# Smart System for Attendance, Safety and Management for School Transport.

*based on Study of smart school and public transport systems*

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***Abstract:*** Generally, security of student is prime concern for parents and also for school due to the cases of child being left in the bus, found missing or child sexual abuse. Trustworthy and secure transportation service for student is most important factor for school for ensuring safety of student. Bus fleets are effectively managed by the system and it reduces the mishaps potentially. The proposed system provides real time information about various parameters of the vehicle like the location and speed calculation through GPS, the predefined routes, the list of passengers, the adherence of drivers to schedule and much more. The purpose of system is to handle or to maintain all the information about school bus and its management which is very crucial. The system further notifies parent about their to school and way back route attendance. In this system, we make use of IoT like Biometrics, RFID and GPS technologies and wireless technologies for remote server connection. Biometrics is used for taking attendance of students and GPS for live location, Speed Calculation, Predefined routes and stops. Parents can access information through mobile application and effectively track their ward through this mobile application. The school administration can also use the application to ensure student safety. Any grievances, notices, official instructions can be communicated between administration and parents through the messaging system. The main purpose of project is to integrate distinct system into consistent manner so that the tedious functions can be handled smoothly by any technical and non-technical person.

***IndexTerms*** **- GPS, IoT, School Bus, Attendance, Safe Transport.**

## I. INTRODUCTION

The journey of students from home to school and back has always been a source of concern for parents due to frequent news of the crimes with children inside the buses and various other mishaps. The transportation systems provided by the bus are but it is full of lacuna's and error. Students often board the wrong buses and get off at the wrong stops. Bus drivers will not be able to identify all the students and will not know in time the missing student. Parents have no way ensuring the safety of their wards until the evening when the bus returns. On the other hand the parents have to rely on these transportations only to provide the good education to their children in schools far from home. On the other hand authorities like CBSE have advocated the necessity of the smart school transport which will fulfil these concerns of the parents and administration. In this paper we have studied various smart transport systems proposed and implemented and have proposed the system for safe and smart transportation of the school students. The proposed system contains 4 main modules as: Base Station, GPS module, GPRS module, Relay Module And Attendance module. The Base station is nothing but the administration side web based system which is responsible for gathering the data in database and other admin tasks. The GPS module will be present in the bus and will acquire the real time location coordinates and attendance module in the bus will ensure the presence of student. This information will be sent over the GPRS module to base. Relay module will ensure whether that driver has not been drunk etc.

## II. LITERATURE SURVEY

The comfort and safety assurance system for the school bus students, their parents and administration can be proposed on the basis of analysis and enhancement of previously proposed ideas regarding transportation and systems which are in function by various public transport service providers like Ola and Uber.Mr Majd Ghareeb and co-authors have tried to develop the system for same concerns. Their paper provides the general idea of the possible solution and the components needed to be included. It proposes the system to track the current GPS location of the buses, give its access to parents; however, it will alarm the driver to pick up or drop the students to their appropriate stops. They suggest to include SMS alert system for the parent side as well [2]. The paper by Amrita Sanam describes the need of the inclusion of the authentication of the students in the school bus safety measures. She reviews various authentication methods and proposes the face recognition based on haar feature based cascade classifier available in OpenCV. system allowing the entry of only authenticated students [3].Mr J. Raj proposed the system where the buses are equipped with the Ublox 6m GPS module which acquire the information regarding the real time coordinates, speed of the buses, adherence to the scheduled routes etc. in every 5 minutes and all this information is stored to the server side database. Further the system uses MFRC522 based RFID sensor to authenticate the children [1].Mr Al-Lawati has specifically focused on the RFID based authentication and the server side database design. He has used the passive RFID sensors being cheap and performance effective. He has tested his system against the web based interface and ATmega32 microcontroller [4]. Paper by Mr Sharad S aims to minimize the waiting time of the bus passengers by providing a real time information of the arrival time of the bus, along with the management and optimization of the fleet of buses. The inputs used are the GPS coordinates of the bus, route number, registration number, timestamp and is transmitted to a MQTT broker. The latitude and longitude is processed on the hardware mapped to compute the shortest path using Dijkstra's Algorithm [5].The system developed by Yifeng Guo uses the RFID based authentication of the parents, children, teacher, drivers etc. It uses the local SD cards to store and process the information instead of the remote database servers. The paper provides the in depth knowledge of the hardware components and architecture used [6].

