MOBILE APPLICATION FOR E-SAMAN SYSTEM

MUHAMMAD NAZMI BIN ABDUL HADI

UNIVERSITI MALAYSIA PAHANG

UNIVERSITI MALAYSIA PAHANG

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Alamat tetap:

F15, Rumah Kakitangan   Penyelia: Dr. Mohamad Fadli Bin Zolkipli
Kilang Sawit Neram, 26160
Kuantan, Pahang.

Tarikh:………………………   Tarikh:……………………………..

MOBILE APPLICATION FOR E-SAMAN SYSTEM

MUHAMMAD NAZMI BIN ABDUL HADI

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I hereby declare that the work in this thesis e n t i t l e d "*Mobile Application for E-Saman System*" is my own research except for quotations and summaries which have been duly acknowledged. The thesis has not been accepted for any degree amd is not concurrently submitted in the candidature of any other degree.

Signature   : ....

Name   : Muhamad Nazmi Bin Abdul Hadi

Matric ID   : CA12004

Date   : ....

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I hereby declare that I have read this thesis and in my opinion this thesis/report is sufficient in terms of scope and quality for the award of the degree of Bachelor of Computer Science (Computer Systems & Networking) with Honours.

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Supervisor   : Dr. Mohamad Fadli Bin Zolkipli

Date   : ....

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ABSTRACT

Mobile technology has nowadays become trend in various fields either in business, education, health, engineering, etc. The need of mobility in accomplishing work is increasing as the technology created more advanced mobile devices that are capable in multitasking such as the smartphones. The manual summons system for Security Department of Universiti Malaysia Pahang is an example of manual system that can be transformed into mobile system. The transformation project is called Mobile Application for E-Saman System. The E-Saman System is the summons management system that managed summons records while the mobile application act as the electronic summons recorder. The purpose of developing the application is mainly to assist security officer of UMP Security Department to record summons among students and staffs of UMP. The application will be developing for use on mobile device that run Android operating system platform. The result of developing this application is expected to reduce time consuming in summons activity and provide better data management of summons records.

ABSTRAK

Teknologi mudah alih telah menjadi trend hari ini dalam pelbagai bidang sama ada dalam perniagaan, pendidikan, kesihatan, kejuruteraan dan lain-lain. Keperluan mudah alih dalam menyelesaikan kerja semakin meningkat kerana teknologi teknologi maa kini telah menghasilkan peranti mudah alih yang lebih maju yang mampu dalam menjalankan pelbagai tugas, contohnya seperti telefon pintar. Sistem saman secara manual Jabatan Keselamatan Universiti Malaysia Pahang adalah satu contoh sistem konvensional yang boleh diubah menjadi sistem mudah alih. Projek transformasi ini dipanggil Aplikasi Mudah Alih bagi Sistem E- Saman. Sistem E- Saman adalah sistem pengurusan saman yang berfungsi untuk menguruskan data saman manakala aplikasi mudah alih berfungsi sebagai perekod saman elektronik. Tujuan membangunkan aplikasi ini bertujuan untuk membantu pengawal keselamatan di Bahagian Keselamatan UMP untuk merekod saman trafik dalam kalangan pelajar dan staf UMP. Aplikasi ini akan dibangunkan bagi kegunaan pada peranti mudah alih yang mempunyai sistem operasi Android. Hasil dari pembangunan aplikasi ini dijangka dapat mengurangkan masa dalam aktiviti saman dan menyediakan sistem pengurusan data saman yang lebih baik.

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LIST OF ABBREVIATIONS

UMP	Universiti Malaysia Pahang
PDA	Personal Digital Assistant
PHP	Hypertext Preprocessor
iOS	iPhone Operating System
JPJ	Jabatan Pengangkutan Jalan
AES	Automated Enforcement System
PDRM	Polis Diraja Malaysia
Myeg	Malaysian E-Grovernment Service Berhad
IDE	Integrated Development Environment
IBM	International Business Machines Corporation
HTML	HyperText Markup Language
XML	Extensible Markup Language
DB	Database
SDLC	System Development Life Cycle
SQL	Structured Query Language
CPU	Central Processing Unit
RAM	Random Access Memory
HDD	Hard Disk Drive
GSM	Global System for Mobile
SMS	Short Message Service
DFD	Data Flow Diagram
USB	Universal Serial Bus

CHAPTER 1

INTRODUCTION

1.1   Background

Mobile technology has become a necessity in daily life nowadays covering business and entertainment activities. Dr. Shem (2013), stated that ten years ago when the first smartphone launched by Blackberry company, it only supported basic call and text messaging, push email, internet faxing and web browsing. The mobile service at that time is limited and only base on personal communication and business oriented purposes.

Now in 2014, mobile technology has become common since the existence of many mobile devices and operating systems such as Apple's iPhone and iPad running iOS and smartphones running Google Android. Many mobile applications has been developed by application developers either for entertainment or to facilitate business process. Priya (2012), defined the term mobile application as applications developed for small handheld devices, such as mobile phones, smartphones, PDAs and so on. Therefore, with mobile applications available, people no longer need to involve in traditional method for business such as meeting

with customers or capturing and storing data manually on paper or desktop computer. Everything is done on the palm of our hands everywhere and anytime.

Mobile technology can benefits organizations by providing usability to its user as it is simple and allow reducing the need of man power. It also provides availability since a mobile application can be access via Internet which is widely available in most countries in the world. Many organizations also choose mobile technology because of its cost effectiveness and easy to manage. Many mobile applications available nowadays are developed and made free for consumers as most of it are developed using open source software and operating system such as Android. It can be concluded that mobile application is the most ideal option to develop a new system that require mobility and simplicity to assist daily activity.

1.2   Problem Statement

UMP Security Department is responsible for managing all security aspects in Universiti Malaysia Pahang including enforcing traffic law towards students and staffs. The common activity related to traffic law enforcement is traffic summon. Traffic summon is given by security guards towards staff and students who failed to follow rules such as vehicle parking at the restricted area, vehicle unregistered in UMP system, vehicle not displaying UMP sticker, students that do not bring matric card for identification, etc.

Currently, UMP Security Department is using manual method for traffic summon. Security officer will write traffic summon into summon sheet and give it to the traffic offenders either student or staff. Then, the security officer will bring the summon records to Security Department headquarters to be key in into the database. This current system is less effective since the process required more time and work by security staff. The data need to be key in manually one by one by referring to the summon sheet and recheck process is needed after that. The probability of human error to occur is high during key in process and it takes lots of time to finish. The risk of data loss or affected by human mistakes or incidents is also exist because summon is recorded on summon sheet that is perishable and less practical to be used for data recording.

Traffic summons will affect students for their graduation because it is considered as violation of university law to UMP. Students will be prevented from viewing their examination result or applying for graduation if they still not paying their summons and this will affect their studies. Therefore, a new reliable and effective application needs to be developing in order to solve the issue and provide a convenient system for UMP Security Department.

1.3   Goal and Objective

The goal of this project is to develop a Mobile Application for E-Saman System in UMP. The following objectives are:

i.   To identify problem of UMP Security Department in managing traffic summons in UMP.

ii.   To plan and design the architecture of Mobile Application for E-Saman System using Android application development method.

iii. To implement and develop Mobile Application for E-Saman System using software development tools.

1.4   Scope

i.   **Target Organization**

The application will be develop mainly for Universiti Malaysia Pahang (UMP). The purpose is to provide a new mobile application for traffic summons replacing the current manual summon system. The main objective of developing the application is to aid UMP Security Department Personnel with more convenient system of managing traffic summon in UMP.

ii.   **Application User**

The application target user is the UMP security officer. UMP security officer will use the application to record traffic summon of students and staffs. The application will be used by user on mobile devices either smartphone or tablet pc while they are on duty.

iii. **Function**

The application functionality is to record traffic summons to be transfer to the database of UMP Security Department. The application will use wireless internet connection to directly store summons record into database. Wireless connection will allow data to be updated into the server instantly in real time, thus solve the problem of late key in of summon data into system.

iv. **Application Platform**

This application will be develop and run using android operating system as a platform for mobile devices such as smartphone and tablet pc. Android operating system is used because it is widely used by people and operates on most of mobile devices available nowadays. Mobile platform is chosen as it is convenient to use on the move while the security officer is on duty.

1.5   Methodology

To develop Mobile Application for E-Saman System, a suitable approach has been used to ensure systematic development process. In this project, Mobile Application Development Life Cycle has been chosen as guideline, Appscend (2013). The life cycle of mobile development is largely no different than the System Development Life Cycle (SDLC) for web or desktop applications. There are usually five major phases of the process as in Figure1.1.
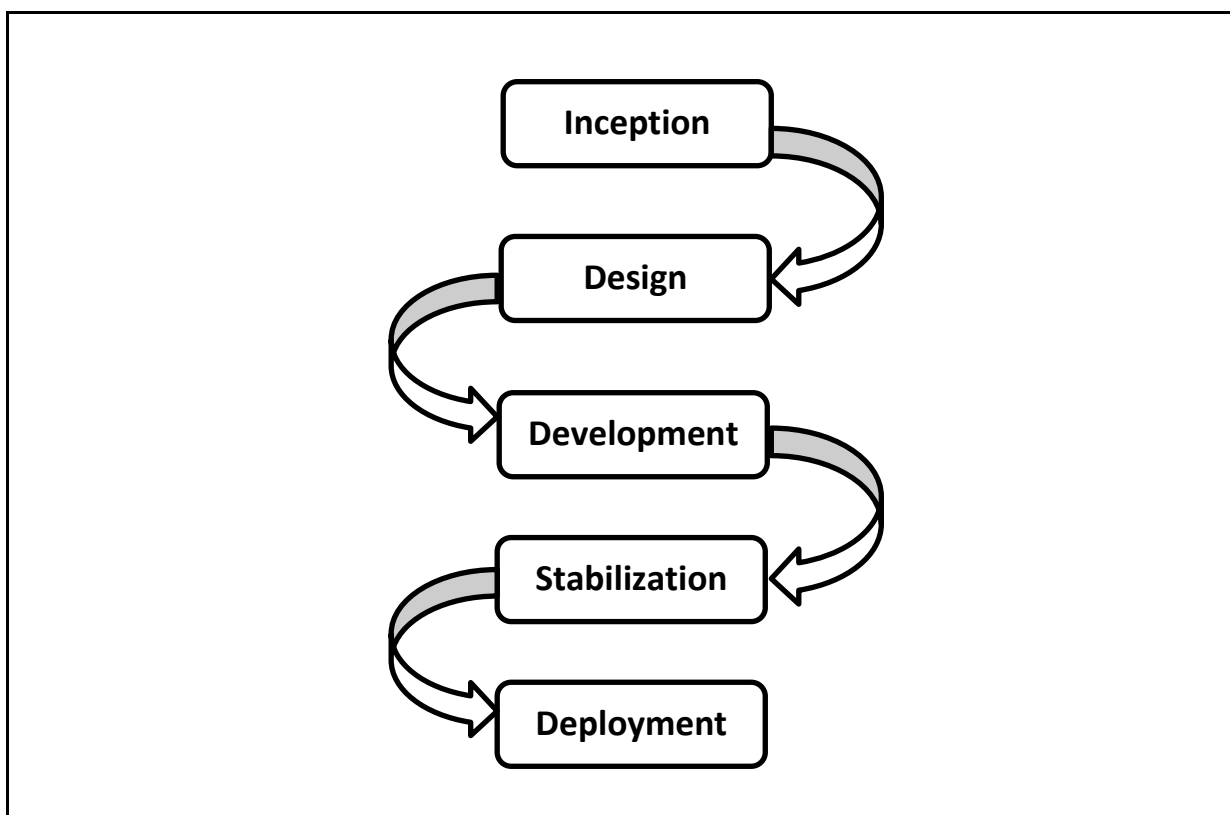

Figure 1.1: Phases in Mobile Application Development Life Cycle

a) **Inception**

This is the first phase in Mobile Development Life Cycle that will be used in the application development. This is the phase where an idea to propose the Mobile Application for E-Saman System is found by collecting information based on current existing problem face by UMP Security Department. The problem of using manual system to record summons is obtained and then refine into a solid basis for the application. The first project objective can be achieved after completing this phase.

b) **Design**

At this phase, the basic layout design and functionalities is proposed by considering based on User Experience (UX) factor. Then, a proper User Interface (UI) design is produced while considering the Interface Guidelines for various platforms. This is to ensure compatibility of application on various mobile devices and to design a good User Interface that match professional standard. The second project objective can be achieved after completed this phase.

c) **Development**

In this phase, the actual building of the application start after the concept phase has achieved some maturation. A working prototype is develop to validate functionality, assumptions, and helps to give understanding of the work scope. The designed prototyped is made to function. The third project objective can be achieved after completed this phase and Stabilization phase.

d) **Stabilization**

After the working system prototype is produced, it is test for any problem or bugs and fix in this phase. A beta version of the application will be release for wide user audience to get their feedback for any changes and improvements. The third project objective will be achieved after completing Development phase and this phase.

e) **Deployment**

After releasing the beta version and made improvement to the application, the final stabilized version is release to user during this phase. The distribution options depend on the application supported platforms such as Apple App Store for iOS applications, Google Play Store for Android applications, Windows Store for Windows Phone applications, etc. For the Mobile Application for E-Saman System however, the application is only introduced to the client which is UMP Security Department. They are also the user responsible to test the application and suggest any improvement or features to it.

