**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

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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.

* 1. 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**.**

**2.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

**3.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** : Automation in Agriculture and IoT

**AUTHOR** : Vaishali Puranik, Sharmila , Ankit Ranjan

DESCRIPTION : Almost everything around us is touch by digitisation. The role the Technology has to play in agriculture sector is becoming more and more visible day by day. Since year of its inception communication has played an important part in agriculture, it was not just limited to in area of crop diagnostics but it has played pivotal role in the modification of age old agricultural practices. One can also witness development in various methodologies and technologies being used in the agricultural system. On the contrary, the agriculture sector in India is witnessing losing ground every day that has affected the production capacity of the ecosystem. There is an emerging need to solve the problem in the said domain to restore vibrancy and put it back on higher growth. A large-scale agricultural system requires a lot of maintenance, knowledge, and supervision. In the given paper we are aiming to automate the Maintenance, Control of Insecticides and pesticides, Water Management and Crop Monitoring.

Published in: 2019 4th International Conference on Internet of Things: Smart Innovation and Usages (IoT-SIU)

**5.TOPIC :** Smart Agriculture System Using IoT and Cloud computing

**AUTHOR :** Sandeep Rathor; Shalini Kumari

DESCRIPTION : Agriculture is integral to all of us. The traditional practices involved in agriculture don't give us the best output in terms of productivity. But the technology available today can harness the true potential of any farm-land. As the population is increasing, the exploitation of resources is increasing and with limited resources, we have to produce the maximum yield. Therefore, it becomes essential that we deploy technology to our help. IOT - Internet of Things is a technology that can help us. It makes things smart by connecting physical devices to the internet. Smart systems provide accurate and upto-date information that enables systematic decision making. IoT in combination to cloud computing can help us revive the agriculture industry.

Published in: 2021 5th International Conference on Information Systems and Computer Networks (ISCON)

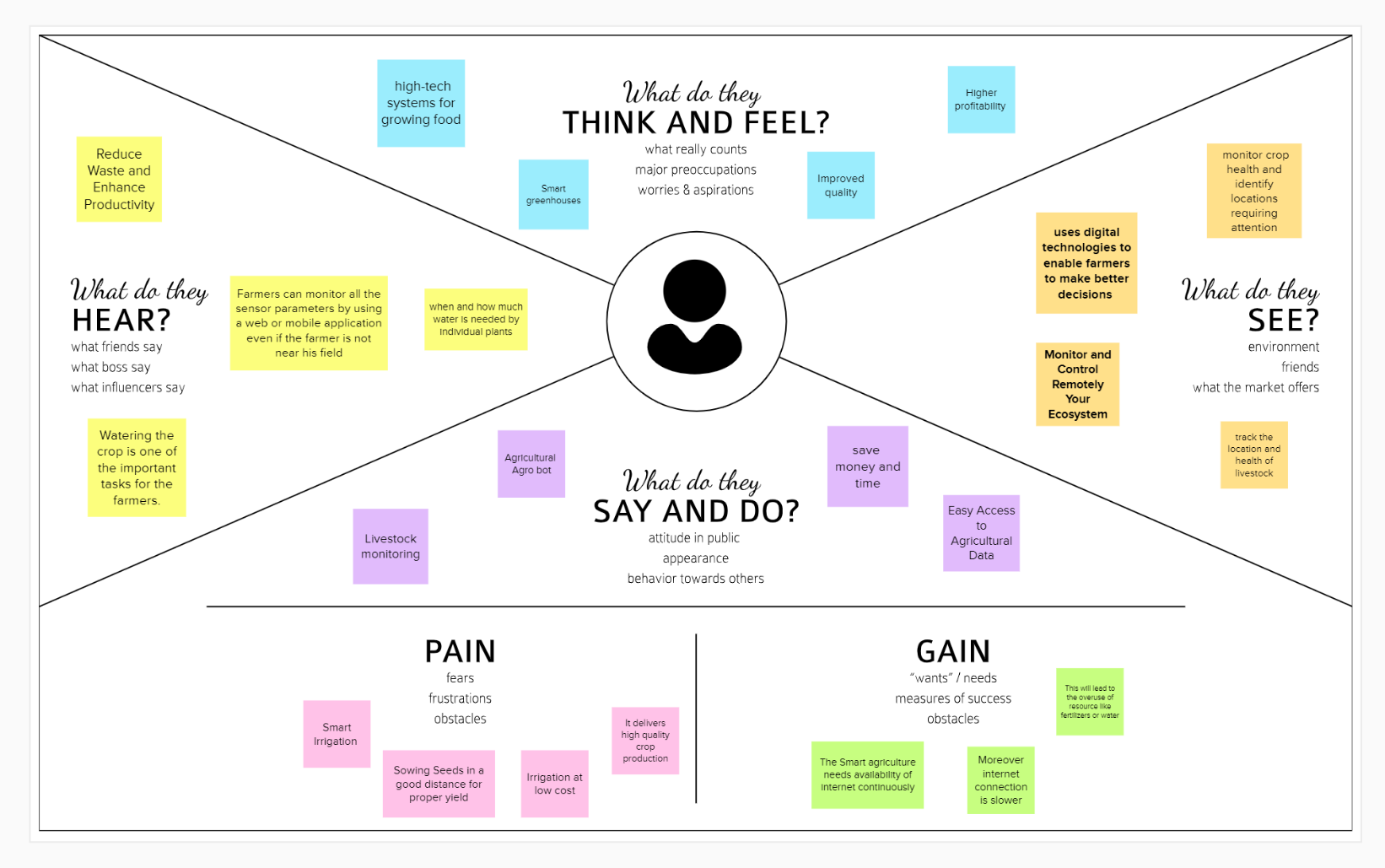
2.3 Problem SOLUTION

To provide efficient decision support system using wireless sensor network which handle different activities of farm and gives useful information related to farm such as Soil moisture, Temperature and Humidity content . Smart Agricultural System solutions provide an integrated IoT platform in agriculture that allows farmers to use different types of sensors and used to collect the information of various parameter and analyse realtime data in order to make informed decisions.

