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*Research Paper*

# NEAR FIELD COMMUNICATION - THE FUTURE TECHNOLOGY FOR AN INTERACTIVE WORLD

**Jignesh Patel[1]* and Badal Kothari[1]**

*Corresponding Author: ***Jignesh Patel*** , ✉ jignesh_29284@yahoo.com

Near Field Communication (NFC), as an emerging and promising technology, is an integration of Radio Frequency Identification (RFID) technology with mobile devices. NFC allow us to create a whole new theory for the vast majority of mobile users. NFC is rising as a near-term reality. It is a backward compatible with RFID and cell phones will bring with it a wealth of new applications. As application space, security mechanism and human interfaces are improved; the companies are working hard to explore these new capabilities; and it has started to incorporate into new generation of mobile phones. In this paper we are presenting some applications of NFC with classification of their operating modes. We will also provide short comparison with other technologies and required players for proposed schema for the deployment of NFC.

***Keywords:*** Near Field Communication, Emerging technology, Mobile Application, Mobile phone, RFID

## INTRODUCTION

NFC is a form of short-range communication that wireless exchanges data between a reader and a target. NFC is essentially a subset of Radio Frequency Identification (RFID) but, as the name implies, near field communication has a shorter read range – maximum of about 20 cm, although it is possible to amplify this. It is also compatible with the global contactless standards (ISO 14443 and/or ISO 18092), which means agencies that have already deployed contactless programs enjoy a built-in advantage, as their equipment may readily interact with NFC- enabled mobile devices and provide richer services. Like RFID, NFC is a versatile and innovative technology and certainly not limited to mobile payments.

NFC may be heavily deployed in a short time to come, as its applications are already undergoing large scale tests in Europe, North America, Asia and Oceania. Test examples are public transport payment, credit cards, electronic tickets, advertisement and W-LAN set up. The NFC development is focused by the NFC Forum, an organization of 180 companies working together to promote NFC.

[1] 1 Department of Computer Science, Hemchandracharya North Gujarat University, Patan

The devices in the communication share a single RF band in which the communication is half-duplex. When one device is transmitting, the other one has to listen first and should start to transmit after the first one finishes. One of the features of NFC technology is that mobile devices can be used both as information storage or an NFC reader. They can read information from NFC tags and also display that information on the screen with an ability to make additional processing. Also it can be used as a digital storage, e.g., storing credit card information, storing URL of website etc.

Features of Near Field Communication includes following

**Intuitive:** It's a very easy way to interact between two devices, because a user just need to bring two devices together and it's done (www.nfc-forum.org/home).

**Interoperable:** NFC works with existing contactless card technologies, existing RFID tags and contactless smartcards (www.nfc-forum.org/home).

**Ready Secure:** Data transmission range is short, due to that when devices get out of that short range communication automatically terminates. This shows that it's inherently secured (www.nfc-forum.org/home).

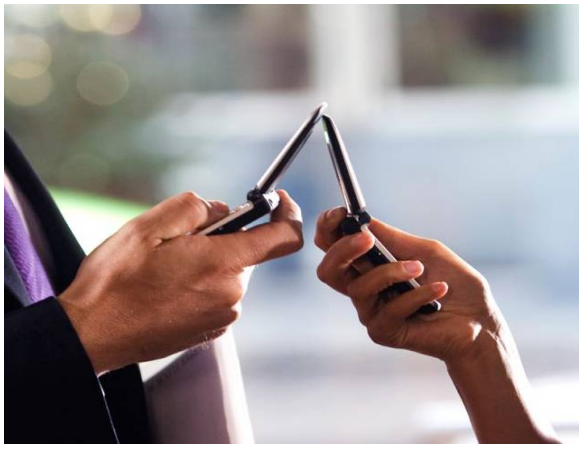
As NFC has enough potential for commercializing. If we talk about one of its use case in commercial market like public transport. We have stored our loyalty card into mobile phone and purchased online ticket along with one day parking ticket also. So just go to the parking lots and tap the phone on gate and redeem your pass for parking and we will successfully enters into the parking, as given in Figure 1.

Now, we have our loyalty card in our phone so we can enter into the station and next to our bench we found one NFC poster. Just go there tap your phone and we can access train route, schedule, running schedule (whether it's late or on time). During travelling ticket checker comes to us, just tap phone on handheld device carried by ticket checker and redeem tickets. During journey there is a person sitting next to us whom we saw after long time. We can see in Figure 2 persons can exchange contact information through NFC by tapping both phones.

Finally, we reach to the destination and exit the station by tapping phone on exit bar as

**Figure 1: Using NFC Paying for Parking**

**Figure 2: Exchanging Information via NFC-Enabled Phones**



displayed in Figure 3. After moving out of the station we call the cab and paying by touching phone to reader and get virtual receipt. So by the journey of this application you just have imagined the power of NFC. Using NFC everything is in your palm. Now to make this all possible we need services from mobile operators as well as other vendors like mobile companies, banks, etc.

**Figure 3: Using NFC Phone, Exiting Station and Opens**


## NFC TAGS

A sample sticker you can see in Figure 4. NFC tags are stickers or wristbands, having small microchips with little aerials which can store a small amount of information for transfer to another NFC device, such as a cell phone.

