SMART FARMER-IOT ENABLED SMART FARMING APPLICATION

IBM PROJECT REPORT

Submitted by,

AKILANDESHWARI P - 812619106002

ABIRAMI M- 812619106001

SIVASHANKARI S- 812619106013

SHALINI R- 812619106011

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SIRUGANUR,TRICHY- 621 105

ANNA UNIVERSITY:CHENNAI-600 025

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CHAPTER-1
INTRODUCTION:

1.1 PROJECT OVERVIEW:

Agriculture plays an important role in the economy of the world; the entire world depends on agriculture for survival. This is attributed to the fact agriculture serves as a source of the basic human needs. Over the years, there has been an increase in the demand for agricultural production especially considering the increase in the world's population and the need to provide Food security in different parts of the world.Smart farming refers to a farm management concept that uses modern technology with the aim of increase the quality and quantity of agricultural products. This approach includes aspects such as the Internet of Things (IoT), data management, soil scanning, as well as the access to GPS among other smart technologies.

1.2 PURPOSE:

The increasing demand for food, both in terms of quality and quantity, has raised the need for intensification and industrialization of the agricultural sector. The amount of worker may lead to poor productivity and quality of agricultural product.water pumping systems are mostly used by farmers to channel enough water to the crops o maintain the soil moisture.

Conventional water pumping system is controlled by manually by farmers. Farmers are hard or even unable to monitor and provide the required conditions for crops at certain time such as during the night or emergency cases. This project aims to

monitoring and controlling water pumping system using IoT. This project used arduino software to program the Node RED board to link the board with cloud system. Then IBM Watson IoT platform is used for data collection and monitoring. This project is used to monitor the temperature, humidity and soil moisture. This project used MIT app inventer to create the android application. Besides this system also control "ON" and "OFF" water pumping system via smartphone using Android interface at a certain range.

CHAPTER-2
LITERATURE SURVEY

A literature review is a comprehensive summary of previous researchers on the topic.The literature review surveys scholarly articles,books,and other sources relevant to a particular area of research.

2.1 EXISTING PROBLEM:

To provide efficient decision web using wireless sensor network which handle different activities of farm and provides useful information associated with farm. Information associated with soil moisture.temperature and humidity content.

2.2 REFERENCES:

S.NO	TITLE	AUTHORS	ABSTRACT	DRAWBACKS

1	Smart farming: opportunities ,challenges and technology enablers	Manlio Bacco∗, Andrea Berton†, Erina Ferro∗, Claudio Gennaro∗	Agriculture is taking advantage of the Internet of Things paradigm and of the use of autonomous vehicles. The 21st century farm will be run by interconnected vehicles: an enormous potential can be provided by the integration of different technologies to achieve automated operations requiring minimum supervision. This work surveys the most relevant use cases in this field and the available communication technologies, highlighting how connectivity requirements can be met with already available technologies or upcoming standards. Intelligence is considered as a further enabler of automated operations, and this work provides	This can be discouraging factor hindering a lot of promising farmers from adopting it.

			examples of its uses.	
2	IoT Sensor Network Approach for Smart Farming: An Application in Food, Energy and Water System	Yemeserach Mekonnen, Lamar Burton, .Arif Sarwat, Shekhar Bhansali	As the global population soars from today's 7.3 billion to an estimated 10 billion by 2050, the demand for Food, Energy and Water (FEW) is expected to more than double. Such an increase in population and consequently, in the demand for FEW resources will undoubtedly be a great challenge for humankind. A challenge that will be exacerbated by the need for humankind to meet the greater demand for resources with a smaller ecological footprint. This paper is proposing a system developed to optimize the use of water, energy, fertilizers for agricultural crops as a solution to this great challenge. It is an automated smart irrigation system that uses real time data from wireless sensor networks to schedule an irrigation. The test-bed consists of a wireless network monitoring soil moisture, temperature, solar	Instead of the peace meal approach.WSU are equipped with different type of sensor with the capability of measurement acquisition and synchronization of data

			radiation, humidity, and fertilizer sensors embedded in the root area of the crops and around the test-bed. Wireless sensor data transmission and acquisition is managed by an Access Point (AP) using ZigBee protocol. An algorithm was established based on threshold values of temperature and soil moisture automated into a programmable microcontroller to control irrigation time.The system'senergydema ndiscompletely	
3	AN IOT BASED SMART AGRICULTURE SYSTEM	Vrushali Tamhane1, Pratiksha Nigade2, Manali Nigade3, Sushmita Kalbhor4, Prof. Sachin S. Shinde 5	Internet of Things (IoT) performs a key position in smart agriculture. Smart farming is an rising concept, because IOT sensors able to supplying statistics approximately their agriculture fields. The project aims making use of evolving technology i.e. IOT and smart agriculture using automation. The proposed	In places where internet connections are frustratingly slow,smart will be an impossibility

			framework causes Farmer to enhance quality and amount of their farm yield by detecting surrounding temperature and moistness esteems, soil dampness esteem and water level of the tank from the field with no human intercession. By utilizing the idea of IOT framework can be more effective. On the other hand we will use a smart system which close and open green paper according to changes in temperature to protect plants from high temperature.	
4	Agri-IoT: A Semantic Framework for Internet of Things-enabled Smart Farming ApplicationS	Andreas Kamilaris∗, Feng Gao†, Francesc X. Prenafeta-Bold´	With the recent advancement of the Internet of Things (IoT), it is now possible to process a large number of sensor data streams using different large-scale IoT platforms. These IoT frameworks are used to collect, process	instead of the peace meal approach. WSU are equipped with different type of sensor with the capability of

			and analyze data streams in real-time and facilitate provision of smart solutions designedtoprovidede cisionsupport.Existing IoT-basedsolutions are mainly domain-dependent, providing stream processing and analytics focusing on specific areas (smart cities, healthcare etc.). In the context of agri-food industry, a variety of external parameters belonging to different domains (e.g. weather conditions, regulations etc.) have a major influence over the food supply chain, while flexible and adaptive IoT frameworks, essential to truly realize the concept of smart farming, are currently inexistent. In this paper, we propose Agri-IoT, a semantic framework for IoTbased smart farming applications, which supports reasoning over various heterogeneous sensor data streams in real-time. AgriIoT can integrate multiple cross-domain data streams, providing a complete semantic processing pipeline, offering a common framework for smart	measurement acquisition and synchronizatio n of data

			farming applications.	

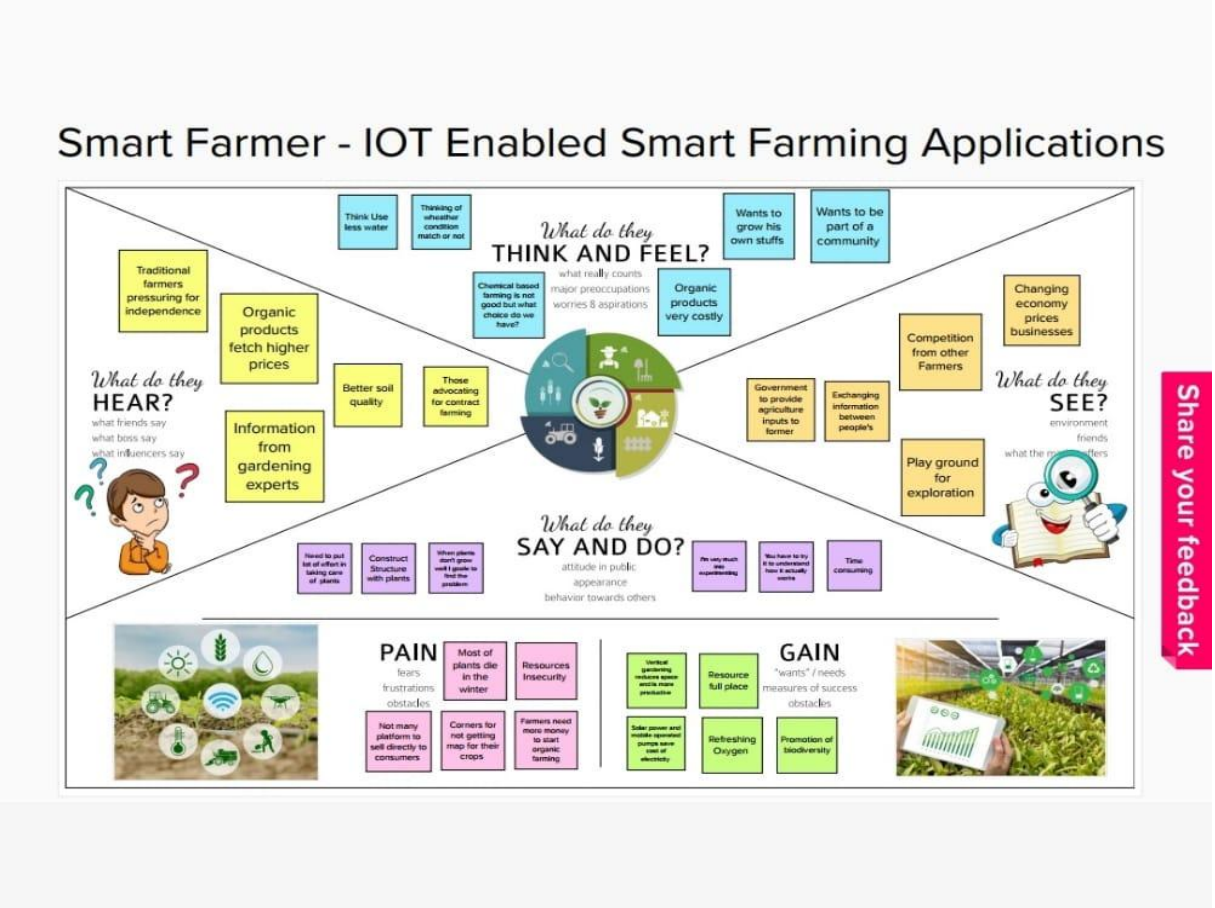
2.3 PROBLEM STATEMENT DEFINITION:

- IoT-based agriculture system helps the farmer in monitoring different parameters of his field like soil moisture, temperature, and humidity using some sensors.
- Farmers can monitor all the sensor parameters by using a web or mobile application even if the farmer is not near his field. Watering the crop is one of the important tasks for the farmers.
- They can make the decision whether to water the crop or postpone it by monitoring the sensor parameters and controlling the motor pumps from the mobile application itself.

CHAPTER-3
IDEATION AND PROPOSED SOLUTION:

3.1. EMPATHY MAP CANVAS:

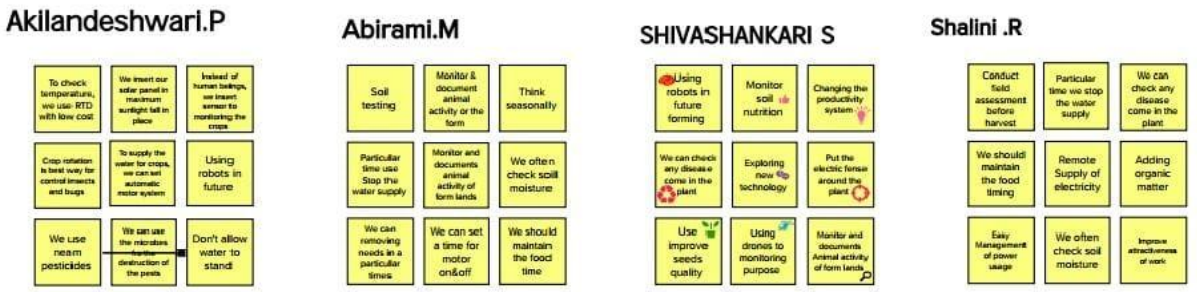
An empathy map is a collaborative tool teams can use to gain a deeper insight into their customers. It helps us to understand the customer's pain, gain and difficulties from their point of view. Proposed solution helped us to analyze and examine our solution more in the grounds of uniqueness, social impact, business model, scalability, etc.

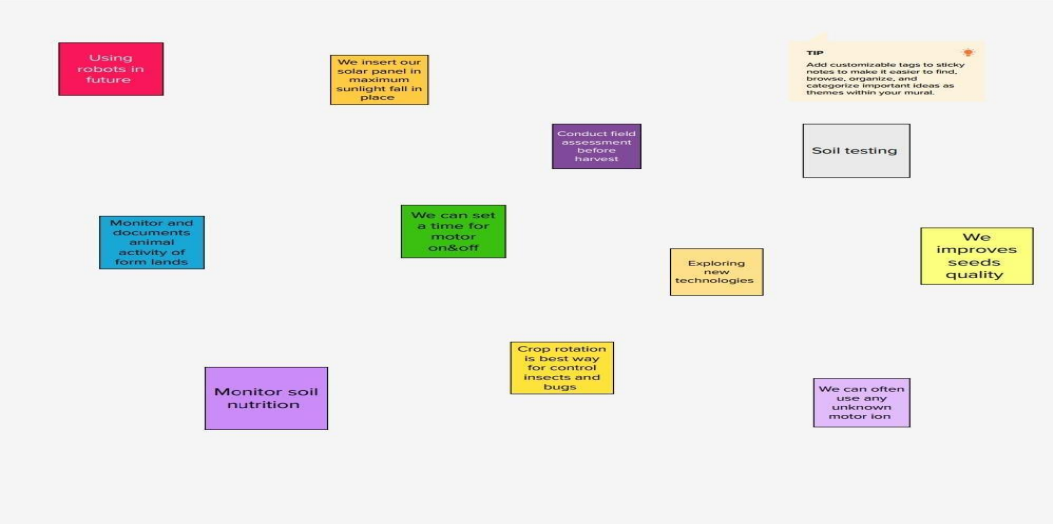


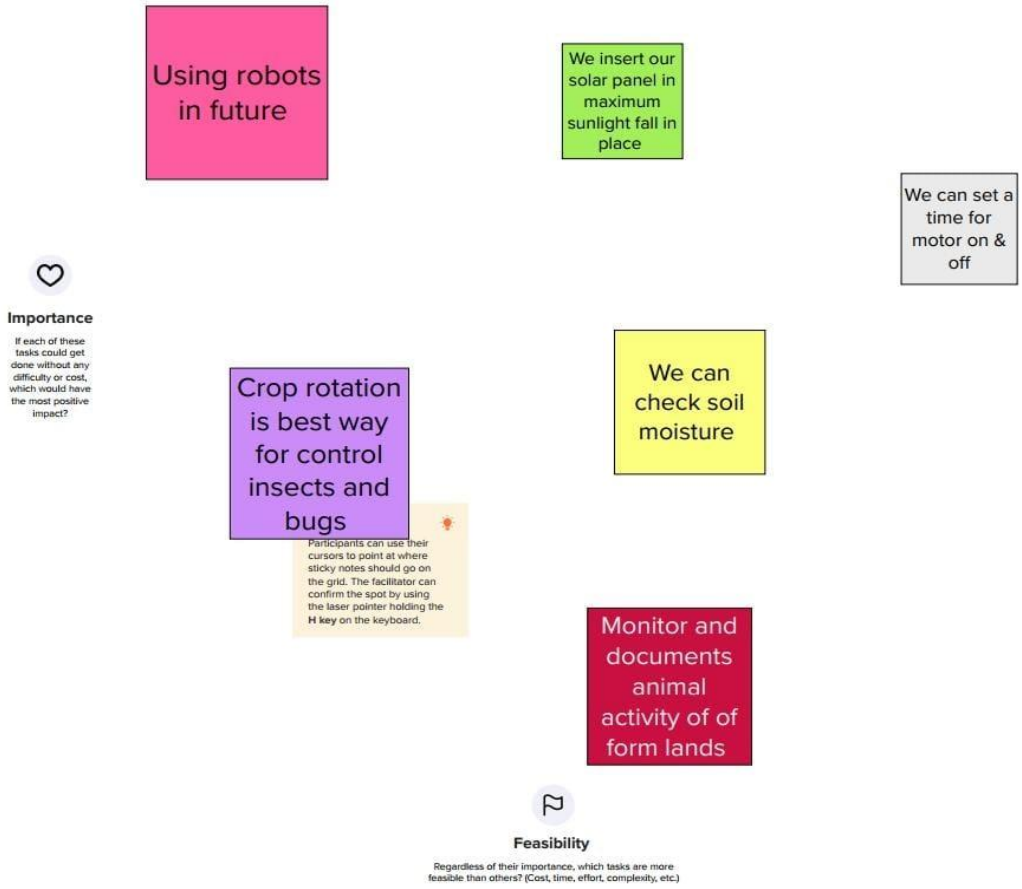
3.2 IDEATION AND BRAINSTORMING:

Brainstorming is a group problem-solving method that helped us to gather and organize various ideas and thoughts from team members.

BRAINSTORMING:





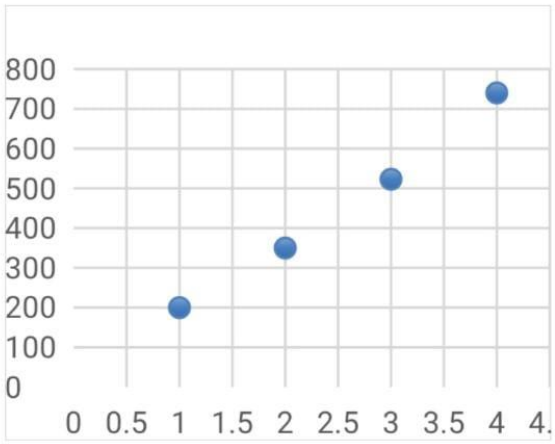


3.3 PROPOSED SOLUTION:

It helped us analyze and examine our solution more in the grounds of uniqueness, social impact, business model, scalability etc..

S.NO	PARAMETER	DESCRIPTION
1	Problem Statement (Problem	● Monitoring the field often it's difficult to the farmers they are unable to do their personal

	to be solved)	works. ● watering the field is more time taken process for farmers because they are waited until the water fully cover the whole land. ● soil moisture, temperature level and humidity levels are need to know because it affect the plant growth and crop yield. ● Power consumption process for motor. Electricity is available only fewer times in villages
2	Idea / Solution description	● We can use the some sensors used to collect the values of temperature, humidity,soil moisture,ect and give this values to the farmers ,it can easily increase the effective efficiency of plants. ● we can use time control systems for motor on, off and irrigation system on ,off. ● precision farming use the drones to monitoring the crop condition and intimate which one requires a nutrition and water,ect.
3	Novelty / Uniqueness Remote access	● It helps the farmers to monitor the motor and irrigation system on, off in anywhere. Alert messages; ● IOT sensors like temperature, humidity,soil moisture, motion detector ,they are collected the information from the farming environment and given to the controller unit (ex;Arduino UNO) it give information to the communication device to reach the farmers (customer)
4	SOCIAL IMPACT/ CUSTOMER SATISFACTION	● It saves the lot of times. ● It reduces the need of more labours. ● Iot can in increase the production efficiency. ● Provide the clean and green foods. ● Iot can also helps in e-commerce business and increase sales. ● It makes a wealthy society.
5	Business Model (Revenue Model)	

		Revenue (No. of Users vs Months)  User Months
6	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

CHAPTER-4

REQUIREMENT ANALYSIS:

It briefs about functional and nonfunctional requirements. It involves the various steps in the entire process. It also specifies features usability, security, reliability, performance, availability and scalability.

4.1 Functional requirements:

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 Gmail
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Log in to system	Check Credentials Check Roles of Access.
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	Log out	Exit

4.2 Non- Functional requirements:

Non-functional Requirements:

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

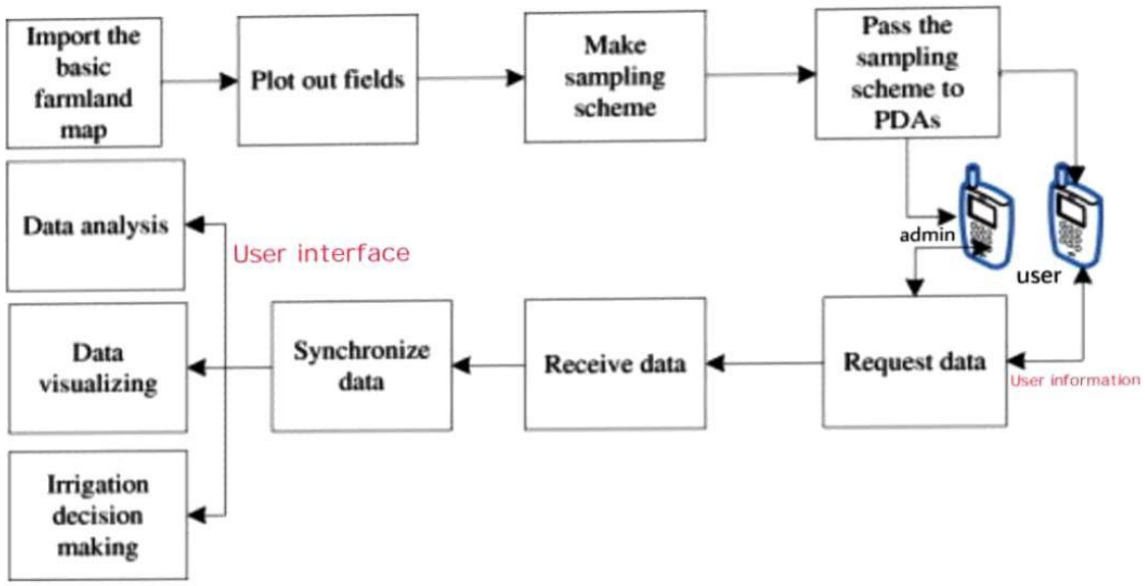
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Usability includes easy learn ability, efficiency in use, remember ability, lack of errors in operation and subjective pleasure.
NFR-2	**Security**	Sensitive and private data must be protected from their production until the decision-making and storage stages.
NFR-3	**Reliability**	The shared protection achieves a better trade-off between costs and reliability. The model uses dedicated and shared protection schemes 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**	Automatic adjustment of farming equipment made possible by linking information like crops/weather

CHAPTER-5

PROJECT DESIGN

5.1 DATA FLOW DIAGRAMS:

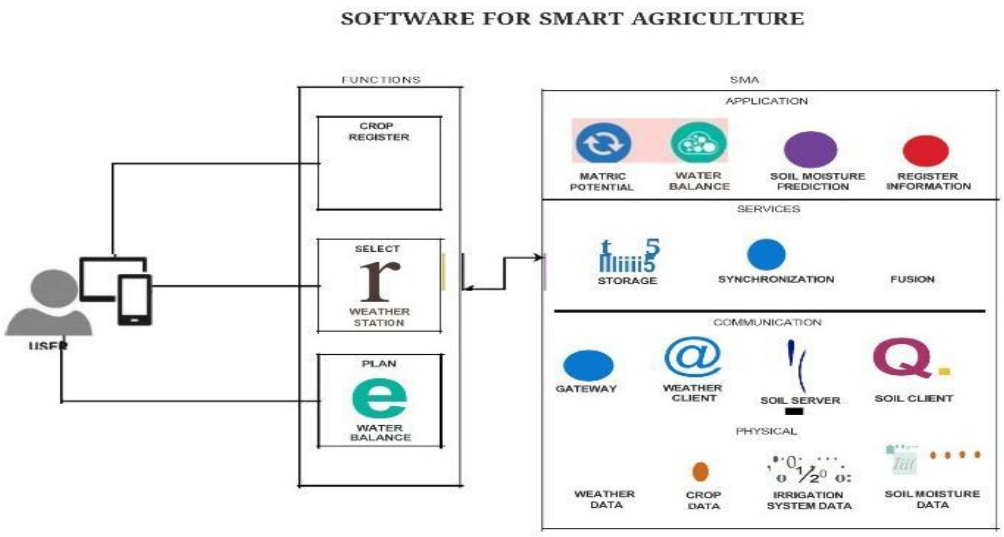
A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.



5.2 Solution and Technical architecture:

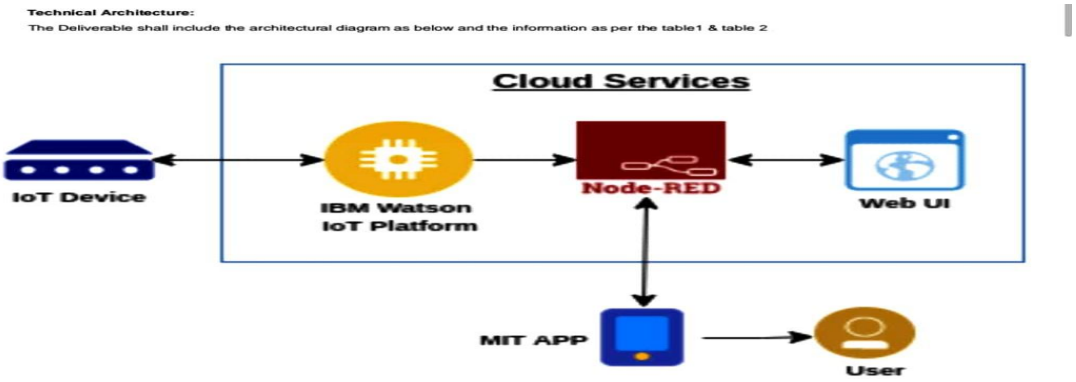
Solution architecture:

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. It helped us understand the features and components used to complete the project.



Technical architecture:

A tech stack is the combination of technologies a company uses to build and run an application or project. It helps us analyze and understand various technologies that needs to be implemented in the project.



- The different soil parameters temperature,soil moistures and then humidity are sensed using different sensors and obtained value is stored in the ibm cloud.
- Arduino UNO is used asa processing unit that process the data obtained from the sensors and whether data from teh weather API.

- NODE-RED is used as a programming tool to write the hardware ,software and APIs.teh MQTT protocol is followed for the communication.
- All the collected data are provided to the user through a mobile application that was developed using the MIT app inventor.The user cloud makes a decision through an app.weather to water the crop or not depending upon the sensor values.by using the app they can remotely operate to the motor switch.

Table-1: components and technologies:

S.NO	COMPONENTS	DESCRIPTION	TECHNOLOGY
1.	User interface	How user interacts with application e.g.web UI,mobile app	HTML,CSS,javascript
2.	Application logic-1	Logic for a process in the application	python
3.	Application logic-2	Logic for a process in the application	IBM watson IOT service
4.	Application logic-3	Logic for a process in the application	IBM watson assistant
5.	database	Data type,configurations ,etc	MySQL,NoSQL
6.	Cloud database	Database services on cloud	IBM cloud
7.	File storage	File storage requirements	IBM block storage or other storage service or local filesystem.
8.	External API-1	Purpose of external API i=used in the application	IBM weather API

9.	Machine learning model	Purpose of Machine learning model	Object recognition model
10.	Infrasture(server/cloud)	Application deployment on local system/cloud Local server configurations: Cloud server configurations:	Local,cloud foundry,kubernetes.

Table-2: application characteristics:

S.NO	Characteristics	Description	Technology
1.	Open - source framework	List the Open - source framework used	Technology of Open - source framework
2.	Security implementations	Sensitive and private data must be protected from their production until the decision-making and storage.	Node-red,open weather app API,MIT app inventor
3.	Scalable architecture	Scalability is a major concern for IOT platforms. It has beeb shown that different architectural choices of IOT platforms affect system.	Technology used
4.	Availability	Automatic adjustment of farming equipment made possible by linking information like crops/weather and equipment to auto-adjust temperature,humidity	Technology used

		,etc.	
5.	Performance	The idea if implementing integrated sensors with sensing soil & environmental or ambient parameters in farming will be more efficient for overall monitoring.	Technology used

5.3 User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority
Customer (Mobile user)	Configure the Application and 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
	Registration Method 2	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
	Registration Method 3	USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low
	Registration Method 4	USN-4	As a user, I can register for the application through Gmail	I can register & access the dashboard with Mail Login	Medium
	Login	USN-5	As a user, I can log into the application by entering email & password	I Logged in, and Check out my Dashboard	High
	Dashboard	USN-6	As a user, I can track, analyze and display data.	Authenticated Users are allowed to access	High
Customer (Web user)	As per the Mobile Application View	USN-7	User Friendly Navigation to Access	Easily Navigated through Pages	High
Customer Care Executive	Helpline to access and report the data error, if in case	USN-8	Provided Stability Support to Recover Issues	If the Data is not Shown or Sensors Not Sensing the Value	Low

CHAPTER-6

PROJECT PLANNING AND SCHEDULING:

6.1 sprint planning & estimation:

_ Sprint Planning is an eventin scrum that defines what can be delivered in the upcoming sprint and how that work will be achieved.It helps us to organize and complete the work effectively and effectively.