IoT based smart framing for Live Monitoring of Temperature and Soil Moisture has been proposed using Arduino and Cloud Computing . The System has high efficiency and accuracy in fetching the live data of temperature and soil moisture. The IoT based smart farming System being proposed via this report will assist farmers in increasing the agriculture yield

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

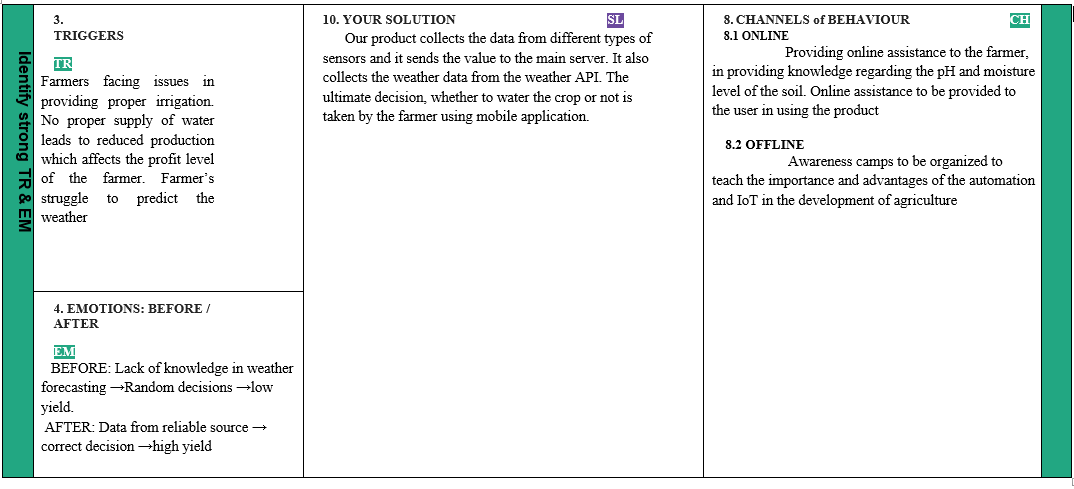
**J&P**

**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.

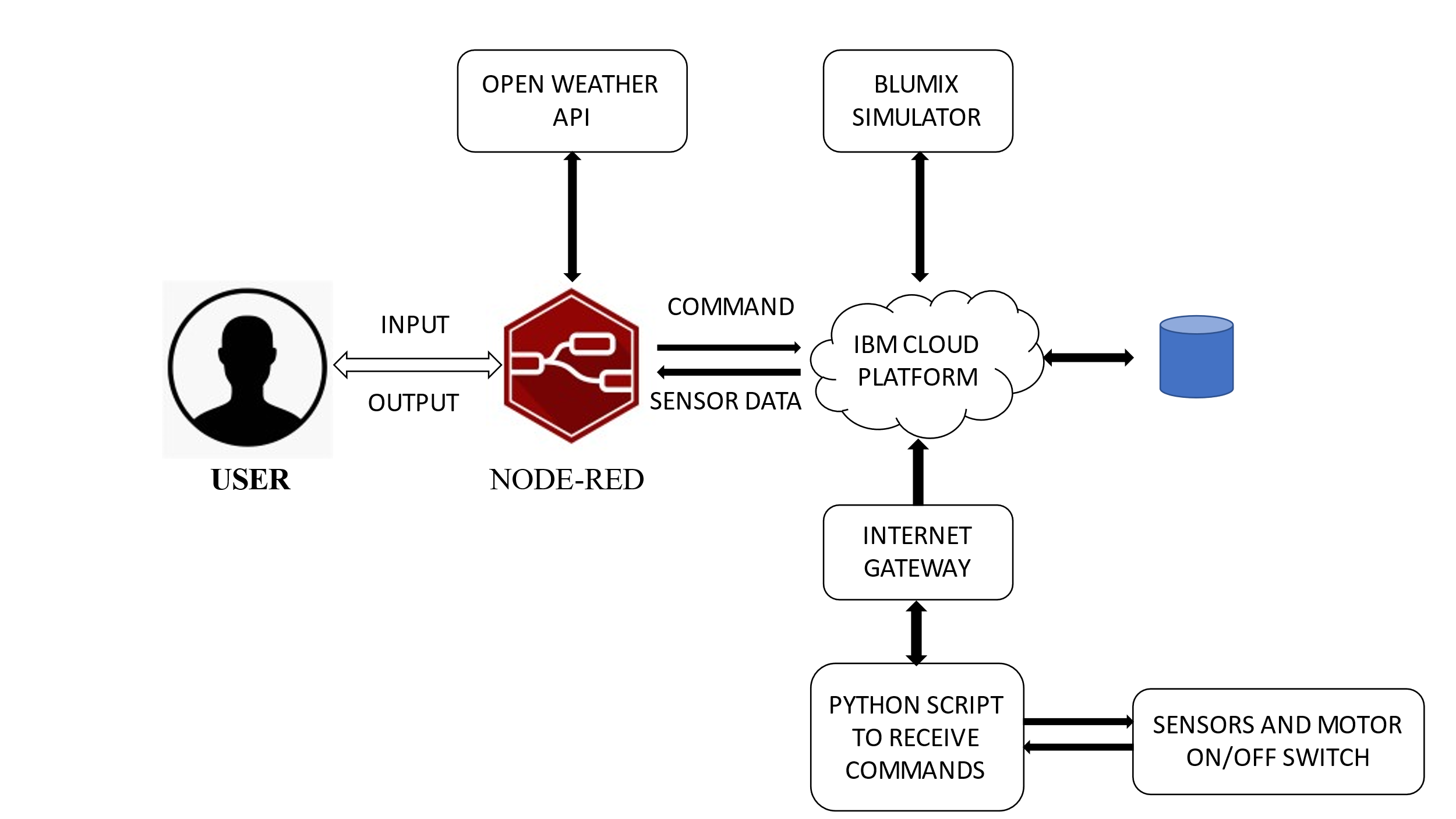
|  |  |  |
| --- | --- | --- |
| **FR No.** | **Functional Requirement (Epic)** | **Sub Requirement (Story / Sub-Task)** |
| FR-1 | User Registration | Registration through Form  Registration through Gmail  Registration through LinkedIN |
| FR-2 | User Confirmation | Confirmation via Email  Confirmation 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:**

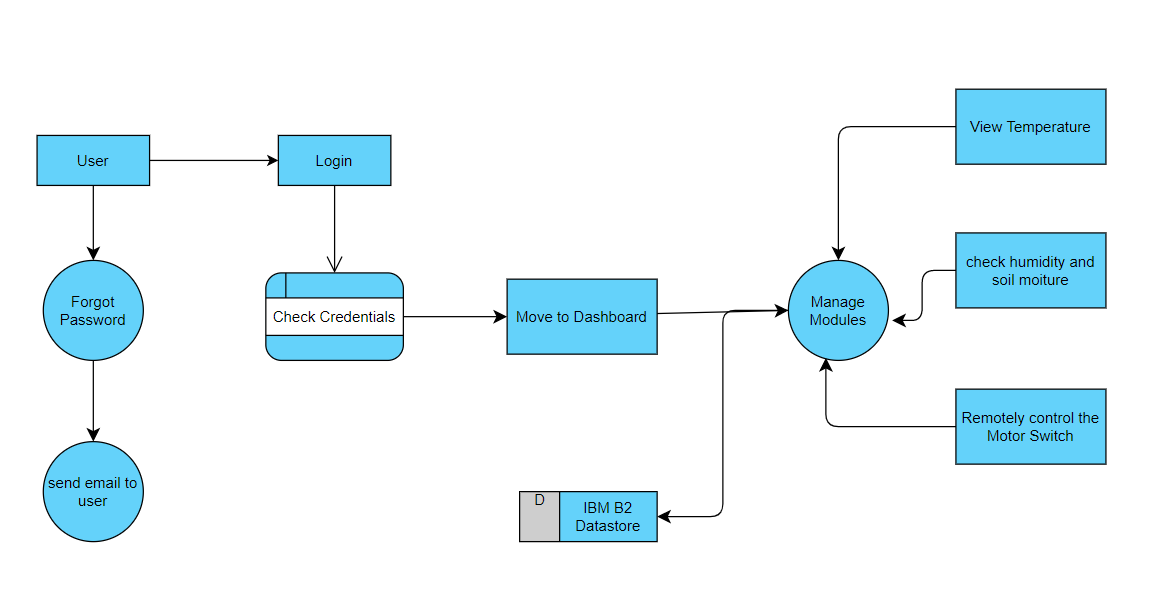
Following are the non-functional requirements of the proposed solution.

