M-Commerce Using NFC Tags

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Abstract— **This paper presents a novel method to create an Android based M-commerce application using NFC. It would require Mobile Devices which support NFC technology. NFC stands for Near Field Communication technology which is a short-range, high frequency, low bandwidth radio technology that allows transferring data within few centimeters. In traditional shopping, the customer needs to physically pick up the items to be purchased and carry cash or credit/debit cards with them to make payments. The application mentioned here would read the NFC tag(s) of the product(s) & add it to the shopping cart in our application. It would also provide methods to change the quantity of product/s purchased and edit the cart. Along with this the customer would be informed about the on-going offers in the store. Payment could be made through cash o r online using existing payment methods. The paper would also throw light on NFC based payments**

I. INTRODUCTION

Since the late 1990s, people have enjoyed a comfortable lifestyle because of mobile devices. By the early 2000's, wireless networks have been developed in Europe and Asia. Currently, the penetration rate of mobile devices in many developed countries is around 80-90%. Mobile devices supported by the development of wireless networks have spread throughout the world. Mobile commerce applications have become the most popular application for mobile device users who want to do business and financial transactions easily and securely, anytime and anywhere. Today the use of physical cash is experiencing a decline in popularity in the business world, because it is being replaced by electronic money (e-money). An important upcoming technology behind mobile payments is Near Field Communication (NFC). As an indication that the NFC has tremendous business potential, leading companies like Nokia, Microsoft, Visa Inc., MasterCard Worldwide and NXP Semiconductors, are actively engaged on them. Payment processing integrated with NFC technology based mobile operating system is the trend today. The prototype application discussed below has been designed to pay for the user side as consumer and the merchant side as a trader or seller by using the handset that already has NFC technology, for instance LG Google Nexus 5. This application prototype also implements the concept of security in e-commerce transactions by using certain protocols like Tag-to-Tag, so that the user's needs for security and comfort while making a financial transaction are met.

The prototype payment application using mobile phone device in which the technology, Near Field Communication (NFC) is already integrated. The discussion in this research focused on the security of NFC based communication when making the payment process between a user and merchant. This study protocol implements Tag-to-Tag as NFC based communication security protocol. Testing is done by simulating the actual payment process by using 2 mobile devices LG Nexus 5, each of which acts as a user and merchant.

1. 1. Moblie commerce

Mobile commerce is the buying and selling of goods or services through wireless devices such as mobile phones, personal data assistants (PDAs), smart phones and other handheld devices. Mobile commerce is also described as any transaction with monetary value which conducted through mobile telecommunications networks. Mobile commerce is all about the wireless e- commerce using mobile devices to conduct business on the internet. It can also be defined as the exchange value or the purchase and sale of financial products, services or information on the internet using mobile devices. Mobile commerce seen globally is very helpful and very beneficial for users but also has its ad vantages and disadvantages. The advantages of mobile commerce are:

1. Customer satisfaction, cost savings and new business opportunities.
2. Transactions can be done anywhere and anytime.
3. Owner has control over the data while the mobile device can be synchronized.
4. Allow for considerable profit.
5. Relations with customers become closer.

1. 2. Moblie Payments

Mobile payments are also defined as the process of exchanging financial value between two entities using mobile devices to pay for a product or service. As depicted in Figure 1, alternative payment options that consumers are able to pay for products or services anywhere and anytime with the convenience of using mobile devices such as mob ile phones, or smart phone. The system can be designed to operate using wireless technology (wireless) such as Infrared, Bluetooth, Wi-Fi (802.1 1), WiMAX (802.16) and the latest technology that is Near Field Communication (NFC). [6]

