

College Bus Tracking System Using Driver GPS

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Abstract: College bus tracking system is an Android application to tracks college bus locations using GPS from the driver's smartphone, offering a cost-effective alternative to traditional hardware-based systems. This method reduces costs and improves communication between buses, students, and college management. Real-time tracking helps students avoid long waits due to traffic or bus issues, optimizing their daily schedules. Parents also benefit from timely updates on bus whereabouts, enhancing confidence in their child's safety. By integrating modern technology, our project aims to improve the efficiency, communication, and safety of the college transportation system.

Keywords: Real-time, Robust Communication, GPS, smartphone

I. INTRODUCTION

In today's fast-paced world, the integration of advanced technology into daily life has become essential. Among the various technological advancements, Android stands out as one of the most accessible and rapidly evolving platforms available to users. This project leverages the capabilities of Android technology to develop an innovative application aimed at tracking the live location of college buses. Traditional bus tracking systems rely heavily on hardware installations that are not only expensive but also cumbersome to manage. These systems require physical devices to be attached to each bus, transmitting location data through a network. Such setups significantly increase costs and maintenance efforts. Moreover, they often lack robust communication channels between buses, students, and college management, making it difficult to address unforeseen issues or emergencies promptly. To overcome these drawbacks, we propose an Android-based college bus tracking system that utilizes the GPS information from the driver's mobile device. This approach eliminates the need for additional hardware installations, thus reducing costs and simplifying the tracking process. The system offers real-time location updates, making it a convenient and efficient solution for tracking bus movements. From the students' perspective, the unpredictability of bus schedules due to traffic jams or breakdowns can lead to long and frustrating waits. By providing real-time tracking information, this application allows students to better manage their time [1], reducing unnecessary waiting periods. Additionally, delays in bus arrivals can cause significant concern for parents. The real-time monitoring feature of our application ensures that parents receive timely updates on the bus's whereabouts, enhancing their confidence in their child's safety during transit. Furthermore, the system facilitates improved communication between the bus drivers, students, and college management. In the event of delays or emergencies, timely information can be disseminated effectively, ensuring that all stakeholders are informed and can respond appropriately.

This project aims to create a user-friendly, cost-effective, and reliable solution for college bus tracking. By utilizing the widely adopted Android platform, we seek to enhance the safety, efficiency, and convenience of college transportation. Ultimately, our goal is to provide a seamless and reassuring experience for students and parents, while also streamlining operations for college management. The motivation for the work is to increase reliance on mobile technology has opened new avenues for enhancing daily conveniences and safety measures. This project is inspired by the need to provide real-time solutions to everyday challenges faced by students and parents regarding college bus tracking. By leveraging Android technology, we aim to replace costly and cumbersome hardware-based tracking systems with a more efficient and economical solution. Real-time GPS tracking via an Android app will significantly reduce the stress and uncertainty of long bus waits and delays. Ensuring timely updates enhances student time management and parental peace of

mind. This system will streamline communication between drivers, students, and college management, addressing unforeseen issues promptly. Our motivation is to create a user-friendly, cost-effective, and reliable bus tracking system. By integrating live tracking features, we aim to provide precise and accurate bus location data, allowing students to plan their commute more effectively. This system will also empower parents with real-time updates, ensuring they are aware of their child's whereabouts and safety. Additionally, the app will facilitate immediate notifications of any delays or changes in bus schedules, minimizing inconvenience and confusion. Moreover, this project supports environmental sustainability by optimizing bus routes and reducing idle times, thereby contributing to lower fuel consumption and emissions. We also envision the app as a platform for future enhancements, such as integrating feedback systems for continuous improvement and expanding to other forms of student transportation. Ultimately, this project seeks to improve the safety and efficiency of college transportation, contributing to a smoother and more secure transit experience. By harnessing the power of mobile technology, we aspire to set a new standard in student transportation solutions [2].

