SMART EXHIBITION BY USING NEAR FIELD COMMUNICATION (NFC)

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BORANG PENGESAHAN PENERIMAAN LAPORAN PSM II

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Tajuk Projek	SMART EXHIBITION BY USING NFC (NEAR FIELD COMMUNICATION)

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SMART EXHIBITION BY USING NFC

(NEAR FIELD COMMUNICATION)

MUHAMMAD AUDI AUFA BIN SALLEHUDDIN

This report is submitted in partial fulfillment of the requirements for the award of
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Faculty of Electronic and Computer Engineering

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JULY 2013

"I hereby declare that this report is the results of my own work except for quotes as cited in the reference."

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ABSTRACT

Near Field Communication Technology (NFC) is a form of very short range contactless communication for distances up to 4 cm (theoretically 20 cm). NFC is the descendant or an evolved form of Radio Frequency Identification (RFID). Although technically its working principal is based on RFID, it is more similar to Bluetooth in applications since it allows communication between active devices. Currently, it has applications mostly in the field of contactless electronic payment. In this report briefly discussed the history of NFC and its theory of operation. I described some of the applications in brief detail and gave examples of how they have been implemented in other technologically advanced countries. Then proceeded on to offer suggestions how NFC can be used to enhance services in any exhibition in Malaysia.

ABSTRAK

Near Field Communication (NFC) adalah satu bentuk komunikasi jarak tanpa sentuh untuk jarak sehingga 4 cm (secara teori 20 cm). NFC adalah satu bentuk berkembang Radio Frequency Identification (RFID). Secara umumnya kerja adalah berdasarkan kepada RFID, ia adalah lebih serupa dengan Bluetooth dalam aplikasi kerana ia membolehkan komunikasi antara peranti aktif. Pada masa ini, ia mempunyai banyak aplikasi dalam bidang pembayaran elektronik tanpa sentuh. Dalam laporan ini membincangkan secara ringkas sejarah NFC dan teori operasinya. Saya menyifatkan beberapa aplikasi secara terperinci ringkas dan memberikan contoh bagaimana ia telah dilaksanakan di negara-negara maju dari segi aplikasi yang lain. Kemudiannya dengan menawarkan cadangan bagaimana NFC boleh digunakan untuk meningkatkan perkhidmatan di pameran besar yang berada di Malaysia.

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CHAPTER I

INTRODUCTION

In this chapter, it will explain about introduction, problem statement, project objective, project scope of Smart Exhibition using NFC System (Near Field Communication System).

1.1 Introduction

Near field communication (NFC) is a set of standards for smartphones and similar devices to establish radio communication with each other by touching them together or bringing them into close proximity, usually no more than a few inches. Present and anticipated applications include contactless transactions, data exchange, and simplified setup of more complex communications such as Wi-Fi.

Communication is also possible between an NFC device and an unpowered NFC chip, called a "tag". Therefore, in this project an NFC technique is proposed to solve the problem of visitor with application at exhibition. Basically, in exhibition when the visitor need to know something about the product, the visitor must asking to the vendor about the product or the vendor put the template at in front of the

product to shown about the product its make difficult to the visitor to understand about the product.

However, the NFC system make the visitor more easily when visit the exhibition. The main objective for this project is to develop about NFC technology by using mobile phone communication.

1.2   Problem statement

Nowadays, in every exhibition is hard for the visitor to find something about the product. For example, visitor comes at car exhibition are want to know about one of the car at exhibition, however the visitor don't know where to get the information about the car. Basically in exhibition, at one product like a car there have someone stand at in front of every booth they will give brochure for every car, then the visitor will know about the information of the car by read in the brochure. Thus, the Smart Exhibition using NFC system with passive NFC device is used to the information can be downloaded to the mobile device. Hence, with using mobile device which is smart phone, visitor can check the information directly in their smartphone without asking the vendor to know about the curtain product.

1.3   Objective

There are 3 objectives of this project:

- To investigate the use of NFC in exhibition.
- To develop NFC technology in the Android system.
- To enhancement the exhibition system efficient by using NFC system.

1.4   Project scope

The scopes of this project are:

This project should be seriously considered and make with full of planning and other preparation so that this project will be smoothly done in the end of the semester. The main target for this project is to build the Smart exhibition system by using NFC system (Near Field Communication) purposely to help visitor when visit exhibition. It will use the active device for reading and writing of passive NFC tag. In the other hand, the passive NFC tag can be operating without a battery. The NFC reader can only detect the NFC tag in distance less than 10cm. the system will be using C programming language to program the NFC tag. The data will be shared by using the NFC technology system.

