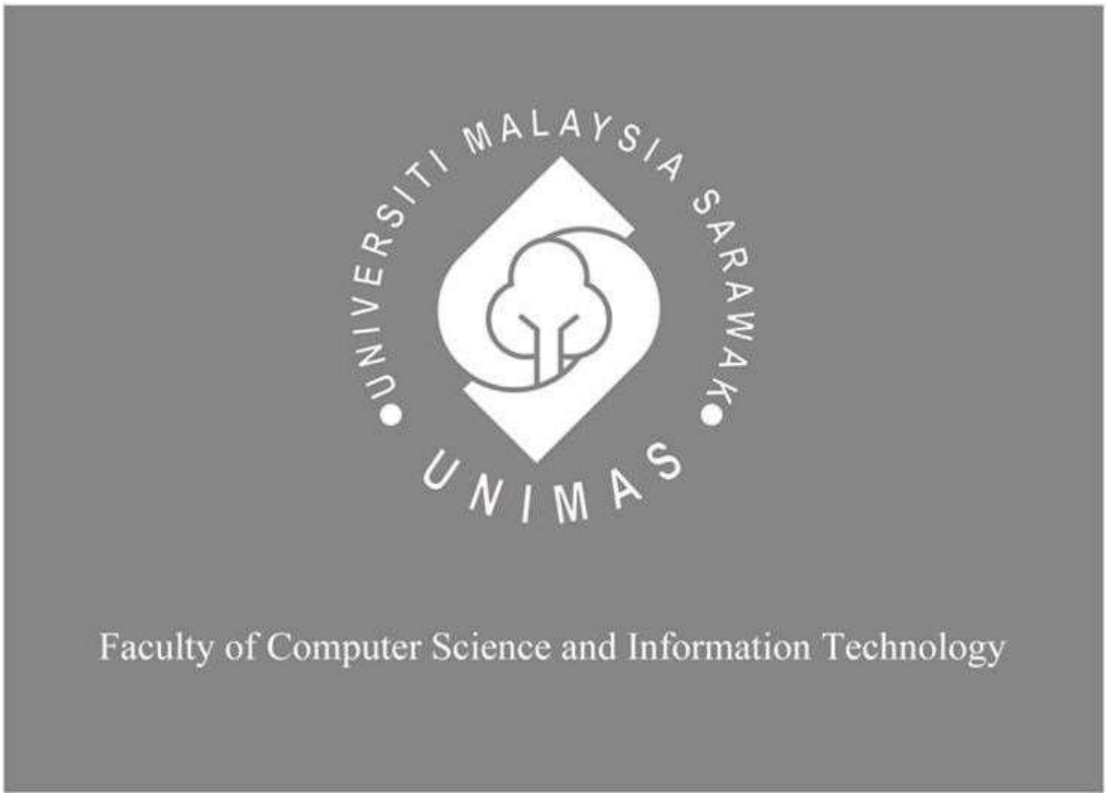

REAL TIME MOBILE-BASED BUS TRACKING

Siti Nur Afiqah Binti Nandu

Bachelor of Computer Science with Honours (Information System)

2019

REAL TIME MOBILE-BASED BUS TRACKING

SITI NUR AFIQAH BINTI NANDU

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Dr LAU SEI PING
Senior Lecturer
Faculty of Computer Science and Information Technology
Universiti Malaysia Sarawak
(SUPERVISOR'S SIGNATURE)

Permanent Address

Jalan Tanah Merah, Kg Merotai Besar, Peti Surat 60040, 91010, Tawau, Sabah

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ACKNOWLEDGEMENT

I would like to express my gratitude to God for giving me the strength to make this far. As for my supervisor, Dr Lau Sei Ping, thank you for accepting me to be under your supervision and guide me step by step throughout my Final Year Project 1 and 2. Furthermore, I would like to express my deepest appreciation to my parents who always encourage and support me along my journey in finishing my Final Year Project during the pandemic of COVID-19. Last but not least, for my friends, thank you for giving me motivational support to keep going whenever I need it the most.

ABSTRACT

In this era of globalization, the probability of bus services to get a passenger has become lower as there is much public transport that can provide more comfortable and user-friendly services. However, some people still choose to ride the buses over other public transport because of the fare is much more affordable. Most of the students in Universiti Malaysia Sarawak is using bus services as their main transportation to go to the lecture. Nevertheless, the time taken for them to wait for the bus is much longer compared to other public transport such as e-Hailing services. What will happen if there is an application that can help the student to track the location of the bus so that they can reduce the waiting time for them to wait for the bus until it arrives?

