DECENTRALIZED PEER TO PEER MESH NETWORK (02)

IOT

TEAM NO. 56

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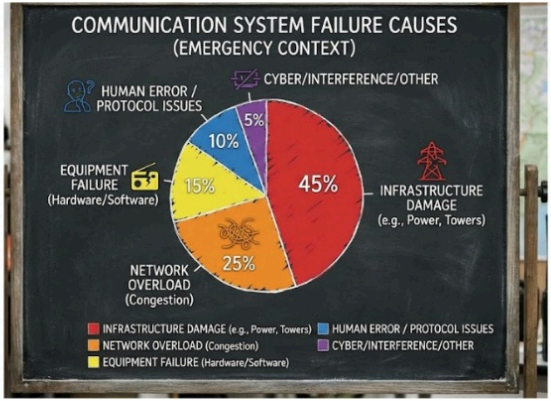
TEAM NAME:
Voltbots

PROBLEM STATEMENT

Scenario depicting critical network failure during calamities



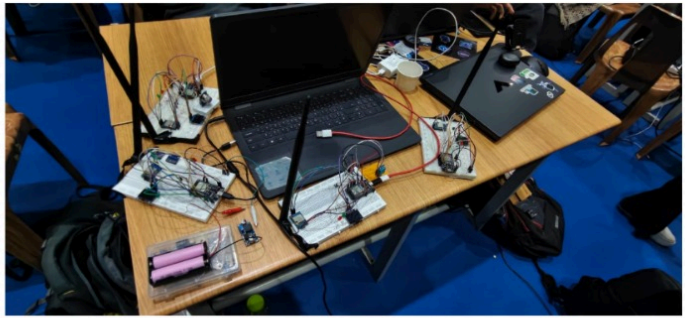
Piechart demonstrating possible network failure data's

- Modern communication systems depend heavily on centralized infrastructure such as the internet, cellular towers, and cloud servers.
- During natural disasters like earthquakes, floods, mining accidents, or oceanic storms, this infrastructure often fails, making real-time communication impossible exactly when it is needed most.
- There is a need for a standalone, offline communication network that can operate independently of existing infrastructure, securely share critical information instantly covering long ranges, and remain functional even if some 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

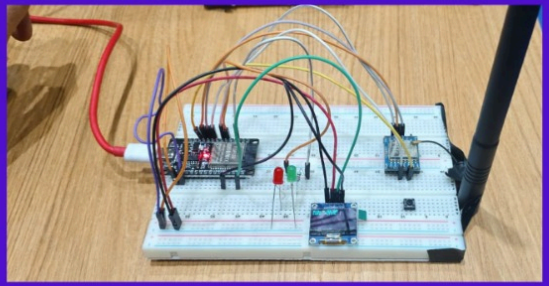
Designed for energy efficiency using short transmissions and sleep cycles, enabling long battery life in remote environments.

SELF-HEALING RELIABILITY

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

DEMONSTRATION 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.



BASE NODE

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

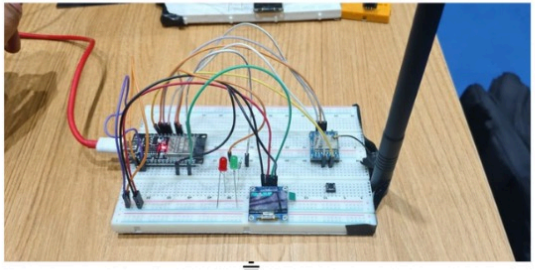
- DHT11
- ESP-32
- LORA SX1278
- LOARA ANTENNAE
- OLED (I2C)

MINE NODE-D

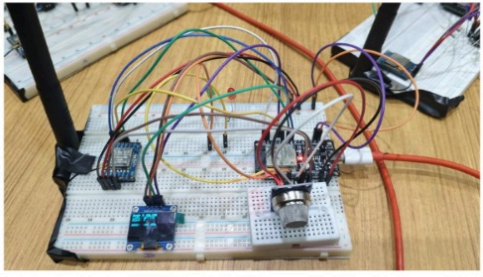
- MQ9
- ESP-32
- LORA SX1278
- LOARA ANTENNAE
- OLED (I2C)

