



WLAN Pi Project

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 @ben__toner

 @nickjturner

WIFI KNOWLEDGE
SUMMIT



www.wlanpi.com

Multitool for WLAN Pros

The WLAN Pi is the affordable community hardware tool to assist you in the validation, troubleshooting, and maintenance of Wi-Fi networks.

Own It

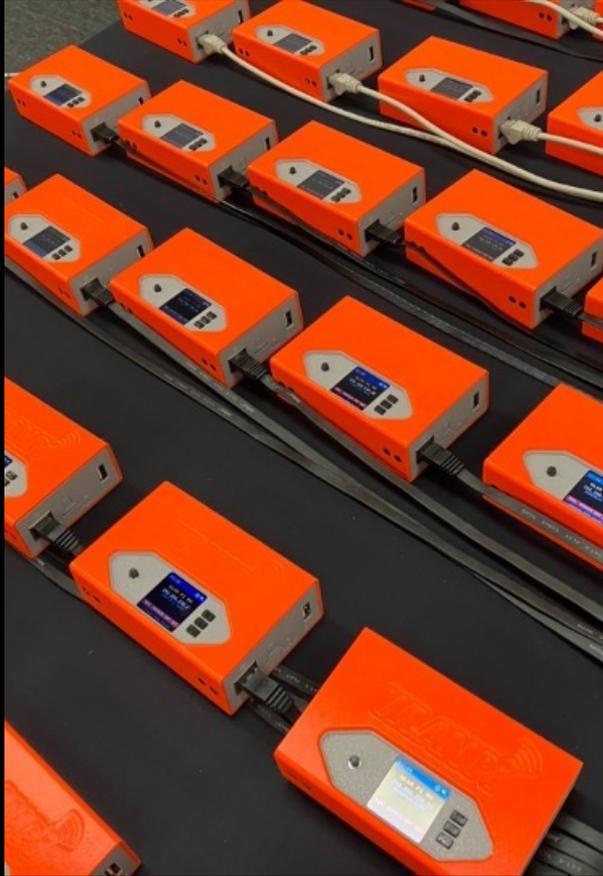
Build it yourself or
buy one ready made

Learn it

Online resources &
Deep Dives

Develop It

Community Driven
Open Source Project



WLAN Pi Project

Community driven open-source project

Linux-based SBC preloaded with Wi-Fi drivers, packages and apps

Started in 2016 at WLPC as a portable iperf3 endpoint

Focused on tools for WLAN professionals

Learn more at www.wlanpi.com

The WLAN Pi Community

Meet the Core Team



Jerry Olla
Wi-Fi Engineer



Jiri Brejcha
Wi-Fi Architect



Adrian Granados
*Actual Developer &
Wi-Fi guru*



Ben Toner
*Actual Developer &
Hardware Aficionado*



Daniel Finimundi
*Wi-Fi Engineer &
