**SMART FARMER – IOT ENABLED SMART FARMING APPLICATION**

**NALAIYA THIRAN PROJECT**

A PROJECT REPORT

*Submitted by*

KAMESH KUMAR K 190801073

KAVIYARAJ C 190801085

JAVEED AKRAM Z 190801067

KAVINSARAN JK 190801083

**BACHELOR OF ENGINEERING**

**IN**

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**RAJALAKSHMI ENGINEERING COLLEGE**

**(An Autonomous Institution, Affiliated to Anna University, Chennai)**

**CHENNAI– 602 105**

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**BONAFIDECERTIFICATE**

Certified that this project report titled **“SMART FARMER - IOT ENABLED SMART FARMING APPLICATION** “ **by NALAIYA THIRAN PROJECT BASED LEARNING Program*”***, is the bonafide work of **KAMESH KUMAR K (190801073), KAVIYARAJ C (190801085), JAVEED AKRAM Z (190801067),KAVIN SARAN JK(19080183)** who carried out the work under faculty mentor and industry mentor supervision, for the partial fulfillment of the requirements for the award of the degree of **BACHELOR OF ENGINEERING IN ELECTRONICS AND COMMUNICATION .**

Certified further that to the best of my knowledge and belief, the work reported here in does not form part of any other thesis or dissertation on the basis of which a degree or an award was conferred on an earlier occasion

[INTRODUCTION 1](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark0)

* 1. [Project Overview 1](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark1)
  2. [Purpose 1](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark2)

[LITERATURE SURVEY 2](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark3)

* 1. [Existing Problem 2](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark4)
  2. [Problem Definition 2](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark5)
  3. References 3

[IDEATION AND PROPOSED SOLUTION 6](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark7)

* 1. [Empathy Map 6](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark8)
  2. [Ideation and Brainstorming 7](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark9)
  3. [Proposed Solution 8](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark10)
  4. [Problem Solution Fit 10](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark11)

[REQUIREMENT ANALYSIS 11](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark12)

* 1. [Functional Requirements 11](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark13)
  2. [Non-Functional Requirements 11](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark14)

[PROJECT DESIGN 12](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark15)

* 1. [Dataflow Diagram 12](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark16)
  2. [Technical Architecture 12](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark17)

5.3 [User Stories 14](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark18)

[PROJECT PLANNING AND SCHEDULING 15](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark19)

* 1. [Sprint Planning & Estimation 15](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark20)
  2. [Sprint Delivery Schedule 15](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark21)

[CODING AND SOLUTION 17](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark23)

[TESTING 18](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark24)

[RESULTS 19](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark27)

[ADVANTAGES AND DISADVANTAGES 20](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark29)

[CONCLUSION 21](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark30)

[FUTURE WORKS 22](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark31)

[APPENDIX 23](file:///C:\Users\sarav\Downloads\Report%20(1).docx#_bookmark32)

1. INTRODUCTION

Internet of Things (IoT) technology has brought revolution to each and every field of common man’s life by making everything smart and intelligent. IoT refers to a network of things which make a self-configuring network. The development of Intelligent Smart Farming IoT based devices is day by day turning the face of agriculture production by not only enhancing it but also making it cost-effective and reducing wastage. The aim / objective of this report is to propose IoT based Smart Farming System assisting farmers in getting Live Data (Temperature, Soil Moisture) for efficient environment monitoring which will enable them to increase their overall yield and quality of products. The IoT based Smart Farming System being proposed via this report is integrated with Arduino Technology mixed with different Sensors and a Wi-Fi module producing live data feed that can be obtained online using MIT app inventor.

* 1. Project Overview

In this project We have developed a mobile application using which a farmer can monitor the temperature, humidity, and soil moisture parameters along with weather forecasting details. Based on these details he can water the crops by controlling the motors through the app and the app gives an alert message if temperature or humidity goes beyond a threshold value.

1.2 Purpose

Agriculture plays a crucial role in the life of an economy. It is the backbone of our economic system, so improving the quality and way of production is crucial. Here comes the Smart Agriculture system. Smart agriculture helps in automated farming, collection of data from the field and then analyses it so that the farmer can make accurate decision in order to grow high quality crop.

IoT based Smart Farming improves the entire Agriculture system by monitoring the field in real-time. With the help of sensors and interconnectivity, the Internet of Things in Agriculture has not only saved the time of the farmers but has also reduced the extravagant use of resources such as Water and Electricity.

2.LITERATURE SURVEY

2.1 Existing problem

Using various machine learning algorithms we will predict the price. The algorithms involves Random Forest Regression. The best model which predicts the most accurate price is selected. After selection of the best model the predicted price is displayed to the user according to user’s inputs. User can give input through website to for used car price prediction to machine learning model.

2.2 References

1. TOPIC: IoT-Enabled Smart Agriculture

AUTHOR: Vu Khanh Quy , Nguyen Van Hau , Dang Van

DESCRIPTION: The growth of the global population coupled with a decline in natural resources, farmland, and the increase in unpredictable environmental conditions leads to food security is becoming a major concern for all nations worldwide. These problems are motivators that are driving the agricultural industry to transition to smart agriculture with the application of the Internet of Things (IoT) and big data solutions to improve operational efficiency and productivity. The IoT integrates a series of existing state-of-the-art solutions and technologies, such as wireless sensor networks, cognitive radio ad hoc networks, cloud computing, big data, and end-user applications. This study presents a survey of IoT solutions and demonstrates how IoT can be integrated into the smart agriculture sector. To achieve this objective, we discuss the vision of IoT-enabled smart agriculture ecosystems by evaluating their architecture (IoT devices, communication technologies, big data storage, and processing), their applications, and research timeline. In addition, we discuss trends and opportunities of IoT applications for smart agriculture and also indicate the open issues and challenges of IoT application in smart agriculture. We hope that the findings of this study will constitute important guidelines in research and promotion of IoT solutions aiming to improve the productivity.

1. TOPIC: Smart Farm Monitoring Using Raspberry Pi and Arduino

AUTHOR: Siwakorn Jindarat, Pongpisitt Wuttidittachotti

DESCRIPTION: This study aimed to investigate an establishment using an Intelligent System which employed an Embedded System and Smart Phone for chicken farming management and problem solving using Raspberry Pi and Arduino Uno. An experiment and comparative analysis of the intelligent system was applied in a sample chicken farm in this study. The findings of this study found that the system could monitor surrounding weather conditions including humidity, temperature, climate quality, and also the filter fan switch control in the chicken farm. The system was found to be comfortable for farmers to use as they could effectively control the farm anywhere at anytime, resulting in cost reduction, asset saving, and productive management in chicken farming.

PUBLISHED IN : 2015 IEEE 2015 International Conference on computer

1. TOPIC: Smart Agriculture Monitoring System Using IOT

AUTHOR: Tanuj Manglani, Aman Vaishnav , Ajayraj Singh

DESCRIPTION: The New beginning of computing technology is arriving such as the Internet of Things (IoT). It is a kind of Global Neural Network the cloud that interfaces various gadgets. Human life and the way work have been revolutionized by the Internet in the past decade. Currently, IoT is changing the trends of human life as the use of emerging technologies which consist of heterogeneous communication devices is increasing. IoT are relevant in different strategies of agriculture. India has agriculture as its essential occupation. As per IBEF (India Brand Equity Foundation), 58% individuals living in rural areas in India are reliant upon agriculture. The agricultural advancement is sped up with the increment in the profitability and up gradation of the plantation frameworks. The IoT has the capacity to change the world. In any case, the use of innovation like IoT in agriculture could have the best effect. Smart Agriculture is an idea wherein data and correspondence innovation is carried out to deal with every one of the exercises and cycles identified with the agriculture space. With the quick improvement of the world population, huge space of land is used to foster lodging and the capacity of creating food is decreased.

Farming has gotten essential in present pattern and keeps food on the tables. Farming with IoT helps in moderating the lack of food by requesting the current land for more grounded usage at least expense. Smart agriculture is an idea that rapidly snaps on the agricultural field. In this paper present a novel design that are developing an automated system which is able to control the crop monitoring of the agriculture lands, which is quite difficult for human beings.

PUBLISHED IN : Published in: 2022 International Conference on Electronics and Renewable Systems (ICEARS)

**4. TOPIC: Smart Agriculture Monitoring and Control System Using IOT**

Authors: **Abhilash Lad, Sumitra Nandre, Krishna Raichurkar, Sumit Zarkhande, Dr. Priya Charles**

DESCRIPTION: The IoT is a network of interconnected devices that can transmit and receive data over the internet and carry out tasks without human involvement. Agriculture provides a wealth of data analysis parameters, resulting in increased crop yields. The use of IoT devices in smart farming aids in the modernization of information and communication. For better crop growth moisture, mineral, light and other factors can be assumed. This research looks into a few of these characteristics for data analysis with the goal of assisting users in making better agricultural decisions using IoT. The technique is intended to help farmers increase their agricultural output.

