# Smart Vehicle Tracking System

BTP project report submitted in the partial
fulfillment of the requirements for the degree of

Bachelors of Technology
in
Computer Science and Engineering

by
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## Certificate

This is to certify that the project work entitled *"Smart Vehicle Tracking System"* by ***Devashish Mahbubani(Y13UC084)***, in partial fulfillment of the requirement of degree in Bachelor of Technology (B. Tech), is a bonafide record of work carried out by him at the Department of Computer Science and Engineering, The LNM Institute of Information Technology, Jaipur, (Rajasthan) India, during the academic session 2016-2017 under my supervision and guidance and the same has not been submitted elsewhere for award of any other degree. In my opinion, this report is of standard required for the award of the degree of Bachelor of Technology (B. Tech).

Rajbir.

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Dr. Rajbir Kaur
(Superviser)

Date: 11/05/2017.



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# Acknowledgement

I would like to express my deepest gratitude to my BTP supervisor Dr. Rajbir Kaur, Department of Computer science Engineering (CSE), The LNM Institute of Information Technology, for her inspiration, idea and guidance for completion of the thesis. Regards to my batchmates for their support throughout the whole work. I am extremely thankful to the IT department of The LNM Institute of Information Technology for helping enormously to complete this work.

# Abstract

Smart Tracking system is an application for people using public means of transport to obtain the geo-location of the vehicle being used for means of transportation. This application allows users to track the vehicle on google maps. It combines the the places visited and route opted by the vehicle and display all this information on map. This application is developed to test whether the users get a rich user experience by having all the information in one place, easy to-access and interactive. With the assistance of Google Maps, every Vehicle will be drawn out on the map with all the locations visited and also the route taken. following system also will carries with it the hardware facet experiments (using Arduino Uno, GPRS/GSM and GPS Modules).Nowadays in the signalized network, travel time estimation is a challenging subject especially because travel times are intrinsically uncertain due to the fluctuations in traffic demand and supply, traffic signals, stochastic arrivals at the intersections, etc. This project focuses on the estimation of complete travel times. Based on the information collected, we will estimate the time that a vehicle might take to reach a particular spot.The project goal is to develop a corresponding smartphone app where users are able to get some real time information about the public transport they are planning to board. An accurate real-time scheduling would reduce publics' tardiness, allow better time management, and offer easy navigation around the city. Successful implementation of the system will not only provide the public with an easy and reliable way of travelling, it would also greatly encourage the use of public transit turning it into a profitable business.

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# Chapter 1
# Introduction

With changing times, the mobile technology has changed a lot and in the last few years we have seen the arrival of various new kinds of gadgets in the form of Smartphone, camera-phone, Android and tablet phones. Drop in prices of smartphones have shown a different perspective of mobile phones, i.e., from simple communication devices to general purpose computers. In fact, the handset industry has turned from simple budget handsets to ultra-modern high end mobile phones. Today's device is nearly everything - it's trendy, innovative, appealing, high-performing, durable, and multi-tasking. Latest gadgets may be used for numerous functions like browsing mobile, internet, taking part in games, emailing, and blogging, messaging, GPS, YouTube, Google search, Gmail and many purposes.

Google's Maps API is one amongst the newest and distinctive innovations, that instantly has helped a lot in vehicle tracking applications. This technology would verify the location of a vehicle using different functions like GPS and different navigation systems. An android smartphone is fitted within the bus that gives effective real time location and also the knowledge about it's estimated time to arrival. The data received and sent can be downloaded to a pc which may be used for analysis. This system is an essential device for tracking buses any time the user wants to monitor it and today it is extremely popular among people having expensive phones. The data collected can be viewed on electronic maps via internet and software.

A tracking system comprises of mainly three parts- vehicle unit, user side application unit and database with software system. The system uses Global Positioning System [GPS], to find information about the location of the vehicle that is to be monitored and then send the latitude and longitude to the monitoring center through server. At the monitoring center(can be user or a server) EC2 software is used to display the vehicle on the Google map. This is how our system tracks automobiles in real time.

The applications can be used:
To supply correct data to passengers some transit agencies have uploaded a map on their web site, with icons indicating this locations of buses in commission on every route.
Due to time period trailing facility, vehicle tracking systems became progressively favourable amongst house owners of vehicles as they're ready to monitor their vehicle unendingly. There are also some transit companies that keep this information only for their own use which can be accessed by their employees only. Other applications include monitoring driving behavior of the driver which is helpful if the company or an organisation have appointed any new driver.

