

(Associate Professor)



UMAIR KHALID  
**01-134131-092**  
ATTA-UR-REHMAN SHAH  
**01-134131-016**

# **Child Location Tracking System**

**Bachelor of Science in Computer Science**

Supervisor: Dr. Faisal Bashir

Department of Computer Science  
Bahria University, Islamabad

December 2016



# Certificate

We accept the work contained in the report titled “Child Location Tracking System”, written by Mr. Umair Khalid and Mr. Atta-ur-Rehman Shah as a confirmation to the required standard for the partial fulfillment of the degree of Bachelor of Science in Computer Science.

Approved by . . . :

Supervisor: Dr. Faisal Bashir (Associate Professor)

---

Internal Examiner: Dr. Muhammad Asfand-e-Yar (Senior Assistant Professor)

---

External Examiner: Dr. Sami-ur-Rehamn (Assistant Professor)

---

Project Coordinator: Dr. Arif ur Rahman (Assistant Professor)

---

Head of the Department: Dr. Faisal Bashir (Associate Professor)

---

December , 2016

# **Abstract**

It is a well-known fact that the sale of any product is directly dependent on the marketing and advertising of the product. On a business platform the race for introducing new and innovative methods of marketing has existed since the very beginning. How you present a product to a customer can make all the difference. The technique presented in this project blends technology in the domain of marketing. The international market has adapted and profited from this technique in the last decade. The project aims to introduce this new method of marketing to the Pakistani markets. This project is related to telecom industry. This project objective is to track the child location through the LTE device. The location of child is displayed on the screen of the android mobile.

# Acknowledgments

In the name of Allah, the Most Gracious and the Most Merciful. Alhamdulillah, all praises to Allah for the strengths and His blessing in completing this project. We would like to express our gratitude towards our friend Saad Farooq who provided me assistance regarding the project through his extensive knowledge of hardware integration. We would like to acknowledge Dr. Usman Shafique for being a continuous guideline throughout the course of this degree project. We are very thankful to Dr. Faisal Bashir for giving me a chance to work on this emerging technology, for supervising this project and providing guidance to make this project successful.

ATTA-UR-REHAMN SHAH  
UMAIR KHALID  
Islamabad, Pakistan

November 2015

# Contents

<b>Abstract</b>	<b>i</b>
<b>1 Introduction</b>	<b>1</b>
1.1 Overview . . . . .	1
1.2 Project Statement . . . . .	2
1.3 Problem Description . . . . .	2
1.4 Project Objective . . . . .	2
1.5 Project Scope . . . . .	3
<b>2 Literature Review</b>	<b>4</b>
2.1 Introduction . . . . .	4
2.2 Description . . . . .	4
2.2.1 Location Tracking Equipment . . . . .	4
2.2.2 Location Tracking App . . . . .	5
2.3 Pros and Cons . . . . .	5
2.4 Gadgets Similar to Project . . . . .	5
2.4.1 U Watch . . . . .	6
2.4.2 Telenor Companion Watch . . . . .	6
<b>3 Requirement Specifications</b>	<b>8</b>
3.1 Project Overview . . . . .	8
3.2 Basic Functionality . . . . .	8
3.2.1 LTE . . . . .	8
3.2.2 LTS Server . . . . .	8
3.2.3 LTS Database . . . . .	9
3.2.4 LTS android Application . . . . .	9
3.3 User Characteristics . . . . .	9
3.4 Functional Requirements . . . . .	9
3.5 Non Functional Requirements . . . . .	10
3.6 Hardware Selection . . . . .	11
3.7 Performance Requirements . . . . .	11
3.8 Budget . . . . .	11
3.9 Use Cases . . . . .	12
<b>4 Design</b>	<b>14</b>
4.1 System Architecture . . . . .	14
4.1.1 Location Tracking Equipment . . . . .	14

4.1.2	Server	14
4.1.3	Android application	14
4.2	Deployment Diagram	17
4.3	System Sequence Diagram	17
4.4	Hardware Design	19
4.5	Data Base Schema	21
<b>5</b>	<b>System Implementation</b>	<b>23</b>
5.1	Tools and Technologies	23
5.1.1	Arduino	23
5.1.2	Android Studio	23
5.1.3	Google Maps Android API	24
5.2	Languages	24
5.3	Methodology	25
5.3.1	LTE	26
5.3.2	Server	28
5.3.3	Location Tacking Application	30
<b>6</b>	<b>System Testing and Evaluation</b>	<b>32</b>
6.1	Functional Testing	32
6.1.1	Integration Testing	33
6.1.2	White Box Testing	33
6.1.3	Black Box Testing	33
6.2	Performance Testing	33
6.3	Acceptance Testing	33
6.4	Test Cases	34
6.4.1	Installation of Application	34
6.4.2	Running the of Application	34
6.4.3	Application Connectivity with Server	35
6.4.4	Uninstalling the Application	35
<b>7</b>	<b>Conclusions</b>	<b>36</b>
	<b>References</b>	<b>38</b>



# List of Figures

2.1	U Watch . . . . .	6
2.2	Telenor Watch . . . . .	7
3.1	Main Use Case . . . . .	12
3.2	Location checking Process . . . . .	12
3.3	Data Base Maintenance process . . . . .	13
4.1	Login Page . . . . .	15
4.2	Current Location . . . . .	15
4.3	Route of Locations . . . . .	16
4.4	User preferences . . . . .	16
4.5	Deployment Diagram . . . . .	17
4.6	System Sequence Diagram . . . . .	18
4.7	Hardware Design . . . . .	20
4.8	DataBase Schema . . . . .	21
4.9	ER of DataBase . . . . .	22
5.1	Overall System . . . . .	25
5.2	Overall System Representation . . . . .	25
5.3	Arduino UNO . . . . .	26
5.4	Tiny GPS . . . . .	26
5.5	GSM . . . . .	27

# List of Tables

2.1	Pros and Cons Table . . . . .	5
3.1	Use Case 1 Table . . . . .	13
3.2	Use Case 2 Table . . . . .	13
6.1	Installation of Application . . . . .	34
6.2	Running the of Application . . . . .	34
6.3	Application Connectivity with Server . . . . .	35
6.4	Uninstalling the Application . . . . .	35

# Chapter 1

## Introduction

### 1.1 Overview

In this modern era information technology plays an important role. Information Technology has introduced many tools that can help us provide the required information at the right time. Information Technology is playing its role in every field of life and its involvement is increasing day by day. Every field of life requires involvement of Information technology one way or the other, this is due to its efficiency and reliability. That is why, in today's a world person greatly relies on computer systems. All the processes that were done manually are now being automated. With advancement in sciences, the sizes of computers are gradually decreasing day by day. While its functionality is increasing exponentially with time thus it plays an important role in one's life. As we know smart phones are playing a vital role in our Life. Therefore now a days, smart phones not only perform the basic functions of a phone serve the purpose of communication but also comes with many other features. The android application like facebook [1] use for communication with friends and use for entertainment to watch video clips. Similarly whatsapp[2]application is use to communicate with others.

- **Computer Network**

The field of computer sciences in which different computer are connected together to share the data and resources. These computer are connected together through reliable Communication channels like Cable , Wi-Fi or Internet etc.

- **Client Sever Communication**

Clint Server model is the important relationship of Computer Networking. This model contains three main component i-e Clint, Server and Service. Server is the machine that performs the task. Service is task that machine can perform. Clint is the requesting machine that requests the service. These titles are generally used in the context of a particular service rather than in labeling a machine: one machine's client may be another machine's server.

## 1.2 Project Statement

In this Final Year Project (FYP), we aim to develop tracking system of kids for the parents to have a continuous watch over their kids. In general, it will be a location tracking system that can be deployed to track the position of any object but in our FYP the objects are the children.

