LUGGAGE IDENTIFICATION SYSTEM USING RFID TECHNOLOGY

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INTRODUCTION:

Who wants to lose their luggage and be at the mercy of the airline! With so much technology available to us today, we present to you an IoT based luggage identification system based on RFID technology that can help us give back the right luggage to the rightful owner.

The aim of the project is to help passengers easily identify their bags upon arrival at destination airports. This can be done by assigning unique codes to their luggage, using radio frequency identification (RFID) tags, during check in at departure airports.

OBJECTIVES:

The main objective of this project was to develop and implement an IoT based luggage identification system for an airport using RFID Technology.

Specific Objectives:

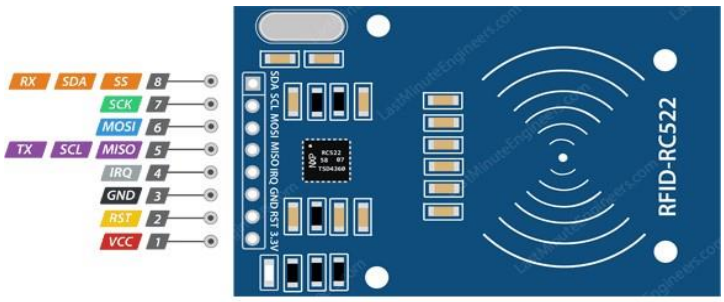
- To write to RFID tags to be attached to the clients' luggage that is, their names and destination.
- To read the RFID tags using the RFID reader at the destination to help identify the luggage owners.
- To store the passengers luggage details on firebase cloud platform

REQUIREMENTS:

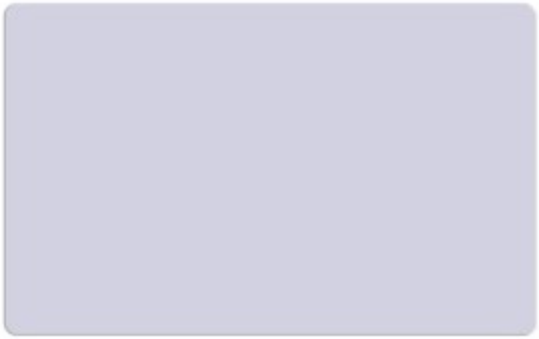
Hardware:

1. **R**adio-**F**requency **I**dentification (**RFID**) is the use of radio waves to read and capture information stored on a tag attached to an object. A tag can be read from up to several feet away and does not need to be within direct line-of-sight of the reader to be tracked. This is of advantage compared to a Bar-code reader. It includes an RFID reader, and an RFID tag.

    a) **RFID reader** is a device used to gather information from an RFID tag, which is used to track individual objects. Radio waves are used to transfer data from the tag to a reader. The following is an image of the sensor (Last Minute Engineers, 2020):

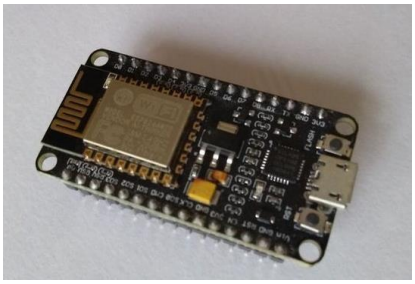


    b) A **passive tag** is an RFID tag that does not contain a battery, the power is supplied by the reader. When radio waves from the reader are encountered by a passive RFID tag, the coiled antenna within the tag forms a magnetic field. The tag draws power from it, energizing the circuits in the tag. The following is an image of the card (Electronics Hobbyists, 2019):



2. **NodeMCU with a USB Cable**

This is an open-source firmware and development kit that helps you to prototype or build IoT products. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It provides some of the most important features of microcontrollers such as GPIO, PWM, ADC, among others. The following is an image of the microcontroller (Dethe, 2018):

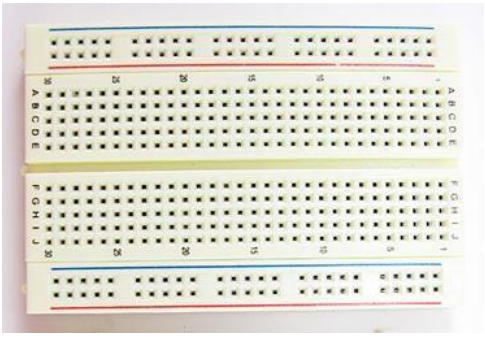


3. **Jumpers**

Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering.

4. **Breadboard**

A breadboard is a rectangular plastic board with a bunch of tiny holes in it. These holes let you easily insert electronic components to prototype. The following is an iamge of the board (Hemmings, 2018)



Software:

A. **Arduino Software (IDE):** The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

B. **Firebase** is a technology that allows you to create web applications without server-side programming, making development faster and easier. It supports Web, iOS, OS X and Android clients. Apps that use Firebase can use and control data without thinking about how data is stored and synchronized across different instances of the application in realtime.

METHODOLOGY

Hardware Connection

The project used NodeMCU ESP8266 (microcontroller) with an Arduino Integrated Development Environment to write and read radio frequency identification (RFID) information to and from an RFID tag. The code was written to and read from an RFID passive card using MFRC5200 RFID sensor.

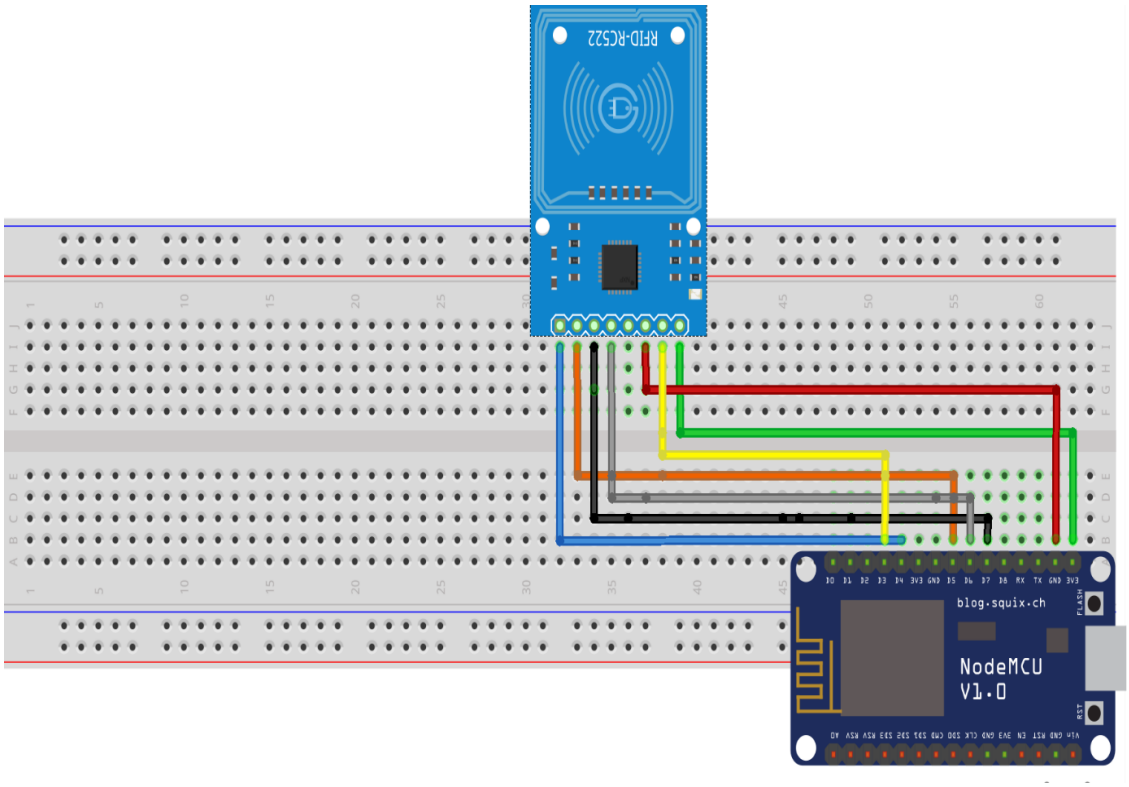
For this to be possible the microcontroller was connected to a computer through a USB port and the sensor was connected to the microcontroller through jumper wires.

