

Near-Field Communication for commercial applications

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ABSTRACT

Technological progress has been gone hand in hand for years. The usage of mobile devices such as smart phones and tablet computers has rapidly increased in recent years. Increase in near field communication supporting device in mobile phones which enables transfer of data in short range without a wire and a physical touch. This NFC technology will pave a new path for various business people. This paper presents some commercial applications of NFC in real world.

Keywords: NFC technology, passive mode, Transfer of data,

1. INTRODUCTION

In a technical point of view Near-Field Communication(NFC) is a short range and wireless technology for data transfer without any physical touch. Which enables two-way data communication in between two electronic devices. For an example exchange of some code just by enabling NFC transfer for two devices and placing the two NFC capable devices close to each other in a short range i.e. of average 4 centimeters(cm). NFC devices can also transfer or receive the data through NFC tags, which are unpowered NFC chips that contain data it gets power by another active NFC device. By reading a NFC tag a device can perform a previously installed program or visit a website link present in NFC tag. NFC was introduced and developed by Sony and Philips. Smart Cards or chips are used for electronic authentication and authorization. NFC is an open standard which can be integrated into many PDAs (personal digital assistance). On the consumer side the primary NFC device is a smart phone or a tablet. In combination with NFC, the device will act as a smart-key to gain access to services from any other NFC device or tag by which security standards can be increased.

NFC is based on the principle of close range wireless communication technology, NFC is developed from Radio Frequency Identification which is popularly known as RFID. At 13.65 frequency a NFC will work and at that frequency it gives comfortable and stable short range communications between two NFC devices. NFC technology is having very fast set up when compared to Bluetooth and Wi-Fi modules. And can be used to access a Bluetooth or Wi-Fi connection automatically without any manual process. Which can also increase security when there are no other NFC-devices within a 20-cm radius. NFC also supports a passive and peer to peer mode of communication. In order to examine the whole NFC technology an extensive review of the literature is needed this literature produces types of NFC communication.

1. How NFC works

NFC enabled devices to communicate each other using radio waves. And these radio waves are generated using the antenna. So, if we take the case of smart-phone, then the antenna is fitted on the Li-ion battery of smart-phone. While in case of NFC tag, if you tear down that you will find antenna pattern shown in

fig.1. So using these antennas, these devices are able to communicate with each other.

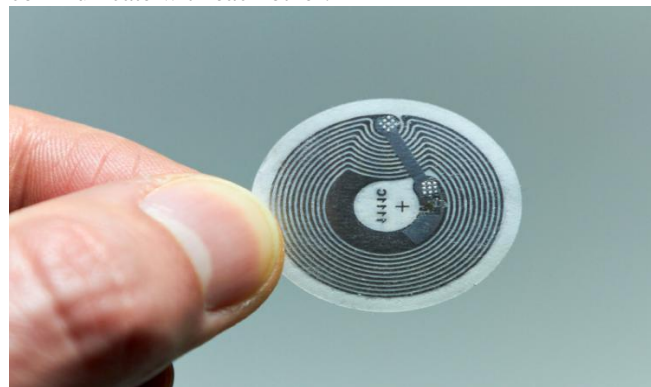


Fig 1. Antenna pattern in NFC tag

2. Types of Near Field Communication

NFC allows contactless communications between smart NFC-enabled devices in short range about 4cm (approx). NFC has more similarities with RFID and offers a bunch of protocols based on the ISO-14443 [3], which are standardized in [1] and [2]. NFC works at a radio frequency of = 13.65 c f MHz, while offers three options at low data rate communications, namely 106,212, and 424 Kbps. In contrast to RFID, NFC supports short-range communications, and additionally two-way communication between devices. NFC supports two communication modes. They are:

3.1 Passive Mode:

In this mode, near field communication takes place between two electronic devices in which one acts like an Initiator (active device), which sends data, and the Target, which receives data (passive device). During the NFC transaction, the active device RF field is activated and the passive device responds using a load modulation technique. NFC is referred to as reader or writer and as a card emulator in passive mode. Examples of passive mode NFC are a smart phone interacting with an NFC tag, placed in a movie banner to know information about that movie. In the above case the smart phone plays the role of an active device and tag placed in banner plays a role of passive device, and another example is payments using NFC. In which smart phones act in card emulation mode using the reader's RF field and the payment machine acts as an active device. The NFC

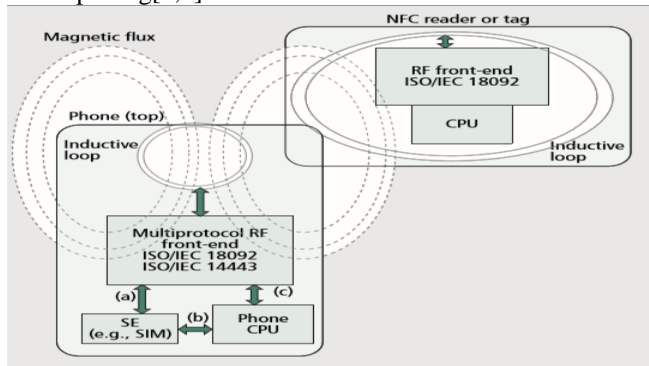
in passive mode serves several real-life applications, such as e-ticketing [4].