All of the phases in the Mobile Application Development Life Cycle are done on a certain planned period of time. The Gantt chart of full schedule of the application development can be referred on Appendix A. The objective of this project can be achieved after all of the phases in the Mobile Application Development Life Cycle have been completed.

1.5 Summary

This chapter gave a comprehensive introduction to the Mobile Application for E-Saman System in general, as well as the step by step mobile application development life cycle to achieve the project goal. It introduced the purpose to develop the application, scope of user and general components of the application development including development platform and methods. The problems exist that resulted in this project development are also identified. The goal is set and few objectives are stated to be achieved by the end of this project. The scope of the application is set so that any procedure or methods planned to be used for development is suitably chose. The mobile application development life cycle is explained briefly to clearly describe the whole process of development to achieve success in this project. It is desired with the plan and procedure in this chapter will provide better facilities and guides for the mobile application development to proceed systematically.

CHAPTER 2

LITERATURE REVIEW

2.1 Overview

In this chapter, there will be six subtopics that will cover consists of the definitions of the Mobile Applications for E-Saman System, existing mobile applications, and software and hardware requirements to develop the application.

Subtopic 2.2 will describe the definition and structure of mobile application. Subtopic 2.3 will define and discuss about E-System, while subtopic 2.4 will explain the concept of E-Saman system. Subtopic 2.5 will cover on the existing mobile applications for E-Saman system and discuss in detail on the specifications and functions of current applications that can be improved on this project. The last subtopic 2.6 will discuss in detail about the software and hardware requirements in developing the applications in this project.

Overall contents in this chapter will provide the detail information regarding the method of implementation that will be carried out in this project.

2.2   Mobile Application

Mobile applications trend has been implemented in various fields such as business and entertainment. In 2013, the Apple App Store generated $10 billion in application downloads as stated on ITBusinessEdge (2014). Both Google Play Store and Apple App Store have attracted over 50 billion downloads consecutively during 2013. For 2014, the momentum is likely to continue, but in a variety of directions.

Amy (2011) stated that, a mobile application or also called native application is a program that runs on a handheld device (phone, tablet, e-reader, iPod Touch, etc.) which has a "smart" operating system which supports standalone software and can connect to the internet via Wi-Fi or a wireless carrier network. She also stated that the term native application means that the mobile application can only be native to only one type of mobile operating system such as either iOS, Android, BlackBerry, Symbian, Windows Phone, etc. For example, an Android application works only on Android devices, so a piece of mobile application must be develop and maintain separately to allow the application available to other mobile platform.

A mobile application's structure will usually consist of multi-layered components which are the presentation layer, business layer, and data layer, Microsoft (2011). Mobile application can also be divided into two types of application either thin Web-based client or a rich client. In rich client application, the business and data services layers are likely to be located on the mobile device itself. In the thin client application, all of the layers will be located on the server.

Figure 2.1 illustrates the typical structure of a mobile application specifically the rich client architecture with components grouped by areas of concern. The rich client architecture consists of Mobile Client Application part and Mobile Support Infrastructure. Mobile Client Application is the client-side of the application that contains Presentation Layer, Business Layer, Data Layer, and Local Database or Cache. It is also the part to implement security and configuration of the application.

Mobile Support Infrastructure is the server-side of the application where data sources and web servers are implemented. It is connected to the client-side for data storing via online network.
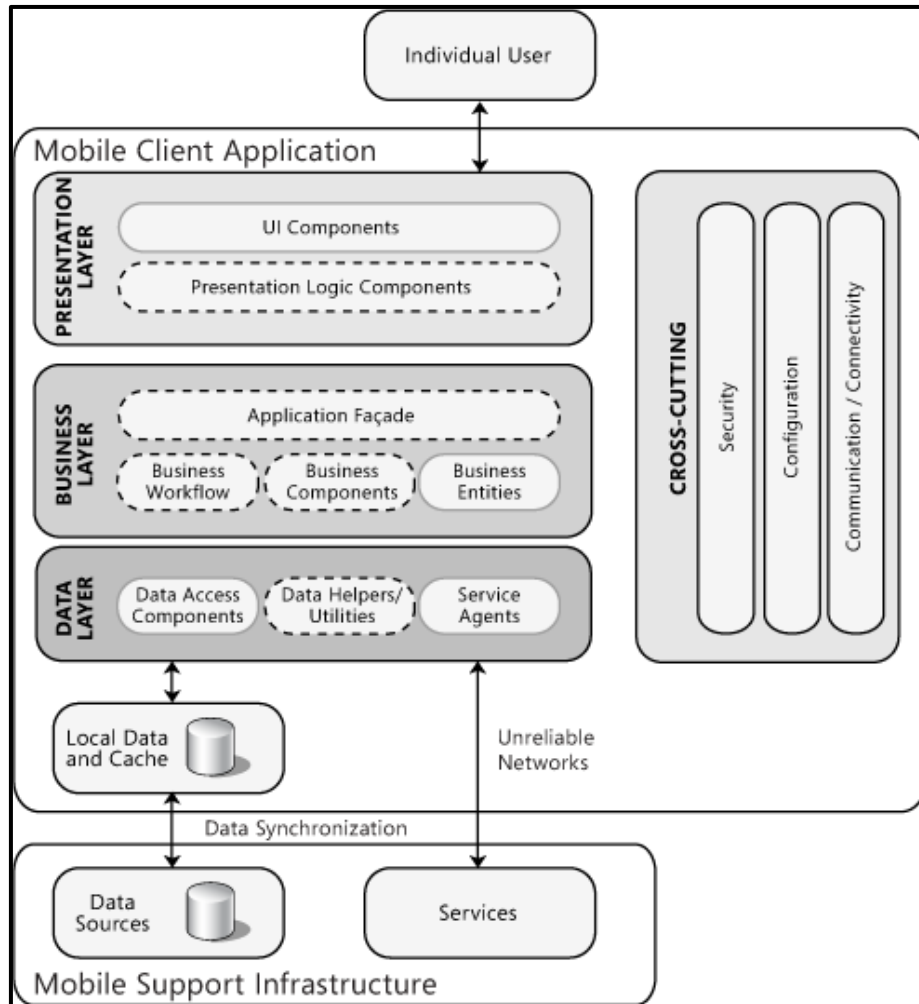

Figure 2.1: General Structure of Mobile Application

2.3   E-System

Electronic System (E-System) is groupings of electronic circuits and components which are designed to accomplish one or more complex functions, Babylon (2009). It is a system of integrated programs designed to make it easier for a user to discover information in a convenient way rather than manual system. The examples include telecommunication systems, computer systems, power distribution systems, radar systems, electronic music systems, and many others.

E-System usually implemented an online system concept in managing services to user. Online E-System is defined as any electronic interactive system that delivers information to users via telephone lines to personal computers (PCs) or via cables to terminals, SoftLabs (2010). The system provides information, usually in text form, about news, education, business, entertainment, shopping, and more. Some also provide message services and graphic and audio information. The term videotext was formerly applied to electronic interactive systems of this type.

E-System has transformed the old manual system into a better and easier system. It has also triggered a full scale development of online technology including mobile technology. Every single task nowadays is available via online system such as E-Commerce, E-Business, E-Education, etc. It makes it easier for people as the system can be access either via personal computers or mobile devices through internet connection.

2.4   E-Saman System

E-Saman is an electronic online summon system. The scope of the system differ base on the types of summon that become the objective of the system development. The system can be either traffic summons system, parking summons system, or any kind of online summon system. The E-Saman system usually develops on web based systems that use programming language such as PHP and MySQL. Web based systems is a computer system that transmitted over the World Wide Web, Dictionary (2011). In general, the E-Saman system can be access by user on the internet via a web browser.

The E-Saman system usually has the functions of displaying existing summon records, inserting and storing new summon records. Electronic summon system start with web based system that functions as a data hub for user and system's administrator to store and view summon record. The system then upgraded into a more convenient web application that allow user to pay summon via online banking. Various types of summons that covered different offenses are also included into the electronic summon system from time to time as the needs by organization increases.

The current existing E-Saman systems in Malaysia are mainly function to allow user to check summons record. There is still no function to pay summons online via bank integration with the system. Some example for E-Saman system in Malaysia is the Myeg website that allows Malaysian citizens to check summons for JPJ and PDRM, Myeg (2012). The E-Saman systems in Malaysia are also available in mobile platform that can be downloaded from the Android Playstore for Android smartphone's user.

2.5   Existing Mobile Application for E-Saman System

There are many mobile applications for E-Saman System available for download either from the Google Playstore for Android platform or the Apple Store for iOS platform. These mobile applications can all be downloading for free and ready to be use. Below are some examples of the Android mobile application for E-Saman System.

2.5.1   Malaysia Parking Summons

Malaysia Parking Summons is a free mobile application developed by MAXSIM (2013) to allow people to check for parking summon issued by local governments of Malaysia. The application requires internet connection to function, but did not require user for registration or log in to access it. User just needs to key their vehicle registration number to check for parking summons records. A list of parking summons for the vehicle will be display if there are records and a pop up notification of 'No Summon Record Found' will appear if there is no record of summons.

