

Jon Marler - K4CHN - Aug 2025



Meshtastic: Mesh networking made easy with LoRA & ESP32

K4CHN / Jon Marler

Amateur Radio Operator / Hacker

- First radio - Lafayette KT-200
- Passed Technician @ DefCon 27
- Passed General @ DefCon 28
- Passed Extra @ DefCon 29
- 40m voice
- Fairly active on 40m FT8
- Monitor 14.230 SSTV
- Breaker and fixer of all things
- May or may not be a robot cat from the future



Presentation Agenda

Meshtastic: Mesh networking made easy with LoRA & ESP32

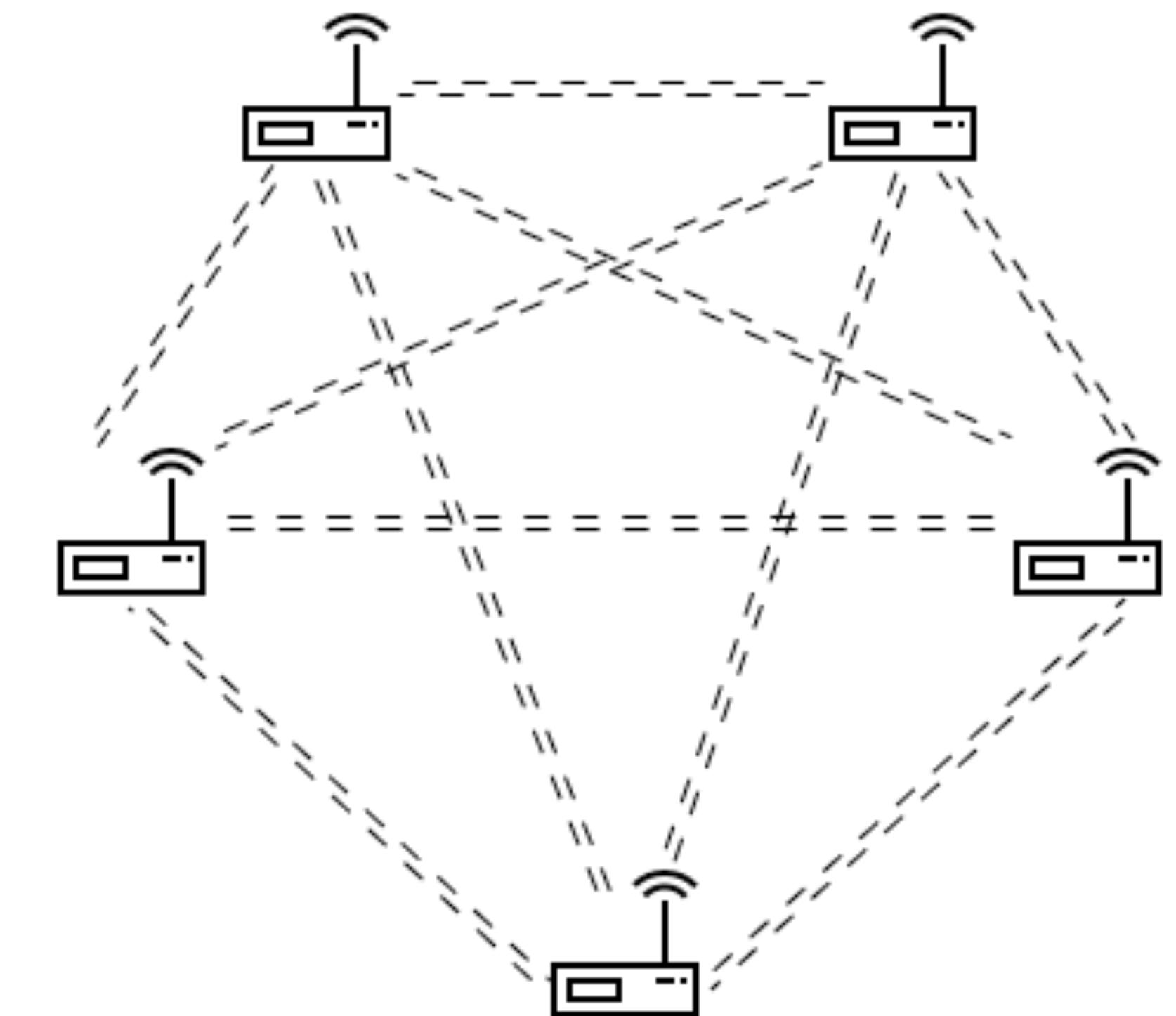
- Mesh Networking Introduction
- What is LoRA?
- Meshtastic Introduction
- Hardware Overview
- Demo: Setting up Meshtastic
- Real-world Use Cases & Scenarios
- Q&A

Introduction

Meshtastic: Mesh Networking Introduction

What is mesh networking?