# Chapter 2
# Tracking System Overview

Several types of vehicle tracking devices exist.They are classified as:

- **Passive tracker:** Passive devices store GPS location, speed, heading and sometimes trigger event such as door open or closed, key on or off,
- **Active tracker:** Active devices conjointly collect constant info however sometimes transmit knowledge in time period via cellular or satellite networks to a laptop or data center for analysis.

There are different types of tracking system:

- **Automatic Vehicle Location System:** Automatic Vehicle Location (AVL) system- AVL system is an advanced method to track and monitor any remote vehicle with the device that receives and sends signals through GPS satellites. AVL comprises of Global Positioning System (GPS) and Geographic Information System (GIS) in order to provide the real geographic location of the vehicle.

- **Assisted global positioning System:** In AGPS system, a terrestrial RF network is used to improve the performance of GPS receivers as it provides information about the satellite constellation directly to the GPS receivers. AGPS uses both mobiles and cellular networks to locate the accurate positioning information. AGPS is used to overcome some limitations of GPS. With unassisted GPS, locating the satellites, receiving the data and confirming the exact position may take several minutes.
- **Radio Frequency Identification:** RFID is Associate in Nursing automatic identification technique victimization devices referred to as tags to store and remotely retrieves knowledge. RFID uses radio waves to capture knowledge from tags. The chase technique of RFID is comprised of 3 components: tag (passive, semi passive and active), reader (antenna or integrator) and code (middleware). RFID tag that contains electronics circuits sends the vehicle data to a foreign RFID scanner that is then read via the code.

The type of tracking system implemented in the project will be an Assisted Global Positioning system in android system, the architecture of the android operating system enabled with GPS is discussed in the next chapter.

# Chapter 3
# Android Architecture

This project is developed on Android, the overview of the architecture of the Android Operaating system is as follows:

## Section 3.1 Android Operating System Architecture:

- *Linux Kernel:* At the bottom of the layers is Linux - Linux 2.6 with approximately 115 patches. This provides basic system functionality like process management, memory management, device management like camera, keypad, display etc. Also, the kernel handles all the things that Linux is really good at such as networking and a vast array of device drivers, which take the pain out of interfacing to peripheral hardware.
- *Libraries:* On top of Linux kernel there is a set of libraries including open-source Web browser engine Webkit, well known library libc, SQLite database which is a useful repository for storage and sharing of application data, libraries to play and record audio and video, SSL libraries responsible for Internet security etc.

## Section 3.2 Android System Architecture:

- *Android Runtime:* This is the third section of the architecture and available on the second layer from the bottom. This section provides a key component called Dalvik Virtual Machine which is a kind of Java Virtual Machine specially designed and optimized for Android. The Dalvik VM makes use of Linux core features like memory management and multi-threading, which is intrinsic in the Java language. The Dalvik VM enables every Android application to run in its own process, with its own instance of the Dalvik virtual machine. The Android runtime also provides a set of core libraries which enable Android application developers to write Android applications using standard Java programming language.
- *Application Framework:* The Application Framework layer provides many higher-level services to applications in the form of Java classes. Application developers are allowed to make use of these services in their applications.
- *Applications:* You will find all the Android application at the top layer. You will write your application to be installed on this layer only. Examples of such applications are Contacts Books, Browser, and Games etc. Application components are the essential building blocks of an Android application. These components are loosely coupled by the application manifest file AndroidManifest.xml that describes each component of the application and how they interact.

## Section 3.3 Android Application Lifecycle:

- *Starting State:* When an activity does not yet exist in memory, it is in the starting state.
- *Resumed/Running State:* An activity that is in the foreground is in the running state. Any activity that is currently on the screen and interacting with the user is the running activity at that particular point in time. It exists at the top of the Activity stack.

