



NFC Enabled Smartphone Application for Mundane Activities

Authors

S.Pavithra¹, Kayalvizhi Jayavel²

¹Information Technology, SRM University, Chennai, India

Email: pavithra_subrayan@srmuniv.edu.in

²Asst.Professor, Information Technology, SRM University Chennai, India

Email: kayalvizhi.j@ktr.srmuniv.ac.in

Abstract

People persistently attempt to enhance their personal satisfaction and advances, have an imperative part on it. Money transactions between mobile phones is exhausted and a troublesome operation to perform following there is not a straightforward and safe approach to do it. Near field communication (NFC) is another secure short range remote wireless connectivity technology, that can play an imperative part on this sort of issues, and it is not difficult to utilize. The NFC innovation can offer a vital commitment to rearrange some day by day operations, for example, payments and mobile transactions. NFC innovation is utilized with a basic motion that triggers a considerable measure of background operations. The paper concentrates on NFC innovation and proposes a distributed based application that exhibits the use of NFC and Bluetooth advances for money transactions between mobile phones and embedded device. The principle applications concentrating in our work is moment pay at nourishment court/shopping centers. A system will be proposed, assessed and exhibited in Android mobilephone with NFC implicit.

Keywords: *Embedded Device; Mobile Payment; NFC; Peer-to-peer; Security.*

INTRODUCTION

Near field communication (NFC) ^[1] is another remote correspondences innovation with security help. It rose up out of the mix of contactless distinguishing proof (Radio Frequency Identification - RFID) and mobile phone device. It was propelled in 2004 by Philips, Sony, and Nokia, however just as of late is in effect more famous. When it showed up there were very few device supporting it, so NFC was under the bed up to this point. Soit is normal that the greater part of the mobile phones will be furnished with a NFC interface. NFC meets expectations at 13.56 MHz and can be utilized for correspondence between two cell phones or between a passive and an active device. NFC can be utilized with an extensive differences of devices like cell telephones, record books, desktops, locks, printers, TV's, and buyer

hardware. NFC offers clients much sort of administrations like payments, loyalty, transport, travel, society, and infotainment. These days, NFC makes a blast in world device, on the grounds that numerous tasks have conceived with this innovation. As far and wide as possible numerous organizations are scrutinizing on NFC innovation and are making loads of activities concentrating on it. There are numerous continuous tasks utilizing this innovation. A typical ticket or a coupon are issues of past. Mobile phones can be utilized as virtual vouchers, transport tickets, or even general store dependability cards.

Near-field (or near field) communication (NFC) is a form of short-range wireless communication where the antenna used is much smaller than the wavelength of the carrier signal (thus preventing a standing wave from developing within the antenna). In the near-field (there is no universally

accepted definition of the length of the near field but for practical purposes one can assume it is roughly one quarter of a wavelength) the antenna can produce either an electric field, or a magnetic field, but not an electromagnetic field. Thus NFC communicates either by a modulated electric field, or a modulated magnetic field, but not by radio (electromagnetic waves). For example, a small loop antenna (also known as a magnetic loop) produces a magnetic field, which can then be picked up by another small loop antenna, if it is near enough.

NFC remains for Near Field Communication. It is a short-range (a few inches/ centimeters) radio technology that enables communication between devices that either touch or are momentarily held close together. NFC is an open technology standardized by the NFC Forum. It is based on RFID.

A fundamental rule of the NFC innovation is "it's all in a touch", this implies that just touching an article with a NFC device promptly triggers an action. NFC offers purported labels (focused around existing RFID transponders) that can be utilized to store different information structures. It is a headway of inductively coupled nearness Radio Frequency Identification (RFID) innovation. Other than institutionalization through regularizing bodies like ISO/IEC and Ecma International, further determination of information organizations, conventions and NFC applications is determined by the NFC Forum. NFC lives up to expectations in an exceptionally natural manner for the user: two devices (i.e., NFC device and embedded device) start their correspondence by bringing them nearly together (it is additionally called "touching" each other). The touching of the segments is seen as a revelation of expectation from the user. This ease of utilization makes the innovation ideal for the retail management system. Retailers have been known to utilize conventional promoting strategies, for example, physically recording stock things or examining standardized tags. These strategies, and also known, are prolonged, wasteful, and erroneous contrasted with the NFC strategy. The motivation behind why retailers love NFC innovation is on account of you can supplant scanner tags with reasonable NFC-Tags which are checked with a

