

# Analysis Of Bus-Based Tracking GPS (*Global Positioning System*)

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## 1. Introduction

### 1.1 Background

The development of the era and the technology is now quite a lot of us feel the benefits in many ways, more and more companies that created everything that always related to technology, and after the authors observe the company is taking a crack of the individual nature of today who like to be something that is simple, practical, and easy to use. Lots of companies are trying to exploit the situation, but here I will see in terms of transportation, we can see that there are some companies that take a crack at creating a variety of applications that lead to transport, to make it easier for people who want to travel without having to wait a long time , can be timely, can come directly to localized, such as an application example *Gojek, Uber, and Grabtaxi*.

## 2. Basis Theory

### 2.1 Literature Review

The review was used as a comparison between researchers has been done and that will be designed by the researcher. Review of the literature obtained from a journal entitled A Bus Tracking Information System using Consumer Grade GPS: A Case Study written by Shamsul Kamal Ahmad Khalid, Nurul Syahadah Mohd Salleh and Noor Azah Samsudin from Universiti Tun Hussein Onn Malaysia, Parit Raja, Batu Pahat Johor , Malaysia. In the journal bus tracking information system using a standard phone connection Internet and consumer-grade GPS, this system will continue to update estimates of time of arrival based on the actual location of buses on the route that leads to the next bus stop. With the graphical information provided to passengers through smart phones, passengers will be able to see the actual location of the bus. The prototype for the bus service University Tun Hussein On Malaysia has implemented - which consists of buses equipped with Android devices will continue to send the current GPS location of the bus to a centralized server and read by client.

## 3. Analysis Of Results And Discussion

### 3.1 An Android Application For College Bus Tracking Using Google Map

This journal is *the International Journal of Computer Science and Engineering Communications* (2015) pages 1057 -1061 ISSN 2347-8586 vol 3 issue of the Journal written 3. Priya S. et al (2015) from the Department of

Information Technology St. Peter's College of Engineering and Technology, Chennai, India.

#### 3.1.1 Results

The application consists of both transmitter and receiver inbuilt in the phone. The transmitter is used to transmit the vehicle location and status information to the server. The recipient is a user who can view details about the location of the bus using its smart phone via Google maps. Due to the movement of the bus is always available, this project can ensure the safety of the track bus. The increase in the future for this project is to create an online application to find the location of the bus. And also plans to improve GPS devices on each bus so it is not important for the driver to have an Android phone

#### 3.1.2 Discussion

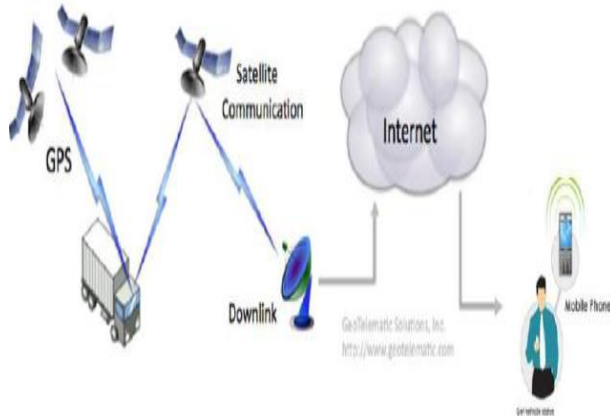
##### a. Project Description

In a journal entitled, "An Android Application For Tracking College Bus Using Google Map" we will track the location of the bus using GPS and display them using Google maps. Here we do it in the android platform using an android phone for android phones containing transceiver GPS and GPS

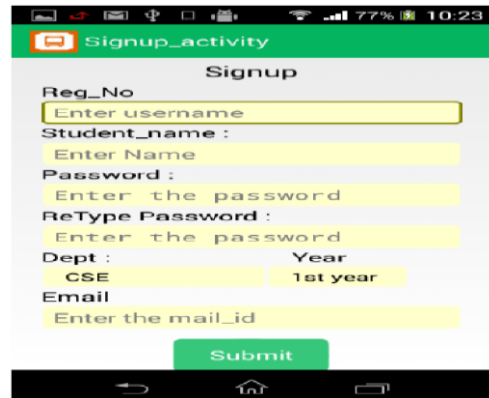
receiver built-in. in the user interface when a user selects a bus route, bus location, user, source, and destination will be displayed on a Google Map, long-distance and bus time it takes to reach the user is also displayed. Looking into the details of the information provided in Google folders users can start according to the time displayed.

