HUAWEI

Spark Infinity

Huawei Developer Competition

Challenge Name: Mesh Technology

Project Name: Red Flag

Team Name: S T E L L A R I O N

Organization: Mae Fah Luang University

Email/Phone: +66835087266

HUAWEI CLOUD
EVERYTHING AS A SERVICE

Overview

Project Overview

Project Name	Red Flag
Team Name	S T E L L A R I O N
Contacts	6631502028@lamduan.mfu.ac.th
Technical Field	Mobile, Cloud, IoT, Mesh Networking
Technologies	Flutter, BLE, Wi-Fi Direct, Node.js, Cloud Hosting
Keywords	Disaster Response, Crowd Safety, SOS Alert, Offline Mesh, Real-Time Monitoring
Applicable Fields	Disaster Management, Event Safety, Telecommunications, Public Safety, Healthcare
Description (in 200 words)	The system is designed for both flood-prone areas and crowded venues like concerts, festivals, or stadiums, where cellular networks often fail due to overload. Features include priority-based alerts, message deduplication, indoor positioning fallback, multilingual support, and privacy-preserving identifiers. By combining online map monitoring with offline resilience, our project empowers communities to respond faster, coordinate effectively, and ultimately save lives during crises.

Contents

Team Introduction

SWAN HTET

AUNG MYINT MYAT

ARKAR PYAE PHYO

Edu:	Mae Fah Luang University	Mae Fah Luang University	Mae Fah Luang University
Role:	Team Leader	Developer	Developer
Exp:	Project Manager	Frontend Developer	Backend Developer
	HCCDA - Tech Essentials	HCCDA - Tech Essentials	HCCDA - Tech Essentials
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Project Introduction

Project Background

Severe floods and crowded-event incidents often cause network overloads or complete loss of internet, leaving people unable to call for help or receive timely alerts; our solution bridges that gap by combining online map monitoring with an offline phone-to-phone mesh so critical messages still travel when infrastructure fails.

Key Features

- Single HELP button that instantly sends location and emergency status.
- API map monitoring for real-time hazard visualization and responder coordination.
- Offline mesh using BLE/Wi-Fi for peer-to-peer SOS propagation and store-and-forward.
- Gateway support (User Phones) to bridge mesh → internet.
- Priority routing, deduplication, and short TTL to prevent message overload.

Project Introduction

- Indoor positioning fallback, multilingual UI, and privacy-preserving ephemeral IDs.
- Application scenarios
- Flood-prone communities and rural areas with intermittent connectivity.
- Large gatherings: concerts, sports events, festivals, and protests where cellular networks are congested.
- Remote work sites, refugee camps, and disaster relief zones where infrastructure is damaged.

Problems solved

- Delivers SOS and hazard alerts even when cellular or internet services are unavailable.
- Reduces response time by providing precise location and triage metadata.
- Prevents dashboard overload through clustering and priority scoring.
- Lowers false alarms via verification by gateways or authorized staff.

Project Introduction

Target Users

- Affected civilians (General Public) in disaster- and crowd-risk zones.
- Event organizers and venue safety teams.
- NGOs, volunteer rescue groups, and local governments / emergency services.

Technical Architecture

Overview

Hybrid online–offline emergency platform: mobile apps use cloud for real-time map monitoring and responder coordination and form a BLE/Wi-Fi mesh offline so HELP messages can be store-and-forwarded to gateways that upload to cloud.

Key technologies & Collaboration

Flutter + native Kotlin/Swift for UI + mesh; BLE/Wi-Fi Direct for local P2P; Node.js + Kafka/Redis for ingestion & routing; Postgres/PostGIS for geospatial storage; OBS for media; responder web dashboard (React) for dispatch.

Roles of Huawei Cloud

CCE / ECS	GaussDB (Postgres/PostGIS)	DMS / RocketMQ
OBS	FunctionGraph / API Gateway / SMN	Cloud Eye / Logging

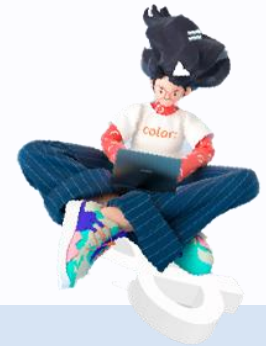
Technical Architecture

Implementation principles

Resilience (Graceful Degradation to Mesh), Security & Privacy by Design (TLS, ephemeral IDs), Battery-Efficient Mesh (Duty Cycles), Priority Triage & Deduplication to Reduce Noise.

Deployment & service Flow

- User taps HELP → compact signed message created.
- Broadcast via local mesh (store & forward).
- Gateway (phone/Raspberry Pi) uploads queued messages when online.
- Cloud API enqueues into DMS.
- Workers dedupe, cluster, score triage, persist in GaussDB.
- Dashboard/notifications dispatch to responders; updates sync back via gateways.