S.Sudha have carried out one important and interesting research about the correlation of the person's thumb impression and gender. For this she have taken the observations from several human subjects and analysed for ridge count, RTVTR, white lines count, ridge count asymmetry, and pattern type concordance. This can be implemented in future authentication algorithms [7]. We also have referred the previous work done by us regarding the system ensuring the safety of the passengers traveling through the public transports. There, we have reviewed the existing smart transportation systems like Ola, Uber, Jamaica Taxi etc. and some other authentication and location tracking ideas. And further have proposes the system which uses the GPS as well as the finger print based passenger authentication system [8].From the above survey we can state that the location tracking system like GPS, authentication system like RFID or biometric etc. Remote server to store and process the information and the customized web or the android based software application giving access to this data are the most important sections of such system.

## III. PROPOSED SYSTEM

The smart school transport management system can be proposed on the basis of enhancement of several existing passenger comfort and safety assurance systems and proposed systems which are analysed before. First of all the system should be automated and digitized as far as possible. The system will be designed keeping the concerns of parents and needs of the system admins to the centre [8]. The system should provide the live bus location tracking facility to the admins as well as the parents to deal with the issue of the security assurance[1][2][8]. It should also provide the means of the authentication of the students, so that the attendance will be automated and personalised tracking will be enabled. Being important safety parameter.
The framework is isolated into four fundamental units: transport unit found inside the school transport providing the GPS and authentication information to school unit, school unit situated inside the school server room responsible for the acceptance and the further processing of the data, Framework database which is responsible for the storage and updating all database information, real time system generated information and the business logic; The Web Application is nothing but the graphical user interface part of the system which provides the means of the access to the system for users based on their privileges viz. Parents and Admins. The transport unit is in charge of identifying the child when he boards up or leaves the transport and after that this data is sent to the school unit. The school unit is the central unit where it gathers information from every one of the transports, adds them to the framework database, checks if there are missing children, and it sends an instant message warning to their parents.

## IV. IMPLEMENTATION

Based on all the brainstorming above, we can say that the following are the primary units of the system:

Transport Unit
School Unit
Framework Database
User End Application

Let's discuss about these modules one by one:

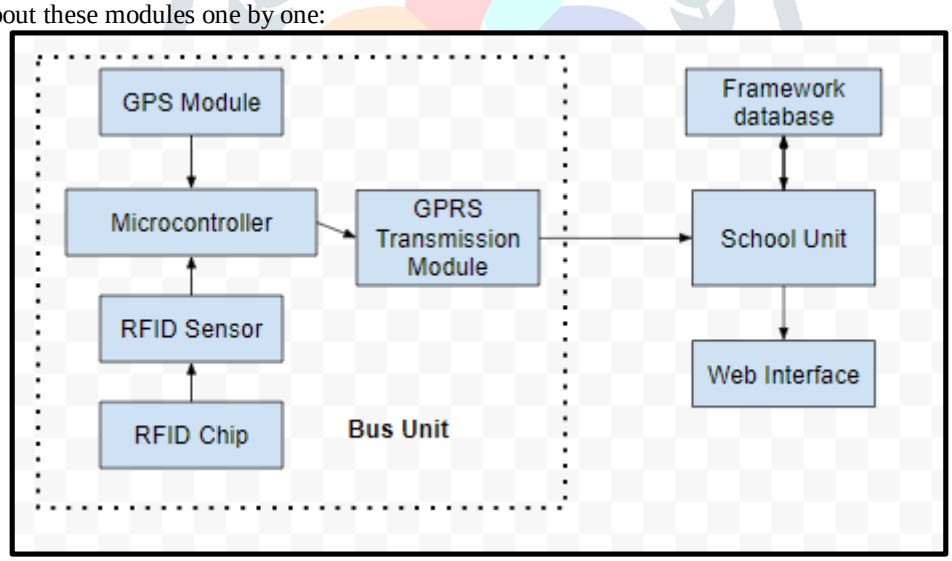


**Fig. 1 System Architecture Diagram**

### 4.1 Transport Unit:

Table The transport unit has GPS trackers installed in it which enables high accuracy tracking of buses. Real time tracking performed by the GPS school bus tracker which gives update about the location of the bus, arrival and departure time, speed, idle time of bus, bus route and distance travelled information to the parents and administration.
The main purpose for using GPS school bus tracker over other tracker is because normal tracker only tracks the bus and records the information which can be viewed by the admin later on, while parents and administration gets instant notification through GPS school bus trackers. This keeps the school bus system updated throughout the commute and reduces the chaos present in the system.
Here are some advantages of the real time tracking of GPS school bus tracker:

i) Ensure the safety of ward through commute: GPS tracking allows parents to keep a constant watch on the school bus movement through live map feature. Parents can view the bus location on map, stoppages, traffic condition, etc... The movement that affects safety of students or any unusual behaviour can be easily identified.