TITLE	DESCRIPTION	DATE
Literature Survey & Information Gathering	A literature review is a comprehensive summary of previous researches on the topic. The literature review surveys scholarly articles, books, and other sources relevant to a particular area of research.	30 september 2022
Prepare Empathy Map	An empathy map is a collaborative tool teams can use to gain a deeper insight into their customers. It helps us to understand the customers' pain, gain and difficulties from their point of view.	30 september 2022
Ideation-Brainstorming	Brainstorming is a group problem-solving method that helped us to gather and organize various ideas and thoughts from team members	2 october 2022
Proposed solution	It helped us analyze and examine our solution more in the grounds of uniqueness, social impact, business model, scalability	6 october 2022

	etc.	
Problem Solution Fit	It helped us understand and analyze all the thoughts of our customer,their choice of options, problems, root cause, behavior and emotions.	8 october 2022
Solution Architecture	Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. It helped us understand the features and components used to complete the project	15 October 2022
Customer journey map	It helped to analyze the various steps, interactions, goals and motivation, positives, negatives and opportunities	16 october 2022
Solution requirements	It briefs about functional and nonfunctional requirements. It involves the various steps in the entire process. It also specifies features usability, security, reliability, performance, availability and scalability.	12 october 2022
Data flow graphs	A Data Flow Diagram (DFD) is a traditional visual representation of 22 October 2022 the information flows	18 october 2022

	within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.	
Technology architecture	A tech stack is the combination of technologies a company uses to build and run an application or project. It helps us analyze and understand various technologies that needs to be implemented in the project.	22 october 2022
Prepare milestone and activity list	Helps us understand and evaluate our progress and accuracy so far.	26 october 2022
Project development -delivery of sprint-1,2,3,4	develop & submit the developed code by testing it	Towards progress

6.2 Sprint Delivery Schedule:

Use the below template to create product backlog and sprint schedule:

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Mobile/web user Registeration	USN-1	As a user I can register the application by entering my email, password so that feel good	10	High	Abirami. M
Sprint-1		USN-2	As a user I want confirmation mail for registration	10	Medium	Shalini .R
Sprint-2	Mobile/web user Login	USN-3	As a user I can login the application by entering my email and password so that am entering the application	10	High	Akilandeshwari . P
Sprint-2		USN-4	As a user I can login to the application by entering my phone number so can easily enter into the dashboard	10	Low	Siva Shankari .S
Sprint-3	Monitoring and controlling	USN-5	As a user I want smart application so that monitor the fields	2	High	Abirami. M
Sprint-3		USN-6	As a user I want to know the temperature level so that easily know irrigation timing	5	High	Akilandeshwari . P
Sprint-3		USN-7	As a user I want to check the humidity sothat helpful to put water	5	Low	Siva Shankari . S
Sprint-3		USN-8	As a user I wants smart application so that monitor anywhere at anytime	3	Low	Shalini. R
Sprint-3		USN-9	As a user I want motor control so that stop water wastage	5	High	Abirami .M

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-4	Software connection	USN-10	As a admin I want to satisfy their users so that connect & store in ibm iot	5	Medium	Akilandeshwari. P
Sprint-4		USN-11	As a admin I want to make software (node red,ibm Watson) connection so that simulate the values	5	Medium	Siva Shankari. S
Sprint-4		USN-12	As a admin I want to test the application so that know it's work or not	10	High	Shalini. R

Project Tracker ,Velocity & Burndown Chart:(4Marks)

Sprint	Total Story Points	Duration	Sprint Start 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 Oct 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	19 Nov 2022

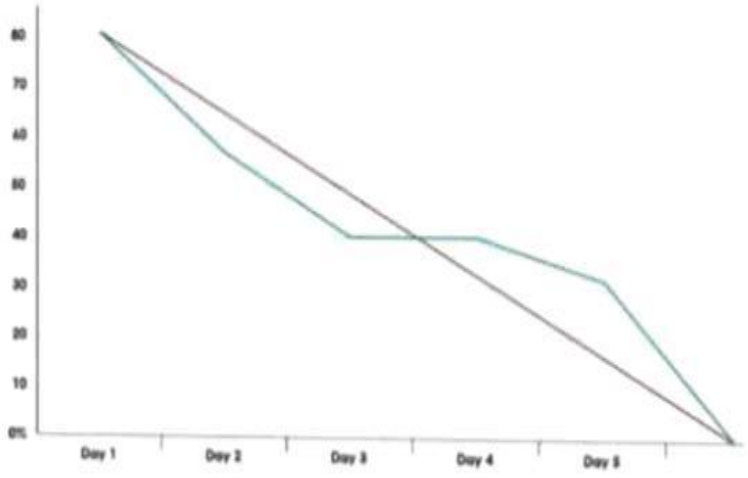
Velocity:

Imagine we have a 06-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

Average Velocity = Sprint Duration / Velocity = 20/6=3.33

Burndown chart:

A burn down chart is a graphical representation of work left to do versus time. It is often used in agilesoftware developmentmethodologies such asScrum. However, burn down charts can be applied to any project containing measurable progress over time.



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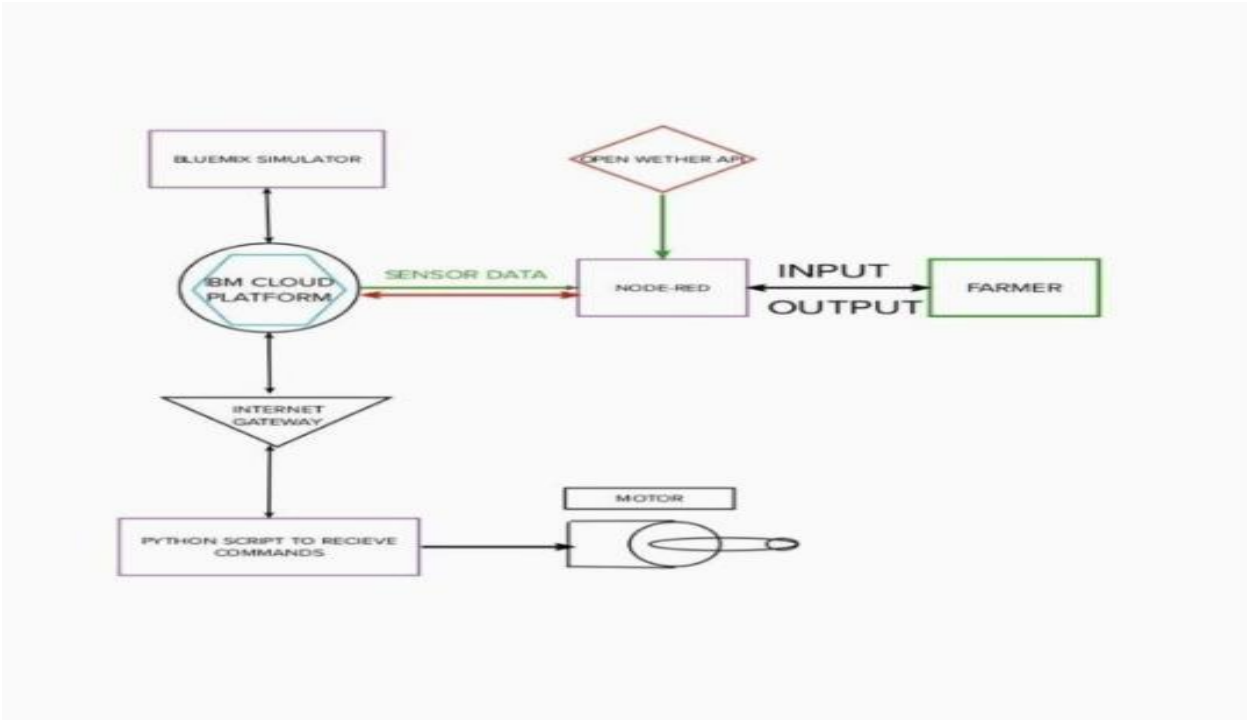
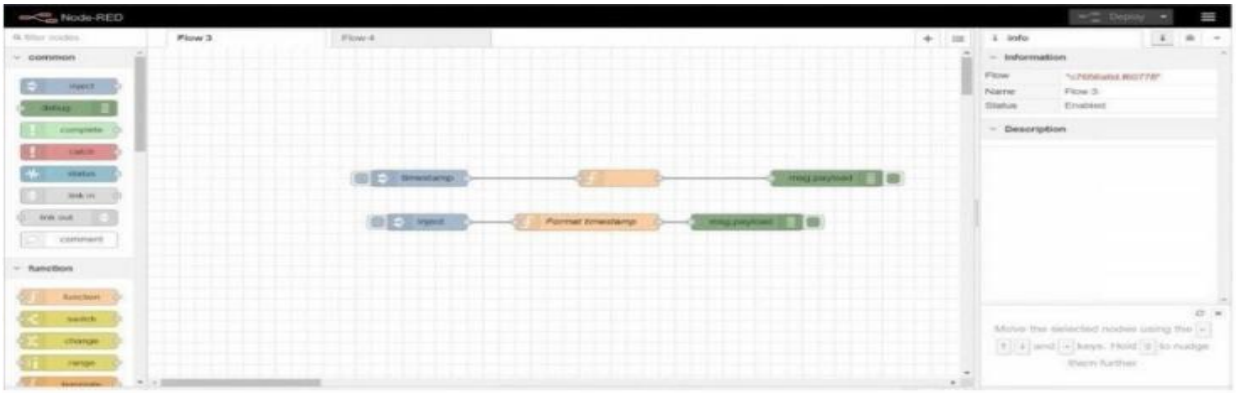
CHAPTER-7

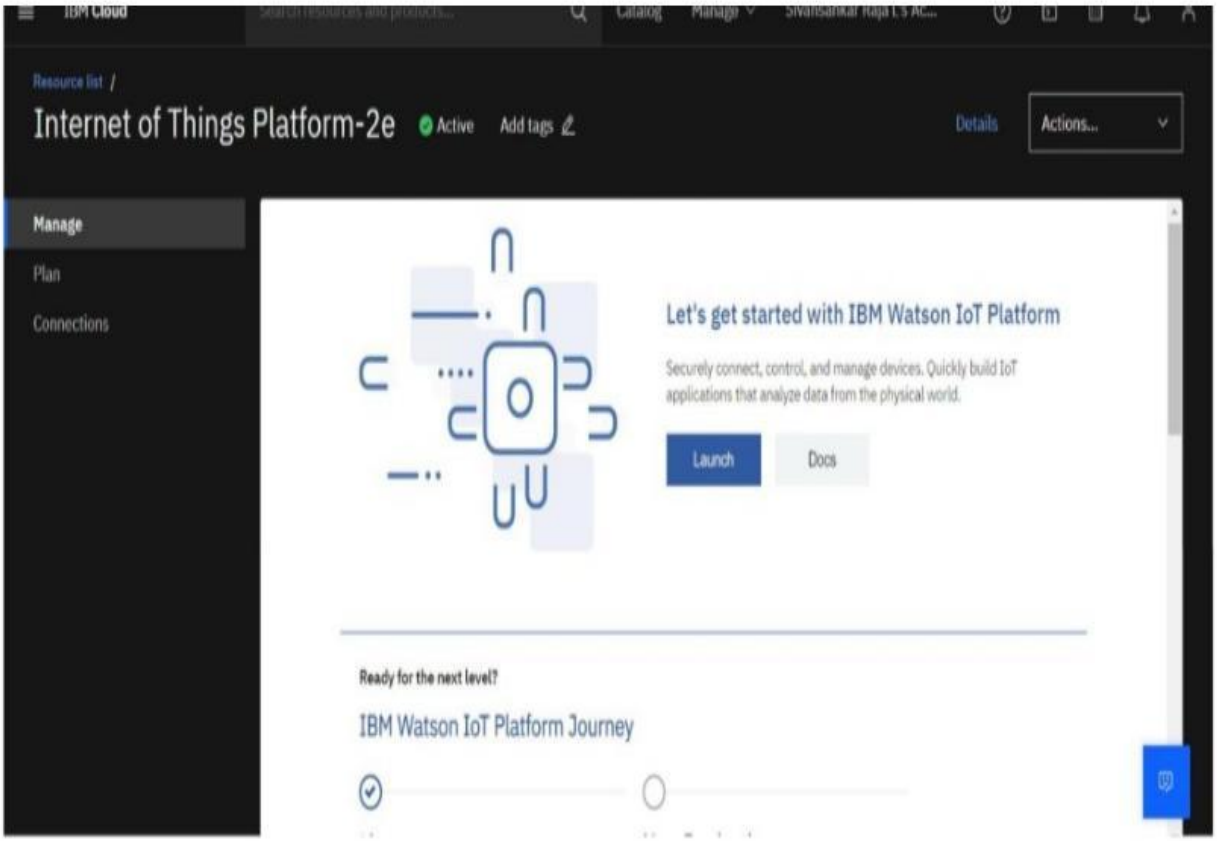
CODING & SOLUTIONING

7.1 Features: sprint-1

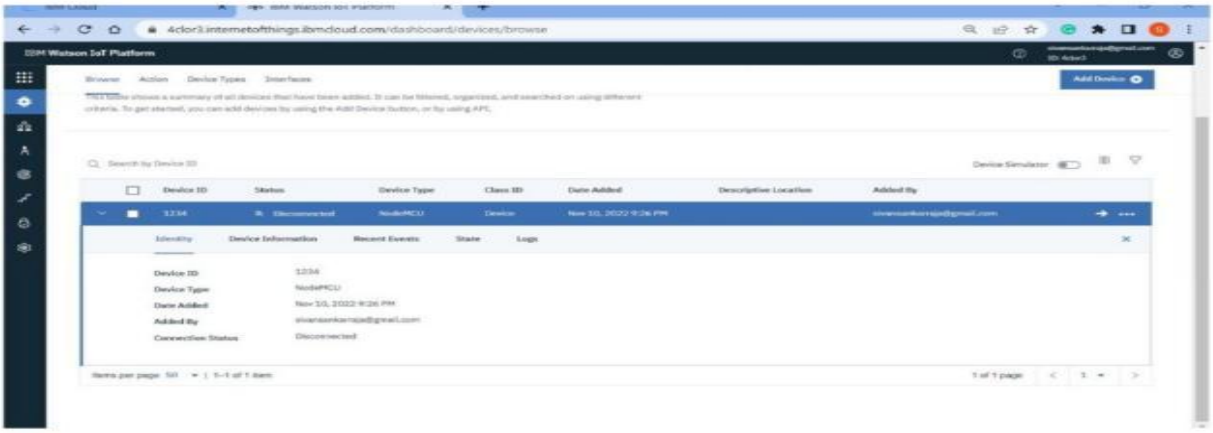




- First install npm/node.js
- Open cmd prompt
- Type => npm install node-red


Resource list /
Internet of Things Platform-2e
Active
Add tags
Details
Actions...
Manage
Plan
Connections
Let's get started with IBM Watson IoT Platform
Securely connect, control, and manage devices. Quickly build IoT applications that analyze data from the physical world.
Launch
Docs
Ready for the next level?
IBM Watson IoT Platform Journey

SPRINT-2:



4.2.c Python IDE

Install Python3 compiler

Install any python IDE to execute python scripts, in my case I used Spyder to execute the code.

