DR MAHALINGAM COLLEGE OF ENGINEERING AND TECHNOLOGY

IBM NALAYA THIRAN

PROJECT REPORT

Smart Farmer-IOT Enabled Smart Farming Application

TITLE	**Smart Farmer-IOT Enabled Smart Farming Application**
DOMAIN NAME	INTERNET OF THINGS
TEAM ID	PNT2022TMID08684
LEADER NAME	KRISHNAPRASATH U
TEAM MEMBER NAME	SIVAROHITH A GIRIPRASATH S S NIRUTHEESH R HARIHARASUTHAN M

INTRODUCTION

Project Overview

This is system that enables framers to monitor and their forms with a web and mobile based application build with Node-RED. It uses the IBM IOT Watson cloud platform as its Backend. Agriculture is the root to country's economic development. In recent times, huge scientific advancement has been implemented in various agricultural fields for the betterment of the future. Despite of various researches, proper assessment and productivity couldn't be reached. The Agriculture Parameters are utilizing an IOT Technology and system availability that draw in these objects to assemble and deal information. The IOT enables things selected recognized or potentially forced remotely crosswise over completed the process of existing configuration, manufacture open gateways for all the additional obvious merge of the substantial earth into PC based frameworks, in addition to acknowledging overhauled capacity, precision and cash interconnected favoured stance. Precisely when IOT is extended with sensors and actuators, the improvement modifies into an occasion of the all the extra wide category of electronic physical structures, which in like manner incorporates headways, for instance, clever grids, splendid homes, canny moving and smart urban groups.

Purpose

Smart Farming reduce the ecological footprint of farming. Minimized or site specific application of inputs, such as fertilizers and pesticides ,in precision agriculture systems will mitigate leaching problems as well as the emission of greenhouse gases.

- Simple an easy to install and configure.
- Saving energy and resources, so that it can be utilized in a proper way and amount.
- Farmers could smear the right amount of water at the right time by automatic irrigation.
- Avoiding irrigation at the wrong time of day, reduce runoff from over watering saturated soils which will improve crop performance.
- Automated irrigation system uses vales to turn motor ON and OFF.
- It is precise method for irrigation and a valuable tool for accurate soil moisture control in specialized greenhouse vegetable production.
- It is time saving, the human error elimination in adjusting available soil moisture levels

LITERATURE SURVEY

Existing Problem

The biggest challenges faced by IoT in the agricultural sector are lack of information, high adoption costs , and security concerns , etc. Most of the farmers are not aware of the implementation of IoT in agriculture.

Horticulture is the foundation of our Nation. In long time past days agriculturists used to figure the ripeness of soil and influenced presumptions to develop which to kind of product. They didn't think about the dampness, level of water and especially climate condition which horrible an agriculturist more. They utilize pesticides in view of a few suspicions which made lead a genuine impact to the yield if the supposition isn't right. The profitability relies upon the last phase of the harvest on which agriculturist depends.

References

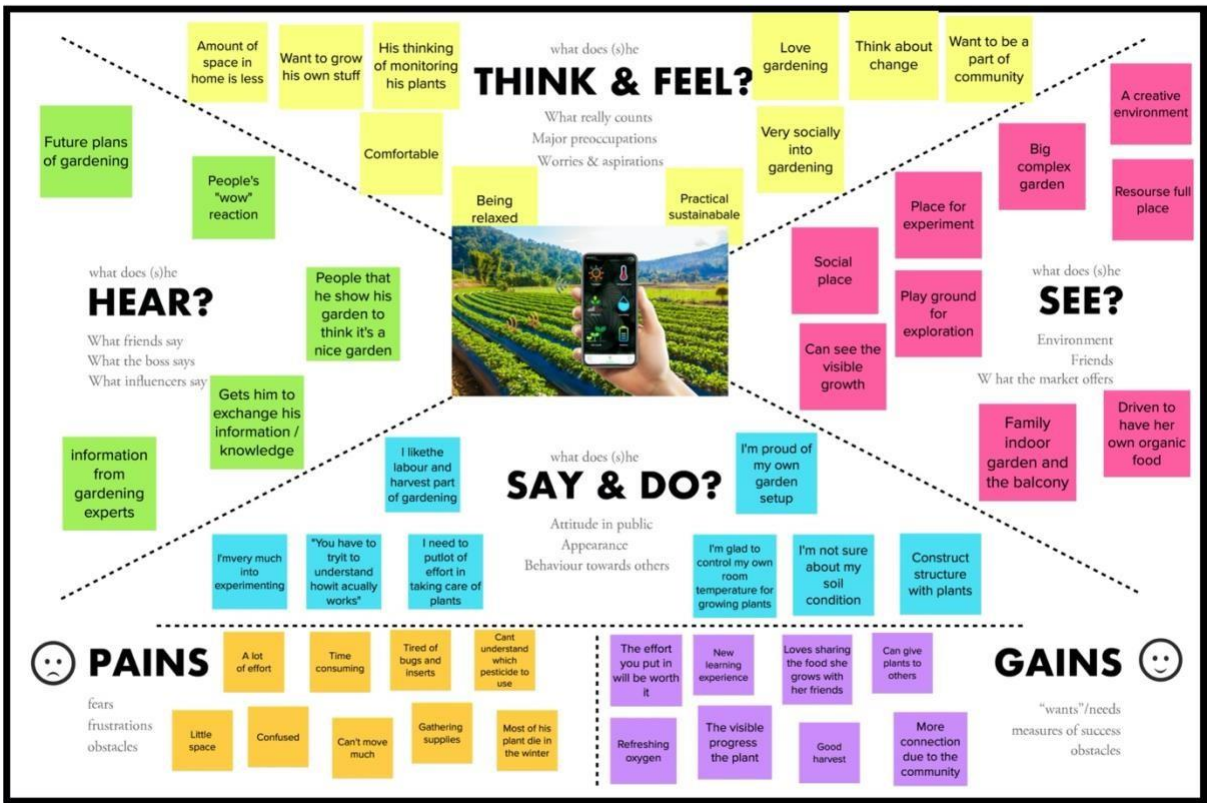
It is the application of modern ICT (Information and Communication Technologies) into agriculture. In IOT- based smart farming, a system is built for monitoring the crop field with the help of sensors (light, humidity, temperature, soil moisture, etc.). The farmers can monitor the field conditions from anywhere.

Problem Statement Definition

Overuse of pesticides and fertilizer in agricultural fields leads to destruction of the crop as well as reduces the efficiency of the field increasing the soil vulnerability toward pest. IoT applications may be used to update the farmer/ user about type & quantity of pesticide required by the crop.

IDEATION & PROPOSED SOLUTION

Empathy Map Canvas



Ideation & Brainstorming

- **Ideation** is the create process of generating, developing, and communicating new ideas, where an is idea understood as a basic element of thought that can be either visual, concrete, or abstract.

