NFC

Near Field Communication

About RFID

RFID : Radio Frequency IDentification

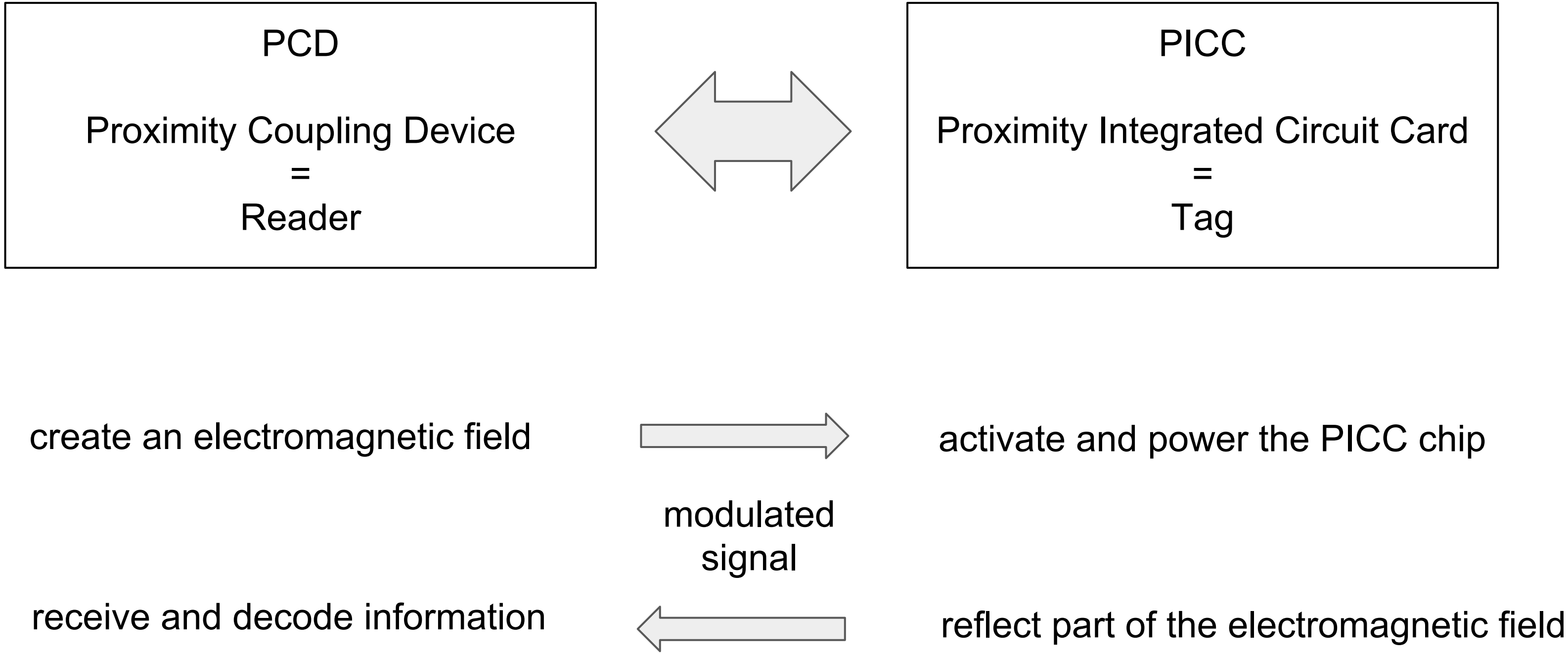
- Identification / Markers
- Referred as RFID tags, radio-stickers, RFID transponders

Set of norms and standards describing a technology allowing to store data on a physical support and to transmit them wirelessly.

