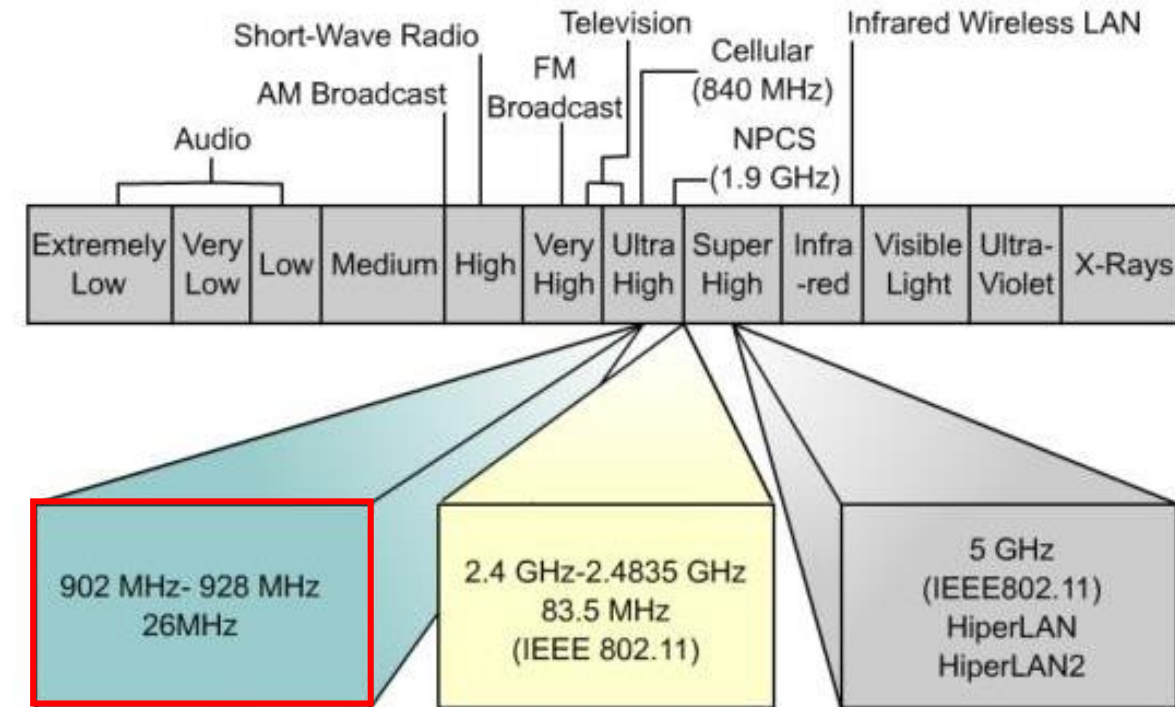


Meshtastic for Amateur Radio Operators

*Exploring LoRa Mesh Networking for Emergency Comms,
Experimentation, and Off-Grid Messaging*

What is Meshtastic?

- An open-sourced, decentralized radio mesh network built to run on affordable, low-power devices for off-grid digital communication.
- Operates in the **902–928 MHz ISM band** (not covered under FCC Part 97).
- Devices form a **decentralized mesh** — no repeaters or infrastructure needed, but specialized nodes can act as Repeaters/Routers.
- Ideal for **emergency preparedness, field day, SOTA/POTA, and ARES/RACES** support.



How does it work?

- Similar to **packet radio** but with **mesh routing** and **encryption**.
- Messages hop across nodes until they reach the destination, or the hop count reaches zero.
- **Hop limit** prevents congestion and routing loops (like TTL in IP networks).
- Radios prioritize **edge nodes** based on RSSI/SNR.
- Can be used as a **standalone** device or with smartphones/laptops **connected via Bluetooth, WiFi** or serial connection.
- The radio stores up to 30 messages/packets in memory when not connected to a client app.

