

Mesh Networks For Beginners

Set Up Your First Meshcore & Meshtastic Node!



What are we learning today?

- Common & custom types of LoRa Nodes
- Legal & practical considerations
- LoRa & Mesh networking fundamentals
- Meshtastic vs Meshcore
- How to set up new nodes for Meshtastic & Meshcore
- Configuring settings to join local community nets

**MESH
CORE**



who is kody kinzie and what is their profession

Sources

Kody Kinzie Collection - Eventbrite

Kody Kinzie - Varonis | LinkedIn

eventbrite · 1

Kody Kinzie on LinkedIn: A New HOPE (2022)

linkedin · 2



YouTube

linkedin · 3

View 2 more

Answer

- Kody Kinzie is a cybersecurity researcher based in Kalispell ¹ ³.
- He has expertise in Wi-Fi security and low-cost cyber weapons ¹.
- Kody Kinzie is a cybersecurity professional, OSINT analyst, and researcher. He also has a background in the USAF ³.
- Additionally, he is known for his active engagement in cybersecurity research, as evidenced by his presence on YouTube ⁵.

who is Kody Kinzie?

ChatGPT

- 🛡️ Kody Kinzie is a **security researcher** specializing in open-source intelligence and Wi-Fi security.
- 📺 He shares his knowledge through **two YouTube channels**, Hak5 and Null Byte, teaching cybersecurity to beginners.
- 🌎 Organizes **cybersecurity training and outreach** events in Los Angeles.
- 🔍 Focuses on **low-cost hacking tools** and has a strong background in teaching various security topics.



Fireside Cyber Chat Kody Kinzie 4:30PM EST 23 Feb 2022 Watch 🔍

Fireside Cyber Chat Kody Kinzie 4:30PM EST 23 Feb 2022 Watch 🔍

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Hi! I'm Kody Kinzie.

You can find me at www.hack.gay

I'm a security researcher who focuses on Wi-Fi and LoRa radios, digital investigations, and electronics.

I love teaching people how to get started with ethical hacking in person and on my YouTube channels:

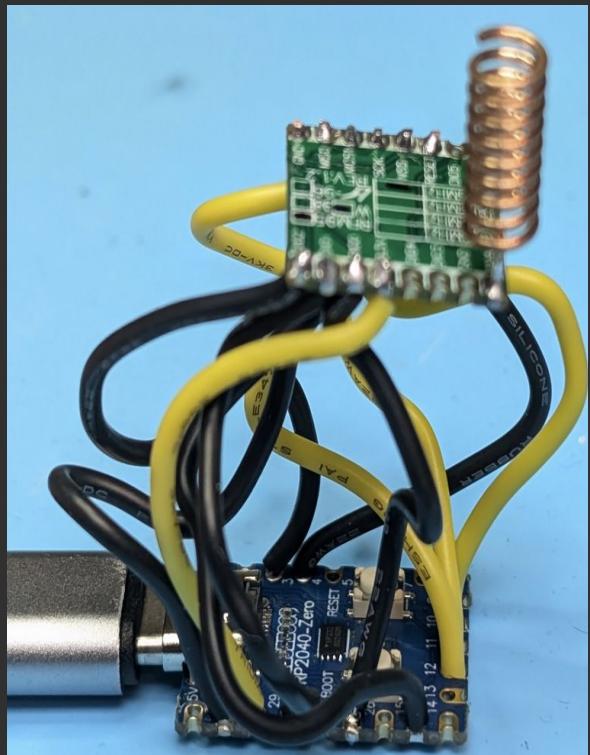
- Retia
- Null Byte

What is the point of Mesh Networks?

- Bidirectional, encrypted off-grid communication over long distances
- Amplified by nearby nodes, regional networks can span 200+ miles
- Monitor sensors, track objects, control hardware remotely
- Robust communication in areas with congested or nonexistent infrastructure
- Ultra-low cost hardware makes nodes disposable

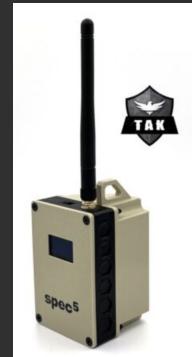
What is the cost of participating?

- You can make your own horrible nodes for \$5
- \$70-\$90 for a fancy node from China
- \$120+ for ruggedized, fully featured nodes



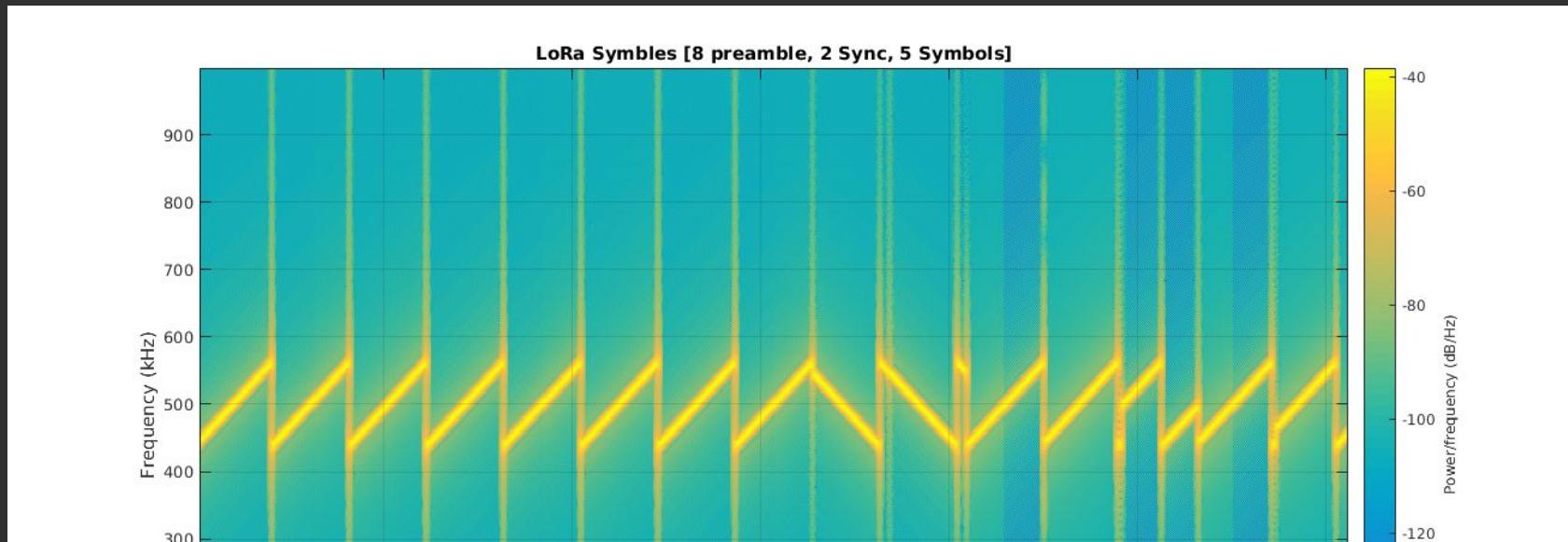
What can we make with this?

- Off-grid chatting between devices in remote areas (backwoods)
- Communication in areas with congested service (concerts, raves)
- Inter-vehicle communication (vehicles, boats, & aircraft)
- Encrypted disaster/emergency response
- Map and military intelligence sharing
- Remote Sensor telemetry (presence, environmental)
- GPS Tracking of moving nodes
- Remote control of hardware: vehicles, ambient lighting, flashes



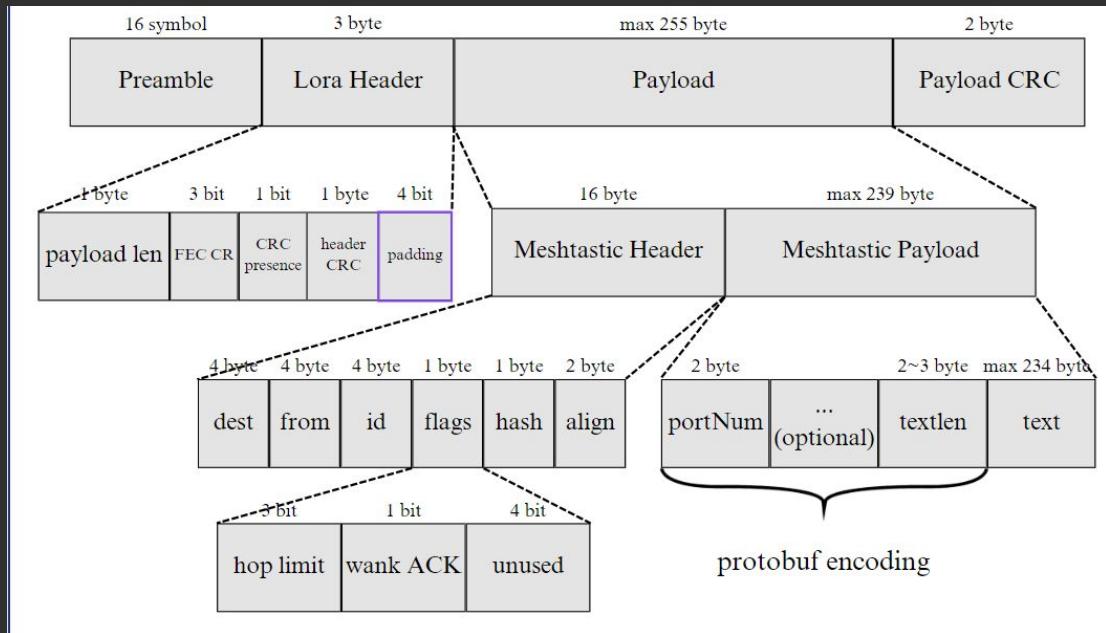
Defining Terms: LoRa Radio

- LoRa - The long range radio standard we use to transmit, encoding data using up and down chirps



Defining Terms: Meshtastic

- Meshtastic - A protocol, with packets sent over LoRa, that allows for encrypted mesh networking primarily at Layer 3 (Network Layer) of the OSI model



What is Meshtastic?

Meshtastic adds encryption, managed flood routing, & convenient apps to LoRa

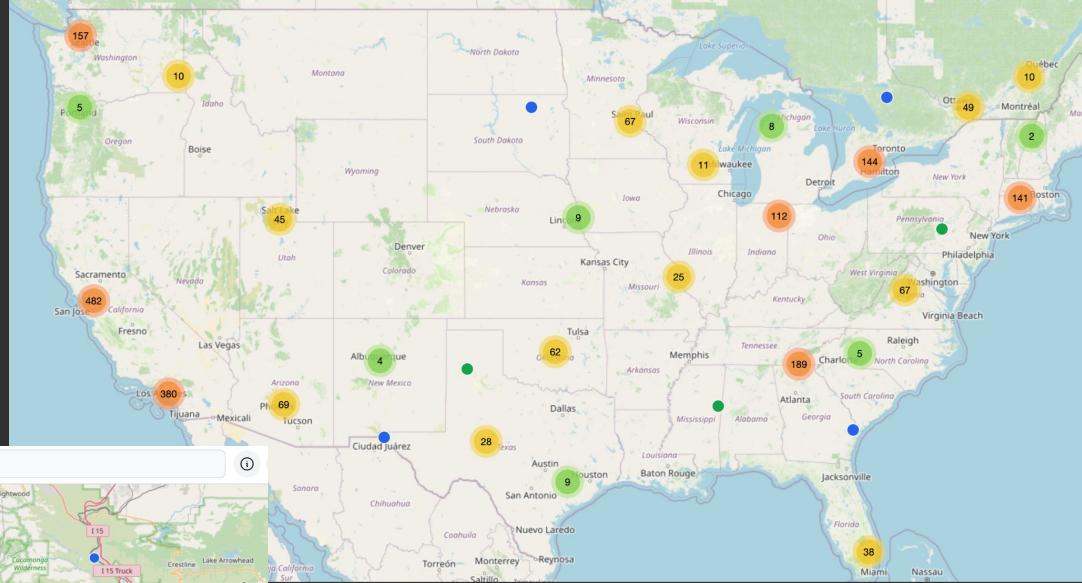
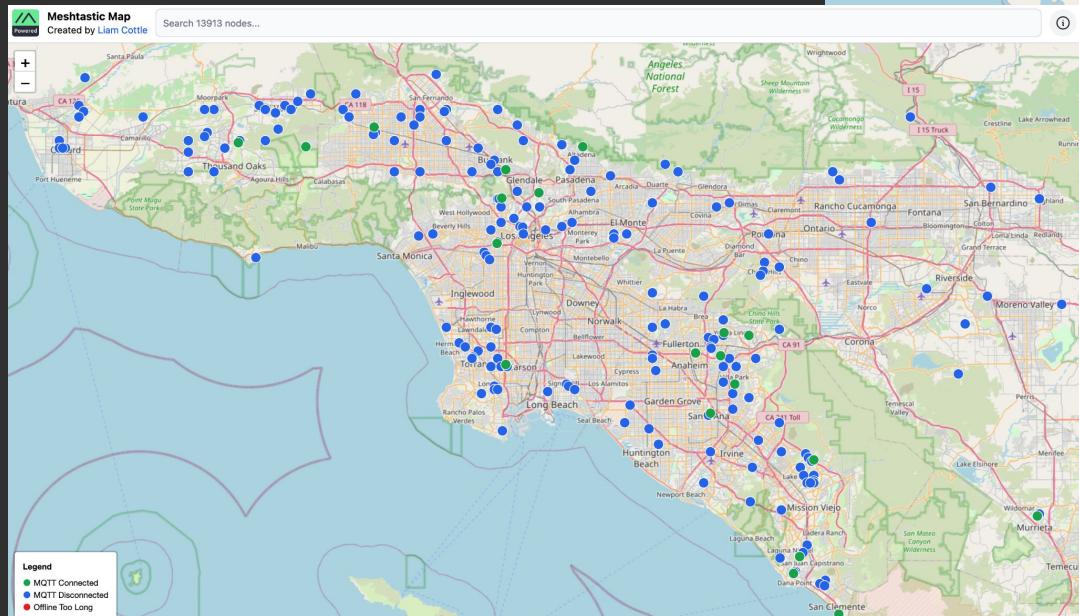
- Users control nodes via Bluetooth, Wi-Fi, or Serial connection
- Managed with iOS, Android, MacOS or Windows apps
- Can also connect via any chrome browser with WebSerial webapp!
- Encrypts packets & removes headaches of matching radio settings



Real World Mapping

meshtastic.liamcottle.net

Uses local MQTT collectors



- Collector nodes forward observed nodes over internet to the map via MQTT
- Blind spots, but I can track location of nodes over time
- Tracked my flight!

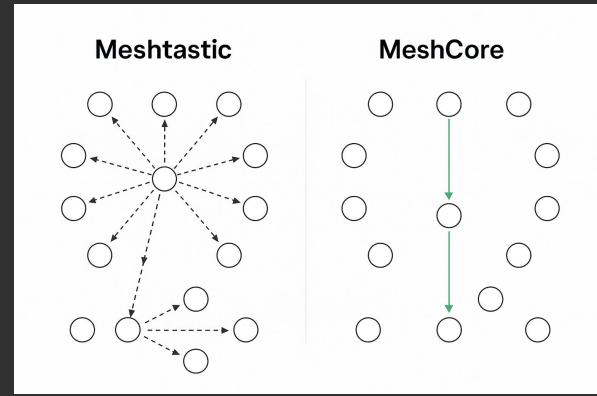
Defining Terms: Meshcore

- Meshcore - Another Layer 3 protocol introduced in 2025, designed to be more scalable and allow for more reliable direct messaging than Meshtastic



Meshcore Vs Meshtastic

- Meshtastic uses flood routing, all devices repeat traffic they hear by default
 - This is loud, many devices are transmitting and causes network traffic and congestion
 - Lots of unnecessary traffic
 - Maximum of 7 hops and no defined routes means low reliability for DM's
- Meshcore uses static routes, floods only when needed, only repeaters repeat packets they hear
 - Much more quiet because only repeaters send telemetry and repeat
 - Manually send adverts to be discovered
 - Remembering paths prevents unnecessary flooding and scales better



Hardware Fundamentals

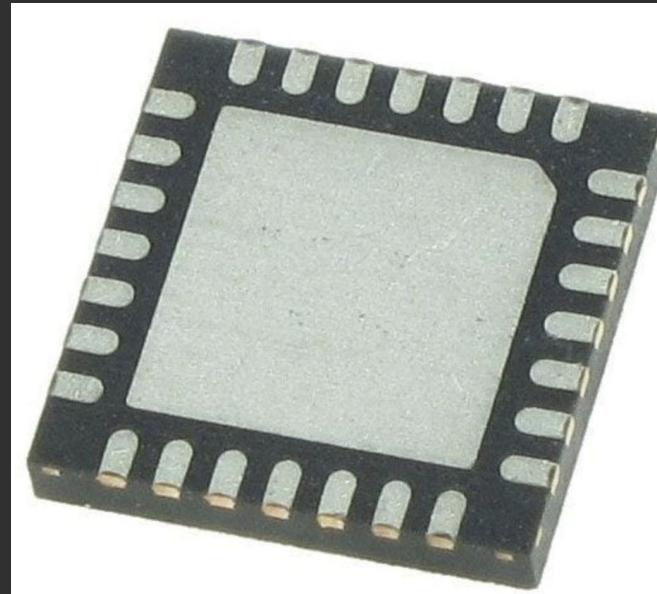
Picking or building a node starts with understanding how they work!

