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Emergency Services

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Abstract: *This abstract introduces an Emergency Services System designed to streamline emergency response processes. The system accommodates patients, ambulance drivers, and hospitals, fire brigades and fire locations through a user- friendly interface. Users register and log in to access functionalities tailored to their roles: patients can book ambulances based on availability and hospital proximity while viewing detailed ambulance listings. Ambulance drivers can view patient requests, accept them, and update their status upon completion. People can report fire; admin can assign rescue teams respectively. The system efficiently manages multiple requests, displaying remaining patients, fire locations when a driver is on duty and marking accepted requests accordingly. Additionally, hospitals maintain driver records, fire brigade team records, facilitating seamless management and coordination within the emergency response network. Emergency medical response in India is lagging behind other countries. This is partially because of lack of technology implementation at ground zero. To address the issue, we are introducing emergency services system. It would take India to competitive position in emergency services around the globe. Over the last few years there is a revolutionary development in the field of Internet of Things (IoT). [1]. It can be used seamlessly & widely in large number of end system where subset of a large amount of data can be accessed and processed easily and powerfully. IoT and smartphone technologies helps in building a platform which serves every smartphone user. The application collects location information from Global Positing System (GPS) hardware and uses Google Map Application Programming Interface (API) to plot details of the ambulances and location where fire has been caught on the Google Map Client of the App. [1]. Same functionality can be used for the other module which enables user to find the hospitals with the number of services provided by those in brief manner. With the help of medically equipped and technologically powered ambulance, information about patient's health details can be sent to the hospital in order to take further action. The platforms that are used, capable of molding into various services that are implemented and it is believed that these technologies can make a revolutionary work in public GPS work if utilized properly. An online fire reporting system is a platform that allows users to report fires to relevant authorities in real-time using the internet. This system can be used by the general public or emergency services to provide fast and accurate information about the location, intensity, and other relevant details of a fire.*

Keywords: GPS- Global Positioning System, Ambulance hiring, Fire Brigade, Emergency, Services, Request, dispatch

I. INTRODUCTION

In today's era, there are many cities which are working on transforming themselves into Smart Cities. If the city is going to be called as Smart City, then it should have all possible advancements in the sector of smart technology. Improving efficiency in healthcare sector if one of the difficult and most challenging jobs. That includes various aspects such as getting ambulance within minimum amount of time, providing proper treatment to the patient so that the chances of surviving increases in critical condition. Traffic congestion is one of the major problems in urban areas, which have caused much hitches for the ambulance. Moreover, road accidents in the city have been increased and to

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bar the loss of life due to the accidents is even more crucial. [1]. We can overcome these limitations by upcoming technology like IoT i.e., Internet of Things. [13] Various hardware devices can be connected with each other via wired and wireless networking tools and software implementations. [1].

Use of various REST APIs can help to communicate between the server and client end which is implemented in this project. REST APIs are designed in such a way that time complexity will be minimized extensively. This is achieved by exchanging only the required data with server in order to minimize the traffic and loss of data packets in the process of transaction. With the help of cutting-edge technology and keeping the goal in mind we've developed this application. It is also an attempt to participate actively in the process of transforming into smart city and make required services more accessible. [1].

The Online Fire Reporting is used to report fire incidents immediately. Users can visit the website and report any fire incidents. Users can also track the fire incident reporting Status. The online Fire Reporting has two roles as Admin and User. Admin will be the user of this project who can control the whole website. In the Dashboard section, the admin can briefly view information about fire incidents. In the team section, the admin can manage Teams (Add/Update/Delete). In the Fire Alerts section, the admin can view new, assigned, Team on the way, Fire relief work in progress, completed requests, and all requests and give a remark. In the Reports section, the admin can view fire incidents in a particular period and search for the fire reporting/incidents. In the website setting, the admin can change the setting of a website, like logos, contents, etc. Admin can also manage own profile. Admin can also recover their password.

