

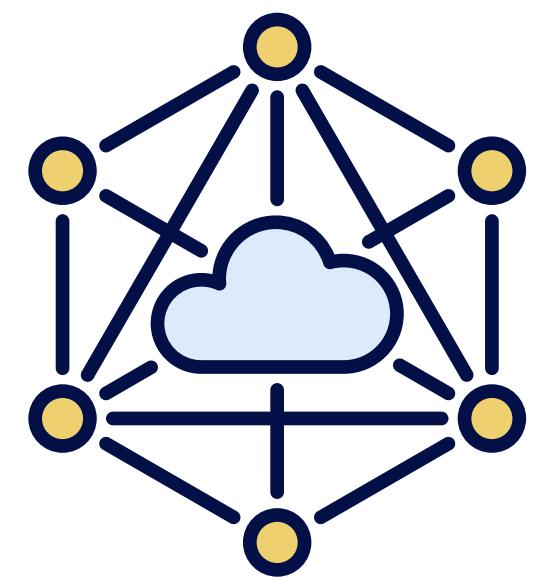


VOLTBOLTS

**DECENTRALIZED MESH NETWORK FOR DISASTER
RESCUE, COMMUNICATION, AND SUPPLY DELIVERY
WITH INTEGRATED COMPUTATIONAL INTELLIGENCE**

Presented by:

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EVENT:

**TiFORGE
REC, CHENNAI**

PROBLEM STATEMENT



Scenario depicting critical network failure during calamities

- Modern disaster response is often crippled by the failure of centralized infrastructure such as cellular towers, internet backbones, GPS systems, and cloud services.
- In post-disaster zones, remote terrain, or denied environments, this creates a critical communication and logistics gap that delays rescue operations and disrupts essential supply delivery.

A news report from NDTV Punjab about a food supply crisis in flood-hit Punjab villages. It shows a reporter interviewing a man and a helicopter landing in floodwaters.

FOOD SUPPLY CRISIS IN FLOOD-HIT PUNJAB VILLAGES

GROUND REPORT

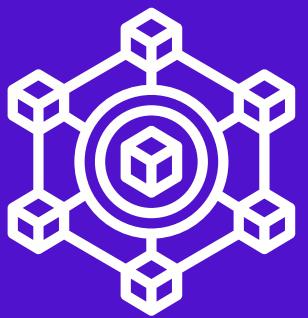
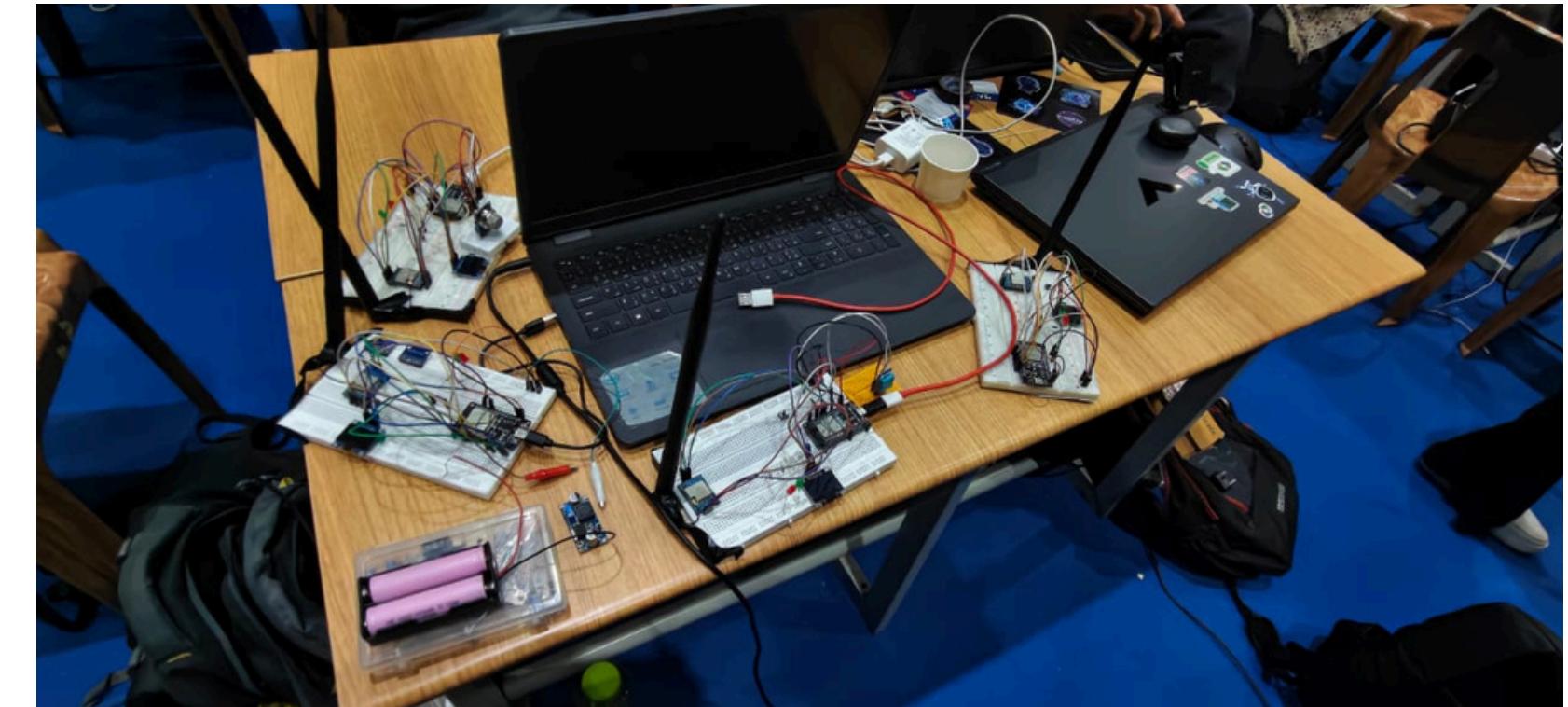
source: NDTV punjab

- There is a need for a standalone, AI-powered, self-healing mesh network that operates without infrastructure, intelligently prioritizes rescue and supply data over long distances, and remains functional even when nodes fail.

PROPOSED SOLUTION

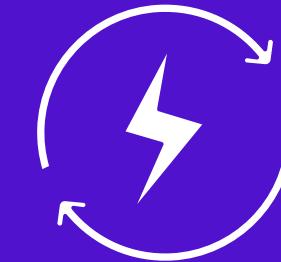
DECENTRAILED PEER TO PEER MESH NETWORK

A LoRa-powered decentralized mesh network of low-power nodes enabling reliable, infrastructure-free communication through hop-by-hop packages forwarding in inaccessible environments.



