

NETWORKING WITHOUT THE INTERNET

MARLIES HEIJKOOP @ NLNOG DAY 2026

whoami?

- * Marlies Heijkoop
- * Got suckered into setting up an IPv6 tunnel at age 14 in 2001
- * Personal AS214723
 - * worked on AS204751 and AS208209
- * Founding Architect @ Gomibo (Belsimpel)
- * Recovering from burnout
- * @marlies@tacobelllabs.net on the fediverse



what this talk isn't

- * A deep technical dive
- * A tutorial
- * Prepping for the collapse of society
- * The Next Big AI-powered Crypto Thing
- * Aimed ham radio people
 - * also not not for them, there's lots of hams on the mesh
- * About Meshtastic
 - * Meshcore is dominant in The Netherlands so that's what I'm using

networks are awesome

- * social: because communication is awesome!
- * technical: complex distributed systems with complex emergent behaviour
- * we sometimes forget they're cool
 - * especially when paid to work on them

save your love for tech & networks

- * You (used to) love these things for good reason!
- * But now...
 - * pointy-haired bosses
 - * evil big-tech and AI overlords
 - * instagram-induced FOMO
 - * algorithms pushing stuff that makes you sad
 - * ads! so much ads!
- * Try and keep that flame burning, have some fun!

meshcore

- * Decentralised network using radio
- * Almost nation-wide coverage
- * Cheap hardware
- * No radio license required

but...

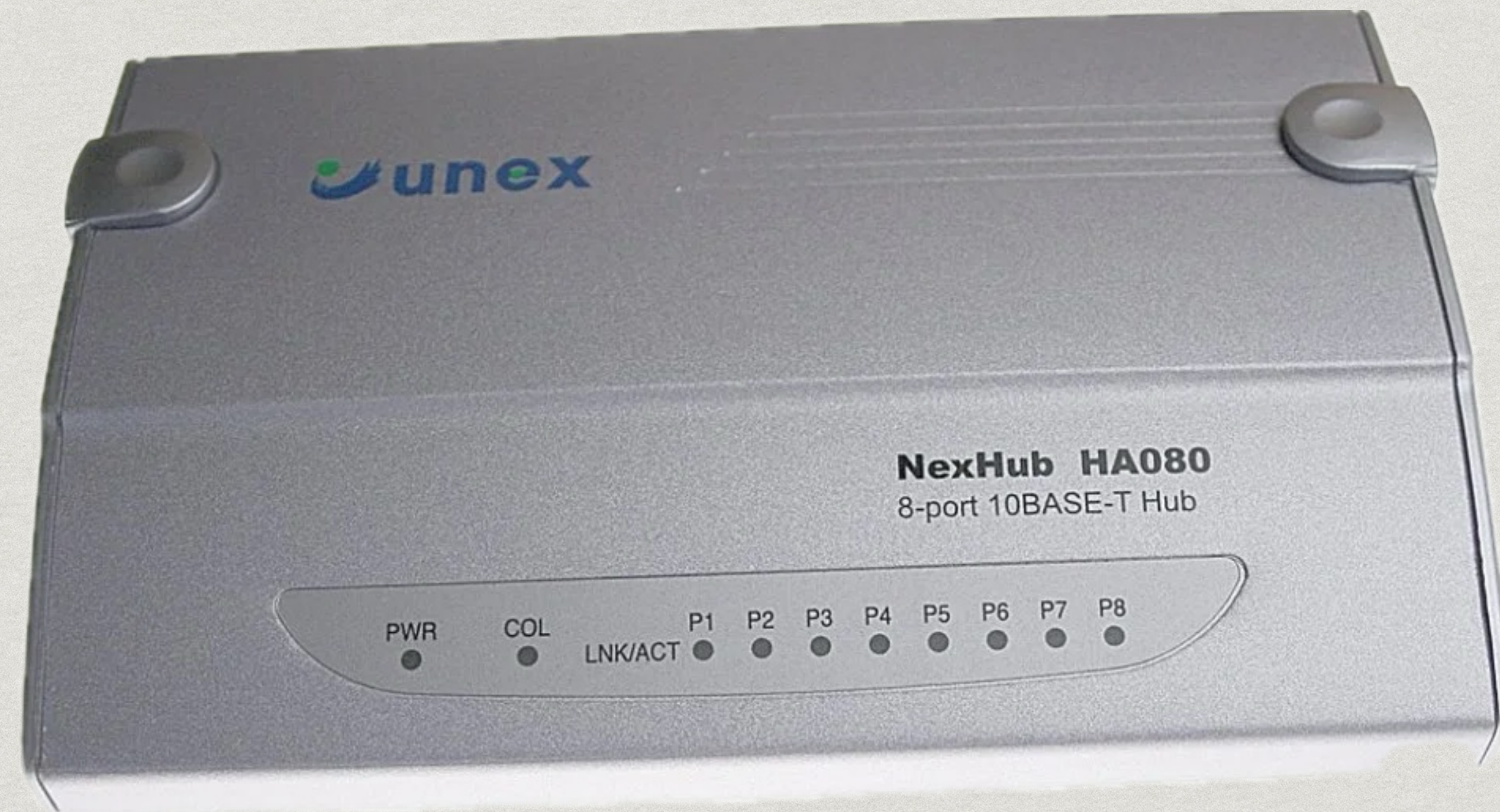
- * Tiny packets - text only
- * No delivery guarantees *
- * Limitations aren't always a bad thing

