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# SAHAAYA – INTEGRATED LIFE SAVING SERVICES FOR EMERGENCY RESPONSE

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**Abstract**: This paper presents Sahaaya – Integrated Life Saving Services, a centralized emergency response system designed to provide real-time assistance by integrating multiple critical services such as ambulance booking, blood donation, and safety alert mechanisms into a unified digital platform. The proposed system implements a multi-layer service architecture comprising a Request Processing layer for handling user inputs and emergency requests, a Real-Time Communication layer for instant notifications and tracking using WebSocket-based communication, and a Service Integration layer that connects users with nearby service providers based on location and availability. The system is deployed using a scalable full-stack architecture with React/React Native frontend, Node.js backend, and MongoDB/PostgreSQL databases to ensure efficient data handling and secure communication. A priority-based request handling mechanism ensures faster response for critical emergencies, while integrated modules such as SOS alert system, live ambulance tracking, blood donor matching, and safety tools (including fake call feature) enhance system reliability and usability. A real-time dashboard interface provides live updates, request status tracking, and user interaction features for seamless coordination. Experimental analysis demonstrates that the system significantly reduces response time, improves service accessibility, and maintains stable performance under concurrent user requests, with emergency response actions processed within a few seconds under normal network conditions.

**Index Terms:** Emergency Response System, Ambulance Booking, Blood Donation, SOS Alert, Real-Time Tracking, Public Safety, Smart Healthcare, WebSocket Communication, Integrated Services, Mobile Application.

## I. INTRODUCTION

Emergency situations such as accidents, medical emergencies, and safety threats require immediate response and proper coordination to save lives. However, existing emergency systems often operate independently, making it difficult for users to access multiple services quickly during critical situations. This lack of integration leads to delays, inefficient communication, and reduced effectiveness of emergency response systems.

Traditional solutions such as ambulance services, blood donation platforms, and safety applications are designed separately and do not provide a unified approach. Ambulance systems generally focus on transportation without real-time tracking or coordination, while blood donation systems help locate donors but lack integration with emergency transport. Similarly, safety applications provide alert mechanisms but are not connected to medical or rescue services. These limitations highlight the need for a centralized system that can handle multiple emergency services efficiently.

With advancements in mobile technologies and real-time communication systems, it is now possible to develop integrated platforms that improve emergency response. Technologies such as location-based services, instant communication, and scalable backend systems enable faster coordination between users and service providers. By utilizing these technologies, emergency systems can be made more efficient,

reliable, and accessible.

This paper presents Sahaaya – Integrated Life Saving Services, a unified platform designed to integrate ambulance booking, blood donation, and safety alert services into a single application. The system enables real-time request processing, location-based service matching, and instant communication. By providing features such as live tracking, SOS alerts, and safety tools, the system enhances response time and improves coordination, making it an effective solution for modern emergency management.

## II. RELATED WORK

Several systems have been developed to address different aspects of emergency services, but most of them focus on individual functionalities rather than providing an integrated solution. Ambulance management systems primarily concentrate on vehicle dispatch and patient transport, often lacking real-time tracking and coordination with other emergency services. Similarly, blood donation platforms are designed to connect donors and recipients based on availability, but they do not provide immediate support in terms of transportation or emergency handling.

Safety applications developed for personal protection typically offer features such as SOS alerts and location sharing. While these systems help in notifying emergency contacts, they are usually limited to communication-based solutions and do not integrate with medical or rescue services. As a result, users are required to rely on multiple applications to handle different emergency needs, which increases complexity and delays response time.

Recent advancements in mobile technologies and smart healthcare systems have introduced location-based services and real-time communication features. However, many existing solutions still lack centralized coordination and seamless integration of multiple services. The absence of a unified platform remains a significant limitation in current emergency response systems.

The proposed Sahaaya system addresses these challenges by integrating ambulance services, blood donation systems, and safety alert mechanisms into a single platform. This unified approach improves response time, enhances communication between users and service providers, and provides a more efficient and reliable solution for handling emergency situations.

## III. SYSTEM ARCHITECTURE

The proposed system implements a layered application architecture designed to support real-time emergency services through a centralized digital platform. The architecture comprises four major components: the user application interface, the backend processing system, the database management layer, and the real-time communication subsystem.