II. LITERATURE SURVEY

***OLA cab service*: -** Ola Cabs was founded on 3 December 2010 by Bhavish Aggarwal, currently CEO, and Ankit Bhati. As of 2017, the company has expanded to a network of more than 600,000 vehicles across 110 cities. In November 2014, Ola diversified to incorporate autos on trial basis in Bangalore. Post the trial phase, Ola Auto expanded to other cities like Delhi, Pune, Chennai and Hyderabad and Kolkata starting December 2014. In December 2015, Ola expanded its auto services in Mysore, Chandigarh, Indore, Jaipur and Guwahati, Visakhapatnam. Ola was valued at $US5 billion as of September 2015. [2]

***UBER Cab service*: -** Uber was founded in 2009 as Uber Cab by Garrett Camp, the cofounder of Stumble Upon, and Travis Kalanick, who had sold his Red Swoosh start up for $19 million in 2007. Kalanick joined Camp and gives him & quot full credit for the idea & quot of Uber. On New Year's Eve, Camp spent $800 hiring a private driver with friends and had been mulling over ways to decrease the cost of black car services ever since. He realized that sharing the cost with people could make it affordable, and his idea morphed into Uber. & quot Garrett is the guy who invented that shit, & quot Kalanick said at an early Uber event in San Francisco. The first prototype was built by Camp, and his friends, Oscar Salaza and Conrad Whelan, with Kalanick being brought on as & quot mega advisor & quote to the company. [2].

E-AMBULANCE: Real-Time Integration Platform for Heterogeneous Medical Telemetry System: -

(IEEE Paper by: - ***Basem Almadania, Manaf Bin-Yahyaa, Elhadi M. Shakshukib Year 2015)***

The goal is to enhance healthcare services through improvements in sensor networks, medical devices, wireless communication, middleware, and software applications. Indoor and outdoor health monitoring systems are gaining attention for their ability to detect diseases early, provide emergency assistance, and reduce healthcare costs. These systems collect periodic physiological data from patients via sensors and communicate it to medical professionals. Additionally, they provide emergency reports in critical situations. The proposed E-Ambulance system aims to enable remote health monitoring and automatic responses while patients are still in transit, addressing urgent needs before reaching a medical center. [2].

Smart Ambulance System

(IEEE Paper by: - Poonam Gupta, Satyasheel Pol, Dharmanath Rahatekar, Avanti Patil)

Emergency medical response in India is currently behind other nations, mainly due to the lack of technology at the grassroots level. To address this, a smart ambulance system is being introduced, which aims to enhance India's position in global emergency services. With the rise of Internet of Things (IoT) and smartphone technologies, this system will

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allow ambulances to be tracked via GPS and mapped using Google Maps. It also helps users find nearby hospitals and access their services. Additionally, the system enables real-time sharing of patient health data with hospitals, improving emergency care efficiency.[2].

Smart Band Ambulance System

(IEEE Paper by: - Shubhanshu Singh Patwal, Rohit Kumar, Rishabh Mishra)

With diseases, especially cardiac issues, rapidly affecting densely populated regions, particularly the elderly living alone, a smart band ambulance system is being introduced to enhance emergency services in India. Leveraging recent advancements in the Internet of Things (IoT), this system will monitor heartbeats continuously through a smart band. The collected data will be sent to a centralized database for analysis, and if irregularities are detected, the person will be alerted, and an ambulance will be dispatched if needed. Users can track the ambulance's location using GPS and Google Maps via their smartphones. [2].

III. PROPOSED SYSTEM FOR PROJECT

The **Emergency Services** project introduces an **Ambulance Hiring and Fire Reporting System, along with other medical and utility services, it also provides guidelines for hazardous situations**. This system can be divided into several key modules, each represented as blocks that interact with each other. The system is designed for users to report fire incidents or request ambulances, medical or utility services through mobile application, and for administrators to manage resources and respond to incidents and provide guidelines to rescue oneself in any hazardous situation.

