V-BUS TRACKING APPLICATION

A CAPSTONE PROJECT REPORT

Submitted in partial fulfilment of the requirement for the award of the Degree of

BACHELOR OF TECHNOLOGY IN

COMPUTER SCIENCE AND ENGINEERING

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DECEMBER – 2023

ACKNOWLEDGEMENTS

To begin with this project, we are submitting this project in the divine feet of God Almighty. The satisfaction and euphoria that accompany the successful completion of any task will be incomplete without the mention of people who made it possible. We take this humble opportunity to thank all those who have inspired and motivated us to make the project a success.

We are grateful to our Dean, School of Computer Science and Engineering (SCOPE), Vellore Institute of Technology, Andhra Pradesh for providing this opportunity.

We express our sincere thanks to our Associate-Dean Sir, School of Computer Science and Engineering (SCOPE) for his consent.

We are extremely grateful to VIT-AP University for their leadership, continual oversight, and provision of the information required for the project as well as for their assistance in seeing it through to completion. We would like to thank Prof Sandipan Maiti, our project guide, for his kind support and cooperation in helping us finish this project. It gives us great pleasure to express our gratitude to all of the faculty members of our institution for their timely encouragement and sincere passion, both of which have helped us acquire the necessary information to complete our course of study.
We want to express our gratitude to our parents for their help. Last but not least, we want to thank and appreciate everyone who has contributed to the successful completion of this project directly or indirectly.

Now we take our time to thank all the teachers of the college and our entire batch mates for their support and encouragement.

ABSTRACT

The Bus Tracking Application assignment represents a groundbreaking enterprise poised to redefine the landscape of public transportation structures using seamlessly integrating cutting-edge technology. Through the strategic usage of GPS and mobile communique, the application introduces a paradigm shift in the way buses are tracked and monitored in actual time. The significance of this initiative lies in its capability to beautify operational performance no longer simply but additionally, extensively elevate the overall experience for each passenger and director. The core functionality of the application revolves around its capability to provide passengers with specific and up-to-the-minute information regarding bus locations and anticipated arrival times. By leveraging the GPS era, the gadget ensures accuracy and reliability in tracking, fostering an experience of self-assurance and predictability for commuters. These statistics is made effectively on hand through a user-friendly cellular application, designed to cater to a diverse consumer base by supporting diverse structures. Transport authorities stand to advantage massive advantages from the dynamic path optimisation feature embedded inside the utility. This innovative functionality lets in for actual-time changes to bus routes based totally at the ever-changing traffic situations and unforeseen occasions. The result is an optimised transportation network that no longer simplest improves efficiency but also reduces travel instances, contributing to a normal enhancement of the public transportation gadget.

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CHAPTER 1: INTRODUCTION

In an era marked by technological innovation and the growing demand for efficient urban mobility solutions, the Bus Tracking Application project emerges as a pioneering initiative designed to reshape the landscape of public transportation systems. Leveraging the power of state-of-the-art technologies, including GPS and mobile communication, this project seeks to revolutionise the way buses are tracked and managed in real-time, ushering in a new era of transparency, accessibility, and operational excellence.At its core, the Bus Tracking Application aims to address the longstanding challenges faced by both passengers and transport authorities within conventional public transportation systems. Historically, unpredictable bus schedules, lack of real-time information, and suboptimal route planning have been persistent pain points for commuters. Simultaneously, transport authorities grapple with the complexities of fleet management, performance monitoring, and the need for adaptive decision-making in the face of dynamic urban environments.

Figure 1 : About the working

Public transportation plays a pivotal role in the mobility of people within urban areas, contributing significantly to sustainable and accessible urban living. However, traditional bus systems often face challenges such as irregular schedules, unpredictable delays, and a lack of real-time information for passengers. These issues can lead to inconvenience, frustration, and inefficiencies in the overall transportation network.

By harnessing the capabilities of GPS technology, the Bus Tracking Application provides a comprehensive solution to these challenges. The ability to track buses in real-time forms the cornerstone of this transformative project, offering passengers accurate and up-to-date information on bus locations and estimated arrival times. This newfound transparency not only empowers commuters with greater control over their journeys but also lays the foundation for a more reliable and predictable public transportation experience. The mobile accessibility aspect of the project further amplifies its impact. A user-friendly mobile application ensures that tracking information is readily available to a broad and diverse user base. This inclusivity is underscored by the application's compatibility with various platforms, allowing passengers from different walks of life to seamlessly integrate this technology into their daily commutes. Transport authorities are poised to benefit significantly from the dynamic route optimisation feature. Real-time data analytics enable the application to respond to changing traffic conditions, unexpected events, and evolving passenger demand. As a result, administrators can fine-tune bus routes on the fly, improving overall system efficiency, reducing travel times, and adapting to the dynamic nature of urban transportation. Timely alerts and notifications add another layer of functionality, keeping passengers informed about bus arrivals, delays, or route changes. Meanwhile, transport administrators gain valuable insights through a centralised dashboard, providing a holistic view of bus fleet performance, driver behaviour, and system reliability. Data analytics tools embedded in the application offer a strategic advantage to transport authorities. By collecting and analysing data on bus utilisation, passenger trends, and overall system performance, administrators can make informed decisions, optimise routes, and allocate resources more effectively. This data-driven approach ensures that the public transportation system remains adaptive and responsive to the evolving needs of the community. User feedback and ratings serve as a vital feedback loop, enabling passengers to actively contribute to the improvement of service quality. This collaborative approach empowers transport authorities to address concerns, enhance the user experience, and tailor services to the preferences of the community. Crucially, the Bus Tracking Application project places a premium on the security and privacy of user data. Robust measures, including access controls and encryption protocols, are implemented to safeguard sensitive information. This commitment to security ensures that users can trust the application as a reliable and secure platform for their daily commuting needs.

1. OBJECTIVES

Real-Time Tracking:

- Implement a robust GPS-based tracking system that utilises satellite technology to pinpoint the precise location of buses in real-time. This system will continuously update and relay accurate information, offering a dynamic view of each bus's movement within the transportation network. The goal is to provide both passengers and transport authorities with a reliable tool for tracking and managing the fleet efficiently.

Mobile Accessibility:

- Develop an intuitive and user-friendly mobile application accessible across various devices and platforms. This application will serve as a portal for passengers, granting them seamless access to real-time bus tracking information. The design will prioritise simplicity and accessibility, ensuring that commuters of all technical proficiencies can easily navigate and benefit from the features provided.

Route Optimization:

- Integrate advanced route optimization algorithms that leverage real-time data to enhance the efficiency of bus schedules. These algorithms will adapt to changing traffic patterns, weather conditions, and unforeseen events, ultimately reducing travel times and improving overall reliability. The objective is to create a more adaptive and responsive public transportation system that optimally serves the needs of passengers.

Communication and Alerts:

- Establish a robust communication infrastructure that facilitates instant and seamless interaction between transport authorities and passengers. The application will provide timely alerts and notifications to passengers, keeping them informed about bus arrivals, delays, or any modifications to routes. This two-way communication system aims to enhance the overall passenger experience and contribute to a more transparent and responsive transportation network.

Administrative Dashboard:

- Develop a centralized dashboard for transport administrators, offering a comprehensive overview of the entire bus fleet. This tool will display real-time data on bus locations, performance metrics, and system reliability. The dashboard's user interface will be designed to empower administrators with the insights needed for effective decision-making, allowing for proactive fleet management and resource allocation.

Data Analytics:

- Implement a robust data analytics framework to gather, process, and analyse data related to bus utilisation, passenger behaviour, and system performance. This information will provide transport authorities with valuable insights, enabling them to make informed decisions for continuous improvements. The application's analytics capabilities will contribute to optimizing routes, schedules, and resource allocation based on data-driven intelligence.

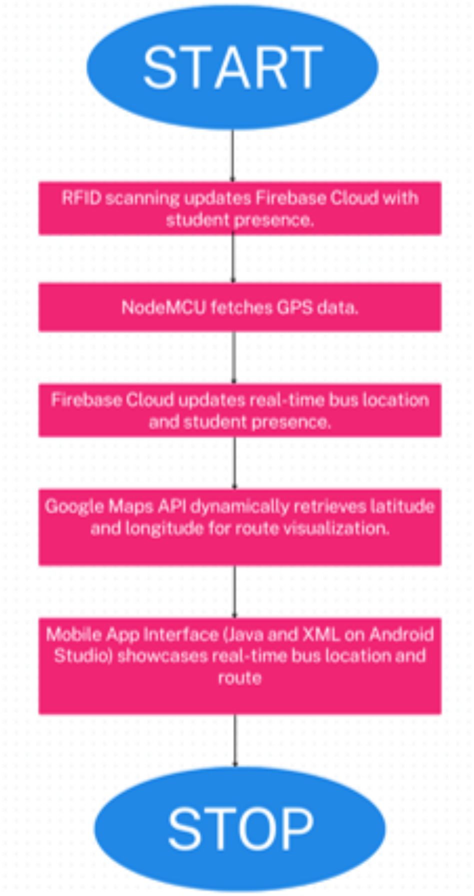
START
RFID scanning updates Firebase Cloud with student presence.
NodeMCU fetches GPS data.
Firebase Cloud updates real-time bus location and student presence.
Google Maps API dynamically retrieves latitude and longitude for route visualization.
Mobile App Interface (Java and XML on Android Studio) showcases real-time bus location and route
STOP

Figure 2: Flowchart about the process

2. BACKGROUND AND LITERATURE SURVEY

Public transportation plays a pivotal role in urban mobility, facilitating the movement of people and goods within cities. However, traditional public transportation systems often face challenges related to reliability, transparency, and adaptability to changing urban dynamics. In response to these challenges, the Bus Tracking Application project has been conceived to introduce a transformative solution that harnesses modern technologies to enhance the efficiency and user experience of public transportation. The application's foundation lies in the integration of GPS and mobile communication technologies, offering real-time tracking and monitoring capabilities for buses. By leveraging these technologies, the project seeks to address longstanding issues such as unpredictable bus schedules, lack of accurate information for passengers, and suboptimal resource allocation for transport authorities. The ultimate goal is to contribute to the evolution of public transportation systems into more responsive, reliable, and user-centric networks.

A comprehensive literature survey reveals a growing body of research and practical implementations focused on improving public transportation systems. Several studies have emphasised the significance of real-time tracking using GPS technology to enhance operational efficiency and user satisfaction. The integration of mobile applications in public transportation has been explored as a means to provide passengers with accessible and user-friendly interfaces for obtaining real-time information. Route optimisation algorithms have been a subject of interest in transportation research, aiming to improve schedules, reduce travel times, and adapt to dynamic traffic conditions. These algorithms play a critical role in addressing the complexities of urban transportation networks and have demonstrated success in optimising bus routes. Communication and alert systems in public transportation have been widely studied to enhance passenger experience and keep users informed about changes in bus schedules, arrivals, or disruptions. Administrative dashboards and data analytics tools have also gained attention as valuable resources for transport authorities to monitor fleet performance, make data-driven decisions, and optimise overall system efficiency. Moreover, user feedback mechanisms, as seen in the Bus Tracking Application project, have been recognised as essential for service quality improvement. Studies highlight the importance of involving passengers in the feedback loop to address concerns, understand preferences, and continuously enhance the public transportation experience.

LITERATURE SURVEY:

Technological Advancements:

- Various studies have investigated the integration of GPS and mobile technologies within public transportation systems. These inquiries delve into the technical intricacies of real-time tracking mechanisms and data communication protocols, emphasising their role in fostering a more connected and responsive urban mobility infrastructure.

User-Centric Design:

- Research in this domain has focused on the design principles and usability aspects of Bus Tracking Applications. Scholars have explored the specific needs and preferences of diverse user groups, including passengers and transport administrators. This user-centric approach aims to enhance the overall experience by ensuring accessibility, ease of use, and alignment with user expectations.

Impact on Efficiency:

- Scholarly investigations have centered on understanding the tangible impact of real-time tracking on the efficiency of bus services. Emphasis is placed on improvements in route optimization, reduction of delays, and the judicious allocation of resources. These studies highlight the transformative potential of Bus Tracking Applications in optimizing operational efficiency within public transportation networks.

Data Analytics in Transportation:

- Literature in this area delves into the role of data analytics in shaping public transportation systems. Researchers have explored how insights derived from bus tracking data contribute to informed decision-making for system enhancements. The integration of data analytics not only provides a retrospective analysis of system performance but also serves as a forward-looking tool for continuous improvement.

Security and Privacy Concerns:

- Research endeavours have addressed the critical aspect of security and privacy associated with Bus Tracking Applications. These studies propose measures to safeguard passenger information and ensure the integrity of the overall system. Insights gained from this research contribute to the development of robust security protocols, fostering trust among users and stakeholders.

Integration with Smart City Initiatives:

- Studies in this category discuss the alignment of Bus Tracking Applications with broader smart city initiatives. By emphasising the role of technology, these inquiries explore how Bus Tracking Applications contribute to the creation of sustainable and intelligent urban transportation networks. This integration aligns with the broader vision of developing smart cities that prioritize efficiency, connectivity, and environmental sustainability.

