

E-BUS SYSTEM USING NEAR FIELD COMMUNICATION (NFC)

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 FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

 BORANG PENGESAHAN STATUS LAPORAN  
 PROJEK SARJANA MUDA II

Tajuk Projek : E-BUS SYSTEM USING NEAR FIELD COMMUNICATION (NFC)

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## DECLARATION

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## DEDICATION

*This thesis is dedicated to parents, supervisor, and friends  
for the support and motivation*

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## ABSTRACT

This project is to develop E-Bus System using Near Field Communication (NFC) application. NFC is a wireless communication technology that allows two devices to talk by tapping them together. NFC tag is a small device with a microchip attached to an antenna. A small amount of information can be stored in the microchip to be transferred to another device. NFC tags are tiny enough to be embedded in all sorts of products such as stickers, key chains, labels and business cards the good thing about NFC tag is that it is passive. That means, no battery or power source is required. NFC tags draw power from the device that reads them through magnetic induction. The purpose of E-Bus System using NFC is to provide a centralized platform for schedule provider and any information to help people or user get any update information more precisely. The system that is use in E-Bus System need human-interaction which are a person to update the database or the new information into the website and program it into the specific NFC Tag. This system will give a lot of benefit to the user that have smartphone with NFC application in it because they can get all the information just by tapping their phone to the NFC Tag. The information that user can get are about the bus schedule, bus route, map, gallery (advertisement) and contact number.

## ABSTRAK

Projek ini adalah untuk membangunkan E-Bus Sistem menggunakan aplikasi Near Field Communication (NFC). NFC adalah teknologi komunikasi tanpa wayar yang membolehkan kedua-dua peranti untuk berinteraksi dengan menyentuhkannya bersama. Tag NFC adalah alat kecil dengan mikrochip dilampirkan kepada suatu antena. Sedikit maklumat boleh disimpan dalam mikrochip yang akan dipindahkan ke peranti lain. Tag NFC adalah cukup kecil untuk diterapkan dalam pelbagai produk seperti pelekat, rantai kunci, label dan kad perniagaan. Kebaikan tentang tag NFC ia merupakan suatu alat yang pasif. Ini bermakna, tidak ada bateri atau sumber tenaga diperlukan. Tag NFC memerlukan kuasa dari peranti yang membaca mereka melalui aruhan magnet. Kegunaan utama E-Bus System menggunakan NFC adalah untuk memberikan platform bagi penyelarar jadual bas dan maklumat-maklumat terkini demi membantu pengguna untuk mendapatkan informasi terkinidengan lebih cepat dan tepat. Sistem yang digunakan dalam E-Bus System memerlukan interaksi manusia di mana seseorang perlu mengemaskini data maklumat kedalam laman web serta memasukkan program kedalam Tag NFC. Sistem ini dapat memberikan banyak manfaat kepada pengguna bas yg mempunyai telefon pintar bersama dengan aplikasi NFC di dalamnya. Pengguna boleh mendapatkan maklumat terkini seperti jadual bas dan peta dengan hanya menyentuhkan telefon pintar mereka pada Tag NFC yg telah disediakan.



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## ABBREVIATION

NFC	-	Near Field Communication
RFID	-	Radio Frequency Identification
EAT	-	Expected Arrival Time
RTD	-	Record Type Definition
NDEF	-	NFC Data Exchange Format
CEO	-	Chief Excecutive Officer
BIT	-	Bus Information Terminal
GPS	-	Global Positioning System
LAN	-	Local Area Network
HLD	-	High Level Design

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## **CHAPTER I**

### **INTRODUCTION**

This chapter will explain generally about the project, which includes the background, problem statements, objectives and scope. Moreover, sustainable development and potential commercialization of this project also will be explained briefly to complete this chapter.

#### **1.1 Project Background**

Public transports like buses, taxies, trains, and etc. are used to bring people from one place to another place. Nowadays, people used smartphones widely even three years old kids have their own tablet. The smartphones are used to make their life easier and comfortable. The technology keeps changing from days to days for example; the newest technology that comes into IT world is Near Field Communication (NFC). This technology is a new technology that comes to Malaysia. Google Wallet, a new payment method that involves the use NFC by waving the smartphones in front of scanner, had made a hot topic in tech circles. Most of the applications that use NFC, mainly for sharing information with other people in short time. Thus, this motivates to come out with Interactive bus stop using NFC.

NFC also known as Near Field Communication, as a subset of RFID, is a bidirectional short range communication technology. The working principle of NFC is via electromagnetic field induction, thus it is designed for simple and safe data exchange directly between two devices. NFC allows an interaction distance of approximately 5-10 cm. NFC offers three different operation modes which are passive tag (card emulation), active device for reading and writing of passive tags, and peer to peer communication (both device are active). E-Bus System using NFC is a technology that uses NFC (looks like SIM card or card reader). NFC is a contactless technology which uses radio waves to connect NFC enabled smartphones like Samsung SIII, Samsung SIII Mini and the latest smartphone is Blackberry Z10 to the NF reader which is look like a mini sticker. NFC technology allocates two devices to communicate by tapping them together. With NFC, people can tap the mobile devices to everyday objects and certain pre-defined actions will be performed like exchanging digital contents, interacting with social networks, changing device settings or even open an application on the other device.

