"SecureChild - Children Tracking Android Application"

Snehal P. Umratkar[1], Prof. Ram Kumar[2]
[1]Second Year, Third Semester
M.E. (Computer Science & Engineering)
[2]Department of Computer Engineering
Jagadambha College of Engineering & Technology,
Yavatmal, (M.S), India-445001

Abstract

Android operating system is at the top in market because of its features like portability, platform independence, and low memory consumption. As android operating System is used in mobile phones, tablets and laptops it has covered more than 80% of the market. Now everyone is using android phone. As android is an open source operating system many developers are developing various applications every day, Millions of applications are available for use free of cost. These applications are helpful for Ticket booking, Banking services, Online shopping, Tracking our family members etc. The SecureChild Application is designed for School and Parent to track the children while they are travelling through School Van.

The days are Gone when one of the two parents will sit at home to take care of the children and one earns. Now time has come for both the parents to work; in such scenario the security of children is very important. The numbers of users have Android phone equipped with Global Positioning System which can be used efficiently for security and protection purpose. This Application is mainly developed for toddler going to school to make sure that at what exact time child has reached school and at what time he/she left school. Also gives the van location and information about van drivers and Babysitter which will be in van to take care of toddlers. This also gives the expected time of the van while pick up and drop. This "SecureChild" is a multipurpose children safety application which will work on android platform.

Keywords: GPS, apps, SecureChild, Android, Child-Safety apps.

1. Introduction

Today is the world of Smartphone right from the villagers to metropolitan every one carries Smartphone. Among these about 84 percent of the market is covered by android and this share is growing continuously, considering this fact in mind, the very important issue of Children security can be resolved using Android phone.

Children security is the main aim of this application. For a parent it is risky to give children with school bus driver. Will they reach school? Will the driver drive bus within speed limit? Will he bring them to home safely? Will he follow the proper root to home? All such question will come to the parent, so there is a need to solve these questions. This application SecureChild will

be very helpful to such worried parents and assures them the safety of children.

Internet has brought revolution in the field of communication. One can use internet for various purpose but the main aim of internet is sharing of information. The most useful application of internet is web services where internet plays a very important role.

"SecureChild" is an application which will take care of your child while he/she is travelling to school and from the school here Global Positioning System reading is used for tracking the bus. This application is used by both School and Parent. School will maintain all the database of Student like Name of student, Parent name, Parent phone number, Van number through which child will travel and also the Drivers and Babysitters details like their Name, Phone number, Licenses number and Address. Any change in Driver or Babysitter will be immediately informed to the parent this is done to avoid the scenario of fake Driver or Babysitter. Also the Status SMS will be sent to the parent saying Reached school, Left School or Absent in School.

2. Literature Review and Related Work

There are verity of general purpose and specific GPS based application such as Runkeeper , Easy Tracker[1] and Family360, Tracking pro. All these have main function of finding and storing location of friends on the map. Runkeeper has added functionality of measuring the heart rate and consumption of calories. Family360 will ask the permission for sharing your location to the people you have included in your family. There is an application called CHEEKA [2] which focuses on common usage by everyone irrespective of age group also irrespective of activities like sport or fitness. There are various locating technology as describe:

- GPS: It is Global Positioning System It locates a user through a device that is in communication with a constellation of satellites.
- Wireless Position: It locates a user using both private and public Wi-Fi access Point, user can be mapped according to the location of these access point.
- Cellular identification: It locates using cellular data of mobile phone.
- IP Location: It locates users using IP address of the internet network.

Among these various technologies Global Positioning System is the most effective one to locate a user. With the emergence of Global Positioning System capable mobile, user started to write an application passing location data to a central server to make the location available to other user.

Chandra A, Jain S, Qadeer M A[2], has proposed the location sharing system based on Global Positioning System and General Packet Radio Services(GPRS) using J2ME, PHP, and MYSQL which gives the user current location, send this location using SMS and view them on Google map. But it has implementation problem and accuracy problem ,and has no centralizes data base as well as some security issues and have no two way communication between Web server and device

Saranya, J, Selvakumar J. [4] focuses on implementing children tracking system for every child attending school it includes a child module and two receiver modules for getting the information about the missed child on periodical basis. The child module includes ARM7 microcontroller (1pc 2378) Global positioning system (GPS) Global system for mobile communication Global System for Mobiles (GSM) Voice playback circuit and the receiver module includes Android mobile device in parent's hand and the other as monitoring database in control room of the school

Ito, A.,Ohta, T.,Inoue, S. [5],[10] has given, new security system for children on school route by using mobile ad hoc network that is constructed based on mobile phone with Bluetooth function. About 700 students used this system for four months. And it is found that this system has good performance and accuracy to keep safety of students on the way to school.

