



WEBINAR PRESENTS | 40 MINUTES

WLAN Pi for Wi-Fi Troubleshooting

A deep dive into the open-source hardware multi-tool designed to diagnose, capture, profile, and troubleshoot complex wireless networks for IT Experts & Engineers.

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Network Engineer & Trainer | Media Host

An experienced system and wireless engineering veteran, presenting rich technical perspectives gathered from the early BBS system architectures through modern high-density Wi-Fi deployments.

▪ Network Engineer

Active infrastructure architect since the early BBS bulletin system era.

▪ Certified Trainer

Official instructor for MikroTik and Ubiquiti UniFi environments.

▪ Tech Media Host

Broadcaster and reviewer at Beartai Hitech & Techoffside.

▪ Future Tech Enthusiast

Dedicated Apple ecosystem enthusiast and crazy Tesla driver.

What is WLAN Pi?

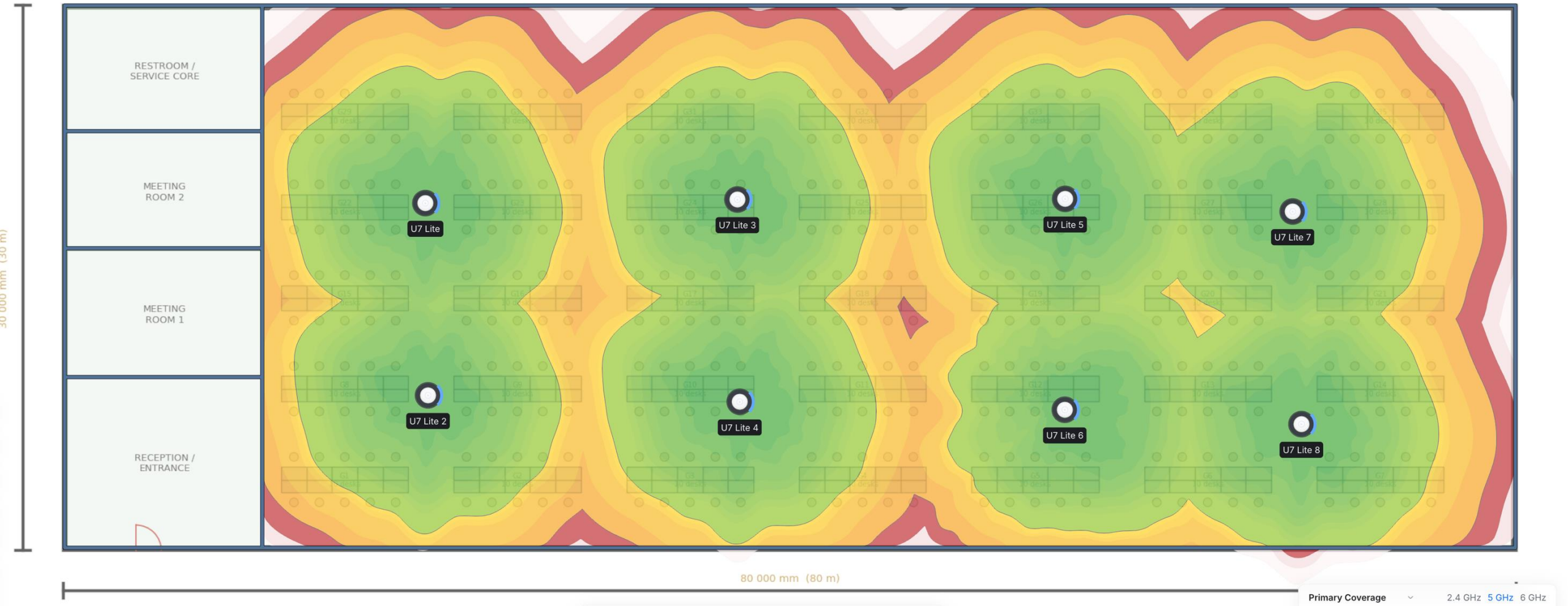
Created by the wireless community in 2016 at the WLPC conference, WLAN Pi was built to overcome expensive, bulky hardware tools.

It is an open-source single-board computer (SBC) platform optimized to run critical command-line diagnostics and analytical toolsets.

Maintained actively by Wi-Fi veterans (including Jerry Olla, Nigel Bowden, Jiri Brejcha, and Francois Verges), it is the industry-standard portable companion for active network engineers.



My experience with WLAN PI



My experience with WLAN PI

- Client MAC: 04:ed:33:40:f0:c9
- OUI manufacturer lookup: IntelCor
- Capture channel: 36

802.11k	Supported
802.11r	Not reported*
802.11v	Supported
802.11w	Supported
802.11n	Supported (2ss)
802.11ac	Supported (2ss), SU BF not supported, MU BF not supported
802.11ax_draft	Not supported
Max_Power	14 dBm
Min_Power	0 dBm
Supported_Channels	36,40,44,48,52,56,60,64,100,104,108,112,116,120,124,128,132,136,140,144,149,153,157,161,165

* Reported client capabilities are dependent on available features at time of client association.

การ์ด WIFI ที่ดีๆ ก็จะเชื่อมต่อได้ทุก Channel



My experience with WLAN PI

d8-9c-67-64-e0-83_5.8GHz.txt

- Client MAC: d8:9c:67:64:e0:83

- OUI manufacturer lookup: HonHaiPr

- Capture channel: 36

802.11k	Not reported* - treat with caution, many clients lie about this
802.11r	Not reported*
802.11v	Supported
802.11w	Supported
802.11n	Supported (2ss)
802.11ac	Supported (2ss), SU BF not supported, MU BF not supported
802.11ax_draft	Not supported
Max_Power	25 dBm
Min_Power	8 dBm
Supported_Channels	1,2,3,4,5,6,7,8,9,10,11,12,13,36,40,44,48,52,56,60,64,100,104,108,112,116,120,124,128,132,136,140,149,153,157,161

การ์ด WIFI ของ Office
ที่มีปัญหาไม่รองรับ Channel 144



* Reported client capabilities are dependent on available features at time of client association.

WLAN Pi Hardware Lineup



WLAN Pi M4+

Built on Raspberry Pi CM4. Features a vibrant 1.44" color screen, joystick navigation, Wi-Fi 7 radios, and native 802.3af PoE capabilities.



WLAN Pi GO

The ultimate pocket tool. Snaps easily to the back of phone, runs Intel BE200 Wi-Fi 7 chipset, and integrates with the official mobile application.



WLAN Pi R4

A highly adaptable DIY solution utilizing standard Raspberry Pi 4, custom 3D-printed case, and a powerful Wi-Fi 6E USB adapter.

WLAN Pi R4

Parts

- Raspberry Pi 4 Model B 2 GB or 4 GB - From \$44.99
- Waveshare 128×128, 1.44inch LCD display HAT for Raspberry Pi - [Order ↗](#) here for \$11.99
- MediaTek 7612U USB Wi-Fi adapter with Monitor mode support - [Order ↗](#) here for \$19.17
- Sandisk Edge or similar 16 GB or larger micro SD card - From \$10.99
- Waveshare Lightweight Aluminum Alloy Case for Raspberry Pi 4 - [Order ↗](#) here for \$17.99
- WLAN Pi Fascia Kit (the orange and grey top of the case, button and joystick caps) - [Order ↗](#) here for \$43
- **That's around \$148 in total**



WLAN Pi R4

A highly adaptable DIY solution utilizing standard Raspberry Pi 4, custom 3D-printed case, and a powerful Wi-Fi 6E USB adapter.

Why WLAN Pi?

▪ Locked Drivers

iOS and Android block monitor mode & raw frame modification.

▪ Raw RF Snipe

Kernel-level drivers support monitor mode, frame capture, and injection.

▪ No Native Ports

Lack of RJ45 Ethernet, active PoE options, and hardware DB9/serial.

▪ Full Interfaces

Equipped with PoE, gigabit ethernet, and multiple antennas.

▪ Security Risk

High-value laptops are unsafe left long-term inside equipment closets.