*) Basic acknowledgement packets are sent for DMs but the Two Generals have nothing to aid them like e.g. TCP sequence numbers

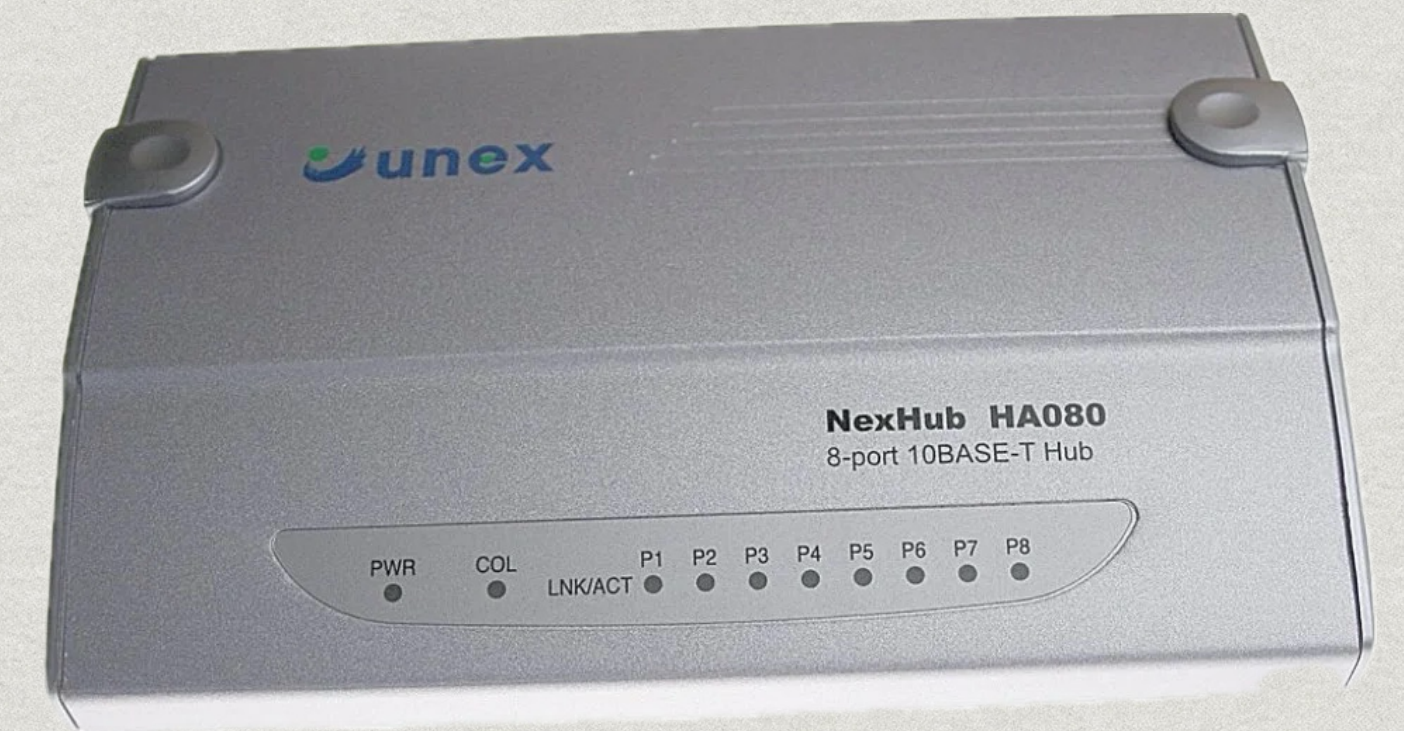
the basics

- * Meshcore uses LoRa modulation
 - * long range
 - * low power
 - * works at ridiculously low signal-to-noise levels
 - * very slow

