

# SMART INDIA HACKATHON 2025



- **Problem Statement ID – 25139**

- **Problem Statement Title-**

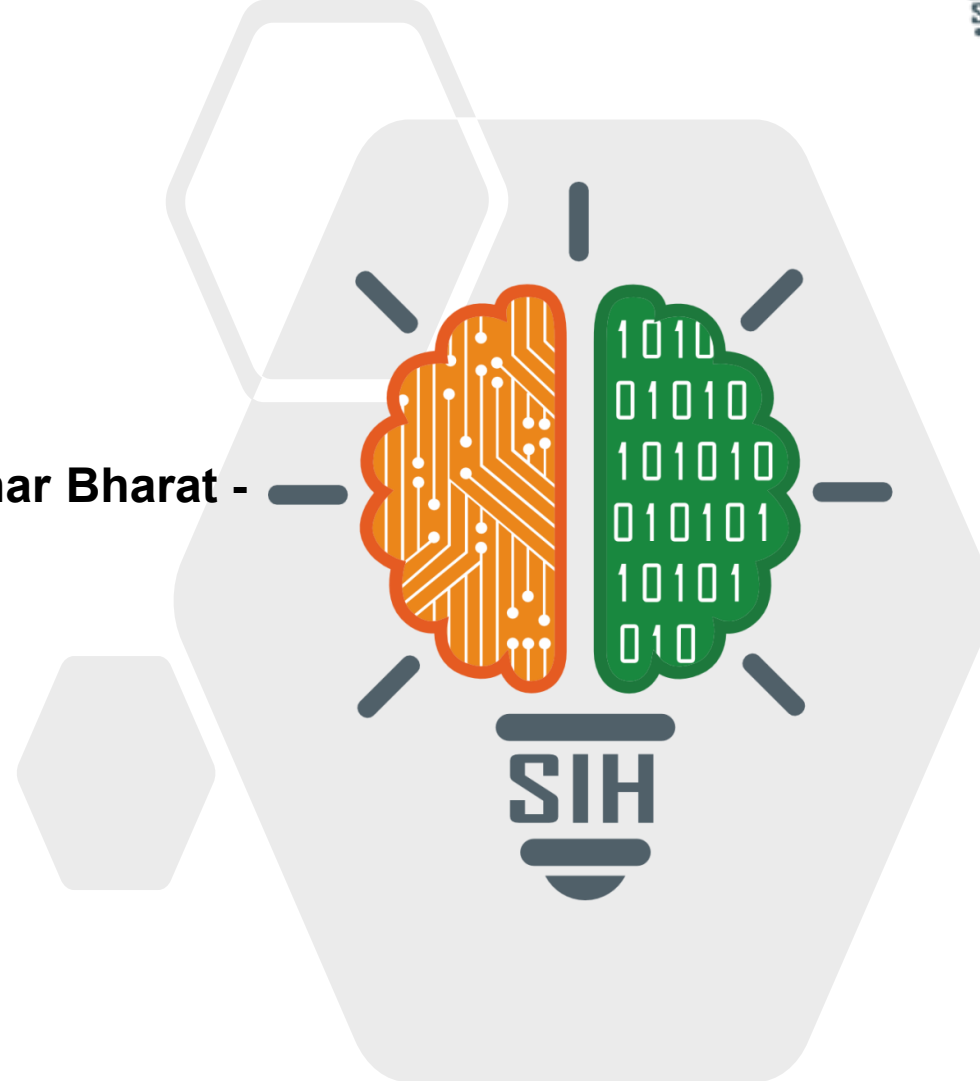
**Student Innovation: Swadeshi for Atmanirbhar Bharat -  
Disaster Management**

- **Theme- Disaster Management**

- **PS Category- Software**

- **Team ID- 92160**

- **Team Name- Obstacle Breakers**



## IDEA / SOLUTION :

**Implementation of a decentralized mesh network for transmitting critical, structured survival data in zero-network disaster zones.**

