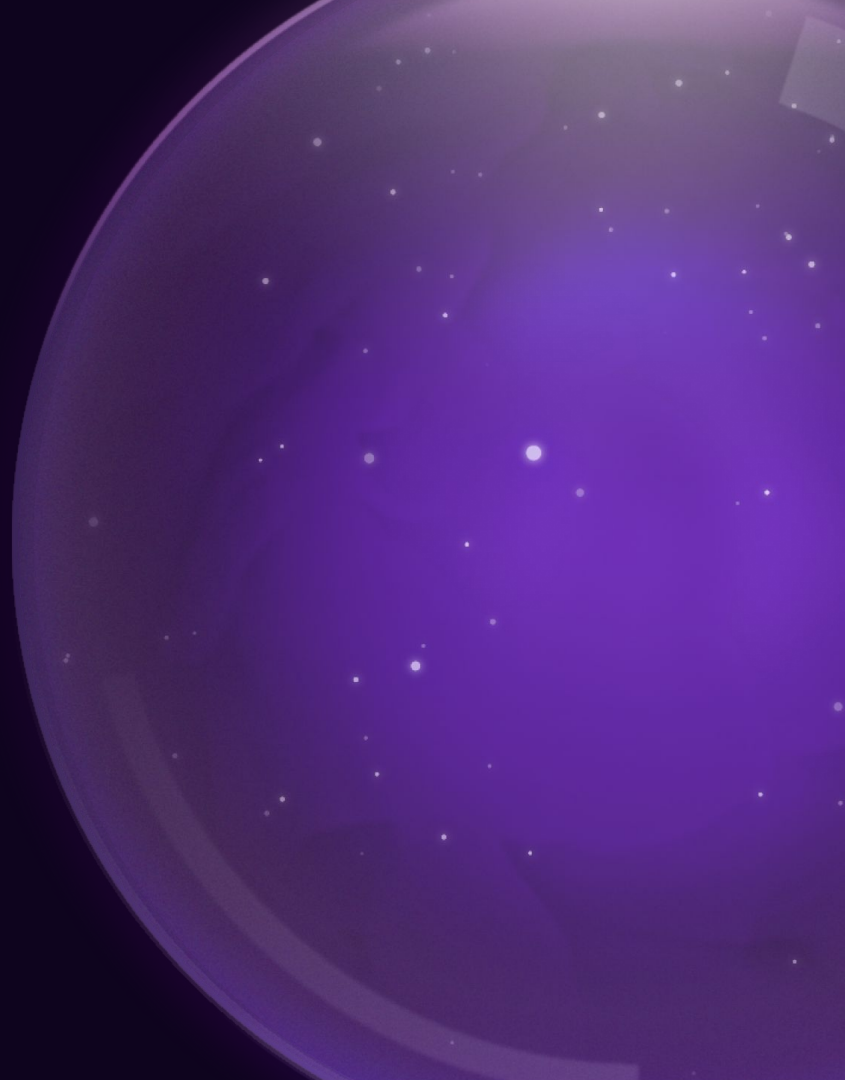
LEAVE-BEHIND WI-FI SENSORS DON’T HAVE TO BREAK THE BANK

WLPC Prague 2026



October 2026

About me



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Product @ Orb

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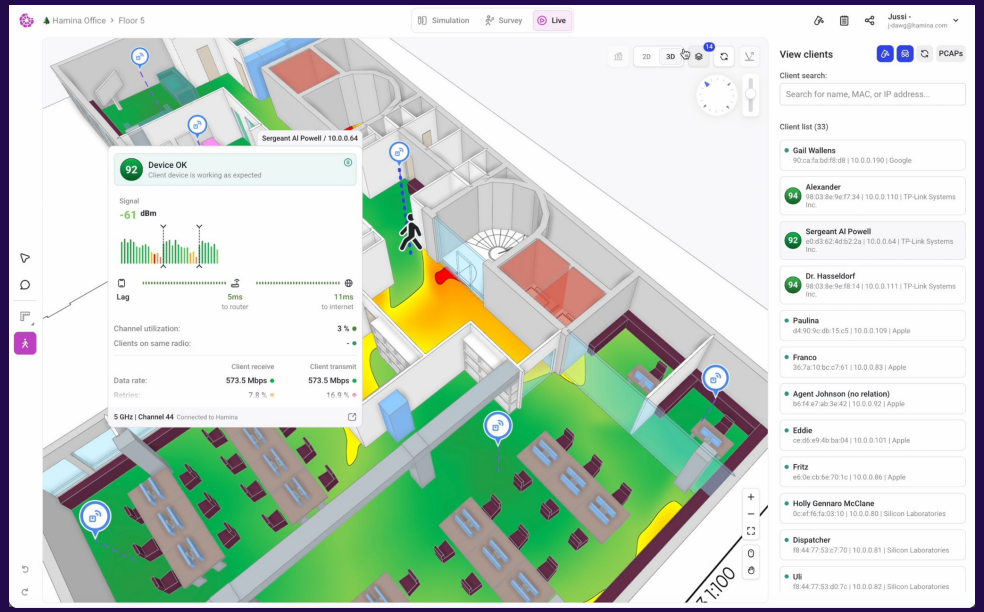
Our Wi-Fi Journey