ii) The chances of mishaps can reduce with better monitoring: Other than live location tracking facility, the GPS tracker is kept alerted the behaviour of driver to the school bus admin. In case the drivers drives the bus over limit, or bus stops at the place for long time, or if student is dropped at wrong stop, it sends notification to the school bus admin so the admin can take appropriate decision.
ii)Provide Peace Mind to parents : System send important notification to the parents in order to assure parents peace of mind. If the student is de-boarded at wrong stop parent will be easily notified. The system keeps parents and admin updated about everything thing between to and from school.
As the part of the authentication and attendance management, RFID tracking is also included in GPS school bus tracking solution which automates the school attendance management system along with tracking students inside the school campus. RFID tracking time saver and accurate attendance report is provided. Alert messages are received by parents if their kids are outside school before the school hours. The school authorities and admin are notified in the case student is missing from the class or not present in the class even if he is not marked absent, enters restricted area or is present in school premises after school hours.

The transport unit will distinguish the children when they load up/leave the transport. It will utilize RFID innovation to accomplish this reason. This technology comprises of a reader and labels. There are three sorts of RFID readers dependent on their frequency ranges, low frequency, high frequency and ultra-high frequency [5]. We picked to utilize UHF RFID reader, on the grounds that it has a quicker information exchange than the others [6]. Additionally, the separation can be controlled to be short or long as required. The RFID reader will be situated inside the school transport by the passage. It will be situated where it will just identify the kids when they are inside the transport. Be that as it may, if the kid was outside close to the transport, the reader won't distinguish him. Every kid will wear a card with RFID label appended to it. The transport unit is in charge of sending pertinent label data to the school unit where it will be put away and handled. In light of the gotten data, other related kid's data can be recovered from the database for further handling (for example messaging the parent). There are two sorts of RFID labels, passive and active labels. We picked passive RFID labels since they have a short reading go which fit our necessity to identify the child when he is near the reader (for example whenever s/he loads up or leaves the transport). Additionally, they are less expensive than active RFID labels and need no upkeep rather than active labels that need support what's more, standard substitution of battery [4].

**4.2 School Unit:**

The school unit comprises of a server interfaced with GSM modem to get information from the transport. The server at the same time goes about as database server and web server to have the web-application created to control the framework setting, refresh, and question the framework database. Furthermore, the server speaks with a SMS door to send warning on the off chance that a kid is identified missing.

**4.3 Framework database:**

The database of the framework needs to meet certain business rules. A business rule is "a concise, exact, and unambiguous portrayal of a strategy, method, or guideline inside an explicit association" [4]. It decides entities, attributes and relationships of the database. The business rules of the database of our framework are:

i) a child can be in just a single transport, yet a transport may have numerous children.
ii) A relative may have numerous children enlisted at the school.
iii) A transport might be driven by at least one driver, yet a driver can drive just a single transport.
iv) A kid may have numerous attendance records; however an attendance record has one kid.

**4.2 User End Application:**

One fundamental part in our framework is the database-driven web/android based application to control the framework, refresh, and query the database. There are two alternatives to sign into the site, as a parent or as an administrator. The administrator can add, modify, delete or view data about child and their relatives, transports and drivers. Then again, each parent can see the status of his/her kids on the off chance that they load up/leave the transport toward the beginning of the day and evening.

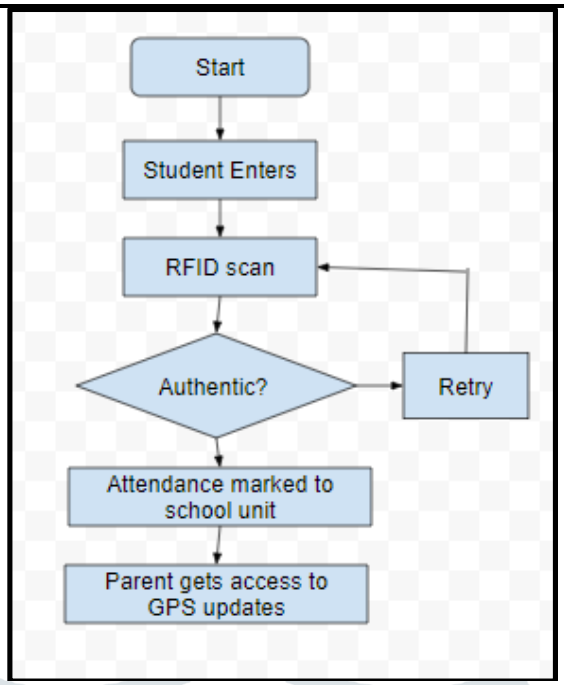


**Fig2.System Flow**

## V.RESULTS

The application should provide following kind of results when deployed in action:

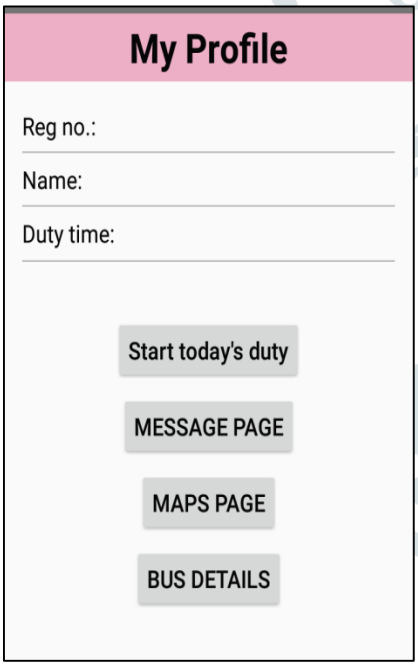


**Fig.3 Dashboard**

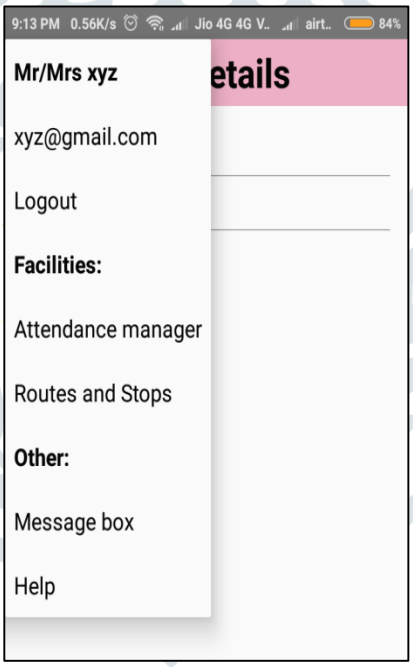


**Fig.4 Menu Bar**

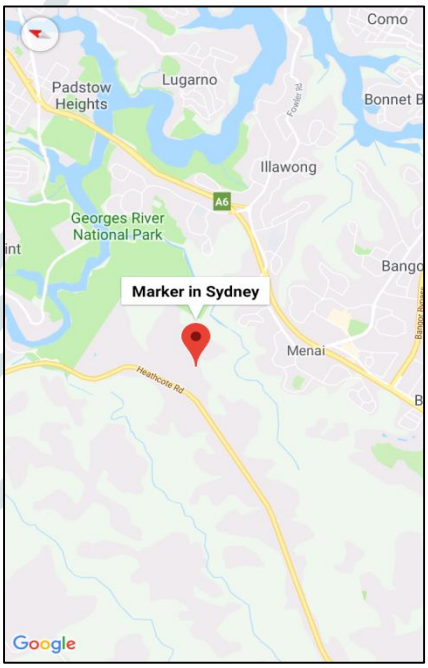


**Fig.4 Bus Location Pin**

## VI. ANALYSIS AND FUTURE SCOPE:

After the trials of the above demo system, we found that the GPS pin visible as location and the actual location of the bus has difference of several meters. The use of handheld GPS device like smartphone gave significantly unacceptable deviations. In case of specialised GPS devices, distortions are not so severe to display the bus at place. This may happen due to the delays in updating of GPS data in the database. The speed of the vehicle also has significant effect. The baud rate and the protocol need to be precisely calibrated in receiver and interface program. The baud of 4800 to 9600 is prescribed but data transfer further lags. These lacunas can be overcome by using the prediction algorithms based on current and previous readings [4].

The feedback from volunteer users states that the full time tracking service availability created confusion, (especially while racking for multiple children. Also multiple buses travel for multiple rounds) as bus location was visible even after their service time. As further improvement, prediction of the arrival time of the bus at the respective pickup and drop locations can be implemented [6]. As the further layer of authorisation and security check, the advanced researches like gender detection can be implemented based on finger prints [7].

## VI. CONCLUSION:

The system we have proposed is nothing but the choice of the most efficient and feasible methods among the various existing solutions as well as proposed system we have analysed. The system ensures the safety of the students travelling through the bus by combining GPS technology with RFID authentication which provides personalised tracking, speed management, attendance, absentee alert system etc. The parents will be carefree getting access to the live information track; and administration tasks will also become smooth and automatic. Further the improvisations are possible based on the needs of the school implementing this system.

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