- A decentralized network topology where each node connects directly and dynamically with multiple other nodes
- Failure tolerant
- Expands by adding more nodes
- Coverage limited by number of nodes
- Transport mechanism agnostic

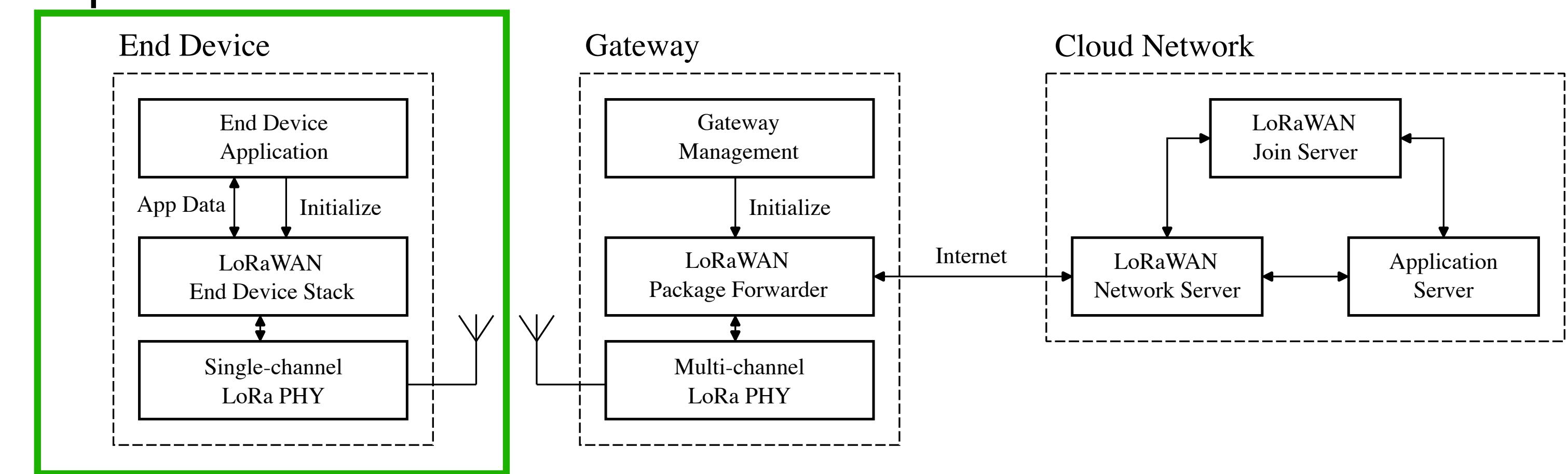


What is LoRA?

Meshtastic: LoRa & LoRaWAN

What is LoRa and LoRaWAN?

- Wireless communication technology for Low Power, Long-Range spread spectrum data transmission
- LoRAWAN expands this with communication protocol and hardware specifications
- Up to 10-15 km
- Ideal for battery powered & solar operation
- License Free!
 - 868 Mhz - Europe
 - 915 Mhz - USA