Let's go through what makes up a LoRa node



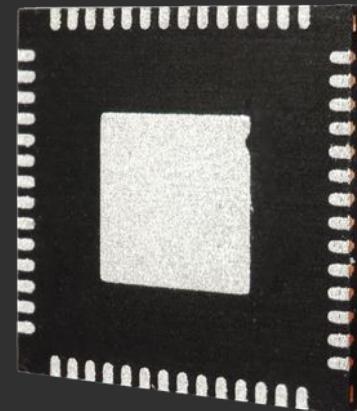
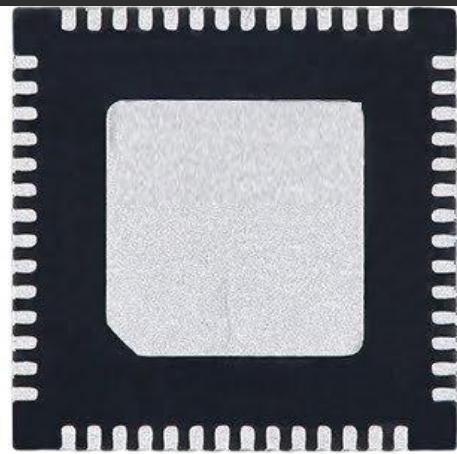
Defining Terms: LoRa Radio Chips

- **LoRa Chipset** - The LoRa radio chip that controls radio transmission, such as sx1262



Defining Terms: Host Microcontroller

- **Host Microcontroller** - The “brains” that run Meshtastic, handle Bluetooth, Wi-Fi, & Serial communication, & interface with external hardware



Defining Terms: Breakout Boards

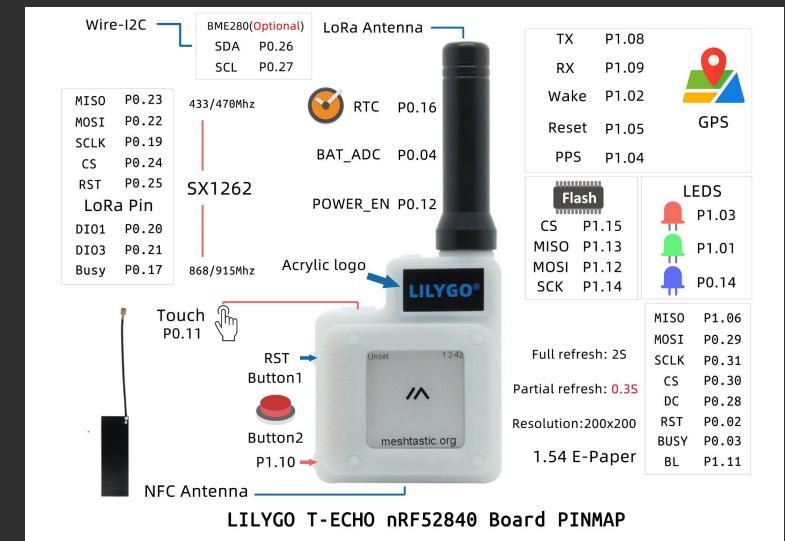
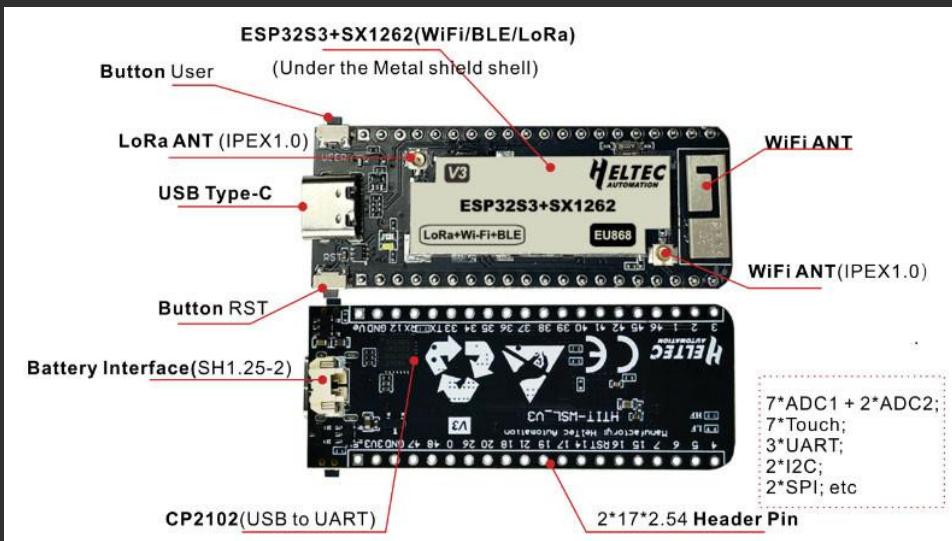
- **Breakout board:** An expansion board designed to make a bare host or radio chip more useful, breaking out pins & sometimes USB & power management



Defining Terms: Nodes

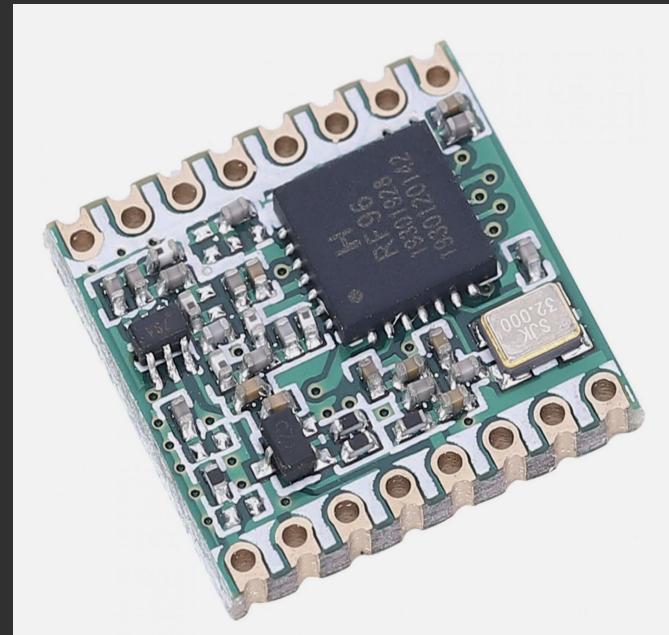
- **LoRa Node:** A combination of LoRa radio & host microcontroller. Together, they can run Meshtastic or Meshcore!

Simple Node <-----> Complex Node

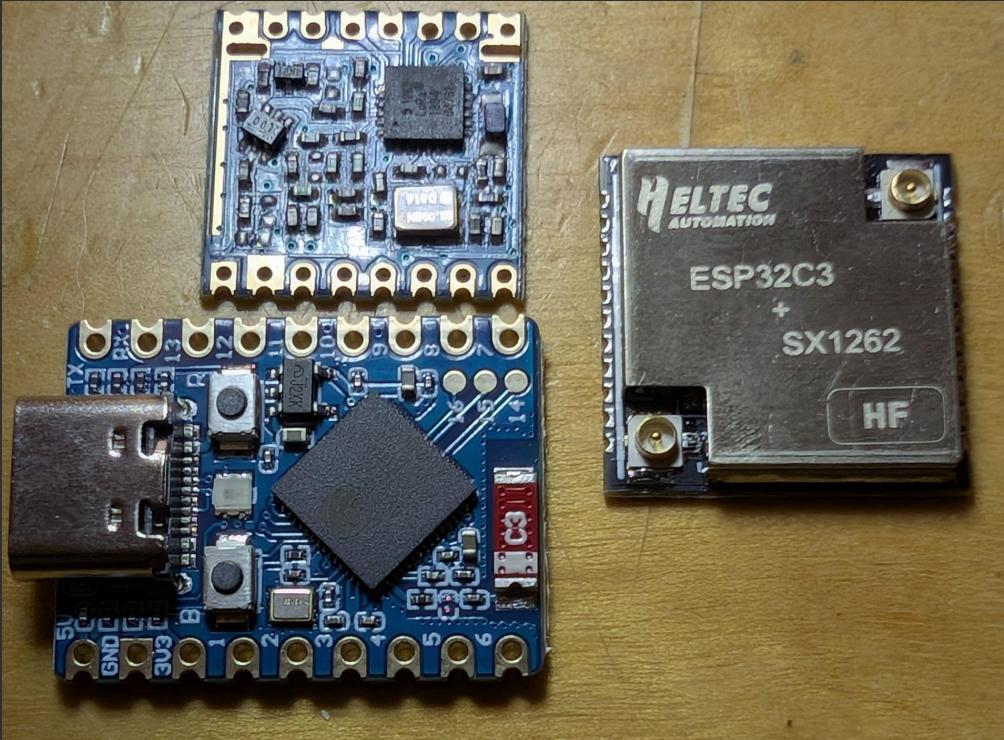


Host + Radio = Node

RP2040 Zero (host breakout) + RFM95 (radio breakout) = \$5 Node

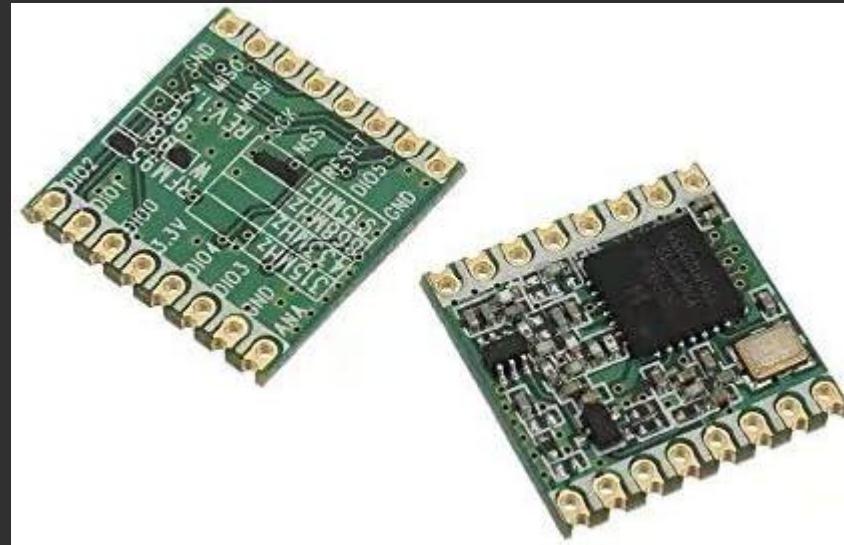


Future Nodes for \$15



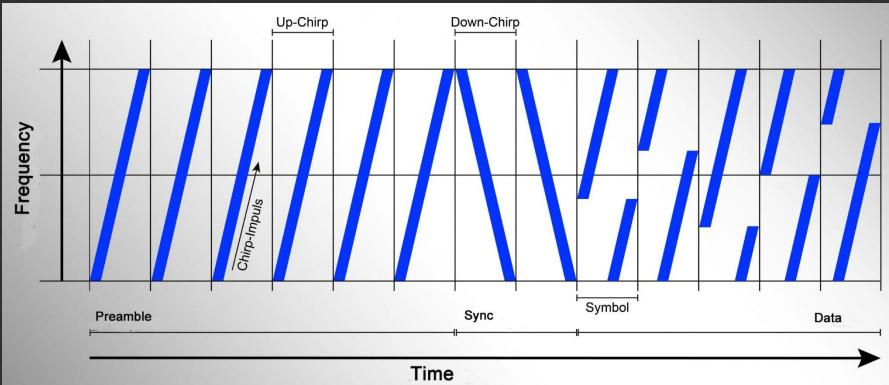
Introduction to LoRa

- LoRa stands for Long Range, alternative radio standard
- Radios that operate in unlicensed sub-GHz frequency bands
- Slow data rates but very long range
- Not for webcam monitoring, but ideal for telemetry, chat, control signals



What makes LoRa special?

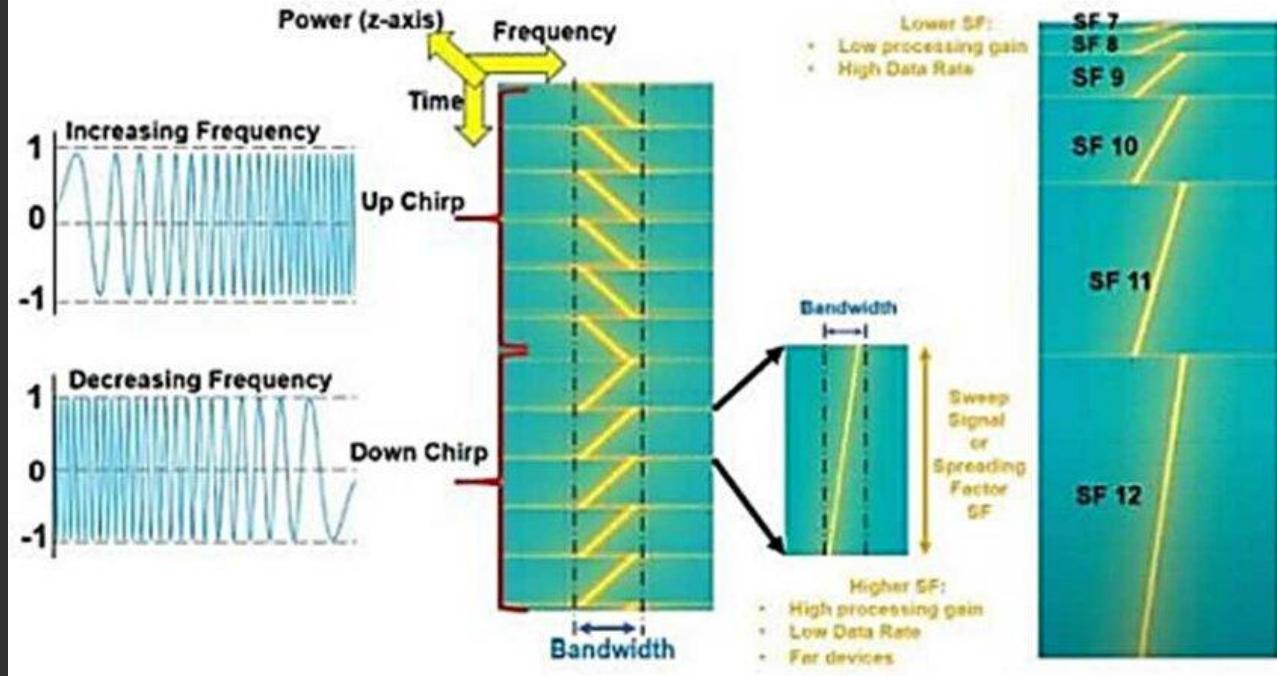
- Long range protocol uses up and down “chirps” to send data
- Chirp Spread Spectrum modulation helps packets survive noise & interference
- Successfully receive & decode packets 20 dB below the noise level
- Receiver sensitivity of a maximum of -149 dBm



Data rate	Sensitivity			
	CC1020	CC1101	SX1261	SX1261
FSK	FSK dBm	FSK	LoRa	
1.2 kBit/s	-117 dBm	-112 dBm	-123 dBm	-129 dBm
2.4 kBit/s	-117 dBm	-111 dBm	-121 dBm	-126 dBm
4.8 kBit/s	-114 dBm	-109 dBm	-118 dBm	-123 dBm
9.6 kBit/s	-112 dBm	-107 dBm	-116 dBm	-120 dBm

Source: interline.pl

What are chirps?



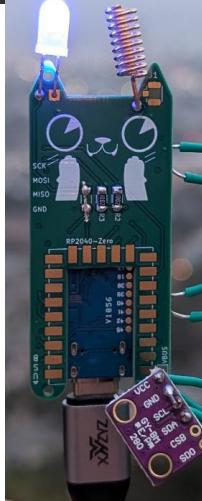
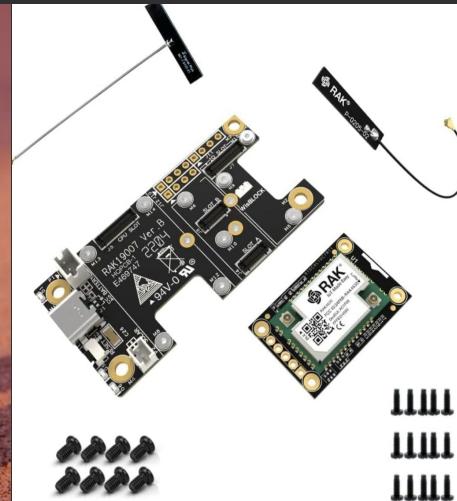
- Chirp is a signal in which the frequency increases (up-chirp) or decreases (down-chirp) linearly over time
- Encodes information by varying the frequency over a set bandwidth
- Spreads the signal across time & frequency, making it easier to detect
- Require minimal power, ideal for battery-operated IoT devices

What other devices can I use?

