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NFiD: An NFC based system for Digital Business Cards

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Abstract - *The advancements in technology have made digitization in daily activities inevitable. Business cards, one of the last analog tools in use for communication, need a digital alternative. We present an NFC-based system to replace paper cards with digital business cards in marketing and business. The technological aspects of the system are presented, wherein the business contacts are instantly transferred to the user's smartphone. Additionally, an Android app allows the user to browse all contacts and store or retrieve contacts from the cloud.*

Key Words: **Digital Business Card, NFC Technology, Android app, Cloud Storage**

1. INTRODUCTION

The modern world demands ubiquitous computing in every aspect of life. We are living in a world where ubiquitous computing has become the norm, with almost every individual carrying a smart mobile device. The development in ubiquitous technology, along with portable access to data via smart phones, has triggered a rapid decline in the usage of business cards. Nevertheless, paper business cards are being widely used as a medium of formally sharing contact details. We will design a digital alternative to business cards using Near Field Communication (NFC) cards, access contact data using NFC-enabled smart phones, and store this data in the cloud for secure portable access.

2. CURRENT SCENARIO SURVEY

The usage of business cards are archaic, dating back to the 15th century when they were used to announce one's intention to meet another person. With the evolution of civilization, business cards are used by marketers and businessmen as a mean to share contact details among others.

Often considered to be royal in status, business cards continue to be used for the purpose they were meant to. It is estimated that more than 27 million business cards are produced everyday in the United States alone, with a market revenue of more than $798 million. [1]

However, a survey suggests that 88% of business cards handed out will be thrown out in less than a week, with conversion into digital contact cited as a major factor for the same. [1] This suggests that although people accept paper business cards, they prefer digital contacts over carrying the paper card everywhere they go.

Although digital contacts on a smart phone fulfill the requirement, they lack the ability to store complex contact data. The risk of losing a digital contact can be realized when loss of data / loss of device occurs. Introduction of third party cloud syncing services have mitigated this risk to a great extent, however people continue to be skeptical about their usage because of possible aggregation of personal contacts by organizations. Moreover, digital contacts require manual data entry.

It is estimated that NFC-enabled shipments are to increase fourfold by 2018, making one in every three devices NFC-ready.[2] This statistic reinforces the necessity of usage of NFC in the products of the modern world.

2. NEAR FIELD COMMUNICATION

Near Field Communication (NFC) is a technology which allows communication between devices in close proximity, having low-power operation. [3] NFC is based on the Radio Frequency Identification (RFID) technology, and provides contact-less communication between devices in very low range of up-to 4 cm.[5] NFC operates at a frequency of 13.56 MHz and its data transfer rates reach up to 424 Kb/s.[5] The low range eliminates any interference, therefore ensuring reliable communication.

Table -1: NFC Specifications

Specifications	
Network Type	Point-to-point
Range	0 to 4 cm
Frequency	13.56 MHz
Data Transfer Rate	424 Kbps
Set up time	Less than 0.1 sec.

2.1. Modes of Operation

NFC devices can work in three modes: Tag Read/Write, Card Emulation, and Peer-to-peer mode.[4]

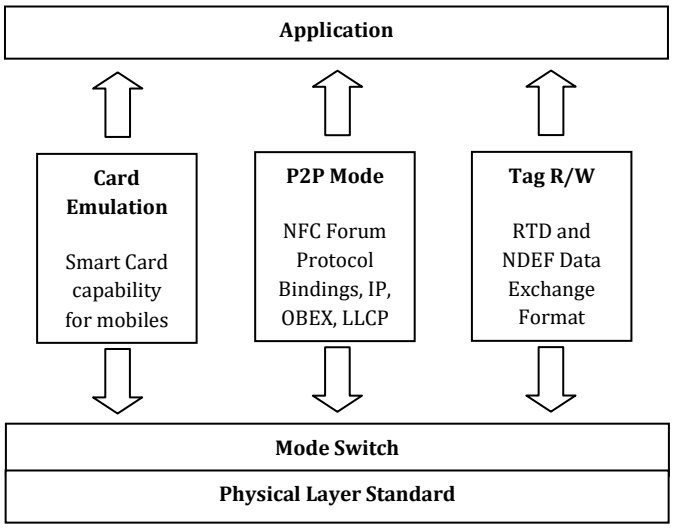

Fig-1: NFC modes and switch

In card emulation mode, the NFC device emulates an NFC tag. In Tag R/W mode, an NFC tag can be read or written by an NFC device. Finally, the P2P mode allows two NFC devices to bi directionally communicate and exchange data with each other.

2.2. Android NFC Protocol Stack

Android devices generally use the PN544 module, developed by NXP Semiconductors. The driver loaded in the Android kernel bears the name libpn544_fw.so.[6] In close proximity of an NFC device or a tag, the kernel calls services to read or write the data.