Objectives of the Study

- Enhancing the efficiency of the college transportation system.
- In this system we implement a REAL TIME data transfer in order to get accurate location using only android application
- Ensure real-time tracking of college buses to enhance safety and security.
- Provide a user-friendly interface for students and staff to access bus information easily

II. LITERATURE STUDY

- "A Survey of Bus Tracking System using IoT in Different Applications" Shri Krishna Rai1, Saurabh Mishra, Yogesh Tiwari, Saurabh Tomar published in the International Journal for Research in Applied Science & Engineering Technology (IJRASET) in 2020. This paper provides a comprehensive review of Bus tracking system implementation in various applications, including schools, education [3].
- A Review of n IOT based Bus Tracking System by Miss Payal W. Paratpure, Prof. P.R. Indurkar, Prof A.W. Hinganikar, published in the International Journal of Advances in Engineering and Management (IJAEM)in 2021. This paper provides an overview of the Bus Tracking and Management System Using IoT their functionality, and their limitations [4].
- "Smart Bus Tracking System": A Literature Review" by (Keerthana. M1, Rama.B, Priyadharshini., Vijayalakshmi., published in the International Journal of Creative Research Thoughts (IJCRT) in 2023 [5].
- " College Bus Tracking System: A Literature Review" by Ashish Sonar, Sanket Patil, Sushil Urkude, Swapnil Sandhan, published in the international Journal of Advanced Research in Science, Communication and Technology (IJARSCT) in 2022. This paper focuses on the use of College Bus Tracking System and reviews the literature on their effectiveness in improving students' satisfaction [6].
- "A Survey of IoT based Intelligent Bus Monitoring System " Dr. N. Dhanasekar Chitra Valavan S. Soundarya, published in the International Journal for Research in Applied Science & Engineering Technology (IJRASET) in 2019. This paper provides a comprehensive review of Bus tracking system implementation in education institutes [7].
- "A Survey of IoT based Intelligent Bus Monitoring System " Dr. N. Dhanasekar Chitra Valavan S. Soundarya, published in the International Journal for Research in Applied Science & Engineering Technology (IJRASET) in 2019. This paper provides a comprehensive review of Bus tracking system implementation in education institutes [8].

Overview of current system:

When it comes to live vehicle tracking, several methods are employed to ensure real-time accuracy and reliability. One common approach is using GPS trackers with inbuilt GSM modules, which can incur a delay of about 5-10 minutes due to the time required for SMS transmission to the GSM module. Another method involves devices embedded inside the bus, incorporating GPS trackers and IoT sensors to provide continuous and detailed data about the bus's location and condition, ensuring minimal delays and comprehensive information. Additionally, the traditional GPS tracking system equips each bus with a dedicated GPS

tracking device, requiring installation and network connectivity to transmit location data to a central server. This method is widely used due to its established reliability, although it involves higher installation and maintenance costs. By leveraging these various tracking technologies, transportation systems can offer enhanced accuracy, real-time updates, and improved efficiency in monitoring vehicle movements. Moreover, integrating advanced analytics and predictive modeling can further optimize route planning and improve response times to unforeseen circumstances, thereby enhancing the overall safety and efficiency of transportation services.

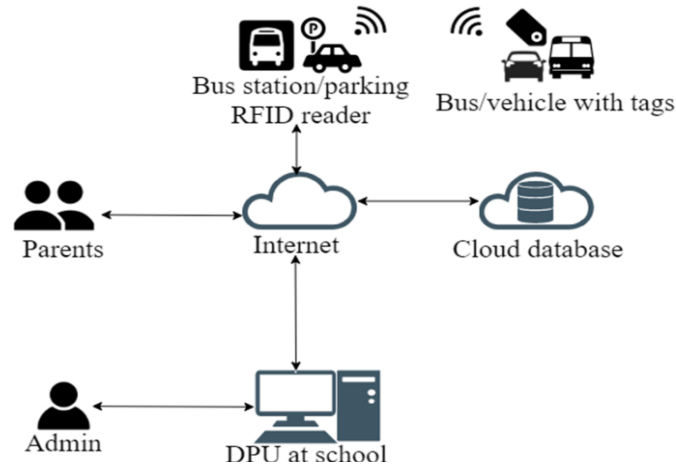


Fig.1 Flow Diagram of Existing system

Limitations with the current scenario:

Hardware-Based Tracking: The current system relies on physical devices installed in each bus to track its location. These devices transmit location data through a network, necessitating the installation and maintenance of hardware in every vehicle. **Limited Communication:** There is often a lack of robust communication channels between bus drivers, students, and college management. This can make it difficult to address unforeseen issues, such as delays or emergencies, promptly and effectively. **Maintenance Challenges** The existing system requires ongoing maintenance to ensure the hardware functions correctly. This can be logistically challenging and time-consuming, particularly for large fleets of buses. **High Costs:** Implementing and maintaining hardware-based tracking systems involves significant costs. These expenses include the purchase, installation, and regular maintenance of tracking devices for each bus.

