

Chicago FM Club

Presentation: Meshtastic

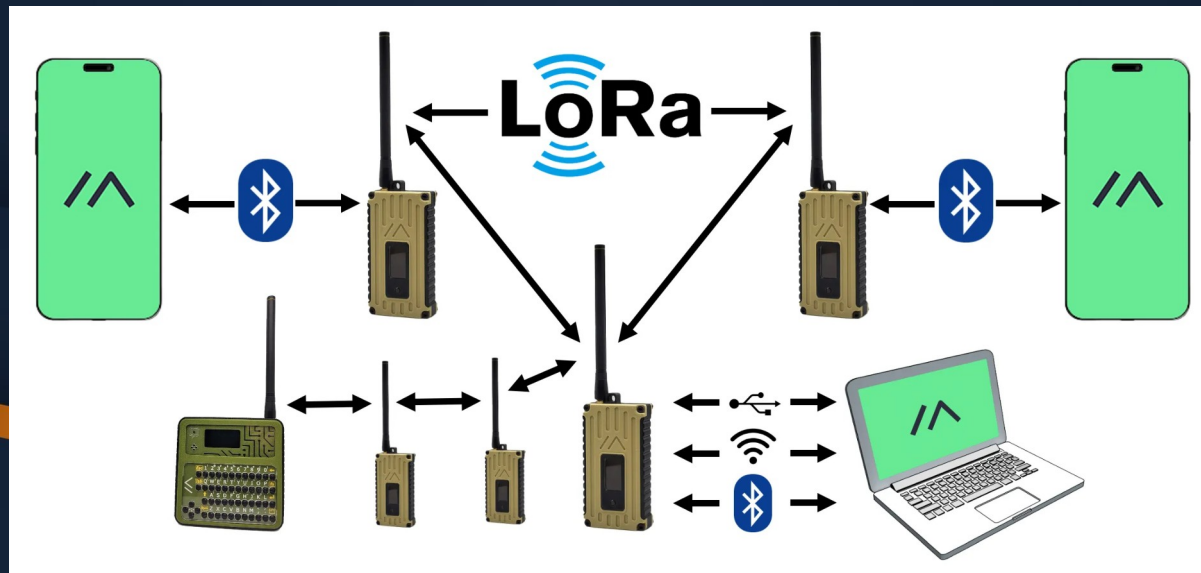
Presented by: Nate Russell, N9BBM
Broadcast Engineer, CBS Chicago WBBM-TV

Meshtastic

What is it?
How does it work?
Who uses it?
Why do we need it?