DECENTRALIZATION

No central server or control point; each node operates independently and cooperates to route packages across the network.



LOW POWER CONSUMPTION

Designed for energy efficiency using short transmissions and sleep cycles, enabling long battery life in remote environments.

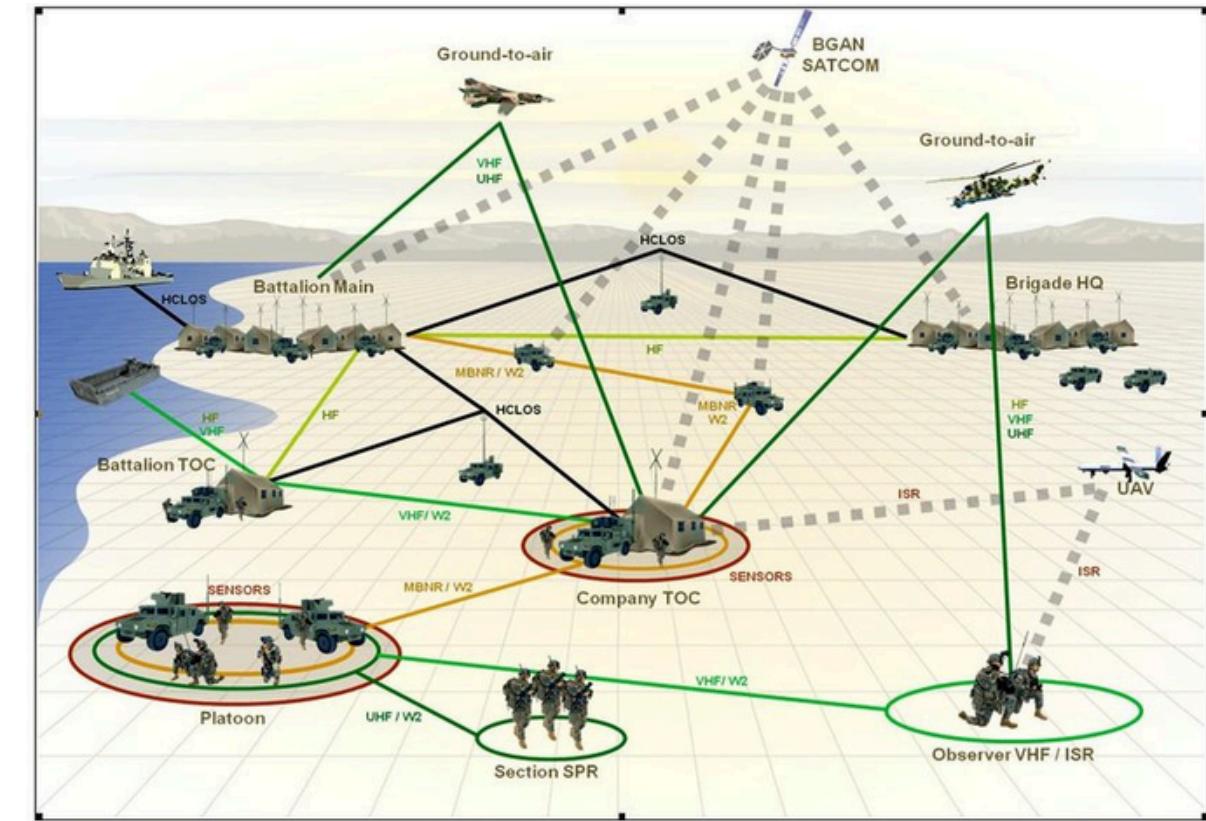


SELF-HEALING RELIABILITY

If a node fails, packages automatically reroute through other nodes, ensuring uninterrupted communication without manual intervention.

DEMOCRATIZATION AND UNIQUENESS

- FOUR INDEPENDENT LORA-ENABLED NODES FORM A DECENTRALIZED WIRELESS MESH NETWORK.
- A MESSAGE IS GENERATED MANUALLY OR BY SENSORS AT A SOURCE NODE.
- THE MESSAGE IS TRANSMITTED WIRELESSLY USING LORA COMMUNICATION.
- INTERMEDIATE NODES RECEIVE AND FORWARD THE MESSAGE TO NEIGHBORING NODES.
- MESSAGES HOP NODE-TO-NODE UNTIL THEY REACH THE DESTINATION NODE.
- RECEIVED MESSAGES ARE DISPLAYED LOCALLY ON THE OLED SCREEN.
- COMMUNICATION CONTINUES EVEN IF ONE NODE FAILS DUE TO SELF-HEALING ROUTING.
- TO IMPROVE UNIQUENESS, WE HAVE MODIFIED THE BASE NODE WITH APPROPRIATE SENSORS ACCORDING TO GEOGRAPHICAL REQUIREMENT.



CITY NODE

- IT IS A BASE NODE
- ESP-32
- LORA SX1278
- LOARA ANTENNAE
- OLED (I2C)

EARTHQUAKE PRONE NODE(B)

- MPU 6050
- ESP-32
- LORA SX1278
- LOARA ANTENNAE
- OLED (I2C)