Daisuke Igaue, Takumi Ichimura [9] has developed an android application for kid's protection which consists of 2 layered learning where Profit-Sharing works to plan a target position in higher layer and Q-learning trains the state-action pair to the target in lower layer. They have developed Android application which the agent can notify that danger situation close in on the child by the acquired knowledge from the learning result.

3. Problem Analysis

As many similar applications were there to track student but each of them has some and other drawback like Accuracy in reading location because Global positioning system can have errors when object to be track is in closed room, Global

Positioning System devise with each student to track them and the Privacy. "SecureChild" application tries to overcome these problems. The assurance to the parent that child is reached school or left school is main aim of this application. Most of school provides cameras in school campus to monitor all the activities inside campus but while going to the school and coming back from school the responsibility is on the Van Driver and Babysitter, so to track them is also important. There may be chances of stolen School bus came to pick child and parent will never understand that the Driver and Babysitter are fake and parent will hand over their children to them, So there is a need to overcome this problem and to communicate with parent regarding Status of Van and Change in Driver or Babysitter. By this application parent will get Assurance that Driver is well trained and his Licenses Number will be known to them. Global positioning system may have some problem when object location is difficult to track i.e. closed room so in SecureChild application 3 methods are use and most accurate result among them is used these three readings are Global positioning system reading, second is location based on IP address and third is location based on distance from nearer tower. The result will be more accurate.
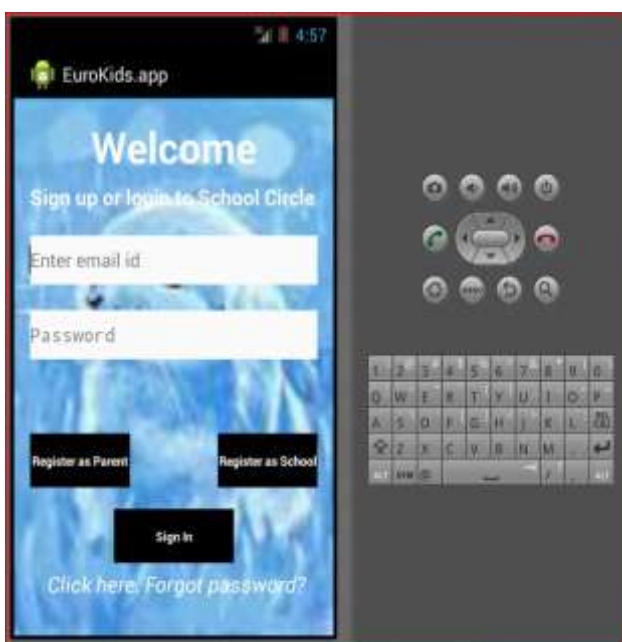
4. Proposed Work

SecureChild application is developed in Android platform and database is created using SQLite which is the light version of SQL and works exactly same as SQL only difference is it takes very low space so best suitable for mobile apps.

The Application is divided into 4 main modules:

1. The User Interface module that is front end and is done using Android SDK (software development kit). This will use XML for static User interface and JAVA for runtime changes in user interface.

2. User Authentication, Facebook integration and Google login integration. As shown in below Figure 1, User Interface is created, user has to register either as a School or Parent, while registration as Parent all the required data should be entered such as Email Id, Password, Phone number, Child Name, Batch and Van number. database is created using these fields which will be used throughout application.

