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Smart Emergency Response and Ambulance Assistance System

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***Abstract*—In a road accident or medical emergency the first few minutes matter most, and they are often wasted. The victim may be unconscious and unable to say who they are or what conditions they have. Bystanders rarely know whom to call. If several of them phone for help about the same crash, dispatchers receive overlapping reports that someone has to sort out by hand, and language differences between callers and responders add more delay. We present ResQAI, an Android-based emergency coordination platform that tackles these problems with a single incident record shared by victims, bystanders and responders. Every registered user gets a unique Emergency ID and a matching QR code. Scanning the code shows a bystander or responder only what is needed for immediate help, not the rest of the person's data. Reports about the same event are matched and grouped under one Incident ID, which cuts down duplicate dispatch requests. The app records GPS location and basic incident details, supports several languages, and, if the user has given permission, can bring in verified health information such as ABHA records from the Ayushman Bharat Digital Mission. From this information the system estimates how severe the incident is and prepares a structured summary for the right service: ambulance, police, or rescue and traffic units. ResQAI is meant to work alongside India's ERSS 112 service and professional medical care, not to replace them. We describe the architecture, the data flow and a six-step implementation process covering registration, reporting, QR identification, incident creation and duplicate linking, assessment, and response and closure. We also propose how the system should be evaluated: response time, information accuracy, incident-matching accuracy, communication success and usability. This paper presents the design and the evaluation plan only; we report no measured results.**

***Index Terms*—Emergency response, incident management, Android application, emergency QR, duplicate detection, multilingual communication, ambulance coordination, Kotlin, Spring Boot**

I. Introduction

Fast, coordinated response matters a great deal in road accidents and medical emergencies, but a few practical problems keep slowing it down. Victims are often unconscious or confused and cannot tell anyone who they are or what their medical history is, and the people who stop to help usually cannot find out either. Often several people at the scene call emergency services separately, so responders receive overlapping reports that they have to reconcile by hand.

ResQAI addresses these gaps with one coordination layer that connects victims, bystanders and responders through a single incident record. It is intended to run alongside existing infrastructure such as India's ERSS 112 service, as a layer for coordination and information rather than a substitute for professional emergency response.

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A. Novelty and Key Contributions

Existing tools usually offer identification, location sharing or emergency reporting as separate features that are not tied to a shared incident. This work makes the following contributions:

1) *Incident-Centric Coordination:* One Incident ID ties together the reports from victims, bystanders and responders, so several reports about the same accident become a single record instead of several separate events.
2) *Emergency ID and Privacy-Preserving QR:* Each user has a unique Emergency ID and QR code. Scanning it gives a bystander or responder only the information the user has authorized for emergencies.
3) *Multilingual Communication:* Information is organized and shown in several languages, so reporters, victims and responders are less likely to misunderstand one another.
4) *Authorized Health-Information Context:* Verified health information is added to a report only if the user has allowed it, so medical context is available without giving up privacy.
5) *Structured Emergency Assessment:* The collected details are used to estimate severity and to send a structured report to the right ambulance, police, or rescue and traffic service.

II. Literature Review

Most earlier work looks at one piece of the problem at a time. India's Ayushman Bharat Digital Mission issues the ABHA number, a digital health identifier that allows authorized access to health records [1]. In an emergency such records could give useful medical context, as long as authorization and privacy are respected. On the response side, the Emergency Response Support System (ERSS) runs the single emergency number 112 and brings voice calls, SMS and SOS alerts into one central dispatch service [2]; its mobile app adds location-aware alerts [3]. These channels depend on the victim or a nearby person having a working phone and being able to describe what happened. Mobile SOS apps likewise offer location sharing, emergency contacts and alerts, but when several people report the same accident they can still produce duplicate or uncoordinated requests.

Work on language models in healthcare adds another angle. A systematic review of large language models in patient care [4] points to growing interest in clinical settings. The World Health Organization (WHO) guidance on prehospital emergency care stresses timely, well-organized care before the patient reaches hospital [5], and help from bystanders matters most when the victim is unconscious, injured or unable to communicate.