ceci n'est pas une switch



the humble ethernet hub

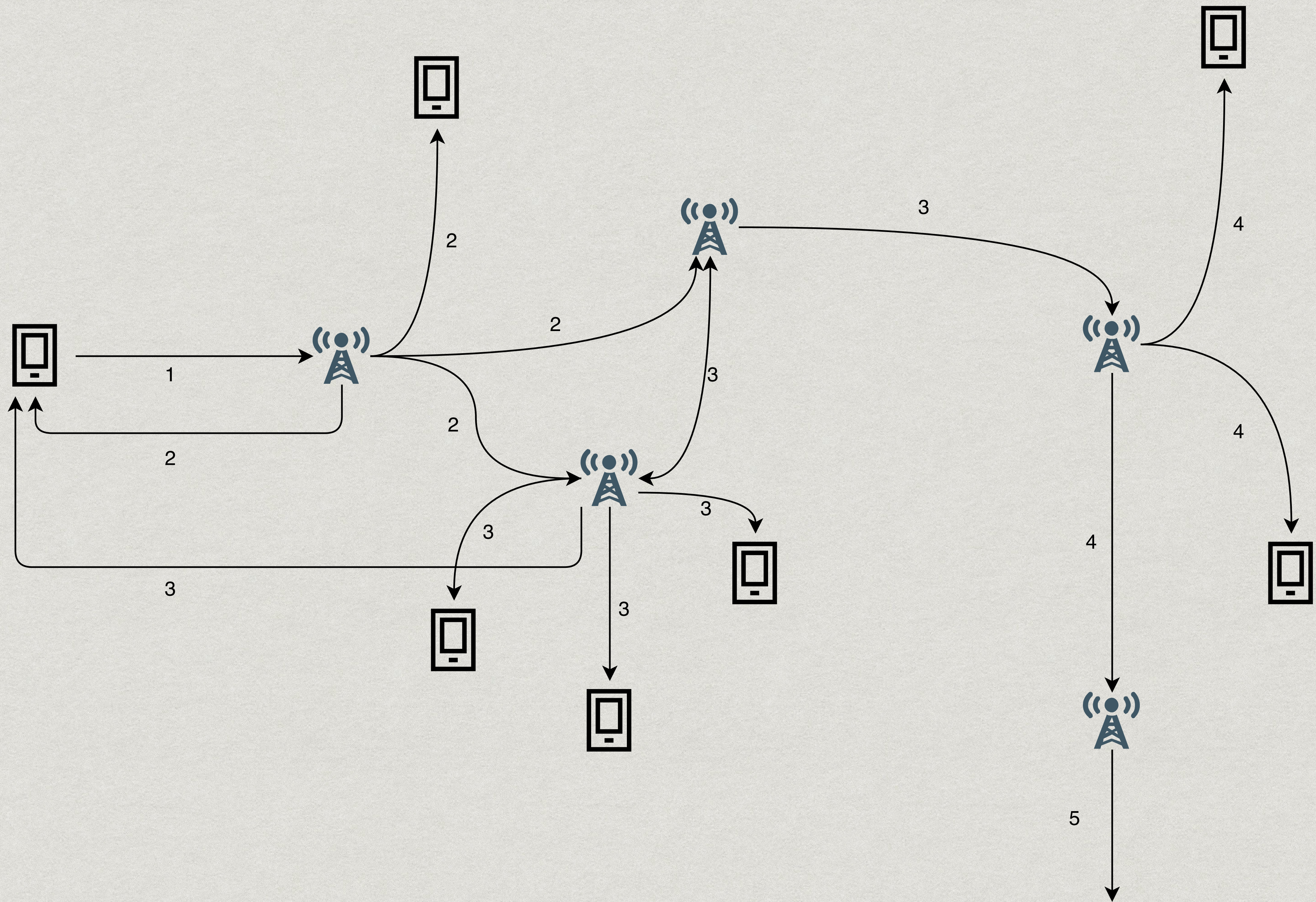


- * Receive an ethernet frame? Send it to every other port!
- * Collisions? Problem for another layer!
- * Meshcore is even worse than ethernet hubs
 - * even the original sender gets frame back!

repeaters and companions

