IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)
An International Open Access, Peer-reviewed, Refereed Journal

EMERGENCY VEHICLE ARRIVAL ALERT SYSTEM FOR TRAFFIC CLEARANCE

1st Hande Tejal Sunil
Dept Computer Engineering,
Jaihind College Of Engineering
Kuran, India.

2nd Ghangale Mayuri Santosh
Dept. Of Computer Engineering,
Jaihind College Of Engineering
Kuran, India.

3rd Ozarkar Kadambari Chandrakant
Dept.of Computer Engineering,
Jaihind College Of Engineering
Kuran, India.

4thP.A. Mande.
Dept. of Computer Engineering,
Jaihind College Of Engineering
Kuran, India.

Abstract: This paper reviews advanced systems designed to reduce delays faced by emergency vehicles. The focus is on solutions that use GPS tracking, cloud platforms, and mobile applications to send alerts to nearby drivers when an emergency vehicle is approaching. This helps drivers clear the way quickly, reducing response time, improving traffic flow. The solution is cost-effective, easy to implement, and suitable for smart city applications.

Index Terms - Emergency Vehicle Alert, GPS Tracking, Cloud Platform, Mobile Application, Real-Time Notification, Traffic Management.

I.INTRODUCTION

The rapid expansion of urban areas, controlling traffic congestion to guarantee the uninterrupted movement of emergency response vehicles. Delays caused by dense traffic can seriously impact the arrival time of ambulances, fire engines, and police units, potentially leading to critical situations.

This paper introduces an **Intelligent Emergency Vehicle Alert Framework** that utilises **cloud computing and GPS-based communication** to instantly warn nearby motorists about approaching emergency vehicles. The system's primary aim is to enhance traffic efficiency, improve public safety, and minimise emergency response delays. By seamlessly integrating **GPS tracking and cloud infrastructure,** the proposed model delivers a fast, secure, and user-friendly platform. Designed to complement **smart city ecosystems**, it ensures that emergency services can navigate traffic smoothly, reach destinations faster, and contribute to safer and more efficient road networks.

II.OBJECTIVES

A. **Enhance Public Safety:** By warning surrounding traffic to clear the road promptly, emergency vehicles such as fire engines and ambulances can travel swiftly and safely.
B. **Shorten Response Time:** By using GPS and cloud technologies, emergency vehicles can be instantly identified and alerted quickly, enabling them to get to accident or emergency sites more rapidly.
C. **Improve Communication:** To offer a mobile-based alert system that permits immediate communication between the public and emergency services in times of crisis.
D. **Ensure smooth traffic flow:** To reduce congestion and give emergency vehicles unrestricted mobility by automatically alerting cars on the same route to move aside.
E. **Turn on Real-Time Tracking:** To use GPS to track emergency vehicles in real time and store the data in the cloud for future performance reviews and real-time monitoring.
F. **Encourage Smarter Planning with Data:** To improve alert accuracy, route planning, and overall emergency operations by analysing stored data to comprehend traffic and emergency trends.

III. RELATED WORKS

A. **GPS-Based Tracking System:** Real-time tracking through GPS technology enables continuous Supervision of emergency vehicles, helping authorities improve coordination and shorten arrival times during critical situations. Although IoT-based tracking alternatives exist, they usually involve higher implementation costs and more intricate system setups.
B. **Integration of Cloud Computing:** Adopting cloud computing technology allows emergency response systems to process information rapidly and store large volumes of data efficiently. This eliminates the need for dedicated physical hardware while ensuring that alerts are generated and delivered instantly during emergencies.
C. **Mobile Application Notifications:** Mobile applications that combine GPS with network connectivity can immediately inform nearby road users when emergency vehicles are approaching. This not only increases driver awareness but also enhances overall traffic safety by minimising delays.
D. **Communication Techniques:** Earlier systems relying on IoT or RF communication faced limitations in range and data transmission speed.Cloud-based communication models overcome these issues by offering broader coverage and faster data transfer, ensuring more reliable real-time coordination.
E. **Data Handling and Analytical Processing:** Evaluating previously collected traffic flow and route information allows systems to identify recurring patterns. This analysis contributes to more precise predictions, smarter route planning, and improved emergency management in future operations.