When we launched Orb in April of 2025, Wi-Fi was not a point of emphasis.

Some smart people in this room really latched onto the idea an guided us.

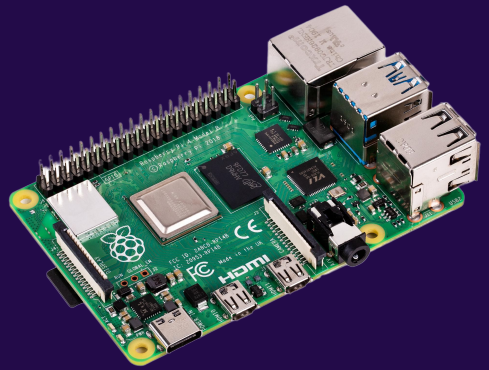
We repeatedly heard from customers and prospects that their existing network experience monitoring solutions were not providing ROI because they were too expensive to deploy at scale.

There's demand for cost-effective leave-behind hardware sensors!



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Why are existing solutions hundreds or thousands of dollars?





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What might make a good sensor?

- It is inexpensive enough to deploy at scale.
- It is representative of real client experience (within reason).
- It runs a secure operating system and can be updated remotely.
- It is robust. Power cycles, NAND-wear, and full disks shouldn’t take out your sensors.
- It is customizable. You should be able to bake in your configurations and choose the packages you want.

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Introducing sensorbox

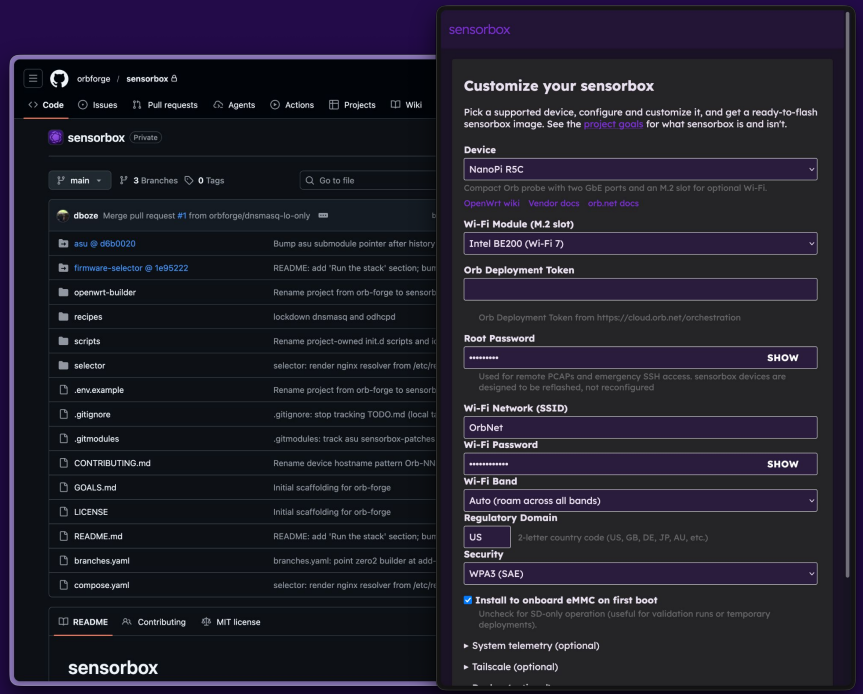
Cost-effective hardware sensors:

- 2x gigabit (multi-WAN/VLAN), ~$25
- Wi-Fi 7 + gigabit, ~$100

All vendors are welcome to extend

Completely free and open source (MIT): contribute, fork it, whatever

https://github.com/orbforge/sensorbox



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What is sensorbox?