Wider surveys cover the applications, advances and challenges of large language models in medicine and healthcare [6], and a scoping review summarizes how they are used in medicine [7]. Research on compact models shows that language models with under a billion parameters can be tuned to run on a device [8], and another review looks at transformer-based models in healthcare [9]. Together these suggest that language support and structured summaries are becoming realistic for time-critical uses such as emergency reporting, although their reliability has to be established before anyone relies on them for clinical decisions.

At the population level, the WHO Global Status Report on Road Safety 2023 [10] documents how many people are harmed by road traffic injuries, which is why the speed and quality of the first response to road accidents remain a public-health concern.

Research Gap: Current systems tend to handle victim identification, location sharing, duplicate handling, health-record access and language support separately rather than around a common incident. What is missing is a platform that connects victims, bystanders and responders through one incident. ResQAI fills this gap by combining an Emergency ID, a privacy-preserving QR code, incident management, duplicate detection, location capture and multilingual communication.

III. System Architecture and Workflow

ResQAI uses a centralized architecture built around the incident. Four kinds of participants take part: victims, bystanders, emergency responders and platform administrators. Instead of treating each report as a separate transaction, the system sends every report, location, Emergency ID reference and any authorized supporting information through one processing pipeline. The pipeline classifies the incident and detects duplicates, then forwards a single consolidated, structured record to the appropriate response service.

A. Workflow Diagram

At a high level, an accident leads to a report from the victim (through the app, a scanned QR code or their Emergency ID) or from a bystander (a GPS-tagged report). These reports go into an incident engine that detects duplicates, identifies the victim and, where authorization allows, checks medical data against ABHA-linked records. The structured result goes to a decision layer that classifies the emergency and routes it to the relevant service (ambulance/EMS, police, or rescue and traffic), and the hospital receives the relevant details as needed. Fig. 1 shows the whole flow.

B. Implementation Architecture

Fig. 2 shows how the prototype implements this workflow in four tiers. The Android app contains everything a phone owner needs when there is no data connection: a Room database holding the local emergency profile, a Kotlin rule-based engine that classifies the emergency through a short dialogue, live GPS with an optional offline PIN-code lookup, an on-device message builder with Android text-to-speech, a call manager that dials the configured emergency number over the normal cellular network, and a WorkManager queue that retries pending reports when connectivity returns. A bystander uses an online client to scan the victim's Emergency QR code,

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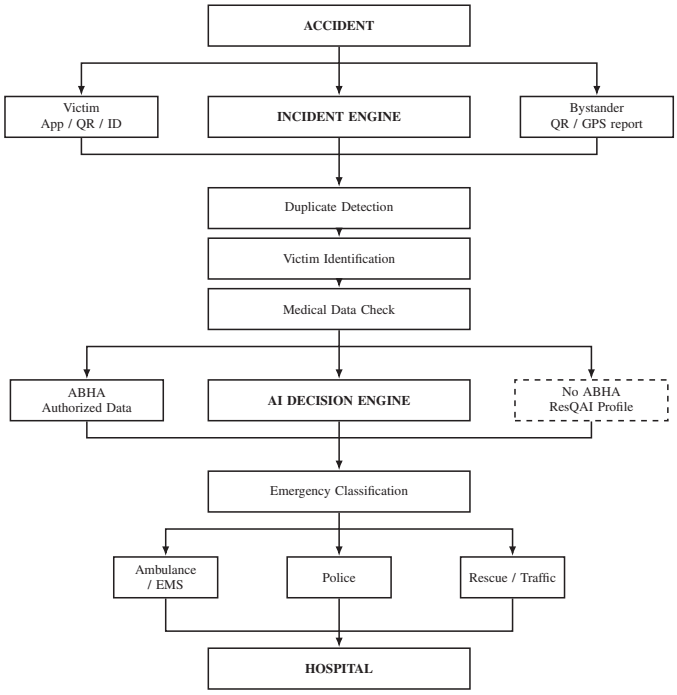


Fig. 1. ResQAI system workflow: from incident occurrence through detection, classification, and response routing.

pick the emergency type and submit the report together with their own GPS position.

