

# Bus Tracking System

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## Abstract:

This paper is about a Bus Tracking System that helps people know where buses are now. It uses GPS and a mobile app to show bus locations and estimated arrival times. This helps passengers wait less and plan their trips better. It also helps transport authorities keep an eye on bus movements and improve transport. The system is affordable, easy to use and great, for travelers and students.

*Keywords* — **Bus Tracking System, GPS, Mobile Application, Real-Time Tracking, Public Transport.**

## I. INTRODUCTION

Public transport is very important for students, office workers, and people who travel every day. But many times, people don't know where the bus is or when it will arrive. Because of this, they end up waiting at the bus stop for a long time. Not knowing whether the bus is late or coming soon makes travel uncomfortable and stressful. This is a common problem that public transport users face every day.

A Bus Tracking System helps solve the problem of waiting for buses. The bus system is really helpful. It lets people who are waiting for the bus see where the bus is now. The bus has a GPS device on it. This GPS device keeps sending the location of the bus to a server. It does this using the GPS and a mobile app that people can use on their phones. The bus system is great because the GPS device, on the bus is always sending out its location so people can always see where the bus is. The bus system is really helpful because it has this GPS device that is always working. This information is then shown on the app. So passengers can see where the bus is. They can find out when the bus will arrive. The bus tracking system provides regular updates to passengers. These updates help passengers know the current location of the bus and its expected arrival time. As a result, passengers can plan their journey better and avoid unnecessary waiting at the bus stop. Bus system passengers can now plan their bus trips better. They do not have to wait for the bus for a long time. This is because bus system passengers know when the bus will actually arrive at the bus stop. The bus system is very useful, for college students.

The system also makes taking the bus more reliable. The bus tracking system helps people who take the bus. The bus location is shared with passengers. They can plan their trips using the bus location. Transport authorities can use the system to keep an eye on bus movements manage routes and fix delays. This makes the whole public transport system work better. The Bus Tracking System is helpful, for both passengers and transport management. It makes public transport smarter and more efficient. The system benefits passengers. Helps transport authorities manage buses more effectively. The Bus Tracking System provides real-time information. It helps passengers and transport authorities. The system makes buses reach on time.

## II. SYSTEM ARCHITECTURE

The Bus Tracking System has a design. It has three parts: GPS Unit, Central Server and Mobile Application. These parts work together to give bus location information in real-time.

The GPS Unit is put inside the bus. It collects the bus location as latitude and longitude. The location is sent to the Central Server using internet. The Central Server gets the location data from the GPS Unit. It stores the data in a database. Then the server uses this data to figure out where the Bus Tracking System buses are and when they will arrive. The Mobile Application lets users see where the Bus Tracking System buses are on a map.

It gets updated data, from the Central Server. Shows bus movement and arrival information in real-time. This application is easy to use. Helps passengers track buses. The Mobile Application makes it simple for users to find bus information. The Bus Tracking System uses the Mobile Application to provide information about the Bus Tracking System.

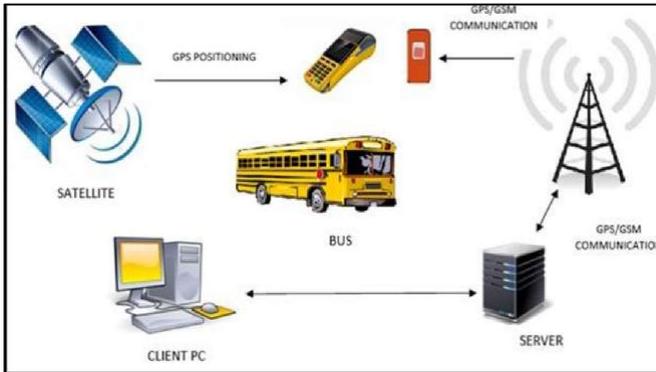


Figure 1. Architecture of the proposed GPS-based bus tracking system with passenger monitoring

The Bus Tracking System is really helpful because it connects the buses, a server and the passengers. Each bus has a GPS device that always knows where the bus is. This information goes to a server using a network. The central server figures out where the Bus Tracking System bus is, which route the Bus Tracking System bus is. When the Bus Tracking System bus will get to each stop. Then the central server shares this information with the passengers using an application. The mobile app shows the bus on a map so passengers can see where it is and which route its taking. They can also see when it will arrive at their stop. This helps the passengers plan their trip and they do not have to wait long.