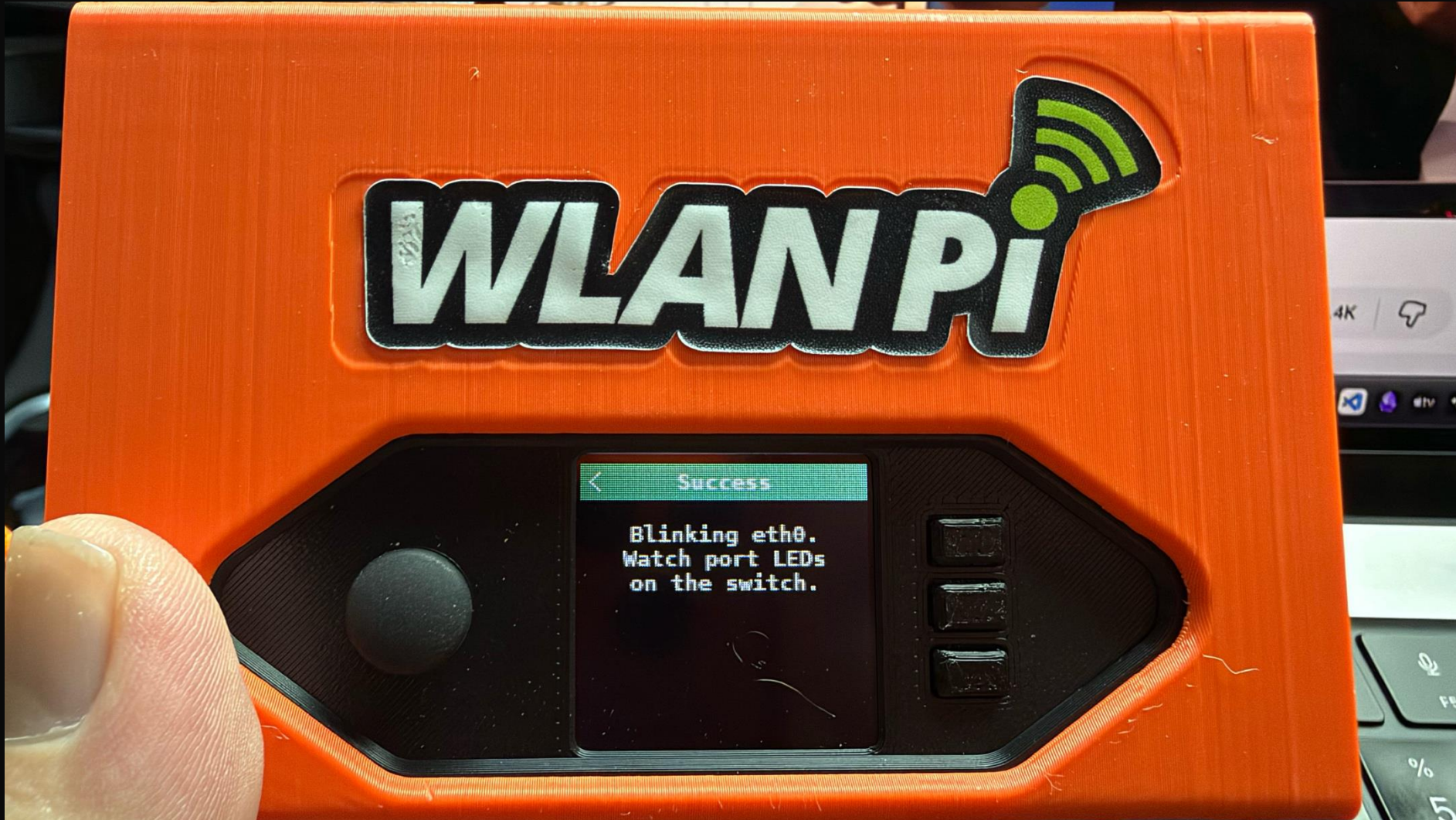
▪ Deploy & Forget

Low-cost, headless profile allows remote continuous analytical sensing.

CDP & LLDP Parsing



Port LED Blinker



IP / DHCP / TFTP

A Word of Caution

Server mode enables DHCP server on the wired eth0 interface of the WLAN Pi. Only plug this interface to a network which is under your management. Never connect WLAN Pi in Server mode to a production network. It can disrupt production services !!!

Subnets

- Wired subnet: 172.16.42.0/24
- Wireless subnet: 172.16.43.0/24

Requirements

To use server mode on your WLAN Pi, you will need:

- WLAN Pi Pro device

HTML5 Speedtest



SPEED TEST ▾

PROFILER ▾

NETWORK

KISMET ▾

GRAFANA ▾

COCKPIT



 127.0.0.1

 53% 47.7C

 239/1896MB 13%

 7/59GB 13%

 1m

STOP

Ping

1.00_{ms}

Jitter

0.19_{ms}

Download

283

Mbps

Upload

215

Mbps

Works best on Chrome, Edge, and Firefox browsers.

Powered by [LibreSpeed](#)

iPerf Server

~ (-zsh)

Last login: Sun Jul 19 00:46:35 on ttys003

> iperf -c 169.254.42.1

Client connecting to 169.254.42.1, TCP port 5001
TCP window size: 128 KByte (default)

[1] tcp connect to 169.254.42.1 port 5001 failed (Connection refused) on 2026-07-19 16:26:55 (+07)

> iperf -c 169.254.42.1

Client connecting to 169.254.42.1, TCP port 5001
TCP window size: 128 KByte (default)

[1] local 169.254.42.3 port 57101 connected with 169.254.42.1 port 5001

[ID] Interval Transfer Bandwidth

[1] 0.00-10.03 sec 258 MBytes 216 Mbits/sec

🍏 ⌘ ~ > _

✓ took 10s ⌚ at 16:27:39 ☺

wlanpi@wlanpi-c14: ~ (ssh)

WLAN Pi M4+

Mode: server
Release: 3.4.4
Uptime: 0 days, 0 hrs 2 mins 37 secs
Date: Sun 19 Jul 2026 04:27:16 AM CDT
Memory: Total: 1896MB, Used: 258MB, Free: 1162MB
Disk: Total: 59GB, Used: 7.2GB, Free: 49GB
CPU temp: 47°C
CPU util: 10%
Internet: Unreachable

Network interfaces:
eth0 172.16.42.1
pan0 169.254.43.1
usb0 169.254.42.1

Tip

Are you using the right RF regulatory domain? Check by "sudo wlanpi-reg-domain get". Change domain by "sudo wlanpi-reg-domain set <country code>", followed by "sudo reboot".

wlanpi@wlanpi-c14:~ \$ iperf3 -s
iperf3: error - unable to start listener for connections: Address already in use
iperf3: exiting
wlanpi@wlanpi-c14:~ \$ iperf -s

Server listening on TCP port 5001
TCP window size: 85.3 KByte (default)

[1] local 169.254.42.1 port 5001 connected with 169.254.42.3 port 57101 (icwnd/mss/irrt=14/1448/606)

[ID] Interval Transfer Bandwidth

[1] 0.00-10.03 sec 258 MBytes 216 Mbits/sec

Reachability and Cloud Service Check



Client Profiler

802.11 generational:

- 802.11n (HT) + spatial streams
- 802.11ac (VHT) + spatial streams + MCS + 160 MHz + beamforming
- 802.11ax (HE) + spatial streams + MCS + features (SR, TWT, UORA, BSR, etc.)
- 802.11be (EHT) + spatial streams + MCS + features
 - EHT MAC: EPCS, OM Control, R-TWT, SCS Traffic Description
 - EHT PHY: MCS 15, MCS 14
 - MLE: 9 multi-link capabilities
- 6 GHz band capabilities (out-of-band)

Client Profiler

Management & security:

- 802.11k (Radio Resource Management)
- 802.11r (Fast Roaming)
- 802.11v (BSS Transition Management)
- 802.11w (Protected Management Frames)
- RSNX: SAE H2E
- RSN Ciphers: Group Cipher, Pairwise Cipher(s)

Client Profiler

Other:

- Max/min power
- Supported channels
- Extended capabilities: SCS, MSCS
- Randomized MAC detection
- Manufacturer/chipset heuristics

Client Profiler

Profiles				
Output below is sorted by last modification timestamps. Most recent profiles will show at the top.				
LAST MODIFICATION	CLIENT MAC	BAND	TEXT REPORT	DOWNLOAD
2026-07-04 00:49:53	82-d9-ab-35-8c-a7	5.0GHz	PROFILE	PCAP
2026-07-04 00:35:59	f4-28-9d-a6-b7-b7	5.0GHz	PROFILE	PCAP
2026-07-04 00:30:31	e4-c7-67-63-93-95	5.0GHz	PROFILE	PCAP
2026-05-03 08:49:58	82-31-5e-e3-bd-90	5.0GHz	PROFILE	PCAP
2026-05-03 08:49:29	90-32-4b-00-76-df	5.0GHz	PROFILE	PCAP
2026-05-03 08:49:15	5a-ee-df-d0-9a-16	5.0GHz	PROFILE	PCAP
2026-05-03 08:47:43	10-68-38-7f-c2-ba	5.0GHz	PROFILE	PCAP
2026-05-03 08:44:38	ee-84-4f-4d-ca-b1	5.0GHz	PROFILE	PCAP
2026-05-03 05:41:10	72-62-01-dc-01-a4	5.0GHz	PROFILE	PCAP

Client Profiler

82-d9-ab-35-8c-a7_5.0GHz.txt

- Client MAC: 82:d9:ab:35:8c:a7

- OUI manufacturer lookup: Apple (Randomized MAC)

- Chipset lookup: Unknown

- Frequency band: 5 GHz

- Capture channel: 149

802.11k	Supported
802.11r	Supported
802.11v	Supported
802.11w	Not reported
802.11n	Supported (2ss)
802.11ac	Supported (2ss), MCS 0-9, [X] 160 MHz, [X] SU BF, [X] MU BF, Beamformee STS=7
802.11ax	Supported (2ss), MCS 0-11, [] 160 MHz, [] TWT, [X] Punctured Preamble, [] SU Beamformer, [X] SU Beamformee, I
802.11be	Not supported
6 GHz Operating Class	Supported
Max Power	25 dBm
Supported Channels	36-64, 100-144, 149-165**
Number of Channels	25

Key: [X]: Supported, []: Not supported

* Reported client capabilities are dependent on available features at the time of client association.

