NEAR FIELD COMMUNICATION (NFC) TECHNOLOGY USING ANDROID PHONE FOR CASHLESS TRANSACTION

[1]Mr. Vishwajeet Rajendra Nikam, [2]Prof. N C. Patil
[1]Student of Master of Engineering, [2]Professor of Master of Engineering
Electronics & Telecommunication Department
N Patel College of Engineering , Shahada, Maharastra ,India

Abstract— Near Field Communication (NFC) is a technology for contactless short-range communication. Based on the Radio Frequency Identification (RFID), it uses magnetic field induction to enable communication between electronic devices. The number of short-range applications for NFC technology is growing continuously, appearing in all areas of life. Especially the use in conjunction with mobile phones offers great opportunities. One of the main goals of NFC technology has been to make the benefits of short-range contactless communications available to consumers globally. The existing radio frequency (RF) technology base has so far been driven by various business needs, such as logistics and item tracking. While the technology behind NFC is found in existing applications, there has been a shift in focus most notably, in how the technology is used and what it offers to consumers.

Index Terms— NFC , RFID

I. INTRODUCTION

NFC is wireless technology which provides communication between two mobile phones which contain NFC tags, using short range radio waves. It uses the magnetic field induction for this purpose. Both devices can communicate with each other using NFC technology when they touch each other or brought very close to each other. It requires short range of approximately four centimeters to perform the exchange of information between two devices. We can do payment using our NFC enabled phone by swiping it out in front of the phone reader and then the purchase price will automatically paid from credit a new technology, so NFC enabled mobile users need to be educated on how it will work for them to make payment or exchange any information. But there is a requirement of a protected infrastructure for NFC technology so that it could be widely adopted all over the world. This technology has several advantages over other wireless technology because it provides bidirectional communication for exchanging information. Near field communication, abbreviated NFC, is a form of contactless communication between devices like smartphones or tablets. Contactless communication allows a user to wave the smartphone over a NFC compatible device to send information without needing to touch the devices together or go through multiple steps setting up a connection. Fast and convenient, NFC technology is popular in parts of Europe and Asia, and is quickly spreading throughout the United States. Near field communication maintains interoperability between different wireless communication methods like Bluetooth and other NFC standards including FeliCa -- popular in Japan -- through the NFC Forum. Founded in 2004 by Sony, Nokia, and Philips, the forum enforces strict standards that manufacturers must meet when designing NFC compatible devices. This ensures that NFC is secure and remains easy-to-use with different versions of the technology. Compatibility is the key to the growth of NFC as a popular payment and data communication method. It must be able to communicate with other wireless technologies and be able to interact with different types of NFC transmissions. The technology behind NFC allows a device, known as a reader, interrogator, or active device, to create a radio frequency current that communicates with another NFC compatible device or a small NFC tag holding the information the reader wants. Passive devices, such as the NFC tag in smart posters, store information and communicate with the reader but do not actively read other devices. Peer-to-peer communication through two active devices is also a possibility with NFC. This allows both devices to send and receive information.

II. NFC TYPES

NFC works in active mode as well as passive mode. In active mode, both devices, tagged with NFC chip, generate their own electromagnetic field alternatively to exchange information. Both devices are active in this mode. One of the devices deactivates its electromagnetic field during data transfer. In passive mode, one of the devices acts as a transponder and uses the electromagnetic field of other device for its own operating power. In other words we can say that one device is active which generates its radio frequency field and the other device uses that field for data exchange Bluetooth and Wi-Fi seem similar to near field communication on the surface. All three allow wireless communication and data exchange between digital devices like smartphones. Yet near field communication utilizes electromagnetic radio fields while technologies such as Bluetooth and Wi-Fi focus on radio transmissions instead. Near field communication, or NFC for short, is an offshoot of radio-frequency identification (RFID) with the exception that NFC is designed for use by devices within close proximity to each other. Three forms of NFC technology exist: Type A, Type B, and FeliCa. All are similar but communicate in slightly different ways. FeliCa is commonly found in Japan. Devices using NFC may be active or passive. A passive device, such as an NFC tag, contains information that other devices can read but does not read any information itself. Think of a passive device as a sign on a wall. Others can read the information, but the sign itself does nothing except transmit the info to authorized devices. Active devices can read information and send it. An active NFC device, like a smartphone, would not only be able to collect information from NFC tags, but it would also be able to exchange information with other compatible phones or devices and could even alter the information on the NFC tag if authorized to make such changes. To ensure security, NFC often establishes a secure channel and uses encryption when sending sensitive information such as credit card numbers. Users can further protect their private data by keeping anti-virus software on their smartphones and adding a password to the phone so a thief cannot use it in the event that the smartphone is lost or stolen. For more information on the specifications and different forms of NFC technology, view the rest of our technology pages.