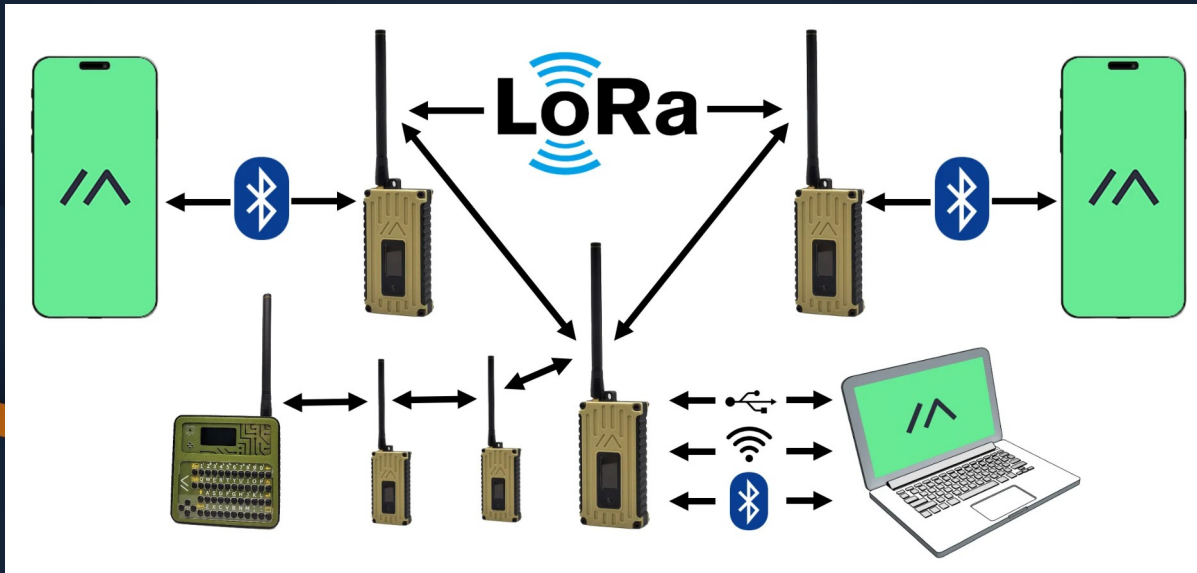
Meshtastic

- Inexpensive radios
- Long range off-grid communication
 - Utilizes LoRa



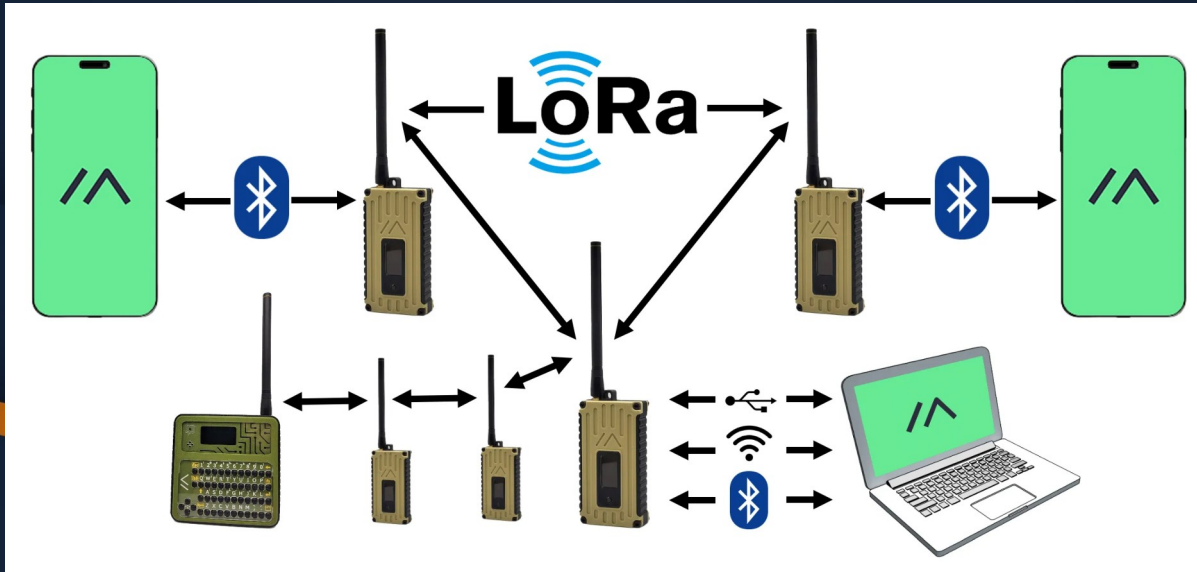
Meshtastic

- Decentralized communication
- No dedicated router required
- Encrypted communication

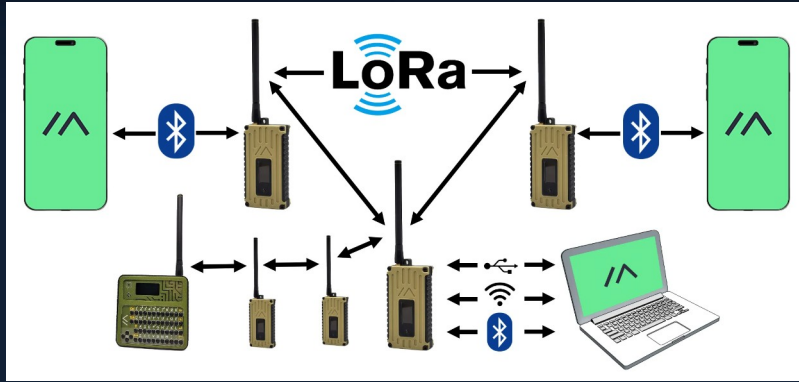


Meshtastic

- Great Battery Life
- TX and RX text messages
- Optional GPS based location features