** Reported channels do not factor local regulatory domain. Detected channel sets are assumed contiguous.

Client Profiler

- Client MAC: 88:bf:e4:cd:37:bd
- OUI manufacturer lookup: HuaweiTe
- Capture channel: 36

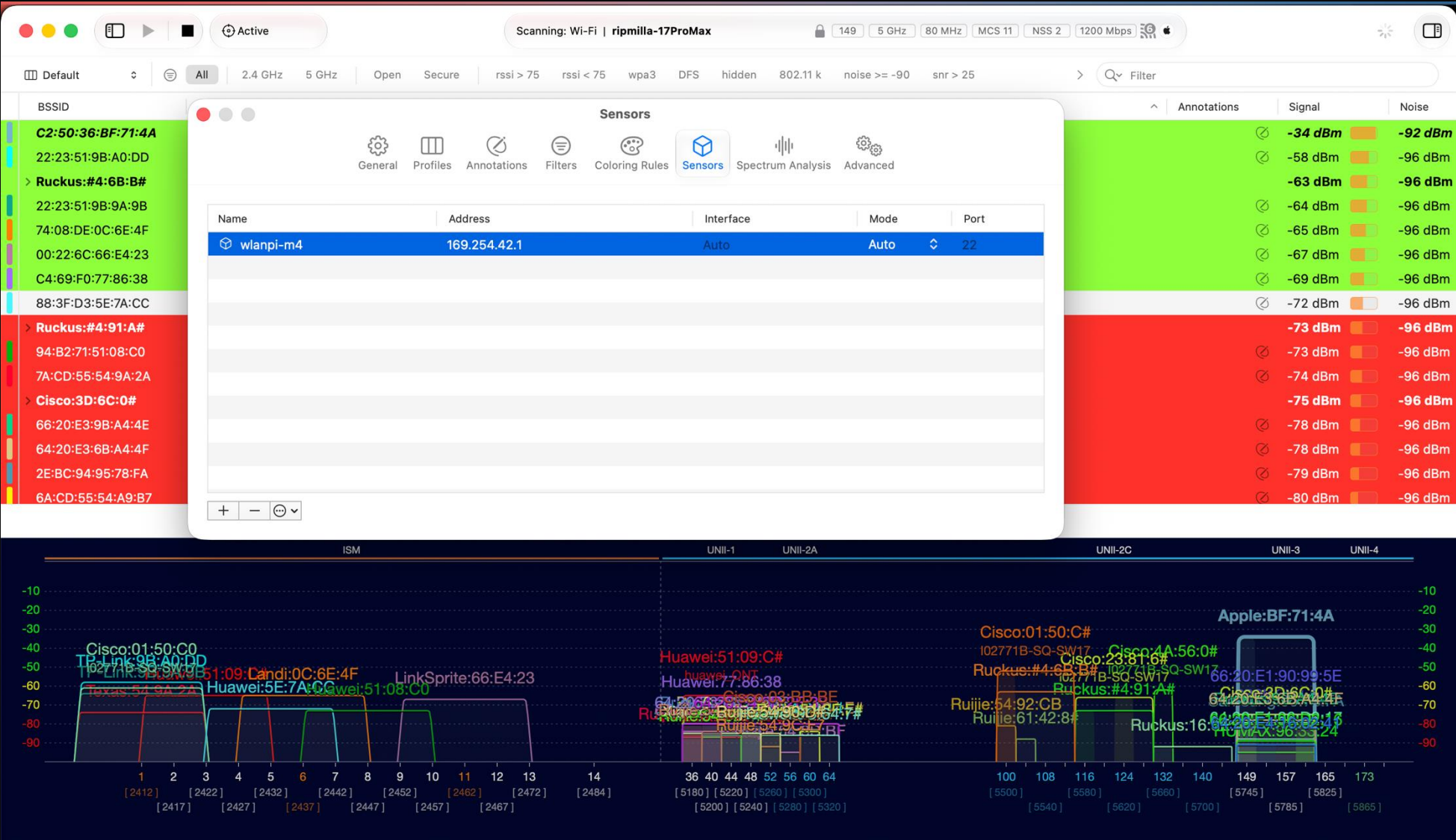
802.11k	Supported
802.11r	Supported
802.11v	Supported
802.11w	Supported
802.11n	Supported (2ss)
802.11ac	Supported (2ss), SU BF supported, MU BF not supported
802.11ax_draft	Not supported
Max_Power	17 dBm
Min_Power	3 dBm
Supported_Channels	36,40,44,48,52,56,60,64,68,72,76,80,84,88,92,96,100,104,108,112,116,120,124,128,132

* Reported client capabilities are dependent on available features at time of client association.