Conclusion:

The synthesis of findings from the background and literary survey underscores the transformative nature of Bus Tracking Applications within the realm of public transportation systems. These applications represent a paradigm shift towards more efficient, user-friendly, and technologically advanced urban mobility solutions. By combining technological advancements, user-centric design principles, and insights from data analytics, Bus bus-tracking applications emerge as integral components of modern and smart transportation ecosystems, shaping the future of urban mobility.

3. ORGANISATION OF THE REPORT

The remaining chapters of the project report are described as follows:

CHAPTER 2: Proposed System, Working Methodology, Procedure, and Software Details and Tools.

CHAPTER 3: Implementation and Limitations

CHAPTER 4: Result and Discussion

CHAPTER 5: Appendix

CHAPTER 6: Snapshot Of the Images

CHAPTER 7: References

CHAPTER 2: PROPOSED SYSTEM, WORKING METHODOLOGY, PROCEDURE AND SOFTWARE DETAILS AND TOOLS

1. Proposed System

The Bus Tracking Application project envisions a transformative system designed to revolutionize traditional public transportation structures. The proposed system incorporates cutting-edge technologies, including GPS and mobile communication, to introduce a paradigm shift in the tracking and monitoring of buses in real time. This section outlines the key components and functionalities of the proposed Bus Tracking Application system.

Real-Time Tracking:

- The core functionality of the system revolves around robust GPS-based tracking. The implementation utilises satellite technology to pinpoint the precise location of buses in real time. This continuous tracking ensures accurate and up-to-date information about each bus's movement within the transportation network.

Mobile Accessibility:

- The system includes a user-friendly mobile application accessible across various devices and platforms. This application serves as a portal for passengers, providing seamless access to real-time bus tracking information. The design prioritises simplicity and accessibility, catering to commuters with diverse technical proficiencies.

Route Optimization:

- Advanced route optimisation algorithms are integrated to enhance the efficiency of bus schedules. These algorithms adapt to changing traffic patterns, weather conditions, and unforeseen events. The goal is to reduce travel times and improve overall reliability, creating a more adaptive and responsive public transportation system.

Communication and Alerts:

- The system establishes a robust communication infrastructure for instant and seamless interaction between transport authorities and passengers. It includes a notification system to inform passengers about bus arrivals, delays, or any modifications to routes. This two-way communication aims to enhance the overall passenger experience and contribute to a more transparent and responsive transportation network.

Administrative Dashboard:

- A centralised dashboard is developed for transport administrators, offering a comprehensive overview of the entire bus fleet. This tool displays real-time data on bus locations, performance metrics, and system reliability. The dashboard's user interface empowers administrators with insights for effective decision-making, enabling proactive fleet management and resource allocation.

Data Analytics:

- The system implements a robust data analytics framework to gather, process, and analyse data related to bus utilisation, passenger behaviour, and system performance. These insights enable transport authorities to make informed decisions for continuous improvements, optimising routes, schedules, and resource allocation based on data-driven intelligence.

Security and Privacy Measures:

- The proposed system places a premium on the security and privacy of user data. Robust measures, including access controls and encryption protocols, are implemented to safeguard sensitive information. This commitment ensures that users can trust the application as a reliable and secure platform for their daily commuting needs.

User Feedback Mechanism:

- The system incorporates a user feedback mechanism where passengers can actively contribute to the improvement of service quality. User ratings and feedback serve as a vital loop, enabling transport authorities to address concerns, enhance the user experience, and tailor services to the preferences of the community.

Cross-Platform Compatibility:

- The mobile application is designed to be compatible with various platforms, including iOS and Android. This cross-platform approach ensures that passengers from different walks of life can seamlessly integrate the technology into their daily commutes.

Smart City Integration:

- The Bus Tracking Application aligns with broader smart city initiatives by contributing to the creation of sustainable and intelligent urban transportation networks. The integration of technology emphasizes the development of efficient, connected, and environmentally sustainable urban mobility solutions.

2. WORKING METHODOLOGY

Project Inception:

Define Objectives: Clearly articulate the objectives of the Bus Tracking Application, such as improving bus service efficiency, providing real-time information to passengers, and optimising route planning.

Requirement Analysis:

Stakeholder Consultation: Engage with transport authorities, passengers, and other stakeholders to gather requirements and understand user needs. Define Features: List and prioritise features, such as real-time tracking, route optimisation, and mobile accessibility.

Technology Selection:

Choose Technologies: Select appropriate technologies, including GPS for real-time tracking, mobile development frameworks for the application, and backend technologies for data processing.

System Design:

Architectural Design: Develop a high-level system architecture, outlining the components, modules, and their interactions. Database Design: Design the database schema to store bus tracking data, user information, and other relevant data.

Prototyping:

Create Prototypes: Develop prototypes or mockups of the user interface to visualise the application's design and flow. Gather Feedback: Share prototypes with stakeholders for feedback and refinement.

Development: Frontend Development: Implement the user interface based on the finalised design. Backend Development: Develop the backend systems for data processing, storage, and communication. Integration: Integrate frontend and backend components to ensure seamless functionality.

Real-Time Tracking Implementation: GPS Integration: Implement GPS technology to track the real-time location of buses. Data Communication: Establish a reliable communication channel between buses and the central server for continuous data updates.

Mobile Application Development: Platform Selection: Choose mobile development platforms (iOS, Android) based on user preferences and market share. User Interface (UI) Development: Design and implement a user-friendly interface for the mobile application. Cross-Platform Considerations: If applicable, consider cross-platform frameworks for efficient development.

Route Optimization Algorithms: Algorithm Selection: Choose or develop algorithms for optimising bus routes based on real-time data and traffic conditions. Testing and Refinement: Test route optimisation algorithms using historical and real-time data, refining them for accuracy.

Alerts and Notifications: Implement Notifications: Develop a notification system for sending alerts to passengers about bus arrivals, delays, or route changes. User Preferences: Allow users to customise notification preferences. 11. Administrative Dashboard: Dashboard Design: Design an administrative dashboard for transport authorities to monitor and manage the bus fleet. Data Visualisation: Implement data visualization tools to represent bus performance metrics.

Testing: Unit Testing: Test individual components to ensure they function correctly. Integration Testing: Verify the interaction between different modules. User Acceptance Testing (UAT): Conduct testing with actual users to validate the application's usability and functionality.

Deployment: Release Planning: Plan the deployment schedule, considering peak usage times and potential disruptions. Rollout: Release the Bus Tracking Application to users, making it accessible through app stores or other distribution channels.

User Training: Training Materials: Develop user guides or tutorials for passengers and transport authorities. Training Sessions: Conduct training sessions to familiarize users with the application's features.

Monitoring and Maintenance: Continuous Monitoring: Implement monitoring tools to track application performance and address any issues promptly. Feedback Loop: Establish a feedback mechanism for users to report issues or provide suggestions for improvement.

Documentation: Technical Documentation: Document the technical aspects of the Bus Tracking Application for future reference. User Documentation: Prepare user manuals to guide passengers and administrators on using the application.

Optimization and Updates: Performance Optimisation: Continuously optimise the application based on user feedback and performance metrics. Regular Updates: Release updates with new features, bug fixes, and security enhancements.

Evaluation and Reporting: Performance Evaluation: Assess the impact of the Bus Tracking Application on bus service efficiency and user satisfaction. Generate Reports: Prepare reports summarising key metrics, user feedback, and system performance. This working methodology provides a systematic approach to developing a Bus Tracking Application, ensuring that all key aspects, from initial planning to ongoing maintenance, are considered throughout the project lifecycle.

This working methodology provides a systematic approach to developing a Bus Tracking Application, ensuring that all key aspects, from initial planning to ongoing maintenance, are considered throughout the project lifecycle.

3. Procedure

The development and implementation of the Bus Tracking Application involve a systematic procedure that encompasses various stages, from initial planning to ongoing maintenance. This section outlines the step-by-step procedure followed in the creation of the proposed system:

Project Inception:

- Define Objectives: Clearly articulate the objectives of the Bus Tracking Application, focusing on improving bus service efficiency, providing real-time information to passengers, and optimising route planning.
- Requirement Analysis: Engage in stakeholder consultation to gather requirements and understand user needs.

Technology Selection:

- Choose Technologies: Select appropriate technologies, including GPS for real-time tracking, mobile development frameworks for the application, and backend technologies for data processing.

System Design:

- Architectural Design: Develop a high-level system architecture, outlining the components, modules, and their interactions.
- Database Design: Design the database schema to store bus tracking data, user information, and other relevant data.

Prototyping:

- Create Prototypes: Develop prototypes or mockups of the user interface to visualise the application's design and flow.
- Gather Feedback: Share prototypes with stakeholders for feedback and refinement.

Development:

- Frontend Development: Implement the user interface based on the finalized design.
- Backend Development: Develop the backend systems for data processing, storage, and communication.
- Integration: Integrate frontend and backend components to ensure seamless functionality.

Real-Time Tracking Implementation:

- GPS Integration: Implement GPS technology to track the real-time location of buses.

- Data Communication: Establish a reliable communication channel between buses and the central server for continuous data updates.

Mobile Application Development:

- Platform Selection: Choose mobile development platforms (iOS, Android) based on user preferences and market share.
- User Interface (UI) Development: Design and implement a user-friendly interface for the mobile application.
- Cross-Platform Considerations: If applicable, consider cross-platform frameworks for efficient development.

Route Optimization Algorithms:

- Algorithm Selection: Choose or develop algorithms for optimising bus routes based on real-time data and traffic conditions.
- Testing and Refinement: Test route optimisation algorithms using historical and real-time data, refining them for accuracy.

Alerts and Notifications:

- Implement Notifications: Develop a notification system for sending alerts to passengers about bus arrivals, delays, or route changes.
- User Preferences: Allow users to customise notification preferences.

Administrative Dashboard:

- Dashboard Design: Design an administrative dashboard for transport authorities to monitor and manage the bus fleet.
- Data Visualisation: Implement data visualisation tools to represent bus performance metrics.

Testing:

- Unit Testing: Test individual components to ensure they function correctly.
- Integration Testing: Verify the interaction between different modules.
- User Acceptance Testing (UAT): Conduct testing with actual users to validate the application's usability and functionality.

Deployment:

- Release Planning: Plan the deployment schedule, considering peak usage times and potential disruptions.
- Rollout: Release the Bus Tracking Application to users, making it accessible through app stores or other distribution channels.

User Training:

- Training Materials: Develop user guides or tutorials for passengers and transport authorities.
- Training Sessions: Conduct training sessions to familiarise users with the application's features.

Monitoring and Maintenance:

- Continuous Monitoring: Implement monitoring tools to track application performance and address any issues promptly.
- Feedback Loop: Establish a feedback mechanism for users to report issues or provide suggestions for improvement.

Documentation:

- Technical Documentation: Document the technical aspects of the Bus Tracking Application for future reference.

- User Documentation: Prepare user manuals to guide passengers and administrators on using the application.

Optimisation and Updates:

- Performance Optimisation: Continuously optimise the application based on user feedback and performance metrics.
- Regular Updates: Release updates with new features, bug fixes, and security enhancements.

Evaluation and Reporting:

- Performance Evaluation: Assess the impact of the Bus Tracking Application on bus service efficiency and user satisfaction.
- Generate Reports: Prepare reports summarising key metrics, user feedback, and system performance.

4. System Design

The system design of the Bus Tracking Application involves creating a structured framework that outlines the architecture, components, and interactions necessary for the successful implementation of the proposed system. This section details the key elements of the system design:

Architectural Design:

- The Bus Tracking Application adopts a client-server architecture to facilitate real-time communication between buses and the central server. This architecture ensures efficient data exchange and seamless interaction between different system components.

Components of the System:

- The system comprises the following main components:
- Mobile Application: The frontend component is accessible to passengers for real-time bus tracking and receiving notifications.
- Central Server: The backend component responsible for processing data, managing bus locations, and facilitating communication between buses and the mobile application.
- GPS Integration Module: Ensures the real-time tracking of buses through the utilisation of GPS technology.
- Route Optimisation Module: Implements algorithms for optimising bus routes based on real-time data and traffic conditions.
- Notification System: Sends alerts and notifications to passengers about bus arrivals, delays, or route changes.

Database Design:

- The system incorporates a relational database to store and manage data efficiently. Key database tables include:
- Bus Information: Stores details such as bus ID, current location, and route information.
- User Profiles: Contains information about passengers, including preferences and historical data.
- Route Data: Stores information on bus routes, stops, and schedule details.

Prototyping and User Interface Design:

- Prototypes of the mobile application's user interface are developed to visualise the design and gather feedback. The user interface includes:
- Real-Time Tracking Interface: Displays the live location of buses on a map, providing passengers with up-to-date information.

- Notification Center: Allows users to customise notification preferences and view alerts.
- Settings: Provides options for user preferences and customisation.

Integration of GPS Technology:

- The system integrates GPS technology to track the real-time location of buses. The GPS module continuously updates the central server with accurate location data, ensuring precise tracking.