|  |  |  |
| --- | --- | --- |
| **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

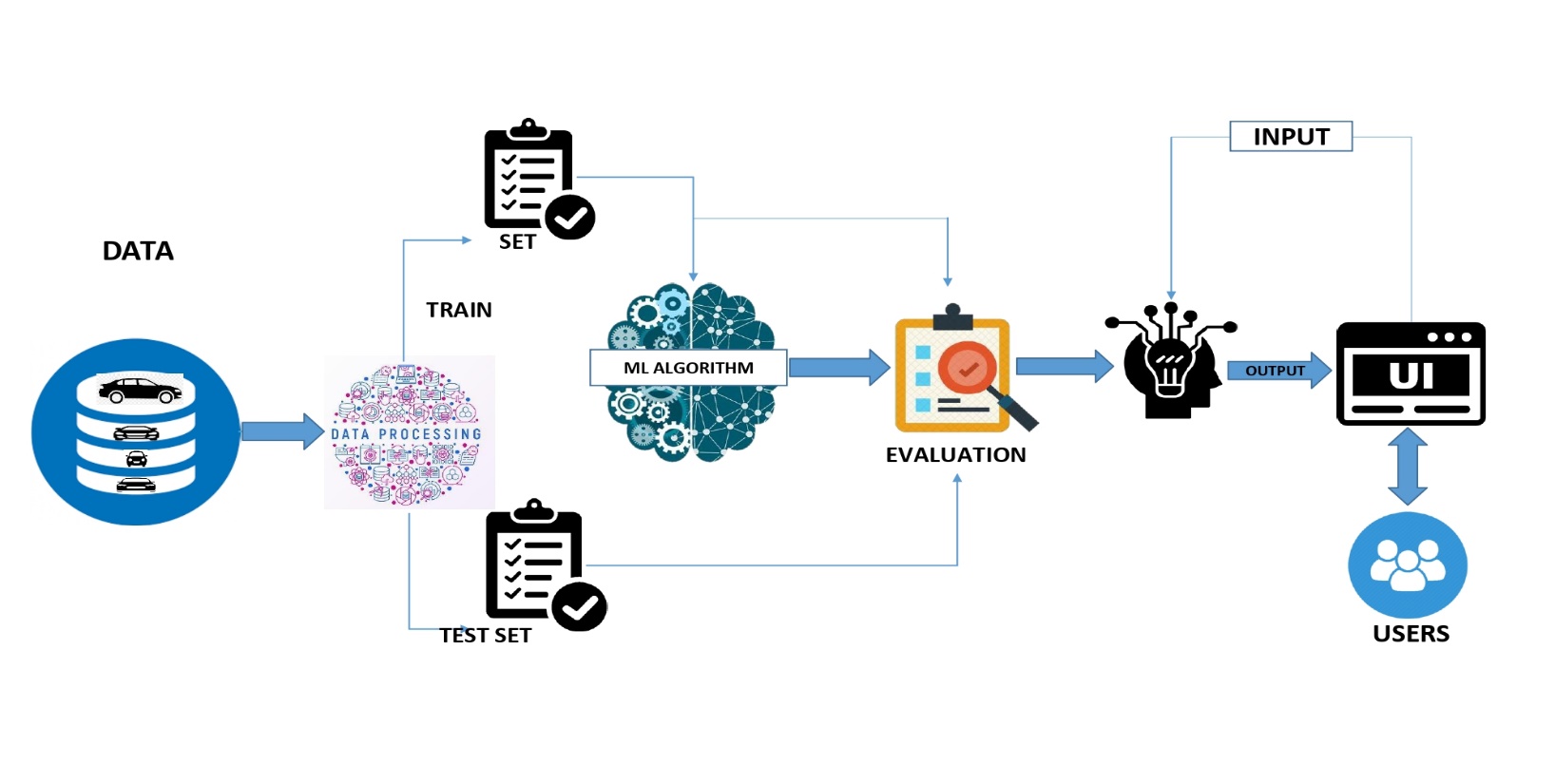


**Data Flow Diagrams:**

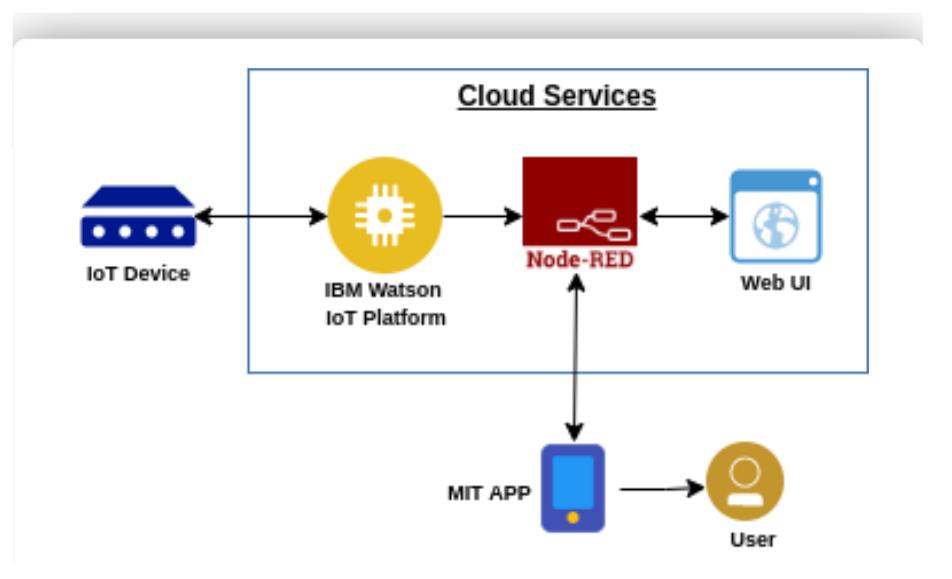


5.2 Solution and Technical Architecture

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:

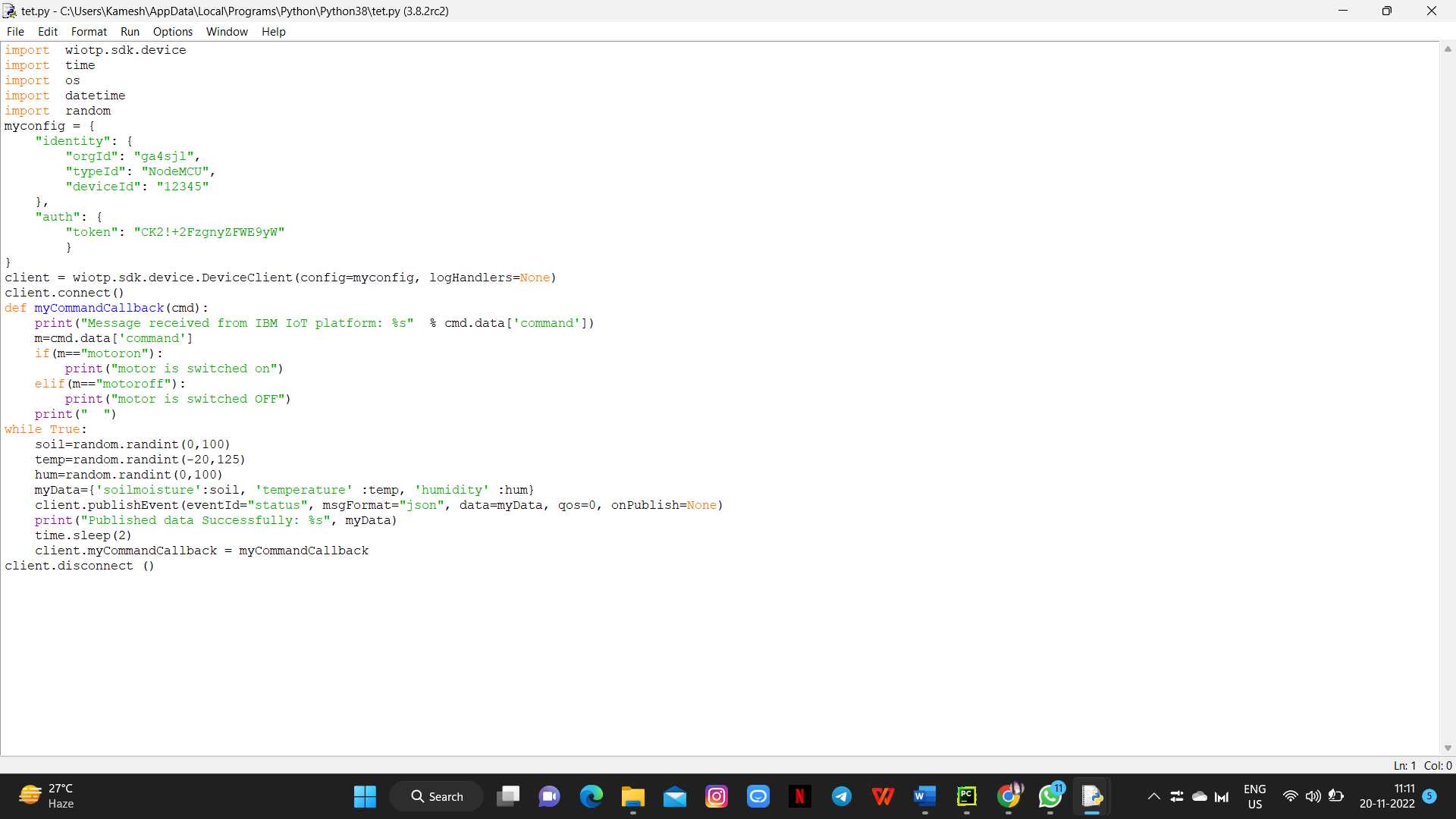
soil=random.randint(0,100) temp=random.randint(-20,125) hum=random.randint(0,100)

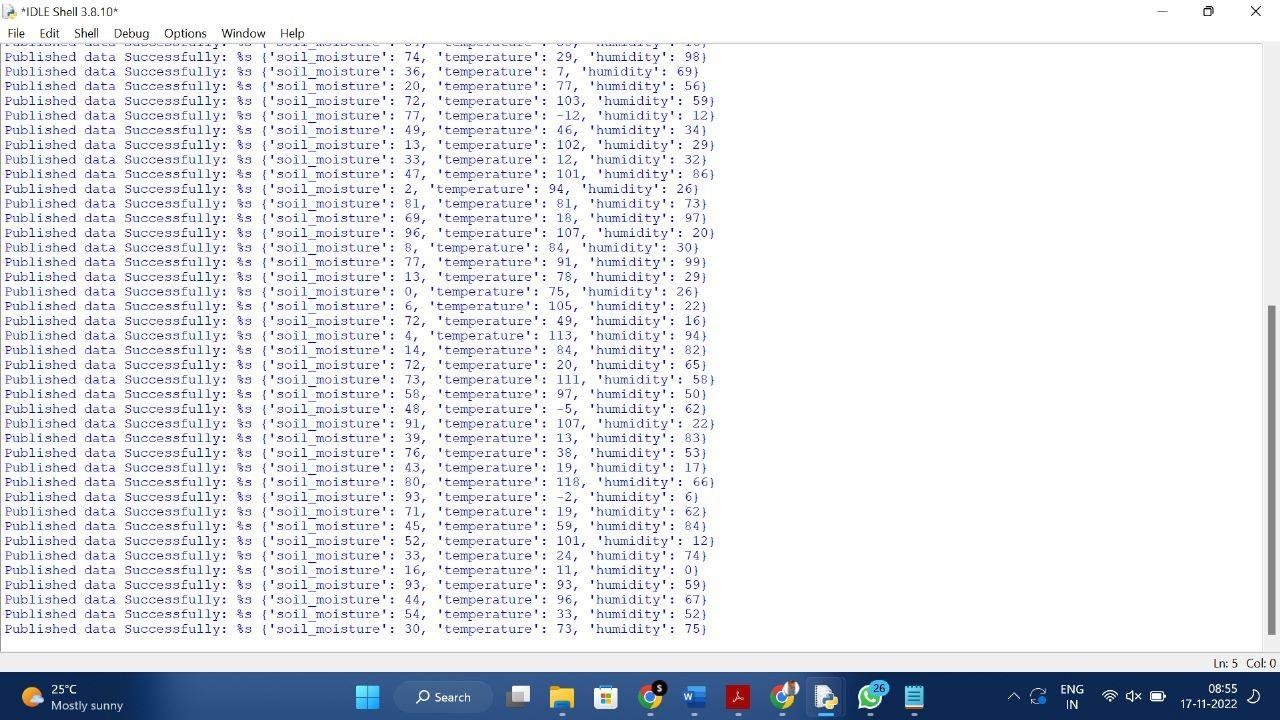
myData={'soilmoisture':soil, 'temperature' :temp, 'humidity' :hum} client.publishEvent(eventId="status",msgFormat="json",data=myData,qos=0,onPublish=None)

