# INFORMATION SENSING BY RADIO FREQUENCY OF RFID WITH AUTHENTICATION USING ARDUINO

S. NARENKUMAR[1], G. SURYA NARAYAN[2], K. R. PREM ANAND [3],
Mr. I. VASUDEVAN[4], Mr. T. THANGARASAN[5]

[1] *Under Graduated Student, Computer Science Engineering, K.S.R College of Engineering, Tamil Nadu, India*
[2] *Under Graduated Student, Computer Science Engineering, K.S.R College of Engineering, Tamil Nadu, India*
[3] *Under Graduated Student, Computer Science Engineering, K.S.R College of Engineering, Tamil Nadu, India*
[4] *Assistant Professor, Computer Science Engineering, K.S.R College of Engineering, Tamil Nadu, India*
[5] *Assistant Professor, Computer Science Engineering, K.S.R College of Engineering, Tamil Nadu, India*

## ABSTRACT

*RFID is radio frequency identification technology, an emerging technology which uses radio frequency electric fields to identify and track data stored in chip which can be implant to objects. This paper defines the data storing and retrieval technique by implementing RFID data storage with authentication system for secure data accessing. The data stored in the chip will be accessed with RFID RC522 sensor signals to the antenna attached to the chip, and authenticated with fingerprint sensor in the mobile device with the use of ESP8266 Node MCU, which is a Wi-Fi sensor controlled with Arduino UNO. Data will be sensed and retrieved using the RFID chip with concept of Near Field Communication (NFC) and the data will be shared to specific network connected mobile devices that will be monitored using android application with mobile. Radio frequency emission to the storage chip antenna from sensor will be processed by Automatic Identification Data Capture (AIDC) method with user fingerprint identity verification and the data will be accessed securely.*

**Keyword: -** *Arduino UNO R3, RFID MFRC522 Sensor, Tags, Wi-Fi sensor, ESP8266, NFC, Fingerprint, AIDC, Node MCU.*

## 1. INTRODUCTION

Having the data stored in a secured manner is our day-to-day priority in order to avoid the personal details which need not to be theft by others. We do many ways in order to store the data in a safe manner, but somehow our personal data have been theft even so much security we provide. In order to avoid that theft process of data, we have created a way of Store, Read and Write the data in a secured way so that no one could access easily the data. The way is simpler to store the data in secure manner in the RFID cards or tags with the help of the applications and tools like Arduino, RFID sensor, Wi-Fi sensor and cables to run the process of the data secured from being theft by the unknown user. We have created a solution and except the user no one can easily can access the data. The user can store the data in the RFID tags which is placed in a secret area where no one can see the tag and user can view, write and read the data stored in the tag with the help of the Wi-Fi sensor connected in the mobile with the help of the fingerprint protected lock present in the data in order to avoid theft and the user can only access the data only with the login details otherwise user cannot view the sources stored in the data. An android application is used with

the Wi-Fi sensor connection so only the owner of the data can be viewed and others cannot access the data easily even if they have source, because of the password protection of the stored data.

## 2. OBJECTIVE

The main objective of this project is to implement the verification system for the RFID data reading module to sense the data securely with the radio frequency signals using the RFID sensor. Therefore, we implement the Arduino circuit system and the Node MCU to control the RFID sensed data and to transfer and receive the information with the mobile system for the fingerprint verification the user. This authentication process will secure the access of data by the authorized user and enhance the privacy of our information.

### 2.1 Existing System

- Data stored and accessed from the chip information is processed without the authorization of viewing the data.
- Scanning the storage chip data with the radio frequency signals will directly read and write information to the chip with the antenna.
- Without the authentication system, the confidential data can be accessed by unauthorized users which leads to data eavesdropping.

#### 2.1.1 Drawbacks of Existing System

- Direct accessing of the data reduces the privacy of user's stored information because of loss in security of stored data.
- Privacy of important data will be not secure.

### 2.2 Proposed System

- Information will be accessed with the radio signals with the authentication system of fingerprint verification and this will improve the security of the data stored in the chip.
- By using the authentication method, information privacy will be increases for the data in RFID based storage objects.

#### 2.2.1 Advantages of Proposed System

- Confidentiality of data can be achieved by using the fingerprint verification method and the existing system will be upgraded.
- Data privacy will be managed from unwanted data accessing users.
- Application of the data storing method with authentication will encourage people to implement with more real world objects process and management.
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## 3. COMPONENTS USED

### 3.1 Arduino UNO R3:

- It has high performance and low power AVR 8-bit microcontroller.
- It has 131v powerful instructions. Most single clock cycle execution.
- 32x8 Generic purpose registers.
- Fully static operations up to 20MIPS throughput at 20MHz and On-chip 2 cycle multiplier.
- Operating voltage: 1.8to 5.5v
- Temperature range: 40 degrees Celsius to 85 degrees Celsius.