### 3.1.3 System Architecture

Three modules in this project: Registration, Bus Tracking, Route discovered



**Figure 1** Architecture



**Figure 2** User Registration

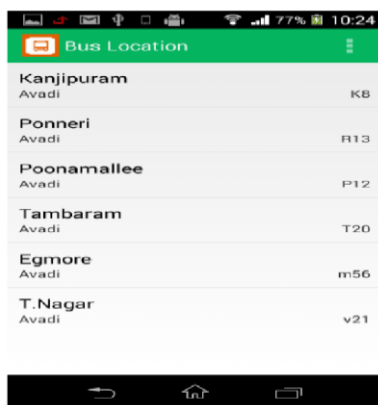
### 3.2 module Description

#### a. Registration

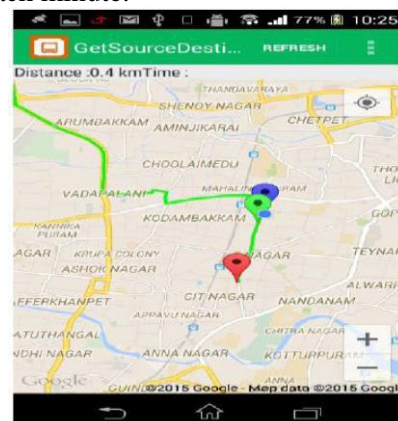
this module is provided for users to register themselves with the details such as name, password, confirm password, email id, mobile number as showed in Figure 2, and use the app to track the campus bus. Registered users can log in with a user name and password once they are registered. The details of the registered students themselves will be maintained in the database.

#### b. Bus Tracking Module

In this module when the bus right bus been found using a particular IP address that is on the bus. Then the bus location tracked by latitude and longitude. In accordance with the movement of buses, changes in latitude and longitude will be updated in the database for each minute.



**Figure 3.** Bus Routes



**Figure 4** Location Bus4 These

#### c. The Route Module Found

In this module latitude and longitude values are updated in the database is used to find the exact location of the bus using a map Google and shown in Figure 4. Source buses and the destination, users, bus featured in Google maps with different colors to clearly identify them. The distance between the user and the bus along with the expected time is calculated and displayed.

### 3.3 Analysis of Bus Tracking System Using GPS on Smart Phones

This journal is *IOSR Journal of Computer Engineering (IOSR-JCE)* Vol 16, Issue 2, e-ISSN 2278-0661, p-ISSN 2278-8727 ver. X11 maret april 2014. The journal was written by Mr. Pradip Mane and Prof. Suresh Vaishali khairnar Dept. of Information Technology, Terna Engineering College, Mumbai, India.

### 3.3.1 Results

Presenting the evaluation to improve satisfaction with public transport, reduce waiting times, increase the use of transit, encourage users to use public transport, and increase the perception of safety among motorists. sustainable urban mobility is a key factor for the quality of life of citizens which country, increasingly large number of the population lives in urban areas. Integration and interoperability of different transport networks visible in the document as the key to improved urban mobility, together with increased travel information.

### 3.3.2 Discussion

#### a. Website

Website is the main entry point for most riders when used for the first time. Home pages have a description of the project, links to various interfaces, and further details about the research is driven by apps. Three main interfaces supported by a website that is the standard web desktop interface, the Android mobile-optimized web interface and the text-only web interface.

##### 1. The standard web desktop interface

designed to mimic the free Google Maps interface of the major sites many users are already familiar with it. Specifically, the main view is a map view of Google, the search field at the top and the search results on the left panel. Users can browse the maps directly to see a transit stop in specific locations, in addition, users can search by route to show the route map and stops along the route.

##### 2. The Android-optimized mobile web interface is

designed first and foremost for mobile browser on Android. Web apps optimized is just to run something like "apps" on the phone. Web apps This basically consists of web pages that are optimized on a touch screen Android web browser. When the original application was finally allowed in Android, the author finally developed and released a native app for Android that can take advantage of the location and mapping features of the phone.

3. The text-only web interface is designed to be used with a web browser only very basic text on the phone's features. It does not use graphics and layout are very basic to display the information. Features offered and navigation is very similar to the interface of Android optimized mobile web, but only presented using a simple layout.

