



# Near Field Communication Technology

**For Prelims:** NFC, Wi-Fi, Bluetooth Technologies.

**For Mains:** IT and Computers.

## Why in News?

Google Pay has recently launched a new feature in India, 'Tap to pay for UPI', in collaboration with Pine Labs. The feature makes use of **Near Field Communication (NFC) technology**.

- The functionality will allow users with NFC-enabled Android smartphones and **UPI (Unified Payments Interface)** accounts linked to Google Pay to carry out transactions just by tapping their phones on any Pine Labs Android point-of-sale (POS) terminal across the country.
- The process is **much faster compared to scanning a QR code or entering the UPI-linked mobile number** which has been the conventional way till now.
- In February 2022, **Apple introduced Tap to Pay** on the iPhone.

## What is NFC and how does it work?

- NFC is a **short-range wireless connectivity technology that allows NFC-enabled devices to communicate with each other** and transfer information quickly and easily with a single touch - whether to pay bills, exchange business cards, download coupons, or share a document.
- NFC transmits data **through electromagnetic radio fields**, to enable communication between two devices. Both devices must contain NFC chips, as transactions take place **within a very short distance**.
  - NFC-enabled devices must be either physically touching or within a few centimetres from each other for data transfer to occur.
- In 2004, consumer electronics companies, Nokia, Philips and Sony together formed the NFC Forum, which outlined the architecture for NFC technology to create powerful new consumer-driven products.
- Nokia released the first NFC-enabled phone in 2007.

## What are the other applications of NFC technology?

- It is used in **contactless banking cards to perform money transactions** or to generate contact-less tickets for public transport.
  - Contactless cards and readers use NFC in several applications from securing networks and buildings to monitoring inventory and sales, preventing auto theft, and running unmanned toll booths.
- It is **present in speakers, household appliances, and other electronic devices** that are controlled through smartphones.
- It **also has an application in healthcare**, to monitor patient stats through NFC-enabled wristbands. NFC is **used in wireless charging** too.

## How safe is this technology?

- NFC technology is designed for an operation between devices within a few centimetres from each other. This makes it **difficult for attackers to record the communication between the devices compared to other wireless technologies** which have a working distance of several metres.
- The user of the NFC-enabled device determines by the touch gesture which entity the NFC communication should take place with, making it more difficult for the attacker to get connected.
- The **security level of the NFC communication is by default higher** compared to other wireless communication protocols.
- Since the receiving device reads data the instant one sends it, NFCs **also reduce the chance of human error.**

## Where does it stand in comparison to other wireless technologies?

- The **IrDa (Infrared) technology is a short range (a few metres) connection based on the exchange of data over infrared light** where the two communication devices must be positioned within a line of sight. Today, this technology is **mainly used for remote control devices.**
- For larger data communication with computer devices **this technology was replaced by Bluetooth or WiFi connections.**
  - However, for these technologies' **receiver devices need their own power supply due to the larger working distance.**
  - Therefore, the receiving device **cannot be powered by the Radiofrequency (RF) field like in NFC.**
  - Another consequence of the larger working distance is the **need for the user to configure their device and to pair them together for communication.** Connection cannot be initiated by a simple touch gesture like in NFC.

## Note

**Bluetooth: Developed in the late 1990s,** it is a technology designed **to enable short-range wireless communication between electronic devices**, such as between a laptop and a smartphone or between a computer and a television.

- Bluetooth **works by using radio frequencies**, rather than the infrared spectrum used by traditional remote controls. As a result, Bluetooth eliminates the need not only for a wire connection but also for maintaining a clear line of sight to communicate between devices.
- Bluetooth works at 2.4GHz frequency.

**Wi-Fi (Wireless Fidelity):** It is **similar to Bluetooth in that it also uses radio waves for high-speed data transfer over short distances** without the need for a wire connection.

- Wi-Fi works by breaking a signal into pieces and transmitting those fragments over multiple radio frequencies. This technique enables the signal to be transmitted at a lower power per frequency and also allows multiple devices to use the same Wi-Fi transmitter.
- Initially **developed in the 1990s**, Wi-Fi has undergone several standardization processes, approved by the Institute of Electrical and Electronics Engineers (IEEE), to allow for greater bandwidth in data transfer.
- Wi-Fi based networks work at 2.4, 3.6 and 5 GHz .

## UPSC Civil Services Examination, Previous Year Questions (PYQs)

**Q. With reference to 'LiFi', recently in the news, which of the following statements is/are**

**correct? (2016)**

1. It uses light as the medium for high speed data transmission.
2. It is a wireless technology and is several times faster than 'WiFi'.

**Select the correct answer using the code given below:**

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

**Ans: (c)**

- **Li-Fi stands for Light Fidelity and** is a Visible Light Communications (VLC) system which runs wireless communications that travels at very high speeds. The term was coined by University of Edinburgh Professor Harald Haas during a TED Talk in 2011. Haas envisioned light bulbs that could act as wireless routers.
- Wi-Fi technology **uses radio waves for transmission, whereas Li-Fi utilizes light waves.** Wi-Fi works well for general wireless coverage within the building/ campus/compound, and Li-Fi is ideal for high density wireless data coverage in a confined area or room and is free from interference issues unlike the Wi-Fi. Speed of data transmission for Li-Fi is approximately 1 Gbps and for Wi-Fi – IEEE 802.11n is approximately 150 Mbps. **Hence, statements 1 and 2 are correct.**
- *Therefore, option (c) is the correct answer.*

**Q. What is the difference between Bluetooth and Wi-Fi devices? (2011)**

- (a) Bluetooth uses 2.4 GHz radio frequency band whereas Wi-Fi can use 2.4 GHz or 5 GHz frequency band
- (b) Bluetooth is used for Wireless Local Area Networks (WLAN) only, whereas Wi-Fi is used for Wireless Wide Area Networks (WWAN) only
- (c) When information is transmitted between two devices using Bluetooth technology, the devices have to be in the line of sight of each other, but when Wi-Fi technology is used the devices need not be in the line of sight of each other
- (d) The statements (a) and (b) given above are correct in this context

**Ans: (a)**

**Q. Consider the following: (2010)**

1. Bluetooth device
2. Cordless phone
3. Microwave oven
4. Wi-Fi device

**Which of the above can operate between 2.4 and 2.5 GHz range of radio frequency band?**

- (a) 1 and 2 only
- (b) 3 and 4 only
- (c) 1, 2 and 4 only
- (d) 1, 2, 3 and 4

**Ans: (d)**

- Bluetooth is a wireless technology for exchanging data between fixed and mobile devices over short distances. The working frequency band is 2.400 to 2.485 GHz. **Hence, 1 is correct.**

- A cordless telephone works in the frequency band of 2.4 GHz and 5.8 GHz. **Hence, 2 is correct.**
- Microwave oven uses frequencies of 2.45 GHz. **Hence, 3 is correct.**
- Wi-Fi is technology for radio wireless local area networking of devices. Wi-Fi most commonly uses the 2.4 GHz band. **Hence, 4 is correct.**
- *Therefore, option (d) is the correct answer.*

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