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# Server-Less Cloud Architecture based School Bus Tracking System

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**Abstract:** *Safety has become one of the most indispensable issue in the present world, especially when it comes to kids. Server-less Cloud Architecture based School Bus tracking system is a software created for addressing and solving one of the biggest security issue that the parents of the school going children who travel by the school bus face, 'Has my child reached school safely?'. The project aims at providing the parents with a software through which they would be able to track their children when they board the bus and when they get off along with the route that the school bus is taking.*

*The advantage of a cloud based tracking system is that one can access it anywhere and anytime. The implementation is easy and one can get upgrades quickly.*

*Since this system will have an ability to store and process the database on the cloud, the system will be more secure and substantial. Scalability and cost management is efficient because of the server-less architecture.*

**Keywords:** *Cloud architecture, tracking, safety, GPS*

## I. INTRODUCTION

Security being the major issue for parents for whom it is not possible to physically drop their kids to school and hence rely on the school transportation service like the school bus and school van. But, there are many cases when a kid is left behind in the school or is not able to reach back home safely.

Unusual situations that occur on the road like accidents, construction work, traffic jam affect the operation of the bus system. These everyday problems lead to delays in the bus dispatching times. This disruption can be circumvented by developing a system which furnishes real time data.

The project concentrates on the execution of Serverless real time bus tracking system. The use of server less cloud architecture will ensure easy storage and efficient management of large data. We are aiming to deploy the project to a school for the school bus facility. The school bus will have a device (an android phone or a tab) operated by the school bus attendant who will mark and notify the attendance of each of the student who boards and gets off the school bus [1][2].

## II. THEORY

### A. Foundation

With the furtherance in technology and the need to provide with a system that is both cost efficient and provides best possible utilization, the approach of our project has been completely user centric.

Even though there are multiple vehicle tracking applications, they are not yet widely accepted for various reasons. Mainly, because they are expensive. Therefore, the need to build a project which will be of least or negligible expense became a target. Server-less cloud computing is the major solution for the same.

### B. Feasibility and Scope

At initial phase the scope of the system will be at a particular school which will be helpful for the parents. The system will be handled by a central manager who is responsible for the registering and maintaining data of those students. The end users of the system will be the parents (at local level) or the guardians.

The important stakeholder of the system will be the school, however, they won't be directly using the system. Providing the work to the school is the key process of the system which will be easily handled by an automated part of the system. The success and the profitability of the project partly depend on managerial competence of the major ingredients of the proposed project which are the users i.e. schools and parents.

The capability of the infrastructure of a process is to achieve and sustain the properties of isolation, atomicity, durability, consistency, etc in the matter of the data stored of the users and benefiteres.

### *C. Project Description*

The main aim is to build a software that enables parents to track the LIVE location and get timely updates whenever the school bus is on the move. We will first create a tracking application using Android Studio and Google maps API. Cloud architecture will be used for easy maintenance and management of large data.

Each parent/guardian will be provided with a unique ID through which they will be able to log in into their respective application. The geographical co-ordinates of the school bus will be received by the user (parents) with the help of GPS function, which is easily available in smartphones today.

A common notification will be sent to the parents in the notification centre feature of the application when the school bus will leave the school premises to pick-up the kids.

The bus attendant will mark the attendance of the kids, which will be sent as a notification to the respective parents. Other necessary alerts like change in the route or delay due to any cause will be notified to the parents. Additional features like automatically updating about the arrival time to the respective stops (for example: "Reaching your stop in 5 minutes") which will help save the time of the guardian responsible to pick up the kid from the bus stop.

The flow of the system will be as follows

- 1) The bus attendant and the parents will register on their individual application.
- 2) The bus attendant will send the GPS co-ordinates via the mobile phone which is used as the tracking device.
- 3) The data is sent to the server at fixed intervals which is stored in the database (cloud architecture).
- 4) Google Maps Application Interface is used, for the data to be processed and displayed on the map.
- 5) The bus attendant checks and marks the attendance of every child that boards/gets off bus.
- 6) The attendance is marked on the application and is sent to the respective parent as a message on the application itself.
- 7) Parents monitor the LIVE location of the bus on their mobile device.
- 8) A few minutes prior to boarding or dropping off, an automatic "get ready" message is sent to the parents to plan their time accordingly.
- 9) The process continues for entire tracking and monitoring.

