HR) - Rates Disabled	<input checked="" type="checkbox"/> 1, 2, 5.5 & 11 OFF	<input checked="" type="checkbox"/> Not Applicable in 5GHz -	<input checked="" type="checkbox"/> Not Applicable in 6GHz -
6 802.11 k - Neighbor Report	<input checked="" type="checkbox"/> Recommended	<input checked="" type="checkbox"/> Recommended	<input checked="" type="checkbox"/> Recommended
7 802.11 r - Fast Transition ^^*	<input checked="" type="checkbox"/> Recommended	<input checked="" type="checkbox"/> Recommended	<input checked="" type="checkbox"/> Recommended
8 802.11 v - Steering	<input checked="" type="checkbox"/> Not Recommended	<input checked="" type="checkbox"/> Not Recommended	<input checked="" type="checkbox"/> Recommended
9 AP Firmware - Consistent	<input checked="" type="checkbox"/> Consistent Firmware	<input checked="" type="checkbox"/> Consistent Firmware	<input checked="" type="checkbox"/> Consistent Firmware
10 AP Firmware - Updated	<input checked="" type="checkbox"/> Check Firmware	<input checked="" type="checkbox"/> Check Firmware	<input checked="" type="checkbox"/> Check Firmware
11 AP Transmit Power ^^*	<input type="checkbox"/> 7dBm Target	<input type="checkbox"/> 13dBm Target	<input type="checkbox"/> 16dBm Target
12 Channels - Consistent Bonding	<input checked="" type="checkbox"/> Do NOT bond channels!	<input checked="" type="checkbox"/> High Side Consistent	<input checked="" type="checkbox"/> High Side Consistent
13 Channels - DFS in Use	<input checked="" type="checkbox"/> Not Applicable -	<input type="checkbox"/> Use & Review	<input checked="" type="checkbox"/> Not Applicable in 6GHz -
14 Channels - Utilization/BSS Load ^^*	<input type="checkbox"/> Target <40%	<input type="checkbox"/> Target <20%	<input type="checkbox"/> Target <20%
15 Interference - Adjacent Channel	<input type="checkbox"/> >-85dBm	<input type="checkbox"/> >-85dBm	<input type="checkbox"/> >-85dBm
16 Interference - Co--Channel	<input type="checkbox"/> >-85dBm	<input type="checkbox"/> >-85dBm	<input type="checkbox"/> >-85dBm
17 Interference - Non-802.11	<input type="checkbox"/> >-96dBm	<input type="checkbox"/> >-96dBm	<input type="checkbox"/> >-96dBm
18 Minimum Basic Rates - Trim	<input type="checkbox"/> MBR>=12Mbps	<input type="checkbox"/> MBR>=12Mbps	<input type="checkbox"/> MBR>=12Mbps
19 OBSS - Primary/Secondary	<input checked="" type="checkbox"/> Do NOT have OBSS	<input checked="" type="checkbox"/> Do NOT have OBSS	<input checked="" type="checkbox"/> Do NOT have OBSS
20 PoE to Access Point - Requirements	<input type="checkbox"/> 802.3 af - 15.4W	<input type="checkbox"/> 802.3 at - 25.5W	<input type="checkbox"/> 802.3 bt - 51W
21 PoE to AP's/PHY to AP's - Validate	<input checked="" type="checkbox"/> Confirm / Validate	<input checked="" type="checkbox"/> Confirm / Validate	<input checked="" type="checkbox"/> Confirm / Validate
22 Signal - Primary RSSI	<input type="checkbox"/> -67dBm	<input type="checkbox"/> -65dBm	<input type="checkbox"/> -65dBm
23 Signal - Secondary RSSI ^^*	<input type="checkbox"/> -67dBm	<input type="checkbox"/> -65dBm	<input type="checkbox"/> -65dBm
24 SSID's - Across Bands	<input checked="" type="checkbox"/> Have 2.4GHz-only SSIDs	<input checked="" type="checkbox"/> Use w/RNR	<input checked="" type="checkbox"/> Use w/RNR
25 SSID's - Minimize Count	<input checked="" type="checkbox"/> <= 4	<input checked="" type="checkbox"/> <= 4	<input checked="" type="checkbox"/> <= 4

2.4 GHz Results 0% 5 GHz Results 0% 6 GHz Results 0%

Wi-Fi Checklist Notes

You do NOT have to match the metrics or values - adjust and map metrics to your specific environment and requirements. You should be able to document your reasoning behind any changes.

