# IoT BASED SCHOOL BUS TRACKING SYSTEM

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**Abstract -** *Nowadays, parents are perturbed about school going children because of the increasing number of cases of missing students. On occasion, students need to wait a much longer time for arrival of their school bus. There exist some communication technologies that are used to ensure the safety of students. But these are incapable of providing efficient services to parents. This paper presents the development of a school bus monitoring system, capable of providing productive services through emerging technologies like Internet of Things (Iota). The proposed IoT based system tracks students in a school bus using a combination of RFID/GPS/GSM/GPRS technologies. In addition to the tracking, a prediction algorithm is implemented for computation of the arrival time of a school-bus. Through an Android application, parents can continuously monitor the bus route.*

***Key Words*:**  Vehicle tracking; microcontroller; RFID; GPS;

## 1.INTRODUCTION

Ensuring safety and security of school student is a prime concern for society, the world over. There have been numerous reports such as kidnapping of school students on their way home or to school and delaying of school bus due to road traffic. A recent study shows that number of missing children, across the country, increased by 84 percent between 2013 and 2016. Technology can provide a comprehensive solution to this vexing problem. School vehicle tracking systems play a major role in the safety of school children. For tracking a school bus we propose an IoT-based school bus monitoring system. IoT is defined as the inter-communication of "connected devices" and "smart devices", and other items embedded with electronics, software, sensors, actuators, and network connectivity, which enable these objects to collect and exchange data. An in-vehicle device, using Radio Frequency Identification (RFID) tag, identifies each studentand tracks the bus via the global positioning satellite (GPS) module. A GSM module is deployed to notify the parents about the entry and exit status of students, and up to the minute reports, of running status of the bus, appended with location and speed of the bus. Short message alerts are sent to parents, if the predefined, route schedule of the school bus, is modified. The information collected by a GPS receiver in the vehicle is communicated to a Cloud server. A smartphone application empowers the end user, to monitor the location of school bus, and view the route path, using Google maps. The mobile application also determines the arrival times of a School Bus.

## 2. RELATED WORK

This phase of the paper elaborates telematics technologies for the progress of various vehicle monitoring applications like tracking location of vehicle and location of theft vehicle. Zambada, et al, propose a school bus monitoring system with the use of localization and speed sensors. This will allow parents and school authority to keep real-time track of the school bus behavior. A publish and subscribe architecture is used; a parent or any stakeholder, who needs data is called subscriber. S. Lee, G. Tewolde and J. Kwon developed and tested a vehicle tracking system, in this paper an in-vehicle device comprised of GPS, GSM and General Packet Radio service (GPRS) modules, and it is embedded inside the vehicle, whose position is to be tracked in real time using a Smartphone application. A hardware prototype was developed for vehicle tracking in. Geographical coordinates of the vehicle, obtained by GPS Receiver, are communicated to the user's phone, using GSM modem and the system is not capable of proving Google maps. Single in proposed a GPS-based Bus Tracking System. It is an application that has its client side on the Android platform and the main objective of this paper is to acquire real-time location of the bus and the updated transit schedule of the bus-route, it is comprised of two main modules; a GPS-based sub-system, which tracks the current location; the other modules predicted the average velocity of the bus using clustering and back propagation method. To make efficient tracking system some papers have introduced features like bus arrival time calculation. Liu, et al in integrated the k-nearest neighbor (k-NN) algorithm with cluster analysis and applied principal component analysis (PCA) for computations of bus arrival times. Road traffic is the key factor that effects arrival time calculations. In, Sai, et al, dealt with solutions to different traffic anomalies using Hadoop map Reduce. For more

precise prediction of the road traffic a cost effective method using Apache Spark was introduced by Prathilothamai, et al in.

## 3. SYSTEM REQUIREMENTS

A. Hardware Requirements

1. Arduino Uno: Arduino Uno is a microcontroller board based on the ATmega328P.It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 Analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.
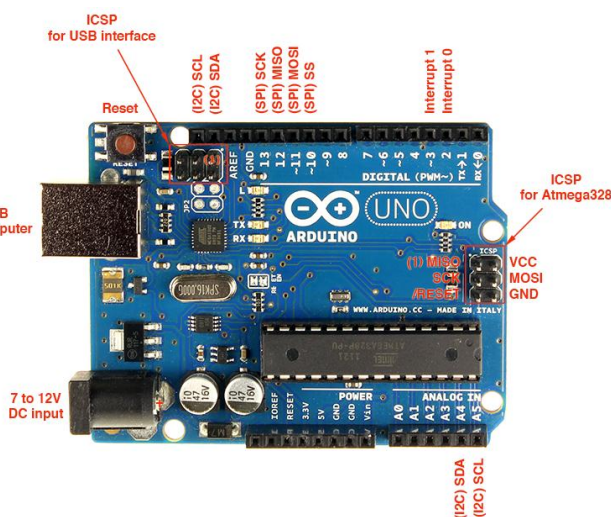


Fig 1 Arduino Uno

**2. GSM Module:** Turning ON the GPS module on the phone would not cost us anything but getting a location usually involves transaction with cell phone service provider so as to extract the location

fast and with as little network connectivity as possible plus non visibility of satellites. In short: no cell phone service implies any GPS location, as far as handheld devices are considered.