ABSTRAK

Pada era globalisasi ini, kebarangkalian bagi perkhidmatan bas untuk mendapatkan penumpang semakin berkurangan kerana wujudnya lebih banyak pengangkutan awam yang menyediakan perkhidmatan yang lebih selesa dan mesra pengguna. Walau bagaimanapun, terdapat segelintir masyarakat yang masih menggunakan bas sebagai pengangkutan utama kerana tambang yang dikenakan lebih berpatutan berbanding pengangkutan yang lain. Kebanyakan pelajar di Universiti Malaysia Sarawak menggunakan perkhidmatan bas sebagai pengangkutan utama mereka untuk pergi ke kuliah. Namun, masa yang diambil untuk mereka menunggu bas adalah lebih lama berbanding pengangkutan awam yang lain seperti perkhidmatan E-hailing. Apakah yang akan terjadi sekiranya terdapat satu aplikasi yang dapat membantu pelajar menjejak lokasi bas agar mereka dapat mengurangkan masa untuk menunggu bas sehingga sampai?

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CHAPTER 1

1.1 Introduction

Global Positioning System which is constantly called GPS as an abbreviation was initially built by the U.S. Department of Defense where it was often referred to the American navigation system known as NAVSTAR (Kyes, 2017). Kyes (2017) claimed that during 2004, Qualcomm completed tests of live assisted GPS on mobile phones. Block II satellites were launched in 2008 followed by GPS IIF satellite in 2016 (Kyes, 2017).

Global Positioning System is one of the most crucial features that needed when it regards to tracking application. GPS has been quite popular for the past recent years along with the rapid growth of technologies. It also contributes a lot in our daily life such as finding a destination, finding the best route, tracking the location of e-hailing services, telecommunication and more. Real Time Mobile-Based Bus Tracking is a mobile-based application that can track the location of the bus in real-time by using the help of GPS and it has three stakeholders which are student, bus management, and bus driver.

The purpose of this project is to help the student know the location and the estimated time arrival of the bus in real-time. It is because the student always misses the bus even though they have followed the bus schedule. Besides, bus management can fulfil the service level agreement that they have signed with bus drivers. The management is not able to monitor either the bus driver is operating on time or not and this can weaken the trust they have with each other. Moreover, this project can help the bus drivers to prove their work efficiency and increase the evaluation of their performance by verifying the bus operation based on the bus

schedule. As the bus driver represents the image of the bus company, thus the quality of work delivered by them needs to be monitored for them to keep providing the best services.

Real Time Mobile-Based Bus Tracking will be using a mobile phone as a device to track the location of the bus. The mobile application will be installed on the bus driver's phone and the student will be able to track the location of the bus through this. The reason of using a mobile application instead of installing a GPS device is because the buses that used to take the students are changing every time and it will cost a lot if the devices need to be installed in each bus.

1.2 Problem Statement

Problem statement of this project will be as follow:

i. The student could not estimate the time arrival of the bus.

   Although the schedule of the bus has been distributed to the student, there are a few factors that might affect the timely arrival of the bus such as speeding, traffic jam or the time taken for the bus to load the students and the student have no information about this.

ii. The student could not estimate the location of the bus.

   The student only knows when the bus will arrive as it has stated in the bus schedule. They did not know where the exact location of the bus at the current time. As the bus will stop at many pickup points, the student needs to know where the nearest place they can wait for the bus instead of going to the main waiting venue to wait for the bus.

iii. No proper system that can inform on the operation of the bus.

   Bus management has no information on the current status of the bus, whether the bus driver operates within the scheduled time or not. It makes it harder for them to monitor the performance of their employees.

1.3 Objective

The objectives that will be achieved through this project are:

i. To reduce the waiting time for the student

ii. To locate the real-time location of the bus

iii. To evaluate the performances of the bus service based on arrival time at each designated stop

1.4 Methodology

The methodology that will be used for this project is Rapid Application Development (RAD). The reason for the RAD methodology being used for the Real Time Mobile-Based Bus Tracking is because it allows to break down the project into smaller manageable tasks, suitable for a short time frame and more (Anderson, 2019). There are 4 phases in this methodology which are shown in Figure 1.1 below (Team, 2018).