If you know WHY and HOW you are going to break the rules - by all means go ahead and do so. If not, try to stay with recommendations

Items to Review and Report	Notes
1, 6, 11 Only	Use 1, 6, 11 only unless strong reason to do otherwise
20 MHz Channels	Use only 20MHz channels in 2.4GHz
40 MHz Channels	Use the widest channel until you can't - you can't when you get CCC/CCI
80 MHz Channels	Use the widest channel until you can't - you can't when you get CCC/CCI
802.11 b (HR) - Rates Disabled	Turn off 1, 2, 5.5 and 11 to keep 802.11b clients OFF
802.11 k - Neighbor Report	AP's scan, then share results to clients with Neighbor Reports
802.11 r - Fast Transition ^^*	Coupled with 802.11k allows for faster roaming - may cause issues with legacy devices
802.11 v - Steering	Aids in roaming, load balancing & band steering - but may cause issues in 2.4GHz and 5GHz with older devices
AP Firmware - Consistent	Check to see all access points are running the same level of Firmware
AP Firmware - Updated	Are your access points on the most current firmware level? If not, is there a good reason?
AP Transmit Power ^^*	Discuss and plan a strategy for dealing with minimum AP Tx Power for your network to meet design requirements
Channels - Consistent Bonding	Consistent high-side Primary channel can help prevent OBSS conditions - in 6GHz primary should be PSC
Channels - DFS in Use	Use DFS channels until you can't
Channels - Utilization/BSS Load ^^*	Track and manage this critical metric of RF health! Voice, video and data all may use different target levels
Interference - Adjacent Channel	Worse than CCC - use same techniques to fix as CCC
Interference - Co--Channel	Co-Channel Contention is a terrible waste of the thing we have least... air time. Minimize CCC by better design, tuning, and channel planning
Interference - Non-802.11	Find and eliminate these non-802.11 RF interference sources - May be difficult to achieve in 2.4GHz environments. Set metric appropriately.
Minimum Basic Rates - Trim	Start with 12 Mbps and test - perhaps in High Density 24 Mbps will work better
OBSS - Primary/Secondary	We do NOT like any OBSS condition - work hard to remove any OBSS condition!
PoE to Access Point - Requirements	Are your switches providing the required Power over Ethernet your access points need to enable all needed features?
PoE to AP's/PHY to AP's - Validate	Confirm PHY connection rates as well as actual PoE draw to access points to ensure they are performing as designed.
Signal - Primary RSSI	Set these target requirements based on your client device requirements
Signal - Secondary RSSI ^^*	If you need full AP redundancy, then may match Primary RSSI, else may be lower RSSI - Set your metric appropriately
SSID's - Across Bands	Pre-6GHz recommendation to keep 2.4GHz and 5GHz SSID's separate if possible. But if you add 6GHz, recommendation is to use RNR's for out of band discovery
SSID's - Minimize Count	Remove SSIDs to keep total SSID count as low as possible - One per Authentication Method works well

Extended Wi-Fi Checklist

The details that sometimes get left behind



34	802.11 b - ERP Protection		<i>If supporting b clients</i>		<i>Not Applicable</i>	-		<i>Not Applicable</i>	-
35	802.11 d - Country Code		<i>ON</i>		<i>ON</i>			<i>ON</i>	
36	802.11 e - Quality of Service		<i>ON</i>		<i>ON</i>			<i>ON</i>	
37	802.11 h - TPC		<i>ON</i>		<i>ON</i>			<i>ON</i>	
38	802.11 i - Security		<i>No TKIP - No WEP</i>		<i>No TKIP - No WEP</i>			<i>No TKIP - No WEP</i>	
39	802.11 w - Mgmt Protection		6GHz Support ON		6GHz Support ON			<i>Required</i>	
40	Airtime Fairness		<i>Not Recommended</i>		<i>Not Recommended</i>			<i>Not Recommended</i>	
41	AP Background Scanning		<i>ON</i>		<i>ON</i>			<i>ON</i>	
42	Auto RF / AP Tx Power Settings		Static or Tightly Controlled		Static or Tightly Controlled			Static or Tightly Controlled	
43	Band Steering *^*		<i>Not Recommended</i>		<i>Not Recommended</i>			<i>Not Recommended</i>	
44	Beacon Interval at 102.4ms		<i>ON</i>		<i>ON</i>			<i>ON</i>	
45	Captive web portal use		Use only if required		Use only if required			Use only if required	