## 1.3 Problem Description

Pakistan has faced the worst kind of terrorism in the last decade that has spread from country borders to mainstream cities. In Pakistan attacks on schools have made the parents worried about their young children when they are in school. The basic problem is how to equip children so that their parents are always informed of their young ones once they are away from home e.g., school. There are two options one is to equip each child with mobile phone so that it can be tracked and the second is to develop specialized equipment for this purpose. The former is easy to deploy and use but is not feasible for young kids who are school going. The latter requires the design and development of a tracking device that enables parents to monitor their children location via some web/mobile interface. There are specialized trackers available for cars and other equipment but they are only one way as they only provide tracking. The user cannot interact with them in case of emergency to send some notification. Another factor is their high cost and they mostly provide web based services. However, some child locators are recently launched by Telecoms operators e.g., Ufone for the same purpose. Our objective is to develop our indigenous system that can latter on support more services than currently available on on-shelf systems.

## 1.4 Project Objective

The objective of this FYP is to develop a child tracking device and system that will enable parents to monitor the location of their children through the developed application. Although, the developed system will be a general purpose location tracking system but it is referred as child tracking system because of the following reasons:

- The Location Tracking Equipment (LTE) will be carried by children in school bags as mobiles are not allowed in school.
- The LTE will be equipped with emergency notification mechanism to enable children to immediately inform their position in case of emergency.

The LTS will provide following services to its users:

- They can define the daily route/schedule of their children presence with respect to time.
- View the history and current location of the child.
- View the current speed with which child is moving in case they are travelling e.g. school bus.
- Get alerts if Child is out of schedule.

## **1.5 Project Scope**

The scope of this work is limited to tracking the position of the child provided that the child is carrying LTE. The same system can be used for tracking other objects like cars but the LTS and LTS Android application will only be designed for child tracking purposes. It is assumed that GSM network will be available to the LTE and the device is turned ON when it is in the possession of the child.

## **Chapter 2**

# **Literature Review**

### **2.1 Introduction**

Recently terrorism and kidnapping are reported all around the world. Especially, in Pakistan security concerns are the talk of the town. Knowing the location and health status of the individuals affected by the incident is the first concern of their loved ones. If communication infrastructure is available after the incident then mobile communication can be used as a quick mean for accessing the status and nature of damage. A new disturbing wave of terror that targets schools and small children is getting the headlines. In this scenario, both location and wellbeing of our kids in the schools is a common worry of all parents. Hand held devices and mobiles are not allowed in schools therefore parents are always concerned about their kids. Recently, in Pakistan few gadgets are introduced by different Telecom companies like U-watch In this chapter we discuss how the application developed in this project can help in marketing of a product along with an overview of some other already developed applications that work in similar manner.

### **2.2 Description**

In this project GPS based child tracking/navigation system is implemented. This is done by fetching the information of the Child such as location by using GPS (Global Positioning System). The information is obtained after every specified time. This periodic information of location is transmitted to tracking server. Server Continuously Getting Location from Location Tracking Equipment (LTE ).There is a database on Server Side that Collect all the Information coming from LTE and store in database as long as the device is turned on.

#### **2.2.1 Location Tracking Equipment**

The Global Positioning System (GPS) or Navstar is the device that is use to get the location. Location on earth is measured in terms of 2 dimension coordinates. For example location

Coordinate of Bahria University is (33.715773, 73.029807). Along with this it also Provide the time and date of Reading in all weather conditions. Location of the Child is determined by using the GPS. The information from the GPS is collected by the Arduino. Arduino is the microcontroller use for controlling Physical Devices. It sends the Information to Server Though GSM (Global System for Mobile Communications). It can send data by sending sms or by Https request. For this system we use https request.

### 2.2.2 Location Tracking App

Location Tracking Equipment which is mounted in the Child's bag. The end user will use the application to benefit and monitor the status of the LTE. It will provide easy and professional interface to its users. Application will show:

- The current Location of child along with time when location is read.
- The Route followed by the Child.
- User can Define schedule/ preferences.
- Generate Notification to User in case if child is out of Schedule.
- Speed of child during travelling.

## 2.3 Pros and Cons

Pros	Cons
In case of emergency, one could know Exact location of people who needs help. For example, when someone is trapped somewhere during disaster, the firefighter could know where exactly he or she is.	One of the flaw in GPS is it doesn't recognize the presence of river, mountains and other obstruction in Path. So this lead to false reading of coordinates.
Seeking for someone. It can help you find a lost individual.	Tracking devices could easily be used for stalking purposes.
Parents could easily know where their child is and also get information related to speed of child if moving in Vehicle.	Powerful Batteries are required for GPS and GSM Kit so this would lead to additional cost in part of the consumer.

Table 2.1: Pros and Cons Table

## 2.4 Gadgets Similar to Project

Some well-known applications of Tracking systems that work similar to the proposed system and are already being used on a commercial scale are discussed below :

### 2.4.1 U Watch

Ufone is the one of best Telecom company in Pakistan provides cellular Service. It Launched a gadget similar to our project Which Provide the tracking system for kids via wrist watch. Its like a wrist watch with functions alarm, time and date. Along with parent and child can communicate to each other by dialing number. If parents are worried that their child waste



Figure 2.1: U Watch

their time in Smartphone, So they can replace child smartphone with the U-Watch. Along with calling parent can also track their kids.[3]

Main features of U-Watch are:

- Real-time Tracking
- Voice Calling
- Emergency/SOS Calling
- Safe Zone/ Geo-fence
- Tracking History Playback
- Splash Proof
- Pedometer
- Watch Removal Function and Remote Turn-off

### 2.4.2 Telenor Companion Watch

Telenor Companion Watch is another gadget introduce by the Telenor. It's a wearable watch use for tracking device for child's safety. If your child wears this attractive watch, parent can monitor their child location. It can also communicate with Parents and vise versa. Its a communication gadget that enables parents to stay in touch and keep track of their children when they are not with them. Telenor Companion Watch connect child with parents'/admin's Smartphone through a Mobile app that displays the accurate and real-time location of the child. In case of an emergency. Children can generate SOS call to parent's numbers. It is diverted to other number automatically if there is no response from the first





Figure 2.2: Telenor Watch

number. Voice message communication between child and parent is also implemented. Geo-fencing is another important feature in this watch through which parents can define the safe zone for children and get alert if child goes beyond the fence. A parent can monitor as many as five Companion watches at a time and assign them different names in the mobile phone app for easy identification of the children.[4]

Main Key Features of Telenor Watch are:

- Real Time Tracking: keep check on exact location of children
- SOS Call: In case of Emergency, child have to press a button and Automate SOS call will be generated to designated numbers.
- Geo Fencing: In Geo-fencing parents can define the safe zone for children and get alert if child goes beyond the fence.
- Voice Calling: cellular communication Between child and Parents
- Pedometer: Keep track of steps your child has taken.
- Silent Monitoring: If you believe your kid is at a place where he can't receive your call, turn on Silent Monitoring. With this great tool, you can hear surroundings of your child without even telling him.

## **Chapter 3**

# **Requirement Specifications**

### **3.1 Project Overview**

This FYP is a child tracking device and system that will enable parents to monitor the location of their children through the developed application. Although, the developed system will be a general purpose location tracking system but it is referred as child tracking system because the Location Tracking Equipment (LTE) will be carried by children in school bags as mobiles are not allowed in school. The LTE will be equipped with emergency notification mechanism to enable children to immediately inform parents in case of emergency.

### **3.2 Basic Functionality**

#### **3.2.1 LTE**

LTE is stands for Location tracking equipment. This equipment will mounted in child bag. It will comprise of Arduino[5] platform, GPS module, GSM kit and batteries. Both GSM kit and GPS module will be connected with the Arduino via serial interface pins. All the equipment will be powered by a single battery source. The device will be programmed using device programming software available for Arduino platform. It get data coming from GPS module. GPS get data from the connected satellites. This data will be periodically transmitted via GSM interface to the (Location Tracking Server)LTS.