III. PROPOSED WORK

In this system we implement a REAL TIME data transfer in order to get accurate location using only ANDROID applications. We also implemented Realtime database in order to get past the unavailability of services. We tend to construct a system which is completely dependent on the ADMIN. This application will be made easy to install & complete user friendly. Further can be easily replaced with HIGH end GPS trackers by simplified code modification.

Advantages:

It allows users to view the data from smart phone anywhere and anytime through server application. Improving the performance of the system using better component design. 24/7 availability.

Proposed Methodology

The development of an Android-based college bus tracking system involves several key stages: Requirement Analysis, Planning, System Design, Development, and Testing, Training, and Support. Initially, Requirement Analysis aims to understand the needs of students, parents, and college management through surveys and interviews, defining essential features like real-time tracking, notifications, and emergency alerts, and creating a detailed requirement specification document. The Planning stage establishes the project's structure, evaluates feasibility and risks, and outlines management and technical approaches. In the System Design stage, requirements are translated into detailed design elements, including functional

hierarchy diagrams, screen layouts, business process diagrams, and entity-relationship diagrams, ensuring the design aligns with system architecture and performance criteria. This stage also involves creating user interface mock-ups, integrating security protocols, and conducting design validation through peer reviews. During Development, the application is built based on the design specifications, with activities including frontend development using Android tools, backend development for server-side logic, GPS integration for real-time tracking, and setting up a notification system for students and parents.

Finally, the Testing, Training, and Support stage involves unit testing of individual programs, integration testing of module dependencies, and verification of data exchange and privacy issues. This thorough methodology ensures the delivery of a robust, scalable, and user-centric software solution.

ARCHITECTURE DIAGRAM

Architecture diagramming is the process of creating visual representations of software system components. In a software system, the term architecture refers to various functions, their implementations, and their interactions with each other. The provided diagram appears to depict a high-level architecture for a mobile application designed to facilitate communication between students and drivers, possibly for a ridesharing service. The central component is the Database, which stores all necessary information such as student and driver details, trip requests, and other relevant data. The Student App allows students to log in, view profile information, see drivers on a map, request rides, and view past requests. The Driver App enables drivers to log in, view profile information, see trip requests, view a map, accept or reject rides, and manage their service status. An Admin component, likely a web interface, allows system administrators to manage student accounts in the database. The diagram indicates that both the student app and driver app communicate with the database to retrieve and update information, but there is no direct communication shown between the student app and driver app. This overview provides a basic understanding of the system architecture, without detailing the specific interactions between components.

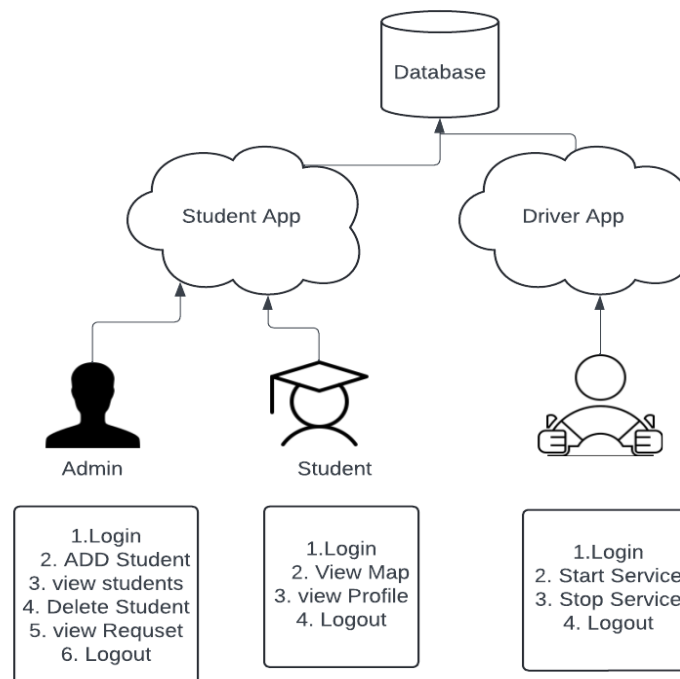


Fig 2: Architecture Diagram

IV. DESIGN

The system design for the Android-based college bus tracking application focuses on leveraging Android technology to create a seamless and efficient solution for managing transportation within educational

institutions. It encompasses a client-server architecture where native Android applications are developed for students, parents, and bus drivers, ensuring intuitive user interfaces and responsive functionalities. The server-side backend utilizes scalable cloud services to handle data storage, processing, and API management securely. Authentication and access control mechanisms, including OAuth for secure login and role-based permissions, are implemented to safeguard user data and manage access levels effectively. Real-time GPS tracking via Android's location services API enables continuous updates on bus locations, displayed through interactive maps for users to track movements in real-time. Push notifications are integrated to inform stakeholders about bus status changes promptly, enhancing communication and responsiveness. Route planning algorithms optimize bus routes dynamically based on traffic conditions and schedules, minimizing delays and improving operational efficiency.

