



# NFC Tags

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# About NFC (Near Field Communication) Tags

- Facilitates data transfer between two devices i.e. phones, tablets, smart watches.
- Contactless interaction, made very popular during the pandemic.
  - 20% of the population has access to NFC technology
- Nokia launched first NFC enabled phone in 2006, but did not take off till recently
- Work wirelessly without needing WiFi or LTE.
- The payments are very secure, with tokenization and encryption
- Devices need to be in a 10-20 cm radius to communicate.
  - Other alternatives with longer ranges, but not as efficient i.e. RFID.



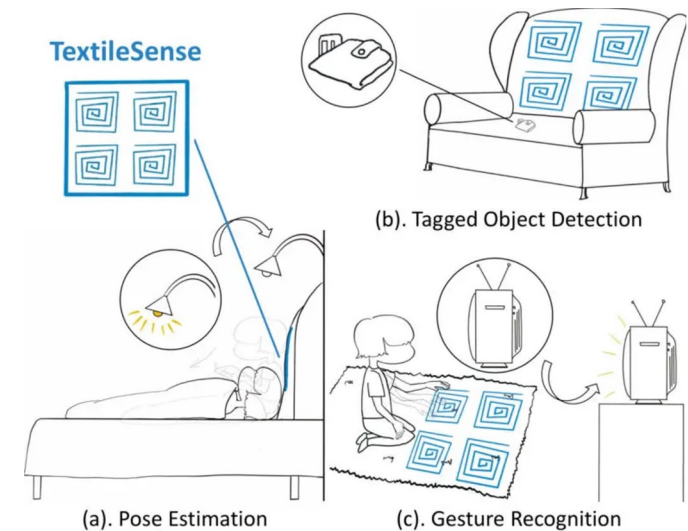
# Uses of NFC (Examples)

- **Contactless Payments**
  - Apple Pay
  - Google Wallet
- **Home Security**
  - Lock/Unlock
- **Cars**
  - Lock/Unlock
  - Start/Stop engine
- **Transportation**
  - Metro
- **Digital Tickets**



# Latest Trends in NFC

- Sprayable NFC tags: Smart Furniture
- Check product legitimacy
- Prevent Identity Frauds
- Wireless earbuds charging and power share
- Unlock cars and homes without keys



# NFC vs RFID

## NFC

- User Centric, subset of RFID
- Mobile Payments
- Secure payments and single use transaction no. is generated each time
- Invisible and integrated easily

## RFID-Radio Frequency Identification devices

- Item/Product Centric used by manufacturers/retailers
  - Tracking/Tracing items, alerts, e-wallets
  - Can be hacked and reprogrammed
  - Usually large and visible
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# How it works

## **NFC Tag → NFC Reader**

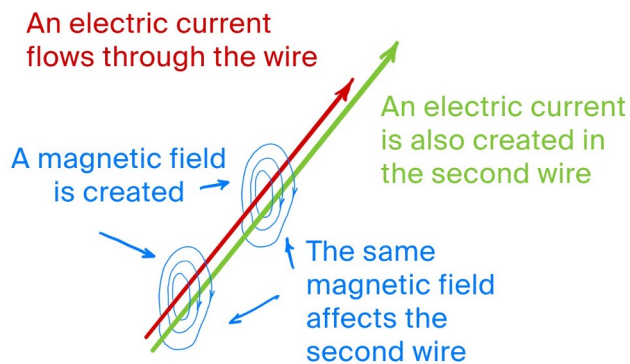
Devices communicate via radio waves to activate the receiving device

