

# **PROJECT REPORT**

**IBM – NALAIYA THIRAN**

**PROJECT NAME : SMART FARMER – IOT ENABLED SMART  
FARMING APPLICATION**

**TEAM ID : PNT2022TMID38157**

**TEAM :**

**SRI RAJESWARI . E – TEAM LEAD**

**MATHIBALAN . M**

**RUHI ANGEL . A**

**THIRUPONPUGAZH . P**

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# **1. INTRODUCTION**

## **Project Overview**

Agriculture plays a important role in country's economy and provides a large scale employment to the people. However, agriculture is highly dependent upon weather and climate. For example, changes in temperature, soil moisture, carbon dioxide may result in low yield of crops. It is Significant to monitor environmental parameters in order to manage crop growth and increase the agricultural production yield. The sensed information is not only important for decision making but also for evaluating impacts of agricultural practices on environment. Nowadays, it is more necessary than ever to increase the crop yields food grain production. Cloud connected, wireless system aid in this crop yield maximization, which automates day- to-day agricultural tasks and real time monitoring for smart decision-making.

## **Purpose**

- Need for technology to monitor important parameters like soil moisture, temperature, Humidity etc. to improve the cultivation process.
- Need for technology to monitor weather of particular area with reliable source to save the crops at the time of natural calamities like flood, cyclone etc.
- Development of certain techniques to reduce the workforce, energy and time for cultivation.
- Development of a feasible method to control the electrical equipment in the farm from any part of the world.

# **2. LITERATURE SURVEY**

## **EXISTING PROBLEM**

1. Controlling the device from longer distance from web application.
2. Getting the weather data from weather station.
3. Transfer of node data to the gateway at faster rate.
4. Unavailability of data's such as PH level, potassium, Nitrogen etc related to the soil.

## **PROPOSED SOLUTION**

1. To control a device from longer distance from web application.
2. To get the weather details like wind speed, temperature, humidity from weather station through weather API.
3. To display the data in the web application.

# References

## 1) IoT Enabled Smart Farming and Irrigation System:

**Authors:** M. Rohith, R Sainivedhana, Dr. N. Sabiyath Fatima

**Published:** IEEE 2021

**Description:** In this paper, authors have demonstrated a IoT enabled smart farming and irrigation system to automate the process of watering to plants. This system helps to measure the values of various parameters such as humidity, moisture and temperature of plants and water them accordingly. This system consists of three sensors which will sense the values of humidity, moisture and temperature of plants. If any of the sensor values decreases the motor automatically turns on the water for plants. The ultimate significance of the paper is that most of the manual work is reduced and watering process is automated with the help of IoT enabled devices as a result of which healthy plants can be grown.

## 2) A Systematic Review of IoT Solutions for Smart Farming:

**Authors:** Emerson Navarro, Nuno Costa, and António Pereira

**Published:** MDPI 2020

**Description:** In this work, authors have presented a systematic review of the state-of-the-art of IoT adoption in smart agriculture and identified the main components and applicability of IoT solutions. In this particular work it was observed that the use of artificial intelligence and image processing techniques has become more common to improve the management of smart farming. From the identified applications of IoT for smart farming it was observed that the most common application is the monitoring of

crops. Here, authors showed that different network protocols may be simultaneously used in IoT solutions for smart farming.

### **3) A Multi-collective, IoT-enabled, Adaptive Smart Farming Architecture:**

**Authors:** G. Kakamoukas, P. Sariciannidis, G. Livanos, M. Zervakis, D.

Ramnalis, V. Polychronos, T. Karamitsou, A. Folinis, N. Tsitsiokas

**Published:** IEEE 2019

**Description:** In this paper, authors have proposed a precision architecture for Smart Farming in order to use precise and efficient approaches for monitoring and processing information from farms,

crops, forestry, and livestock aiming at more productive and sustainable rural development. This proposed architecture encloses wireless sensor networks, meteorological stations and unmanned aerial vehicles along with an information processing system that leverages machine learning and computing technologies. The innovation of the proposed architecture lies in the creation of an integrated monitoring and decision support system for efficient allocation of resources and protection of plant capital from the diseases