Linux Guru*



Nick Turner
*Wi-Fi Engineer +
Prints things, in 3D*

2022 Honorable Contributors



Josh Schmelzle
*Wi-Fi Engineer +
WebUI and Python
Master*



Colin Vallance
*Wi-Fi Engineer +
Python Dude*



Nigel Bowden
Wi-Fi Engineer

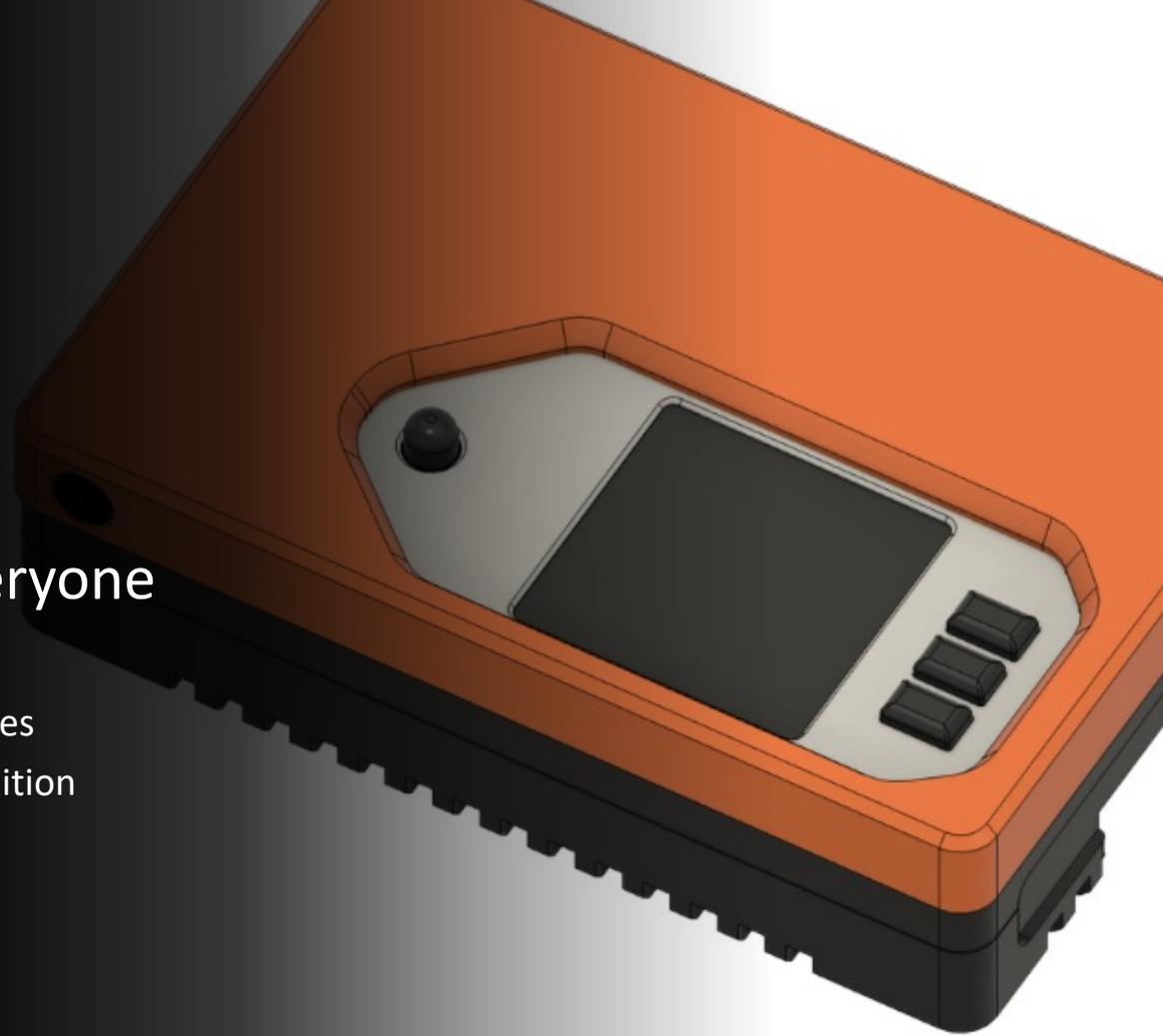


Joel Crane
*Wi-Fi Engineer +
Prints things, in 3D*

What have we been doing

WLAN Pi accessible for everyone

- Overcoming hardware supply chain issues
- Create the Do-It-Yourself Community Edition
- More Wi-Fi 6E



WLAN Pi Evolution

2016 Odroid-C2



2018 NanoPi NEO2



2022 WLAN Pi R4/M4



2016

2018

2022

2023

 **Raspberry Pi**

2022 WLAN Pi Pro



2023 More Wi-Fi 6E



Smaller, lower cost, DIY

WLANPI M4

Leave-Behind



PoE or USB-C powered

Connect to a network and leave behind

Remote access for Wired and Wireless monitoring

Mobility testing using external battery

WLANPI R4

Self-Build



USB-C powered

Wired ancillary tool using USB OTG and Bluetooth (optional)