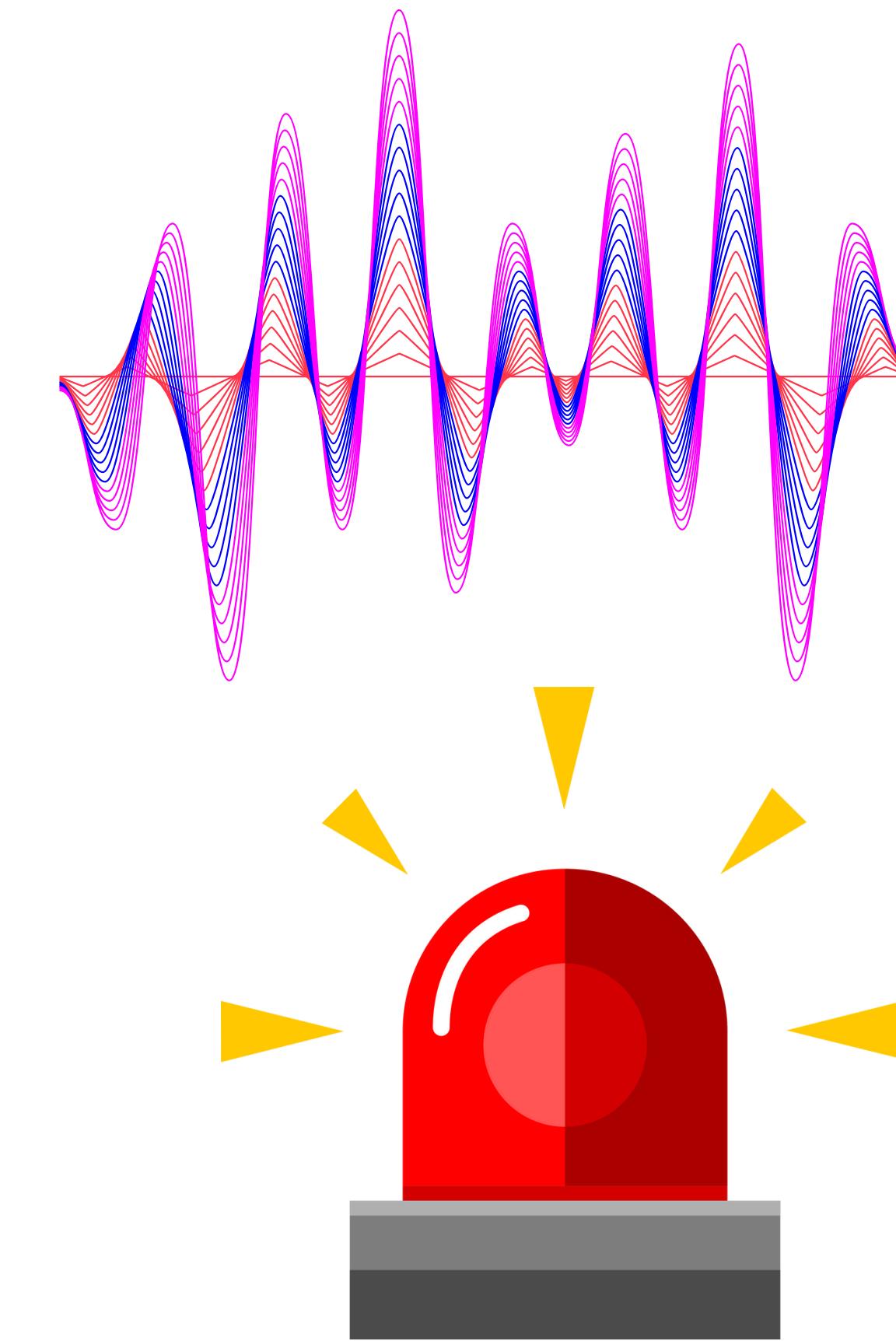
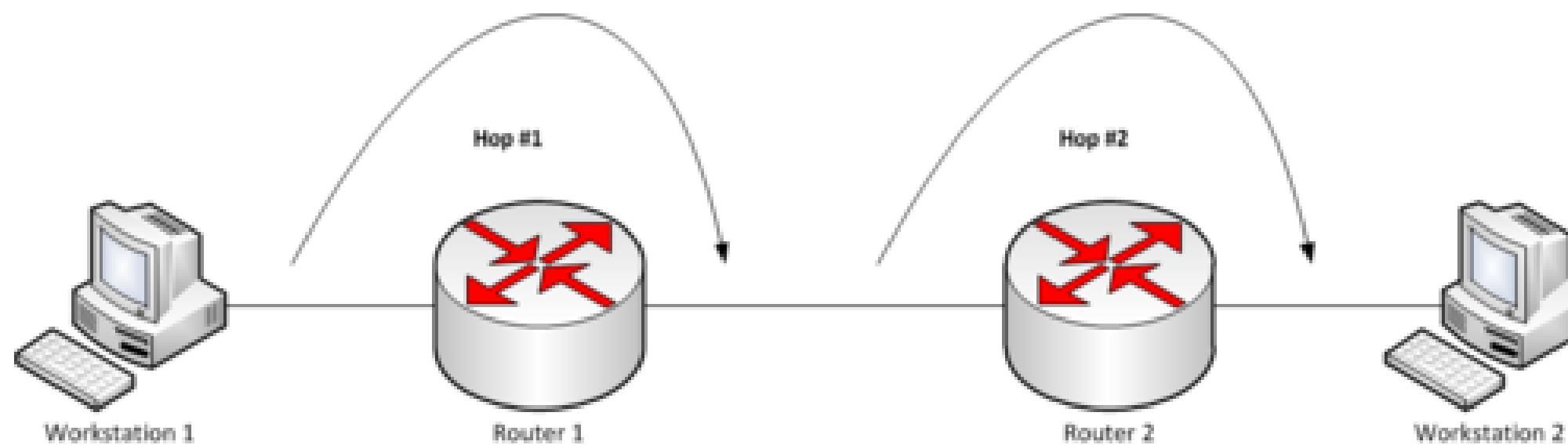
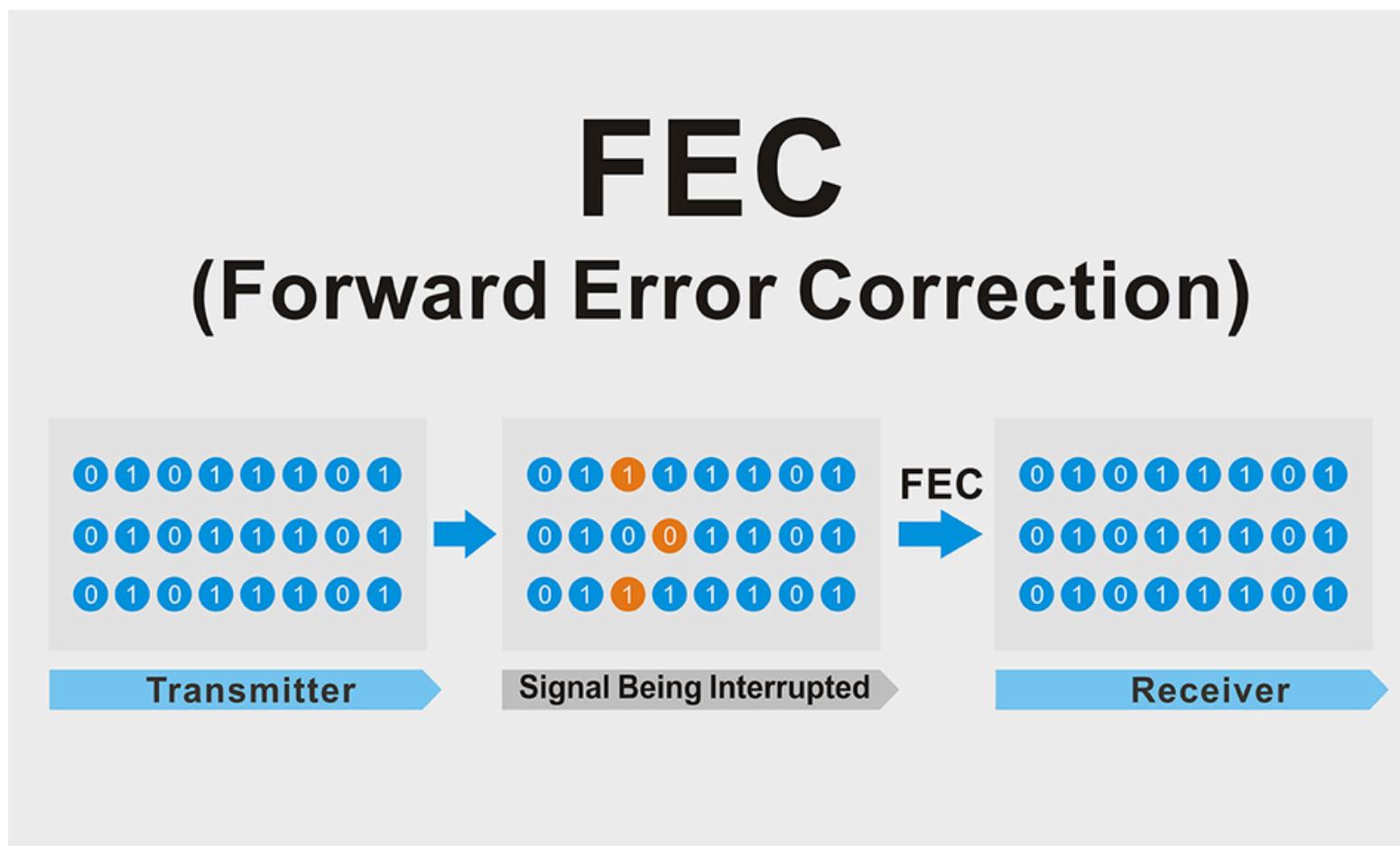
OCEAN NODE-C