- * companions are end-user devices
- * repeaters listen for packets and re-broadcast what they hear*
- * spanning-tree schmanning-tree





does that even work?!

does that even work?!

* Yes

does that even work?!

- * Yes (mostly, sorta)

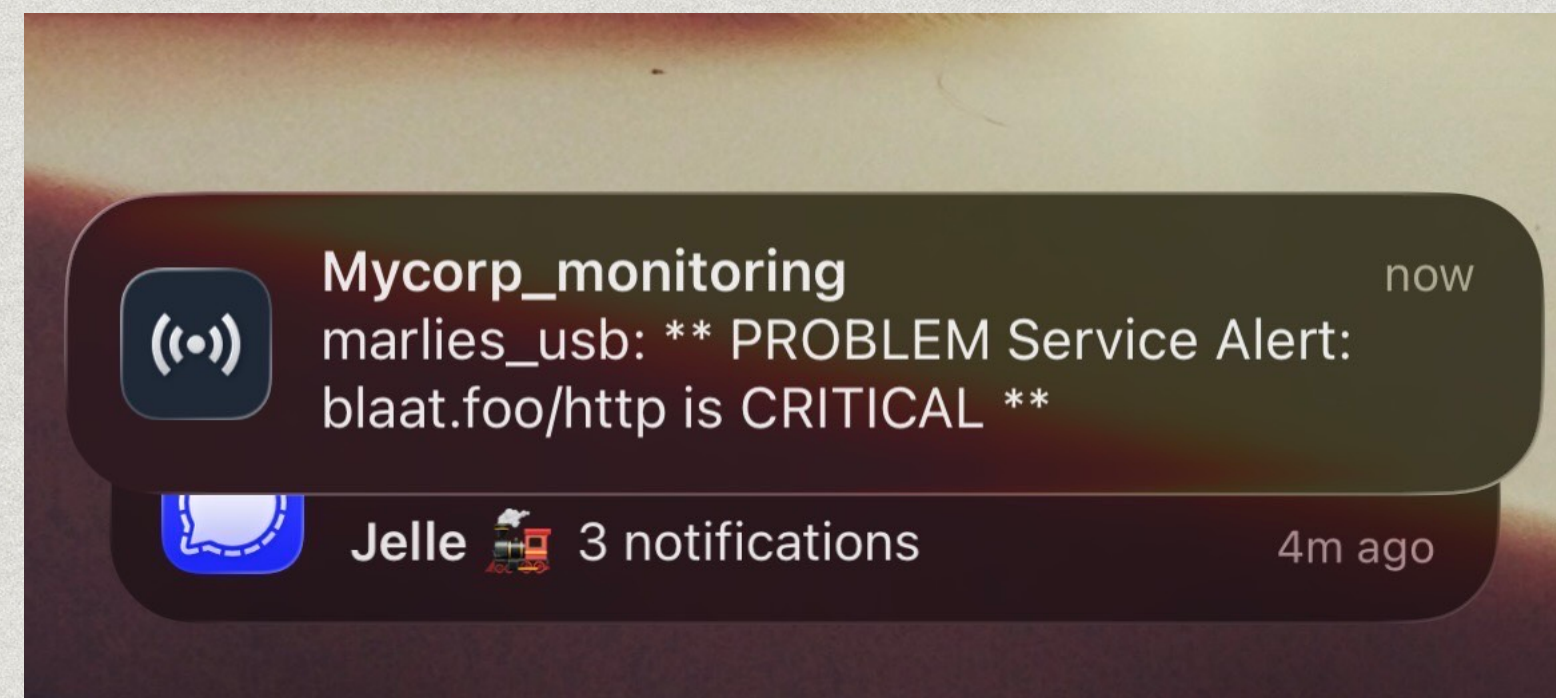
is it useful?

