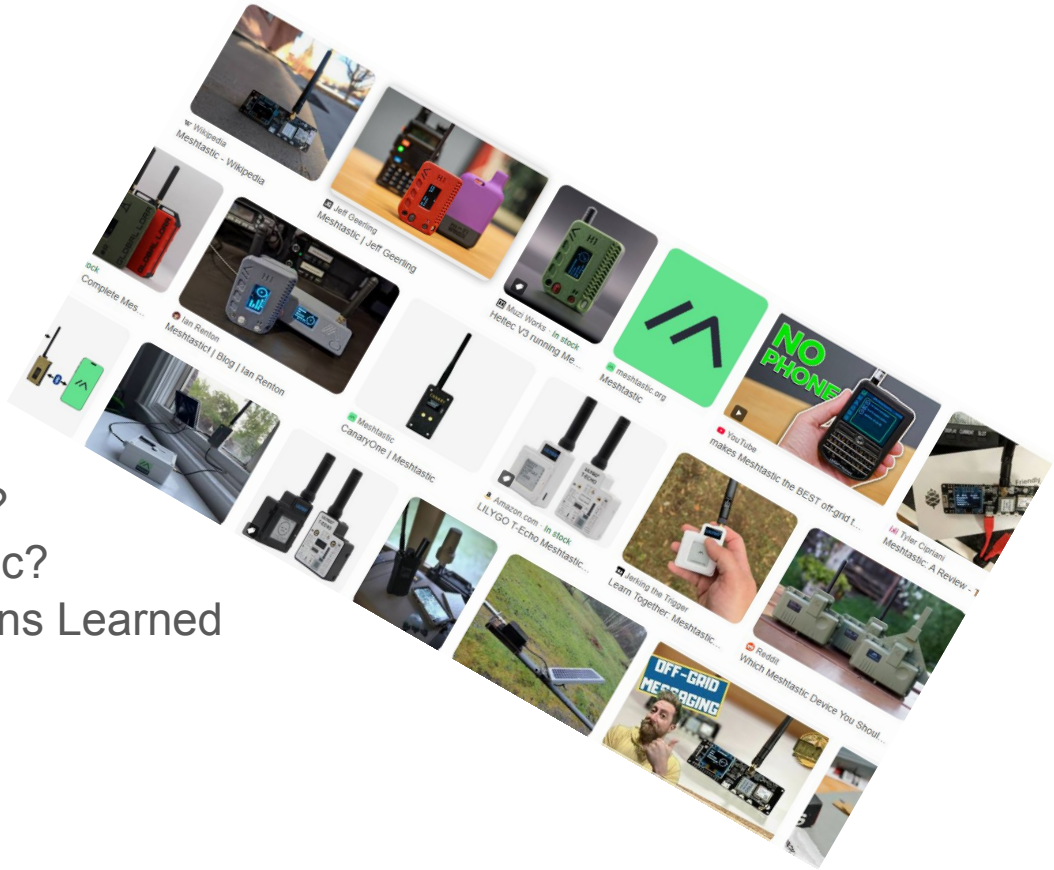
Meshtastic

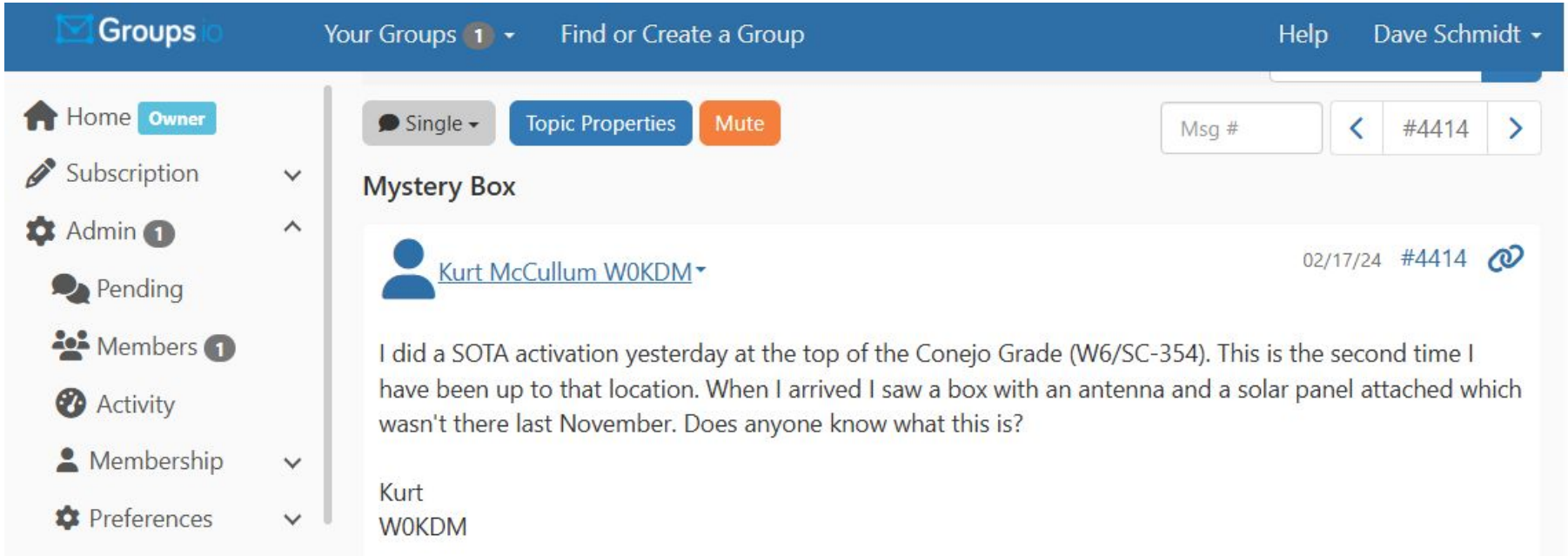
April 11, 2025 Dave AI6VX

Topics

- My Introduction to Meshtastic
- What is “Mesh”?
- What is Meshtastic?
- What is LoRa?
- How do I use it and what can it do?
- Why would I want to use Meshtastic?
- Clarification of Capabilities / Lessons Learned
- Getting Started
- App Screenshots and Video
- Summary



My Intro to Meshtastic



Dave Schmidt AI6VX via groups.io <dgschmidt=gmai... Feb 19, 2024, 8:00 PM Reply

to K6MEP

Kurt, some SB folks came back with this info.

> From: **Ken Alker** <ka6ken@alker.net>
> Date: Mon, Feb 19, 2024 at 5:46 PM
>
> A ham in town has been deploying these:
> <https://store.rokland.com/products/lilygo-ttgo-lora32-v2-1_1-6-version-915mhz-esp32-lora-oled-0-96-inch-sd-card-bluetooth-wifi-wireless-module-esp-32-sma-q211>
>
> as part of this network: <https://lora-alliance.org/>
>
> but I don't know if he's gone as far as Camarillo, or what housing he's
> using to contain the electronics.
>
> Ken

What is Mesh?

Short for ‘Mesh network’