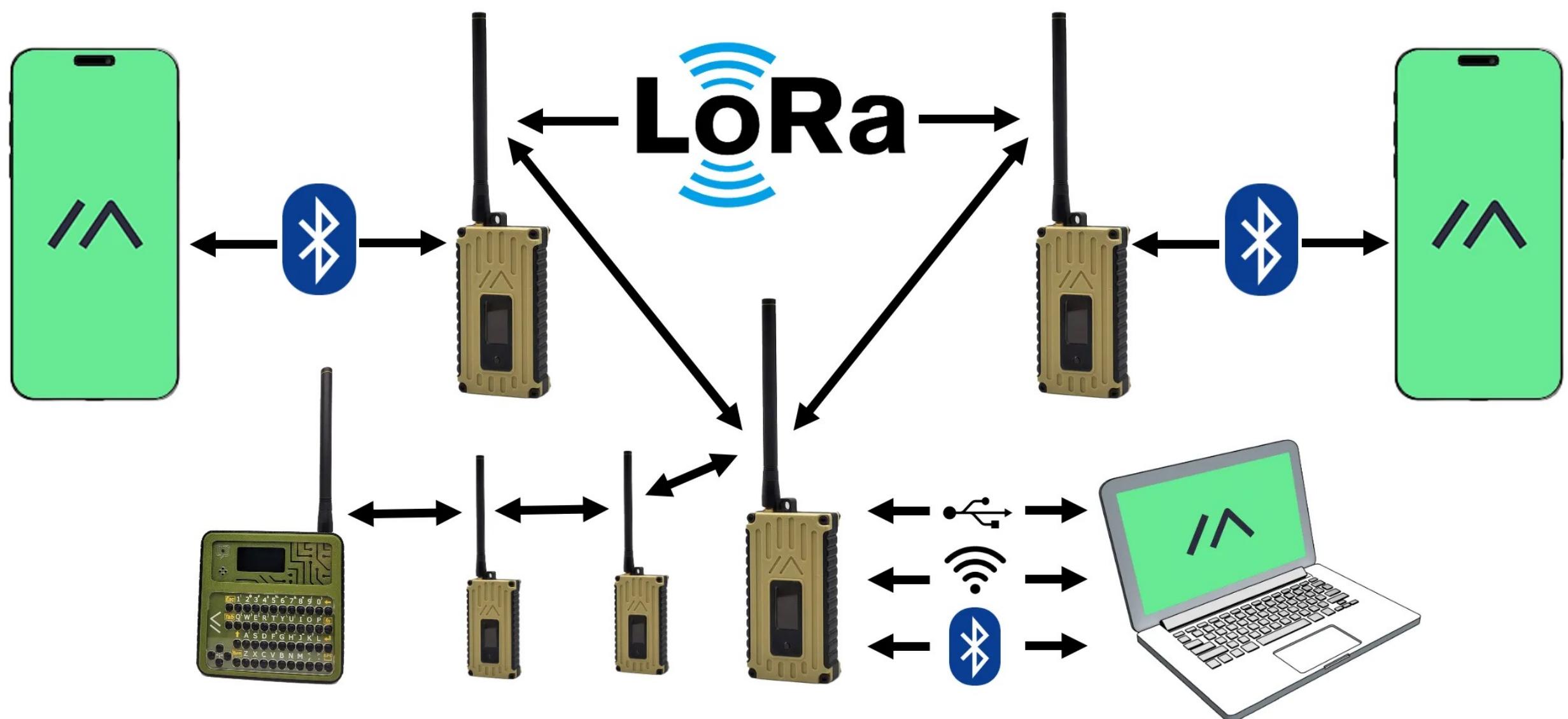


Meshastic Introduction

Meshtastic: Introduction to /ʌɛʃtʌstɪc

What is Meshtastic?

- Open-Source, decentralized, off-grid mesh networking leveraging LoRa technology created by Kevin Hester in 2020
- Ties together LoRa radio mesh networks, WiFi, Bluetooth Low-Energy, GNSS/GPS into one system using ESP32 and nRF52840
- DIY focused w/ commercial offerings
- First used @ DefCon during DefCon 32 (2024)



