

# SCHOOL BUS SECURITY AND MONITORING SYSTEM USING RFID

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**Abstract :** This project presents a system to monitor pickup/drop-off of school children to enhance the safety of children during the daily transportation from and to school. The system consists of two main units, a bus unit and a school unit. The bus unit the system is used to detect when a child boards or leaves the bus. This information is communicated to the school unit that identifies which of the children did not board or leave the bus and issues an alert message accordingly. The system has a developed android-based database-driven application that facilitates its management and provides useful information about the children to authorized personal. A complete prototype of the proposed system was implemented and tested to validate the system functionality. This system is aimed at proposing a method for improving the child security systems already available. The system consists of tracker module, RFID module and an android application on the parent's phone. The tracker module will be with the child at all times so that the position of the child can be tracked continuously. The RFID module will be placed in the school and the bus. The child has to swipe the RFID tag every time he/she enters and exits the school or bus. The android application on the parent's phone will show the current location of the child. It will also show the safe zone implemented using geofencing concept. The proposed system ensures that a child is safe while commuting from their home to school or vice versa. Parents will be informed when the child enters and leaves school. This information is also stored in the school's database. For children travelling by the school bus, information of when the child has entered or left the bus will also be sent to the parents as well as to the school's database. For children who walk to school a safe zone is defined, if the child leaves the safe zone an alert is sent to the parent's mobile phone. At any given time, the parent can check the location of the child using GPS on the android application.

**IndexTerms – RFID Reader, RFID Tag, GPS, GSM, Database, IOT.**

## I. INTRODUCTION

Children safety is most important to their parents. Despite the best safety measures, children due to their lack of skills to protect themselves, may end up in a situation that endangers their life . we focus on a particular risk associated with the daily bus trip to and from school. There have been previous incidents where a child is forgotten in the bus and eventually die because of suffocation. To improve transportation safety, some schools employ a bus supervisor to look after the children inside the bus. With the increase in number of accidents, traffic and unfortunate events, parents are often concerned about their child's safety. The stress increases when they are not able to track the school bus. All this problem we will solve in this project. This paper presents a system to monitor the daily bus pickup/drop-off of children to enhance the overall safety of the daily bus transportation to/from school.

In this project used an RFID-based system that aims at enhancing the safety of children during the daily bus trip to and from the school. RFID-based detection unit located inside the bus detects the RFID tags worn by the children. It then sends, via a GSM modem, the relevant data to the system database server. The system checks and detects which child did not board or leave the bus and issues an alert message to this effect. In addition, the system checks the children attendance and updates the database. The parents can log into system website and monitor the details of their children.

## II. STATEMENT OF THE PROBLEM

Now days, the number of crime over children is increasing day by day .the implementation of School Security System(SSS) via RFID to avoid crime, illegal activates by students and reduce worries among parents. The project is the combination of latest Technology using RFID, GPS/GSM, WSN and web based development using PHP, VB. net language and SQL. By using RFID technology it is easy track the student thus enhances the security and safety in selected zone. The information about student such as in time and out time from Bus and campus will be recorded to web based system and the GPS/GSM system automatically sends information (SMS / Phone Call) to their parents. The system aim at automatically detecting when child boards or leave the bus and issue an alert message when a child does not board or leave the bus to reduce the parents' concerns about using the bus for the daily transport of their children without being lost or forgotten. parents would be able to track the school bus when it arrives and departs to and from the school. The live location can be tracked by the parents. The school organization and parents can continuously monitor the bus. This will ensure the students safety while pick up and drop off. The system has developed mobile application that facilitates its management and provide useful information about children to authorized personal. A number of researchers have conducted the amount of work related to the RFID based security system. We presented the school bus tracking system based on RFID technology and GSM module. The RFID tag was embedded inside the student school bag in order to provide the tracking mechanism. The notification message will be sent to the parents throughout the GSM module technology