#### **3.2.2 LTS Server**

The location tracking server will be the interface between the LTE and the end user (parents). Since reliable communication is necessary between network entities.

### 3.2.3 LTS Database

A database will be associated with the LTS to store and manage LTE data. It contains parent's preferences regarding possible position of their child. Since periodic updates will be issued by each LTE device to the database therefore the possible records in the Database will depend on both number of LTE's. How long position updates should be stored and the organization of database will be subject to implementation.

### 3.2.4 LTS android Application

The end user will use the application to benefit and monitor the status of the LTE. It will provide easy and professional interface to its users to not only get updates of LTE location but also define preferences. User simply select the location on map and expected time/date of child arrival to that specific place. For example, a user can specify the location for his child(LTE) as (X, Y) during 0830 to 1400 hrs. Along with this user can also view the route followed by Child, speed and histories of speed and location.

## 3.3 User Characteristics

There are no such major user characteristics involved related to the user, In order for him to operate the application. The user just needs to know how to operate his android device and make sure that hardware device LTE must be ON.

## 3.4 Functional Requirements

The following are the basic functional requirements of the LTE.

### 1. Functional Requirement 1 (Battery)

At the point when the battery is ON, it must be responsible to send the particular power supply that the LTE required.

### 2. Functional Requirement 2 (Arduino)

Arduino is a micro controller. GSM kit and GPS module will be connected with the Arduino via serial interface pins.

### 3. Functional Requirement 3 (GPS Working)

The GPS beneficiary gets signals from every GPS satellite. The satellites transmit the definite time when the signals are sent. GPS is connected with 24 satellites, it gets signal from these satellites. It is mandatory that GPS module is connected with at least three GPS satellites to get the position coordinates in form of latitude and longitude otherwise it does not get the GPS signal hence therefore tracking is impossible. So

this is make sure that module is connected with Arduino via serial port and there are enough GPS signal to track the module.

#### 4. **Functional Requirement 4 (GSM Working)**

When the GPS get the location coordinates the GSM is responsible to send the location coordinates to the data base, so the Mobile application access those coordinates.

The following are the basic functional requirements of the Application.

##### 1. **Functional Requirement 1 (Internet)**

Smart phone's internet should be ON while launching the Mobile application, because user(parents) need to login by providing username and password to operate the application .

##### 2. **Functional Requirement 2 (Data Base Server Connectivity)**

Application and LTE must be connected to database server; server should be alive 24/7. so that device and mobile app should be connect anytime and anywhere.

##### 3. **Functional Requirement 3 (Login)**

User(parents) must be login with username and password to see the child location, view route followed by child, speed with which child is moving and add user preferences into data base.

### 3.5 **Non Functional Requirements**

#### 1. **Reliability**

The application should work consistently. Irrelevant activity not be open against the tabs like if client open the route tab the route activity must be open.

#### 2. **Portability**

The nature of the application is itself portable as it is being developed of hand held android devices.

#### 3. **Timing**

The application should response in seconds.

#### 4. **Extensibility**

Incuse updates of the application are available, the user should be able to update the application.

## 3.6 Hardware Selection

### 1. Operation System

The smart phone should have an android operating system. Preferably Android 4.0.3 (Ice-cream sandwich) or above.

### 2. GSM kit

GSM is used to send the location coordinates to the data base, so the Mobile application access those coordinates. It proved 2G to device to browse the link with different value so that data is store in database on server

### 3. GPS Module

The GPS beneficiary gets signals from every GPS satellite. The satellites transmit the definite time the signals are sent.

### 4. Arduino

Arduino is a micro controller. GSM kit and GPS module will be connected with the Arduino via serial interface pins.

### 5. Battery

A battery used for power supply for hardware devices ( Arduino, GPS Module , GSM kit) that these devices work properly.

## 3.7 Performance Requirements

The smart phone should have the minimum system requirements for the application. The processor, the memory and the android version should be compatible with the ones the application is designed for. Data coming from LTE should be store in data base with proper way so that the Mobile application access data easily without any delay.

## 3.8 Budget

The budget will be required for

1. GSM Kit
2. GPS Module
3. Battery
4. Smart Phone
5. Arduino

### 3.9 Use Cases

#### 1. Users Interaction with complete system

The use case Figure 3.1 show how the user can interact with the system.

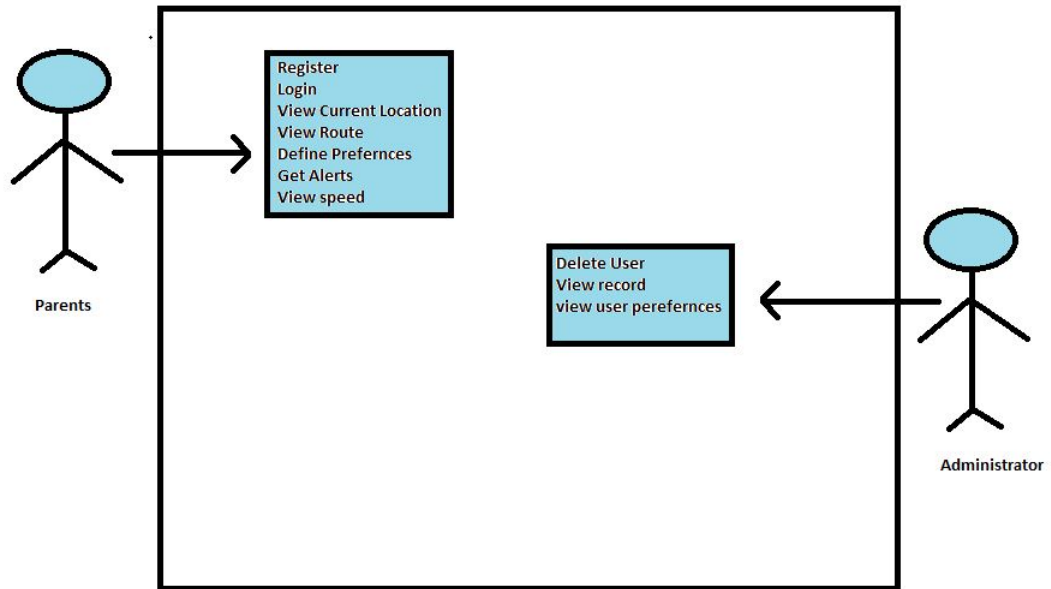


Figure 3.1: Main Use Case

#### 2. Location Checking Process

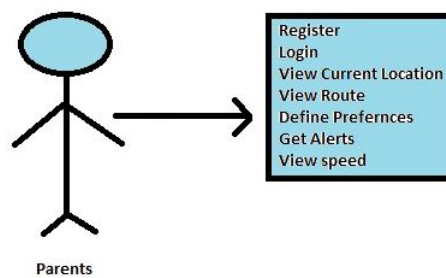


Figure 3.2: Location checking Process

Use Case Id	UC 1
Description	view current location of child, define user preferences and view route map of child locations.
Primary Actor	Parents
Pre-Condition	The user has to open the application
Post Condition	Current location, route map will be displayed against their tabs.

Table 3.1: Use Case 1 Table

### 3. Data Base Maintenance Process

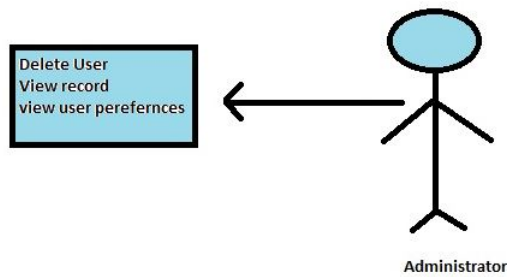


Figure 3.3: Data Base Maintenance process

Use Case Id	UC 2
Description	Maintain the records of child location and delete the unusual records.
Primary Actor	Admin
Pre-Condition	The user has to open the web server.
Post Condition	All the records of data base must be display.