### **1) Internet of Things and LoRaWAN – Enabled Future Smart Farming**

**Authors:** Bruno Citoni, Francesco Fioranelli, Muhammad A. Imran, Qammer H. Abbasi

**Published:** IEEE 2019

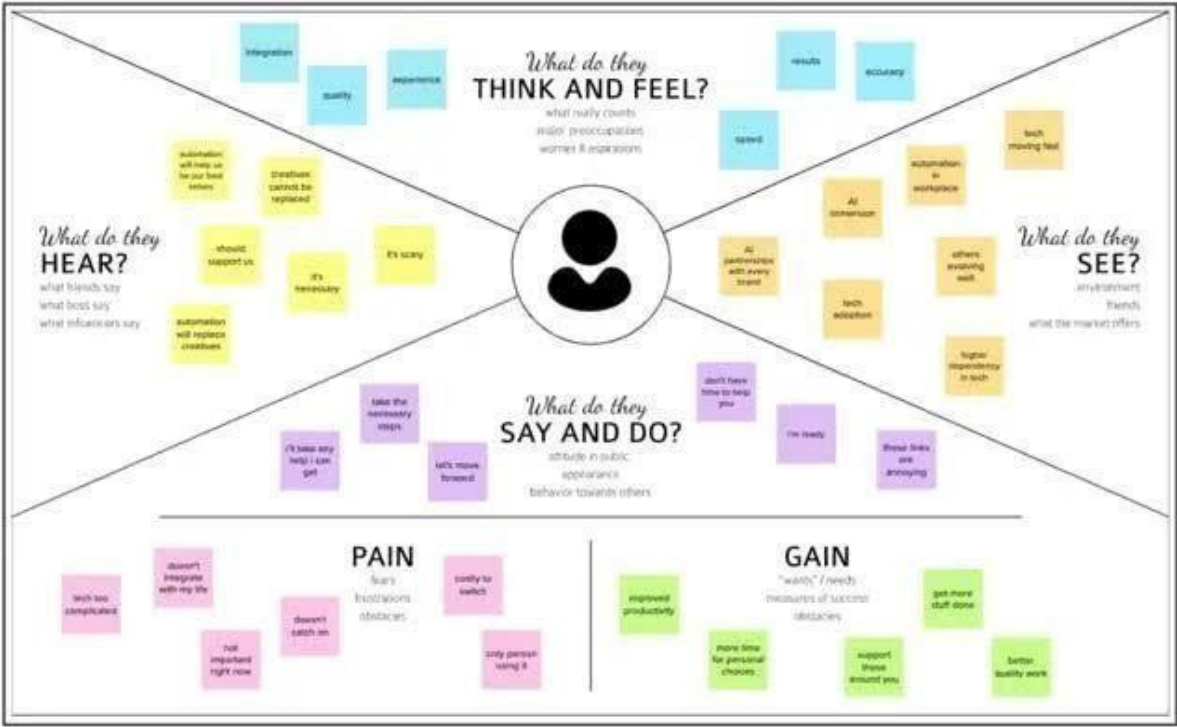
**Description:** In this paper authors have explained about LoRaWAN which is been under the spotlight in recent years due to its suitability to be the standard communication protocol for IoT deployments. It provides long communication range and low energy consumption by drastically reducing the available data rate. They also explained about the development of LoRaWAN enabled smart agriculture test to improve the understanding about the impact of the limitations using experimental test data, and moving towards building predictive models and adaptive network management algorithms for smart farming using the data collected

## PROBLEM STATEMENT DEFINITION



3. IDEATION & PROPOSED SOLUTION

EMPATHY MAP CANVAS



# IDEATION & BRAINSTORMING

## Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

- 10 minutes to prepare
- 1 hour to collaborate
- 2-8 people recommended

[Share template feedback](#)

### Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

10 minutes

- Team gathering**  
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.
- Set the goal**  
Think about the problem you'll be focusing on during the brainstorming session.
- Learn how to use the facilitation tools**  
Use the Facilitation Superpowers to come happy and prepared to create.