### A. User Interface Layer

The user interface is developed as a mobile and web-based application using modern frontend technologies such as React and React Native. It provides users with access to essential emergency services including ambulance booking, blood donation requests, and SOS alert activation. The interface is designed to be intuitive and responsive, enabling users to quickly interact with the system during critical situations. It also displays real-time information such as service status, tracking updates, and notifications.

### B. Service Processing Layer

The processing layer handles the core functionality of the system by managing user requests and coordinating services. When a user initiates an emergency request, the system identifies the type of service required and processes it accordingly. It uses location-based algorithms to match users with the nearest available service providers, such as ambulances or blood donors. This layer also manages communication between users and service providers, ensuring timely updates and efficient coordination.

### C. Real-Time Communication System

The system incorporates a real-time communication mechanism using WebSocket-based protocols and API integration. This enables instant transmission of notifications, alerts, and tracking updates between users and service providers. Features such as live ambulance tracking, SOS alerts, and request status updates rely on this subsystem. The communication system ensures minimal delay and continuous data exchange, which is critical in emergency scenarios.

### D. Database Management Layer

The system implements a three-strike violation tracking mechanism. Each detected attack on a port-DPID combination increments a violation counter. Violations 1 and 2 result in temporary port blocking for 30 seconds via OFPFlowMod, followed by automatic unblocking upon timer expiration. The violation counter persists across temporary blocks and is only reset upon manual admin intervention.

Upon reaching 3 violations, the system applies a permanent block with no automatic unblocking, requiring administrator action through the web dashboard.

### E. Web Dashboard and Security

A data management layer is responsible for storing and retrieving all system-related data, including user information, service requests, and provider details. Databases such as MongoDB or PostgreSQL are used to ensure secure and efficient data handling. The system supports fast data retrieval and maintains consistency across all modules. This layer also enables historical data storage for monitoring and future analysis.

## IV. IMPLEMENTATION

### A. Frontend Implementation

The user interface is developed using React and React Native to provide a responsive and interactive experience across mobile and web platforms. The application consists of multiple screens such as login, registration, home dashboard, and service modules. Navigation between screens is handled using modern routing techniques, ensuring smooth transitions and usability. The interface captures user inputs, displays real-time updates, and provides quick access to emergency services. UI components are designed to be simple and accessible, allowing users to operate the system efficiently during critical situations.

### B. Backend Implementation

The backend of the Sahaaya system is implemented using Node.js and Express framework to handle API requests, service coordination, and real-time communication. The server processes user inputs such as emergency requests, location data, and service selection. Each request is validated and routed to the appropriate service module, including ambulance booking, blood donation, or SOS alerts. The system maintains user sessions and request states, ensuring proper tracking and communication between users and service providers. Asynchronous handling of requests enables the system to manage multiple users simultaneously without performance degradation.

### C. Security and Authentication

Security is implemented through user authentication mechanisms such as JWT-based login and encrypted password storage using hashing algorithms. Role-based access control ensures that only authorized users can access specific functionalities. Secure API communication is maintained to protect sensitive data such as user information and location details. These measures ensure system reliability and prevent unauthorized access.

## V. RESULTS AND EVALUATION

The Sahaaya – Integrated Life Saving Services system was evaluated under real-time operational scenarios to analyze its performance, responsiveness, and reliability across different modules. The evaluation was conducted by simulating multiple user interactions, emergency requests, and service operations under varying network conditions. Performance metrics were collected by observing system behavior during ambulance booking, blood request processing, SOS alert triggering, and user interaction workflows.

### A. System Response Performance

The system demonstrated fast response times during real-time operations. Emergency requests such as ambulance booking and blood donation matching were processed within a few seconds under normal network conditions. The system efficiently handled concurrent user requests without significant delay, ensuring smooth execution of critical services. Minor latency was observed during poor network connectivity; however, it did not significantly impact the overall system functionality. The results confirm that the system meets the requirements of time-sensitive emergency applications where quick response is essential.