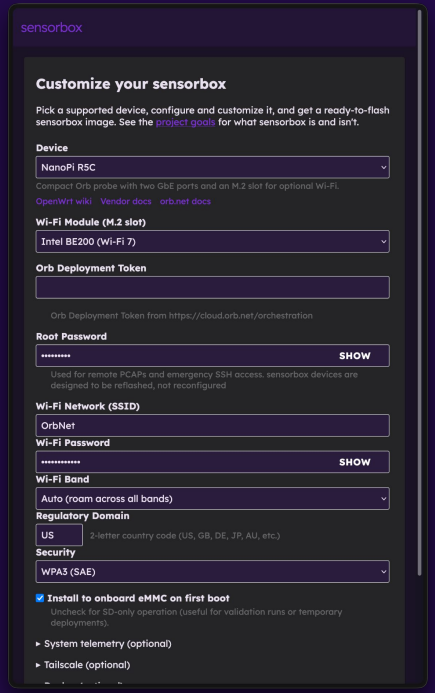
Runs locally on your laptop or a server

Access via your web browser

Fill out a simple web form to configure Wi-Fi connectivity, inject API keys, customize packages, etc.

sensorbox builds an image for you to flash onto an SD card or directly onto a device.

If the device has eMMC, sensorbox automatically installs itself.



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Use cases

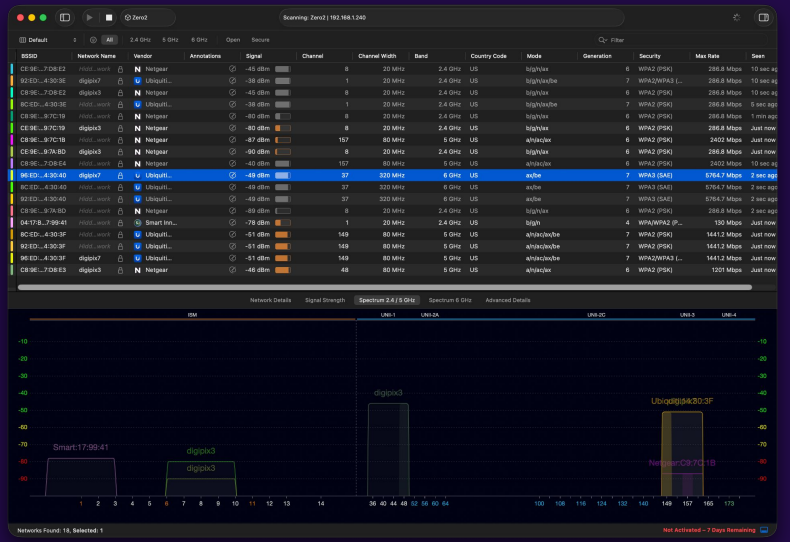
Deploy hardware sensors at scale to cover many locations

Continuously monitor internet and network experience

If an issue in experience, remotely trigger a PCAP to identify root cause and resolve (works with WiFi Explorer Pro)

Run other tools via containers

Simple and cheap multi-WAN monitoring



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Okay, we're done with the propaganda.

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Things I tried: travel/cheap routers

Not really representative of a normal client.

- Doesn't use client NIC or drivers
- Overbuilt RFE and antennas
- Higher tx/rx (admittedly tweakable)

Like everything else, getting more expensive.



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Things I tried: Raspberry Pi ecosystem

Built-in Wi-Fi is not great.