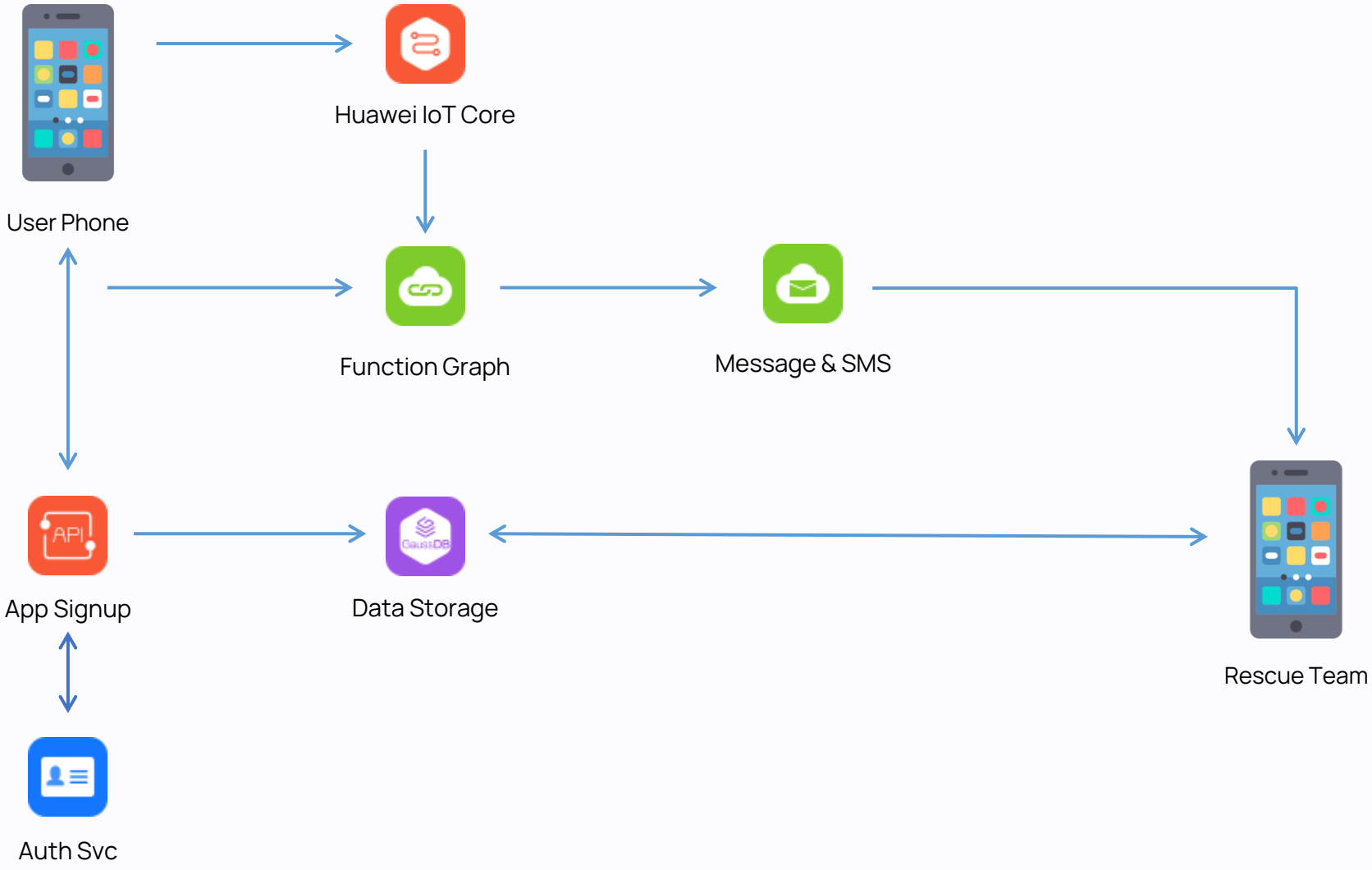


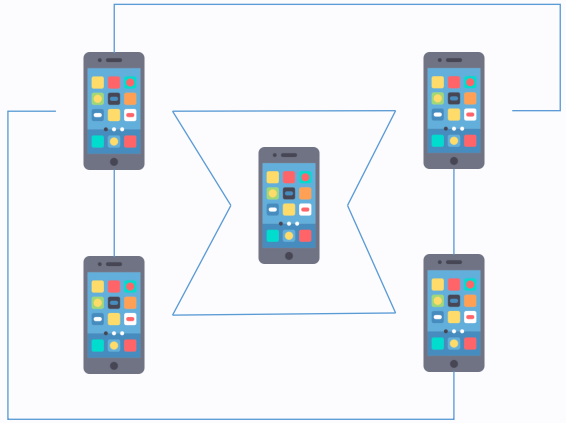
Technical Architecture

Technology Maturity & Roadmap

Core infra (DB, messaging, cloud, maps, BLE) is mature; biggest technical risks are iOS background BLE limits and battery on low-end devices; roadmap: MVP (HELP button, cloud APIs, basic Mesh + Gateway) → mid (Clustering, Media, CAP) → long (Predictive Modeling, LoRa/Satellite Gateways, Telco Integration).

