Meshtastic

What it is and how to use it!

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Outline

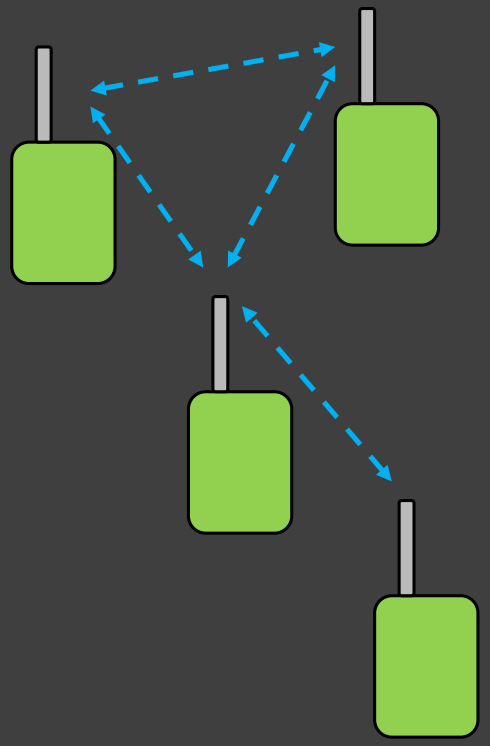
- What is Meshtastic?
- What is a node?
- How does it work?
- Configurations
- How can you join the mesh?
- JPLARC Node
- Future Ideas

What is Meshtastic?

- Long range off-grid communication

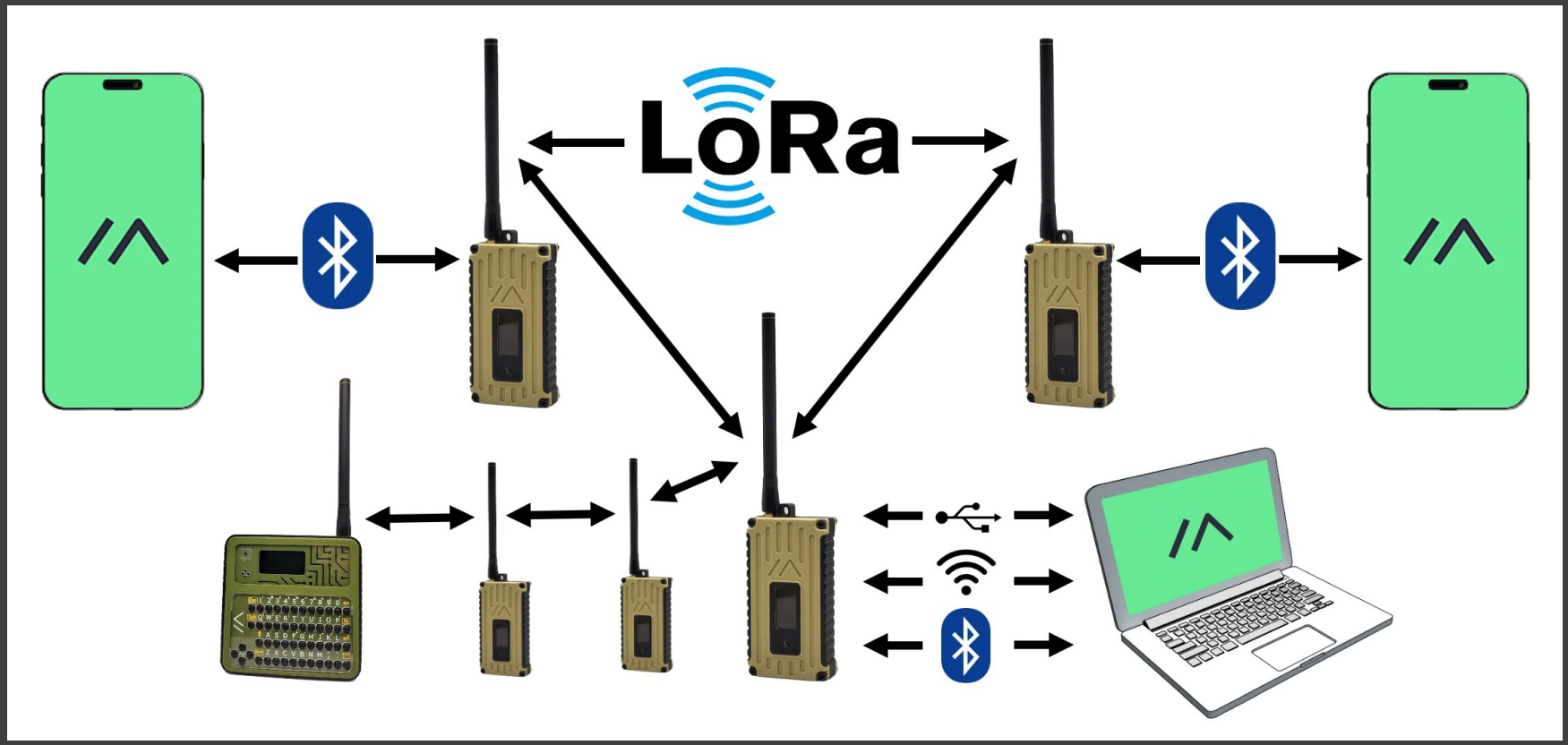
- Radio nodes form Mesh based communication
- Non-ham mesh network (915Mhz – shared ISM and ham)
- Low bandwidth, think text messages
- Encrypted (yes, it's legal)
- Based on LoRa (long-range) radio protocol
- Meshtastic handles routing - up to the application layer