The pins were connected as follows:

The following are the connections between NodeMCU Esp8266 and the RFID sensor (Shaddow, July):

NodeMcu	RC522
* VCC:	3v3
* GND :	GND
* RST:	D3
* MISO:	D6
* MOSI:	D7
* SCK:	D5
* SS:	D4

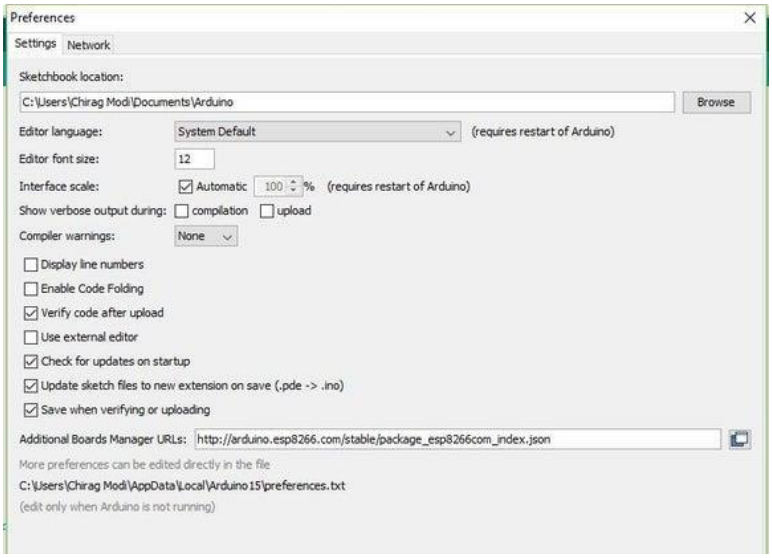
Figure 1 is an image of the circuit diagram depicting how the ESP8266 was connected to the RFID Sensor:



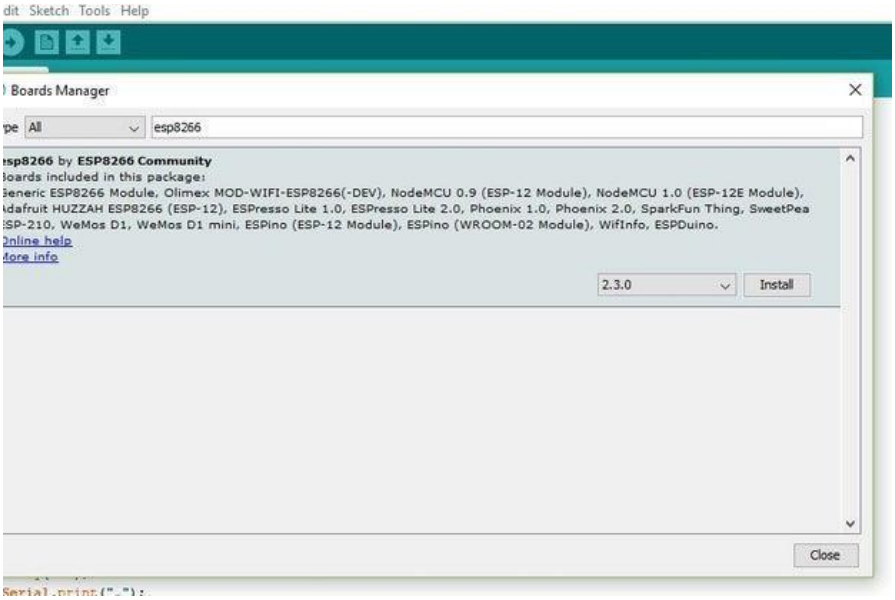
Arduino IDE setup

We followed the following steps in setting up the software

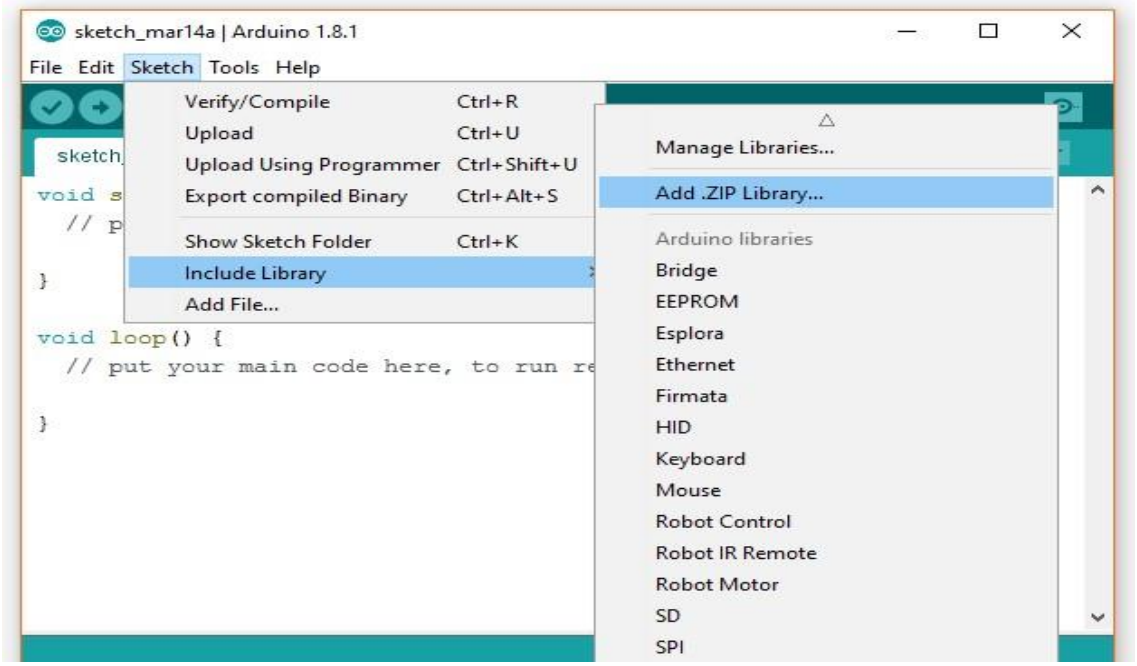
1. We downloaded the software from the Arduino site: https://www.arduino.cc then followed the prompts to install to our computers
2. After we installed the Arduino IDE we navigated to the file tab and then clicked on preferences and added the following link in the additional Boards Manager URLs http://arduino.esp8266.com/stable/package_esp8266com_index.json