The transport authorities can also see this information on a management dashboard. They can see all the buses. They can tell if any of the buses are late. They can even change the routes of the buses to make them better. The Bus Tracking System is very good because it uses GPS devices, a server, a mobile app and a dashboard to make a network that helps people. This network makes the buses more reliable, convenient and efficient. The Bus Tracking System is a tool, for the passengers and the transport authorities.

For example, a student waiting for the bus can use the app to see where Bus Number 25 is. The app will say it's 3 kilometers away and will arrive at their stop in 8 minutes. This is really helpful because they don't have to arrive or risk missing Bus Number 25. They can leave home on time. Get to college when needed. An office worker can also use the app to plan their trip to work. They can see where the buses are now. The people in charge can track the buses.

See if there are traffic jams. They can check how fast the buses are going. The app helps students, office workers and people in charge to stay updated on bus locations and schedules.

1. The students can plan their trip to college.
2. The office workers can plan their trip to work.
3. The people, in charge can track the buses.

They can see if there are any traffic jams and how fast Bus Number 25 and other buses are moving.

This way the people, in charge can keep an eye on Bus Number 25 and all the other buses. This helps them make the bus service better. If we add details like the bus numbers, when the buses will arrive or the route the buses take the app will be more helpful. This is because it gives both the people riding the buses and the people in charge information to make good decisions, about Bus Number 25 and other buses.

### III. WORKING METHODOLOGY

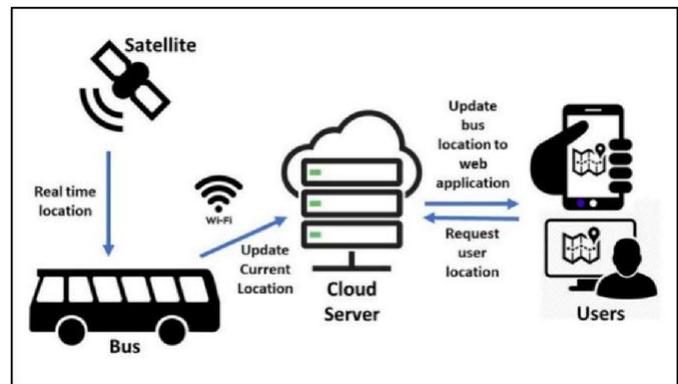


Figure 2. Architecture of the proposed GPS-based bus tracking system with passenger monitoring.

The proposed Bus Tracking System works like this: It gets real-time data processes it and helps users. The system keeps running to give bus location information to passengers and transport authorities.

Here's how it starts:

A GPS module inside the bus gathers its location in terms of latitude and longitude. As the bus moves along its route the GPS module keeps updating the location data at intervals. As the bus moves along its route the GPS module keeps updating the location data at intervals. The bus location is in the form of latitude and longitude coordinates. The GPS module collects the time geographical location of the bus. The system uses real-time data acquisition, processing and user interaction. The bus tracking system provides up-to-date bus location information.

The location information that is collected is sent to the server using the internet on your phone like GSM or LTE. This happens a lot to make sure we can track the bus in time. The server gets the information that is sent to it. It keeps it safe in a databases it can be used later. Once the location information is kept safe the server looks at it to figure out where the bus is now. Then it calculates when the bus will arrive at the next stops. The server helps the bus and the mobile application talk, to each other so everything works smoothly and we can count on it to work right. The bus location information and the mobile application are connected by the server.

The mobile app asks the server for updated information through APIs. The app shows where the bus is, on a map and what time it will arrive at the stop. People can see the buss location and estimated arrival time. This helps them know where the bus is and when it will get there. The buss location is shown on a map. They can plan their trip better. Wait less at the bus stop. The system keeps getting information and giving updates without stopping. This makes the system accurate, reliable and interactive which is good, for people using transportation.

#### IV. RESULT / OUTPUT



Figure 1: GPS Hardware Unit (Bus Side Device)

This picture shows the GPS-based hardware unit that is installed inside the bus. The GPS-based hardware unit has an important part, including a NodeMCU, which is an ESP8266 a GPS module called NEO-6M an OLED display, a power supply and some connecting wires. The GPS module gets the real-time location of the bus, which's the latitude and the longitude of the bus. The NodeMCU sends the location of the bus to the cloud server over the internet so it can be processed and used for tracking the bus. The GPS-based hardware unit is a part of this system.