Extended Wi-Fi Checklists

Supporting Notes

802.11 b - ERP Protection

If you have 802.11b clients - you should NOT have!

802.11 d - Country Code

Confirm this setting accurately matches your geography

802.11 e - Quality of Service

Enable this for BSS Load IE, WMM and WMM-PS features

802.11 h - TPC

Enable TPC to help clients extend battery life

802.11 i - Security

Do NOT use TKIP or WEP - and discuss and plan for Cipher Suites appropriately - 6GHz is WPA3/OWE-ONLY.

802.11 w - Mgmt Protection

Mandatory in WPA3

Airtime Fairness

ON to help over the air throughput - not fantastic - but every little bit helps

AP Background Scanning

To help access point find and share information on neighboring AP's

Auto RF / AP Tx Power Settings

Almost a religious debate in the community - chose Static or Dynamic based on your network complexity and company policies

Band Steering *^*

If you do not have SSID's shared across bands, then this is unnecessary

Extended Checklist

Site _____

Date ___ / ___ / ___

Radio Frequency Bands

- 26 160 MHz Channels
- 27 320 MHz Channels
- 28 40 MHz Intolerant
- 29 6GHz - In Band Discovery
- 30 6GHz - Low Power Indoor
- 31 6GHz - Out of Band Discovery
- 32 6GHz - Preferred Scanning Channels
- 33 6GHz - Standard Power
- 34 802.11 b - ERP Protection
- 35 802.11 d - Country Code
- 36 802.11 e - Quality of Service
- 37 802.11 h - TPC
- 38 802.11 i - Security
- 39 802.11 w - Mgmt Protection
- 40 Airtime Fairness
- 41 AP Background Scanning
- 42 Auto RF / AP Tx Power Settings
- 43 Band Steering **
- 44 Beacon Interval at 102.4ms
- 45 Captive web portal use
- 46 Channel 144
- 47 Channel 165
- 48 Channel Settings - Automatic
- 49 Channel Widths - Dynamically Applied
- 50 Client Isolation Turned ON
- 51 Clients per Radio - Active
- 52 Clients per Radio - Associated
- 53 DFS - Recurring Events
- 54 Load Balancing
- 55 Mesh Used Correctly **
- 56 MU-MIMO
- 57 OFDMA **
- 58 Probe Supression
- 59 SSID's - Hidden
- 60 SSID's - Same Across 5GHz & 6GHz
- 61 TKIP & WEP & WPA 1
- 62 Transmit Beamforming **
- 63 Wi-Fi MultiMedia - WMM
- 64 WPA 2
- 65 WPA 2-3 Transition **
- 66 WPA 3