[Open article](#)

### 1 Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

5 minutes

**PROBLEM**

A farmer, he wants to improve his income and reduce his time in the land work so he need to apply the application based on the smart farmer

**Key rules of brainstorming**  
To run an smooth and productive session

- Stay on topic
- Encourage wild ideas
- Order judgment
- Listen to others
- Go for volume
- If possible, be visual

### 2 Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

**HEMANATHAN M**

Predictive analytical for smart farming	Farm automation	Precision farming
End to end farm management system	Monitoring climate conditions	Resource optimization

**KRISHNAMOORTHY K**

GIS software and GPS	Smart water management	Green house automation
Crop management	Reduce waste	Fertilization

**DINESHKUMAR G**

Agricultural database management	Agricultural drones	Plant watering automation
Monitor and control irrigation system using mobile app	Farming software and online data	Drone and other aerial imagery

**RANJITHKUMAR R**

Temperature sensor	Soil moisture sensor	Mini water pump
GSM module	Wifi module	Arduino or Node mcu

**Need some inspiration?**  
Take a look at some ideas generated by other users.

[Open examples](#)

### 3 Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence like 'What if a drone & bigger than a sticky note, try and see if you can break it up into smaller sub-groups.'

10 minutes

Precision farming

Monitor and control irrigation system using mobile app

Crop management

Mini water pump

### 4 Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on the grid to determine which ideas are important and which are feasible.

10 minutes

**Importance**  
How much your idea will impact the customer's problem?

**Feasibility**  
How much of your idea can you build with the resources you have?

### 5 After you collaborate

You can export the mural as an image or pdf to share with members of your company who might find it helpful.

**Quick actions**

- Share the mural**  
Share a link to the mural with stakeholders to keep them active and aware of the session.
- Export the mural**  
Export a copy of the mural as a PDF or PNG to share it with stakeholders to review your ideas.

**Keep moving forward**

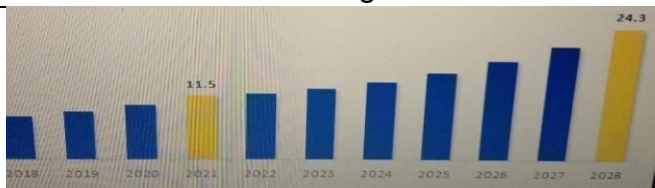
- Stopgap the mural**  
Define the components of a new idea or strategy.
- Customer experience journey map**  
Understand customer needs, not what they want, but what they need.
- Storyboard to visualize opportunities & threats**  
Identify emerging, hidden, new, opportunities and threats (SWOT) to develop a plan.

[Open the template](#)

[Share template feedback](#)



## PROPOSED SOLUTION

S.No.	Parameter	Description																								
1.	Problem Statement (Problem to be solved)	<ul style="list-style-type: none"><li>Most of the farmers use large portions of farming land and it becomes very difficult to reach and track each corner of large lands. Sometime there is a possibility of uneven water sprinkles.</li><li>Challenges faced by IOT in agriculture are high adoption, security concerns, information lackness.</li></ul>																								
2.	Idea / Solution description	<ul style="list-style-type: none"><li>Smart Farming has enabled farmers to reduce waste and enhance productivity with the help of sensors (light, humidity, temperature, soil moisture, etc..)</li><li>Further with the help of these sensors, farmers can monitor the field conditions from anywhere.</li></ul>																								
3.	Novelty / Uniqueness	<ul style="list-style-type: none"><li>Role of SENSORS : IOT smart agriculture products are designed to help monitor crop fields using sensors and by automating irrigation systems.</li><li>As a result, farmers and associated brands can easily monitor the field conditions from anywhere without any hassle.</li></ul>																								
4.	Social Impact / Customer Satisfaction	<ul style="list-style-type: none"><li>Water conservation</li><li>Saves lot of time</li><li>Increased quality of production</li><li>Real time data and production insight.</li><li>Remote monitoring.</li></ul>																								
5.	Business Model (Revenue Model)	 <table><caption>Projected Revenue (2018-2028)</caption><tr><th>Year</th><th>Revenue</th></tr><tr><td>2018</td><td>~5.0</td></tr><tr><td>2019</td><td>~5.5</td></tr><tr><td>2020</td><td>~6.0</td></tr><tr><td>2021</td><td>11.5</td></tr><tr><td>2022</td><td>~7.0</td></tr><tr><td>2023</td><td>~7.5</td></tr><tr><td>2024</td><td>~8.0</td></tr><tr><td>2025</td><td>~9.0</td></tr><tr><td>2026</td><td>~10.0</td></tr><tr><td>2027</td><td>~12.0</td></tr><tr><td>2028</td><td>24.3</td></tr></table>	Year	Revenue	2018	~5.0	2019	~5.5	2020	~6.0	2021	11.5	2022	~7.0	2023	~7.5	2024	~8.0	2025	~9.0	2026	~10.0	2027	~12.0	2028	24.3
Year	Revenue																									
2018	~5.0																									
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2024	~8.0																									
2025	~9.0																									
2026	~10.0																									
2027	~12.0																									
2028	24.3																									
6.	Scalability of the Solution	<ul style="list-style-type: none"><li>Scalability in smart farming refers to the adaptability of a system to increase the</li></ul>																								