Speculation about whether Apple would include NFC (near field communication) capabilities in its rumoured iPhone 5 has been rampant this year fuelled by growing interest in the technology and its rapid push into the mainstream through inclusion in smartphones. Yet Apple is too late to claim first-mover advantage: devices including Nokia's 6131 NFC SAGEM's my700X Samsung's D500E BenQ's T80 Sagem's Cosyphone Google's Nexus S Nokia's C7 Samsung's Galaxy S II and Research In Motion's BlackBerry Bold 9900 and 9930 all incorporate NFC capabilities allowing them to read information from 'passive' tags or wirelessly communicate with other devices using an 'active' or 'peer-to-peer' mode. NFC support is built into the later versions of two key mobile operating systems (Android 2.2 and BlackBerry OS 7.0) and if it's added to iOS 5 would become well-established on the key consumer smartphone platforms.

III. NFC CORPORATE

NFC technology is making things easier and more secure in the home and workplace. Though technology has already increased productivity, NFC is providing new innovative ways to conduct basic functions and make home living easier. The major concept driving NFC innovation in the workplace is similar to that in the mobile payment sector. Take an everyday workplace task and make it faster and easier and more secure by allowing it to be done on a workers mobile device. This theme is also gaining popularity in on the home front as well as companies are finding ways to simplify everyday tasks like unlocking doors and logging in to computers.

A. Transportation At this stage in its life cycle near field communication's (NFC) possibilities are limitless. This phenomenon is capable and possible to be "the thing" of the future. This idea of transferring data and/or information via a mobile device is what innovative technology is all about. Currently NFC is hitting the market in full speed with no stop in sight. There are key markets in which NFC is currently in and preparing to dominate; one of which is transportation. Whether in China or Germany transportation is a necessity in the lives of us all. Simplifying the transportation process as a whole is what the idea of NFC is striving for. The idea of NFC in public transportation is not new to NFC; how to implement it effectively is. Bay Area Rapid Transit (BART) a California transit system first implemented this trial back in 2008. With this trial select riders were given a NFC enabled Sprint phone. With this phone riders were able to enter the train gates and pay for their rides by tapping their phone on the platform of the gate entrance. Riders were also able to utilize "smart advertisements". These were ads that were inside the train station and allowed the participants to hold their phone up to a given advertisement and receive addition information from that ad such as locations and directions . With the advancement of technology and more specifically technology within mobile devices other transit authorities have begun to implement this. Currently transportation agencies have implemented the use of mobile enabled devices in the United States, Europe and Japan. A spokesman for Germanys National Railway indicated that they plan to implement NFC-based ticketing by the end of 2011. The emphasis on NFC enabled devices is the security. The "near connections" this secures information especially that of banking information.

B. Hotel Industry Not only is it possible to get from one destination to the next using NFC but if your destination is a hotel this technology can also be utilized in the area. As mentioned in the security section using a mobile device to act as a key to enter into hotel rooms and even to register a guest is what a Clarion hotel is piloting. In Stockholm an urban area of Sweden Clarion has given a group of selected repeat visitors near field communication enabled mobile phones. With these devices visitors are able to register via cell phone as well as activate their hotel key. By simply waving the cell phone near to door guests are given access to enter the room. The advantage about this is Clarion will not have to change their radio enable locks that are currently used; NFC is fully compatible. Since no change is required this will allow visitors who are not equipped with a NFC device to still be able to use the standard hotel key. This will also lead to speedier check in times for guests since waiting in lines is no longer necessary and also allow room for staff reductions.

