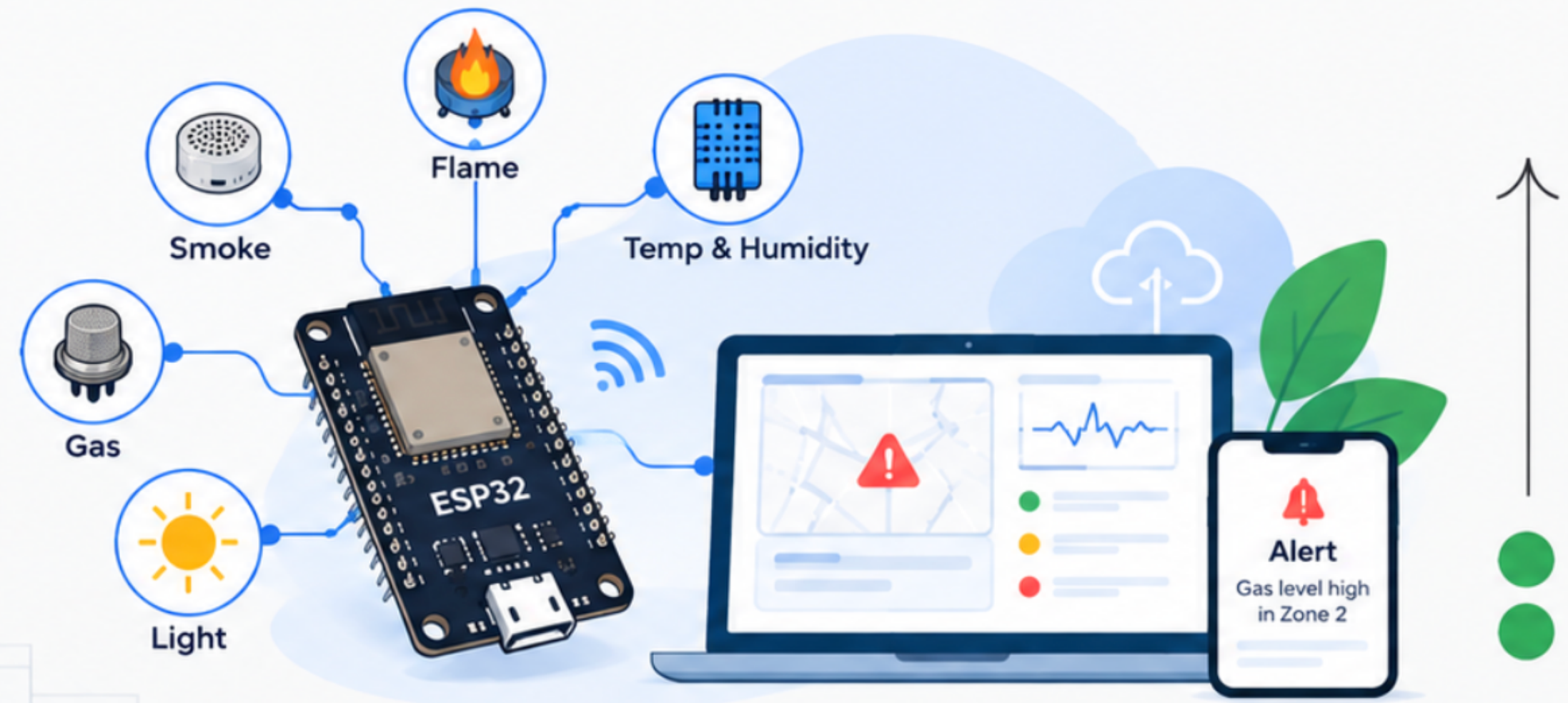


UnifyOS

AI-Powered Environmental Safety System

Real-time monitoring. Smarter alerts. Safer spaces.



Team Details

- a. **Title:** *UnifyOS: Building an AI-Powered Emergency Response System for Smart Venues*
- b. **Author Name:** *Sadia Peerzada*
- c. **Conference:** *Raptors Conference*



UnifyOS complies
with 4 UN SDG

What is UnifyOS ?

UnifyOS is an AI-powered IoT emergency response platform that enables real-time crisis coordination in hospitality venues. It combines smart panic buttons, distributed sensors, and AI triage to coordinate guests, staff, and first responders in seconds—reducing emergency response time from minutes to seconds and preventing chaos during critical incidents.