Table 3.2: Use Case 2 Table

# Chapter 4

## Design

In this chapter architecture and design of system intended to be developed is discussed. This chapter also presents the overview of different component of system and how these components interact with each other.

### 4.1 System Architecture

System consist of three main component:

#### 4.1.1 Location Tracking Equipment

Location tracking equipment (LTE) is the hardware component of system that consists of different module i-e batteries, GPS, GSM and Arduino. These modules are connected together and programmed in such a way that it get the location of child and send it to remote server by using GPRS.

#### 4.1.2 Server

For server we get the free domain from 000webhost[6]. For our system our domain is cltsbuic.comli.com . On Server side there is a database. Php files are uploaded on server that connects the application to database. LTE access the php file and send location in database. On the other side, Client Mobile application access that data through Php file uploaded on server.

#### 4.1.3 Android application

The end user will use the application to benefit and monitor the status of the LTE. Parents first register himself by providing their Information and the IMEI number of LTE. User



login into Application after authenticated from server as shown in Figure 4.1. Application

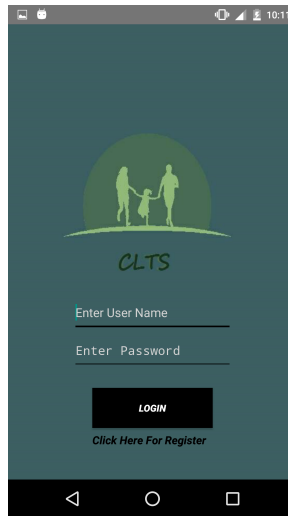


Figure 4.1: Login Page

contain three tabs:

- Current Location
- Route
- Preferences

In first tab user can see the current location of child on the Google map along with time and date when this reading was taken as shown in Figure 4.2. In second tab shows the Route followed by the child on Google map as shown in Figure 4.3. While in third tab, user can define their preferences as shown in Figure 4.4.

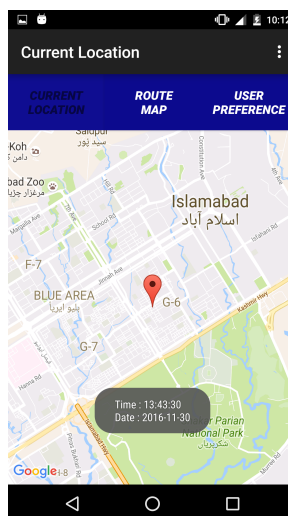


Figure 4.2: Current Location

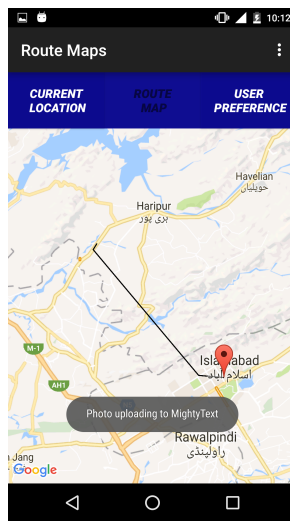


Figure 4.3: Route of Locations

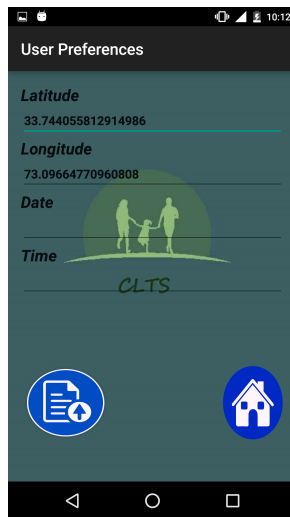


Figure 4.4: User preferences

## 4.2 Deployment Diagram

The Figure 4.5 system deployment diagram shows that how the application will be deployed on hardware device.

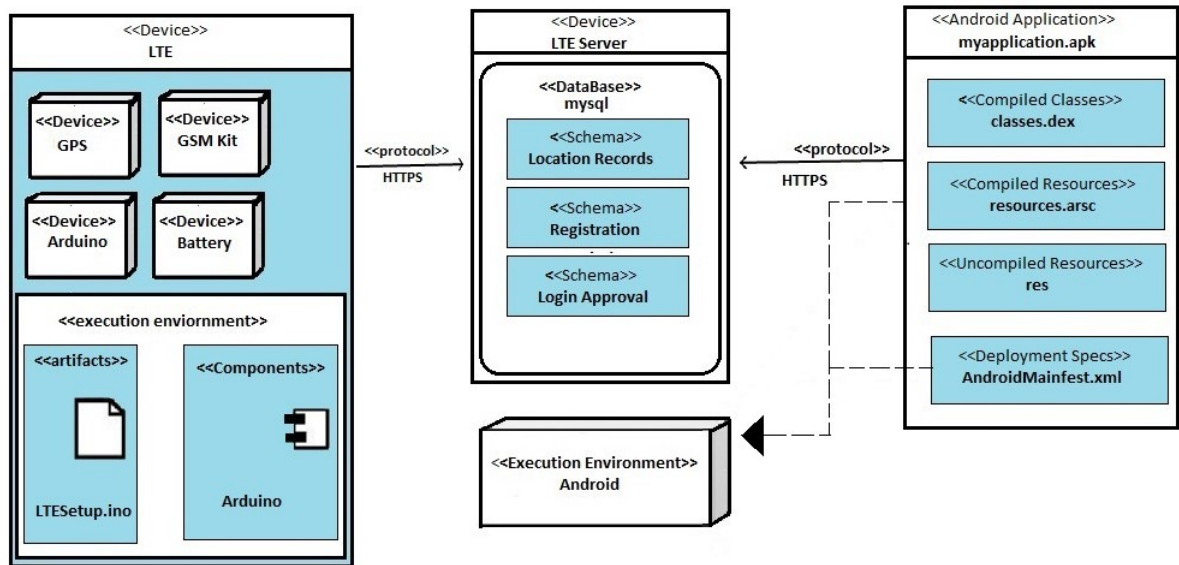


Figure 4.5: Deployment Diagram

## 4.3 System Sequence Diagram

The Figure 4.6 sequence diagram shows that how the processes interact with each other and in which order. Processes interaction description is given below:

- User open the application.
- User enter the username and password, then application verify the username and password from the database record. If the password or username incorrect application shows the dialog box that the password is incorrect try again. If password and user name correct new activity open which contain three tabs.
  - Current Location
  - Route map
  - Speed of LTE
- When user press the current location tab, application access the database server and get the current location longitudes and latitudes value, then display location on map with help of marker.

- When user press the speed of LTE tab, application access the database server and get the speed of LTE device, then display the speed of LTE.
- When user press the current location tab, application access the database server and get the current location longitudes and latitudes value, then display location on map with help of marker.