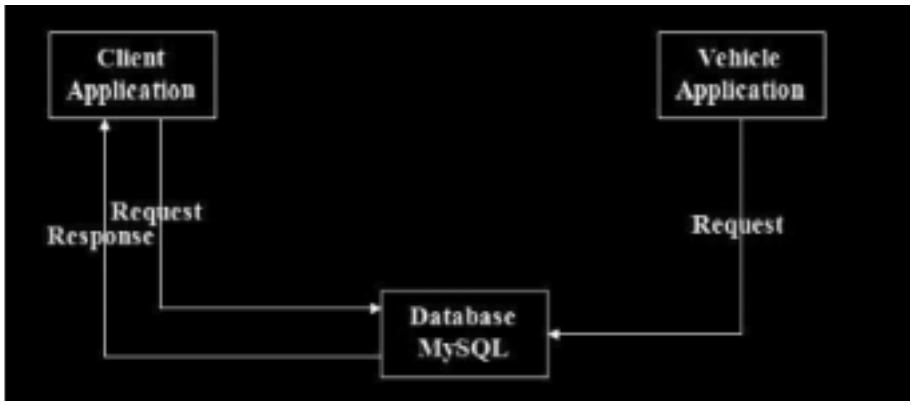
- *Paused State:* When an activity is not in focus (i.e. not interacting with the user), but is still visible on the screen, it is in the Paused state.
- *Stopped State:* An activity that is not visible on the screen, but exists in the memory is in the Stopped State.
- *Destroyed State:* A Destroyed activity results from the removal of an activity (that is no longer required) from the memory. Such removals generally occur, when the activity manager decides that there is no use for such activities anymore.

## Section 3.4 Android GPS ( Global Position System):

The Global Positioning System (GPS) may be a satellite-based navigation system created of a network of twenty four satellites placed into orbit by the U.S. Department of Defense.
GPS devices could have capabilities such as:

- maps, together with streets maps, displayed in human clear format via text or during a graphical format,
- Turn-by-turn navigation directions to a personality's accountable of a vehicle or vessel via text or speech,
- Directions fed on to associate autonomous vehicle like a robotic probe,
- Traffic congestion maps (depicting either historical or real time data) and instructed various directions,
- Information on close amenities like restaurants, refueling stations, and holidaymaker attractions.