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

client.myCommandCallback = myCommandCallback

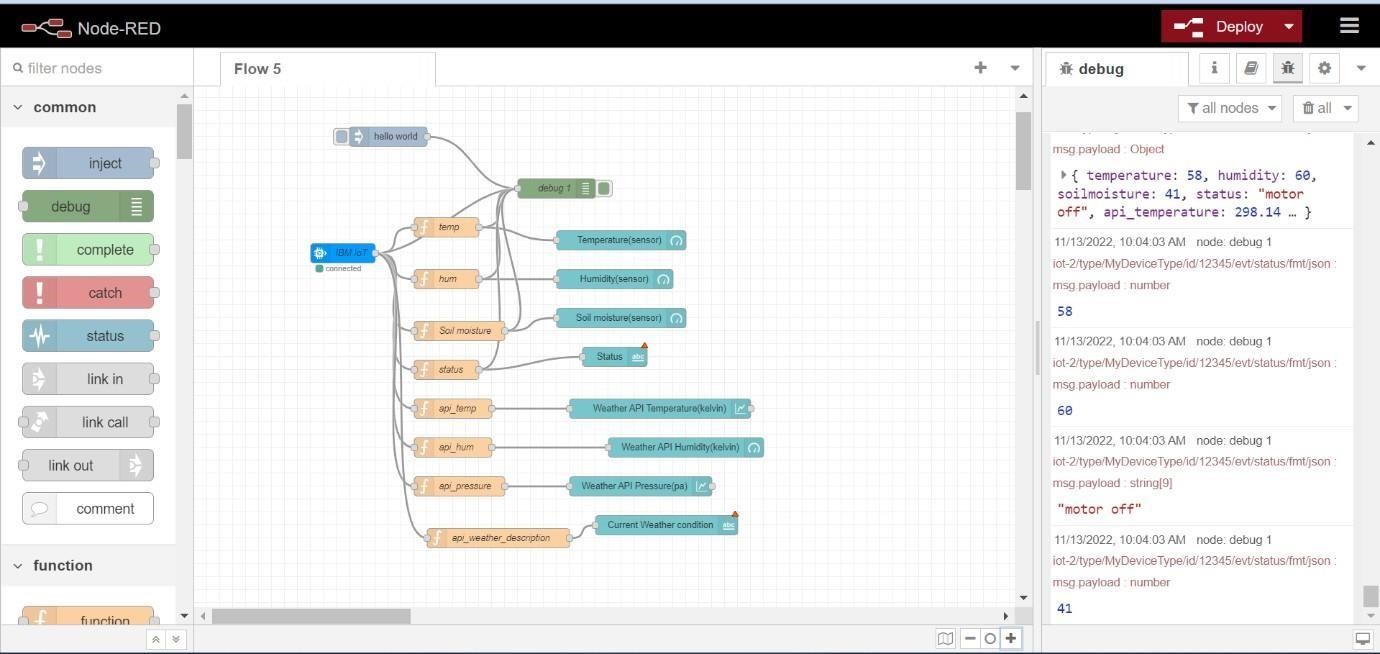
client.disconnect ()