Online requests go to a Spring Boot backend. It validates the Emergency ID, checks that access to the victim's stored medical profile is authorized, builds the incident context (victim, emergency and location), and runs the call workflow, including status and error handling. Data is stored in MongoDB Atlas, speech is generated with the Sarvam Speech API, and outbound emergency calls go through Twilio.

C. Data Flow

The operational data flow proceeds as follows:

- A victim or bystander starts a report in the ResQAI app.
- The app records the location, the Emergency ID if one is available, and a description of the incident.
- The submitted data is stored securely and processed in the backend database.
- The system compares each new report with existing records. If it matches one, the report is linked to that Incident ID instead of creating a new one.
- The consolidated information is sent to the appropriate emergency service.
- Responders use this single incident record to coordinate their work in the field.

Fig. 3 shows the two paths that run in parallel at the implementation level. In the offline path, holding the SOS control loads the local profile, classifies the emergency, gets live GPS and, if a verified dataset is installed, an offline PIN-code lookup, and builds the emergency message. The message is played aloud through Android text-to-speech, and the call manager places a normal cellular call to the configured number. One limitation is that the text-to-speech audio plays on the device and is not automatically sent into the call. In the online path, the bystander's QR scan, emergency type and GPS position go to the backend, which validates the Emergency ID, retrieves the authorized victim profile, builds the incident context, generates speech and starts a Twilio call to the emergency recipient. Incident and report status are saved, and any report that could not be sent is retried by the WorkManager queue.

IV. Implementation Methodology

The implementation follows a fixed sequence of steps, chosen to keep the delay between report and response short and the system reliable.

A. Methodology Framework

Fig. 4 gives the lifecycle that follows once a user has registered, from the first report to coordinating the response. The execution steps in Section IV-B describe the full process in more detail, beginning with registration.

B. Execution Steps

1) *User Registration and Emergency ID Generation:* When a user registers, they receive a unique Emergency ID and a privacy-preserving QR code. The code lets people identify the user quickly at an emergency scene without exposing sensitive personal details directly.
2) *Emergency Reporting:* A victim or bystander reports an accident or medical emergency in the app and gives basic details: the location, the victim's apparent condition and how many people are involved.
3) *QR Scanning and Identification:* A bystander, or a responder who arrives later, scans the victim's Emergency QR code. The system returns only the information that has been authorized for release, so unrelated personal or medical data stays hidden.
4) *Incident Creation and Processing:* The platform creates a unique Incident ID for each new emergency. When several independent reports describe the same event, they are recognized and merged under that Incident ID, so one accident is not handled several times.
5) *Emergency Assessment and Communication:* The collected information is analyzed to estimate how severe the emergency is and what kind of help is needed. Multilingual support is applied at this point so that the reporter and the responding team both receive the information clearly, which lowers the risk of misunderstanding across languages.
6) *Response Coordination and Closure:* The finished, structured incident record goes to the relevant emergency response service. It keeps being updated as the response proceeds and is closed once the emergency is resolved.