DOI Link: <https://doi.org/10.22214/ijraset.2022.40512>

**5. TOPIC: IoT Applications in Agriculture**

Author’s**: Escuela de Ingeniería en Computación e Informática, Guayaquil, Ecuador.**

DESCRIPTION: IoT technologies allow developing systems that support different agricultural processes. Some of these systems are remote monitoring systems, decision support tools, automated irrigation systems, frost protection systems, and fertilization systems, among others. Considering the aforementioned facts, it is necessary to provide farmers and researchers with a clear perspective of IoT applications in agriculture. In this sense, this work presents a systematic literature review of IoT-based tools and applications for agriculture. The objective of this paper is to offer an overview of the IoT applications in agriculture through topics such IoT-based software applications for agriculture available in the market, IoT-based devices used in the agriculture, as well as the benefits provided by this kind of technologies

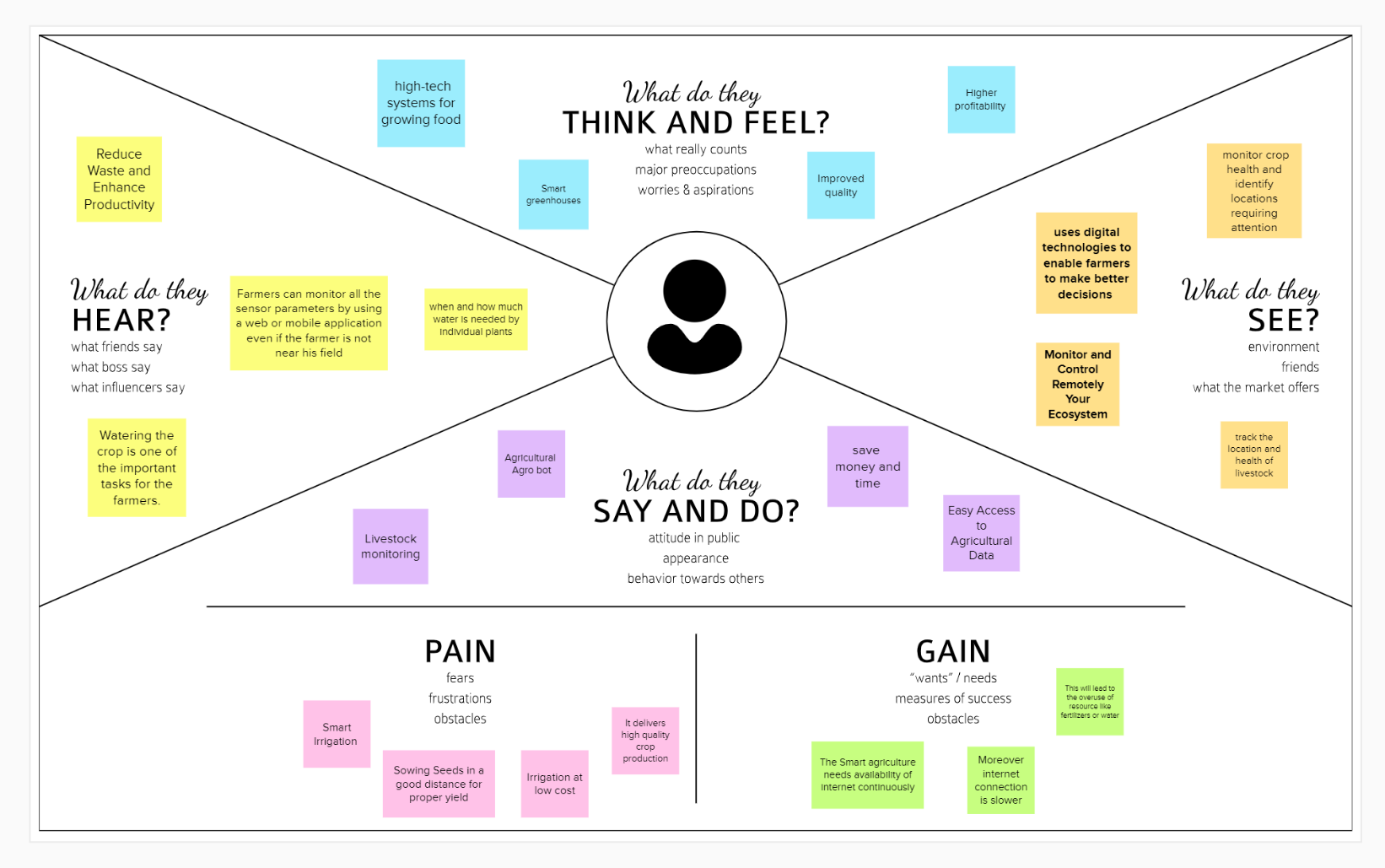
2.3 Problem Statement Definition

The prices of new cars in the industry is fixed by the manufacturer with some additional costs incurred by the Government in the form of taxes. So customers buying a new car can be assured of the money they invest to be worthy. But due to the increased price of new cars and the incapability of customers to buy new cars due to the lack of funds, used cars sales are on a global increase. Predicting the prices of used cars is an interesting and much-needed problem to be addressed. Customers can be widely exploited by fixing unrealistic prices for the used cars and many falls into this trap. Therefore, rises an absolute necessity of a used car price prediction system to effectively determine the worthiness of the car using a variety of features. Due to the adverse pricing of cars and the nomadic nature of people in developed countries, the cars are mostly bought on a lease basis, where there is an agreement between the buyer and seller. These cars upon completion of the agreement are resold. So reselling has become an essential part of today’s world.

The main aim of this project is to predict the price of used cars using the various Machine Learning (ML) models. This can enable the customers to make decisions based on different inputs or factors namely Brand or Type of the car one prefers like Ford, Hyundai, Model of the car namely Ford Figo, Hyundai Creta, Year of manufacturing like 2020, 2021, Type of fuel namely Petrol, Diesel, Price range or Budget, Type of transmission which the customer prefers like Automatic or Manual, Mileage to name a few characteristic features required by the customer. This project Car Price Prediction deals with providing the solution to these problems. Different techniques like multiple linear regression analysis, k-nearest neighbours, naïve bayes and decision trees have been used to make the predictions. The predictions are then evaluated and compared in order to find those which provide the best performances.

3. IDEATION AND PROPOSED SOLUTION

3.1 Empathy Map Canvas:



3.2 Ideation and Brainstorming:

An empathy map is a collaborative tool teams can use to gain a deeper insight into their customers. Much like a user persona, an empathy map can represent a group of users, such as a customer segment. The empathy map was originally created by [Dave Gray a](http://www.xplaner.com/)nd has gained much popularity within the agile community.

Ideation essentially refers to the whole creative process of coming up with and communicating new ideas. Ideation is innovative thinking, typically aimed at solving a problem or providing a more efficient means of doing or accomplishing something. It encompasses thinking up new ideas, developing existing ideas, and figuring out means or methods for putting new ideas into practice. Ideation is similar to a practice known as brainstorming.

3.3 Proposed Solution

**Proposed Solution Template:**

|  |  |  |
| --- | --- | --- |
| **S.No.** | **Parameter** | **Description** |
|  | Problem Statement (Problem to be solved) | We are witnessing unprecedented levels of  adoption of technology in Agriculture. |
|  | Idea / Solution description | Smart Agricultural System solutions provide an integrated IoT platform in agriculture that allows farmers to leverage sensors, smart gateways and monitoring systems to collect information, control various parameters on their farms and analyse real-time data in order to make informed decisions |
|  | Novelty / Uniqueness | Various eminent researchers have been making efforts for smart farming by using IoT concepts in agriculture. But, a bouquet of unfolded challenges is still in a queue for their effective solution. This study makes some efforts to discuss past research and open challenges in IoT based agriculture |
|  | Social Impact / Customer Satisfaction | Reduces the wages for labors who work in the agricultural field. It saves a lot of time. IoT can help improve customer relationships by enhancing the customer's overall experience. |
|  | Business Model (Revenue Model) | A monthly subscription is charged to farmers for prediction and suggesting the irrigation timing based on sensors parameters like temperature, humidity, soil moisture. |
|  | Scalability of the Solution | Scalability in smart farming refers to the adaptability of a system to increase the capacity, for example, the number of technology devices such as sensors and actuators, while enabling timely analysis. |

* 1. Problem Solution fit

**Focus on J&P, tap into BE, understand RC**

**Explore AS, differentiate**

**Deﬁne CS, ﬁt into CC**

**AS**

**5. AVAILABLE SOLUTIONS**

The irrigation process is automated using IoT Meteorological data and field parameters were collected and processed to automate the irrigation process.Disadvantages are efficiency only over short distances and difficult data storage.

Deployment of huge number of sensor is diffcult.it requires an unlimited or continuous internet connection to be successful

**CC**

**6. CUSTOMER CONSTRAINTS**

**CS**

**1. CUSTOMER SEGMENT(S)**

The customer for this product is a farmer who grows crops.our goal is to help them,moniter field parameter remotely.

**Explore AS, differentiate**

**Define CS, fit into CC**

Using proper drain system to overcome the effects of excess water due to heavy rain. Using hybrid varieties of crop that are resistant to pests.