Remote access for Wired and Wireless monitoring

Mobility testing using external battery

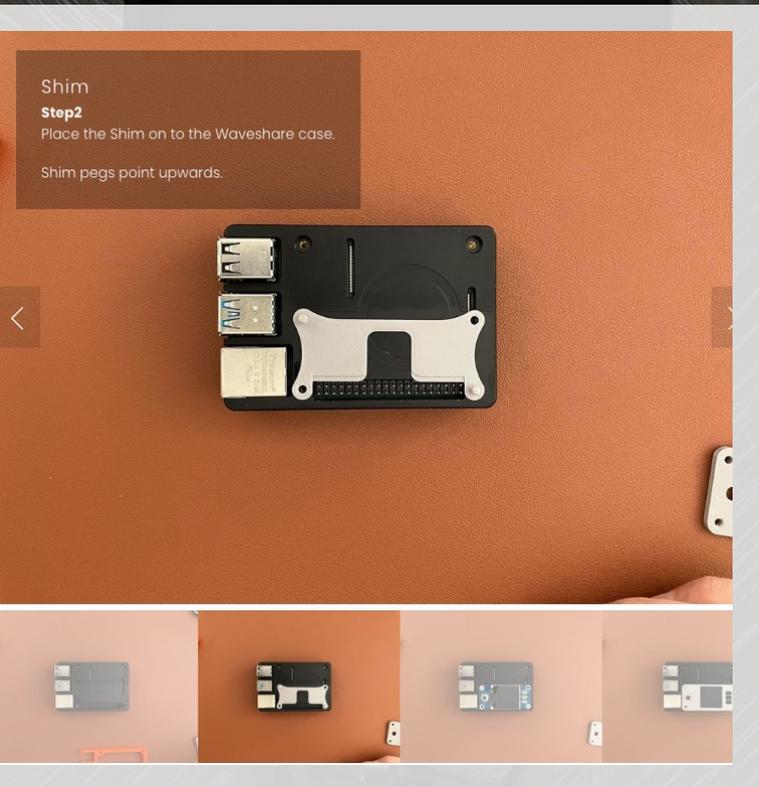


Get started with as little as a single Raspberry Pi 4

- Bring Your Own Pi
- Download [WLAN Pi OS](#)

Find one with [rpilocator](#)





Self Build

Fully documented for you to build at home

- Bring Your Own Pi
- Purchase a [Kit*](#)
- Download [WLAN Pi OS](#)
- Assembly in less than 30 minutes

Find one with [rpi locator](#)

\$165

BYOP Kit* + Pi

Make it yourself for

Under \$300

* BYOP Kit Includes COMFAST Wi-Fi 6E adapter



Leave Behind Simple, Ready to Use

- Low Cost
- Internal Wi-Fi 6E Adapter (M.2)
- PoE provides power for leave-behind

\$550

Ready to Use



Supporting more Wi-Fi adapters

More commercial Wi-Fi 6E adapters.

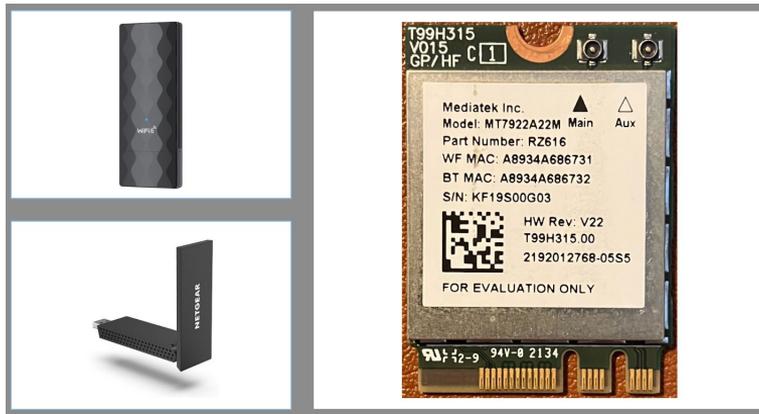
Many of them now supported in WLAN Pi for you to choose



- 6E Fully supported today
- Improved 6GHz regional support
- Mass market adapters



- New chipsets available
- Wi-Fi 7 driver patch commits to driver
- Adapter samples in hand



5 Confirmed USB Devices

MEDIATEK
MT 7612U / 7921AU

COMFAST
CF-951AX / 953AX

NETGEAR
Nighthawk AXE3000

4 Confirmed M.2 Devices

INTEL
AX 200/210

MEDIATEK
MT 7921/7922

Wi-Fi 6E Lessons Learned

How ready are Wi-Fi 6E adapters?

Support has not been plain sailing

Not all Wi-Fi 6E adapters are built the same !

Many don't support 320 MHz
Some don't support 160 MHz
Some don't support all channels

Driver/firmware bugs
Reg Domain Issues
Intel ax210 LAR requirement

Features

What can you do with your WLAN Pi

Out of the box

The screenshot displays the WLAN Pi web interface. On the left, a large QR code is visible. In the center, a circular inset shows a physical WLAN Pi device (a black Cisco Aironet 1552) connected to an orange Raspberry Pi. The interface includes a 'Remote capture on wlanpi-eea' window with the following configuration:

- Interface Name:
- Channel:
- Channel Width:
- Buttons:

Below the configuration window, there are two donut charts:

- Overall Packets:** A donut chart showing a very small slice of blue, representing a tiny fraction of the total.
- Data Packets:** A donut chart showing a larger slice of blue, representing a significant portion of the total.