Wikipedia: A **mesh network** is a local area network topology in which the infrastructure nodes (i.e. bridges, switches, and other infrastructure devices) connect directly, dynamically and non-hierarchically to as many other nodes as possible and cooperate with one another to efficiently route data to and from clients.

Simpler explanation: One node (device) sends or receives data with other nodes that it can directly ‘see’. Those other nodes in turn can re-transmit/receive data with other nodes they can see but the first might not.

- Each node creates its own routing table based on nodes it hears, but also from information shared from those nodes.
- Data can be ‘efficiently’ passed from source to destination even if there not a direct path.

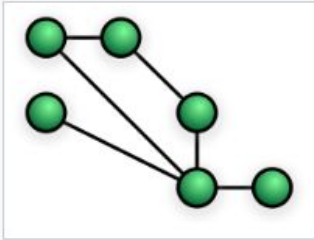
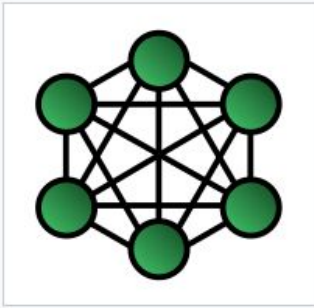


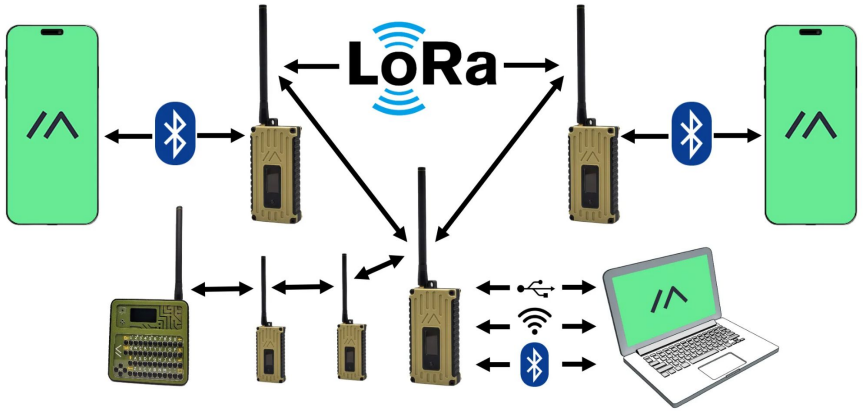
Illustration of a *partially connected* mesh network



A *fully connected* mesh network, where each node is connected to every other node in the network

What is Meshtastic?

