Start your own Internet Resilency Club Using crisis engineering to prepare for loss of communications

Valerie Aurora, Bow Shock Systems

https://bowshock.nl



Valerie Aurora, Bow Shock Systems

- Systems software consultant with 25 years of experience
- Worked on VPN, TCP/IP implementation, network device drivers, etc.
- Wrote the TCP/IP Drinking Game and fraqguiz games
- Moved to Amsterdam from San Francisco in 2023



Submarine cables at Museu das Comunicações





My nightmare scenario

- I wake up one morning and have no internet or cellular connection... \bullet
- and all the people who can fix it also have no connection...
- and no emergency comms plan...
- and most of them have been outsourced outside of Europe anyway...
- and there isn't enough backup hardware...





Disruption is the new normal for Europe

- <u>Russian modem-wiper attack</u> on Ukraine also took out German wind turbines
- NATO head says all of Europe should prepare for war
- Amsterdam preparing for <u>weeks without power</u>
- 10+ hour Iberian peninsula blackout
- Ships just can't keep their anchors up when crossing cables...

Newnew Polar Bear, suspected of causing Balticconnector cut

Credit: Alf van Beem





What is Europe doing to prepare?

- <u>Report on the cybersecurity and resiliency of the EU communications</u> infrastructures and networks by EC and ENISA is quite good!
- However, the implementation of these recommendations seems correlated to how close a country is to current or potential front lines
- Ukraine is leading the way on both implementation and knowledge sharing
- An <u>earlier version</u> of the "<u>Network Resilience</u>" talk by Ukrainian IXP 1-IX directly inspired the invention of Internet Resiliency Club
- Go see this talk on Tuesday afternoon!!! You'll be thinking about it for weeks



What is Europe doing to prepare?

- The Netherlands is doing, uh, the opposite of preparing
- If the Dutch government has a plan for restoring the internet during catastrophic loss of communications, it's a well-kept secret
- Dutch telecoms are outsourcing technical roles to countries outside Europe
- Dutch technology firms in general are moving to U.S.-owned clouds
- And look what they did to the Dutch national emergency communications system (NCV)...



Before: redundant, hardened, wired



Source: https://berthub.eu/articles/posts/cyber-security-pre-war-reality-check/







NCV Integraal Ontwerp.

Source: <u>https://berthub.eu/articles/posts/cyber-security-pre-war-reality-check/</u>

After: cloud cloud cloud cloud cloud cloud cloud c



We can't prevent crises but we can use them

- Crisis engineering is the study of structural transformation of organizations during crises that threaten their core functions
- Organizations usually avoid risky or expensive changes when things are working, like changes necessary to prepare for crises
- But when a crisis happens, a few people prepared with tools and plans can carry out major change very quickly
- Developed while fixing a bunch of broken U.S. government systems
- More on crisis engineering at https://layeraleph.com/



What can ordinary people do?

- What if I could set up up an ad hoc emergency communications network between networking experts that could bootstrap recovery efforts?
- Everyone would be a volunteer, so it has to be easy, cheap, and fun
- Must be able to communicate for days with any centralized infrastructure, including power
- Ham radio is a no-go: too expensive, time-consuming, and power-hungry



LoRa and Meshtastic to the rescue!

- LoRa (Long Range) radios can send text messages over line-of-sight
- LoRa radios are cheap ($\in 20$), low power (< 1 W), don't need a license \bullet
- Meshtastic open source firmware sends text messages over LoRa
- Uses simple 3 hop flood-forward protocol
- Uses Bluetooth or WiFi to connect to phone/computer
- Allows multiple encrypted channels to separate traffic
- ~2500 nodes in Europe on <u>MeshMap.net</u> (many more unregistered)



Amsterdam MeshMap







Amsterdam nodes in Meshtastic map





I started an Internet Resiliency Club

- Invited fun nice internet-y people to hang out every couple of months
- Established normal comms (Matrix, Signal, mailing list)
- Bulk bought LoRa radios/batteries/solar panels and handed them out
- Picked a LoRa channel to chat, send ASCII art, plan meetups, etc.
- When disaster strikes, we can communicate with our LoRa radios and help bootstrap recovery operations



Choosing hardware is a pain

- My recommendations:
 - More time than money: <u>Heltec V3</u>, ~€20, Bluetooth/WiFi, no battery/GPS
 - More money than time: <u>LILYGO T-Echo</u>: ~€80, ~24h battery, Bluetooth, GPS
- Optional: add 15W USB power bank with trickle charge (e.g. <u>Anker 326</u>)
- Optional: add a 15W solar panel (e.g. <u>Heko Solar Unfold 15</u>)
- Optional: upgrade the antenna (stock ones are usually terrible)
- IMPORTANT: never power on without the antenna connected or it might fry!



My gear (with me today)







You can start an Internet Resiliency Club too

Suggestion: ask your employer to give LoRa radios and mobile phone power banks to interested staff members!

Detailed instructions and non-Amazon European links to purchase hardware:

https://bowshock.nl/irc/

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- The entire Amsterdam Internet Resiliency Club

• 1-IX for the "Network Resilience" talk and the "Ukraine - The Battle for Communications" video

