

SMARTPOSTER DEVELOPMENT USING NEAR FIELD COMMUNICATION (NFC) FOR WI-FI AND SMARTMALL PROMOTION

Emir Husni

School of Electrical Engineering and Informatics
Institut Teknologi Bandung, Jalan Ganesha 10, Bandung 40132, Indonesia

ABSTRACT

Today's technology development makes life easier by utilizing the net. Internet keeps people connected to each other and to information sources. One of the technologies commonly used is Near Field Communication (NFC). NFC works by applying radio frequency. In the 2011, Google integrated NFC into a mobile phone with the Android operating system. With that, Android mobile phone-users' activities become simpler and more leisurely, because something can be sufficed with a simple tap from an NFC-enabled device to another NFC-enabled device, so users' interactions with their devices are concentrated. In this study, NFC technology is applied to promote Wi-Fi service and coupon download. The users can get it done by tapping their Android mobile phone to a smart poster that has two NFC tags. With NFC, users do not need to access their mobile phone settings to connect to Wi-Fi, they can only tap their Android devices to the smart poster. Moreover, they can download a coupon that is available from the application and spend it in stores.

Keywords: e-coupon, Near Field Communication, Wi-Fi, Android.

I. INTRODUCTION

Technology is made to support the humans' lives, and then they can be more effective and efficient. It is used for the simplest task like cracking eggs to the complex ones like constructing space station. One of the most important applied scientific disciplines in human animation is the applied science that

allows us to interchange information, communication.

The mobile telephone set is one of communication technologies commonly employed in the society. These years, cell phone companies compete to adopt the

newest technologies into their products, for example, Near Field Communication (NFC)^{1,2}.

As a close-range wireless communication engineering that holds potential to aid billions mobile phones close to the world, NFC offers many valuable uses in everyday lives, such as, in trading, serves as member card, keys for hotel access, office, house and many other designs that can be incorporated in one mobile phone^{3,4}.

Unfortunately, NFC technology isn't widely recognized by the public. It's really different with other technologies like camera in the mobile phone that the user definitely knows how to work it. That is why, socialization about NFC is needed

This work utilizes NFC technology to plug into a mobile telephone to a Wi-Fi network that is used in a mall. The inquiry conducted on this issue because of the high growth of mobile telephone set and internet user numbers. Established on the International Telecommunication Union Development Sector (ITU-D) data, in 2013, there are 6.8 billion registered mobile phone users from the total of 7.1 billion populations. In developing countries, 89 of 100 people are mobile users. Furthermore, other data stated that 2.7 billion people are linked to the net. In developing countries, 31 of 100 people are connected to the net.

II. BACKGROUND

Android is an operating arrangement for mobile that consists of an operating system, middleware and application⁵. This operating system which is based in the Java programming language and ran in Linux kernel and brings in many characteristics.

An Android application has a life cycle – started when Android initiated a component to respond intent to quit when the intent is terminated⁶. Figure 1 depicted the life cycle of an Android application.

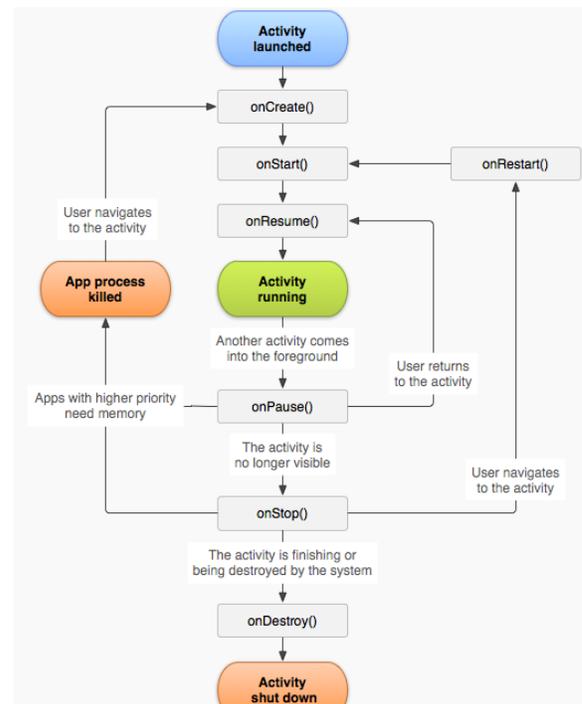


Figure 1 Android Activity Lifecycle⁶

Later evolutions in technology and infrastructure of ubiquitous computing and pervasive computing have motivated the discovery of a variety of applications that is becoming really useful in human

lifespan. The effects of the present invention are the development environment that interprets and responds to human desires, Smart Spaces, which in this study will be discussed on Smart mall.