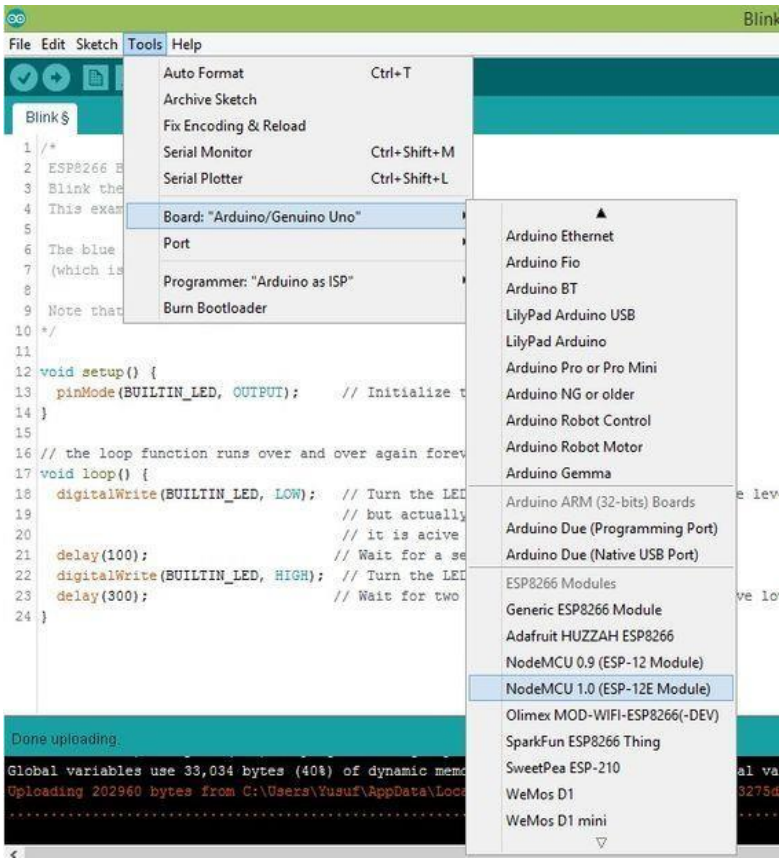
3. We then installed the esp8266 board by navigating to Tools - Boards - Boards Manager and searching for esp8266lick Install



4. We installed additional libraries by going to Sketch > Include Library > Manage Libraries the selecting the downloaded zip file of all the need libraries for RFID, ESP8266WiFi, FirebaseArduino and Blynk



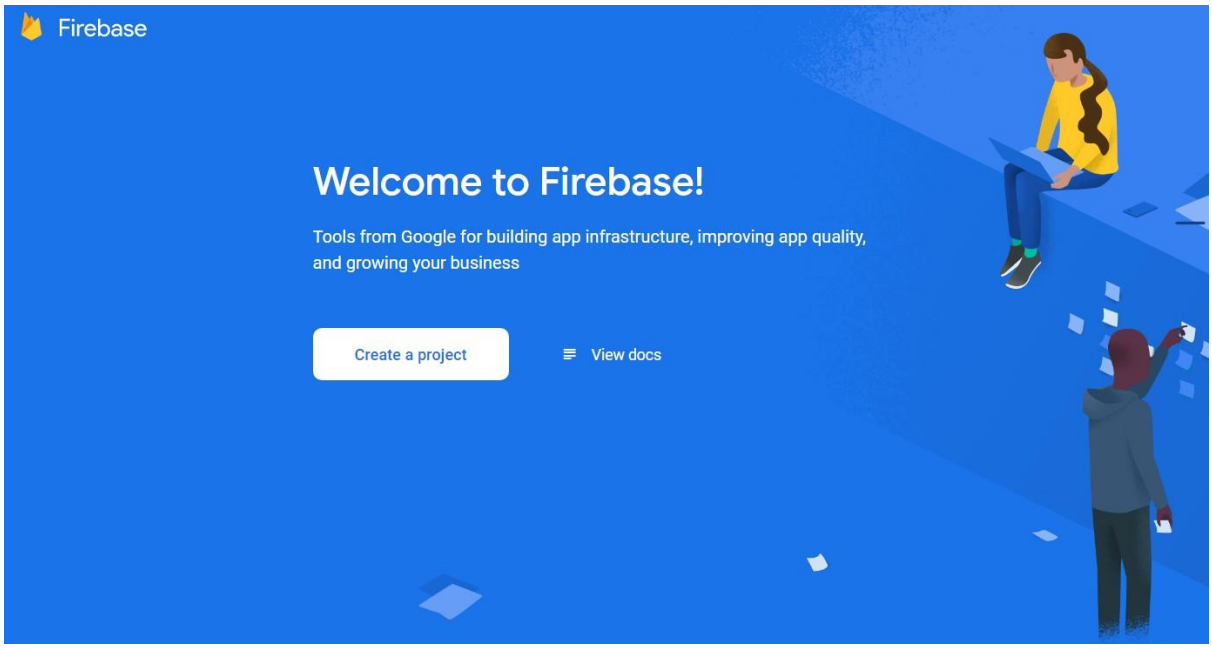
5. After all libraries were installed, we selected the ESP8266 board and COM port



