Emergency Communication Using Meshtastic LoRa Networks

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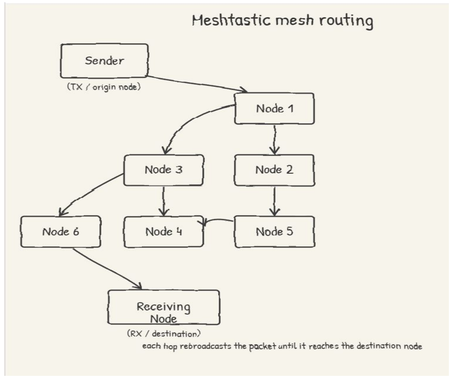
Abstract

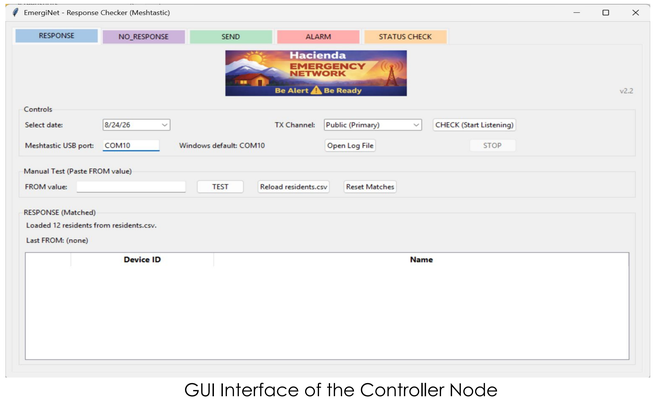
This project implements an off-grid emergency communication network using LoRa modulation and the Meshtastic protocol. By deploying independent relay nodes, the system delivers emergency alerts without relying on cellular or internet infrastructure.

Architecture

Every node that receives a packet automatically rebroadcasts it to its neighbors, so the message ripples outward hop by hop until it reaches the destination node.



Meshtastic network

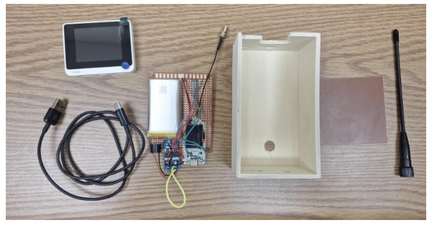


GUI Interface of the Controller Node

Acknowledgement

We thank Dr. Farid, Bob, John, Frank, Sonoma State University,the Sonoma County Department of Emergency Management and the participating communities for their assistance with field testing and development of the EmergiNet project.

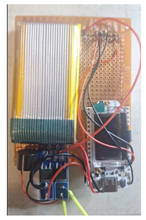
Implement



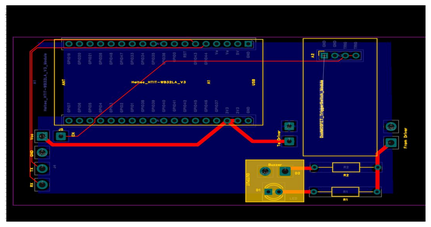
All component apart



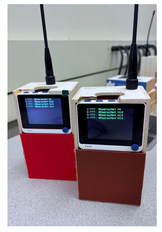
Front of PCB



Back of PCB



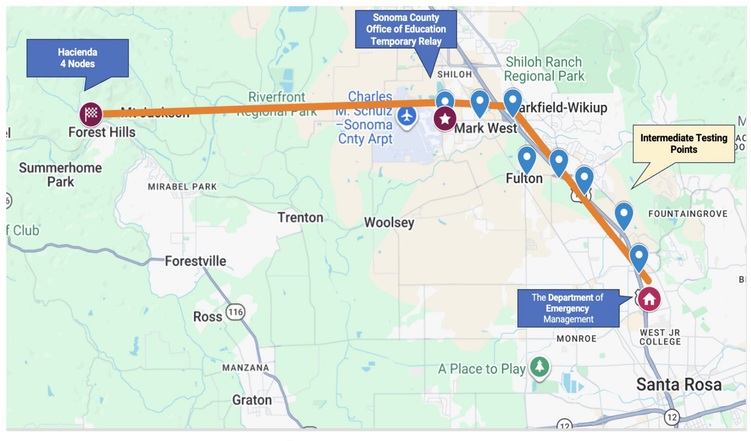
Schematic view of the PCB



Final prototype

Methods

- Study location: Santa Rosa Administration Center, Sonoma County Office of Education, Hacienda
- Data collection methods: Sending message in public and private channel from node #1. If node #2 receive the message, record the location coordinate.
- Data analysis methods: Marking the test point on the map. Deciding where is the best location to place the transition node.



Range testing map

Results

- Placing node #2 at the Sonoma County Office of Education for the most consistent transmission.
- All participating nodes successfully received messages from the controller node through the EmergiNet dashboard.
- Hacienda uses two solar-powered relay nodes to improve coverage in terrain-challenged areas.

Test Results

LOCATION OF Controller		Bob	Bob	Michael L	Michael L
Date		21-Jul	22-Jul	7-Aug	7-Aug
Alert Message	Bob C				
	Frank P				
Auto Check	Pat V				
	Faik C				
	Mark K				
	Regina C			NA	NA
	Marla F				
	Nicole F				
	John H			NA	NA
	Michael L.				
	Jessie, F.				

Future Work

- Doing more range test
- Improving the device prototype
- Improving relay-node, placement
- Connecting participating communities with local emergency management department for broader emergency communication and alert coverage.
- Expanding the network to other towns