What makes our solution different from the existing ones?

USPs of our solution...

Features	UnifyOS	Fire Alarm	SMS/Push Alerts
Physical Panic Button	✓ Yes	✗ No	✗ No
Real-Time Location Tracking	✓ Yes (room-level)	✗ No	✗ No
AI Triage & Severity Scoring	✓ Yes (Gemini API)	✗ No	✗ No
Multi-Sensor Detection	✓ Yes (smoke, motion, audio, crowd)	Limited (smoke only)	✗ No
Staff + Guest + 911 Unified	✓ Yes (single dashboard)	✗ Separate systems	✗ Partial
Crowd Density Detection	✓ Yes (ultrasonic + audio)	✗ No	✗ No
Offline Resilience	✓ Yes (local storage)	✓ Yes	✗ No
Multilingual Alerts	✓ Yes (Google Translate)	✗ No	⚠ Partial
Post-Incident PDF Report	✓ Yes (auto-generated)	✗ No	✗ No
Cost Per Device	✓ ₹1,400	₹25,000-1,50,000	₹5,000-35,000



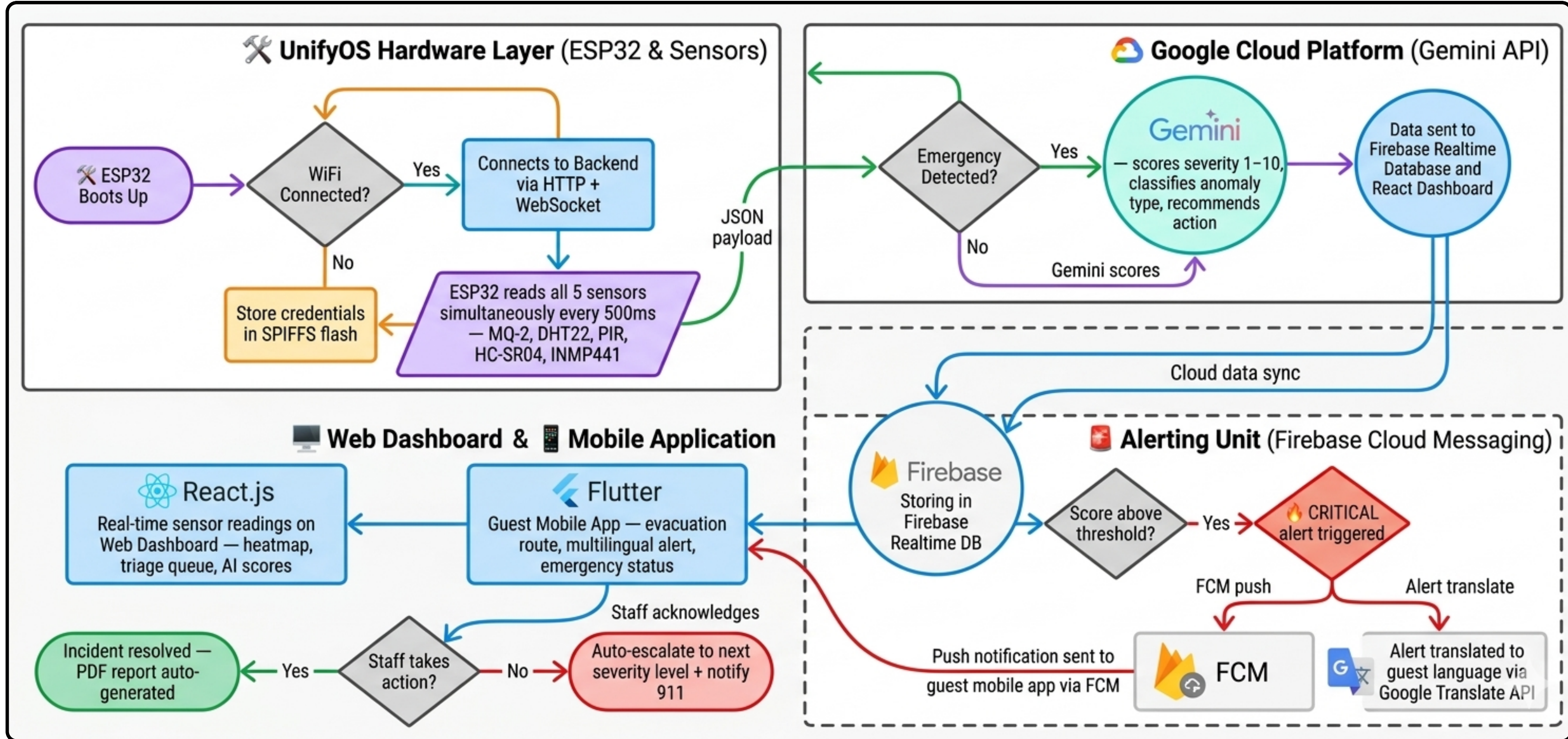
 HARDWARE	 MOBILE APP
 Smart Panic Button (ESP32 + 12mm Red Button) - Physical emergency trigger on device	 Real-Time Emergency Alerts - Instant push notifications when panic button pressed or anomaly detected
 Multi-Sensor Detection - MQ-2 (smoke/gas), DHT22 (temperature), PIR (motion), HC-SR04 (crowd), INMP441 (audio)	 Smart Evacuation Routes - AI-suggested safest exit based on crowd density heatmap & hazard zones
 Real-Time Cloud Sync - WiFi-enabled data transmission to Firebase via WebSocket for instant updates	 Live Status Dashboard - "Alert received" → "Staff notified" → "Help coming" real-time status feed
 Offline-First Architecture - Alerts stored locally (SPIFFS), retry when WiFi reconnects	 Multilingual Support - Google Translate API detects guest language, alerts in native tongue
 AI-Powered Triage - Sensor data sent to Gemini API for real-time severity scoring (1-10)	 Accessibility Features - High contrast, large text, screen reader support for all guests
 Low Power Design - 4xAA battery (8-10hrs) or USB powered for continuous operation	 Cloud-Powered - Works anywhere with Google Cloud Run & Firebase hosting

