# Near Field Communication (NFC)

NFC is a short-range high frequency wireless communication technology that enables the exchange of data between devices over about a 10 cm distance. It is an upgrade of the existing proximity card standard (RFID) that combines the interface of a smartcard and a reader into a single device [1]. It allows users to seamlessly share content between digital devices, pay bills wirelessly or even use their cellphone as an electronic traveling ticket on existing contactless infrastructure already in use for public transportation.

The significant advantage of NFC over Bluetooth is the shorter set-up time. Instead of performing manual configurations to identify Bluetooth devices, the connection between two NFC devices is established at once (under a 1/10 second).

Due to its shorter range, NFC provides a higher degree of security than Bluetooth and makes NFC suitable for crowded areas where correlating a signal with its transmitting physical device (and by extension, its user) might otherwise prove impossible.

NFC can also work when one of the devices is not powered by a battery (e.g. on a phone that may be turned off, a contactless smart credit card, etc.).

**How NFC works?**

There are four ways how NFC works.
1. Phone to phone
2. Phone to device
3. Phone to tag
4. Phone to reader

1.  **Phone to Phone**

In this category two cell phones equipped with NFC communicate with each other. They can transfer music files or pictures by just touching each other.



**Figure 1: Phone to Phone NFC Transaction**

**2. Phone to Device**

Here NFC equipped cell phone can communicate with any device. For example, by just touching phone with NFC equipped printer can print the pictures stored in cell phone. Or by touching payment device can perform payment transaction.

### 3. Phone to Tag

Tag contains data. Normally tags are embedded on posters for marketing purpose. Cell phone is touched with tag and data from tag is transferred to cell phone. For example there is a tag on bus terminal which by touching cell phones transfers bus timings

and other details.

### 4. Phone to Reader

We can purchase and store electronic tickets on our cell phones. Cell phone can communicate with external reader by just touching it with reader. So one can purchase ticket easily instead of standing and waiting in a long queue.

**Figure 4: Phone to Reader Transaction**

**NFC Applications**

NFC fall under three different categories upon its usage in different fields.

1- Service initiation category

2- Peer-to-Peer category

3- Payment and Ticketing category

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*"An inventor fails 999 times, and if he succeeds once, he's in. He treats his failures simply as practice*