Smart mall utilizing 3rd generation computing that aims to minimize human interaction and computing devices integrate into the surroundings. And then the mall visitors can enjoy the mall facilities with easy, convenient and interactive.

To support smart mall, needs technology that supports visitor interaction as the technology for determining the location, NFC, QRCode⁷, computer networks and others. Visitors use the interface that is possessed by its smart devices such as smartphones and tablets. Smartphones and tablets in the current times are very supportive for the implementation of smart mall because many applied sciences are employed in it such as GPS, Wifi, camera, NFC, touchscreen and other. Below is a photo of an exemplar of the application of NFC and QR Code for smart mall.

NFC is a short-range wireless communication engineering (the furthest range is 20 cm), within frequency of 13.56 MHz. This applied science is based on Radio-Frequency Identification (RFID) which is produced by combining interface of a mobile phone and a reader into a gimmick. The use of NFC can be managed in three ways, as follows:

1. Card Emulation. A device acts as a card that can be read by some other device.
2. Reader mode. A device can scan an RFID tag.
3. Peer to Peer (P2P) mode.

NFC is introduced by Google to Android 2.3 (level 9 API) devices. In Android 2.3, its capability just limited to tag reading only. In Android 2.3.3 (level 10 API), the capabilities to write data and data transfer from P2P mode are presented.

To protect the data inside the tag, use AES. Advanced Encryption Standard (AES) is a cryptographic algorithm that applied to secure data^{8,9}. AES algorithm is a symmetric block cipher text that can encrypt and decrypt data. Encipher changes the data that can't be read – called cipher text. On the other hand, decipher changes the cipher text data to its previous format that known as plain text. AES algorithm uses 128 chips, 192 bits and 256bit cryptographic keys to encrypt and decipher data from 128 bit block.

The decision to choose AES based on three primary criteria: safety, cost and algorithm characteristic along with its operation. Safety is the most important factor in the evaluation. It consists of margin against all known sign analysis, as considerably as the extraneous ones. In addition, AES should be detached to use without paying royalty, inexpensive to be visited in a smart card that has small

memory, efficient and fast (as fast as Triple DS at minimum) when works in any 8 bits to 64 bit devices and assorted software. DES uses a Feistel structure that has superiority because its encryption structure and description are the same even though it uses not invertible F function. The Feistel's main weakness is merely half of the information is processed in each cycle. While AES uses Substitution Permutation Network (SPN) structure that has greater parallelism level, and thus it is expected to be faster than Feistel.

AES or Rijndael algorithm as one of the most important algorithms surely has many components that have utilized in everyday lives. It is congenital that it needs only about shelter or information concealment in its execution. Single of the utilization of AES is 7-zip compression. Ace of the processes in 7-zip enciphers the data by using AES-256 method that the key is produced by Hash function. The combination creates the information protected and more secured from virus attack which is one of the nemesis in computer organization and information because its harmful nature.

A router that used in this study is mikrotik router RB951G 2HD. MikroTik is designed by MikroTik Ltd, a company in Latvia. Initially, MikroTik is intended as an Internet Service Provider (ISP) that served using wireless technology. As for now, MikroTik provides service to many wireless ISP and very popular in Indonesia. MikroTik now

also produces hardware and software for internet connection around the macrocosm. Its main hardware product is router, switch, antenna and other supportive devices, as for its software product is MikroTik Router OS.

III. IMPLEMENTATION

Conventional poster generally used as one-way information media. Because of its characteristic, a somebody that reads a poster cannot interact further with the invoice.

Smartposter is a poster equipped by one or more readable NFC tags^{3,4}. Data are included in the tags accessed by mobile phone or any other devices that has NFC functions just by tapping the devices to the NFC tags.