**BE**

**7. BEHAVIOUR**

**RC**

**9. PROBLEM ROOT CAUSE**

The frequent change or unpredictable weather and climate, made it difficult for the farmers to do agriculture. These factors play a major role in making decision whether to water the plant or not. The monitoring of the field is hard when the farmer is out of station, thus leading to crop damage

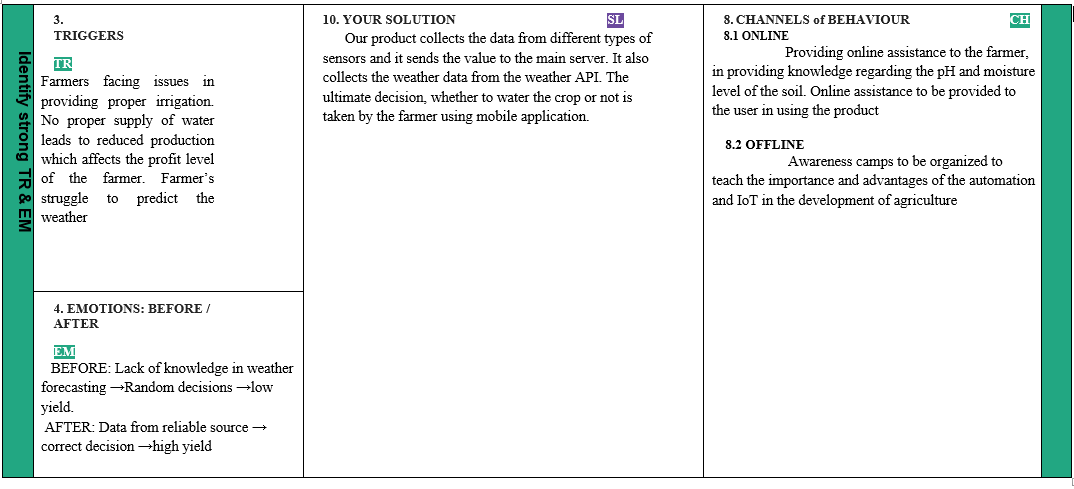
**J&P**

**2. JOBS-TO-BE-DONE / PROBLEMS**

The objective of this product is to obtain the different field parameters using sensor and process it using a central processing system. Cloud is used to store and transmit the data by using IoT. Weather APIs are employed to assist the farmer in making decision. The farmer could take decision through a mobile application.

**Focus on J&P, tap into BE, understand RC**

**Focus on J&P, tap into BE, understand RC**



4. REQUIREMENT ANALYSIS

**Functional Requirements:**

Following are the functional requirements of the proposed solution.

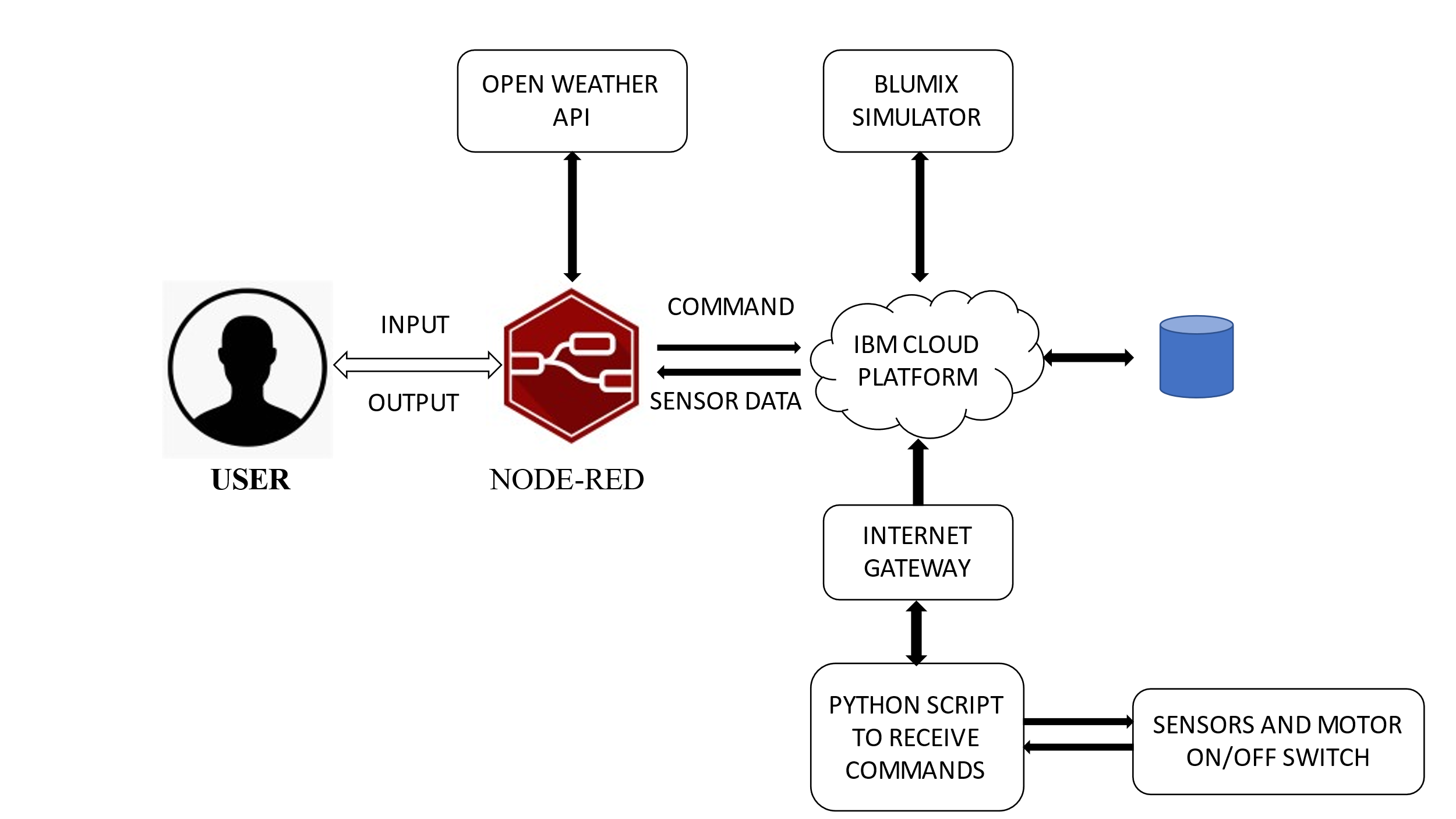
|  |  |  |
| --- | --- | --- |
| **FR No.** | **Functional Requirement (Epic)** | **Sub Requirement (Story / Sub-Task)** |
| FR-1 | User Registration | Registration through Form  Registration through Gmail  Registration through LinkedIN |
| FR-2 | User Confirmation | Confirmation via Email  Confirmation via OTP |
| FR-3 | Sensor function for framing system | Measure the temperature and Humidity  Measure the soil Monitoring check the crop diseases |
| FR-4 | Manage modules | Manage System Admins  Manage Roles of User  Manage User permission |
| FR-5 | Check whether details | Temperature details  Humidity details |
| FR-6 | Data Management | Manage the data of weather conditions  Manage the data of crop conditions  Manage the data of live stock conditions |

**Non-functional Requirements:**

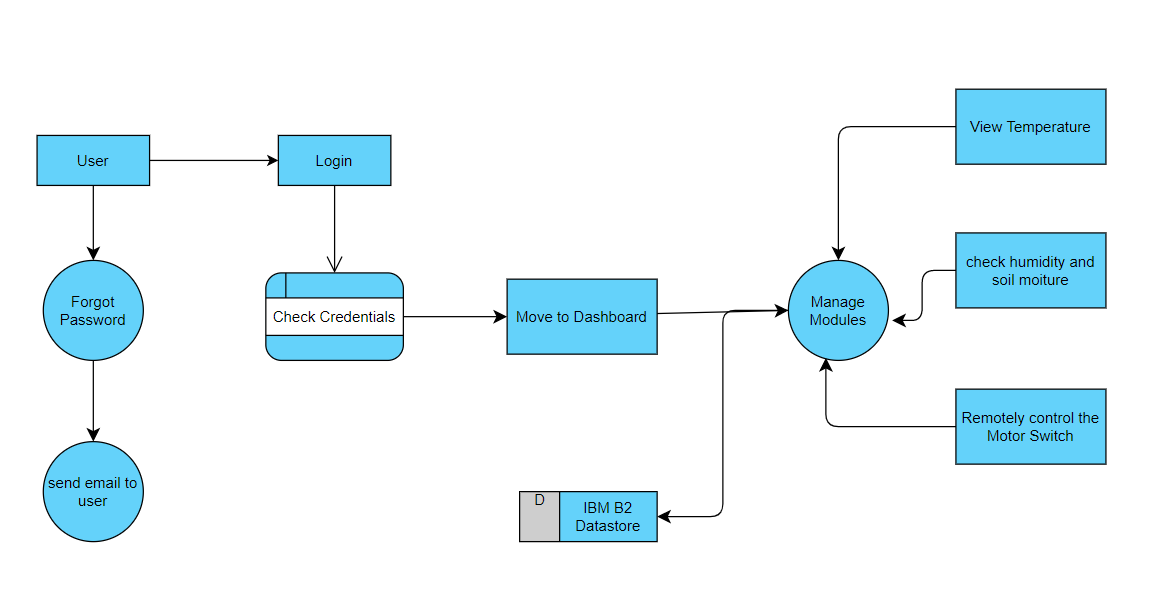
Following are the non-functional requirements of the proposed solution.

|  |  |  |
| --- | --- | --- |
| **FR No.** | **Non-Functional Requirement** | **Description** |
| NFR-1 | **Usability** | Usability includes easy learn ability, efficiency in use,remember ability, lack of errors in operation and subjective pleasure. |
| NFR-2 | **Security** | All the details about the user are protected from  unauthorized access.  Detection and identification of any misfunctions of sensors |
| NFR-3 | **Reliability** | The shared protection achieves a better trade-off between costs and reliability.  The model uses dedicated and shared protectionschemes to avoid farm service outages. |
| NFR-4 | **Performance** | the idea of implementing integrated sensors with  sensing soil and environmental or ambient parameters in farming will be more efficient for overall monitoring. |
| NFR-5 | **Availability** | This app is available for all platform |
| NFR-6 | **Scalability** | Scalability refers to the ability to increase available resources and system capability without the need to go through a major system redesign or implementation |