The Cloud Application Gateway will communicate with both ends i.e. the user's application as well as the mobile device that is used as the tracking device. The database will store the information about each passenger (student) traveling in the school bus. Their name, their guardian's phone number, address, route to their stop, number of stops between their stop and the school and the ID of the guardian's mobile device through which major communication of sending of data will take place.

### *D. Approach*

Gathering the societal needs and expectations and understanding them thoroughly to visualize and create the optimal product is the number one goal. Taking forward this goal into creating what best satisfies the said goal is the approach. Starting off by building the basic tracking application using the Google Maps API and then moving ahead by adding the attributes and functionalities by analysis and testing. The application will be built keeping in mind the nature of the users, in this case the parents. Considering their busy schedule and the need to save time, creating an easy to access software, with direct interaction, minimal complexity and user friendly interface is the goal.

### *E. Requirement Gathering*

In order to improve the system and make it more advance, various steps such as requirement gathering, analysing the system meticulously and planning are necessary.

The information which is collected should be accurate and true. Only through the correct information, the working of an application can be taken forward. Registration of a user for the Server-less Cloud Architecture based School Bus Tracking System is a must. The attendance requires a daily status update of the student and also the boarding and arrival updates should be recorded. The user's identity must be checked for authenticity in order for the user to log into the application. Locating the vehicle constantly with precision is important. Keeping a track of the bus and examining the activities of the school bus is required.

### *F. Methodology*

We are going to use the incremental model methodology. Since it is an incremental model, iteration of each phase (Analysis, design, coding, testing) will take place based on users' desideratum. Accordingly, upgraded versions will be built.

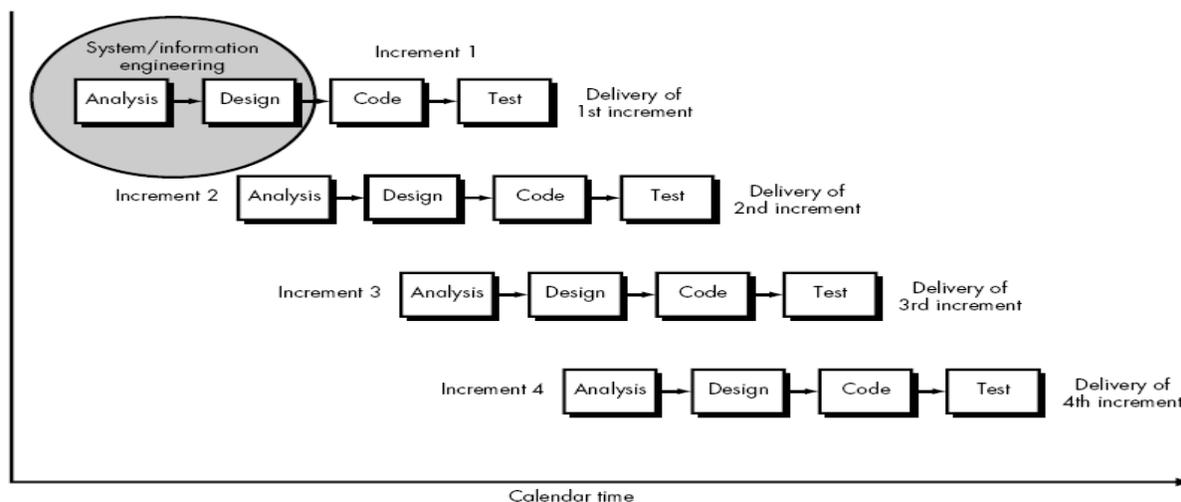


Fig. 1 Incremental Process Model [5]

