

# Bus Tracking System using Mobile GPS Technology

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**Abstract—** This research work introduces a cost-effective Bus Tracking System that eliminates the need for expensive GPS devices in buses. Instead, it harnesses the GPS capabilities of drivers' mobile devices for real-time bus location tracking. The system comprises two modules one is designed for user application for users and the other is a driver application for drivers. Users can access the system via any web browser, providing vital information on bus numbers, routes, and stops. In a transportation landscape where bus locations often remain uncertain, this solution addresses this issue by precisely fetching real-time bus locations from drivers' mobile GPS. It transforms the user experience, facilitating efficient journey planning. The user-friendly interfaces ensure accessibility, offering a dependable and cost-effective transportation information platform. This innovative approach offers an optimal solution for accurate and easily accessible transportation information without costly onboard GPS device.

**Keywords—**Bus Tracking, Collage bus Tracking, Bus tracking using driver's mobile location

## I. INTRODUCTION

Transportation holds a central significance in the everyday routines of college students, affecting their punctuality, readiness, and overall academic experience. Today, technology enables us to leverage the power of mobile GPS to track buses in real-time, providing immense potential to enhance the user's commuting experience. Efficient bus transportation in educational institutions deeply impacts student performance and institutional credibility. However, unpredictability and a lack of real-time monitoring often mar this system. Technological progress, specifically the incorporation of GPS tracking in college bus systems, has the potential to revolutionize this scenario. This research paper delves into the application of driver mobile GPS-based systems for tracking bus locations in academic institutions. Bus tracking operates by utilizing a fusion of

Satellites and cellular towers. The system consistently gathers location data from the mobile GPS devices of drivers in each vehicle, subsequently transmitting this data to a secure web-based platform. This information is then utilized to dynamically monitor the real-time location of each bus. It explores how such systems provide vital data such as bus routes, stops, and real-time location to students and parents, enhancing predictability and reliability.

## II. LITERATURE REVIEW

A system in reference [1], is a Bus Tracking System, This system operates on a GPS-based tracking system, utilizing ReactJS for application development. The collected GPS data is subsequently employed to monitor the location of each bus. It could present the estimated arrival time of the buses. In addition to this functionality, it provides the capability to generate or modify routes and locations within the database. This system reference [2] is designed for any travel organization to retrieve real-time information about the current locations of their vehicles. Users can access the application through a web browser. In this software, a mobile application is designed for monitoring bus tracking, aiming to minimize passenger waiting times. The application goes beyond mere tracking; it can also detect instances of deviations and unauthorized stops initiated by the bus driver. The Global Positioning System (GPS) is harnessed for accurate bus location, while Radio-Frequency Identification (RFID) technology is implemented for bus identification purposes. This combination ensures precise tracking and identification, enhancing overall system reliability. The mobile application provides real-time insights into bus movements, allowing passengers to stay informed and reduce their waiting times effectively. The incorporation of GPS and RFID technologies not only ensures accurate tracking but also serves as a deterrent against unauthorized actions. Bus data will be stored in a cloud server allowing for online

accessibility. The Internet of Things and the mobile application were designed by using two ESP8266Wi-Fi modules that separated the GPS and the functions of sensors. GPS Neo-6m was used to track the bus route. The system in Reference [3], This study revolves around the development of a Bus Tracking System, with the principal objective being the creation of a GPS-tracking application that can enhance the accuracy and efficiency of tracking school buses compared to existing bus-tracking systems. the system in reference [4], Each bus in the system will be equipped with RFID tags, while RFID readers will be strategically positioned at every bus stop. Acting as the central controller, an Arduino unit will manage the entire system. To ensure constant monitoring, a GSM module will facilitate the transmission of tracking messages to authorized individuals. The system in reference [5], to solves the drawback of the public transportation system. So our system handles the data like the location and management of buses. It provide the current location of the bus on Maps to the remote user. The system in reference [6], This paper proposes the Android app development focuses on optimizing transportation services for university students utilizing bus rental companies. The key aim is to diminish student waiting times by facilitating swift communication between bus drivers and passengers. The app ensures timely sharing of information, enhancing overall efficiency and creating a more user-friendly experience for students relying on bus services. The approach centres on utilizing advanced GPS technology via the Internet of Things (IoT), empowering college students to monitor college bus movements in real time for efficient tracking and schedule management. Establishing a timetable and incorporating live updates on the current locations of buses for users. The approach outlined in reference [7] relies on cutting-edge GPS technology through the Internet of Things (IoT), enabling college students to monitor the movements of college buses. It also facilitates maintaining a schedule and integrating real-time bus location updates for users. A System could be developed with GPS, maps, SMS services, a web sever and database server. Use of this application, the students can caught the live location with the internet connection.