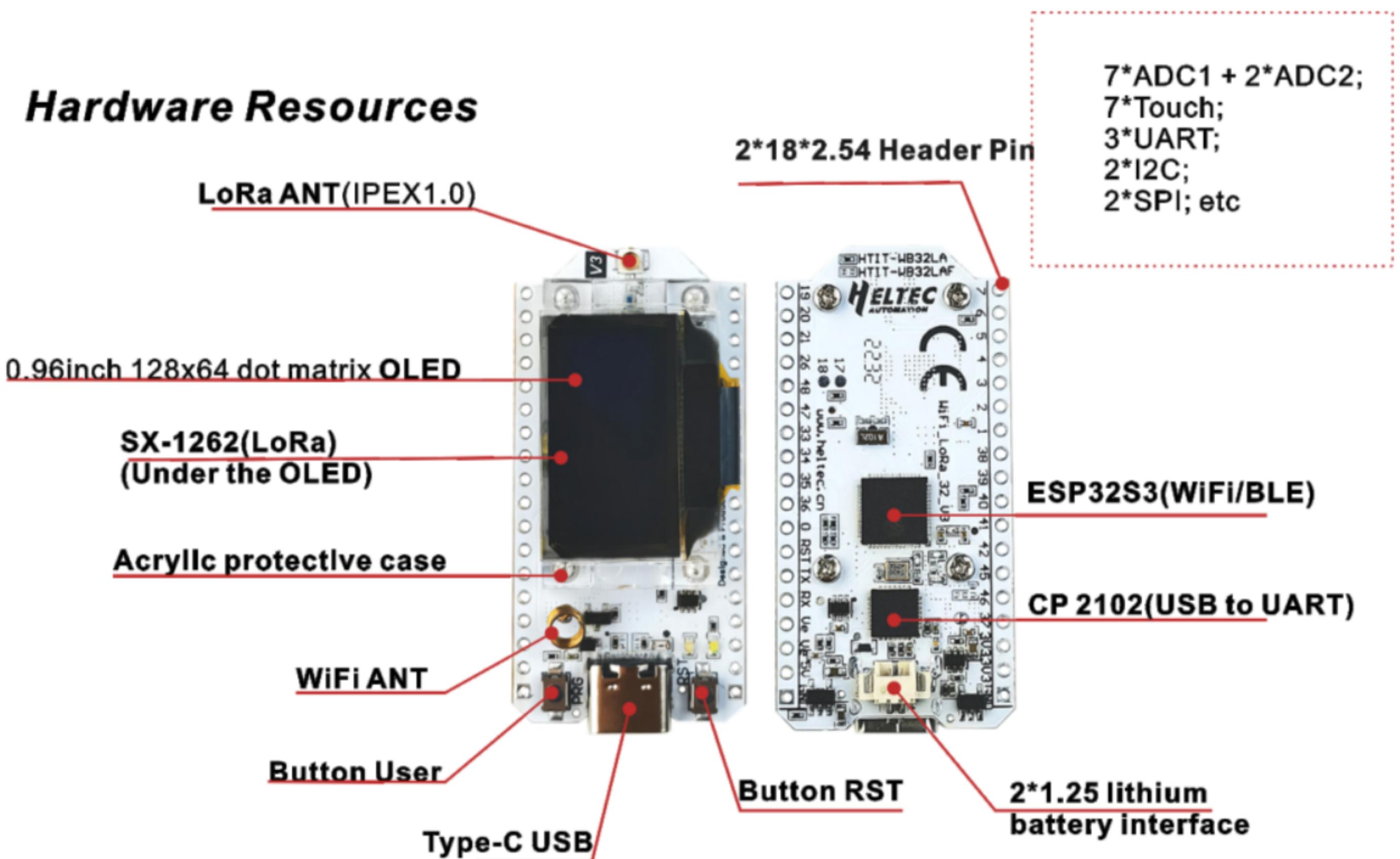
Hardware Overview

Meshtastic: Hardware Overview

What hardware do I need to get started?

- ESP32 Microcontroller
- LoRa Radio Module
- GPS / GNSS Module *
- Battery & Charging Circuit *
- Display Module *

* Optional



Meshtastic: Hardware Overview

Common Meshtastic Devices



Demo: Setting up Meshtastic

M
Ho

FLASHER

DEFCON 38

Select Target Device

Select Firmware

Flash

Device

Plug in your device via USB. Please ensure the cable is not a power-only one.

Firmware

Choose from the release options or upload a release zip downloaded from Github.

Flash

Flash your device. Choose whether you wish to update your device or flash and install from scratch.