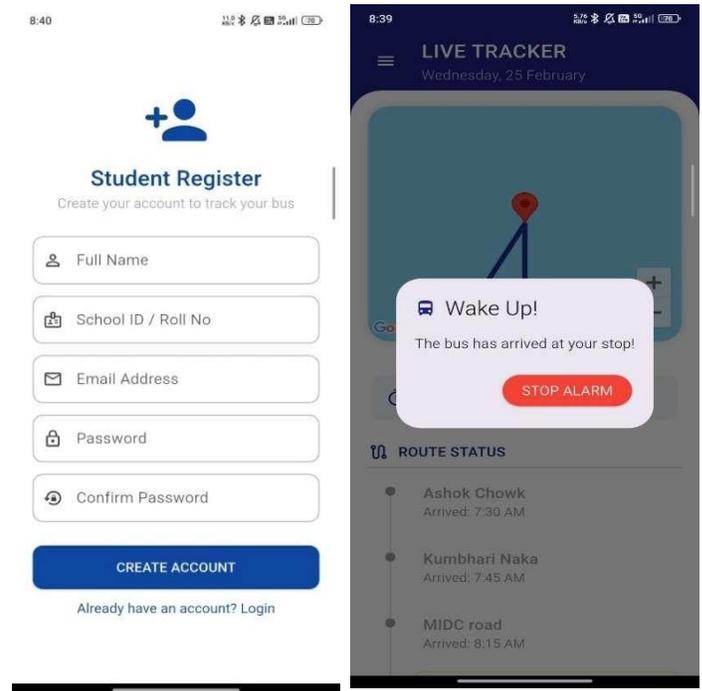


Figure 2 & Figure 3: Student Registration and Bus Arrival Alert

These figures show the mobile application features of the bus tracking system. The registration screen allows students to create a secure account using basic personal details. After login, the system tracks the bus in real time and sends an automatic alert when the bus reaches the selected stop. This reduces waiting time and improves convenience for students.

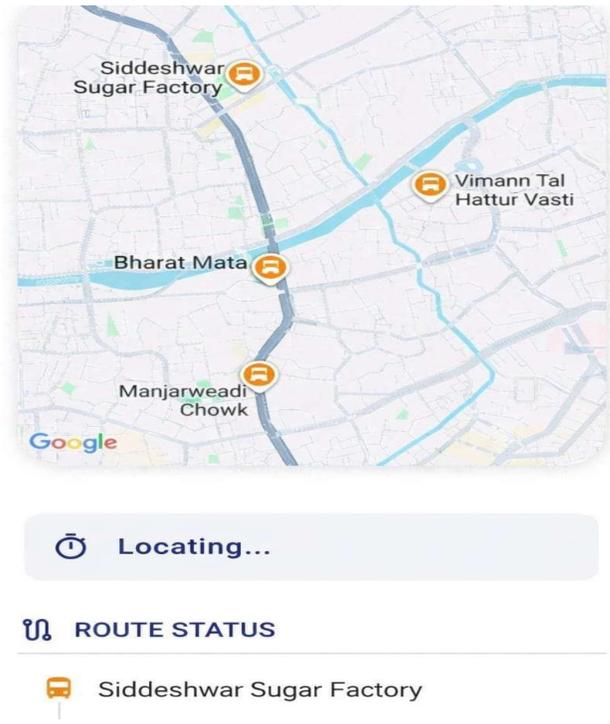


Figure 4: Live Bus Tracking and Route Status

This picture shows what is inside the bus. It has a device that uses GPS to figure out where the bus is. This device is made up of a things: a small computer called NodeMCU a GPS module called NEO-6M a tiny screen, a power supply and some wires to connect everything. The GPS module is always finding out where the bus is, getting the location, like the latitude and longitude. Then the NodeMCU sends this information to a computer, on the internet so people can see where the bus is and keep track of it.

## V. CONCLUSION

The Bus Tracking System is a way to figure out where the bus is when you are not sure. It uses GPS and a mobile app so you can see where the Bus Tracking System bus is now and when it will get to your stop. This way you do not have to stand around waiting. You can plan your trip a lot better. The people who are, in charge of the buses can also see where all the buses are and if any of the buses are running late. The Bus Tracking System helps them make sure the buses are running on time and that the routes the Bus Tracking System buses take are good. It makes taking the Bus Tracking System bus more reliable and a lot easier to use. It helps people and the bus company talk to each other better. It is part of making the city a smarter place with transportation. The Bus Tracking System is good, for everyone who uses the bus.

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