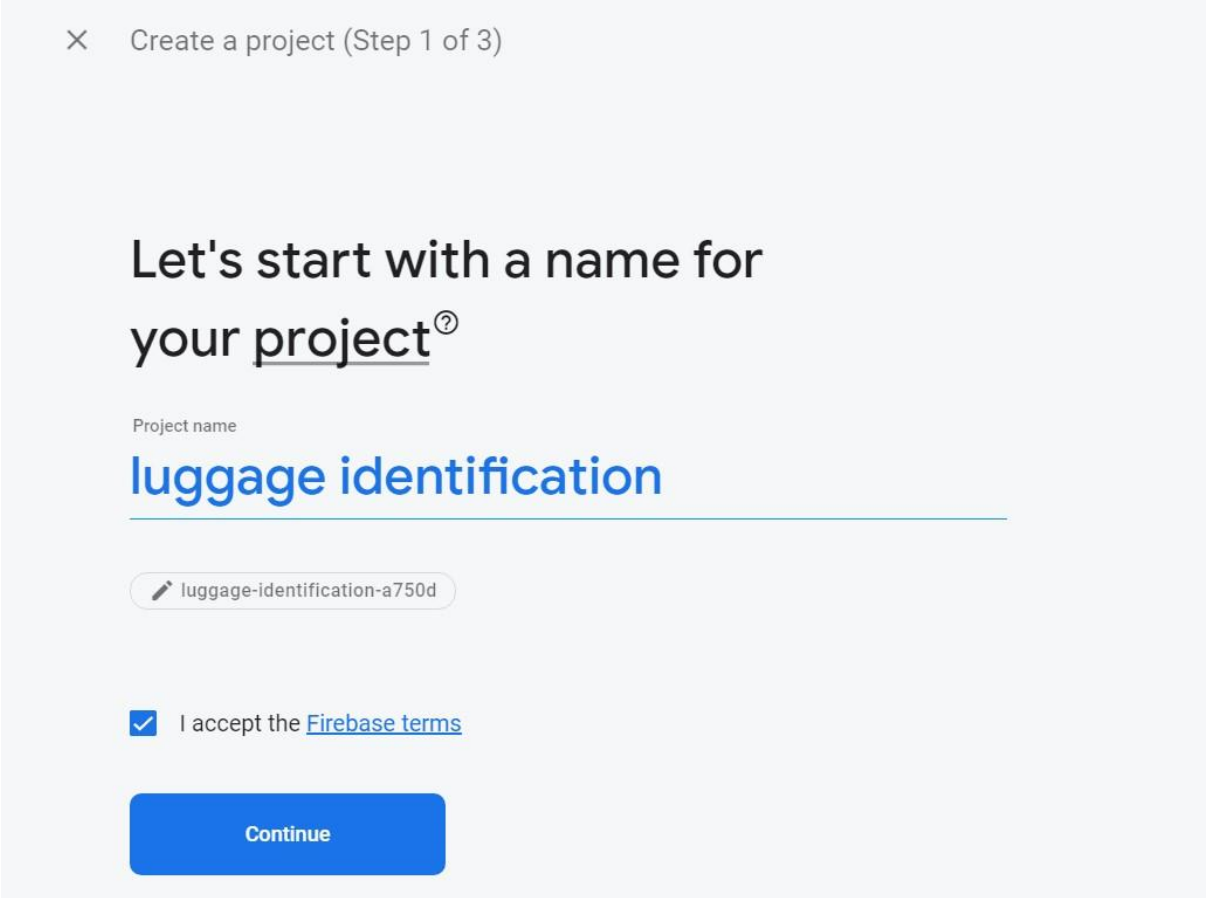
6. After the setup we wrote the code, compiled and uploaded to the board

Firebase set up

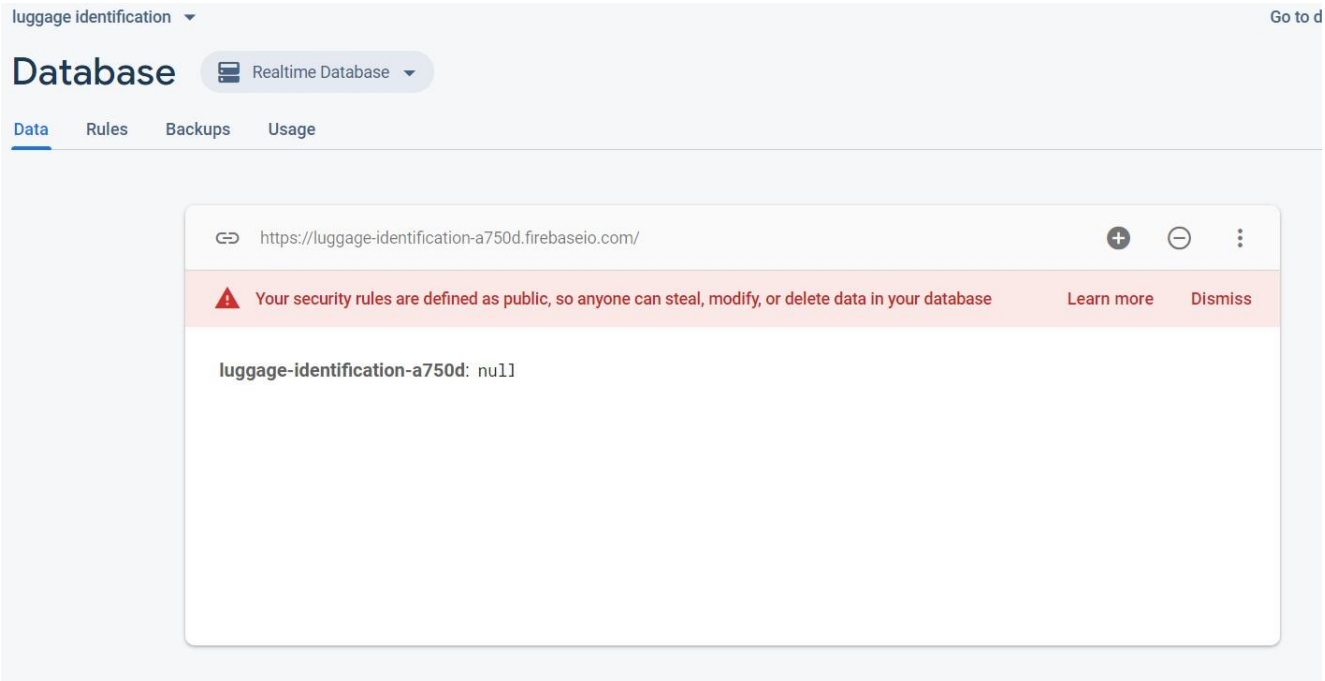
1. We went to the Firebase website and signed up for an account
2. We then logged in to the Firebase console and created a project by clicking on the create project button.