   Password will be saved only once and in case of forgot password same password will be sent to the Email Id.
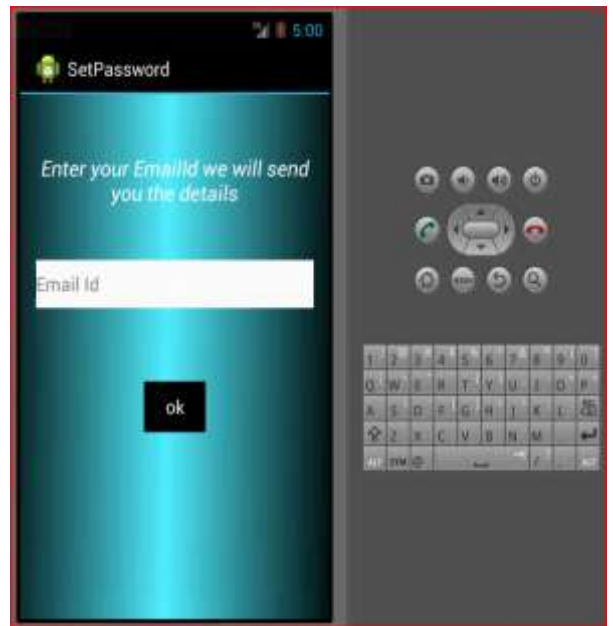
Figure 2: Forgot password

As shown in Figure 2 here intent is used to send the password to the entered email id.

Integrating this application with the Facebook and Google will help in increasing the security of this app by this we can use corresponding Facebook and Google login id and password for this application.

3. The important functionality is sending SMS about the status of child and also to notify changes in Driver and Babysitter details to corresponding parent as shown in Figure 3 and Figure 4.

Figure 1: Login Activity

Figure3: Activity showing Driver and Babysitters information.

To send and receive SMS permissions are to be entered into the Manifest.xml file as shown below.

```
<uses-permission
android:name="android.permission.SEND_SMS"
```

Broadcast receiver will broadcast the sending SMS and received SMS will be caught by the receiver in the application.

Broadcast Receiver will be running in background all the time and will activate when any event (SMS received) occurs.
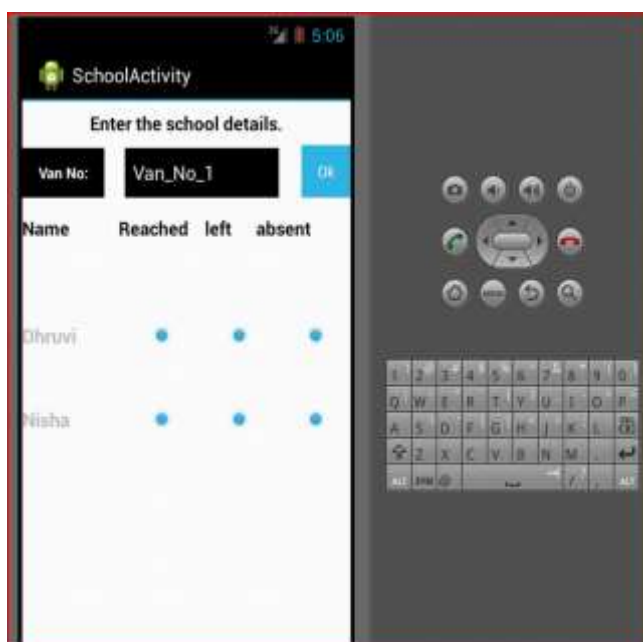

Figure4: Status Sending Activity

4. The last and very important functionality of this Application is Location Based Services (LBS) to track the School Van.

LBS is an information dissemination system that can be accessed by mobile devices through the mobile network. It is driven by the ability of the system to detect the geographical position of the mobile device. It also uses permissions as below:

```
<uses-permission
android:name="android.permission.ACCESS_NETW
ORK_STATE" />
<uses-permission
android:name="android.permission.ACCESS_FINE
_LOCATION" />
```

In case of GPS there are total 27 satellite out of which 24 is revolving around earth with the speed double the speed of earth and rest three will come into picture in case of failure of any one among these 24. The orbits are arranged so that anytime, anywhere on Earth, there are at least four satellites "visible" in the sky. A Global Positioning System receiver's job is to locate three or more of these satellites to figure out the distance to each, and use this information to deduce its own location. This operation is based on a mathematical principle called trilateration. They will use method called 2-D Trilateration and 3-D Trilateration to get the exact location of any object.