The application is currently support parking summons check for a few City Council (Majlis Perbandaran) and City Hall (Dewan Bandaraya) such as Dewan Bandaraya Kuala Lumpur (DBKL), Majlis Perbandaran Subang Jaya (MPSJ), Majlis Perbandaran Kuantan (MPK), etc. Figure 2.2 shows the interfaces of Malaysia Parking Summons mobile application. There are four main interface of the application. The first interface is the main page, the second interface is the page to check summons where user prompt to enter their vehicle number, the third interface is the display summons record page, and the last interface is the page for description of each summons record.
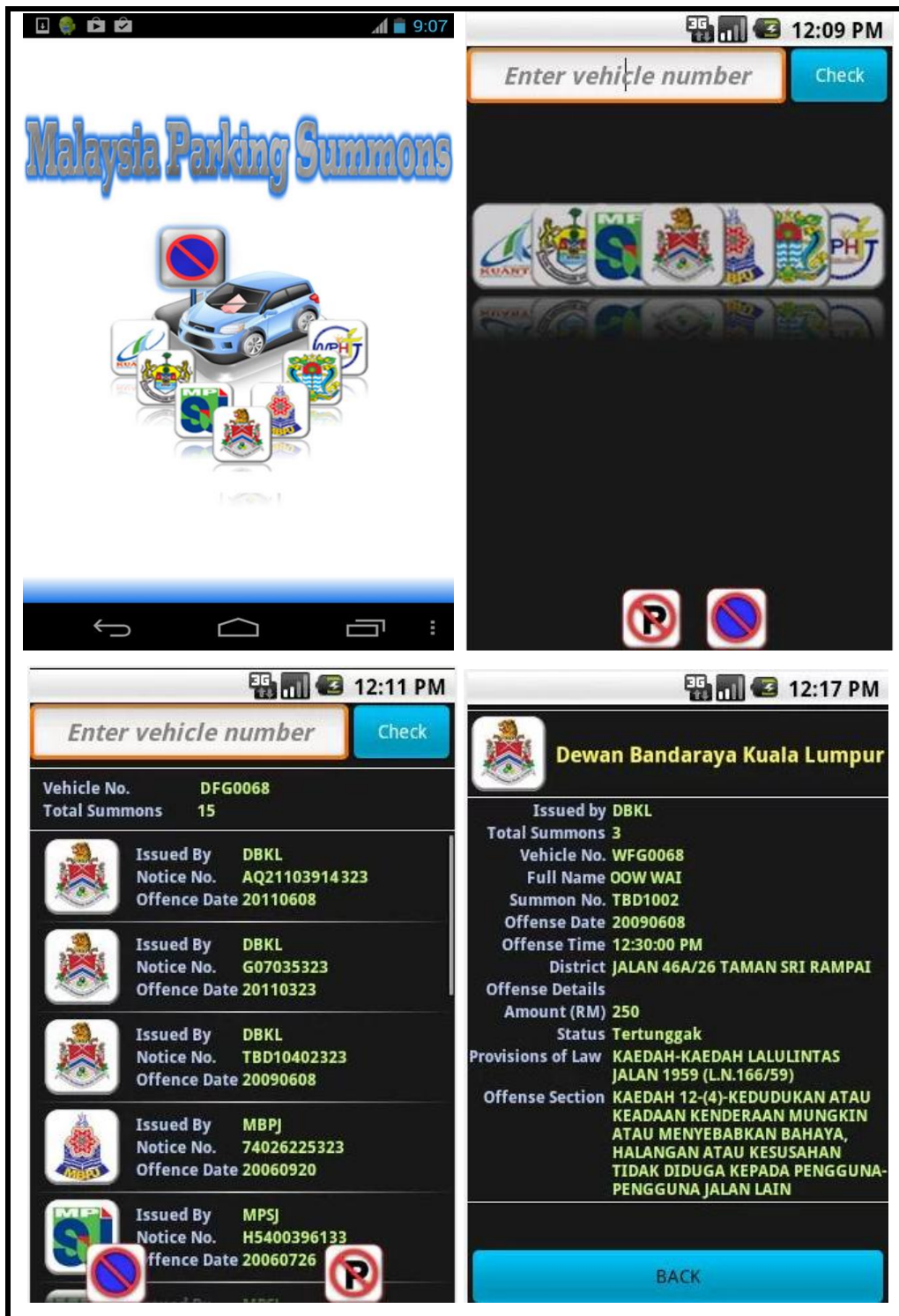
Figure 2.2: Interface of Malaysia Parking Summons application

2.5.2 Malaysia JPJ Summons

Malaysia JPJ Summons is a free mobile application developed by MAXSIM (2013) to allow people to check for JPJ and AES summons issued by JPJ Malaysia and Malaysian Royal Police. The application can be used to check summons record by user inserting their Malaysian Identification Card number and numerical captcha. Internet connection is needed for the application to work, but user does not require registering or logging into the system.

Figure 2.3 shows the interfaces of Malaysia Parking Summons mobile application. There are three interface of the application. On the first interface when user opens the application, there is textbox for user to either insert their identification card number or company registration number. User need also to enter captcha of text to verify as human user before proceed to click Check button. User then will be navigated to the second interface where list of summons record are display if exist. Each summons record can be clicked and user will be navigated to the third interface where the detail of the summons is viewed. A popup window will appear if there is no summons record found in the application's database for current user.
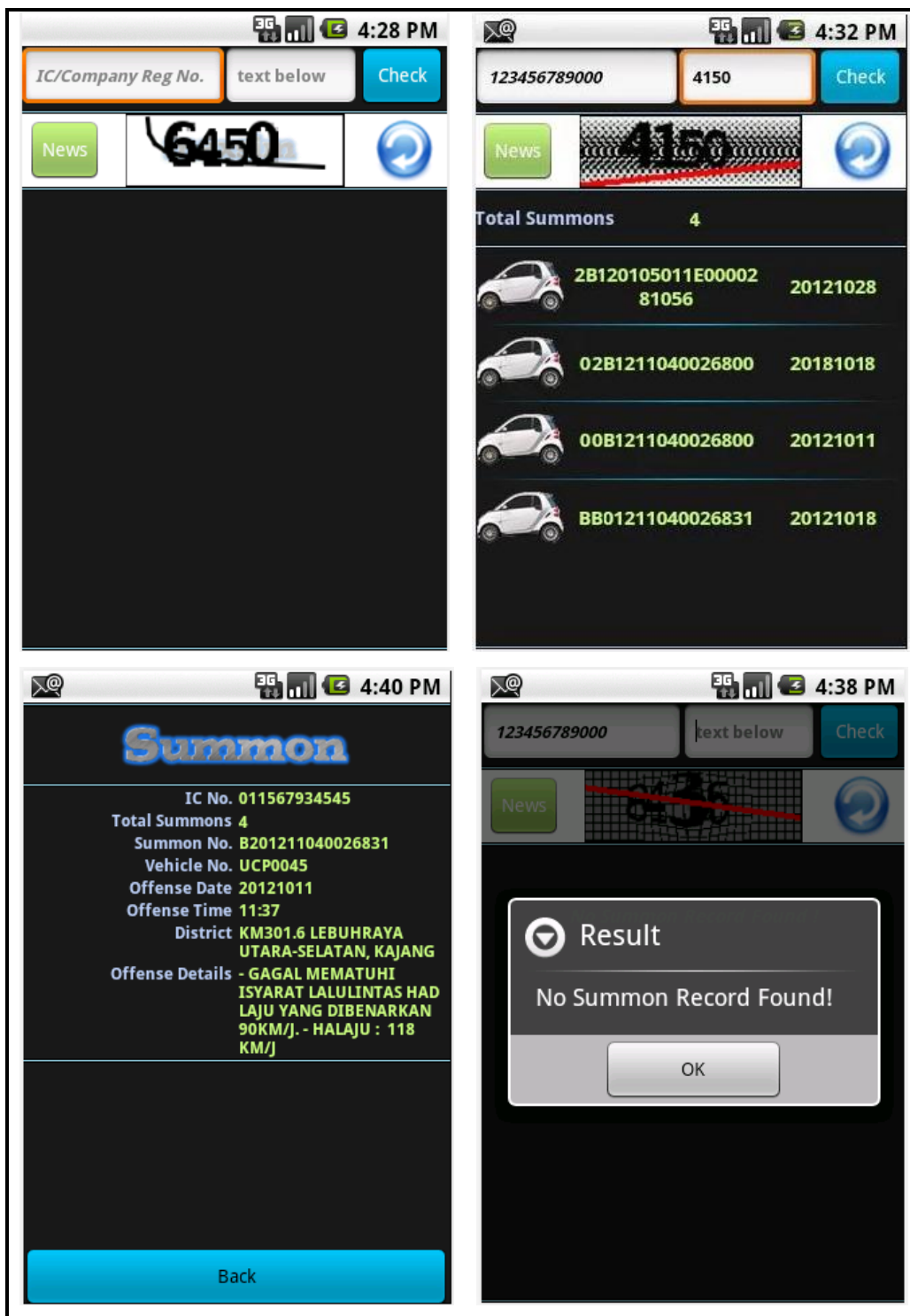
Figure 2.3: Interface of Malaysia JPJ Summons application

2.5.3 Myeg Summon Check

Myeg Summon Check is a free mobile application developed by Umair (2014) to allow people to check for Police summons issued by Malaysian Royal Police. The application is associated with Myeg servers to browse for latest updated police summons records. The functions of the application will be added with the ability to check for other type of summons stored in the Myeg server.

To use the system, user needs to have their own Myeg account and log into the application using their Myeg username and password. User then can either enter their identification card number, passport number, company registration number, or vehicle registration number to browse the system for summons record. Figure 2.4 shows the interfaces of Myeg Summon Check mobile application. There are three interfaces for the application. The first interface is the login interface for user to login with Myeg account. After login user is navigated to the second interface where they need to enter the option as mention such as identification number to check summons record. User then navigated to the third interface where summons record are displayed. If there is no summons found then the alert is also displayed on the third interface.
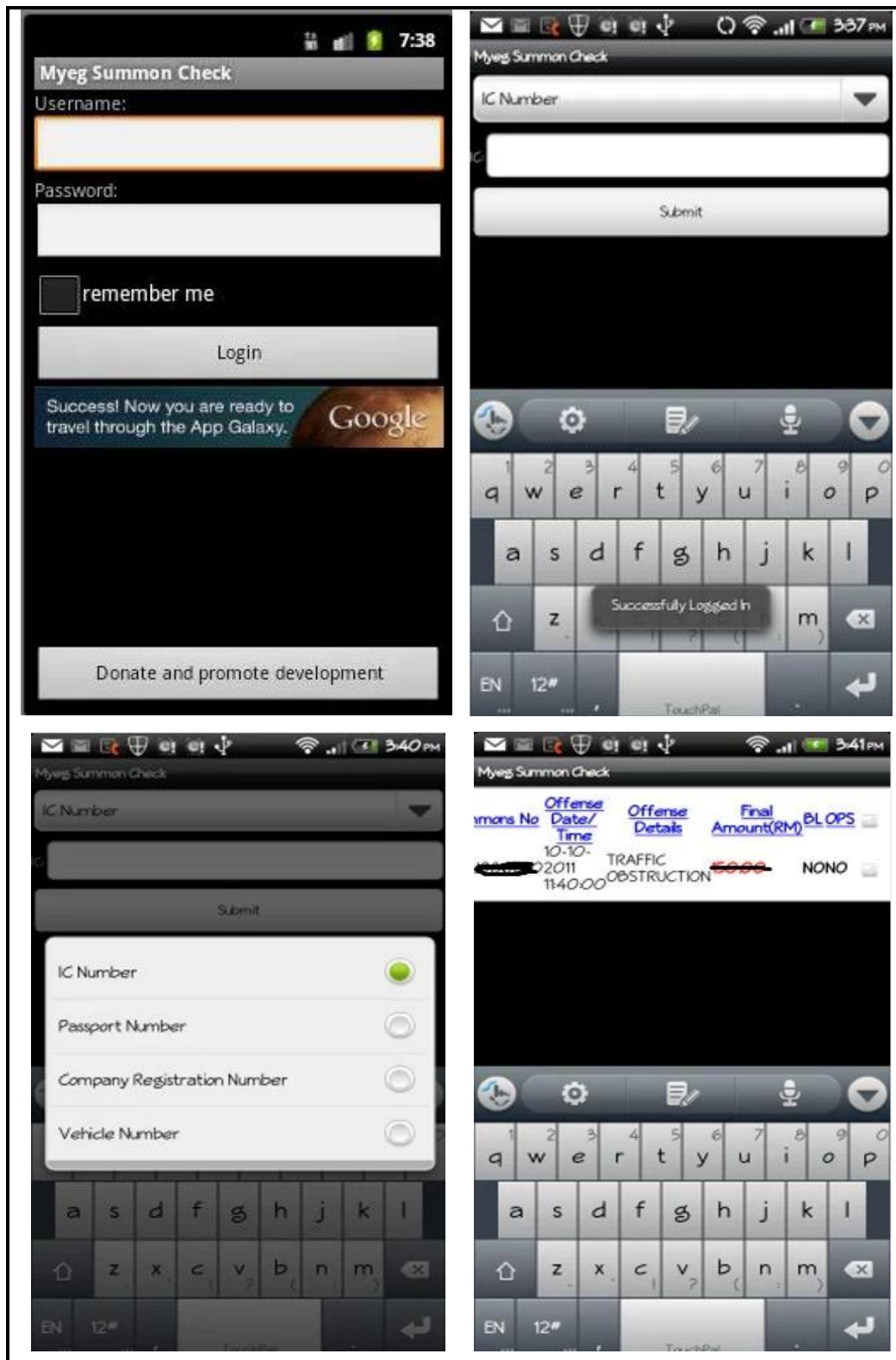
Figure 2.4: Interface of Myeg Summon Check application

2.5.4   Semak Saman Secara Online

Semak Secara Online is a free mobile application developed by Success Action Enterprise (2013). It is a simple application that connected to JPJ web server to allow user display their summons status. The application allow user to check status of traffic summon, AES summon, JPJ summon, JPJ blacklist, and Police blacklist. The application also provide user with other functions such as send complaint to JPJ, check the latest vehicle registration number for every states, and monitor traffic status around Malaysia. The application can also be viewed in different languages which are Malay, English, Chinese, and Tamil.