#### a. Android app

Android app provides applications to identify locations to quickly access real-time arrival information for public transit nearby. In contrast to the interfaces described so far, Android has a built-in localization capabilities, using sensor data fusion of GPS, WiFi and cell-tower localization for a quick gain and improve location on a user's phone. This location information can significantly reduce the time required to access real-time arrival information to a stop nearby. Extra keys outside of the ability to know the location of Android has a lot of the same features available on other interfaces: map, bookmark, view recent stop, and seek dismissal by route, address, and via a number.

#### b. API

Application programming Interfaces (APIs), this android app is supported on the backend with a web-based API, a standard technique to provide dynamic data to mobile applications. When authors create APIs for Android, the author decided to make freely available API for developers so they can create their own applications.

#### c. The Service Alerts web app

The author believes that the real-time public transport information of all kinds is important in improving the usability of public transport. One important component of real-time information including service alerts: details about changing the route, cancellations, delays, and other changes in service. Inform motorists about the service marks a timely manner is crucial to improve the rider experience.

### 3.4 College Bus Android Application Using GPS Tracking

An International Journal of New Innovations in Engineering and Technology ISSN: 2319-6319 Vol. 4 Issue 4, April 2016 Written by G.Kiran Kumar, CB Aishwarya, & A. Sai Mounika of the Department of CSE, MLRIT, Hyderabad, India.

#### 3.4.1 Results

this android application using the help of GPS, GPRS, GSM and Google maps to track and find a campus bus. This application successfully demonstrated the bus location via Google maps. This system can be extended to multiple applications as follows:

1. Anti-theft system for cars and bicycles.
2. Managing public transport buses and trains.
3. Tracking valuable asset.
4. As the vehicle management software for transport companies. And there are many more similar applications and thus, the system is able to prove and be very helpful in the future.

#### 3.4.2 Discussion.

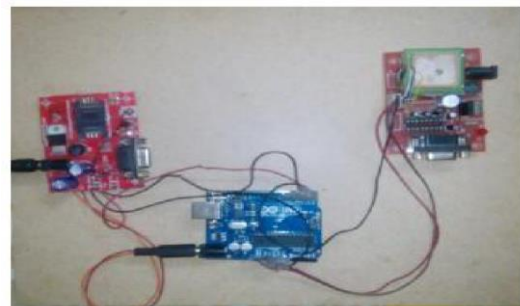
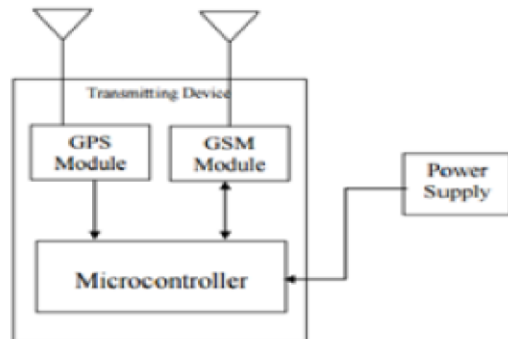
##### A. Description of Hardware Units:

1. Global Positioning System (GPS): Technology has advanced rapidly in recent years and has become very easy for people to use tracking system. GPS stands for Global Positioning System has a number of applications currently popular the field of navigation, tracking, etc. GPS is a space-based navigation system that provides location and time information in all conditions.

weather

2. Global System for Mobile communications (GSM): A GSM module works as a modem for transmitting data to the server. Communication of data using GPRS (General Packet Radio Service). One of the key features of GSM is the Subscriber Identity Module, commonly known as the simcard.

3. Microcontroller Arduino



**Figure 5** Hardware Setup

is an open-source prototyping platform is easy to use hardware and software. Arduino board can read the input - light on the sensor, the finger on the button, or the Twitter message and convert it into output, we can tell the council what to do by sending a set of instructions to the microcontroller and then placed on a board. To do so, we are here using the Arduino programming language and Arduino software (IDE).

##### B. Description of Monitoring Unit:

Application monitoring is to provide the use of the user friendly, the platform in terms of tracking the user friendly where students and faculty staff will be able to easily find the bus campus. This monitoring applications will be an android-based application. To access the campus bus location, users will need a android based phone with internet access. As the user opens the application, the application will download the values of the longitude and latitude of the server with a static IP address via the GPRS network and show real time current location of the campus bus. This app will automatically take the coordinates and shows the output in the form of an integrated Google map in it.

