



ResQMe

An Intelligent Cyber-Physical Emergency Response System:
automatic detection, context hand-over and drone-assisted response

[Team member names]

[Department], [University] · [Course code and name] · Supervisor: [Supervisor]

STACK
SwiftUI app (iOS 26) · Node.js /
Express · Socket.IO · PostgreSQL 16
· Python FastAPI

SETTING
Dubai, UAE. Drones simulated;
satellite gateway proposed.



Source code
github.com/
Manavarya09/ResQMe

1 Abstract

ResQMe is a working prototype that gets the context of an emergency to responders automatically. An iOS app raises an alert from a hold button, an on-device fall and crash detector, a walk-route deviation or a missed check-in. After a short cancel window it sends live location, an encrypted Medical ID, a scene description with photo and audio, and responders chosen for the caller's profile and position. A web console acknowledges the alert, dispatches a simulated drone and hands off an SBAR report. Without signal, the alert can travel as one signed SMS over a proposed satellite gateway.

2 Problem & Motivation

In the first minutes after an accident, crime or medical event, response is limited by information more than by vehicles. The proposal names six gaps:

- victims located late
- no pre-arrival assessment
- no medical data on arrival
- unaware of nearby threats
- fragmented coordination
- untrained bystanders

Existing safety apps are mostly manual alert buttons.

3 Objectives

- Alert in one gesture, or automatically, with a cancel window.
- Location, Medical ID and scene evidence to responders before arrival.
- A live console: acknowledge, drone reconnaissance, handoff.
- Guidance until help arrives: first aid, CPR, a calm voice.
- Work offline; encrypt data at rest [6]; TOTP [3] and app lock.

5 Methodology & Key Algorithms

5.1 Escalation state machine

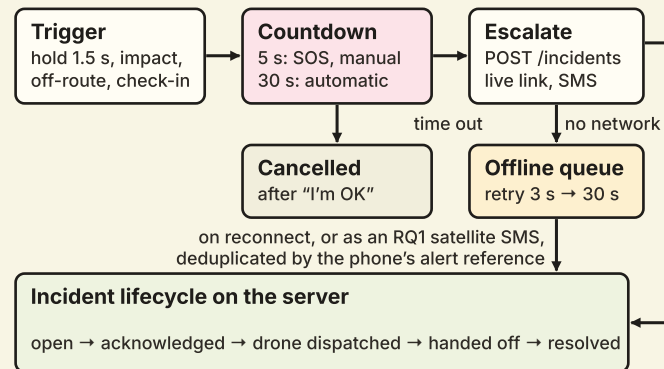


Fig. 2: All triggers share one countdown (5 s for SOS, 30 s for impact). Scene capture runs in parallel, so it never delays the alert.

6 Features: the iOS App



Fig. 5: iOS 26 simulator against the live backend (demo data, Dubai). Also built: AI first-aid guide with 8 training videos and a 110 bpm CPR pacer; Simli avatar [7] with on-device voice fallback; live location links; silent SOS, crime reports, evidence locker and safety heatmap; "home safe" check-in; Apple Health import; TOTP and Face ID lock; responder mode.

8 Evaluation & Results

Component	Framework	Tests	Pass
Backend, 20 suites	Jest, Supertest	254	254
ai-service	pytest	74	74
iOS app logic	Swift Testing	104	104

Backend and ai-service re-run 8 Oct 2026. iOS suite run on the iOS 26 simulator, 8 Oct 2026.

Talking avatar (measured)	Time
First video frame, LiveKit	2.4–3.1 s
First video frame, peer-to-peer	4.7 s
Audio to lip-sync	0.25–0.4 s

Development measurements from Dubai, not a controlled benchmark.

Verified end to end

- SOS → acknowledge → drone → handoff → resolve, live on the phone.
- Both Walk With Me modes and the off-route alert.
- Matching RQ1 test vectors on phone and server.