How will it be able to solve the problems?

- **Reduces** emergency response time from **3-5 minutes to <10 seconds** via real-time alerts.
- **AI triage** ensures highest-priority incidents are handled first (**severity scoring 1-10**).
- **Works offline**—alerts stored locally & synced when **WiFi returns (offline-first architecture)**.
- Accessible to all guests—**multilingual, high contrast, screen reader support**, no tech required.
- Coordinates **3 groups (guests + staff + 911)** in ONE unified system (eliminates silos).

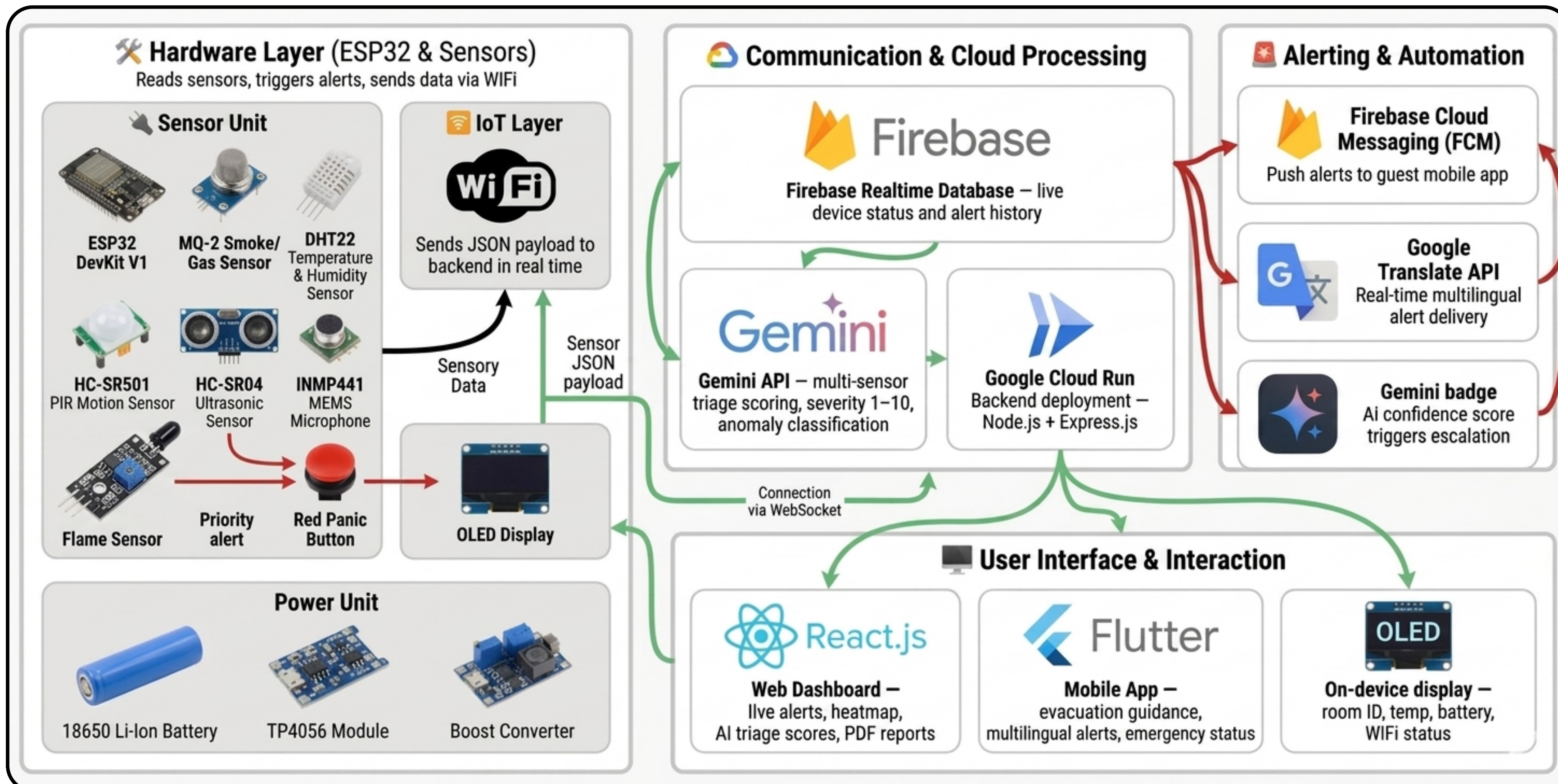


Process-Flow Diagram



Architecture Diagram

Building Blocks of our Solution





Technologies to be used in the solution

we've integrated cutting-edge tech in UnifyOS across various domains to ensure scalability and reliability

CATEGORY	TECHNOLOGIES USED
Hardware & IoT	ESP32 DevKit V1, MQ-2 Smoke/Gas, DHT22 Temp & Humidity, HC-SR501 PIR, HC-SR04 Ultrasonic, INMP441 Mic, Flame Sensor, OLED Display, Panic Button, Buzzer, RGB LEDs, TP4056, Boost Converter, 18650 Li-Ion Battery
Firmware	Arduino C++ (Arduino IDE), ESP32 FreeRTOS, SPIFFS Offline Storage, I2S Audio Protocol, HTTP POST over WiFi
Backend & Database	Node.js, Express.js, WebSocket, REST API, PDFKit, Firebase Realtime Database, Firebase Firestore
Frontend & Mobile	React.js Web Dashboard, Web Speech API, React Native / Flutter Mobile App
AI & Automation	Gemini API (Vertex AI) – multi-sensor triage scoring, severity 1–10, action recommendation
Google Services	Firebase Cloud Messaging (FCM), Google Translate API, Google Cloud Run, Firebase Authentication, Google IAM
DevOps	Replit (development), GitHub

 **Google Technologies Used**



Gemini API
For multi-sensor triage scoring, severity detection and anomaly classification.



Google Translate API
For real-time multilingual emergency alerts to guests.



Firebase
Firebase Authentication, Firebase Realtime Database, Firebase Cloud Messaging (FCM)

 **Google Cloud Platform**



Google Cloud Run
For backend deployment and scalability.



Firebase Realtime Database
For live device status sync and real-time alert streaming to dashboard.