At the bottom right, a table displays statistics:

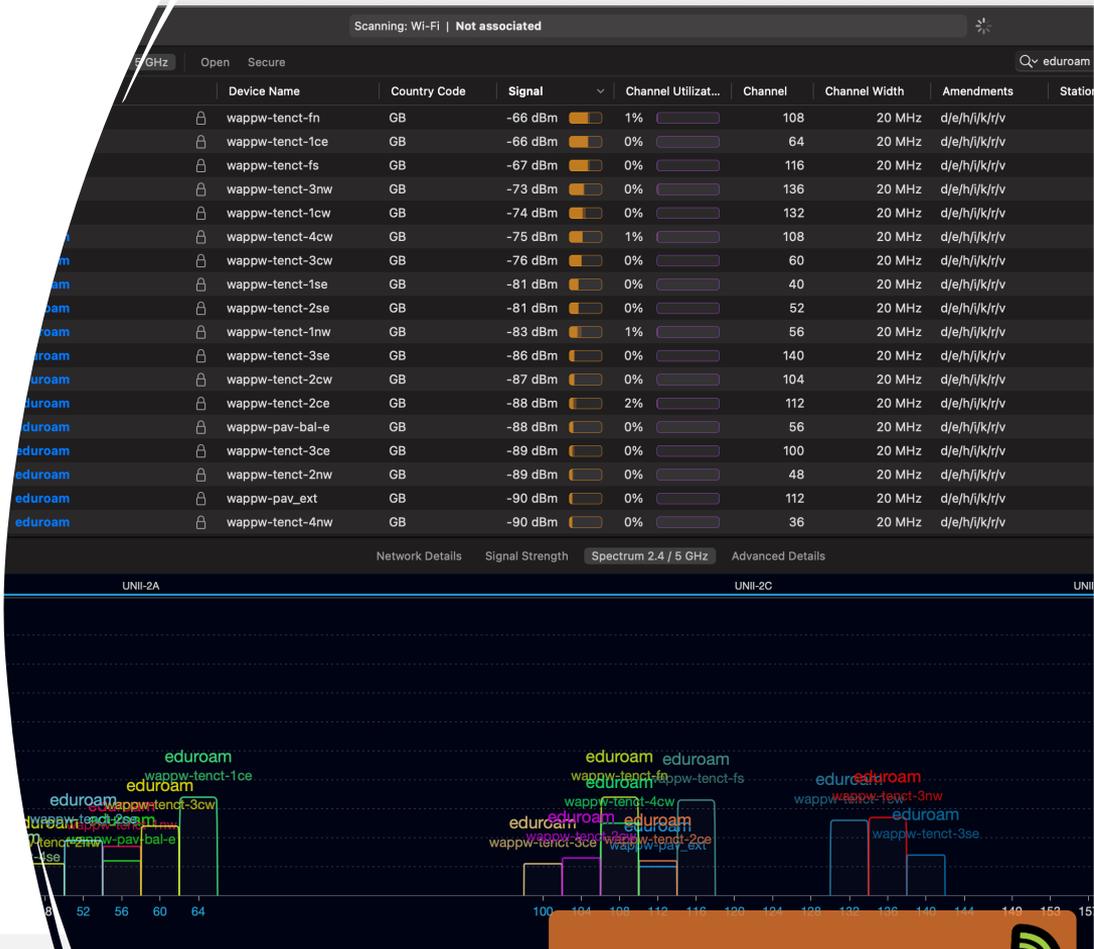
Overall Packets	257
Management	250
Data	7
Retired Packets	0
Fragmented Packets	0
Retired Packets	1
Data (size)	8.25 KB
Retired Data	225 B

Additional interface elements include a list of 'Advised SSIDs' and a 'Wi-Fi remote capture: wifidump' button highlighted in blue.

Wi-Fi Scanning Local Or Remote

Easy scanning, local or remote

- Leave behind & access remotely
- Your choice of application
 - Wi-Fi Explorer Pro
 - WiFi Scanner
 - Kismet



Profiler

The quickest way to find out device Wi-Fi capabilities

- Standard Capabilities (HT / VHT / HE)
- Supported channel
- Max Power
- Amendments support
- **Wi-Fi 6E support**

e6:a0:5e:47:8e:c1_5.8GHz

```
- Client MAC: e6:a0:5e:47:8e:c1
- OUI manufacturer lookup: Randomized MAC
- Frequency band: 5 GHz
- Capture channel: 48
```

```
802.11k      Supported
802.11r      Supported
802.11v      Supported
802.11w      Supported
802.11n      Supported (1ss)
802.11ac     Supported (1ss), MCS 0-9, [ ] 160 MHz, [X] SU BF, [
802.11ax     Not supported
Max Power    23 dBm
Supported Channels 36-64, 100-144, 149-173**
Number of Channels 27
```