4 System Architecture

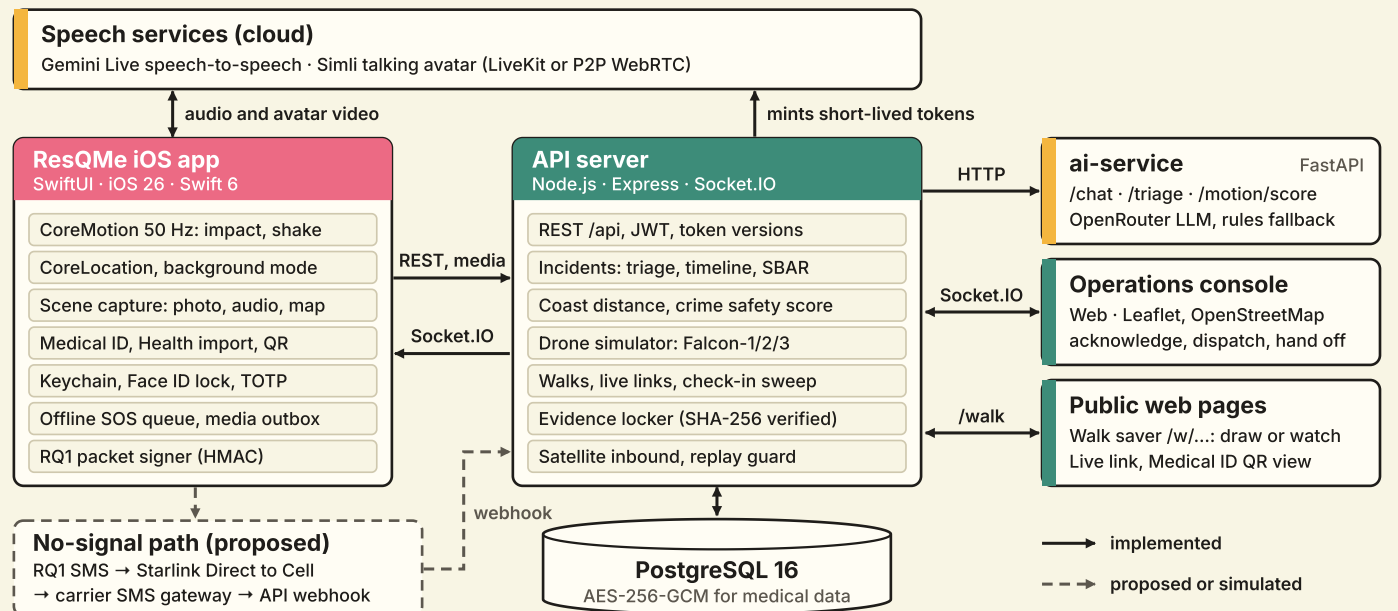


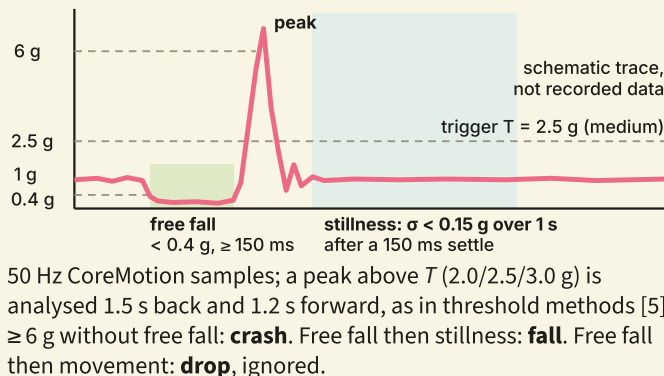
Fig. 1: The phone talks to one API over HTTPS and Socket.IO. Keys for the LLM, Gemini and Simli stay on the server, which mints short-lived session tokens. Drones run in a server-side simulator; the satellite path runs through a simulation endpoint.

4.1 No-signal SOS packet (RQ1)

RQ1 | S10ZR0 | a7k2m9q4xz | S | 25.19721 | 55.27437 |
15 | 0+ | PA | 1791410694 | c43235881d2067cf

Proposed for Starlink Direct to Cell [7]. Version, key id, alert ref, trigger, lat, lng, accuracy, blood type, responders, time, MAC: the first 8 bytes of HMAC-SHA256 [2] under a per-user key kept in the Keychain. 77 characters here, about 120 at worst: one GSM-7 SMS. Bad MACs, packets over 30 min old and replays are rejected.