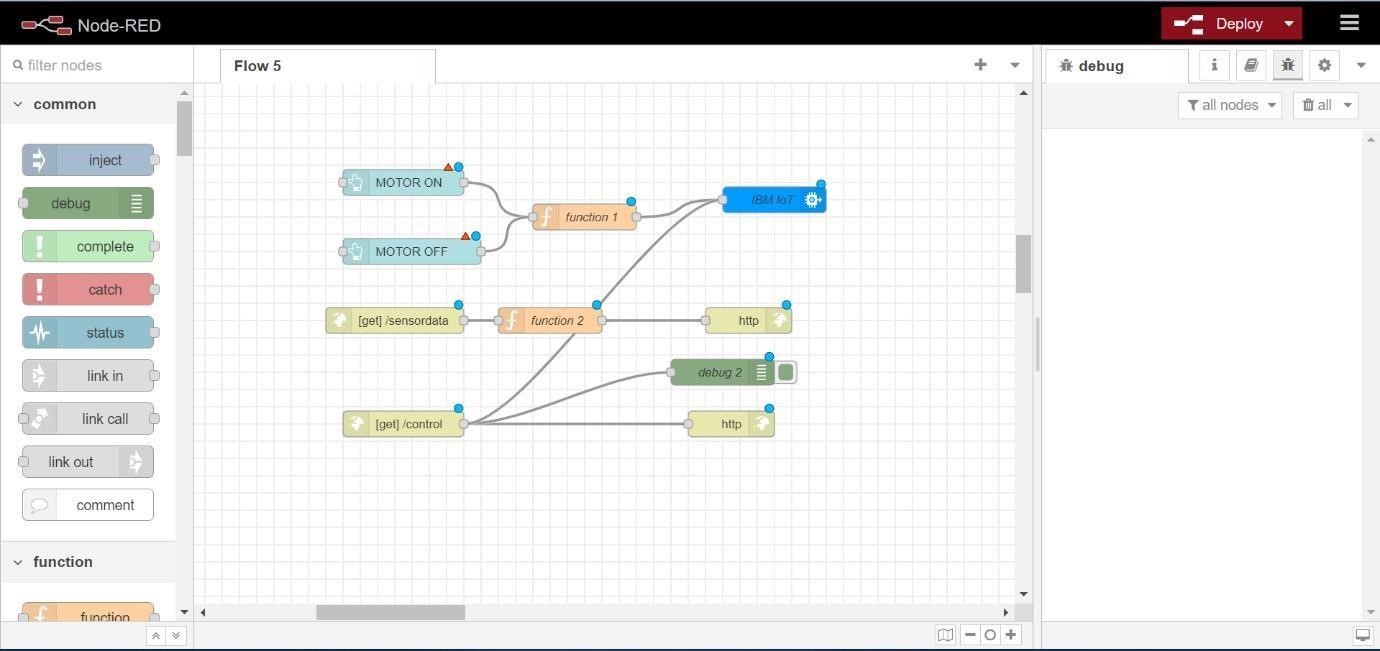


8. TESTING & RESULT

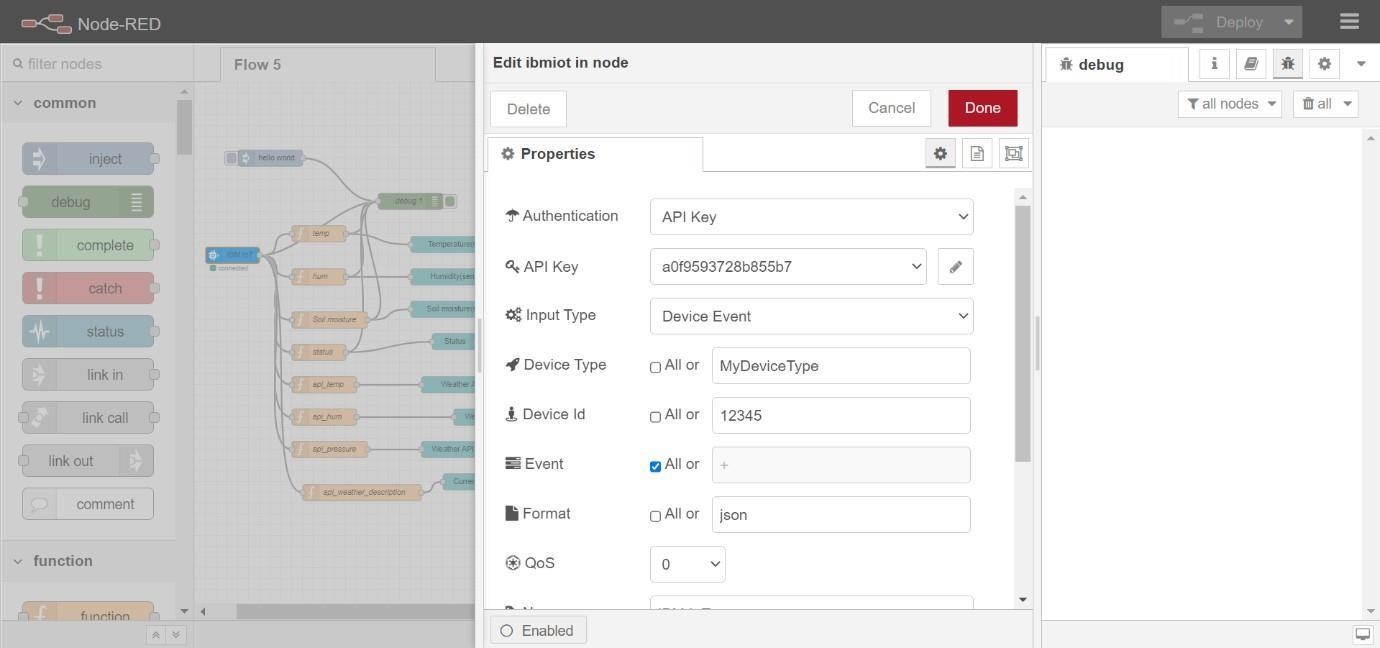
Flow:1



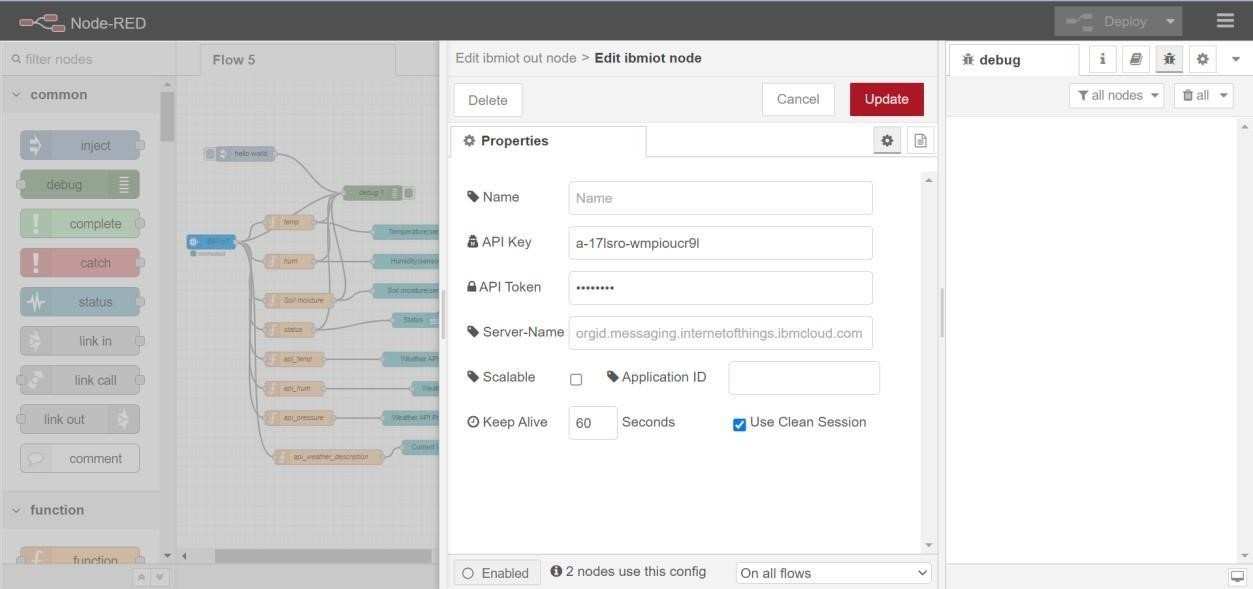
Flow:2



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