5. PROJECT DESIGN

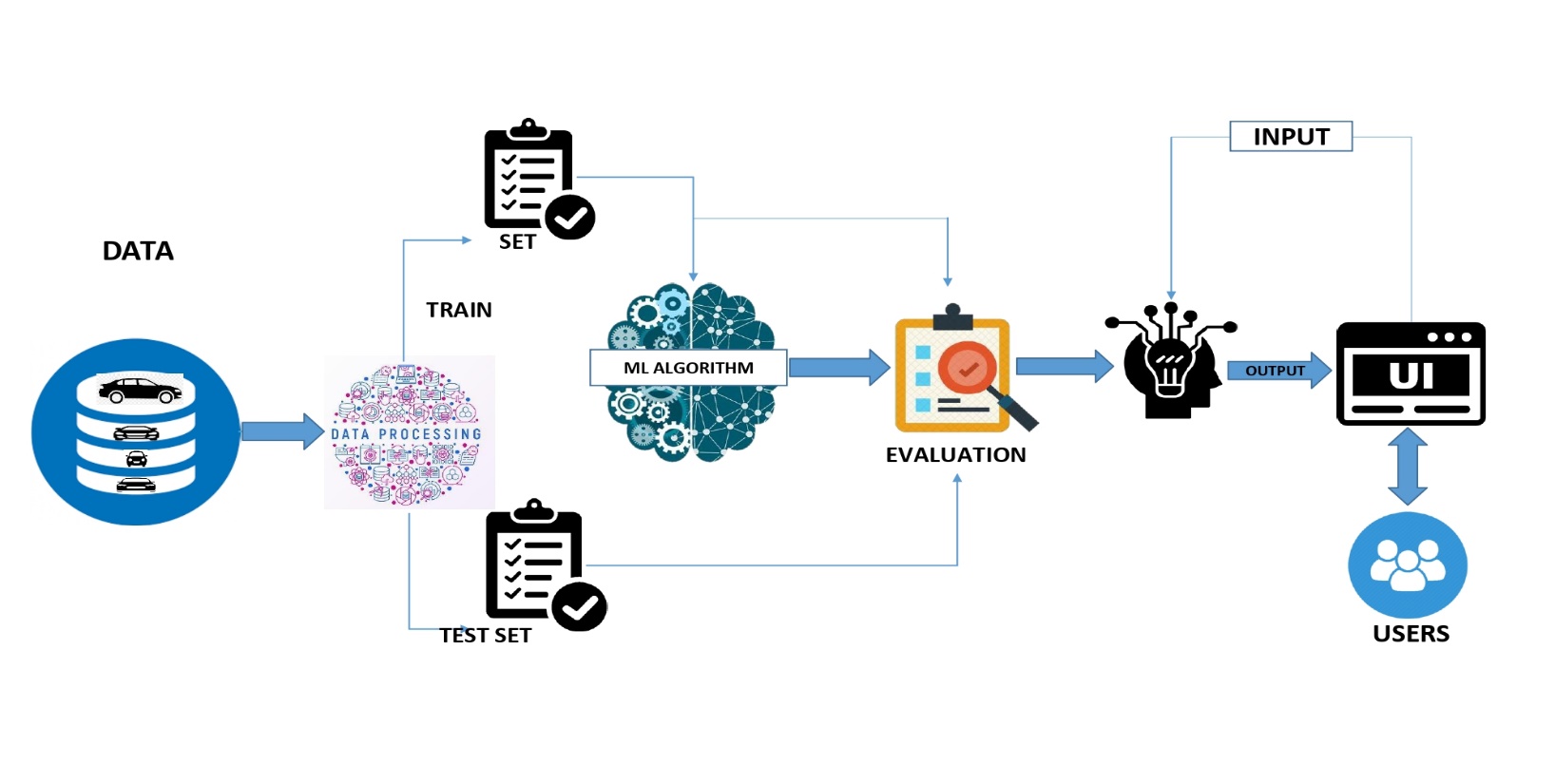


**Data Flow Diagrams:**

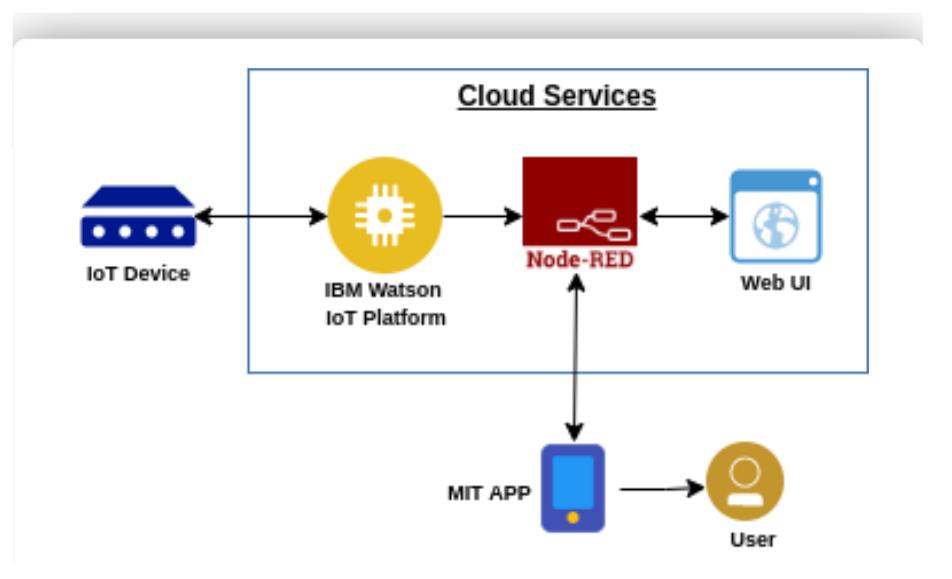


5.2 Solution and Technical Architecture

Solution Architecture:



Technical Architecture:

5.3 User Stories

| **User Type** | **Functional Requirement (Epic)** | **User Story Number** | **User Story / Task** | **Acceptance criteria** | **Priority** | **Release** |
| --- | --- | --- | --- | --- | --- | --- |
| Customer (Mobile user) | Registration | USN-1 | As a user, I can register for the application by entering my email, password, and confirming my password. | I can access my account / dashboard | High | Sprint-1 |
|  |  | USN-2 | As a user, I will receive confirmation email once I have registered for the application | I can receive confirmation email & click confirm | High | Sprint-1 |
|  |  | USN-3 | As a user, I can register for the application through Gmail |  | Medium | Sprint-1 |
|  | Login | USN-4 | As a user, I can log into the application by entering email & password |  | Medium | Sprint-1 |
| Customer (Web user) | Dashboard | USN-5 | As a User can view the dashboard, and this dashboard include the check roles of access and then move to the manage modules. | I can view the dashboard in this smart farming application system. | High | Sprint-2 |
|  |  | USN-6 | User can remotely access the motor switch | In the smart farming app | High | Sprint-3 |
| Administrator |  |  | As a user once view the manage modules this describes the Manage system Admins and Manage Roles of User and etc. |  |  | Sprint-2 |

6. PROJECT PLANNING AND SCHEDULING

Product Backlog,Sprint Schedule, and Estimation

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Functional**  **Requirement**  **(Epic)** | **User Story**  **Number** | **User Story / Task** | **Story Points** | **Priority** | **Team**  **Members** |
| Sprint-1 | Registration | USN-1 | As a user, I can register for the application by entering my Gmail, email then you can received the OTP or Verification Code. | 2 | High | KAMESHKUMAR  KAVIYARAJ  JAVEEDAKRAM  KAVINSARAN |
| Sprint-1 |  | USN-2 | As a user, I will receive confirmation Gmail or email once I have registered for the application. | 2 | High | KAMESHKUMAR  KAVIYARAJ  JAVEEDAKRAM  KAVINSARAN |
| Sprint-2 |  | USN-3 | As a user, I can register for the application through Gmail and phone number. | 2 | High | KAMESHKUMAR  KAVIYARAJ  JAVEEDAKRAM  KAVINSARAN |
| Sprint-1 |  | USN-4 | As a user, I can register for the application through Gmail and phone number. | 2 | Medium | KAMESHKUMAR  KAVIYARAJ  JAVEEDAKRAM  KAVINSARAN |
| Sprint-1 | Login | USN-5 | As a user, I can log into the application by entering email & password | 1 | High | KAMESHKUMAR  KAVIYARAJ  JAVEEDAKRAM  KAVINSARAN |

# 

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sprint** | **Functional**  **Requirement**  **(Epic)** | **User Story**  **Number** | **User Story / Task** | **Story Points** | **Priority** | **Team**  **Members** |
|  | Dashboard | USN-6 | Once confirmation message received after login the system and Check Credentials Once check the credentials after go to the Manage modules. | 2 | High | KAMESHKUMAR  KAVIYARAJ  JAVEEDAKRAM  KAVINSARAN |
|  |  | USN-7 | In this manage modules described the below functions like Manage System Admins Manage Roles of User Manage User permission and etc.. | 2 | Medium | KAMESHKUMAR  KAVIYARAJ  JAVEEDAKRAM  KAVINSARAN |
|  | Logout | USN-8 | Then check Temperature, humidity and moisture after then logout or exist the application. | 1 | Medium | KAMESHKUMAR  KAVIYARAJ  JAVEEDAKRAM  KAVINSARAN |