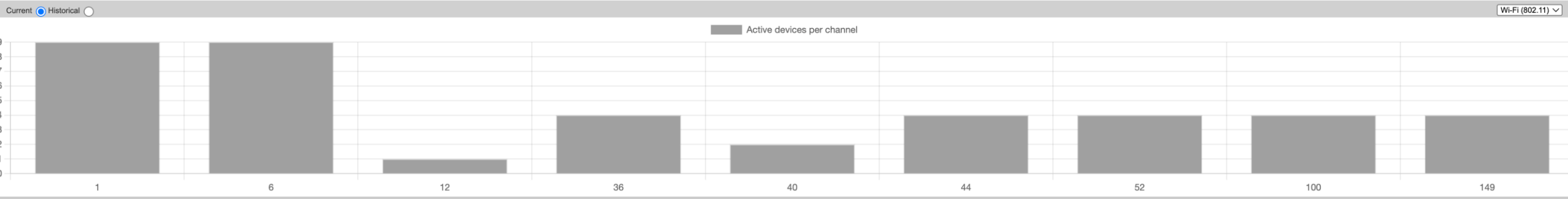
Huawei P30 Pro
หายไปทั้งโซนเลยจ้า



Remote Wi-Fi Sensor with Wi-Fi Explorer



Name	Type	Phy	Encryption	Sgn	Chan	Data	Packets	Clients	BSSID	Last Seen	First Seen	MAC	Frequency	Manuf	Uptime	QBSS Chan Usage
test-hotspot	Wi-Fi AP	IEEE802.11	Open	-50	1	0 B		0	50:E4:E0:19:F2:65	Jul 22 2026 11:04:43	Jul 22 2026 11:04:23	50:E4:E0:19:F2:65	2412000	Hewlett Packard Enterprise	9d 20h 55m 56s	15.29%
test-hotspot	Wi-Fi AP	IEEE802.11	Open	-58	1	0 B		0	50:E4:E0:19:FF:E5	Jul 22 2026 11:04:44	Jul 22 2026 11:04:23	50:E4:E0:19:FF:E5	2412000	Hewlett Packard Enterprise	9d 20h 55m 58s	12.94%
test-hotspot	Wi-Fi AP	IEEE802.11	Open	-64	6	0 B		0	50:E4:E0:1A:00:65	Jul 22 2026 11:04:37	Jul 22 2026 11:04:24	50:E4:E0:1A:00:65	2437000	Hewlett Packard Enterprise	9d 20h 55m 54s	14.90%
test-hotspot	Wi-Fi AP	IEEE802.11	Open	-36	36	0 B		0	50:E4:E0:19:F2:75	Jul 22 2026 11:04:44	Jul 22 2026 11:04:24	50:E4:E0:19:F2:75	5180000	Hewlett Packard Enterprise	9d 20h 55m 58s	31.37%
test-hotspot	Wi-Fi AP	IEEE802.11	Open	-67	44	0 B		0	50:E4:E0:1A:00:75	Jul 22 2026 11:04:45	Jul 22 2026 11:04:25	50:E4:E0:1A:00:75	5220000	Hewlett Packard Enterprise	9d 20h 56m 3s	3.137%
test-hotspot	Wi-Fi AP	IEEE802.11	Open	-63	100	0 B		0	50:E4:E0:19:FF:F5	Jul 22 2026 11:04:39	Jul 22 2026 11:04:26	50:E4:E0:19:FF:F5	5500000	Hewlett Packard Enterprise	9d 20h 55m 54s	2.745%
test-hotspot	Wi-Fi AP	IEEE802.11	Open	-73	52	0 B		0	F0:61:C0:A4:BB:15	Jul 22 2026 11:04:39	Jul 22 2026 11:04:25	F0:61:C0:A4:BB:15	5260000	Hewlett Packard Enterprise	10d 7h 54m 18s	4.706%
test-hotspot	Wi-Fi AP	IEEE802.11	Open	-60	6	0 B		0	F0:61:C0:A4:BB:05	Jul 22 2026 11:04:37	Jul 22 2026 11:04:37	F0:61:C0:A4:BB:05	2437000	Hewlett Packard Enterprise	10d 7h 54m 15s	10.59%
VR-WIFI	Wi-Fi AP	IEEE802.11	WPA2-PSK	-50	1	0 B		7	50:E4:E0:19:F2:62	Jul 22 2026 11:04:44	Jul 22 2026 11:04:23	50:E4:E0:19:F2:62	2412000	Hewlett Packard Enterprise	9d 20h 55m 56s	15.29%
VR-WIFI	Wi-Fi AP	IEEE802.11	WPA2-PSK	-59	1	0 B		2	50:E4:E0:19:FF:E2	Jul 22 2026 11:04:44	Jul 22 2026 11:04:23	50:E4:E0:19:FF:E2	2412000	Hewlett Packard Enterprise	9d 20h 55m 58s	12.94%
VR-WIFI	Wi-Fi AP	IEEE802.11	WPA2-PSK	-62	6	0 B		3	F0:61:C0:A4:BB:02	Jul 22 2026 11:04:37	Jul 22 2026 11:04:24	F0:61:C0:A4:BB:02	2437000	Hewlett Packard Enterprise	10d 7h 54m 15s	10.59%
VR-WIFI	Wi-Fi AP	IEEE802.11	WPA2-PSK	-62	6	0 B		8	50:E4:E0:1A:00:62	Jul 22 2026 11:04:37	Jul 22 2026 11:04:24	50:E4:E0:1A:00:62	2437000	Hewlett Packard Enterprise	9d 20h 55m 54s	14.90%



Remote Wi-Fi Sensor with Wireshark

Wireshark

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Standard input

Apply a display filter ... <Alt>/>

Hide Bad Hide Data Hide Management Hide Control Filter to AP/Client Convo 4Way HandShake

No.	Time	Transmitter	Receiver	Frame Type	Channel	Length	Duration	Signal Strength	Data Rate	MCS index	PHY type	SSID
3236	2026-07-19 19:38:53.020689	64:20:e3:b3:23:0f	Broadcast	Beacon	36	412	0	-90 dBm	6.0		802.11a (OFDM)	<MISSING>
3237	2026-07-19 19:38:53.024870	66:20:e3:93:23:0e	Broadcast	Beacon	36	464	0	-89 dBm	6.0		802.11a (OFDM)	"VHOUSE 5G"
3238	2026-07-19 19:38:53.062195	64:20:e3:ef:69:61	Broadcast	Bad (Malformed)	36	412	0	-91 dBm	6.0		802.11a (OFDM)	<MISSING>
3239	2026-07-19 19:38:53.066418	66:20:e3:9f:69:60	Broadcast	Beacon	36	497	0	-92 dBm	6.0		802.11a (OFDM)	"Fluke 5G_8xs"
3240	2026-07-19 19:38:53.069788	HewlettPacka_19:f2:71	Broadcast	Beacon	36	386	0	-46 dBm	6.0		802.11a (OFDM)	<MISSING>
3241	2026-07-19 19:38:53.070286	HewlettPacka_19:f2:73	Broadcast	Beacon	36	382	0	-46 dBm	6.0		802.11a (OFDM)	"VR-EAP"
3242	2026-07-19 19:38:53.070816	HewlettPacka_19:f2:74	Broadcast	Beacon	36	384	0	-46 dBm	6.0		802.11a (OFDM)	"VR-EAP-TEST"
3243	2026-07-19 19:38:53.071314	HewlettPacka_19:f2:75	Broadcast	Beacon	36	353	0	-46 dBm	6.0		802.11a (OFDM)	"test-hotspot"
3244	2026-07-19 19:38:53.076693	c2:e3:fb:9a:91:80	Broadcast	Beacon	36	469	0	-92 dBm	6.0		802.11a (OFDM)	"Whan166_5G"
3245	2026-07-19 19:38:53.123094	64:20:e3:b3:23:0f	Broadcast	Beacon	36	412	0	-89 dBm	6.0		802.11a (OFDM)	<MISSING>
3246	2026-07-19 19:38:53.127240	66:20:e3:93:23:0e	Broadcast	Beacon	36	464	0	-90 dBm	6.0		802.11a (OFDM)	"VHOUSE 5G"
3247	2026-07-19 19:38:53.172212	HewlettPacka_19:f2:71	Broadcast	Beacon	36	386	0	-46 dBm	6.0		802.11a (OFDM)	<MISSING>
3248	2026-07-19 19:38:53.172710	HewlettPacka_19:f2:73	Broadcast	Beacon	36	382	0	-46 dBm	6.0		802.11a (OFDM)	"VR-EAP"
3249	2026-07-19 19:38:53.173217	HewlettPacka_19:f2:74	Broadcast	Beacon	36	384	0	-46 dBm	6.0		802.11a (OFDM)	"VR-EAP-TEST"
3250	2026-07-19 19:38:53.173706	HewlettPacka_19:f2:75	Broadcast	Beacon	36	353	0	-46 dBm	6.0		802.11a (OFDM)	"test-hotspot"
3251	2026-07-19 19:38:53.225499	64:20:e3:b3:23:0f	Broadcast	Beacon	36	412	0	-90 dBm	6.0		802.11a (OFDM)	<MISSING>
3252	2026-07-19 19:38:53.229651	66:20:e3:93:23:0e	Broadcast	Beacon	36	464	0	-90 dBm	6.0		802.11a (OFDM)	"VHOUSE 5G"
3253	2026-07-19 19:38:53.266999	64:20:e3:ef:69:61	Broadcast	Beacon	36	412	0	-91 dBm	6.0		802.11a (OFDM)	<MISSING>
3254	2026-07-19 19:38:53.274591	HewlettPacka_19:f2:71	Broadcast	Beacon	36	386	0	-46 dBm	6.0		802.11a (OFDM)	<MISSING>
3255	2026-07-19 19:38:53.275071	HewlettPacka_19:f2:73	Broadcast	Beacon	36	382	0	-46 dBm	6.0		802.11a (OFDM)	"VR-EAP"
3256	2026-07-19 19:38:53.275596	HewlettPacka_19:f2:74	Broadcast	Beacon	36	384	0	-46 dBm	6.0		802.11a (OFDM)	"VR-EAP-TEST"
3257	2026-07-19 19:38:53.276086	HewlettPacka_19:f2:75	Broadcast	Beacon	36	353	0	-46 dBm	6.0		802.11a (OFDM)	"test-hotspot"

Frame 1: Packet, 463 bytes on wire (3704 bits), 463 bytes captured (3704 bits) on interface en0, id 0

802.11 radio information

IEEE 802.11 Beacon frame, Flags:C

IEEE 802.11 Wireless Management

IEEE 802.11 Radiotap Capture header

Header revision

Header pad

Header length

MAC timestamp

Flags

Data rate (Mb/s)