1. 3. Near Field Communication

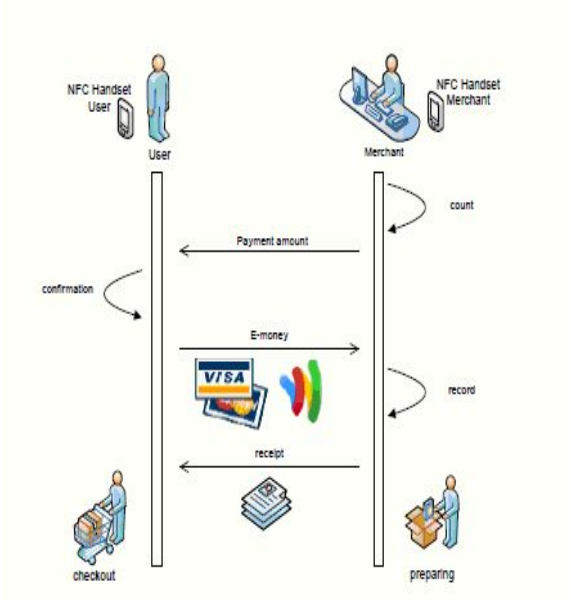
Near Field Communication (NFC) is a new wireless connectivity technology to the radius of short range, which evolved from the combination of contactless identification and interconnection technologies (RFID). NFC operates at a frequency of 13.56 MHz and has a data transfer rate of up to 424 Kbps. Effective communication and optimal between two NFC-enabled devices occurs when they are at a distance of 0 to 10 cm. Simple movement as twist or swing will establish connections between devices and can initiate

NFC, which will also be compatible with Bluetooth or Wi-Fi . NFC technology is a combination between the smartcard and reader that is planted in a single device, such as mobile phones or smart phones. With the NFC device planted on a mo bile device, then the transaction activities such as retrieving information through NFC tags, micro-payments or payment transactions can be done by juxtaposing it to the NFC reader, which is in the user's mobile device and for payments at terminal point of sale (POS) at the location of the transaction. With a feature like this then NFC referred to as device that supports the contactless transaction. [4]

1. 4. Working of nfc tags

NFC tags are considered passive devices, which means that they operate without a power supply of their own and are reliant on an active device to come into range before they are activated. The trade-off here is that these devices can't really do an y processing of their own; instead they are simply used to transfer information to an active device, such as a smart phone.

In order to power these NFC tags, electromagnetic induction is used to create a current in the passive device. We won't get too technical on this, but the basic principle is that co ils of wire can be used to produce electromagnetic waves, which can then be picked up and turned back into current by another coil of wire. This is very similar to the techniques used for wireless charging technologies, such as Qi or A4WP. [1]



II. EXISTING SYSTEMS.

NFC isn't a fundamentally groundbreaking technology. Like Bluetooth and Wi-Fi, it's a wireless radio communications standard. In the wireless world , NFC's closest relative is actually RFID (radio frequency identification). Retailers and parcel shipping companies in particular love RFID as a way to keep tabs on inventory supplies and shipments. Unlike RFID versions, NFC readers aren't always specialized devices. As a matter of fact, NFC chips will be incorporated right into your smart phone's circuitry. About 20 percent of phones worldwide might have NFC cap abilities by 2014. With the widespread reach of NFC phones, NFC tags could one day beco me as common as bar codes.

You can call them smart tags, info tags or, in this case, NFC tags, but their basic architecture is similar to RFID tags. They both have a bit of storage memory, along with a radio chip attached to an antenna.

III. PROBLEM STATEMENT

Today's systems are traditional commerce or e- commerce systems of retail which have a lot of disadvantages in themselves like every commerce system has. The prototype application's aim is to remove as many inconsistencies as possible from these systems and to make a system which is consumer friendly and high performing. The system's ultimate aim would be consumer convenience and time efficiency. This goal could be achieved by using a M-Commerce system implemented using NFC technology. The use of NFC would benefit the system in many ways mainly with automation and security.

The consumer for a regular shopping experience goes to the mall and roams around in the outlet for the search of their desired goods. They physically pick up the desired items, place them in a trolley/cart and then carry the trolley all around. Once done with the shopping they need to stand in queues to get the billing done, which is a time consuming process. And ultimately carry the shopping bags back home. Using M-commerce application this entire process could be simplified and made more user-friendly.

