Faculty of Engineering & Applied Science

SOFE 4610U
Design & Analysis of IoT

Project Progress: RFID Attendance System

Group#: 2

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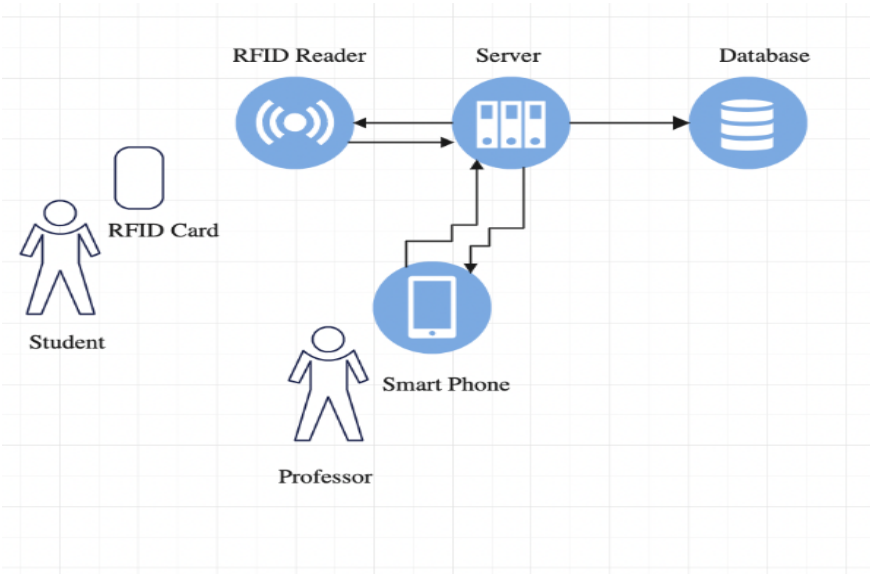
Technologies/Equipment

The technologies and equipment that will be used throughout our project are all fundamental in their own way. Each device serves its own unique purpose. We will be using the NodeMCU ESP8266-12E Board, Arduino UNO Board, and MFRC522 RFID Module. Along with these devices we will be using the RFID cards, connecting jumper wires, and a breadboard.

Along with the NodeMCU we will be working with the Adafruit.io platform where we will be able to use the MQTT broker. The Arduino Board and the RFID scanner will work together to scan the RFID cards and log the data. The ESP8266-12E Board will then help log the scanned log into the Adafruit.io cloud platform. This data will then be able to be viewed in the Adafruit.io cloud platforms dashboard.

System Architecture



The image above shows the overall system architecture of a simple RFID attendance system. The Arduino and RFID scanner scans the RFID cards/tags and sends the data to the server which then stores that information in the database which is the Adafruit IO cloud platform. The information is then displayed in the Adafruit IO dashboard which can be accessed by the professor using a smartphone or computer.

The use cases we will be focusing on is UC-3: Log student attendance. When a student's card is read by the RFID scanner their attendance will be recorded onto the Adafruit.io cloud platform. This will hold their student profile and any other information.

Code

Our code has two major components, one for the Arduino Board and one for the NodeMCU. The code for the Arduino Board required us to download MFRC522 library, which is to help us with the setup of the RFID scanner module. On our hardware the SDA and RST pins will be connected, so we must define the pins that are connected in the program. Within the setup function, we initiated the serial communication at 9600 and initiated the software serial baud rate at 115200. The line PCD_Init was used to open communication with MFRC522.

```
void setup()
{
  Serial.begin(9600);   // Initiate a serial communication
  ser.begin (115200);
  SPI.begin();      // Initiate  SPI bus
  mfrc522.PCD_Init();   // Initiate MFRC522
  Serial.println("Put RFID Card to Scan...");
  Serial.println();

}
```

Within the loop function we will check to see if a new card/student is present. If a new card is detected then the UID and username of the student will be printed.

```
void loop()
{
  // Look for new cards
  if ( ! mfrc522.PICC_IsNewCardPresent())
  {
    return;
  }
  // Select one of the cards
  if ( ! mfrc522.PICC_ReadCardSerial())
  {
    return;
  }
  //Show UID on serial monitor

  String content= "";
  byte letter;
  for (byte i = 0; i < mfrc522.uid.size; i++)
  {

     content.concat(String(mfrc522.uid.uidByte[i] < 0x10 ? " 0" : " "));
     content.concat(String(mfrc522.uid.uidByte[i], HEX));
  }
```

```
if (content.substring(1) == "E9 9C B0 E3"
{
  Serial.println("1-Rodaba Ebadi");
  ser.write(1);
  Serial.println();

  delay(3000);
}
```

For the NodeMCU code we have within the loop function the ESP8266-12E board will read the data from the serial and then publish it to the Adafruit IO server.

```
void loop() {
  // ping adafruit io a few times to make sure we remain connected
  if(! mqtt.ping(3)) {
    // reconnect to adafruit io
    if(! mqtt.connected())
      connect();
  }
   if ( Serial.available() ) { // Update and send only after 1 seconds
   char a = Serial.read();
   ID = a;

   if (! Attendance.publish(ID)) {                    //Publish to Adafruit
      Serial.println(F("Failed"));
    } else {
      Serial.println(F("Sent!"));
```

Next Steps

Our next step for the project is to start connecting the hardware aspect to the software aspect. We have purchased the RFID module and tags and are currently waiting for them to be delivered. Once we have all our equipment we can connect all of the boards and pieces together. We will also be able to troubleshoot any errors and issues that there may be with the boards and the code itself.