



Impact of NFC Technology over Short Range Communication

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Abstract:

In this exploration paper we survey three promising short-go remote correspondence, for example, Radio Frequency Identification (RFID), Bluetooth, zigbee and Near-field Communication (NFC). NFC portable administrations are an imperative developing area for NFC innovation, with incredible potential for development. The NFC Forum's system for quickening the development of this business area includes perceiving and depicting what is expected to acknowledge effective NFC versatile administrations, for example, key advances, run of the mill use cases, and the structure of the general biological community. The achievement NFC over a wide scope of uses relies on upon its expansive scale adoption by ventures and customers. This suggests the requirement for basic, ease usage of the innovation in a wide assortment of devices. This paper examines NFC innovation in subtle element alongside its conventions, correspondence modes, examination with different advances furthermore its security angles.

Keywords: NFC; RFID.

1. INTRODUCTION

Within the last few years, contactless card technology has been maturing and has been adopted by major sectors such as transport, payment, and retailing. In parallel, mobile phones with the additional offerings of Internet and multimedia services have successfully entered people's lifestyles. Contactless card technology can now expand its domain of applicability by adding contactless functionality to the mobile phone. The Near Field Communication (NFC) mobile service, which leverages the current contactless infrastructures, has just started to emerge. In some countries, services benefiting from the convergence of contactless card technology and mobile phones have already been introduced commercially, and these converging services are ubiquitous and successful. Several varieties of "Contactless technology" exist today. Of most interest to Mobile Network Operators (MNOs) and to third party Service Providers is Near Field Communication (NFC) technology. NFC is designed to operate over very short distances, typically less than 4 cm and is foreseen as a strong enabler to meet new customer needs and drive value added business models.

2. What is Near Field Communication (NFC)?

NFC is a standards-based technology used to provide short range wireless connectivity technology that carry secures two-way interactions between electronic devices. Communications are established in a simple way, not requiring set-up by users as in the case of many other

wireless communications. As such NFC enables users to perform contactless transactions, access digital content and connect electronic devices by touching devices together. NFC near field communication provides contactless communication up to distances of about 4 or 5 centimetres. In this way there communications are inherently more secure because devices normally only come into contact and hence communication when the user intends this.

As no physical connectors are used with NFC near field communication, the connection is more reliable and does not suffer problems of contact wear, corrosion and dirt. NFC utilizes inductive-coupling, at a frequency of 13.56 MHz - a licence free allocation in the HF portion of the radio spectrum. NFC is a form of RFID, but it has a specific set of standards governing its operation, interface, etc. This means that NFC equipment, and elements from a variety of manufacturers can be used together. The NFC standards determine not only the contactless operating environment, but also the data formats and data transfer rates.

3. Communication Modes: ACTIVE AND PASSIVE

The NFC interface can operate in two different modes: active and passive. An active device generates its own radio frequency (RF) field, whereas a device in passive mode has to use inductive coupling to transmit data. For battery-powered devices, like mobile phones, it is better to act in passive mode. In contrast to the active mode, no

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internal power source is required. In passive mode, a device can be powered by the RF field of an active NFC device and transfers data using load modulation. Hence, the protocol allows for card emulation, e.g., used for ticketing applications, even when the mobile phone is turned off. This yields to two possible cases, which are described in Table. The communication between two active devices case is called active communication mode, whereas the communication between an active and a passive device is called passive communication mode.

In general, at most two devices communicate with each other at the same time. However in passive mode the initiator is able to communicate with multiple targets. This is realized by a time slot method, which is used to perform a Single Device Detection (SDD). The maximal number of time slots is limited to 16. A target responds in a random chosen time slot that may lead to collision with the response of another target. In order to reduce the collisions, a target may ignore a polling request set out by the initiator. If the initiator receives no response, it has to send the polling request again

4. Operating modes of NFC

PEER-TO-PEER MODE (NFC):

This mode is the *classic* NFC mode, allowing data connection for up to 424kBit/sec. The electromagnetic properties and the protocol (NFCIP-1) is standardized in ISO 18092 and ECMA 320/340.

READER/WRITER MODE (PCD):

NFC devices can be used as a reader/writer for tags and smart cards. In this case the NFC device acts as an

initiator and the passive tag is the target. In reader/writer mode data rates of 106 kBit/sec are possible.