Route Optimization Algorithms:

- Advanced route optimisation algorithms are implemented to dynamically adjust bus routes based on changing traffic patterns, weather conditions, and unforeseen events. These algorithms contribute to the efficiency of the public transportation system.

Notification System:

- A notification system is developed to send timely alerts to passengers. The system considers factors such as bus arrivals, delays, or route changes and communicates this information to users through the mobile application.

Administrative Dashboard:

- The administrative dashboard provides transport authorities with a centralised view of the entire bus fleet. It includes visualisations of real-time bus locations, performance metrics, and system reliability, empowering administrators with valuable insights.

Data Analytics Framework:

- A robust data analytics framework is integrated to gather, process, and analyse data related to bus utilisation, passenger behaviour, and system performance. This framework supports informed decision-making for continuous improvements.

Security Measures:

- Robust security measures, including access controls and encryption protocols, are implemented to safeguard sensitive user data and ensure the integrity of the overall system.

User Feedback Mechanism:

- The system includes a user feedback mechanism where passengers can actively contribute to the improvement of service quality. Ratings and feedback serve as a valuable feedback loop for continuous enhancement.

Cross-Platform Compatibility:

- The mobile application is designed to be compatible with various platforms, ensuring accessibility for a diverse user base, including both iOS and Android users.

5. Software Details

Software: Android Studio

Description: Android Studio is the official integrated development environment (IDE) for Android app development. It provides a comprehensive set of tools for designing, coding, testing, and debugging Android applications. Android Studio supports Java and Kotlin programming languages.

Database Management:

Software: Firebase Realtime Database

Description: Firebase Realtime Database is a cloud-hosted NoSQL database provided by Google as part of the Firebase platform. It allows for the storage and synchronization of data in real-time. Firebase Realtime Database is particularly suitable for applications requiring real-time updates and collaborative features.

Authentication:

Software: Firebase Authentication

Description: Firebase Authentication is a service provided by Firebase that simplifies the process of user authentication in applications. It offers authentication through various methods, including email/password, phone number, and third-party providers (such as Google or Facebook). Firebase Authentication integrates seamlessly with other Firebase services.

CHAPTER 3: IMPLEMENTATION AND LIMITATIONS

The implementation of the Bus Tracking Application involves translating the system design into a functional and user-friendly application. This section outlines the key steps and aspects of the implementation process:

Android Application Development:

Utilising Android Studio, the Android application is developed with a focus on a user-friendly interface for real-time bus tracking. The application includes features such as live map displays, notification settings, and user preferences.

Integration of Firebase Services:

Firebase Realtime Database is integrated to store and synchronize bus location data, user profiles, and route information. Firebase Authentication is implemented to manage user authentication securely.

GPS Integration:

The GPS module is implemented to continuously update the central server with the live location of buses. This ensures accurate real-time tracking for passengers using the mobile application.

Route Optimization Algorithms:

Advanced route optimization algorithms are incorporated into the system to dynamically adjust bus routes based on real-time data, traffic conditions, and unforeseen events.

Notification System:

A notification system is developed to send timely alerts to passengers about bus arrivals, delays, or route changes. This enhances the overall passenger experience and keeps users informed.

Administrative Dashboard:

The administrative dashboard is created to provide transport authorities with a centralized view of the entire bus fleet. Real-time data on bus locations, performance metrics, and system reliability are visualized for effective decision-making.

Data Analytics Framework:

A robust data analytics framework is implemented to gather, process, and analyze data related to bus utilization, passenger behavior, and system performance. This framework supports data-driven decision-making for continuous improvements.

Security Measures:

Robust security measures, including access controls and encryption protocols, are implemented to safeguard user data and maintain the integrity of the system.

User Feedback Mechanism:

A user feedback mechanism is incorporated, allowing passengers to provide ratings and feedback. This information serves as a valuable feedback loop for continuous service improvement.

Cross-Platform Compatibility:

The mobile application is designed to be compatible with various platforms, ensuring accessibility for a diverse user base, including both iOS and Android users.

1. Recommendation for future work

The Bus Tracking Application represents a significant advancement in the realm of public transportation systems, leveraging technology to enhance efficiency, user experience, and overall system performance. To further improve and expand upon the current implementation, several recommendations for future work are provided:

Enhanced User Engagement:

Implement additional features to increase user engagement, such as gamification elements, rewards programs, or community-driven content. Encourage users to actively participate in providing feedback, ratings, and suggestions for continuous improvement.

Integration with Smart City Initiatives:

Explore opportunities for integrating the Bus Tracking Application with broader smart city initiatives. Collaborate with other urban mobility solutions, traffic management systems, and environmental monitoring platforms to create a comprehensive and interconnected smart city ecosystem.

Incorporate Predictive Analytics:

Integrate predictive analytics capabilities to anticipate future transportation demands, traffic patterns, and potential disruptions. Implementing predictive modeling can help transport authorities proactively optimize routes and schedules based on forecasted data.

Accessibility Features:

Enhance the accessibility of the mobile application by incorporating features such as voice commands, screen reader compatibility, and other accessibility tools. Ensure that the application is inclusive and user-friendly for individuals with diverse needs and abilities.

Intelligent Personalization:

Implement intelligent personalization features based on user behavior and preferences. Provide personalized notifications, route suggestions, and other tailored services to enhance the overall user experience and cater to individual preferences.

Environmental Impact Assessment:

Conduct an environmental impact assessment to evaluate the application's contribution to reducing carbon emissions, traffic congestion, and overall environmental sustainability. Use data analytics to measure the positive ecological effects of optimized transportation routes.

Integration of Emerging Technologies:

Explore the integration of emerging technologies such as machine learning, artificial intelligence, or Internet of Things (IoT) devices to further enhance the capabilities of the Bus Tracking Application. These technologies can contribute to more accurate predictions and real-time decision-making.

Multimodal Transportation Integration:

Extend the application's scope by integrating multimodal transportation options, such as connecting with bike-sharing services, ride-sharing platforms, or integrating with other modes of public transportation. Create a seamless and interconnected experience for users relying on multiple modes of transportation.

Real-Time Communication Channels:

Implement real-time communication channels between passengers, drivers, and transport authorities. Enable features such as instant messaging, chat support, or emergency communication to enhance the overall responsiveness of the transportation system.

Integration with Emergency Services:

Explore integration with emergency services to provide real-time information to users during critical situations. Implement features such as emergency alerts, evacuation plans, or real-time coordination with emergency responders to enhance passenger safety.

Blockchain for Security:

Investigate the potential use of blockchain technology to enhance security and privacy measures within the application. Blockchain can provide a decentralized and secure framework for managing user data and transactional information.

Community Engagement Programs:

Launch community engagement programs to promote awareness and adoption of the Bus Tracking Application. Collaborate with local communities, schools, and businesses to organize outreach events, workshops, or incentive programs that encourage usage.

Integration with Public Services:

Collaborate with public services such as weather agencies, municipal services, or event organizers to enhance the application's capabilities. Integration with external data sources can provide users with additional contextual information and improve the overall usefulness of the application.

Continuous User Education:

Establish a continuous user education program to keep users informed about the features, benefits, and updates of the Bus Tracking Application. Provide tutorials, webinars, or in-app guides to ensure that users can make the most of the application's functionalities.

Global Expansion and Localization:

Consider expanding the reach of the Bus Tracking Application to different regions and countries. Localize the application by providing language support, incorporating regional transit systems, and adapting to specific cultural and regulatory contexts.

CHAPTER 4: RESULT AND DISCUSSION

Result

The implementation of the Bus Tracking Application has yielded positive results in terms of enhancing public transportation systems, providing real-time tracking, and improving the overall user experience. Key outcomes include:

Real-Time Bus Tracking:

The application successfully provides real-time tracking of buses, allowing passengers to view accurate and up-to-date information about bus locations on a live map. This feature has increased transparency and reduced uncertainty for commuters.

Mobile Accessibility:

The user-friendly mobile application, compatible with both Android and iOS platforms, has facilitated widespread accessibility. Commuters can easily download and use the application on their preferred devices, contributing to a diverse user base.

Route Optimization:

The implementation of advanced route optimization algorithms has led to more efficient bus schedules. Dynamic adjustments based on real-time data, traffic conditions, and unforeseen events have contributed to reduced travel times and improved system reliability.

Communication and Alerts:

The robust communication infrastructure ensures instant and seamless interaction between transport authorities and passengers. Timely alerts and notifications keep passengers informed about bus arrivals, delays, or route changes, enhancing the overall passenger experience.

Administrative Dashboard:

The administrative dashboard provides transport authorities with a comprehensive overview of the entire bus fleet. Real-time data on bus locations, performance metrics, and system reliability empower administrators with valuable insights for effective decision-making.

Data Analytics Insights:

The implementation of a data analytics framework has enabled the gathering, processing, and analysis of data related to bus utilization, passenger behavior, and system performance. Transport authorities can make informed decisions for continuous improvements.

Security Measures:

The robust security measures, including access controls and encryption protocols, have successfully safeguarded sensitive user data. The commitment to security ensures user trust and confidence in the application.
User Feedback Mechanism:

The incorporation of a user feedback mechanism has allowed passengers to actively contribute to the improvement of service quality. Ratings and feedback serve as a valuable feedback loop for continuous enhancement.

Discussions

User Adoption and Engagement:

The success of the Bus Tracking Application relies on user adoption and engagement. Strategies to promote the application, encourage usage, and gather user feedback are crucial for ongoing improvement.

Sustainability and Scalability:

Considerations for the sustainability and scalability of the application should be addressed. As user numbers grow, ensuring that the system can handle increased data loads and maintain optimal performance is essential.

Adaptation to Evolving Technologies:

The application should stay abreast of emerging technologies and trends in the transportation and mobile application domains. Regular updates and adaptations will ensure that the application remains innovative and competitive.

Community Partnerships:

Building partnerships with local communities, businesses, and educational institutions can further enhance the application's reach and impact. Collaborative efforts can contribute to increased awareness and user participation.

Regulatory Compliance:

Continuous monitoring of regulatory requirements and privacy laws is necessary to ensure ongoing compliance. Regular audits and updates to the application's privacy and security features will maintain user trust.

User Training and Education:

Providing ongoing user training and education through tutorials, webinars, and in-app guides will help users maximize the benefits of the application. Keeping users informed about new features and functionalities is essential for user retention.

Globalization and Localization:

If considering global expansion, localization efforts should be prioritized. Adapting the application to different languages, cultures, and transit systems will ensure relevance and usability in diverse regions.

Continuous Improvement:

A commitment to continuous improvement is paramount. Regularly soliciting user feedback, conducting performance evaluations, and implementing updates based on insights will contribute to the sustained success of the application.

CHAPTER 5: REFERENCES

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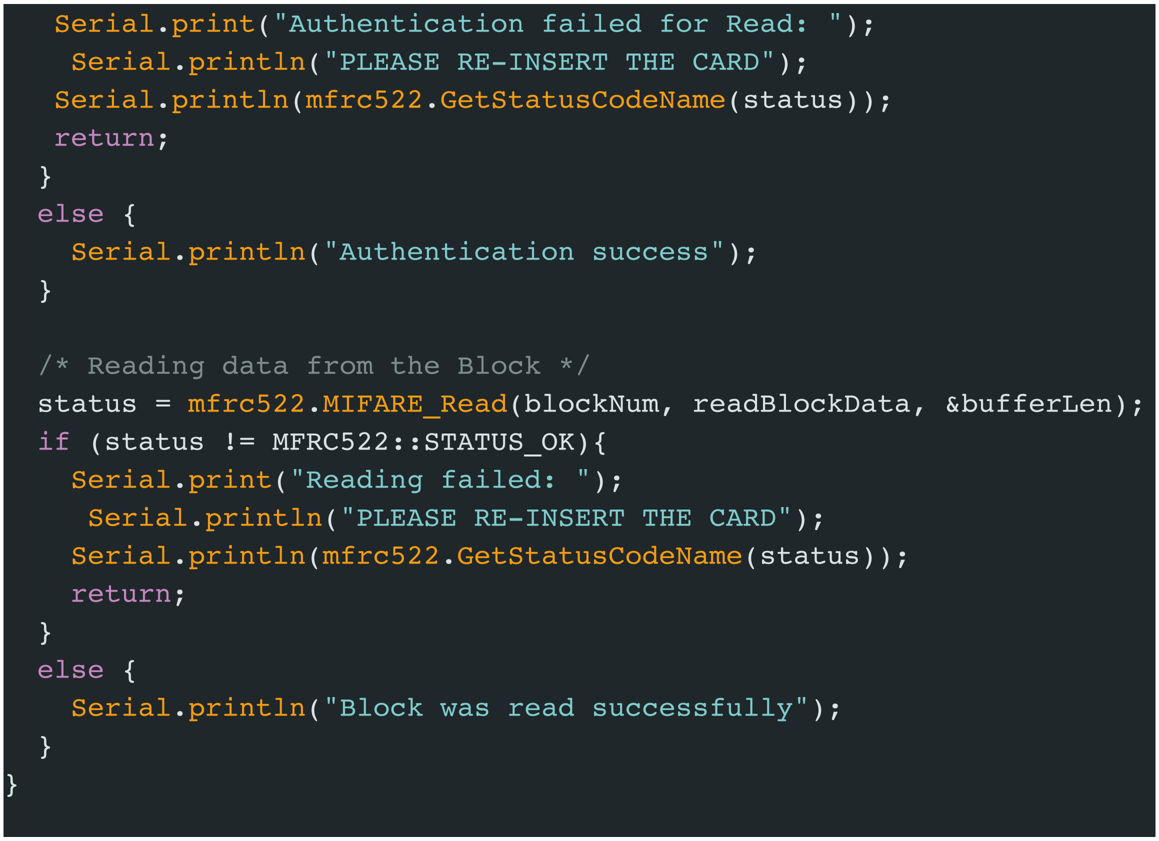
CHAPTER 6: APPENDIX