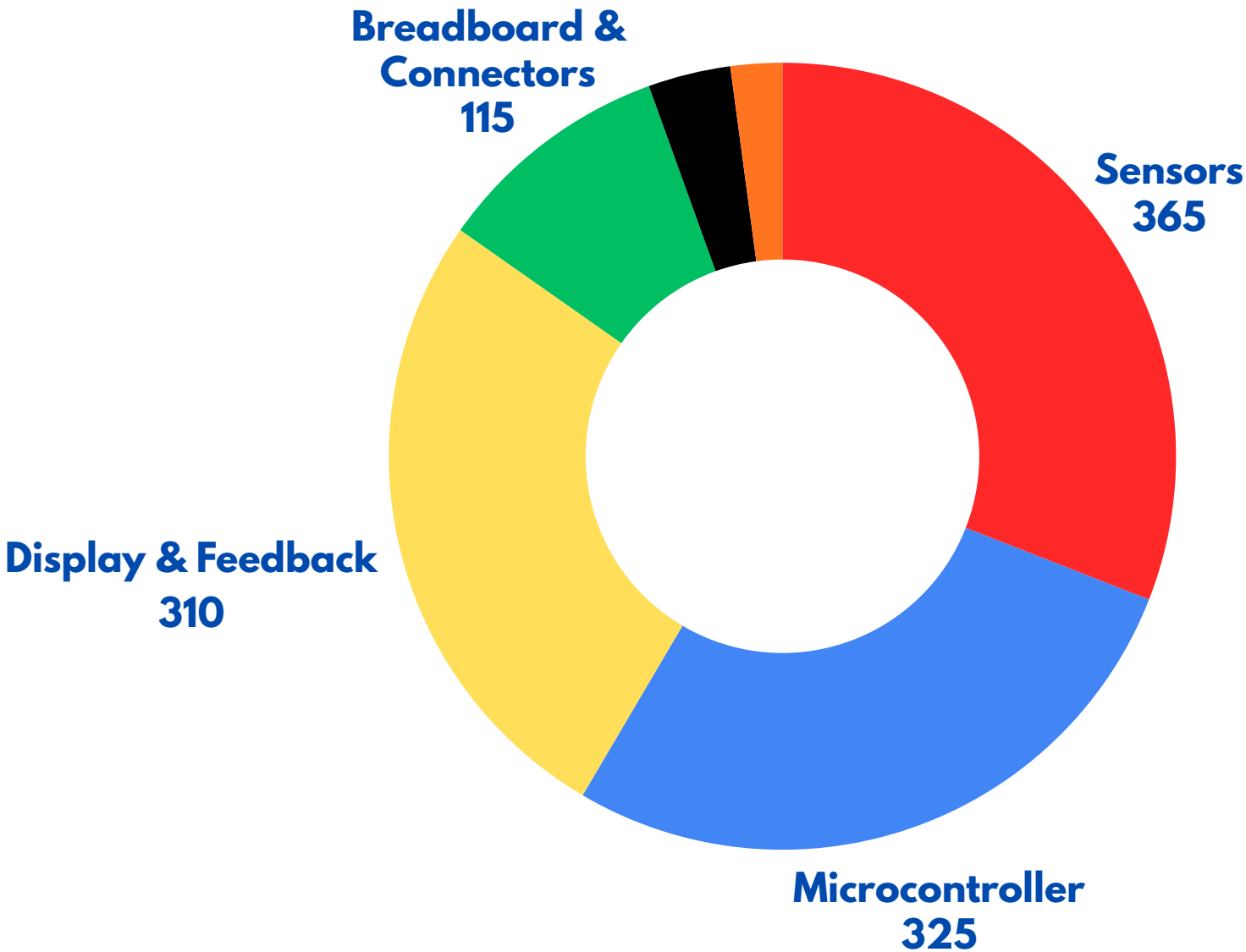
Google IAM
For access control and security.



CATEGORY	COST (INR)
Sensors & Microcontroller	
ESP32	₹325
MQ-2 Smoke/Gas Sensor	₹100
DHT22	₹229
PIR Sensor	₹70
Flame Sensor	₹35
INMP441 Microphone	₹5
Display & UI	
0.96" OLED Display (I2C)	₹150
Red/Green/Blue LEDs	₹10
Active Buzzer	₹10
Electronics	
Jumper Wires	₹40
220Ω Resistors	₹10
10K Resistors	₹10
10K Potentiometer	₹15
Female Headers	₹20
PCB Perfboard	₹140
Soldering Iron	₹15
Solder Wire	₹70
App / Cloud	Free
TOTAL	₹1,254