Channel frequency

Channel flags

Antenna signal

Antenna noise

Antenna

Vendor namespace

IEEE 802.11 wireless LAN

Type/Subtype

Duration

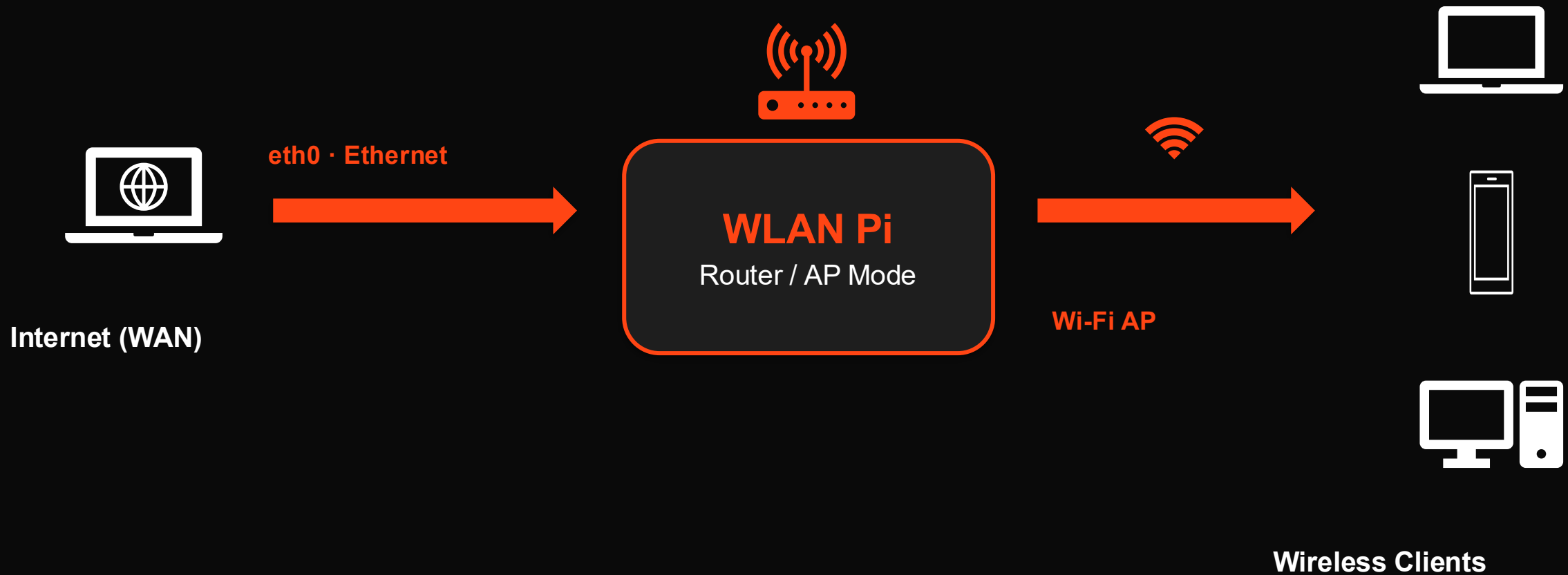
Receiver address

wireshark_Standard inputZKISS3.pcapng

Packets: 3257 · Dropped: 0 (0.0%)

Profile: MetaGeek Profile (v2.0)

Wi-Fi Hotspot



Wi-Fi Console



Notebook connects over Wi-Fi to the WLAN Pi, which bridges to the device's serial port — remote CLI access with no physical console cable at the desk.

Bridge Modes



WLAN Pi joins a Wi-Fi network and bridges it to eth0 — a notebook wired into the Ethernet port gets full network access over the bridge.

9 Common Wi-Fi Fails ⚙️

1

COVERAGE

Primary & Secondary

2

CHANNELS & POWER

Channel choice, width,
Tx, DFS

3

INTERFERENCE

Noise, RF interference, SNR,
CCI, ACI, OBSS

4

DATA RATES

MBR, supported,
disabled

5

CAPACITY

of active stations & client
serving radios, rate limiting

6

SSID CONFIG

Multi-band SSID, too many
SSIDs, band steering, load
balancing, compatibility

7

SECURITY

MFP, legacy security, MITM,
weak passphrase, physical
security

8

DESIGN

APs placement &
capabilities, mounting,
antennas choice

9

UPSTREAM DEVICES & SERVICES

Broadband, FW, DNS, DHCP,
equipment, RADIUS, bad
cable

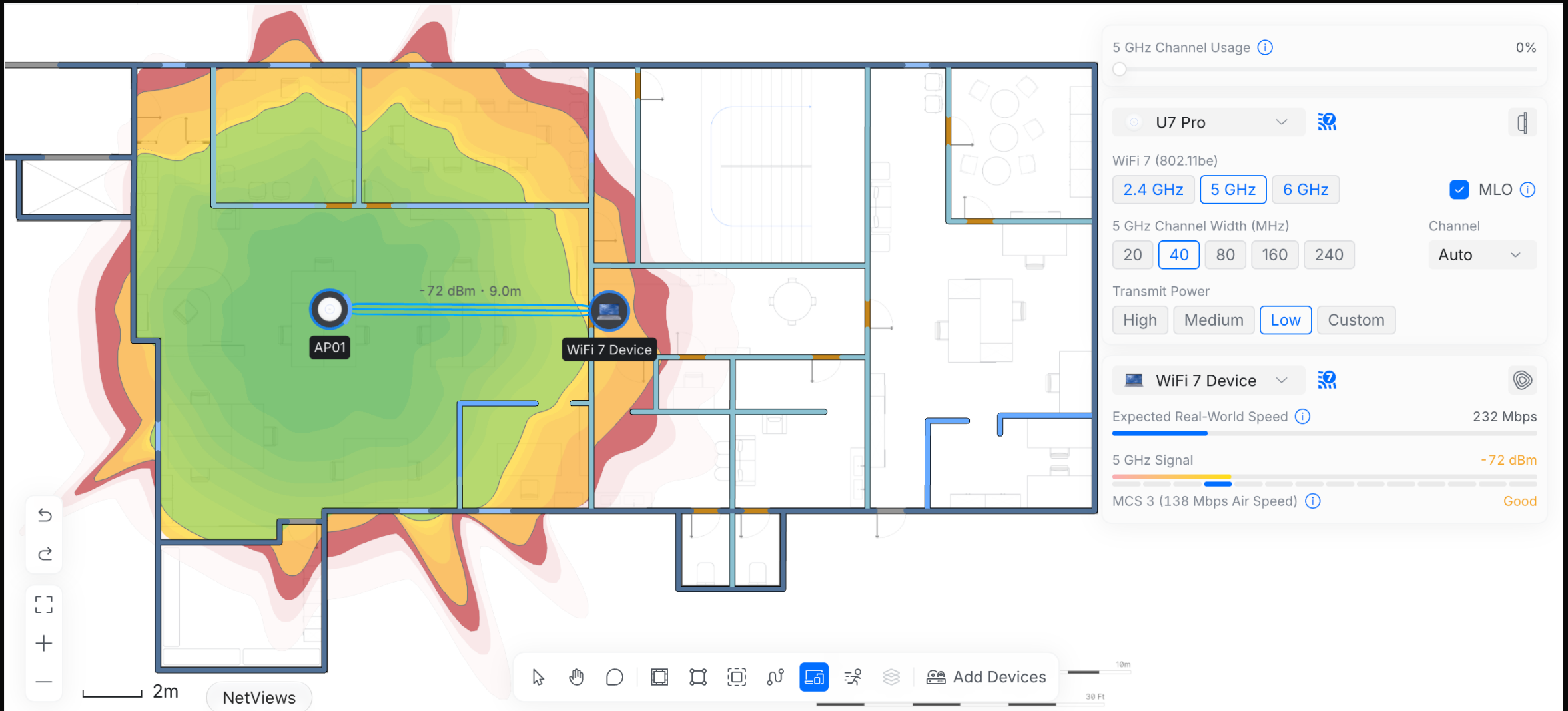
SYMPTOMS & CAUSES

Coverage

RSSI below -67 dBm, weak secondary-AP overlap, and dead-zone blind spots.

WLAN Pi TOOL

Wi-Fi Explorer / Kismet with the WLAN Pi as a remote scanner.