6.2 Sprint Delivery Schedule

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Total**  **Story**  **Points** | **n** | **Date** | **Sprint End**  **Date**  **(Planned)** | **Story Points**  **Completed (as on**  **Planned End**  **Date)** | **Sprint Release Date (Actual)** |
| Sprint-1 | 20 | 6 Days | 24 Oct 2022 | 29 Nov 2022 | 20 | 29 Oct 2022 |
| Sprint-2 | 20 | 6 Days | 31 Oct 2022 | 05 Nov 2022 | 20 | 05 NOV 2022 |
| Sprint-3 | 20 | 6 Days | 07 Nov 2022 | 12 Nov 2022 | 20 | 12 NOV 2022 |
| Sprint-4 | 20 | 6 Days | 14 Nov 2022 | 19 Nov 2022 | 20 | 1. ct 2022 |

7.CODING AND SOLUTIONING

import wiotp.sdk.device import time

import os

import datetime

import random

myconfig = {

"identity": {

"orgId": "ga4sjl",

"typeId": "NodeMCU",

"deviceId": "12345"

},

"auth": {

"token": "CK2!+2FzgnyZFWE9yW"

}

}

client = wiotp.sdk.device.DeviceClient(config=myconfig, logHandlers=None) client.connect()

def myCommandCallback(cmd):

print("Message received from IBM IoT platform: %s" % cmd.data['command']) m=cmd.data['command']

if(m=="motoron"):

print("motor is switched on")

elif(m=="motoroff"):

print("motor is switched OFF")

print(" ")

while True:

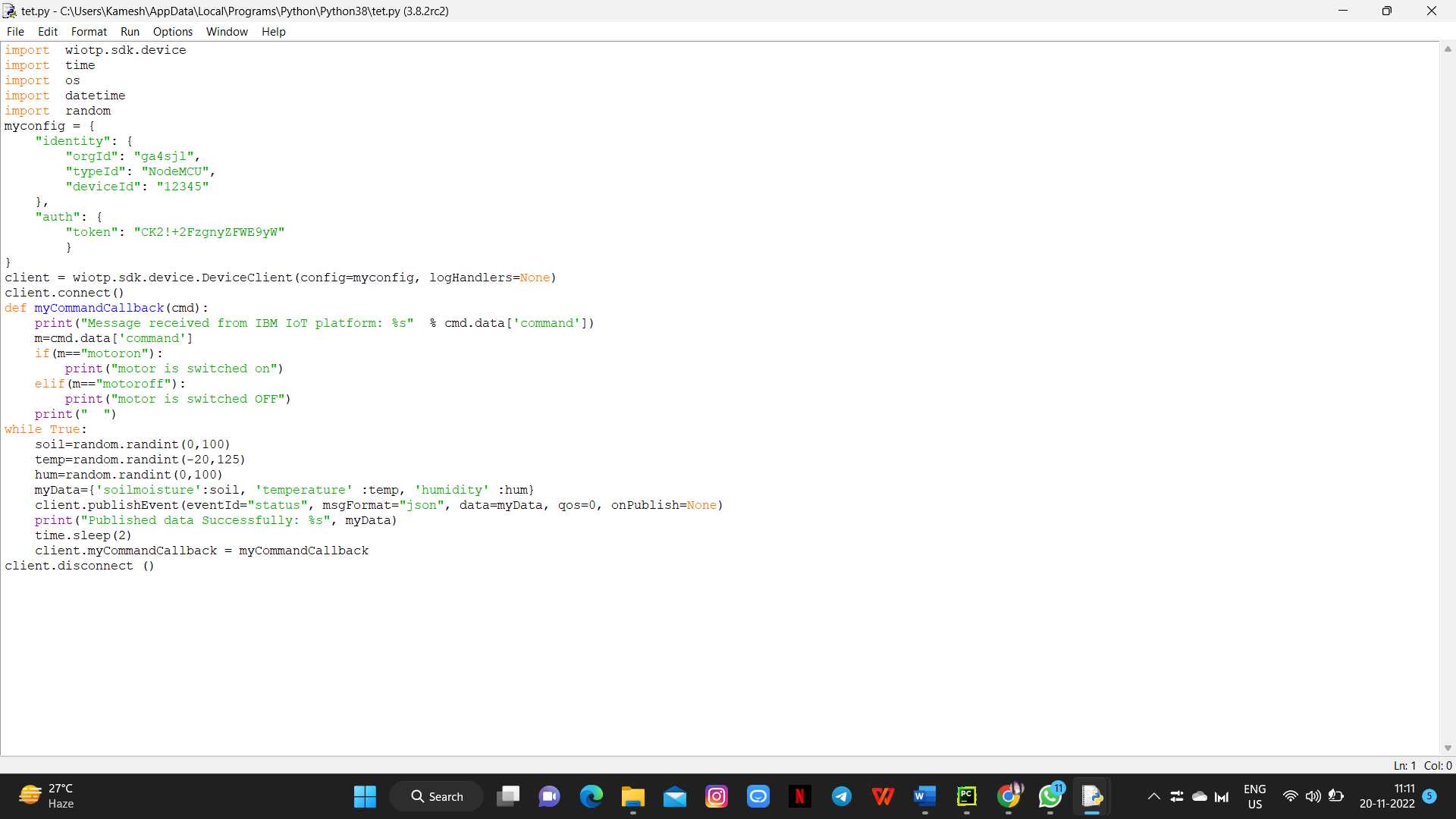
soil=random.randint(0,100) temp=random.randint(-20,125) hum=random.randint(0,100)

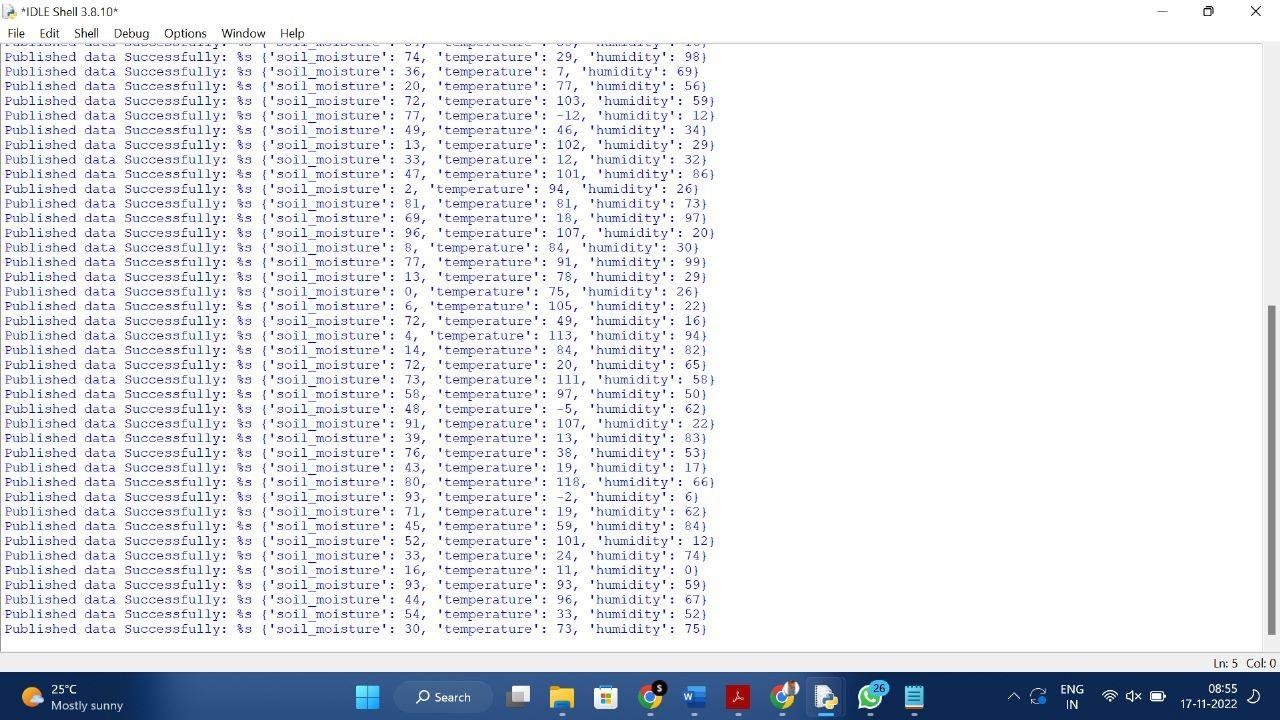
myData={'soilmoisture':soil, 'temperature' :temp, 'humidity' :hum} client.publishEvent(eventId="status",msgFormat="json",data=myData,qos=0,onPublish=None)

print("Published data Successfully: %s", myData) time.sleep(2)