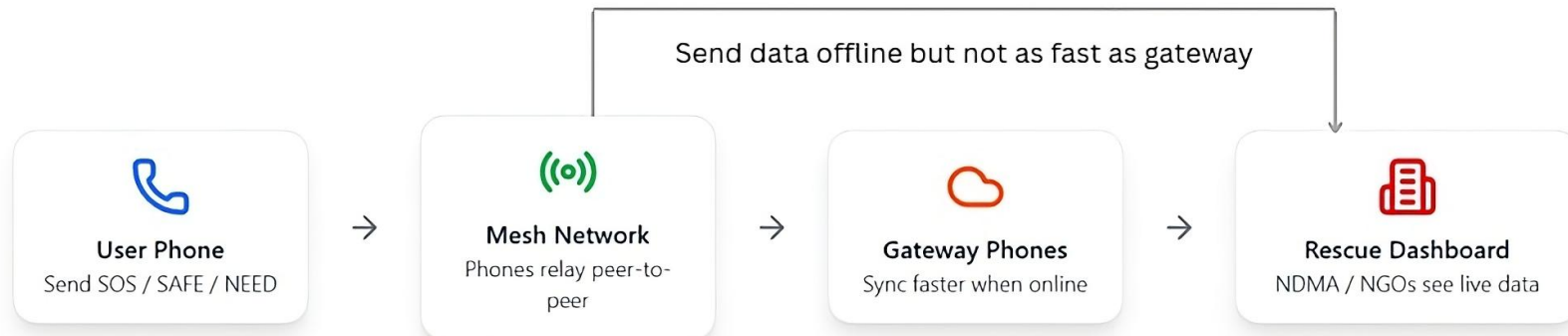
- People can send short, structured messages like **SAFE**, **NEED**, **SOS** for quick help.
- Every phone becomes a **signal carrier** (store-and-forward), passing the message along until it reaches farther areas.
- Special **gateway phones** will upload collected messages to the main server as soon as they get even a little internet.
- The app is made for **emergencies first** – it saves battery with a low-power mode and supports **all regional languages** for local users.

## Problem Resolution :

- Builds a peer-to-peer lifeline when networks fail, so no one is left alone.
- Turns disaster zones into real-time data maps using smart mesh networking.

## Unique Value Propositions (UVP) :

- Shares clear survival messages (SAFE, NEED, SOS) instead of normal chat.
- Every phone helps build a self-healing, citizen-powered network.
- Sends data from offline users to online aid dashboards.
- Works without any external network, with a simple one-tap regional languages interface.



## **Mesh Protocol Development:**

Uses Wi-Fi Direct and custom JSON packets with unique IDs for loop-free, low-power message hopping.

## **Mobile Application Development:**

React Native – Framework used for building the cross-platform app, designed with three modules: UI, Networking, and Gateway Sync.

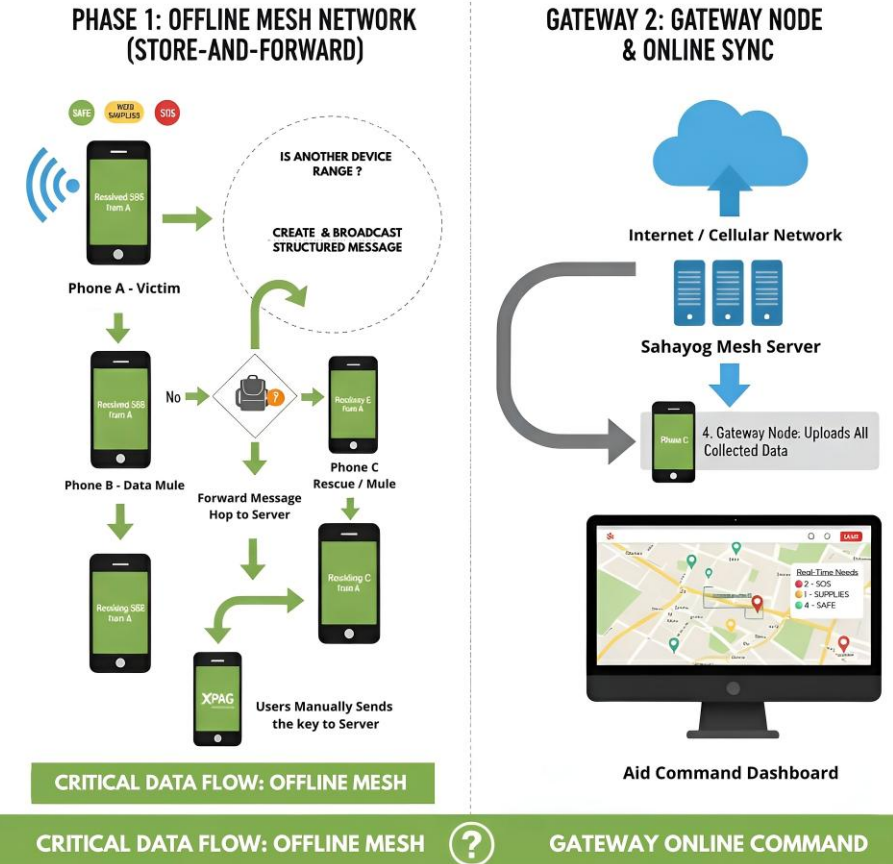
## **Encryption and Security:**

TLS/SSL for all gateway-to-server communication, with native device file-system encryption for secure data storage.





## **Backend & Cloud Infrastructure:**

Node.js & Express.js – High-performance REST APIs for data ingestion.  
MongoDB – NoSQL database with geospatial features to store and query victim location data efficiently.





