

1 NFC Introduction

1.1 Introduction

NFC is an acronym for Near Field Communication. NFC is a short-range radio technology that enables communication between devices that are held in close proximity. The NFC Forum (www.nfc-forum.org) is standardizing the technology to be an open-platform across mobile devices and systems with which they interact.

2 Comparison with other wireless technologies

2.1 Comparison

There are different wireless technologies on the market which are replacing a cable-based connection. These technologies allow a data transfer with a range of up to 100 meters. It is common for these technologies that receiver devices need their own power supply due to the larger working distance, thus the receiving device cannot be powered by the RF field. Another consequence of the larger working distance is the need for the user to configure their device and to pair them together for the communication as this connection cannot be initiated by a simple touch gesture. For these wireless technologies NFC provides an additional service as it can simplify the pairing process between two devices. Famous examples for these wireless technologies are Bluetooth, Wi-Fi and Zigbee technology.

The IrDa technology is a short range (a few meters) connection based on the exchange of data over infrared light. To make an IrDA connection the user must position the two communication devices within a line of sight. For larger data communication with computer devices this technology was replaced by Bluetooth or WiFi connections, this is why IrDa technology today is mainly used for remote control devices. Similar to the previously described wireless technologies, the IrDA receiver must also have its own power supply.

RFID technologies uses a similar communication technology as NFC technology but it uses other base frequencies for the generated RF field. These technologies are used in various markets however they do not target the wide range of use cases as NFC offers for consumers and end customers.

3 NFC Technology

3.1 NFC Concept Explanation

The RF field generated by an NFC Forum Device to communicate with an NFC Forum Tag has three tasks:

1. To transfer power from the NFC Forum Device to the NFC Forum Tag. Therefore the NFC Forum Tags don't need batteries or other power supplies for operation as the necessary power for communication is provided by the RF field. This technology is also ideal for small IoT devices acting as an NFC Forum Tag as no additional power is needed for the NFC communication.
For Wireless Charging the primary goal of NFC Technology is to transfer power thus extending communication. In this case NFC communication is used to regulate the power transfer. When Wireless Charging mode is active the field strength of the RF field can be increased allowing a power transfer of up to 1 W.
2. The NFC device is sending information to an NFC Forum Tag by modulating the RF field signal (signal modulation).
3. The NFC device is receiving information from an NFC Forum Tag by sensing the modulation of the load generated by the NFC Forum tag (load modulation).

NFC technology is designed for an operation distance of a few centimeters, this makes it more difficult for attackers to record the communication between an NFC Forum Device and an NFC Forum Tag compared to other wireless technologies which have a working distance of several meters. In addition, the user of the NFC Forum Device determines by the touch gesture which entity the NFC communication should take place, which makes it more difficult for the attacker to get connected. As a result, the security level of the NFC communication is by default higher compared to other wireless communication protocols. Additionally, the NFC Forum has added Peer to Peer communication which is a mechanism to cipher all exchanged data to avoid that a spy can interpret recorded communication.

4 NFC Applications

4.1 Applications of NFC

NFC technology has evolved from a combination of contactless identification and interconnection technologies including RFID and it allows connectivity to be achieved very easily over distances of a few centimetres. Simply by bringing two electronic devices close together they are able to communicate and this greatly simplifies the issues of identification and security, making it far easier to exchange information. In this way it is anticipated that Near Field Communications, NFC technology will allow the complex set-up procedures required for some longer range technologies to be avoided.

Near field communication NFC lends itself ideally to a whole variety of applications. These include:

- Payment cards
- Ticketing
- Mobile phones, PDAs, etc
- Check-out cash registers or "point-of-sale" equipment
- Turnstiles
- Vending machines
- Parking meters
- ATMs
- Applications around the office and house, e.g. garage doors, etc

Contents

- 1 **NFC Introduction 1**
 - 1.1 Introduction 1
- 2 **Comparison with other wireless technologies 2**
 - 2.1 Comparison 2
- 3 **NFC Technology 3**
 - 3.1 NFC Concept Explanation 3
- 4 **NFC Applications 4**
 - 4.1 Applications of NFC 4