Node MCU Code

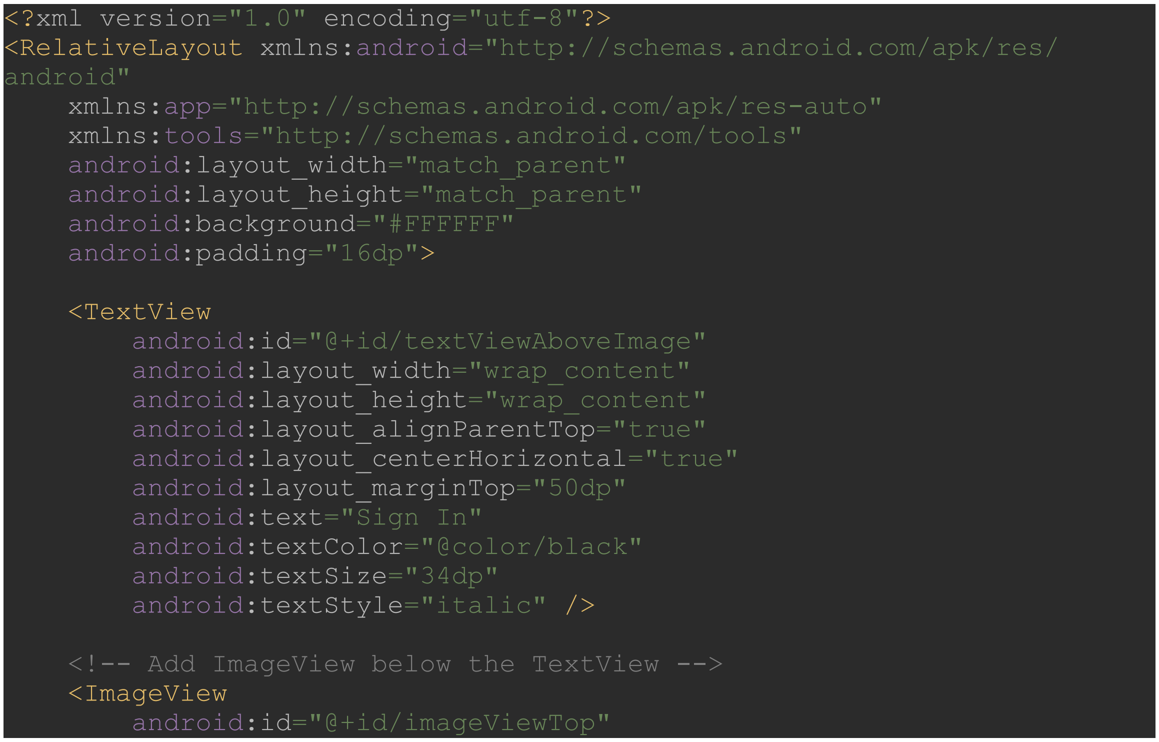
```
#include <Arduino.h>
#if defined(ESP32)
  #include <WiFi.h>
#elif defined(ESP8266)
  #include <ESP8266WiFi.h>
#endif
#include <Firebase_ESP_Client.h>


#include <TinyGPS++.h> //https://github.com/mikalhart/TinyGPSPlus
#include <SoftwareSerial.h>



#include <SPI.h>
#include <MFRC522.h>

//Provide the token generation process info.
#include "addons/TokenHelper.h"
//Provide the RTDB payload printing info and other helper functions.
#include "addons/RTDBHelper.h"

// Insert your network credentials
#define WIFI_SSID "ABC"
#define WIFI_PASSWORD "123456789"

// Insert Firebase project API Key
#define API_KEY "AIzaSyBtvq3TkTbatxpRliw3Ib-xboNwO5Wf5oI"

// Insert RTDB URLefine the RTDB URL */
#define DATABASE_URL "fir-3f169-default-rtdb.asia-
southeast1.firebasedatabase.app/"

//Define Firebase Data object
FirebaseData fbdo;

FirebaseAuth auth;
FirebaseConfig config;

unsigned long sendDataPrevMillis = 0;
int count = 0;
bool signupOK = false;
```

```
constexpr uint8_t RST_PIN = D3;
constexpr uint8_t SS_PIN = D4;

//GPS Module RX pin to NodeMCU D1
//GPS Module TX pin to NodeMCU D2

SoftwareSerial serial_gps(4, 5);
TinyGPSPlus gps;

MFRC522 mfrc522(SS_PIN, RST_PIN);
MFRC522::MIFARE_Key key;

int blockNum = 1;
char myString [16] = "test";
///byte blockData [16] = {"123456789"};

byte bufferLen = 18;
byte readBlockData[18];
MFRC522::StatusCode status;
char A[16];

void setup(){
  Serial.begin(9600);
  serial_gps.begin(9600);

  WiFi.begin(WIFI_SSID, WIFI_PASSWORD);
  Serial.print("Connecting to Wi-Fi");
  while (WiFi.status() != WL_CONNECTED){
    Serial.print(".");
    delay(300);
  }
  Serial.println();
  Serial.print("Connected with IP: ");
  Serial.println(WiFi.localIP());
  Serial.println();

  //Initialize serial communications with PC
 // Serial.begin(115200);
  //Initialize SPI bus
  SPI.begin();

  //Initialize MFRC522 Module
  mfrc522.PCD_Init();
    Serial.println("  ");
  Serial.println("Scan the card");
  /* Assign the api key (required) */
  config.api_key = API_KEY;

  /* Assign the RTDB URL (required) */
  config.database_url = DATABASE_URL;

  /* Sign up */
  if (Firebase.signUp(&config, &auth, "", "")){
    Serial.println("ok");
    signupOK = true;
  }
  else{
    Serial.printf("%s\n",
config.signer.signupError.message.c_str());
  }

  /* Assign the callback function for the long running token
generation task */
  config.token_status_callback = tokenStatusCallback; //see addons/
TokenHelper.h

  Firebase.begin(&config, &auth);
  Firebase.reconnectWiFi(true);
}

void loop(){

while(1){

  /* Look for new cards */
  /* Reset the loop if no new card is present on RC522 Reader */
  if ( ! mfrc522.PICC_IsNewCardPresent()){return;}

  /* Select one of the cards */
  if ( ! mfrc522.PICC_ReadCardSerial()) {return;}


for (byte i = 0; i < 6; i++){
    key.keyByte[i] = 0xFF;
  }

  Serial.print("\n");
  Serial.println("*Card Detected*");
  /* Print UID of the Card */
  Serial.print(F("Card UID:"));
  for (byte i = 0; i < mfrc522.uid.size; i++){
    Serial.print(mfrc522.uid.uidByte[i] < 0x10 ? " 0" : " ");
    Serial.print(mfrc522.uid.uidByte[i], HEX);
  }
  Serial.print("\n");
  /* Print type of card (for example, MIFARE 1K) */
  Serial.print(F("PICC type: "));
  MFRC522::PICC_Type piccType =
mfrc522.PICC_GetType(mfrc522.uid.sak);
  Serial.println(mfrc522.PICC_GetTypeName(piccType));


   /* Read data from the same block */
   Serial.print("\n");
   Serial.println("Reading from Data Block...");
   ReadDataFromBlock(blockNum, readBlockData);


   /* Print the data read from block */
   Serial.print("\n");
   Serial.print("Data in Block:");
   Serial.print(blockNum);
   Serial.print(" --> ");
   //for (int j=0 ; j<16 ; j++){
   int j=0;

   char A[j]= {readBlockData[j],
              readBlockData[j+1],
              readBlockData[j+2],
              readBlockData[j+3],
              readBlockData[j+4],
              readBlockData[j+5],
              readBlockData[j+6],
              readBlockData[j+7],
              readBlockData[j+8],
              readBlockData[j+9],
               readBlockData[j+10],
                readBlockData[j+11],
                 readBlockData[j+12],
                  readBlockData[j+13],
                   readBlockData[j+14],
                    readBlockData[j+15]
                    };

    Serial.println(A);

 serial_gps.available();
     gps.encode(serial_gps.read());
  if(gps.location.isUpdated()) {
    Serial.print("Latitude=");
    Serial.print(gps.location.lat(),6);
    Serial.print(" Longitude=");
    Serial.println(gps.location.lng(),6);
    delay(2000);
  }

  if (Firebase.ready() && signupOK && (millis() - sendDataPrevMillis > 100 || sendDataPrevMillis == 0)){
    sendDataPrevMillis = millis();

    // Write an Int number on the database path test/int
    if (Firebase.RTDB.setString(&fbdo, "test/user/",A)){

      Serial.println("PASSED");
      Serial.println("PATH: " + fbdo.dataPath());

      Serial.println("TYPE: " + fbdo.dataType());

    }

    else {
      Serial.println("FAILED");
      Serial.println("REASON: " + fbdo.errorReason());
       Serial.println("PLEASE RE-INSERT THE CARD");

    }

  }
     Serial.print("\n");
     void(*resetFunc) (void) = 0;  // declare reset fuction at address 0
    resetFunc(); //call reset*/

}}

 //ReadDataFromBlock() function

void ReadDataFromBlock(int blockNum, byte readBlockData[]) {

  /* Authenticating the desired data block for Read access using Key A */
  status = mfrc522.PCD_Authenticate(MFRC522::PICC_CMD_MF_AUTH_KEY_A, blockNum, &key, &(mfrc522.uid));

  if (status != MFRC522::STATUS_OK){
```



```
   Serial.print("Authentication failed for Read: ");
    Serial.println("PLEASE RE-INSERT THE CARD");
   Serial.println(mfrc522.GetStatusCodeName(status));
   return;
  }
  else {
    Serial.println("Authentication success");
  }

  /* Reading data from the Block */
  status = mfrc522.MIFARE_Read(blockNum, readBlockData, &bufferLen);
  if (status != MFRC522::STATUS_OK){
    Serial.print("Reading failed: ");
     Serial.println("PLEASE RE-INSERT THE CARD");
    Serial.println(mfrc522.GetStatusCodeName(status));
    return;
  }
  else {
    Serial.println("Block was read successfully");
  }
}
```