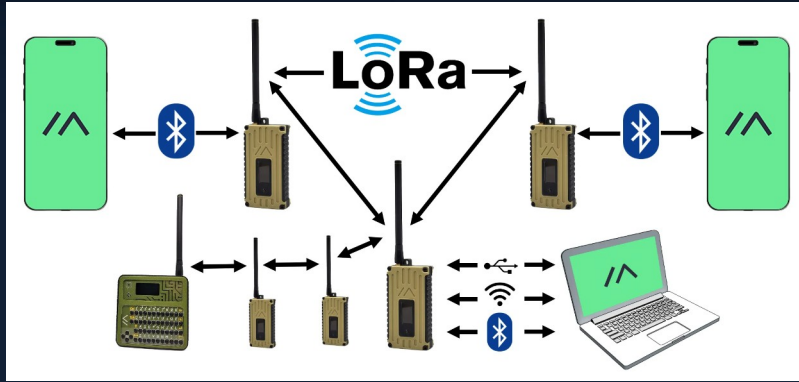


LoRa



- Long-range radio protocol
- No license required
- Widely accessible
- Radios paired with a single phone, Wi-Fi, or serial connection

LoRa



- 915Mhz (ISM Band)
- 104 Frequency slots
- 902-928Mhz
- Max power: 30dBm

LoRA

Radio presets:

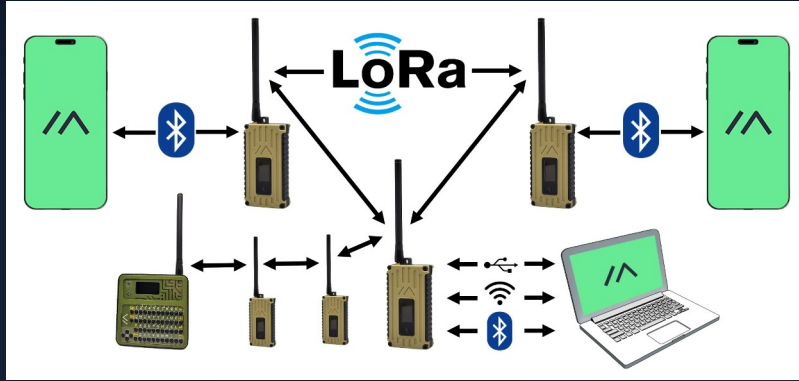
Channel setting	Alt Channel Name	Data-Rate	SF / Symbols	Coding Rate	Bandwidth	Link Budget
Short Range / Turbo	Short Turbo	21.88 kbps	7 / 128	4/5	500 ¹	140dB
Short Range / Fast	Short Fast	10.94 kbps	7 / 128	4/5	250	143dB
Short Range / Slow	Short Slow	6.25 kbps	8 / 256	4/5	250	145.5dB
Medium Range / Fast	Medium Fast	3.52 kbps	9 / 512	4/5	250	148dB
Medium Range / Slow	Medium Slow	1.95 kbps	10 / 1024	4/5	250	150.5dB
Long Range / Fast	Long Fast	1.07 kbps	11 / 2048	4/5	250	153dB
Long Range / Moderate	Long Moderate	0.34 kbps	11 / 2048	4/8	125	156dB
Long Range / Slow	Long Slow	0.18 kbps	12 / 4096	4/8	125	158.5dB
Very Long Range / Slow	Very Long Slow	0.09 kbps	12 / 4096	4/8	62.5	161.5dB

LoRA

Link budget VS data rate



LoRa



- AES256-CTR encryption
- Direct messages use Public Key Cryptography (PKC)
- Periodic broadcasts of traffic are encrypted (position, telemetry, traceroutes)