##### C. Experimental Setup

1. System Specifications:

Interface Hardware for this application is the Client PC with Internet connection, Server with Static IP, GSM SIM card with GPRS enabled. Interface Software for this application is Android Studio and Google Maps API.

Hardware Unit:

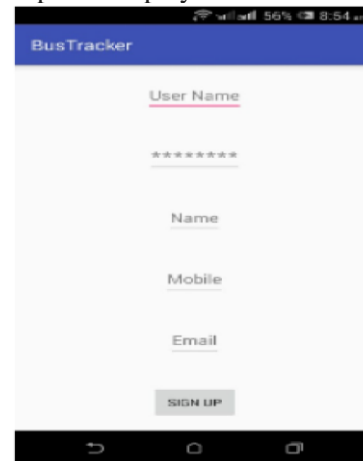
hardware unit shown in the figure below. The hardware unit consists of a GPS module, GSM module and microcontroller Arduino. GSM SIM card is inserted and connected to the power supply. Microcontrollers by using the command dumped into it, it takes latitude and longitude of the current position of the GPS module and passes it on to the GSM module. GSM will be connected to the server via GPRS. Thus the values can be stored into the database on the server.

Software Unit:

Android apps are shown in the image below. This application will display the output via Google maps. Once the user opens the application, it shows the login and registration pages. If the user is a new user, he can register by using the registration. If he is already registered, then the username and password used to login. Once logged in, users can find the bus using Google maps. Google maps showing the exact location of the campus bus. Location is derived from the database server where the coordinates are stored. This location is transferred as a Google map and displayed to the user



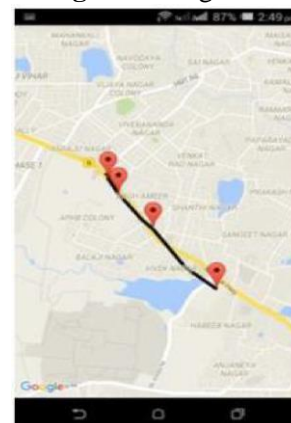
**Figure 6** Login



**Figure 7.** Register



**Figure 8** Location of The Bus



**Figure 9** Bus Stops

Figure 3.7 shows the login page. This page is displayed every time a user opens the app. Users, if already a member, can provide a username and password and log into the application. Registration page can be opened to register as a member. The registration page shown in Figure 3.8. 3.9 image shows the campus bus location using Google Maps. The bus stop can also be seen on the map. The bus stop is marked all over the bus routes, as shown in Figure 5:10.

*3.5 Analysis and Design Prototype Tracking Application Bus University Multimedia Nusantara on the Android Platform*



Is Journal, *ULTIMA Info sys* Vol. IV, No. 1 ISSN 2085- 4579 June 2011. The Journal is written by Edgar Winata and Johan Setiawan from the Department of Information Systems, Multimedia Nusantara University, Tangerang, Indonesia.

### 3.5.1 Results

a. The prototype of application *tracking* this campus bus designed for the care of the Marketing section campus bus and student campus bus transport service users and uses of *smart phones* with Android operating system version 2.2 (Froyo). The prototype application built using Android version 2.2 (Froyo) because its quite a lot and can be used also on *smart phones* with Android operating system that is newer than the version 2.2 (Froyo).

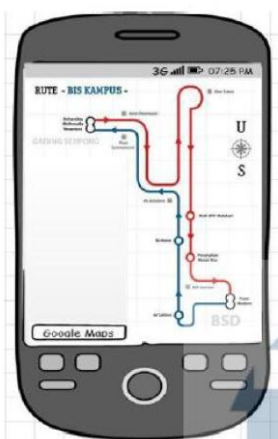
b. Application prototype *tracking* This bus is the facilitator for the user to be able to see and know the campus bus service, position the campus bus, bus stops dot the campus and campus bus schedule.