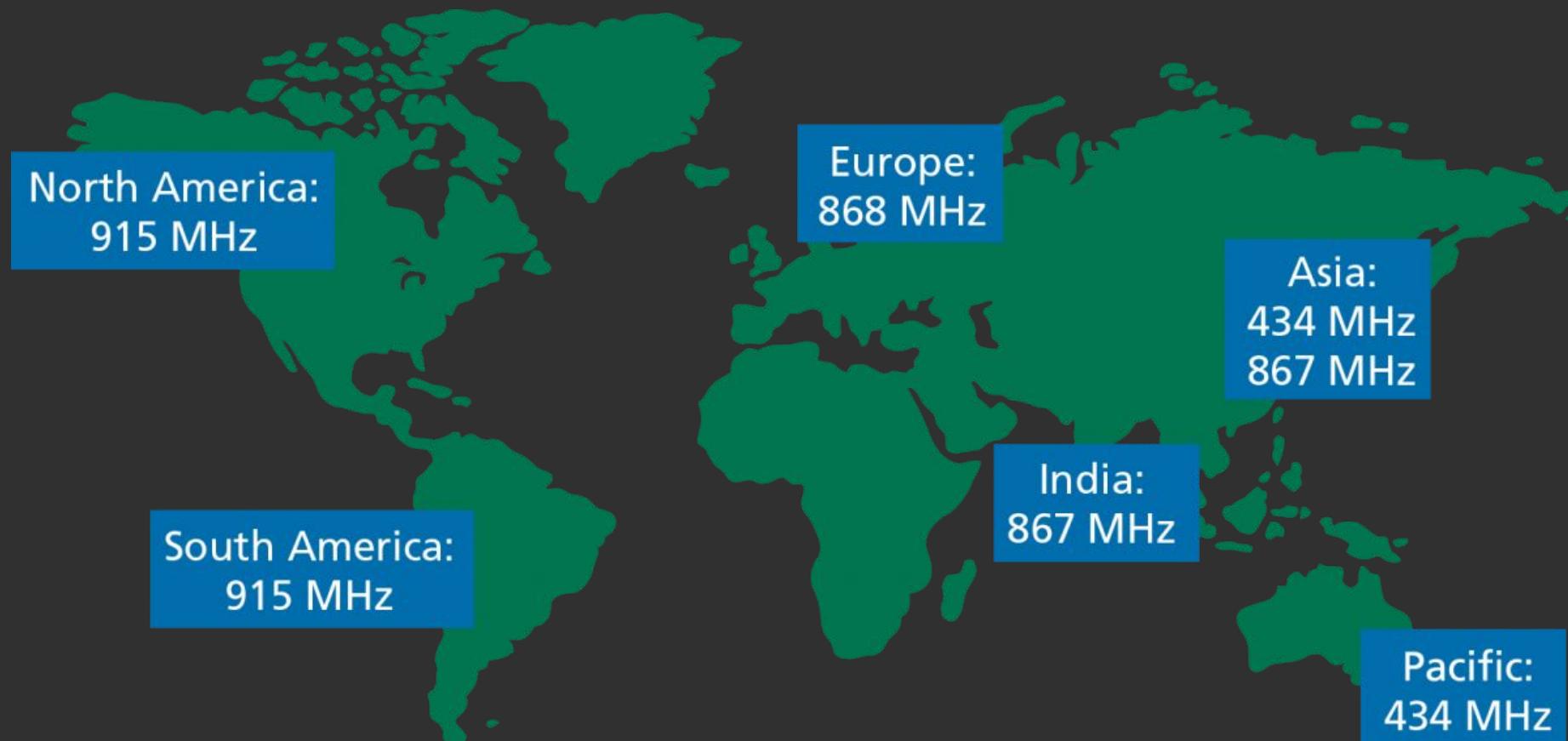
Here are some of the usual suspects:

Heltec v3, Lilygo T-Deck, Rak Wireless Wizblock,

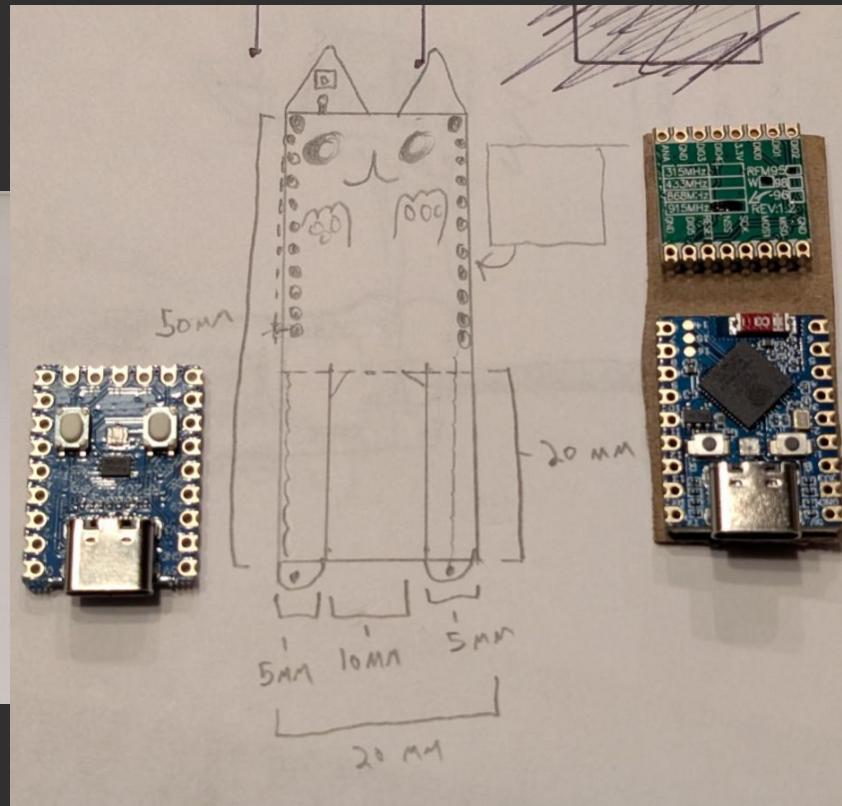
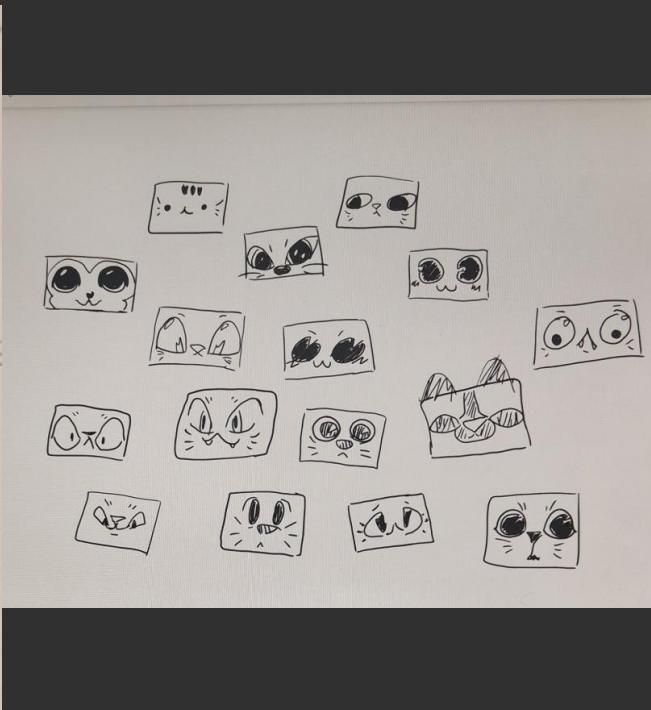
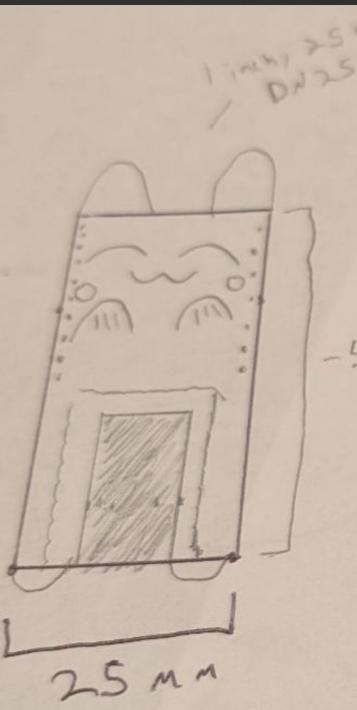
Lilygo T-Deck, Nibble, Nugget



Regional frequencies - Check your radios!



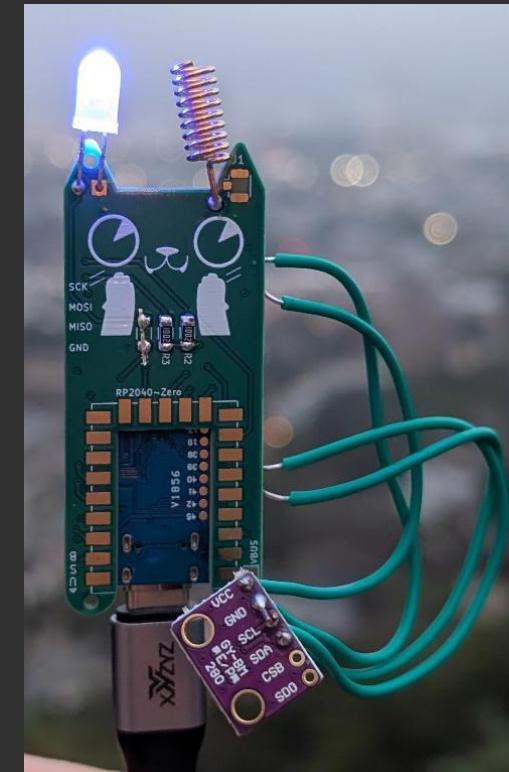
Making 300 Custom Meshtastic Kits: The Nibble



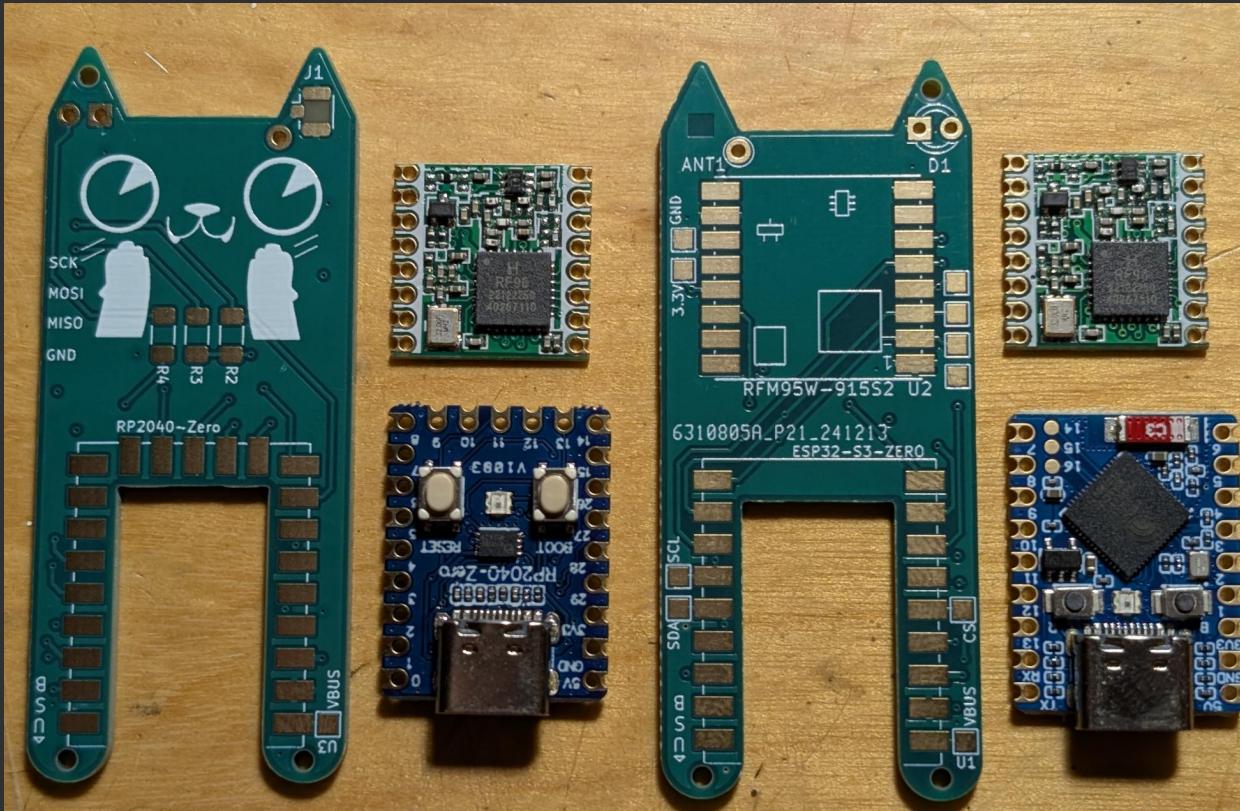
The Nibble - The Original Cat Meshtastic Node Kit

- Combines RP2040 or ESP32s3 host with sx1276 radio
- Designed to be soldered by beginners
- Pick between RP2040 with serial only, or esp32s3 with Bluetooth & Wi-Fi
- Designed to fit 1 inch PCV pipe for outdoor placement
- Pads for adding SPI or i2c sensor chains like bme280

- RP2040 version can't connect to iOS over serial, but serial works on Android, desktop, & webapps
- We made 300 Nibbles at c3!
- Open Sourced at Hackers On Planet Earth