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

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

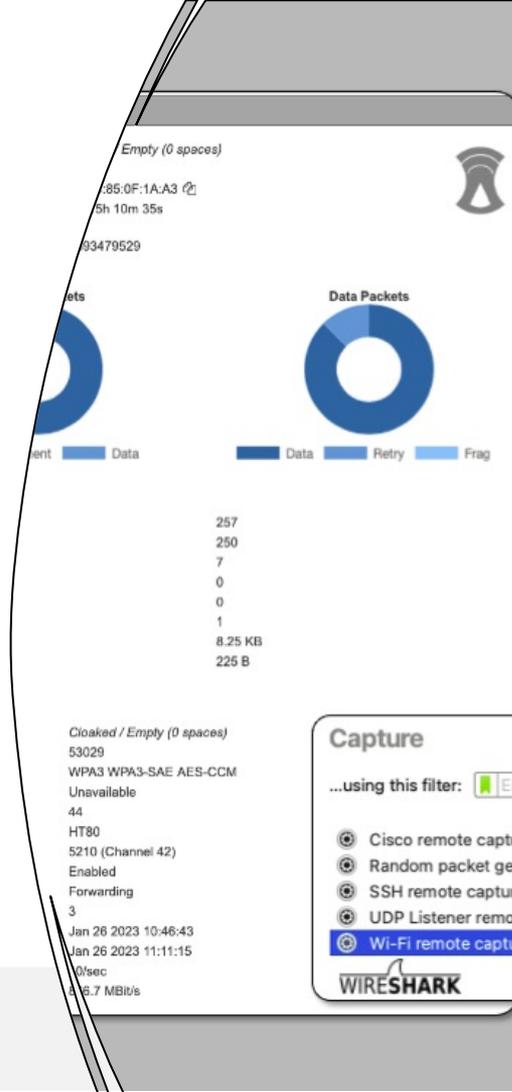
** Reported channels do not factor local regulatory domain. Detected channels are based on the capture channel.



Wi-Fi Packets Local Or Remote

Easy scanning, local or remote

- Leave behind & access remotely
- Capture on 6GHz (Wi-Fi 6E)
- Multi-channel captures
- Your choice of application
 - Airtool 2
 - Wireshark 4
 - Kismet



The image shows a dialog box titled 'Remote capture on wlanpi-eea'. It has a Wi-Fi icon with a wrench. The text says 'Remote capture on wlanpi-eea' and 'Enter the interface name, channel, and channel width:'. There are three input fields: 'Interface Name: Automatic', 'Channel: 6 GHz 5 (PSC)', and 'Channel Width: 80 MHz'. At the bottom, there are two buttons: 'Cancel' and 'Start Capture'.

The image shows a dialog box titled 'Capture'. It has a dropdown menu with the text '...using this filter: Enter a capture filter ...'. Below the dropdown, there's a list of capture filters with radio buttons: 'Cisco remote capture: ciscodump', 'Random packet generator: randpkt', 'SSH remote capture: sshdump', 'UDP Listener remote capture: udpdump', and 'Wi-Fi remote capture: wifidump'. At the bottom, there's a 'WIRESHARK' logo. On the right side, there's a list of interfaces: '5 interfaces shown, 18', 'Wired', 'Wireless', and 'External Capture' (checked). There's also a 'Show hidden interface' button.



WIRESHARK

Powered By



Spectrum Analysis

Spectrum in all the bands

- Use a 3rd party spectrum analyzer device
 - Remote and Local
- Metageek WiSpy dBx
- Oscium WiPry Clarity
 - Free Shipping
 - 20% of each sale supports the WLAN Pi project