### 3.5.2 Discussion

#### A. System Overview

Prototype or system that will be designed for students Multimedia Nusantara University campus bus transport service users who travel from home to campus and vice versa. Or prototype system is designed app on *platform* the Android that can only be used by students who use a *smart phone* operating system Android. System or application that created it allows the user to see the information and the position of campus buses. Several bus information which can be viewed by the user, among others: the location of the bus position campus, the campus bus routes, bus stops dot the campus and campus bus schedule. Some basic description and features of the applications made:

1. A basic map that will be used is *Google Maps*. On *Google Maps*, there are several types of map views include *Satellite View* and *Street View*. In a prototype application that will be created will use *View Street*
2. Each time a user opens the app, it automatically captures the position of the most recent bus from the web server. *Refresh* automatically performed every 1 minute.
3. At the time of opening the app *default* will display a map, campus bus service, bus stops dot the campus, and campus buses position.
4. Scheduling buses will be stored in a database so that in the event of a schedule change does not need to do an update on the application, but will read a bus schedule data in a database on the web server
5. To get the last position of the bus needed an application *send point* that would needs to be installed on a mobile phone Android needs to be placed on the bus. The application allows you to read and send coordinate position in point *Latitude* and *Longititude* format. Point *Latitude* and *Longititude* the server. The database of point data *Latitude* and *Longititude* read by the application *tracking* and displayed in order to see the position of the last bus.



**Figure 10** Sketch Main Page Views



Bus Schedule: shows a bus schedule page. **Figure 11** Main Menu page



**Figure 12** Sketch Bus Schedule Page Views Sketch

## B. User Interface Design Sketch

Sketch of *the user interface* on this application is divided into several sections according to application requirements. Sketch of a user interface designed among other things is *the user* the main page of interface, *the user interface* with the main page of the menu panel, and *the user interface* bus schedule page. On the main page (see Figure

3.11 above) will display a map based on Google Maps. On the main page the user can view the route to and from the bus campus, where the position of the bus, and the dots bus stop campus if the user pressing the "menu" on the Android phone, it will display a menu panel as in Figure 5:12 where there are several menus like "My Position", "Bus Position", "Bus Schedule" and "Exit". Below is an explanation of the menu fourth:

My Position: shows the position of application users.

Bus Position: refreshes to the position of the bus

## C. Sketch Page views bus schedule

bus schedule On the page (Figure 3.13), displayed the scheduled departure time of dots bus bus stop. The bus schedule page created with tables. In order to facilitate the transfer or bus schedule updates, the database so that future whenever there are changes in campus bus departure schedule is not necessary to perform an update on the application. On this bus schedule page when pressing the button "back" on your Android phone will go back to the main page. When pressing the "menu" on the Android phone will not display or perform any action.

## D. Database Design

Needs database in the application needs to store a variety of information necessary bus and bus schedules. The table will be created in the database include tables Bus, Log bus table, schedule table, the table location, and table departures.

## E. Use Case

In this use case diagram consists of several *use cases* that can be done by the User actor. Figure 3.14 is a picture use case diagram campus bus tracking application. Actor Users can see the bus service, the position of the bus, the bus stop point, and its position on the main page. Additionally actor Users can also see the bus schedule at the bus schedule page.

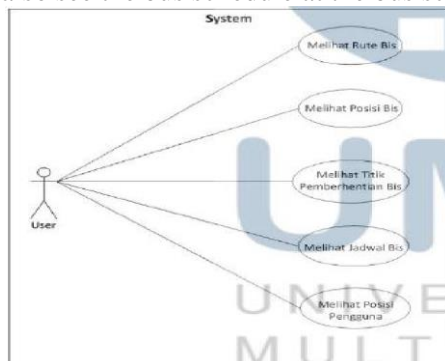


Figure 13 Use Case Diagram

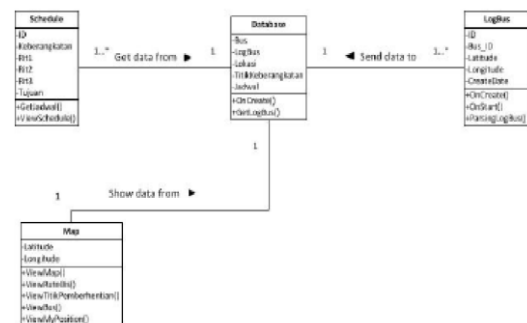


Figure 14 Class diagram

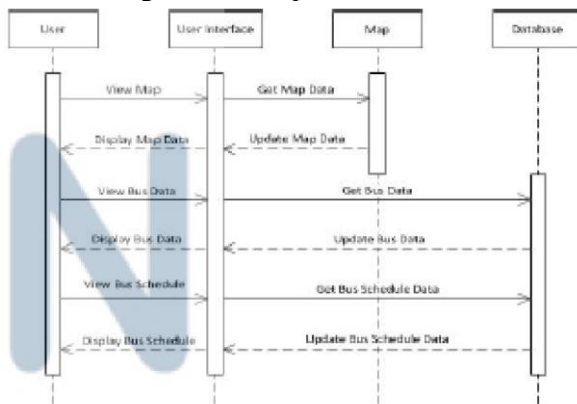
## F. Class Diagram

Class diagram in this application consists of several classes, including class maps which describe the object folder on the application, the Database class describes an object database that is used in applications, Log Bus class describes an object that sends the latest position buses will be stored in the database, and Class schedule describes an object that is used to store and display the bus schedule.