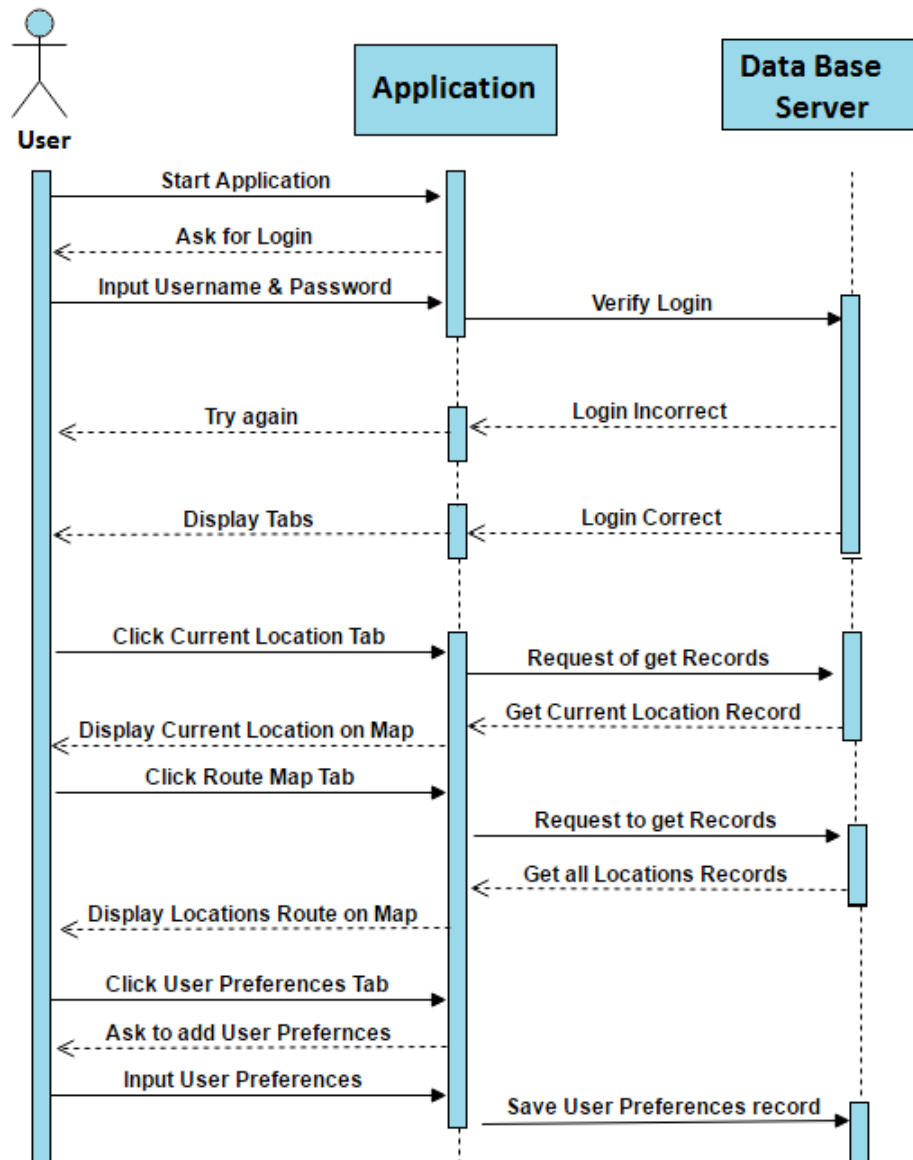


Figure 4.6: System Sequence Diagram

## 4.4 Hardware Design

The Figure 4.7 shows the hardware design. The hardware design components consists of:

- arduino uno
- Sim 900 Arduino
- GPS vk16u6
- Battery

### Arduino UNO

Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). 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.[7]

### Sim 900 Arduino

The Arduino GSM Shield V2 connects Arduino to the internet using the GPRS wireless network. Just plug this module onto your Arduino board, plug in a SIM card from an operator offering GPRS coverage. The shield uses digital pins 2 and 3 for software serial communication with the M10. Pin 2 is connected to the M10's TX pin and pin 3 to its RX pin.[8]

### GPS vk16u6

VK16U6 weight is about 14g, in the same with the specifications of the products is the smallest, performance is strongest, the most exquisite GPS module. Built-in fast 50 satellite positioning and tracking ability ublox chip, the built-in battery backup, built-in high gain LNA, the “double road, PCB zedoary process, large area radiation GPS signal, not the locator. Signal is better and more stable.[9]

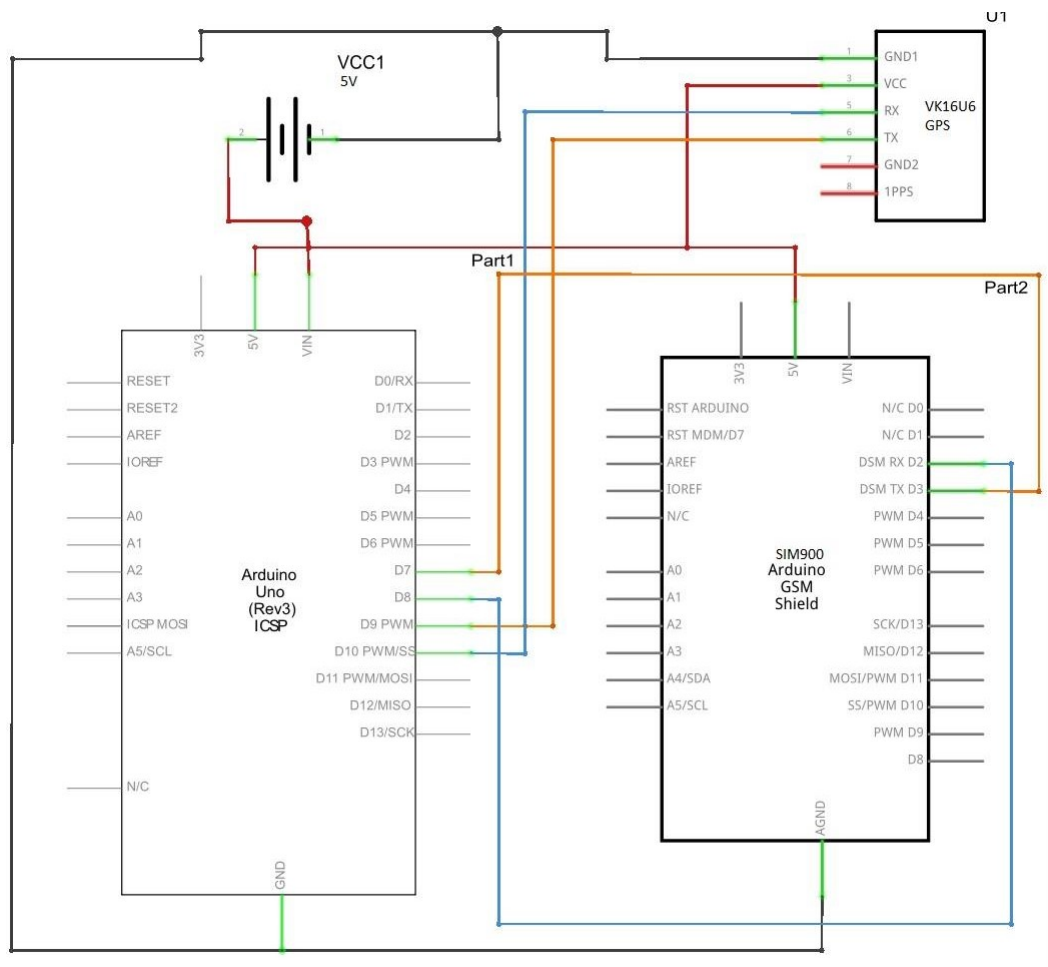


Figure 4.7: Hardware Design

## 4.5 Data Base Schema

Data base include 5 tables. Table names and their attributes are given below and shown in a Figure 4.8. ER diagram is shown in Figure 4.9.

- **Location**(date,time, latitude, longitude, IMEI).
- **Notificationflag**(flag).
- **Speed**(time, date, C\_speed, IMEI).
- **Preferences**(date,time, latitude, longitude, UserId).
- **users**(userid, name, contact, username, password).
- **Track**(Userid, IMEI).