Reading or writing can be performed by creating or retrieving an NDEF format message from the NFC tag. Certain APIs have been exposed for developers to build apps capable of performing the same.

The NfcAdapter class represents the local NFC adapter. In order to get the default NFC adapter of the Android device, we can use the helper method Nfc Adapter .get Default Adapter(context). If the device does not have NFC capability, this helper method returns null.

Android Devices allow the user to turn on or off the NFC adapter from the phone settings. To find if the NFC Adapter is enabled, we can call the method *is Enabled()* on the object of *Nfc Adapter*. The method returns *true* if the adapter is enabled.

As soon as the NFC tag is in proximity to the NFC Adapter, the system triggers an Intent *android. nfc. action. TECH_DISCOVERED*. We can handle this intent by setting our own intent-filters for read and write on the respective activities.

A valid NFC intent returns the data from the NFC tag as a *Parcelable* array. Each entry of the *Parcelable* array can be cast to *NdefMessage.* Each *NdefMessage* entry contains an *NdefRecord*, which in turn contains a *payload* which is actually the data we have stored on our NFC tag. This *payload* can be stored as a String.

For writing data to an NFC tag, we use the same *NdefAdapter* class. We generate an *NdefRecord* which contains our data as a payload. We can then create an *NdefMessage* from all the generated *NdefRecord.*

One can then simply call Ndef. Write Ndef Storage(Nde fMessage), provided they have the tag details from the intent, to store the data on the NFC tag.

3. SYSTEM DESIGN

In our system, the NFC tag acts as a physical entity representing the digital card. The tag stores the contact information of the user, and can be scanned by our Android application. To prevent eavesdropping of contact data by third party applications or NFC readers, appropriate encryption algorithm is used which renders the data incomprehensible to any tool other than our Android app.

3.1. System Architecture

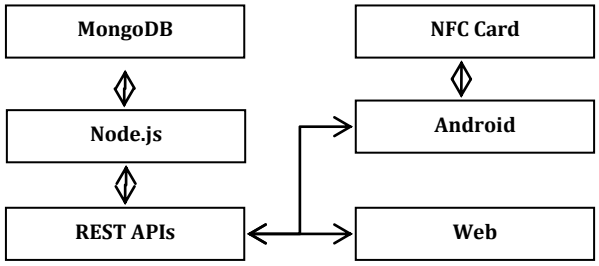

Fig-2: System block diagram

The user side of the system consists of an NFC tag and an NFC-enabled Android phone. An Android application controls the reading and writing of data from and into the NFC tag. The data stored in the tag is encrypted using an appropriate algorithm to prevent eavesdropping by a third party. The Android application also displays the contacts scanned by the user. These contacts are stored in the user's own cloud storage space. The cloud side of the system consists of a MongoDB database to store user data, NodeJS for server side scripting and REST APIs to access or modify the server data.

3.2. Android App

The Android app allows reading one tag at a time. Each card will be scanned by the device and the contact details will be displayed. The user will have a provision to then save the contact to the cloud. Once saved, the app will maintain a list of all saved contacts. This can be accessed by the user on any device with the use of a login system.

The app is launched as soon as the tag is placed near the NFC device. The app then displays the contact details and allows the user to save the contact.

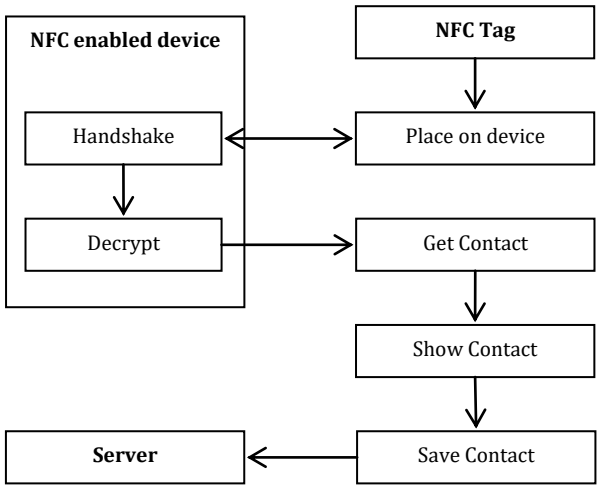

Fig-3: User Interaction

CONCLUSION

With the increase of ubiquitous computing in the modern world, there has been a requirement to replace paper business cards with a digital alternative for various reasons. This paper presents a ubiquitous method for replacement of paper business card using Near Field Communication (NFC) technology.

NFC is a technology which allows communication between devices in close proximity, having low-power operation.

The proposed model is an improvement over the existing business card storage system using NFC, which has a basic security flaw - eavesdropping. By using encryption, we are able to prevent eavesdropping by third parties. An Android app is also developed for easy access to contact data from the NFC card as well as the cloud.

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