A. hotel lock using NFC

C. Social and Entertainment No new technology would be complete if it too didn't add its footprint to the social networking, gaming and entertainment world. Some people are dependent on social networking sites to receive information and NFC is making taking the possible avenues to make it easier for this audience to receive their information.

IV. SYSTEM DEVELOPMENT

A. *Block diagram of NFC*

Deploying NFC mobile contactless payment applications requires an ecosystem in which stakeholders cooperate to deliver different functions and capabilities. Stakeholders in the NFC ecosystem. As the figure illustrates, the secure element in the NFC-capable device (discussed in the following section) is provided to the consumer by one of the ecosystem stakeholders. Which secure element is chosen and who provides it has critical implications for usability, portability, ubiquity of handsets, and control. The ST21 NFCA system-on-chip combines a complete hardware capability for 13.56 MHz contactless communication with an useful embedded firmware which handles

B. *SPI Communication*

The SPI interface of the PN532 is compliant with the SPI bus specification. The PN532 is configured as slave and is able to communicate with a host controller with a clock (SCK) up to 5MHz. The SPI interface includes a specific register allowing the host controller to know if the

PN532 is ready to receive or to send data back.

7	6	5	4	3	2	1	0
rfu	rfu	rfu	rfu	nu	nu	nu	RDY

Fig. 5. Frame structure

Advanced SPI communication (with Handshake mechanism combination)
A better way for the host controller is to use the P70_IRQ pin that indicates when the PN532 is ready to send its frame. In that case, the host controller can wait for this line to be asserted by the PN532 and has no more need to read the status byte. As a consequence, the overall traffic on the SPI bus is reduced.
Advanced SPI communication (with Handshake mechanism combination)
A better way for the host controller is to use the P70_IRQ pin that indicates when the PN532 is ready to send its frame. In that case, the host controller can wait for this line to be asserted by the PN532 and has no more need to read the status byte. As a consequence, the overall traffic on the SPI bus is reduced.
The PN532 combines a modulation and demodulation concept completely integrated for different kinds of contactless communication methods and protocols at 13.56 MHz with an easy-to-use firmware for the different supported modes and the required host controller interfaces. This document describes the firmware embedded in the PN532 chip, in particular the global behavior in the system depending if the PN532 device is used as initiator or target. The PN532 is a highly integrated transmission module for contactless communication at 13.56 MHz including microcontroller functionality based on an 80C51 core with 40 Kbytes of ROM and 1 Kbytes of RAM. The PN532 combines a modulation and demodulation concept completely integrated for different kinds of contactless communication methods and protocols at 13.56 MHz with an easy-to-use firmware for the different supported modes and the required host

C. NFC Standard

1. NDEF - To enable interoperability when transferring data to and from tags and between NFC devices, the NFC Forum has specified a common data format known as the NFC Data Exchange Format, NDEF. NDEF is a lightweight and compact binary format, which can carry URLs, vCard, and NFC-specific data types. NDEF allows NFC functionality to easily use any supported tag type to transfer data as NDEF hides all the tag type-specific details from the application. NDEF is exchanged in messages, which consists of sequence of records. Each record carries a payload. The payload contents can be of type URL, MIME media, or NFC-specific data type. For NFC-specific data types the payload contents must be defined in an NFC Record Type Definition file (RTD). The type of data in the record, and the size of the record are indicated in a header attached to the payload. The header includes a type field for identifying the type of payload. The payload length indicates the number of octets in the payload. The optional payload identifier allows user applications to identify the payload carried within an NDEF record. The format of the TYPE field value is indicated using the TNF (Type Name Format) field. For information on supported types and corresponding TNF values, refer to Section 3.2.6 of the NFC Data Exchange Format (NDEF) technical specification in the NFC Forum