Technical Architecture : Solution Overview





Functions

Overview

Hybrid emergency platform: online map monitoring + offline phone-to-phone mesh for SOS and hazard alerts, with or without internet.

Core Functions

- One-tap HELP: instant SOS with location.
- API Map Monitoring: unified hazard view for responders.
- Offline Mesh (BLE/Wi-Fi): relay messages when internet fails.
- Edge Gateways: volunteer phones verify & forward alerts.
- Triage & Clustering: dedupe, cluster, and score incidents.
- Indoor Fallback & Simple UX: proximity hints + pictograms.

Functions

Uniqueness

- Seamless cloud ↔ mesh fallback.
- Battery & network optimized crowd mode.
- Privacy-first ephemeral IDs.

Demo Flow

HELP → dashboard receives & triages → mesh/verification → rescue dispatched → user updated.

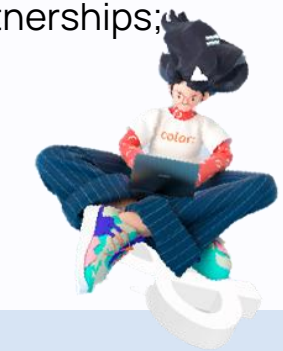
Innovations

Overview

A hybrid rescue platform combining real-time map monitoring with an opportunistic phone-to-phone mesh and gateway verification to deliver reliable one-tap SOS and crowd safety in both networked and network-denied environments.

Requirement & tech prospect analysis

- Requirement: robust cross-platform discovery, low-power mesh, secure E2E message integrity, and scalable cloud ingestion.
- Feasibility: core building blocks (BLE, Wi-Fi, cloud queues, PostGIS) are mature; the hardest limits are iOS background BLE and low-end device variability.
- Prospect: short-term win via Android-first + gateways; mid-term growth via LoRa/satellite gateways and telco/CAP partnerships; long-term value from predictive risk models and analytics.



Innovations

Original innovations / technical breakthroughs

- Hybrid verified-mesh model: first-line mesh propagation plus gateway verification to reduce false positives and guarantee higher delivery confidence.
- One-tap UX that abstracts network state: identical user experience whether online/offline, minimizing human error in panic.
- Adaptive crowd mode: density-aware duty cycles and priority routing to scale in thousands-person venues without mesh overload.

Business Value

Social & Business Impact

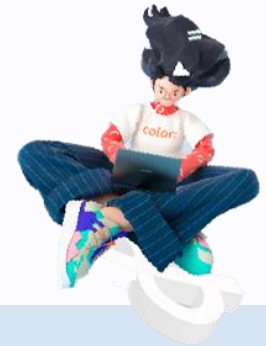
- Rapid disaster response saves lives and reduces damage.
- Empowers communities in flood-prone and low-connectivity areas.

Business Model & Profitability

- Partnerships with governments, NGOs, and rescue organizations.
- Scalable and cost-effective deployment using existing smartphones.

Opportunities & Market Strategy

- Addresses gaps in offline-capable emergency communication.
- Tech selection: BLE/Wi-Fi mesh + cloud APIs + edge verification.
- Market promotion via disaster preparedness campaigns.
- Collaborate with local authorities, NGOs, and volunteer networks.
- Fully compliant with privacy laws and disaster-response regulations.



Demo & Follow-up Plan

Follow-up plan

Stepwise rollout from prototype → pilot → scale-up with partners (NGOs, gov agencies, telecoms).

Prototype / Pilot / Scale-up	Challenge	Solution
Build core mesh + SOS	Reliability	Edge Verification
Small-scale field test	Adoption	Simple pictogram UI + Training
Nationwide deployment	Coverage	Volunteer gateway network + partnerships

Steps & Timeline

0–6 months
MVP Prototype
Lab testing.

6–12 months
Pilot in flood-prone region
with NGO/gov support

12–24 months
Expand to wider regions,
integrate more APIs, refine UI.

24+ months
Regional scale-up across APAC
with compliance certifications.

DEMO

Achievements of this Project

1st Runner Up
Code For Hope Hackathon 2025

Shortlisted Team (On-going)
UNDP Civic Tech Innovation Challenge 2025

THANK YOU

Asst.Prof. Suppakarn Chansareewittaya, Ph.D.

Asst.Prof. Teeravisit Laohapensaeng, Ph.D.

Kemachart Kemavuthanon, Ph.D.

Titiya Chomngern, Ph.D.