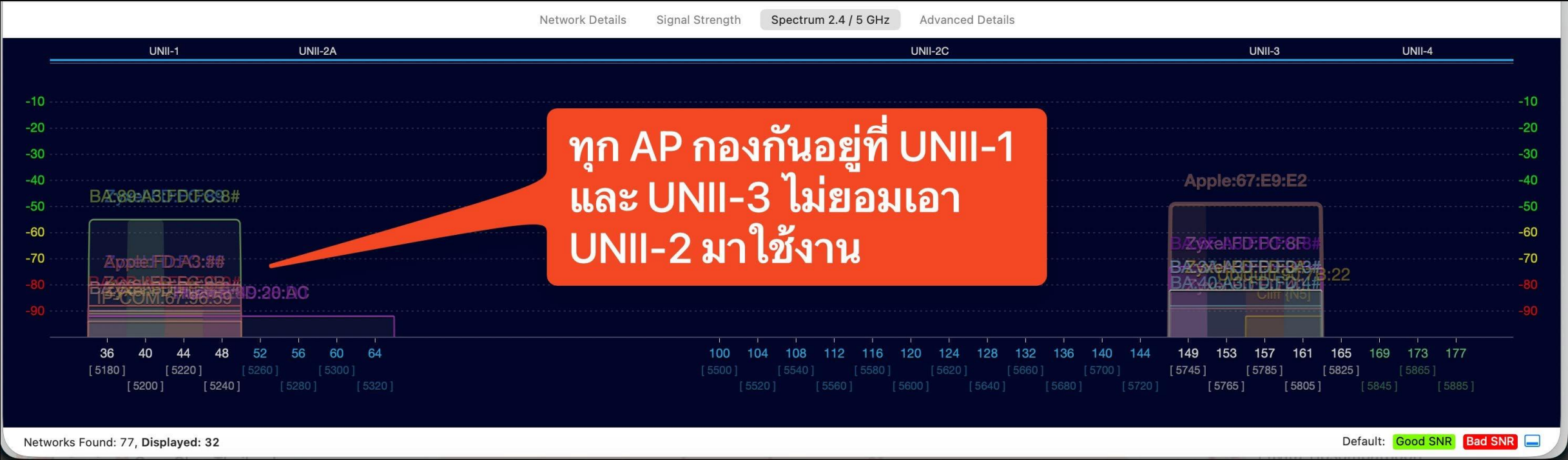
Channel & Power

SYMPTOMS & CAUSES

DFS radar hits, wrong channel widths (80 MHz), and Tx-power mismatches between APs.

WLAN Pi TOOL

CLI wireless scan to audit channels, widths, and Tx power.



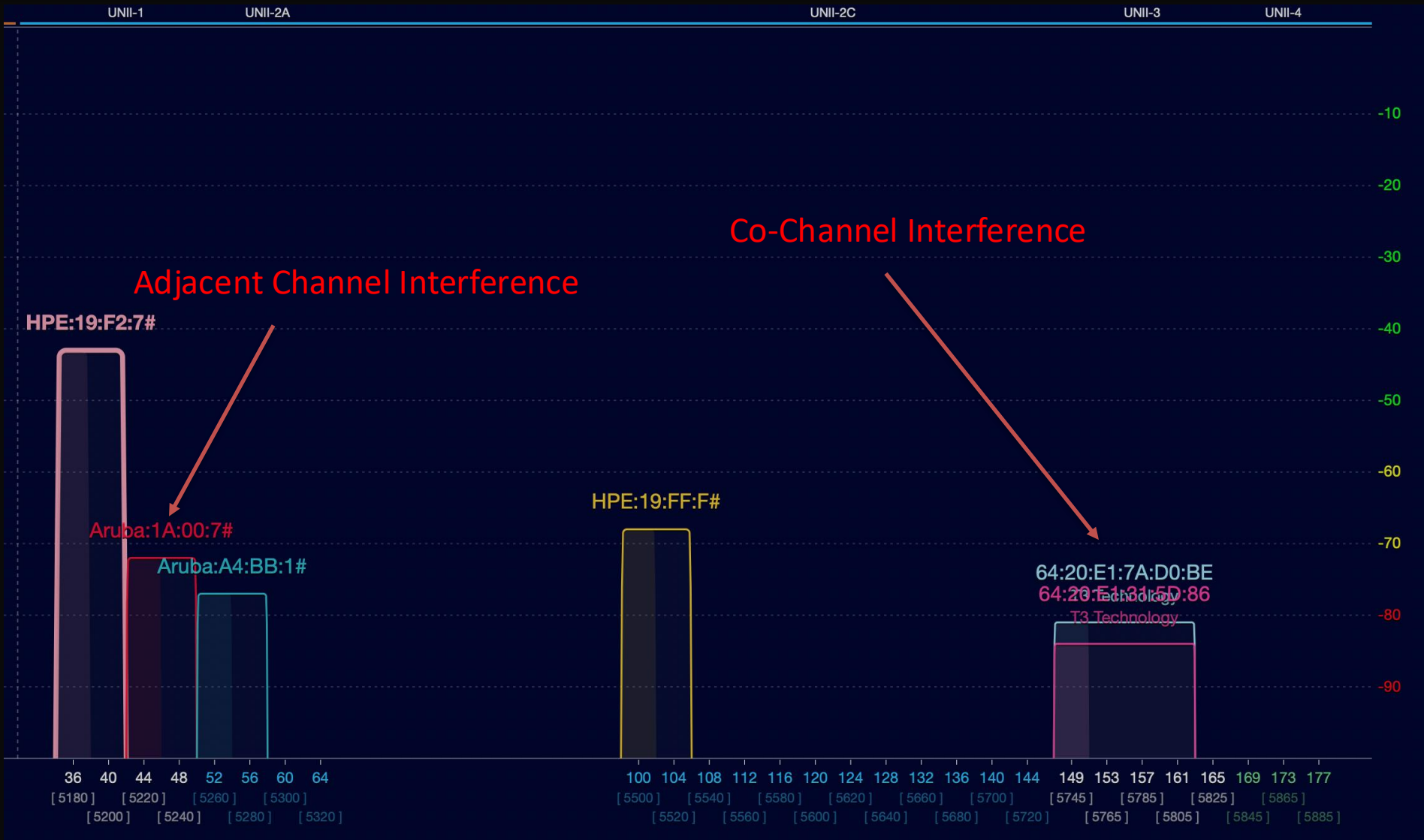
Interference

SYMPTOMS & CAUSES

Non-Wi-Fi noise, adjacent-channel interference (ACI), low SNR, and OBSS contention.

WLAN Pi TOOL

Spectrum-analyzer dock to visualize the RF noise floor.



Interference

Non-Wi-Fi noise, adjacent-channel interference (ACI), low SNR, and OBSS contention.

Spectrum-analyzer dock to visualize the RF noise floor.



Data Rates

SYMPTOMS & CAUSES

Legacy 802.11b data rates left enabled, causing excessive airtime bloat.

WLAN PI TOOL

WiFi-Explorer with WLAN PI and filter

	Information Element	Details
8 bytes	> ⓘ SSID	Lek_2.4G
8 bytes	▼ ⓘ Supported Rates	1(B), 2(B), 5.5(B), 11(B), 9, 18, 36, 54 Mbps
	Element ID:	1
	Length:	8 bytes
	Supported Rate:	1 Mbps (DSSS) (BSS Basic Rate)
	Supported Rate:	2 Mbps (DSSS) (BSS Basic Rate)
	Supported Rate:	5.5 Mbps (HR-DSSS) (BSS Basic Rate)
	Supported Rate:	11 Mbps (HR-DSSS) (BSS Basic Rate)
	Supported Rate:	9 Mbps (OFDM)
	Supported Rate:	18 Mbps (OFDM)
	Supported Rate:	36 Mbps (OFDM)
	Supported Rate:	54 Mbps (OFDM)
1 bytes	> ⓘ DSSS Parameter Set	Current channel: 11

Wi-Fi Explorer Filter
(dot11.net.band == 2.4 AND dot11.net.min_basic_rate <= 11) OR
(dot11.net.band == 5 AND dot11.net.min_basic_rate <= 6)

Capacity

SYMPTOMS & CAUSES

Exhausted airtime, aggressive rate-limiting, and over-allocated clients per radio.

WLAN Pi TOOL

Wi-Fi Explorer look for Channel Utilization in BSS Load

48	20 bytes	>  RSNE	Group Cipher: CCMP-128; Pair Wise Cipher(s): CCMP-128; AKM Suite(s): PSK/AES-CCMP
221	24 bytes	>  Vendor Specific: Microsoft	Wireless Multimedia (WMM)
50	4 bytes	>  Extended Supported Rates	24, 36, 48, 54 Mbps
11	5 bytes	▼  BSS Load	Stations: 2, Channel Utilization: 21%
Element ID:			11
Length:			5 bytes
Station Count:			2
Channel Utilization:			21% (56)
Available Admission Capacity:			31250
45	26 bytes	>  HT Capabilities	20 MHz, Short GI for 20 MHz, Short GI for 40 MHz, 2 Spatial Streams
61	22 bytes	>  HT Operation	Primary Channel: 4 (20 MHz Channel Width Only), Nonmember protection r
74	14 bytes	>  Overlapping BSS Scan Parameters	

SSID Configurations

SYMPTOMS & CAUSES

Excessive SSIDs bloating beacon overhead, plus improper band-steering settings.