Code:
WLANPI

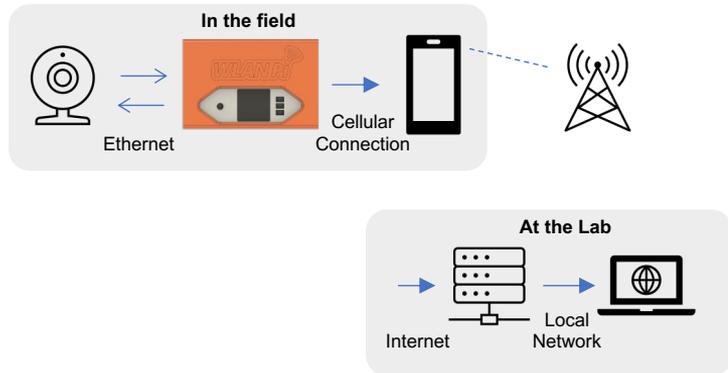


Powered By **WLAN Pi**

Bridge Mode

Mobile connected things

- Use your phone to connect things
- Transparent Layer 2 bridge



Powered By



Kismet



Web-based Wireless Analysis

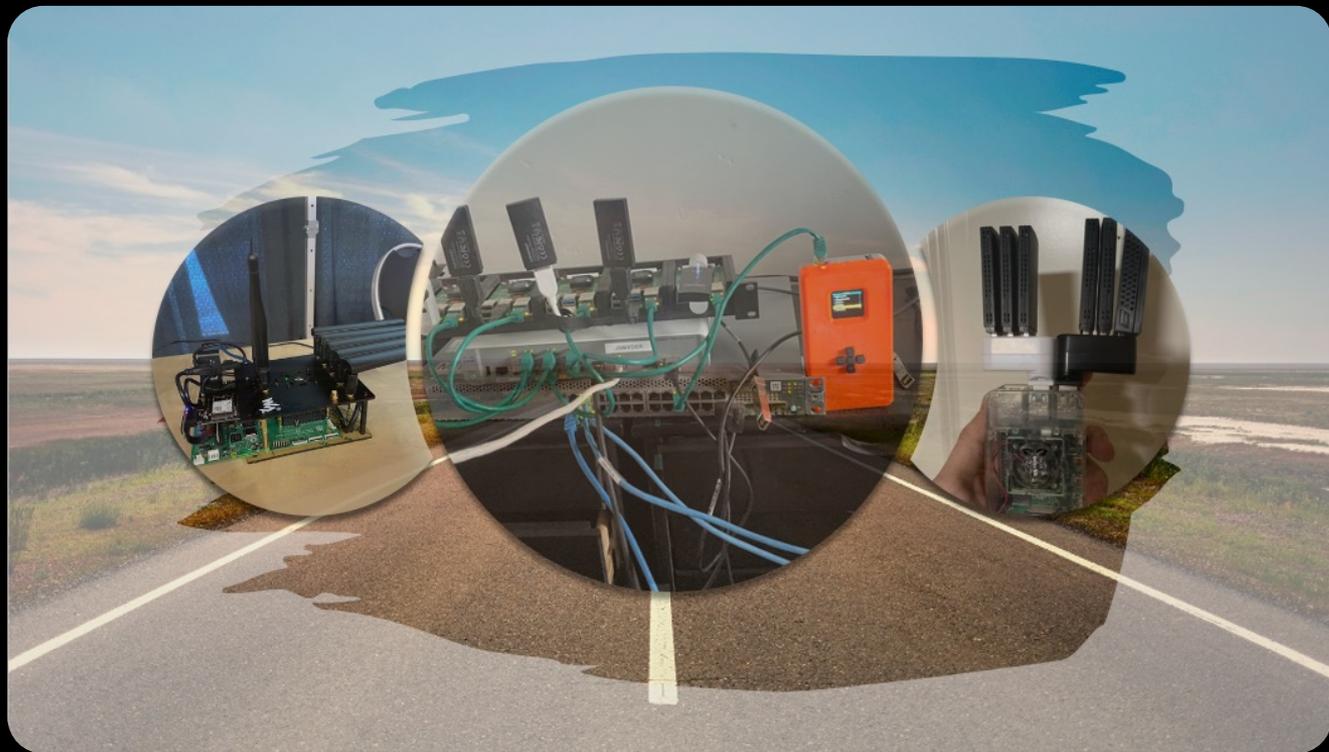
- Discover & Analyse
- Monitor and Capture
- Wi-Fi, Bluetooth and other wireless devices
- Works directly in your browser



Powered By **WLANPi**

IN THE WILD

Homebrews
taking
WLAN Pi to
the next
level



Name Kjetil Teigen Hansen

Project Monster Pi

“A **small handheld device** with 6x USB adapters that could capture on all ETSI PSC channels (6Ghz) to do **roaming analysis**”