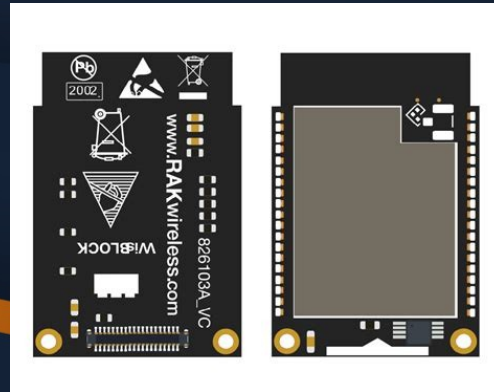
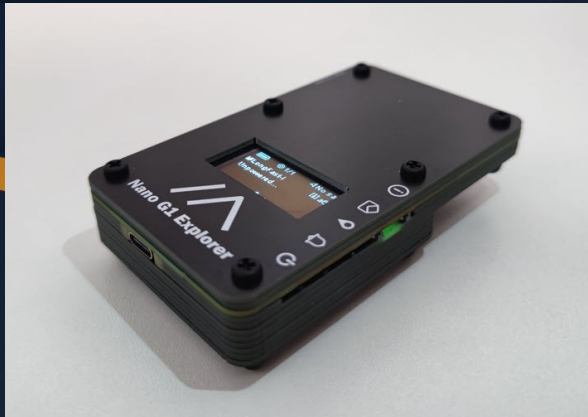
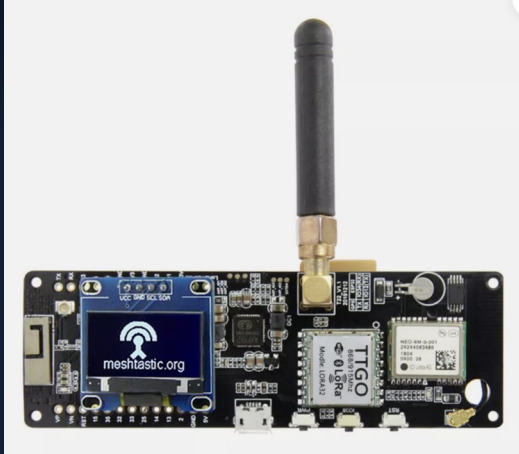
LoRA Hardware

- Meshtastic works with Micro-Controller Units (MCU)
- ESP32
- NRF52
- RP2040

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LoRA ESP32 Hardware



LoRA ESP32 Hardware

- LILYGO® TTGO T-Beam (>V1.1 recommended)
- LILYGO® TTGO Lora (>V2.1 recommended)
- Nano G1
- Station G1
- Heltec V3 and Wireless Stick Lite V3
- RAK11200 Core module for RAK WisBlock modular boards
- Support WiFi and Bluetooth

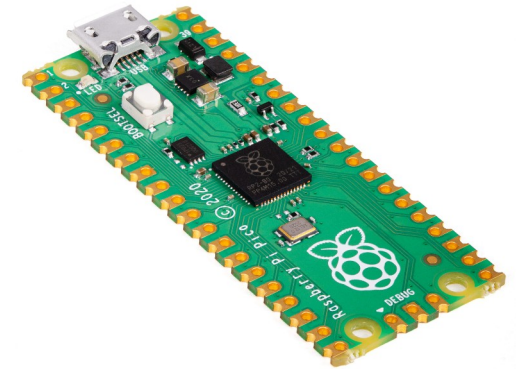
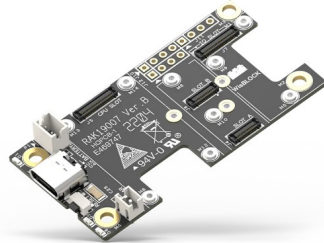
LoRA nRF52 Hardware



LoRA nRF52 Hardware

- RAK4631 Core module for RAK WisBlock modular boards
- LILYGO® TTGO T-Echo
- More power efficient than ESP32 chip and easier to update, only supports bluetooth

