**A**

**Mini Project Report**

**On**

# **“RFID based Door Lock that uses MQTT communication”**

### **Submitted By:**

### Project Team Members Name

1. Sumir Broota

2. Jai Vaswani

3. Niharika Devkhile

4. Kshitij Waghela

## **PAGE INDEX**

|  |  |  |  |
| --- | --- | --- | --- |
| **Chapter Topic**  **No.** | | | **Page No.** |
|  |  | ABSTRACT | 8 |
| **1.** | INTRODUCTION | | 9 |
|  | 1.1 | NEED FOR NEW SYSTEM | 9 |
|  | 1.2  1.3  1.4 | DETAILED PROBLEM DEFINITION  PRESENTLY AVAILABLE SYSTEMS  MODULES OF THE SYSTEM | 9  9  10 |
|  |  |  |  |
|  |  |  |  |
| **2.** | REQUIREMENT ANALYSIS | | 12 |
|  | 2.1 | METHOD USED FOR REQUIREMENT ANALYSIS | 12 |
|  | 2.2  2.3  2.4 | DATA REQUIREMENT  FUNCTIONAL REQUIREMENT  SYSTEM SPECIFICATION | 13  14  14 |
| **3.**  **4.**  **5.** | 3.1  3.2  3.3  4.1  5.1  5.2 | PLANNING AND SCHEDULING  PROJECT PLANNING  PROJECT SCHEDULING (Cost & Effort)  RISK ASSESSMENT  SYSTEM MODELING  DATA FLOW DIAGRAM  DESIGN  USE CASE DIAGRAM  UML DIAGRAM | 15  15    15  15  16  16  17  17  17 |
| **6.** | 6.1  6.2  6.3  6.4  6.5 | CODING  HARDWARE SPECIFICATION  ADDITIONAL HARDWARE COMPONENTS  PLATFORM  PROGRAMMING LANGUAGE USED  SOFTWARE TOOLS USED | 18  18    18  18  18  18 |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  | CONCLUSION | | 19 |
|  | BIBLIOGRAPHY | | 20 |
|  |  | |  |
|  |  | |  |
|  |  | |  |

## **TABLE INDEX**

|  |  |  |
| --- | --- | --- |
| **Table Table**  **No.** | | **Page No.** |
|  | |  |
| **1.1** | Table 1 System Specification | 14 |
|  |  |  |
|  | | |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  | | |

## **FIGURE INDEX**

## 

|  |  |  |
| --- | --- | --- |
| **Fig.No Figure** | | **Page No.** |
|  | |  |
| **1.1** | Figure 1 FAST Diagram | 12 |
| **1.2** | Figure 2 Data Flow Diagram | 16 |
|  | | |
| **2.1** | Figure 3 Use Case Diagram  Figure 4 UML Diagram | 17  17 |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  | | |

## 

## 

## 

## **ABSTRACT**

Radio Frequency Identification (RFID) is an inexpensive Technology, which can be implemented for several applications such as security, asset tracking, people tracking, inventory detection, and access control applications. The main objective of our project is to design and implement a physical security system which can be deployed at a secure site to allow only authorized people with their RFID tags to access the area. We did this by using a wifi module such as the NodeMCU ESP 8266 for logging and control. It is connected with an RFID reader to validate the user and unlock the door in real time. The advantage of using passive RFID keys is that it functions without a battery and passive tags are lighter and are less expensive than the active tags. A centralized system manages the controlling, and logging task. The authenticated user is able to put their tag in contact with the reader and simply unlock the system. An attempt to unlock is logged by the system and sent to the central server noting the basic

information of the user and the datetime of access.

**Keywords:** RFID, door locking system, NodeMCU ESP 8266

## 

## 

## 

## 

## 

## **THEORY**

1. **INTRODUCTION**

**1.1 NEED FOR NEW SYSTEM**

In today’s world, security is one of the most crucial factors for any organization, and this includes physical security, as well as security for all devices. In our project, using the latest state of the art IoT technologies, we address the problem of physical security, by proposing a secure way to allow/deny entry to users into a secure area.