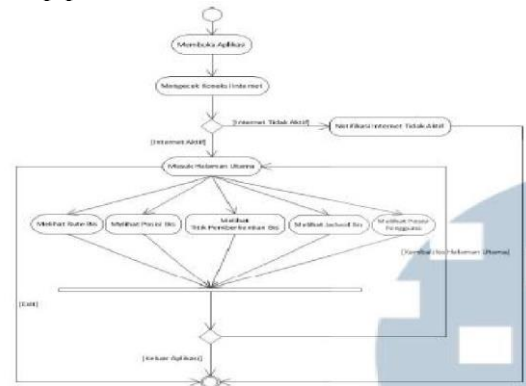
## G. Sequence Diagram

Sequence diagram describes the interaction of objects that are interrelated. In this sequence diagram illustrates the flow of events an activity to illustrate the flow of data from the application. Figure 4.6 is a drawing sequence diagrams on the campus bus tracking application. In sequence diagrams, *users* see through the *User Interface*. User Interface Map data request via the Google Maps API to display map.

Users view data via the User Interface bus, a data bus retrieved from the database. Data bus route bus taken, among others, the position of the bus, and the bus stop point.



**Figure 15** Sequence Diagram



**Figure 16** Activity Diagram

Users can also see the bus schedule via the User Interface on the schedule page. By the time the User would like to see the bus schedule, schedule page User Interface retrieve data bus schedules from the database.

#### H. Activity Diagram

Activity starts when you open the application. When first opened, the application will check for the availability of an Internet connection. If there is no internet connection will get a notification that the internet is not active. If there is an internet connection then it will go to the main page. On the main page there is some *activity* that can be seen, among other things see the bus, look at the position of the bus, the bus stop viewing point, see the bus schedule, and see the position of the user. If already perform *activity* such can select the option to return to the main page or exit the application. From the main page can exit directly from the application by selecting Exit choice.

#### I. Application Development tools and

In the programming on the application, the program code created using a software specification as follows:

1. Programming Language: Java, PHP
2. Software Prerequisites: Eclipse 3.6.2, the Android SDK, Java Runtime , Apache Server.
3. Extension Library: lib curl, android.jar and maps. Jar (com.google.android.maps)
4. Additional Tools: Dreamweaver, php MyAdmin.

The minimum specification for computer hardware needed to build an application:

1. Operating System: Windows XP
2. Space Requirement: 1 GB
3. Random Access Memory Requirements: 512 MB
4. Additional Tools: Mobile Android Froyo minimum.

## 4. Conclusions And Recommendations

### 4.1 Conclusion

Based on the journal's four authors concluded that the GPS tracker can certainly be applied to the vehicle bus, and the authors think it would be more effective, since the bus is public transportation.

1. The workings of this system is that GPS uses satellite signals system that captures the signal from a GSM card (Global System for Mobile Communication). The arrests signal captured by the GPS sensor and translated into coordinates and managed by the data processing system of the GSM card. So that's why GSM card used must have a strong and stable signal.

2. Application of GPS Tracker on a bus, at a bus laid a device called a GPS Tracker, the most important part in the GPS navigation systems is several satellites in orbit earth or what we often call in space. GPS satellites currently numbering 24 units, all of which can emit signals to Earth that can then



be captured by a receiver such signals or GPS Tracker, from satellites that captured earlier will result in the coordinates, while to locate the position of the coordinates had been integrated into the map, so the user must use a smart phone that already has a GPS feature.

#### 4.2 Suggestion

Author is making this application will provide a positive impact for the community, so it is expected in the future will be made a bus tracking application that this study is not only limited to my analysis. The cooperation of many parties including the government will be needed in the socialization of tracking applications is later, so that all elements of society can feel good or positive impact of this application.

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