**Figure 4: Sample NFC Tags with Small Chip Inside**


## COMPARISON WITH OTHER TECHNOLOGIES

Tables 1, 2 and 3 gives comparison of NFC with other similar technologies. Here we will present a little comparison with similar kind of technologies like RFID contactless card, barcodes and QR codes.

**Table 1: NFC Versus RFID Vard**

| NFC | RFID Contactless Card |
|---|---|
| You can hold multiple cards in single device (virtual cards). The use of respected card can be done with ease using application. | You must carry several different physical cards and has to use particular card at different places. |

**Table 2: NFC Versus Barcode**

| NFC | Barcode |
|---|---|
| You don't need to align phone against NFC reader just tapping on reader is enough to initiate communication. | Barcode is easy to use but can be difficult to read. It must be at just right angle. |

**Table 3: NFC Versus QR Codes**

| NFC | QR Codes |
|---|---|
| It supports mobile payment and NFC tag can have ability to be programmed, so can be easy to perform specific task i.e. as you arrive at home your mobile wifi should on and change profile to normal, just tap on the NFC sticker and it will be done. That's easy, so we can say it's having programmability. | As we know it does not supports mobile payment. It's only having encoded version of the information. |

## NFC OPERATION MODES

As per NFC forum (www.nfc-forum.org/home), there are three operating modes; Peer-to-Peer, Reader/Writer, and Card Emulation.

**Peer-to-Peer Mode:** In the peer-to-peer mode, two devices can exchange data at link-level. This mode is standardized on the ISO/IEC 18092 (formerly ECMA 340[4]) standard, and allows data speed up to 424 Kbit/s. Examples of such mode are,

- File Transfer
- Transfer of Business Card (contact transfer)

**Reader/Writer Mode:** In the reader/writer mode, NFC devices can read and write data from/to NFC tags. In this mode NFC mobile acts as an initiator and passive tag acts as target. Here tag does not need any power. The initiator device generates radio signals and the target device gets powered by this electromagnetic field. The target device responds to the initiator by modulating the existing electromagnetic field. So NFC tag does not need a battery to work. It takes power from initiator device using load modulation technique. Examples are,

- Smart-poster
- Mobile Healthcare (ECMA-340)
- Social networking
- Vehicle information system

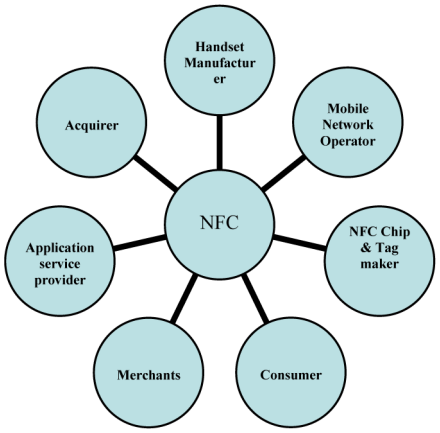
**Card Emulation Mode**: In the card emulation mode, NFC device acts as an RFID card and other NFC devices can read data from this NFC device. Stored information in the NFC device is used for further operations. Examples are,

- Payment
- Access control systems.
- Coupons
- E-ticketing
- Electronic Voting

## NFC ECOSYSTEM PLAYERS

Here, we will discuss about some major service providers of NFC, who helps to generate major ecosystem without which commercialization is not possible. There could be other players in this ecosystem, but these are the main entities (Figure 5).

**Figure 5: NFC Ecosystem**




**Handset Manufacturer:** Mobile Handset manufacturer has a role in NFC by producing and selling NFC-enabled handsets and may also act as secure element provider for securing hosting applications. Companies like Nokia, Samsung, HTC, RIM has already started to make NFC enabled handsets.

**Consumer:** He/she is a main entity of NFC ecosystem, because everything is around consumer. He/she owns payment credentials, contact information or may just act as a simple user.

**Merchants:** Merchants are retailers, provide goods or services and give payment options to customers at point of sale. Merchants are having relation with acquirer also.

**Acquirer:** It is a bank that processes and settles a merchant's credit card transaction with the help of a card issuer means bank.

**Application service providers:** They are issuing payment application to consumers. This service provider company could be the same company who is issuing cards.

**NFC Chip and Tag Manufacturer:** Chip and tag

manufacturer are responsible for making NFC chip, which can be place in mobile handsets and also into the NFC tag for active or passive communications.

**Mobile Network Operators:** It is really important stockholder in this ecosystem. It is the network operator who decides whether to turn it on. The existing infrastructure of mobile network can be use to provide data connectivity service to users. They may also provide NFC chip into the SIM card as an optional feature.

## CONCLUSION

This paper explores the use of NFC, a very promising technology. We just try to give some basics at start of paper, so we can have an idea about the kind of technology. For the understanding purpose we elaborated in brief an example of public transport. Then after we moved on to the quick comparison with previous all kinds of technology, which can be somewhere replaced by NFC. At last we show a basic player, who has important role in commercialization of NFC. It has a great potential to go further and take position into our mobile phones.

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Hyderabad, INDIA. Ph: +91-09441351700, 09059645577
E-mail: editorijlerst@gmail.com or editor@ijerst.com
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