- Speed grade: 0-20MHz@1.8-5.5v


**Fig -1:** Arduino Uno R3 Board

### 3.2 RFID RC522

- Radio Frequency Identification, this technology uses radio waves to capture and read information stored on tag attached to an object, which can be any shape or size.
- This tag can read the data up to several feet away and also does not need to be within direct lines of sight this has the advantage over Bar-code and QR Code.
- Passive RFID tags are used for cheap cost and has more advantages in near field communication and does not needs more power source like Active RFID tag.
- It has an operating current of 13-26mA/DC 3.3V. The Idle current is 10-13mA/DC 3.3V. It has operating frequency of 13.56MHz.
- The Operating environment will be the temperature of 20-80 degree Celsius and the storage temperature of environment will be 40-85 degree Celsius.

**Fig -2:** MFRC522 RFID Sensor Chip


### 3.3 ESP8266 Node MCU

- ESP8266 is Wi-Fi enabled system on chip module developed by Expressive system. This is mostly used for the development of embedded applications for IoT (Internet of Things) implementation.
- It has the capabilities of 2.4 GHz Wi-Fi.
- The General-purpose registers input and output has 16 GPIO.
- The Analog to digital conversion has 10-bit ADC.
- This MCU module is low cost and standalone wireless transceiver.

**Fig -3:** ESP8266 Node MCU Sensor Chip

## 4. MODULES

The project consists of different modules of operating process of user's information, which is organized and controlled by the total architecture of the system. These module separate process will provide individual data, that information is used for other module for data processing.

### 4.1 Data Reader and Writer Module

The reader and writer module is processed with the RFID MFRC522 sensor chip, which is used to sense the information with the antenna attached to the storage chip and also write the data to the storage chip with the radio frequency signals. This module is controlled by the Arduino board and the sketch uploaded to Arduino UNO R3 board to control the circuit system of RFID data processing.

### 4.2 Storing Module

Data stored in the storage tags is processed with the chip located inside the objects, which identifies the radio frequency signals from the RFID sensor by using the antenna attached to the chip. These are Passive RFID storage tags which can be made with any objects of shape and size. Storing the data and reading the data is performed with the data reader and writer module of the circuit system. After storing the data, the information can be accessed without making a direct contact with the tags, because of radio frequency can penetrate through any intermediate objects and the data will be processed.

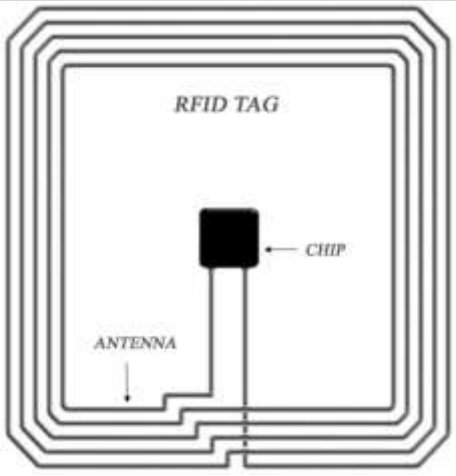


**Fig -4:** RFID Storage Tag and Card

**Fig -5:** RFID Tag Circuit

### 4.3 User Verification Module

The verification process is performed with the fingerprint sensor and that is inbuilt with the mobile device is used for system. The user fingerprint data is stored by default and recorded for further verification process. Data from the RFID sensor is transferred to Arduino board and before the data is made to view in display, the Arduino board controls the Wi-Fi sensor to request acknowledgement from the fingerprint sensor in the device. After the user data is authenticated the sensed information will be transferred to display for viewing.

### 4.4 Controller Module

Arduino UNO R3 provides the overall control to the circuit system with the Node MCU Wi-Fi sensor and MFRC522 RFID sensor. The controlling process is monitoring and perform to manage output from the modules with each other by the sketch uploaded to the Arduino board. The sketch makes the Arduino board to work independent without the computer control with a power battery. Data processing will automatically execute with user's information and manages the system circuit.

## 5. SYSTEM ARCHITECTURE

The Architecture of circuit system consists of the components majorly used for data management and processing, which is the Arduino UNO R3 board, acts as a centralized control for the process of RFID MFRC522 sensor chip and the Wi-Fi sensor Node MCU system. For the verification process of the user's fingerprint, the fingerprint sensor in the mobile device is implemented. Data sensed by the Radio frequency identification sensor is transferred to the device by the Wi-Fi sensor after the fingerprint verification data is received from the mobile device fingerprint sensor to the Arduino board and the data is further transferred to the display for viewing the information stored in the chip.