4.1. 2-D Trilateration and 3-D Trilateration

Imagine you are somewhere in the United States and you are TOTALLY lost --for whatever reason, you have absolutely no clue where you are. You find a friendly local and ask, "Where am I?" He says, "You are 625 miles from Boise,

Idaho. You ask somebody else where you are, and she says, "You are 690 miles from Minneapolis, Minnesota." Now you have two circles that intersect. You now know that you must be at one of these two intersection points. If a third person tells you that you are 615 miles from Tucson, Arizona, you can eliminate one of the possibilities. You now know exactly where you are --Denver, Colorado as shown in Figure 5. This same concept works in three-dimensional space, as well, but you're dealing with spheres instead of circles. This will be useful when the object to locate is not on earth but it is above the earth surface.
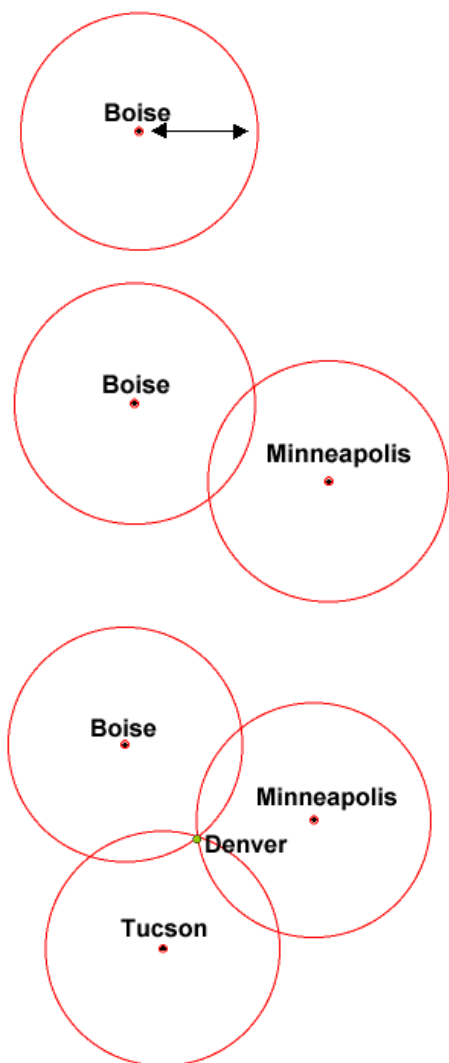

Figure5:

Trilateration

Another method called Cell Tower Triangulation An alternative method to determine the location of a cell phone is to estimate its distance to three nearby cell towers as shown in figure 6. Distance of the phone to each antenna could be estimated based upon the lag time between the moment the tower sends a ping to the phone and receives the answering ping back. This method is quite similar to the 2D-Trilateration Method.
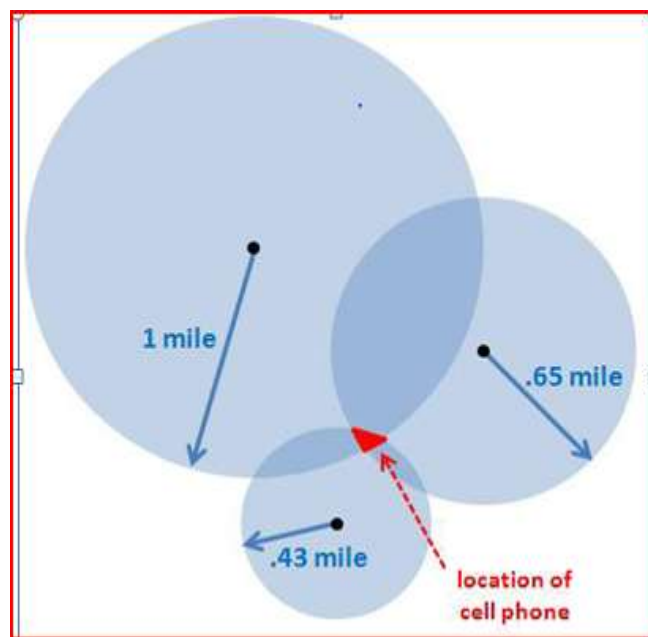

Figure 6: Triangulation cell phone detected within a certain radius of 3 cell towers-the area where each cell tower overlap the phonies where it is pinpointed.