### **Typical Procedure:**

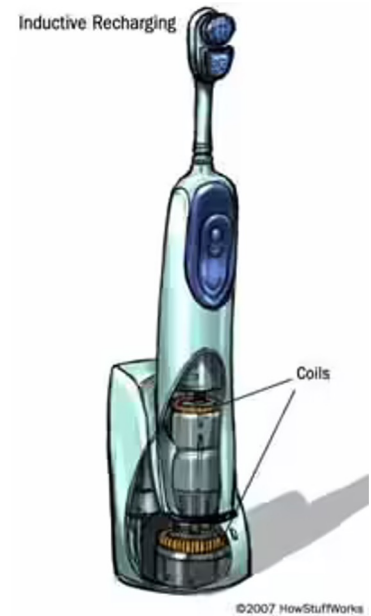
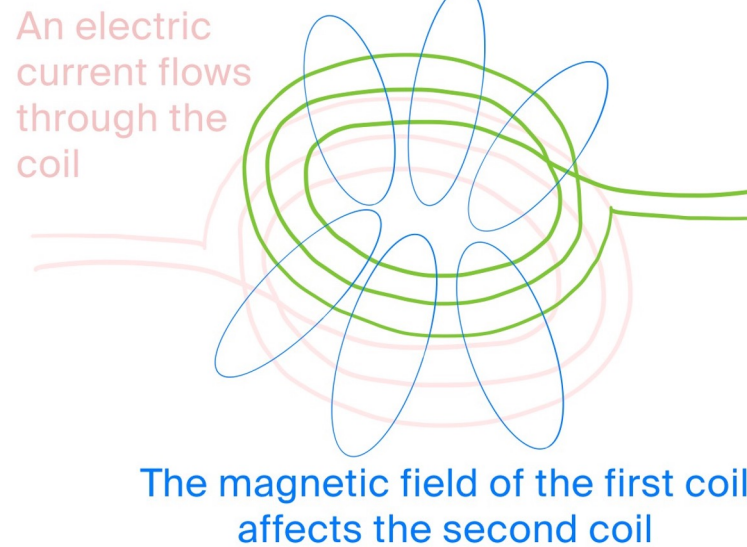
1. User holds NFC tag in close proximity to NFC reader
    - a. Will only work in short distances ~ 5 inches
  2. Radio wave is sent to the the readers antenna to activate the device
  3. Encrypted data exchange occurs between the two devices
    - a. An NFC tag will only connect to one NFC reader at a time
  4. Tag and reader deactivate after exchange
    - a. NFC tags do not have batteries but instead draw power from the host (Ex. Smartphones)
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# How are NFC Tags Powered?

- Powered by reading device
- Magnetic induction



In the second coil, an electric current appears, which then charges the battery



# NFC Tag Security Risks

- Eavesdropping
    - Close range
    - During transaction
  - Data corruption and manipulation
    - Corrupt data being sent to reader
  - Middleman interception
    - Similar to data corruption
  - Physical theft
    - E.g. Stolen ID card
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# Disadvantages of NFC

- Only works for short distances
  - The power utilization is more in NFC empowered gadgets
  - Low information move rates from 106-424 kbps
    - Only good for quick transactions
  - More secure than credit cards but not totally risk free
    - Due to prominence of mobile based hacking these days
  - Interception Attacks
    - NFC data transfer is rerouted to a device other than the one that is intended
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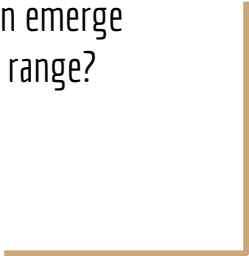
# Advantages of NFC

- Low cost at Scale
  - Battery free function
  - Cannot be Cloned
  - Can be updated
  - Compatible with existing devices and RFID
  - Light and Thin form factor
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# Discussion

What other uses and drawbacks can emerge from NFC tags if we extend their range?



# References

- <https://electronics.howstuffworks.com/everyday-tech/wireless-power.htm>
  - <https://www.nomtek.com/blog/what-are-nfc-tags>
  - <https://electronics.howstuffworks.com/everyday-tech/wireless-power.htm>
  - <https://medium.com/practicum-by-yandex/how-wireless-charging-works-1b8f3e40be5c#:~:text=When%20you%20put%20such%20a,will%20charge%20the%20phone's%20battery>
  - <https://blog.beaconstac.com/2020/10/nfc-latest-trends/>
  - <https://www.nfcw.com/nfc-world/researchers-unveil-fabric-friendly-nfc-sensors-that-track-tags-everyday-objects-and-people/>
  - <http://nearfieldcommunication.org/nfc-security.html>
  - <https://gotap.uk/nfc-knowledge/security-privacy-and-safety-with-nfc/#:~:text=Data%20Corruption%20and%20Manipulation,being%20sent%20to%20another%20device.>
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