## FIT PROBLEM SOLUTION

<div style="background-color: #f8d7da; padding: 2px; font-size: 0.8em; margin-bottom: 5px;">             Define CS, BS into CS.         </div> <div style="background-color: #fff3cd; padding: 2px; font-size: 0.8em; margin-bottom: 5px;">             Focus on BS, CS into BS, Understand BS         </div> <div style="background-color: #d4edda; padding: 2px; font-size: 0.8em;">             Identify strong TR &amp; BS         </div>	<div style="background-color: #f8d7da; padding: 2px; font-size: 0.8em; margin-bottom: 5px;">             Focus on BS, CS into BS, Understand BS         </div> <div style="background-color: #fff3cd; padding: 2px; font-size: 0.8em; margin-bottom: 5px;">             Focus on BS, CS into BS, Understand BS         </div> <div style="background-color: #d4edda; padding: 2px; font-size: 0.8em;">             Focus on BS, CS into BS, Understand BS         </div>	<div style="background-color: #f8d7da; padding: 2px; font-size: 0.8em; margin-bottom: 5px;">             Focus on BS, CS into BS, Understand BS         </div> <div style="background-color: #fff3cd; padding: 2px; font-size: 0.8em; margin-bottom: 5px;">             Focus on BS, CS into BS, Understand BS         </div> <div style="background-color: #d4edda; padding: 2px; font-size: 0.8em;">             Focus on BS, CS into BS, Understand BS         </div>
<b>1. CUSTOMER SEGMENT(S)</b> <span style="float: right; background-color: #f8d7da; padding: 2px 5px; font-size: 0.8em;">CS</span> Customers are the farmers and they are of types Marginal Farmers, Small Farmers, Semi-medium, Medium and Large. Farmers with large hectares of land require Smart-farming assistance to make things easy and reliable.	<b>6. CUSTOMER LIMITATIONS</b> <span style="float: right; background-color: #f8d7da; padding: 2px 5px; font-size: 0.8em;">CL</span> <small>CL: BUDGET, DEVICES</small> Improper irrigation, Productivity issues, Difficulty in the management of inputs and outputs for farming activity, also climatic conditions affect the farmers, Reliability is less in traditional farming.	<b>5. AVAILABLE SOLUTIONS</b> <span style="float: right; background-color: #f8d7da; padding: 2px 5px; font-size: 0.8em;">AS</span> <small>AS: PLACES &amp; PROXIMITY</small> Smart Farming has increased the productivity, and management of farming activity and timely reaction towards moisture, temperature, & climatic prediction. Automation via app/web-app has made it more sustainable than before.
<b>2. PROBLEMS / PAINS</b> <span style="float: right; background-color: #fff3cd; padding: 2px 5px; font-size: 0.8em;">PB</span> <small>PB: FREQUENCY</small> Smart farming includes the Internet of things and this integrates the hardware and software part helping to make the automation easy like the irrigation facilities on timely basis and also prediction of climatic conditions before in hand gives the farmer a warning and to be prepared for the change.	<b>9. PROBLEM ROOT / CAUSE</b> <span style="float: right; background-color: #fff3cd; padding: 2px 5px; font-size: 0.8em;">RC</span> <small>RC: CAUSE</small> Major problems the farmers facing is the soil erosion, climatic changes, and biodiversity loss. Expectations of the customers get ruined. Demand for the quality food. Investment in farming i.e. productivity.	<b>7. BEHAVIOR</b> <span style="float: right; background-color: #fff3cd; padding: 2px 5px; font-size: 0.8em;">BE</span> <small>BE: FREQUENCY</small> The climatic condition and changes prediction is literally hard for the farmers and via smart farming its resolved.
<b>3. TRIGGERS TO ACT</b> <span style="float: right; background-color: #d4edda; padding: 2px 5px; font-size: 0.8em;">TR</span> Growing the awareness among people by showing up some ads or poster and also arranging campaigns to teach about Smart farming and also showing an example of it.	<b>10. YOUR SOLUTION</b> <span style="float: right; background-color: #d4edda; padding: 2px 5px; font-size: 0.8em;">SL</span> <small>SL: SOLUTION</small> To overcome all the problems and hurdles there is only one way and that is to integrate smart farming practices into the farming industry.	<b>8. CHANNELS of BEHAVIOR</b> <span style="float: right; background-color: #d4edda; padding: 2px 5px; font-size: 0.8em;">CH</span> <small>CH: CHANNEL</small> Online mentoring can help farmer to use the smart farming technology.
<b>4. EMOTIONS</b> <span style="float: right; background-color: #d4edda; padding: 2px 5px; font-size: 0.8em;">EM</span> <small>EM: BEFORE / AFTER</small> All the farmers want the traditional way only because they are emotionally connected to it but once they start using smart farming then the yield and productivity make them fulfilled.		<small>CH: OFFLINE</small> Farmers can buy the products from trusted shops and also week-based campaigns teaching them the smart farming practice can help them to convert from the traditional way to the modern way.