- Open-source
- Inexpensive (starting around $5)
- No Ham Radio license required (but it can help!)
- No cell towers, Wi-Fi, or internet needed!
- Emergency, hiking, private comms, events, experiments

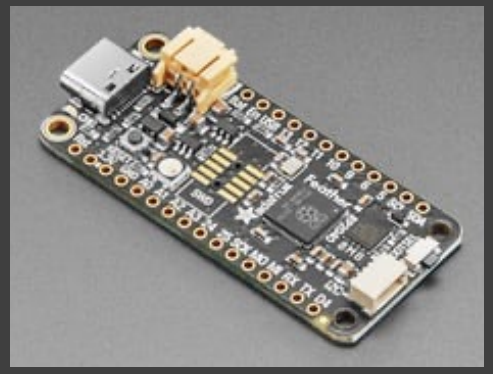


https://meshtastic.org

What is Meshtastic



What is a Node?



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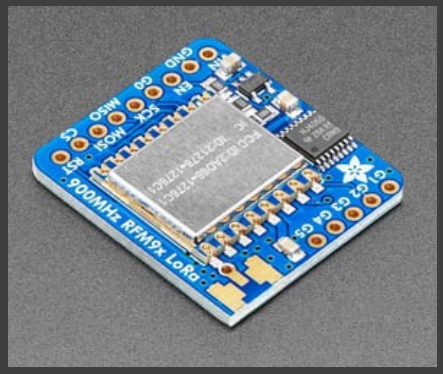

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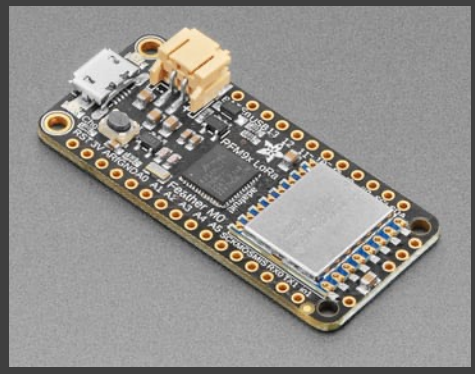


Host

- Microcontroller
- Processor
- Runs Meshtastic Software
- Bluetooth, Wi-Fi, Serial, sensors