Wi-Fi SSID Overhead Calculator

VARIABLES:

Beacon Data Rate (Mbps)

802.11a 12 Mbps

Beacon Frame Size (Bytes)

330

Beacon Interval (ms)

102.4

ASSUMPTIONS:

802.11b Long Preamble used for 1 Mbps; Short Preamble used for 2, 5.5, 11 Mbps

802.11g short slot time is assumed, with no 802.11b clients within range

WMM is enabled and beacons are transmitted using Best Effort AC

Amount of Overhead:

0-10% Low

10-20% Medium

20-50% High

>50% Very High

Number of APs on Channel*	Number of SSIDs									
	1	2	3	4	5	6	7	8	9	10
1	0.28%	0.56%	0.84%	1.12%	1.40%	1.68%	1.96%	2.24%	2.52%	2.80%
2	0.56%	1.12%	1.68%	2.24%	2.80%	3.36%	3.92%	4.48%	5.04%	5.61%
3	0.84%	1.68%	2.52%	3.36%	4.20%	5.04%	5.89%	6.73%	7.57%	8.41%
4	1.12%	2.24%	3.36%	4.48%	5.61%	6.73%	7.85%	8.97%	10.09%	11.21%
5	1.40%	2.80%	4.20%	5.61%	7.01%	8.41%	9.81%	11.21%	12.61%	14.01%
6	1.68%	3.36%	5.04%	6.73%	8.41%	10.09%	11.77%	13.45%	15.13%	16.82%
7	1.96%	3.92%	5.89%	7.85%	9.81%	11.77%	13.73%	15.70%	17.66%	19.62%
8	2.24%	4.48%	6.73%	8.97%	11.21%	13.45%	15.70%	17.94%	20.18%	22.42%
9	2.52%	5.04%	7.57%	10.09%	12.61%	15.13%	17.66%	20.18%	22.70%	25.22%
10	2.80%	5.61%	8.41%	11.21%	14.01%	16.82%	19.62%	22.42%	25.22%	28.03%
11	3.08%	6.17%	9.25%	12.33%	15.42%	18.50%	21.58%	24.66%	27.75%	30.83%
12	3.36%	6.73%	10.09%	13.45%	16.82%	20.18%	23.54%	26.91%	30.27%	33.63%
13	3.64%	7.29%	10.93%	14.57%	18.22%	21.86%	25.50%	29.15%	32.79%	36.44%
14	3.92%	7.85%	11.77%	15.70%	19.62%	23.54%	27.47%	31.39%	35.31%	39.24%
15	4.20%	8.41%	12.61%	16.82%	21.02%	25.22%	29.43%	33.63%	37.84%	42.04%
16	4.48%	8.97%	13.45%	17.94%	22.42%	26.91%	31.39%	35.88%	40.36%	44.84%
17	4.76%	9.53%	14.29%	19.06%	23.82%	28.59%	33.35%	38.12%	42.88%	47.65%
18	5.04%	10.09%	15.13%	20.18%	25.22%	30.27%	35.31%	40.36%	45.40%	50.45%
19	5.33%	10.65%	15.98%	21.30%	26.63%	31.95%	37.28%	42.60%	47.93%	53.25%
20	5.61%	11.21%	16.82%	22.42%	28.03%	33.63%	39.24%	44.84%	50.45%	56.05%

Security Standards

Missing Protected Management Frames (MFP) and weak WPA2/WPA3 keys.

Information Element	Details
▼ ≡ RSN Capabilities:	0x0028
.... 0	Preauthentication: Not supported
.... 0.	Reserved
.... 10..	PTKSA Replay Counter: 4 replay counters (0x0002)
.... ..10	GTKSA Replay Counter: 4 replay counters (0x0002)
.... ..0..	MFP Required: No
.... ..0...	MFP Capable: No
.... ..0	Joint Multi-band RSNA: Not supported
.... ..0.	PeerKey Enabled: No
.... .0..	Reserved
.... 0...	Reserved

dot11.rsn.mfp_capable

Wrong AP mounting, improper antenna choice, and incorrect AP placement.

Physical AP Design

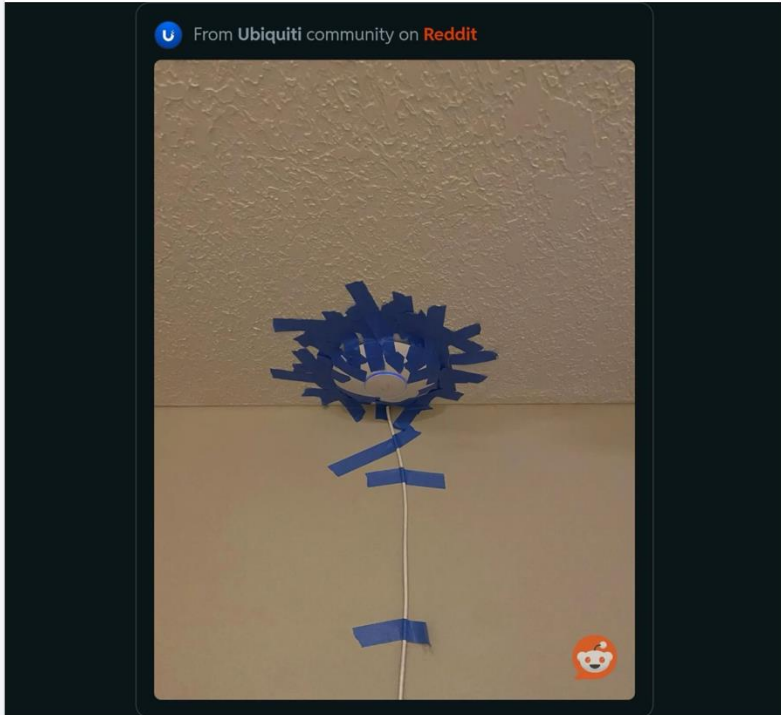


Physical AP Design

Wrong AP mounting, improper antenna choice, and incorrect AP placement.

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😬... See more



👍 68 💬 7 ➦ 7



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อย่างน้อยก็คว่านั่งลง 😬... See more

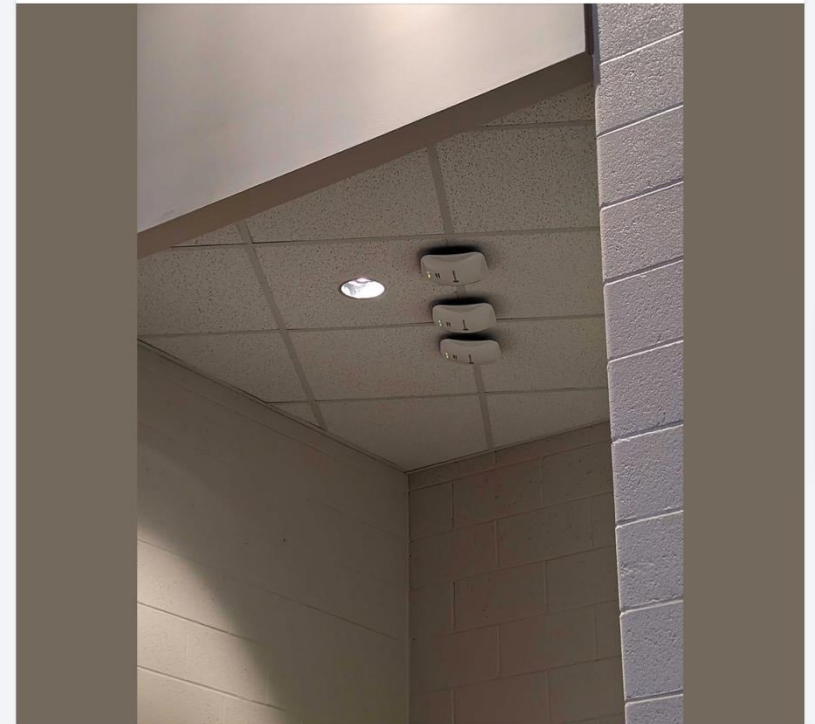


👍 85 💬 4 ➦ 3



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มีหลายคำถามในภาพนี้ 😬... See more



👍 108 💬 18 ➦ 9



Upstream Services

SYMPTOMS & CAUSES

DHCP scope exhaustion, slow DNS resolution, and bad Ethernet cabling.