Every mobile phone has Infineon chip as shown in Figure 7 which will communicate with the satellite to get the position in terms of longitude and latitude. geoQuadra( ) used for converting longitude and latitude location into street map.
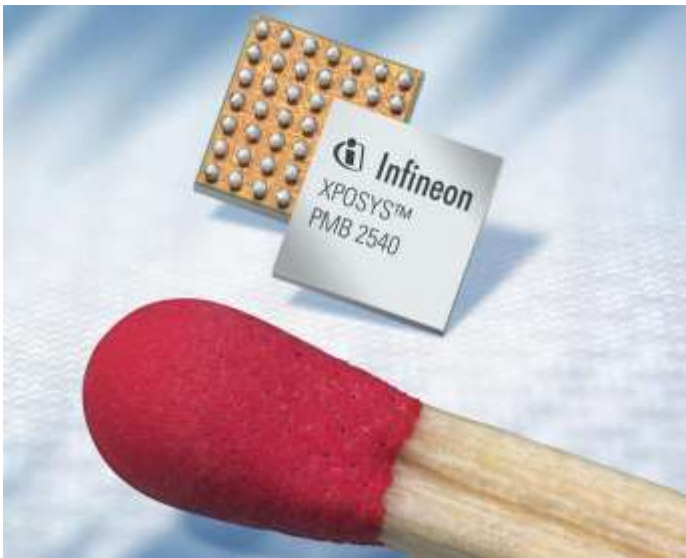
Figure 7: Infineon chip

Following table shows the Android Location classes:

4.2. Location Classes:

| Address	A class representing an Address, i.e. a set of strings describing location.
Criteria	A class indicating an application criteria for selecting a location provider
Geocoder	A class for handling geocoding.
GpsSatellite	This class represent the current state of GPS Satellite
GpsStatus	This class represent the current state of GPS engine
Location	A class representing a geographic location sensed at a particular time (a "fix").
LocationManeger	This class provides access to system location services.
LocationProvider	An abstract super class for location provider.

Table 1: Location Classes
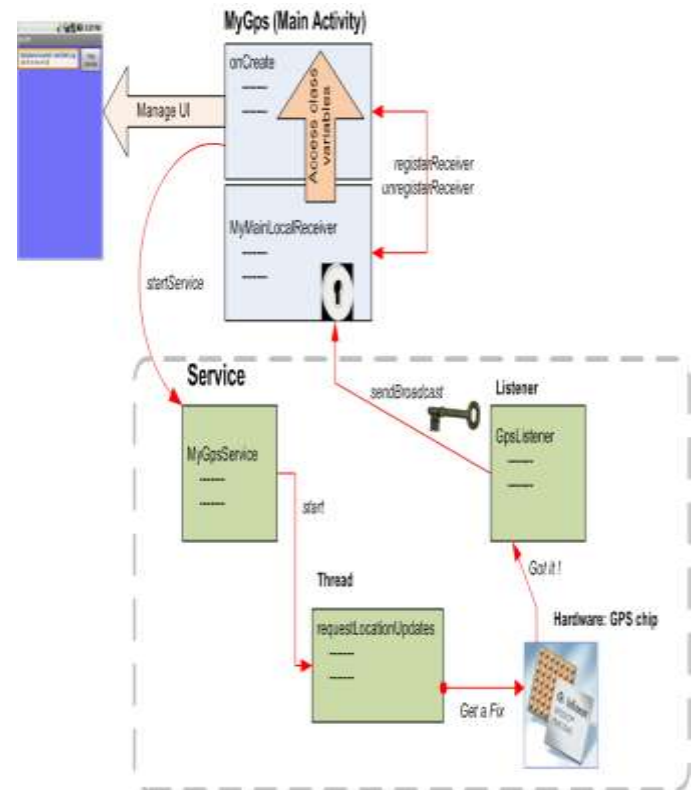
Figure8: Obtain Location from Global Positioning System

Above Figure 8 request GPSservices and display latitude and longitude values on the User Interface. Additionally we deliver an SMS with this information. Global positioning System chip is not a synchronous device that will immediately respond to a "give me a GPS reading" call.