From Meshtastic.org - Meshtastic® is a project that enables you to use inexpensive LoRa radios as a long range off-grid communication platform in areas without existing or reliable communications infrastructure. This project is 100% community driven and open source!



Features

- Long range* (*331km record by MartinR7 & alleg*)
- No phone required* for mesh communication
- Decentralized communication - no dedicated router required
- Encrypted communication
- Excellent* battery life
- Send and receive text messages between members of the mesh
- Optional GPS based location features
- And more!

***Will be addressed in a later slide**

What is LoRa?

TheThingsNetwork.org - LoRa (LongRange) is a wireless modulation technique derived from Chirp Spread Spectrum (CSS) technology. It encodes information on radio waves using chirp pulses - similar to the way dolphins and bats communicate! LoRa modulated transmission is robust against disturbances and can be received across great distances.

- Frequencies used depend on the country
  - US / Canada / Mexico 902 - 928 MHz (sold as ‘915Mhz’)
  - Europe 863 - 870 MHz
  - Asia 920 – 925 MHz
- RF power limited to 1W but nearly all boards are only **100 - 160mW**
- Hams can use 433 MHz for higher power, but cannot use encryption

Meshtastic Key Points

Each person must have their own node to participate !

- It is a physical device that communicates with other nodes
- Does not rely on any existing infrastructure
- Decentralized
- Crowd Sourced
  - Participation increases the network and coverage
- No license required if using LoRa/ISM band
- It uses low power RF !
- Messages can be encrypted (not if using ham band)
- You must be in Bluetooth range with the node

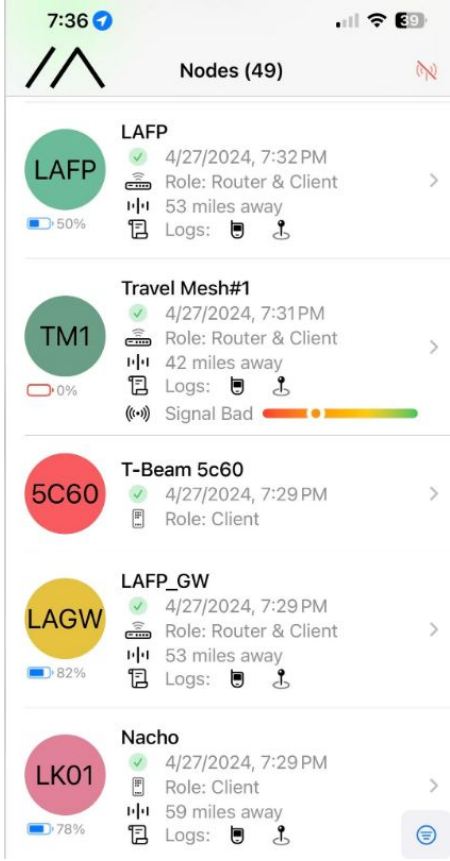
How Do I Use It, What Can It Do?

How to use it

- Meshtastic app on your phone
  - Connects via Bluetooth (range 20-40 ft)
- Buy a self contained node
  - Small display, internal battery, small keypad

What you can do

- Send and receive public and private text based messages
- Share GPS location and measured weather data



Why Would I Want To Use It?

- You want to communicate short or long distances without going through existing infrastructure
  - Emergency use if infrastructure goes down
- You want to send encrypted messages
- You want to GPS track something or be tracked yourself
- You like gadgets or like to tinker

Clarifications on Capability

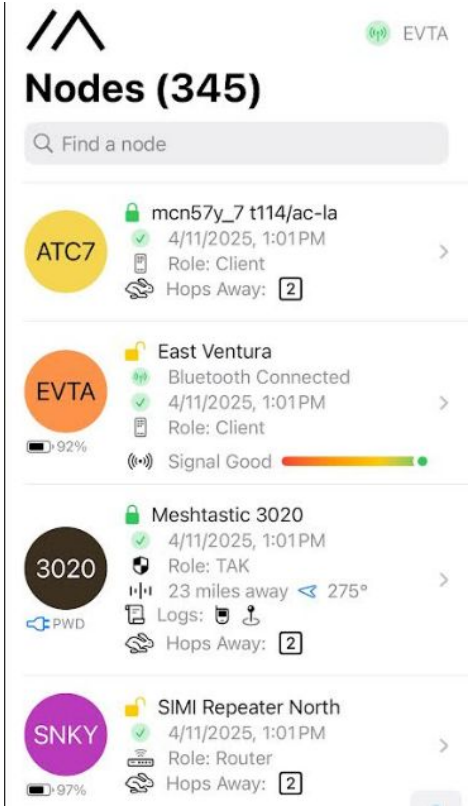
- “Long range”
  - LoRa is limited to 1W but most chipsets are in the 100-160mW range.
  - Antenna and height makes a difference
  - Don’t expect much range for a node you carry around.
- “No phone required”
  - Does not use cellular networks but you still need to use an app on your phone
    - Self contained nodes are the exception
- “Excellent battery life”
  - ESP32 processor based nodes are power hungry (~ 1-2 days per charge)
  - NRF (RAK) based nodes are frugal and best for solar installations (7+ days per charge)