### III. METHODOLOGIES OF PROBLEM SOLVING

In proposed system model that suitable for implementing the safety mechanism for the school bus transportation where attendance is taken and parents are informed via SMS. A system that count every entry and exit of students based on recognizing the unique identification information of the RFID technology has been performed. The presence of GSM module technology enables most of parents to be informed while their children is entering or leaving the school bus via the SMS. The operation mechanism between the components has been controlled by microcontroller. Android application: This is an app which is used as a user interface. User can interface with the system using the application. All the values send through the wireless module can be seen through the application. Pick-up and Drop In this application, when child will get dropped at inappropriate place or drop then the location of the child will get automatically sent to the parents, Location of the child will tracked by the GPS sensor, Parents can see this information in the android application via smart phone. The system consists of two main units, a bus unit and a school unit. The bus unit the system is used to detect when a child boards or leaves the bus. This information is communicated to the school unit that identifies which of the children did not board or leave the bus and issues an alert message accordingly. The bus unit is responsible for detecting the child when he boards or leaves the bus and then this information is sent to the school unit. The school unit is the central unit where it collects data from all the buses, adds them to the system database, checks if there are missing children, and it sends a text message notification to their parents. The RFID reader will be located inside the school bus by the entrance. It will be positioned where it will only detect the children when they are inside the bus. An RFID system is composed of three main components 1. An Antenna or coil, 2.A Transceiver (with decoder) and 3 An RFID Tag. The antenna will transmit radio signal to activate the tag so the data could be read or written. Data storage and retrieval purposes are performed using special devices, the RFID tag. The tag is very small and can be placed anywhere on anything or inserted in human body. The school unit consists of a server interfaced with GSM modem to receive data from the bus. The server simultaneously acts as database server and web server to host the web-application developed to manipulate the system setting, update, and query the system database. In addition, the server communicates with an SMS gateway to send notification in case a child is detected missing.

### IV. REVIEW OF LITERATURE

In existing system tracking system that utilizes Android terminals that communicate among themselves using Bluetooth technology to form clusters. The clusters communicate the relevant information using WLAN. The major drawback of this system is that the deployment cost is high. There are commercial systems for tracking children such as Bluetooth-based tracking devices which are designed to be worn by children as a bracelet or a necklace. One disadvantage of this type of this applications is that they work only in a limited range. Other products may rely on biometric features such as the Kid track biometric system, the disadvantages of this approach is that it is not automatic and difficult for young children to place their palms correctly on the scanner. This may lead to inaccurate data if the scanner did not detect a child's palm. In Some existing system Smart school bus tracking software system gives parent, student, bus firms mainly the ability to track the location of their school buses using GPS. The location information sent via GPS device of the smart bus of school bus, Parents can view their payment information, and they can follow child's bus activity through notifications. But Parents can only track the Bus, but the parents does not know if child is in the bus or not. Child's security is less. In some system, mechanism for a dual authentication has been proposed to ensure that the students get on and off the bus. 1) At first student's fingerprint will be checked for the first level verification. 2) If fingerprint matches then RFID will be checked for second level verification. Drawback of this system is fingerprint image is sensitive issue. Some existing system presents the school bus tracking system based on RFID technology and GSM module. RFID tag was embedded inside the identity card. The notification message will be send to parent throughout the SIM-300 GSM module technology. Drawback of this systems are Structure: During building the project you have to make size as small as possible, Cost: Most important factor which cannot be denied is cost, Not very powerful.

### V. ASSUMPTION AND DEPENDENCIES:

Project Assumption can be defined as a statement that is generally considered to be a true without any proof or evidence. It is one of the major factors in planning process. Project Dependencies & Assumptions are very different from each other. According to the Project Management Institute, an assumption is any project factor that is considered to be true, real, or certain without empirical proof or demonstration. Realistically speaking, it's impossible to plan a project without making a few assumptions. The key is knowing how to spot those assumptions and putting safeguards in place so that if any assumption is proven false, the impact on project delivery will be minimal. Let's look a little more closely at the assumptions that can impact any project. Project assumptions can fall under a few different categories, including resource assumptions, budget assumptions, and scope assumptions. Here are some more specific examples of project assumptions:

- You'll have access to all the resources you need to complete the project, both human and material.
- Project team members will have the resources they need to complete their individual tasks on time, from specialized equipment and software down to electricity during working hours.
- Personnel costs will not change during the project cycle. As children, they are lack of skills to protect themselves. So it is our responsibility, as parents, teachers and as a person, to safeguard children and to teach them the skills to be safe. Today, most of the students are traveling to school by school buses or school vans. Parents think that their kids are safe when they travel by school bus. But are they really safe? There are many common problems such as students getting kidnapped out of school, bus getting delayed in traffic and your kid is the last one to get down by bus and is alone in the bus.

## VI. IMPLEMENTATION AND RESULTS

### 1. Arduino IDE

The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language Java. It is used to write and upload programs to Arduino board. The source code for the IDE is released under the GNU General Public License, version 2. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures.