In order to engineer a good solution that takes into account the potential delays in obtaining location data we place the User Interface in the main activity and the request for location call in a background service. This service runs in the same process space as the main activity, therefore for the sake of responsiveness we must place the logic for location data request in a separate parallel thread. A thread (unlike an Activity) needs the presence of a Looper control to manage IPC

message sending. This implies and additional Looper.prepare and Looper.loop methods surrounding the location Update method. This will gives the location parameter like Latitude and Longitude, now it has to be converted into street

map to be understandable for user to track so geoQuadra method is used for that which will show the exact street map.
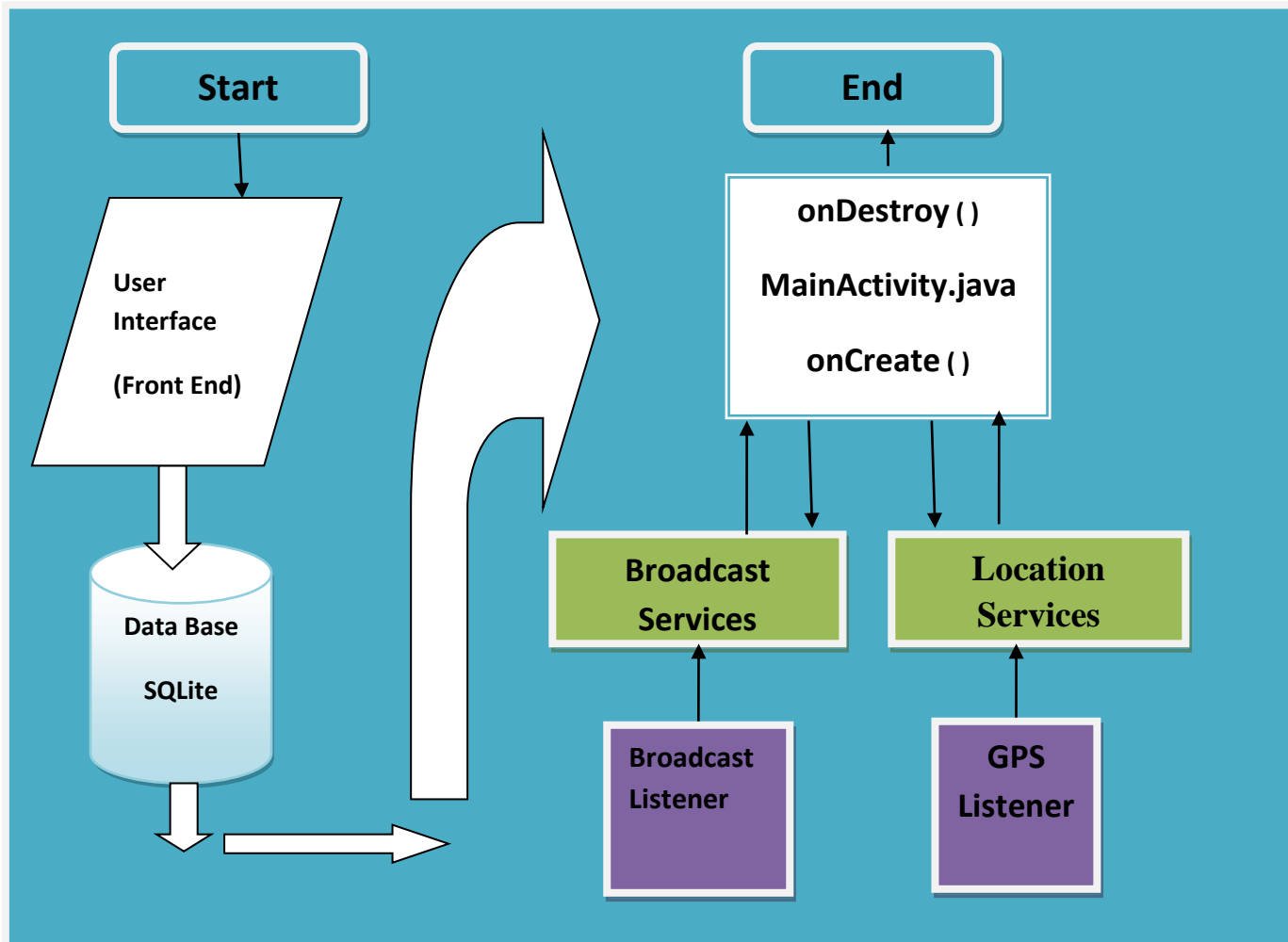
Flowchart

Figure 9: Flowchart

5. Advantages and Limitations

Advantages

It gives Smart application based on android platform for tracking the School going children while commuting to and from the school which ensures safety in transition. It establishes real time Global Positioning System tracking of School Vehicle in android apps. (Application)

It gives database containing each Student Name; Parents Contact Number, Email Id, Class/ Section, photo identification, School timings and address etc. Driver and Babysitter details will be also provided to the parent to protect from situations such as stolen school bus. Integrating this app with Facebook and Google avails the access through it and increases its security. Without Internet connection also the status of child and the

changes in the Driver and Babysitter can be sent to parent. Licenses Number

Limitations

This application has main drawback that is; Internet connection is required for tracking the **current** location of School Van without internet connection current status of School van cannot be obtained. Manual input is required every time for sending the status of student to the parent so one person always need to take the children into the School and to make them sit into School Van. This app is developed only for android platform but not for other such as iOS (Apples products) (input output system) and windows. An Android phone is required for this application to use.