The figure 2 below depicted a characterization of the general plan from the created user system:

1. Users who do not own a mobile phone application is needed to connect it to the wifi with SSID named App Download. If users already own an application run directly to step 3.
2. Tap mobile phone to Tag A, and the user will download the reader application directly to the mobile telephone, and thus set up the application.
3. Tap mobile phone to tag B, then the user will automatically connect to Wi-Fi that provides complimentary internet access.

4. Users who connect to the internet for a certain duration can download discount coupons from download coupon local server.

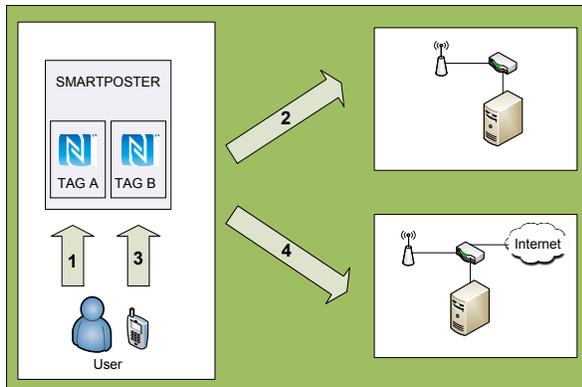


Figure 2 The general plan of user system implementation.

The figure 3 below is a depiction of the general plan from the created administrator system:

1. The administrator running the application and choosing the menu writer Tag A, then fill in the URL to download a reader application then tap to tag A.

2. The administrator running the application and choosing the menu writer Tag B, then fill in the information at a lower place.

- a. SSID
- b. Password
- c. Duration variable
- d. Connected variable

- e. Name of shop 1
- f. Coupon download link of store 1
- g. Name of shop 2
- h. Coupon download link of store 2
- i. Name of shop 3
- j. Coupon download link of store 3

Later on that administrator tap his cell phone to Tag B.

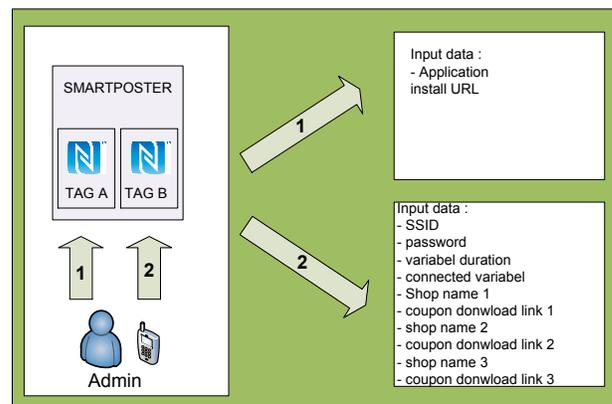


Figure 3 The general plan of administrator system implementation.

Basically, the systems consist of two applications for two different users. One for NFC tags administrator, one for smartposter users. The general design of the applications regarded from figure 4 below:

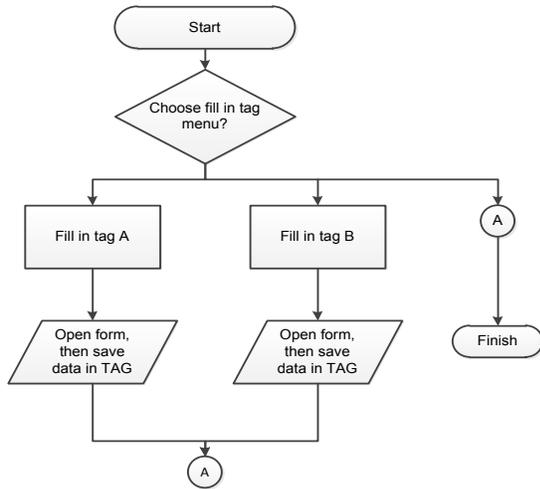


Figure 4 Smartposter tags administrator application diagram.