The Nibble - The Original Cat Meshtastic Node Kit

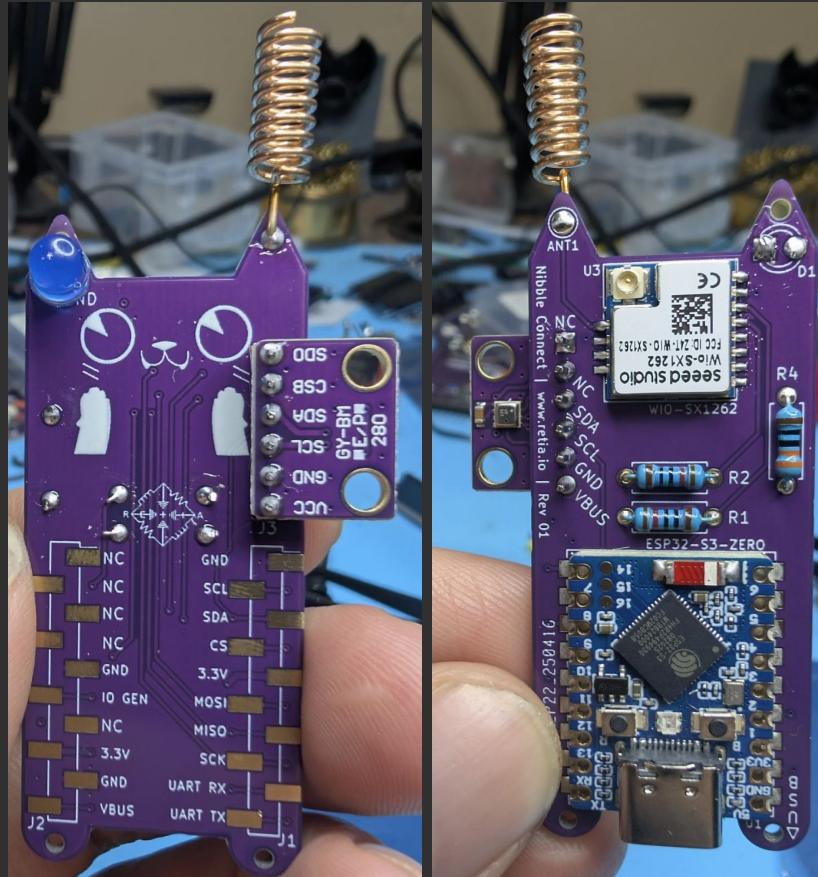


Make your own:
github.com/retiallc/nibble

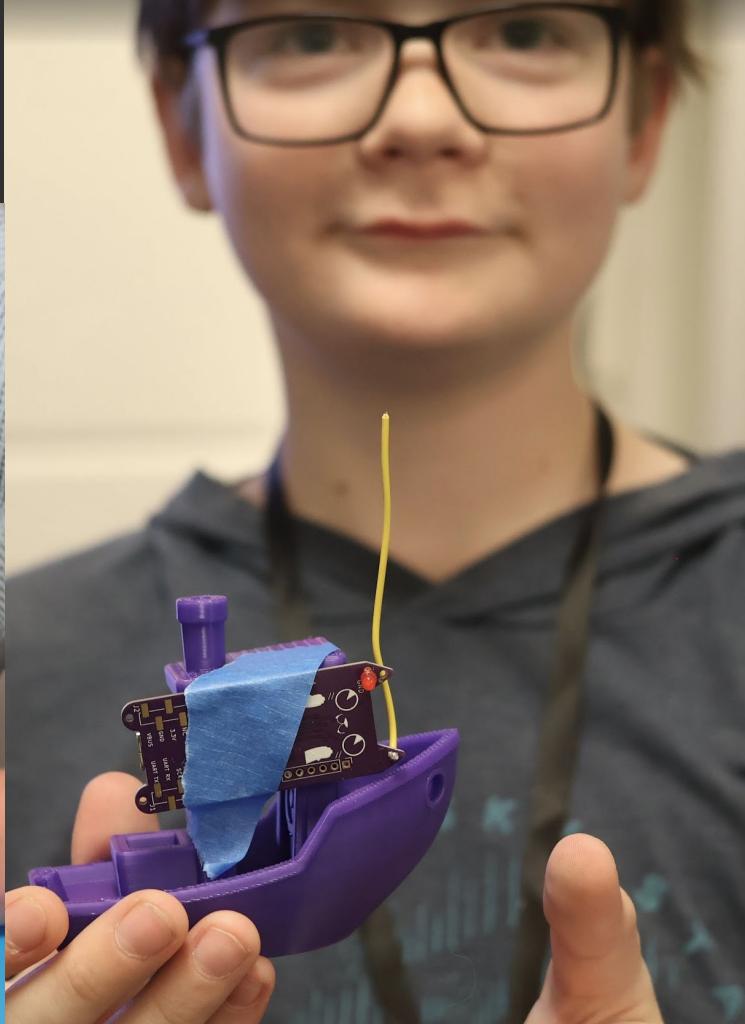
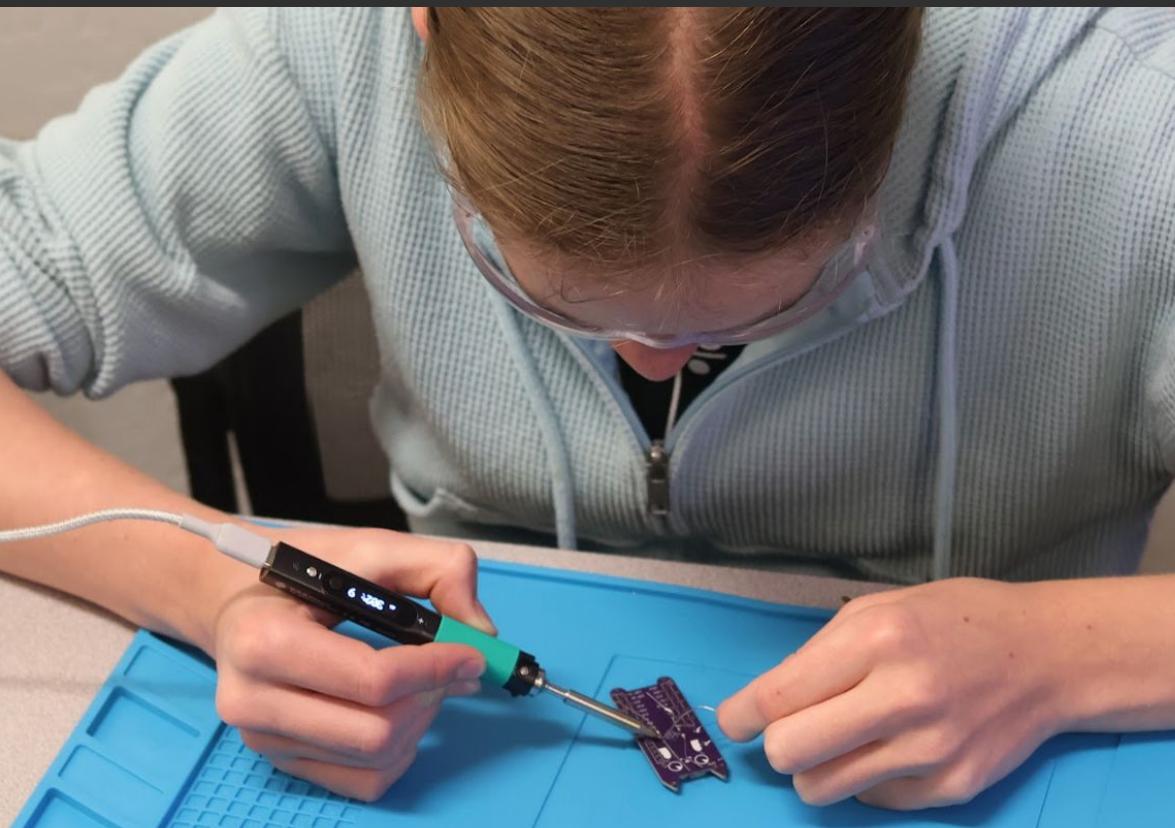
Update: The Nibble Connect

Based on feedback from C3, we created the Nibble Connect for our kids cyber camps:

- Selected ESP32s3 Microcontroller (no more rp2040)
- Upgraded to Seeed sx1262 LoRa Radio
 - software definable frequency & more sensitive
- SMD Female Pin Headers (not very breadboard friendly)
- Mount for BME280 weather station sensor



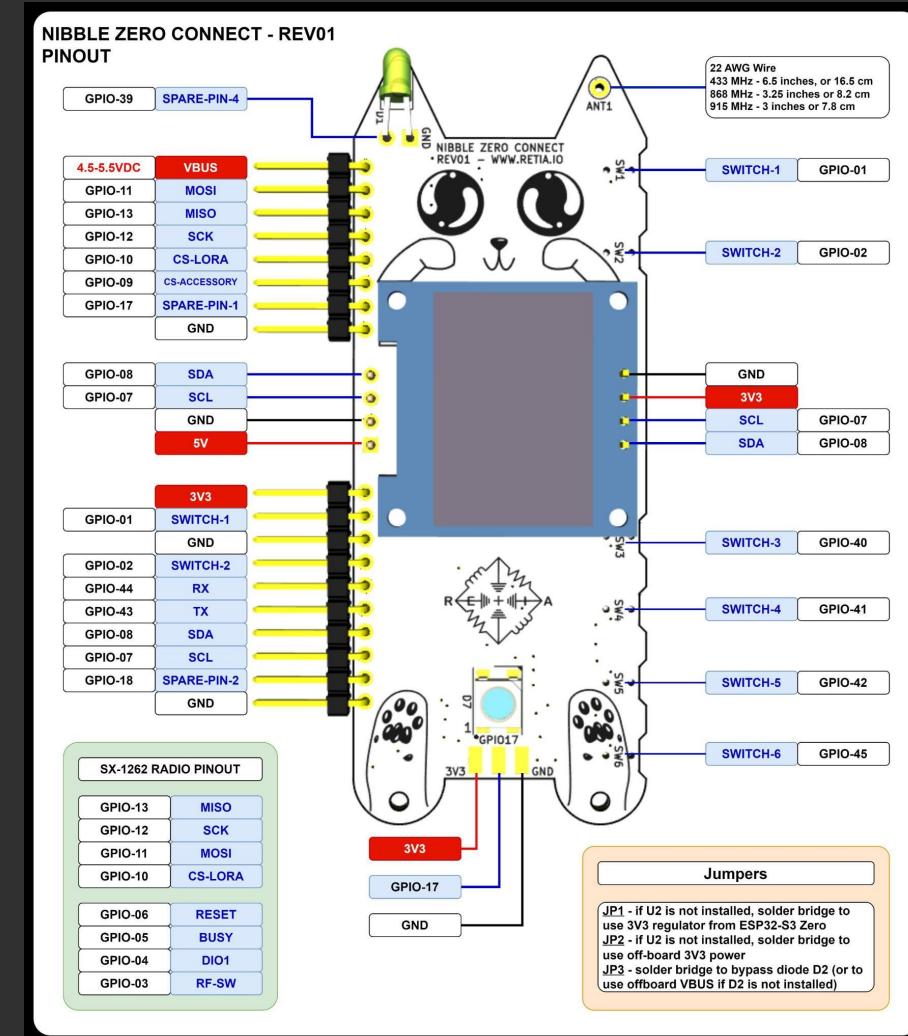
Update: The Nibble Connect



And Finally: Nibble Zero

What about a node that can use all the best features of Meshtastic & Meshcore, plus work with Flipper Zero?

- Also uses ESP32s3 & sx1262 LoRa Radio
- 6 buttons for region select & sending canned messages
- I2c mount for adding OLED screen
- Flipper Zero and Breadboard compatible pin headers
- Mount for BME280 weather station sensor
- Neopixel tail



How did we make these?

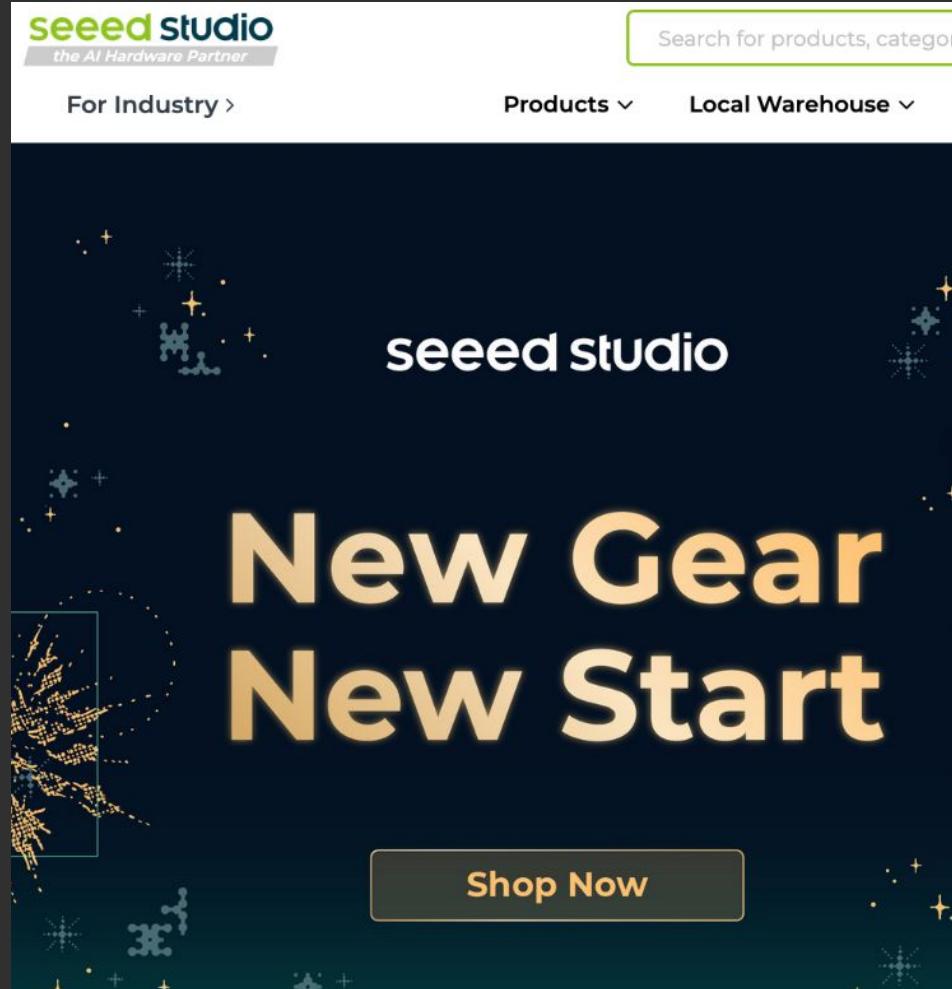
13 friends and volunteers at Null Space Labs worked to create about 125 Nibbles for 39c3

- 3 software developers donated over 40 hours to get meshtastic, meshcore, & Reticulum working
- 13 helpers soldered for over 100 volunteer hours total
- 2 hardware designers tested & prototyped
- Almost everyone was paid in hardware, pizza, or volunteered to build these for you!
- We had to pay 120% tariff on everything

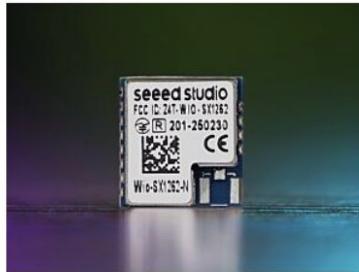


Sponsor: Seeed Studio

- Seeed Studio sponsored radios for this project!
- The WIO Sx1262 module is the radio we use
- Thank you very much to Seeed for helping making this possible!

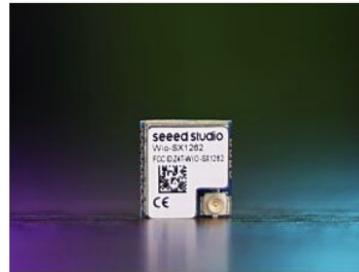


Different Radio Types, Different Antennas!!!



113991436

Wio-SX1262 Wireless Module without
IPEX (Tape Reel), SX1262 embedded,...



Warehouse Available

[USA >](#)

[EU >](#)

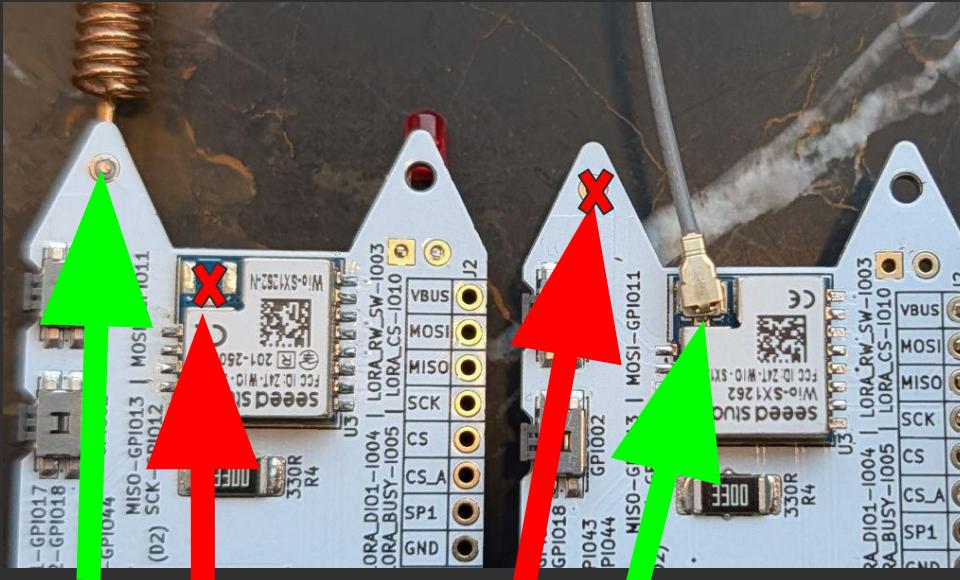
114993390

Wio-SX1262 Wireless Module (Tape
Reel), SX1262 embedded, supports...

The radio without
IPEX connector is
ONLY connected via
the antenna pin

The radio with IPEX
connector is **ONLY**
connected via the
IPEX connector

HOW TO ADD AN ANTENNA:



No IPEX?

Connect antenna to
the ANT1 pin, IPEX
pad is disconnected

IPEX?

Connect antenna to the
IPEX connector, ANT
pin is disconnected

PLEASE READ THIS

**YOUR NIBBLE WILL CRASH WHEN
YOU CONNECT IT TO YOUR FLIPPER
(UNLESS YOU UPDATE IT)**

An earlier version of our Meshtastic build listens on a pin the Flipper uses to probe for add-ons, causing it not to boot

The newest version on Nugget.dev fixes this



Let's Flash Meshtastic - www.nugget.dev



Nugget Dev Suite

Developer Site for the Nugget: A Cat-Shaped Hacking Tool

In a Chrome based
browser, open
Nugget.dev

CONNECT YOUR NUGGET

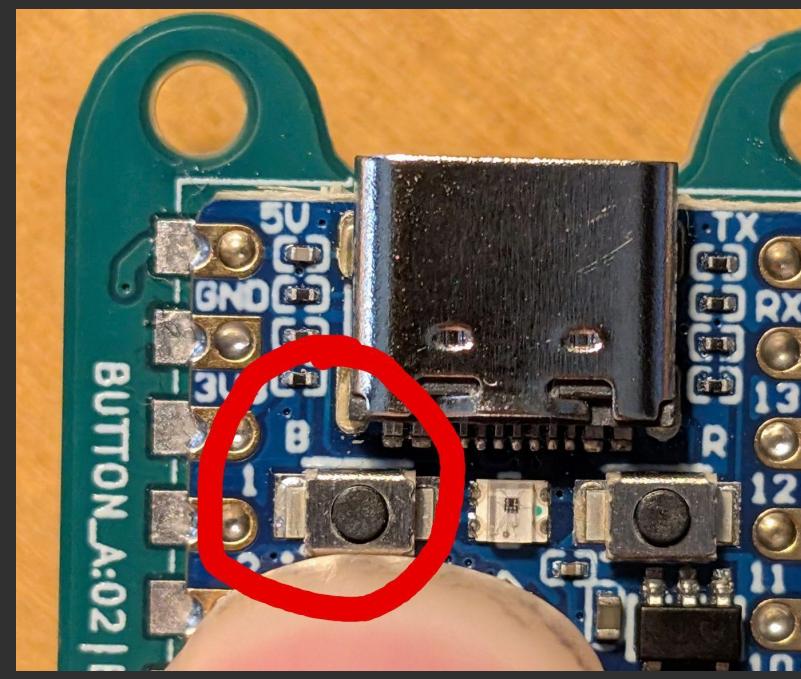
Update Via Chrome-Based Browser

Let's Update!