NFC-empowered PDA for expanded security and pinpoint GPS area and time precision. This is enormously valuable for merchandisers, wholesalers, and rack agents who work with a wide extent of items and stock at distinctive areas. Store network administration has been disentangled with NFC as it replaces all manual paper work with exact area, worker, and stock information for each item. This implies that you can have an exact record of all inventories in the store and in the distribution center continuously. This venture manages the novel methodology of retail management system utilizing NFC where the client has the accessible through the mobile phones by means of NFC. This model consolidates the utilization of a focal NFC per user in which client with their NFC enabled phones can make their payments effectively.

Security characteristics has been included for the same to make the exchanges all the more productively. In forthcoming years the NFC innovation can offer an essential commitment to streamline some every day operations, for example, payments and money transactions.

This paper concentrated on NFC innovation and proposes a distributed based application that shows the utilization of NFC and Bluetooth advancements for money transactions between mobile phone and embedded device. NFC innovation issued with a basic motion that triggers a great deal of foundation operation. It exhibits the NFC accessibility for secure and simple correspondence and validation in portable applications.

The rest of the paper is sorted out as follows. Section II presents NFC data exchange format while Section III introduces related work focusing on peer to peer applications. The design and construction of NFC application investigation are examined on Section IV and Section V gives discussion and conclusion and Section VI gives Future work.

NFC DATA EXCHANGE FORMAT

The NFC Data Exchange Format (NDEF) detail characterizes an information arrangement to trade data between two NFC enabled devices. NDEF is a

lightweight, parallel message arrange that can be utilized to epitomize one or more application, characterizing payloads of self-assertive sort and size into a solitary message build. Every payload is depicted by a sort, a length, and a discretionary identifier. Sort identifiers may be URI'S (Uniform Resource Identifier), MIME (Multipurpose Internet Mail Extensions) media sorts, or NFC-particular sorts. Illustrations of NDEF utilization can be tested when two NFC Forum devices are close one another.

A NDEF message is traded over the NFC Forum LLCP convention (Logical Link Control Protocol). A NDEF message with two connections is demonstrated in Figure 2. At the point when a NFC Forum devices is in vicinity of a NFC Forum tag, a NDEF message is recovered from the NFC Forum tag by method for the NFC Forum label conventions.

NDEF MESSAGE		
Email (message/rfc822)	Pic1.png (image/png)	Pic2.png (image/png)

Table1 – Example of a NDEF message with two connections.

Record Type Definition (RTD) is a set of determinations characterized by NFC Forum to compose NFC labels. "Record Typenames are used by NDEF applications to recognize the semantics and structure of the record content". NFC Forum recommends the utilization of their RTDs and NDEF messages for disentangling NFC Communications. A NDEF Message with Data is indicated in Table 2.

NDEF MESSAGE				
SP (Smart Poster)			Application/vcard	
URI	Text	Action	Config.	vcard data

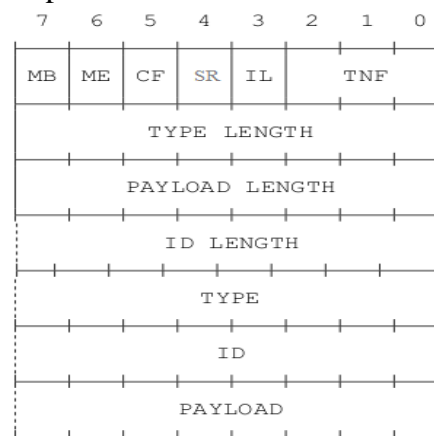
Table 2 – Example of an NDEF Message with Data.

The NFC Data Exchange Format (NDEF), characterizes a typical arrangement and guidelines for trading information structures through NFC. Application particular information structures

alongside sort data are pressed into NDEF records. Various records structure a NDEF message. Table 3 depicts the layout of an NDEF record (a) and that of an NDEF message (b).