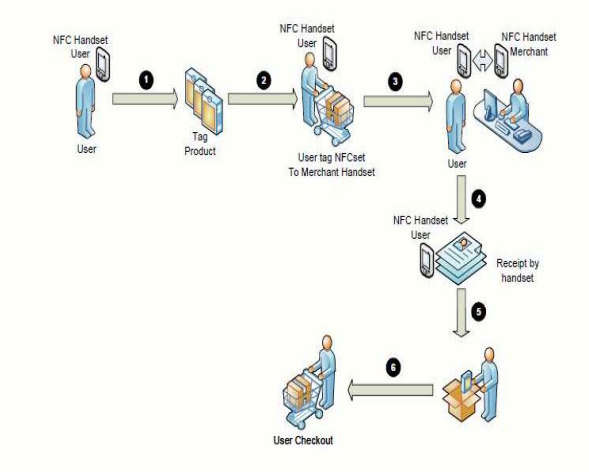
IV. PROPOSED SYSTEM

The proposed application system will be using Android-based mobile phones which are integrated with NFC technology. In general, the user will do the entire shopping process with the help of their Android mobile phones with a software application that would read and process the tap to the NFC Tag of the products, which are to be purchased. These tags assigned to the products would retrieve the information about them from a main database which is stored on the server at the merchant's end. The products whose NFC tags were tapped (read) will be stored in a shopping list/cart. Users will be able to perform editing of existing products in the cart such as the process of addition, subtraction of quantity or deletion of the pro duct all together from the cart. Furthermore, the user will be informed about the on- going offers in the store and could avail them right from the application itself. The user at all times would be aware of the expenditure made by them and could verify the same. Finally, the user will checkout and confirm the same to the Merchant by performing a handshake with the merchant device. The shopping cart consisting of selected items will be processed and the same will be recorded in the merchant and user history.

Application processing time is not too long, for instance the application process features not more than 1-2 seconds for communication between mobile device and the server and 2-3 seconds for processing description of goods based on reading of NFC tags.

Payments as of now could be made using cash at the point of sale o r online using existing payment gateways through a credit/debit card. In future with the development

and advancements in NFC based payments, the same could be applied for the prototype application.



The overview of the entire system has been sho wn in Figure 2. Overview of shopping system based on NFC tags [4]

V. METHODOLOGY

The System Requirements to develop such a system could be classified as follows:

Hardware Requirements

1. NFC tags that would store pro duct information.
2. Mobile Device running on Android operating system and which support NFC technology.
3. Merchant Device.

Software Requirements

1. Android SDK
2. NFC Tag Writer by NXP Semiconductors OR NFC Writer by Tag stand.

VI. ANALYSIS

The overall analysis based on the study of the research paper can be summed up as follows:

6.1 Automation

The entire shopping process could become a digitally immersive experience. Smart phones equipped with NFC can be paired with NFC tags or stickers which can be programmed by NFC app s to automate tasks. These programs can also allow for a change of phone settings, a text to be created and sent, an app to be launched, or any numb er of commands to be executed, limited only by the third party NFC app, fo r instance Tag Writer. These applications are perhaps the most practical current uses for NFC since it does not rely on a company or manufacturer but can be utilized immediately by anyone NFC tag.

6. 2. Cheap and effective

The strongest argument in favor of NFC, over other forms of short range wireless communication, is that tags are incredibly cheap to make and maintain, but can still be used for a wide range of applications. With very simply circuitry and very few components, NFC tags can be produced on a mass level for very low unit costs.

6.3. Availabiltiy

We generally feel that QR Codes and NFC tags sit alongside each other and both have their ad vantages and disadvantages. We think that the user experience with NFC tags is generally better and in the instances where the additional cost of using an NFC tag is less relevant to the overall cost (for example on a wristband, brochures o r posters), it would be our p reference.

6.4. Security

Although the communication range of NFC is limited to a few centimeters, NFC alone does not ensure secure communications. Applications particularly dealing with payments may use higher-layer cryptographic protocols (e.g., SSL) to establish a secure channel & overcome potential threats such as:

1) Eavesdropping
2) Data modification
3) Relay attack
4) Lost property

CONCLUSION

NFC based shopping is created as a model with the use of NFC technology that allows users to perform the shopping process and verification of expenditure. Applications created with ease of understanding and the design can be created and tailored to the shopping process to make it more effective and user friendly. Thus making it easier & convenient for the users to do the entire shopping process with the use of this application as compared to the existing systems. As the application described in the paper would be a prototype that would shape the future & there still remains much to do in terms of development and improvement of the existing models. And about 25-30% of work is been done and we are under the developing phase of procedure to make the Android application and work is still going on to complete it and is under process.

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