SNS COLLEGE OF ENGINEERING

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Accredited by NAAC-UGC with 'A' Grade
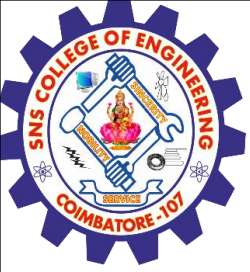Approved by AICTE, Recognized by UGC & Affiliated to Anna University, Chennai

Department of AI & DS

Course Name – Internet of Things & AI
III Year / V Semester

CONNECTIVITY TECHNOLOGIES AND COMMUNICATION PROTOCOLS

NFC PROTOCOL

- **Near-field communication (NFC) is a short-range wireless connectivity technology that uses magnetic field induction to enable communication between devices when they're touched together or brought within a few centimeters of each other.**

- It communicates over a very short range (0 - 5 cm) for security. It is present in most iOS and Android mobile phones. Users simply approach a mobile to a tag to connect

- This includes authenticating credit cards, enabling physical access, transferring small files

- NFC extends RFID and contactless capabilities with more dynamic features enabled by modern smartphones. .

Typical steps for engaging with an NFC tag

1 - Search for the NFC tag

2 - Tap the tag

3 - Access the data

Working of NFC

- All modern phones now support NFC chips and applications, such as Apple Pay and Google Pay, to take advantage of the billions of RFID tags and terminals already deployed. NFC makes it easier to load multiple cards into a single phone for payments, municipal transit, building access, opening car doors and other use cases.

- no power is required for the basic mechanics of listening to and responding to NFC requests. This makes it possible to implement in items that lack a battery, such as credit cards.

- NFC also complements wireless technologies such as Bluetooth, Ultrawideband (UWB), Wi-Fi direct and QR codes.

- Its most significant advantage is that it is the easiest wireless technology for setting up a connection, which makes it useful for IoT devices.

- NFC devices can be classified into 2 types:

- **Passive NFC devices –**

- These include tags, and other small transmitters which can send information to other NFC devices without the need for a power source of their own. These devices don't really process any information sent from other sources, and can not connect to other passive components. These often take the form of interactive signs on walls or advertisements.

- **Active NFC devices –**

- These devices are able to both the things i.e. send and receive data. They can communicate with each other as well as with passive devices. Smartphones the best example of active NFC device. Card readers in public transport and touch payment terminals are also good examples of the technology.

How does NFC work?

- NFC is based on radio-frequency identification (RFID) technology, which allows compatible hardware to use radio waves to both controls and communicate with otherwise unpowered and passive electronic tags!

- NFC transmits via Electromagnetic Induction, which can induce electric currents within passive components as well. This means that passive devices can be powered by the electromagnetic field produced by an active NFC component, and don't need their own power supply.

- The transmission frequency is 13.56 megahertz for data across NFC. Data can be sent at either 106, 212, or 424 kilobits per second which is quick enough for a range of data transfers like contact details to swapping pictures and music.

- The NFC standard currently has three distinct modes of operation
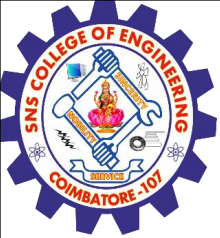
NFC Three Modes of Data Exchange

- **Reader/Writer mode** – One-way data transmission where the active device, which may be your smartphone, establishes a link with another device in order to read data from it. This mode is used by NFC advertisement tags.
- **Peer-to-Peer mode** – This enables two NFC-enabled devices to share different types of data. Both devices transform from active to passive when sending and receiving data in this mode. Most common use in smartphones.
- **Card Emulation mode** – The NFC device can be used to make purchases or tap into public transportation networks as a smart or contactless credit card, i.e. Google Pay and Apple Pay.
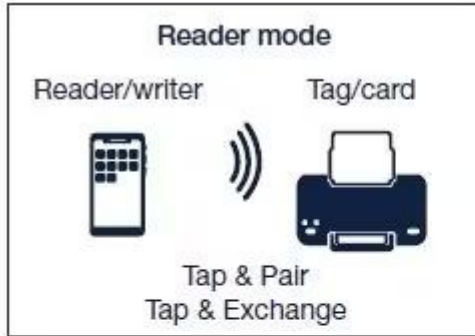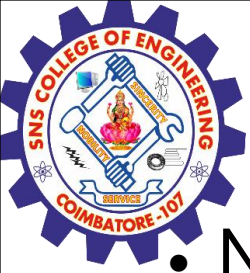
How NFC benefitted IoT

- NFC and IoT are two very different technology that has similar benefits. One is a solution for two devices to communicate, while the other is an autonomous system for data collection and transfer.

- Therefore, if they are implemented together, NFC will bring real benefits for IoT

- It doesn't need a pairing code to connect,

- it's even more power-efficient than other wireless communication types because it uses chips that run on very low power
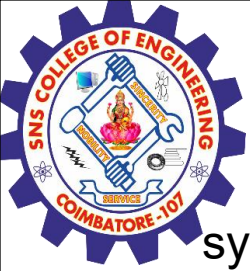
system that aims to collect and transmit data autonomously, there will definitely be some challenges.

- NFC makes connecting two separate IoT devices easy and intuitive thanks to its simple tap-and-go mechanism. Minimal configuration and no wires are required!

- NFC provides data security on many levels. Hackers can take advantage of wide-open networks. NFC counters with built-in features that restrict eavesdropping opportunities, as well as easy-to-deploy options for additional security to fit each use case.

- NFC is a strong indication that the consumer wants to take a specific action because NFC chips must be in near proximity to each other to initiate a transaction. This defends against hackers gaining unauthorized entry.

- NFC tags will share data passively even if they don't have power or an IoT link. Users who have an NFC-enabled computer can tap it to get information like URLs.

Operating frequency

- **The system is mainly used in three frequency bands.**

  1) Low-frequency band(LF):

- General Frequency Range: 30 – 300 kHz

- Primary Frequency Range: 125 – 134 kHz

- Read Range: Contact – 10 Centimeters

- **2) High-frequency band (HF):**

- Primary Frequency Range: 13.56 MHz

- Read Range: Near Contact – 30 Centimeters

- **3) Ultra-high frequency band:**

- General Frequency Range: 300 – 3000 MHz

- Primary Frequency Ranges: 433 MHz, 860 – 960 MHz