TAG EMULATION MODE (PICC):

In this mode the NFC device emulates an ISO 14443 smart card or a smart card chip integrated in the mobile devices is connected to the antenna of the NFC module. A legacy reader can't distinguish a mobile phone operating in tag emulation mode from an ordinary smart card.

This is an advantage of NFC technology as already existing reader infrastructures do not need to be replaced. The smart card chip used for tag emulation is also referred to as secure element.

5. Essential Specification

- Like ISO 14443, NFC communicates via magnetic field induction, where two loop antennas are located within each other's near field, effectively forming an air-core transformer. It operates within the globally available and unlicensed radio frequency ISM band of 13.56 MHz, with a bandwidth of almost 2 MHz.
- Working distance with compact standard antennas: up to 20 cm .
- Supported data rates: 106, 212, or 424 kbit/s .
- There are two modes:
 - Passive Communication Mode: The Initiator device provides a carrier field and the target device answers by modulating existing field. In this mode, the Target device may draw its operating power from the Initiator-provided electromagnetic field, thus making the Target device a transponder.
 - Active Communication Mode: Both Initiator and Target device communicate by alternately generating their own field. A device deactivates its RF field while it is waiting for data. In this mode, both devices typically need to have a power supply.

B a u d	A c t i v e D e v i c e	P a s s i v e d e v i c e
4 2 4 k B d	M a n c h e s t e r , 1 0 % A S K	M a n c h e s t e r , 1 0 % A S K
2 1 2 k B d	M a n c h e s t e r , 1 0 % A S K	M a n c h e s t e r , 1 0 % A S K



1 0 6 k B d	M o d i f i e d M i l l e r , 1 0 0 % A S K	M a n c h e s t e r , 1 0 % A S K
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Table 1- SPECIFIEDBANDWIDTH

NFC employs two different codings to transfer data. If an active device transfers data at 106 kbit/s, a modified Miller coding with 100% modulation is used. In all other cases Manchester coding is used with a modulation ratio of 10%.

6. Comparison with Parallel Devices

Contrasted with other short-run correspondence advances, which have been incorporated into cellular telephones, NFC rearranges the way customer gadgets communicate with each other and gets quicker associations. The issue with infrared, the most established remote innovation presented in 1993, is the way that an immediate viewable pathway is required, which responds delicately to outside impacts, for example, light and reflecting items. The huge point of interest over Bluetooth is the shorter set-up time. Rather than performing manual setups to distinguish the other's telephone, the association between two NFC gadgets is built up without a moment's delay ($<0.1s$). Table focuses out these distinctive abilities of NFC, Bluetooth and infrared. Every one of these conventions are point-to-point conventions. Bluetooth additionally underpins point-to multipoint interchanges. With under 10 cm, NFC has the most brief range. This gives a level of security and makes NFC suitable for swarmed zones. As opposed to Bluetooth and infrared NFC is good to RFID. Near Field Communication (NFC) is a developing remote innovation that is intended to encourage secure, short-run correspondence between electronic gadgets, for example, cell telephones, individual information aides (PDAs), PCs and installment terminals. The idea is straightforward: so as to make two gadgets impart, unite them or make them touch.

	N F C	Benefits of NFC	Bluetooth	I n D a
Network Type	Point-to-Point	Easy set up, pairing	Point-to-Multipoint	Point-to-Point
R a n g e	$<0.1m$	Safe, suitable for crowded area	1 0 m	1 m
S p e e d	424kbps		721kbps	115kbps
Set-up time	$<0.1s$	Fast transaction	6 s	0.5 s
M o d e s	Active-Active, Passive-Passive	Reader mode & card like mode	Active-Active	Active-Active
Compatible with RFID	Y e s	Can work with existing infrastructure	N o	N o

Table2-COMPARISON OF DIFFERENT DEVICE

7. Security Aspects

1) Eavesdropping-NFC offers no insurance against listening in. RF waves for the remote information exchange with a receiving wire empowers assailants to get the transmitted Monitoring information. By and by a malignant individual would need to keep a more extended separation all together not to get took note. Listening stealthily is greatly influenced by the correspondence mode. That is on account of, in light of the dynamic or latent mode, the exchanged information is coded and adjusted in an unexpected way. On the off chance that information is exchanged with more grounded adjustment it can be assaulted simpler. Along these lines, a uninvolved gadget, which does not create its own particular RF field, is much harder to assault, than a dynamic gadget.