**Location:**

<u>Time</u>	<u>Date</u>	Latitude	Longitude	IMEI
-------------	-------------	----------	-----------	------

**Preference:**

<u>Time</u>	<u>date</u>	Lattitude	Longitude	Userid
-------------	-------------	-----------	-----------	--------

**Speed:**

<u>Time</u>	<u>date</u>	C_speed	IMEI
-------------	-------------	---------	------

**Users:**

contact	name	<u>password</u>	<u>userid</u>	<u>username</u>
---------	------	-----------------	---------------	-----------------

**Track:**

<u>Userid</u>	<u>IMEI</u>
---------------	-------------

Figure 4.8: DataBase Schema

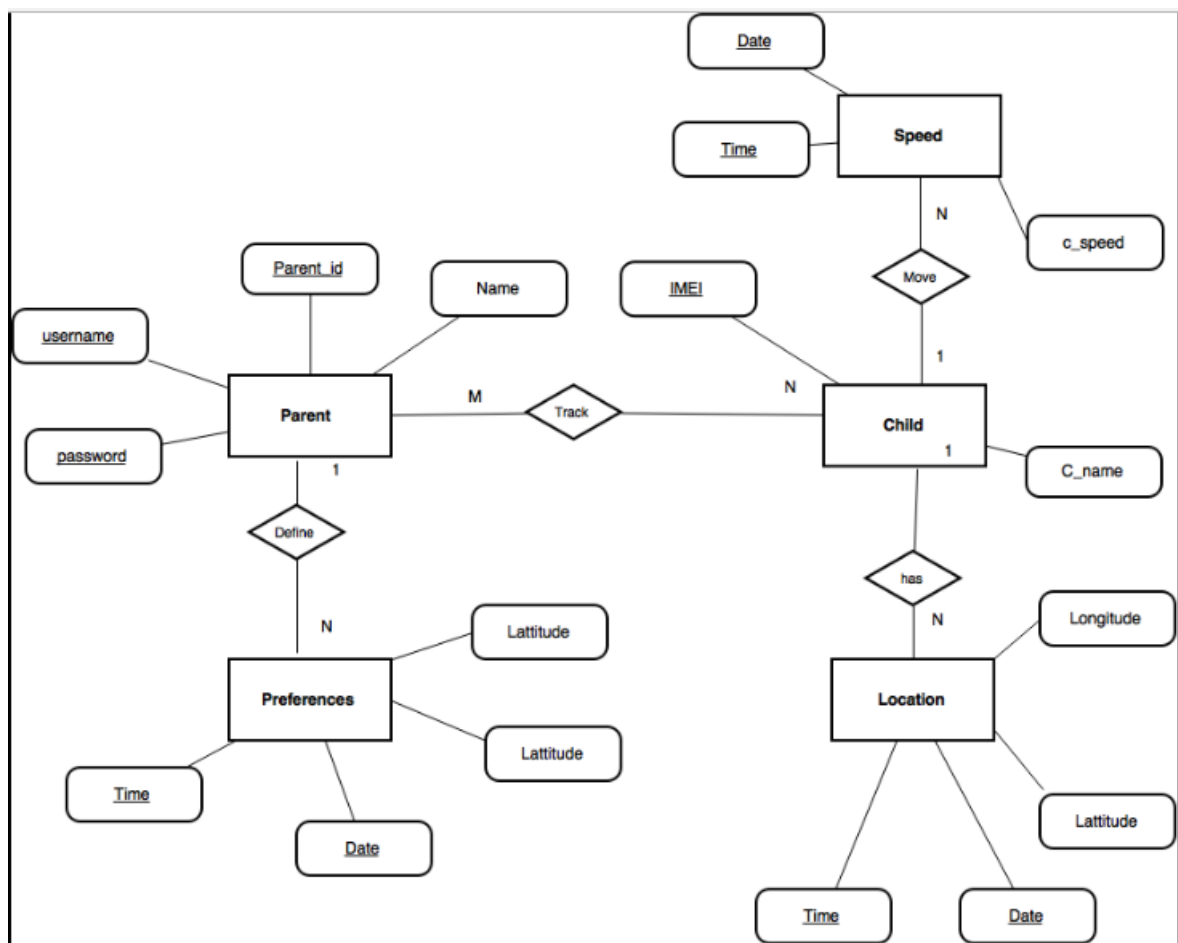


Figure 4.9: ER of DataBase



# Chapter 5

## System Implementation

In this chapter, we will discuss the tools and technologies, The libraries and algorithm use in development of system. As discussed earlier that we have 3 component of system.

- Location Tracking Equipment (LTE)
- Location Tracking Server (LTS)
- Android Application

### 5.1 Tools and Technologies

#### 5.1.1 Arduino

Arduino provide the platform that is open-source based on the easy-to-use hardware and software. It is use to build the digital devices and interactive object that can control and sense the physical device. Arduino consists of microcontroller and design board. Programmer program the hardware device on Arduino software. For this project, we are building the LTE in which location of device is collected from satellite using GPS library. Arduino project provides an integrated development environment (IDE) based on a programming language named Processing, which also supports the languages C and C++.

#### 5.1.2 Android Studio

Android Studio is the official integrated development environment (IDE) for Android platform development. Android Studio offers even more features that enhance your productivity when building Android apps, such as:

- A flexible Gradle-based build system.
- Build variants and multiple APK file generation.
- Code templates to help you build common app features.

- A rich layout editor with support for drag and drop theme editing.
- Lint tools to catch performance, usability, version compatibility, and other problems.
- Code shrinking with Pro Guard and resource shrinking with Gradle.
- Built-in support for Google Cloud Platform, making it easy to integrate Google
- Cloud Messaging and App Engine.

### 5.1.3 Google Maps Android API

From Google maps Android API, we can add maps on our android Application based on Google Map Data. The API automatically handles access to Google Maps servers, data downloading, map display, and response to map gestures. We can add makers, polylines, polygons, and overlays to a basic maps, and to change the user's view of a particular map area. It also provide information about location through which user can interact with map. The API allows you to add these graphics to a map:

- Icons anchored to specific positions on the map (Markers).
- Sets of line segments (Polylines).
- Enclosed segments (Polygons).
- Bitmap graphics anchored to specific positions on the map (Ground Overlays).
- Sets of images which are displayed on top of the base map tiles (Tile Overlays).

## 5.2 Languages

- Java language been used for development of this application. Java is a widely used object oriented language, which supports a wide range of libraries. It is also the mother language to android operating system.
- Php language is use in server in order to access and Insert the data from the server and into the server respectively. It can easily integrated with databases like mysql, Informix, oracle etc. In this project we are using mysql.
- C++ and C language is used for the development of Tracking Equipment (Hardware).it is used in Arduino software.

### 5.3 Methodology

As we discussed earlier that there are 3 modules in this system that are shown in Figure 5.1 and Figure 5.2.

- Location tracking Equipment (LTE)
- Location Tracking Server (LTS)
- Location tracking Application

These modules are connected together through the Internet. The high-level representation of the system is as under. Now we discuss these components one by one.