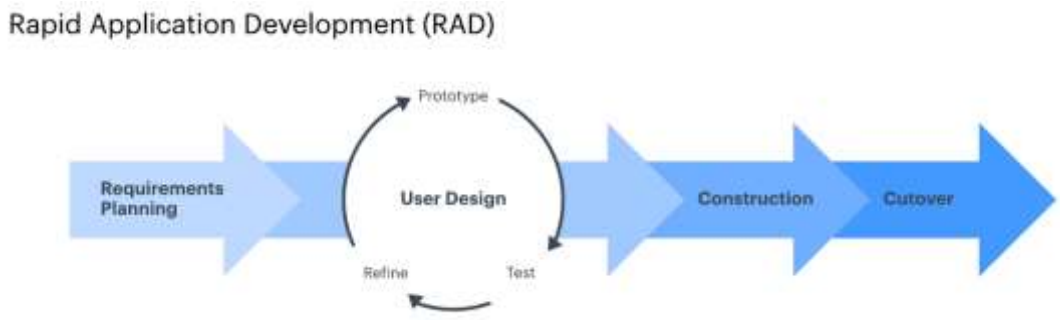


Figure 1.1: Rapid Application Development (RAD)

1.4.1 Requirement Planning

The first phase of RAD methodology which is requirements planning will be done in Chapter 1 and Chapter 2. As the current problem faced by the stakeholders need to be determined, a met up with the stakeholders which were bus operator, students, and bus management was conducted. The objectives and goals of this project also had been discussed during the met up. Next, the background study of this project will be presented. Several existing systems will be analysed and compared with the proposed system. The purpose of this comparison is to determine the features that can be improved and implement in the proposed system.

1.4.2 User Design

The second phase is user design and will be done in Chapter 3, Requirement Analysis and Design. An observation will be conducted to prove that the Real Time Mobile-Based Bus Tracking is a need for the stakeholders. Database and system features will be designed during the user design phase. Entity Relationship Diagram (ERD), Use Case, Class Diagram and System Sequence Diagram (SSD) will be used to present the design. Besides, a low fidelity prototype of the system might be expected during this phase.

1.4.3 Rapid Construction

Rapid construction is the third phase of RAD methodology and will be done in Implementation and Testing, Chapter 4. This phase is where the application coding, testing and integration taking place (Anderson, 2019). This phase will be repeated until the requirement is met. The database will be set up based on ERD that has been designed in the User Design phase. The coding of Real Time Mobile-Based Bus Tracking will be

implemented in this phase. The programming languages that might be used are PHP, SQL, HTML, CSS, and JAVA.

1.4.4 Cutover

Cutover will also be included in Chapter 4, Implementation and Testing. As the project has been developed, it will be tested and evaluated during this phase to determine whether the objectives of the project have been achieved or not.

1.5 Project Scope

Real Time Mobile Based Bus Tracking will be done for the bus route within Rafflesia Residential College and UNIMAS. This college provides a bus service that picks up and drops off students of UNIMAS to the main campus. Most of the college residents are taking the shuttle bus as their transports to go to their class.

Besides, the bus service was conducted by a private company. Two bus drivers will be on duty in a day and they will be using two different routes for the bus to go through every day. However, there is only one route used in one operation. There are six stopping points for the bus driver to pick up and drop off the UNIMAS students who are taking the bus.