Figure 2.5 shows the interfaces of Semak Saman Secara Online mobile application. There are only two interfaces of the application which is the main page and the display page. The main pages contain many functions such as to check traffic summons, JPJ blacklist, PDRM blacklist, and JPJ complaints. The main weakness of this system is that all of the functions stated are only made as button to external links to other websites such as the JPJ or PDRM website. Users are also able to navigate to Facebook page of the application developer or check for traffic information but it is only link to other websites. That made the screen view became very limited and hard to use the systems. When user clicks each of the functions available, it will then navigated to the second page where all of the external links to websites are displayed. Other extra function is user able to change the language into Malay, English, Chinese, and Tamil.

Figure 2.5: Interface of Semak Saman Secara Online application

2.5.5   Comparisons of Existing Mobile Application for E-Saman System

All of the applications are only develop to assist user in checking their summons status either traffic, JPJ, AES, or parking summons. The Malaysia Parking Summons application have probably the most good Graphical User Interface (GUI) and simpler than other applications. For the functionalities, the Myeg Summons Check application is the best since it is integrated with the Myeg server where all records of traffic summons either JPJ or PDRM are stored and can be accessed. The added of other functionalities from the Semak Saman Secara Online application such as multi-languages translations and traffic information would perfect the Myeg Summons Check application while using the interface from Malaysia Parking Summons application. Overall analyze data stated that the two best application from all four applications would be the Malaysia parking Summons and Myeg Summons Check applications. The least good application would be the Malaysia JPJ Summons application with quite bad interface and the Semak Saman Secara Online application that only have link to external websites. All the differences of functionalities for all of the applications are summarized into Table 2.1.

From all of the stated mobile applications, there is no single applications that have the function to allow security officer to insert summon data. The existing systems have the opposite function when compared to the proposed mobile application for E-Saman System in terms of target user and main function. There are no applications being develop to assist security officers or police officers to key in summons data via mobile yet. Therefore, it is highly recommended that the Mobile Application for E-Saman System to be developed to assist UMP Security Department for the scope of UMP, in enforcing traffic summons using a more convenient and systematic system.

Table 2.1: Comparison between existing mobile applications for E-Saman System and UMP Mobile Application for E-Saman System

Features supported	Existing mobile application	Malaysia Parking Summons	Malaysia JPJ Summons	Myeg Summon Check	Semak Saman Secara Online	Mobile Application for E-Saman System
Record new traffic summon						√
View and edit traffic summon						√
Check traffic summon status				√	√	√
Check JPJ summon status			√		√	
Check AES summon status			√		√	
Check parking summon status		√				
Check JPJ blacklist					√	
Check Police blacklist					√	
Send complaint to JPJ						
Check available vehicle registration number					√	
Monitor traffic status					√	
Online data access		√	√	√	√	√

2.6 Software & Hardware Specifications

To develop android applications, an Integrated Development Environment (IDE) is needed. IDE is an application that facilitates application development. IDE can be described as a graphical user interface (GUI)-based workbench design to aid a developer in building software applications with an integrated environment combined with all the required tools at hand [15]. There are many IDE or developments tools available for developing mobile applications either free or paid. The most commonly used software to develop Android application are Eclipse, Netbeans, and IntelliJ IDEA.

2.6.1 Software Specifications

There are various development software available online for mobile application development either open source or for subscription. The three most common and finest software being widely used by mobile application developer are Eclipse, NetBeans, and IntelliJ IDEA.

2.6.1.1 Eclipse

According to Priya (2014), Eclipse has been release by IBM in 2001 as an open source platform. It is used in both open source and commercial projects at first and now became a major platform which used several programming languages including Java, C, C++, Ruby, Perl, etc. The advantage of Eclipse is that it features various plugins which makes it versatile and highly customizable. Eclipse platform works in the background, compiling code and showing up errors as when it occurs. The entire IDE is organized in Perspectives, which are essentially sort of visual containers, which offer a set of views and editors. Eclipse is advantageous in multitasking, filtering and debugging. It can fit the needs of large development projects and handle various tasks such as analysis and design, product management, implementation, content development, testing and documentation.

2.6.1.2 NetBeans

Priya (2014) stated that, NetBeans was independently developed 1990s. It is then became an open source platform after it was acquired by Sun in 1999. Now, this IDE is a part of Oracle and can be used to develop software for all versions of Java ranging between Java ME, up to the Enterprise Edition. Just as Eclipse, NetBeans also features a variety of plugins. NetBeans offers various different bundles such as 2 C/C++ and PHP editions, a Java SE edition, the Java EE edition, and 1 kitchen sink edition. This IDE also offers tools and editors which can be used for HTML, HTML5, PHP, XML, JavaScript and more. NetBeans scores over Eclipse with the features database support, with drivers for Java DB, MySQL, PostgreSQL and Oracle. Its Database Explorer allows developer to easily create, modify and delete tables and databases within the IDE.

2.6.1.3 IntelliJ IDEA

Priya (2014), also stated that IntelliJ IDEA was released in 2001 as both commercial and open source edition. IntelliJ support a variety of languages, including Java, Scala, Groovy, Clojure and more. This IDE comes with features such as smart code completion, code analysis and advanced refactoring. IntelliJ IDEAS was mainly targets the enterprise sector, but then additionally supports SQL, ActionScript, Ruby, Python and PHP. Version 12 of this platform also comes with a new Android UI designer for Android app development. IntelliJ also features several user-written plugins. It was currently offers 947 plugins, plus an additional 55 in its enterprise version. Users can submit more plugins by using its built-in Swing components.

2.6.2   Comparison of Existing IDE Features

The IDE software that is going to be used for development of Mobile Application for E-Saman System is the Eclipse. The Eclipse is chosen because it is an official IDE for developing native Android application. Using Eclipse will allow developer to use various types of plugins such as the IBM Worklight and Cordova plugins. For the project development however, the original Java IDE will be used with no other plugins. It is because the project is intended for developing native Android application as it has higher performance than using plugins such as Worklight and Cordova. It is also easy to find suitable libraries for integration with hardware when using the Java IDE.

Software Eclipse is chosen to be used as it is often updated with the latest features for latest Android versions compared to NetBeans and IntelliJ IDEA that required years of time gaps before updated with the latest development environment. There are also plenty of codes sources and tutorials for mobile development using the software Eclipse that allow smooth development of the project. Table 2.2 differentiates the features supported by the three IDE Eclips, NetBeans, and IntelliJ IDEA.

Table 2.2: Comparison between different IDE features

Features supported	IDE	Eclipse	NetBeans	IntelliJ IDEA
Supported languages		Java,Ada,ABAP, C,C++, COBOL, Fortran, Haskell, JavaScript, Lasso, Natural,Perl, PHP, Python,R, Ruby (including Ruby on Rails framework),Scala, Clojure,Groovy, Scheme,Erlang	Java,PHP,C/C++, HTML5.	Java,JavaFX, JavaScript, CoffeeScript, HTML/XHTML/CSS, XML/XSL, ActionScript/MXML, Python, Ruby/JRuby, Groovy, SQL. PHP,Scala,Clojure, Dart,Haxe,Kotlin, TypoScript,Jelastic (via seperate plugin).
Supported technologies and frameworks		Equinox OSGi, Standard Widget Toolkit,JFace.	Apache Struts 2, Wicket,ICEfaces 2.0	JSP,JSF,EJB,Ajax, Google Web Toolkit, Struts,Struts 2,JBoss Seam, Spring, Hibernate/JPA,Web Services,Ruby on Rails, Grails (framework),Java,ME MIDP/CLDC,OSGi,Android, Tapestry, Google App Engine,FreeMarker,Velocity.
Supported application servers		Tomcat,GlassFish.	GlassFish,Tomcat.	GlassFish,JBoss,Tomcat, Jetty,WebLogic, WebSphere, Geronimo

2.6.3 Comparison of Existing Application Server

For the application server, Eclipse with IBM Worklight supports MySQL, Oracle 11g, and DB2 databases. In this project MySQL will be used as the application server as it is very familiar with developer and have wide sources of references.

MySQL is the selected application server for the development of the application project. When comparing all three database engines for application servers, MySQL and Oracle would favor being chosen as it is open source software compared to DB2 that is for commercial. DB2 is more familiar with other Eclipse plugin such as the IBM Worklight compared to the MySQL, Stackoverflow (2012). DB2 is also suitable for Rapid Application Development (RAD) compared to MySQL that is familiar with SDLC or the Mobile Application Development Life Cycle, Stackoverflow (2012). From performances perspective, DB2 is suitable for faster development while MySQL is more to database management. For large database capacity, MySQL would suit perfectly compared to DB2. Other than that, all three database engines have almost the same features. Table 2.3 illustrates the differences between the three application servers, DBMS (2012).

Table 2.3: Comparison between different application servers

Name	DB2	MySQL	Oracle
DB-Engines Ranking	Rank : 6 Score: 184.58	Rank : 2 Score: 1292.67	Rank : 74 Score: 1.21
Developer	IBM	Oracle	Oracle
Initial release	1983	1995	2011
License	commercial	Open Source	Open Source
Implementation language	C and C++	C and C++	Java
Server operating systems	Linux Unix Windows z/OS	FreeBSD Linux OS X Solaris Windows	Linux OS X Windows
Database model	Relational DBMS	Relational DBMS	Key-value store
Data scheme	yes	yes	schema-free
Typing	yes	yes	no
Secondary indexes	yes	yes	no
SQL	yes	yes	no
APIs and other access methods	JSON style queries XQuery	ADO.NET JDBC ODBC	Java API

	ADO.NET JDBC ODBC		
Supported programming languages	C C# C++ Cobol Fortran Java Perl PHP Python Ruby Visual Basic	Ada C C# C++ D Eiffel Erlang Haskell Java Objective-C OCaml Perl PHP Python Ruby	Java
Server-side scripts	yes	yes	

2.6.3.1 MySQL

MySQL is the most popular Open Source SQL database management system (DBMS) that is developed, distributed, and supported by Oracle Corporation. It is based on the structure query language (SQL), which is used for adding, removing, and modifying information in the database. Standard SQL commands, such as ADD, DROP, INSERT, and UPDATE can be used with MySQL, MySQL (2007).