Radio

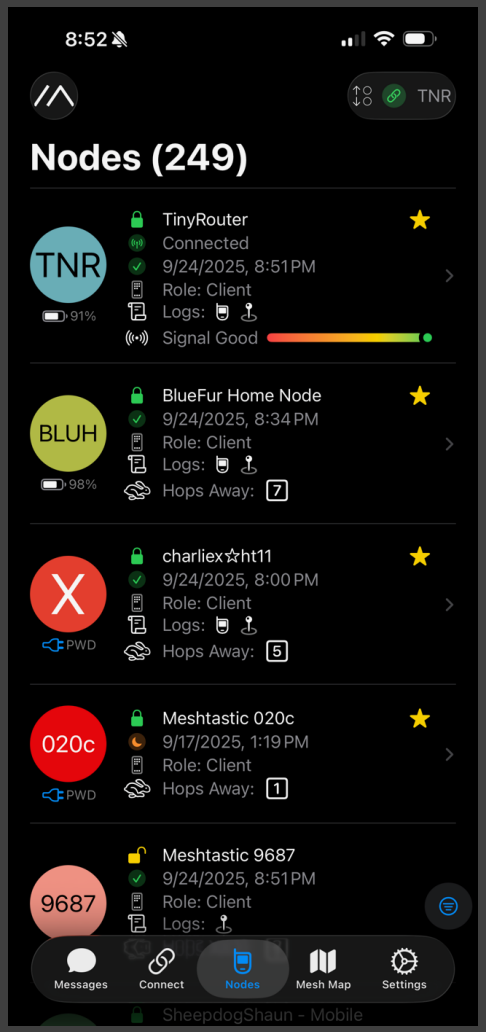
- ISM Band Transceiver
  - 915 MHz (US)
  - 433MHz (EU)
- Supports LoRa Protocol
  - Chirp Spread Spectrum (CSS) Modulation
- Power Output: <1W

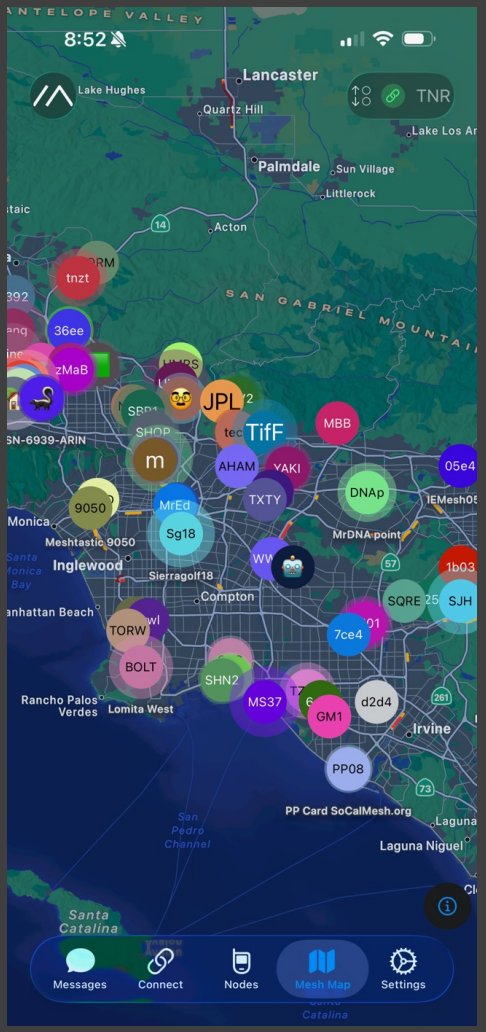
Node

- Meshtastic Node!
- Configurable
- Gateway into the mesh
- Messaging and/or sensor or controller

How does it work?

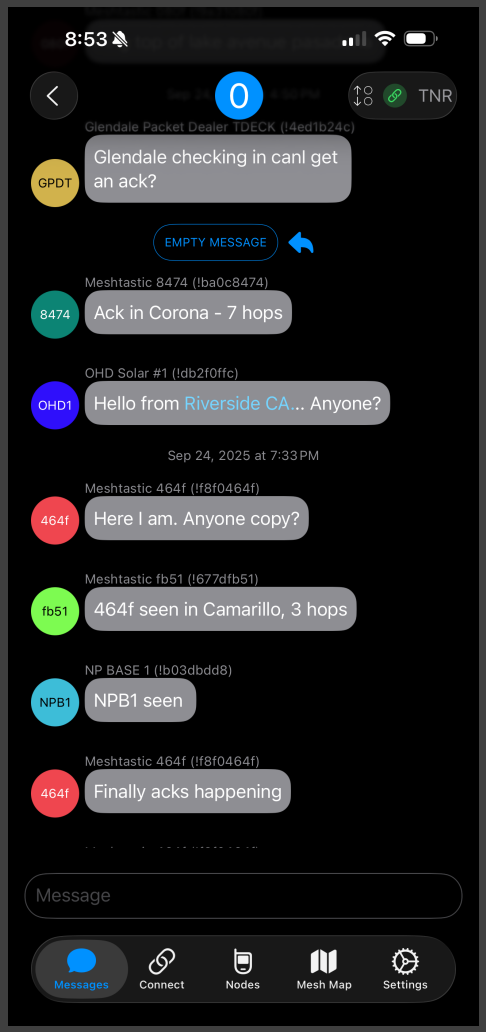
- Interface with apps
  - Meshtastic App
    - iPhone
    - Android
    - Mac/Windows/Linux
  - Web Browser Client
  - Python CLI
- Use app to pair via Bluetooth, Wi-Fi, Serial port
- Find nodes around you
- Builds a map