## SAHAYOG MESH: COMMUNITY LIFELINE






## Analysis of Feasibility :

-  **Technical:** Wi-Fi Direct/Bluetooth mesh + structured SOS packets
-  **Financial:** Low-cost (open-source, smartphones available)
-  **Market:** Citizens, NDMA/NDRF, NGOs
-  **Operational:** Zero-setup, low training, easy deployment in disaster-prone regions.

## Potential Challenges & Risks :

-  **Technical:** Limited mesh range, battery drain, false SOS risk.
-  **Financial:** Scaling infra cost, reliance on govt adoption.
-  **Market:** Awareness + perception as “just another app.”
-  **Operational:** Terrain issues, training for responders.

## Strategies for Overcoming

-  **Methods/Principles:** Hybrid mesh (Wi-Fi + BLE), low-power “disaster mode,” digital signing for SOS.
-  **Algorithms:** Priority-based message queue (SOS > NEED > SAFE).
-  **Strategies:** Govt + telecom CSR partnerships, regional language UI, pre-install in govt/NGO devices.

# IMPACT AND BENEFITS

## Potential Impact

### Positive:

- **Improvement** – Faster rescue coordination & structured survival data.
- **Economical** – Low-cost, works on existing smartphones.
- **New Opportunities** – Integration with NDMA, telecom CSR, NGOs.
- **Social Benefits** – Empowered citizens, reduced panic, trust in community networks.

### Negative:

- **Cost** – Scaling infra (cloud, deployment).
- **Tech Adoption Issues** – Initial resistance, need awareness/training.

## Benefits of the Solution

### Social:

- Improved access to rescue in disconnected zones.
- Community empowerment through structured status sharing.
- Reduction in chaos & duplication of relief efforts.

### Economic:

- More productive relief operations (prioritized SOS = faster action).
- Reduced wastage of resources (supplies sent where needed).
- Opportunity for market partnerships (CSR, govt adoption).

### Environmental:

- Energy efficiency via disaster mode & low-power design.
- Reduced waste of relief materials through better tracking.
- Supports sustainable disaster management practices.

## Research:

- ❖ Disaster Trends in India: Odisha & coastal regions face frequent cyclones & floods → demand for resilient communication.
- ❖ Mesh Networking: Proven in crisis zones (Hurricane Sandy, Nepal Earthquake) → shows reliability when infrastructure fails.
- ❖ Ground Reality: NDMA & NDRF reports emphasize the gap in last-mile communication during disasters.

## Reference:

- ❖ NDMA India – National Disaster Management Authority Guidelines\  
<https://ndma.gov.in/>
- ❖ SOS — Self-Organization for Survival: Introducing Fairness in Emergency Communication to Save Lives  
<https://arxiv.org/abs/2006.02825>
- ❖ Enabling disaster-resilient communication using multi-hop device-to-device framework  
<https://link.springer.com/article/10.1007/s11276-020-02481-2>

## Comparison with Existing Apps

Feature / App	Sahayoga Mesh (Your Project)	Bridgefy	FireChat / FireChat Alerts	Briar	Serval Mesh
Structured Emergency Messages	✅ (Safe / Need / SOS + checklist + GPS)	❌ (Unstructured chat)	❌ (Generic alerts only)	❌ (Unstructured text/posts)	❌ (Generic messaging only)
Multi-hop Forwarding	✅ (Data-mule phone-to-phone)	✅ (Relay hopping)	✅ (Mesh relay)	✅ (Bluetooth/Wifi peer-to-peer)	✅ (Strong multi-hop mesh)
Gateway / Online Sync	✅ (Uploads via gateway node)	⚠️ Partial (some sync)	⚠️ Partial (depends)	✅ (Syncs when internet available)	⚠️ Limited
Localization & Disaster UX	✅ (Odia support, crisis interface)	❌ (Not disaster/local focused)	❌ (No local language/disaster UX)	⚠️ Some UX thought, not disaster-focused	❌ (No disaster UX focus)
Low-Power / Disaster Mode	✅ (Planned low power/disaster mode)	❌ (No dedicated mode)	❌ (Not described)	❌ (No dedicated mode)	❌ (Not described)
Minimal Setup	✅ (Auto-start, no login/pairing)	✅ (Minimal, turn on Bluetooth)	✅ (Simple, minimal setup)	❌ (No login needed)	✅ (Minimal registration)
Aggregated Needs Map	✅ (Planned visual map for rescuers)	❌	❌	❌	❌
Encryption & Security	⚠️ Planned (transit + storage)	⚠️ Some encryption, not full	⚠️ Basic security	✅ Strong privacy & encryption	✅ Strong encryption/privacy