Table i: system Performance Summary

| Module | Response Time | Accuracy/ Efficiency | Status |
|---|---|---|---|
| Blood Donation | 2-5 sec | High matching accuracy | Successful |
| Ambulance Booking | 3-6 sec | Accurate location detection | Successful |
| SOS Alert System | < 2 sec | Instant alert delivery | Successful |
| Real-Time Tracking | Continuous | Minimal delay | Stable |

### B. Real-Time Communication Efficiency

The real-time communication mechanism was evaluated based on SOS alerts, notifications, and location tracking features. The system successfully delivered emergency alerts instantly along with accurate user location details. Notifications were transmitted efficiently between users and service providers, enabling effective coordination. The implementation of real-time communication technologies ensured continuous updates without noticeable delay. Slight latency was observed under heavy user load conditions, but the system maintained overall stability. This confirms that the communication framework is reliable for emergency response scenarios.

### C. Module-Wise Performance Analysis

The Blood Donation module performed effectively by accurately matching donors based on blood group and location. Requests were processed quickly, and notifications were successfully delivered to nearby donors, ensuring timely responses. The Ambulance Service module efficiently identified the nearest available ambulance using location-based services. The booking process was smooth, and real-time tracking updates were consistently accurate. The SOS Alert system demonstrated high reliability by instantly triggering alerts and sharing location data with emergency contacts and services. Overall, all modules operated efficiently and contributed to the system's effectiveness in handling emergency situations.

table ii: system Evaluation Metrics

| Metric | Observed Value | Expected Performance |
|---|---|---|
| Response Time | < 5 seconds | < 10 seconds |
| Notification Delivery | Instant | Real-time |
| System Stability | High | High |
| Network Delay Impact | Minimal | Acceptable |
| Concurrent Users Handling | Efficient | Scalable |

### D. User Interface and System Reliability

The user interface was evaluated for usability, accessibility, and responsiveness. The dashboard provided a clear and organized view of available services, allowing users to navigate easily between different modules. The application maintained consistent performance across different devices and screen sizes. The design ensured that even non-technical users could interact with the system without difficulty.

### E. Comparison with Existing Systems

The proposed Sahaaya system demonstrates improved efficiency compared to traditional emergency service applications by integrating multiple life-saving services into a single platform. Unlike existing systems that operate independently, Sahaaya enables real-time communication, location tracking, and coordinated service delivery. This integrated approach reduces response time and enhances overall system reliability, making it more effective for emergency management.

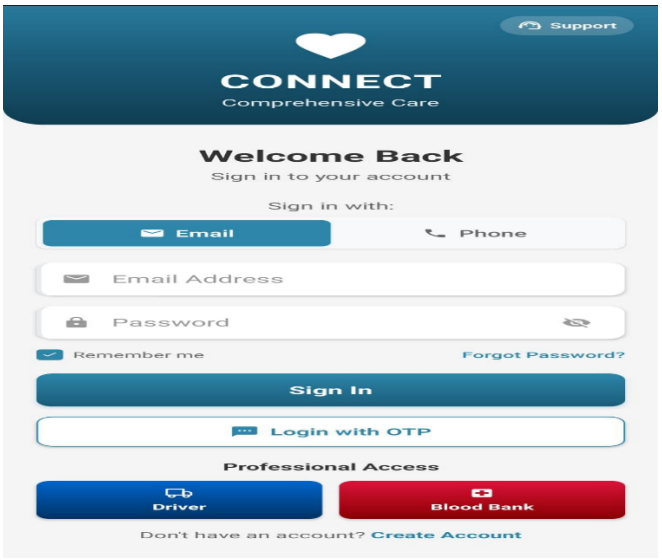


figure 1.1: user login interface for sahaaya application

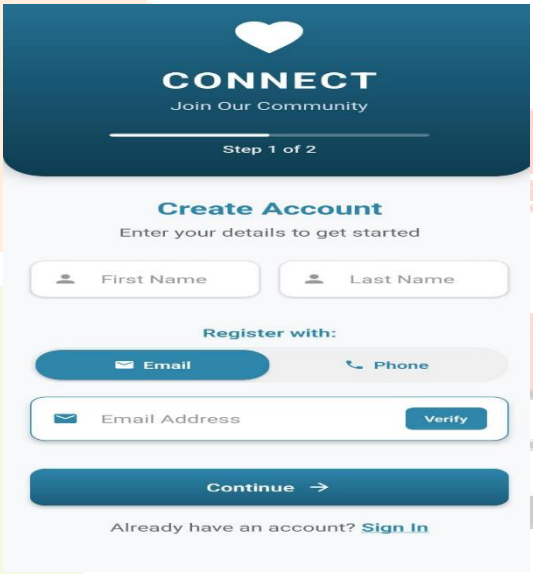


figure 1.2: user registration screen with email/phone verification


figure 1.3: main dashboard showing integrated services (blood, ambulance, disha safety)