LoRA RP2040 Hardware

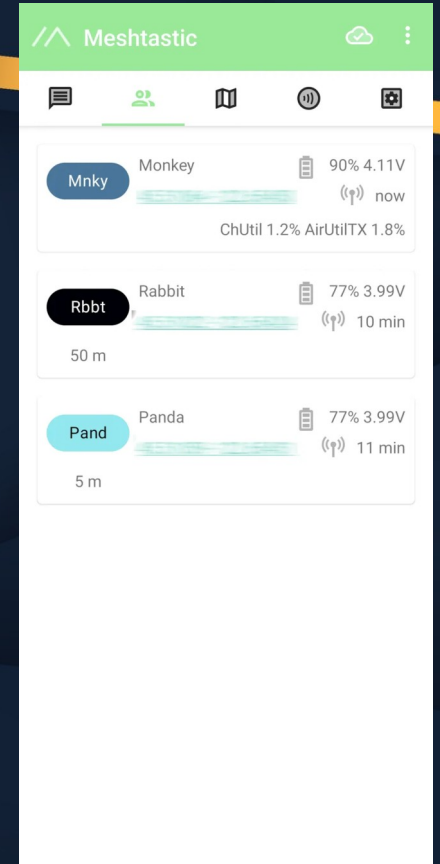
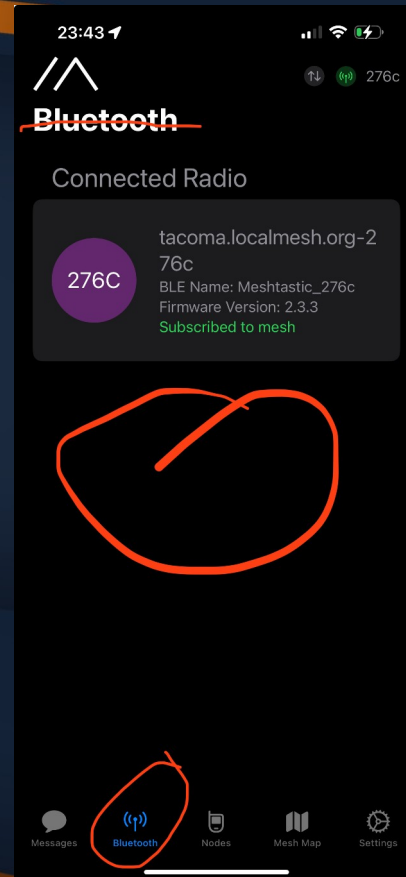
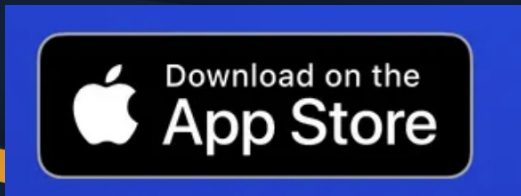


LoRA RP2040 Hardware

- The RP2040 is a dual-core ARM chip developed by Raspberry Pi. Supported RP2040 devices include:
- Raspberry Pi Pico + Waveshare LoRa Module (Note: Bluetooth on the Pico W is not yet supported by Meshtastic)
- RAK11310 Core module for RAK WisBlock modular boards

Meshtastic Connections

- Android and Apple iOS applications



Meshtastic Connections

- Web GUI
- Client.meshtastic.org
- Meshtastic.local

The screenshot displays the Meshtastic web interface. On the left is a navigation sidebar with a home icon, a green cube icon, and a plus sign. Below these are links for Messages, Map, Config (highlighted), Channels, and Peers. Under 'Config Sections', there are links for Device Config (highlighted) and Module Config. At the bottom of the sidebar are icons for a moon, a right arrow, and a keyboard icon, along with the ID 'a65bc37'. The main content area is titled 'Device Config' and has a sub-header 'f3d8 Meshtastic f3d8'. It features a navigation bar with tabs for Device, Position, Power, Network, Display, LoRa, and Bluetooth. The 'Device Settings' section includes: 'Role' set to 'Client'; 'Serial Output Enabled' with a toggle switch turned on; 'Enabled Debug Log' with a toggle switch turned off; 'Button Pin' set to '0'; 'Buzzer Pin' set to '0'; and 'Rebroadcast Mode' with a description 'How to handle rebroadcasting'.

CFMC: Meshtastic

Questions???

Comments???