Description of the Proposed System

The system comprises several key components:

3.1 User Interface (UI) Block

Mobile App Interface

- User & Agency registration and login
- Request ambulance
- Report fire
- GPS location services for reporting
- Notifications (request confirmation, estimated time of arrival)

3.2 Input Processing Block:

Request Parsing and Validation

- Validates user inputs (e.g., location, type of emergency)
- Error handling (e.g., incorrect location data, incomplete information)

3.3 Emergency Services Request Management Block

Ambulance Management System

- Manage available ambulances
- Track ambulance locations
- Assign nearest available ambulance
- Fire Brigade Management System
- Manage fire stations and resources
- Track fire trucks and personnel availability
- Dispatch nearest available team to fire location

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3.4 Real-Time Location and Mapping Block

GPS Location Tracking

- Real-time tracking of ambulance/fire truck
- Show ETA to user
- Optimize routes for emergency vehicles o Integration with Google Maps or similar services

3.5 Admin Interface Block

Admin Dashboard

- Monitor active requests (ambulance/fire reports)
- View status of emergency vehicles
- Manage resources and personnel
- Generate reports and analytics

3.6 Database Block

- **User Database-** Store user information, request history
- **Incident Database -** Log fire reports and ambulance requests. Track status of incidents (open, in-progress, closed)

3.7 Notifications and Alerts Block

- **Emergency Alerts-** Notify users in case of fire hazards in nearby areas
- **Real-time updates-** Send updates on vehicle dispatch, arrival times

IV. IMPLEMENTATION

This is a cross-platform mobile application designed to provide assistance in emergencies. The app incorporates specialized features for different user groups such as firefighters, ambulance personnel, police officers, and general users. It leverages the power of Flutter, Firebase, and Google Maps API to deliver accurate and real-time information to both users and responders.

The system comprises of several key Modules:

Agency Module:

- Allows organization/ Admin to manage and assign teams, accept request, Add and assign teams that provide services. Monitor the entire system.

Admin Features

- **User Management**: Admin panel for managing user accounts and permissions.
- **Report Management**: Ability to view, edit, and update incident reports by authorized personnel.
- **Resource Allocation**: Tools for managing and deploying fire service resources based on incident data.

Citizen (User) Module:

- **Emergency Contact:** Call emergency numbers according to emergency type, and see nearby locations of hospitals, police stations, and more. Add emergency contacts to receive distress SMS messages.
- **Medical:** Allows users to request medicals services like hiring an ambulance, reporting accidents and locating nearby hospitals.
- **Fire Brigade:** Allows users to report fire incidents by requesting a fire brigade.
- **Police:** Allows users to report crime and contact police stations.
- **Emergency Response:** A database that shows the requested, accepted and pending services.
- **Local Services:** Allows users to access local services like nearby pet or NGO caretakers, etc.

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- **Utility Services:** Allows users to access services in case of electricity issues or gas pipe line issues.

Guideline Modules:

- **Previous Disaster Sheet:** Gives a report on previously occurred disasters like earthquake along with guidelines for them.
- **School safety programme:** Allows admin to organise and guide students regarding all the hazardous situations and what to do if they are caught in such a situation.
- **Events:** Allows admins to organize demo drill in institutions guiding people on any of the hazardous situations
- **Quizinga:** Allows users to answer quiz and acknowledges them about what to do in emergency situations
- **Safety Game:** The safety game is like a simulation of a particular situation that can help to guide users and children to get a clear idea of what to do in such situations.

User Interface Features

User Registration and Login: Secure sign-up and login processes for users and department personnel.
A user-friendly platform for users to request ambulances, track vehicles.
Reporting Form: A simple and intuitive form for users to report incidents, including fields for:

- Location (address, GPS coordinates)
- Type of fire (e.g., residential, commercial, wildland) o Severity level (low, medium, high)
- Additional details (e.g., number of people involved, presence of hazardous materials)

Real-Time Updates: A dashboard for users to view the status of their reports (e.g., acknowledged, in response, resolved).