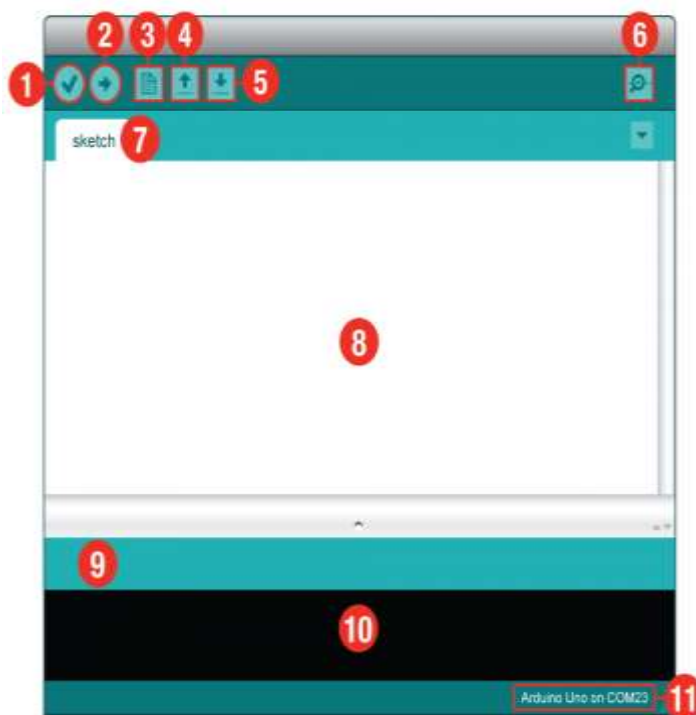


Fig 6.1. Arduino IDE

### 2. Firebase

Firebase is a mobile platform from Google offering a number of different features that you can pick 'n mix from. Specifically, these features revolve around cloud services, allowing users to save and retrieve data to be accessed from any device or browser. This can be useful for such things as cloud messaging, hosting, crash reporting, notifications, analytics and even earning money through Android App.