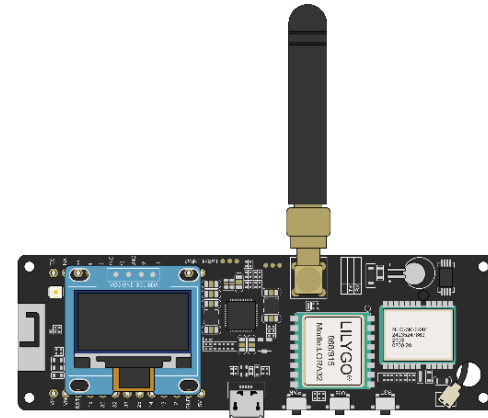


Use Cases

- **Emergency Communication (EmComm)**
 - Solar and battery power nodes can function for weeks and relay messages when other communication infrastructure is not available
 - Send text-based situational reports, resource requests and check-ins
 - Free up voice channels for more urgent comms
 - Communicate with family and friends over encrypted channels
- **Field day, Summits/Islands on the Air (SOTA)**
 - Keep connected without cellular service
 - Share GPS location and short messages between teams
- **Integrate with other systems**
 - Gateway to internet for extended functionality
 - Low cost entry level node for internet-linked ham services
 - Experiment with various sensors (weather, GPS, micro controllers)

Supported boards

- **ESP 32** – equipped with WiFi and Bluetooth, higher power consumption, can use Filesystem, has 4 MB of usable PSRAM
 - LILYGO T-beam and Lora
 - Nano G1
 - Station G2
 - Heltec V3
 - RAK 11200 core with WisBlock
- **nRF52** – equipped with Bluetooth only, low power usage
 - RAK 4631 with WisBlock
 - LILYGO T-echo
- **RP2040** – dual-core ARM chip from Raspberry Pi
 - Pi Pico + Waveshare LoRa module
 - RAK 11310 core with WisBlock



T-Beam



RAK 4631 WisBlock



Heltec V3



Pi Pico LoRa

Power Options and LoRa Antennas

Power

- Most boards have **USB C connection** for firmware upgrades, debugging and power
- Very **small power draw**
 - 64-195 mA transmit
 - 7mA-80mA idle (based on the chip)
- Can be powered with single 18650 LiFePO4 cells, salt batteries, small solar panels, supercapacitors, PoE
- Some boards have solar and battery inputs built-in



Antennas

- Most stock antennas that come with boards have low gain
- Boards typically come with **u.FL** connectors, some have **SMA**
- Antennas need to be tuned specifically for ISM band, a lot of fakes on market
- Community tested antennas, reports and resources available on Meshtastic website
 - [LoRa Antennas | Meshtastic](#)



How to get started

- Started Boards and complete kits sold by several companies:
 - RAK
 - Heltec
 - LILYGO
 - Raspberry Pi
 - Find these on Amazon or Florida-based store Rokland (store.rokland.com)



- Common starting boards:
 - Heltec T114 V2 or Wifi LoRa 32 (V3)
 - RAK 4631 WisBlock
 - LILYGO T-beam V1.2
 - Seeed SenseCAP T1000
- Some come pre-flashed with Meshtastic firmware
- Easy web-based flasher at [Meshtastic Web Flasher](#)



Licensed Operator Mode

- Meshtastic uses 902-928 MHz ISM band for North America
- The maximum output power for North America is +30 dBm ERP, firmware limited by Meshtastic
 - Semtech SX1262 LoRa transceiver limits transmission power to +22 dBm
- There is an option to enable higher power settings. Must put in your call sign and the radio will only transmit in unencrypted mode



Licensed Operator



Onboarding for licensed operators requires firmware 2.0.20 or greater. Make sure to refer to your local regulations and contact the local amateur frequency coordinators with questions.

What licensed operator mode does:

- * Sets the node name to your call sign
- * Broadcasts node info every 10 minutes
- * Overrides frequency, dutycycle and tx power
- * Disables encryption



Frequency 0



30db Transmit Power



Support and Communities

- Open-sourced project composed of volunteers that develop the firmware and software/apps
 - World-wide community, main discord has 34k members, ~6k online most of the time
- Can contribute on GitHub ([Meshtastic · GitHub](#)) or join on Discord server (<https://discord.gg/ktMAKGBnBs>)
- Join Local Communities: [Local Groups | Meshtastic](#)
 - Upstate SC Mesh <https://discord.gg/ZVtQeThnPU>
- Mesh Map (there are several): [Meshtastic Powered Map](#)