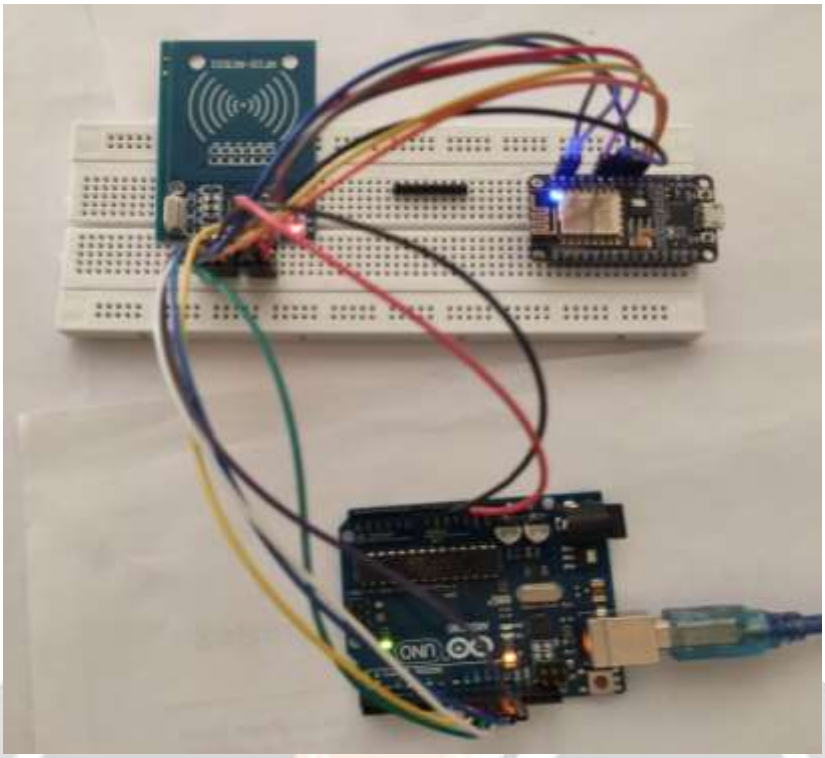

**Fig -6:** Architecture of Sensor Circuit System

The communication process of the circuit system is diagrammatically explained with the collaboration diagram (Fig -7), where the data flow and execution is mentioned with the input and output specification. The control begins with the Arduino board and gather data from the storing module of storage tags and chips with data read and write module, which is RFID sensor and the storage tags. And the user verification about fingerprint information is processed by using the Wi-Fi sensor and the fingerprint sensor by receiving the authorization of access or denied data to the Arduino controller board for the user fingerprint data. Based on the authorization the data will be transferred to the application in the device for viewing the output data, which is the stored data in RFID tags or the denied message about the verification.

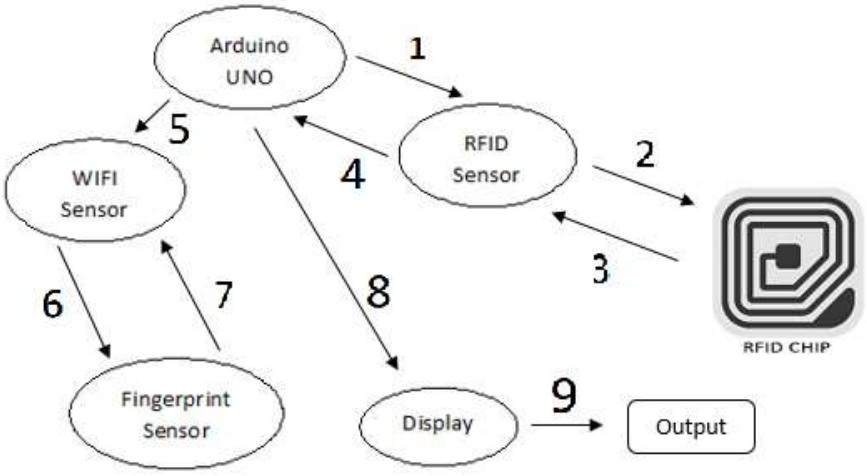


**Fig -7:** Collaboration Diagram

## 6. CONCLUSIONS

The RFID is used to store, read and write the data which is performed with the control of the Arduino board. Users can secure and retrieve the data to enhance the privacy of information. This project is implemented to perform the data and its related operations in a secure way of approaching with the data in the RFID based storage tags and chips. The study shows that the RFID used with major applications such as vehicle tracking, container tracking, object tracking, supply chain management tracking, asset tracking, library management, access control and environmental conditions monitoring. By implementing this system with these applications, data processing will be more secure and ease way of approaching the information better than the Barcodes and QR codes with real world objects.

## 7. ACKNOWLEDGEMENT

We respect and thank Mr. I. Vasudevan and Mr. T. Thangarasan, for providing us an opportunity to do the project work at K.S.R. College of Engineering, Namakkal District, and giving us all support and guidance, which made us complete the project duly and Our team for such co-operation in development and dedication in research to complete the project in time. We are extremely thankful to Mr. I. Vasudevan and Mr. T. Thangarasan, for providing such a nice support and guidance.

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