Project Proposal: Emergency Offline Communication System

Problem Statement

Natural disasters such as floods, cyclones, and earthquakes often result in widespread communication breakdowns. During these crises, mobile networks and internet services become unreliable or completely unavailable, isolating affected individuals and communities. This communication failure can delay rescue operations, increase panic, and prevent victims from sending emergency alerts or receiving timely help. In Bangladesh and many other disaster-prone regions, this lack of connectivity becomes a major obstacle to effective disaster response. Therefore, there is a need for a mobile communication system that can operate independently of conventional network infrastructure to ensure that people can still communicate, share locations, and seek help when traditional systems fail.

Introduction

The Emergency Offline Communication System is a proposed Android-based mobile application designed to provide communication capabilities without relying on cellular networks or the internet. It utilizes Bluetooth and Wi-Fi Direct mesh networking to enable peer-to-peer message transmission between nearby devices. This system can help users send SOS alerts, GPS locations, and short text updates during emergencies. By forming a decentralized network, messages can hop between devices until they reach someone with network access or emergency responders, ensuring that no one is left completely disconnected. The project is inspired by real-life disasters where victims could not reach help due to broken networks. Technologies like mesh networking have already proven useful in similar contexts, and this project aims to adapt such technology to the local environment with user-friendly design and reliability. The goal is to create a practical solution that contributes to community safety, resilience, and disaster management.

Project Description

The proposed system will be an Android mobile application capable of establishing an offline mesh network using Bluetooth and Wi-Fi Direct APIs. The app will allow users to send and receive short text messages and SOS alerts within a network of connected devices, even in the absence of mobile data or Wi-Fi connectivity. Each device running the app will act as a node in the mesh network. When a user sends a message or alert, it will automatically propagate through nearby devices until it reaches its destination or a device with internet connectivity. The application will use SQLite for local data storage, ensuring messages are stored securely until delivered. The system will include an SOS feature that lets users send their GPS coordinates with a single tap. Emergency responders or connected users will be able to view these locations on an offline map interface, making rescue coordination easier. Security and privacy will be considered through basic encryption of transmitted messages. The app will also include a user-friendly interface, designed to work efficiently on low-end Android devices, as these are common in developing regions. Battery optimization and offline functionality will be prioritized. The ultimate goal is to build a lightweight, accessible, and reliable emergency communication tool that empowers

communities to stay connected in disaster situations.

Planned Features

1. Offline Messaging: Send and receive text messages without internet or mobile network.

2. Mesh Networking: Automatically connects nearby devices using Bluetooth/Wi-Fi Direct to create a communication chain.

3. SOS Alert System: Allows users to send emergency alerts with GPS location coordinates.

4. Offline Location Sharing: Share and receive locations even without internet access.

5. Local Data Storage: Store messages and logs using SQLite for offline access.

6. Automatic Message Forwarding: Messages hop between devices to reach intended recipients.

7. Encryption: Basic encryption for message security and privacy.

8. Battery Optimization: Efficient use of Bluetooth and Wi-Fi to preserve power during prolonged use.

9. User Interface (UI): Simple, responsive interface suitable for non-technical users. 10. Testing & Evaluation: Real-world simulation to test performance and message delivery range.

Weekly Breakdown of Project Plan (12 Weeks)

Week 1:
Project Research and Requirement Analysis - Study existing offline communication apps (Bridgefy, FireChat). - Identify hardware and software requirements. - Define scope and limitations.

Week 2:
System Design and Architecture - Create system flowcharts and data flow diagrams. - Define mesh network model (Bluetooth + Wi-Fi Direct). - Design SQLite database schema for message storage.

Week 3:
UI/UX Design - Design mockups for login, chat, and SOS pages. - Decide on color schemes and layouts. - Review designs with supervisor for feedback.

Week 4:

Environment Setup and Initial Coding - Configure Android Studio project. - Integrate Bluetooth and Wi-Fi Direct modules. - Set up SQLite database.

Week 5:

Offline Messaging Module Development - Implement message sending and receiving functions. - Test peer-to-peer message transfer between two devices.

Week 6:

Mesh Networking Implementation - Extend communication to multiple nodes. - Test message forwarding across 3 to 4 devices.

Week 7:

SOS and GPS Integration - Implement location tracking and SOS button. - Ensure coordinates can be shared offline.

Week 8:
Message Encryption and Data Handling - Add encryption for transmitted messages. - Handle message queueing and delivery confirmation.

Week 9:
UI Integration and Optimization - Combine backend modules with user interface. - Test smooth navigation and low battery usage.

Week 10:
Testing and Debugging - Conduct tests under simulated network failure. - Fix connectivity and data loss issues.

Week 11:
Documentation and Report Preparation - Prepare user manual, technical documentation, and screenshots. - Record findings from test results.

Week 12:
Final Presentation and Submission - Compile final project report and presentation slides. - Demonstrate live working prototype.

Conclusion

The Emergency Offline Communication System aims to be a vital tool for disaster communication, bridging the gap when conventional systems fail. By using Bluetooth and Wi-Fi Direct mesh networking, it ensures that people can still connect, share information, and send help requests even in the most challenging situations. The project not only strengthens emergency response but also promotes the development of local, low-cost, and sustainable technological solutions. With proper implementation, this system can contribute significantly to disaster management efforts and community resilience.