**1.2 DETAILED PROBLEM DEFINITION**

To create a secure, cost effective and fast system that can lock/unlock a door based on an RFID chip scanned by an RFID reader. The system should also facilitate easy addition/revoking access of any user.

**1.3 PRESENTLY AVAILABLE SYSTEMS FOR THE SAME**

**1.3.1 TRADITIONAL LOCK-KEY SYSTEM**

This type of a trivial system is simple to implement, but it fails as it can easily be bypassed by skilled key makers/robbers. It is also complex to give multiple people access as a separate key has to be made every time a new person has to be given access and the key has to be destroyed while revoking access.

**1.3.2 BIOMETRIC BASED SYSTEMS**

This is one of the most secure systems in the market as biometrics are unique for every single person, and cannot be replicated easily. Adding new users and revoking access is easy as well. However, this system fails when it comes to costs. These devices are sophisticated and expensive, and also need regular maintenance from time to time.

**1.3.3 CAMERA BASED FACIAL RECOGNITION SYSTEM**

This too, like a biometric based system, is secure as it is based on unique features of a person. But if not implemented correctly, it can be easily bypassed by using a picture of the authorized person instead. There are also many factors that can affect the efficiency of this system, like glasses, masks, lighting, etc.

**1.4 MODULES OF THE SYSTEM**

**1.4.1 MICROCONTROLLER WITH WIFI FACILITY**

An arduino or nodeMCU is required to operate the RFID reader, and sync the data with the Arduino cloud whenever a new person tries to enter. The same arduino can also be used to activate/deactivate the lock mechanism of the door.

**1.4.2 RFID READER**

An RFID reader is required to scan the RFID chip of the person trying to gain access to the system and send the appropriate information to the microcontroller.

**1.4.3 RFID CHIP**

Unique RFID chips have to be issued to the authorized people which will be scanned when they try to enter the secured area.

**1.4.4 CLOUD SYSTEM**

A cloud system is important for easier implementation of adding new users or revoking access of users without tampering the device at all times. However, for this ease of access to be possible, the devices need to be connected to the internet at all times.

**1.4.5 MQTT Communication**

MQTT which stands for Message Queuing Telemetry Transport. MQTT communication is used as a communication medium between the user and the arduino as it is a lightweightpublish/subscrib**e** messaging protocol designed for M2M (machine to machine) telemetry in low bandwidth environments.

|  |  |  |
| --- | --- | --- |
| **2** | **.** | **REQUIREMENT ANALYSIS** |
|  | **2.1** | **METHOD USED FOR REQUIREMENT ANALYSIS(FAST)**  FAST analysis: What is Function Analysis System Technique (FAST)? A technique to develop a graphical representation showing the logical relationships between the functions of a project, product, process or service based on the questions “How” and “Why”.  Simple Fast Information Diagram.  FAST diagram    Fig 1: FAST diagram |
|  | **2.2** | **DATA REQUIREMENT**  The data requirements of our project is as follows:   1. WhiteList data: this list allows us to match RFID unique IDs to names of their users while simultaneously allowing us to control the authorized users. Format of data used: 192\_112\_227\_115-Sumir&Broota;101\_52\_73\_217-Jai&Vaswani;  * ; denotes end of entry * & denotes presenc of ‘ ‘ used because stdin uses ‘ ‘ as a delimiter * - denotes presence of RFID UID on left and name data on right * \_ denotes the UID values in integer format  1. RFID Read\_Data: this data allows us to identify the carrier of the tag to evaluate if the user has access or not. Format of the data read in integer:  * 192 112 227 115  1. Network Credentials: this allows our network board to connect to the internet via the network router. It can be directly connected via ethernet or use a wireless medium such as Wifi. Example:  * SSID:VU\_Router * Pass: VU!@#$%^&\*  1. Device Cloud Credentials: this allows our device to connect to the arduino cloud server using the device name as login id and secret key as password. Example:  * Device name: ba67a6dd-a410-48c4-920f-t8eaef3f8add * Secret Key(Pass): WQDIFQ4W8GK2V97T8BF0 |
|  | **2.3** | **FUNCTIONAL REQUIREMENT**   1. Objective - Our objective is to only authorize people with their RFID tags to access the area 2. End result - Our end result is to implement a smart lock system which provides a   convenient way to automate the access control feature   1. Testing - We used 1 white listed RFID card and 1 black listed RFID card for   testing purposes   1. External interfaces - We used external interfaces like RFID tags, RFID readers   and NodeMCU |
|  | **2.4** | **SYSTEM SPECIFICATION** |
|  |  | The system specifications of our project is as follows:   |  |  | | --- | --- | | **ITEM** | **DETAILS** | | NodeMCU | ESP8266 | | RFID Reader | MFRC522 | | RFID Tag | Passive |   Table 1: System Specification Table |
|  |  |  |
|  |  |  |