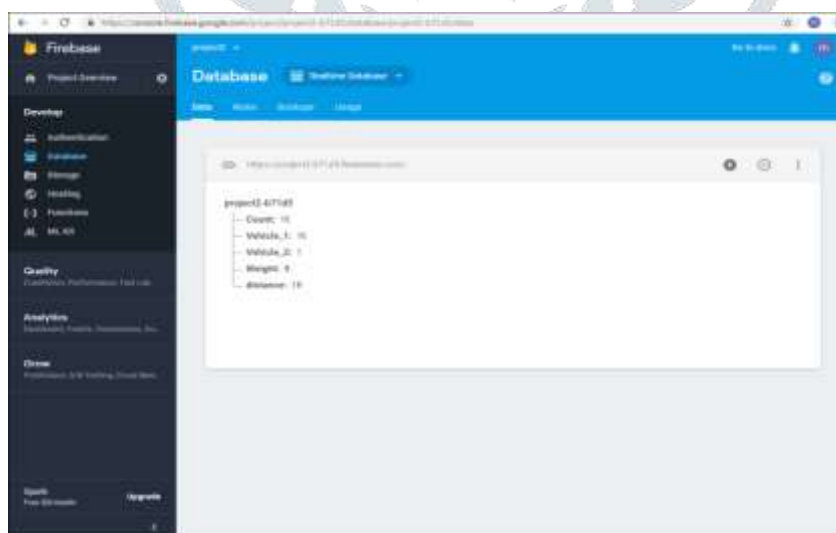


Fig 6.2. Firebase

### 3. Interfacing Firebase With Android App

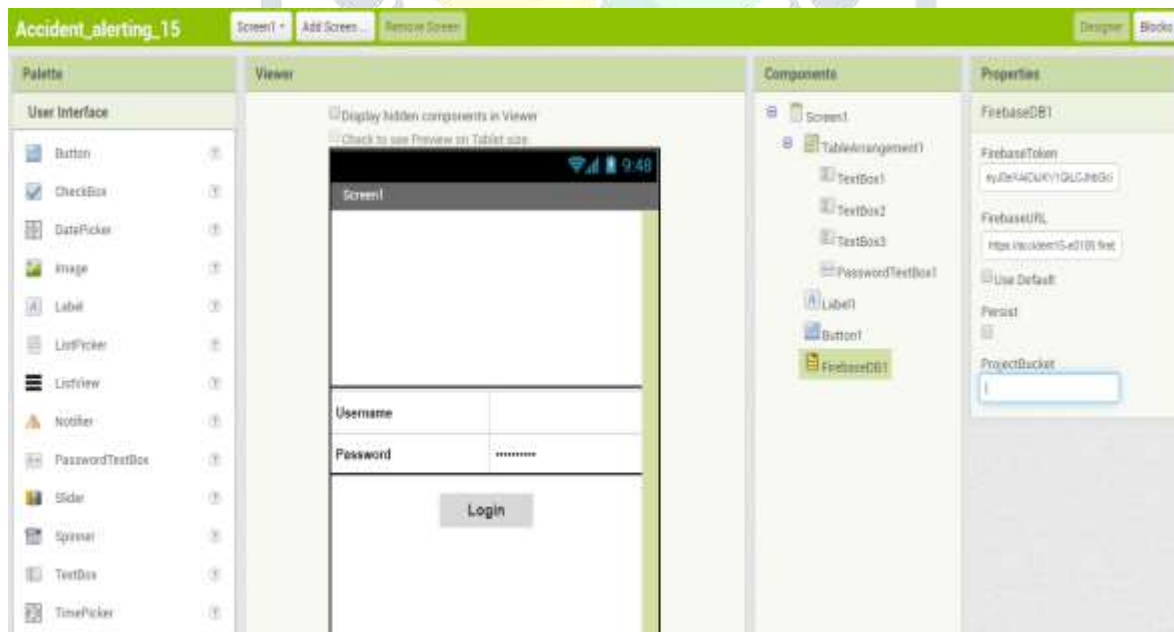
Head over to MIT App Inventor Website follow these steps to build your app. This is very simple app builder simply built by dragging and dropping elements

1. Start a new project with a name of your choice.
2. In this project we'll be dealing with switching the Login ,So we need only one button, 3 textbox and one password box.



Fig 6.3.Interface Firebase With Android App

3. You can change the text and other attributes of the button in Properties tab.
4. Since we are using Firebase we'll be adding our firebase attribute to it which is present in the experimental section of the user interface tab, by dragging it to the viewer section.
5. Now, Switch to blocks tab and build the logics shown in the above picture.
6. Then, again head to Designer tab and make the following changes  
Project Bucket should be empty.  
Firebase Token Should be as it is, No changes to be made.  
Now in the firebase URL box, enter the URL copied in the previous step, uptick the use default box.