client.myCommandCallback = myCommandCallback

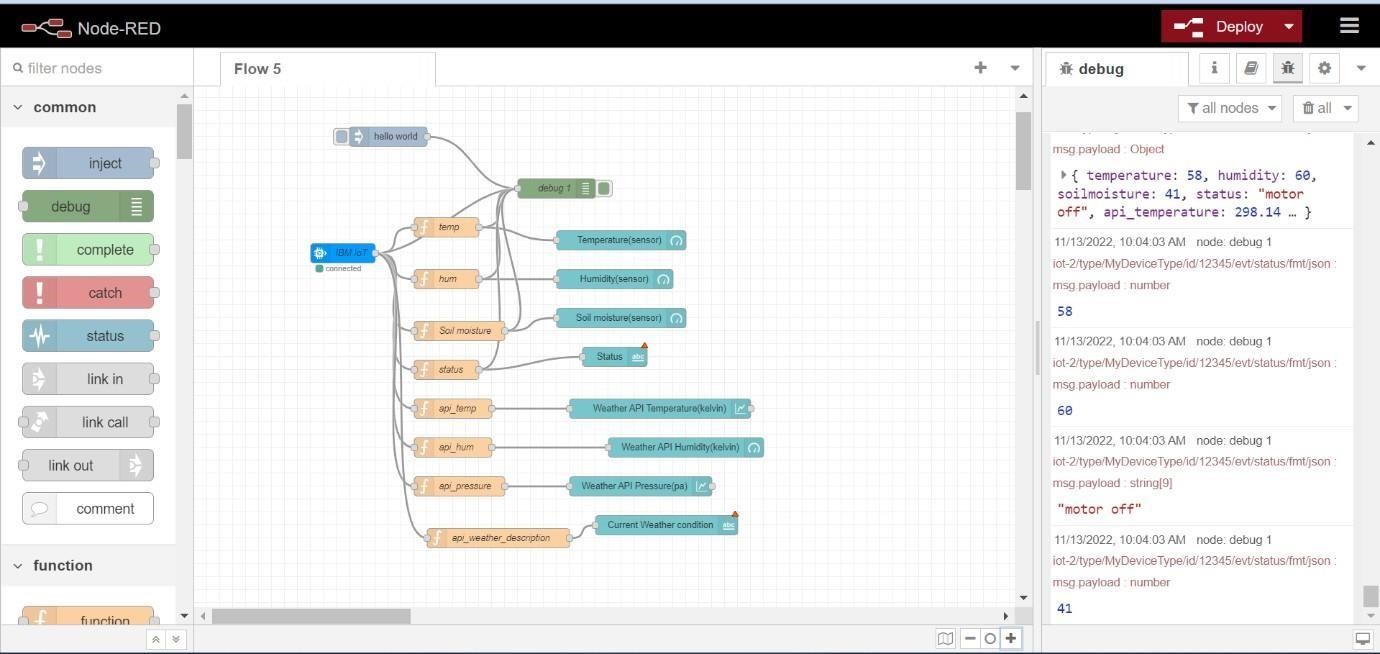
client.disconnect ()