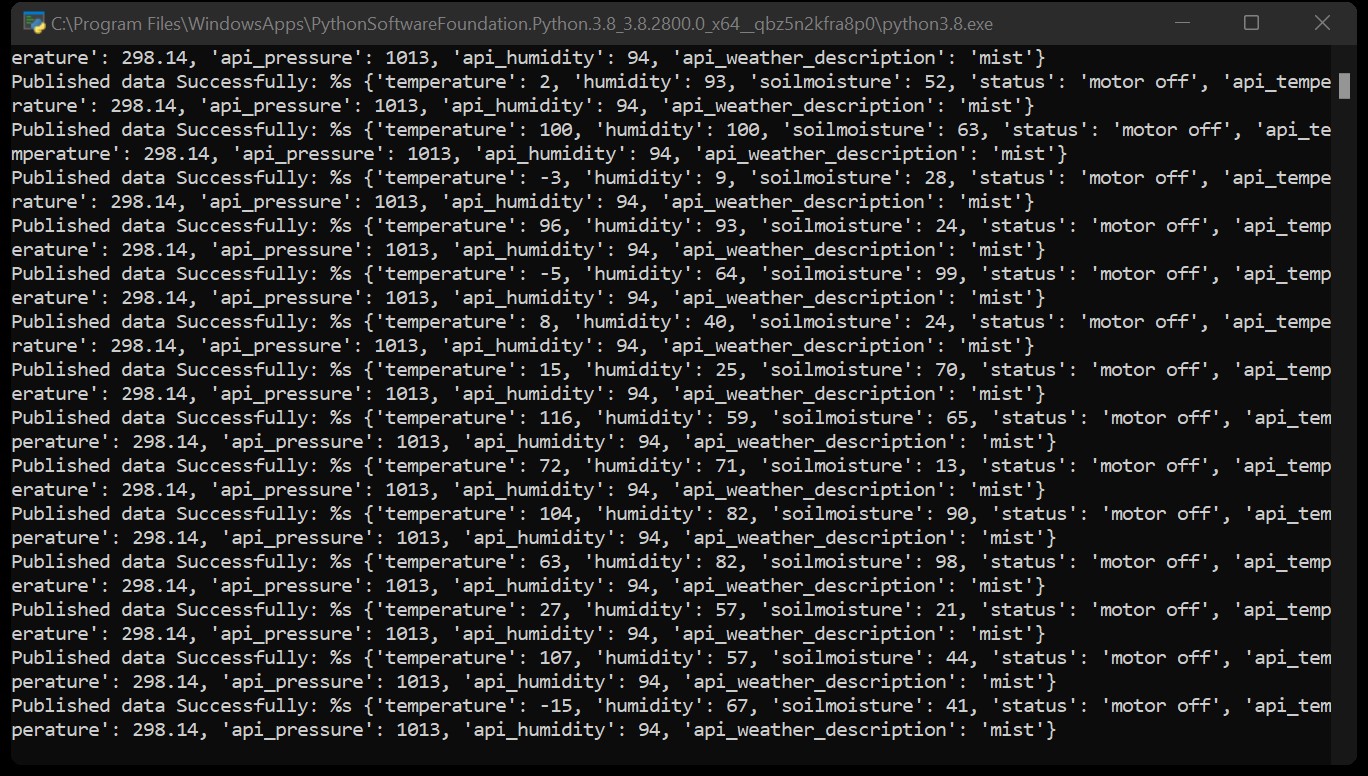


Flow:2 Configuring All Nodes With IBM IOT Platform



## 

## Execution of Python Program



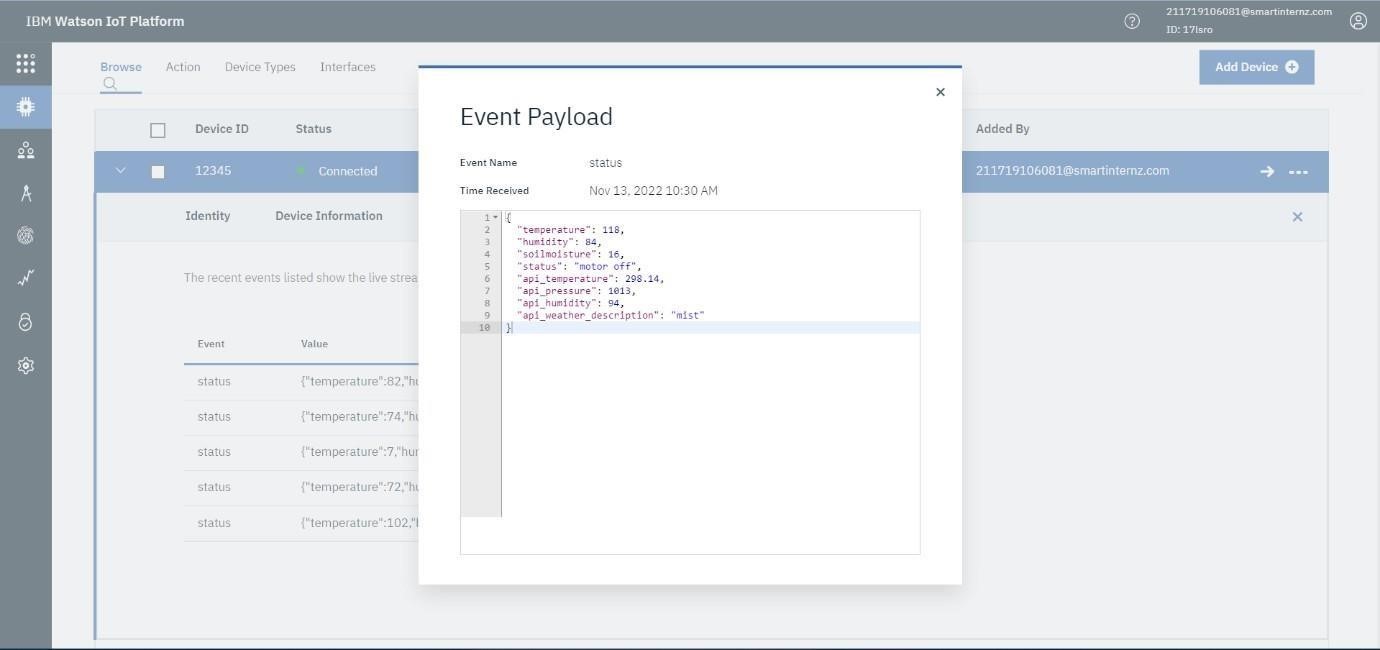
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## Web UI Output