3. We created a project named as follows

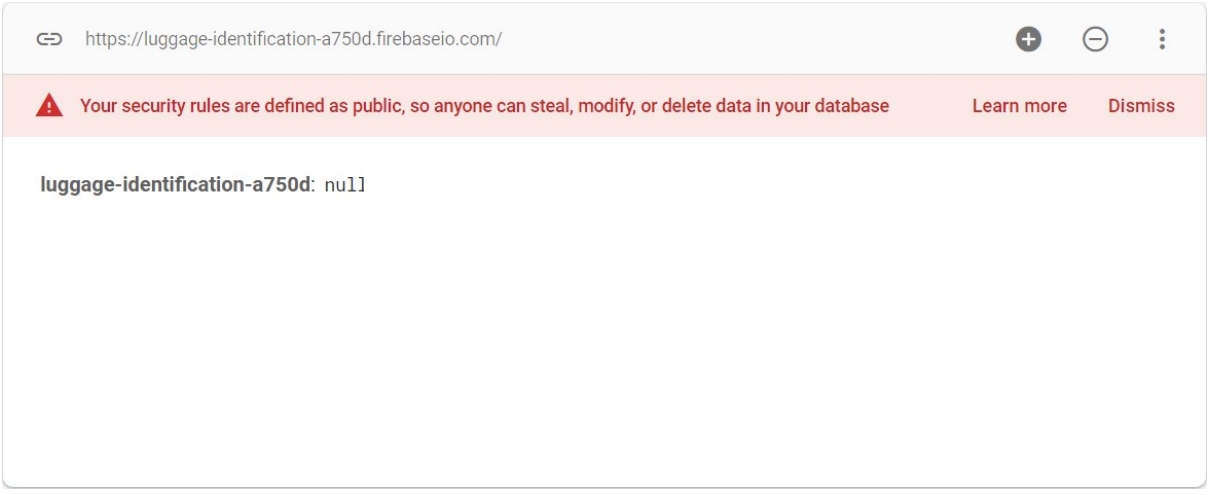


4. We were directed to the project window and clicked on databases then selected the realtime database option and created a database for the project

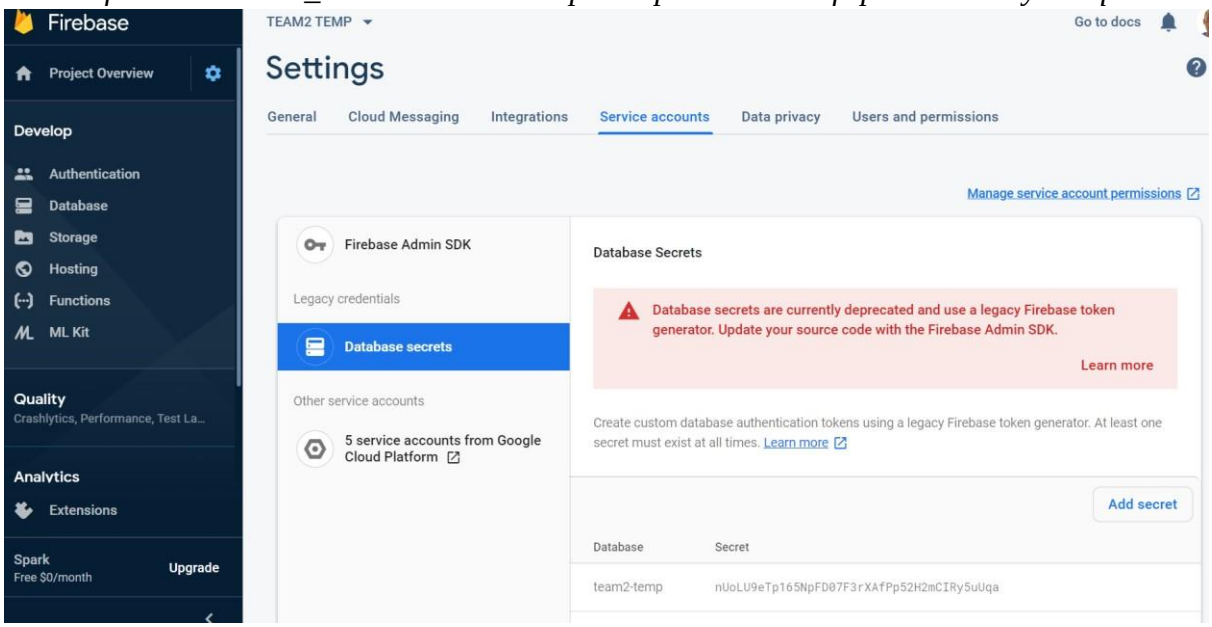


5. To run the project we got the database link and the secret key. For the database link, on database window copied the link without https and replace in the following line of code

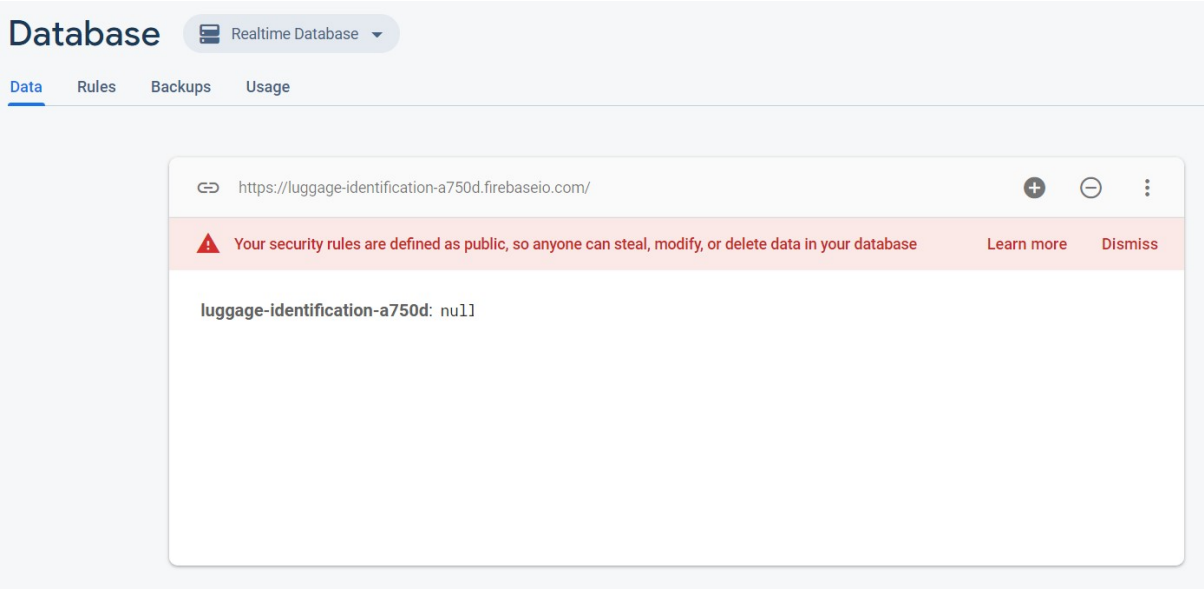
#define FIREBASE_HOST " luggage-identification-a750d.firebaseio.com "



5. For the database secret we clicked on project overview/user and permissions, then clicked on service accounts, database secrete and copied to the following line of code
   #define FIREBASE_AUTH "nUoLU9eTp165NpFD07F3rXAfPp52H2mCIRy5uUqa"