6 adapters all scanning at the same time

6 x 6GHz PSC channels captured

Challenges

Finding the right adapters to work in the power and data budget

Next

12 Adapters!



Name Mark Houtz

Project CBRS Pi

“I wanted to see if I could build something like the WLAN Pi but for CBRS. The flexibility and expandability make the use of the WLAN Pi top notch”

Introduced LTE & 5G modem cards to the WLAN Pi

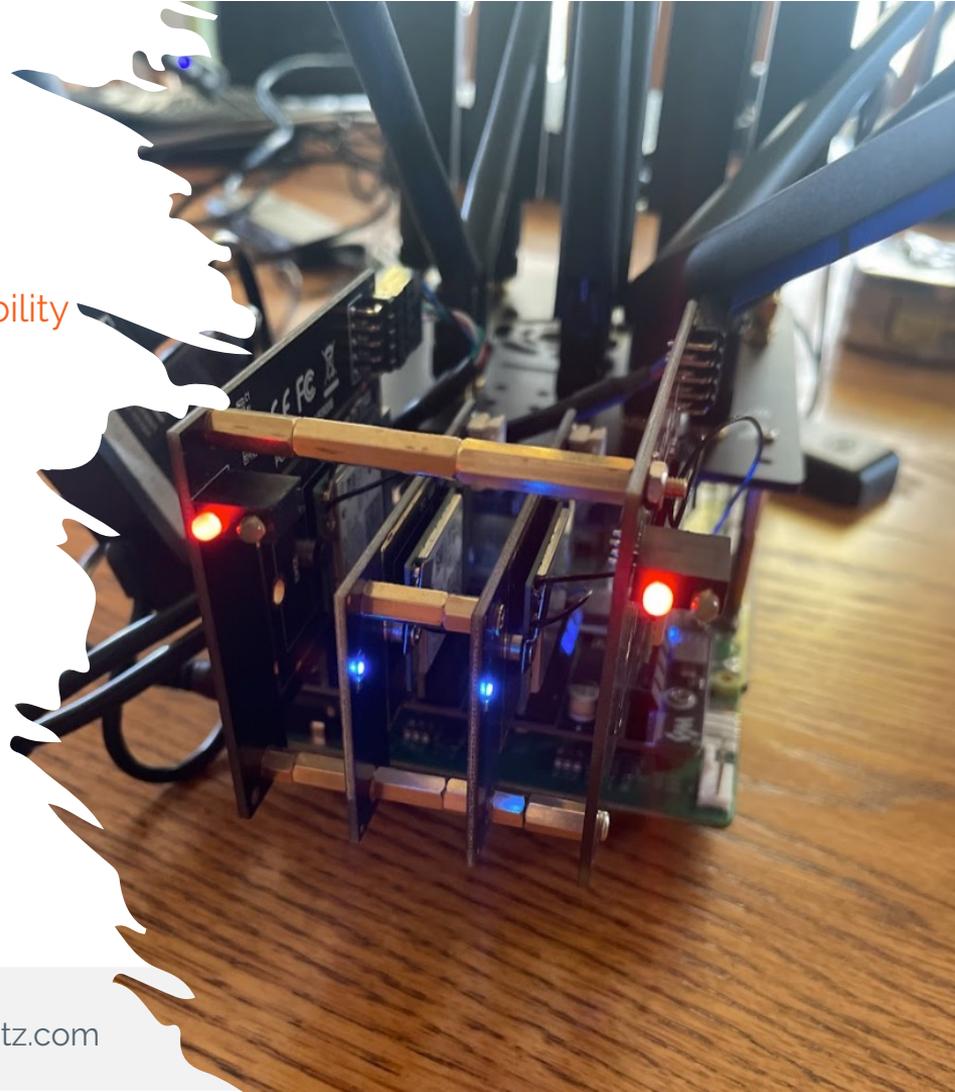
Capture signaling and Control PCAPs on private LTE/5G

Challenges

Figuring out the modem drivers

Next

I've been asked about a CBRS Scanner



Name **Jake Snyder**

Project **Wi-Fi 6E Test Pi**

"I wanted to build a lab where I could test and validate behaviors of Wi-Fi 6E devices. The WLAN Pi [support for Wi-Fi 6 adapters](#) and getting [the kernel and drivers working](#) allows me to spend more time [focused on my wlan testing.](#)"

Wi-Fi 6E
validation lab

Coordinated
packet captures
and multi-host
testing

Remote
management &
configuration of
multiple adapters



Name Ben Toner

Project Mirror Pi

"I wanted an easy way to bring **real-time log analysis** onto the iPhone/iPad. WLAN Pi OS is the perfect platform and allows side-by-side comparison of device with the **WLAN Pi as a reference client**"

Real time access
to Apple logs
while on the go.