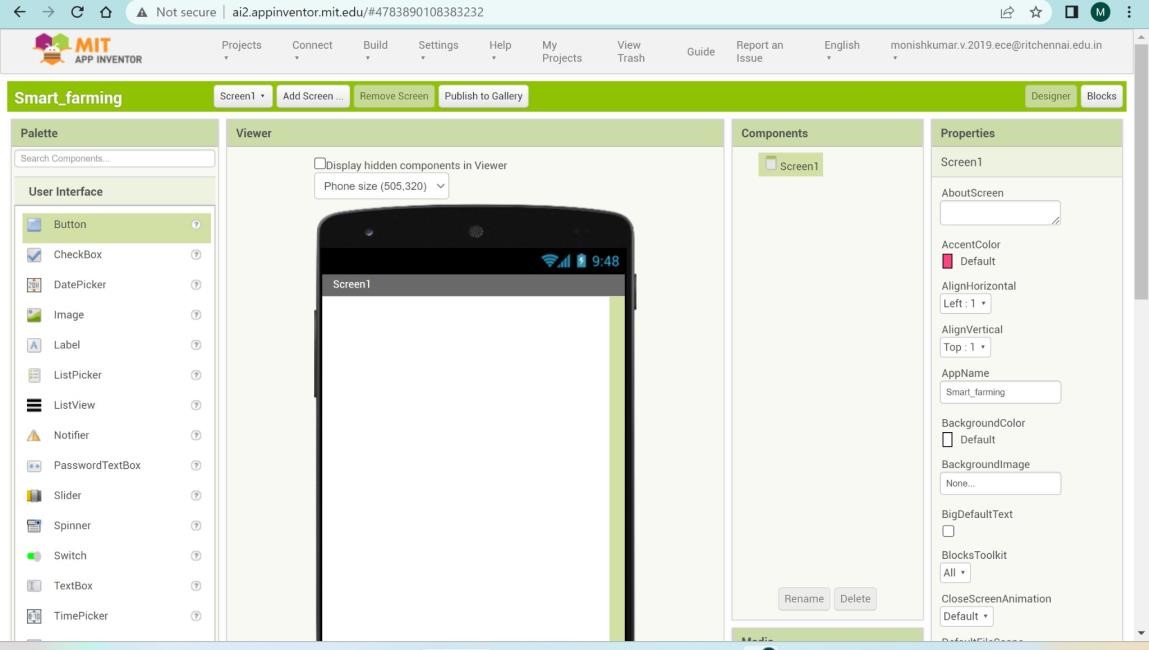
## 

## IBM Watson IoT Platform Device Connect & Live Data

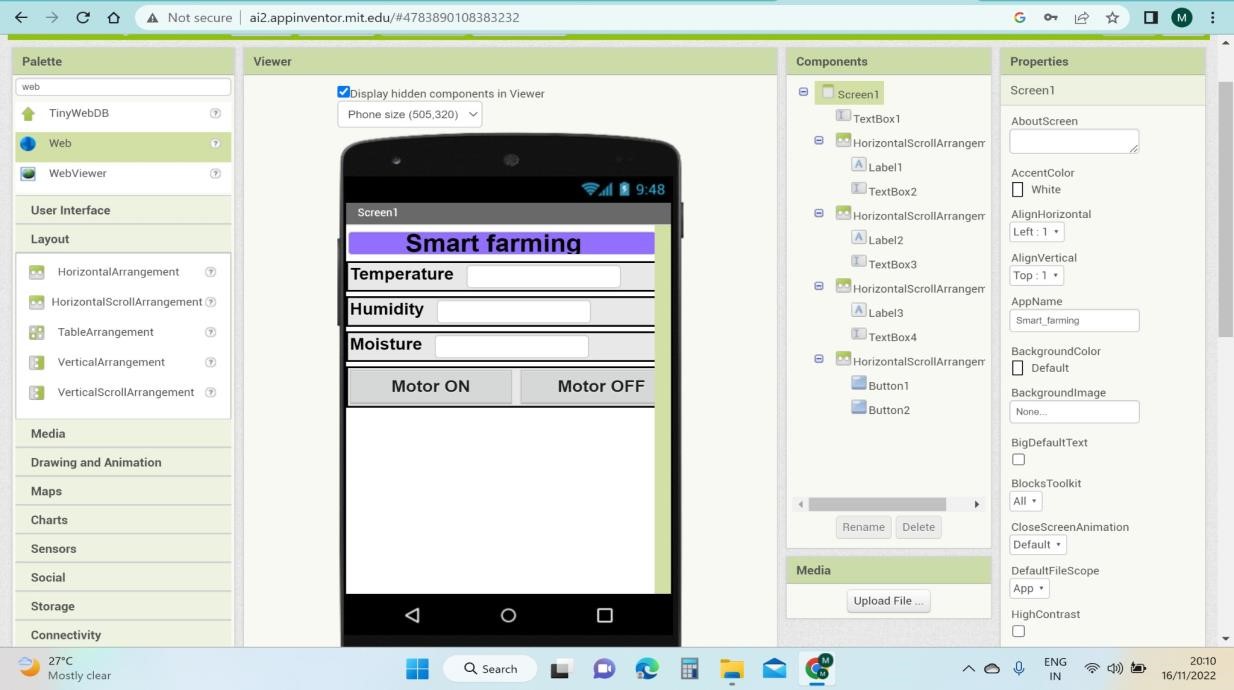


**MIT APP INVENTOR**

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

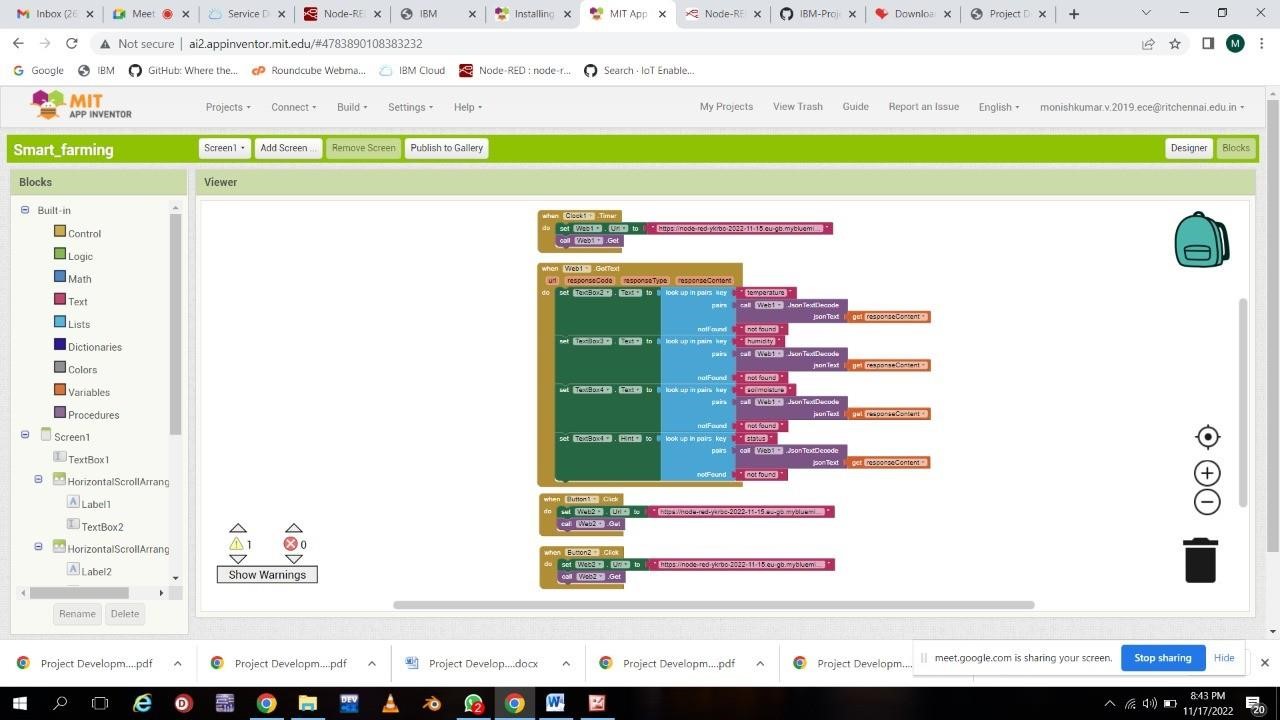


**Step 2:** Create Your User Interface By Using the Preset Tools

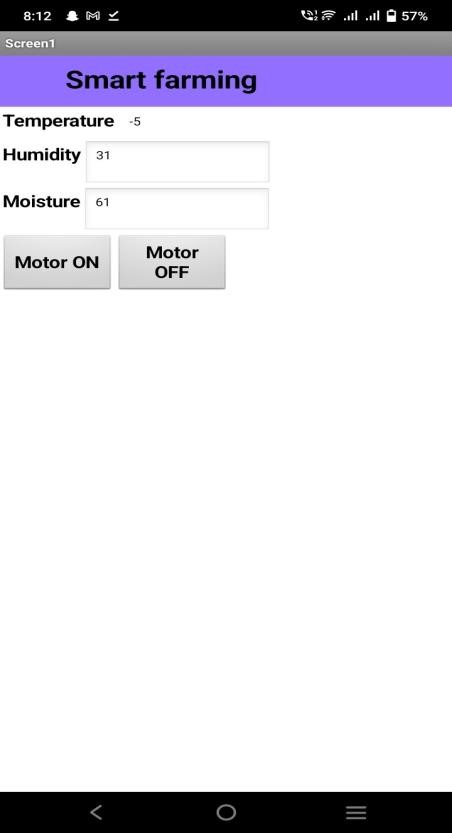


**Step 3:** Back End Process

* 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