- * first up: does it need to be?
- * new people in your phone wishing you good morning
- * Home Assistant integration
 - * “did my house burn down or is it just Ziggo”
- * communication without cell service
- * last resort monitoring?

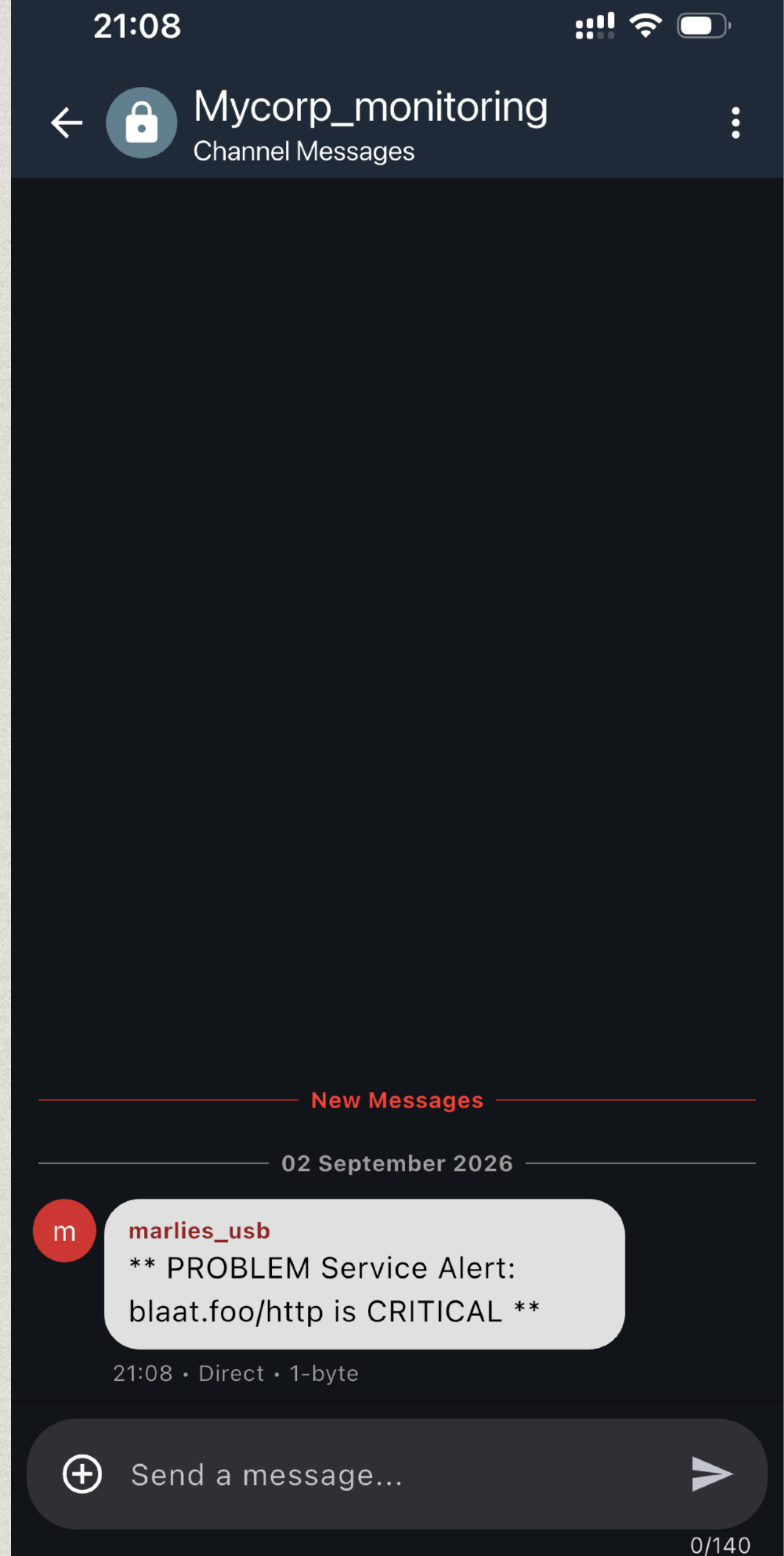


monitoring! you could!

```
(130) marliesheijkoop@charybdis:~  
$ meshcore-cli -s /dev/cu.usbserial-0001 chan 1 '** PROBLEM Service Alert: blaaf.foo/http is CRITICAL **'  
INFO:meshcore:Serial Connection started  
INFO:meshcore:Connected to marlies_usb running on a v1.17.1-d929643 (13) fw.  
marliesheijkoop@charybdis:~  
$
```



(if you do this for real you probably want to use a room-server)



our little secret

- * you're never gonna *really* need this for monitoring your prod infra but it's a great excuse to get permission to put repeaters on roofs

my recommendations

- * techworkers (join them, they're cool!) have a guide aimed at tech workers (that's you!)
 - * <https://www.techworkers.nl/en/resources/intro-mesh-network-communication/>
- * Erratum: There have been some new developments (new radio settings for NL, region filtering, etc) not reflected in the above
- * see Dutch Meshcore for up-to-date info on how to configure your new toy :)

my recommendations

- * Get a companion **and** a repeater
 - * ensures your signal is getting out of the house (and vice-versa)
 - * contribute to the network
 - * flash 'Dutch Meshcore' firmware
- * Don't get a standalone companion / blackberry-style cyberdeck
 - * sounds all cool and '*Hackers (1994)*' but using an app on your phone is far more convenient
 - * they end up gathering dust