Not connected

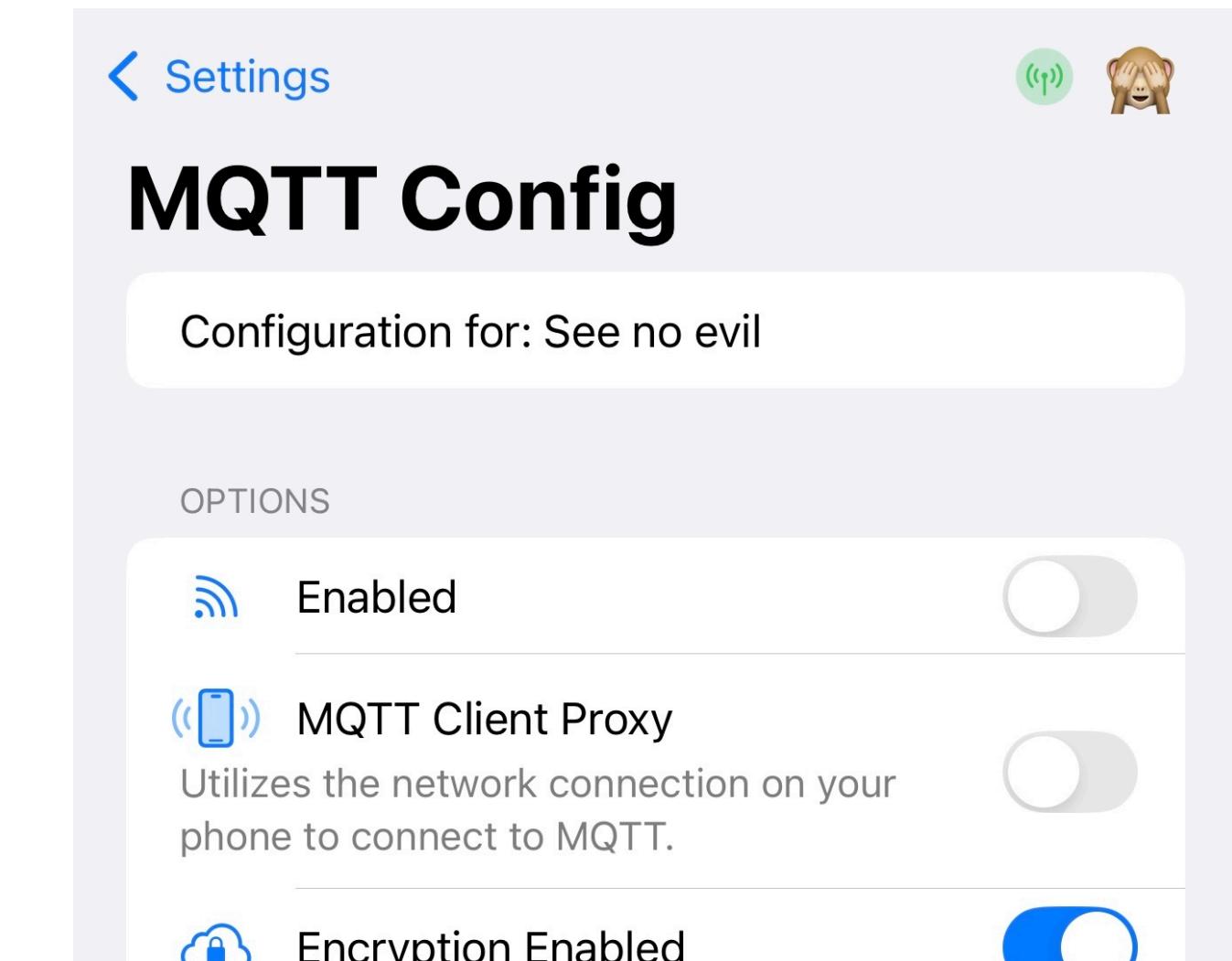
Real-world Use Cases & Scenarios

Meshtastic: Amateur Radio Operations

Extending Amateur Radio Operations

- Extend traditional radio communication with digital text messaging
- Support ham radio field operations, contests, and conventions
 - HamNation
 - Def Con
- Licensed Frequency Operation
 - **No encryption allowed**
- **DISABLE MQTT**

DISABLE MQTT



Meshtastic: Disaster Response

Assisting with emergency and disaster response

- Provide digital messaging and communication when traditional cellular networks are down
- Cheap, unlicensed, reliable, easy to use communication
- Mobile phone app & app store connectivity
 - Sideload if you can
- Standalone devices are the best option
 - T-Deck

Meshtastic: Off-Grid Communication

Stay in touch when you are off-grid

- Off-grid Communication Network
 - Hiking / Camping / Climbing / Remote Cabin Living
 - Long-range monitoring and IoT environments
 - Crop, Livestock, and Land Management
 - Wildlife Tracking & Sensor Networks
 - Remote expeditions
 - Community Networks

Q&A

Thank You!

Stay in Touch

How to stay in touch with me

- QRZ - <https://www.qrz.com/db/K4CHN>
- Email: K4CHN@arrl.net
- Github: <https://www.github.com/jmarler>
 - <https://github.com/jmarler/DefCon33HRVPresentations>
 - Contains all links from presentation & presentation itself