6. To view the database we clicked on database and selected real-time database

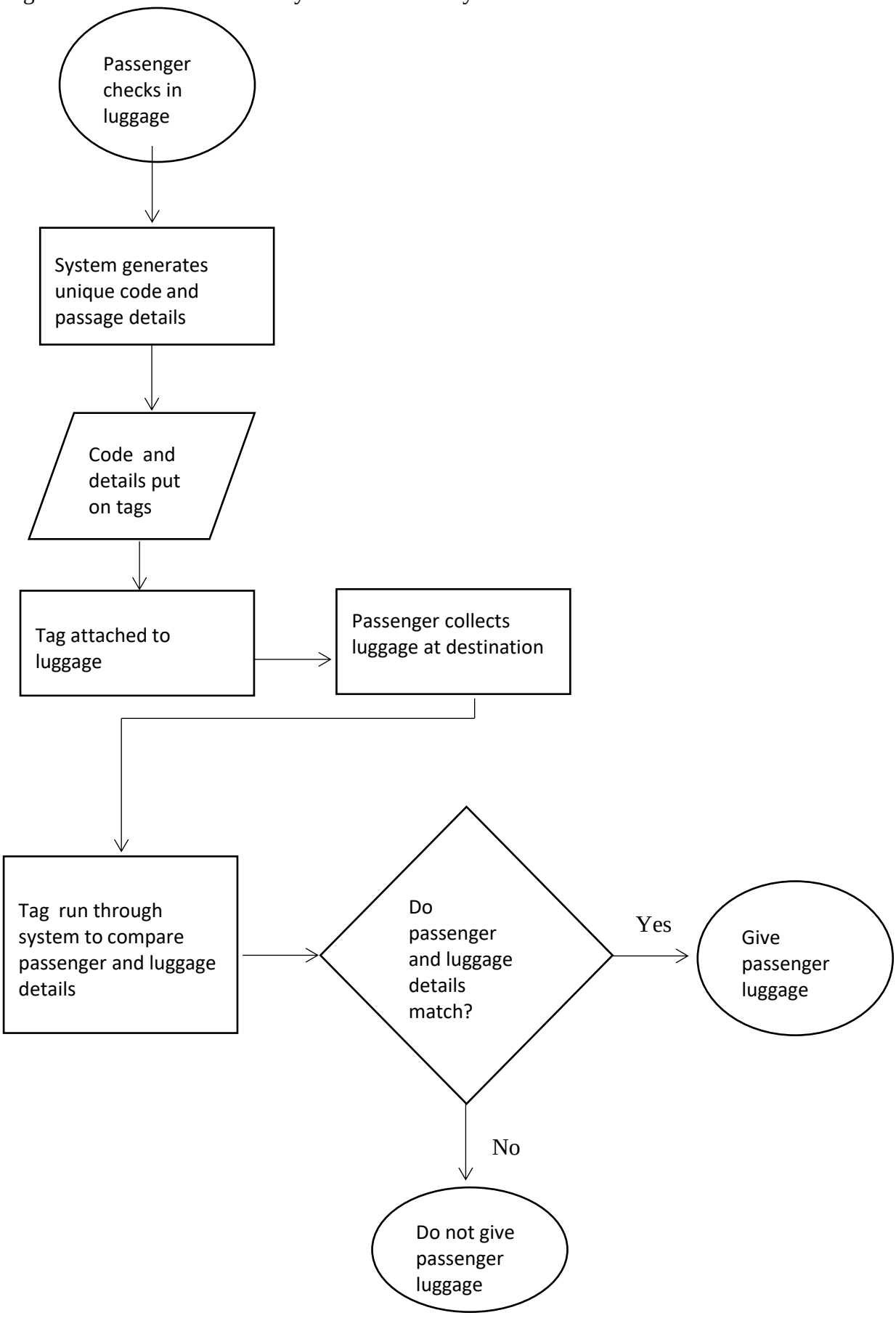


HOW IT WORKS

The goal of the system is to help passengers easily identify their bags upon arrival at destination airports. This can be done by assigning unique codes to their luggage, using radio frequency identification (RFID) tags, during check in at departure airports. On arrival the passenger details are compared with the luggage tag.

If the details of the passenger and those on the tag are a match the passenger will be given the luggage. If they do not match the luggage will not be given to the passenger.

Figure 2 is a flow chart of the system functionality:

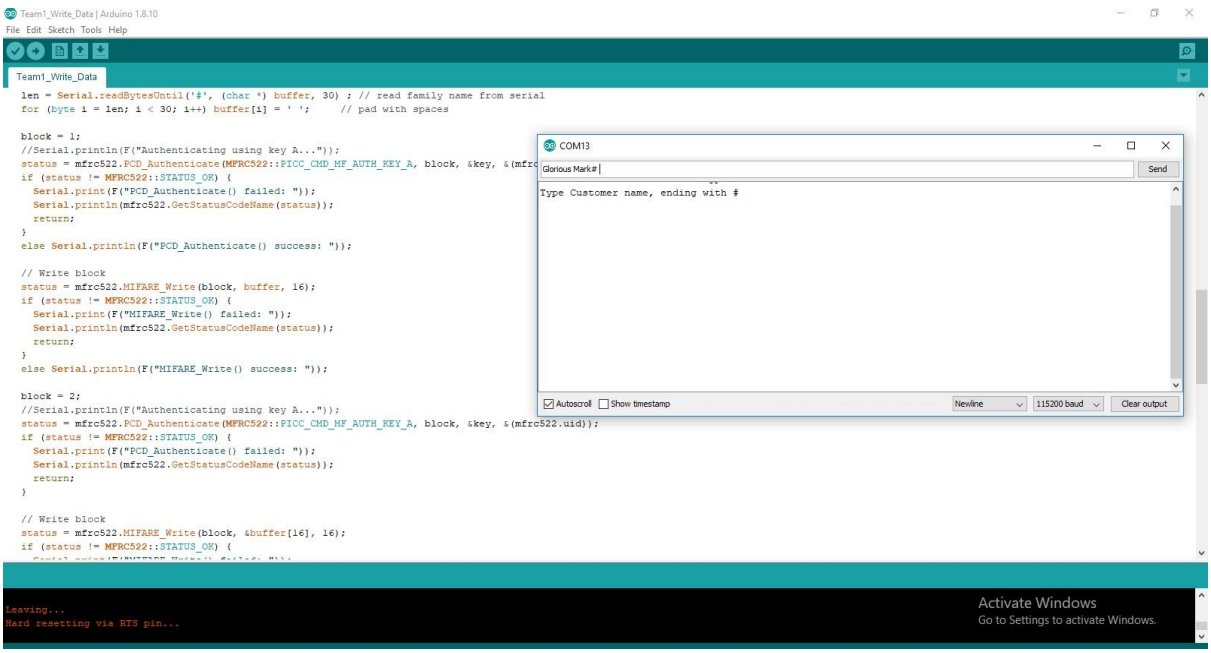


IMPLEMENTATION:

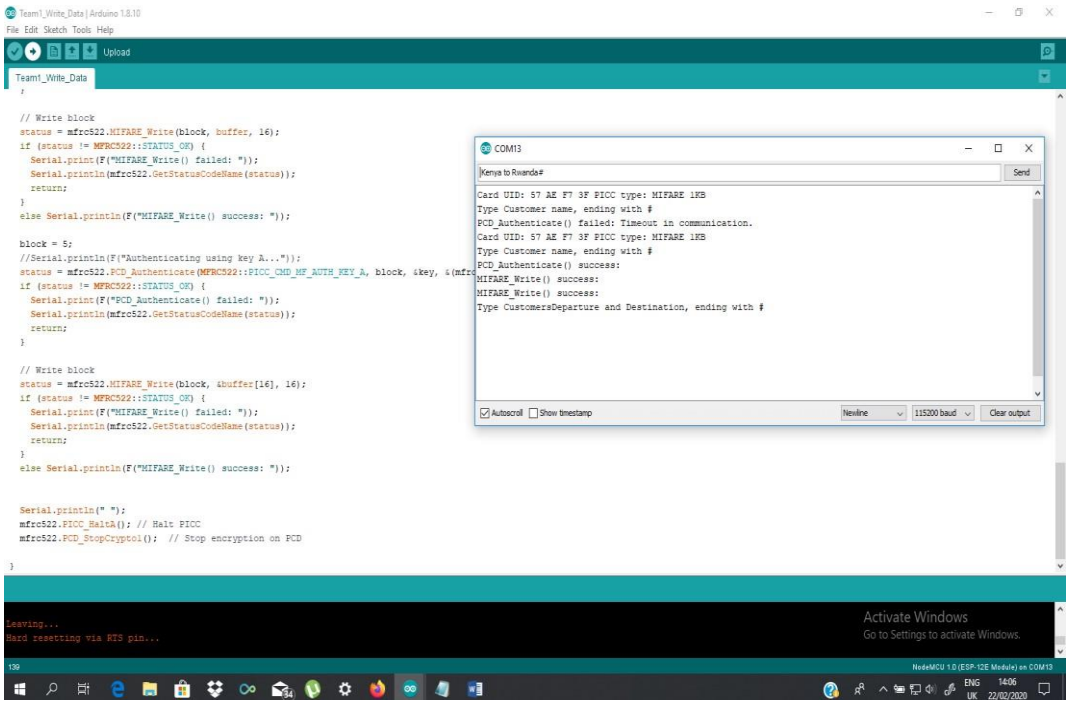
We implemented the system and got the following outputs