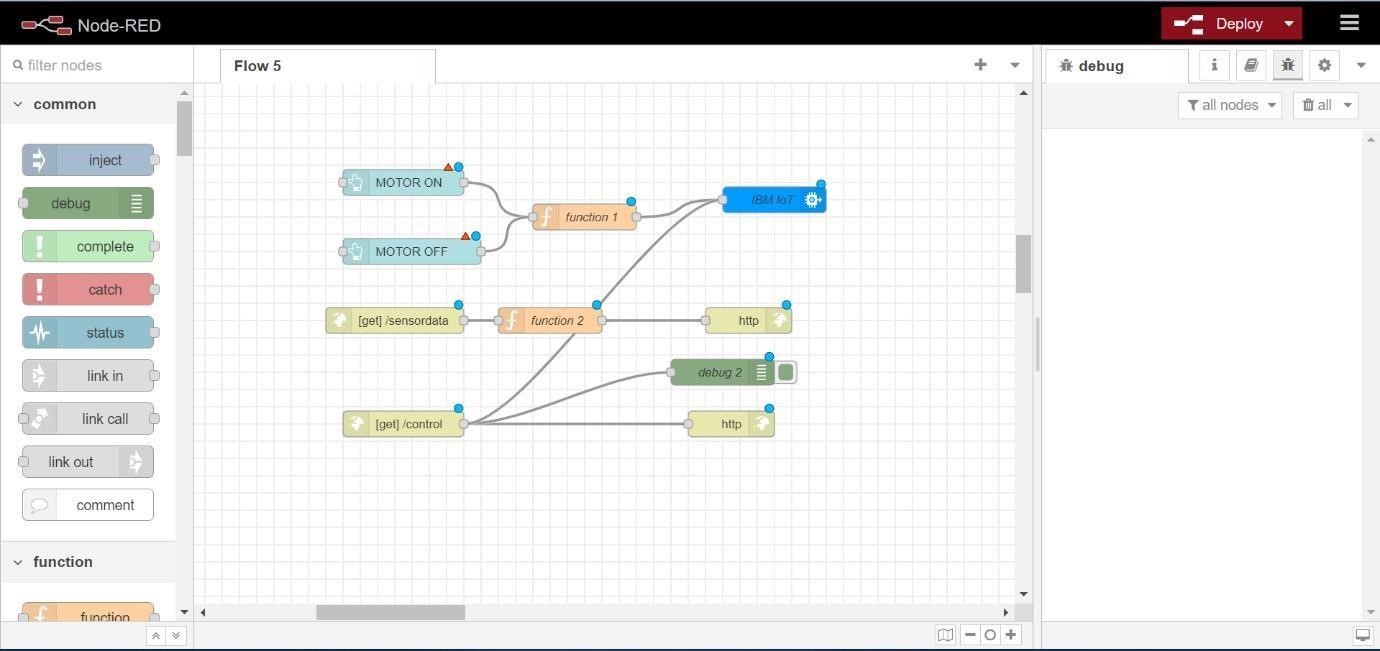


8. TESTING & RESULT

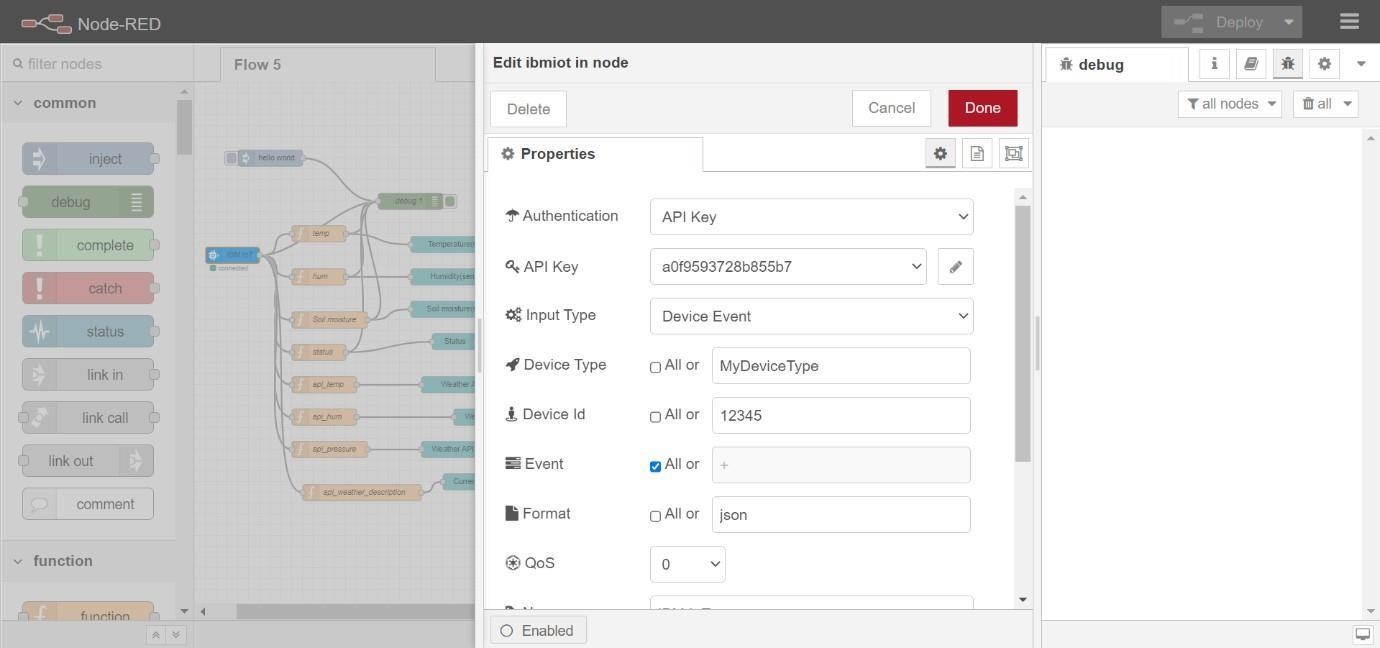
Flow:1



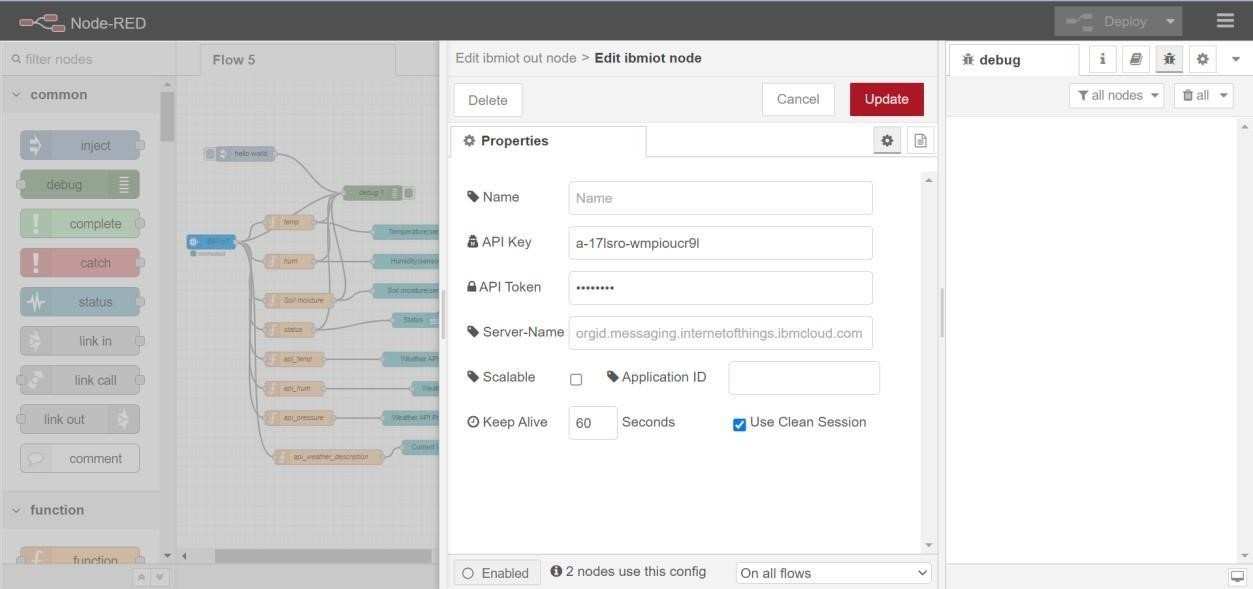
Flow:2



## Flow:1 Configuring All Nodes With IBM IOT Platform

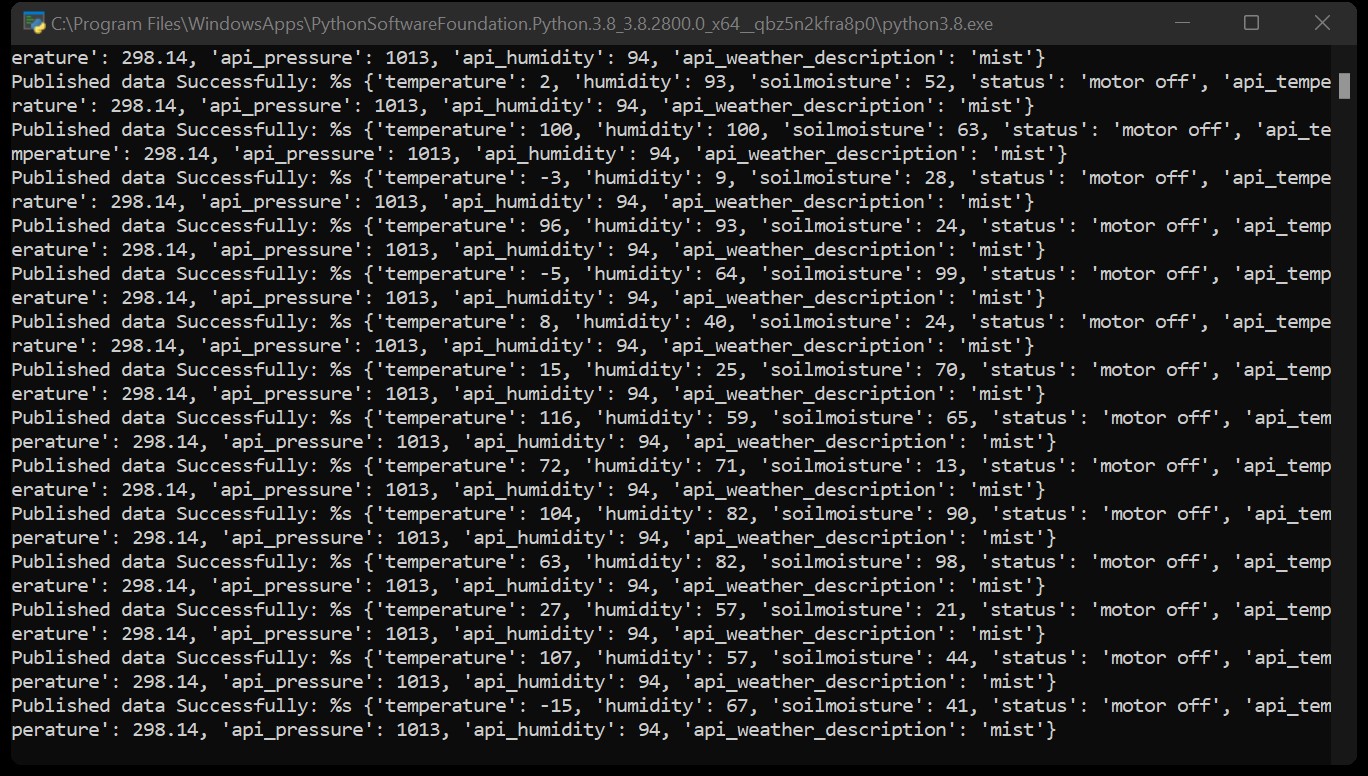


Flow:2 Configuring All Nodes With IBM IOT Platform



## 

## Execution of Python Program



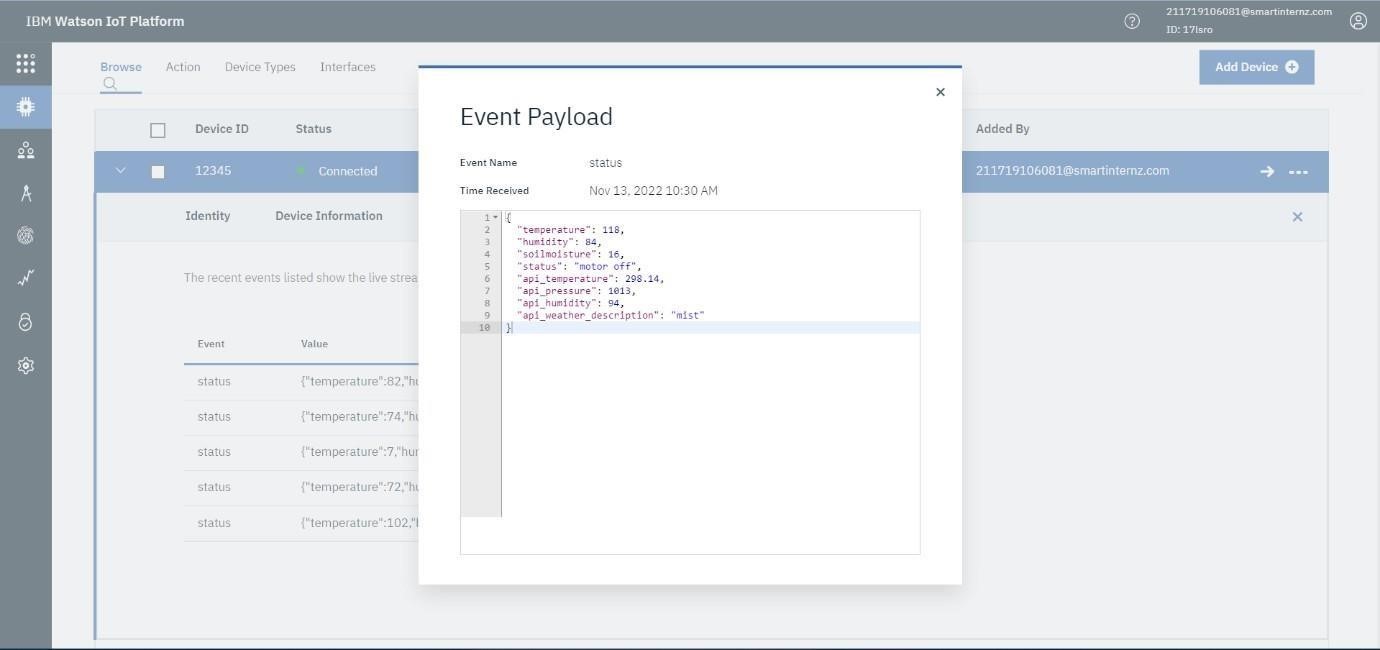
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## Web UI Output



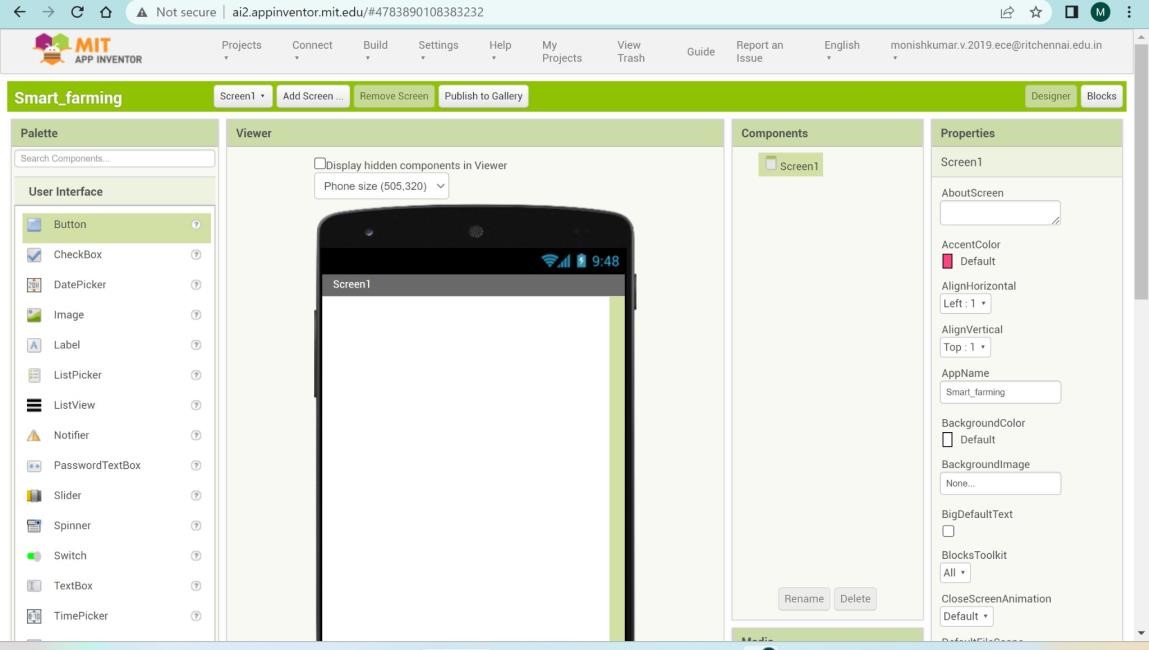
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## IBM Watson IoT Platform Device Connect & Live Data