A NDEF record comprises of various header fields and a payloads field. The header contains five banners - Message Begin (MB), Message End (ME), Chunk Flag (CF), Short Record (SR) and ID Length Present(IL)-a sort arrangement (Type Name Format, TNF), the length data for fields of variable length, a type ID (Type) and a discretionary record identifier (ID).

ME and MB mark the first and the last record of a NDEF message individually. The banner CF defines that the payload of that record is proceeded in the following record. SR characterizes whether the extent of the payload Length field is diminished from a 4-byte unsigned number to a 1-byte unsigned number. The banner IL figures out whether the discretionary field and its comparing length field are present.



(a)

NDEF Message		
R ₁ MB=1	...	R _n ME=1

(b)

Table 3 – NDEF record (a) NDEF Message (b)

The ID field may be utilized to indicate a one of a kind identifier for each one record. This identifier can be utilized to cross reference between records. The NFC Forum has characterized a set of extraordinary sort specifications. They spread essential information sorts and additionally unpredictable information structures for particular utilization cases.

RELATED WORK

This area studies the most important related literature about NFC, running from NFC tags structure to the utilization of peer-to-peer mode.

A. NFC Tag

NFC phone will act as an NFC reader which will read data from an NFC tag.



Fig. 1- NFC Tag and Reader

There are three different filters for tags:

1. ACTION_NDEF_DISCOVERED
2. ACTION_TECH_DISCOVERED
3. ACTION_TAG_DISCOVERED

The list is sorted from the highest to the lowest priority. Now what happens when a tag is attached to the smartphone? If the system detects a tag with NDEF support, an Intent is triggered.

An ACTION_TECH_DISCOVERED Intent is triggered if no Activity from any app is registered for the NDEF Intent or if the tag does not support NDEF. If again no app is found for the Intent or the chip technology could not be detected, then an ACTION_TAG_DISCOVERED Intent is fired.

In summary this means that each app needs to filter after the Intent with the highest priority. In our case, this is the NDEF intent. We implement the ACTION_TECH_DISCOVERED Intent first to highlight the difference between priorities. The following graphics shows the process:

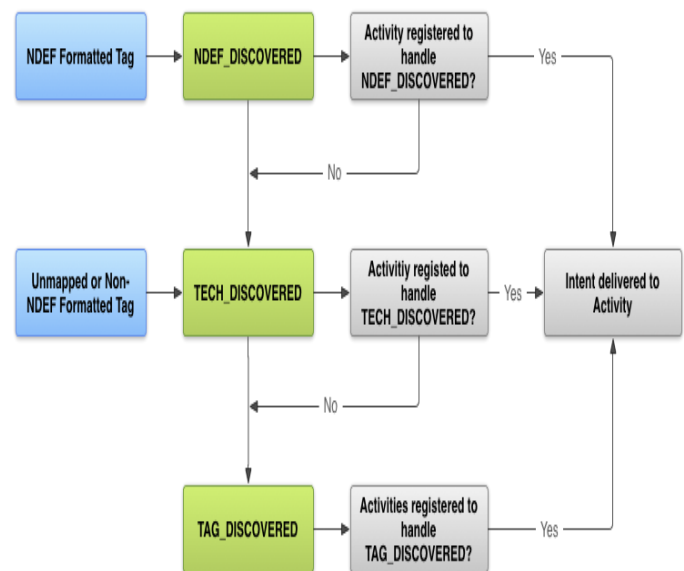


Fig. 2 - Reading NFC tag in android

We must specify the technology we are interested in. For this purpose, we create a subfolder called xml in the res folder. In this folder we create the filenfc_tech_filter.xml, in which we specify the technologies.

```

<?xml version="1.0" encoding="utf-8"?>
<resources
  xmlns:xliff="urn:oasis:names:tc:xliff:document:1.2"
  >
  <tech-list>
  <tech>android.nfc.tech.Ndef</tech>
  <!-- class name -->
  </tech-list>
</resources>