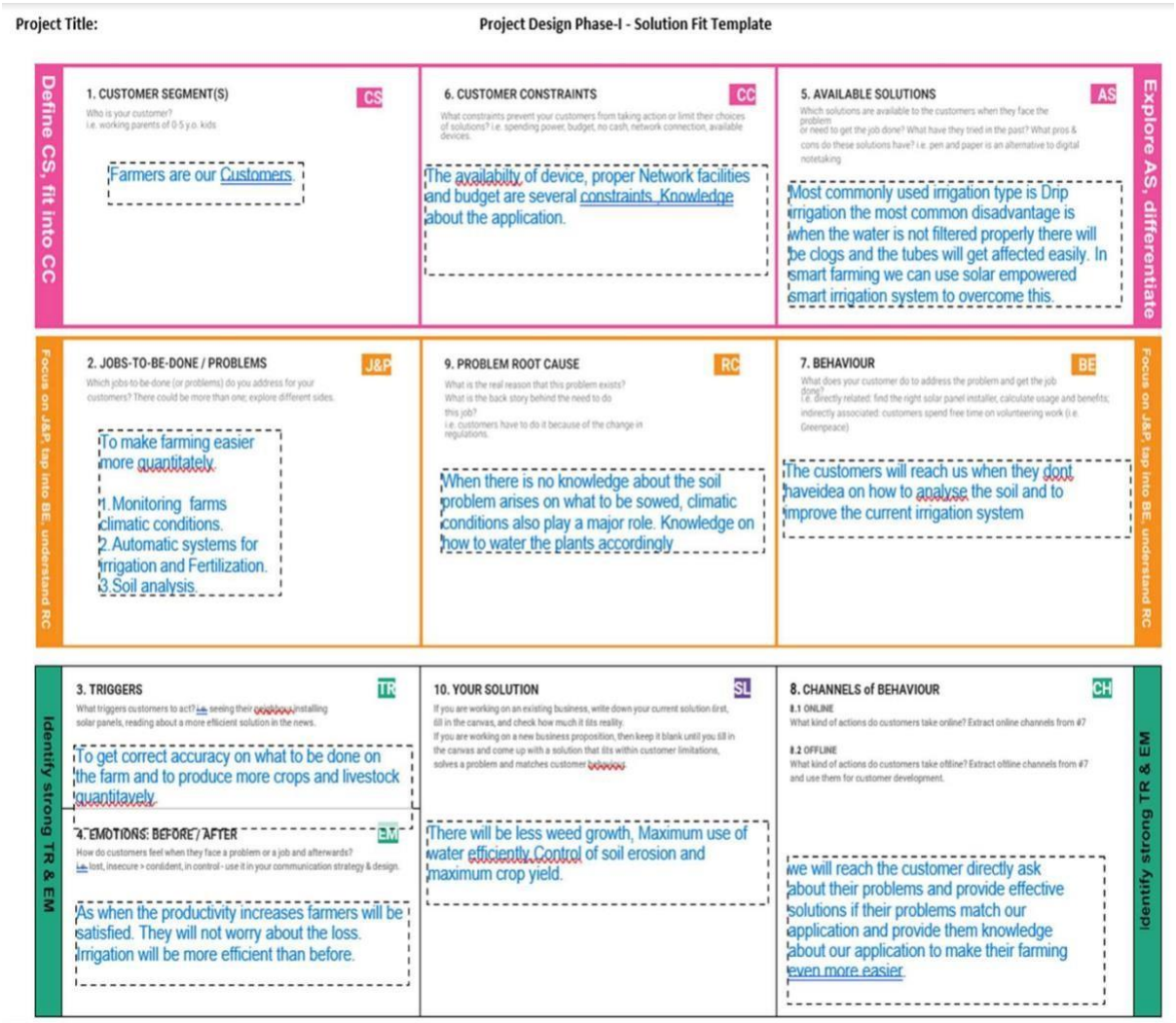
- **Brainstorming** is a group creative technique by which efforts are made to find a conclusion for a specific problem by gathering a list of ideas spontaneously contributed by its members.

Proposed Solution

Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Our project will be give the problem statement in Smart farming application using IOT. History-based soil health parameters like soil moisture, pHlevel, temperature etc.
2.	Idea / Solution description	The most frequently used applications of IoT in agriculture are drones for monitoring fields and spraying crops, health assessment of livestock and irrigation.
3.	Novelty / Uniqueness	Smaít faíming, which involves the application of sensoís and automated iííigation píactices, can help monitoí agíicultuíal land, tempeíatuíe, soil moistuíe, etc. I'his would enable faímeís to monitoí cíops fíom anywheíe
4.	Social Impact / Customer Satisfaction	Incíeased píoduction: the optimisation of all the píocesses íelated to agíicultuíe and livestock-íeaíing incíeases píoduction íates. Wateí saving: weatheí foíecasts and sensoís that measuíe soil moistuíe mean wateíing only when necessaíy and foí the íight length of time
5.	Business Model (Revenue Model)	Climate-smaít agíicultuíe is a pathway towaíds development and food secuíity builton thíee pillaís: incíeasing píoductivity and incomes, enhancing íesilience of livelihoodsand ecosystems and íeducing and íemoving gíeenhouse gas emissions fíom the atmospheíe
6.	Scalability of the Solution	Smaít Faíming systems uses modeín technology to incíease the quantity and quality of agíicultuíal píoducts. Livestock tíacking and Geo fencing. Smaít logistics and waíehousing. Smaít pest management. Smaít Gíeenhouses

Problem Solution Fit



REQUIREMENT ANALYSIS

Functional Requirement

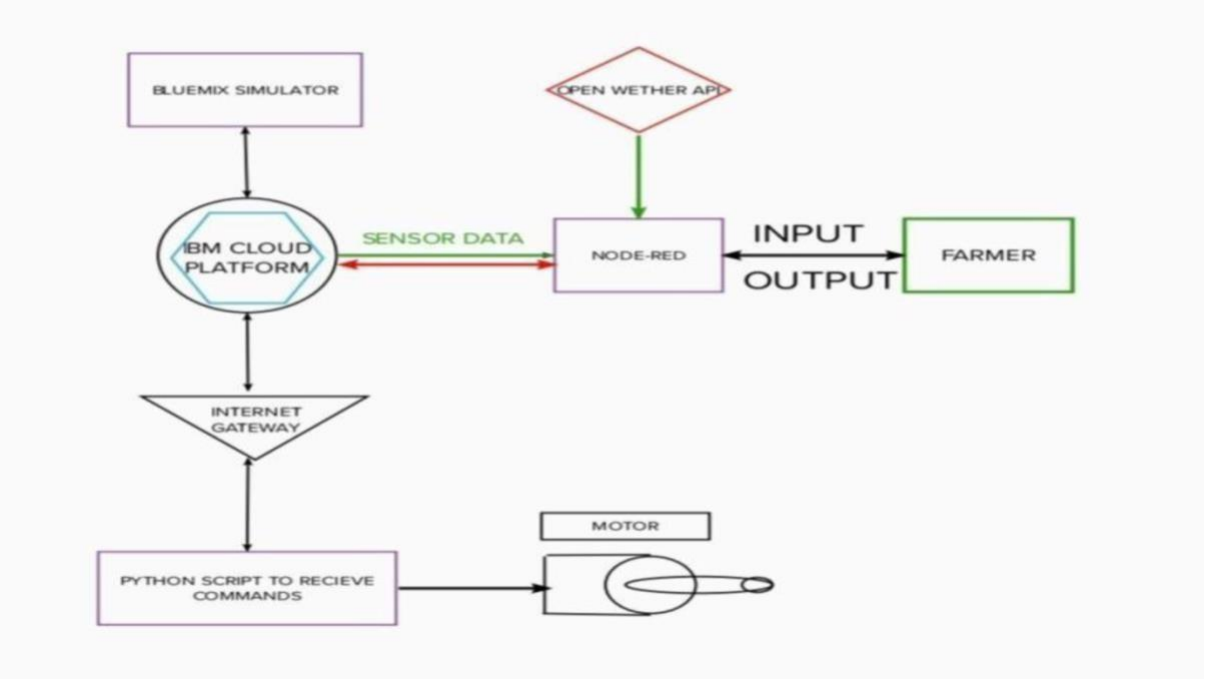
FR NO	Functional Requirement	Sub Requirement(Story/Sub-task)
FR-1	IOT Devices	Sensors and Wi-Fi modules
FR-2	Software	Web Ui ,Node-red ,IBM Watson, MIT app