## Section 3.5 System Design and Transloc API:



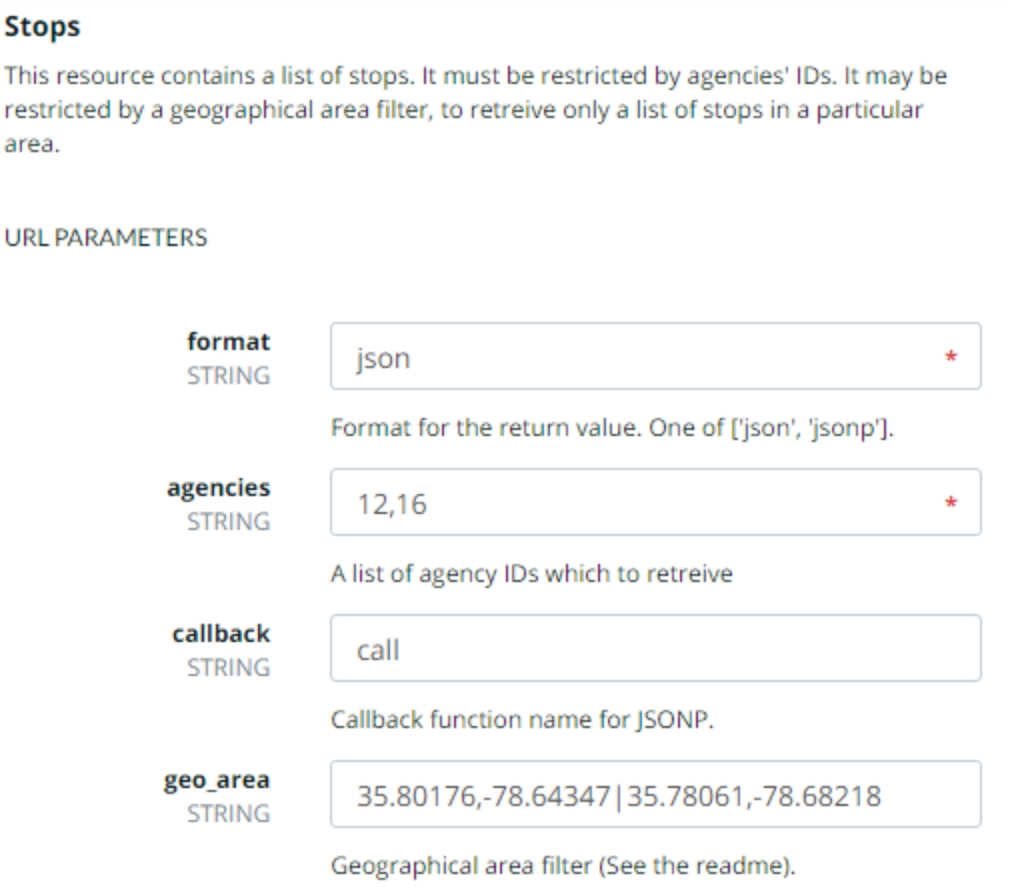

Above figure 3.1 shows the typical architecture of the system, it shows how system works and what phases of system are. The major content of this architecture are following:

- User interface (Android application).
- Server
- Database

Client will ask for the location of the bus through his android device. Request to the server is made

automatically.Bus is equipped with GPS device. Through GPS it will find its location and deliver it to server.Server will handle the locations and deliver it to the intended client.

*Transloc Open API 1.2***:** This uses JSON (JavaScript Object Notation) which is a lightweight data-interchange format. It is easy for humans to read and write. It is easy for machines to parse and generate and is to use.



# Chapter 4

## Database Management using Amazon EC2

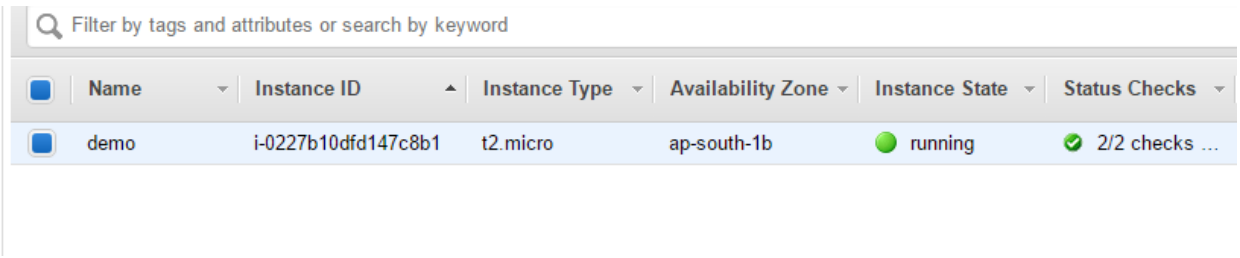
Existing DBMSs give varied functions that permit management of a info and its knowledge which might be classified into four main useful groups:

- ***Data definition:*** Creation, modification and removal of definitions that define the organization of the data.
- ***Update:*** Insertion, modification, and deletion of the actual data.
- ***Retrieval*****:** Providing information in a form directly usable or for further processing by other applications. The retrieved knowledge is also created obtainable during a type essentially an equivalent because it is hold on within the info or during a new type obtained by fixing or combining existing knowledge from the info.
- ***Administration:*** Registering and observance users, implementing knowledge security, observance performance, maintaining knowledge integrity, managing concurrency management, associated convalescent info that has been corrupted by some event like an sudden system failure.

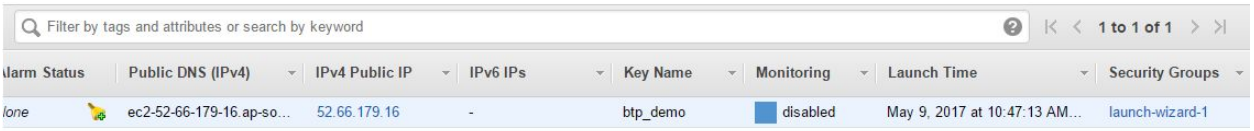
EC 2 instances are completely virtualized. They can use on (ephemeral) or off instance (EBS) storage. Use of EBS is generally preferred for better resiliency, because if the physical host fails, the VM can be launched on another host quickly. EC2 provides security through complete virtualization of resources including VM instances, storage and network. EC2 operates on commodity hardware, not expensive, highly fault tolerant enterprise systems. They have architected the EC2 infrastructure to anticipate and deal with hardware failures through replication. They are proponents of horizontal scaling.

