

Secured Green Payments using NFC Device

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Abstract— Recently smart mobiles are used for so many applications along with communication. By making use of the flexibility of smart phones, recently Near Field Communication (NFC) technology becomes more popular. The NFC can be applied to all areas of communication including body area networks. Here in this paper we are applying NFC for several applications like serve Ticketing, parking & Hotel Payment by using Wi-Fi. This paper introduces the communication aspects between NFC based android device and at the server site using IP address of the vendor site.

Index Terms— Near Field Communication (NFC), Internet Protocol address, Radio Frequency Identification Device (RFID)

I. INTRODUCTION

NFC devices can be used in contactless payment systems, similar to those currently used in credit cards and electronic ticket smartcards, and allow mobile payment to replace or supplement these systems. With growing number of mobile phones worldwide, people not only speed up the payment process, but can also recharge, check their balance, transactions can be made by using android app on NFC device.[1]

NFC stands for “Near Field Communication” and, as the name implies, it enables short range communication between compatible devices. This requires at least one transmitting device, and another to receive the signal. A range of devices can use the NFC standard and can be considered either passive or active, depending on how the device works. The NFC technology is itself a combination of Radio Frequency Identification Device (RFID) and contactless smart card technologies and secure payment and data store functions for mobile and consumer electronics devices.

The NFC technology implementation directed for ticketing and transforming fast transaction or transportation payment.

NFC is a wireless close-range connectivity technology works with 13.56MHz radio frequency under the space of 20cm.[2]

NFC technology allows three modes of operation –peer to peer, reader-writer mode & card emulation mode.[3] This paper deals with Card emulation mode using NFC android device. This technology got the speed of 424Kbps.[2]. Android version 4.4 dubbed Kit-Kat has recently introduced a new (at least “new” for the official Android distribution) NFC feature called host-based card emulation or HCE for short. HCE is the basis for a different approach to contactless payments, a pivot away from the original strategy based on the embedded secure element. The first signs of that shift arrived earlier this summer with a curious change in the Nexus 7 hardware specs. Previous Nexus devices starting with Nexus S all contained an embedded secure element, a critical feature leveraged by Google Wallet for NFC payments. While the tablet form-factor is arguably less convenient for tapping against a point-of-sale terminal– and Wallet even ran on the larger Nexus 10 tablet– the SE was also present in original Nexus 7-2012.

An NFC device in card emulation mode emulates contactless smartcard according to compatible RFID standards. [4]

The work on NFC was started by Phillips and Sony in 2002 and they complemented it by developing the first NFC forum along with Nokia. Since then, the NFC forum has more than 150 members and research is being conducted by many companies and academic organizations in this field. NFC can also be called the 2nd generation or ‘2G’ RFID. A lot of NFC-enabled phones now exist in the market and many applications have been or are being developed [5].

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II. SYSTEM DESIGN

Ticketing, Parking and Hotel Payment has been seen the major application's in this paper .By using the IP address from the vendor site ,communication can be established between NFC enabled phone and server having it's user details and authentication is been carried out for security purposes. The NFC standards offer support for many different protocols, and there are different types of cards that can be emulated.

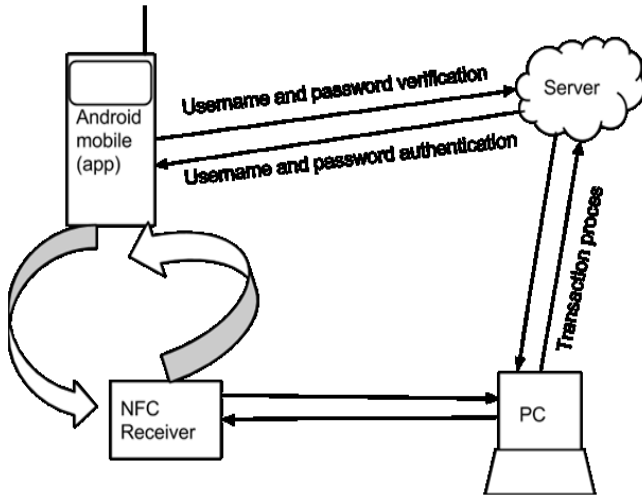


Fig. 1. Block diagram of Universal NFC Receiver

The above figure above shows the block diagram of universal NFC receiver. Following are the procedural steps:

1. An NFC device with multiple applications is at the user site and, NFC receiver at the vendor site which is connected to PC and server.
2. Transaction or transforming payment is done at the server site using Wi-Fi from the vendor site.
3. Communication should be established between NFC phone and hardware PN532 and transaction is then performed.