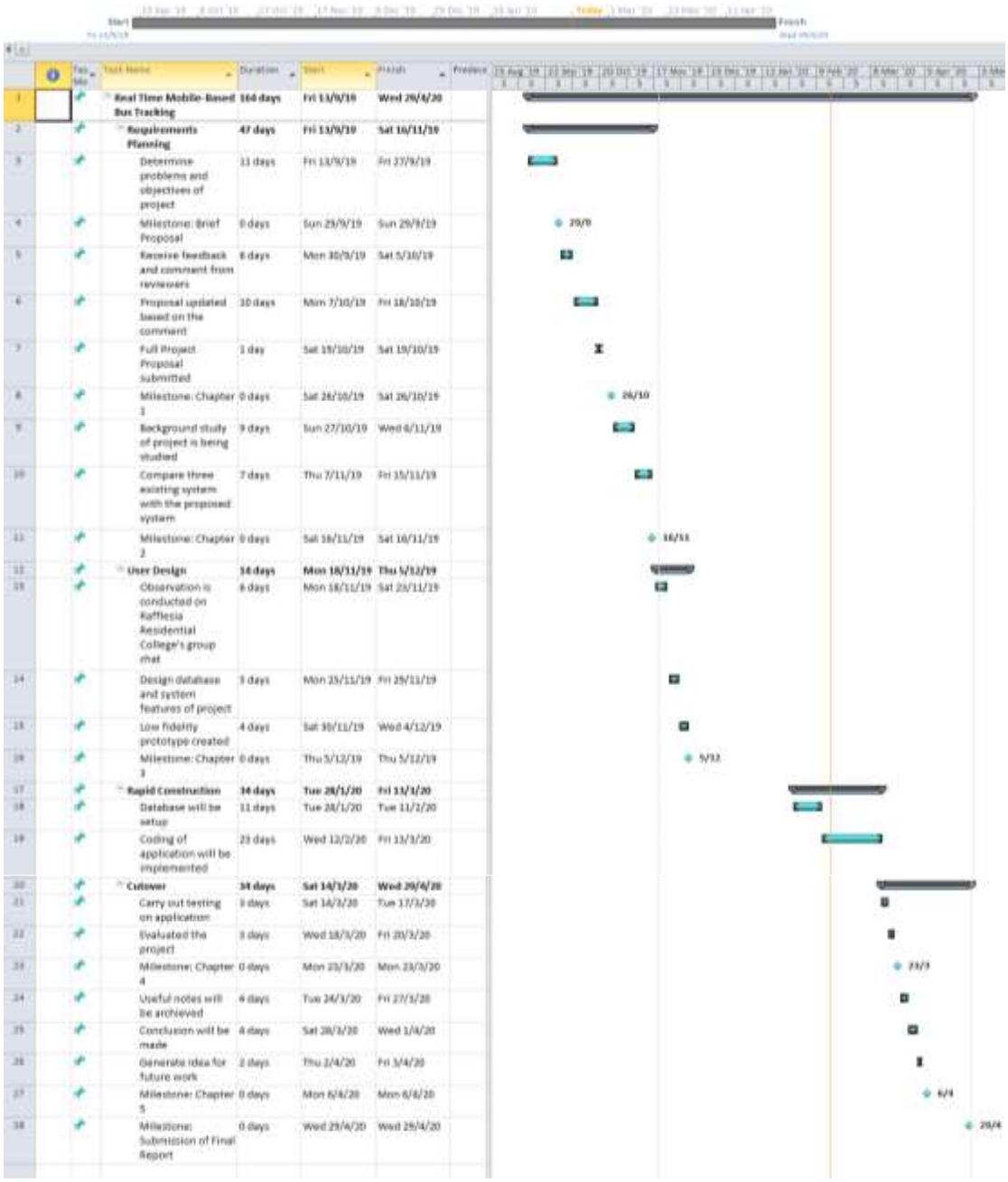
This project will have three types of stakeholders which are student, bus driver and bus management. Two platforms will be used to represent the Real Time Mobile-Based Bus Tracking which is mobile application and web management system. The mobile application will be specific for android users only and will be available for student and bus driver while web management system will be available for the bus management only.

1.6 Significance of Project

This project will help the student to get on the bus on time and avoid missing the bus if the objectives of this project are being achieved. As they get to see the estimated time arrival of the bus at each stopping points, the students can reduce the waiting time for them to wait for the bus to arrive. For bus management, they will be able to track the performance of the bus service serves by their employee. This project also will help the employees who are bus drivers to prove their work efficiency and increase their performance.

1.7 Project Schedule

This final year project will be held for 2 semesters and it has two parts which are Final Year Project 1 and Final Year Project 2. It starts from 13th September 2019 until 08th May 2020. Figure 1.2 shows the Gantt chart of the project schedule.