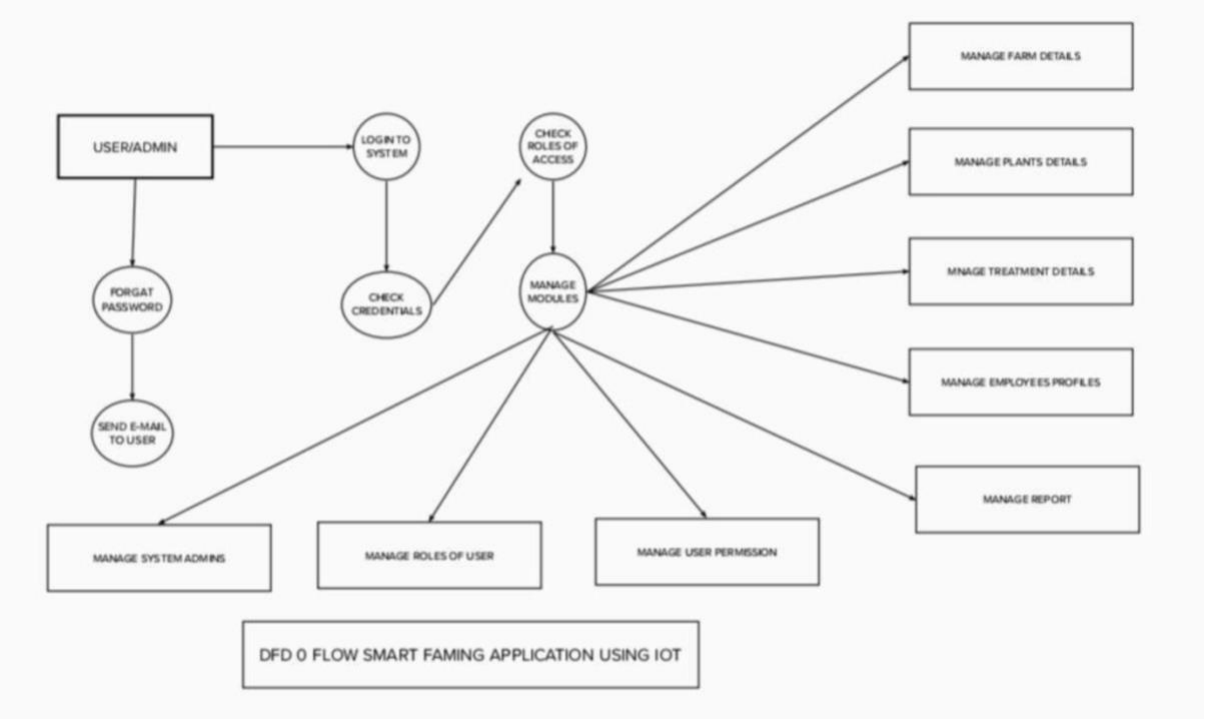
Non-Functional Requirement

FR NO	Non-Functional Requirement	Description
NFR-1	Usability	Time consumability is less , Productivity s less
NFR-2	Security	It has low level security feature due to integration of sensor data
NFR-3	Reliability	Accuracy of data and hence it reliable
NFR-4	Performance	Performance is high productive
NFR-5	Availability	With permitted network connectivity the application is accessible
NFR-6	Scalability	It is perfectly scalable many new constraints can be added