***Demonstration:*** Initially Xampp server was used to run the demo mobile application on localhost, but later shifted it to Amazon EC2, so that the app can run globally,

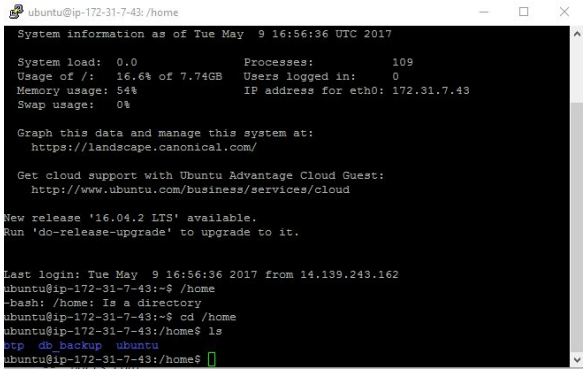
Server Type: t2.micro



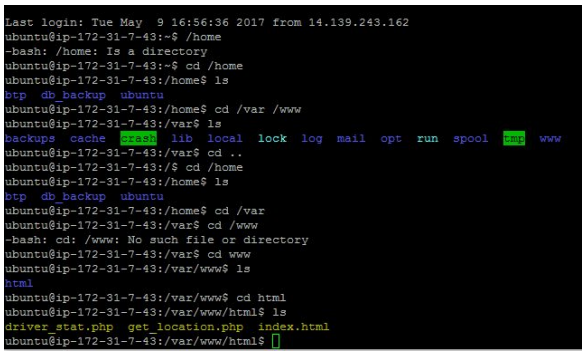

Public IP allocated: 52.66.179.16



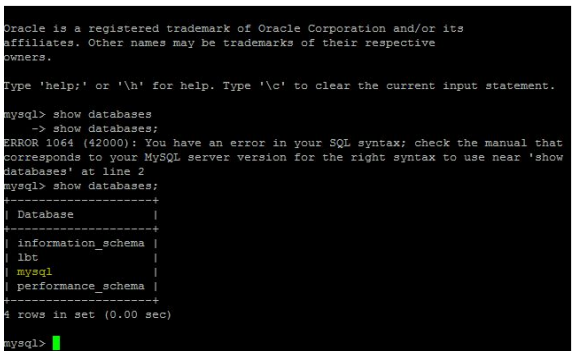

Apache Server installed on 52.66.179.16 which can be accessed via Windows using a software Putty.exe, as follows:




Backup files stored in /home,




Php files stored in /var > www > html




Database name: **lbt**

```
| mysql              |
| performance_schema |
+--------------------+
4 rows in set (0.00 sec)

mysql> use lbt;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> show tables
    -> show tables;
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that
corresponds to your MySQL server version for the right syntax to use near 'show
tables' at line 2
mysql> show tables;
+---------------+
| Tables_in_lbt |
+---------------+
| bus_location  |
+---------------+
1 row in set (0.00 sec)

mysql>
```

Table name: Bus _ location

```
mysql> show tables;
+---------------+
| Tables_in_lbt |
+---------------+
| bus_location  |
+---------------+
1 row in set (0.00 sec)

mysql> select * from bus_location
    -> select * from bus_location
    -> select * from bus_location;
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that
corresponds to your MySQL server version for the right syntax to use near 'selec
t * from bus_location
select * from bus_location' at line 2
mysql> select * from bus_location;
+-------------+-------------+----------------+----------+
| current_lat | current_long | distance       | track_id |
+-------------+-------------+----------------+----------+
| 26.934004   | 75.9229797   | 149.6455078125 |        1 |
+-------------+-------------+----------------+----------+
1 row in set (0.00 sec)

mysql>
```

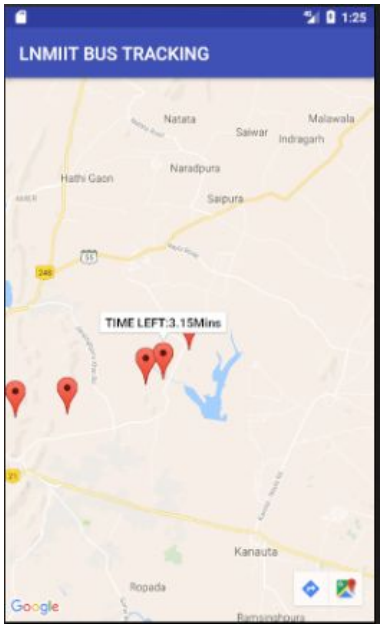
Values being stored in the database are highlighted.