➢ You can see the received data in Recent Events under your device

➢ Data received in this format(json)

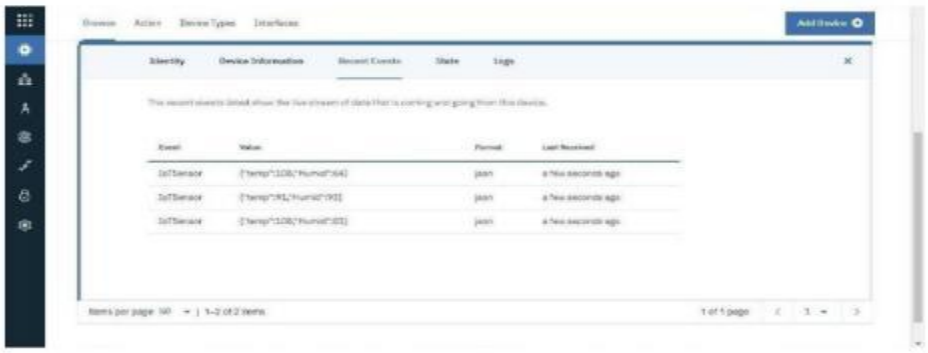
{

"d": {

- "name": "NodeMCU",
- "temperature": 17,
- "humidity": 76,
- "Moisture ": 25

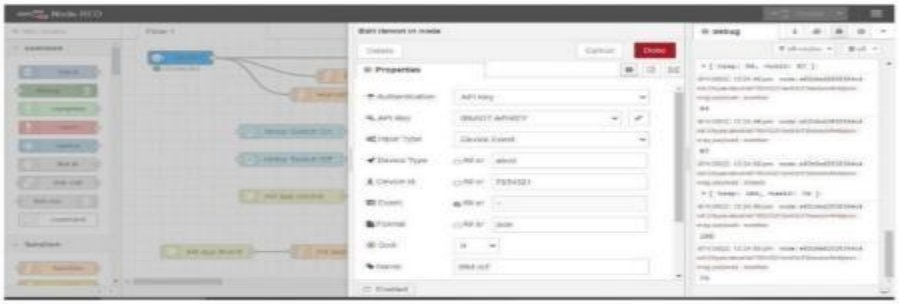
}

}

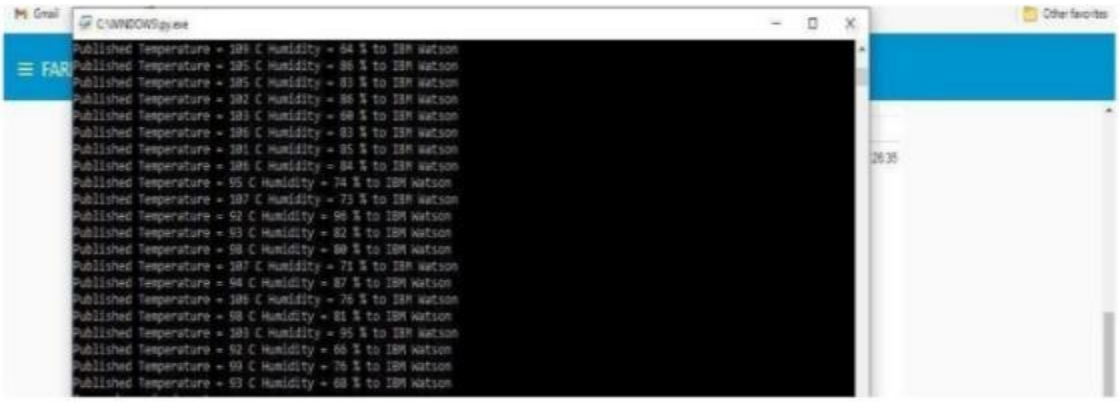


Configuration of Node-Red to collect IBM cloud data

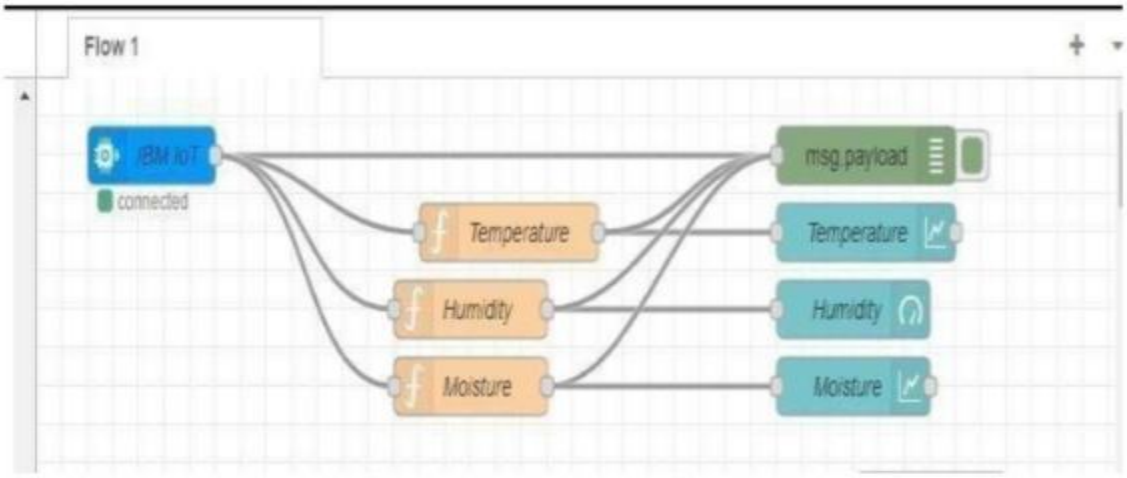
The node IBM IOT App In is added to Node-Red workflow. Then the appropriate device credentials obtained earlier are entered into the node toconnect and fetch device telemetry to Node-Red.



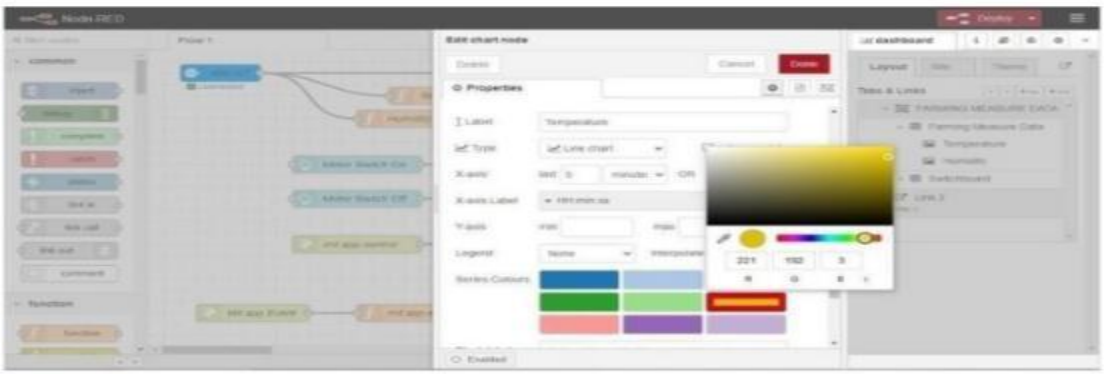
Once it is connected Node-Red receives data from the device Display