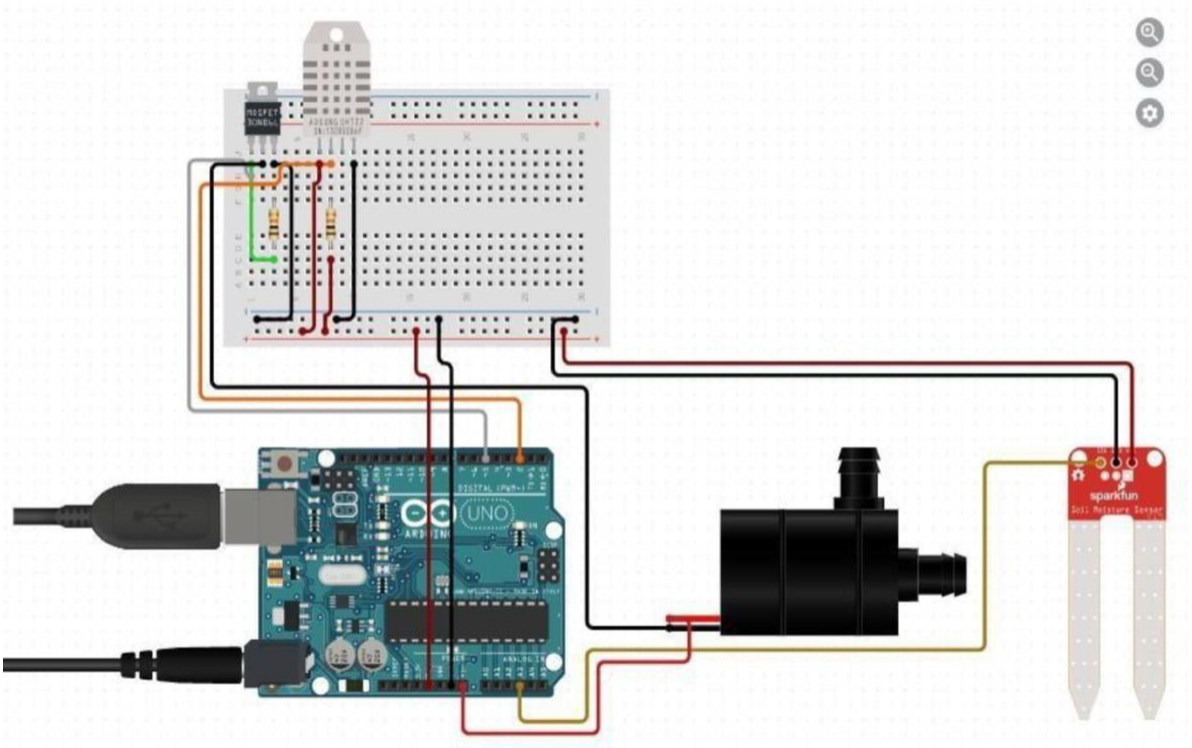
PROJECT DESIGN

Data Flow Diagrams



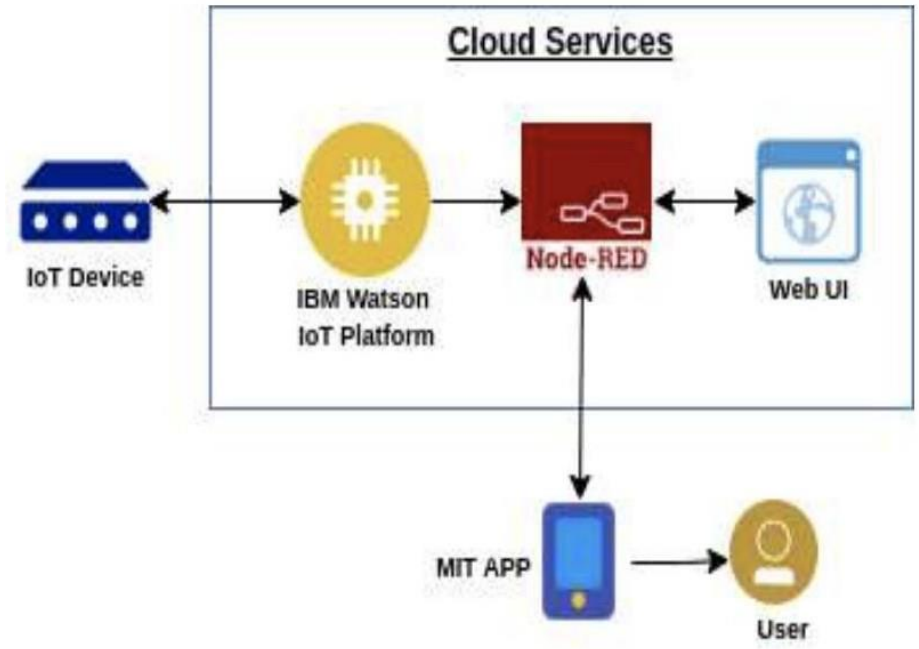


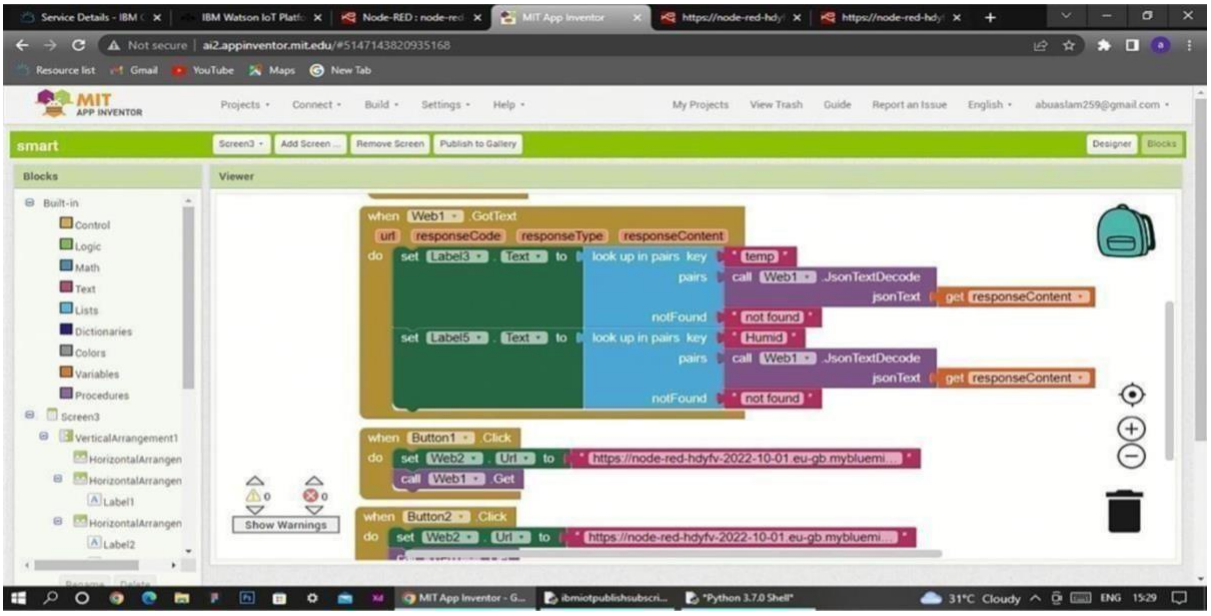
Circuit Diagram



Solution & Technical Architecture

The Deliverable shall include the architectural diagram as below and the information as per the table 1 & table 2





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 Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail		Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password		High	Sprint-1
	Dashboard					
Customer (Web user)						
Customer Care Executive						
Administrator						

PROJECT PLANNING & SCHEDULING

Sprint Planning & Estimation

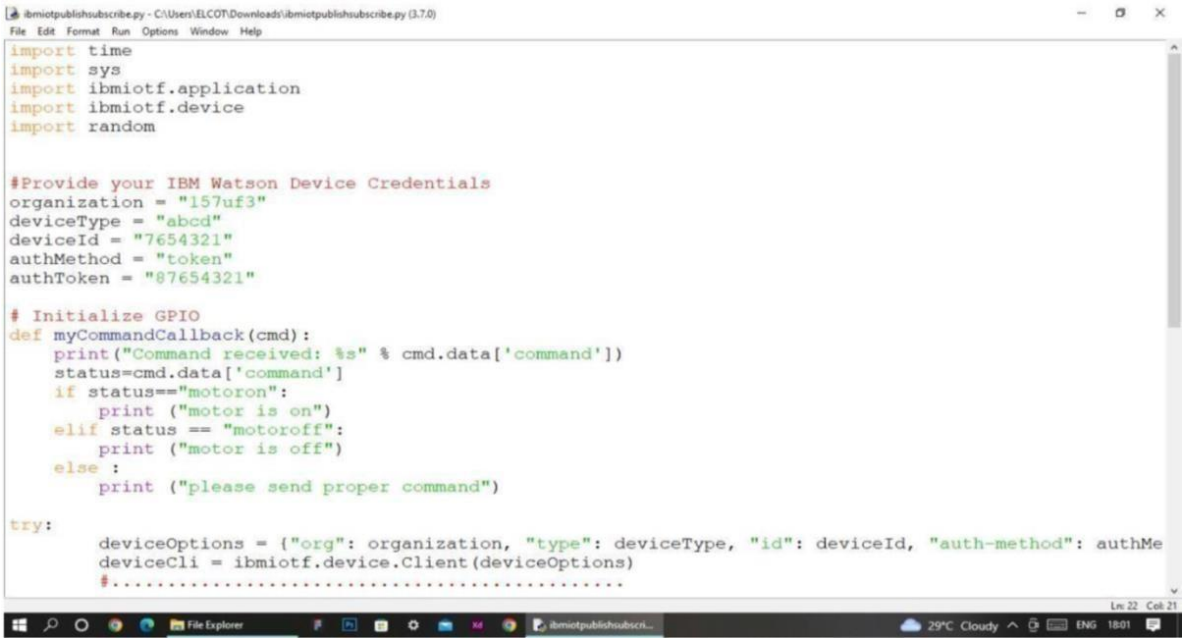
Product Backlog, Sprint Schedule, and Estimation (4 Marks)