- DHT11
- ESP-32
- LORA SX1278
- LOARA ANTENNAE
- OLED (I2C)

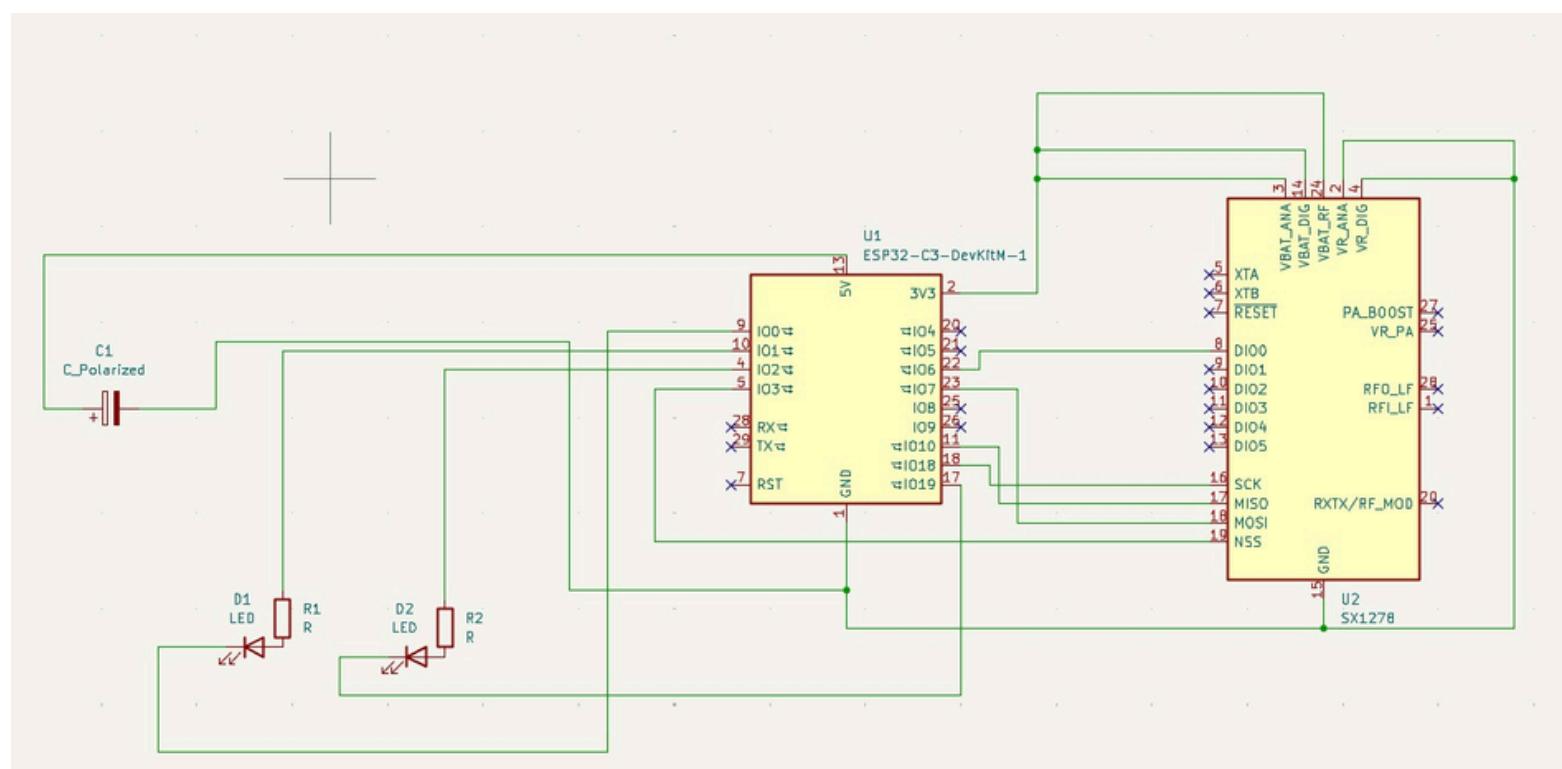
MINE NODE-D

- MQ9
- ESP-32
- LORA SX1278
- LOARA ANTENNAE
- OLED (I2C)