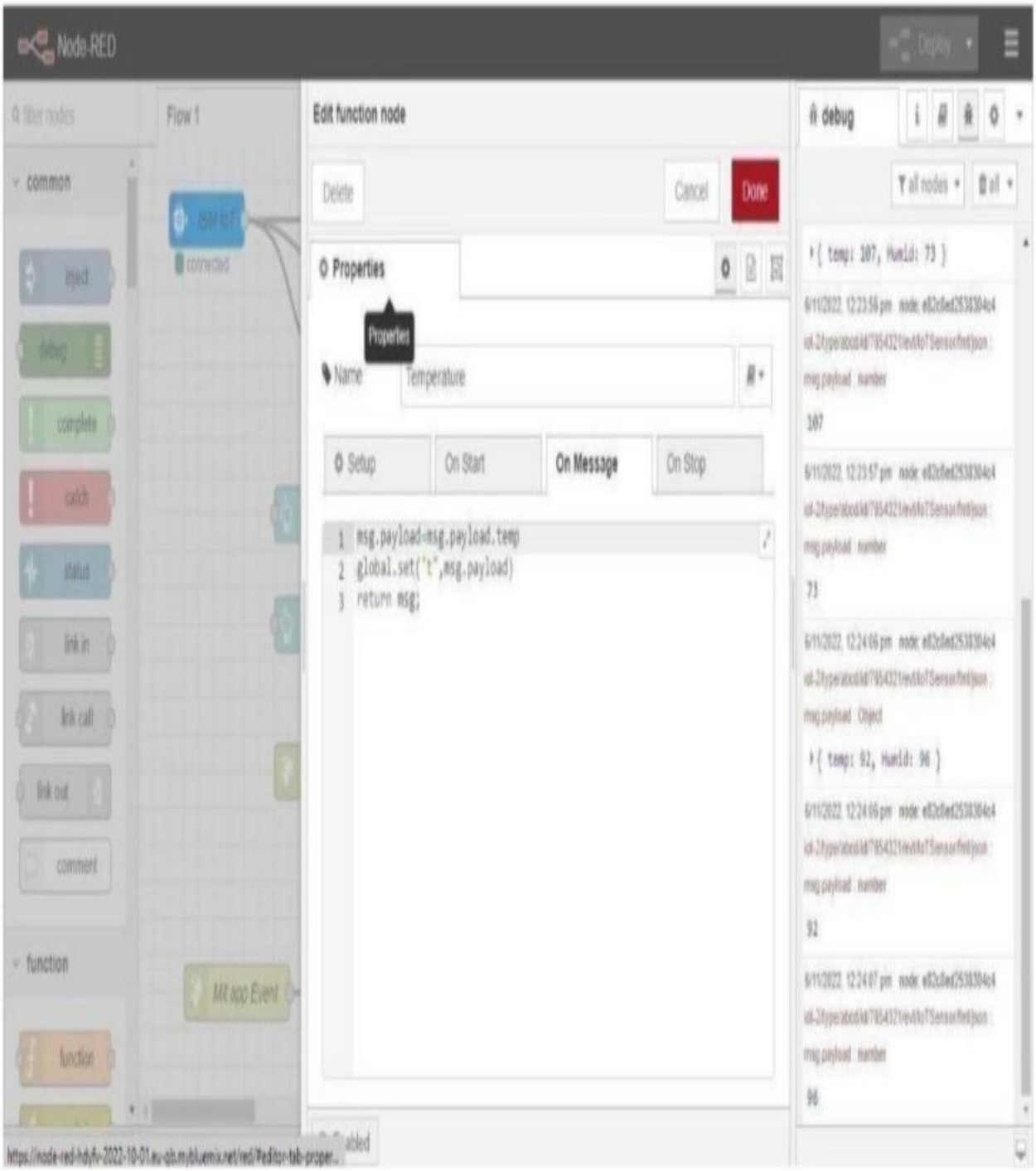


Data received from the cloud in Node-Red console

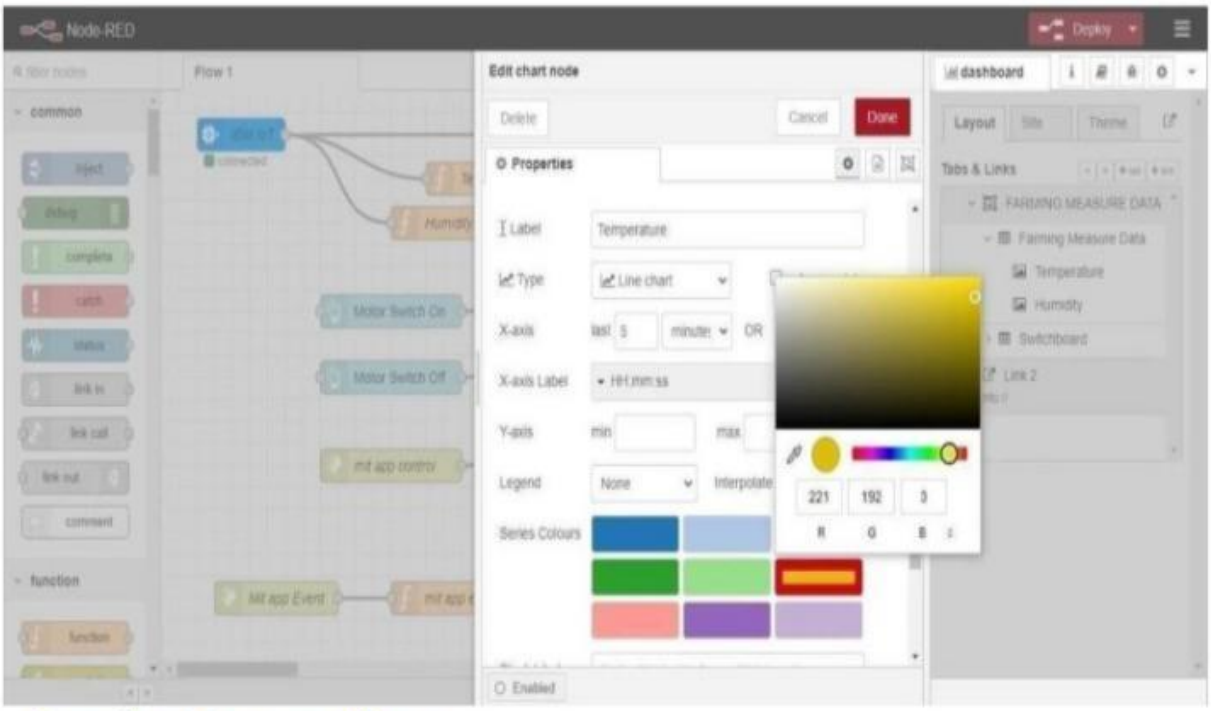


Nodes connected in following manner to get each reading separately

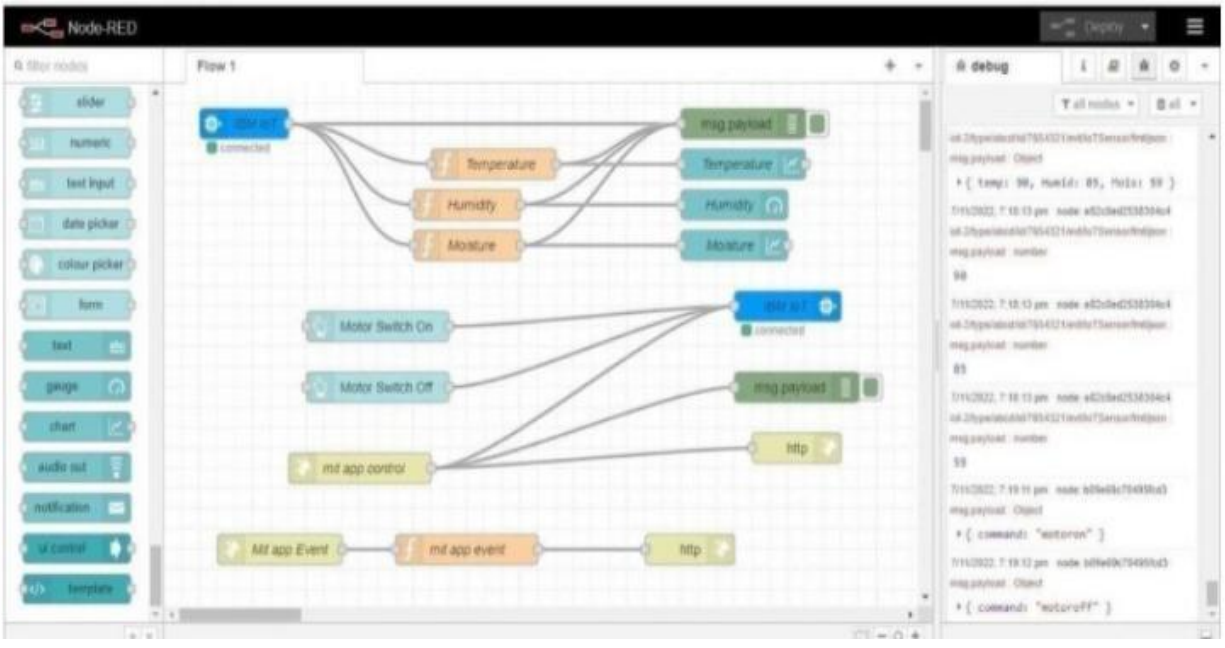


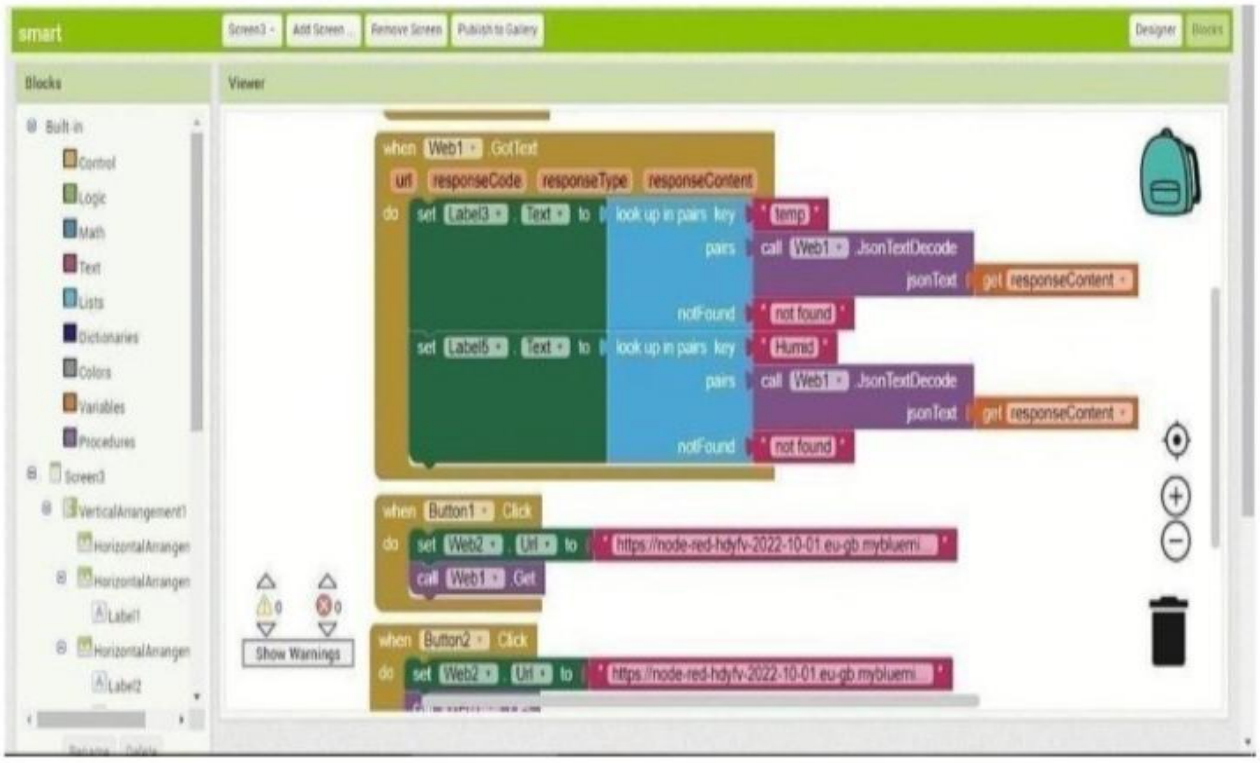

Node-RED
Deploy
Flow 1
Edit function node
common
inject
debug
complete
catch
status
link in
link call
link out
comment
function
function
Delete
Cancel
Done
Properties
Name
Temperature
Setup
On Start
On Message
On Stop
1 msg.payload=msg.payload.temp
2 global.set('t',msg.payload)
3 return msg;
debug
all nodes
all
{ temp: 107, Humid: 73 }
107
73
{ temp: 92, Humid: 96 }
92
96

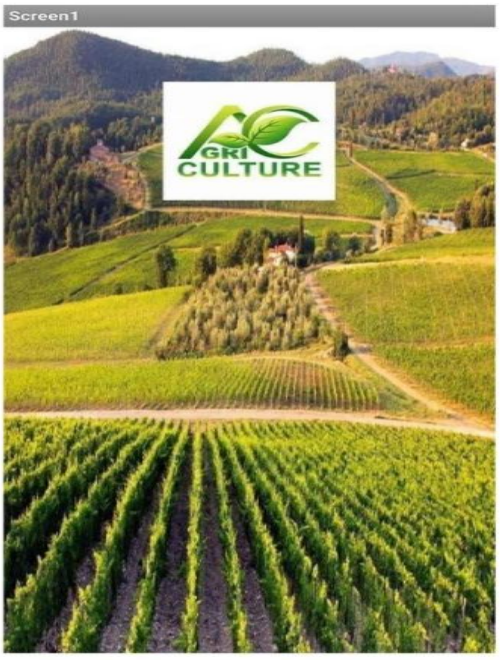
SPRINT-3:



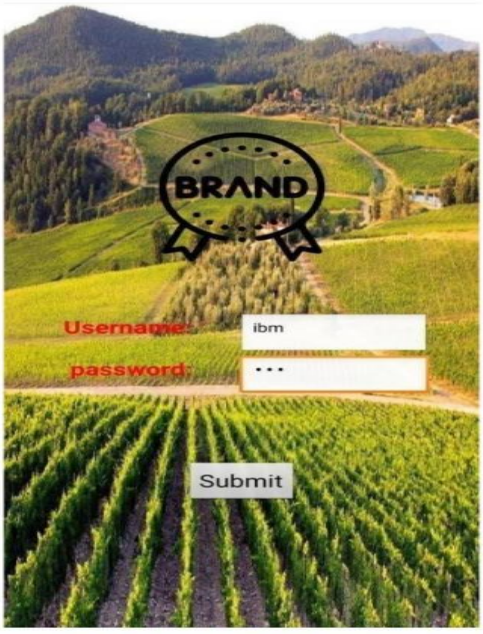
Complete Program Flow



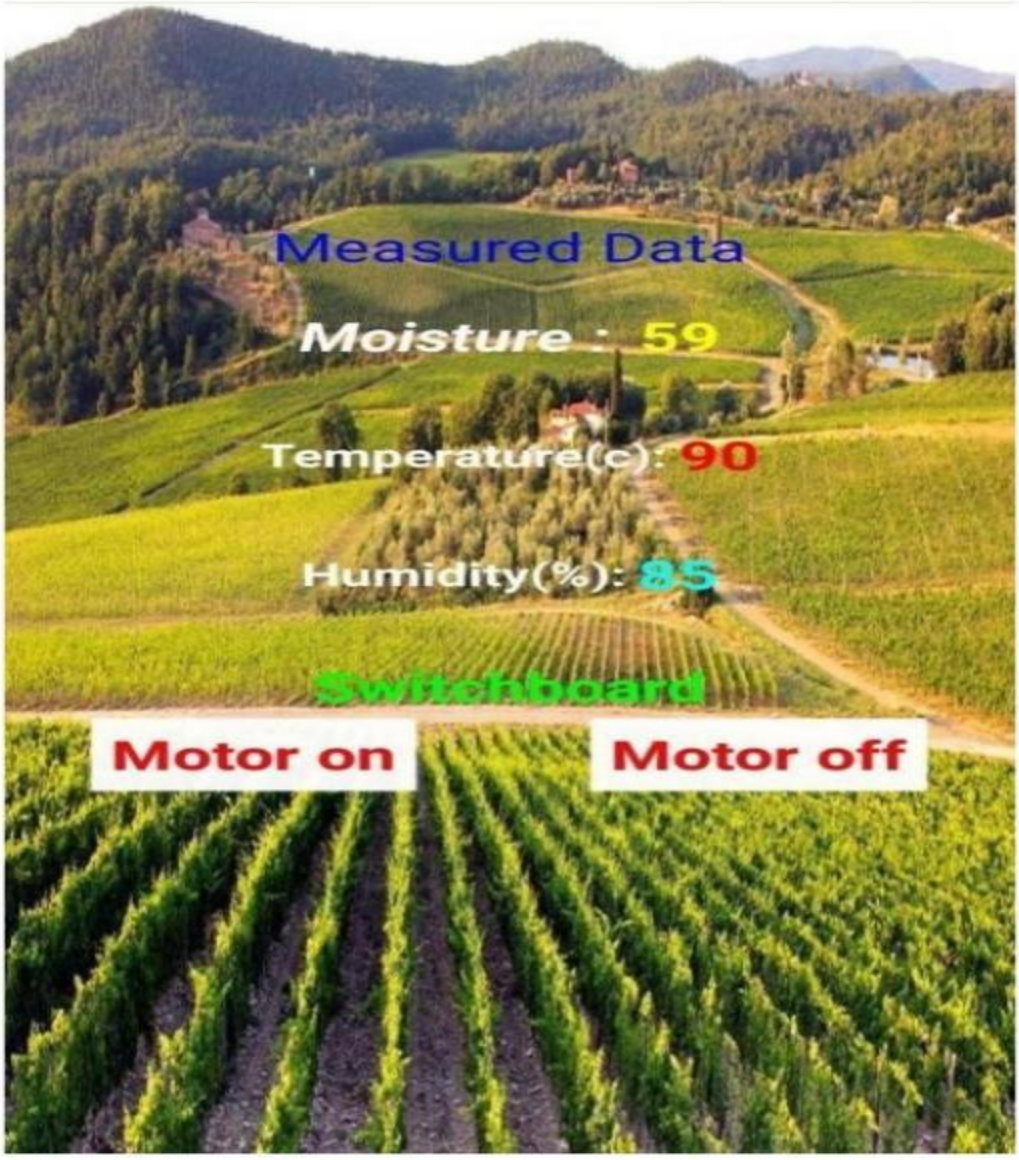




SCREEN – 1

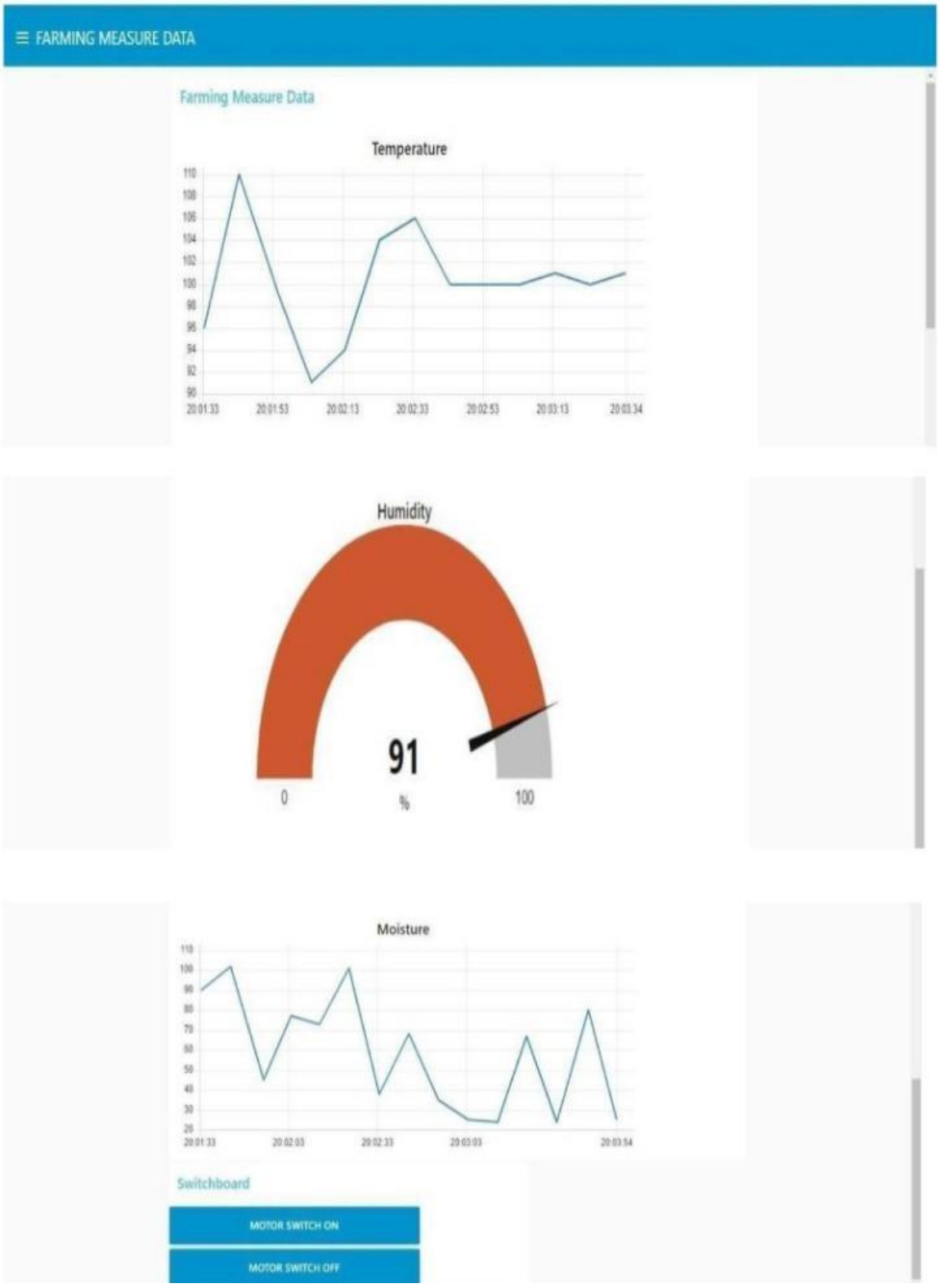


SCREEN - 2

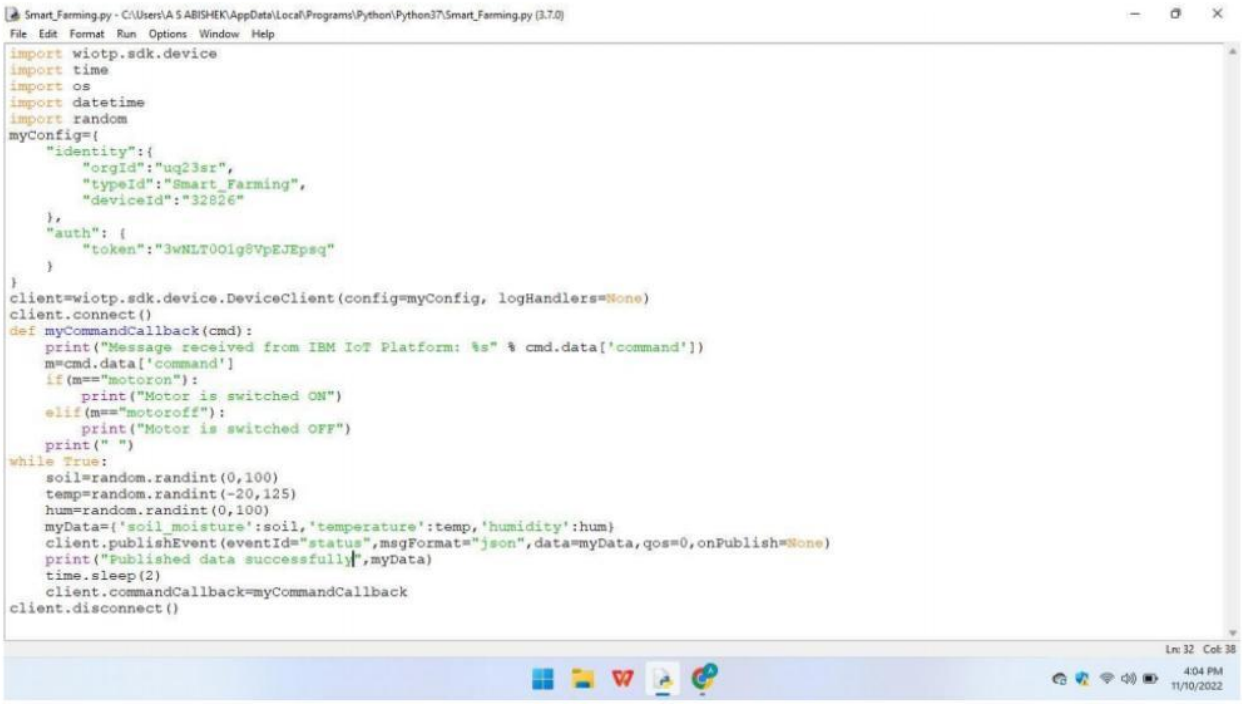


SCREEN - 3

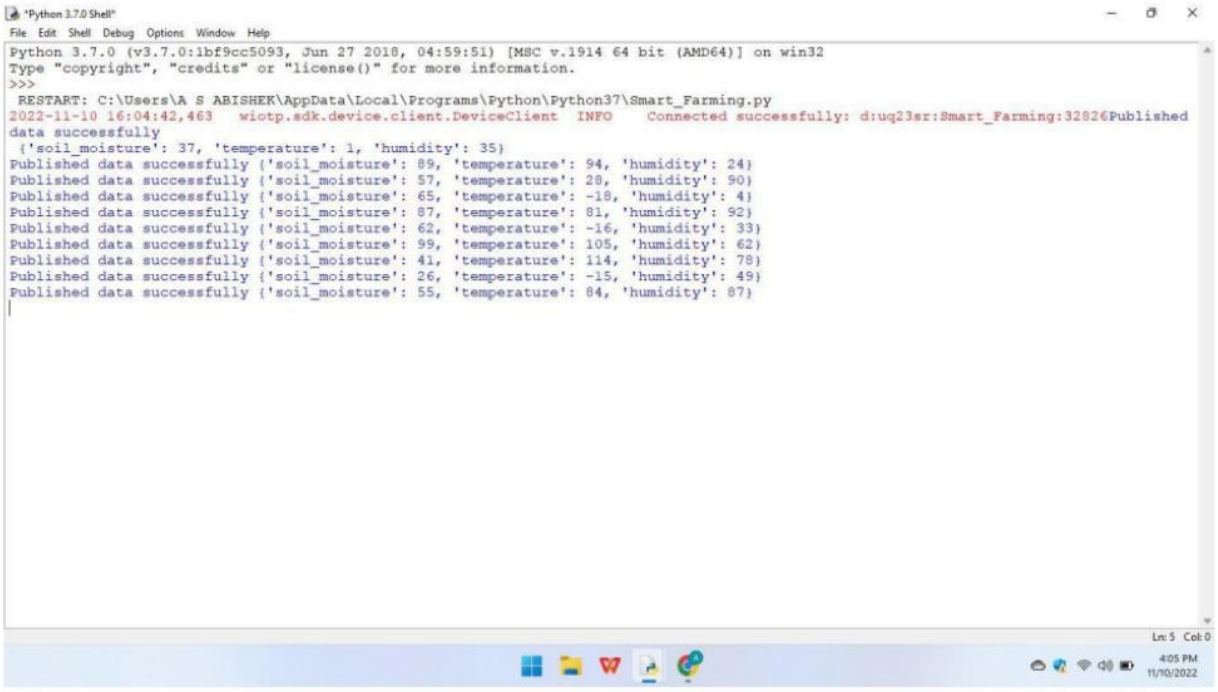
Web APP UI Home Tab


FARMING MEASURE DATA
Farming Measure Data
Temperature
110
108
106
104
102
100
98
96
94
92
90
20:01:33
20:01:53
20:02:13
20:02:33
20:02:53
20:03:13
20:03:34
Humidity
91
%
0
100
Moisture
110
100
90
80
70
60
50
40
30
20
20:01:33
20:02:03
20:02:33
20:03:03
20:03:54
Switchboard
MOTOR SWITCH ON
MOTOR SWITCH OFF

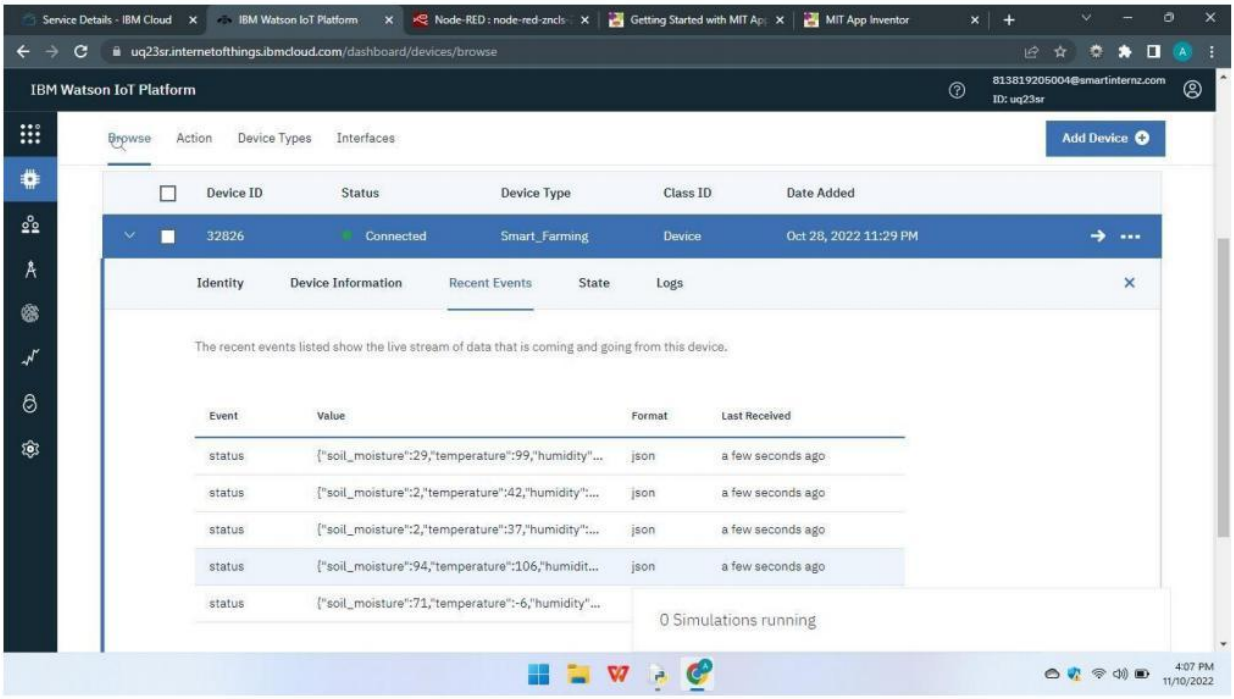
SPRINT-4:

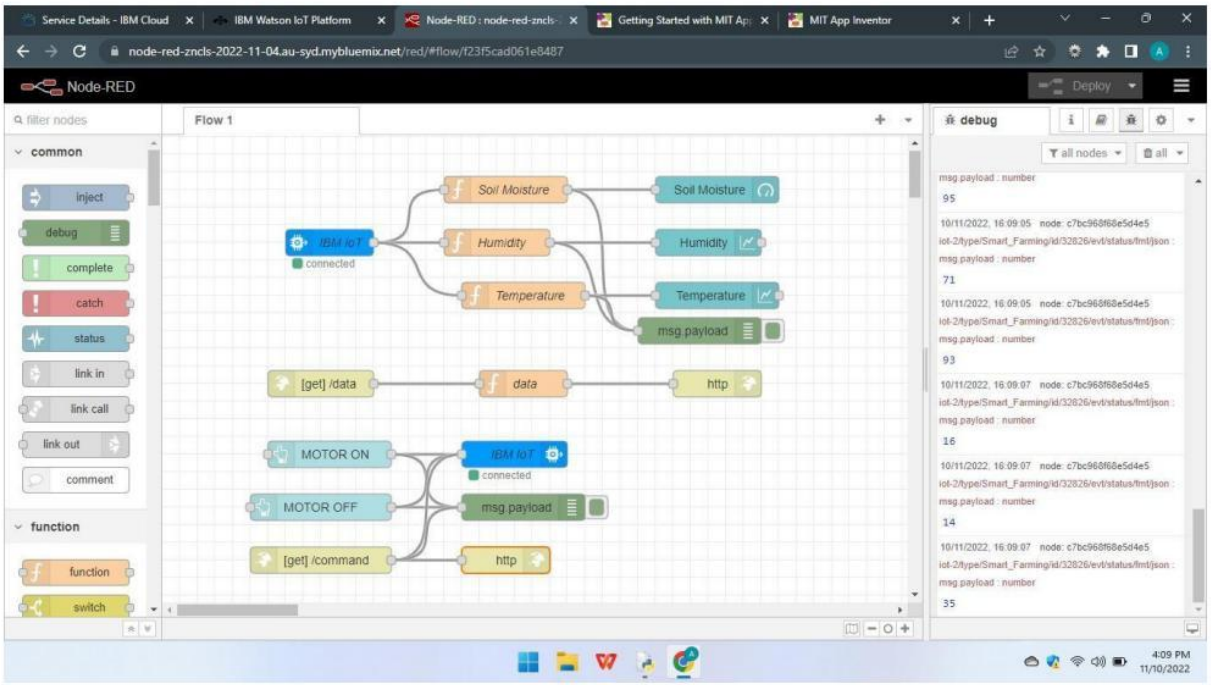


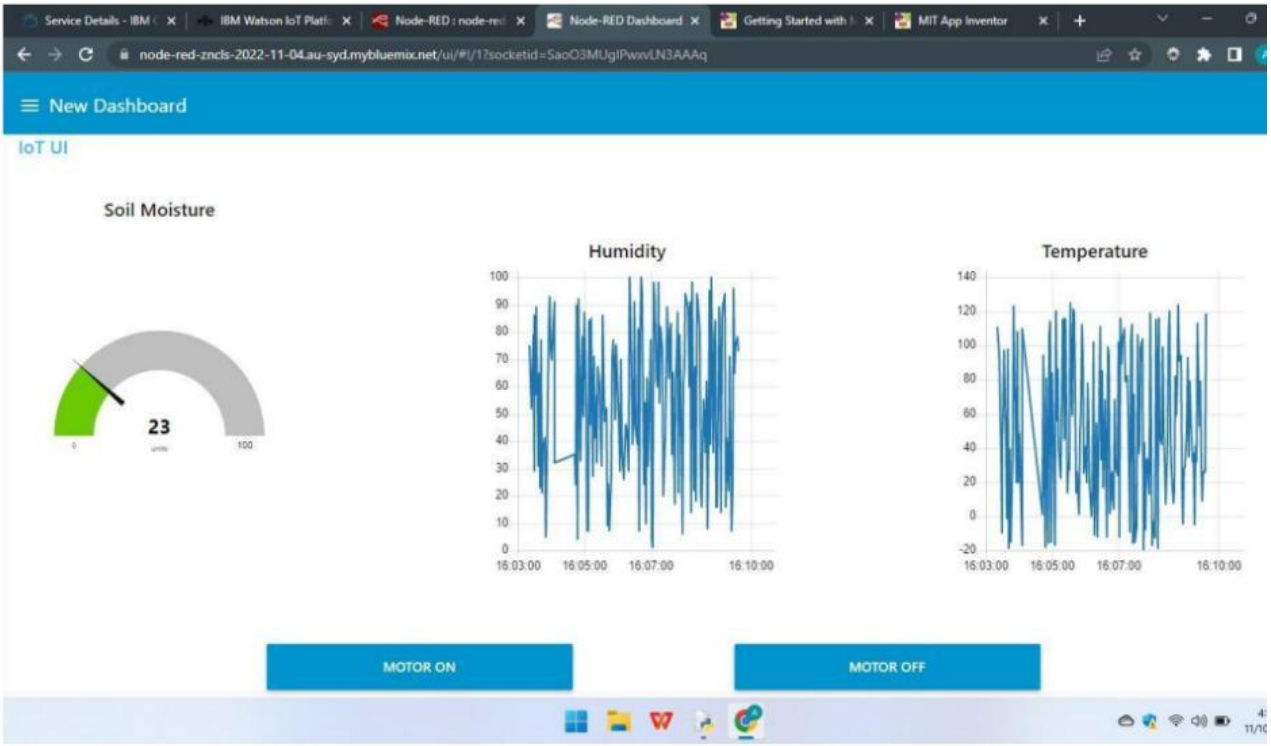
```
Smart_Farming.py - C:\Users\A S ABISHEK\AppData\Local\Programs\Python\Python37\Smart_Farming.py (3.7.0)
File  Edit  Format  Run  Options  Window  Help
import wiotp.sdk.device
import time
import os
import datetime
import random
myConfig={
    "identity":{
        "orgId":"uq23sr",
        "typeId":"Smart_Farming",
        "deviceId":"32826"
    },
    "auth": {
        "token":"3wNLT0O1g8VpEJEpsq"
    }
}
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={'soil_moisture':soil,'temperature':temp,'humidity':hum}
    client.publishEvent(eventId="status",msgFormat="json",data=myData,qos=0,onPublish=None)
    print("Published data successfully",myData)
    time.sleep(2)
    client.commandCallback=myCommandCallback
client.disconnect()
```

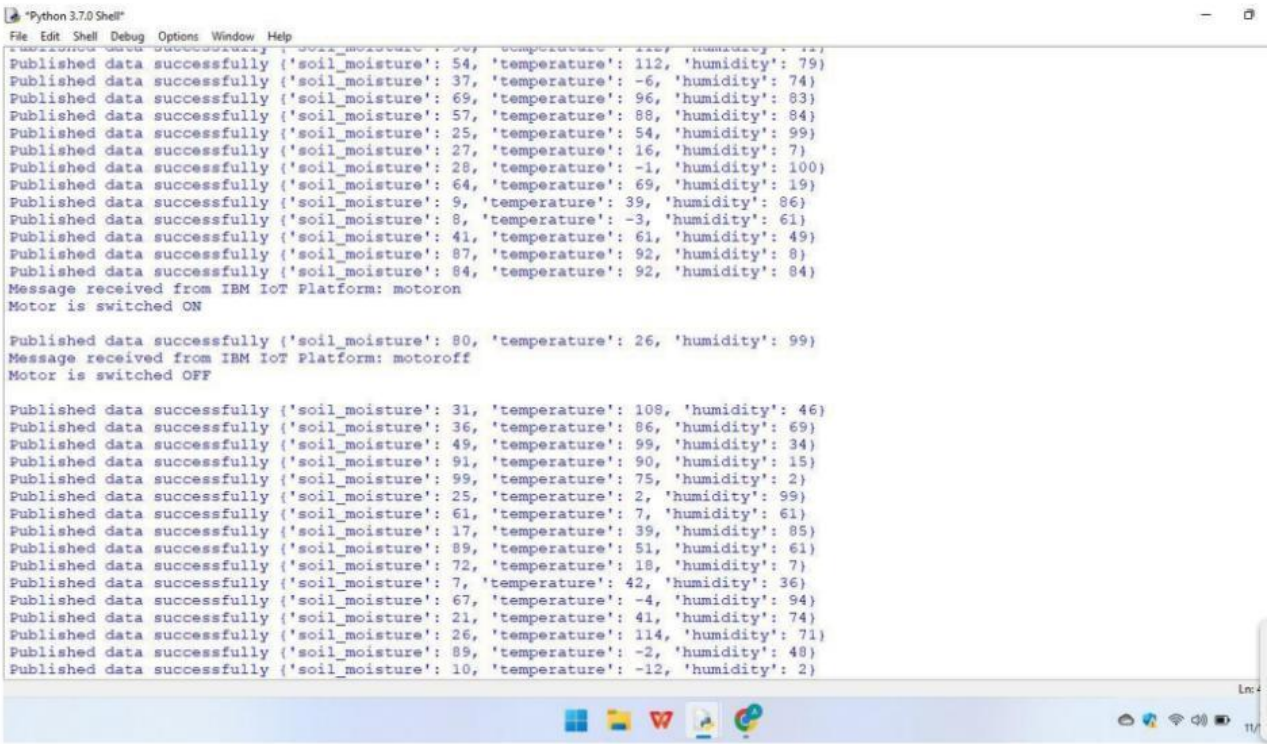


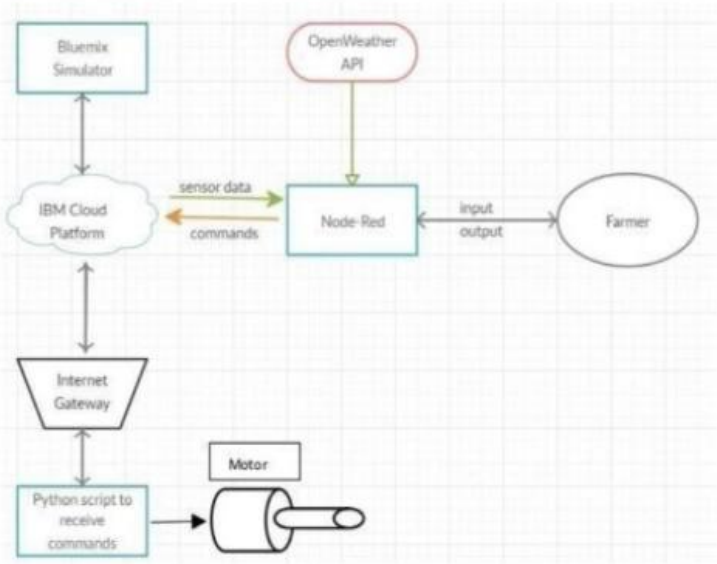
```
*Python 3.7.0 Shell*
File  Edit  Shell  Debug  Options  Window  Help
Python 3.7.0 (v3.7.0:1bf9cc5093, Jun 27 2018, 04:59:51) [MSC v.1914 64 bit (AMD64)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
 RESTART: C:\Users\A S ABISHEK\AppData\Local\Programs\Python\Python37\Smart_Farming.py
2022-11-10 16:04:42,463   wiotp.sdk.device.client.DeviceClient  INFO    Connected successfully: d:uq23sr:Smart_Farming:32826Published
data successfully
 {'soil_moisture': 37, 'temperature': 1, 'humidity': 35}
Published data successfully {'soil_moisture': 89, 'temperature': 94, 'humidity': 24}
Published data successfully {'soil_moisture': 57, 'temperature': 28, 'humidity': 90}
Published data successfully {'soil_moisture': 65, 'temperature': -18, 'humidity': 4}
Published data successfully {'soil_moisture': 87, 'temperature': 81, 'humidity': 92}
Published data successfully {'soil_moisture': 62, 'temperature': -16, 'humidity': 33}
Published data successfully {'soil_moisture': 99, 'temperature': 105, 'humidity': 62}
Published data successfully {'soil_moisture': 41, 'temperature': 114, 'humidity': 78}
Published data successfully {'soil_moisture': 26, 'temperature': -15, 'humidity': 49}
Published data successfully {'soil_moisture': 55, 'temperature': 84, 'humidity': 87}
```


IBM Watson IoT Platform
Browse
Action
Device Types
Interfaces
Add Device
Device ID
Status
Device Type
Class ID
Date Added
32826
Connected
Smart_Farming
Device
Oct 28, 2022 11:29 PM
Identity
Device Information
Recent Events
State
Logs
The recent events listed show the live stream of data that is coming and going from this device.
Event
Value
Format
Last Received
status
{"soil_moisture":29,"temperature":99,"humidity"...
json
a few seconds ago
status
{"soil_moisture":2,"temperature":42,"humidity":...
json
a few seconds ago
status
{"soil_moisture":2,"temperature":37,"humidity":...
json
a few seconds ago
status
{"soil_moisture":94,"temperature":106,"humidit...
json
a few seconds ago
status
{"soil_moisture":71,"temperature":-6,"humidity"...
0 Simulations running

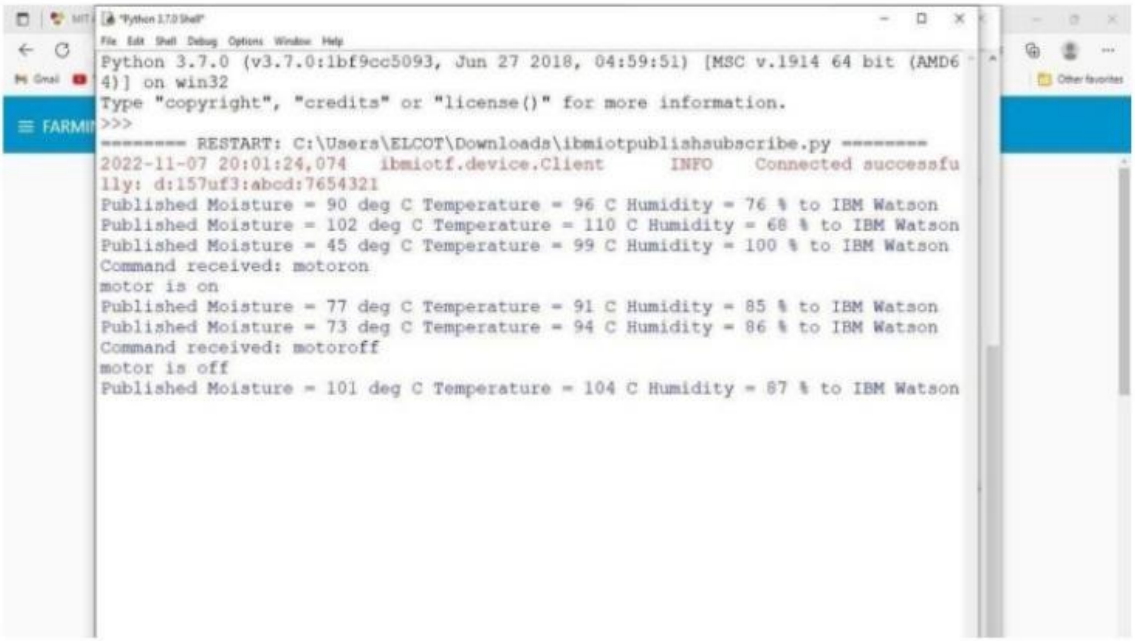

Node-RED
Deploy
Flow 1
common
inject
debug
complete
catch
status
link in
link call
link out
comment
function
function
switch
Soil Moisture
Humidity
Temperature
msg.payload
IBM IoT
connected
[get] /data
data
http
MOTOR ON
MOTOR OFF
[get] /command
debug

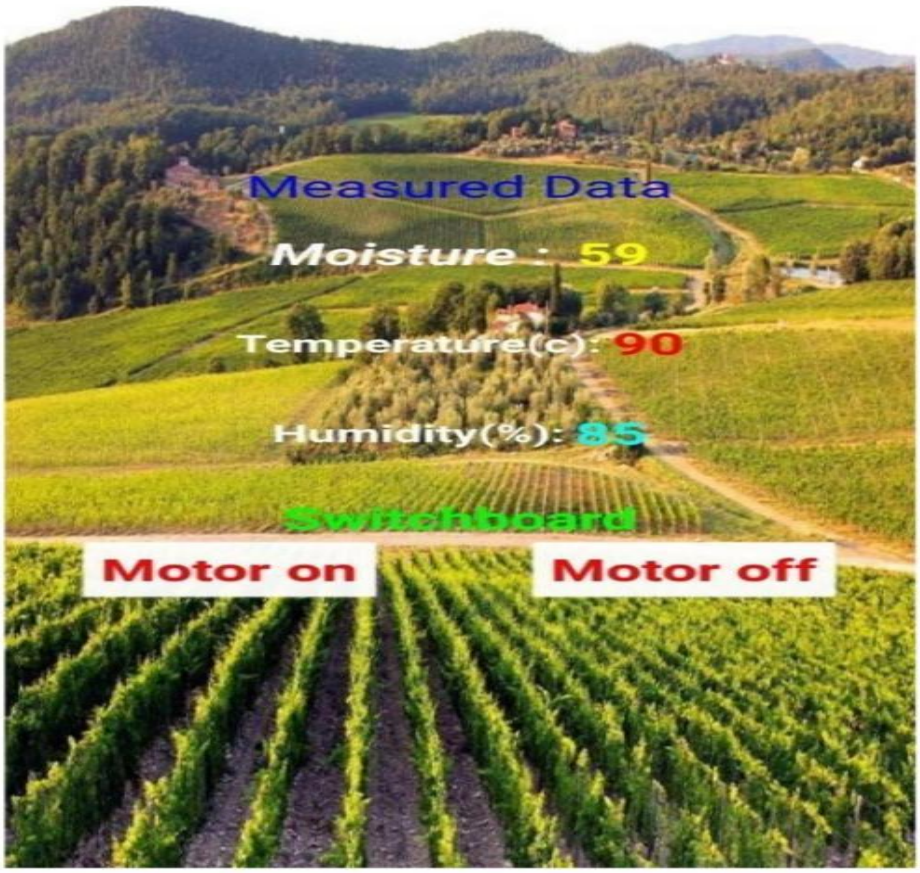

Service Details - IBM
IBM Watson IoT Platfo
Node-RED : node-red
Node-RED Dashboard
Getting Started with I
MIT App Inventor
node-red-zncls-2022-11-04.au-syd.mybluemix.net/ui/#!/1?socketid=SaoO3MUgIPwxvLN3AAAq
New Dashboard
IoT UI
Soil Moisture
23
Humidity
Temperature
MOTOR ON
MOTOR OFF