IV. PROBLEM STATEMENT

Develop a Cloud-Based Emergency Vehicle Alert System (EVAS) application to efficiently track emergency vehicles to reduce response delays and improve road safety.

V. PROPOSED SYSTEM

The Emergency Vehicle Alert System (EVAS) is designed to establish instant communication between emergency vehicles and normal traffic, improving overall road safety and minimising the time taken to respond to emergencies. The system runs on a cloud-based platform that uses GPS to constantly monitor the location of emergency vehicles and send their live coordinates to a central server. This server analyses the data to determine all nearby vehicles within a 500-meter radius. It sends immediate alerts through a mobile application, informing drivers to yield the right of way and clear the road. EVAS minimises the chance of accidents, allows for faster emergency access, and facilitates more seamless traffic flow by facilitating quick communication between civilian drivers and emergency personnel. By removing the requirement for more IoT gear, the system is now simpler to deploy in cities, more cost-effective, and more adaptable. The cloud stores all data pertaining to vehicle movement and alerts for subsequent analysis, enabling officials to pinpoint recurring traffic hotspots, enhance routes, and increase operational dependability. The system is made of two primary modules: one for emergency vehicles and one for regular motorists. The regular vehicle module receives timely alerts whenever an emergency vehicle is detected nearby, while the emergency vehicle module constantly transmits location data to the cloud. Secure APIs manage the integration between the cloud server and the application, ensuring efficient and reliable communication. The precision, responsiveness, and communication efficiency of EVAS are assessed during testing under simulated traffic circumstances. The recorded data, which includes vehicle speed, route timing, and alert response, is analysed to determine the reasons for delays and optimise system performance. In general, EVAS provides an affordable, automated, and useful method for enhancing urban traffic management, improving emergency coordination, and advancing the development of intelligent and safer transportation systems.

VI. METHODOLOGY

The proposed Emergency Vehicle Alert System (EVAS) will employ a combination of cloud technology, GPS tracking, and mobile application components to achieve efficient real-time communication between emergency and normal vehicles. The system will consist of two main modules: one for emergency vehicles and another for regular drivers. Each emergency vehicle will have a mobile application that continuously transmits its live GPS location to a centralised cloud server. This data will be processed to detect all normal vehicles located within a 500-meter radius of the emergency vehicle. Integration between the mobile application and the cloud server will be achieved through APIs to ensure fast and secure data communication. Normal vehicle users will also use the application, which will receive instant alert notifications whenever an emergency vehicle is detected nearby. These notifications will prompt drivers to clear the way, thereby minimising congestion and enabling faster emergency response.