	Task Name	Duration	Start	Finish
1	**Real Time Mobile-Based Bus Tracking**	**164 days**	**Fri 13/9/19**	**Wed 29/4/20**
2	**Requirements Planning**	**47 days**	**Fri 13/9/19**	**Sat 16/11/19**
3	Determine problems and objectives of project	11 days	Fri 13/9/19	Fri 27/9/19
4	Milestone: Brief Proposal	0 days	Sun 29/9/19	Sun 29/9/19
5	Receive feedback and comment from reviewers	6 days	Mon 30/9/19	Sat 5/10/19
6	Proposal updated based on the comment	10 days	Mon 7/10/19	Fri 18/10/19
7	Full Project Proposal submitted	1 day	Sat 19/10/19	Sat 19/10/19
8	Milestone: Chapter 1	0 days	Sat 26/10/19	Sat 26/10/19
9	Background study of project is being studied	9 days	Sun 27/10/19	Wed 6/11/19
10	Compare three existing system with the proposed system	7 days	Thu 7/11/19	Fri 15/11/19
11	Milestone: Chapter 2	0 days	Sat 16/11/19	Sat 16/11/19
12	**User Design**	**14 days**	**Mon 18/11/19**	**Thu 5/12/19**
13	Observation is conducted on Kafflesia Residential College's group chat	6 days	Mon 18/11/19	Sat 23/11/19
14	Design database and system features of project	3 days	Mon 25/11/19	Fri 29/11/19
15	Low fidelity prototype created	4 days	Sat 30/11/19	Wed 4/12/19
16	Milestone: Chapter 3	0 days	Thu 5/12/19	Thu 5/12/19
17	**Rapid Construction**	**34 days**	**Tue 28/1/20**	**Fri 13/3/20**
18	Database will be setup	11 days	Tue 28/1/20	Tue 11/2/20
19	Coding of application will be implemented	23 days	Wed 12/2/20	Fri 13/3/20
20	**Cutover**	**34 days**	**Sat 14/3/20**	**Wed 29/4/20**
21	Carry out testing on application	3 days	Sat 14/3/20	Tue 17/3/20
22	Evaluated the project	3 days	Wed 18/3/20	Fri 20/3/20
23	Milestone: Chapter 4	0 days	Mon 23/3/20	Mon 23/3/20
24	Useful notes will be archieved	4 days	Tue 24/3/20	Fri 27/3/20
25	Conclusion will be made	4 days	Sat 28/3/20	Wed 1/4/20
26	Generate idea for future work	2 days	Thu 2/4/20	Fri 3/4/20
27	Milestone: Chapter 5	0 days	Mon 6/4/20	Mon 6/4/20
28	Milestone: Submission of Final Report	0 days	Wed 29/4/20	Wed 29/4/20

Figure 1.2: Gant Chart

1.8 Expected Outcome

The expected outcome of this project is a mobile-based application which can allow the student to view the current location of the bus, the next stop of the bus and the estimated time for the bus to arrive. The student also will get to view the bus schedule prepared by the management through the mobile application. It also allows the bus drivers to initiate the application by choosing which route will be used. Bus drivers will play a big role in this project as they need to tap on the start route button for the application to carry out the task. As for the bus management, a web management system will be created to monitor the performance of their employee and set up the coordinates of each stopping points. Moreover, the management will be able to register the information about the bus and the drivers.

1.9 Outline of Project Report

Real Time Mobile Based Bus Tracking project report will consist about five chapters which are Introduction, Literature Review, Requirement Analysis and Design, Implementation and Testing, Conclusion and Future Work. In Literature Review, Chapter 2, it will consent about the background study of this project. The differences between the similar project with the proposed project will be compared.

Besides, for Requirement Analysis and Design in Chapter 3, the Rapid Application Development method will be discussed more detail on how to apply it in this project. The step by step design and prototype maybe show in this chapter. As for Chapter 4 which is Implementation and Testing. The system has been completed and will be tested out in this chapter.

Lastly is Conclusion and Future Work in Chapter 5. the objectives of this project will be review again to conclude either it has been accomplished or not. The evaluation will be conducted to ensure the strength and weakness of this project. Some ideas of improvement will be stated to improve the weakness of the project for future work.

CHAPTER 2

2.1 Introduction

There are three existing systems which are FLGRide, NextGUTS and MSL that is being compared with the proposed system. MSL was used by a company of charter and shuttle bus services while FLGRide and NextGUTS were used in the university environment. FLGRide and MSL are mobile application while NextGUTS is just a feature in a mobile application. The similarities and differences of all existing system will be described in this chapter.

2.2 Existing System

2.2.1 FLGRide Mobile Application

Northern Arizona Intergovernmental Public Transportation Authority (NAIPTA) is a transport agency that operating Mountain Lift, Mountain Link and Mountain Line system placed in Flagstaff, Arizona ("About Us - Mountain Line | Fixed Route Service in Flagstaff," 2019). Northern Arizona University has collaborated with NAIPTA to provide a shuttle bus for the people in their community during university closure and recognized holiday ("Shuttle Information | University Transit Services," n.d.). This article mentioned that Mountain Link is the bus that operating during this period and it can be tracked by using FLGRide Mobile Application.

FLGRide Mobile Application can be used in Android and iOS. Thus, it can be downloaded from both stores. The application is providing real-time and accurate arrival times for every Mountain Line Bus. FLGRide mobile application allows the passenger who wishes to ride the