RFID tags

- Badges
- Stickers
- Keychains
- Sub dermal capsules
- Embedded in objects

Communication



PCD

Proximity Coupling Device
=
Reader

PICC

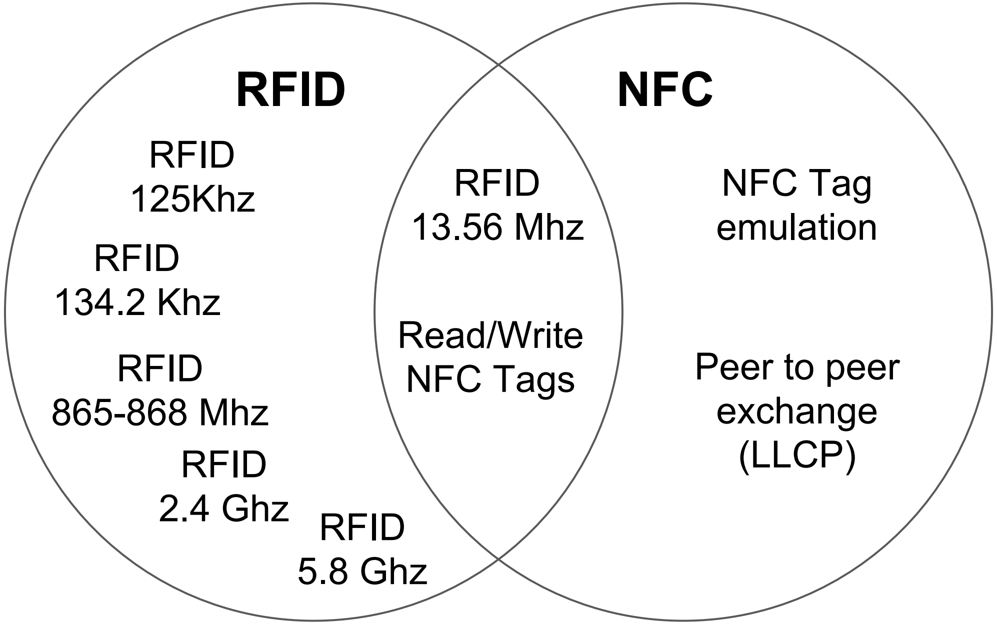
Proximity Integrated Circuit Card
=
Tag

create an electromagnetic field → activate and power the PICC chip

modulated signal

receive and decode information ← reflect part of the electromagnetic field

RFID vs NFC



RFID

RFID
125Khz

RFID
134.2 Khz

RFID
865-868 Mhz

RFID
2.4 Ghz

RFID
5.8 Ghz

RFID
13.56 Mhz

Read/Write
NFC Tags

NFC

NFC Tag
emulation

Peer to peer
exchange
(LLCP)

Source : Hackable Magazine #10

RFID vs NFC

NFC

Stands for Near Field Communicationn

Described by other ISO standards than RFID

- ISO/IEC 144431-1 : Physical characteristics
- ISO/IEC 144431-2 : Power interface and Radio-frequency management
- ISO/IEC 144431-3 : Initialisation and anti-collision
- ISO/IEC 144431-4 : Transmission protocol

NFC

13.56 Khz ONLY

Two types of modulation (way to communicate), described by the ISO 14443-4 :

- ISO 14443-A (aka Type A)
- ISO 14443-B (aka Type B)
- Note : there is a type F, mostly used in Japan (Railway Suica cards)

NFC tag types

Type 1 : has an UID (Unique IDentifier). This UID can be made read only (locked)

Type 2 : idem and integrates an anti-collision mechanism

Type 3 : no UID, can be made read-only (locked)

Type 4 : UID, locking, anti-collision and dynamic content (can change itself)

Readers

RC522 chip

- Only to read and RFID NXP Mifare tags.
- Cannot be used as a NFC target (in Peer to Peer communication for instance)
- Not supported by NFC compliant libraries

PN532

Does support NFC

NFC as Data Format

NDEF

- Stands for NFC Data Exchange Format
- Standard used to describe messages
- Messages can be made of one or several records
  - TNF (Type Name Format) = type of type
  - Type of information
  - Payload (actual information)
  - Data Length
  - Start/End of record (MB / ME)
  - Data itself (CF)

In detail

NTF : 0x01 = Well Known Message

Record type : 0x55 = URI Code (Uniform Resource Identifier)

Content : 0x06 = mailto (email address)

Data : someone@newschool.edu

For more details, see the NFC Forum http://nfc-forum.org/

Also on https://learn.adafruit.com/adafruit-pn532-rfid-nfc/ndef

Compatible NFC tags 1/2

Mifare classic (manufactured by NXP)

- 1k (752 actuel octets out of 1024) aka S50.
- 4k (3440 actual octets out of 4096) aka S70.

Mifare Ultralight (manufactured by NXP)

- Something used in parking tickets for instance
- Used for "short life" solutions

Compatible NFC tags 2/2

NTAG210/213/215/216

- Similar to the Mifare Ultralight
- NFC type 2
- Respectively 44, 144, 504 and 888 octets

Mifare DESFire and DESFire EV1

- Embedding a microprocessor, an OS, and protection mecanisms.
- NFC type 4

Mifare classic

ISO 14443-A tags

Manufactured by NXP

Partially follow ISO 14443-3 and 14443-4 standards

As a result, only NXP reader chips (or NXP licenced products) can communicate with this type of tags

NFC Readers + software 1/2

USB key SCM SCL3711

- On any OS with a corresponding NFC software

NFC enabled Android smartphones

- NFC Tag Info by NXP : read only but shows a lot of technical details
- NFC Tools (Pro) by Julien Veuillet aka wakdev
- NFC Tagwriter by NXP
- Mifare Classic Tool by Gerhard Klostermeier

Raspberry Pi with an I2C or ISP shield or with the above USB key

- LibNFC

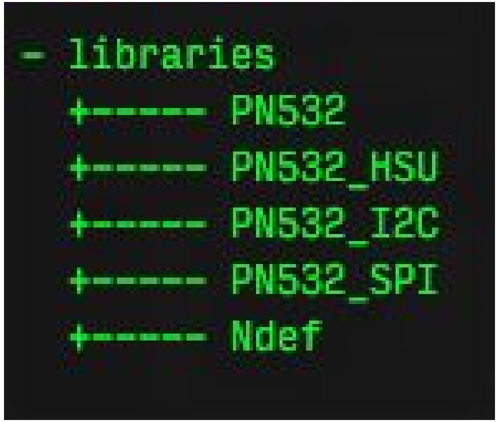
NFC Readers 2/2

Arduino

- Hardware : shield integrating a PN532 chip

Libraries (not the Adafruit PN532 library)

- https://github.com/Seeed-Studio/PN532
- https://github.com/don/NDEF



```
- libraries
  +------ PN532
  +------ PN532_HSU
  +------ PN532_I2C
  +------ PN532_SPI
  +------ Ndef
```

Architecture / A few things to take into account

Equip people with Readers or Tags

The need for a centralized system / interconnected architecture

Read only or Read/Write

Visual/Sound feedback / Actuators (buttons, ...)

Security and anonymity

Tracability

Loss of device / ID

Arduino Examples

Read

Write

Read and write

Visual feedback