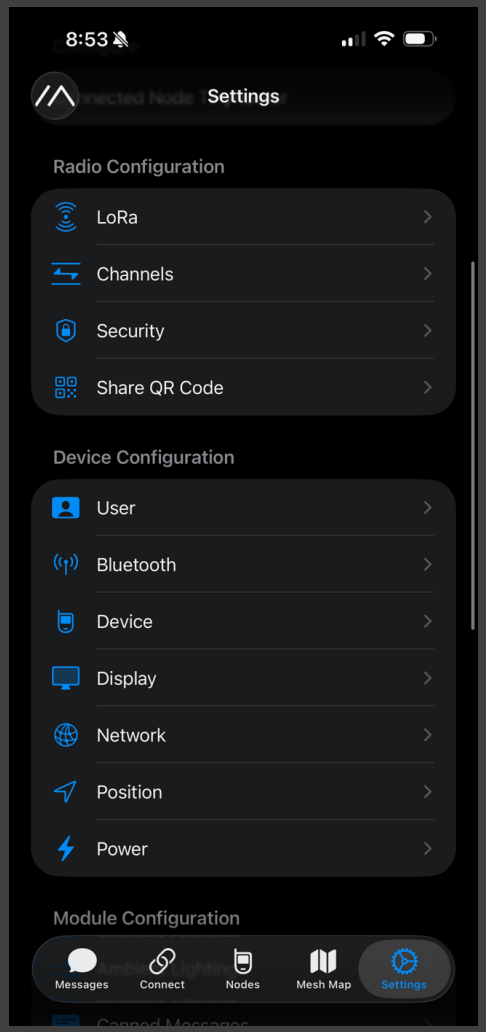




How does it work?

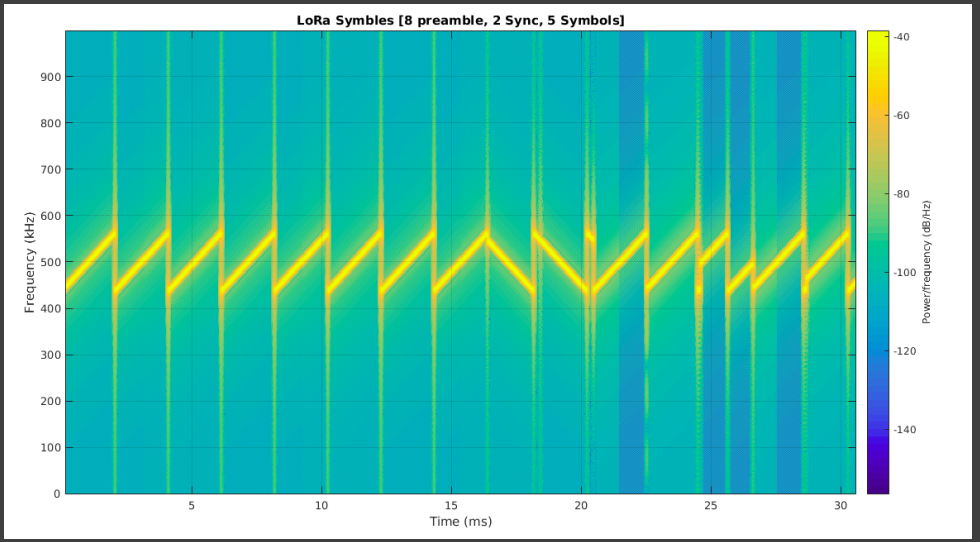
- Messaging Interface
- Select nodes to DM
- Group chats with channels
- **Channel 0** = Primary Public Channel
- LoRa Configuration
  - Radio Config
  - Channels
  - Encryption
  - Position Reporting
  - MQTT
  - Power Saving
  - Sensors and IO
  - Telemetry