	2.4GHz	5GHz	6GHz
26	✗ Not Applicable	✗ Not Recommended	📶 Check CCC
27	✗ Not Applicable	✗ Not Applicable	✗ Not Recommended
28	✅ Neighbors off 40MHz	✗ Not Applicable	✗ Not Applicable
29	✗ Not Applicable	✗ Not Applicable	📶 Choose Method
30	✗ Not Applicable	✗ Not Applicable	📶 Use
31	✗ Not Applicable	✗ Not Applicable	📶 Choose Method
32	✗ Not Applicable	✗ Not Applicable	📶 Use PSC - see notes
33	✗ Not Applicable	✗ Not Applicable	📶 Check AFC
34	✅ If supporting b clients	✗ Not Applicable	✗ Not Applicable
35	✅ ON	✅ ON	✅ ON
36	✅ ON	✅ ON	✅ ON
37	✅ ON	✅ ON	✅ ON
38	✅ No TKIP - No WEP	✅ No TKIP - No WEP	✅ No TKIP - No WEP
39	📶 6GHz Support ON	📶 6GHz Support ON	✅ Required
40	✗ Not Recommended	✗ Not Recommended	✗ Not Recommended
41	✅ ON	✅ ON	✅ ON
42	📶 Static or Tightly Controlled	📶 Static or Tightly Controlled	📶 Static or Tightly Controlled
43	✗ Not Recommended	✗ Not Recommended	✗ Not Recommended
44	✅ ON	✅ ON	✅ ON
45	📶 Use only if required	📶 Use only if required	📶 Use only if required
46	✗ Not Applicable	📶 Client Compatibility	✗ Not Applicable
47	✗ Not Applicable	📶 Client Compatibility	✗ Not Applicable
48	✗ Not Recommended	✗ Not Recommended	✗ Not Recommended
49	✗ Not Recommended	✗ Not Recommended	✗ Not Recommended
50	✅ ON in Public Settings	✅ ON in Public Settings	✅ ON in Public Settings
51	📶 <20	📶 <20	📶 <20
52	📶 <40	📶 <40	📶 <40
53	✗ Not Applicable	📶 Check DFS Logs	✗ Not Applicable
54	✗ Not Recommended	✗ Not Recommended	✗ Not Recommended
55	📶 If required <+ 1 Hop	📶 If required <+ 1 Hop	📶 If required <+ 1 Hop
56	✗ Not Recommended	✗ Not Recommended	✗ Not Recommended
57	📶 ON - Then Validate	📶 ON - Then Validate	📶 ON - Then Validate
58	📶 In Large Venues	📶 In Large Venues	📶 In Large Venues
59	✗ Not Recommended	✗ Not Recommended	✗ Not Recommended
60	✗ Not Applicable	📶 Use w/RNR	📶 Use w/RNR
61	✗ Not Recommended	✗ Not Recommended	✗ Not Recommended
62	✗ Not Recommended	✗ Not Recommended	✗ Not Recommended
63	✅ Always ON	✅ Always ON	✅ Always ON
64	📶 Use	📶 Use	✗ Not Recommended
65	✗ Not Recommended	✗ Not Recommended	✗ Not Allowed
66	📶 Recommended	📶 Recommended	📶 Required