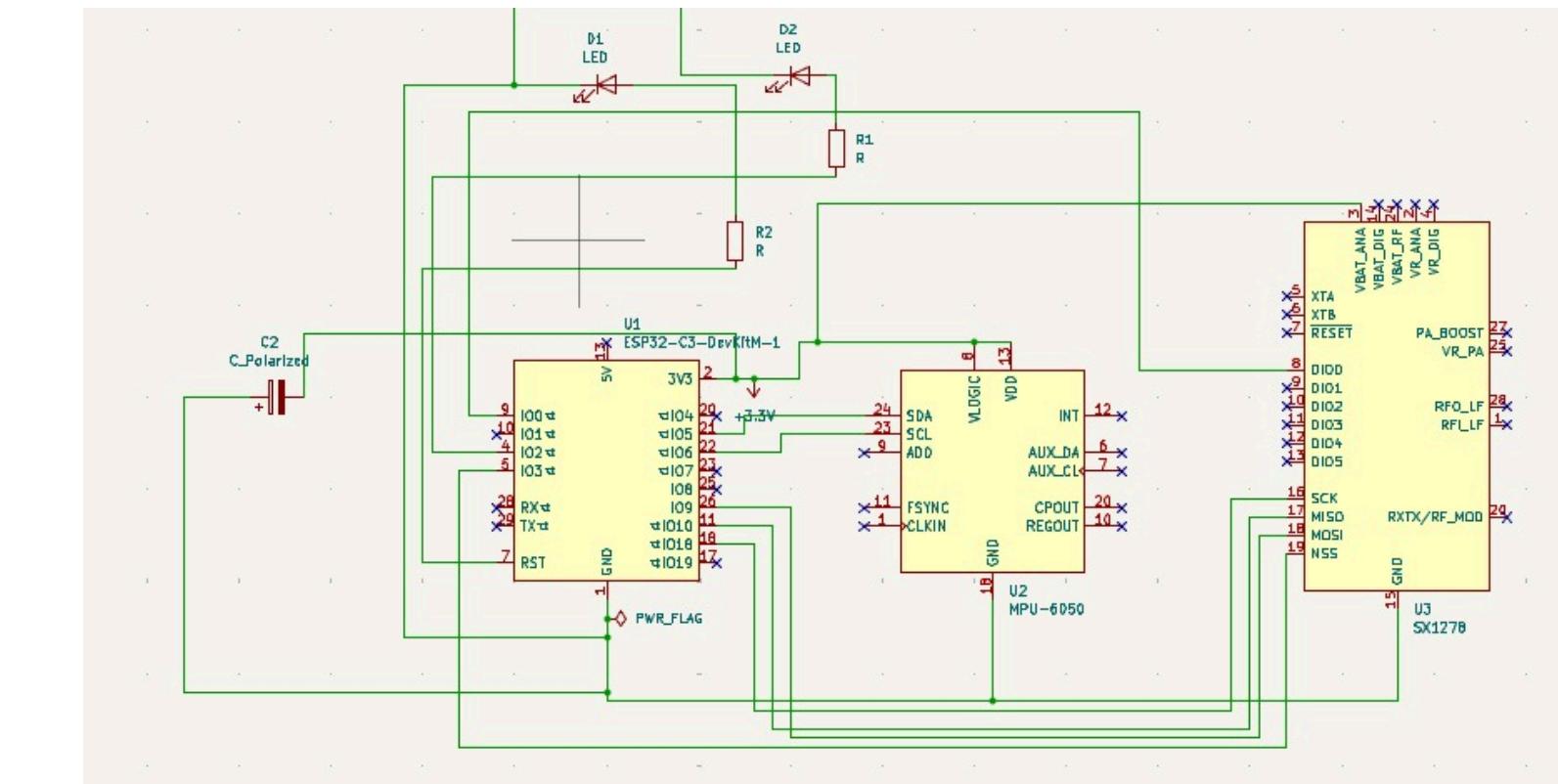
TECHNICAL APPROACH



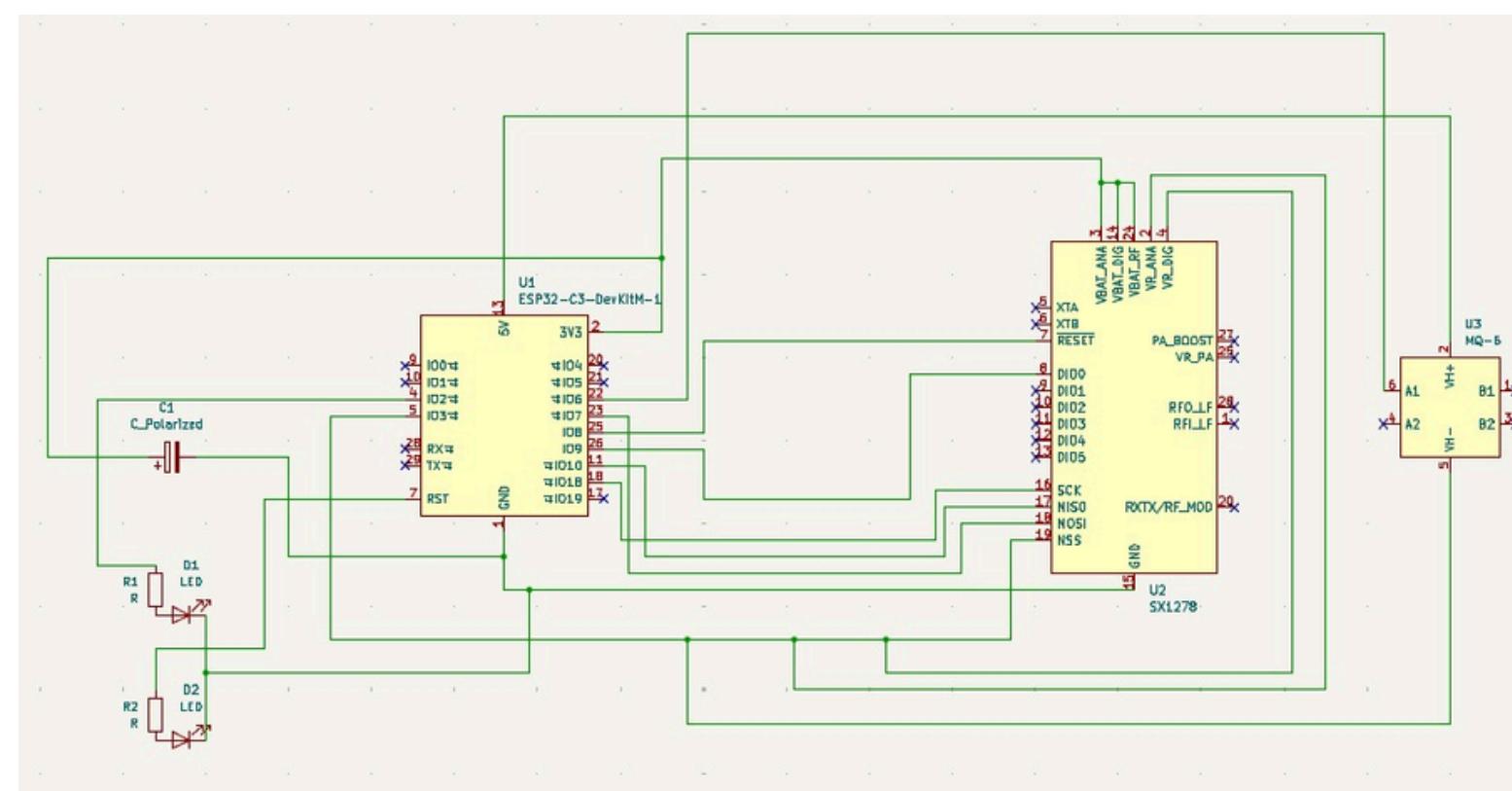
ARCHITECTURE (KI-CAD)