A web-based management dashboard provides college administrators with comprehensive oversight, including analytics tools to monitor fleet performance and ensure service reliability. Data security measures such as encryption and compliance with privacy regulations are prioritized to protect sensitive information. The system design emphasizes scalability, performance optimization, and user-centric design principles to deliver a robust solution that enhances safety, efficiency, and convenience in college transportation management.

V. WORKING

The application described facilitates seamless management of college transportation through distinct user roles and functionalities. Students, admins, and drivers authenticate using ID and password credentials to access tailored features. Upon admin login, the home screen presents options like adding/viewing students and buses, managing bus locations, and logging out. Adding a student requires inputting details such as name, roll number, department, year, and semester, which are then viewable in an organized format on the student view page. Similarly, admin functionality includes adding drivers by entering name, ID, password, and contact number, subsequently viewable on the driver view page. For tracking buses in real-time, selecting the Map option on the student home page or View Bus Location on the admin page redirects to a map interface. This interface displays the bus's live location, current and college locations, distances between them, and driver contact details. This comprehensive approach ensures efficient monitoring and management of transportation logistics, enhancing convenience and operational oversight for all users involved.

VI. RESULTS

The College bus tracking application successfully integrated student, college management and driver significantly increasing their robust communication. Student benefited from enhanced convenience and communication with driver. Overall, the application is very useful for students and parents for robust communication. The apps user friendly interface and navigation facility seamless onboarding and daily use for both student and parents.



LOGIN HERE

Enter the Login Id

Enter the Password

LOGIN

Fig 1: Login screen

Here, we authenticate the Student and Admin and Driver them the access to the data in the application regarding the type of the user being login. The application accepts the 2 credentials as the login credentials. They are Id and the password

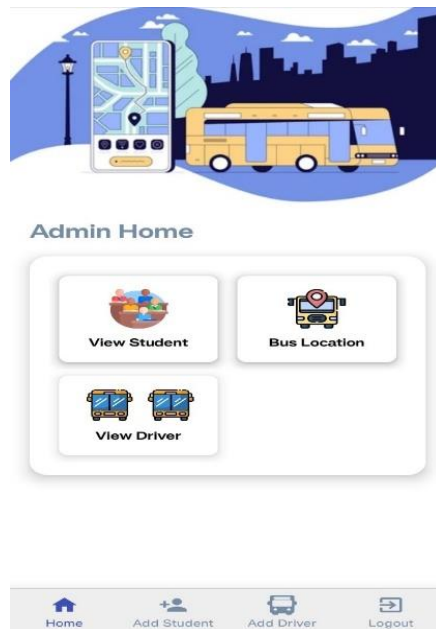


Fig 2: Admin home page

This is the home screen of the admin in the application. Once the admin login into the application, then the application will show him this page as a result. This screen holds the data as follows. Add Student, View Student, Add Bus, View Buses, View Bus Locations, Logout.

The image shows the 'Add Student' form in the application. The form has a blue header with the text 'Add Student' and a close button (X). Below the header, there are several input fields: 'Enter the student roll number' with a text input field containing 'Roll Number'; 'Enter the student default password' with a text input field containing '0000'; 'Enter the student name' with a text input field containing 'Student Name'; 'Enter the student department' with a text input field containing 'Department'; 'Student year' with a text input field containing 'Year'; and 'Student Semester' with a text input field containing 'Semester'. At the bottom of the form, there is a red 'SUBMIT' button.

Fig 3: Add Student

Fig 3: To register a new student, the admin is required to provide essential details including the student's name, roll number, department, year, and semester. Once all necessary information is entered, the admin proceeds by clicking the submit button.