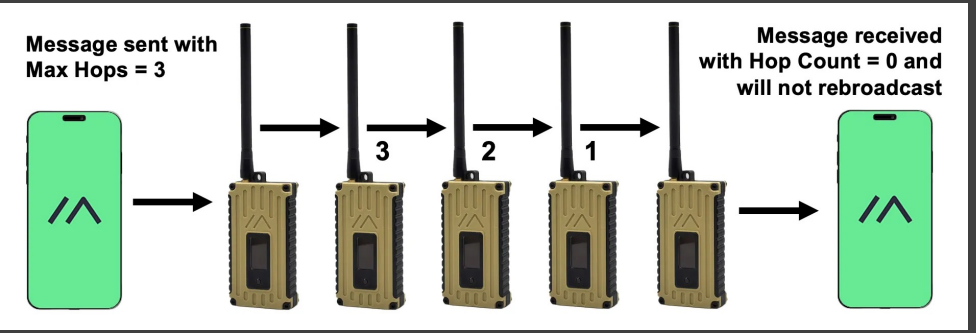




Configuration

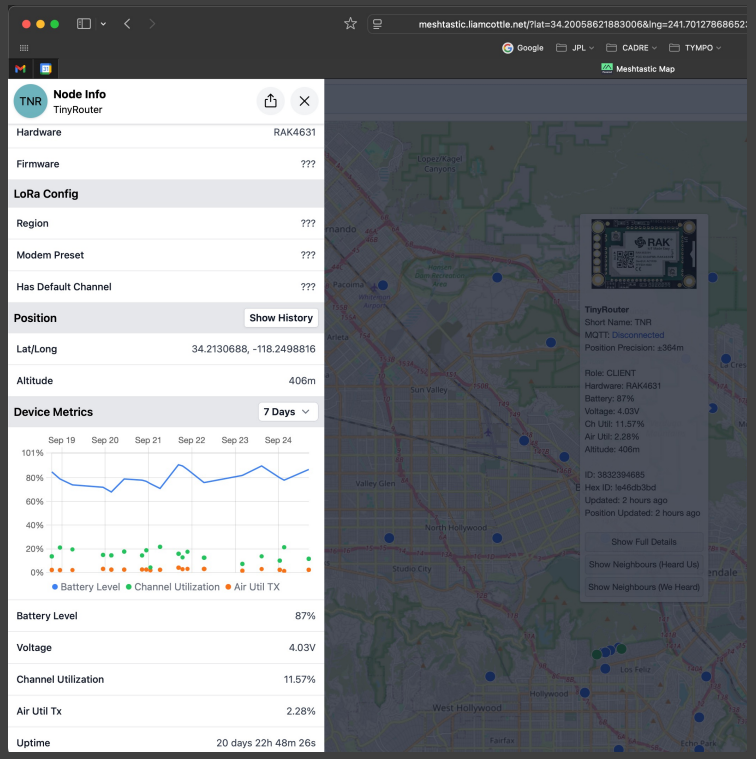
- LoRa is based on Chirp Spread Spectrum (CSS)
  - Range
    - Bandwidth and Spreading Factor
    - Short, Medium, Long
  - Speed
    - Duration of transmission
    - Options: Slow, Moderate, Fast, Turbo
  - Most popular: **Long-Fast**
- How does a message propagate?
  - Configure “Hop count”
    - Max Hops = 1-7
  - More hops -> more reach.. but it creates congestion





Configuration

- Some mismatched config = no comms
  - Frequency
  - Range/Speed
  - Encryption
  - MQTT
  - Ham Mode
    - More power yes… but less people
    - Most users are not licensed and use encryption
    - Primary public channel has a shared key
- MQTT Gateway Nodes
  - What is it? Mesh nodes connected to the internet for reporting and message passing
  - You can configure your node to uplink to MQTT gateway nodes to upload your location and telemetry
  - https://meshtastic.liamcottle.net



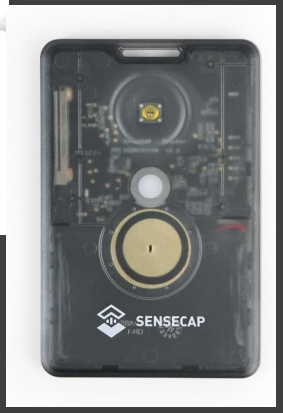
How can you join the mesh?