```

```

<!--
<resources xmlns:xliff="urn:
oasis:names:tc:xliff:document:1.2">
<tech-list>
<tech>android.nfc.tech.IsoDep</tech>
<tech>android.nfc.tech.NfcA</tech>
<tech>android.nfc.tech.NfcB</tech>
<tech>android.nfc.tech.NfcF</tech>
<tech>android.nfc.tech.NfcV</tech>
<tech>android.nfc.tech.Ndef</tech>
<tech>android.nfc.tech.NdefFormatable</tech>
<tech>android.nfc.tech.MifareClassic</tech>
<tech>android.nfc.tech.MifareUltralight</tech>

```



```

</tech-list>
</resources>
-->

```

Now we must create an intent filter in the manifest, and the app will be started, when we attach a tag.

```

<? xml version="1.0" encoding="utf-8"?>
<activity
android:
name="net.vrallev.android.nfc.demo.MainActivity"
android: label="@string/app_name"
<intent-filter>
<action android:
name="android.intent.action.MAIN" />
<category android:
name="android.intent.category.LAUNCHER" />
</intent-filter>
<intent-filter>
<action android:
name="android.nfc.action.TECH_DISCOVERED"
/>
</intent-filter>
<meta-data
android:
name="android.nfc.action.TECH_DISCOVERED"
android: resource="@xml/nfc_tech_filter" />
</activity>

```

B. PEER-TO-PEER

Peer-to-peer (P2P) is one of the three modes supported by the TRF7970A. The Near Field Communication (NFC) market is emerging into multiple fields including Medical, Consumer, Retail, Industrial, Automotive and Smart Grid. Peer-to-peer is very common in these fields, since it allows for a wireless virtual channel to be created between two devices. This application report describes two NFC technologies NFC-F and NFC-A protocols, which are used to initiate the communication for peer-to-peer active or passive modes. Furthermore, it explains how to implement an application using active or passive P2P communication.



Fig. 3 - NFC Device to exchange data in peer to peer mode.

The NFC Forum has published what observers says is a much needed specifications to standardize the way NFC phone or other devices exchange messages in peer to peer mode.

DESIGN AND CONSTRUCTION OF NFC APPLICATION

Money Transaction is a peer-to-peer (P2P) NFC based application. The main goal of this application is to transfer money between NFC mobile phone and embedded device.

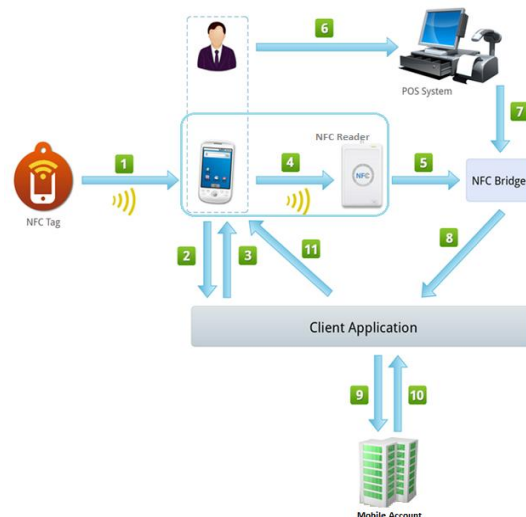


Fig. 4 – Illustration of retail management system
The system architecture of the proposed retail management system is presented in Figure 4. First user scans a NFC tag which has the information about the merchant. Merchant ID is extracted from the NFC tag to the phone. Therefore

phone uses a web service to request for a payment code from the client application with that it sends the payment code to the phone and then the payment code is sent to the NFC reader. Then the payment code is queued with the NFC Bridge.

After this user selects the items to pay. Then the selected items and their total prices are queued in the NFC Bridge. NFC Bridge submits the transaction list to the client application.

Therefore client application validates the transaction at the service providing mobile account. If the validations are passed, then the mobile account sends the transaction success status message to the client application. Transaction confirmation message is sent to the user with the transaction information.



Fig. 5 – Illustration of NFC enabled mobile phone or NFC reader

As mentioned in the above figure 5. NFC enabled phone and there are many free or low cost apps available on all NFC supported mobile platforms including Android, Windows Phone and Blackberry. Apps offer the best solution because they are easy to use and importantly handle details such as data formatting behind the scenes.

The objective of the paper work is to develop an efficient retail management system where the user friendly shopping is being made possible with the usage of NFC enabled Smart phones for Mundane Activities.