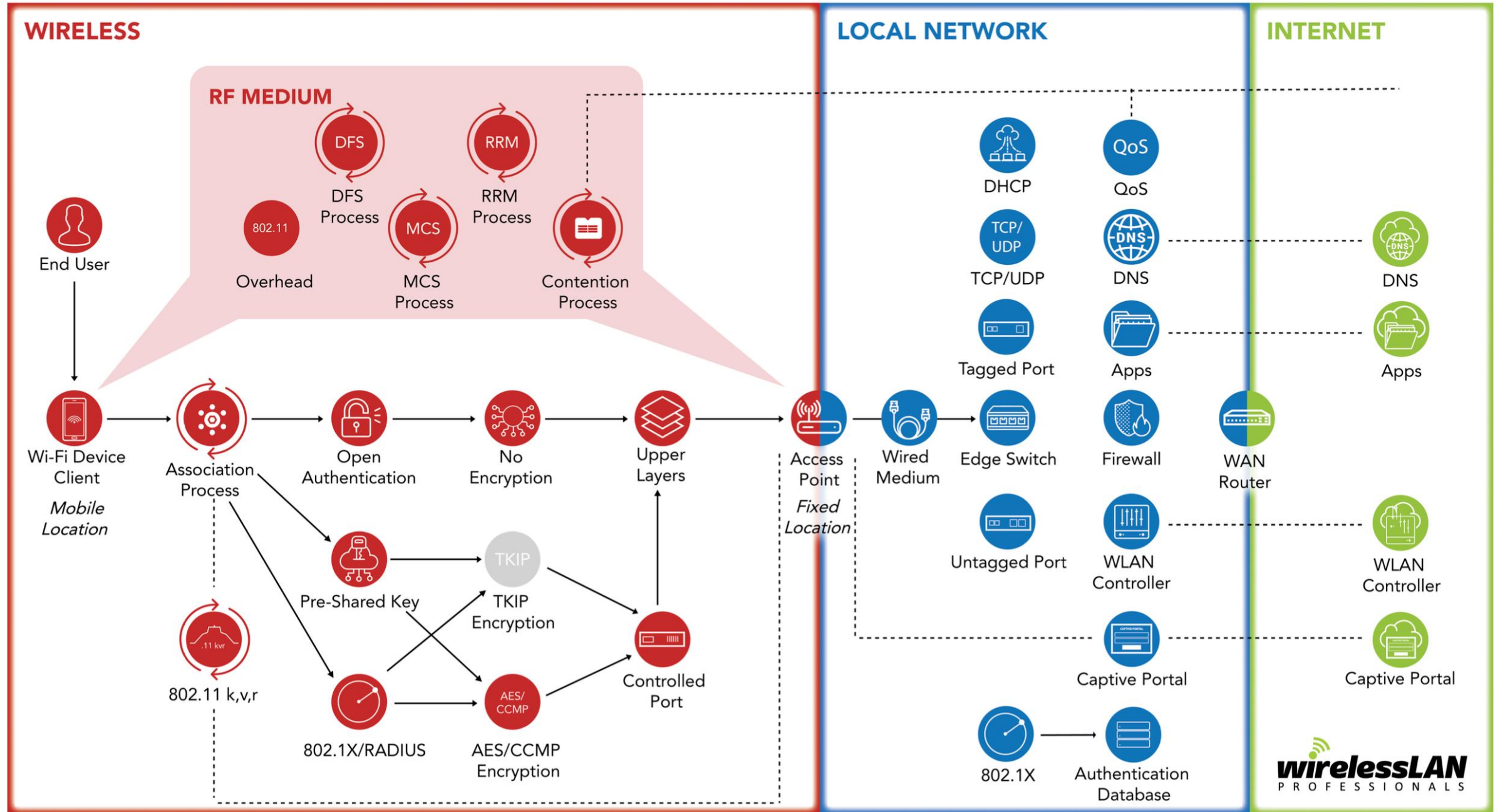
Workspace: <none> 2

Log

#	Time	Buffer	Topics	Message
4964	2026-04-28 11:21:45	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4965	2026-04-28 11:21:46	memory	dhcp, info	dhcp2 deassigned 192.168.111.166 for AA:6F:A5:0D:E4:6E A05s-...
4966	2026-04-28 11:21:46	memory	dhcp, info	dhcp2 assigned 192.168.111.166 for AA:6F:A5:0D:E4:6E A05s-kh...
4967	2026-04-28 11:21:47	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4968	2026-04-28 11:21:50	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4969	2026-04-28 11:21:51	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4970	2026-04-28 11:21:52	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4971	2026-04-28 11:21:58	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4972	2026-04-28 11:21:58	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4973	2026-04-28 11:22:00	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4974	2026-04-28 11:22:14	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4975	2026-04-28 11:22:15	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4976	2026-04-28 11:22:16	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4977	2026-04-28 11:22:17	memory	dhcp, info	dhcp2 deassigned 192.168.111.32 for EC:FA:BC:8E:72:1C ESP_8E...
4978	2026-04-28 11:22:17	memory	dhcp, info	dhcp2 assigned 192.168.111.32 for EC:FA:BC:8E:72:1C ESP_8E72...
4979	2026-04-28 11:22:18	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4980	2026-04-28 11:22:21	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4981	2026-04-28 11:22:26	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4982	2026-04-28 11:22:32	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4983	2026-04-28 11:22:39	memory	system, info, account	user vronlineadmin logged in from 10.100.2.1 via winbox
4984	2026-04-28 11:22:52	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4985	2026-04-28 11:22:52	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4986	2026-04-28 11:22:54	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4987	2026-04-28 11:22:58	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4988	2026-04-28 11:22:59	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4989	2026-04-28 11:23:01	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4990	2026-04-28 11:23:03	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4991	2026-04-28 11:23:13	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4992	2026-04-28 11:23:14	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4993	2026-04-28 11:23:15	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4994	2026-04-28 11:23:15	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4995	2026-04-28 11:23:15	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4996	2026-04-28 11:23:16	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4997	2026-04-28 11:23:17	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4998	2026-04-28 11:23:17	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty
4999	2026-04-28 11:23:18	memory	dhcp, error	dhcp2: failed to give out IP address: pool <dhcp_pool2> is empty

5000 1 Live

WIRELESS LAN TROUBLE SHOOTING - POTENTIAL CAUSES



Wi-Fi Checklist – Before Installation

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

Wi-Fi Checklist – After Installation

1	Document AP's MAC & Assigned Name	☒		
3	Document AP's Location	☒		
4	Document AP's Switch/Port Used	☒		
5	Document AP's IP Address	☒		
6	Confirm AP Installed in proper orientation	☒		
7	Confirm External Antennas installed correctly	☒		
8	Wait for Access Point to receive configuration	☒		
9	Perhaps Wait 2nd Reboot of AP if needed	☒		
10	Listen in Air for All SSID's being Broadcast	☒		
11	Connect Client to Each SSID	☒		
12	Check Each SSID for Proper VLAN & IP Pool	☒		

Wi-Fi Checklist – Configuration

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

Wi-Fi Checklist – Configuration

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

WLAN Pro TOOLKITS

09:24

WLAN Pros Toolbox

How this app works

A 5-minute tour of the app

4

Test Network

Network Quality · Wi-Fi Information · Cellular I...

24

Networking Tools

Ping (TCP) · Traceroute (System) · Network Dis...

32

Calculators & Tools

Free Space Path Loss · EIRP Calculator · Link ...

96

Quick Reference

Wi-Fi Channels · 802.11 Standards · MCS Index

55

Educational Resources

Reference Cards · Blogs · Podcasts

Search all tools...

09:22

< Test My Connection

Wi-Fi signal

LIVE

Walk around while this runs to see how your Wi-Fi signal changes from spot to spot.

Wi-Fi data rate

573 Mbps →

SNR

51 dB ~

RSSI

-44 dBm ~

What to tell support

Internet Down

39 Mbps

Internet Up

72 Mbps

Delay / dropped data

17 ms · 0%

Wi-Fi network

VR-EAP

Tested

Jul 20, 9:22 AM on iOS

Copy these details

Paste this into an email or text to your IT or support team.

Network

DNS resolution time

5 ms (cloudflare.com)

09:23

WLAN Pros Toolbox

Is it your Wi-Fi or your Internet?

Check My Connection

Fix Your Own Wi-Fi

Learn and fix your Wi-Fi. The free book

How this app works

A 5-minute tour of the app

Test Network

Network Quality · Wi-Fi Information · Cellular I...

Networking Tools

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Calculators & Tools

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Quick Reference

Wi-Fi Channels · 802.11 Standards · MCS Index

09:23

< Calculators & Tools

Search Calculators & Tools...

AllRF & PropagationAntenna & CoverageCapacity & PowerCoordinates & GPSConversionsHam RadioLearn / RF intuitionUtilities & GeneratorsAEC & Documentation

RF & Propagation

9

Cable Loss

Coax loss by cable type, length, and frequency

Tool

Earth Curvature

Earth bulge over a path, with K-factor

Tool

Free Space Path Loss

FSPL for any frequency and distance

Tool

Fresnel Zone

First-zone radius and 60% clearance

Questions & Discussion

Thank you for attending this session on WLAN Pi diagnostics!