5.2 Impact and fall detection



50 Hz CoreMotion samples; a peak above T (2.0/2.5/3.0 g) is analysed 1.5 s back and 1.2 s forward, as in threshold methods [5]. ≥ 6 g without free fall: **crash**. Free fall then stillness: **fall**. Free fall then movement: **drop**, ignored.

Fig. 3: Features used by the on-device detector.

5.3 Responder planner and coast check

Rule	Score
Police, Ambulance base	+2 each
Condition on Medical ID	Amb. +10
Age ≥ 65	Amb. +8
≤ 1 km from coast / in water	CG +5 / +20
Crime / fire nearby	+6 / +4

Score ≥ 2 is pre-selected. The server takes the minimum point-to-segment distance d to a 41-vertex UAE coastline; the cross-product sign gives sea or land. Near = in water or $d \leq 1$ km.

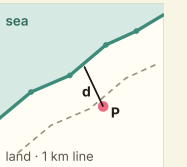


Fig. 4: Coast Guard is offered at JBR beach, 214 m from shore, but not in Downtown Dubai, 3.4 km inland (Fig. 5b, Fig. 6).

7 Operations Console

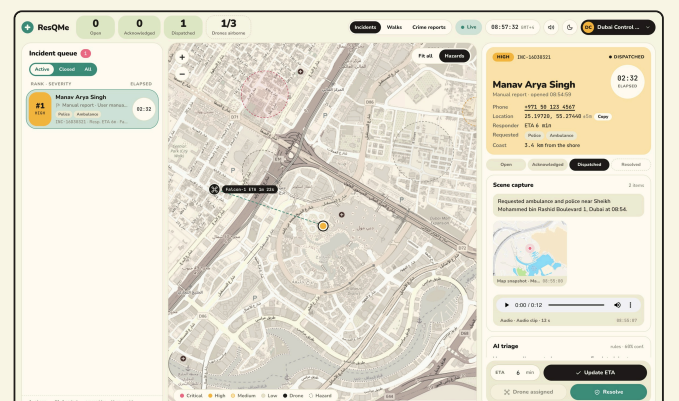


Fig. 6: High-severity alert in Downtown Dubai, acknowledged (ETA 6 min) with drone Falcon-1 en route: queue, live map, and incident detail with the auto-generated scene description, map snapshot and audio. Handoffs follow SBAR [4].

11 References

- [1] UAE Government portal, "Handling emergencies" (999, 998, 997, 996), u.ae, accessed 8 Oct 2026.
- [2] H. Krawczyk, M. Bellare, R. Canetti, "HMAC," RFC 2104, 1997.
- [3] D. M'Raihi et al., "TOTP," RFC 6238, 2011.
- [4] K. M. Haig et al., "SBAR: a shared mental model...", *Jt. Comm. J. Qual. Patient Saf.* 32(3):167–175, 2006.
- [5] A. K. Bourke et al., "Evaluation of a threshold-based tri-axial accelerometer fall detection algorithm," *Gait & Posture* 26(2):194–199, 2007.
- [6] M. Dworkin, "Recommendation for block cipher modes of operation: GCM and GMAC," NIST SP 800-38D, 2007.
- [7] Google, Gemini Live API (ai.google.dev); Simli API (docs.simli.com); SpaceX, Starlink Direct to Cell (starlink.com). Accessed Oct 2026.

12 Acknowledgements

We thank [Supervisor] and [Department, University]. Map data © OpenStreetMap contributors; first-aid videos by the British Red Cross and St John Ambulance. Scan the QR code (top right) for the source code: github.com/Manavarya09/ResQMe.

9 Limitations & Future Work

- Drones simulated; satellite SOS needs a carrier partner and TDRA approval; dispatch needs CAD integration.
 - Crash detection runs only in the foreground on iOS.
 - No push notifications yet; iOS needs a tap to send SMS.
 - Crime data seeded or community-reported; coastline approximate.
 - No user study; detector not yet measured on real falls.
- Next: field trial with responders, recorded fall dataset, Apple Watch, official feeds, hosted deployment.

10 Conclusion

An ordinary phone can gather what a responder needs (where, who, what happened, which service) within an alert's cancel window. ResQMe covers detection to handoff, works offline and is backed by 432 automated tests. The remaining work is partnerships and evaluation with real responders. The AI supports emergency services and never replaces them [1].