3.2 Peer-to-Peer Mode:

As described in passive mode, In active mode NFC allows two PDAs which are NFC enable to use their own RF field to transmit data between them. Both devices switch on their RF field when transmitting data in Initiator mode and sense the medium for the second device's RF field when in Target mode. The two devices switch between the sender and the receiver, eventually forms a peer-to-peer mode communication scheme. Active mode NFC can support application that involve devicepairing[1,2].



Fig 3. NFC based payment



Fig

2. Internal structure of NFC devices

In above figure we described an example for passive mode and peer-to-peer mode of NFC devices. In this mode there is a high-level depiction of a phone reader and a passive tag. Each has an inductive loop and the coupled magnetic flux lines show how the energy is transferred. The phone is shown supporting both ISO/IEC 18092 and ISO/IEC 14443 and it is also supporting a Secure Element (SE) which is where any bank card, credit card, and encryption information would stay and may be a SIM card. In above figure we indicated arrows which tell the flow of three uses. The (a) path is between the NFC front gate and secure elements; it acts as a card emulator. In this mode a secure transaction may occur as if it were a contactless card. In path (b) would be used when the phone needs to load the SE with a secure application, or financial "Topping Up". In path (c) would be used when the phone is operating as a reader and in peer-to-peer mode.

3. Applications

NFC allows one and two way communication between two devices, suitable for many applications.

3.1 Commerce

NFC devices can be used in payment systems without a contact, similar to smart cards which are used at present.

In the Kit-Kat version of Android (4.4 version), Google made a platform to support for secure transactions based on NFC through HCE (Host Card Emulation) based on card emulator in passive mode. HCE is used for payments, smart keys, card access, money transactions and other customer services. KitKat version applications are used to regenerate the function of an NFC smart card by HCE, allowing any NFC card holders to start transactions with their device. Apps which act as readers for card emulators for other transactions based on NFC.

On September 9, 2014, Apple announced support for NFC-powered transactions as part of Apple Pay in iPhones. NFC tags can be read from the iOS 11 version; the third party is allowed to access the data from NFC tags [5].

3.2 Social networking

For sharing photos, videos, documents, etc., on social media in a simple easy way using NFC. It can be done using peer-to-peer mode.



Fig 4. NFC in social media

3.3 Identity and access tokens

NFC-enabled devices can act as electronic identity documents and key-cards. NFC has a short range and also encrypts the data and is more suitable than less private RFID systems. As we can store the data (46 bytes) in NFC tags by placing an NFC tag on an NFC reader or writer by dumping the program in it using a PC.



Fig 5. NFC access token card

3.4 Smart phone automation and NFC tags

NFC-enabled devices can easily be paired up with NFC tags to make things easy. Here, NFC tags get information through NFC apps in mobile phones. Some applications of NFC in smartphones are illustrated.



Fig 6. NFC in smart phone

3.5 Instantly add an Wi-Fi network

Using NFC tag there is no need of remembering the wifi password or writing the Wi-Fi password in a paper and placing it in balcony for guests. As this tag stores some information regarding the Wi-Fi and makes things simple when your guest just simply comes near the NFC tag he/she gets automatically connected to Wi-Fi.

3.6 Launch a Website URL

Same as in the above case there is no need of writing the URL . Just by going near to NFC tag our phone gets the information of that URL which can be launched through our mobile browser .

3.7 In Cars

It can be used in car also as it makes things easy when we get into car we use our smart-phones frequently to turn on navigation,maps,music and so..on . To make this connection easy at first we encrypt some data to launch a particular app and placing tags this in car for different uses such as for Bluetooth one tag for music another tag . Just by tapping on that tag we get that app running .and we can toggle that app also just by re-tapping on that tag



Fig 8. NFC tags in car.

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5 Conclusion

In this we have seen the evolution of NFC. And how NFC is better than other communication systems. Types of Near-Field Communication and slight explanation on types. One of the unique applications opened up by NFC is the opportunity for proximate financial transactions. A future smart-phone might double as your electronic wallet and replace your credit cards in a more integrated virtual form. This is not so far-fetched, as contact-less credit cards have been in use for some time, and the underlying protocols already exist. Given that most people in the developed world no longer leave their homes without a cell phone in hand, it makes sense to expand a phone's capability further to include commerce, thus reducing the number of additional debit and credit cards that we need to carry. However, despite these benefits, there are security concerns among the general public over contact-less and mobile phone methods of payment.

Open source NFC stacks are available for Linux, Android, Windows, Mobile, and embedded system solutions . Samsung has made the first move with its Android NFC smart-phone. It's perhaps only a matter of time before NFC becomes another "must have" feature for mobile devices.

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