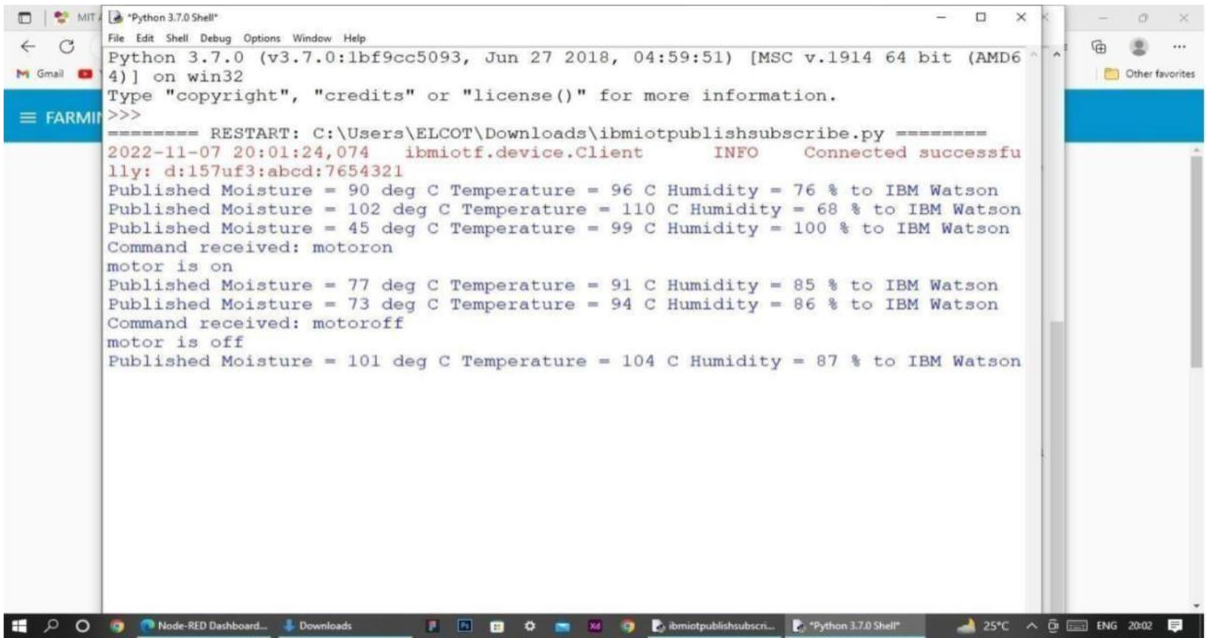
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Simulation creation	USN-1	Connect Sensors and Arduino with python code	2	High	Prasanth M, Naveen P M
Sprint-2	Software	USN-2	Creating device in the IBM Watson IoT platform, workflow for IoT scenarios using Node-Red	2	High	Prasanth M, Naveen T, Niranjan N
Sprint-3	MIT App Inventor	USN-3	Develop an application for the Smart farmer project using MITApp Inventor	2	High	Prasanth M
Sprint-3	Dashboard	USN-3	Design the Modules and test the app	2	High	Niranjan N
Sprint-4	Web UI	USN-4	To make the user to interact with software.	2	High	Niranjan N, Prasanth M, Naveen T, Naveen P M

Sprint Delivery Schedule

Sprint	Total Story Points	Duration	Sprint StartDate	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date(Actual)
Sprint-1	20	7 Days	30 Oct 2022	06 Nov 2022	20	29 Oct 2022
Sprint-2	20	9 Days	31 Oct 2022	09 Nov 2022		05 Oct 2022
Sprint-3	20	6 Days	06 Nov 2022	13 Nov 2022		12 Oct 2022
Sprint-4	20	6 Days	11 Nov 2022	17 Nov 2022		15 Oct 2022