MySQL can be used for a variety of applications, but is most commonly found on Web servers. A website that uses MySQL may include Web pages that access information from a database. These pages are often referred to as "dynamic," meaning the content of each page is generated from a database as the page loads. Websites that use dynamic Web pages are often referred to as database-driven websites.

MySQL is also used for developing mobile applications. Software such as Eclipse integrated with MySQL database to connect the mobile applications to the database in order to save or display data. Because MySQL is open source just like Eclipse, the Eclipse/MySQL combination has become one of the popular choices for database-driven mobile applications.

2.6.4   Hardware Specifications

Table 2.4 shows the hardware specifications proposed in developing the Mobile Application for E-Saman System.

Table 2.4: Hardware specifications

Hardware	Functions
1) Mobile Mykad Reader -Name: CI ShowKad -Model no.: ACR38U-PocketMate -Manufacturer: Advanced Card System Ltd. -Connector: Micro USB OTG cable	Scan data from offender's Mykad

2) Desktop Computer
Specifications:
   - Processor: Intel(R) Core i5-3450 CPU
   - RAM: 8.00 GB
   - Graphics: AMD Radeon R7 265
   - HDD: Seagate Barracuda 1TB
	Use for application development using Eclipse software

3) Smartphone / Tablet -Name: Samsung Galaxy S III -OS: Android 4.3 Jelly Bean -RAM: 1 GB -Processor: Quad core 1.4Ghz	Act as Android development emulator to run the application and test for querying data or adjusting application's compatibility

2.7 Summary

This chapter provides detail descriptions about the existing applications system related to E-Saman System. From the comparisons and study, many specifications and functions are discussed and decided for the best and optimum result. Sample of existing system have generate ideas of design and functions that can be implemented on the Mobile Application for E-Saman System application project. The software and hardware specifications for this project are also obtained based on study for determining the best one. The next step after this chapter would be documenting the design of the application and the use of the stated software and hardware. With all the information obtained from this chapter, it is expected that the documentation process would run smoothly and successfully.

CHAPTER 3

PROPOSED SYSTEM

3.1 Overview

In this chapter, there will be two main topics that will be covered which are design of Mobile Application for E-Saman System and the hardware and software requirements. The two main topics are divided further into four other subtopics.

Subtopic 3.2 will cover on the logical design, Subtopic 3.3 will cover on the interface design, and Subtopic 3.4 will cover on the database design, while the last Subtopic 3.5 will explain on hardware and software requirements.

Overall contents in this chapter will provide reader with the detail information of the proposed design of application interface and database including software and hardware requirements.

3.2   Logical Design

Logical design is a phase to design a logical architecture showing the interrelationships of the logical components of the system. The logical design is more conceptual and abstract than the physical design. In the logical design, developer looks at the logical relationships among the objects, Oracle (2012).

Figure 3.1 shows the complete architecture of E-Saman System combine with Mobile Application for E-Saman System. For this project, it will cover only on the mobile application. The flow of overall system start from traffic offender to mobile phone via IC reader, data sent to server, and pass on to GSM device and finally reached back to the offender.
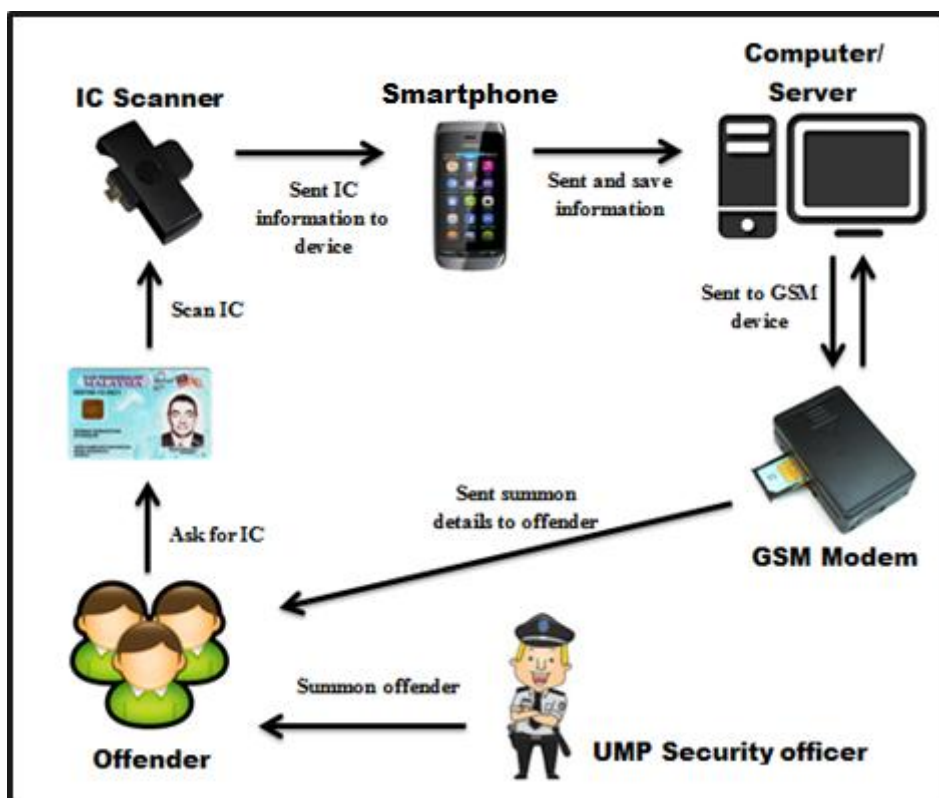
Figure 3.1: Architecture of E-Saman System and Mobile Application for E-Saman System

At the first stage of summons mechanism, UMP security officer will request the offender to hand out their identification card to get personal information. The identification card will be scan using a Mykad scanner attached to a smartphone or tablet computer. The Mobile Application for E-Saman System installed on the Android-based smartphone will retrieve the offender's basic information such as name and Mykad number. The information will be automatically inserted and displayed into the summon form in the summons application. The security officer will then fill out the rest of summons information on the application such as type of offense, type of vehicle, vehicle's registration number, date and time of summons. When the security officer submits the new summon issue into the application system, the data is then processed and transmitted to the web server. The data from the web server database are then transferred to the GSM modem. The GSM modem will process the data based on phone number and send it to the offender through Short Message Service (SMS) to notify them about the summons details. The offender will have to pay the summons within a period of time and can appeal for discount in that period. After that period of time, the summon amount will remain as the actual summon pay rate. The summon records in the server will remains as future reference such as for processing student's merit, but the payment status will changed according to payment made by the offenders.

Figure 3.2 shows the architecture of Mobile Application for E-Saman System which is the client-side of overall system. The process flow consists of half from the overall system excluding the GSM function.
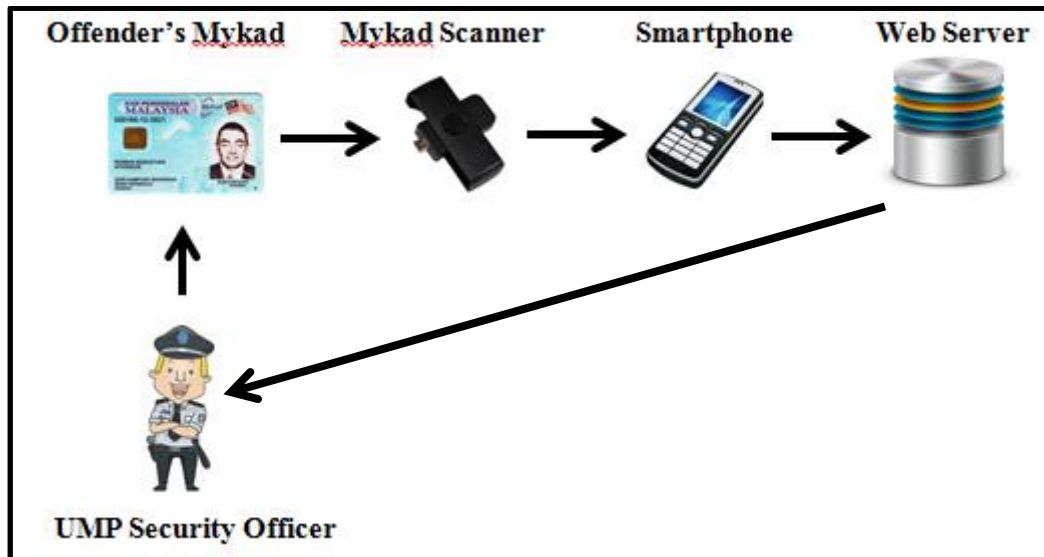
Figure 3.2: Architecture of Mobile Application for E-Saman System

The mechanism for this module starts by UMP security officer issuing summons to the offender and request for their identification card. The offender's Mykad is extracted for information using the Mykad scanner into the application. The security officer complete creating summons details on the application. The application process data and send it to be store on the web server.

3.2.1   Data Flow Diagram (DFD)

A data-flow diagram (DFD) is a graphical representation of the flow of data through an information system. DFDs can also be used for the visualization of data processing. A DFD provides no information about the timing or ordering of processes, or about whether processes will operate in sequence or in parallel, DFD (2009).

Figure 3.3 shows the Data Flow Diagram level 0 for scanning the Mykad's information. On this level, UMP security officer will scan the offenders Mykad using Mykad scanner. The basic information scanned is then displayed on the mobile application for personal information category.
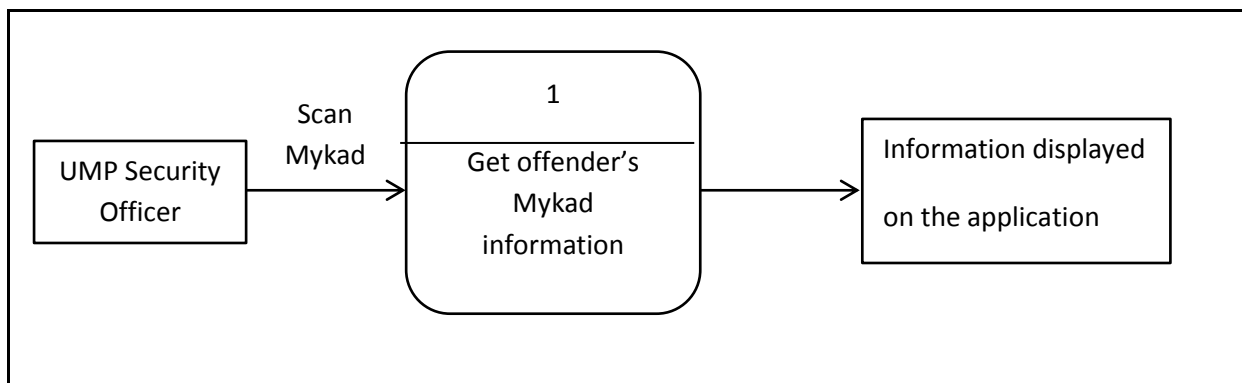
Figure 3.3: DFD level 0 for UMP security officer scan offender's Mykad information