2.4 GHz Results 0%

5 GHz Results 0%

6 GHz Results 0%

Extended Notes

Radio Frequency Bands	Notes
160 MHz Channels	Use the widest channel until you can't - you can't when you get CCC/CCI
320 MHz Channels	Use the widest channel until you can't - you can't when you get CCC/CCI
40 MHz Intolerant	Keeps neighbors from using 40MHz channels in 2.4GHz
6GHz - In Band Discovery	6GHz SSID only requires FILS, or Unsolicited Probe Responses or use of Preferred Scanning Channels - PSC's
6GHz - Low Power Indoor	Check with your Regulatory Domain
6GHz - Out of Band Discovery	6GHz access points can be found using RNRs on 2.4GHz or 5GHz SSIDs
6GHz - Preferred Scanning Channels	Useful to help 6GHz clients find access points - where channel plan supports it - In some Geos, you might need to use non-PSC channels
6GHz - Standard Power	Check with your Regulatory Domain
802.11 b - ERP Protection	If you have 802.11b clients - you should NOT have!
802.11 d - Country Code	Confirm this setting accurately matches your geography
802.11 e - Quality of Service	Enable this for BSS Load IE, WMM and WMM-PS features
802.11 h - TPC	Enable TCP to help clients extend battery life
802.11 i - Security	Do NOT use TKIP or WEP - and discuss and plan for Cipher Suites appropriately - 6GHz is WPA3/OWE-ONLY.
802.11 w - Mgmt Protection	Mandatory in WPA3
Airtime Fairness	ON to help over the air throughput - not fantastic - but every little bit helps
AP Background Scanning	To help access point find and share information on neighboring AP's
Auto RF / AP Tx Power Settings	Almost a religious debate in the community - chose Static or Dynamic based on your network complexity and company policies
Band Steering **	If you do not have SSID's shared across bands, then this is unnecessary
Beacon Interval at 102.4ms	Set it and forget it - leave it at standard default
Captive web portal use	Realize the complexities Captive Portals add to your network, and friction they cause your users. CP's don't start until AFTER the network is working!
Channel 144	Confirm all clients can use and access this channel
Channel 165	Confirm all clients can use and access this channel & Apple not using it too much
Channel Settings - Automatic	Configure you Auto RF to meet vendor specific needs and STUDY the best way to apply to minimize CCC and maximize throughput
Channel Widths - Dynamically Applied	OFF - may cause issues when channels change width and confuses client device algorithms for roaming
Client Isolation Turned ON	Stops AP's from allowing Client to Client traffic - useful in public situations
Clients per Radio - Active	
Clients per Radio - Associated	Metric may change, depending on the density of your environment. This recommendation is for standard density, LPV would be higher.
DFS - Recurring Events	Remove any DFS channels if recurring triggering events
Load Balancing	Useful in high density environments - but may cause issues in normal density
Mesh Used Correctly **	Mesh always has a price - but can be used with additional dedicated radios/bands without the penalty - use metric for target environment
MU-MIMO	OFF - unless you can prove stability and compatibility with your client devices
OFDMA **	ON - unless you can show it is causing issues with client devices
Probe Supression	Useful in high density environments - but may cause issues in normal density
SSID's - Hidden	Don't hide your SSID's
SSID's - Same Across 5GHz & 6GHz	For 6GHz out-of-band discovery to use Reduced Neighbor Reports - RNR's - to help clients find access points
TKIP & WEP & WPA 1	Do Not Use
Transmit Beamforming **	OFF - unless you can prove stability and compatibility with your client devices - See Devin Akin's Wi-Fi Adjuster course
Wi-Fi MultiMedia - WMM	Without, clients limited to only 54Mbps
WPA 2	Discuss and plan a strategy for dealing with WPA 2 & WPA 3 for your network
WPA 2-3 Transition **	This "may" work in your environment - check your client devices - plan on getting off transition as soon as possible
WPA 3	WPA 3 is REQUIRED for 6GHz networks - Discuss and plan a strategy for dealing with WPA 2 & WPA 3 for your network

When to follow Rules

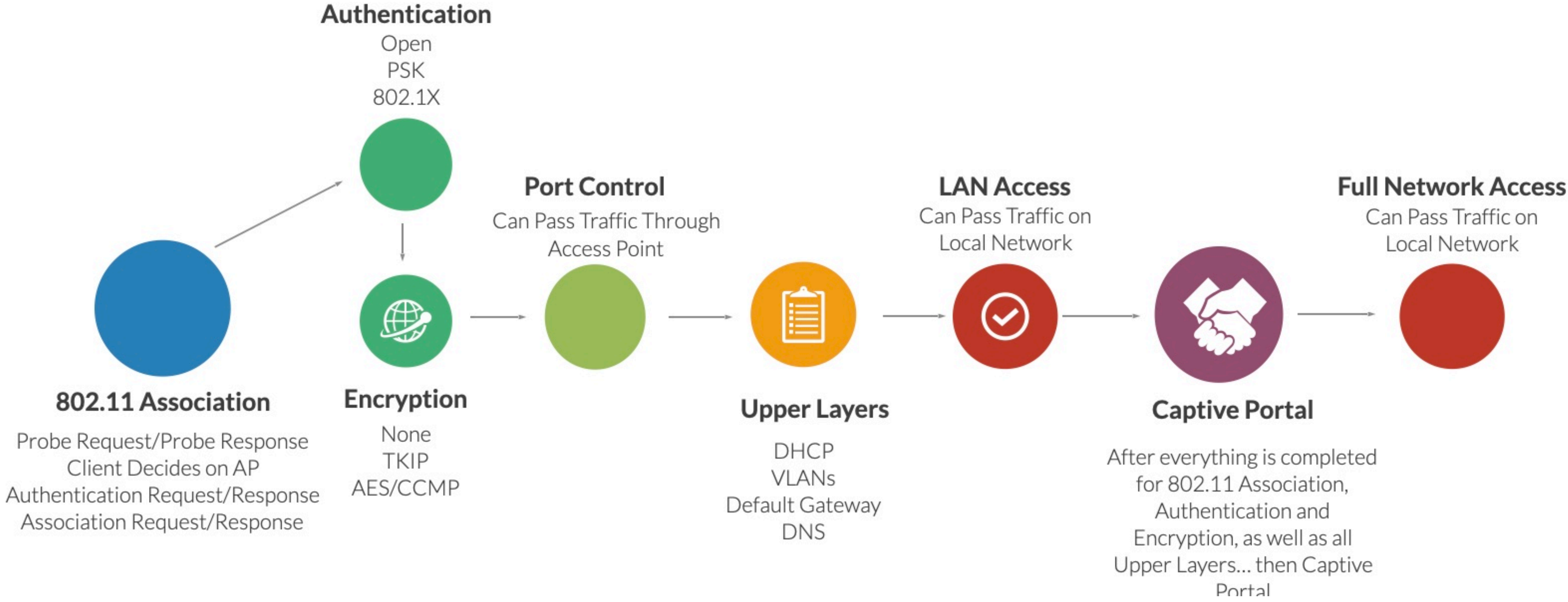
And when to break them...