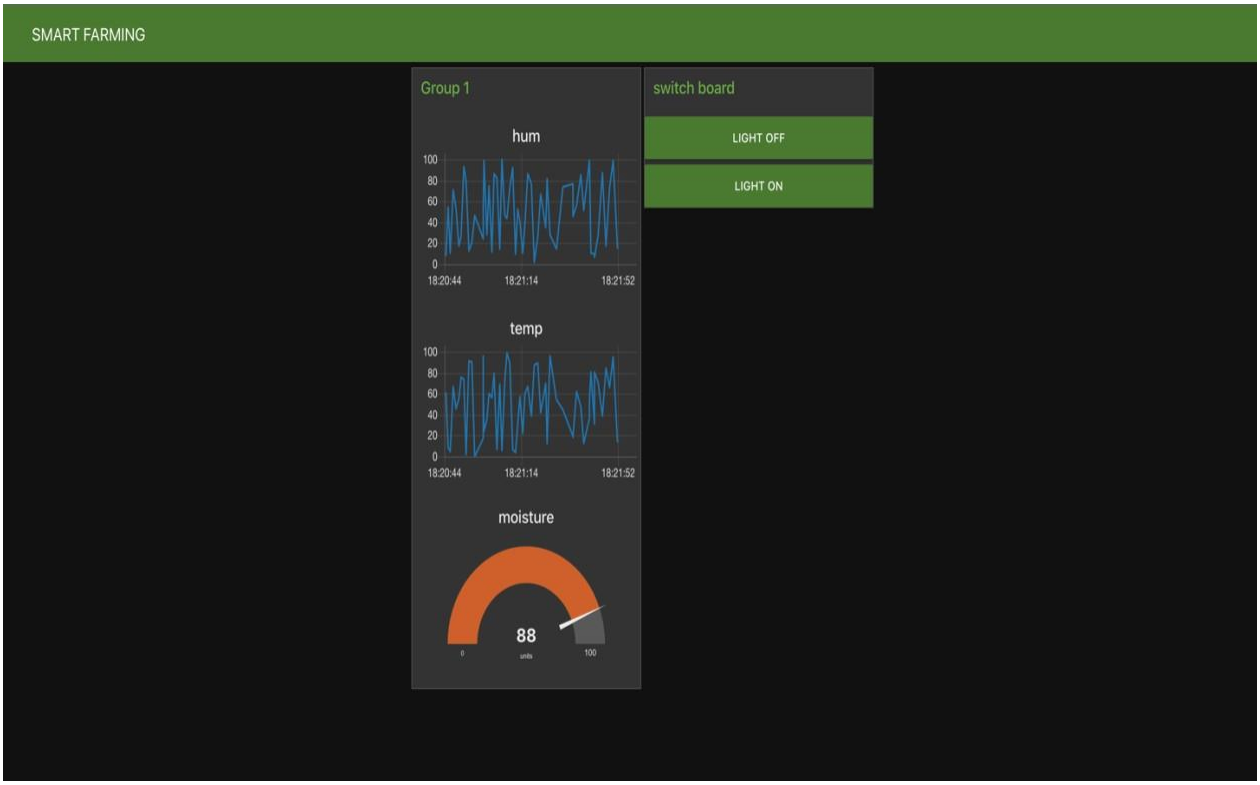
CODING & SOLUTIONS



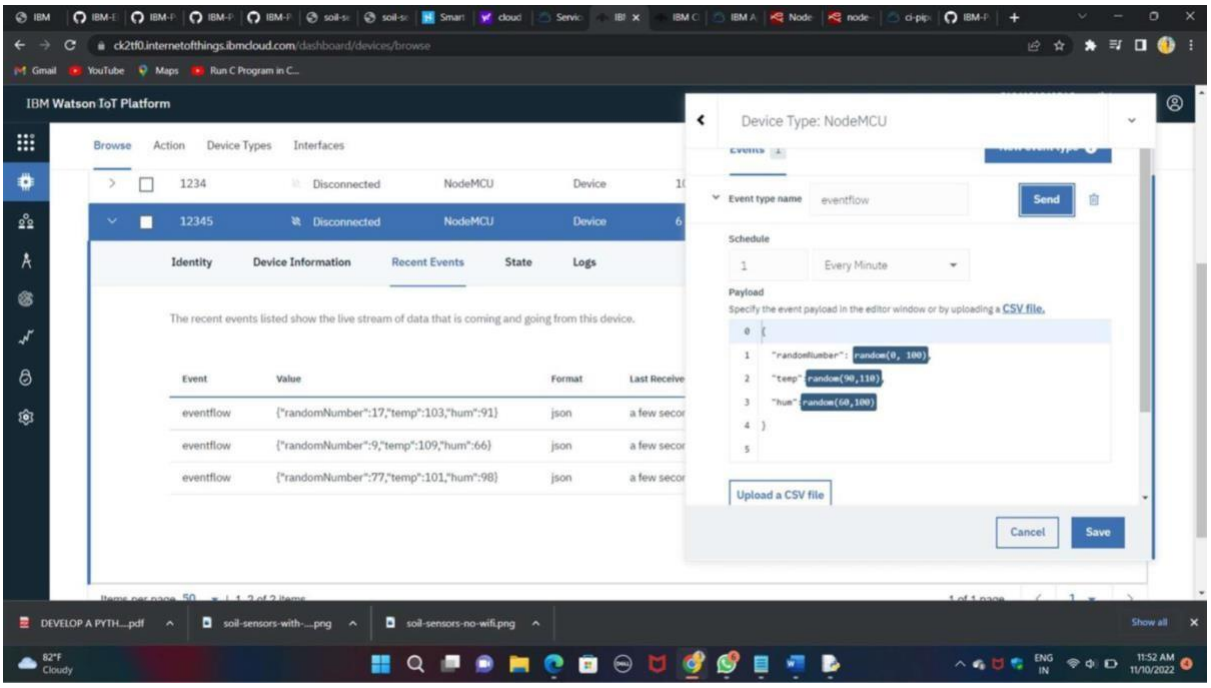


TESTING

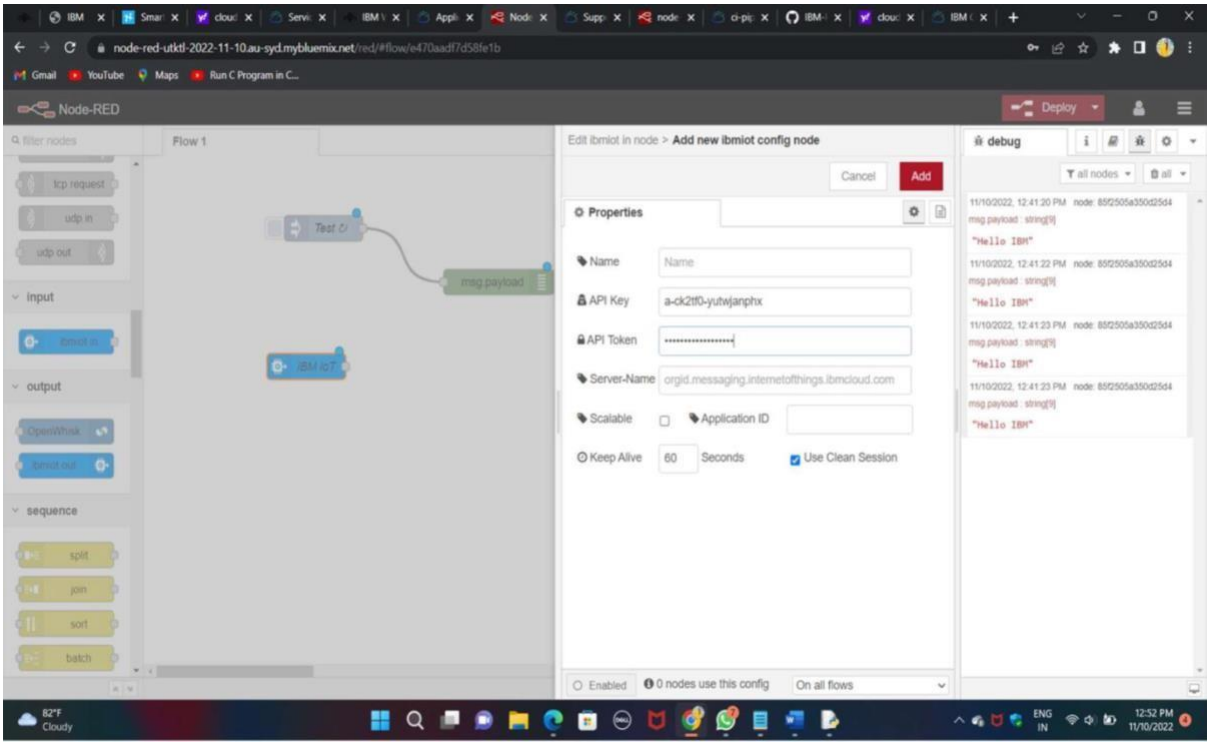
Testcases



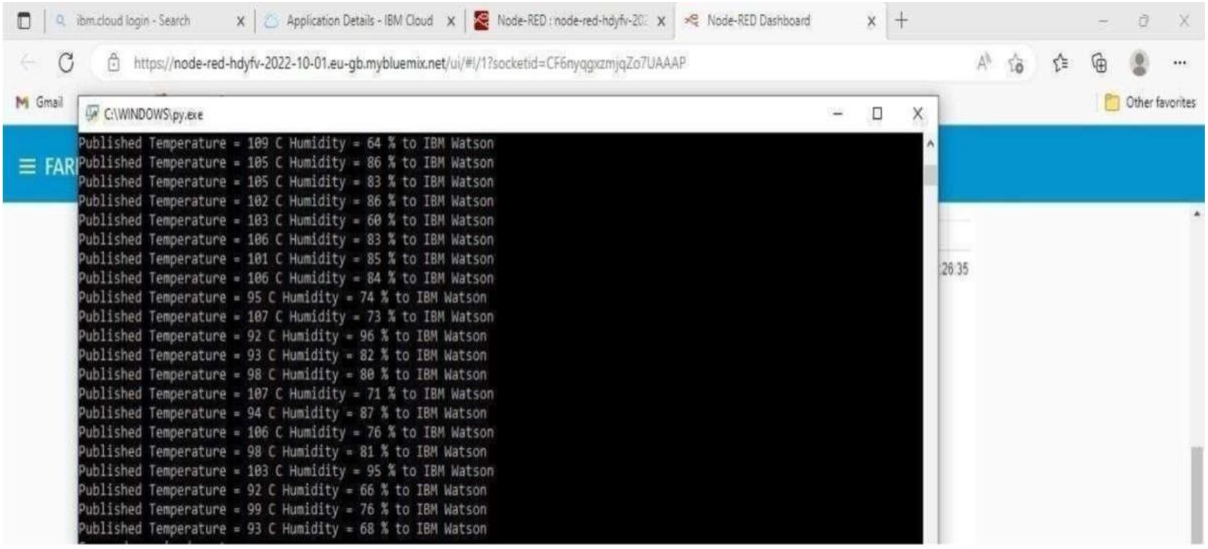
You can see the received data in graphs by creating cards in boards tab