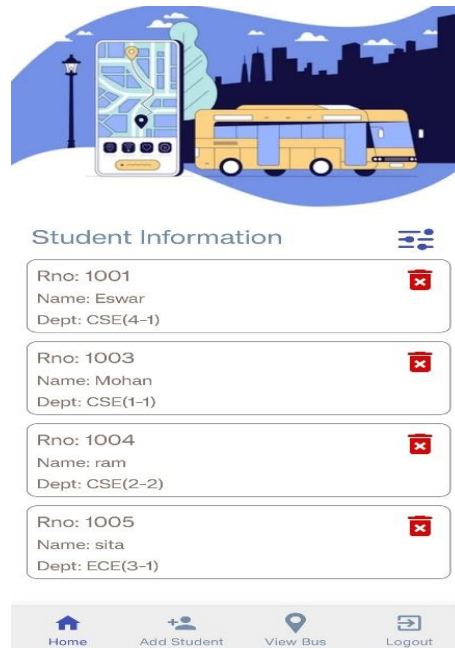


Fig 4: View Student

Fig 4: After adding the student information into the database, the details can be viewed on a dedicated page. On this page, the student's roll number, name, department, year, and semester are displayed in an organized manner, providing a clear and comprehensive overview of each student's information.

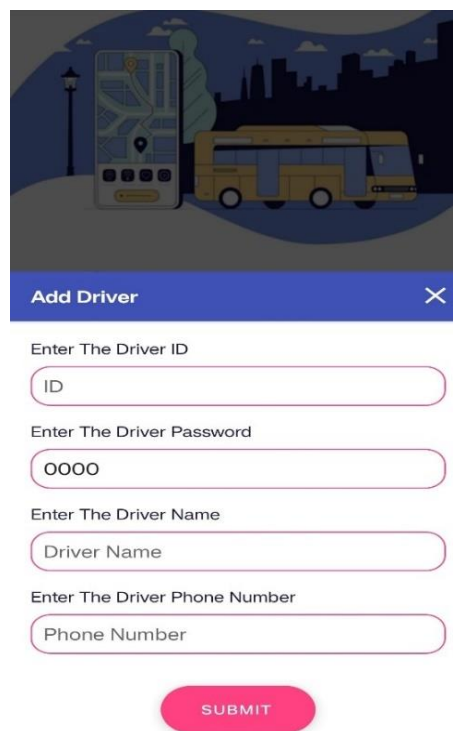


Fig 5: Add Driver

The admin possesses the exclusive privilege to add new driver to the database, playing a crucial role in maintaining accurate and up-to-date records. To register a new driver, the admin is required to provide essential details including the driver's name, Id, password, and number.



Fig 6: View Driver

After entering the driver information into the database, the details are displayed on a dedicated page. This page showcases the driver's ID, number, name, in an organized manner, offering a clear and comprehensive overview of each driver's information.

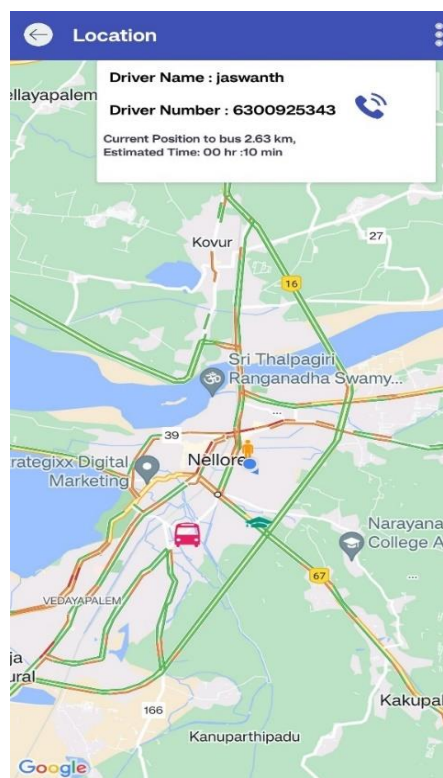


Fig 7: Map Page

When you click on the Map option in the student home page, or on the View Bus Location in the admin page, you will be redirected to the bus location page. Here, you can see the live location of the bus through real-time tracking. The page displays your current location, the bus's live location, and the college location. Additionally, you can view the distance between the college and the bus, as well as the distance between your current location and the bus location. Moreover, the page provides driver information, including the driver's name and contact number, allowing you to call the driver directly if needed. This comprehensive feature ensures that both students and admin can efficiently monitor and manage transportation details.

VII. Conclusion

In this project we designed and developed a real time bus tracking system using Android studio. In this project we try to save the time of the students mainly who uses the college transportation service and we also tend to help them with easy and tension mornings for a bright and peaceful day. This application does not need any external hardware except a smartphone which is available to all the students. So, the overall cost is very low or no cost needed for tracking the bus location. It provides nearly accurate data in real time that makes possible for the user to track the buses.

VIII. REFERENCES

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