#### 4. REQUIREMENT ANALYSIS

##### FUNCTIONAL REQUIREMENT

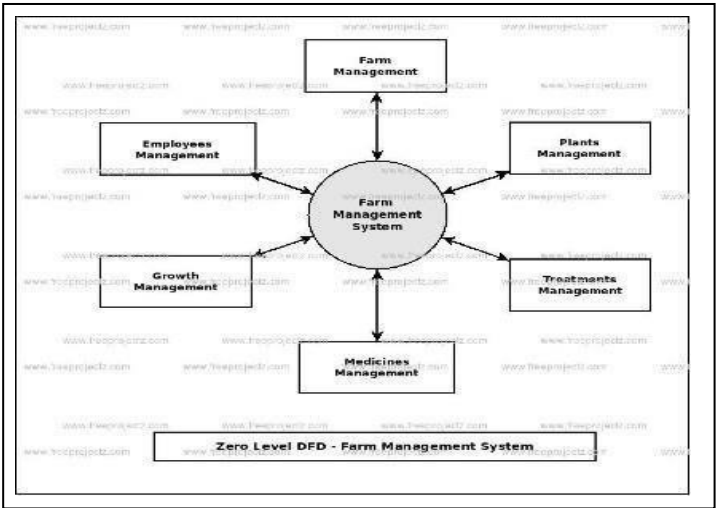
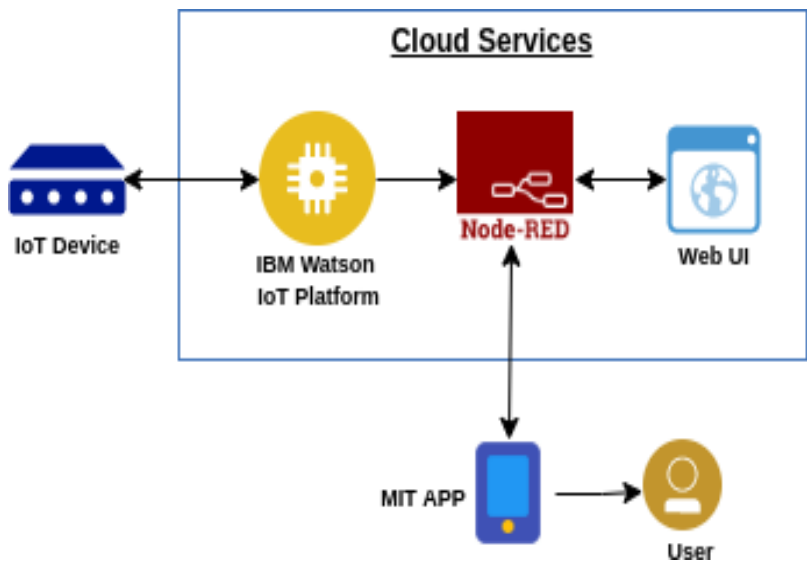
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration/Login	Phone Application And Wifi Module.
FR-2	User Permission	User permission for irrigation via Mobile Application and software Web UI Application
FR-3	Log in / App	Check Id / username And Check Roles access.
FR-4	Check whether details	Temperature and Humidity details
FR-5	Log out	Exit