System Interconnections:

- **User Interface ↔ Input Processing Block** - The user submits a request via mobile/web.
- **Input Processing Block ↔ Emergency Services Request Management**- Validated requests are sent to the respective management systems (ambulance or fire).
- **Emergency Services Request Management ↔ Real-Time Location & Mapping**-The system assigns the closest available resource and updates the location in realtime.
- **Admin Interface ↔ All Other Blocks** -Admins monitor and manage requests, resources, and handle issues in the system.
- **User Interface ↔ Notifications and Alerts Block** -Users receive real-time updates on their request status.

Existing System:

Dispatch System:

- **Centralized Control**: A system that receives requests, assesses the nearest available ambulances, Fire brigades and dispatches them accordingly.

Notification System

- **Alerts for Fire Departments**: Immediate notifications sent to local fire services upon report submission.
- **User Notifications**: Updates to users regarding the status of their report (e.g., when help is dispatched or the incident is resolved).

Map Integration

- **Geolocation**: Integration with mapping services (e.g., Google Maps) to allow users to pinpoint the fire's location accurately.
- **Incident Mapping**: A real-time map displaying active incidents and their statuses, accessible to fire department personnel

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Data Management and Analytics

- **Incident Database**: A secure database to store reported incidents, including timestamps, locations, and outcomes.
- **Analytics Dashboard**: Tools for fire departments to analyse data on incidents, response times, and patterns over time.
- **User Profiles**: Store user information, medical history, and previous requests for a personalized experience.
- **Ambulance & Fire Brigade Fleet Management**: Information on available ambulances, Fire Brigade their types, and current locations.
- **Other Services**: information on local services nearby such as, NGOs, pet caretakers, police station, medicals, utility services like electricity, gas pipe line.

Mobile Compatibility

- **Mobile App**: A dedicated mobile application for easier reporting and access on-the-go.
- **Push Notifications**: For immediate alerts and updates directly on users' mobile devices.

Safety and Guideline Management

- **Incident Review**: Mechanism for fire departments to conduct post-incident reviews and gather insights.
- **Activities:** Quizzes, games. Mock drill events and guidelines.

V. DETAILS OF DESIGN, WORKING & PROCESSES

The **Emergency Services** project introduces Rakshak, an SOS Rescue Flutter Mobile App, designed to provide users with a quick and reliable way to seek help during emergencies. Whether facing medical emergencies, personal safety threats, or critical distress situations, the app ensures immediate assistance through location tracking. Developed using the Flutter framework, Rakshak is compatible with both Android and iOS platforms. This system can be divided into several key modules, each represented as blocks that interact with each other. The system is designed for users to report incidents or request services through mobile application, and for administrators to manage resources and respond to incidents.

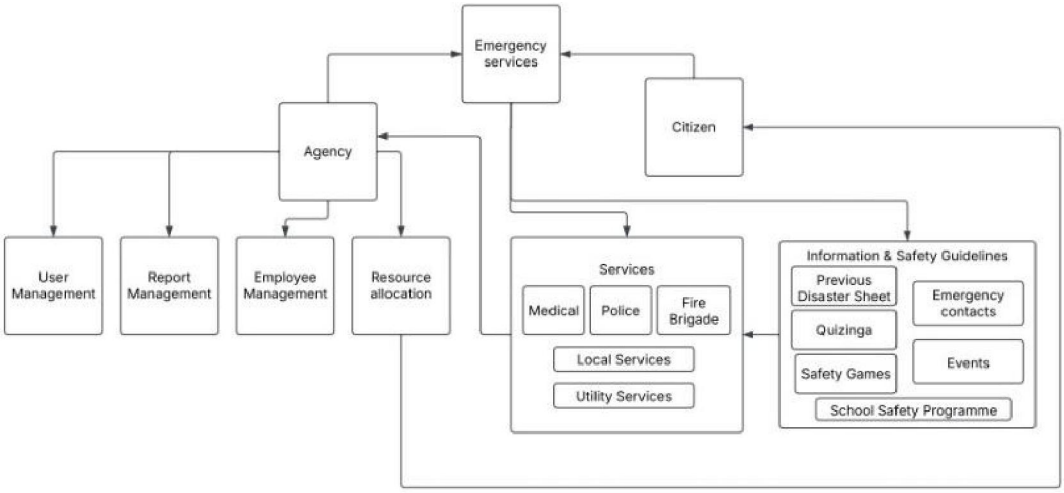

Figure 1: Block Diagram

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The design includes:

Context Level Diagram

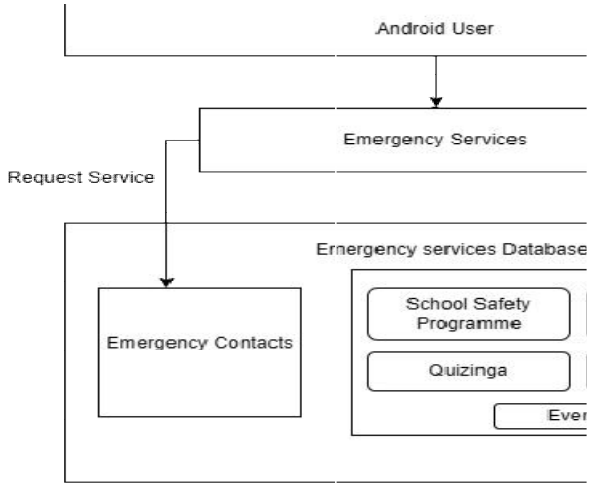

Figure 2: Context Level Diagram

The **Context Level Diagram** for the **Emergency Services System** illustrates the system's primary interactions with external entities, including public users, admins/operators, and emergency services (ambulance and fire departments). Public users initiate emergency requests (for ambulances or fire reports), while admins and operators manage service allocation, dispatch, and monitoring of emergency responders. The system interacts with GPS and location services to track data and route emergency vehicles efficiently. The diagram highlights the flow of data between these entities and the central system, ensuring a seamless emergency response process

DFD Diagram

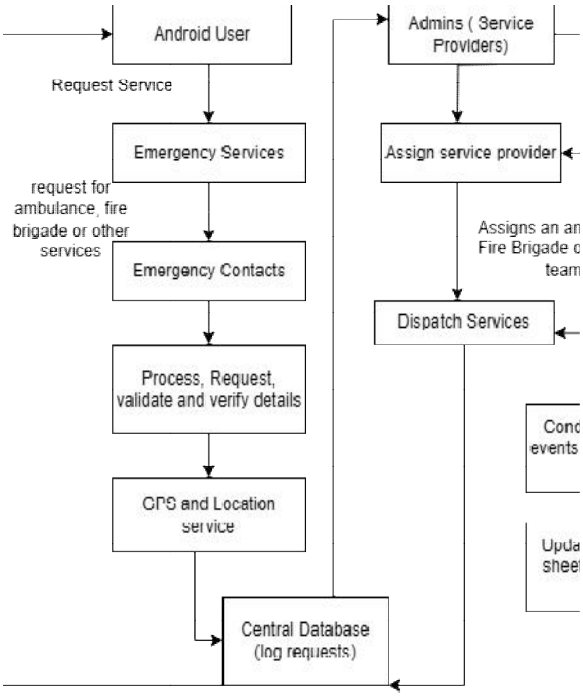

Figure 3: DFD Diagram

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The **Data Flow Diagram (DFD)** for the **Emergency Services System** provides a detailed breakdown of the system's processes, data stores, and interactions with external entities. It shows how public users submit emergency requests, which are validated and processed by the system. The system then matches the nearest available ambulance or fire service, notifies the admin/operator for dispatch, and provides real-time tracking to both the user and the admin. The system communicates with GPS services for location data, and logs all requests, service statuses, and responses in a central database, ensuring efficient resource allocation and tracking of emergency services

Sequence Diagram

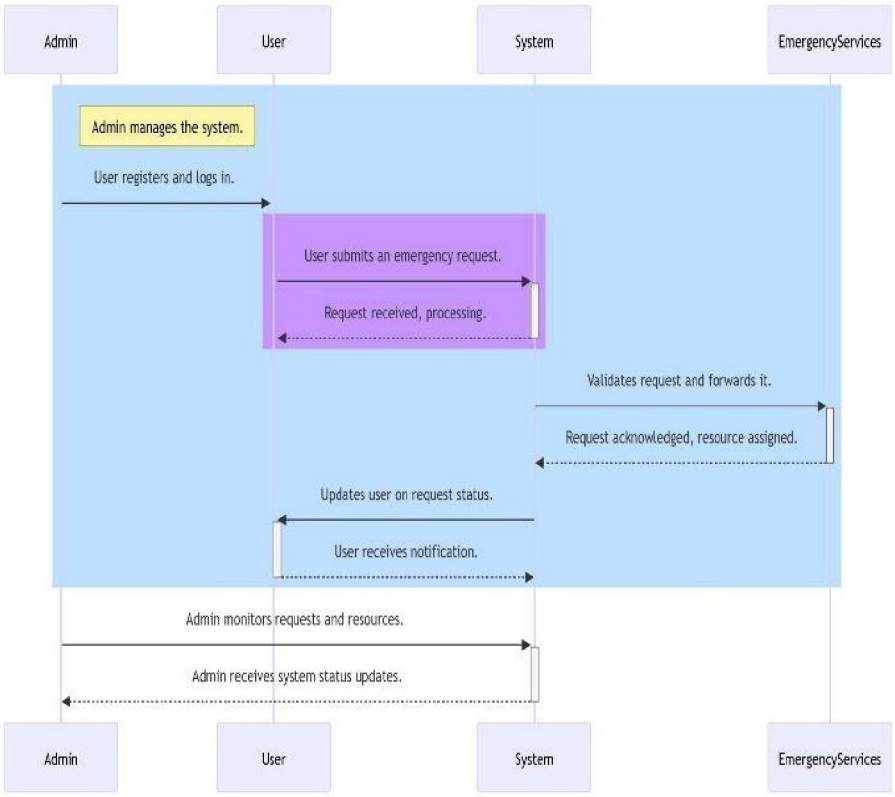

Figure 4: Sequence Diagram

The **Sequence Diagram** for the **Emergency Services System** illustrates the step-by-step interactions between users, the system, admins/operators, and emergency service providers (ambulance or fire departments). The sequence begins with users submitting emergency requests, which the system validates before notifying the nearest service provider. Admins/operators manage dispatch, and the service provider confirms the dispatch and begins responding to the emergency. The system continuously updates the user and admin with real-time tracking of the ambulance or fire truck. Once the service is completed, the system logs the completion and notifies both the user and admin, concluding the interaction