Android Studio Code
SignIn Xml



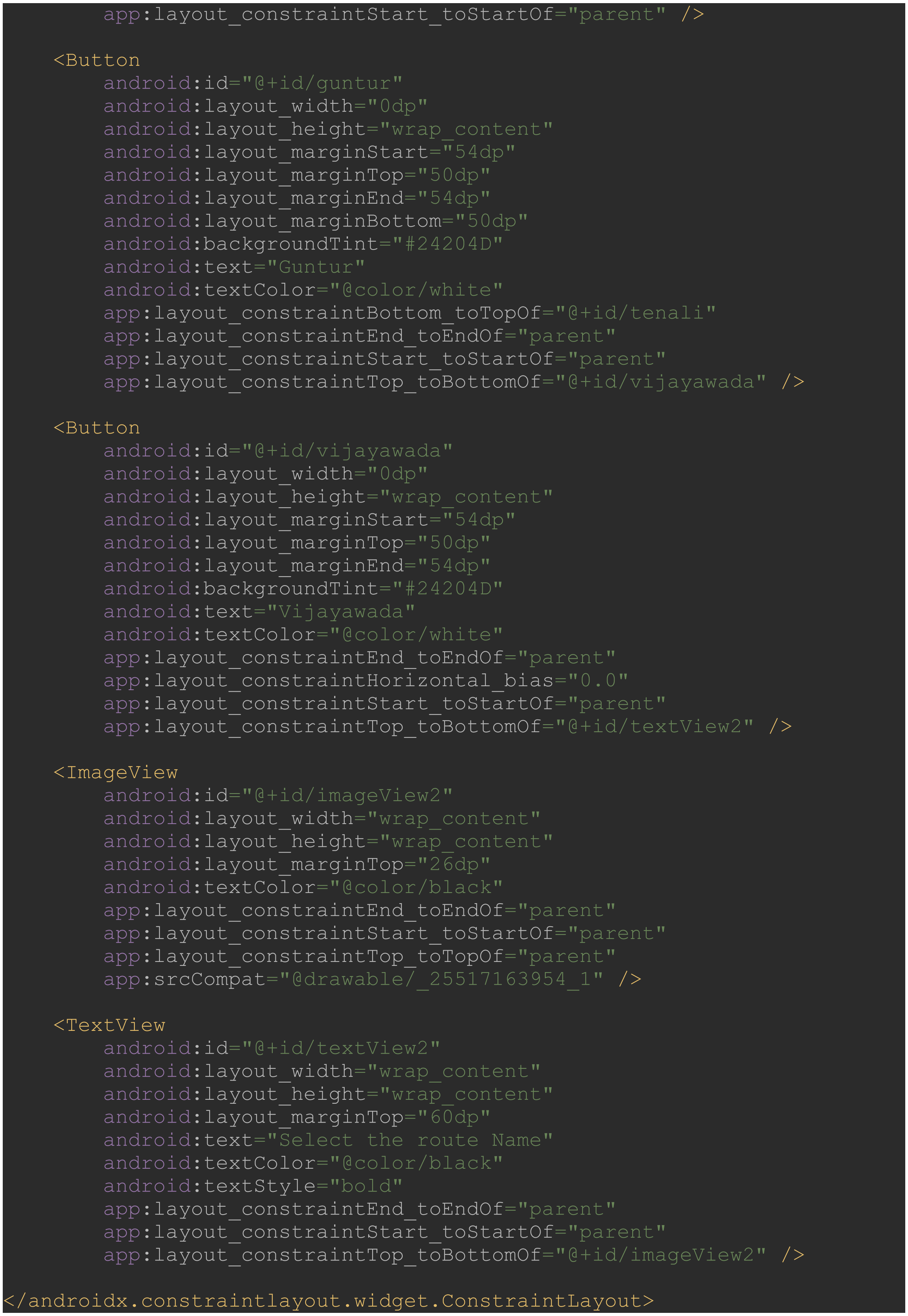
```
<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout xmlns:android="http://schemas.android.com/apk/res/
android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:background="#FFFFFF"
    android:padding="16dp">

    <TextView
        android:id="@+id/textViewAboveImage"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_alignParentTop="true"
        android:layout_centerHorizontal="true"
        android:layout_marginTop="50dp"
        android:text="Sign In"
        android:textColor="@color/black"
        android:textSize="34dp"
        android:textStyle="italic" />

    <!-- Add ImageView below the TextView -->
    <ImageView
        android:id="@+id/imageViewTop"
        android:layout_width="350dp"
        android:layout_height="200dp"
        android:layout_below="@id/textViewAboveImage"
        android:layout_centerHorizontal="true"
        android:layout_marginTop="30dp"
        android:scaleType="centerCrop"
        android:src="@drawable/flat_bus_with_building_41577_54" />


    <EditText
        android:id="@+id/editTextEmailSignIn"
        android:layout_width="match_parent"
        android:layout_height="50dp"
        android:layout_below="@id/imageViewTop"
    android:layout_centerHorizontal="true"
    android:layout_marginTop="50dp"
    android:layout_marginBottom="8dp"
    android:hint="Email"
    android:inputType="textEmailAddress"
    android:textColor="@color/black" />

    <Button
        android:id="@+id/buttonSignIn"
        android:layout_width="374dp"
        android:layout_height="50dp"
        android:layout_below="@id/editTextPasswordSignIn"
        android:layout_marginTop="20dp"
        android:backgroundTint="#EE2E31"
        android:text="Sign In" />

    <EditText
        android:id="@+id/editTextPasswordSignIn"
        android:layout_width="match_parent"
        android:layout_height="50dp"
        android:layout_below="@id/editTextEmailSignIn"
        android:layout_marginTop="20dp"
        android:layout_marginBottom="16dp"
        android:hint="Password"
        android:inputType="textPassword"
        android:textColor="@color/black" />

    <TextView
        android:id="@+id/textViewSignUpPrompt"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_below="@id/buttonSignIn"
        android:layout_centerHorizontal="true"
        android:layout_marginTop="16dp"
        android:text="Don't have an account? Click here to Sign Up."
        android:textColor="@color/black" />

</RelativeLayout>
```

SignIn Java

```
package com.example.vbustrack;

import android.content.Intent;
import android.os.Bundle;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.TextView;
import android.widget.Toast;

import androidx.annotation.NonNull;
import androidx.appcompat.app.AppCompatActivity;
import androidx.core.content.ContextCompat;

import com.google.android.gms.tasks.OnCompleteListener;
import com.google.android.gms.tasks.Task;
import com.google.firebase.auth.AuthResult;
import com.google.firebase.auth.FirebaseAuth;
import com.google.firebase.auth.FirebaseUser;

public class SignInActivity extends AppCompatActivity {

    private EditText emailEditText, passwordEditText;
    private Button signInButton;
    private FirebaseAuth firebaseAuth;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_signin);

getWindow().setStatusBarColor(ContextCompat.getColor(SignInActivity.thi
s, R.color.black));

        emailEditText = findViewById(R.id.editTextEmailSignIn);
        passwordEditText = findViewById(R.id.editTextPasswordSignIn);
        signInButton = findViewById(R.id.buttonSignIn);
        firebaseAuth = FirebaseAuth.getInstance();

        // Check if the user is already authenticated
        FirebaseUser currentUser = firebaseAuth.getCurrentUser();
        if (currentUser != null) {
            // User is already signed in, navigate to the main activity
            Intent intent = new Intent(SignInActivity.this,
MainActivity.class);
            startActivity(intent);
            finish();
        }

        TextView textViewSignUpPrompt =
findViewById(R.id.textViewSignUpPrompt);
        Button buttonSignIn = findViewById(R.id.buttonSignIn);
        textViewSignUpPrompt.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View view) {
                // Navigate to the Sign Up activity
                Intent intent = new Intent(SignInActivity.this,
SignUpActivity.class);
                startActivity(intent);
            }
        });

        signInButton.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                String email =
emailEditText.getText().toString().trim();
                String password =
passwordEditText.getText().toString().trim();

                firebaseAuth.signInWithEmailAndPassword(email,
password)
                        .addOnCompleteListener(SignInActivity.this, new
OnCompleteListener<AuthResult>() {
                            @Override
                            public void onComplete(@NonNull
Task<AuthResult> task) {
                                if (task.isSuccessful()) {
                                    // Sign in success, go to the main
activity or desired screen
                                    Intent intent = new
Intent(SignInActivity.this, MainActivity.class);
                                    startActivity(intent);
                                    finish();
                                } else {
                                    Toast.makeText(SignInActivity.this,
"You haven't paid the bus fees", Toast.LENGTH_SHORT).show();
                                    return;
                                }
                            }
                        });

            }
        });
    }
}
```

Location Select Xml

```
<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:background="#FFFFFF"
    android:fitsSystemWindows="true"
    tools:context=".MainActivity">


    <Button
        android:id="@+id/tenali"
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_marginStart="54dp"
        android:layout_marginEnd="54dp"
        android:layout_marginBottom="150dp"
        android:backgroundTint="#24204D"
        android:text="Tenali"
        android:textColor="@color/white"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
```



```
        app:layout_constraintStart_toStartOf="parent" />

    <Button
        android:id="@+id/guntur"
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_marginStart="54dp"
        android:layout_marginTop="50dp"
        android:layout_marginEnd="54dp"
        android:layout_marginBottom="50dp"
        android:backgroundTint="#24204D"
        android:text="Guntur"
        android:textColor="@color/white"
        app:layout_constraintBottom_toTopOf="@+id/tenali"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/vijayawada" />

    <Button
        android:id="@+id/vijayawada"
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:layout_marginStart="54dp"
        android:layout_marginTop="50dp"
        android:layout_marginEnd="54dp"
        android:backgroundTint="#24204D"
        android:text="Vijayawada"
        android:textColor="@color/white"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.0"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/textView2" />

    <ImageView
        android:id="@+id/imageView2"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="26dp"
        android:textColor="@color/black"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:srcCompat="@drawable/_25517163954_1" />

    <TextView
        android:id="@+id/textView2"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="60dp"
        android:text="Select the route Name"
        android:textColor="@color/black"
        android:textStyle="bold"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toBottomOf="@+id/imageView2" />

</androidx.constraintlayout.widget.ConstraintLayout>
```

Location Select Java

```
package com.example.vbustrack;

import androidx.appcompat.app.AppCompatActivity;
import androidx.core.content.ContextCompat;

import android.annotation.SuppressLint;
import android.content.Intent;
import android.graphics.Color;
import android.os.Build;
import android.os.Bundle;
import android.view.View;
import android.widget.Button;

public class MainActivity extends AppCompatActivity {

    @SuppressLint("MissingInflatedId")
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);

getWindow().setStatusBarColor(ContextCompat.getColor(MainActivity.this,
R.color.black));

        if (Build.VERSION.SDK_INT >= Build.VERSION_CODES.M) {

getWindow().getDecorView().setSystemUiVisibility(View.SYSTEM_UI_FLAG_LI
GHT_STATUS_BAR);
            getWindow().setStatusBarColor(Color.WHITE);
        }

        Button vijayawada;
        vijayawada = findViewById(R.id.vijayawada);
        vijayawada.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                Intent intent = new Intent(MainActivity.this,
vijayawadaroutenumber.class);
                startActivity(intent);
            }
        });

        Button guntur;
        guntur = findViewById(R.id.guntur);
        guntur.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                Intent intent = new Intent(MainActivity.this,
gunturroutenumber.class);
                startActivity(intent);
            }
        });

        Button tenali;
        tenali = findViewById(R.id.tenali);
        tenali.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                Intent intent = new Intent(MainActivity.this,
tenaliroutenumber.class);
                startActivity(intent);
            }
        });
    }
}
```

Vijayawada Route Number Select Xml

```
<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:background="#FFFFFF"
    android:fitsSystemWindows="true"
    tools:context=".vijayawadaroutenumber">

    <Spinner
        android:id="@+id/spinner2"
        android:layout_width="303dp"
        android:layout_height="wrap_content"
        android:layout_marginBottom="150dp"
        android:background="#24204D"
        android:entries="@array/vijayawada_route_3"
        android:minHeight="48dp"
        android:popupBackground="#24204D"
        android:textColor="@android:color/white"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent" />

    <Spinner
        android:id="@+id/spinner1"
        android:layout_width="303dp"
        android:layout_height="wrap_content"
        android:layout_marginBottom="100dp"
        android:background="#24204D"
        android:entries="@array/vijayawada_route_2"
        android:minHeight="48dp"
        android:popupBackground="#24204D"
        android:textColor="@android:color/white"
        app:layout_constraintBottom_toTopOf="@+id/spinner2"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent" />

    <Spinner
        android:id="@+id/spinner"
        android:layout_width="303dp"
        android:layout_height="wrap_content"
        android:layout_marginBottom="100dp"
        android:background="#24204D"
        android:entries="@array/vijayawada_route_1"
        android:minHeight="48dp"
        android:popupBackground="#24204D"
        android:textColor="@android:color/white"
        app:layout_constraintBottom_toTopOf="@+id/spinner1"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.498"
        app:layout_constraintStart_toStartOf="parent" />

    <ImageView
        android:id="@+id/imageView2"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="26dp"
        android:textColor="@color/black"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:srcCompat="@drawable/_25517163954_1" />

    <TextView
        android:id="@+id/textView2"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="172dp"
        android:text="Select the route number for buses from 
Vijayawada"
        android:textColor="@color/black"
        android:textStyle="bold"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent" />

</androidx.constraintlayout.widget.ConstraintLayout>
```

Vijayawada Route Number Java

```
package com.example.vbustrack;

import androidx.appcompat.app.AppCompatActivity;

import android.content.Intent;
import android.graphics.Color;
import android.os.Build;
import android.os.Bundle;
import android.view.View;
import android.widget.AdapterView;
import android.widget.ArrayAdapter;
import android.widget.Button;
import android.widget.Spinner;

public class vijayawadaroutenumber extends AppCompatActivity {

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_vijayawadaroutenumber);
        if (Build.VERSION.SDK_INT >= Build.VERSION_CODES.M) {

getWindow().getDecorView().setSystemUiVisibility(View.SYSTEM_UI_FLAG_LI
GHT_STATUS_BAR);
            getWindow().setStatusBarColor(Color.WHITE);
        }
        Spinner spinner = findViewById(R.id.spinner);
        ArrayAdapter<CharSequence> adapter =
ArrayAdapter.createFromResource(this,
                R.array.vijayawada_route_1,
android.R.layout.simple_spinner_item);

adapter.setDropDownViewResource(android.R.layout.simple_spinner_dropdow
n_item);
        spinner.setAdapter(adapter);

        spinner.setOnItemSelectedListener(new
AdapterView.OnItemSelectedListener() {
            @Override
            public void onItemSelected(AdapterView<?> parent, View
view, int position, long id) {
                String selectedItem =
parent.getItemAtPosition(position).toString();

                if (selectedItem.equals("Locate Bus")) {
                    // Navigate to the new activity
                    Intent intent = new
Intent(vijayawadaroutenumber.this, MapsActivity.class);
                    startActivity(intent);
                }
                if (selectedItem.equals("View Reg.No's present in
bus")) {
                    // Navigate to the new activity
                    Intent intent = new
Intent(vijayawadaroutenumber.this, regpresent.class);
                    startActivity(intent);
                }
            }

            @Override
            public void onNothingSelected(AdapterView<?> parent) {
                // Do nothing
            }
        });


    }
}
```