- Buy a Mesh!
  - rokland.com
    - Lilygo T-Echo: $72
    - WisMesh Pocket: $90
    - Lilygo T-Deck: $100
  - amazon.com
    - ESP LoRa V3: $22
    - SenseCAP Card Tracker T1000-E: $44
  - SO many options, can't list them all here
- Build a Mesh!
  - adafruit.com
    - Search LoRa modules
  - Check meshtastic.org for supported hardware
  - Super cheap? AliExpress

T-Echo

T-Deck

ESP LoRa V3



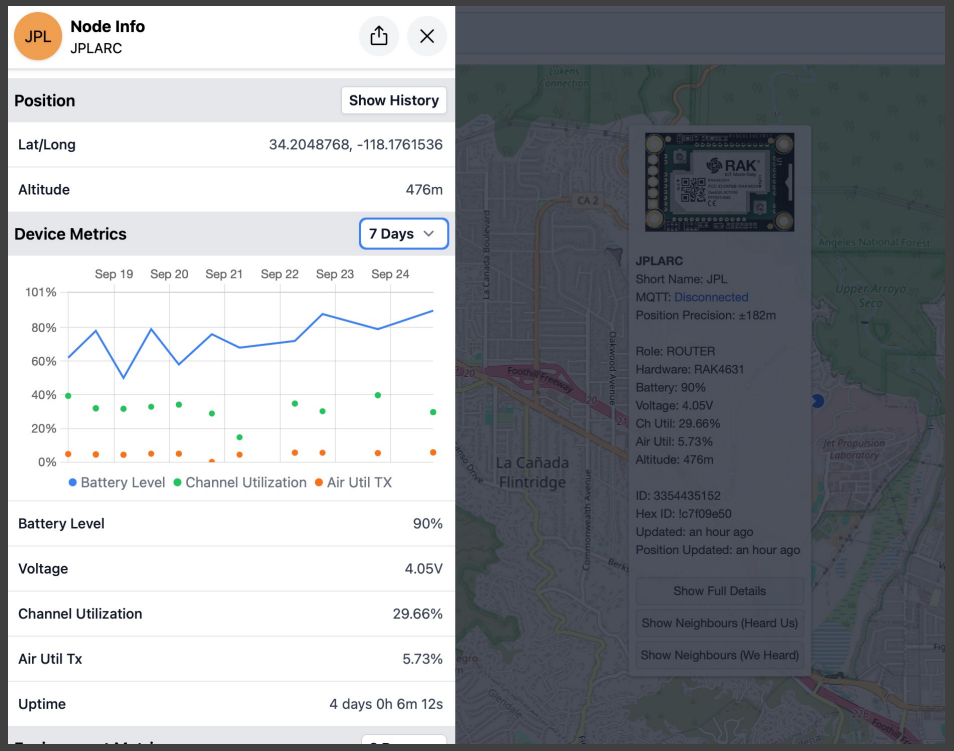
SenseCAP

JPLARC Node Experiment

- Installed on Mesa on August 25th
- RAKwireless Wismesh Repeater Mini
- Solar Powered
- Entirely off-grid!
- Great viewshed!
- Configured router

JPLARC Node Experiment

- One of the busiest nodes in Los Angeles already!
- Air Util TX: **5-6%!!!!**
- Search “JPLARC” on meshtastic.liamcottle.net
- Excellent coverage across lab
- Reporting
  - Battery SoC
  - Channel Utilization
  - Air Util TX



Future Ideas

- Rack mount mesh node
- Cavity Filter
- Yagi antenna array
- Wall Power
- Solar and battery backup
- Multiple nodes?
  - JPLARC @ 1W
  - W6VIO (ham mode) @ 5W
- Mesh net Mondays?
- Contact: Ara Kourchians (347A*)

* Pending reorg