- Access Points on a Wall like a Clock
- Access Points in Hallways
- Access Points with External Antennas
- Specific 'nerd knobs'
- Etc.

Connection Testing Checklist

Testing with a client device

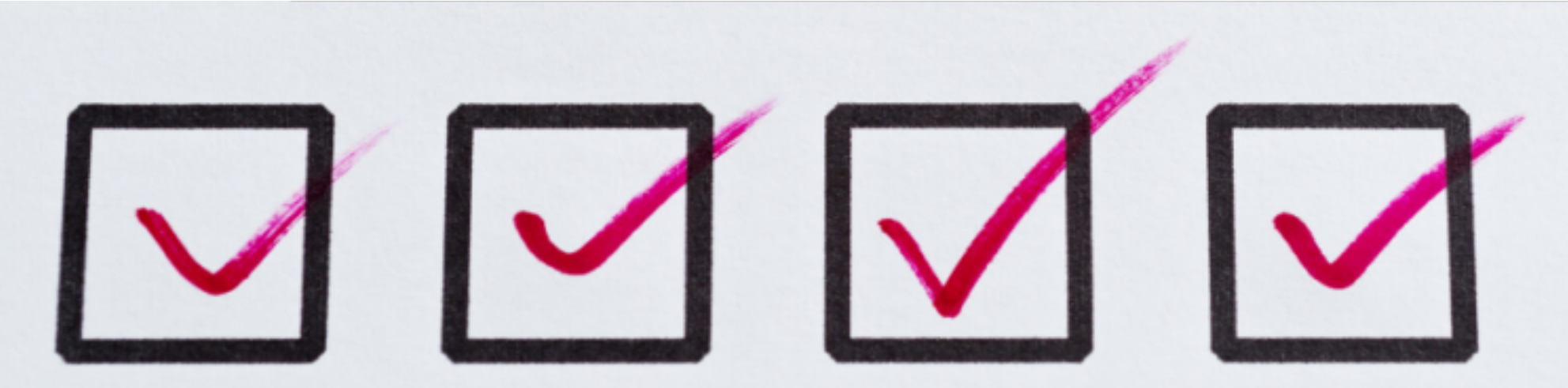


Review of Four Wi-Fi Checklists

Have you forgotten already?



- How to NOT have a Wireless Problem
- Wi-Fi Checklist (Top 25 version)
- Extended Wi-Fi Checklist
- Connection Checklist



Share Knowledge

Knowledge is like manure...






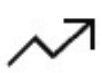
Where to find more shared knowledge...

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Words to Live By

My Epiphany...

Be Nice

Be Happy

Be Grateful

Be Satisfied

Be You... just be you.