**3. PLANNING AND SCHEDULING**

**3.1 PROJECT PLANNING**

1)RFID technology will bring a lot of benefits when it is successfully

implemented

2)We will not overcomplicate the technology and use what is

suitable to meet our objective

3)We will set goals and expectations and track the details of what

works and what does not, this will be key in determining how to

translate the experience we gained from our RFID program

**3.2 PROJECT SCHEDULING (Cost and Effort)**

There are many products in the market all with different price points,

below we have mentioned the average price at which we can get the

items for

RFID reader- Rs.108

Chip - Rs.55

NodeMCU(ESP8266)- Rs.209

**3.3 RISK ASSESSMENT**

Below are the possible risks

1)The power goes off suddenly

2)The system/device might get damaged due to heavy rainfall.

3) The RFID card could be cloned.

**4. SYSTEM MODELING**

**4.1 DATA FLOW DIAGRAM**

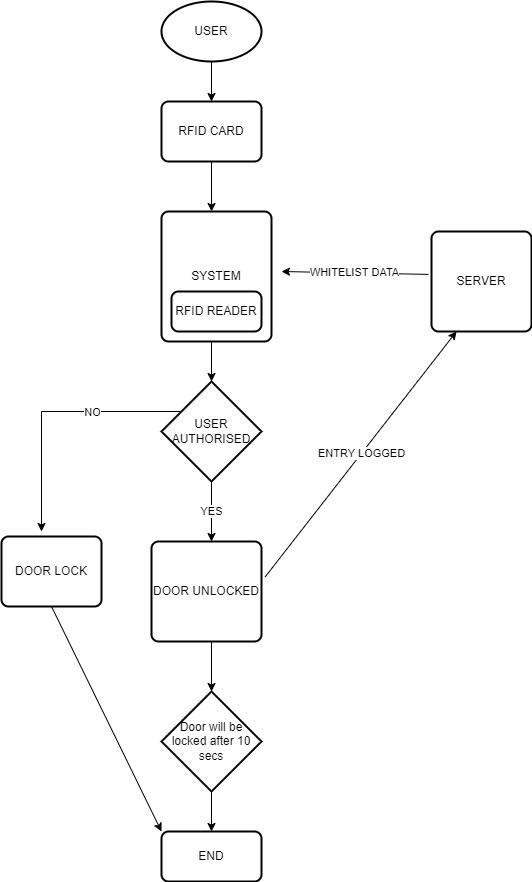


Fig 1: Data Flow Diagram

**5. DESIGN**

**5.1 USE CASE Diagram**

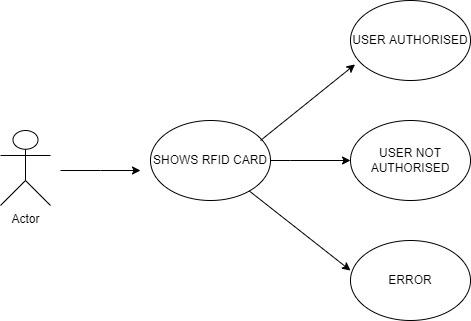


Fig 2: Use Case Diagram

**5.2 UML Diagram**

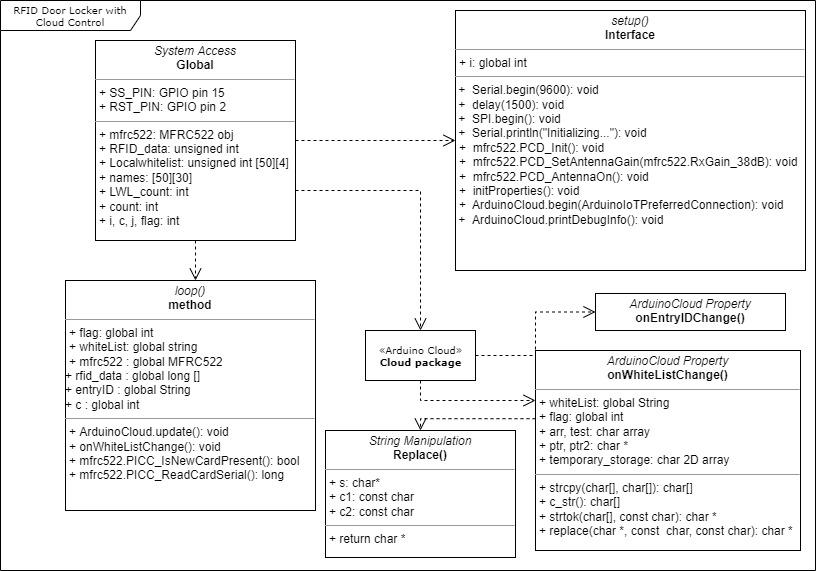


Fig 3: UML Diagram

**6. CODING**

**6.1 HARDWARE SPECIFICATIONS**

RFID reader: An RFID reader is required to scan the RFID chip of the person trying to gain access to the system and send the appropriate information to the microcontroller.

RFID chips: Unique RFID chips have to be issued to the authorized people which will be scanned when they try to enter the secured area.

NodeMCU: The [NodeMCU](http://nodemcu.com/index_en.html) (Node MicroController Unit) is an open source software and hardware development environment, containing all crucial elements of the modern computer: CPU, RAM, networking (wifi), and even a modern [operating system and SDK](http://bbs.espressif.com/).