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Control Flow Diagram

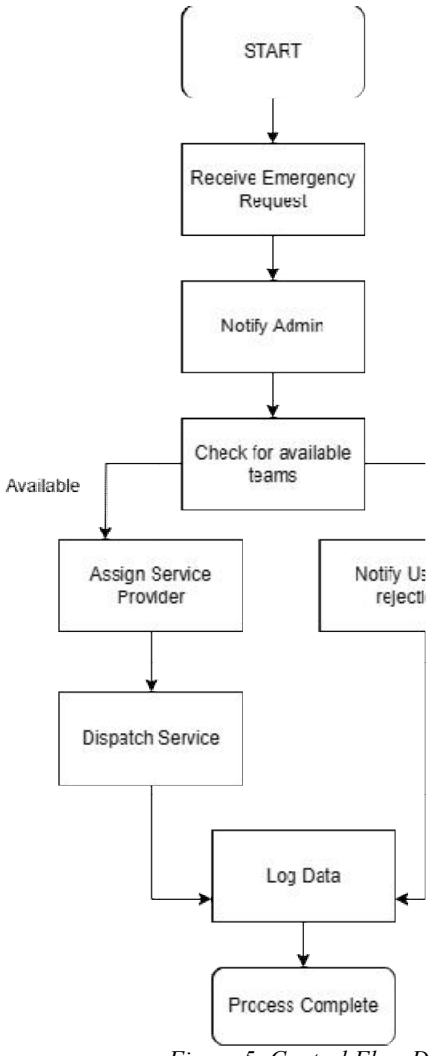

Figure 5: Control Flow Diagram

The **Control Flow Diagram** for the **Emergency Services System** outlines the logical flow of control within the system, focusing on how emergency requests are processed step by step. The system begins by receiving and validating requests from users. If valid, it proceeds to match the nearest available ambulance or fire service, notifying the admin/operator to dispatch the appropriate emergency service. Real-time tracking is provided to users and operators, and the system monitors the progress of the dispatched vehicle. If the service is successfully completed, the system logs the request as completed; if not, the admin is notified for re-dispatch. The diagram emphasizes decision points and the sequence of actions needed to manage emergency services efficiently

VI. FUTURE SCOPE

6.1. Integration with Other Systems

Real-time Data Sharing: In a smart city ecosystem, emergency service apps could be integrated with traffic systems, weather monitoring, and surveillance cameras to provide real-time data to emergency responders, allowing them to optimize routes, avoid traffic jams, and even monitor environmental hazards.

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IoT Sensors: Hospitals, ambulances, and fire trucks could be equipped with IoT devices that send real-time data to emergency services apps. For instance, medical equipment in ambulances could monitor vital signs and send data to the hospital to prepare the medical team in advance

IoT Device Integration: Compatibility with smart fire detectors or sensors that can automatically report incidents, while communication (SMS/notifications) can be integrated using Twilio or Firebase.

6.2. Blockchain for Data Security

Secure Data Sharing: Sensitive medical and emergency-related information must be handled securely. Blockchain technology could be used to create immutable records of patient information, emergency reports, and interactions with first responders, ensuring privacy, security, and auditability.

Smart Contracts: Blockchain could also help automate and streamline payments between patients, healthcare providers, and insurers for emergency services, reducing paperwork and improving efficiency.

6.3. AI and Predictive Analytics

Predictive Emergency Response: AI algorithms can analyze patterns and trends from past data (e.g., traffic, weather, crime, accidents) to predict where emergencies are most likely to occur and proactively dispatch resources to those locations. This would minimize response time and maximize efficiency.

AI-based Triage Systems: AI could help prioritize emergency calls based on severity, analyzing real-time information to better determine which cases need immediate attention. This could also assist dispatchers in managing multiple incidents more efficiently.

6.4. Machine Learning and Natural Language Processing (NLP)

Smart Dispatching: NLP can help analyze spoken emergency calls, extracting relevant information in real-time to alert the right emergency services, reducing the need for manual intervention.

Machine Learning for Incident Management: Machine learning can be applied to analyze trends and optimize incident management by predicting response times, resource allocation, and emergency patterns based on historical data.

VI. CONCLUSION

In conclusion, the Emergency Services System is a vital technological solution aimed at enhancing emergency response services for users in need. By providing a user-friendly interface for the public to request assistance and report fires, the system ensures prompt action from emergency service providers. The well-structured architectural framework supports seamless interactions between users, administrators, and service providers, enabling real-time tracking and efficient resource allocation.

The system's design incorporates robust security measures and integrates advanced features such as GPS tracking and automated notifications, which contribute to improved operational efficiency and user satisfaction. With the adoption of an Agile

development methodology, the project remains adaptable to changing requirements, ensuring that the final product meets the needs of all stakeholders.

Ultimately, this system not only streamlines the process of emergency response but also enhances public safety and trust in emergency services, laying the foundation for a more responsive and efficient emergency management system in the community. Continuous monitoring and updates will further ensure that the system evolves alongside technological advancements and user expectations, thus maintaining its relevance and effectiveness in emergency situations.

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