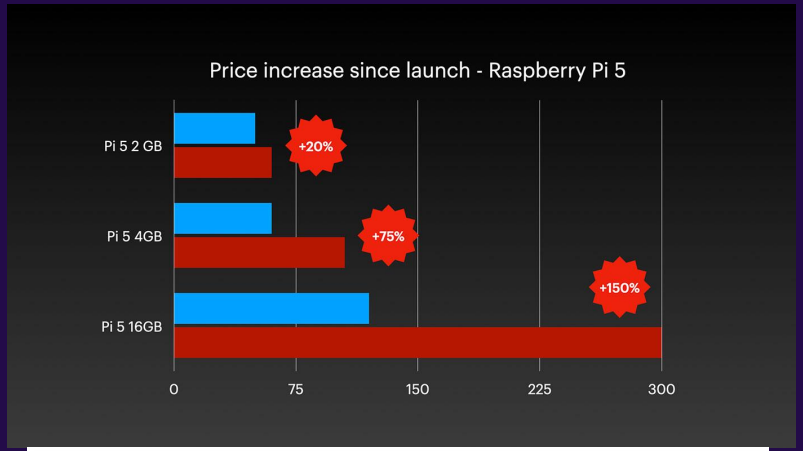
- Limited capabilities
- Gets stuck on 2.4 GHz

Like everything else, getting more expensive.

Limited inventory.

The needed parts add up. Compute module carrier board. M.2 E-Key hat. Case. SD card.

eMMC/NVMe adds even more cost.





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No agenda, just facts.



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Why not extend WLAN Pi software?





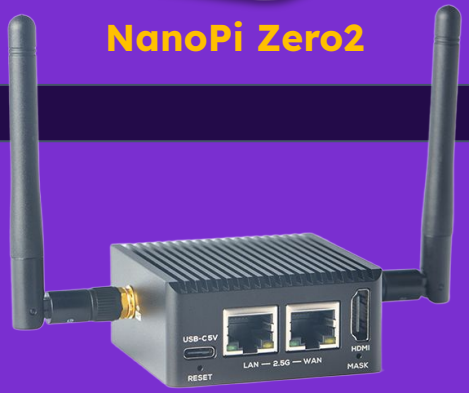
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Interesting devices



NanoPi Zero2

Features: 1 GbE. M.2 Key E. USB-C OTG. Optional eMMC.
Cost: $42 standalone, $89 if you add eMMC, BE200, antennas.
Pros: Cute. Compact. Runs cool without M.2 module.
Cons: Poor internal antenna placement. OpenWrt requires kernel patch. Gets warm with M.2 module.



NanoPi R5C

Features: 2.5 GbE x 2. M.2 Key E. eMMC. External antennas.
Cost: $115. $150 if you add BE200, tri-band antennas.
Pros: Powerful.
Cons: Gets warm. External antennas make it less discrete and can be challenging to tighten. Vestigial HDMI port.

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Interesting devices



Radxa E20C

Features: 1 GbE x 2. eMMC. USB-C OTG.
Cost: $40
Pros: Sturdy. Runs cool.
Cons: No Wi-Fi.



Radxa E52C

Features: 2.5 GbE x 2. eMMC. USB-3. USB-C OTG.
Cost: $92
Pros: Sturdy. Runs cool. USB-3 (A) port for USB Wi-Fi adapter.
Cons: Low inventory. Price now high.

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Interesting devices



Raspberry Pi

Features: Varies.
Cost: Varies.
Pros: Huge software and hardware ecosystem.
Cons: Once you add a case, storage, Wi-Fi add-ons, the price can get high. Models selling well above MSRP or unavailable.



WLAN Pi M4+

Features: 1 GbE. PoE. USB-C OTG. Wi-Fi 7.
Cost: $600
Pros: Large community. Great internal antennas. PoE!
Cons: No eMMC. Expensive (overkill for a leave-behind sensor).

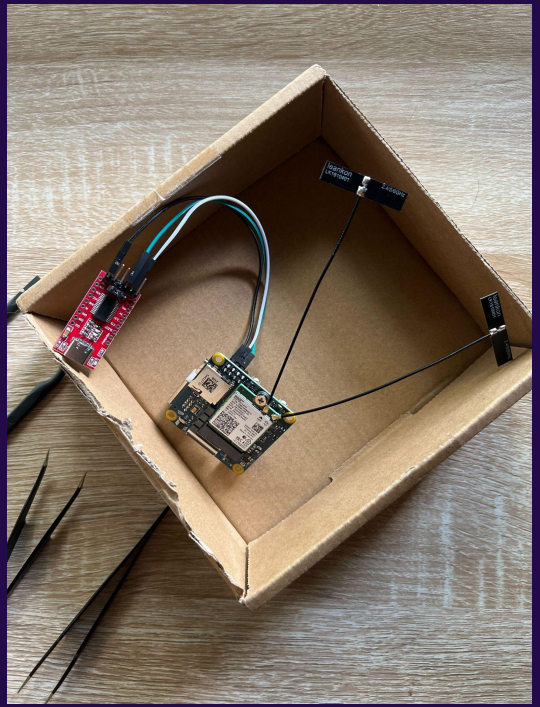
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Did I learn anything?