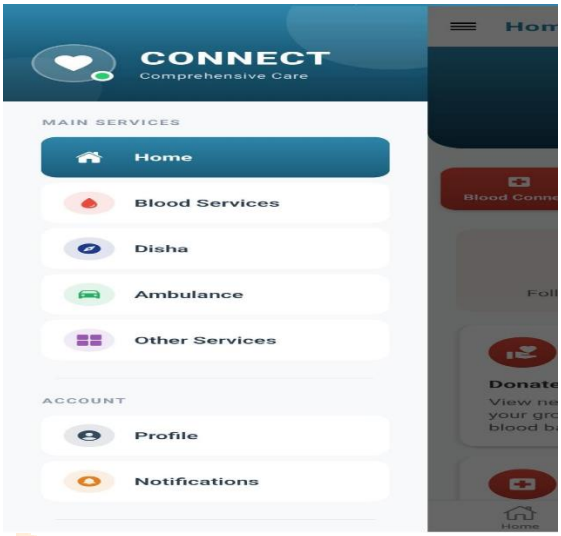


figure 1.4: navigation menu displaying available services and user options

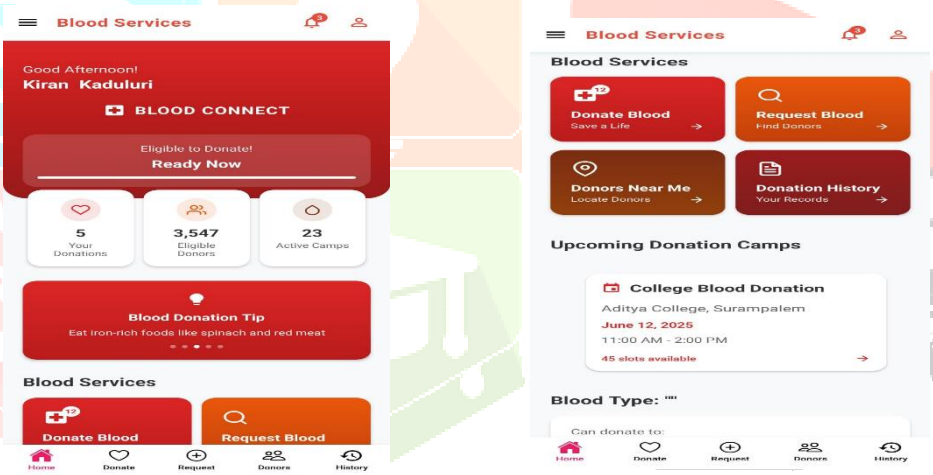


figure 1.5: blood connect module – donation, request, and donor search interface

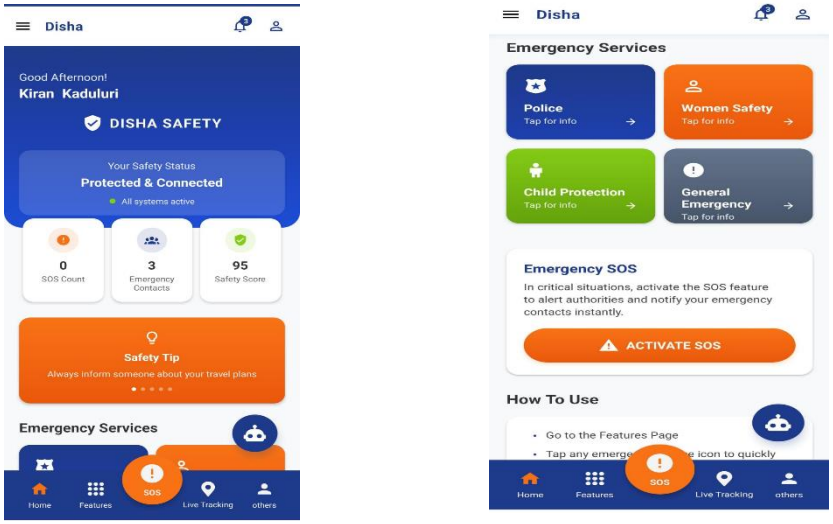


figure 1.6: disha safety module – emergency alert, SOS, and safety features

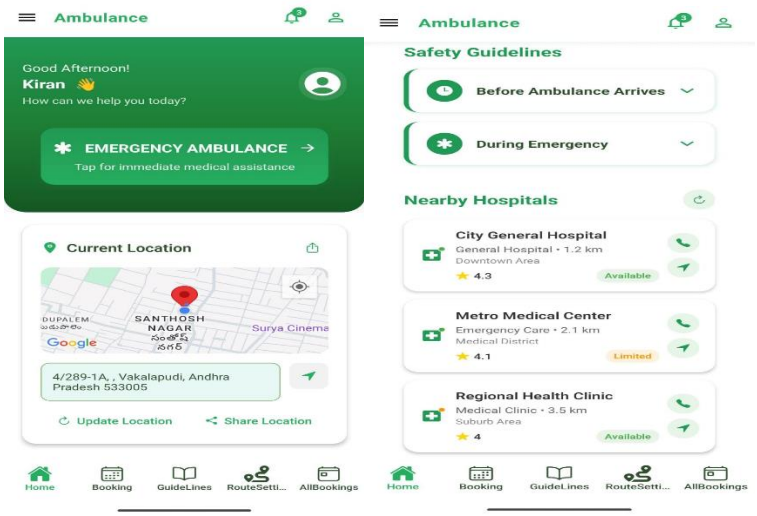


figure 1.7: ambulance service module – location tracking and nearby hospital detection

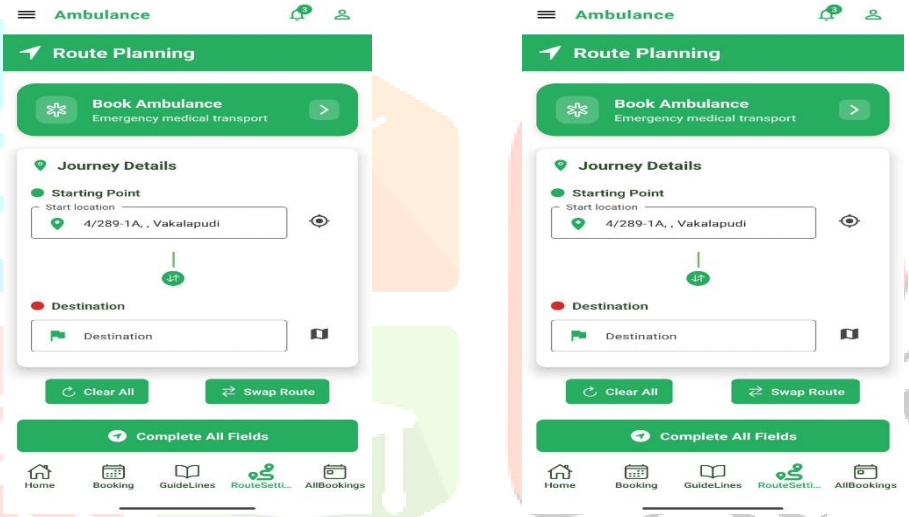


figure 1.8: emergency booking and route planning interface with real-time guidance

## VI. CONCLUSION

This paper presented Sahaaya, an integrated life-saving services system that combines blood donation, ambulance services, and SOS alerts into a single platform to improve emergency response efficiency. The system overcomes limitations of traditional standalone applications by enabling real-time communication, location-based service delivery, and faster coordination between users and service providers.

The implementation demonstrated reliable performance with quick response times, accurate service matching, and stable real-time communication. The ambulance module efficiently identifies nearby hospitals, the blood donation module enables rapid donor matching, and the SOS system ensures instant alert delivery with location sharing. The user-friendly interface further enhances accessibility and ease of use.

Overall, the system improves response time, coordination, and reliability in emergency situations. Future work will focus on cloud deployment, integration of IoT-based monitoring, and incorporation of advanced AI techniques to enhance scalability and predictive capabilities.

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