There are two important part in this project which is the Android smartphone and NFC Tag.

Figure 1.1 The Project Scope

1.5   Methodology

To complete this project, they are several stage to followed and perform. The first stage is to investigate the use of NFC in exhibition. Second stage is, process of develop NFC when using Android system. Third stage is final stage that shows how to use NFC system by using android system in any exhibition want to use this system.

1.6   Organization of report

This report consists of 5 chapters organized as follow:

Chapter I: discuss about introduction of this project. Briefly describe about an introduction to Android OS Platform using Near Field Communication (NFC) for smart exhibition in general. This chapter provides information about NFC functionality and how NFC helps to overcome the problem in exhibition. It also consists of introduction, problem statement, project objective, project scope and methodology.

Chapter II: contain literature review on past studies about this system and relevant information related to NFC (Near Field Communication) from the research around the world.

Chapter III: will discuss about the methodology that have been used in this project. Methodology is one of the most important things in planning of a project. The project must be understood first and then followed by further research about the previous projects that are related to this project.

Chapter IV: describes about the result and discussion. In this chapter, the results of the project, all the problems encountered and discussion on the works will be presented. The results that presented here involving the hardware and software part.

Chapter V: Last chapter discussed about conclusion and recommendation of this final year project for this semester.

CHAPTER II

LITERATURE REVIEW

2.1   Background Study

This chapter explains regarding the literature review which is a description of the literature relevant to a field or research discussed in chapter I. the review and research in this chapter will be discuss about the NFC technology and the other topic is would be the case study on NFC technology.

NFC technology

Case Study about NFC

2.2 NFC Technologies

2.2.1 What is NFC?

Near Field Communication (NFC) is a short range wireless communication technology which is evolved from Radio Frequency Identification (RFID). It enables communication between two NFC enabled devices within few centimeters. NFC is a type of radio communication standard, much like Bluetooth, Wi-Fi and other networking technologies. It's different in that it operates at very slow speeds and only at a short range of just a few centimeters. The communication occurs when two NFC compatible devices are brought together less than four centimeters, or simply by touching themselves. It operates at 13.56 MHz and can transfer data up to 424 Kbits per second. NFC communicates through the magnetically induced signals. Therefore, during transmission, energy is coupled between transceivers instead of electromagnetic radiation as in traditional wireless communication.

2.2.2 History of NFC

NFC is the advance of RFID that was invented by Carles Walton. Carles Walton was among the first to patent innovation related to RFID area. He was born in 1921 and grew up in Maryland and New York and attended Cornell University in electrical engineering course. He went on to the Stevens Institute of Technology in Hoboken, New Jersey, where he earned Master's degree in electrical engineering and economies of engineering. In 1960, he accepted a position with IBM's research and development laboratories where he spent the next decade working on project related to automatic control and disc drives. In 1970, Walton left IBM and started his own company. Proximity Devices, in Sunnyvale, California.

Figure 2.1 Charle Walton NFC inventor

A company called NXP Semiconductors and Sony invented the new NFC technology in 2002. Many major cellular telephone companies had committed to the idea of incorporating it in production by year 2004. Many companies began to incorporate the specification for their product in two year later that was in 2006. The product such as NFC tags, smart tags and smart posters we introduced. There's technologies would allow the user to collect videos, music, photo or other product information by using their phone by receiving or sending device. This very same year the Nokia 6131 was the first phone produces and sold to include NFC chips to enable them to use and to be compatible with NFC smart point. In 2009 P2P or peer to peer application were applied to NFC technology which allowed its users to send pictures, music and movies to other NFC enabled phones using Bluetooth or other NFC connections. In 2010, the first Android operating system to incorporate with NFC technology is Samsung Nexus S smartphone. Within the next five years it is expected that over half of all phones manufactured will be NFC enabled with even more than that by the end of the decade. Whether people want to use it or not, they will have it. The only limitation in the coming years is it cannot be made to be mandatory for anything unless the company plans to alienate a huge percentage of the population.