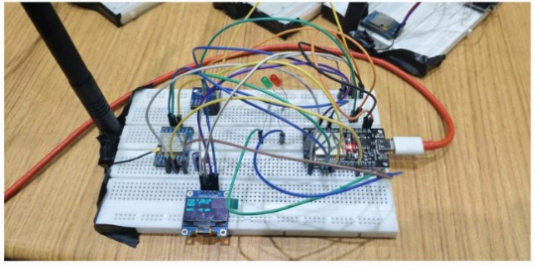
TECHNICAL APPROACH

CITY NODE-A

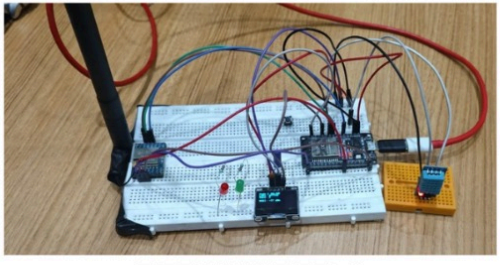


MINE NODE-D



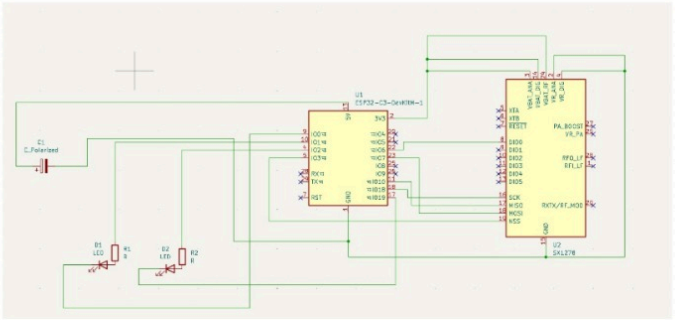


EARTHQUAKE PRONE NODE -B

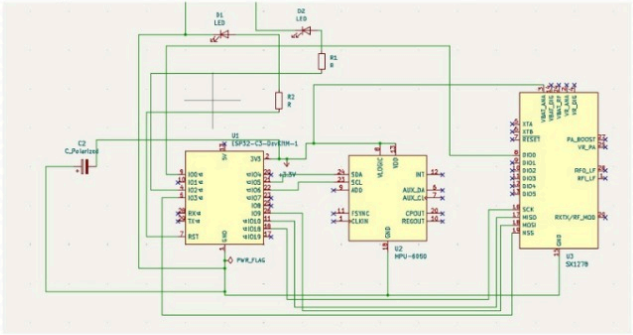


OCEAN NODE-C

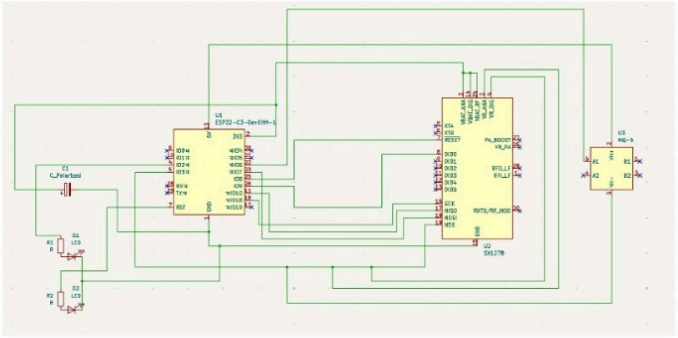
ARCHITECTURE (KI-CAD):



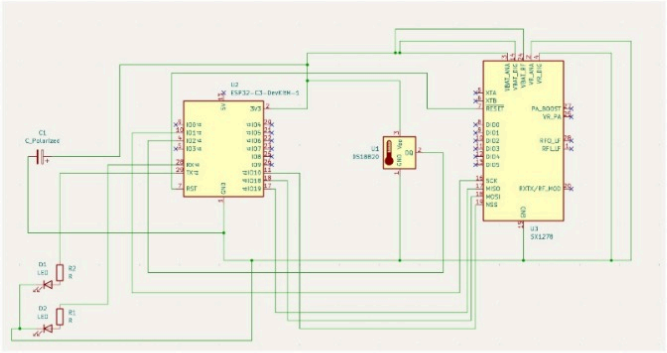
NODE A



NODE D



NODE B



NODE C

Extenral power supply

THANK YOU