NFC customization is being made for the customer management system and payment system. NFC

readers and smart phones are calibrated to communicate in predefined manner with the application being development ported into the phone for the shopping. A novel security approach is being made to make the transactions efficient.

DISUSSION AND CONCLUSION

Checkout toward oneself offices in retail management system have been consistently expanding over the years. These checkout toward oneself units decrease work cost for the store subsequent to the clients performs capacities, for example, scanning things using barcodes, manual paper work meets expectations that were previously done by store staff.

This paper investigated the abilities of the novel NFC innovation for empowering secure versatile payments and exhibit it through the proposal of a NFC distributed portable application, established on NFC Forum standards and Android NFC mobile phones. Numerous arrangements were tested and assessed however this was the best to show a proposal to take care of this issue in light of the fact that it turns straightforward an exhausted undertaking to perform. With a basic touch of NFC enabled device it is conceivable to make a sheltered, solid, and trusted operation for payment.

This proposed application deals with the novel approach of retail management systems using NFC where the user has the available features through the mobile phones via NFC. This model incorporates the usage of a central NFC reader in which customer with their NFC enabled phones can make their payments easily. Security features has been added up for the same to make the payments more efficiently.

FUTURE WORK

Security features has been added up for the same to make the transactions more efficient. Then, this technology offers the possibility to create a huge amount of other type of applications supporting secure transactions among mobile phone and embedded device.

REFERENCES

1. www.androiddevelopers.com
2. NFC Forum, <http://www.nfc-forum.org>
3. Pascal Urine, Selwyn Piramuthu, "Framework and Authentication Protocols for Smartphone, NFC, and RFID in Retail Transactions", in IEEE ISSNIP 2013.
4. Wiechert, Thomas J. P., Thiess, Frederic, Fleischer, Elgar, "A Quantitative Evaluation of NFC Based Contactless Payment Systems in Retail", in IEEE ISSNIP 2013.
5. Wiechert, Thomas J. P., Thiess, Frederic, Fleischer, Elgar, "NFC Based Service Innovation in Retail: An Explorative Study" in IEEE ISSNIO 2013.
6. Muhammad Qasim Saeed, Zeeshan Bilal, Colin D. Walter, "An NFC Based Consumer-Level Counterfeit Detection Framework", 2013 Eleventh Annual Conference on Privacy, Security and Trust (PST).
7. Stephan Karpischek, Florian Michahelles, Florian Resatsch, "Mobile Sales Assistant- "An NFCbased product information system for retailers, 2009 First International Workshop on Near Field Communication", 2009 First International Workshop on Near Field Communication.
8. Pascal Urine, Selwyn Piramuthu, "LLCPS and SISO: A TLS-Based Framework with RFID for NFC P2P Retail Transaction Processing", in 2013 IEEE International Conference on RFID.
9. Sandra Dominikus, Manfred Aigner, "mCoupons: An Application for Near Field Communication (NFC)," 21st International Conference on Advanced Information Networking and Applications Workshops (AINAW'07), Niagara Falls, Ontario, Canada, May 21-23, 2007, pp. 421428.
10. NFC Data Exchange Format, NFC Forum Technical Specification, NDEF 1.0, July 2006.
11. NFC Record Type Definition, NFC Forum Technical Specification, RTD 1.0, July 2006.
12. Michael Roland, Josef Langer, Josef Scharinger, "Security Vulnerabilities of the NDEF Signature Record Type," Third International Workshop on Near Field Communication, Hagenberg, Austria, February 22, 2011, pp. 65-70.
13. JunweiZou, Chu Zhang, Chongbo Dong, Chunxiao Fan, Zhigang Wen, "Mobile Payment based on RFID-SIM Card," The 10th IEEE International Conference on Computer and Information Technology (CIT 2010), Bradford, UK, June 29 – July 01, 2010, pp. 2052-2054.
14. ErkkiSiira, TuomoTuikka, and ViliTörmänen, "Location Based Mobile Wiki Using NFC Tag Infrastructure," 2009 First International Workshop on Near Field Communication (NFC 2009), Hagenberg, Austria, February 24th - 26th, 2009, pp. 56-60.