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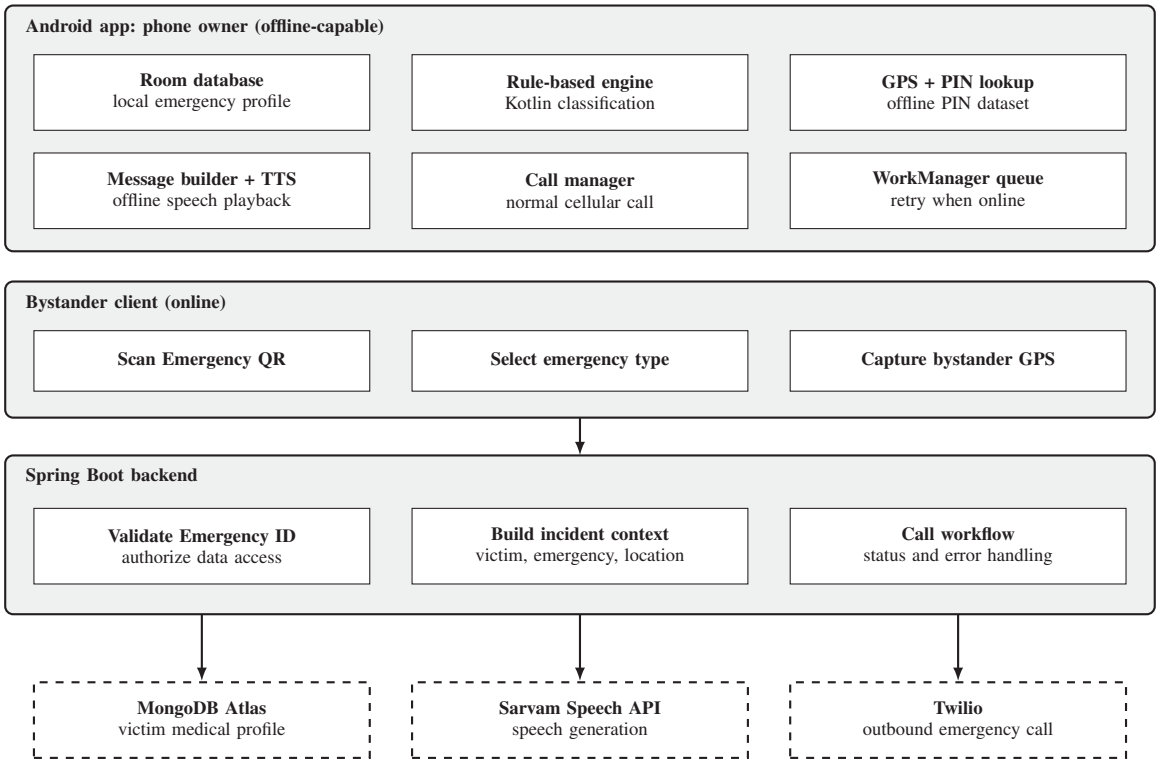


Fig. 2. Implementation architecture. Shaded frames are application tiers; dashed boxes are external data stores and services.

