

## A Comparative Study on School Bus Safety and Security

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**Abstract** - School bus services now play an important role in transporting students from their homes to schools in every country region. Despite their fears about their children's safety, many parents rely largely on school bus services. This study offered an SMS-based solution to enable most parents follow their children's school bus movements (in/out) as a result of this issue. Once their children have boarded the bus and arrived at their destination, parents will receive an SMS. The system aims at building a school bus security system using RFID and GSM technology. RFID and GSM technologies are integrated into the microcontroller. The designed project, according to the research, is capable of allowing both parents and school management to control and monitor a range of features such as the number of children on the bus, each student's details, pick-up and drop-off timings, location, and attendance system. Parents can use an Android application to track the location of the school bus as well as the pick-up and drop-off timings for their children. In short, this prototype system could provide peace of mind to most parents who entrust their children to the school bus transportation system. This paper explores the methods used by different researchers to convert natural language into machine-readable code. We evaluate these approaches and list their benefits and drawbacks so that this domain might be improved. This publication seeks to give young scholars interested in contributing to this subject an overview of the many techniques in this topic.

**Keywords— RFID Module, GSM Module, GPS Module.**

### I. INTRODUCTION

#### A. IOT Basics

The Internet of Things (IoT) is a concept that allows people to interact with one another by connecting all of their devices to the internet. An Internet of things platform connects devices and objects with built-in sensors, combining data from numerous devices and using analytics to provide the most important information with apps adapted to individual needs. Without human intervention, machines can communicate with one another, resulting in faster and more timely output. The Internet of Things (IoT)

was first most helpful to business and manufacturing, where it is sometimes referred to as machine-to-machine (M2M), but the focus is now on stocking our homes and offices with smart gadgets, making it relevant to almost everyone.

The connectivity of an IoT network is its heart. To connect and distribute data among devices, we use a range of technologies. These methods include Wi-Fi, Bluetooth, Ethernet, and Long-Term Evolution (LTE). Edge Computing is a new trend in which, in order to save money, more processing is done on-device and less and less useful data is sent to the cloud. Robotics can be found all over the world, and they assist us in doing our tasks more quickly and efficiently.

The NodeMCU ESP8266 was used to construct this project, which is about the safety and security of school buses using IoT and Cloud. The open source NodeMCU ESP8266 platform is an internet of things (IoT) platform. A microcontroller controls the School Bus, which is administered by an application, along with other functions. Children's head counts on the bus, time logs of students entering and exiting the bus, bus position, and real-time messages to parents are all possible.

Parents are frequently concerned about their children's safety and disturbed by the increasing number of daily instances. With all of their negative emotions locked up, they can't help but wait until the evening to find out about their child's health. Tracking school buses is important not only in terms of a child's safety, but also in terms of a parent's well-being and the school's obligation.

The proposed research offers a low-cost, high-efficiency solution to these problems. This system can track the current position of students, as well as pick-up and drop-off hours, using real-time monitoring. Parents and school administration, as well as other critical help, can quickly reach out to children's aid in an emergency with the use of real-time monitoring. This system covers a low-cost school bus display that tracks a variety of parameters, including the number of children on board, adherence to the route and

schedule, position, speed, and other information that the school and parents require.

The Global System for Mobile Communication (GSM) module and the radio frequency identification system (RFID) have been combined in this system to provide a tracking mechanism, with an RFID tag embedded in the student identification card. After the RFID reader has been scanned, a notice SMS will be sent to the identified parents' mobile phone number using SIM-300 GSM module technology. In a satellite navigation bus tracking system, the GPS module is used.

The notification mechanism helps to ensure individual ward safety while also saving time while students wait for late buses. Students can self-address their problems using this technology, which incorporates real-time monitoring. All of these actions are managed by an application, which both parents and schools can utilize to obtain time records, location data, and real-time SMS service to authorized parents' cell phone numbers.

**B. Paper Organization**

Rest of the paper is organized as Sec II illustrates the problem statement of the project, Sec III the board as well as systematic Literature survey and Sec IV concludes the paper using the following references.

**II. PROBLEM STATEMENT**

This research seeks to overcome a challenge that may lead to terrible scenarios and, as a result, an increase in kidnapping and other criminal actions involving school pupils. Parents may need to confirm that their children have arrived at home or school by calling the bus driver. This will be difficult for the bus driver, and it may lead to additional negative consequences. As a result, the suggested system includes a passive card approach that is embedded inside the student ID card to track students' attendance. Similarly, parents are advised of their children's arrival and departure times from the school bus.