Android 4.4 supports several protocols that are common in the market today. Many existing contactless cards are already based on these protocols, such as contactless payment cards. These protocols are also supported by many NFC readers in the market today, including Android NFC devices functioning as readers themselves. Specifically, Android 4.4 supports emulating cards that are based on the NFC-Forum ISO-DEP specification (based on ISO/IEC 14443-4) and process Application Protocol Data Units (APDUs) as defined in the ISO/IEC 7816-4 specification. Android mandates emulating ISO-DEP only on top of the NFC-A (ISO/IEC 14443-3 Type A) technology. Support for NFC-B (ISO/IEC 14443-4 Type B) technology is optional [6].

Host Card Emulation (HCE) is the presentation of a virtual and exact representation of a smart card using only software. Prior to the HCE architecture, NFC transactions were mainly carried out using the Secure Element. HCE enables the

following: merchants to offer payment cards solutions more easily through mobile, closed-loop contactless payment solutions, real time distribution of payment cards and, more tactically, allows for an easy deployment scenario that does not require them to change the software inside the terminal.

III. FLOW OF WORK

The flow chart of working of an NfcShop application based on android is shown in the Fig.2.

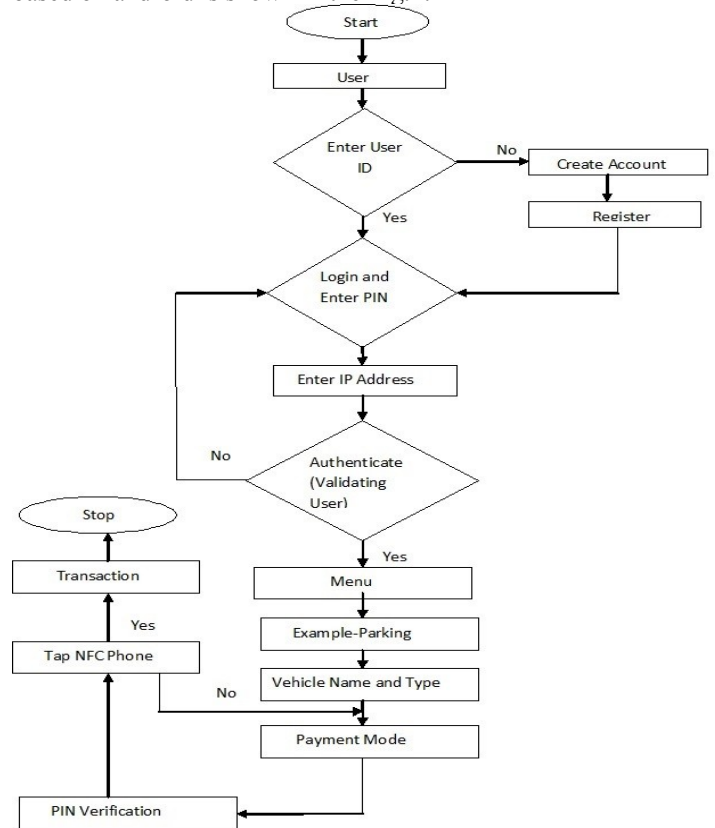


Fig. 2. Flow Chart of working of an NfcShop Application

Fig. 2. gives the information about the multiple applications –Ticketing, Parking & Hotel Payment.

The following steps are:

1. The user will open the app installed in the NFC enabled mobile Phone.
2. The User will fill the user details to create account –User name, User password to login the app contact details, Card Number, PIN of card.
3. Login with the User name & ID, the User need to enter the IP address of the vendor site to use the Wi-Fi service.

4. User login with created login ID and Password with correct IP address, its authenticate at the server site and validates the user.
5. User is found, it proceeds with the main menu consisting of three applications-Ticketing, parking, Hotel Payment.
6. In the flow chart, Parking is considered-the user need to enter Vehicle name and Vehicle type with Parking amount.
7. The User confirms with the Payment, PIN verification is been asked (PIN of card).
8. PIN no. matches at the server site and ask for tapping the NFC enabled phone to the hardware PN532 for further transactions.
9. Transaction is done and balance can be checked at the User site.

The data flow diagram below shows this basic workflow in the case of multiple applications using Wi-Fi from the vendor site for transaction purpose.

IV. SYSTEM DEMONSTRATION AND VALIDATION

This section focuses on the system demonstration, presenting the real deployment of the proposed working application [7].