Hold down the “B” button while plugging your Nibble into your computer via USB type C

Once plugged in, click “Connect your Nugget” and select your device.

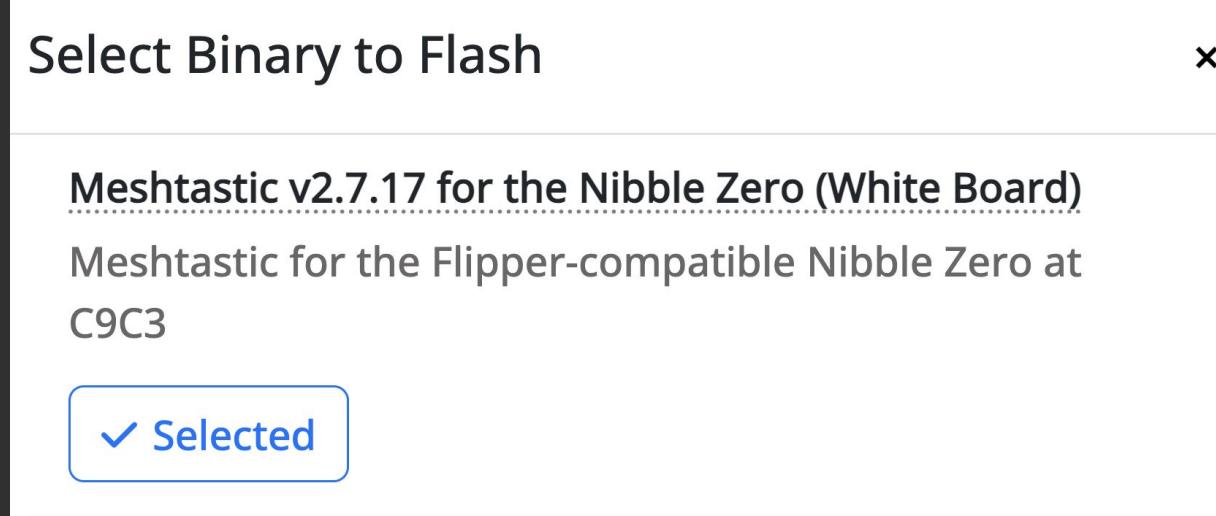
If you’re not sure which it is, unplug and plug it back in to see it appear again.



Flashing is easy!

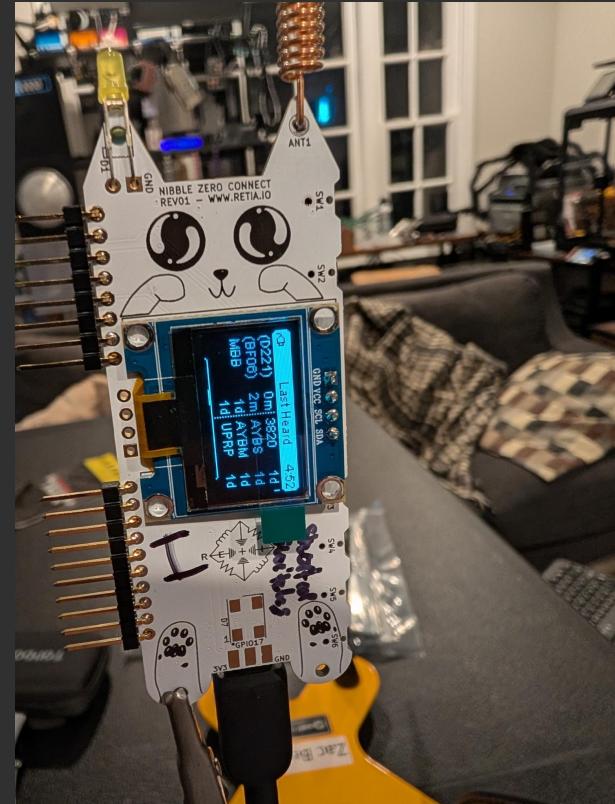
After selecting your Nibble from the drop down menu of serial devices,

- Select the “Meshtastic For Nibble Zero”
- Click program, unplug when complete!



Let's Get Set Up With Meshtastic!

We'll hand out antennas and get set up transmitting!



Check for Heartbeat

When you plug your Nibble back in, it should start up and blink its LED after several seconds.

If you have a screen, it should turn on.

It will NOT transmit until you select the correct region, so let's do that!

In a chrome based browser, go to
<https://client.meshtastic.org/>

Connected Devices

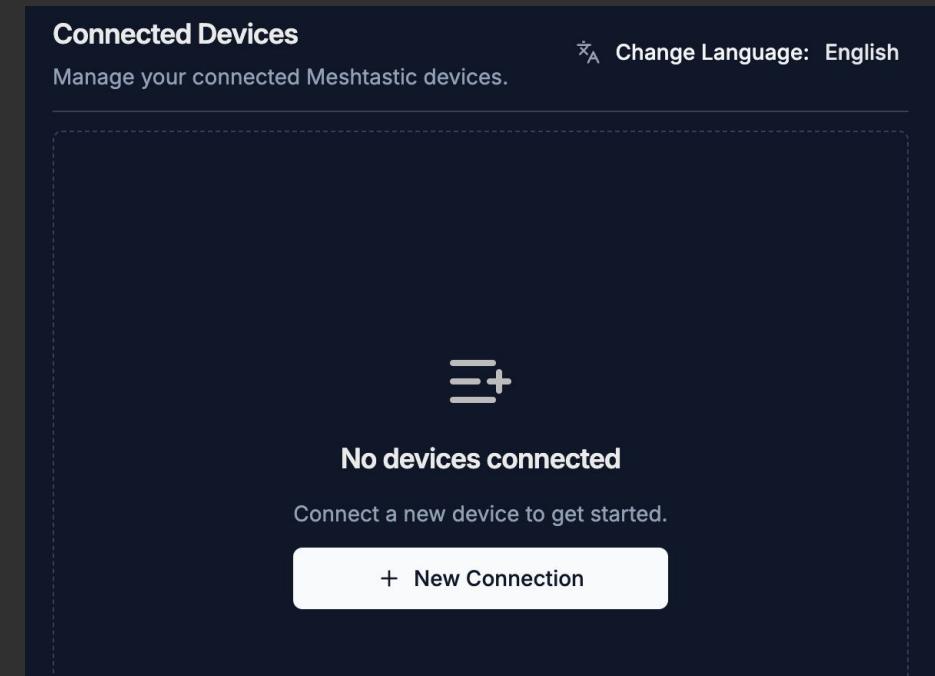
Manage your connected Meshtastic devices.

Change Language: English

No devices connected

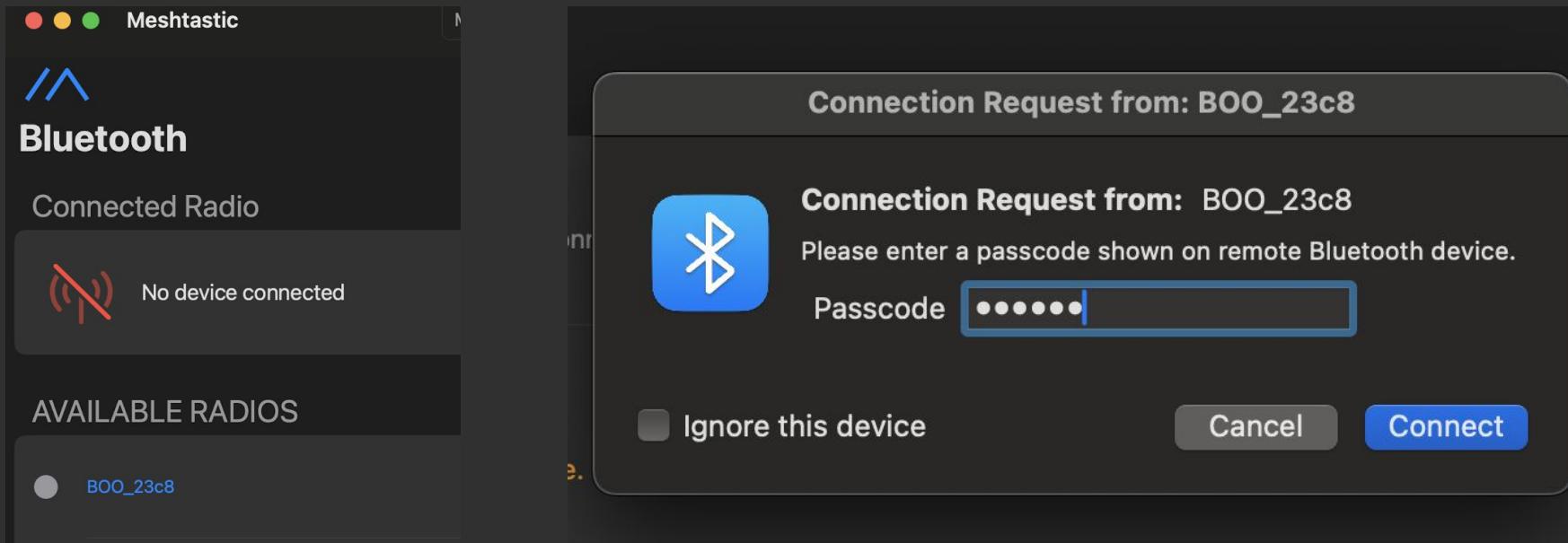
Connect a new device to get started.

+ New Connection

The screenshot shows a dark-themed web interface titled "Connected Devices". At the top right, there is a language selection dropdown set to "English" and a "Change Language" button. Below the title, a sub-instruction says "Manage your connected Meshtastic devices.". A large central area displays a message "No devices connected" with a subtitle "Connect a new device to get started.". At the bottom right of this central area is a white rectangular button with a black border containing the text "+ New Connection" and a small plus sign icon. The entire interface is set against a dark background with light-colored text and icons.

Alt: Connect via Bluetooth with Smartphone App

- Download the Meshtastic smartphone or Desktop app
- Look for your node short name via Bluetooth
- Pair using the pin that appears on the screen



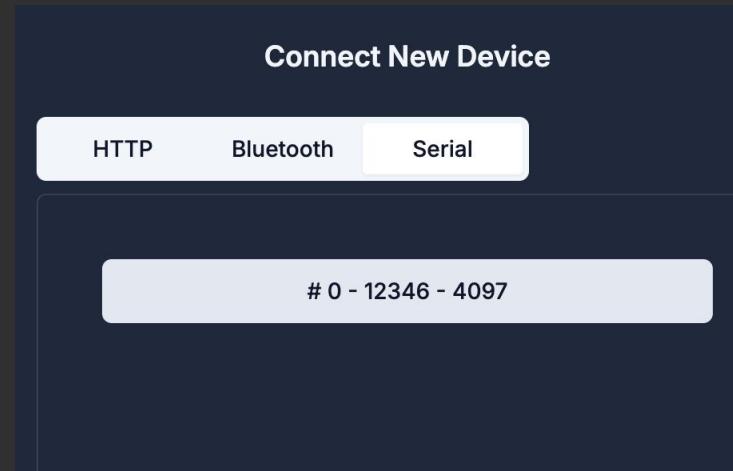
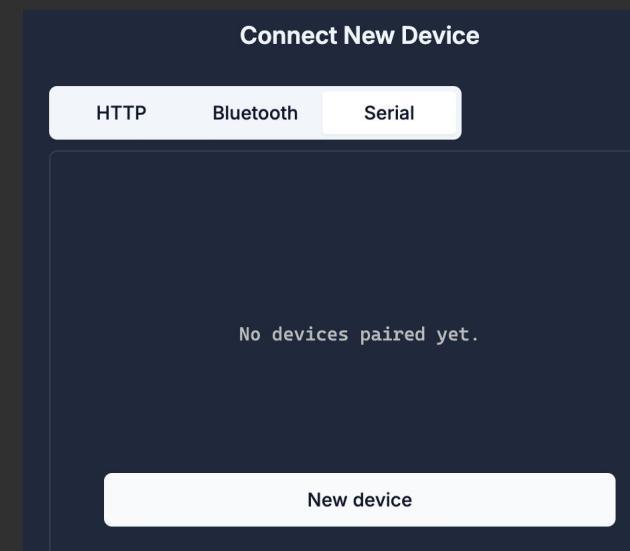
Connect Via Browser

Click on “New Connection” and select “Serial” from the menu of options.

You can also try Bluetooth here if you want.

Click “New device” and select your Nibble the same way you did to flash it.

It should appear as #0, click it to enter the main menu!



Change Device Name

At the main menu, click “Change device name” and add a new name.
You can use emojis!

After you save, it will reboot with the new name.

Change Device Name

The Device will restart once the config is saved.

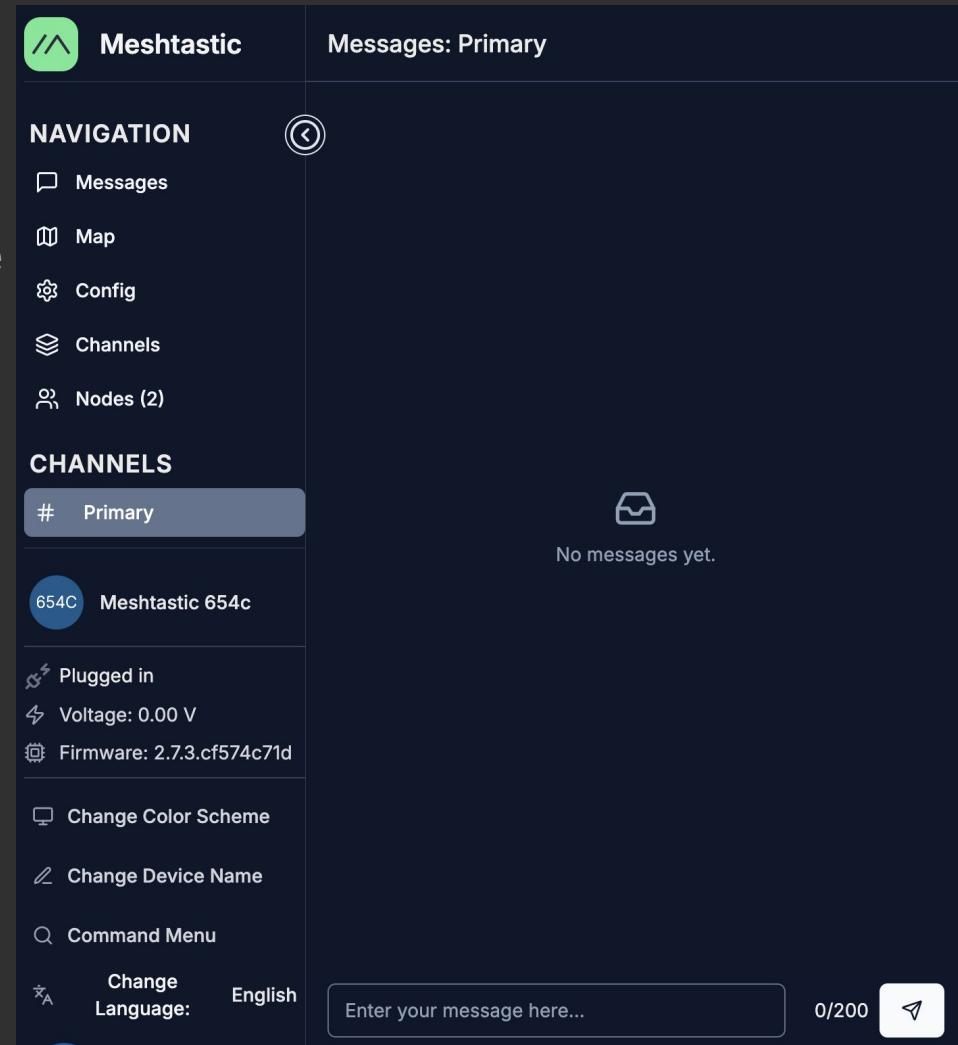
Long Name

 17/40

Short Name

 3/4

Reset **Save**



Let's Enable Our Radio!