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It’s not all fun and games

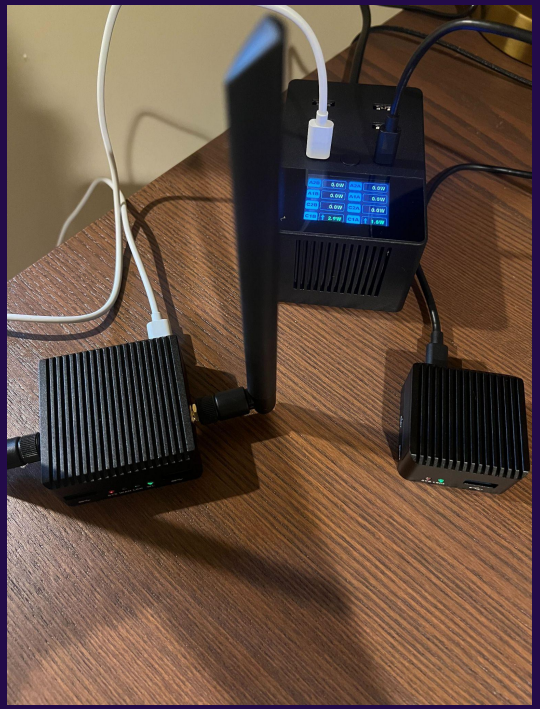
- Figuring all of this out has been immensely rewarding, but also time-consuming and frustrating times.
- I like building things. I don’t like painstakingly attaching I-PEX connectors to an M.2 card only for them to pop off when I try to get the case together.
- If you’re considering building over buying, how much do you value your time?



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Antennas matter (duh)

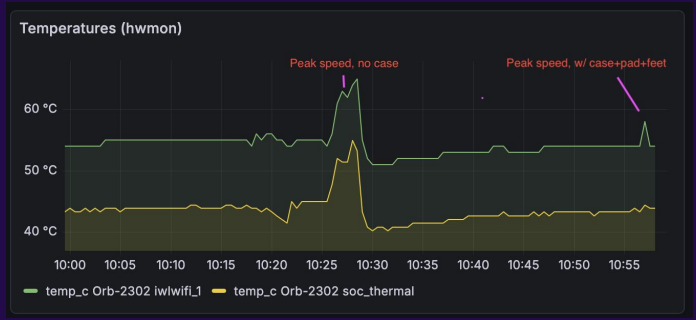
- The antennas that come with the NanoPi devices are not tri-band and don’t reliably roam to 6 GHz
- Sourcing appropriate tri-band antennas can be challenging (had great luck with Leankon for the Zero2)
- External antennas are unwieldy and can loosen over time
- Internal antenna placement on the mostly-metal Zero2 is not ideal– poor signal relative to other clients



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Sometimes bigger IS better

- Small, cute, and branded = pocketable
- Feeling the heat
  - Wi-Fi 7 modules run hot
  - This heat may impact other components in confined environments
  - I’ve had two Zero2 boards fail running long-term with BE200
- Maybe a USB-3 Wi-Fi adapter is the way to go: nice and ugly, no thermal runaway, and easy to assemble!





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Get uncomfortable

- I’m not a Wi-Fi expert. I’m not a hardware engineer. Maybe no one uses this project. But what I’ve learned already has been immensely valuable.
- Cloning a GitHub repo or running a container might sound intimidating to you. But if you point Claude Code, Codex, etc. at the repo it can have the stack running in minutes (or teach you how if you’re into that sort of thing).
- Go build something!

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In conclusion

The **build vs. buy** equations isn't quite as straightforward as I thought.

> How much do you value your time? How much do you hate I-PEX connectors? How much lead time is acceptable for ordering components with limited inventory?

Small and cute is enticing, but might lead to **poor reliability and theft.**

> Should I focus on USB Wi-Fi adapters next? Do you know of other devices that are compelling?

There has never been a better time to **hack on your own project**.

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Thank you!

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