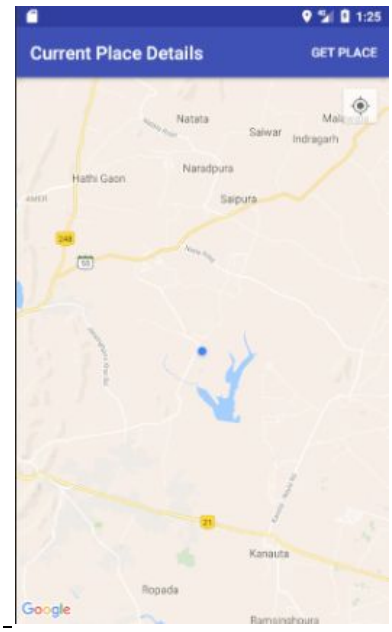
# Chapter 5
# Google Maps

Google has developed a Google maps for the pc or mobile mapping service. It offers second map, satellite map and 360 wide views of streets (Street View).Google Maps provides high-resolution satellite pictures. With the introduction of AN simply searchable mapping and satellite mental imagery tool, Google's mapping engine prompted a surge of interest in satellite mental imagery. Google Maps uses JavaScript extensively. because the Google Maps code is nearly entirely JavaScript and XML, some end-users reverse-engineered the tool and created client-side scripts and server-side hooks that allowed a user or web site to introduce enlarged or custom-made options into the Google Maps interface. For developers, Google launched the Google Maps API (Application Programming Interface) in June 2005. this enables developers to integrate Google Maps into their websites and mobile apps. begin by making AN API Key, it'll be absolute to the net website and directory you enter once making the key. making your own map interface involves adding the Google JavaScript code to your page, and so victimisation JavaScript functions to feature points to the map. For victimisation the Google maps in our web site, we've found Google Map API key from this website https://console.developers.google.com

# Chapter 6
# Result analysis & Conclusion

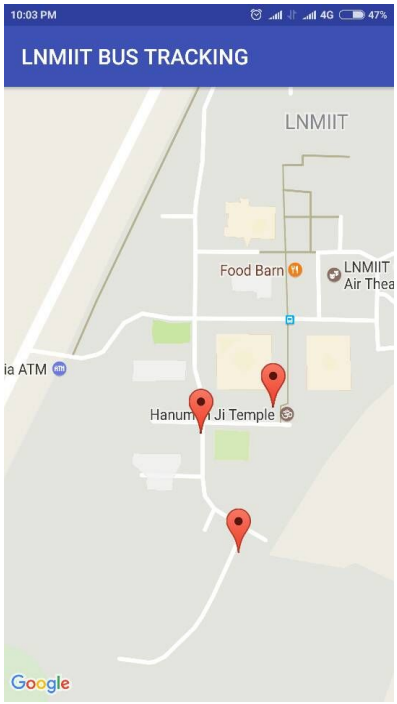
Screenshots of the application are as follows: Test Case 1:




User Side Driver Side

Test Case 2: (Inside the campus using campus cycle -> Temple to faculty & staff quarters)




This is a pilot project of a bigger one, which LNMIIT will be assisting in the making the campus smart which has been proposed with the aim to make the life of the students easy and scheduled with proper travel times. The succession of each unit being manufactured properly and the quality of service it provides after completion of manufacturing, we will go for mass production. The features are actually not only limited to what we added but also more technical features can be developed to enhance this tracking purpose. Vehicle following system resulted in rising overall productivity with higher fleet management that successively offers higher come on your investments. higher planning or route designing will alter you handle larger jobs masses at intervals a selected time. Vehicle following each just in case of non-public still as business purpose improves safety and security, performance watching and will increase productivity. therefore within the returning year, it's getting to play a serious role in our daily living. So in the coming year, it is going to play a major role in our day-to-day living. This system has many advantages such as large capability, wide areas range, low operation costs, effective, Strong expandability and easy to use in vehicle traffic administration. Upgrading this setup is very easy which makes it open to future a requirement. It’s future scope can be adding the ability to share the track and other related information obtained via SMS, Bluetooth or mail. Adding the ability to share the track via Chat Messenger (“WhatsApp”) and social networking site (“Facebook, Twitter”).

# Chapter 7

# References & Glossary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*Glossary*

- API Application programming interface
- GPRS General Packet Radio Service
- GPS Global Positioning System
- RF Radio frequency
- SBS Smart Bus System