Estimated Implementation Cost

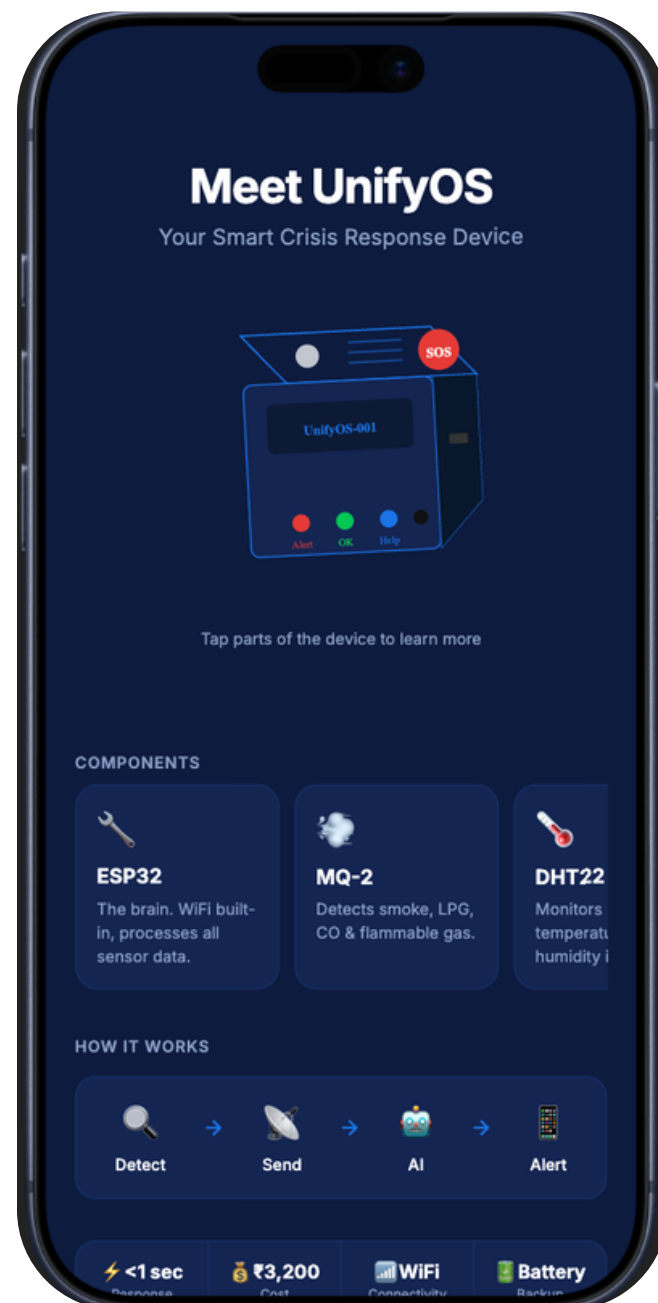
*cost of batteries not included



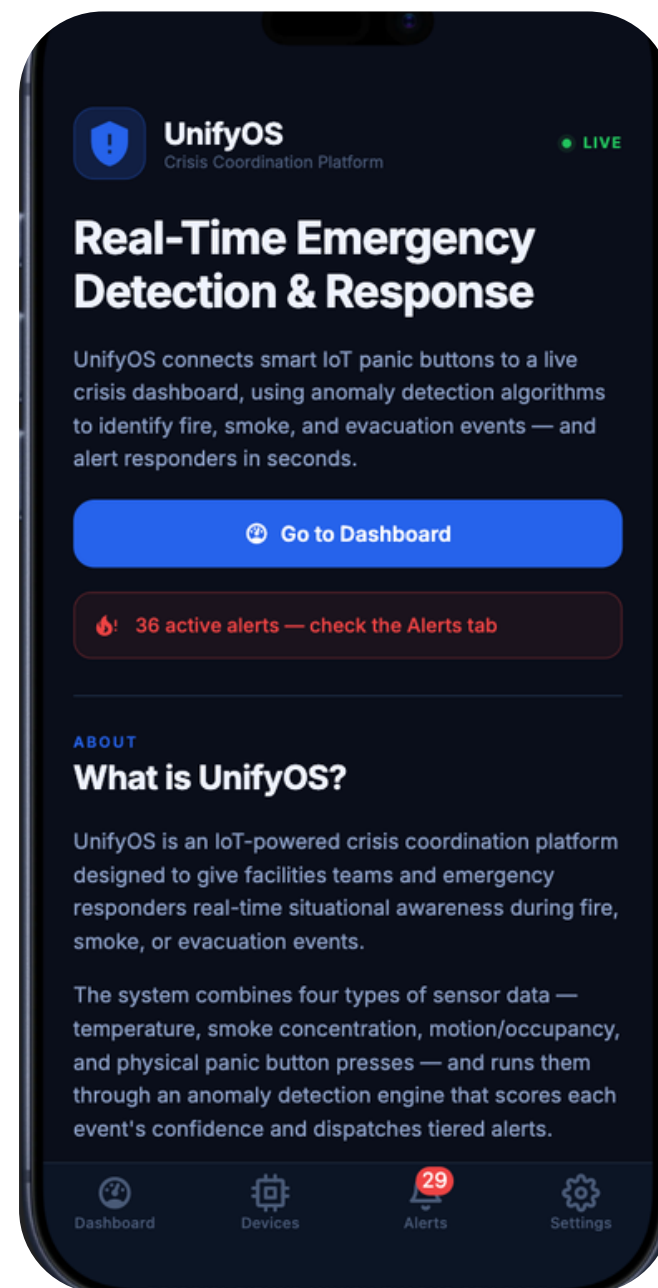


Snapshots of the MVP

1. Device Setup



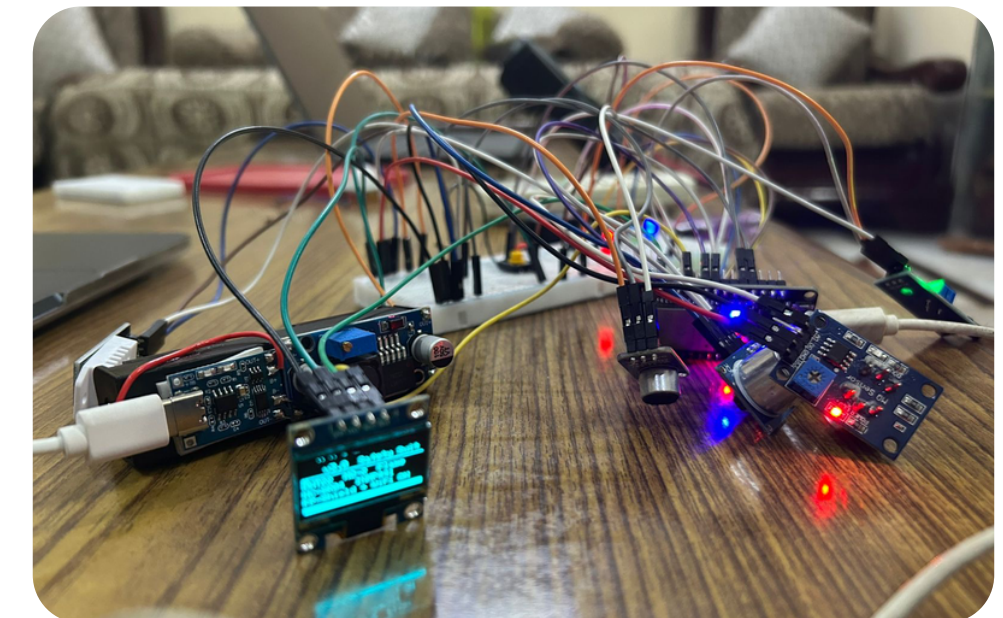
2. Home Page



3. Anomaly/Device Monitoring



4. Hardware Casing look & Prototype



Future Developments

- **UnifyOS Agent** — autonomous *Gemini AI* that coordinates full emergency response without human input
- **Mesh Network** — ESP32 nodes communicate directly, system works even when *WiFi is down*
- **Computer Vision** — *camera module* detects fire and collapsed persons visually
- **Predictive Alerts** — *ML model* predicts emergencies *10–15 mins* before they happen



UnifyOS

Sense • Detect • Respond

Thank You

For your time and support



Safer
Environments



Smarter
Technology



A Safer
Tomorrow