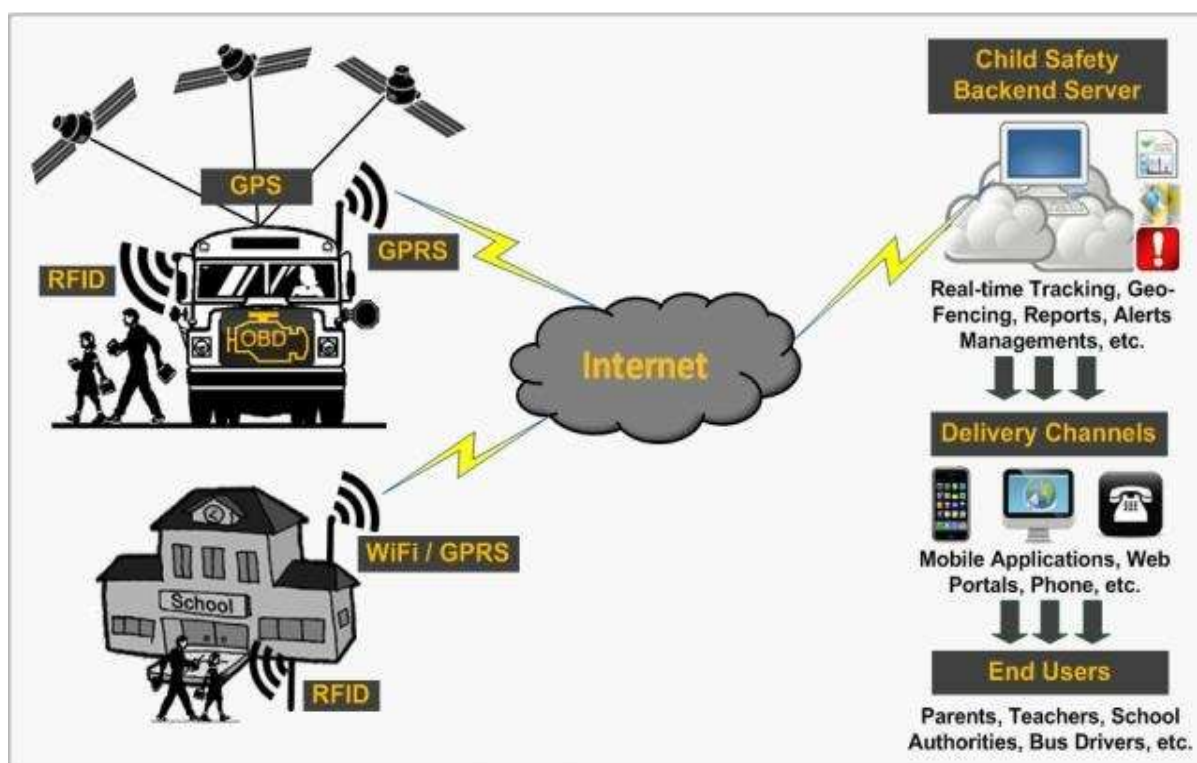


Fig 6.4: system architecture

The system consists of two main units, a bus unit and a school unit. The bus unit the system is used to detect when a child boards or leaves the bus. This information is communicated to the school unit that identifies which of the children did not board or leave the bus and issues an alert message accordingly. The bus unit is responsible for detecting the child when he boards or leaves the bus and then this information is sent to the school unit. The school unit is the central unit where it collects data from all the buses, adds them to the system database, checks if there are missing children, and it sends a text message notification to their parents. The proposed model presents the tracking of the school bus and also alerts about any emergency situation. The RFID reader will be located inside the school bus by the entrance. It will be position where it will only detect the children when they are inside the bus. The proposed system brings together service providers and parents on a common platform using different technologies. In a general overview of the system, a smartphone that has been loaded with the proposed smart application is provided for each school bus service. The location information is sent via GPS device of the smartphone of the school bus. In this manner, a mobile application provides its users with many features. Parents can view their location information of school bus; and they can follow child's bus activity through notifications. Notifications give information about school bus location. Regarding the messaging in communication, the system seems low-cost since free notification messages are used instead of SMS data. The software contains a mobile application to make the relevant clients using the computer benefit from the features served. RFID technology consist of two technologies: 1. RFID Tag and 2. RFID Reader.

1. RFID Tag: RFID tag is a small object that can be attached to or incorporated in to a product. It contains antennas to enable them to receive and transmit radio frequencies to and from transceiver. There are two bases of the RFID Tags Passive and Active. Passive tags required no internal power source, and are commonly used with issues relating to securing. In contrast, active tag required a power source, and is more expensive. In addition, there is another type of tag which is called Semi-passive RFID which is similar to passive tags except for the addition of a very small battery allowing in having a small amount of constant power.

2. RFID Reader: RFID Reader is device that is used to interrogate an RFID tag. The reader has an antenna that emits radio waves, the tag responds by sending back its data. A number of factors can affect the distance at which a tag can be read (the read range). The frequency used for identification, the antenna gain, the orientation and polarization of the reader antenna as well as the placement of the tag on the object to be identified will have an impact on the RFID system's read range.

GSM: GSM (Global System for Mobile communication) is a digital mobile telephony system that is widely used in Europe and other parts of the world. GSM uses a variation of Time Division Multiple access (TDMA) and is the most widely used of the three digital wireless telephony technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data each in its own time slot it operates at either the 900 MHz or 1800 MHz frequency band.

## VII. CONCLUSION

Combining RFID, GPS and GSM advances for safety and security reason is incredibly vital. Presently, as a result of increase in mishaps of kids getting out at wrong stations or children getting missed out at the bus this may lead to demise due to suffocation. This proposal shows that RFID based school bus tracking technology is a feasible alternative for supervising and tracing the pupils during their drive to and from school. Additionally, the expense associated with tagging of material is moderately low. Also the drunk and drive prevention system and the speed control system play a major role to help the children commute safely. In this manner the system is capable of notifying parents/guardians thru text message once the child enters/leaves the varsity, enabling parents/guardians to trace the bus, helping smooth and safer rides to the various destinations. The proposed system presented an RFID-based system that aims at enhancing the safety of children during the daily bus trip to and from the school. RFID-based

detection unit located inside the bus detects the RFID tags worn by the children. It then sends, via a GSM modem, the relevant data to the system database server. Proposed system developed and tested a bus tracking system to track the exact location of a bus. The system checks and detects which child did not board or leave the bus and issues an alert message to this effect. In addition, the system checks the children attendance and updates the database. The parents can log into system website and monitor the details of their children.

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