Normal GPS The method is called trilateration. The receiver listens to a particular frequency and gets data packets in the form of time coded messages from satellites. The receiver figures which satellites it can hear from. It starts gathering those messages containing time information from atomic clocks, current satellite positions etc. Nominal time to get a location is around 30-60 seconds. The same information needs to be confirmed by at least two other satellites.
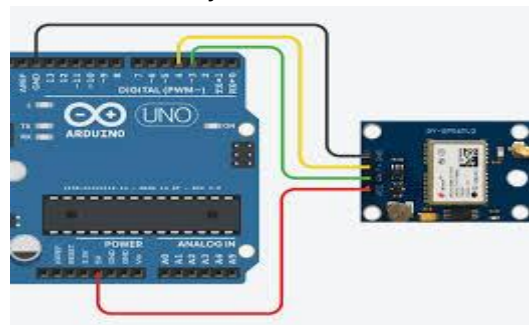


Fig 2 GSM Module

**3. GPS:** A GPS navigation device, GPS receiver, or simply GPS is a device that is capable of receiving information from GPS satellites and then to calculate the device's geographical position. Using suitable software, the device may display the position on a map, and it may offer directions.



Fig 3.1 GPS Module

**4. Rfid:** Radio-frequency identification uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically-stored information. Passive tags collect energy from a nearby RFID reader's interrogating radio waves.
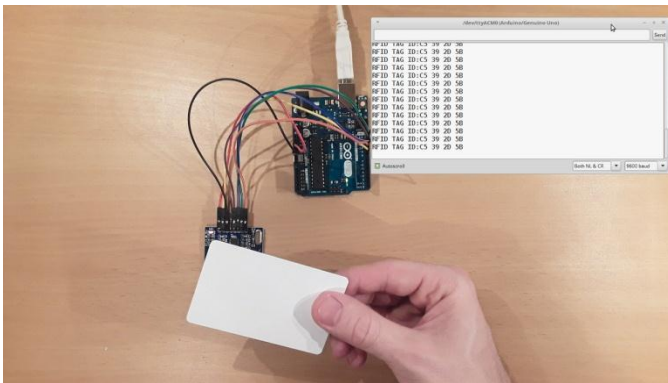
Fig 4 Rfid

**B. Software Requirements**

**1. Apache HTTP Server:** Apache is web server software. Any web server is either hardware (a computer) or software (the computer application) and thus it helps deliver content which is accessed through the computer. It is the back end that provides the support for scripts to work, databases to seamlessly integrate with the web application. Apache played a vital role in initial phases of development of World Wide Web. It helps in implementing core modules for handling server side programming language, authentication schemes, socket transactions & layer securities. While supporting ftp, it has inbuilt HTML authorizing tool & inbuilt search engine. The large public library of add-ons helps one to customize the server end.

**2. PHP Scripting:** It serves as a server side scripting language. The interpreter used at server end is a dedicate PHP processor module and interprets the chunk of code within the delimiters.

Acronym for Hypertext Pre-processor, PHP helps in designing dynamic web content.PHP code is processed in command-line mode performing desired operating system operations and producing program output on its standard output channel. The three main reasons to work with PHP is: first, it fits in greatly with HTML, being interchangeable with it, and only adds new content. Secondly, its user interface provides a richer experience as compared to HTML only. Third and foremost, it's easy to learn and we can easily get started by using only a few functions.

**4.Database:** MySQL is a world renowned open source Relational DBMS supporting standard SQL. At the server end, it can be configured to provide single user or multi user access to a number of Databases and tables. Some of the best features are: cross-platform support, updatable views, cursors, information schema, query caching etc. It can easily be integrated into PHP scripts. It is developed, distributed & supported by Oracle foundation.

**5. Arduino IDE:** Arduino 1.8.2 is the open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software.

## 4. ADVANTAGES

IoT based school bus Tracking system often have several alternatives , like sending automatic alerts to a phone  they can also work as one layer of several combined security measures.
- ➢ Bus tracking
- ➢ Location based services enabled devices
- ➢ Driver monitoring
- ➢ Route monitoring

## 5. RESULT

In the proposed framework, When the parent enters Bus route number and Date, the School bus tracker shows the Bus's current location along with expected arrival times at each bus station. Such information is very handy for parents, who need not anxiously wait for uncertain durations, as they would have acquired the most up to date arrival time of the specified school bus. The following section shows screenshot of two modules. Whenever he parent clicks anywhere on the map, the current position an the travelling path of school bus will be displayed, components have be integrated to provide the security.
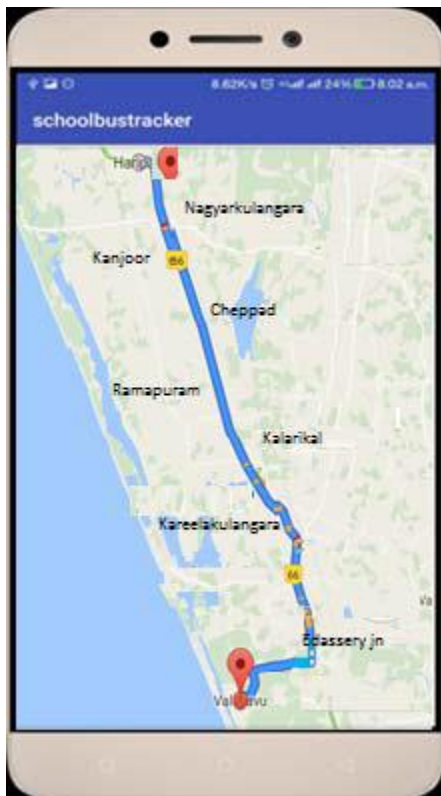
Travelling path of school bus

When the parent needs to know the exact arrival time of bus, by clicking the TIME SCHEDULE button, computed arrival times at each bus stop on the selected route, and details of student are displayed on the screen.

## 6. CONCLUSION

We developed a school bus tracking device, in collaboration with RFID, GPS and GSM/GPRS technologies. Whenever a child enters/exits the bus, the tracking system is capable of notifying the child's parents, through SMS alerts. An Android application has been developed to display vehicle location on Google maps and, display arrival times of a school bus, at each of its designated bus-stop. The implementation is very cost-effective, as it is based on easily accessible electronic devices.

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