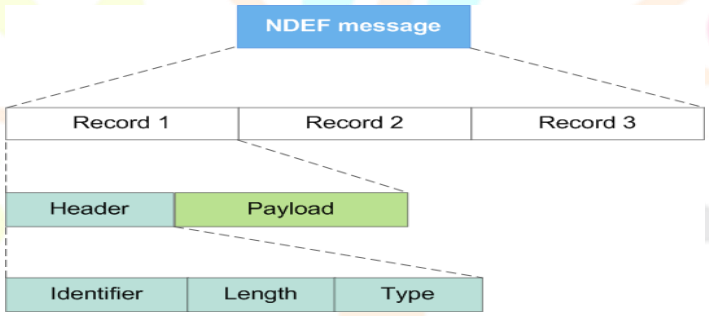


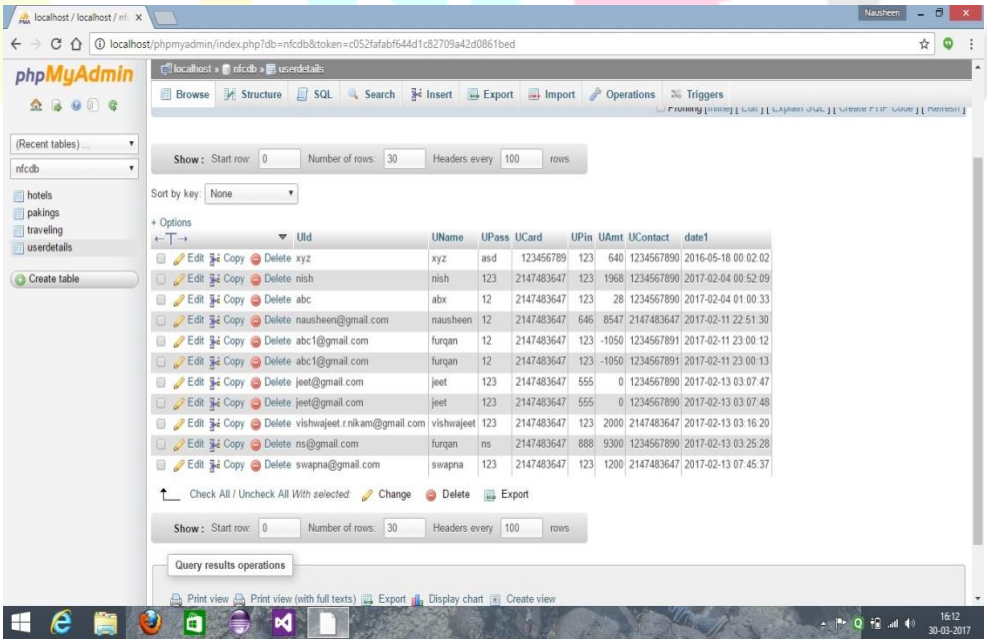
Fig. 6. NDEF message

2. RTD: The NFC Forum has specified several optimized record types which can be carried in NDEF records. Each NFC Forum record type is specified in a Record Type Definition document (RTD). NFC defines the following RTDs:

1) OPERATING OUTPUTS

Here NFC device is operated from number of users summery of each user is stored in PHP server . that means we can chwck & track each user from date & time with there transaction.

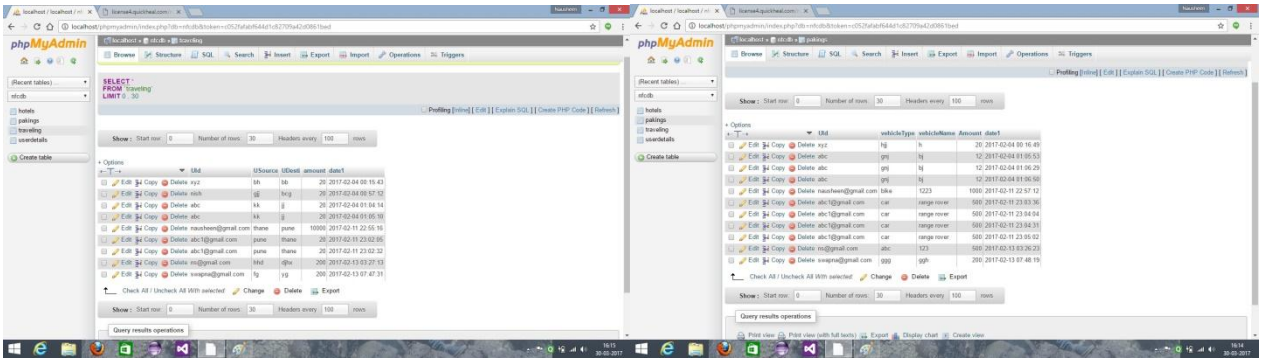
Below fig. gives sample of users uses NFC with there details.