 **Connected Radio**
Shows information for the Lora radio connected via bluetooth.

 **YOUR_NAME_HERE**
BLE Name: BOO_23c8
Firmware Version: 2.5.17
Subscribed to mesh

 **Set LoRa Region**

< **LoRa Config**

Configuration for: YOUR_NAME_HERE

OPTIONS

Region Please set a region ▾
The region is not yet defined.

 United States
European Union 433mhz
European Union 868mhz
China
Japan
Australia / New Zealand

 Presets
Available regions:

 Available regions:
ADVANCE

Set Your Region Via Web or Buttons

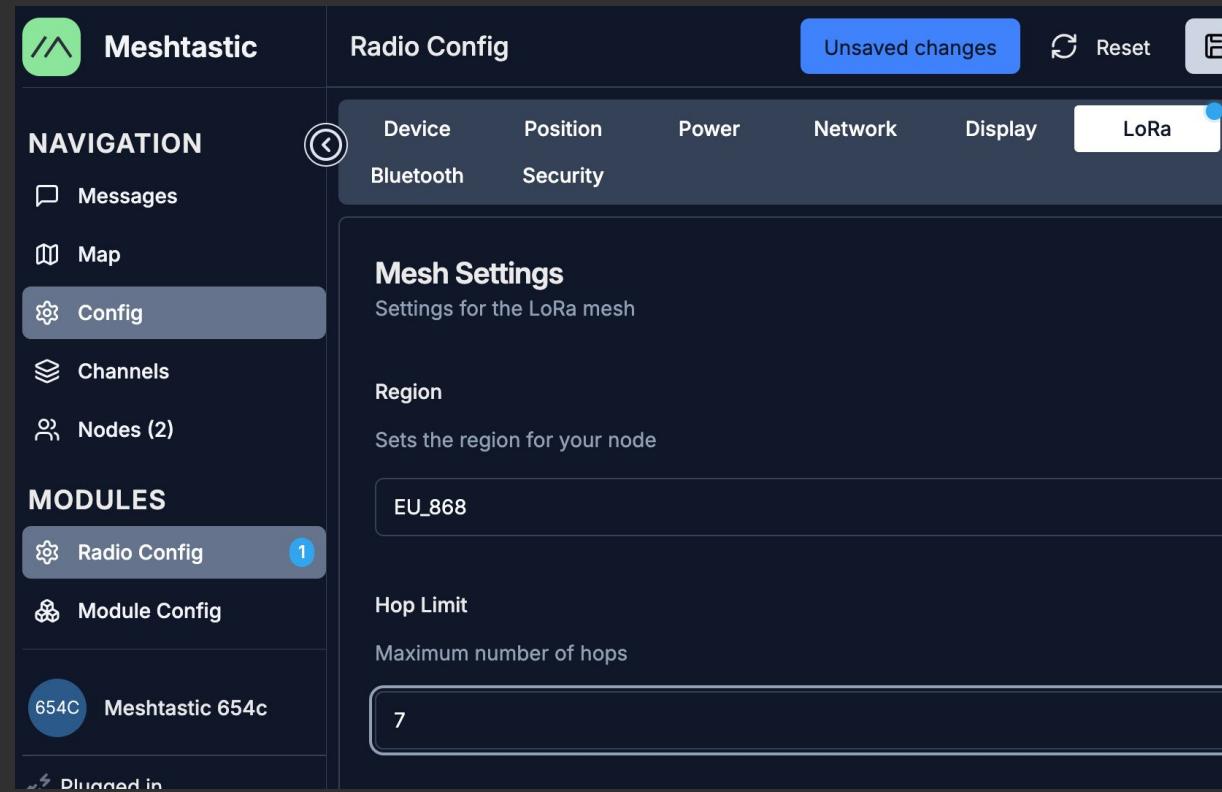
You can use the screen & buttons to set the region, or:

Click on Config, then LoRa.

Select the correct region.

Also set the hop limit to 7.

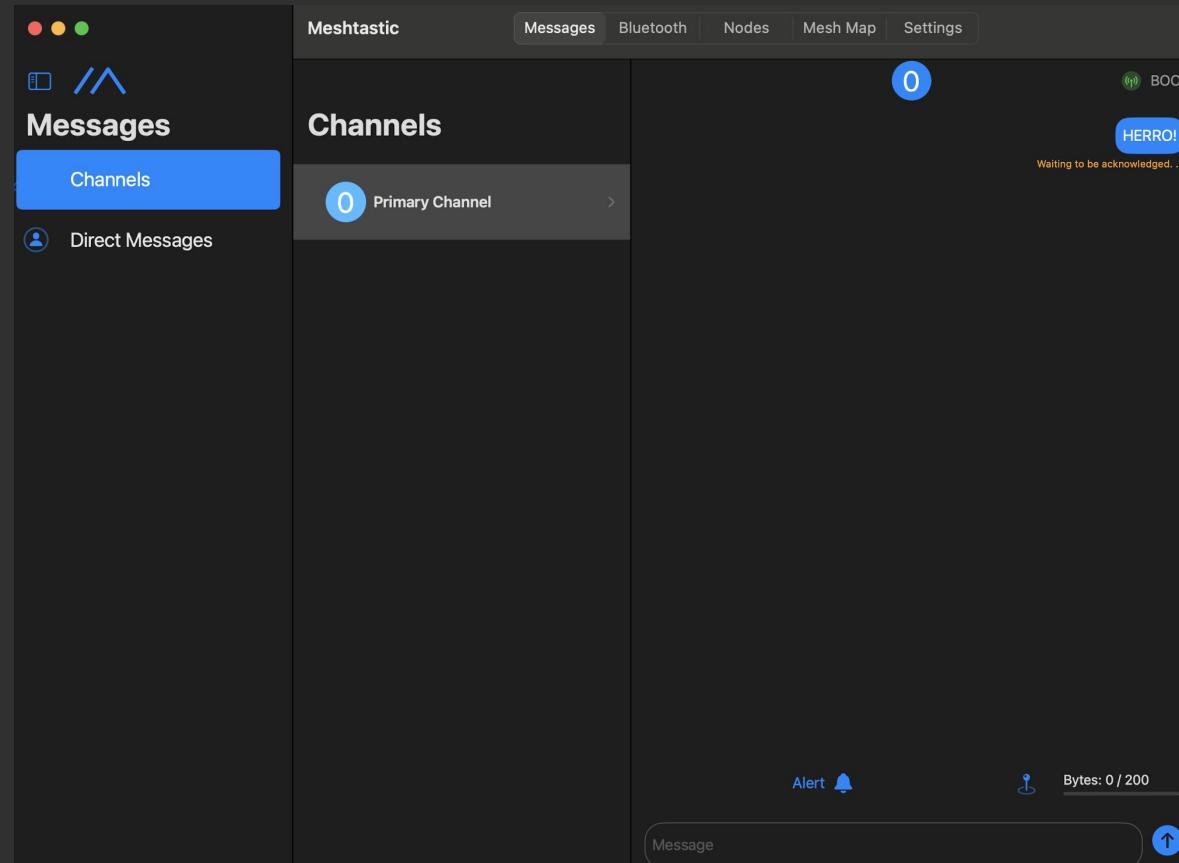
Save, and your Nibble will reboot ready to transmit!



We are transmitting!

Go to channel, primary channel, and type a message.

If you see “acknowledged,” another node has seen and retransmitted your message!



Let's Explore Settings!

MODULE CONFIGURATION

Ambient Lighting

Canned Messages

Detection Sensor

External Notification

MQTT

Range Test

PAX Counter

Ringtone

Serial

Store & Forward

Telemetry (Sensors)

DEVICE CONFIGURATION

User

Bluetooth

Device

Display

Network

Position

Power

RADIO CONFIGURATION

Hourly Duty Cycle

Your region has a 10% hourly duty cycle, your radio will stop sending packets when it reaches the hourly limit.

Limit all periodic broadcast intervals especially telemetry and position. If you need to increase hops, do it on nodes at the edges, not the ones in the middle. MQTT is not advised when you are

LoRa

Channels

Security

Share QR Code

Device roles

✓ Client

Client Mute

Router

Repeater

Tracker

Sensor

Tak

Client Hidden

Lost And Found

Tak Tracker

Device Role	Description	Best Uses
CLIENT	App connected or stand alone messaging device.	General use for individuals needing to communicate over the Meshtastic network with support for client applications.
CLIENT_MUTE	Device that does not forward packets from other devices.	Situations where a device needs to participate in the network without assisting in packet routing, reducing network load.
CLIENT_HIDDEN	Device that only broadcasts as needed for stealth or power savings.	Use in stealth/hidden deployments or to reduce airtime/power consumption while still participating in the network.
TRACKER	Broadcasts GPS position packets as priority.	Tracking the location of individuals or assets, especially in scenarios where timely and efficient location updates are critical.
LOST_AND_FOUND	Broadcasts location as message to default channel regularly for to assist with device recovery.	Used for recovery efforts of a lost device.
SENSOR	Broadcasts telemetry packets as priority.	Deploying in scenarios where gathering environmental or other sensor data is crucial, with efficient power usage and frequent updates.
TAK	Optimized for ATAK system communication, reduces routine broadcasts.	Integration with ATAK systems (via the Meshtastic ATAK Plugin) for communication in tactical or coordinated operations.
TAK_TRACKER	Enables automatic TAK PLI broadcasts and reduces routine broadcasts.	Standalone PLI integration with ATAK systems for communication in tactical or coordinated operations.
REPEATER	Infrastructure node for extending network coverage by relaying messages with minimal overhead. Not visible in Nodes list.	Best positioned in strategic locations to maximize the network's overall coverage. Device is not shown in topology.
ROUTER	Infrastructure node for extending network coverage by relaying messages. Visible in Nodes list.	Best positioned in strategic locations to maximize the network's overall coverage. Device is shown in topology.

What device roles mean

Device Role	BLE/WiFi/ Serial	Screen Enabled	Power Consumption	Retransmit	Prioritized Routing	Visible in Nodes List
CLIENT	Yes	Yes	Regular	Yes	No	Yes
CLIENT_MUTE	Yes	Yes	Lowest	No	No	Yes
CLIENT_HIDDEN	Yes	Yes	Lowest	Local Only	No	No
TRACKER	Yes	No	Regular / Low	Awake Only ¹	No	Yes
LOST_AND_FOUND	Yes	No	Regular	Yes	No	Yes
SENSOR	Yes	No	Regular / Low	Awake Only ¹	No	Yes
TAK	Yes	Optional	Regular	Yes	No	Yes
TAK_TRACKER	Yes	Optional	Regular	Yes	No	Yes
ROUTER	No ²	No	High	Yes	Yes	Yes
REPEATER	Yes	No	High	Yes	Yes	No

Surprise: changing
to a router will turn
off BLE!

Meshtastic LoRa Radio Profiles

8 Profiles: condense complex settings into common use cases

Trade-offs between long range or short range benefits (speed/range)

Often customized for conferences and events

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 kHz ¹	140dB
Short Range / Fast	Short Fast	10.94 kbps	7 / 128	4/5	250 kHz	143dB
Short Range / Slow	Short Slow	6.25 kbps	8 / 256	4/5	250 kHz	145.5dB
Medium Range / Fast	Medium Fast	3.52 kbps	9 / 512	4/5	250 kHz	148dB
Medium Range / Slow	Medium Slow	1.95 kbps	10 / 1024	4/5	250 kHz	150.5dB
Long Range / Fast	Long Fast	1.07 kbps	11 / 2048	4/5	250 kHz	153dB
Long Range / Moderate	Long Moderate	0.34 kbps	11 / 2048	4/8	125 kHz	156dB
Long Range / Slow	Long Slow	0.18 kbps	12 / 4096	4/8	125 kHz	158.5dB
Very Long Range / Slow	Very Long Slow	0.09 kbps	12 / 4096	4/8	62.5 kHz	161.5dB

Adding sensors & hardware

Temperature,motion, other sensors are easy!

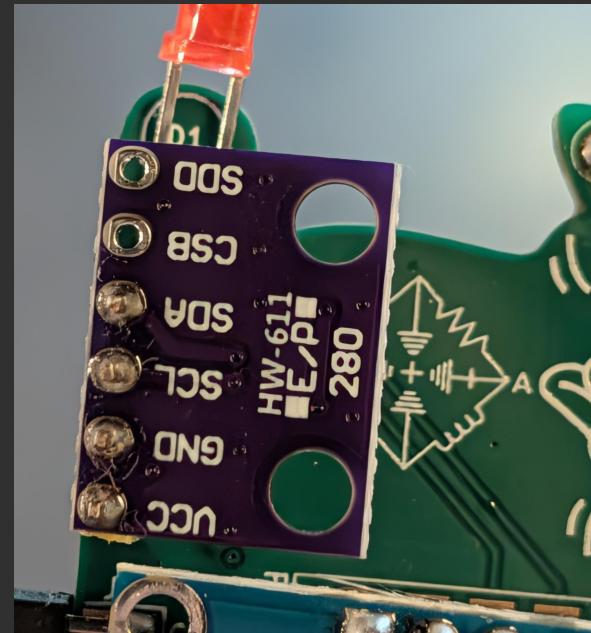
Enable Telemetry module & add common i2c sensors!

Telemetry Settings
Settings for the Telemetry module

Query Interval Interval to get telemetry data
0 Seconds

Update Interval How often to send Metrics over the mesh
0 Seconds

Module Enabled Enable the Environment Telemetry



Currently Supported Sensor Types

I2C Sensors Supported

Sensor	I ² C Address	Data Points
BMP085	0x76, 0x77	Temperature and barometric pressure
BMP180	0x76, 0x77	Temperature and barometric pressure
BMP280	0x76, 0x77	Temperature and barometric pressure
BME280	0x76, 0x77	Temperature, barometric pressure and humidity
BME68x	0x76, 0x77	Temperature, barometric pressure, humidity and air resistance
MCP9808	0x18	Temperature
INA260	0x40, 0x41, 0x43	Current and Voltage
INA219	0x40, 0x41, 0x43	Current and Voltage
INA3221	0x42	3-channel Current and Voltage
LPS22	0x5D, 0x5C	Barometric pressure
SHTC3	0x70	Temperature and humidity
SHT31	0x44	Temperature and humidity
PMSA003I	0x12	Concentration units by size and particle counts by size
DFROBOT_LARK	0x42	Temperature, barometric pressure, humidity, wind direction, wind speed
MAX30102	0x57	Heart Rate, Oxygen Saturation, and body temperature
MLX90614	0x5A	Body temperature

Modules (Part 1)

Name	Description
<u>Ambient Lighting</u>	Adjust the brightness of NCP5623 I2C RGB LEDs
<u>Audio</u>	Enable Support for Codec2 Voice Comms on certain devices.
<u>Canned Message</u>	Set a number of predefined messages to send out directly from the device with the use of an input device like a rotary encoder.
<u>Detection Sensor</u>	Configure a GPIO pin to be monitored for specified high/low status and send text alerts.
<u>External Notification</u>	Incoming messages are able to alert you using circuits you attach to the device (LEDs, Buzzers, etc).
<u>MQTT</u>	Forward packets along to an MQTT server. This allows users on the local mesh to communicate with users on another mesh over the internet.
<u>Neighbor Info</u>	Send info on 0-hop neighbors to the mesh.
<u>Paxcounter</u>	Count the number of BLE and Wifi devices passing by a node.

Modules (Part 2)

<u>Range Test</u>	Send messages with GPS location at an interval to test the distance your devices can communicate. Requires (at least) one device set up as a sender and one as a receiver. The receiver(s) will log all incoming messages to a CSV.
<u>Remote Hardware</u>	Set and read a GPIO status remotely over the mesh.
<u>Serial Module</u>	Send messages across the mesh by sending strings over a serial port.
<u>Store & Forward</u>	Stores messages on a device for delivery after disconnected clients rejoin the mesh.
<u>Telemetry</u>	Attach sensors to the device and transmit readings on a regular interval to the mesh.
<u>Traceroute</u>	Track which nodes are used to hop a message to a certain destination.

Enable Serial Module

Open the Nibble's Serial Module in Meshtastic and apply these settings:

- Enable Serial Module
- Set Receive Pin to 44
- Set Transmit Pin to 43
- Set Baud Rate to 115200
- Set “Mode” to “Textmsg”

Serial Settings

Settings for the Serial module

Module Enabled

Enable Serial output



Echo

Any packets you send will be echoed back to your device



Receive Pin

Set the GPIO pin to the RXD pin you have set up.

44

Transmit Pin

Set the GPIO pin to the TXD pin you have set up.