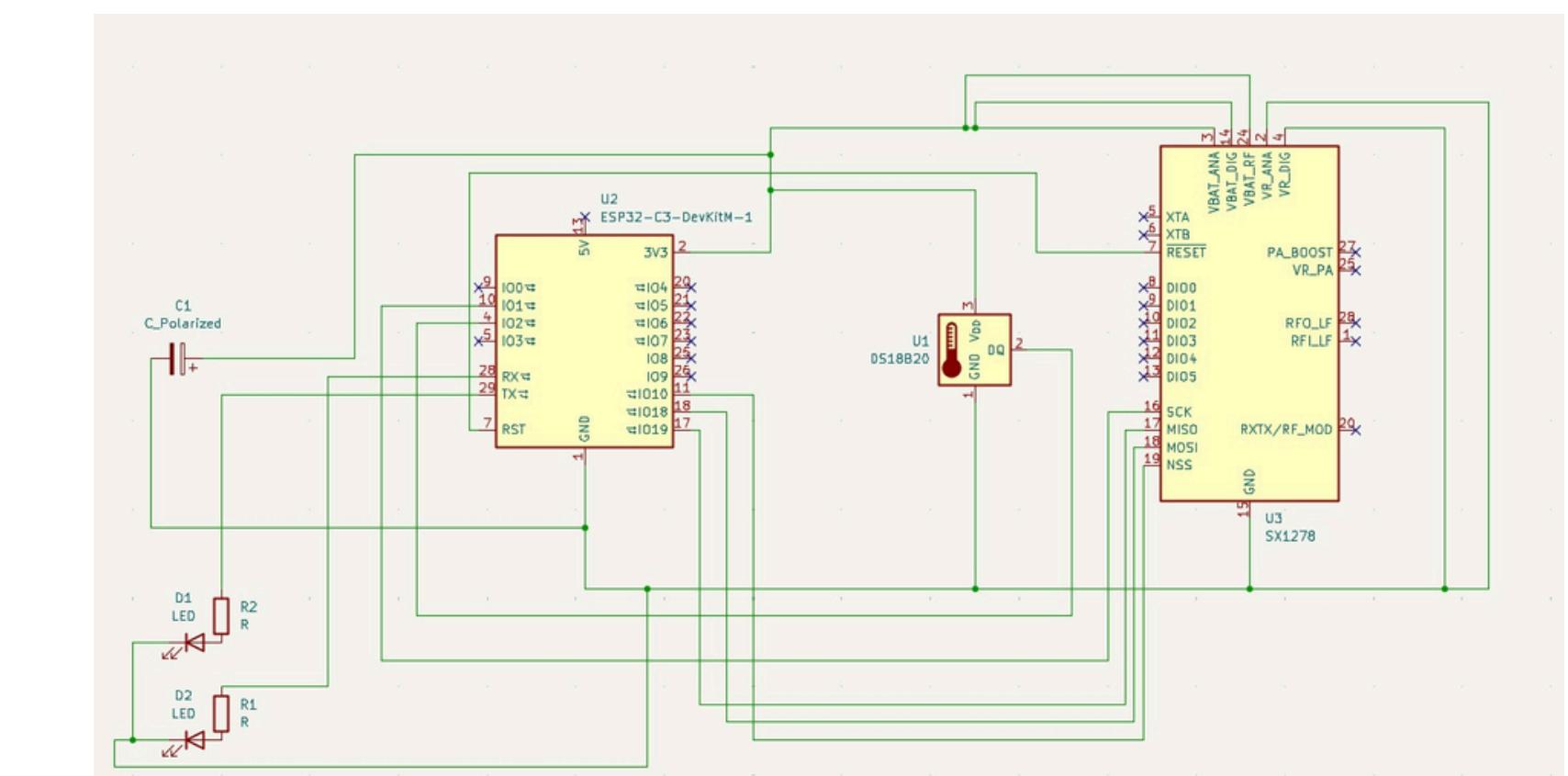
NODE A



NODE D



NODE B

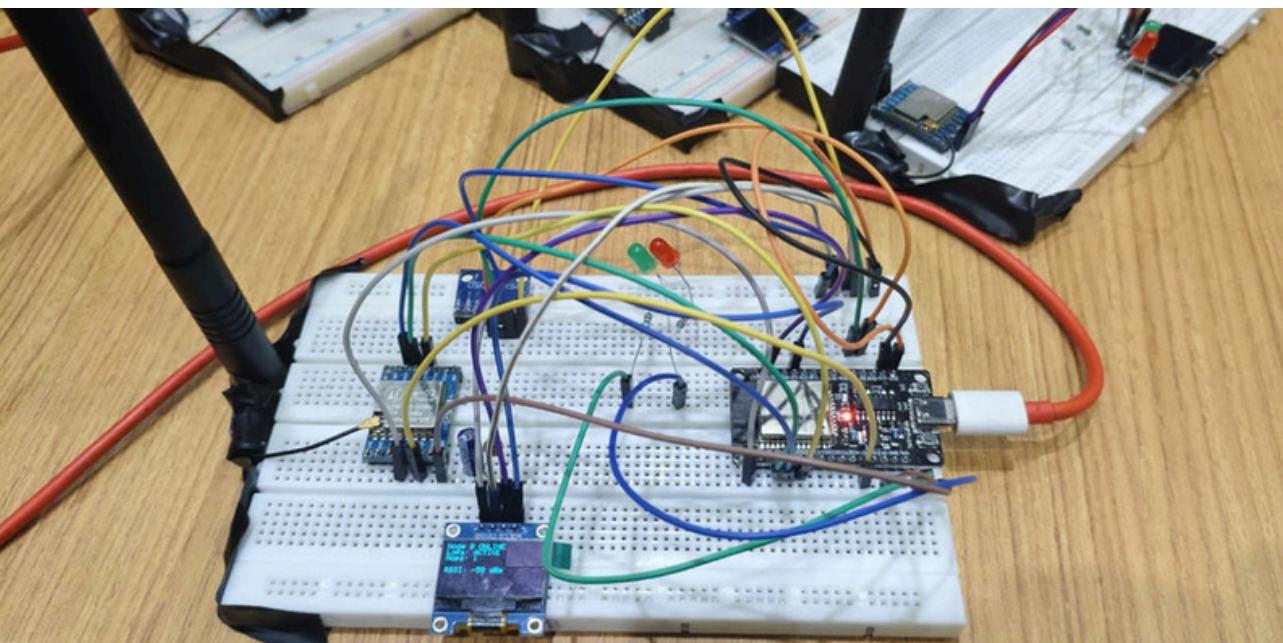
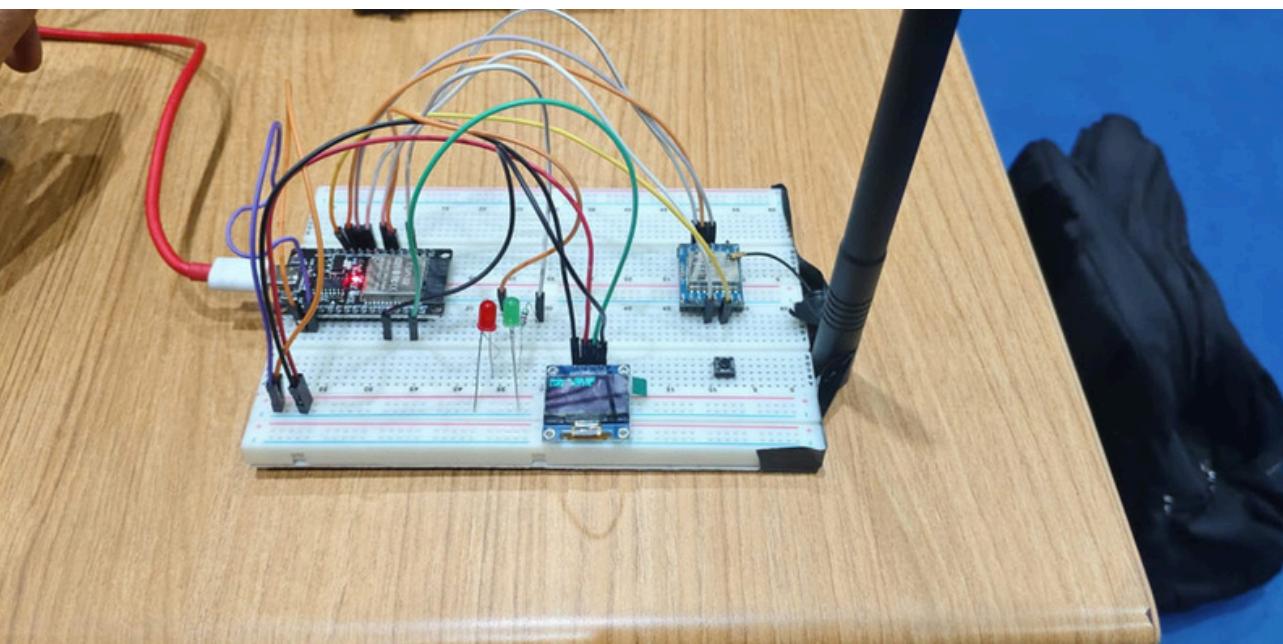