B. User Details

NFC is used in lots of application i am giving just three sample i.e hotel parking , toll plaza & train ticketing for such application same NFC is used . in this application NFC reduces time , cost & very simple use

Below fig. gives information about user which uses parking & uses train ticketing using NFC



C. Parking & Toll Details

V. ACKNOWLEDGMENT

The many benefits and potential uses of NFC technology will continue to drive the technology and push innovation in the field. The keys to future success are evident in the intrinsic values provided by NFC. It is a more secure technology than RFID and Bluetooth due to its frequency and short distance specifications. Though the implementation of NFC is still in its infancy, it is evident that the future will see a proliferation in its use. Companies will benefit from the financial success of their innovations, consumers will benefit from increased productivity, and the economy will benefit from new product growth and increased competition.

REFERENCES

[1] D. Aamoth, "How the New Google Wallet Mobile Payment System Works," Time Magazine Techland, May 2011

[2] D. Balaban, "Germany's National Railway to Roll Out NFC," Touchpoints, August 23,

[3] C. Brown. NFC kit lets patients leave hospital earlier and monitor Available: their return to health from home. [Online]. Available: http://www.nfcworld.com/2011/05/19/37484/nfc-kit-lets-patientsleave-hospital-earlier-and-monitor-their-return-to-health-from-home/

[4] L. Chambers, "PayPal Uses NFC to Make Peer to Peer Payments Easier than Ever," PayPal Blog , July, 2011

[5] S. Clark. Transfinite adds NFC to Facebook. [Online]. Available: http://www.nfcworld.com/2009/10/24/32136/tranzfinity-adds-nfc-tofacebook/

[6] K. Drey. BART: Transportation's NFC Visionary. [Online]. Available: http://www.vivotech.com/blog/index.php/2011/10/25/barttransportations-nfc-visionary/

[7] K. Eaton. Google Eric Schmidt Reveals NFC Smartphone Plans: It's all about advertising. [Online]. Available: http://www.fastcompany.com/1728241/eric-schmidt-gives-awaygoogles-nfc-smartphone-plans-its-all-about-advertising

[8] S. Finz, "Square Allows Mobile Payment Processing," SF Gate, October, 2011

[9] A. Greenspan, "What are the advantages and disadvantages of payment with phones via NFC?" Quora, January 2011 J. Hendel. Future pharma: What near field communication (NFC) means for pharma. [Online]. Available: http://social.eyeforpharma.com/uncategorised/future-pharma-whatnear-field-communication-nfc-means-pharma

[10] J. Hyatt. "HID Blobal and Sony Announce NF enabled Contactless Smart Card Reader Platform for Global Laptop and Mobil Device Market, " Wall Street Journal, Market Watch, November, 2011

[11] J. Liebenau, S. E. Calderwood, P. Karrberg, and G. Hosein, "Near Field Communications; Privacy, Regulation & Business Models A white paper of the LSE/Nokia research collaboration," London School of Economics andPolitical Science

[12] R. King, "Google Wallet NFC Payment Program, Google Offers announced," May, 2011

[13] E. McBride, "NFC Timing Restrictions, " Nfcsec, August, 2011

[14] H. McLean. French retailer tests NFC as aid for visually impaired shoppers. [Online]. Available: http://www.nfcworld.com/2011/09/06/39711/french-retailer-tests-nfcas-aid-for-visually-impaired-shoppers/

[15] J. Morak, D. Hayn, P. Kastner, and G. Schreier. Near Field Communication (NFC) technology - An Enabler of the Internet of (Medical) Things. [Online]. Available: http://www.medetel.eu/download/2008/parallel_sessions/presentation /day2/near_field_communication.pdf, April, 2008

[16] R. Noor. 7 ways Near Field Communication (NFC) will revolutionize our lives. [Online]. Available: http://www.irnovo.com/2011/03/7- ways-near-field-communication-nfc.html

[17] S. Perez. Nokia Launches New NFC-Enabled Games. [Online]. Available: http://techcrunch.com/2011/10/17/nokia-launches-newnfc-enabled-games