Fig.3. shows the User details to be enter while creating the account for NFC shop app.

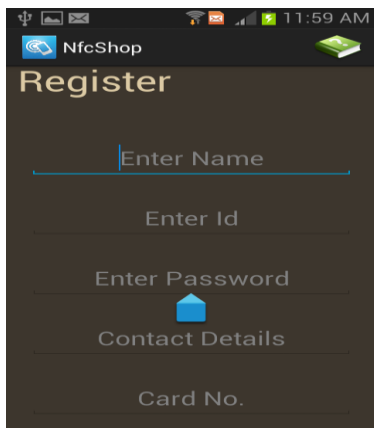


Fig 3. User details for creating account

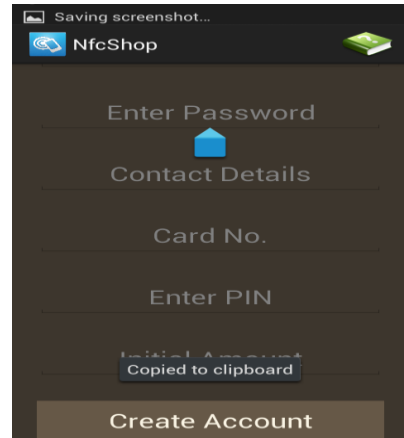


Fig.4. User details.

Fig. 5. shows NFC shop screen presents User to login with created Login ID and Password.

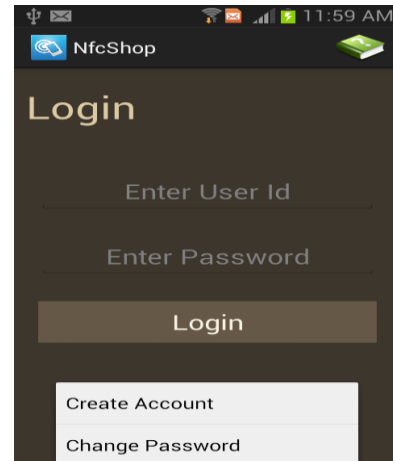


Fig. 5. User Login

Fig 6. Represents to enter the IP address same as the vendor site to utilize the Wi-Fi Service available at the vendor site further process

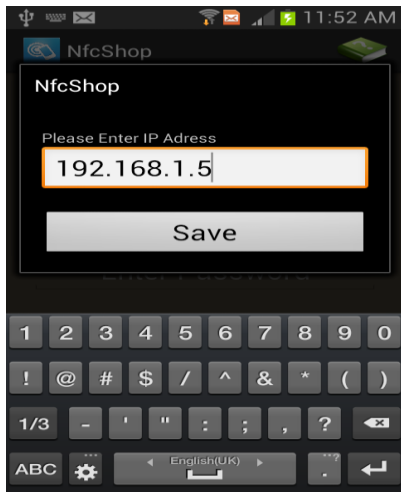


Fig. 6. Enter the IP address from vendor site.

Fig. 7. Validates the Login ID and Password authenticate at the server site and when it matches at the server site, the User is found and proceeds for main menu with multiple Applications.

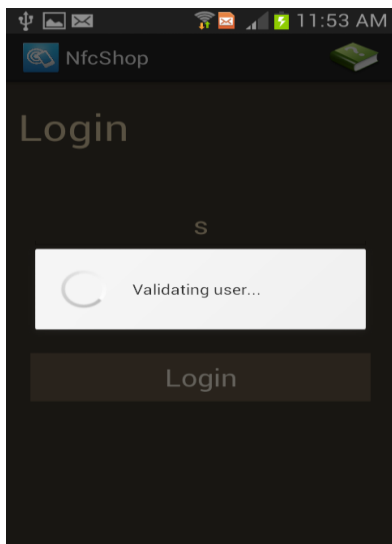


Fig. 7. Validating User

Fig 8. shows the main menu-Ticketing, Parking, Hotel Payment, Recharge, Balance, Transaction Details after Validation and successful IP address.