NODE C

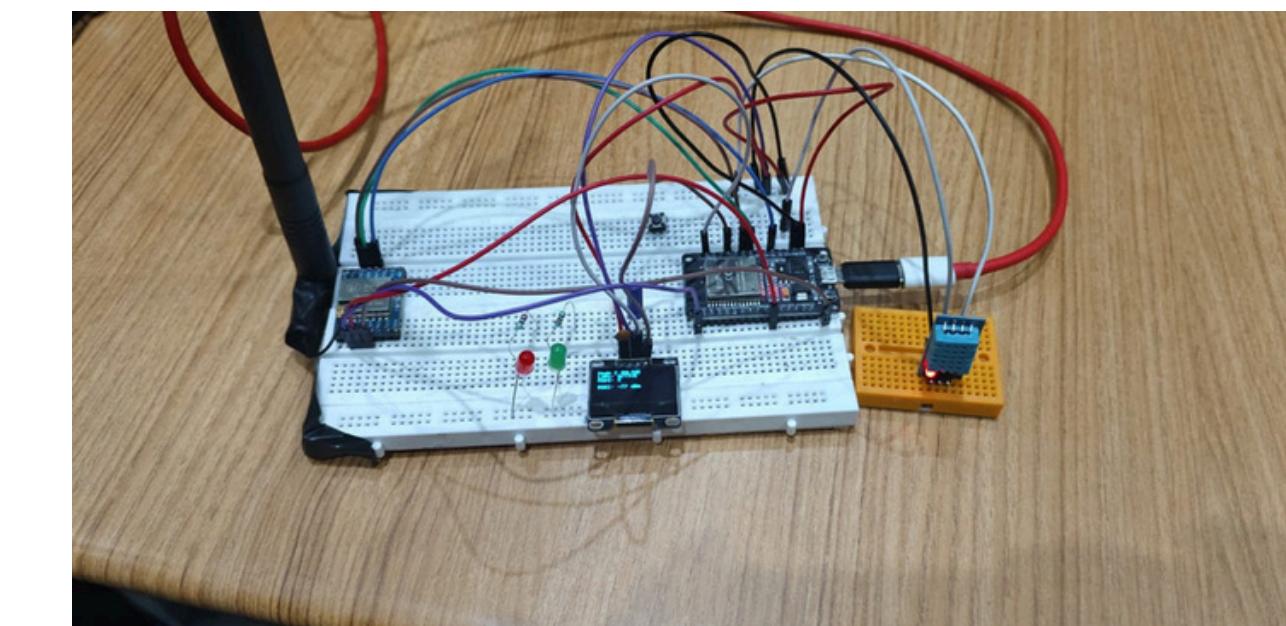
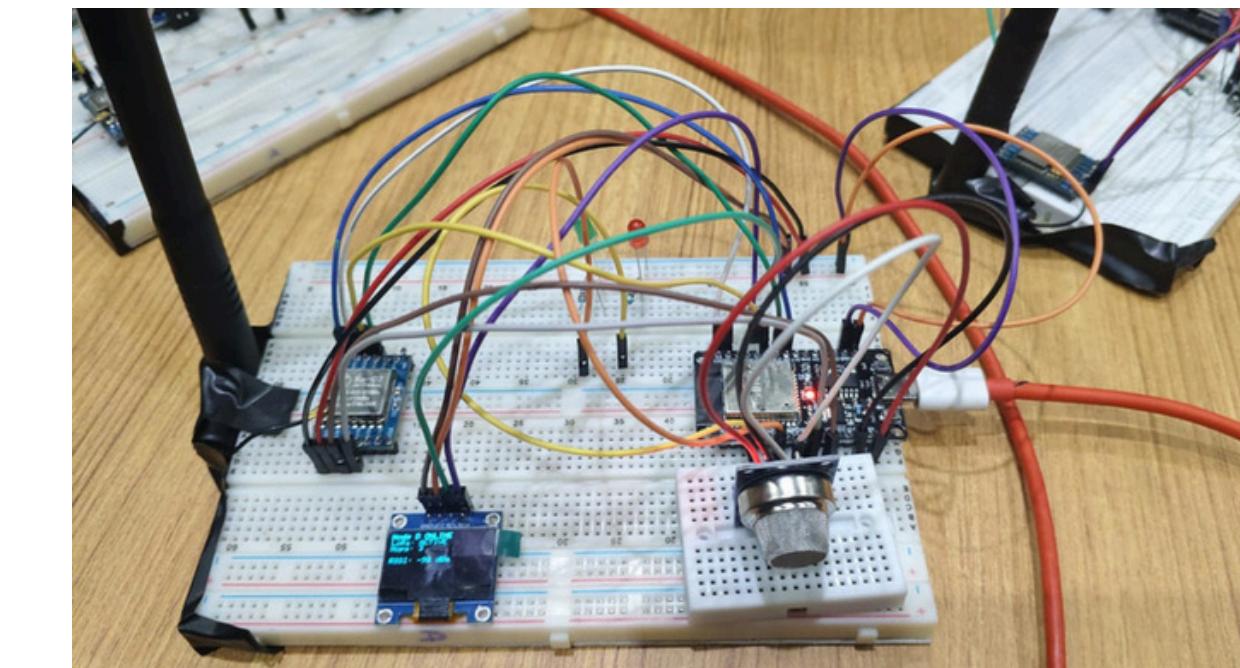
External power supply