Guntur Route Number Xml

```
<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".gunturroutenumber">



    <Spinner
        android:id="@+id/spinner2"
        android:layout_width="303dp"
        android:layout_height="wrap_content"
```

```xml
        android:layout_marginBottom="150dp"
        android:background="#24204D"
        android:entries="@array/vijayawada_route_3"
        android:minHeight="48dp"
        android:popupBackground="#24204D"
        android:textColor="@android:color/white"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent" />

    <Spinner
        android:id="@+id/spinner1"
        android:layout_width="303dp"
        android:layout_height="wrap_content"
        android:layout_marginBottom="100dp"
        android:background="#24204D"
        android:entries="@array/vijayawada_route_2"
        android:minHeight="48dp"
        android:popupBackground="#24204D"
        android:textColor="@android:color/white"
        app:layout_constraintBottom_toTopOf="@+id/spinner2"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent" />

    <Spinner
        android:id="@+id/spinner"
        android:layout_width="303dp"
        android:layout_height="wrap_content"
        android:layout_marginBottom="100dp"
        android:background="#24204D"
        android:entries="@array/vijayawada_route_1"
        android:minHeight="48dp"
        android:popupBackground="#24204D"
        android:textColor="@android:color/white"
        app:layout_constraintBottom_toTopOf="@+id/spinner1"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.498"
        app:layout_constraintStart_toStartOf="parent" />

    <ImageView
        android:id="@+id/imageView2"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="26dp"
        android:textColor="@color/black"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:srcCompat="@drawable/_25517163954_1" />

    <TextView
        android:id="@+id/textView2"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="172dp"
        android:text="Select the route number for buses from Guntur"
        android:textColor="@color/black"
        android:textStyle="bold"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent" />
```

```
</androidx.constraintlayout.widget.ConstraintLayout>
```

Guntur Route Number Java

```
package com.example.vbustrack;

import androidx.appcompat.app.AppCompatActivity;
import androidx.core.content.ContextCompat;

import android.content.Intent;
import android.graphics.Color;
import android.os.Build;
import android.os.Bundle;
import android.view.View;
import android.widget.AdapterView;
import android.widget.ArrayAdapter;
import android.widget.Spinner;
import android.widget.Toast;

public class gunturroutenumber extends AppCompatActivity {

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_vijayawadaroutenumber);
        if (Build.VERSION.SDK_INT >= Build.VERSION_CODES.M) {

getWindow().getDecorView().setSystemUiVisibility(View.SYSTEM_UI_FLAG_LI
GHT_STATUS_BAR);
            getWindow().setStatusBarColor(Color.WHITE);
        }
        Spinner spinner = findViewById(R.id.spinner);
        ArrayAdapter<CharSequence> adapter =
ArrayAdapter.createFromResource(this,
                R.array.vijayawada_route_1,
android.R.layout.simple_spinner_item);

adapter.setDropDownViewResource(android.R.layout.simple_spinner_dropdow
n_item);
        spinner.setAdapter(adapter);

        spinner.setOnItemSelectedListener(new
AdapterView.OnItemSelectedListener() {
            @Override
            public void onItemSelected(AdapterView<?> parent, View
view, int position, long id) {
                String selectedItem =
parent.getItemAtPosition(position).toString();

                if (selectedItem.equals("Locate Bus")) {
                    // Navigate to the new activity
                    Intent intent = new Intent(gunturroutenumber.this,
MapsActivity.class);
                    startActivity(intent);
                }
                if (selectedItem.equals("View Reg.No\\'s present in
bus")) {
```

```
                    // Navigate to the new activity
                    Intent intent = new Intent(gunturroutenumber.this,
regpresent.class);
                    startActivity(intent);
                }
            }

            @Override
            public void onNothingSelected(AdapterView<?> parent) {
                // Do nothing
            }
        });


    }

}
```

Tenali Route Number Xml

```
<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".tenaliroutenumber">


    <Spinner
        android:id="@+id/spinner2"
        android:layout_width="303dp"
        android:layout_height="wrap_content"
        android:layout_marginBottom="150dp"
        android:background="#24204D"
        android:entries="@array/vijayawada_route_3"
        android:minHeight="48dp"
        android:popupBackground="#24204D"
        android:textColor="@android:color/white"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent" />

    <Spinner
        android:id="@+id/spinner1"
        android:layout_width="303dp"
        android:layout_height="wrap_content"
        android:layout_marginBottom="100dp"
        android:background="#24204D"
        android:entries="@array/vijayawada_route_2"
        android:minHeight="48dp"
        android:popupBackground="#24204D"
        android:textColor="@android:color/white"
        app:layout_constraintBottom_toTopOf="@+id/spinner2"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent" />

    <Spinner
```

```
        android:id="@+id/spinner"
        android:layout_width="303dp"
        android:layout_height="wrap_content"
        android:layout_marginBottom="100dp"
        android:background="#24204D"
        android:entries="@array/vijayawada_route_1"
        android:minHeight="48dp"
        android:popupBackground="#24204D"
        android:textColor="@android:color/white"
        app:layout_constraintBottom_toTopOf="@+id/spinner1"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintHorizontal_bias="0.498"
        app:layout_constraintStart_toStartOf="parent" />

    <ImageView
        android:id="@+id/imageView2"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="26dp"
        android:textColor="@color/black"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent"
        app:srcCompat="@drawable/_25517163954_1" />

    <TextView
        android:id="@+id/textView2"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_marginTop="172dp"
        android:text="Select the route number for buses from Tenali"
        android:textColor="@color/black"
        android:textStyle="bold"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintTop_toTopOf="parent" />


</androidx.constraintlayout.widget.ConstraintLayout>
```

Tenali Route Number Java

```
package com.example.vbustrack;

import androidx.appcompat.app.AppCompatActivity;

import android.content.Intent;
import android.graphics.Color;
import android.os.Build;
import android.os.Bundle;
import android.view.View;
import android.widget.AdapterView;
import android.widget.ArrayAdapter;
import android.widget.Button;
import android.widget.Spinner;
import android.widget.Toast;

public class tenaliroutenumber extends AppCompatActivity {
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_vijayawadaroutenumber);
        if (Build.VERSION.SDK_INT >= Build.VERSION_CODES.M) {

getWindow().getDecorView().setSystemUiVisibility(View.SYSTEM_UI_FLAG_LI
GHT_STATUS_BAR);
            getWindow().setStatusBarColor(Color.WHITE);
        }
        Spinner spinner = findViewById(R.id.spinner);
        ArrayAdapter<CharSequence> adapter =
ArrayAdapter.createFromResource(this,
                R.array.vijayawada_route_1,
android.R.layout.simple_spinner_item);

adapter.setDropDownViewResource(android.R.layout.simple_spinner_dropdow
n_item);
        spinner.setAdapter(adapter);

        spinner.setOnItemSelectedListener(new
AdapterView.OnItemSelectedListener() {
            @Override
            public void onItemSelected(AdapterView<?> parent, View
view, int position, long id) {
                String selectedItem =
parent.getItemAtPosition(position).toString();

                if (selectedItem.equals("Locate Bus")) {
                    // Navigate to the new activity
                    Intent intent = new Intent(tenaliroutenumber.this,
MapsActivity.class);
                    startActivity(intent);
                }
                if (selectedItem.equals("View Reg.No\\'s present in
bus")) {
                    // Navigate to the new activity
                    Intent intent = new Intent(tenaliroutenumber.this,
regpresent.class);
                    startActivity(intent);
                }
            }

            @Override
            public void onNothingSelected(AdapterView<?> parent) {
                // Do nothing
            }
        });


    }

    }
```

Maps Activity Xml

```
<?xml version="1.0" encoding="utf-8"?>
<fragment xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:map="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:id="@+id/map"
    android:name="com.google.android.gms.maps.SupportMapFragment"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".MapsActivity" />
```

Maps Activity Java

```
package com.example.vbustrack;

import android.graphics.Bitmap;
import android.graphics.BitmapFactory;
import android.os.Bundle;
import android.widget.Toast;

import androidx.annotation.NonNull;
import androidx.core.content.ContextCompat;
import androidx.fragment.app.FragmentActivity;

import com.google.android.gms.maps.CameraUpdateFactory;
import com.google.android.gms.maps.GoogleMap;
import com.google.android.gms.maps.OnMapReadyCallback;
import com.google.android.gms.maps.SupportMapFragment;
import com.google.android.gms.maps.model.BitmapDescriptor;
import com.google.android.gms.maps.model.BitmapDescriptorFactory;
import com.google.android.gms.maps.model.LatLng;
import com.google.android.gms.maps.model.Marker;
import com.google.android.gms.maps.model.MarkerOptions;
import com.google.firebase.database.DataSnapshot;
import com.google.firebase.database.DatabaseError;
import com.google.firebase.database.DatabaseReference;
import com.google.firebase.database.FirebaseDatabase;
import com.google.firebase.database.ValueEventListener;

public class MapsActivity extends FragmentActivity implements
OnMapReadyCallback {

    private GoogleMap mMap;
    private Marker busMarker;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_maps);

getWindow().setStatusBarColor(ContextCompat.getColor(MapsActivity.this,
R.color.black));

        // Initialize Firebase
        FirebaseDatabase database = FirebaseDatabase.getInstance();
        DatabaseReference myRef = database.getReference("test");

        // Read from the database
        myRef.addValueEventListener(new ValueEventListener() {
            @Override
            public void onDataChange(@NonNull DataSnapshot
dataSnapshot) {
                if (dataSnapshot.exists()) {
                    // Get latitude and longitude from Firebase
                    String latitude =
dataSnapshot.child("lat").getValue(String.class);
                    String longitude =
dataSnapshot.child("lon").getValue(String.class);

                    // Display the map with the updated location
                    displayMap(Double.parseDouble(latitude),
Double.parseDouble(longitude));
                }
            }

            @Override
            public void onCancelled(@NonNull DatabaseError
databaseError) {
                // Handle errors
                Toast.makeText(MapsActivity.this, "Failed to retrieve
data from Firebase", Toast.LENGTH_SHORT).show();
            }
        });
    }

    private void displayMap(double latitude, double longitude) {
        // Obtain the SupportMapFragment and get notified when the map
is ready to be used.
        SupportMapFragment mapFragment = (SupportMapFragment)
getSupportFragmentManager()
                .findFragmentById(R.id.map);
        if (mapFragment != null) {
            mapFragment.getMapAsync(new OnMapReadyCallback() {
                @Override
                public void onMapReady(GoogleMap googleMap) {
                    mMap = googleMap;

                    LatLng location = new LatLng(latitude, longitude);

                    // Remove the previous marker if it exists
                    if (busMarker != null) {
                        busMarker.remove();
                    }

                    // Add a new marker
                    busMarker = mMap.addMarker(new MarkerOptions()
                            .position(location)
                            .title("Location of the bus")
                            .icon(getBusIcon()));


mMap.moveCamera(CameraUpdateFactory.newLatLngZoom(location, 17));
                }
            });
        }
    }

    private BitmapDescriptor getBusIcon() {
        BitmapDescriptor busIcon;
        int iconSize = 120; // Set your desired icon size in pixels

        Bitmap originalBitmap =
BitmapFactory.decodeResource(getResources(), R.drawable.bus_icon1);

        Bitmap scaledBitmap = Bitmap.createScaledBitmap(originalBitmap,
iconSize, iconSize, false);

        busIcon = BitmapDescriptorFactory.fromBitmap(scaledBitmap);

        return busIcon;
    }

    @Override
    public void onMapReady(@NonNull GoogleMap googleMap) {
        // You can handle additional map setup here if needed
    }
}
```