2.2.3 NFC Mode Operation

Based on NFC Forum, there are three main NFC operation mode
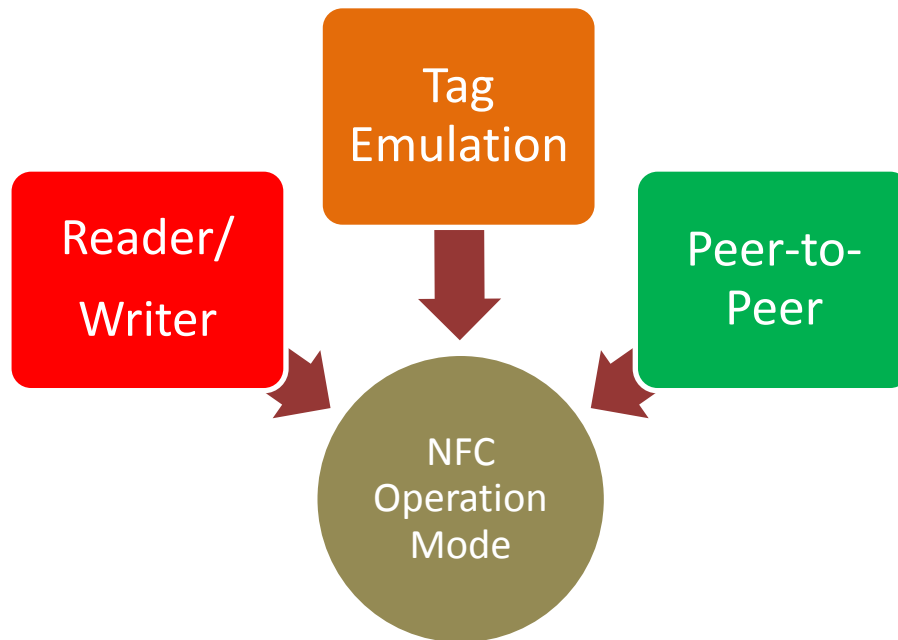
1. **Reader/Writer mode:** In the reader/writer mode, NFC devices can read and write data from/to NFC tags and smart card, NFC device acts as an initiator and passive tag is the target. Passive tags do not need any source of power. Active NFC device create magnetic inductive coupling and transfers energy to smart card when it gets close enough. After the smart card is powered, communication starts. In this mode of communication the data speed can increase up to 106 Kbit/sec.

2. **Card Emulation mode:** In the card emulation mode, NFC device acts as an RFID card and other NFC devices can read data from this NFC device. The advantage of this mode is that there is not any need for NFC tags or a RFID card, and stored information in the NFC device is used for further operations.

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3. **Pear-to-Pear mode:** In the peer-to-peer mode, two devices can exchange data at link-level. This mode is standardized on the ISO/IEC 18092 standard, and allows data speed up to 424 Kbit/sec.
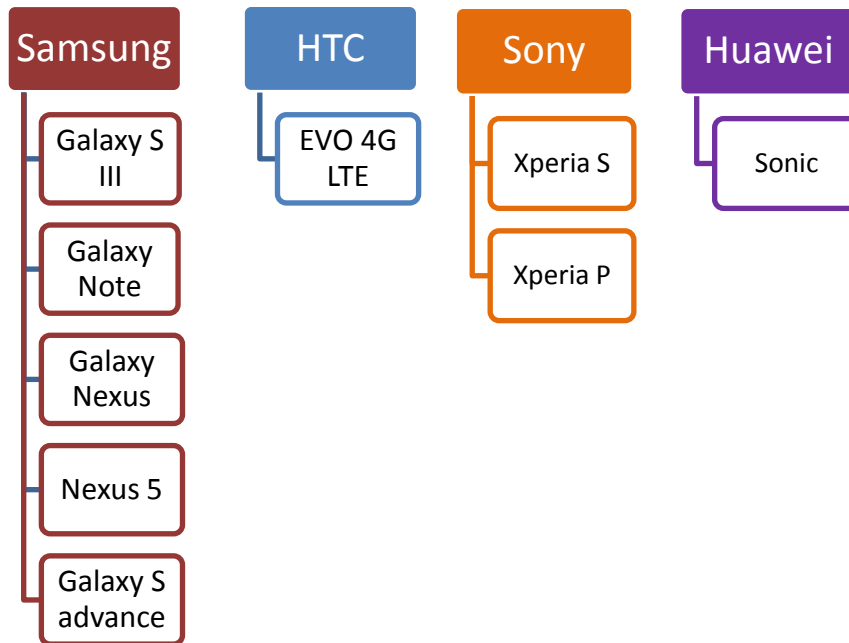
Figure 2.2 NFC Android Devices

2.2.4 NFC Chip

2.2.4.1 NXP Semiconductor

One of the leading chip manufactured that produce NFC chip is NXP Semiconductor NXP provides high performance mixed signal and standard product solution that leverage its leading radio frequency, analog, power management, interface, security and digital processing expertise.

2.2.4.2 NXP Chip Architecture

Figure 2.3 below shows the overview of Samsung galaxy S component with PN65 with NFC chip from NXP. There are also other semiconductor companies such as Inside Secure offers open source implementation of NFC stack.