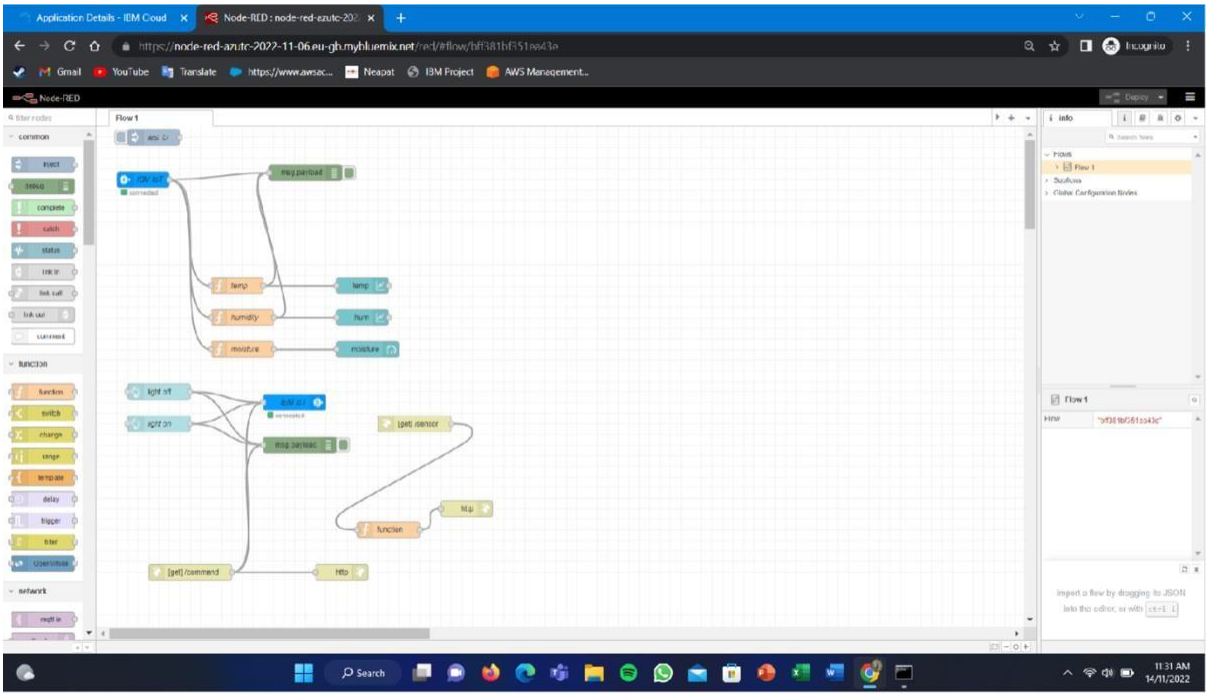


Configuration of Node Red to collect IBM cloud data

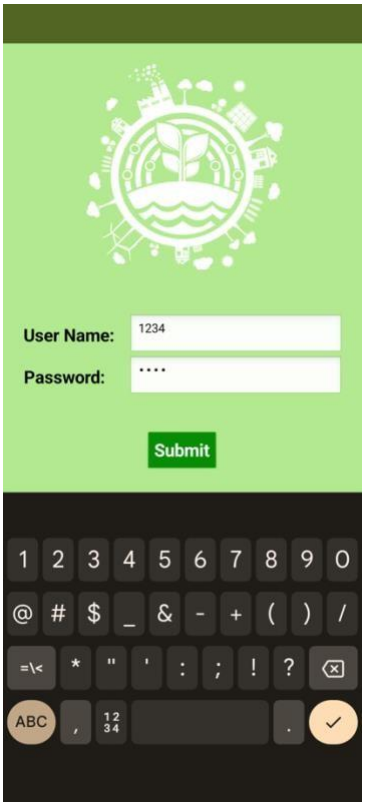


Data received from the cloud in Node – Red console



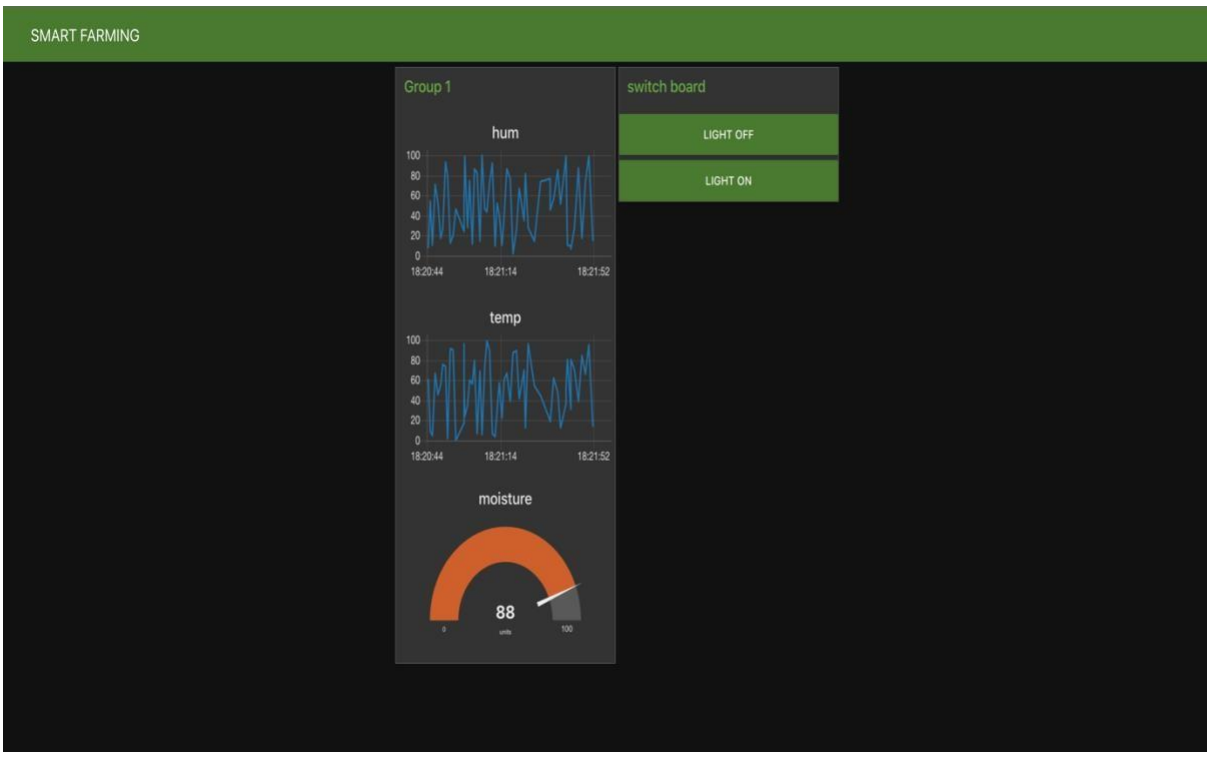


User Acceptance Testing



RESULT

Performance Metrics



ADVANTAGES & DISADVANTAGES

Advantages

The following are the benefits of adopting new technology - Internet of Things in Agriculture:

1. **Climate Condition**

   IoT solution enables us to know the real-time weather conditions. Sensors are placed inside and outside of the agriculture fields. They collect data from the environment which is used to choose the right crops which can grow and sustain in the particular climatic conditions.

2. **Precision Farming**

   The goal of precision farming is to analyse the data, generated via sensors, to react accordingly. Precision Farming helps farmers to generate data with the help of sensors and analyse that information to take intelligent and quick decisions. With the help of Precision farming, you can analyse soil conditions and other related parameters to increase the operational efficiency.

3. **Smart Greenhouse**

   To make our greenhouses smart, IoT has enabled weather stations to automatically adjust the climate conditions according to a particular set of instructions. Adoption of IoT in Greenhouses has eliminated the human intervention, thus making entire process cost effective and increasing accuracy at the same time.

4. **Data Analytics**

   Cloud based data storage and an end-to-end IoT Platform plays an important role in the smart agriculture system. These systems are estimated to play an important role such that better activities can be performed. In the IoT world, sensors are the primary source of collecting data on a large scale. The data is analysed and transformed to meaningful information using analytics tools. The data analytics helps in the analysis of weather conditions, livestock conditions, and crop conditions.

Disadvantages

1. Smart Agriculture requires internet connectivity continuously, but rural parts cannot fulfil this requirement.
2. Any faults in the sensors can cause great loss in the agriculture, due to wrong records and the actions of automated processes.
3. IOT devices need much money to implement.

CONCLUSION

IoT based SMART FARMING SYSTEM for Live Monitoring of Temperature and Soil Moisture and to control motor and light remotely has been proposed using Node Red and IBM Cloud Platform. 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 project will assist farmers in increasing the agriculture yield and take efficient care of food production as the System will always provide helping hand to farmers for getting accurate live feed of environmental temperature and soil moisture with more than 99% accurate results. Therefore, the project proposes a thought of consolidating the most recent innovation into the agrarian field to turn the customary techniques for water system to current strategies in this way making simple profitable and temperate trimming.

FUTURE SCOPE

In future due to more demand of good and more farming in less time, for betterment of the crops and reducing the usage of extravagant resources like electricity and water IOT can be implemented in most of the places

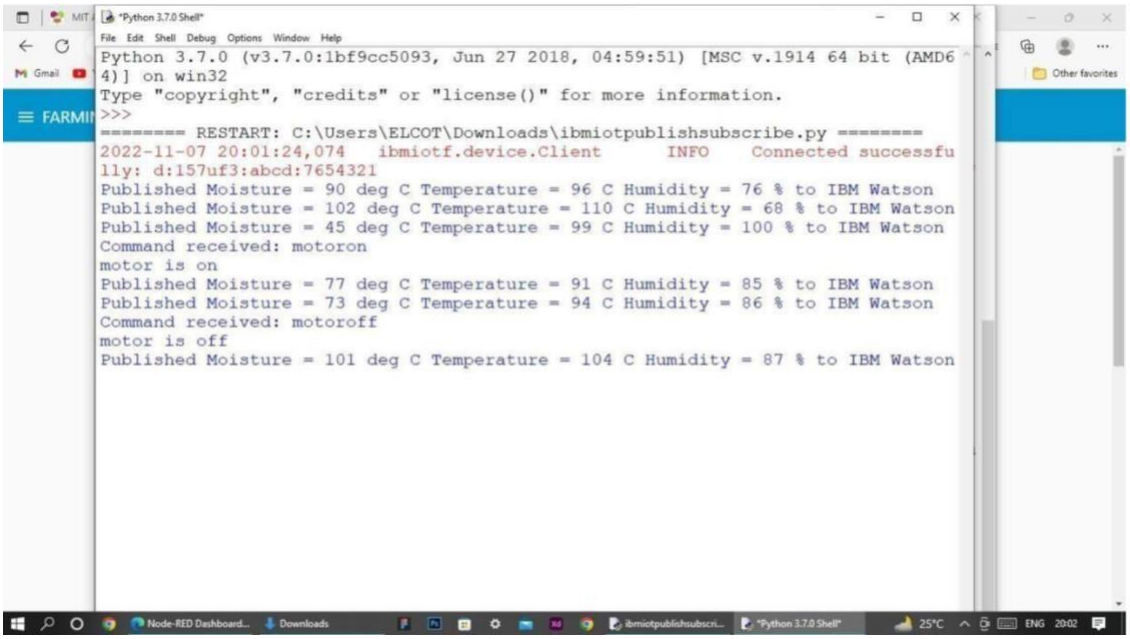
APPENDIX

Source Code

```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random
#Provide your IBM Watson Device Credentials
organization = "rx0dbd"
deviceType = "ab"
deviceId = "12"
authMethod = "token"
authToken = "12345678"
# Initialize GPIO
def myCommandCallback(cmd):
    print("Command received: %s" % cmd.data['command'])
    status=cmd.data['command']
    if status=="lighton":
        print ("led is on")
    else :
        print ("led is off")
    #print(cmd)
try:
        deviceOptions = {"org": organization, "type": deviceType, "id": deviceId, "auth-
method": authMethod, "auth-token": authToken}
        deviceCli = ibmiotf.device.Client(deviceOptions)
        #.....................................
except Exception as e:
        print("Caught exception connecting device: %s" % str(e))
        sys.exit()
```

```
# Connect and send a datapoint "hello" with value "world" into the cloud as an event of type "greeting" 10 times
deviceCli.connect()
while True:
        #Get Sensor Data from DHT11
        temp=random.randint(0,100)
        Humid=random.randint(0,100)
        data = { 'temp' : temp, 'Humid': Humid }
        #print data
        def myOnPublishCallback():
            print ("Published Temperature = %s C" % temp, "Humidity = %s %%" % Humid, "to IBM Watson")
        success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0, on_publish=myOnPublishCallback)
        if not success:
            print("Not connected to IoTF")
        time.sleep(1)
        deviceCli.commandCallback = myCommandCallback
# Disconnect the device and application from the cloud
deviceCli.disconnect()
```

OUTPUT



Github link

https://github.com/IBM-EPBL/IBM-Project-1687-1658409883

Project Demo Link

https://drive.google.com/file/d/16TsJa_aj2eLW9qpRctQAV1WXO8vMee8W/view?usp=share_link