43

Baud Rate

The serial baud rate

BAUD_115200

Timeout

Seconds to wait before we consider your packet as 'done'

0

Mode

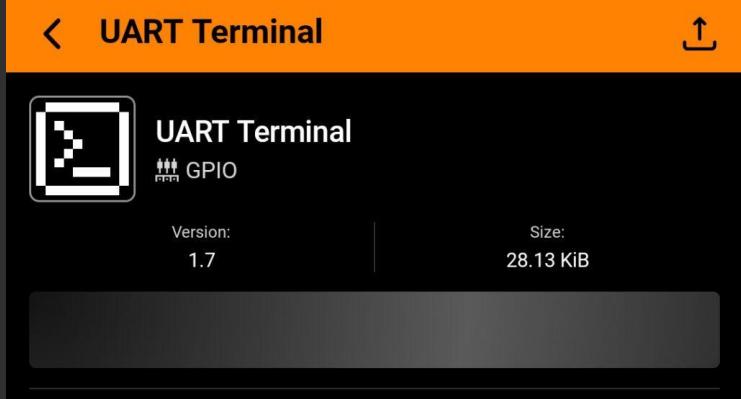
Select Mode

Textmsg

Let's Set Up For Our Flipper!

On your Flipper app, Download the UART Terminal app.

It's usually included in Momentum and Unleashed firmware



The screenshot shows the Flipper app interface with the "UART Terminal" application open. The app icon features a white square with a black right-pointing arrow. The title bar says "UART Terminal" with a back arrow and a share icon. Below the title, it says "UART Terminal" and "GPIO". It shows "Version: 1.7" and "Size: 28.13 KiB". The main screen has two sections: a large orange box on the left containing the text "Hello from UART!" and a smaller orange box on the right labeled "Send command to UART" with a text input field and a keyboard overlay.

Description

Control various devices via the Flipper Zero UART interface. The UART Terminal application allows you to use UART (Universal Asynchronous Receiver-Transmitter) even without a computer, only with your Flipper Zero:

1. On your Flipper Zero, run the UART Terminal app.
2. Connect your Flipper Zero to a device that uses the UART protocol for communication.
3. Select the desired communication frequency. After that, you can start reading and writing data directly from the application.

Plug In And Power On

Plug your Nibble into your Flipper.

To power your Nibble:

Either plug in your Flipper to power, or go to the GPIO app and set “5V on GPIO” to “on”

If it won’t load, make sure you flashed the most recent firmware.



USB-UART Bridge
GPIO Manual Control

5V on GPIO

OFF >

Open UART Terminal

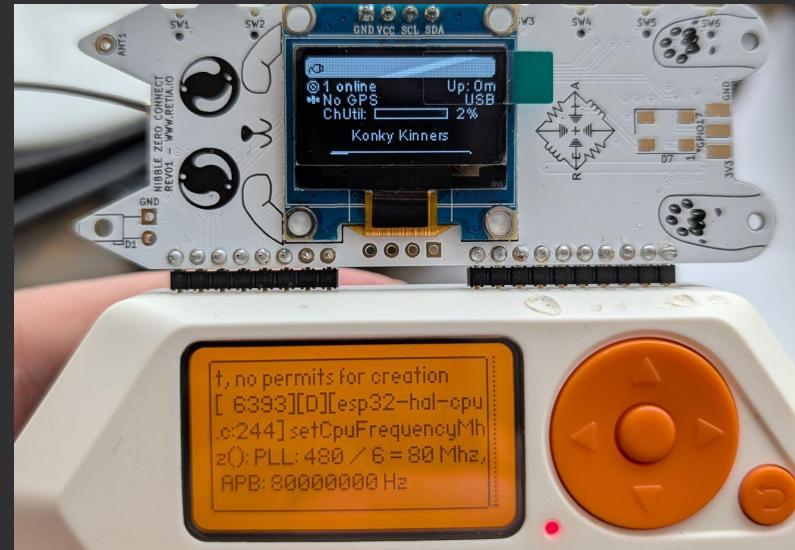
Under Setup, make sure the baud rate is set to 115200

Select “Open Port” and hit the reset button (R) on your Nibble.

You should see serial output appear on the screen!

This means it's set up correctly.

UART Pins 13,14 >
Baudrate < 115200 >
HEX mode OFF >
CR mode Newline >



Send A Message

Select “Send Command”

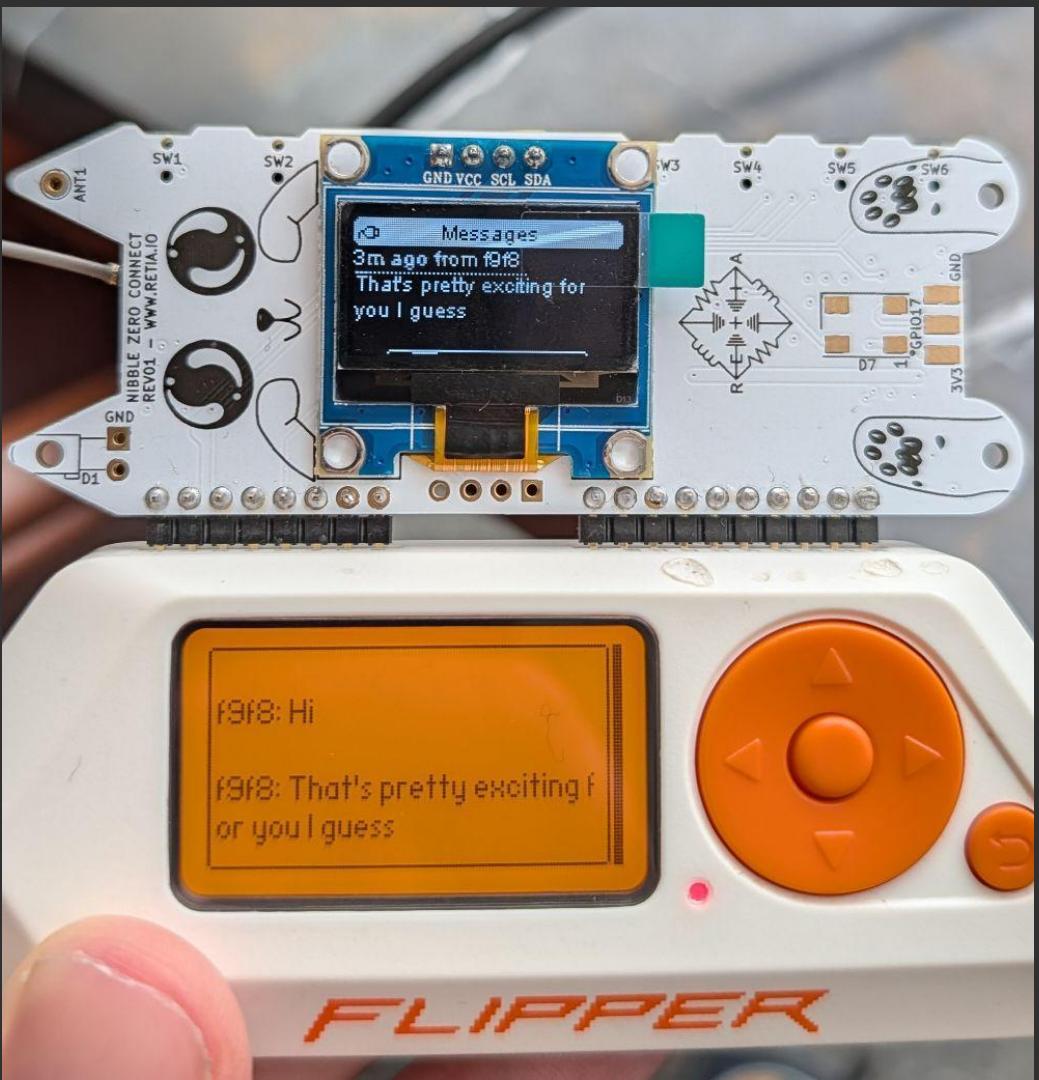
Type out your message and hit “save”

Your message is sent! You should see it on other Meshtastic devices.



See Replies

Replies you receive will appear on the screen of your Flipper!



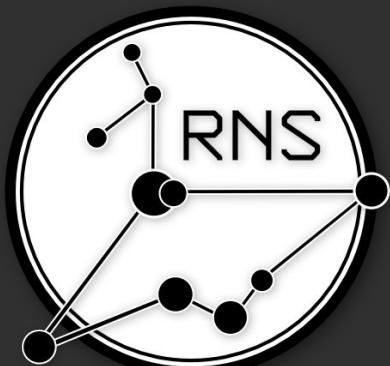
Want to go further?

https://github.com/cool4uma/UART_Terminal

Remote control app is open source, you can improve
and refine it for whatever use case you want!

Meshtastic Alternatives

- Meshcore - Routes more like Tor, does not use flood routing and establishes circuits for DM's. Uses less bandwidth for communication.
- Reticulum - A cryptography-based networking stack for building local and wide-area networks with readily available hardware, including Wi-Fi and LoRa



About MeshCore

MeshCore is a multi platform system for enabling secure text based communications utilising LoRa radio hardware. It can be used for Off-Grid Communication, Emergency Response & Disaster Recovery, Outdoor Activities, Tactical Security including law enforcement, private security and also IoT sensor networks.

Our Mission

At MeshCore, our passion is building reliable and secure decentralised mesh radio networks for text-based communication. We are driven by the need to empower users in off-grid and disaster-stricken regions with a communication tool that does not depend on the internet or cellular networks.

Easy to use

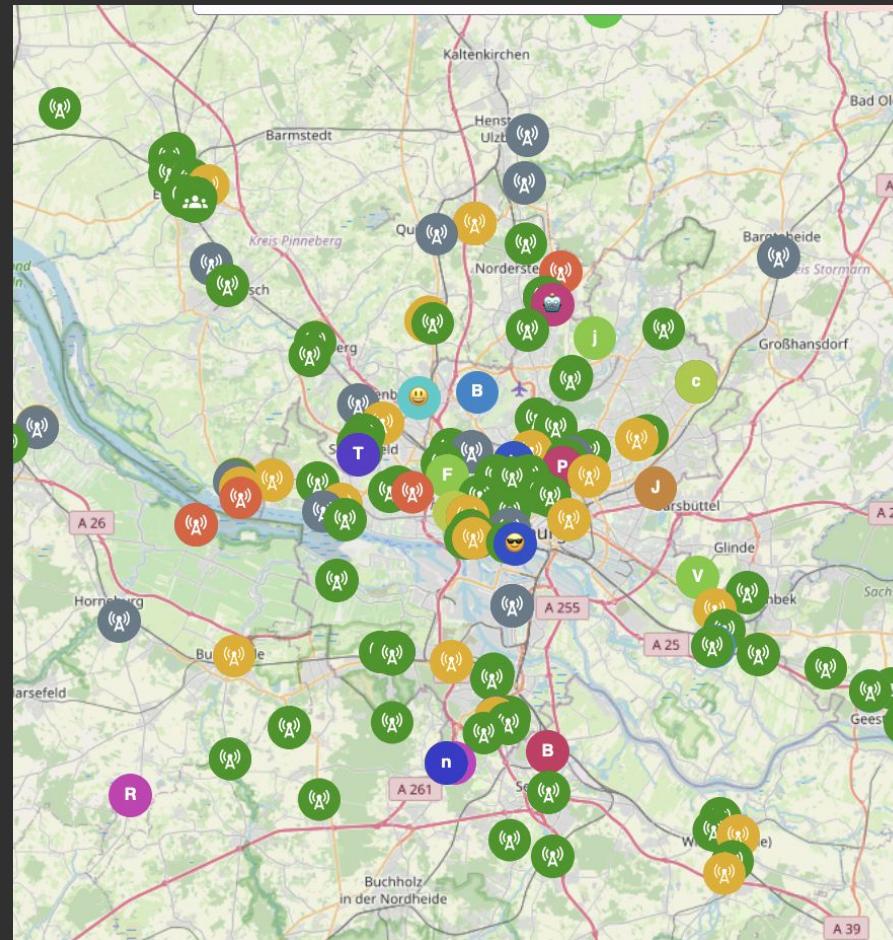
Use our web flasher to install MeshCore firmware on popular devices like the Lilygo T-Deck or Heltec V3 LoRa32, you can also use our web client to communicate securely over radio with other users just using a Chrome web browser - and yes of course it works without the internet!

Let's Set Up Meshcore

In Hamburg, Meshcore has a large community via HanseMesh.

Let's set up Meshcore and join HanseMesh!

Download the MeshCore app for your smartphone



Flash on Nugget.dev

Flashing is the same process as before on Nugget.dev

- 1) Hold down the “B” button of your Nibble while plugging in
- 2) On Nugget.dev from a chrome browser, click “Connect your Nugget” and select your device from the drop-down menu
- 3) Select “**Nibble Zero Meshcore Companion**” from the firmware list
- 4) Click “Program” and unplug when your device is done flashing.

Meshcore for the Nibble Zero (white board)

Off-line and Off-grid messaging platform for a new era of secure communications.

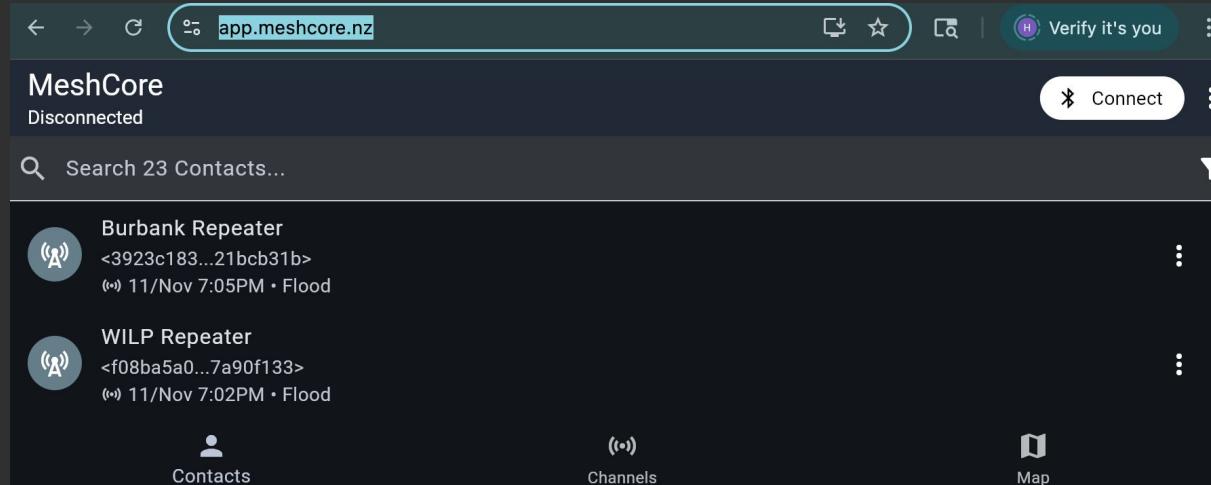
Select Binary

Plug In Your Device & Connect

Plug in your flashed device

It will start up and show a bluetooth pairing PIN

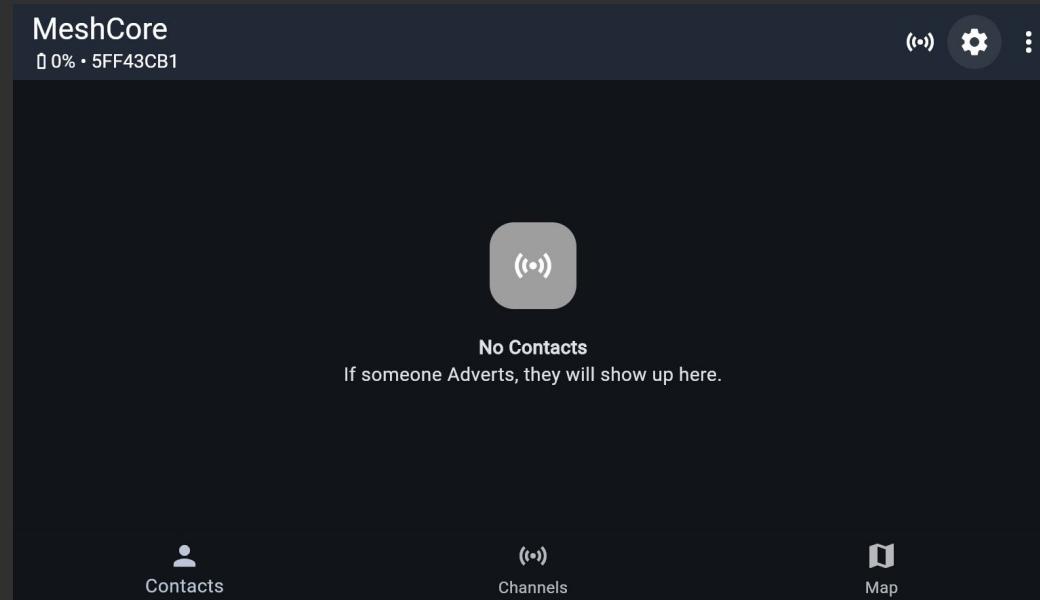
Connect to your device on your smartphone or <https://app.meshcore.nz/>



Pair Via Bluetooth & Open Settings

On <https://app.meshcore.nz/> or the app, select your device and pair using the bluetooth pin. ****YOU MAY NEED TO FORGET THE DEVICE IN BLUETOOTH SETTINGS FOR THIS TO WORK****

Click the gear icon for settings



Connect To Hansemesh



HANSEMESH

[Home](#) [First steps](#) [Community](#) [Hardware](#) [Repeater](#) [FAQ](#) [Locations](#) [Map](#)

HanseMesh is a community-run LoRa wireless network that operates completely independently of the internet and mobile networks. We use the open-source MeshCore firmware for decentralized communication.**

Community & Neighborhood - Direct communication without providers or ongoing costs.