my recommendations

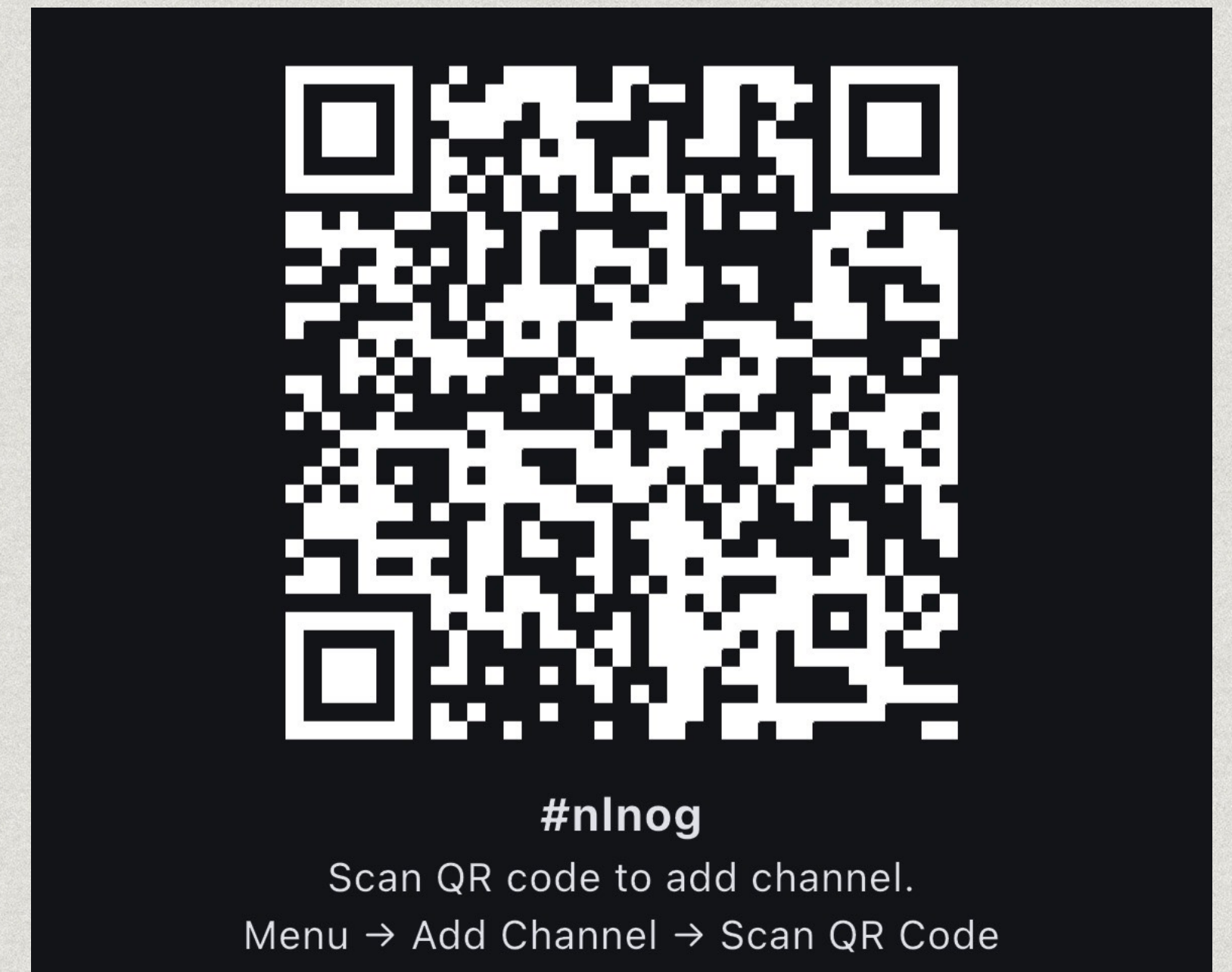
- * want to build your own?
 - * repeater
 - * buy an 'heltec v4' as a base and build around it
 - * a good antenna helps **a lot!**
 - * companion
 - * something nrf52-based like the heltec t114
 - * add a battery and 3d-print your own case

my recommendations

- * don't want to mess with hardware too much?
- * repeater
 - * SenseCAP Solar P1 Pro (fully off-grid!)
- * companion
 - * Seeed L1-Pro or T1000-E (small form factor)
 - * LILYGO T-Echo

join us

- * #nlnog public channel on meshcore
- * when IRC **and** Discord are down
- * when Trump/Putin/whoever blows up the AMSIX or something



questions

* thank you!