**III. LITERATURE SURVEY**

A Sai Aishwarya.Et.al [1] developed "IoT Based Smart School Bus Monitoring and Notification System" (2020) In this paper, they utilised SQLyog and Visual Studio to create a website and mobile application that will allow parents and schools to follow the bus location as well as monitor students using the fingerprint sensor and GPS module controlled by the NodeMCU microcontroller in this study. The basic concept behind this existing system is that parents and administrators may keep track of their children and monitor the bus using a website and application

Nada Abdul Al-Balushi.Et.al [2] implemented "Transport Safety Mechanism of School Children Using IOT based Smart System" (2020) This research paper presents an IoT smart transportation system for a children's school. The system contains IR sensors for counting students, an RFID card and reader for reading student data and keeping track of attendance, and a MQ3 sensor for detecting alcohol and ensuring the driver's safety. It also contains a smartphone app for getting notifications and messages, as well as information about when students boarded and exited the school bus. You can also use Google Maps to track the bus using the most recent coordinates. Things Speak, a public cloud built for IoT, is used in this system.

Palvi Shelke.Et.al [3] wrote "Smart Tracking System for School Buses for Ensuring Child Security using IoT Implications and GPS Technology" (2019) This result implies an android-based solution that allows parents to track their children's whereabouts in real time using IoT apps. A biometric identification system is included in the system to identify the child's existence, and GPS technology can be used to follow the child's whereabouts. Furthermore, if the bus driver or bus worker has drunk alcohol or has exceeded the speed limit, the sensors installed in the bus would alert the school authorities.

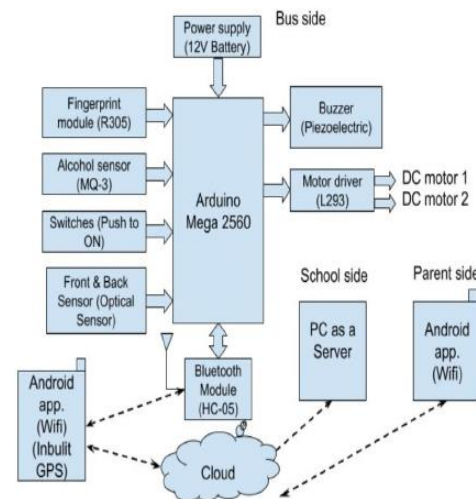


Figure 1. Block Diagram

The block diagram of the entire system is shown in Figure 1. The system's operation, in which the devices and microcontroller operate as a bridge between the application, such as the Blynk app, and the application's control.

Judy Thyparampil Raj.Et.al [4] contributed "IoT Based Smart School Bus Monitoring and Notification System" (2020) The proposed system offers real-time data on a variety of vehicle aspects, including location, route, speed, passenger list,

driver schedule adherence, and much more. The system uses the Firebase Cloud messaging service, and the Blynk app notifies parents when their children get off or on the bus. In this system, they combine RFID and GPS technology, as well as an ESP8266 microcontroller to communicate to a remote server through Wi-Fi.

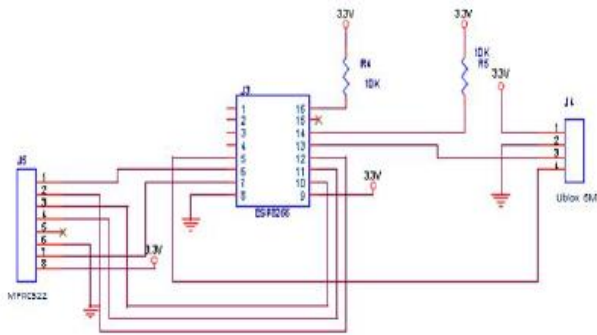


Figure 2. Circuit Diagram

Figure 2 depicts the circuit diagram of the final model of the system's operation in the school bus security system. To control the system, the IoT devices connected to the microcontroller use the Firebase cloud messaging service and the Blynk app application. In [11-24], authors have given different methods in IoT and cloud computing security.

#### IV. CONCLUSION & FUTURE SCOPE

This paper surveys different methods for developing IoT models for school bus safety and security. We may deduce that by making the development process simpler, this initiative will assist developers save time and effort. It not only saves time for the company developing the project, but it also saves money by making the development process faster and easier. It has a lot of potential to change things and make things easier for individuals who operate in this field. A number of research professionals are actively working on this project, which has a lot of space for improvement.

The Future enhancement of this paper is that referring this we can implement a project over any cloud and IoT devices for automation of any systems which in turn help them to work on different ideas and develop them. The proposed system is already achieved the automation of school bus safety for children which can give help school organization and parents to track their children.

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