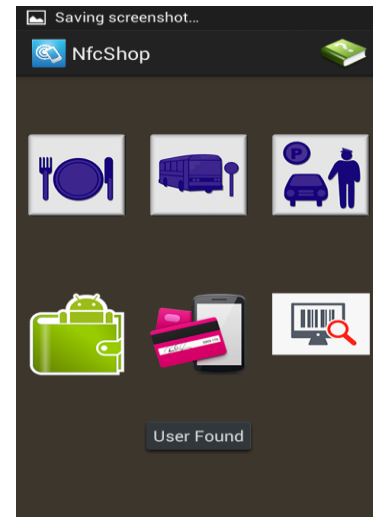


Fig.8 Main menu

One of the application to be selected by the User ,for example, Parking application is selected as shown in Fig.9

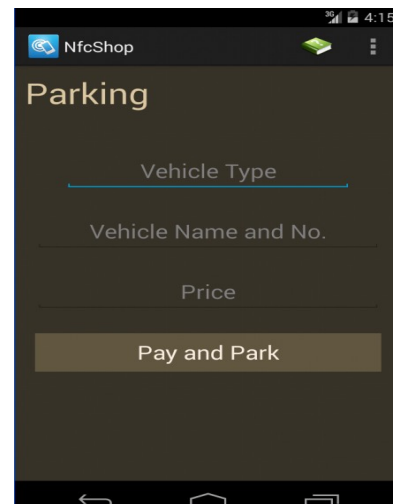


Fig 9. Parking Mode

After the Payment Confirmation, PIN Verification is been asked to enter to match at the server site as shown in Fig.10

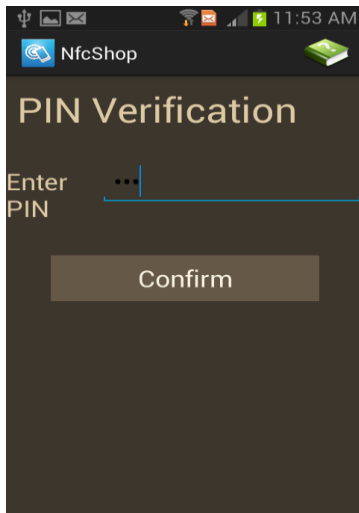


Fig .10.PIN Verification

After PIN Verification, now the NFC enabled phone is ready to tap on the hardware PN532 and further transaction takes place as shown in the Fig.11

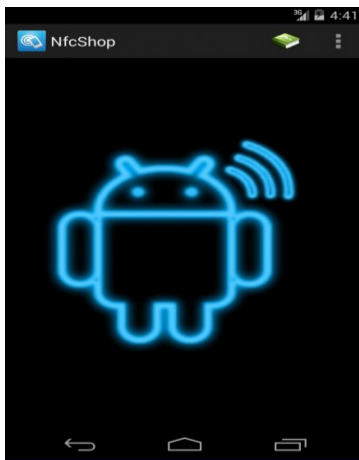


Fig. 11. NFC phone is ready to tap on the hardware

V. APPLICATION'S SCENARIOS

-NFC can be used to improve existing RFID and Bluetooth applications/devices and it can be used for applications which were not possible using previous technologies. We can divide the applications into two categories: identification and information exchange.

Identification includes authorization and authentication such as in contactless credit/debit payment systems, keyless entry (e.g. hotel suite doors), security clearance or authorized access (e.g.

garages, rooms, labs, etc.), medical tags, e-passports, and similar technologies. Data transfer or 'beaming' applications include game download, device configurations such as routers, handing out or taking contact information for mobile phones, social networks, business cards, etc., and many other similar ones. Another important part of this proposed system is the university e-wallet. This e-wallet would be able to pay for food, stationary, printing, and other university services. This system would have a NFC reader installed in their computer of other Point of Sale system. The cashier would simply calculate the cost and key it into the system [5]

A midlet application of Parking designed for the user's phone that guides the user to purchase the tickets or payment for the parking, hotel payment and allows him to check the availability and validity.

One of the results of this study was the perception of the importance of efficiency, feeling of safety, ease of use and automation [8].

- Efficiency: it can be considered as the rate between the achieved results and the effort spent to reach them.
- Feeling of Safety: it allows the user to feel in control of the interface. The study detected that the most common feeling among the users was the fear to operate the interface because they were afraid to lose control over it or to make mistakes.
- Ease of use: the system enables the user to perform simple actions in a simple and direct way.
- Automation: it ensures the user to perform an action in an automatic way in order to decrease his cognitive effort.

VI. CONCLUSIONS AND FUTURE WORK

Applications created with ease of understanding and designing of an app is created and tailored for various applications is more effective and user friendly making it easier for the Users to perform various tasks.

The database used in SQLite database which is owned by the Android platform so that process will be faster and lighter in the process of reading the database.

In the Process the whole activity according to the data flow diagram is run went well with the specific output. Future work deals with modification at hardware site and to establish communication between NFC phone and hardware PN532 for further transactions.

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