6. Conclusion and Future Work

This Application is developed in Android platform and used for the security of children while going to the school and coming back from the school which will be used for parent as well as School. Three methods will be used to track the exact location of Van and using accuracy check functionality the most accurate reading among all of three is obtained. The Reached School, Left School and Absent, status of the child will be sent to the parent just by one simple click which will assures parent about the safe delivery of their children. Driver and Babysitters details are also provided to be the parent, which includes Name, Address and Licenses Number. There are many applications present which will track location but this children tracking application which will assure parent the state of child and tracking of School van is new and very useful.

As this application is developed in Android platform so cant used for other Operating System devices in future I would like to develop it for iOS as well. Many other options to track the Van can also be added into this application such as Van Speed limits Checker, to limit the speed of Van in School Zone and speed limit Zone. Integrating this application with the School App to enhance its feature can also be done in future. The most important Challenge is to generalize this application so that many schools can use it and different databases should be created for different schools as per their requirements.

References:

[1] Doilamis, A. Pelekis, N. Theodoridis, "EasyTracker, *An android application for capturing mobility behaviour*", 16th Panhellinic conference on Informatics (PCI), Volume 1, Issue 1,, pp.357-362, 5-7 October 2012.

[2] Chandra A, Jain S, Qadeer M A," *Implementation of location awareness and sharing system based on GPS and GPRS using J2ME, PHP and Mysql* ", 3rd international conference on Computer research and development(ICCRD), Volume 1, Issue 1, pp. 216- 220, 11-13 March 2011.

[3] Ananda Kanagraj S., Arjun G., Shahina A., "*Cheeka: A Mobile Application for Personal Safety*", 9th IEEE International Conference on Collaborative Computing: Networking

Application and Work-sharing, Volume 1, Issue 1, pp.289 - 294, 20-23 October 2013.

[4] J.Saranya , J.Selvakumar, "Implementation of Children Tracking System on Android Mobile Terminals", 2013 International conference on Communication and Signal Processing (ICCSP), Volume 1, Issue 1, pp.961 – 965, 3-5 April 2013.

[5] Ito, A., Ohta, T., Inoue, S., "Security system for children on school route", International Symposium on Autonomous Decentralized system (ISADS), Volume 11, Issue 3, pp.1 – 6, 23-25 March 2009.

[6] Jianlin Xu, Yifan Yu, Zhen Chen , Bin Cao, Wenyu Dong, Yu Guo, and Junwei Cao, "*MobSafe: Cloud Computing Based Forensic Analysis for Massive Mobile Applications Using Data Mining,*" Tsinghua Science and Technology, Volume 18, Issue 4, August 2013.

[7] W. Enck, D. Octeau, P. McDaniel, and S. Chaudhuri, "*A study of android application security"* in USENIX Security Symposium, San Francisco, USA, 2011.

[8] Rydell, J., St-Laurent L., Prevost D., "*Crowd analysis with target tracking, K-means clustering and hidden Markov models*", 15th International Conference on Information Fusion (FUSION), Volume 1, Issue 1, pp.1903 – 1910, 9-12 July 2012.

[9] Daisuke Igaue, Takumi Ichimura, "*Kids Protection Android System to Notice the Hazard in Dynamic Environment by Hierarchical Modular Reinforcement*", 28th Fuzzy System Symposium, Nagoya, 12-14 September 2012.

[10] Kojima, H., Kohno E., Inoue S., "*A Self-Configurable New Generation Children Tracking System Based on Mobile Ad Hoc Networks Consisting of Android Mobile Terminals*", 10th International Symposium on Autonomous Decentralized Systems (ISADS), Tokyo & Hiroshima, Volume 1, Issue 2, pp.339 – 342,23-27 March 2011.