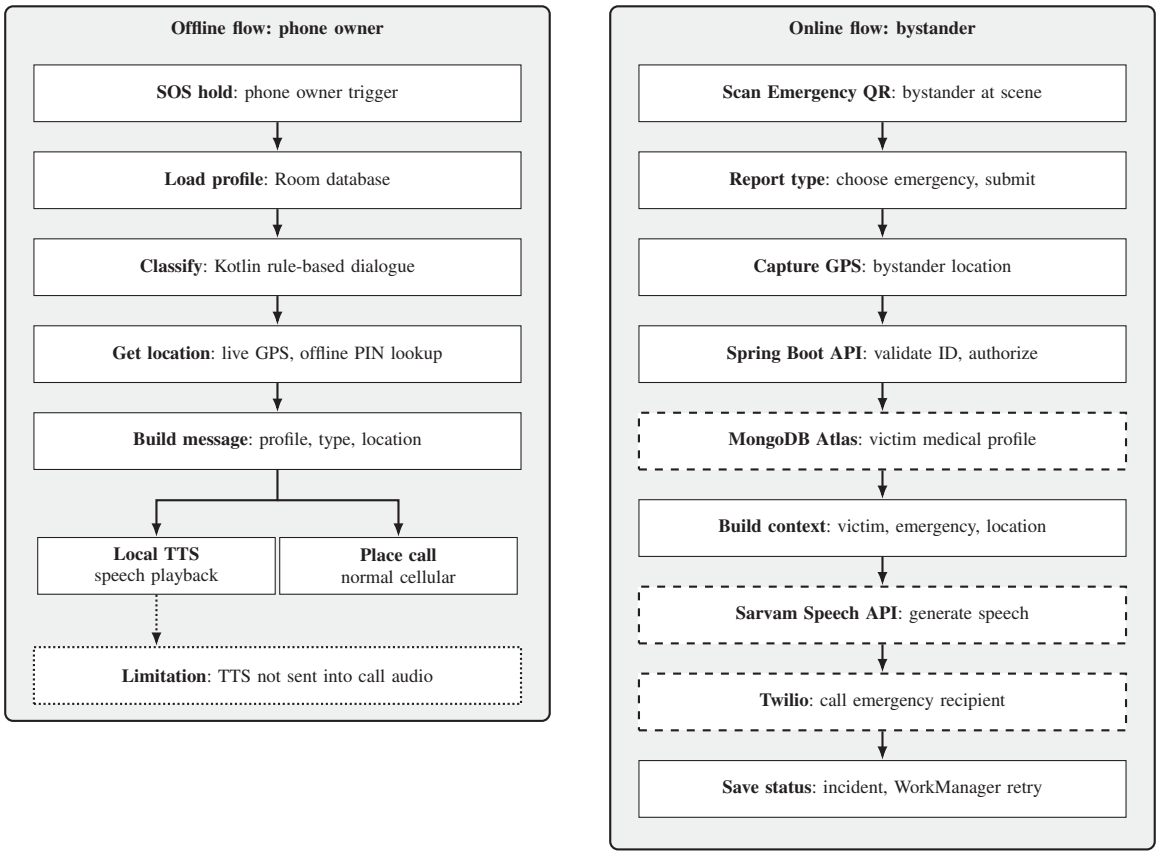


Fig. 3. Implementation data flow. Dashed boxes are external services; the dotted box marks a known limitation of the offline path.

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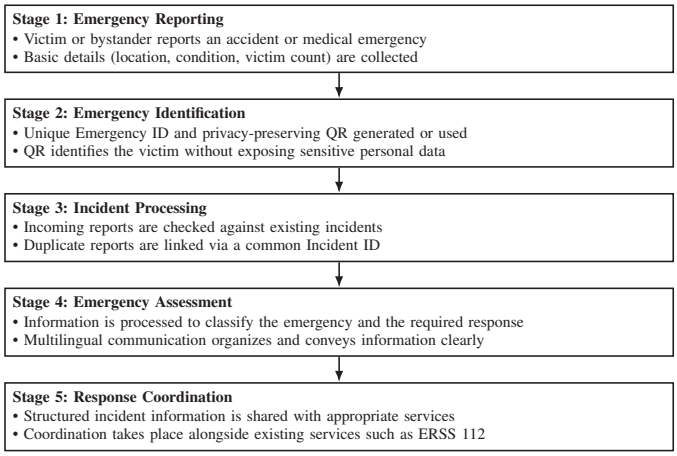


Fig. 4. Implementation methodology: five-stage end-to-end operational life-cycle.

TABLE I
PROPOSED EVALUATION CRITERIA FOR THE RESQAI SYSTEM

Criterion	What is measured
Response Time	Time between the first emergency report and the moment response coordination begins.
Information Accuracy	How correct the captured location, victim and incident details are compared with ground truth.
Incident Matching	How accurately duplicate reports are detected and linked under one Incident ID.
Communication Success	How often emergency information reaches responders and other stakeholders and is understood by them.
Usability	Ease of use, reliability and user satisfaction.

V. EXPECTED OUTCOMES AND DISCUSSION

ResQAI is expected to produce a working emergency-coordination app that supports reporting by victims and bystanders, unique Emergency IDs, privacy-preserving QR identification, incident management, duplicate detection, GPS location capture and a preliminary estimate of severity. We also expect it to make shared information better organized and clearer through multilingual support and, where the user has authorized it, verified health records.

A. Evaluation Criteria

Table I lists the criteria we propose for evaluating the system.

VI. CONCLUSION

ResQAI takes an incident-centric approach to coordinating the response to road accidents and medical emergencies. Rather than relying on separate reporting tools, it links victims, bystanders and emergency services through one shared platform. The unique Emergency ID and privacy-preserving QR code allow quick identification at the scene while limiting how much sensitive information is exposed. Grouping related reports under one Incident ID reduces duplicate handling of the same event, and multilingual communication together with optional, authorized medical-record integration should make the information reaching responders clearer and more complete. ResQAI is not meant to replace infrastructure such as ERSS 112; it is a complementary coordination layer. The goal is to make emergency information sharing faster, better organized and more secure for everyone involved. Our next step is to carry out the evaluation described above and report measured results for each of the five criteria.

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