### G. Technology

Android studio is an environment for Google’s Android operating system. It is used as a solution to many problem solving queries. It can provide an effective approach and one is able to develop an application with ease. It provides a user friendly environment to the users. By downloading the latest version of Android studio, the application can be developed easily as it will come with all the latest features. The Android application can be made for an android phone, if the phone is updated to the latest android software then it will experience less glitches. The older the version, more users will be able to access the application, but the programming will get affected due to that. Starting from basic to complex, all kinds of applications can be built in this environment. For a bus tracking system, the essential components are the log in/registration, attendance, notification centre and the bus tracking page. These components must get easily combined together so that the application usage is efficient. Android studio can be incorporated at many platforms such as TV, Wear OS, Chrome OS and more. Windows, Mac, Linux are the operating systems compatible with Android studio. Every machine which will use Android studio must have the Java JDK installed [12].

### H. Hardware And Software Used

The project focuses on providing the outcome using minimal hardware and software. The application will run on an Android device with minimum 1GB RAM, 500MB internal memory and a server with minimum hosting capacity. Software required is Android operating system, Android Studio and Google maps API. Measurement tools that will be required while testing is an odometer in the motor vehicle and a stopwatch to measure the time and distance accuracy.

## III.LITERATURE SURVEY

Survey based on the research and existing bus tracking systems is noted. Even though there exist many such bus tracking systems, they tend to have a few short comings, majorly when it comes to the expense and complexity of the software. Studying these systems and understanding their limitations to ensure a making of a software that showcases optimal performance is essential.

### A. Here comes the Bus

Here comes the Bus was developed in North America as a school bus fleet Management application. It is widespread till Canada because of its intuitive application seamless interface and outstanding customer service. Here comes the bus solves the safety concern amongst parents for the children. It enables real time monitoring of the location of the bus at any given time. An alert is sent when the bus approaches the desired pick up location and likewise during the drop back. This ensures that the waiting time is reduced to minimum. Technology has enabled this comfort at the click of a button and eliminated the safety concern of the parents. The system makes use of GPS to track the buses. The system is developed and managed by Synovia Solutions. The system has two subscription plans the parents can choose from. One with the LIVE location sharing and monitoring and the other plan, “Student Ridership”, which notifies whether the student got in or off the bus along with the time [3]. Since there are two subscription plans, it becomes quite expensive for the parents as well as the school authority as the school has to buy both the packages.

### B. Chakrerview

Chakrerview is a school bus tracker developed in India for monitoring the real time movement of school buses and thus notifying the parents with the necessary notifications on their mobile phones. The buses are tracked by the school authorities as well on the website or the application. It provides real time traffic movement using GPS. Notifications are reached through SMS to each parent on their mobile phone. The only requirement is a smart phone and an internet service. The benefits which can be reaped using this application are:

- 1) Minimum amount of waiting time for the parent
  - 2) Same application can be used to track more than one student
  - 3) While the student is absent it will not receive any unnecessary notifications
  - 4) It does not use RFID cards, hence no need to worry about carrying it everywhere.
  - 5) The application is capable of also tracking the speed limit
  - 6) In case the limit is violated the parents can approach the school authorities [7].
- a) *Gaps Identified In This Software Are:* The monthly charges are a bit expensive as they use slightly expensive technology for tracking the school buses. This software cannot be used for large number of users and buses.

### C. Track School Bus

Track School Bus is a system which is not as expensive as its competitors. Along with keeping up with the real time location of the school bus, the parents can also change the pick-up points with the feature available on the application. They can also call the school administrators as well as the bus attendants in case of emergencies via the mobile app. In addition to this, with the provision of GPS as well as RFID, parents are able to track their kids even when they are not in the school bus. Track School Bus has multiple features to ensure safety of the kids and also effortlessly manage the school bus transport system [4]. But, because of these complex features, it is difficult for the parents to access the application.

## IV. CONCLUSIONS

Implementation of this project will ensure a complete track of the buses of the school. By implementing our system, the parents will always be assured that their child is safe while traveling to and from the school in the school bus. The features highlighted by the system include efficient time management, assurance of the child's safety and smooth communication between the parent and the bus attendant. Internet-enabled mobile phones can receive real-time transit information and will help the parent to monitor the real time location and safety of their children.

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