2) Data Destruction-An assailant who yearn information

pulverization plans a defilement of the correspondence. The impact is that an administration is no more accessible. Still, the assailant is not ready to create a substantial message. Rather than listening in this is not a latent assault. This assault is generally simple to figure it out. One probability to exasperate the sign is the use of a purported RFID Jammer. There is no real way to anticipate such an assault, however it is conceivable to distinguish it. NFC gadgets can get and transmit information in the meantime. That implies, they can check the radio recurrence field and will see the impact.

3) Data Modification-Unauthorized changing of information, which brings about legitimate messages, is a great deal more convoluted and requests an intensive comprehension. Keeping in mind the end goal to alter the transmitted information a gatecrasher needs to concern single bits of the RF signal. The plausibility of this assault, implies in the event that it is

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conceivable to change a touch of quality 0 to 1 or the a different way, to the quality of the sufficiency adjustment. Notwithstanding, Near Field Communication innovation utilizes regulation of 100% as a part of conjunction with the adjusted Miller coding which prompts 4 conceivable cases. The main case, where a bit may be changed by an aggressor is the place a 1 is trailed by another 1. By filling the delay in two half piece of the RF flag the decoder gets the sign of the third case. Because of the assention of the former piece the decoder would check a substantial one. The other three cases are not powerless to such an assault.

4) Data Insertion-This assault must be executed by an aggressor, if there is sufficient time to send an embedded message before the genuine gadget begins to send his answers. In the event that a crash happens the information trade would be ceased without a moment's delay. Keeping in mind the end goal to anticipate such assaults the gadget ought to attempt to reply with no postponement. On the other hand, again checking the RF field furthermore the safe channel can be utilized to ensure against assaults.

5) Man-in-the-Middle-Attack with a specific end goal to demonstrate that NFC is secure against a Man-in-the-Middle-Attack we need to study both, the dynamic and the detached correspondence mode.

8. Advantages

The long-standing fixation in the installments business with NFC can for the most part be ascribed to one focal favorable position, which is accommodation. In the connection of transportation frameworks particularly, where it may be frosty, stormy, filthy, and essential to move rapidly, the accommodation of simply waving something before a peruser and having it work inside of one second can't be beat. Then again, in the supermarket, it doesn't generally take that any longer to swipe a plastic card than it does to tap a telephone, so in some sense this favorable position has been made a huge deal about.

To the degree that rapidly waving your telephone urges clients not to significantly try taking a gander at the screen, there are some other potential drawbacks. On the off chance that the exchange receipt just appears on the telephone screen (paper will soon be a relic of times gone by, all things considered) and clients quit trying to look, then there is the potential for routine mistakes to sneak past uncaught. Clients used to tap-and-go may likewise pass up a great opportunity for coupons

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or different advancements that commonly show up inside of an application on the telephone screen. Clearly this isn't an imperative variable when you're riding a metro, however when you're purchasing another TV it may be entirely critical.

The security ramifications of any RFID-based innovation are additionally entirely genuine. As of now the RFID stickers utilized by a few merchants to encourage NFC installments are just as trustworthy as the cement on the back, thus if the sticker tumbles off your telephone in a parking area (which happens more than one may might suspect), there's a danger that you could have quite recently lost a great deal of genuine cash. Regardless of the fact that the sticker remains focused telephone, a somewhat advanced criminal who comprehends what he's searching for could simply read information off your RFID tag just by drawing sufficiently near.

9. Future Scope

- Electronic ticketing- Airline tickets, concert event ticket and others.
- Electronic money.
- Electronic keys- car keys, house/office keys, hotel room keys, etc.
- Travel cards.
- Identity documents.

10. CONCLUSION

In synopsis, Near Field Communication is a productive innovation for correspondences with short ranges. It offers an instinctive and straightforward approach to exchange information between electronic gadgets. A huge focal point of this method is the similarity with existing RFID frameworks. Also, it would convey advantages to the setup of longer-range remote advancements, for example, Bluetooth, Wifi.

NFC depends on existing contactless framework around the globe that is as of now being used by a large number of individuals every day. NFC is not a stylish pleasant-to-have innovation, but rather really an innovation that makes people groups lives simpler – less demanding to pay for



merchandise and administrations, less demanding to utilize open transport, and less demanding to share information between gadget.

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