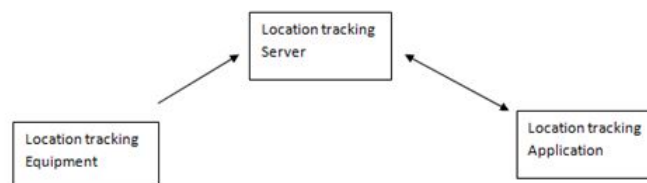


Figure 5.1: Overall System

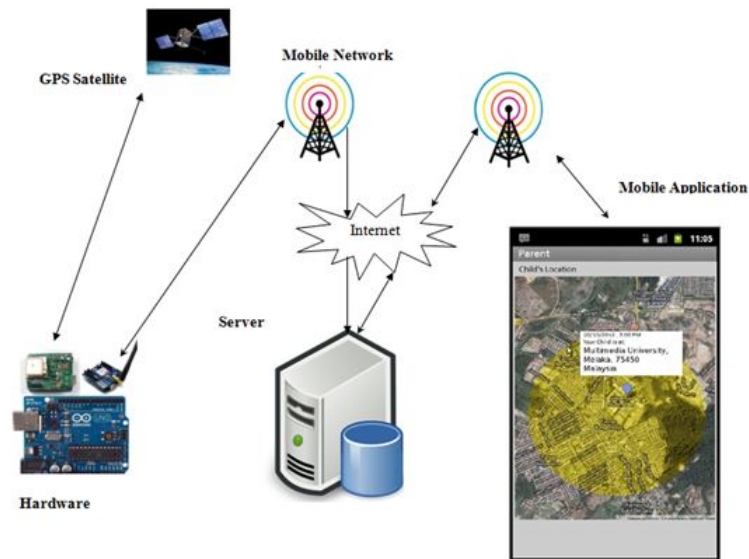


Figure 5.2: Overall System Representation

### 5.3.1 LTE

The main purpose of this device to collect the location coordinates from the connected satellite and sends this data to Server. Along with this there is the emergency mechanism through which child can inform her/his parent by sending notification to their mobile. This device consist of three main component

- Arduino
- GSM
- GPS

#### 5.3.1.1 Arduino

Arduino is the microcontroller that is use to control and sense the physical device. Devices are connected with Arduino and Then Arduino is connected with computer through USB port and programmer programs it by the Arduino software.



Figure 5.3: Arduino UNO

#### 5.3.1.2 GPS

GPS is stand for Global Positioning System. It is the satellite-based navigation system that consists of 24 orbiting satellite. GPS data consist of GPS coordinates and time Date of getting data. There are many modules available in market. We are using Tiny Gps module. For this we are using the library of tinyGps.It is connected with Arduino through serial port i-e 10 and 11.



Figure 5.4: Tiny GPS

### 5.3.1.3 GSM kit

Gsm stands for Global System for Mobile Communications,. This was developed by ETSI(European Telecommunications Standards Institute). It describe the protocol for 2nd generation(2G). It uses as communication source between LTE and Server. It can send data by Sending sms and also by using internet (2G). In this Project the coordinates collected by Arduino from GPS is send to server through GSM kit using internet. It is connected with Arduino through serial port i-e 7 and 8. A battery of 5 volt is connected



Figure 5.5: GSM

with Arduino , GPS and Gsm. GPS is connected via serialport 10 and while GSM is connected via serial port of 7 and 8. GPS pin RX is the receiver pin of GPS is connected with 11 pin of arduino, similarly transmitter pin TX of GPS is connected with pin 10 of arduino. GSM is connected through serial port 7 & 8. GSM receiver pin is connect with pin 8 of arduino, while transmitter pin connect with pin 7 of arduino. GPS get data then transmit this data through its transmission pin TX to arduino. Similarly, arduino transmit it data to GSM through its pin 8. GSM receive it through receiver pin RX and transmit to server the response of server receive by GSM is transmitted to arduino through transmission pin TX, i.e. is receive by arduino through pin 7. GPS first lock the location. When it lock the lock the location it start collecting the location from connected satellite. It wouldn't work if the connected satellite is less than 3. It get the data in the form of three attribute i-e latitude, longitude, time and date.Now we have to send this data to server. For this purpose we use the GSM kit that browse the link and access the PHP file on server i-e Adddata.php with different value like [cltsbuic.com/li.com/Add\\_data.php?d=time&h=date&l=latitude&o=longitude&i=IMEI](http://cltsbuic.com/li.com/Add_data.php?d=time&h=date&l=latitude&o=longitude&i=IMEI) Time, date, latitude and longitude will change accordingly. In this way data is collected and sent to server from LTE.

```

String year;
String Month;
String Day;
String Hour;
String Minute;
String Second;
String Latitude;
String Longitude;
While(GPSAvaivable())
{

Crack_DateTime($year,$Month,$Day,$hour,$minutes,$second)
AdjustTimeZone();//GMT+5
String Time= SetDigitalClock(hour,minutes,second)
String Date=SetDateFomat(year,Month,Day)
GetPostion($Latitude , $Longitude)
SendDataGSM(IMEI,Time,Date,Latitude,Longitude)

}

```

#### 5.3.1.4 Emergency Mechanism

A Emergency mechanism will be introduced in which child presses the button a message will be sent to his parents mobile.

#### 5.3.2 Server

For Server we have to buy the domain. For this purpose we buy a free domain from 000webhost. Our domain name is cltsbuic.comli.com. it provide free webhosting with PHP, MySQL and Cpanel.

Database is created on server with following table:

- Location
- Speed
- Users

There are Number of files on server that is use to manage the database Such as

- Add Data to Data Base
- LTE Location Data

- Current Location of LTE
- User login
- New User signup
- User Preferences
- Check User Preferences
- Notification of LTE Location
- Check the Speed of LTE

### **New user signup**

Parents register itself by providing the IMEI number of LTE on android App and then pass the other credentials. These credentials will be inserted into the database through this file. It simply inserts the data into the Users table.

### **User login**

This file simply accesses the user data from the Database and authorizes the users whether they can login or not and sends the response to the Android Application.

### **Add Data to Database**

Through this file, LTE will connect to the database on the server. The device accesses the file along with four fields, i.e. Time, Date, latitude, and longitude. These four fields will be inserted into the table. Speed can be calculated by the following algorithm.

**Algo:** Speed(Latitude, Longitude, Time, Date)

**Input:** Latitude, Longitude, Time, Date are the attributes

**Output:** Return the speed of LTE

```

Timediffserver<-Findtimediff(time, servertime)
If(Timediffserver<100)
Mapcoordinate1<- from database
Mapcoordinate2<-from database
Timedate1<- from database
Timedate2<- from database
Timebwcoordinate= Findtimediff(Timedate1, Timedate2)
If(Timebwcoordinate<100)
Netdistance<-finddistance(Mapcoordinate1,
Mapcoordinate2)
Nettime<- Timebwcoordinate
Speed<-Netdistance/Nettime
else
Speed=0

```

Speed calculated from this algo is inserted into Speed table.

### **Current Location of LTE**

This file is used to access the current location coordinate of the child that will be used to draw a marker on the Map.

**LTE Location Data**

This file is Use to access all the location coordinates of child that will be use to draw the Route on Map.

**Speed of LTE**

This file access the latest speed of Child. It first check whether the data Time difference of Speed reading and Server time. If its less than 1 min 40sec the allow to read the the latest value of Speed.

**User Preferences**

Users define their preferences for Child location. They simply pick the approximate time and date child to certain location, location will be selected on map. These all attribute will store in the Database through this file.

**Check Preferences**

This file is continuously access by the server through cron job.In This scenro file is access after every 5 minutes.This file simply check the current location and match with location Provided by Parents, if the distance between these two coordinate is less the 0.5 KM then is simply ON the Flag.

```

Current_postion ←GetCurrentPositionFromDatabase()
Preferences_postion← GetPreferencesPositionFromDatabase()
Current_Time_ ←GetCurrentTimeFromDatabase()
prefer_Time_ ←GetpreferenceTimeFromDatabase()
Distance←FindDistance(Current_postion, Preferences_postion)
Time←FindTime(Current_Time_, prefer_Time_)
Flag←GetFlagFromServer()
If(-350<time<350 &&Distance<500)//with in llmin 40 sec child reach within 500 m Circle
Setflag(true)
Else if(time<-350 && Flag!=true)//time expire or already reached(cron job)
Setflag(false)
Else|
Setflag(false)

```

**Notification of LTE Location**

This file is continuously access by the android app to check the status of flag . If its status is True Application Generate the notification that child reach to their place in time. Other wise Alert will be generated.