regpresent Xml

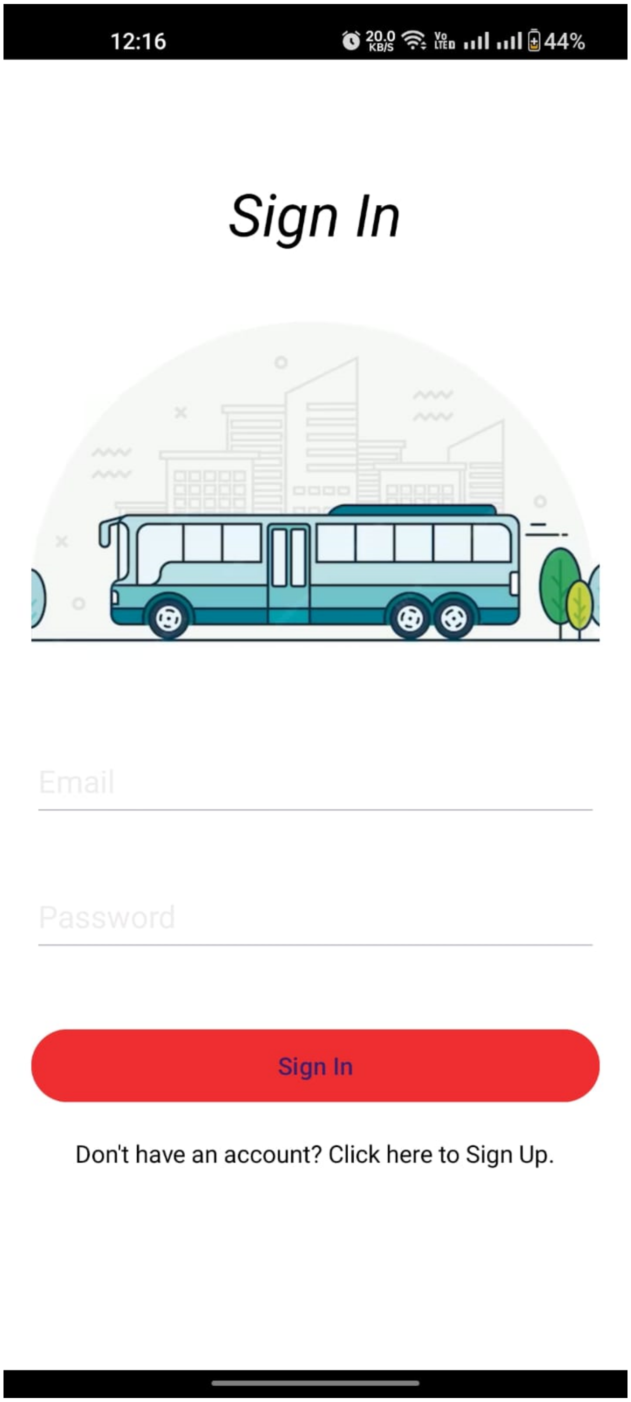
```
<?xml version="1.0" encoding="utf-8"?>
<RelativeLayout xmlns:android="http://schemas.android.com/apk/res/
android"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:paddingLeft="16dp"
    android:paddingTop="16dp"
    android:paddingRight="16dp"
    android:paddingBottom="16dp"
    android:background="#FFFFFF"
    tools:context=".regpresent">

    <ImageView
        android:id="@+id/imageViewTop"
        android:layout_width="350dp"
        android:layout_height="200dp"
        android:layout_centerHorizontal="true"
        android:layout_marginTop="20dp"
        android:scaleType="centerCrop"
        android:src="@drawable/flat_bus_with_building_41577_54" />


    <TextView
        android:id="@+id/registrationNumberTextView"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_below="@id/imageViewTop"
        android:layout_marginTop="30dp"
        android:text="Entered Student: "
        android:scaleType="centerCrop"
        android:layout_centerHorizontal="true"
        android:textColor="@color/black" />

    <TextView
        android:id="@+id/presentStatusTextView"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_below="@id/registrationNumberTextView"
        android:layout_marginTop="16dp"
        android:textColor="@color/black"
        android:scaleType="centerCrop"
        android:layout_centerHorizontal="true"
        android:text="Present in the bus: " />
    <TextView
        android:id="@+id/presentStatusTextView1"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_below="@id/presentStatusTextView"
        android:layout_marginTop="16dp"
        android:textColor="@color/black"
        android:scaleType="centerCrop"
        android:layout_centerHorizontal="true"
        android:text="20BCE7021" />


    <TextView
        android:id="@+id/presentStatusTextView2"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_below="@id/presentStatusTextView1"
        android:layout_marginTop="16dp"
        android:textColor="@color/black"
        android:scaleType="centerCrop"
        android:layout_centerHorizontal="true"
        android:text="20BCR7001" />


    <TextView
        android:id="@+id/presentStatusTextView3"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_below="@id/presentStatusTextView2"
        android:layout_marginTop="16dp"
        android:textColor="@color/black"
        android:scaleType="centerCrop"
        android:layout_centerHorizontal="true"
        android:text="20BCR7052" />


    <TextView
        android:id="@+id/presentStatusTextView4"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_below="@id/presentStatusTextView3"
        android:layout_marginTop="16dp"
        android:textColor="@color/black"
        android:scaleType="centerCrop"
        android:layout_centerHorizontal="true"
        android:text="20BCE7072" />


    <TextView
        android:id="@+id/presentStatusTextView5"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_below="@id/presentStatusTextView4"
        android:layout_marginTop="16dp"
        android:textColor="@color/black"
        android:scaleType="centerCrop"
        android:layout_centerHorizontal="true"
        android:text="20BCE7055" />
    <TextView
        android:id="@+id/presentStatusTextView6"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_below="@id/presentStatusTextView5"
        android:layout_marginTop="16dp"
        android:textColor="@color/black"
        android:scaleType="centerCrop"
        android:layout_centerHorizontal="true"
        android:text="20BCE7099" />
</RelativeLayout>
```

regpresent Java

```
package com.example.vbustrack;

import android.os.Bundle;
import android.widget.TextView;
import android.widget.Toast;

import androidx.annotation.NonNull;
import androidx.appcompat.app.AppCompatActivity;
import androidx.core.content.ContextCompat;

import com.google.firebase.database.DataSnapshot;
import com.google.firebase.database.DatabaseError;
import com.google.firebase.database.DatabaseReference;
import com.google.firebase.database.FirebaseDatabase;
import com.google.firebase.database.ValueEventListener;

public class regpresent extends AppCompatActivity {

    private TextView registrationNumberTextView;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_regpresent);

getWindow().setStatusBarColor(ContextCompat.getColor(regpresent.this,
R.color.black));

        registrationNumberTextView =
findViewById(R.id.registrationNumberTextView);

        // Initialize Firebase
        FirebaseDatabase database = FirebaseDatabase.getInstance();
        DatabaseReference myRef =
database.getReference("test").child("user");

        // Read from the database
        myRef.addValueEventListener(new ValueEventListener() {
            @Override
            public void onDataChange(@NonNull DataSnapshot
dataSnapshot) {
                if (dataSnapshot.exists()) {
                    // Get registration number from Firebase
                    String registrationNumber =
dataSnapshot.getValue(String.class);
```

```
                    // Update TextView with registration number
                    registrationNumberTextView.setText("Entered 
Student: " + registrationNumber);
                } else {
                    // Handle the case where data is not available
                    Toast.makeText(regpresent.this, "Registration 
Number not available", Toast.LENGTH_SHORT).show();
                }
            }

            @Override
            public void onCancelled(@NonNull DatabaseError 
databaseError) {
                // Handle errors
                Toast.makeText(regpresent.this, "Failed to retrieve 
data from Firebase", Toast.LENGTH_SHORT).show();
            }
        });
    }
}
```

CHAPTER 7: IMAGES OF THE APPLICATION AND INTERFACE



Don't have an account? Click here to Sign Up.

Figure 3: Sign page of the App

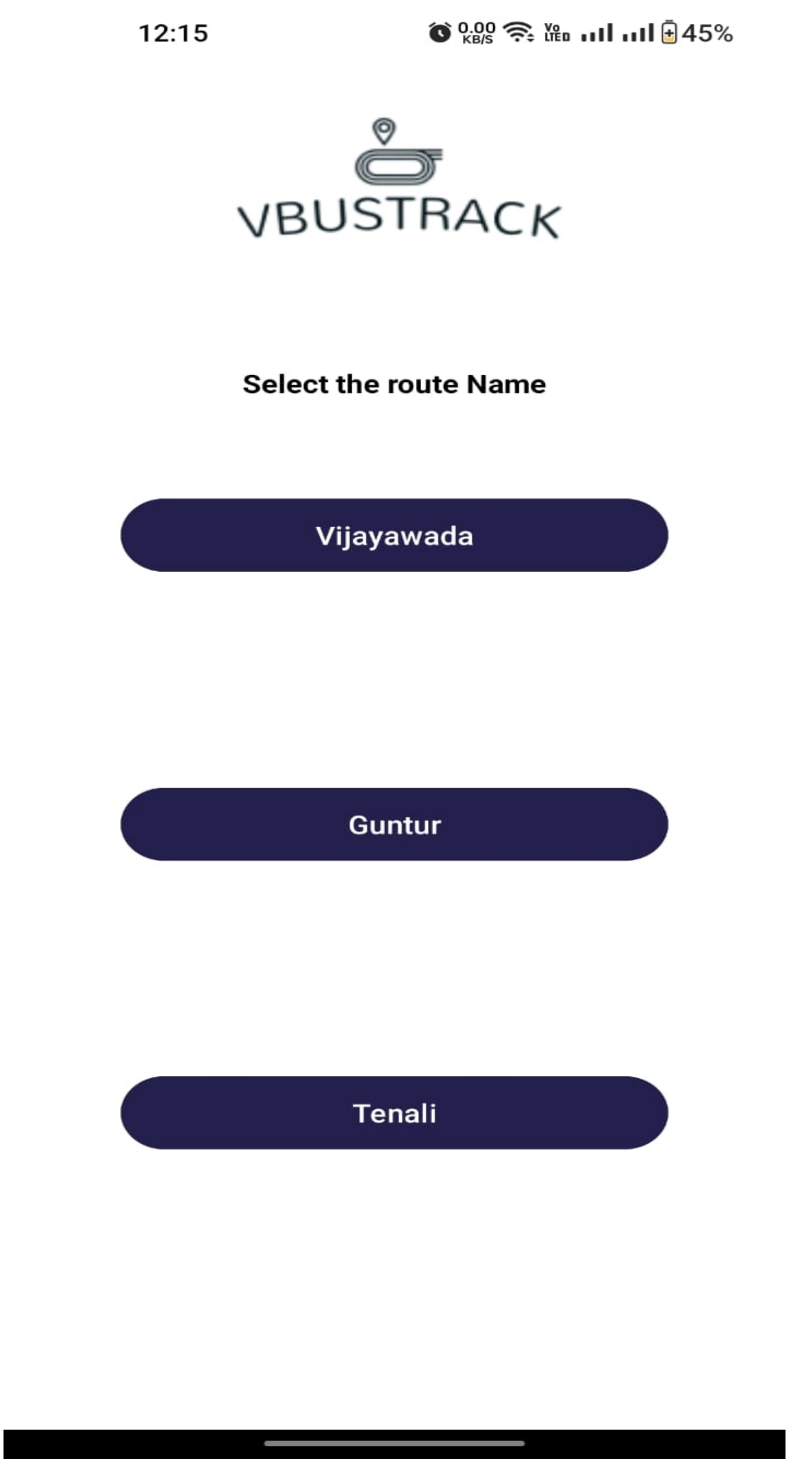
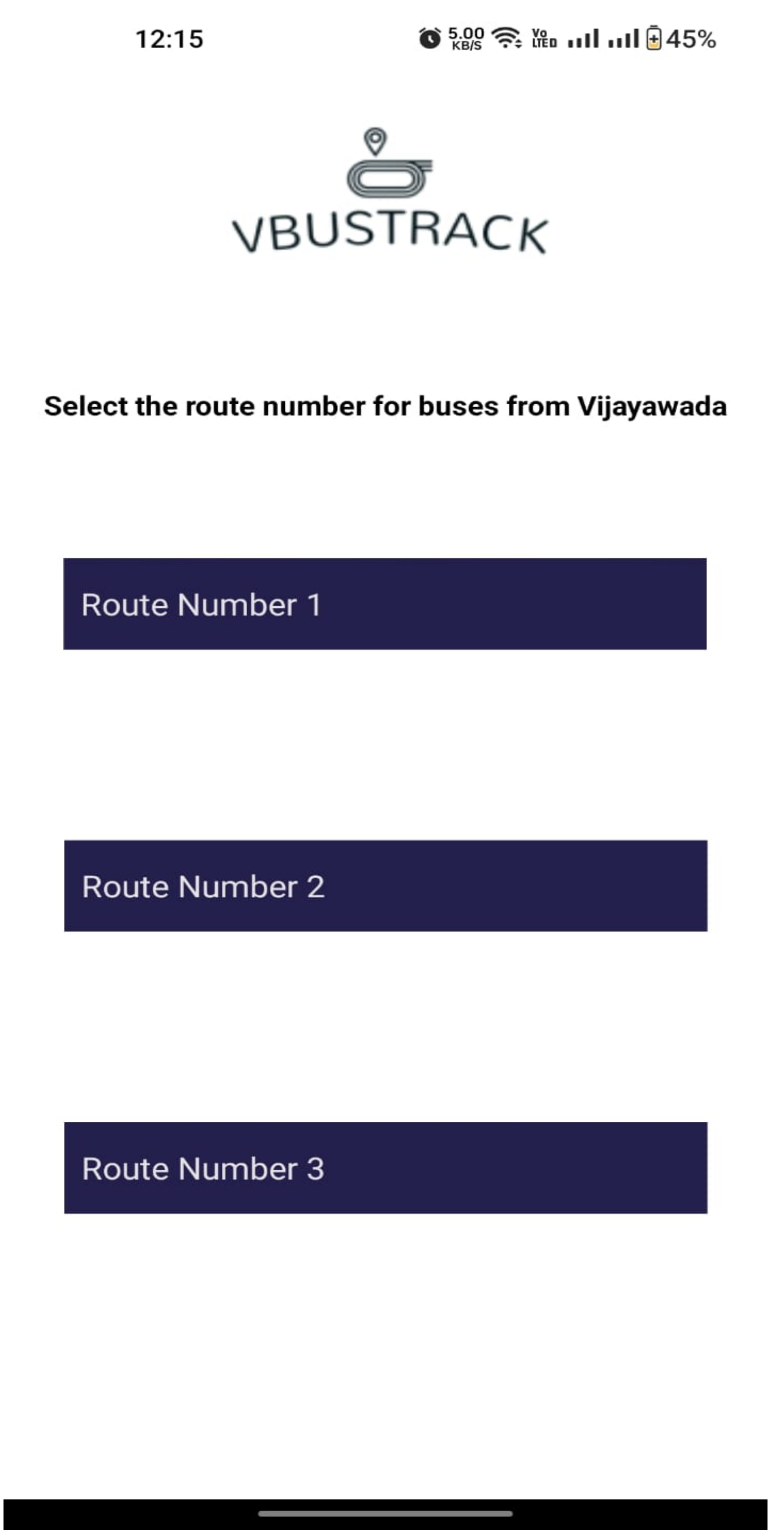
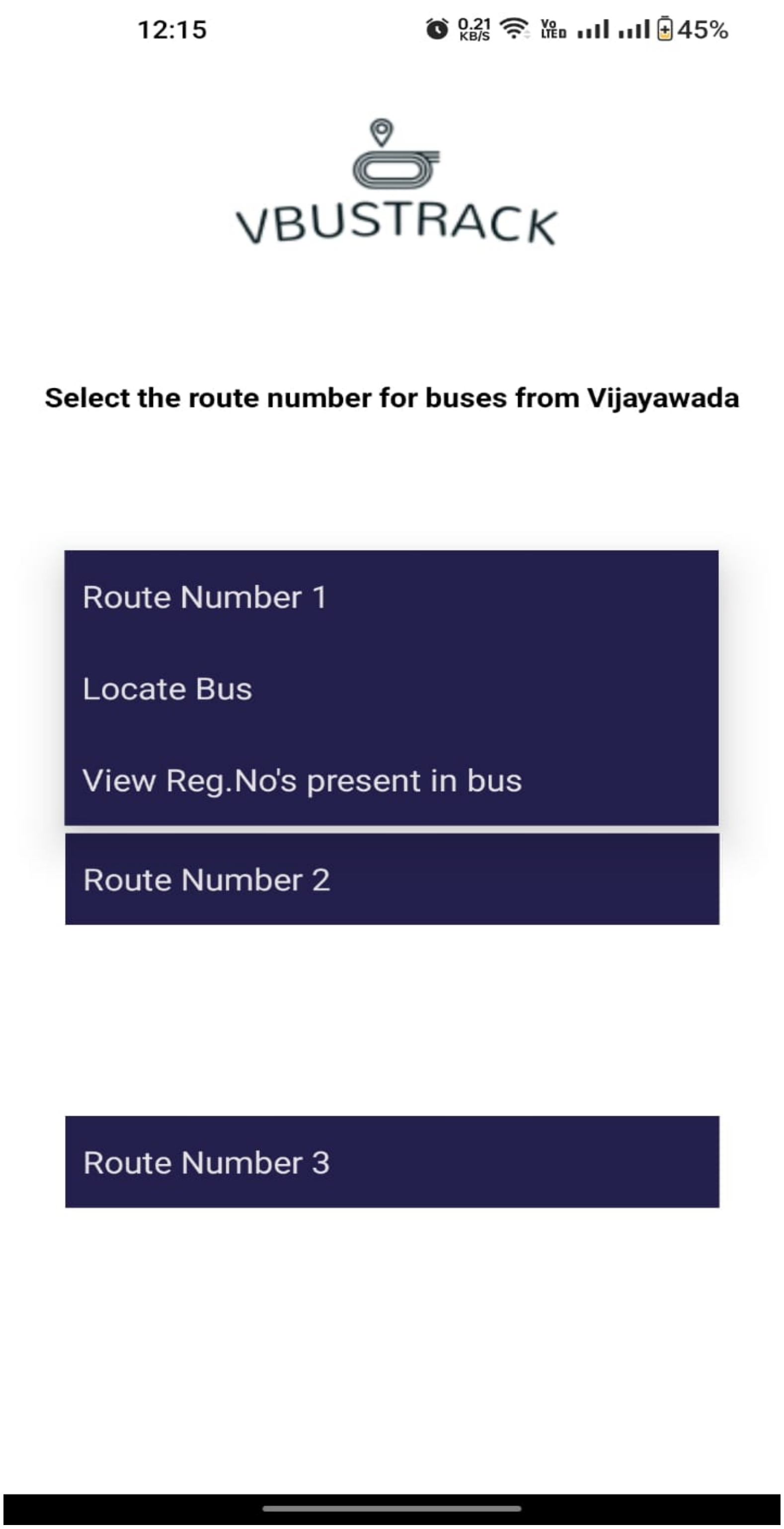


Figure 4: Destinations



Select the route number for buses from Vijayawada

Figure 5: Routes available



Select the route number for buses from Vijayawada

Figure 6: select the routes

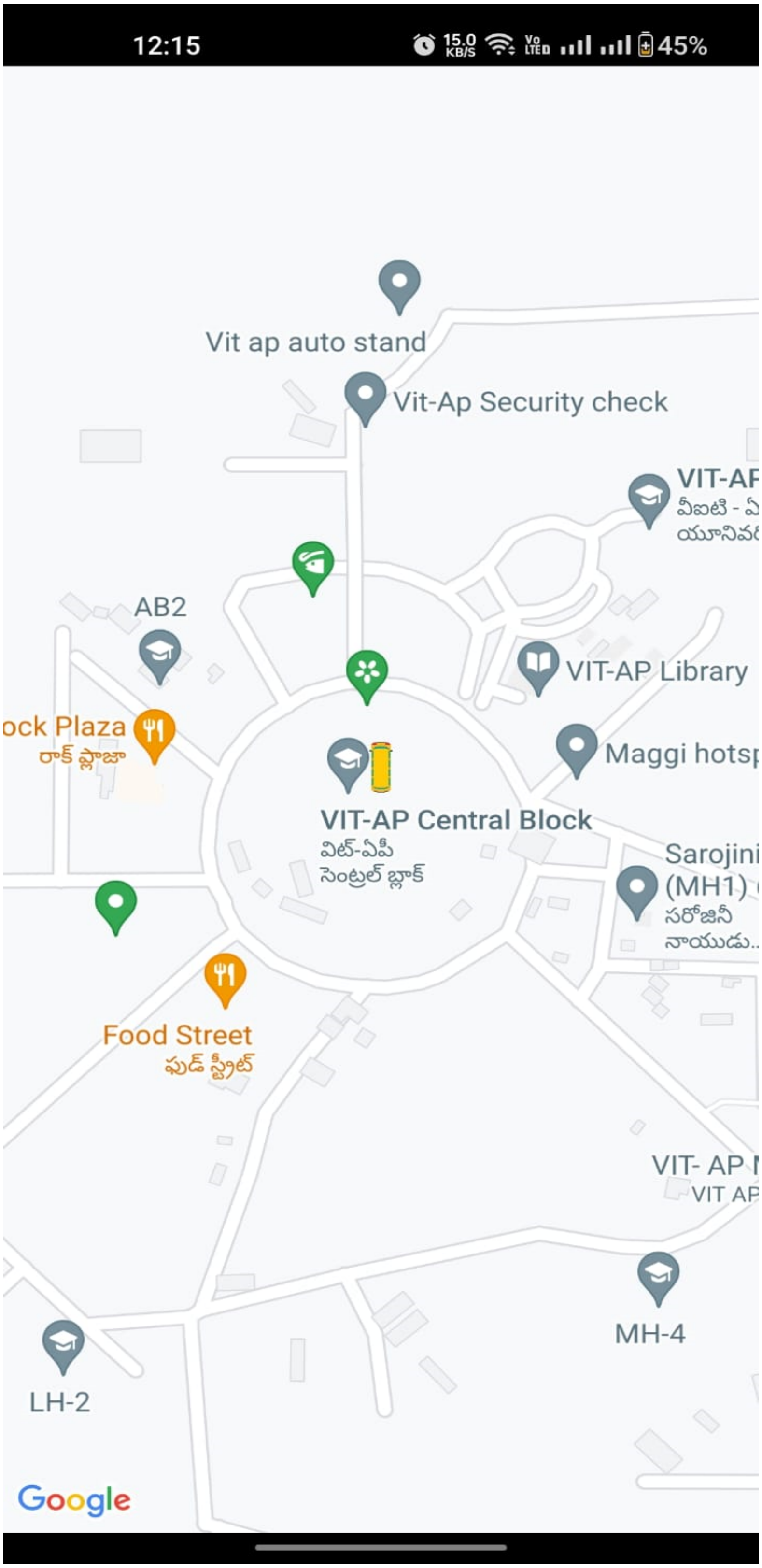
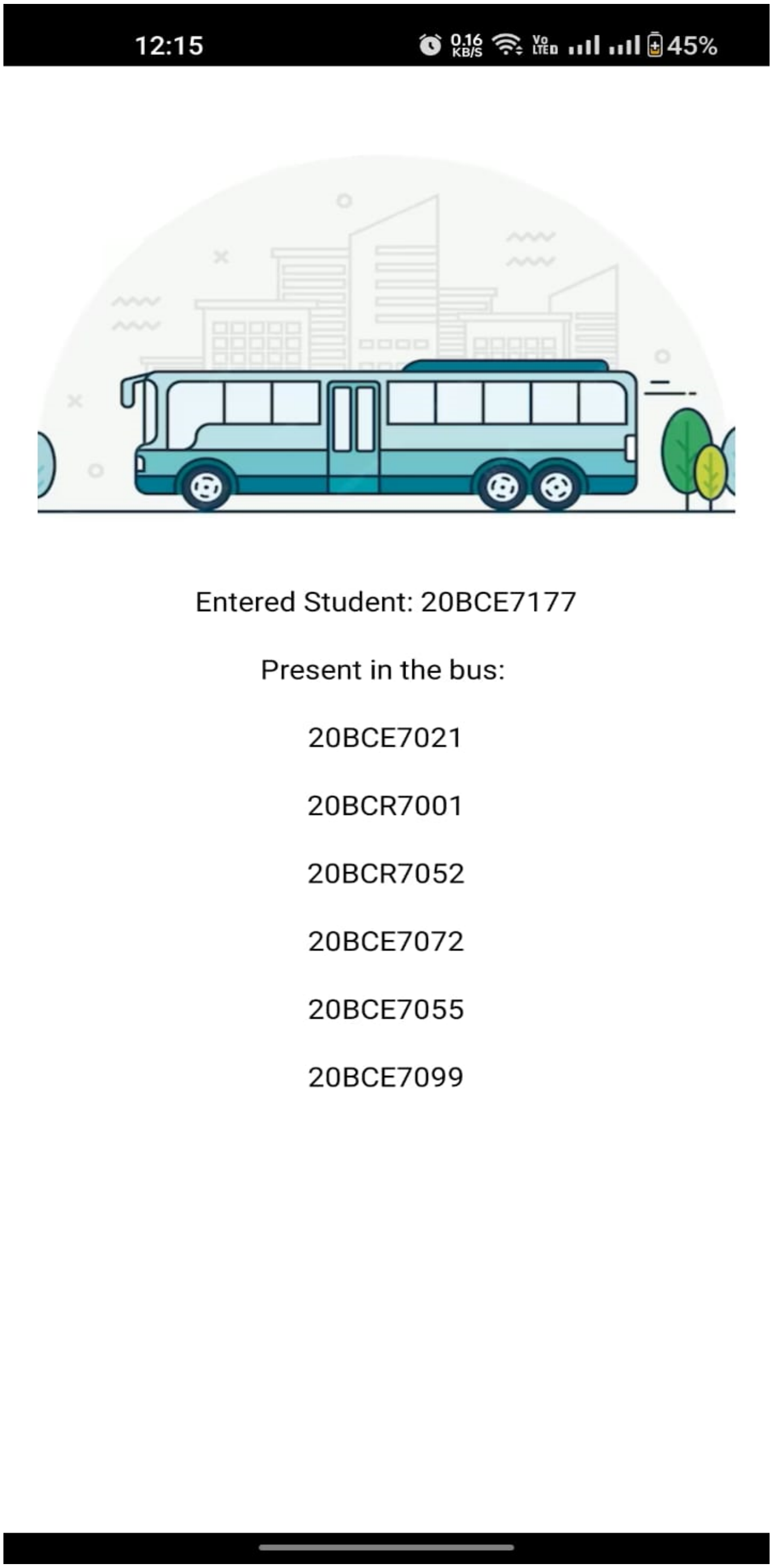


Figure 7: Visualisation of map and route



Entered Student: 20BCE7177

Present in the bus:

20BCE7021

20BCR7001

20BCR7052

20BCE7072

20BCE7055

20BCE7099

Figure 8: Data stored in the database