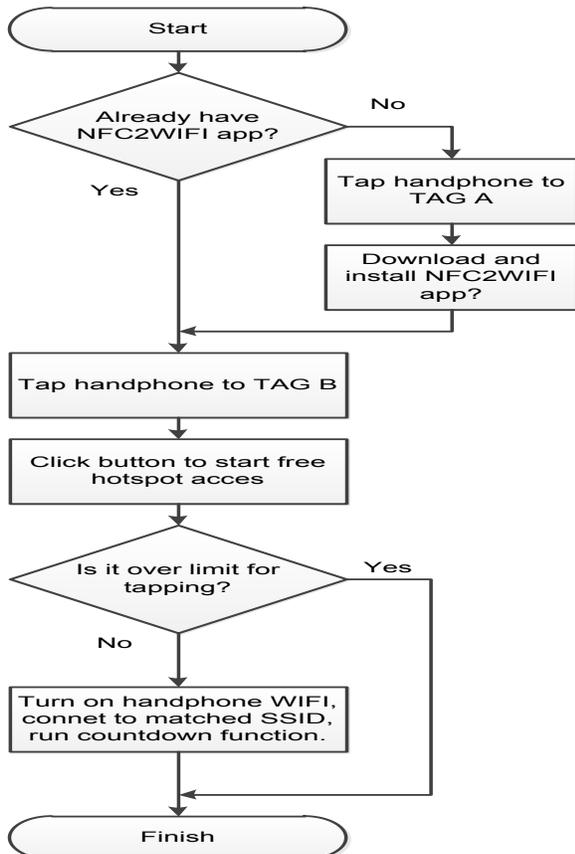


Figure 5 Smartposter user application diagram.

The interface of the application is implemented into mobile phone Samsung Galaxy S3. The interface implementation from each menu and sub-menu tested in test stage. The interface is split into two parts: administrator and user as depicted in figure 5.

The administrator interface consists of three parts: main menu, A tag load part and B tag part. The effect of interface implementation for administrator depicted in figure 6, figure 7 and figure 8.



Figure 6 Administrator main menu interface.

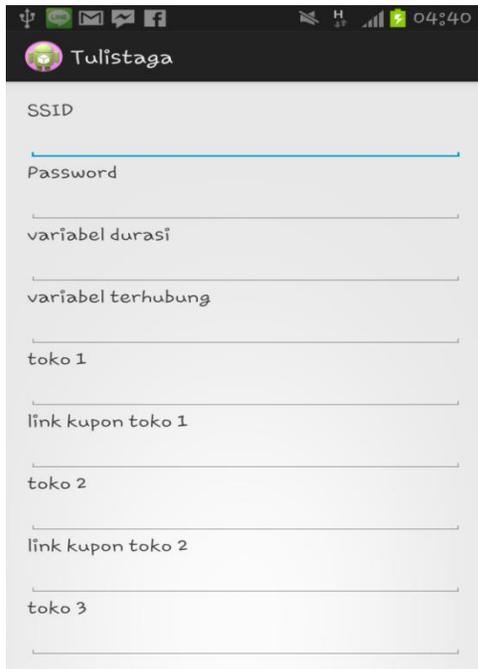


Figure 7 Administrator A tag load menu interface.

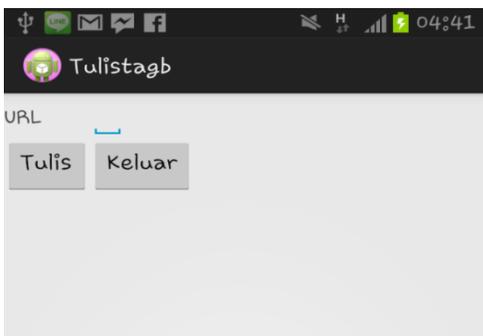


Figure 8 B tag loading interface for administrator.

The interface for smartphone user that use smartposter service depicted in figure 9.