**5.3.3 Location Tacking Application**

Application is based on Android. User login into application after authentication from server. This activity will access the login.php file which authenticates the user. After login there are three tabs of application i-e current location, Route and Speed. Activity that belong to current location continuously access the data of current location after accessing



the selectcurrent.php file. Similarly when Route tab is clicked then it gets the whole data of user's locations after accessing the data.php file on server. Similarly For speed it access the speed.php file to get the speed of child. Users can also define their preferences by providing date, time and location coordinate. These attributes are stored in Database. This activity access the preferences.php file.

## **Chapter 6**

# **System Testing and Evaluation**

Software testing is a process to test the application to find the errors and bugs and remove the detecting bugs and errors. It is a process to checking the requirements of application is fulfilling completely. The techniques of software testing for application are:

- Function Testing
- Performance Testing
- Acceptance Testing

### **6.1 Functional Testing**

Functional testing of application has only concern with the functionality of application. Functional testing is perform by giving the inputs to the function and gets the output. Then check whether the output is correct according to the input or output in incorrect. The types of functional requirements are:

- Unit Testing
- Integration Testing
- Black Box Testing
- White Box Testing

#### **6.1.0.1 Unit Testing**

In unit testing the system is divided into small modules and then test each module to verify if it work properly or not.

### 6.1.1 Integration Testing

Testing the complete project to verify if the components of the project have been integrated properly. Components of our project include android studio activities files, PHP files and hardware components.[10]

### 6.1.2 White Box Testing

White-box testing is the detailed investigation of internal logic and structure of the code. The tester needs to have a look inside the source code and find out which unit/chunk of the code is behaving inappropriately.[11]

### 6.1.3 Black Box Testing

The technique of testing without having any knowledge of the interior workings of the application. The tester is oblivious to the system architecture and does not have access to the source code. Tester providing inputs and examining outputs without knowing how and where the inputs are worked upon.[12]

## 6.2 Performance Testing

It is a process to determine the speed and effectiveness of the application. This process involves measuring the response time of the application. This process checks the reliability, effectiveness and accuracy of the application. Performance testing has following types.

- Stress Testing
- Configuration Testing
- Regression Testing
- Security Testing

## 6.3 Acceptance Testing

Acceptance testing is process to test the acceptability of the system. This process evaluates the system to check whether the system is acceptable for delivery. In our project the installation of application in involve in acceptance testing. Installation of application involves:

- To verify the installation of the complete system on device
- To verify the functional and nonfunctional requirements of the system after installation on device.

## 6.4 Test Cases

### 6.4.1 Installation of Application

The Table 6.1 describes that the application on android mobile properly. Android mobile have android operating system greater then android version(4.0.3)

Test Case Id	01
Description	The application is to be installed on an android device.
Application for	Android based mobile phones.
Requirements	The device should have and android operating system greater then android version (4.0.3) (ice cream sandwich).
Steps to be taken	Run the application apk form the respective location on device.
Expected Result	The complete application should be installed on the device.
Actual Result	The complete application was installed on the device.
Status	Success.
Remarks	N/A

Table 6.1: Installation of Application

### 6.4.2 Running the of Application

The Table 6.2 describes that the application on android mobile must be run properly. Application launched when application in selected from the android menu.

Test Case Id	02
Description	The application should properly start.
Application for	Android based mobile phones.
Requirements	The application has to be launched when selected from the application menu on the device.
Steps to be taken	Select the application from the application menu on the device.
Expected Result	The application should launch without any errors. All the functional and nonfunctional requirements should be operational.
Actual Result	The application launched without any errors.
Status	Success.
Remarks	N/A

Table 6.2: Running the of Application

### 6.4.3 Application Connectivity with Server

The Table 6.3 describes that the application must always be connected through server to get the location updates. Application connects with database and display location and speed of LTE.

Test Case Id	03
Description	The application must always be connected through server to get the location updates.
Application for	Android based mobile phones.
Requirements	The application must properly connected with server to access data of hardware device(LTE).
Steps to be taken	Application connects with server, get the current location from database server, get speed of child from database server and display on the map in application.
Expected Result	Access data from Data Base.
Actual Result	Application connects with database,then display location and speed of LTE.
Status	Success.
Remarks	N/A

Table 6.3: Application Connectivity with Server

### 6.4.4 Uninstalling the Application

The Table 6.4 describes that when the user uninstall the application, the application must completely uninstalled from the device.

Test Case Id	04
Description	Uninstalling the application from the device.
Application for	Android based mobile phones.
Requirements	The complete application should be uninstalled from the device.
Steps to be taken	Uninstall the application form the application manager on device.
Expected Result	Application should be uninstalled.
Actual Result	Application was uninstalled successfully.
Status	Success.
Remarks	N/A

Table 6.4: Uninstalling the Application

## Chapter 7

# Conclusions

This project was the part of those attempts that are evolving over the years. We identified from the commencement that creating a whole outcome would be impossible within the given time frame. We observed the project as a journey where we learned many lessons and increased some visions to the topic which we tried to share in this report. We tried to look at the problem from many points of view which produced some new concepts that could be discovered in the future. More, we have learnt short term project planning and implementation which includes:

- Gathering requirements
- Time management.
- Budget management
- System design
- Implementation with different technology
- GUI design
- Interaction with different tools and technologies.

During working on this project we learnt a lot. Arduino was new tool for us, it was challenging task for us to build such a hardware that get data from GPS and send it to server. We accepted the challenge to make a better and enhanced Location tracking device(LTE) by using Arduino platform, was very interesting and at the same time very time consuming task. Another challenge for us to build a Mobile App and with different feature like Google Map. With the help of ALMIGHTY ALLAH we succeeded and learnt how to manage workload including a lot of new things by facing the difficulties. We

selected the android application because of so many reasons including current market scope and demand.

# References

- [1] GooglePlay. Facebook. <https://play.google.com/store/apps/details?id=com.facebook.katana&hl=en>, 2016. Cited on p. 1.
- [2] GooglePlay. Whatsapp. <https://play.google.com/store/apps/details?id=com.whatsapp&hl=en>, 2016. Cited on p. 1.
- [3] Ufone. U watch. <https://propakistani.pk/2016/02/03/ufone-launches-uwatch-to-keep-your-kids-connected-and-secure/>, 2016. Cited on p. 6.
- [4] Telenor. Telenor companion watch. <https://www.telenor.com.pk/about-news-events/telenor-companion-watch>, 2016. Cited on p. 7.
- [5] Arduino. <http://playground.arduino.cc/Tutorials/GPS>, 2016. Cited on p. 8.
- [6] 000webhost. Server. <https://www.000webhost.com/>, 2016. Cited on p. 14.
- [7] Arduino uno. <https://www.arduino.cc/en/Main/ArduinoBoardUno>, 2016. Cited on p. 19.
- [8] Arduino sim900. <https://www.arduino.cc/en/Main/ArduinoGSMShield>, 2016. Cited on p. 19.
- [9] Gps vk16u6. <https://www.eprolabs.com/product/gps-receiver/>, 2016. Cited on p. 19.
- [10] Integration testing. [https://msdn.microsoft.com/en-us/library/aa292128\(v=vs.71\).aspx](https://msdn.microsoft.com/en-us/library/aa292128(v=vs.71).aspx), 2016. Cited on p. 33.
- [11] white box testing. [https://www.tutorialspoint.com/software\\_testing\\_dictionary/white\\_box\\_testing.htm](https://www.tutorialspoint.com/software_testing_dictionary/white_box_testing.htm), 2016. Cited on p. 33.
- [12] Black box testing. [https://www.tutorialspoint.com/software\\_testing\\_dictionary/black\\_box\\_testing.htm](https://www.tutorialspoint.com/software_testing_dictionary/black_box_testing.htm), 2016. Cited on p. 33.