Figure 3.4 shows the Data Flow Diagram of UMP security officer complete creating new summons record using the offender's information from the Mykad. On this level, the summons details are filled in into the application including type of offense, offender's vehicle details, and time or date of summons occurred. The data is then processed by the system and saved into the device internal memory.
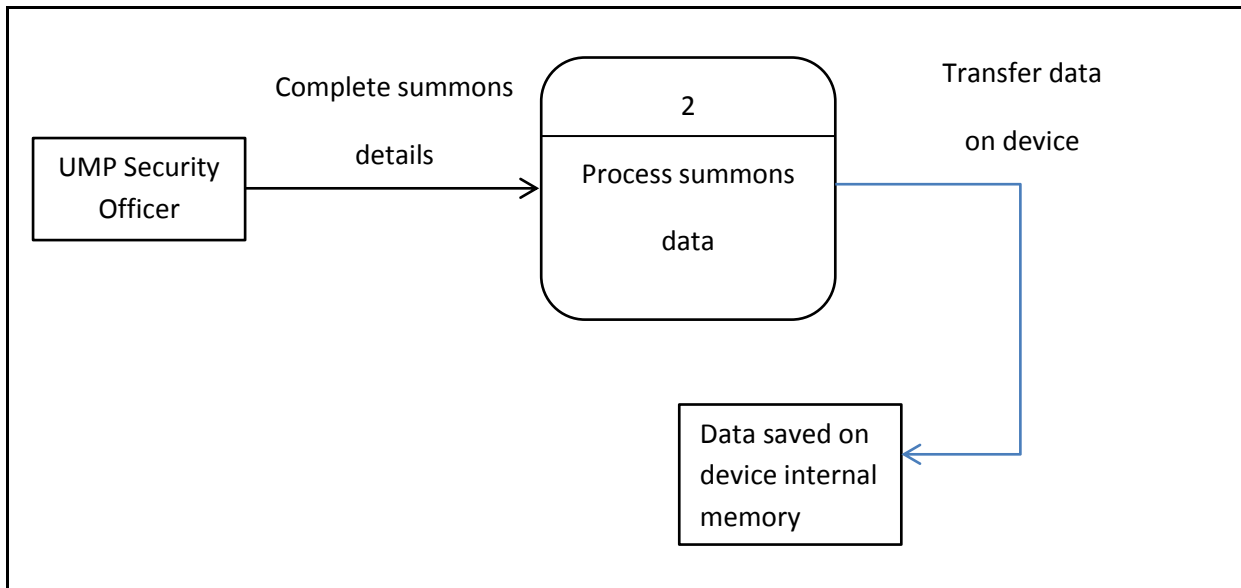
Figure 3.4: DFD level 0 for UMP security officer complete creating new summons

Figure 3.5: DFD level 0 for UMP security officer check summons record for the respected offender. With this function, the security officer can check current summon records for the respective day to be edit or deleted before transfer it to the server database.
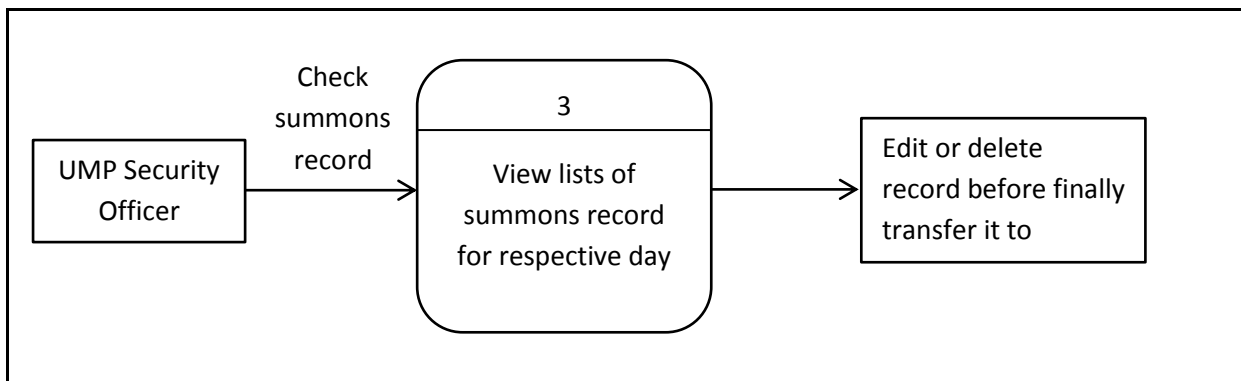
Figure 3.5: DFD level 0 for UMP security officer check summons record

3.3   Interface Design

Overall interface design of the application is made consistently with the same simple layout including fonts, menus, background colour, buttons, textboxes, and data grouping. A few validations are also placed starting with the login interface to provide feedback to user about any misconfiguration or interactions with the system.

Figure 3.6 shows the main menu interface of the application. On main menu, the main functions of the application are displayed in a data-role button list. User can select create summons to add new record of summons or select view summons to view a list of summons record based on certain IC number.
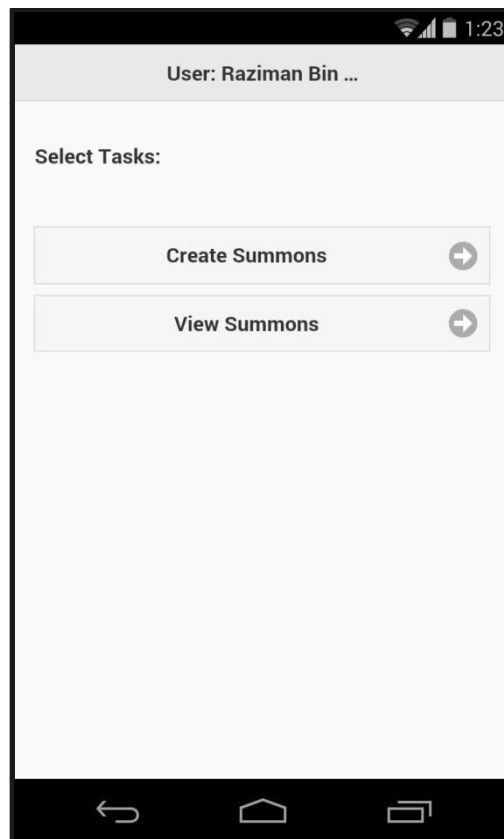
Figure 3.6: Application Menu

Figure 3.7 shows the interface for Create New Summons record. After clicking the button for create summons, user will be navigated to the first page on Figure 3.8, where user can extract data from the offender's Mykad to create summons.

Figure 3.7: Create New Summons Interface

The information of the offender will be displayed on the second page of the module from the reading of Mykad scanner. If the Mykad reader is not functioning, the textbox for the information taken from Mykad can still be fill in manually. User then can just enter data of the summons such as offense description, type of vehicle, vehicle's registration number, and date.

When clicking the submit button, validation is triggered to check for any checkboxes or selections that being left empty and user will be notified with the validation messages. This validation offer user with error prevention and simple error handling that will prevent them from making serious errors.

Figure 3.8 shows the view summons interface of the application. On the first interface of the module, user can check summons record by searching on certain IC number of the students or staffs of UMP. All summons record for the will be displayed as on the second interface of the module consists of offense descriptions, type of vehicles, registration number, date, and payment status. These summon records are only covered records found on the mobile device's internal memory. User can view the summons record, edit or delete it, but there will be history for any changes as prove so there is no unauthorized manipulation of data being made.
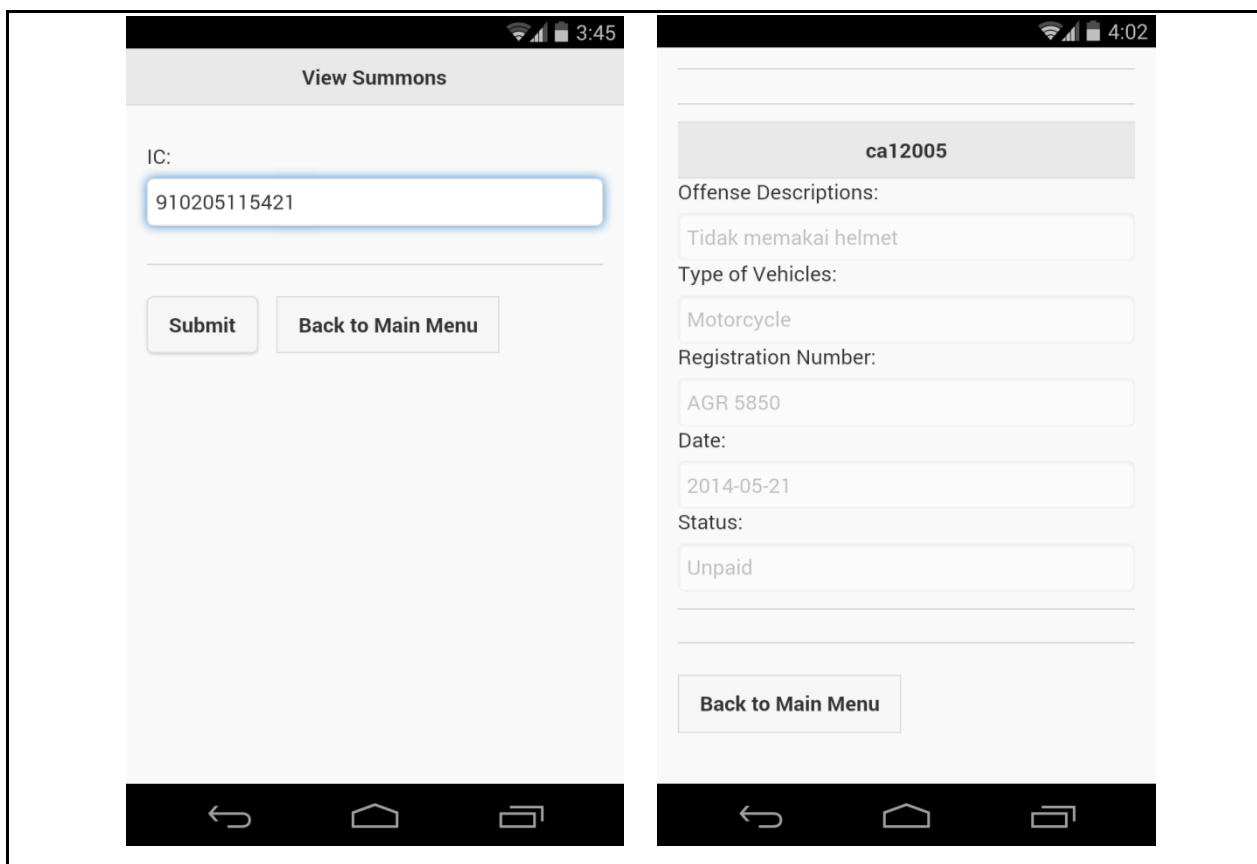
Figure 3.8: View Summons Interface

The summons record will be stated as unpaid by default when security officer first entering the summons. When the offender has paid for their summons, then the status will later be changed to paid on the database. The paid summons record remains for statistics or future reference.

3.4 Database Design

Figure 3.9 shows the database table design for client-side of Mobile Application for E-Saman System. The database only consists of basic offender information and summons information. This client-side database then can be manually transferred into the web server database to update latest data.

	Field	Type	Collation	Attributes	Null	Default	Extra	Action
☐	Id	int(20)			No		auto_increment	
☐	Name	varchar(50)	latin1_swedish_ci		No			
☐	Address	varchar(50)	latin1_swedish_ci		No			
☐	Student/staff ID	varchar(50)	latin1_swedish_ci		No			
☐	IC number	varchar(50)	latin1_swedish_ci		No			
☐	No phone	varchar(50)	latin1_swedish_ci		No			
☐	Traffic offenses	varchar(50)	latin1_swedish_ci		No			

Figure 3.9: Database table design on client-side

Table 3.1 shows the data dictionary of the client-side database table of Mobile Application for E-Saman System. The data dictionary defines and describes the element that has been created on the database table. The table is consisting of few attributes related to the summons information.

Table 3.1: Data dictionary for database table

No.	Field	Type	Length	Description
1.	id	AUTO_INCREMENT	-	number
2.	Name	varchar	30	Name of traffic offender
3.	Address	varchar	50	Address of traffic offender
4.	Student/Staff ID	varchar	50	Student/staff ID number
5.	IC Number	varchar	50	IC Number of traffic offender
6.	No Phone	varchar	50	No phone of traffic offender
7.	Traffic offenses	varchar	50	types of traffic offenses

3.5   Hardware & Software Requirements

3.5.1   Software Requirement

Table 3.2 below shows the final software requirements and its functions that will be used in developing the Mobile Application for E-Saman System.