### III. EXISTING SYSTEM

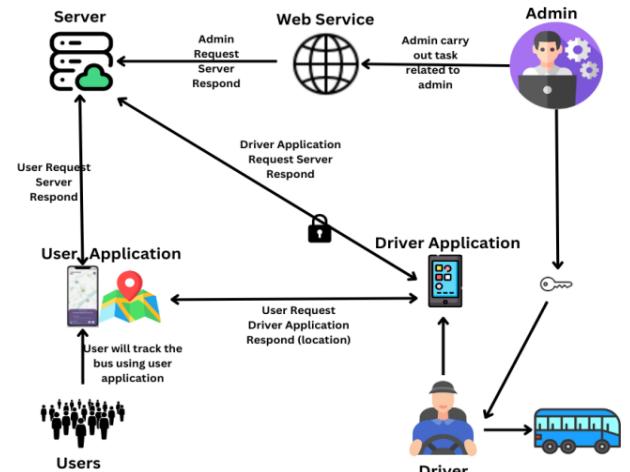
The existing bus tracking system confronts a substantial challenge stemming from its reliance on GPS devices or sensors for monitoring buses. A critical issue arises when attempting to install these tracking instruments on specific buses, as the process proves to be arduous, and in some instances, entirely unfeasible. This installation challenge severely limits the tracking capabilities of those vehicles, creating disparities in the efficiency and reliability of the bus tracking system. To enhance the overall efficacy and dependability of this tracking system, a compelling solution is imperative to address the hurdles related to the installation of GPS devices or sensors on select buses. The crux of the problem lies in the need for a more adaptable and pragmatic tracking approach, one that ensures all buses, regardless of their inherent complexities, can be tracked seamlessly and without compromise. By doing so, this research study seeks to eliminate the existing constraints and offer a comprehensive tracking solution that caters to the unique characteristics and challenges of each bus within the fleet.

### IV. PROPOSED SYSTEM PROTOTYPE

The proposed bus tracking system seamlessly integrates state-of-the-art technologies for a comprehensive solution. Employing MQTT and WebSocket protocols ensures real-time GPS data streaming, complemented by RESTful APIs for periodic batch updates to the location server. Data analytics, powered by Apache Spark and TensorFlow, handles large-scale bus tracking data through preprocessing, feature engineering, and model training. The tracking process involves GPS modules on buses, mobile applications with Android Location API or Core Location Framework, and backend servers using Node.js. Advanced algorithms like k-means clustering and recurrent neural networks identify intricate patterns. To achieve precision, the system employs differential GPS, Kalman filtering, and sensor fusion techniques. Monitoring is conducted through Elasticsearch, Kibana, Prometheus, and Grafana, offering real-time dashboards and anomaly detection. This innovative approach leverages drivers' mobile GPS, presenting a flexible and feasible real-time bus tracking system with unparalleled accuracy and efficient monitoring capabilities.

This proposed Project Contains two phases:

- User Application
- Driver Application



**Fig 1. Proposed System Architecture**

### V. COMPARISON WITH EXISTING SYSTEMS

Compared with existing systems, our approach addresses the limitations of GPS-dependent tracking, offering a more adaptable solution. Unlike systems relying on installed GPS devices, our method ensures seamless tracking for all buses, overcoming challenges associated with device installation on specific vehicles. Here we capture the location by the driver's mobile device rather than depending on GPS Boards.

## VI. FUTURE SCOPE OF THE PROPOSED PROTOTYPE

The future scope of this study involves refining and expanding the system's capabilities. Integration of additional features, such as predictive analytics for bus arrival times, enhanced security measures, and improved user interfaces, can further elevate the system's efficiency and user experience. Collaboration with transportation authorities and potential integration with smart city initiatives could extend the impact of the bus tracking system, contributing to a more connected and efficient public transportation ecosystem.

## VII. CONCLUSION

In conclusion, the proposed bus tracking system represents a significant advancement in transportation technology. By leveraging driver mobile GPS, it delivers real-time tracking, dynamic scheduling updates, and route details through dedicated applications. This innovative approach eliminates the reliance on onboard GPS devices, ensuring cost effectiveness and adaptability. Key features encompass robust user authentication, efficient bus data management, seamless GPS integration, live map tracking, and user-friendly interfaces. The system's integration of cutting-edge technologies signifies a transformative step in enhancing the efficiency, accessibility, and user experience of bus tracking solutions, showcasing its potential to redefine contemporary transportation management.

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