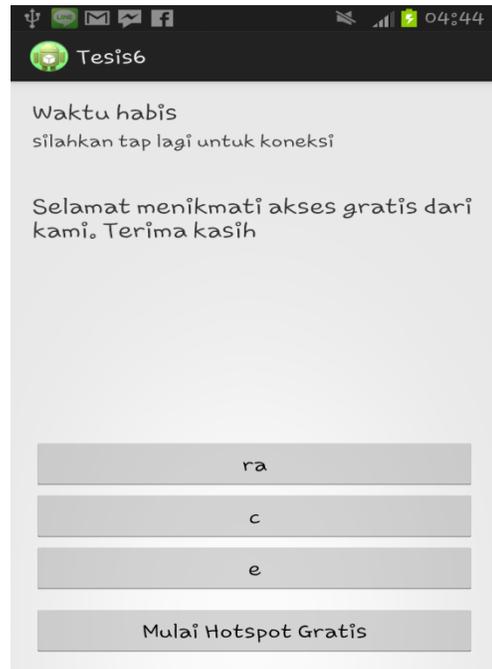


Figure 9 Smartposter user interface.

To support users access Wi-Fi service for free, a network planning is required. The network design used in this work is keyed out in figure 10. In the human body, there are two waiters. The first server store and help the users that request application installer file, NFC2WIFI reader. As for the second server, its task is putting up the voucher. Both hosts have different network, so two access points are needed at minimum. To gain access from the admission points, the users are asked to tap their mobile telephone set to the correct tag.

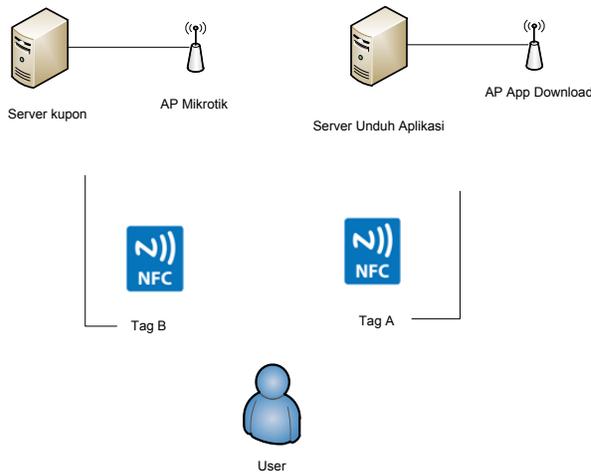


Figure 10 Network planning that is used in this study.

Some tests need hired to preserve the application so that it works efficiently and efficaciously. In this analysis routine, there are various processes: writer application testing and reader application testing. The outcome of the tests depicted in the table1 and table 2 below

Table 1 Writer application test results.

Cases and Results			
Input	Expected Result	Observation	Conclusion
Tag scanning	Tag writing failure if the size of the tag smaller than the data that will be	An error message shown, with available size in the tag and the written	Pass

	written.	data size.	
A Tag menu	Display A Tag menu.	A Tag menu is displayed.	Pass
B Tag menu	Display B Tag menu.	B Tag menu is displayed.	Pass
Encipherer	Enciphers the payload.	The payload successfully enciphered.	Pass
Main menu exit button	Exit from the application.	Exit from the application.	Pass
A Tag page exit button	Return to the home menu.	Return to the home menu.	Pass
Tag B page exit button	Return to the home menu.	Return to the home menu.	Pass

Table 2 Reader application test results.

Cases and Results			
Input	Expected Results	Observation	Conclusion
Tag	Tag	Tag	Pass

scanning	detected.	successfully detected.	Pass
Description	Enciphers the payload.	The payload successfully enciphered.	Pass
Day detection	Reset the connected variable.	The connected variable is reset.	Pass
Number of the variables connected	Connected variable match with the ones in the tag.	Connected variable match with the ones in the tag.	Pass
	Disconnected if exceed the limit of connected variable.	Disconnected.	Pass
Coupon link	The link address consistent with the shop's name in	The link address consistent with the shop's name in	Pass

	the tag.	the tag.	
	Coupon download link match with the shop's name in the tag.	Coupon download link match with the shop's name in the tag.	Pass
Timer	Display the remaining time to be connected to the Wi-Fi.	The remaining time displayed.	Pass
	Wi-Fi disconnected when the time limit is reached.	Wi-Fi disconnected when the time limit is reached.	Pass

IV. CONCLUSION

The psychoanalysis of the tests - be it from the application or the hardware that is employed in this study, shows no problems from the operational aspects of the application. Interactions between the NFC2WIFI application user with user tag and administrator with administrator tag are also having acceptable resulted.

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