Table 3.2: Software requirement

Software	Functions
Eclipse	Develop Android application using Java programming language
XAMPP	Create database and act as local server for storing summons data
Notepad++	Edit programming script for php files
Microsoft Office 2010	Make documentation of project development

3.5.2 Hardware Requirement

Table 3.3 below shows the final hardware requirements and its functions that will be used in developing the Mobile Application for E-Saman System.

Table 3.3: Hardware requirement

Hardware	Functions
1) Mobile Mykad Reader -Name: CI ShowKad -Model no.: ACR38U-PocketMate -Manufacturer: Advanced Card System Ltd. -Connector: Micro USB OTG cable	Scan data from offender's Mykad
2) Desktop Computer Specifications: - Processor: Intel(R) Core i5-3450 CPU - RAM: 8.00 GB - Graphics: AMD Radeon R7 265 - HDD: Seagate Barracuda 1TB	Use for application development using Eclipse software
3) Smartphone / Tablet -Name: Samsung Galaxy S III -OS: Android 4.3 Jelly Bean -RAM: 1 GB -Processor: Quad core 1.4Ghz	Act as Android development emulator to run the application and test for querying data or adjusting application's compatibility

CHAPTER 4

IMPLEMENTATION

4.1   Overview

In this chapter, three subtopics including subtopic 4.2 that will explain in detail about the tools and technologies, and subtopic 4.3 that will explain on the test debugging and running the Mobile Application for E-Saman System. Subtopic 4.2 will discuss more on the technique of implementation for the project including the sample programming script and use of device in developing the application. Subtopic 4.3 will discuss more on the flow of user using the mobile application including with detail explanations of each functions available on the application.

Overall contents in this chapter will provide reader with the detail information of the method of implementation that has been carried out in this project including the product produced.

4.2   Tools and Technologies

Mobile Application for E-Saman System has been developed using the software Eclipse for the interface and functionalities of the application and XAMPP software is used to create the database using MySQL. The mobile application is programmed using Java programming language for the functionalities of the interface in Eclipse software. The database functionalities are programmed using PHP and MySQL on the XAMPP software. In this project, the Eclipse software is use to develop the client side application and the XAMPP software use to develop server side database.

During development process, the mobile application needs to be debugging and run using either the emulator on Eclipse software or directly run on Android device which is the Samsung Galaxy SIII. For testing querying data into server, the application is run only on the emulator, but debugging the application with the Mykad reader device needs to be done using the Android device since it has the Universal Serial Bus On-The-Go (USB OTG) function. The USB OTG function on the smartphone allows the Mykad reader to be functioning and read data from Mykad. Figure 4.1 shows the use of Mykad reader with the application through USB OTG function.

Figure 4.1: Mykad reader using USB OTG

Figure 4.2 shows the emulator interface in Eclipse software. The emulator is use to run the application for testing locally in Eclipse. The emulator provide interface same as on real mobile device interface to allow programmer to customize the application to be suitable with real device.
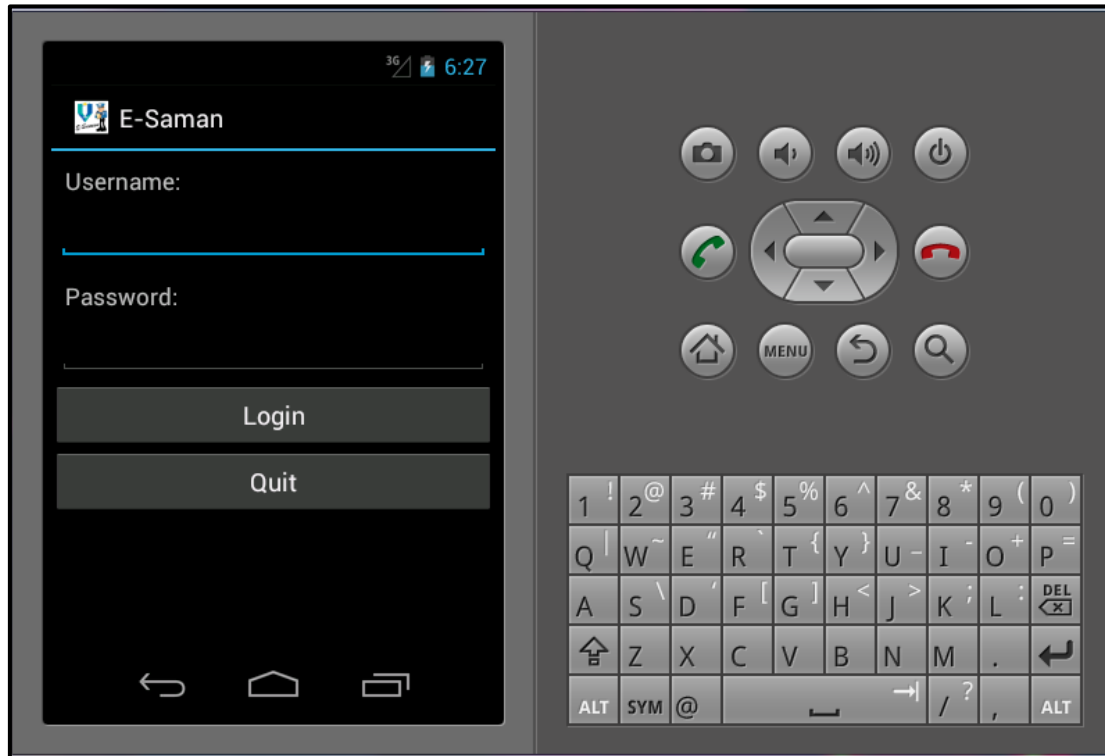
Figure 4.2: Eclipse Android emulator interface

The sample programming codes for mobile application in Eclipse can be referred on Appendix B and Appendix C. Appendix B is the sample codes in XML file for the user interface of the application. Appendix C is the sample codes in Java file for creating the functionalities of the application interface.

4.3   Debugging and Running the Application

During the development process of the application, an Android emulator in Eclipse software is used to test the system functionalities. There are a few interface of the Mobile Application for E-Saman System consist of the login interface, main menu interface, create summons interface, view summons interface, and edit summons interface.

Figure 4.3 shows the Login interface which is the first interface appeared when launching the Mobile Application for E-Saman System. On this interface, user which is UMP security officer needs to log into the application using the username and password that has been created on the E-Saman system database.

Figure 4.3: Login interface

Figure 4.4 shows the Main Menu interface for Mobile Application for E-Saman System. This is the interface directed from the Login interface after user login on the application. On this interface, there are three choices of functions which are creating summons, view summons, and logout. Button Create Summons will navigate user to create summons form where user can add new summons record. Button View Summons will navigate user to View Summons page where user can search for summons record, view, and edit summons record. Button Logout will log user out of the application and navigate user back to the Login page.

Figure 4.4: Main Menu interface

Figure 4.5 shows the Create Summons interface for Mobile Application for E-Saman System. This is the interface directed from the Main Menu interface after user click on the Create Summons button. On this interface user will need to fill in all the details of summons record including offence details, safety officer's details, and offender's details. Name and Mykad number of offender will be read from offender's Mykad using the Mykad reader device. Security officer's detail will automatically filled in by synchronizing data from database based on the login session .Other details such as type of offences, legislation, date, time, and location must be fill in manually by security officer. After clicking on the submit button, user will be navigate back to the Main Menu page.

Figure 4.5: Create Summons interface
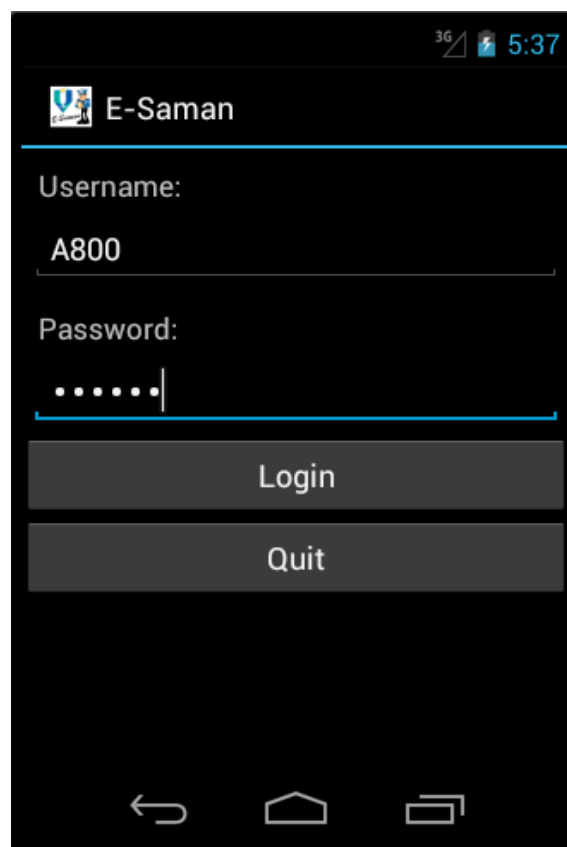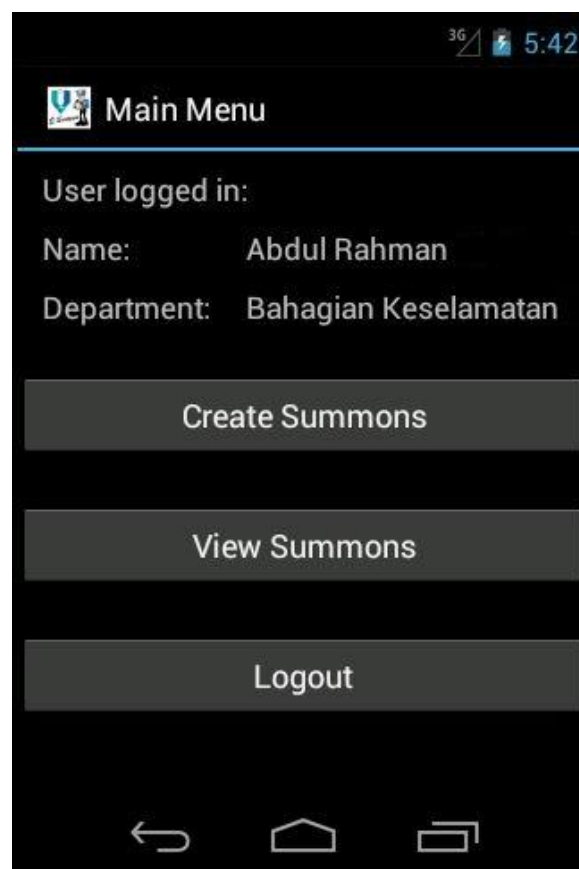
Figure 4.6 shows the View Summons interface for Mobile Application for E-Saman System. This is the interface directed from the Main Menu interface after user click on the View Summons button. On this interface user can search for summons records using matric id of the offenders. First user can fill in the edit text space with offender's matric id and click on Search button. All summons records of the offenders will be displayed in lists that display summons's date. User can click on the date list to display detail information of summons record and directly edit the record for correction. After edit the summons record, user will be navigated to the Main Menu page. There is no delete function because the record must be save into the database for references.
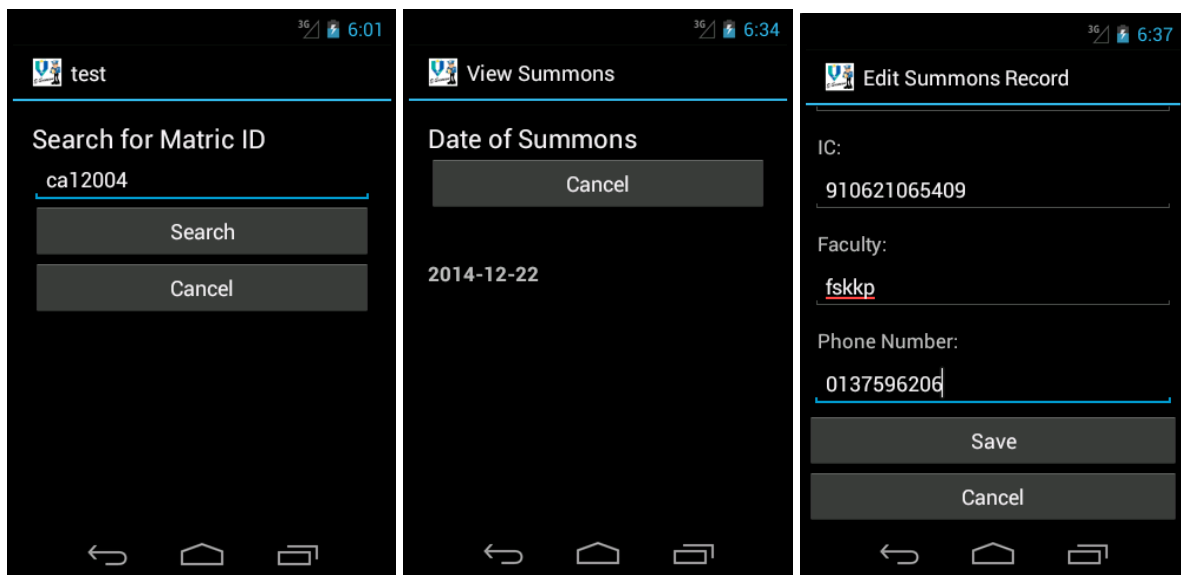
Figure 4.6: View Summons interface