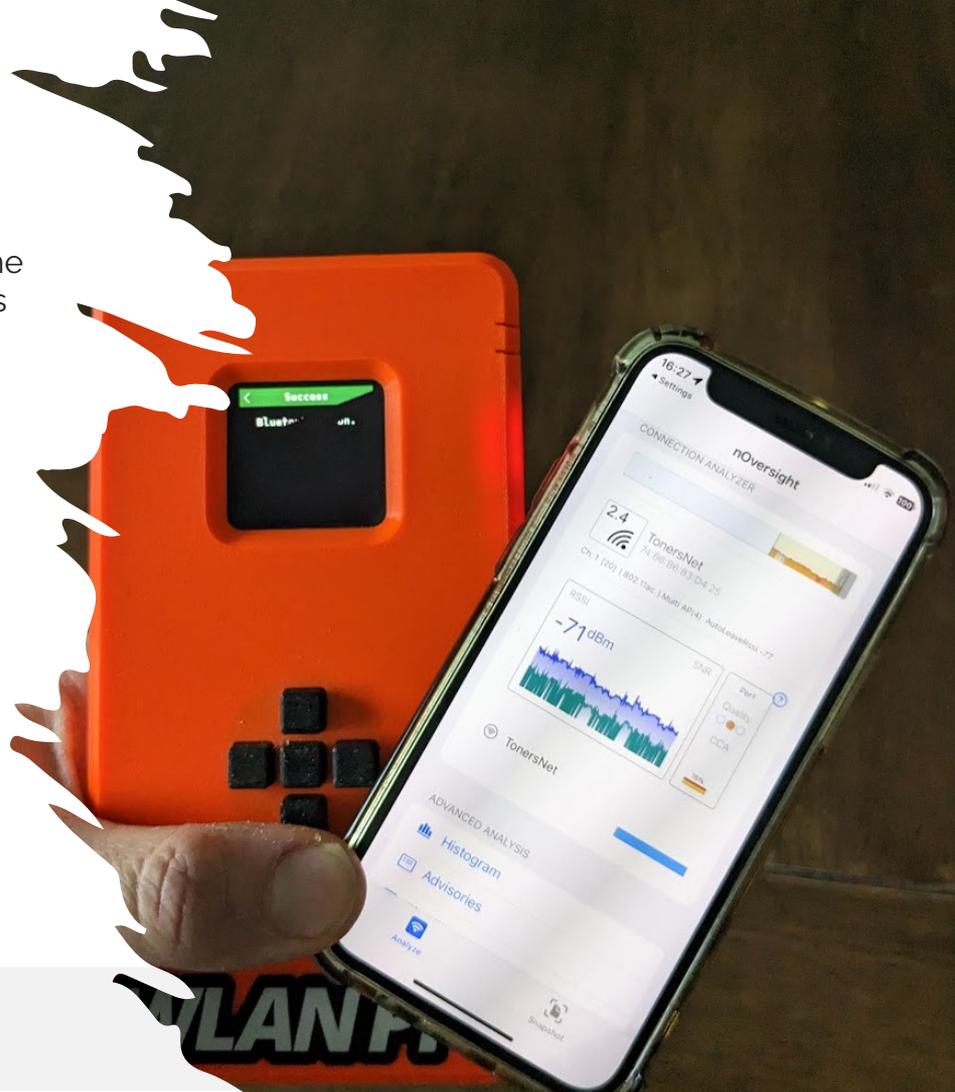
Log Reflector
Phone → WLAN Pi
→ Phone

Challenges

Patching the drivers to work wirelessly

Next

Combine Apple logs with packet captures



Name	Jussi
Project	Hami-Scan

"We want it to be really easy for Hamina customers to use the tools they already have when surveying. With the popularity of the WLAN Pi, it's a no brainer for Hamina to capture its tri-band scan data output."

Real-time WLAN
Pi scanning at
your finger tips

Site survey
function direct
into your Hamina
project

Challenges

Demoing experimental new features

Next

WLAN Pi site surveying on all the bands







Thank you and see you next year!

Until then:

- Be nice to one another
- Share your feedback feedback.wlanpi.com
- Learn more wlanpi.com, on Twitter [@WLANPi](https://twitter.com/WLANPi)
- Get yourself “all the tools” 😊
Check out the conference store...
- [Order online: badgerwifi.co.uk](https://badgerwifi.co.uk)