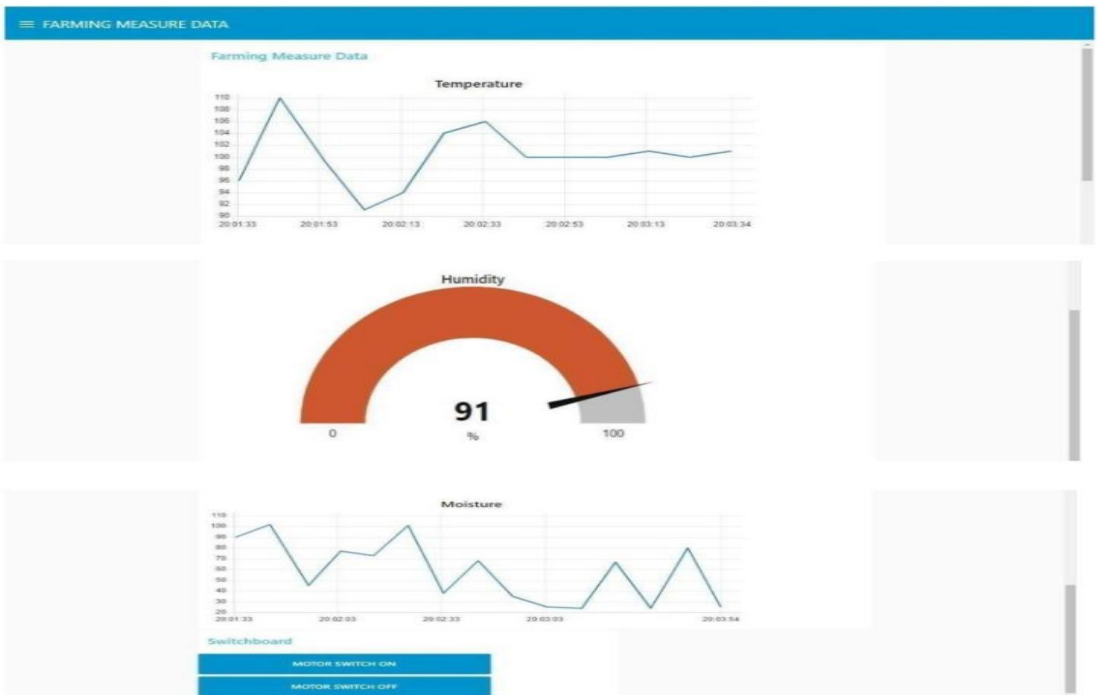

Python 3.7.0 Shell
File Edit Shell Debug Options Window Help
Published data successfully {'soil_moisture': 54, 'temperature': 112, 'humidity': 79}
Published data successfully {'soil_moisture': 37, 'temperature': -6, 'humidity': 74}
Published data successfully {'soil_moisture': 69, 'temperature': 96, 'humidity': 83}
Published data successfully {'soil_moisture': 57, 'temperature': 88, 'humidity': 84}
Published data successfully {'soil_moisture': 25, 'temperature': 54, 'humidity': 99}
Published data successfully {'soil_moisture': 27, 'temperature': 16, 'humidity': 7}
Published data successfully {'soil_moisture': 28, 'temperature': -1, 'humidity': 100}
Published data successfully {'soil_moisture': 64, 'temperature': 69, 'humidity': 19}
Published data successfully {'soil_moisture': 9, 'temperature': 39, 'humidity': 86}
Published data successfully {'soil_moisture': 8, 'temperature': -3, 'humidity': 61}
Published data successfully {'soil_moisture': 41, 'temperature': 61, 'humidity': 49}
Published data successfully {'soil_moisture': 87, 'temperature': 92, 'humidity': 8}
Published data successfully {'soil_moisture': 84, 'temperature': 92, 'humidity': 84}
Message received from IBM IoT Platform: motoron
Motor is switched ON
Published data successfully {'soil_moisture': 80, 'temperature': 26, 'humidity': 99}
Message received from IBM IoT Platform: motoroff
Motor is switched OFF
Published data successfully {'soil_moisture': 31, 'temperature': 108, 'humidity': 46}
Published data successfully {'soil_moisture': 36, 'temperature': 86, 'humidity': 69}
Published data successfully {'soil_moisture': 49, 'temperature': 99, 'humidity': 34}
Published data successfully {'soil_moisture': 91, 'temperature': 90, 'humidity': 15}
Published data successfully {'soil_moisture': 99, 'temperature': 75, 'humidity': 2}
Published data successfully {'soil_moisture': 25, 'temperature': 2, 'humidity': 99}
Published data successfully {'soil_moisture': 61, 'temperature': 7, 'humidity': 61}
Published data successfully {'soil_moisture': 17, 'temperature': 39, 'humidity': 85}
Published data successfully {'soil_moisture': 89, 'temperature': 51, 'humidity': 61}
Published data successfully {'soil_moisture': 72, 'temperature': 18, 'humidity': 7}
Published data successfully {'soil_moisture': 7, 'temperature': 42, 'humidity': 36}
Published data successfully {'soil_moisture': 67, 'temperature': -4, 'humidity': 94}
Published data successfully {'soil_moisture': 21, 'temperature': 41, 'humidity': 74}
Published data successfully {'soil_moisture': 26, 'temperature': 114, 'humidity': 71}
Published data successfully {'soil_moisture': 89, 'temperature': -2, 'humidity': 48}
Published data successfully {'soil_moisture': 10, 'temperature': -12, 'humidity': 2}



7. Observations & Results




Measured Data
Moisture : 59
Temperature(c): 90
Humidity(%): 85
Switchboard
Motor on
Motor off


FARMING MEASURE DATA
Farming Measure Data
Temperature
Humidity
91
%
0
100
Moisture
Switchboard
MOTOR SWITCH ON
MOTOR SWITCH OFF

CHAPTER-8

TESTING

8.1 Unit testing:

Unit testing is a software development process in which the smallest testable parts of an application, called units, are individually and independently scrutinized for proper operation. This testing methodology is done during the development process by the software developers and sometimes QA staff.Unit testing is a type of testing in which individual units or functions of software testing. Its primary purpose is to test each unit or function. A unit is the smallest testable part of an application. It mainly has one or a few inputs and produces a single output.

8.2 Integration testing:

Integration testing is also known as integration and testing (I&T) , is a type of software testing in which the different units, modules or components of a software application are tested as a combined entity. However, these modules may be coded by different programmers. Integration Testing is a type of software testing, which is performed on software to determine the flow between two or more modules by combining them. Integration testing makes sure that the interactions between different components of the software is completed smoothly without any complication.The purpose of the integration testing is to expose

faults in the interaction between integrated units. Once all the modules have been unit tested, integration testing is performed.

8.3 Test cases:

Table 8.1

S.NO	TEST CASE	INPUT	EXPECTED OUTPUT	ACTUAL OUTPUT	RESULT
1	Temperature Detection	Username and Password	60	60	PASS

Table 8.2

S.NO	TEST CASE	INPUT	EXPECTED OUTPUT	ACTUAL OUTPUT	RESULT
1	Humidity Detection	Username and Password	48	48	PASS

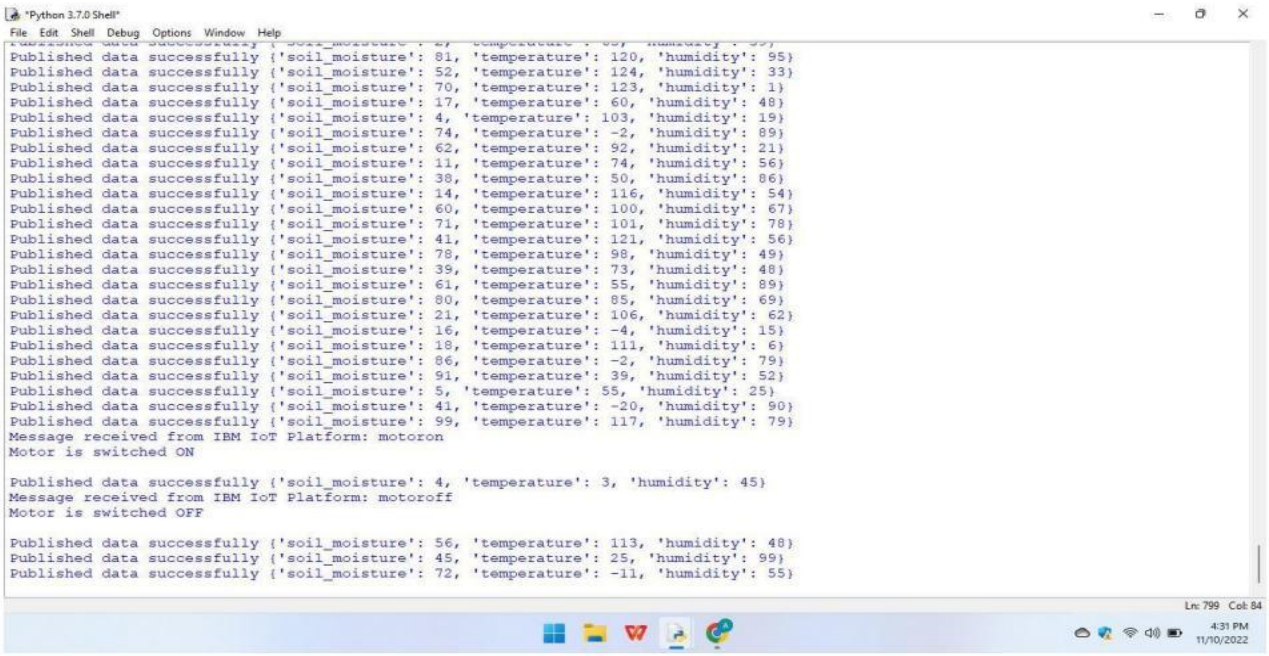
Table 8.3

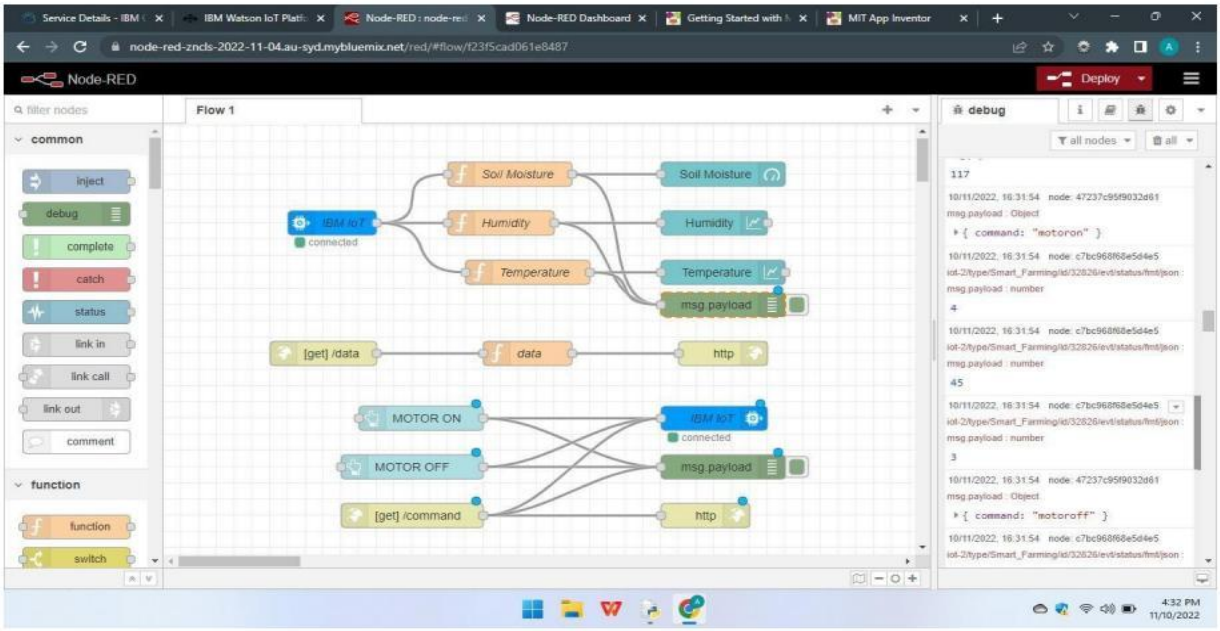
S.NO	TEST CASE	INPUT	EXPECTED OUTPUT	ACTUAL OUTPUT	RESULT
1	Moisture Detection	Username and Password	17	17	PASS

*Note : The Output Values may vary accordingly.

CHAPTER-9

Results





CHAPTER-10
ADVANTAGES AND DISADVANTAGES

10.1 Advantages:

- As it is a mobile friendly application one can access all the metrics in one touch.
- It has clean User interface so that user have smooth control over the application.
- The consumption of electric power is less as compared to other application.
- The moisture level and the temperature levels are monitored at regular intervals.
- It can run on all android versions.
- The application requires less memory and storage space.

10.2 Disadvantages:

- When the network connectivity is poor the performance of the application will be affected
- As it is platform dependent it cannot run on all devices.
- The application will produce inaccurate values when there is a fault or any change in API.
- The user should be more aware on the results produced.

CHAPTER-11

CONCLUSION

- In this work, we successfully develop a system that can help in an automated irrigation system by analyzing the moisture level of the ground.
- The smart irrigation system proves to be a useful system as it automates and regulates the watering without any manual intervention. The primary applications for this project are for farmers and gardeners who do not have enough time to water crops/plants.
- The farmers are facing major problems in watering their agriculture fields.So that the Farmers can Watering their plant Smart.

CHAPTER-12

FUTURE SCOPE

- It helps in automatic irrigation for crops and also helps to maintain the water level in field.
- The system will notify on the critical conditions.
- As this is an automated device it can works even the absence of farmer.

CHAPTER-13

APPENDIX

13.1 GitHub Link for Source Code :

https://github.com/IBM-EPBL/IBM-Project-34559-1660238426/tree/main