FINAL HARDWARE OUTPUT

CITY NODE-A



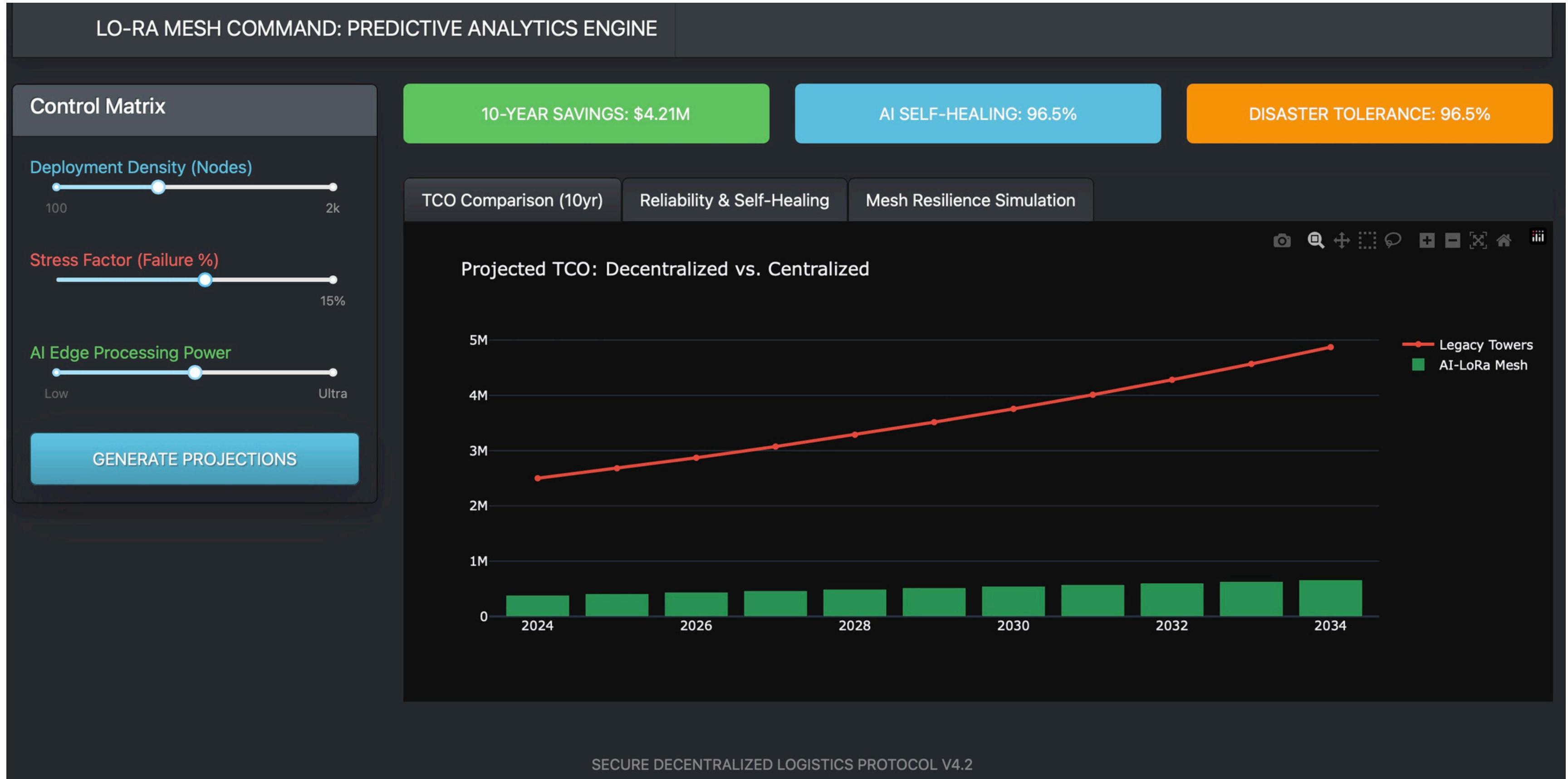
MINE NODE-D



OCEAN NODE-C

EARTHQUAKE PRONE NODE -B

RESULT AND MATRICS





THANK YOU