Emergencies & Disaster Relief - Works during power and internet outages.

Outdoors & Events - Ideal for camping, festivals, and hikes without mobile network coverage.

Privacy - End-to-end encrypted communication; no provider can read your messages.

Education & Research - Learn radio technology, LoRa, and mesh networks practically.

Amateur Radio Entry - Perfect for young people who want to try out radio technology - no license required.

Science & Experiments - Test ranges, antennas, and propagation conditions.

Connect To Hansemesh

Set your radio settings:

EU/UK Narrow Preset
Frequenz: 869.618 MHz
Bandbreite: 62.5
Spreading Factor: 8
Coding Rate: 8

Join the HanseMesh Channel

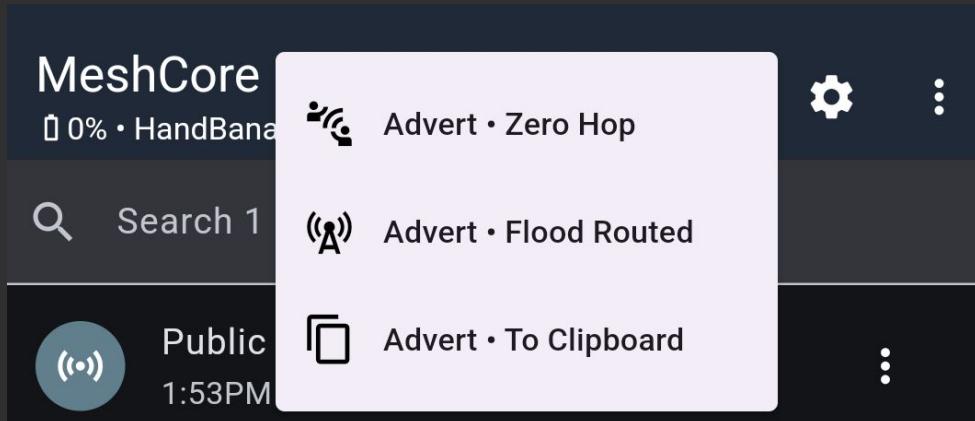
1. In the app: Three dots → "Add Channel"
2. Select "# Join a Hashtag Channel"
3. Enter channel name: #hansemesh



Hit Save, Advertise, & Say Hi!

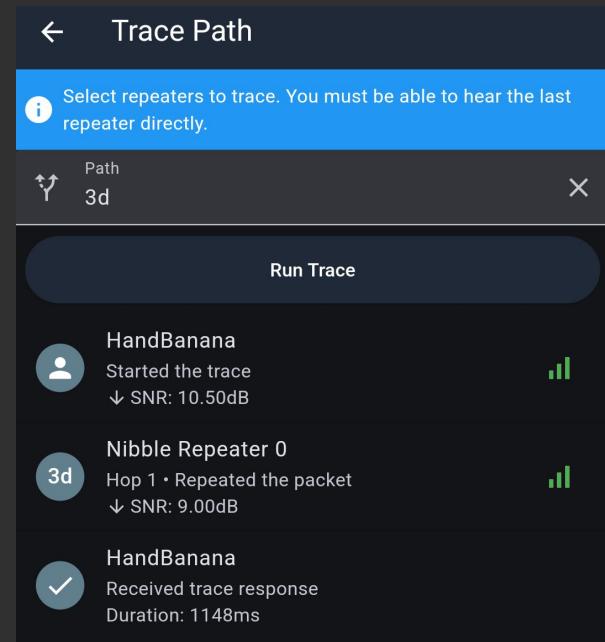
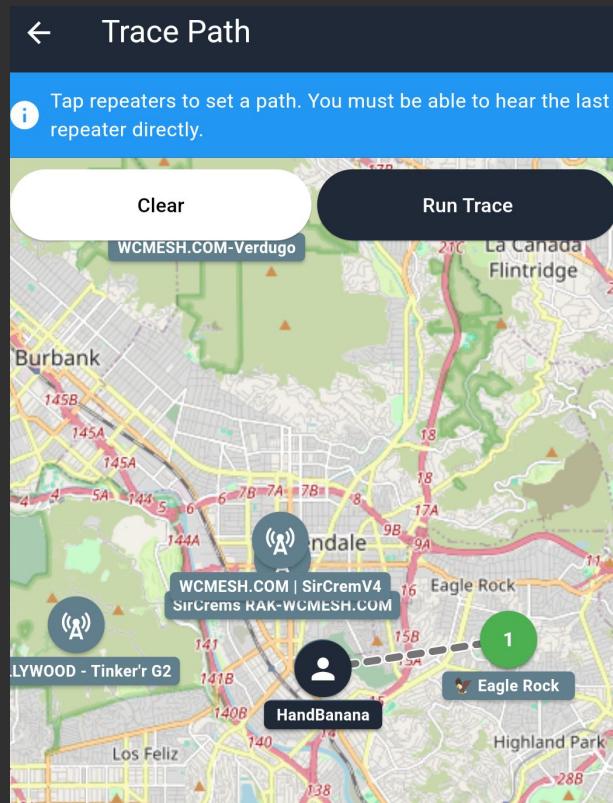
Click the “Advert - Flood Routed” to advertise your node to other devices in the area! You’ll automatically add contacts you see.

Try sending a message in the public chat!



Meshcore Tools To Explore: Trace Path

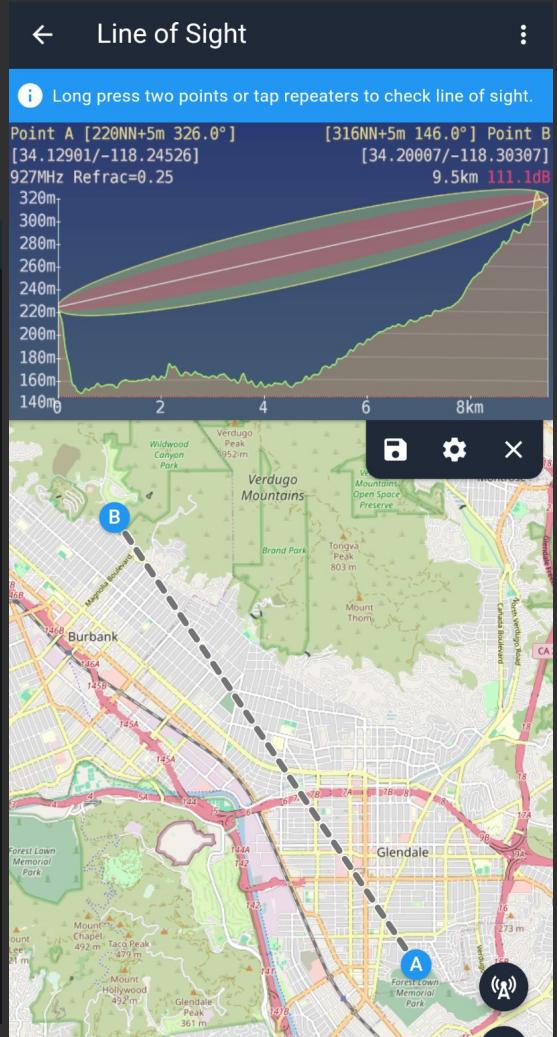
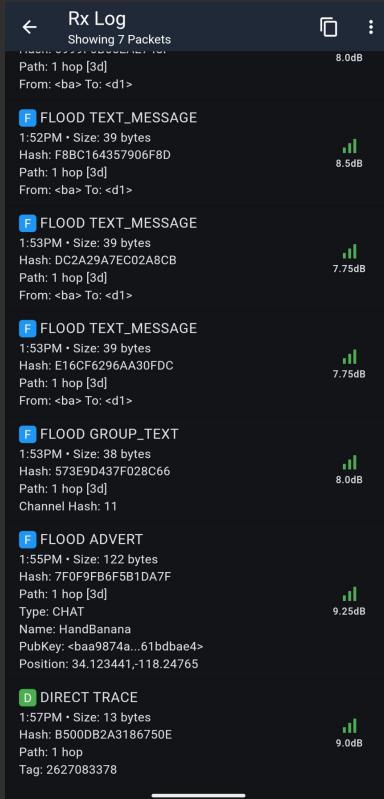
Trace a route between nodes using a map or text interface



Meshcore Tools To Explore: Line of Sight

Check line of sight
between node locations

Also see all received
messages in RX log!



Meshcore Repeater

Want to flash a Meshcore Repeater?

Put your Nibble into boot mode and visit
Nugget.dev

Erase your device, select the Nibble
Meshcore Repeater & flash

Unplug your device and plug it back in,
then go to:

<https://flasher.meshcore.co.uk/>

Nibble Screen Connect Meshcore Repeater

Meshcore v1.9.1 Repeater for Nibble Screen Connect
(green board)

Select Binary

Set Up Repeater

Plug in your Nibble, and then select “Repeater Setup” On:

<https://flasher.meshcore.co.uk/>

Set the name and password

Change the radio settings to:

EU/UK Narrow Preset

Frequenz: 869.618 MHz

Bandbreite: 62.5

Spreading Factor: 8

Coding Rate: 8

Save, and click “**Send Advert**”

Configure Remotely Via Password

You can connect to your repeater via the password you set from another Meshtastic companion node.

Find the repeater in your contacts and select “**Manage**”.

Enter the password you set and you’ll be able to access settings.

The screenshot shows the Meshtastic app's contact screen for a device named "Nibble Repeater 0". At the top right is a circular profile icon with a small antenna symbol. Below it, the device name "Nibble Repeater 0" and its MAC address "`3d56d4f6...3201feea`" are displayed. A row of four buttons follows: "Manage" (gear icon), "Favourite" (star icon), "Telemetry" (graph icon), and "Share" (share icon). The main area contains the following data fields:

- Name:** Nibble Repeater 0
- Public Key:** `3d56d4f63034fb1dbd417a275a17e21ebe06c`
- Position:** 0.0, 0.0
- Distance Away:** Unknown
- Contact Type:** Repeater

Below this, under "Last Advert Heard", is a log entry:

- about a year ago
- 15/May/2024 3:52AM

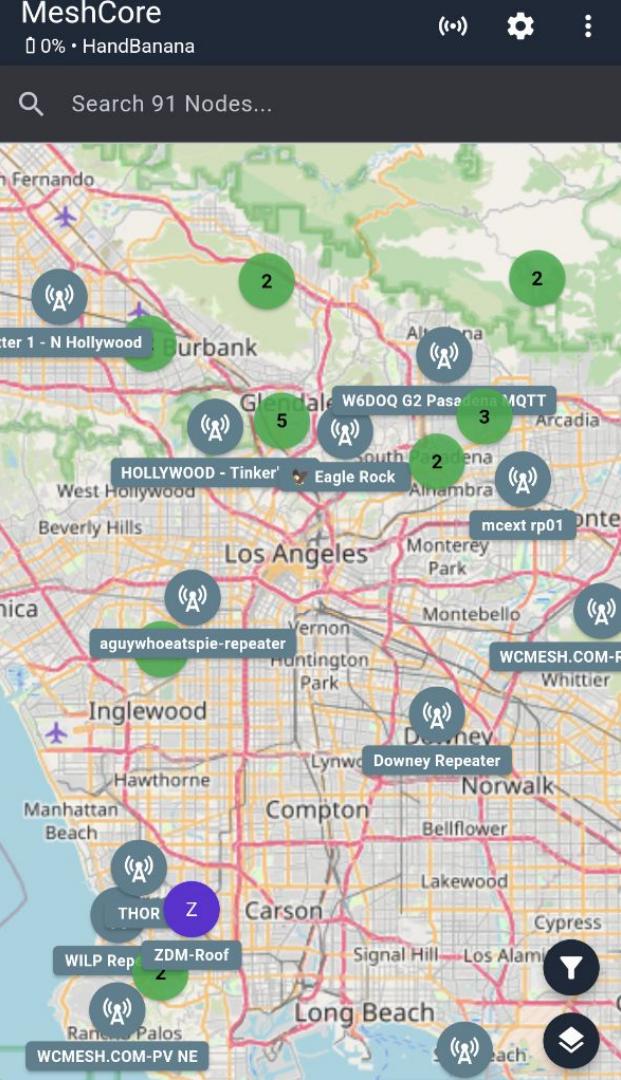
Under "Path", there are two entries:

- Hops Away: Flood
- Out Path

At the bottom, there is a section labeled "Extra Tools" with a pencil icon.

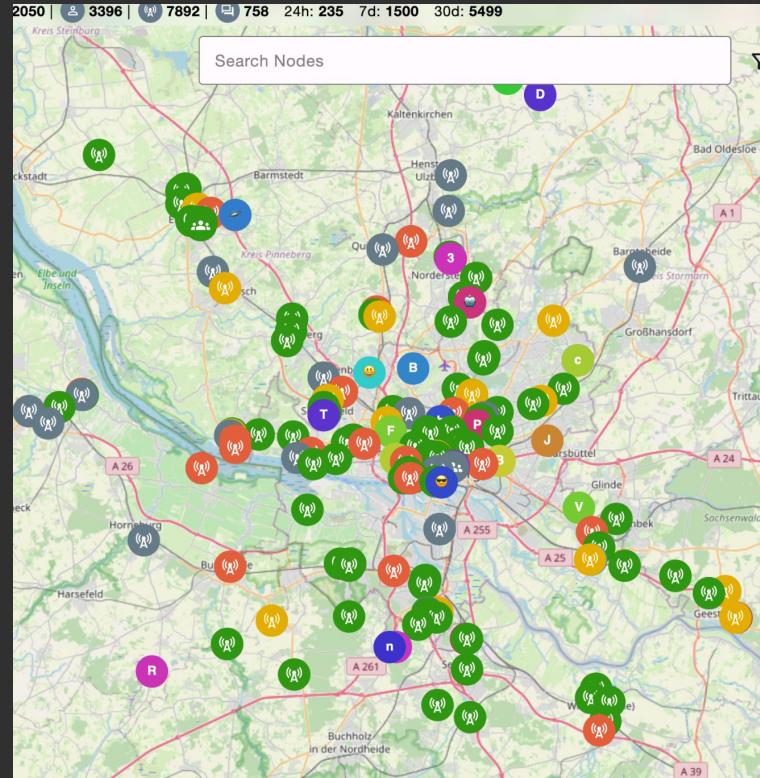
Join Regional Mesh Nets!

Start advertising and transmitting, you should see repeaters start to appear.



German Regional Net: Hansmesh

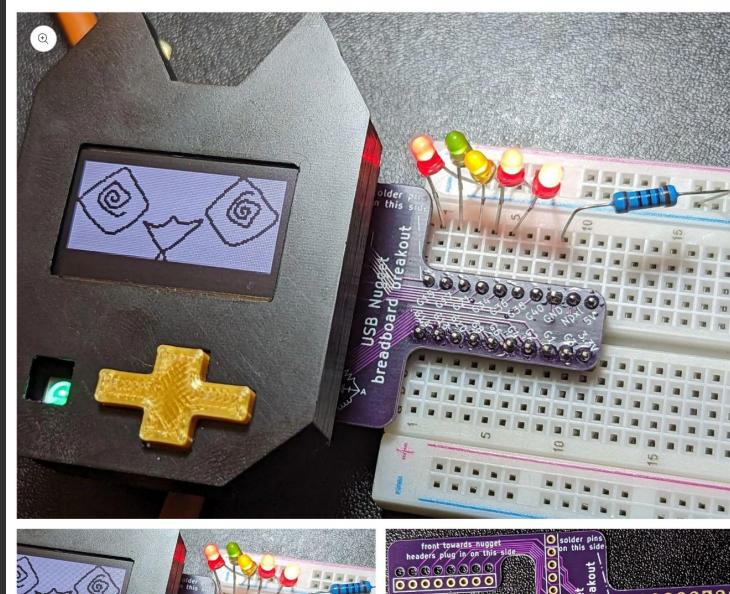
- <https://hansemesh.de>
- Uses Meshcore
- Large regional mesh network!



Teach a friend!

We have kits on Retia.io and discounts for instructors teaching classes!

- Nuggets
- Add-ons
- Online classes



RETIA.IO

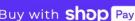
**USB Nugget
Breadboard Tail
Breakout**

\$15.00 USD
Tax included.

Quantity

- 1 +

Add to cart

Buy with  

More payment options

This cute Breadboard tail breakout allows for easy connection to a breadboard for electronics prototyping. It was designed to be used with CircuitPython or Arduino to prototype hardware with the USB Nugget

Keep in Touch

Want to learn more? You can find us here:

- Discord: <https://discord.gg/rjVJbauAUX>
- Store: Retia.io
- Nugget Flasher: Nugget.dev
- My work: www.hack.gay

