CMPE – 272 – Lab – May 9th

Team Members

1. Shreekar Kolanu : 017406493

2. Satwik Upadhyayula : 017423796

3. Vineet Samudrala : 017426253

4. Bala Supriya Vanaparthi : 017464135

Part 1: Differences between NFC and RFID

Technology:

RFID (Radio Frequency Identification) uses radio waves to identify objects uniquely tagged with RFID tags.

NFC (Near Field Communication) is a subset of RFID technology that enables communication between devices within close proximity (usually within a few centimeters).

Operating Frequency:

RFID operates at different frequencies, including low-frequency (LF), high-frequency (HF), and ultra-high-frequency (UHF), depending on the application and required read range.

NFC operates at 13.56 MHz, falling under the HF range.

Communication Range:

RFID typically has a longer communication range compared to NFC. UHF RFID can reach several meters, while HF RFID ranges from a few centimeters to about a meter.

NFC has a short communication range of up to 10 centimeters, making it suitable for secure short-range transactions.

Data Transfer Rate:

RFID generally has higher data transfer rates compared to NFC, especially UHF RFID, which can transfer data faster over longer distances.

NFC has a lower data transfer rate due to its shorter range but is sufficient for small amounts of data transfer, such as contactless payments.

Applications:

RFID is commonly used in supply chain management, inventory tracking, access control systems, and asset tracking.

NFC is widely used for contactless payments, public transportation ticketing, access control, and data exchange between devices.

Security:

Both RFID and NFC can support various security measures such as encryption and authentication.

NFC is often considered more secure due to its short range, making it less susceptible to unauthorized access compared to long-range RFID systems.

Power Requirement:

RFID tags can be passive (powered by the reader's signal) or active (have their own power source). Passive tags are common and do not require a power source.

NFC devices can operate in three modes: reader/writer mode (active mode), card emulation mode (passive mode), and peer-to-peer mode (active mode). Passive NFC devices do not require a power source.

Part 2: Proposal for Library Check-in/Check-out System

For our library's check-in/check-out system, we propose implementing a hybrid solution utilizing both RFID and NFC technologies for enhanced functionality and security.

Components:

RFID Tags: Each library item will be tagged with an RFID tag containing unique identification information.

NFC-enabled Devices: Library users will utilize NFC-enabled smartphones or library-issued NFC cards for authentication and transaction purposes.

RFID Readers: Stationed at check-in/out points, RFID readers will detect tagged items and communicate with the library's database.

NFC Terminals: These terminals will be installed at check-in/out counters for users to tap their NFC-enabled devices/cards for authentication.

Backend Database: A centralized database will store information about library items, users, borrowing history, and authentication details.

Workflow:

Check-out Process:

User approaches the check-out counter with desired items.

Items are scanned by the RFID reader, automatically registering them for check-out.

User taps their NFC-enabled device/card on the NFC terminal for authentication.

Transaction details are updated in the database, recording the user's borrowing history.

Check-in Process:

User returns borrowed items to the library.

Items are scanned by the RFID reader at the check-in counter.

RFID reader communicates with the database to update the item's status as returned.

User taps their NFC-enabled device/card on the NFC terminal for authentication.

Database is updated to reflect the returned items and user's borrowing status.

Benefits:

Efficiency: The combined use of RFID and NFC streamlines the check-in/check-out process, reducing waiting times for users.

Accuracy: RFID technology ensures accurate tracking of library items, minimizing errors in inventory management.

Security: NFC authentication adds an extra layer of security to the system, preventing unauthorized access to library resources.

User Convenience: NFC-enabled smartphones provide users with a familiar and convenient way to authenticate transactions without the need for additional cards or devices.