**6.2 ADDITIONAL HARDWARE COMPONENTS**

Breadboard: A breadboard is used to make up temporary circuits for testing or to try out an idea. No soldering is required so it is easy to change connections and replace components. Parts are not damaged and can be re-used afterwards.

Connecting wires: Wires are used to connect different components used in the project.

**6.3 PLATFORM**

Arduino cloud: The Arduino IoT Cloud, an online platform was used to develop the project which makes it easy for the user to create, deploy and monitor IoT projects.

**6.4 PROGRAMMING LANGUAGE USED**

Embedded C

**6.5 SOFTWARE TOOLS USED**

Arduino cloud: The Arduino IoT Cloud, an online platform was used to develop the project which makes it easy for the user to create, deploy and monitor IoT projects.

Operating system:

Internet connection: We need stable internet connection for the smooth and efficient working of the project.

## **CONCLUSION**

In this paper, we present a smart lock system with a novel access control system using IOT which includes online monitoring. The smart lock system provides a convenient way to automate the access control feature thereby enhancing security and enabling the owner of the property carefree. It is a low cost, flexible, and a very easy to install system with no overhead like planning, cabling, and construction works.

## 

## 

## **BIBLIOGRAPHY**

## 

## 

## 

## Gyanendra K Verma and Pawan Tripathi , “A Digital Security System with Door Lock System Using RFID Technology”, International Journal of Computer Applications (0975 – 8887) Volume 5– No.11, August 2010

1. Andreasa, Cornelio Revelivan Aldawiraa, Handhika Wiratama Putraa, Novita Hanafiaha,Surya Surjarwoa, Aswin Wibisuryab. "Door Security System for Home Monitoring Based on ESP32". 4th International Conference on Computer Science and Computational Intelligence 2019 (ICCSCI), 12–13 September 2019
2. Shrinidhi Gindi1, Naiyer Shaikh2, Kashif Beig3, Abdeali Sabuwala4 ,”Smart Lock System Using RFID”. International Research Journal of Engineering and Technology (IRJET) Volume: 07 Issue: 07 | July 2020

## 

## 