VII. ARCHITECTURE

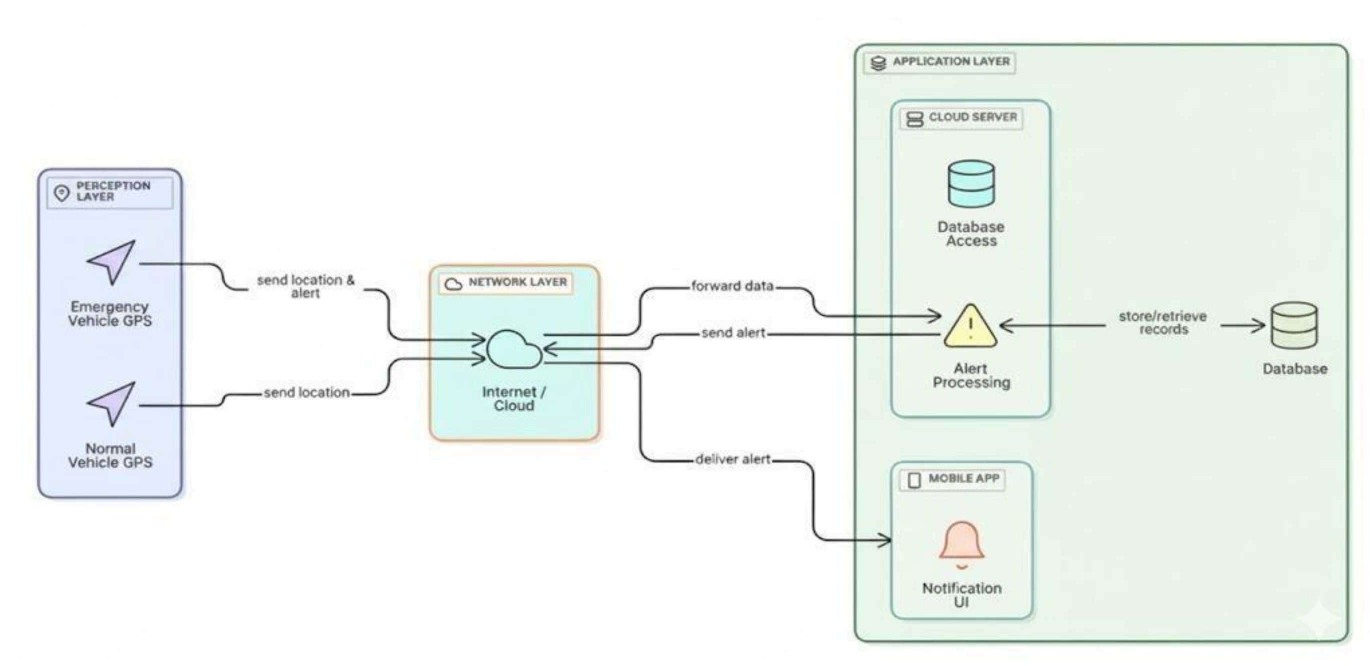

fig. no. 1: architecture of emergency vehicle management system

Certainly, let's break down the functionalities of this Emergency vehicle management system architecture:

Emergency User Module:

- Authorised emergency personnel can initiate alerts through a secured mobile dashboard.
- When an alert is triggered, the system automatically captures the vehicle's identification details and its precise GPS coordinates.
- This data is securely sent to the cloud, enabling rapid alert dissemination to all vehicles in the surrounding area.

Emergency Vehicle Driver Module:

- The emergency vehicle's location is updated continuously in real time.
- Each position update is transmitted to the cloud, allowing accurate route tracking and live monitoring.
- Vehicles in the vicinity receive automatic notifications to yield and make way for the emergency vehicle.

Normal Vehicle Driver Module:

- Regular drivers are instantly notified whenever an emergency vehicle is approaching their vicinity.
- The mobile interface provides clear and safe movement or stopping instructions based on the vehicle's current position.

Cloud Processing Module:

- The cloud platform serves as the central processor that manages and analyses all incoming location and alert data.
- It broadcasts timely notifications to all vehicles within the relevant range.
- The module ensures consistent, real-time communication among all connected users.

Data Storage Module:

- The system securely records alerts, routes, timestamps, and communication history.
- These stored datasets support later analysis of system performance and operational efficiency.
- The insights gained help refine and enhance future emergency response strategies.

Mobile Application Interface:

- The application provides real-time displays of emergency alerts and vehicle movements.
- It offers concise safety guidance to users to promote safe and coordinated behavior.
- The interface facilitates seamless interaction and information exchange among all participants in the network.

VIII. FUTURE SCOPE

The proposed Emergency Services Aggregator System currently includes critical functionalities such as GPS-based location tracking, cloud-enabled communication, automated emergency alerts, and instant notifications to nearby users. Despite these advancements, there remains room for further innovation and refinement. Future improvements could involve the incorporation of Artificial Intelligence (AI) and Machine Learning (ML) techniques to achieve smarter route planning, predictive management of traffic conditions, and proactive detection of areas with a higher likelihood of accidents.