Clarifications on Capability

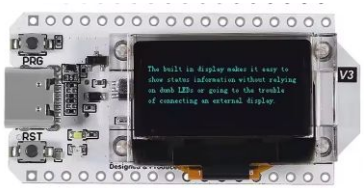
What I’ve learned

- Common to see other nodes and get messages, but unable to respond
- Sending and receiving messages is not reliable
- Message timestamps do not exist
- Difficult to know who your nearest neighbors are

Meshtastic is NOT a substitute for 2-way voice radio comms



Getting Started



Buy a purpose built board

- Lilygo, Heltec and RAK are common manufacturers.
- Prices start <$20 (pre-tariff)
- Choose 915 MHz (US)
- Radio chip - SX1262 160mW vs SX1276 100mW
- Decide if you want GPS
- Get a better antenna (do not operate w/o antenna connected

For solar/roof mounting

- Weatherproof enclosure
- Small solar panel

Getting Started

Power Source

- Board can run from USB power, or from a single attached Li battery
- Harvested or new Lithium 18650 batteries, or Lipo (Lithium Polymer)
- Most of the boards have on-board chargers and will charge from USB

Programming

- No special programmer needed
- Uses USB port and Chrome browser from Meshtastic.org website

Getting Started

Configuring

Start configuration from Meshtastic website or phone app

- Bluetooth password
- Country
- Transmit power
- Decide if you want to share your GPS location (can use phone location)

Use defaults for other settings for maximum ability to connect with other nodes.

Getting Started

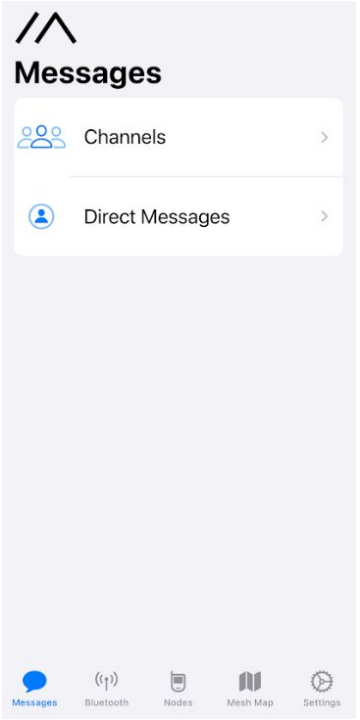
Install App on Phone

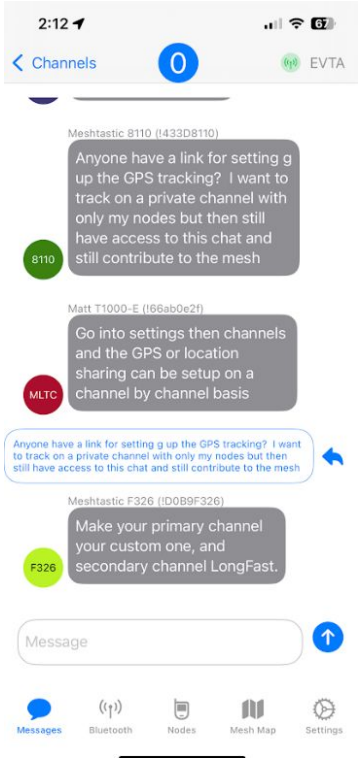
- Install Meshtastic application on phone
- Make sure BT is turned on, connect to node
    - Use BT password shown on screen, or fixed password you set up during config.
- Sit back and wait for nodes to be seen

After you gain experience using the node, you can experiment with private message channels.

Meshtastic App

Video





Summary

- Self built digital messaging hardware that doesn’t require any existing communication infrastructure
- Can communicate over long distances by routing through other nodes
- Messages can be encrypted and sent over private channels

Not a substitute for 2-way radio voice communications

EVTA