## 1.2 Problem Statement

- The schedule that provided by bus company is hard to be announced and updated as it use paper-based information. This situation make peoples cannot get the latest information such as delayed bus, bus schedules changes and etc.
- Paper-based schedules or schedule board used as medium of information may cause related information cannot be reached at respected people efficiently. For example, sometimes the papers that are detaching from soft board are missing or has been tear off by people.
- There is no such an application for bus stops that use NFC application in Malaysia.

## **Objectives**

The objectives of this project are:

- To investigate the use of NFC technology for bus application in conveying information efficiently.
- To provides centralize platform for scheduler provider and people to update and get latest information of bus schedules and related information such as advertisement.

### **1.3 Scopes**

The project covers software design using NFC Simulator Application, NFC Task Launcher/NFC Tag Reader/Writer/NFC Tag info and Java programming. The purpose of this NFC software system in order to assist the real-time in bus system. Software requirements are a field that compromise with establishing the needs of the users that are will be solved by software. In this project it also consist with hardware requirement that can be defined by any operating system or software application is the physical computer resources or components, that also known as hardware. Types of hardware for this project are NFC Tag and devices that have NFC (smartphone).

### **1.4 Project Significance**

This project will give benefit to many people that used bus as transport in term of consuming their time. This can prevent them from not doing anything while waiting for the bus and also can know if any delays happen. The use of NFC in several systems is still quite low in Malaysia, so this project will be the first system that used this technology for bus stop. People also can know the latest advertisement and promotions around their places just by tapping the smartphone onto the sticker (NFC reader) and do not need to go there and will know the promotions on that time.

## **1.5 Sustainable Development**

E-Bus System Using NFC (Near Field Communication):

- Will make shuttle bus system become more effective
- Use only software and hardware which does not harm any nature resources
- Future improvement – bus ticket purchasing (bus station)

## **1.6 Potential Commercialization**

- Shuttle Bus Company (Rapid KL, Panorama)
- Other Bus Company (Transnasional, KKKL, MARA Liner, Inter City and etc.)
- Terminal Bus Company (Terminal Bersepadu Selatan-TBS)

## **1.7 Conclusion**

In conclusion, this project can make people lifestyle easier and more comfortable. This project also can gain benefit as it consumes lower waiting time. All the information like problem statements, objectives and expected output are described briefly in this chapter. In the next chapter, will be discussing about the literature review and project methodology used throughout the development lifecycle.



## **CHAPTER II**

### **LITERATURE REVIEW**

This chapter includes the review about research or experiment that has been conducted regarding this project.

#### **2.1 Introduction**

This chapter will discuss about the literature review and methodology of the project. Literature review is a summary of valuable information of the research sources of the project being used to be as references to build a better system. The literature reviews will provides background information and discovers how the project is related to the works of others.

All the information regarding this project can be getting through journals, articles, books and internet. All of them that have been reviewed are based on bus scheduling, bus information and also about the NFC technology.

## **2.2 Fact Finding**

### **2.2.1 NFC (Near Field Communication)**

NFC is a very important techniques. Here will be the integration of technology in mobile phones to make people's lives much easier. Among those companies Nokia and some other companies in the market today with the presence of NFC in mobile phones of their own. Will be part of mobile phones in the future. NFC has a lot of applications in everyday life. We will not be need to carry cards, different electronic such as access cards, debit cards / credit cards and identity will be the cards are already in the cell phone, and will use them anywhere we want and will not transfer data easily from any device to another. Even more, we can buy and store e-tickets on the cell phone and there is also a set of criteria to determine the work of smart phones and similar devices to be the wireless contact them by touching each other or make them side by side, and not more than the distance of a few centimeters. There is also the current and anticipated applications include data sharing, and simplified setup of more complex communication such as Wi-Fi. Communication is also possible between the device and the NFC chip unpowered NFC, which is named "tag".

NFC (Near field Communication) become a technology shift from one machine to the network and the devices connected to a single concept from hardware to multiple devices purposes. It is important that consumers do not face complications in the hardware configuration for the establishment of a network, leading to near field communications, will be the NFC is a combination between identity and connectivity through technologies that contactless proximity between information and become easy communication between small electronic devices to be created to urge the magnetic induction when they are touching the devices or become closer to each other with a few centimeters to enable communication between them. Also been established and peer-to-peer network for data exchange. Once you create a communications network to other wireless technologies can be used such as Bluetooth and Wi-Fi to exchange a large amount of data and increasing the range of

communications including. [1]

Table 2.1: Comparing NFC to other close range communication technologies [8]

	NFC	RFID	IrDa	Bluetooth
Set-up time	<0.1ms	<0.1ms	~0.5s	~6 sec
Range	Up to 10cm	Up to 3m	Up to 5m	Up to 30m
Usability	Human centric Easy, intuitive, fast	Item centric Easy	Data centric Easy	Data centric Medium
Selectivity	High, given, security	Partly given	Line of sight	Who are you?
Use cases	Pay, get access, share, initiate service, easy set up	Item tracking	Control & exchange data	Network for data exchange, headset
Consumer experience	Touch, wave, simply connect	Get information	Easy	Configuration needed

### Radio Frequency Identification (RFID)

RFID enables a one way wireless communication, typically between an unpowered RFID tag and a powered RFID reader. RFID tags can be scanned at distances of up to 100 meters without a direct line of sight to the reader and as such RFID is used globally for asset tracking in warehousing, airport baggage handling, livestock identification and much more. RFID operates at a range of radio frequencies each with their own set standards and protocols

#### 2.2.2 NFC Modes of Communication

Three modes of communication are defined by NFC forum. [1]