Screen Shots

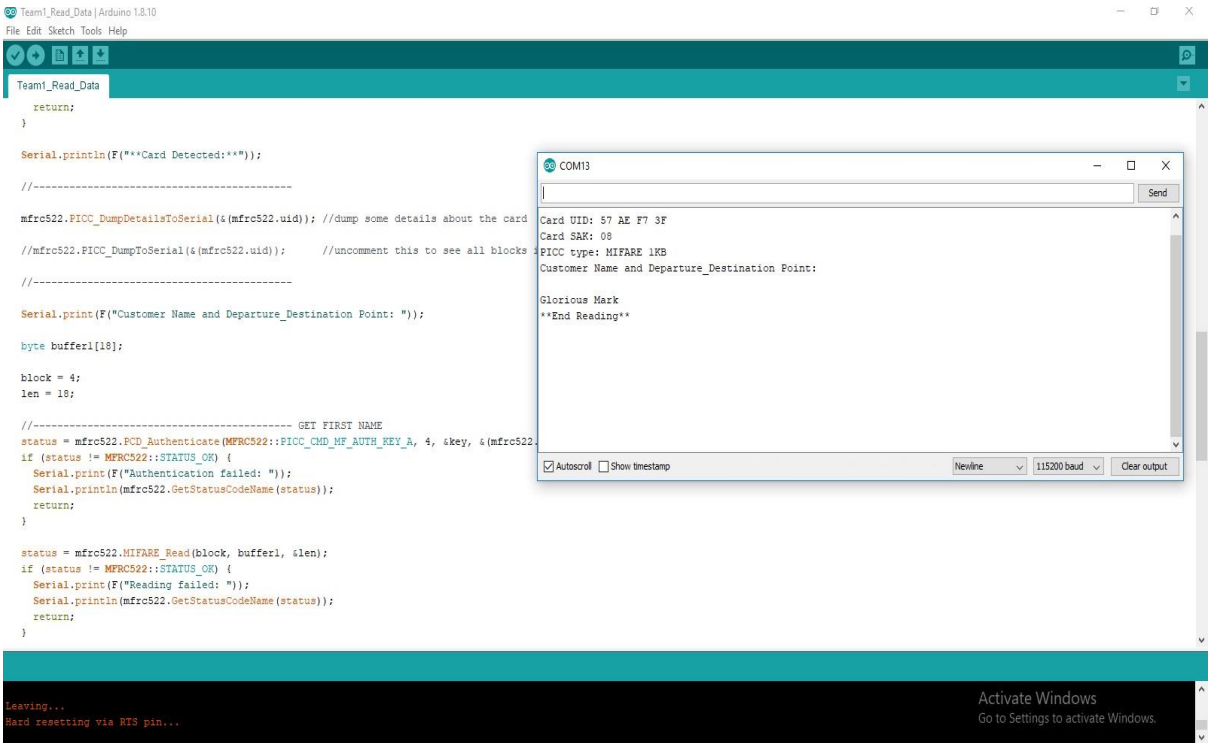
1. Writing Customers Name on RFID card



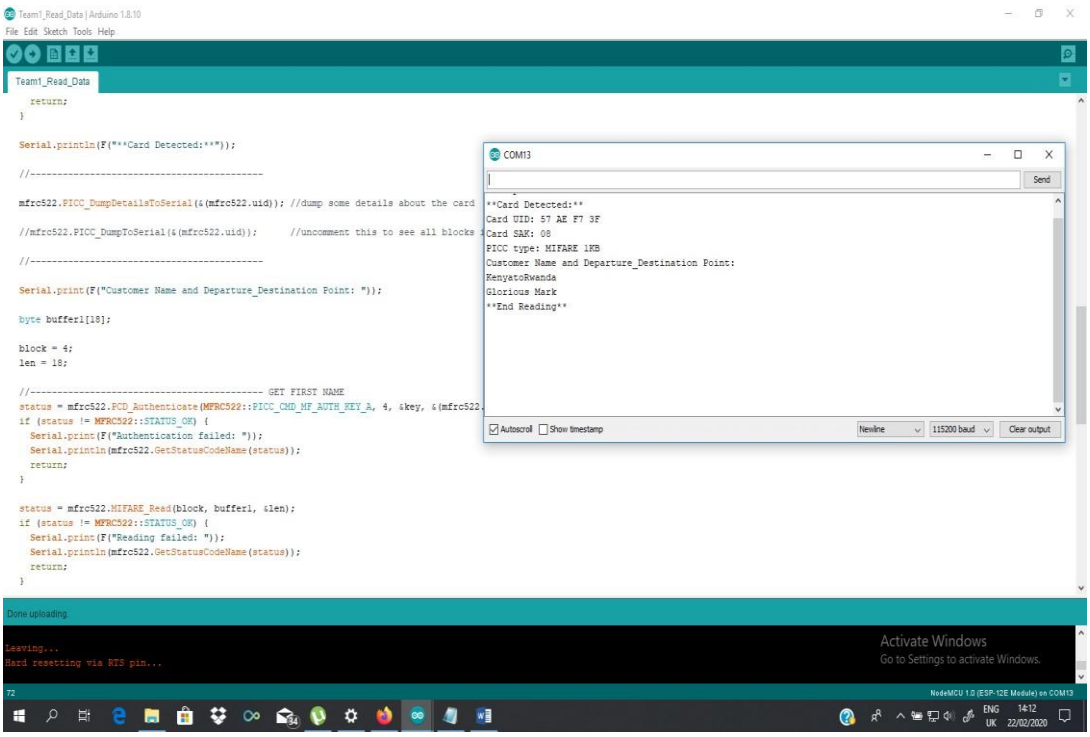
2. Writing Customers Departure and Destination details on RDID Card



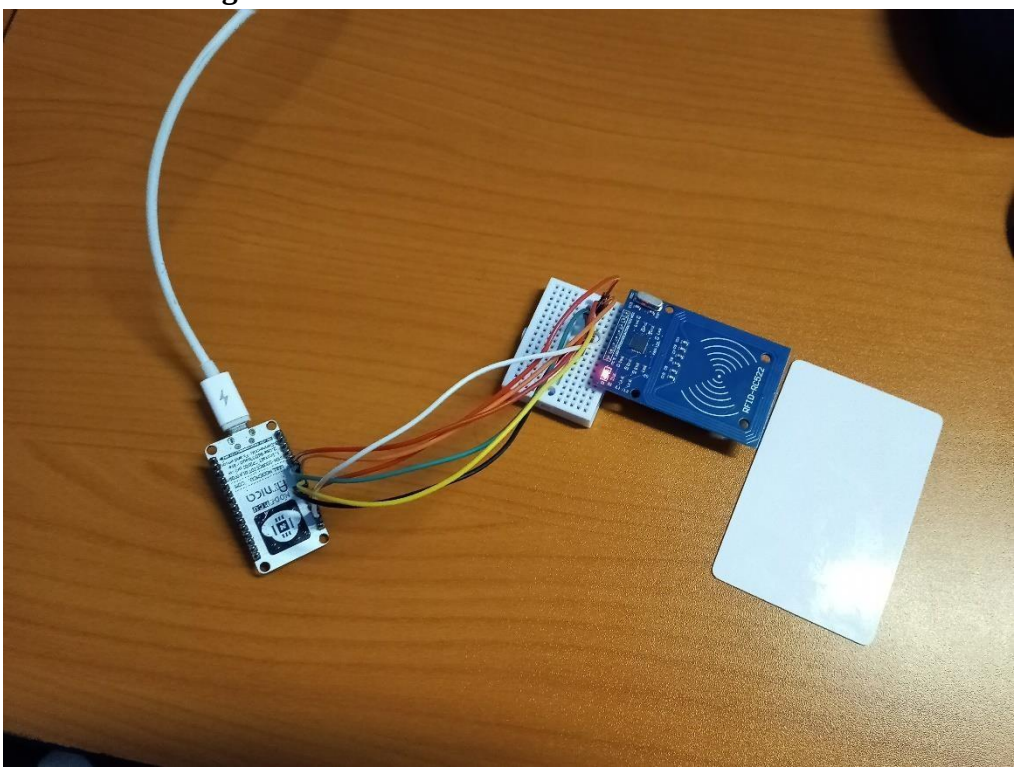
3. Reading Customer name from RFID card

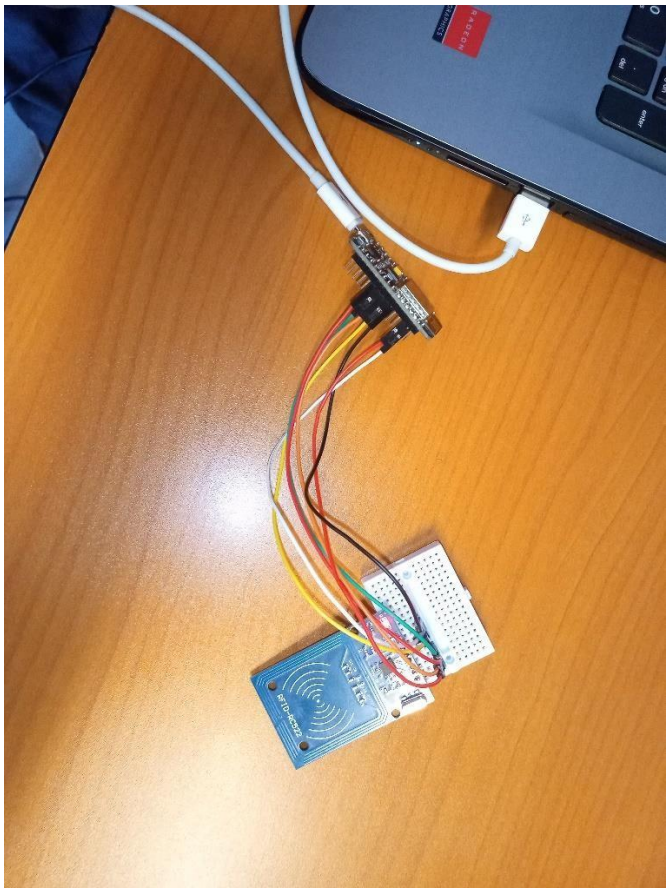


4. Reading Customer name from RFID card



Connection images





APPLICATION AREAS [2] [1] [3]:

1. Item and Inventory Tracking
2. Logistics and Supply chain visibility
3. Attendee Tracking
4. Race timing
5. Access control
6. Interactive marketing
7. Laundry Automation: this can be used in companies were there are a lot of employee uniforms
8. Kiosk: can be used for managing interaction with customers. For example in DVD kioks

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TEAM 1: