

# Advanced School Bus Tracking and the Children Safety System

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**Abstract-** The school bus tracking system is implemented to provide a secure solution. The various devices like GPS, RFID, GPRS\GSM, etc. are used to provide functionalities like Real-time bus tracking, messaging about the in-out of student from the school bus. Additional functionalities like leave management, trip management, alert messaging, etc. also implemented to provide more security to the students. The RFID card will provide the unique identity to the student. The Android app will help the users like parents and administrators to track the bus location remotely. All the notifications are sent to through the android application. The system is capable of providing productive services through emerging technologies like the Internet of Things (IOT).

**Index terms-** GPS, GSM, Micro controller, RFID

## I.INTRODUCTION

Nowadays, smart education is the main factor in smart cities. There are many factors that have an impact on a student's quality education. Students around the world spend more time travelling to and from school. Many students use school buses which may or may not be regulated by the government. Although the students are using the school transportation, then also the situation inside the bus is unknown which makes parents worry. For a working parent, it is difficult to take the ward directly to the school. This makes ensuring student presence on the boarded school bus a necessity to reduce the anxiety of parents. Usually, parents keep calling the driver to check the present location of the bus as well as to ensure their ward has boarded the bus. There is always an element of uncertainty involved in this process. It is always possible for the driver to mistake students for another or to give wrong information. Moreover, keeping track of the child will increase the

anxiety of the parent. Each school bus is instrumented with sensors that collect the information about the situations and conditions inside the school bus and then transmit it to the real time server. This information about each bus is analyzed to enhance the security of students and also to decrease the anxiety of parents. The GPS based system is used to track the particular vehicle and RFID tag is used to identify the student uniquely. The notification will be sent to the parent application whenever the student enters or exits from the bus. The long waiting for the bus sometimes loses the interest of students so the arrival time should be provided. Our system will give the real time tracking of the bus so that parents can track the bus anytime and the arrival can be predicted. If the child doesn't want to go school then the parents can apply for the leave through the system. This will help to save the fuel and time. If at a bus stop due to any reason a child cannot get into the bus, then an alert message will be sent to parents. Transport manager will design the trips according to the leaves applied by parents. Driver will be able to see the route which has to be followed by the bus. In this way, we have implemented our GPS based advanced school bus tracking system. The main objective of the development of this system is to help parents/authority of school to track the school buses and provide interaction in a more efficient and effective way resulting in greater reliability and security.

## II. RELATED WORK

This section describes the related works addressing the issue of school bus tracking.

In [1] BeagleBone based vehicle tracking for school buses is developed to track the school bus in real-time and to provide security to the students while

travelling. This system consists of Beagle Bone Black, GPS, GSM, Alcohol Detector, Door Sensor, and Eye-blink sensor. Beagle bone board along with the sensors is placed in the inner part of the vehicle. The map-reading details are updated on the beagle bone board. The sensors involved in this system helps to provide more security to the students.

In [2] the system consists of three main units, bus unit, parent unit and school unit. The bus unit consists of hardware parts. The bus unit is used to detect when a child enters/exits from the bus using an RFID Card. This information is communicated to the parent unit and school unit that identifies the children did/did not enter/exit the bus. The notification like the students whose next stop is, sent to the parent who stays on the next stop using Geofence. The system enhances the security of the children like the bus hijacked, extracting the location and instantly sending notification to the admin as well as the nearest police station using SOS and Spherical Cosine Rule.

In [3] the system is a SMS based real-time tracking system. The information of each and every student is collected and stored in a database. The collected information is then converted to a unique QR code which is then embedded in the student's identity card. Whenever the student is bored into the school bus the QR code is scanned by the mobile application manually and the details of stop and the timing is sent to the parents as a notification.

In [4] android based system parents are able to track the student location in real-time. This system uses an arduino controller. LCD is used for user interface, it is used to display all the details of student to user. Children need to register their fingerprints using fingerprint modules and switches. The Fingerprint is considered as a unique ID of a student. When the student enters and exits from the school bus, they have to scan the fingerprint. Each fingerprint is assigned with a different location, the location should be selected before scanning. All the collected information then transfer to the server. The server will then pass the message to the parent module. In this way the tracking of the school bus is done with the help of this system.

### III. PROBLEM DEFINITION

Bus transport is considered as the main source for transportation. Although the arrival time and the security issues are there in the bus transport system. People in the local cities use bus transport more than the private transport. The schools and colleges are also considering the bus transport as the main source of transportation. Due to the increase in the number of kidnaps, parents are worried about the children going to school. Although the students are using school transportation, then also some security issues are there, which makes the parent worry. The high-risk zone is when the student is outside the safety of school or home. For a working parent, it is difficult to take the ward directly to the school. This makes ensuring student presence on the boarded school bus a necessity to reduce the anxiety of parents. Usually, parents keep calling the driver to check the present location of the bus as well as to ensure their ward has boarded the bus. There is always an element of uncertainty involved in this process. There is a greater possibility that the driver may provide the wrong information to parents.

The advancement in technology right now makes it possible to live to track the location and make this information available anywhere on the planet. This becomes possible with the introduction of the Internet Of Things. It allows effective communication of devices over the internet, enabling data acquisition, transmission as well as analysis. Based on the existing system and the study we are going to develop a school bus tracking system which is providing the real time tracking of school bus with some advanced functionalities. The functionalities like alert messaging, trip management leave application, etc. enhancing the security of the student. The parents can track the bus and get the locations remotely. Also the school admins also have the access to track and get the locations of the school bus. RFID is used as the unique identity of the student as the QR code or fingerprint scanning increases the anxiety of the helper.

### IV. EXISTING SYSTEM

#### NO FOOD WASTE

No Food Waste crowd-sourced data on hunger zones in India to facilitate surplus food donation. So far, the application has identified 80 locations in Delhi and the capital region. Users themselves can mark hunger

spots, which the team verifies and enters in their databases. Users can also donate food or request the app to deliver the donation using its volunteer drivers. Usually, No Food Waste picks up excess food for a minimum of 50 people. For fewer than 50 people, users drop the food at designated collection points or local facility centers. So far, No Food Waste has fed 500-700 people saving 165 tons of food.

**OLIO**

For some people food waste is an unavoidable part of daily life but research shows that throwing food away causes disturbance for others. OLIO taps into the conscious consumer mindset to offer a food-sharing platform, connecting people with neighbors and local shops all over the world. Users can add a photo and description of their food item with the details of location from where the food is supposed to be picked up.

**V. PROPOSED SYSTEM**

Our proposed system is composed of both hardware as well as software parts. In the software part an android application is developed which has different functions according to users. The components used in hardware are GPS module, Arduino Uno Microcontroller, RFID reader, RFID tag, Power Supply, GSM module. These hardware components are explained below.

**GPS module:** - GPS stands for global positioning system. In our system, a GPS module is used for fetching the real time location of a school bus. It is done with the help of latitude and longitude values of the locations. It is connected to a microcontroller in the hardware unit.

**GSM module:** - GSM stands for global system for mobile communication. It can be used to make a computer or any other processor communicate over a network. In our proposed system GSM module is used for sending the message to mobile applications. It is connected to the arduino Uno.

**RFID reader:** - RFID stands for radio frequency identification. RFID is used for attendance purposes in our system. It takes the identity of students for maintaining attendance inside a bus. RFID reader is used for identification of RFID tag, which reads the

identity number from RFID tag and sends to the server. It is also connected to a microcontroller.

**RFID tag:** - RFID tag contains the identification number, which gives an identity to a particular object. In our system it gives identity to the students as it is embedded in the student's ID card. RFID reader reads this tag. In our system, passive RFID tags are used.

**Microcontroller:** - Basically, a microcontroller is used for processing purposes. In our system Arduino-Uno is used. In the hardware unit, it acts as the central part and all components are attached to it. Information collected by all hardware components is sent to the server through microcontroller.

The following diagram describes the hardware architecture of our proposed system

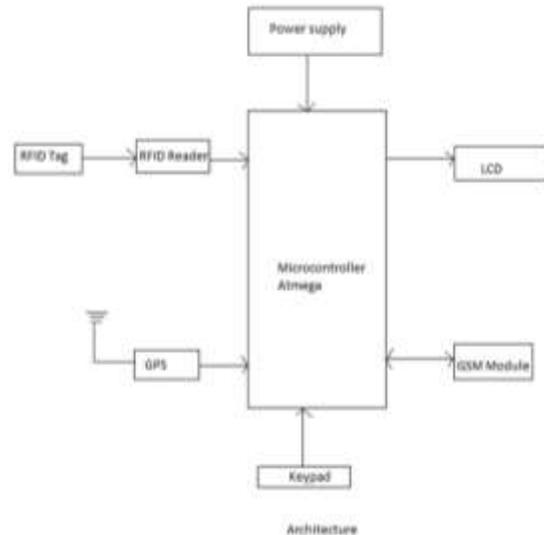


Fig 1. Diagram of proposed system

**VI. METHODOLOGY**

In our system, the application is divided into four different modules according to their features. Each module has different functionalities and features. These modules are explained below:

**Parents –**

Following are the features provided for parent's module.