CHAPTER 5

RESULTS AND DISCUSSION

5.1   Overview

In this chapter, there are six subtopics including the overview which are Subtopic 5.2, Subtopic 5.3, Subtopic 5.4, Subtopic 5.5, and Subtopic 5.6. Subtopic 5.2 will discuss on expected result from this project and continue with Subtopic 5.3 which is discussion. It continues with Subtopic 5.4 which will discuss on the project constraint. Subtopic 5.5 will explain on the advantages and disadvantages of the application. The last Subtopic 5.6 will discuss on future work that can be done to improve the application.

5.2   Expected Results

A prototype of the Mobile Application for E-Saman System has been developed based on the project proposal in order to achieve the objective of this project. This prototype is developed to fulfill the plan of developing the application before start developing the final application after improving all related problems. The prototype application is functioning well and has been test on client which is the UMP Security Department staffs. The application is able to perform its functions including adding summons record, view summons record, and update summons record. The summons record has been successfully transmitted to the server via UMP wireless network from the application run on mobile device. The objective to transform manual summons system into online mobile system is achieved with minor problems and improvements.

5.3   Discussion

Using the prototype of the application has successfully achieve the objective of the project which is to transform the manual system of traffic summon into a mobile online system. The prototype application has proven great improvement from using the manual system including saving time and workload, manage data storage efficiently, and eliminate the problem of late data entry into the system which is the major problem of manual system.

A few improvements has been analyzed and recorded to be including into future work. The improvements are made to eliminate minor problem such as the user interface design layout and error handling mechanism. With improvement through future work that will be started after this project development, the Mobile Application for E-Saman System might become an application that meets professional standard.

5.4   Project Constraint

Project constraint is the problem and constraints in developing the project. This includes development constraint, software constraint, and hardware constraint.

Development Constraint:

i.   Limited time and skill in mobile development platform has caused slow development progress to developer to research mobile development method.

ii.   Java programming language has cause development process delayed when there is error on application debugging and cause longer time to solve the error.

Software Constraint:

i.   The Eclipse software comprises of complicated structure for beginner developer and might give problem in development process.

ii.   The Eclipse emulator software is slow in performance thus force developer to use Android device to debug application in development.

Hardware Constraint:

i.   Limited source of Android device that have the USB OTG function which is compatible with the Mykad reader device.

ii.   Limited budget in providing the Mykad reader device to be used with the application.

5.5   Advantages and Disadvantages of Application

There are various advantages of using Mobile Application for E-Saman System. The first advantage is that the application has successfully transformed the old manual system into an online mobile system which eliminates the use of paper in recording summons record. Using the mobile application can reduce time and workload since the summons record is submitted inline directly into the server and there is no need for UMP Security Department's staffs to key in data manually into the system. Moreover, the application provide convenient to security officer to record summon wherever they go around UMP since it can be installed in most Android device such as smartphone and tablets. The application also provide better data management since all records can be search, edit and view from the application without the needs to check on the database for doing reference. The application is also user friendly since it is easy to install on smartphone and compatible with most Android device which is owned by majority of people especially the UMP security officer.

Aside from the advantages of the application, there are also some disadvantages arise. One of the disadvantages is the application is an online system where wireless network is needed to process data. Therefore, user might need to record data manually on paper if there is network problem occurred in UMP area. Other than that, UMP Security Department needs to purchase the Mykad reader device which cost around RM90 each on the manufacturer website. To use the application, user also needs to install one more application of the Mykad reader in order to read Mykad data from the application to be synchronized into the E-Saman application. The minor problem on the E-Saman application is that the design is less interesting and interactions between functions are quite simple with no animation.

5.6   Future Work

Based on the disadvantages of the E-Saman application stated, the improvement that can be made on the application is improve the user interface while adding more user-friendly characteristics such as error handling with proper validation and UI design that apply usability concept. The application can also be programmed so that it does not need to launch the Mykad reader application first before can read Mykad data and place on the E-Saman application. The function to store data locally on device storage can also be added to overcome network connection problem, where data stored in local storage can precede submission to server when there is network connection again. Other than that, there might be more improvement that can be made to this application to make it more usable for future use that may not be listed here. It is hope that the improvement on Mobile Application for E-Saman System can be continued by future developer.

CHAPTER 6

CONCLUSION

The Mobile Application for E-Saman System is successfully developed and simulated by UMP Security Department staffs. The prototype successfully captured offender's information during summons process and the data is sent to server via wireless network. The performance of the application was acceptable with short execution time and considered functioning as expected and can be used for real implementation. The application has successful eliminate problem of using manual system which is by saving time and workload, and manage data efficiently than using conventional method. Data integrity is also secured and problem of losing data is eliminate while retrieving data for reference is easy as at the tip of finger. The application is rated easy to use by UMP Security Department staffs although there can be improvements made to it. It is expect that the application can contribute hugely to UMP Security Department staff to perform their task efficiently.

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APPENDIX A

Activity Gantt chart
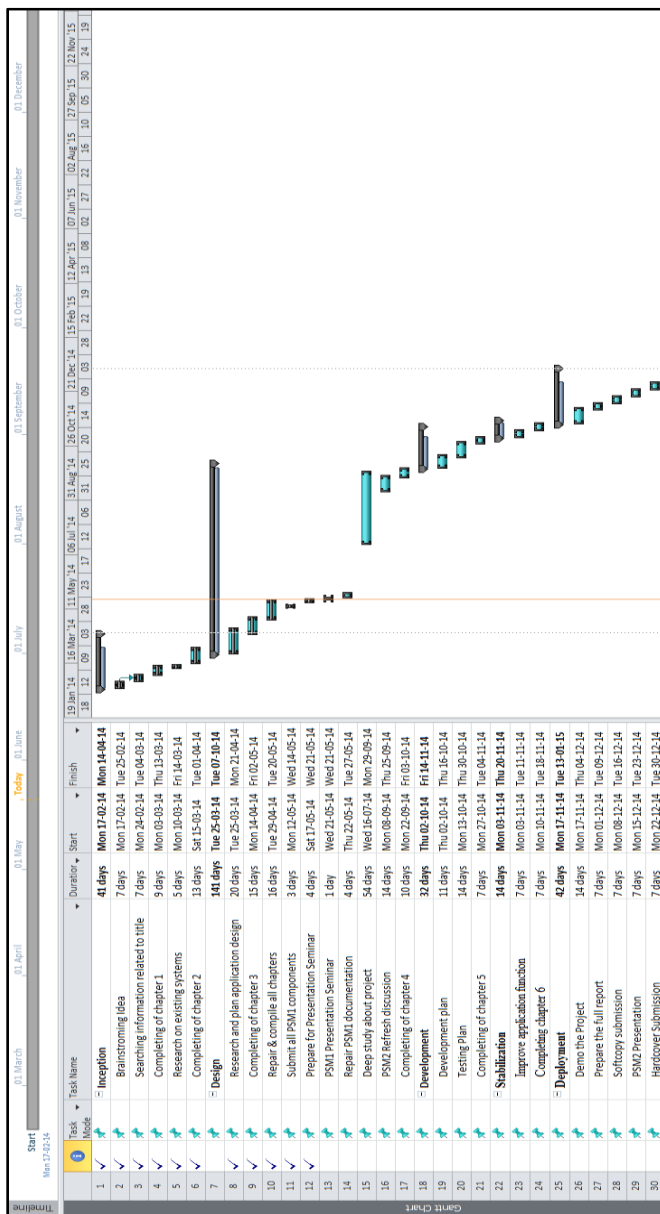
APPENDIX B

Sample Codes in XML File

```xml
1  <?xml version="1.0" encoding="utf-8"?>
2  <LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
3      android:layout_width="match_parent"
4      android:layout_height="match_parent"
5      android:orientation="vertical" >
6
7      <!-- username -->
8      <TextView android:layout_width="fill_parent"
9          android:layout_height="wrap_content"
10         android:text="Username:"
11         android:paddingLeft="10dip"
12         android:paddingRight="10dip"
13         android:paddingTop="10dip"
14         android:textSize="17dip"/>
15
16     <!-- username input -->
17     <EditText android:id="@+id/inputname"
18         android:layout_width="fill_parent"
19         android:layout_height="wrap_content"
20         android:layout_margin="5dip"
21         android:layout_marginBottom="15dip"
22         android:singleLine="true"/>
23
24     <!-- password -->
25     <TextView android:layout_width="fill_parent"
26         android:layout_height="wrap_content"
27         android:text="Password:"
28         android:paddingLeft="10dip"
29         android:paddingRight="10dip"
30         android:paddingTop="10dip"
31         android:textSize="17dip"/>
32
```

APPENDIX C

Sample Codes in Java File

```java
112        int success;
113        String department;
114        String name;
115        String user = username.getText().toString();
116        String pass = password.getText().toString();
117        try {
118            // Building Parameters
119            List<NameValuePair> params = new ArrayList<NameValuePair>();
120            params.add(new BasicNameValuePair("username", user));
121            params.add(new BasicNameValuePair("password", pass));
122
123            Log.d("request!", "starting");
124            // getting product details by making HTTP request
125            JSONObject json = jsonParser.makeHttpRequest(
126                    LOGIN_URL, "POST", params);
127
128            // check your log for json response
129            Log.d("Login attempt", json.toString());
130
131            // json success tag
132            success = json.getInt(TAG_SUCCESS);
133            department = json.getString(TAG_DEPARTMENT);
134            name = json.getString(TAG_NAME);
135            if (success == 1) {
136                Log.d("Login Successful!", json.toString());
137                Intent i = new Intent(MainActivity.this, ScreenActivity.class);
138                i.putExtra("id", user);
139                i.putExtra("department", department);
140                i.putExtra("name", name);
141                finish();
142                startActivity(i);
143                return json.getString(TAG_MESSAGE);
144            }else{
145                Log.d("Login Failure!", json.getString(TAG_MESSAGE));
146                return json.getString(TAG_MESSAGE);
147
148            }
149        } catch (JSONException e) {
```