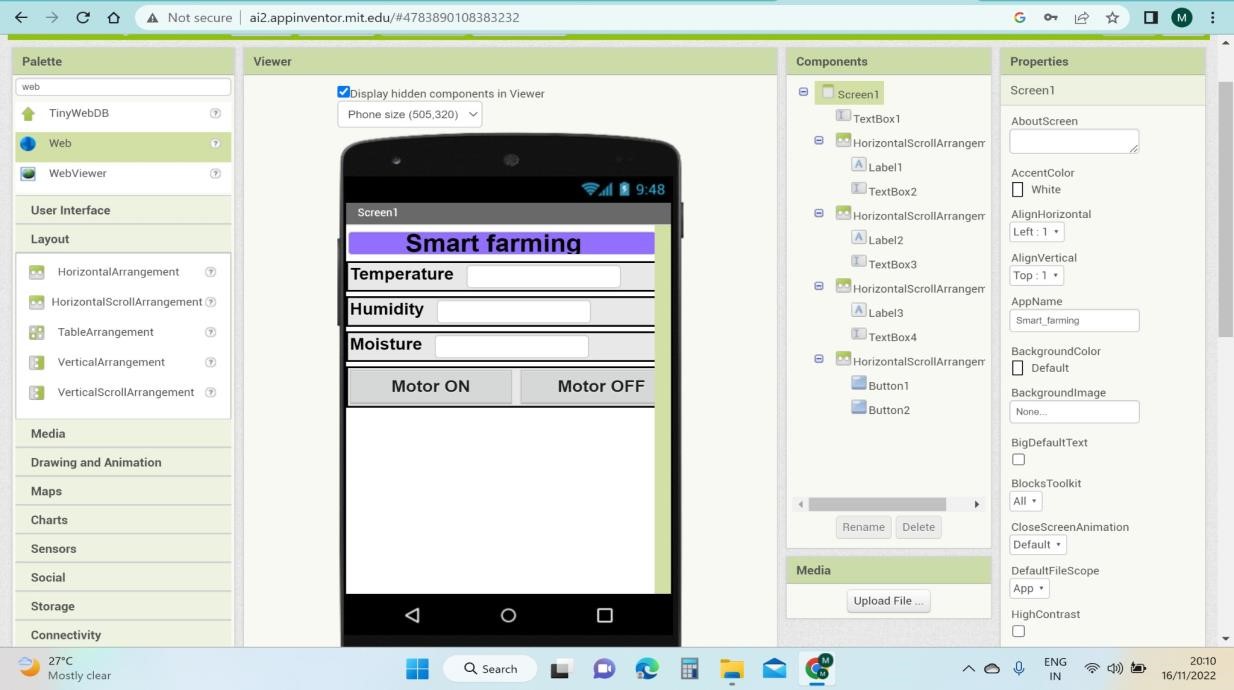


**MIT APP INVENTOR**

**Step 1:** Login Into MIT App Inventor

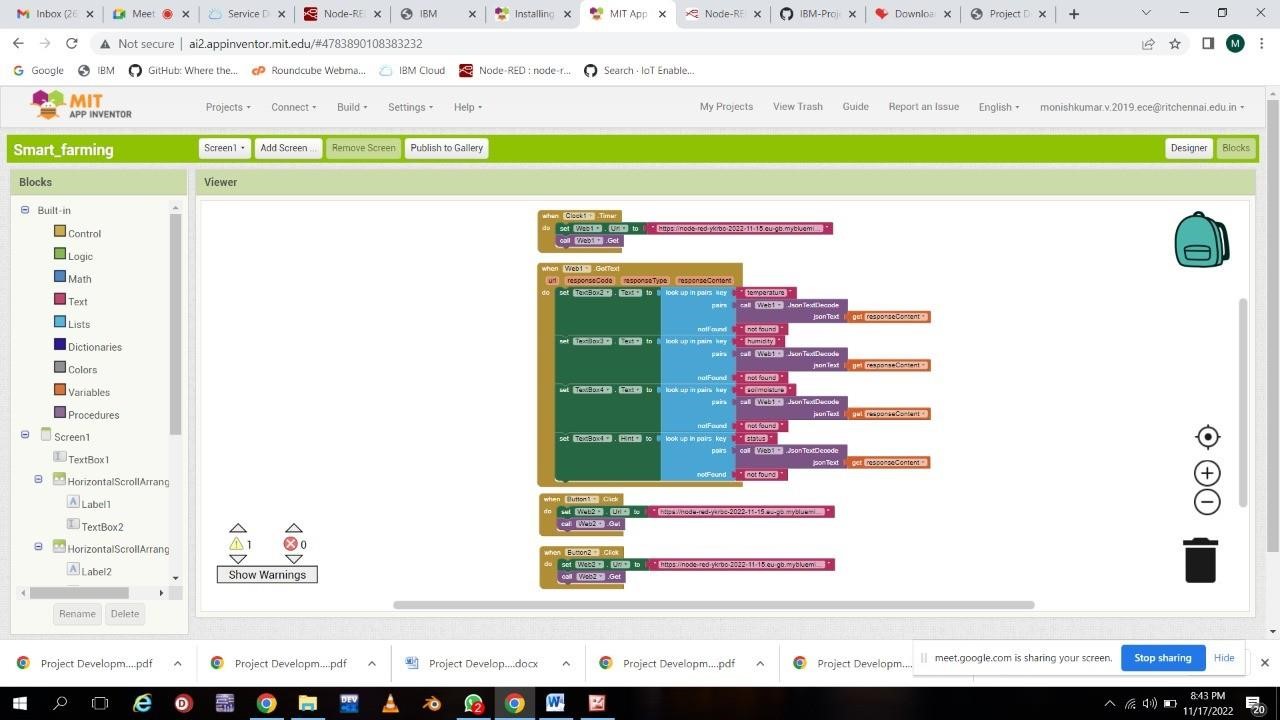


**Step 2:** Create Your User Interface By Using the Preset Tools

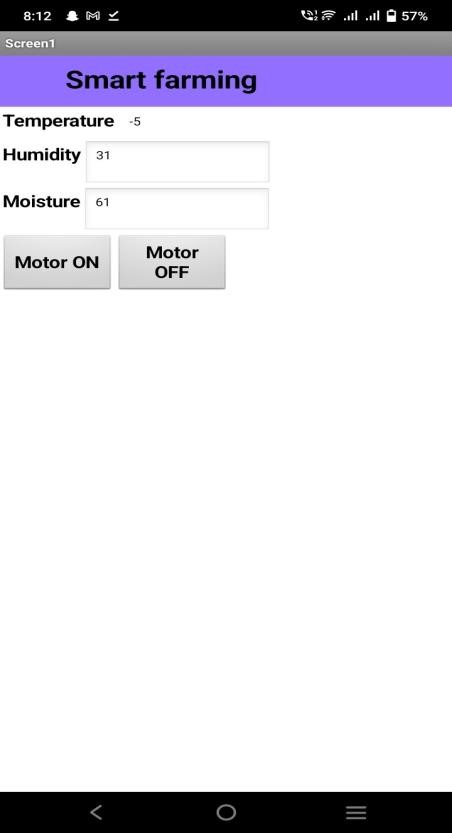


**Step 3:** Back End Process

* Specify the Cloud URL Details to Receive the Date From Node Red.
* Commend Request From App To Node RED to Turn ON /OFF Motor.
* Weather API Data is Displaced From Node RED.



**Step 4:** Live Output In Mobile Application



10. ADVANTAGES

**Advantages** -- A remote control system can help in working irrigation system valves dependent on schedule. Irrigating remote farm properties can be exceptionally troublesome and labor-intensive. It gets hard to comprehend when the valves were started and whether the ideal measure of water was distributed. For situations where a quick reaction is required, manual valve actuation may not be conceivable constantly. Thus, remote observing and control of irrigation systems, generators or wind machines or some other motor- driven hardware become the next logical step. Various sensors will help to increase the productivity and customers can be benifeted.

DISADVANTAGES

Cost, Reliability, Increased channel maintenance.

11. CONCLUSION

The increased prices of new cars and the financial incapability of the customers to buy them, Used Car sales are on a global increase. Therefore, there is an urgent need for a Used Car Price Prediction system which effectively determines the worthiness of the car using a variety of features. The proposed system will help to determine the accurate price of used car price prediction.

12. FUTURE SCOPE

In future this machine learning model may bind with various website which can provide real time data for price prediction. Also we may add large historical data of car price which can help to improve accuracy of the machine learning model. We can build an android app as user interface for interacting with user. For better performance, we plan to judiciously design deep learning network structures, use adaptive learning rates and train on clusters of data rather than the whole dataset.

13. APPENDIX

https://github.com/IBM-EPBL/IBM-Project-24252-1659940568