1. Real Time Tracking – Parents can see the real time location of a school bus in Google maps of the respective bus of their child.

2. Notification – With the help of RFID parents will get notification when their child will board on or board off the bus.
3. Leave – In this feature parents can apply leave on application one day prior to school. Due to this it will help to consume less fuel for the bus.
4. Bus Route: Parents are able to see the route of the respective bus.

**Helper –**

Following are the features provided for helpers.

1. Attendance – The helper can manage the attendance of children inside a bus automatically.
2. Bus Route – Helper is able to see the route of the respective bus.

**Driver: –**

Following are the features provided for driver

1. Message – The driver can message to administration in case of emergency.
2. Bus Route - Driver can see the route of the respective bus.

**Administrator: –**

Following are the features provided for administration.

1. Trip Design- Administration will design the trip according to leave applied by parents.
2. Real Time Bus Tracking- Administration can see the real time location of all buses of school on Google map.
3. Message - Administration can send messages to parent, helper and driver.
4. Bus Route – Bus route of all school buses can be seen by administration.

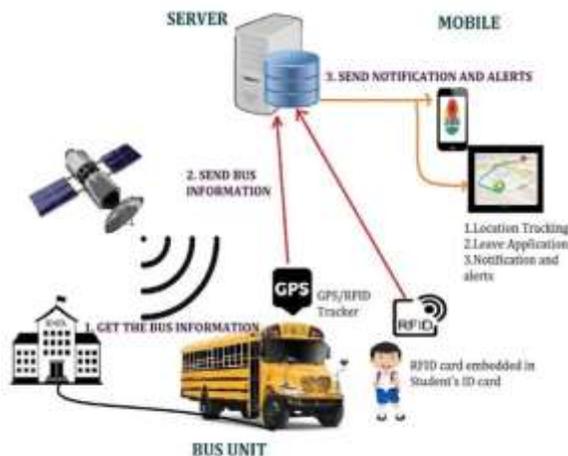


Fig 2. Diagram of Methodology

Overall flow of the system is explained below:

Hardware unit is fitted into the school bus. Database of student details, the bus details are stored in the server. The end user has the mobile application in their mobile. The real-time location of the bus can be shown on the Google Map whenever the bus starts. Then, when the student boards the bus parents will get notification. And the same when students reach school and board off the bus, parents will get notification. If parents apply for a leave the driver will get notification so that the driver will not visit the respective stop on the next day. Routes of all buses will be saved already. On a helper's application automatically attendance inside a bus will be maintained. In this way, our system is working.

**ADVANTAGES OF PROPOSED SYSTEM:**

- 1 The System is Designed to provide a more secure solution to the problem so, we are providing alert messaging, Leave management and real-time tracking features.
- 2 The use of RFID cards will reduce the dependency and the anxiety of the helper. This will help increase the security.
- 3 The real-time message passing between the various users will reduce the time that was required for communication between these users and will help the users to track and monitor the school bus.

**VII. RESULTS**

We have studied many systems of school bus tracking. On the basis of this study, we have tried to implement a better system than previous which has more advanced features than previous systems. Like, we are not only providing a school bus tracking, but attendance inside a bus is maintained, notification is sent to parents and the leave feature is also there. So, along with tracking we are including these features which are not in previous systems. By using the passive reader and tag; we have tried to reduce the cost. In this way, we have tried to make an effective system.

☰ Add RFID

### RFID Registration Form

RFID Number

Student Full Name

Parent Phone(username)

Password

Email

Optional Mobile

Student Roll No.

Standard

Division

Assign Bus :

*busnumber*

Address

Figure 1: Student panel showing registration form

← Bus Details



Bus Number :  
**name**

Name :  
**route**

Route :  
**Route**

Figure 2: Bus panel showing bus details



Figure 3: Showing all the users

### VIII. EXPERIMENTAL RESULTS

When we implement our system in real time, it is beneficial for the parents for keeping safety of children and also for the schools. School administration can keep watch on drivers, which is helpful for reducing crimes like kidnapping. So, overall we are able to maintain the security of school children who are traveling via school bus.

### IX CONCLUSION

The proposed system is designed to track the school bus in real-time with the help of GPS, GSM and RFID. The system also helps to maintain a systematic record of students, apply leave and emergency notifications during times like tire puncture, engine problem and even accidents. The system provides security to students effectively and also is more comfortable for parents and institutes.

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