IX. CONCLUSION

The Emergency Vehicle Alert System offers a practical approach to handling emergencies by utilising GPS tracking, cloud infrastructure, and mobile-based alert mechanisms. When an authorised user activates an alert, the platform immediately processes the request and informs nearby drivers to create a clear passage for the emergency vehicle. This enhances traffic coordination, reduces response delays, and promotes overall road safety through automated notifications and continuous communication. The use of cloud technology also simplifies data handling and supports future scalability, making the system adaptable for integration into emerging smart city transportation frameworks.

X. REFERENCES

[1] P. N., K. Rajesh, P. S., T. G. Kulkarni, S. Shashank, and V. M., "IoT-Based Autonomous Emergency Vehicle Traffic Management System," 2024 International Conference on Knowledge Engineering and Communication Systems (ICKECS), Bengaluru, India, 2024, pp. 1–4, doi: 10.1109/ICKECS2024.2024.xxxxx.

[2] C. Ding, I. Wang-Hei Ho, E. Chung, and T. Fan, "V2X and Deep Reinforcement Learning-Aided Mobility-Aware Lane Changing for Emergency Vehicle Preemption in Connected Autonomous Transport Systems," IEEE Transactions on Intelligent Transportation Systems, vol. 25, no. 7, pp. 6231–6245, July 2024, doi: 10.1109/TITS.2024.3382178.

[3] M. C. *et al.*, "Intelligent Traffic Monitoring, Prioritising and Controlling Model Based on GPS," 2023 International Conference on Innovative Data Communication Technologies and Application (ICIDCA), Uttarakhand, India, 2023, pp. 297–299, doi: 10.1109/ICIDCA56705.2023.10100296.

[4] M. P. Mohandass, K. I., M. R., and V. R., "IoT-Based Traffic Management System for Emergency Vehicles," 2023 9th International Conference on Advanced Computing and Communication Systems (ICACCS), Coimbatore, India, 2023, pp. 1755–1759, doi: 10.1109/ICACCS57279.2023.10112694.

[5] K. Choudhury and D. Nandi, "Detection and Prioritisation of Emergency Vehicles in Intelligent Traffic Management System," 2021 IEEE Bombay Section Signature Conference (IBSSC), Gwalior, India, 2021, pp. 1–6, doi: 10.1109/IBSSC53889.2021.9673211.

[6] U. Dot, "Traffic Signal Preemption for Emergency Vehicles: A Crosscutting Study," Federal Highway Administration, 2006.

[7] M. Masoud and S. Belkasim, "WSN-EVP: A Novel Special Purpose Protocol for Emergency Vehicle Preemption Systems," IEEE Transactions on Vehicular Technology, vol. 67, no. 4, pp. 3695–3700, 2018.

[8] J. B. Kenney, "Dedicated Short-Range Communications (DSRC) Standards in the United States," Proceedings of the IEEE, vol. 99, no. 7, pp. 1162–1182, 2011.

[9] R. Molina-Masegosa and J. Gozalvez, "LTE-V for Sidelink 5G V2X Vehicular Communications: A New 5G Technology for Short-Range Vehicle-to-Everything Communications," IEEE Vehicular Technology Magazine, vol. 12, no. 4, pp. 30–39, 2017.

[10] G. Unibaso, J. Del Ser, S. Gil-Lopez, and B. Molinete, "A Novel CAM-Based Traffic Light Preemption Algorithm for Efficient Guidance of Emergency Vehicles," 13th International IEEE Conference on Intelligent Transportation Systems, 2010, pp. 74–79.

[11] K.-H. Chen, C.-R., Dow, C.-W., Yang, and W.-C. Chiang, "BEVOR: An NTCIP-Based Interoperable Framework for Emergency Vehicle Preemption System Using Web Service and STMF," Journal of Information Science and Engineering, vol. 26, pp. 803–820; IEEE Transactions on Intelligent Transportation Systems, vol. 16, no. 4, pp. 2113–2120, 2015.