##### NON - FUNCTIONAL REQUIREMENT

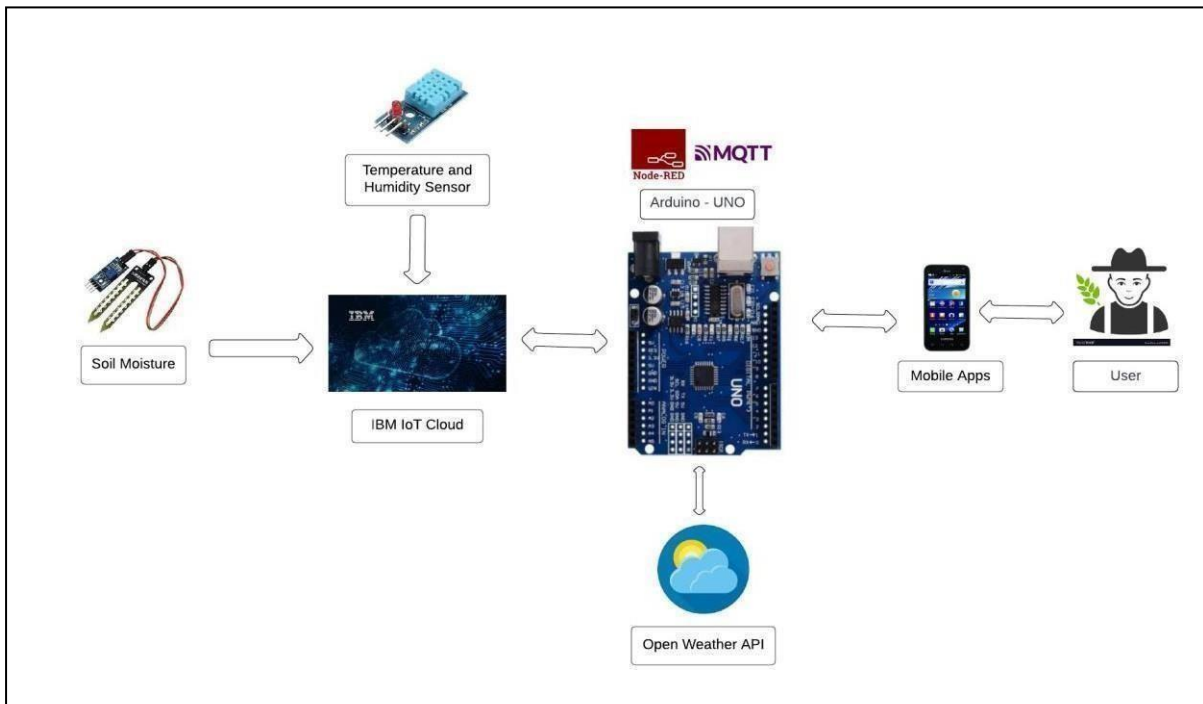
FR No.	Non-Functional Requirement	Description
NFR-1	<b>Usability</b>	User-friendly Interface and learn to ability, efficiency in use, remember ability, lack of errors in
NFR-2	<b>Security</b>	Sensitive and private data must be protected from their production until the decision-making and storage stages
NFR-3	<b>Reliability</b>	The shared protection achieves a better trade-off between costs and reliability. Accuracy of data
NFR-4	<b>Performance</b>	The process of the usage is easy and simple which allows to monitor and control with application's stability and accuracy
NFR-5	<b>Availability</b>	Automatic adjustment of farming equipment made possible by linking information like crops and weather
NFR-6	<b>Scalability</b>	we can upgrade the Smart farming Application automatic real time decision -making is feasible in an environment composed of dozens of thousand

5. PROJECT DESIGN

DATA FLOW DIAGRAMS



## SOLUTION & TECHNICAL ARCHITECTURE



# USER STORIES

## 6. PROJECT PLANNING & SCHEDULING

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
	Permission	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-2
Customer (Web user)	Login/App	USN-3	As a user, I can log into the application by entering email & password	I can register & access the dashboard with Login	High	Sprint-3
	Check whether details	USN-4	As a user, I can register for the application through Mobile application	Temperature and Humidity details	High	Sprint-4
Customer Care Executive		USN-5	To make the user to interact with the software	Data base to stored in cloud services	High	Sprint-5
	Log out	USN-6	Exit	Sign out	High	Sprint-6

## SPRINT PLANNING & ESTIMATION

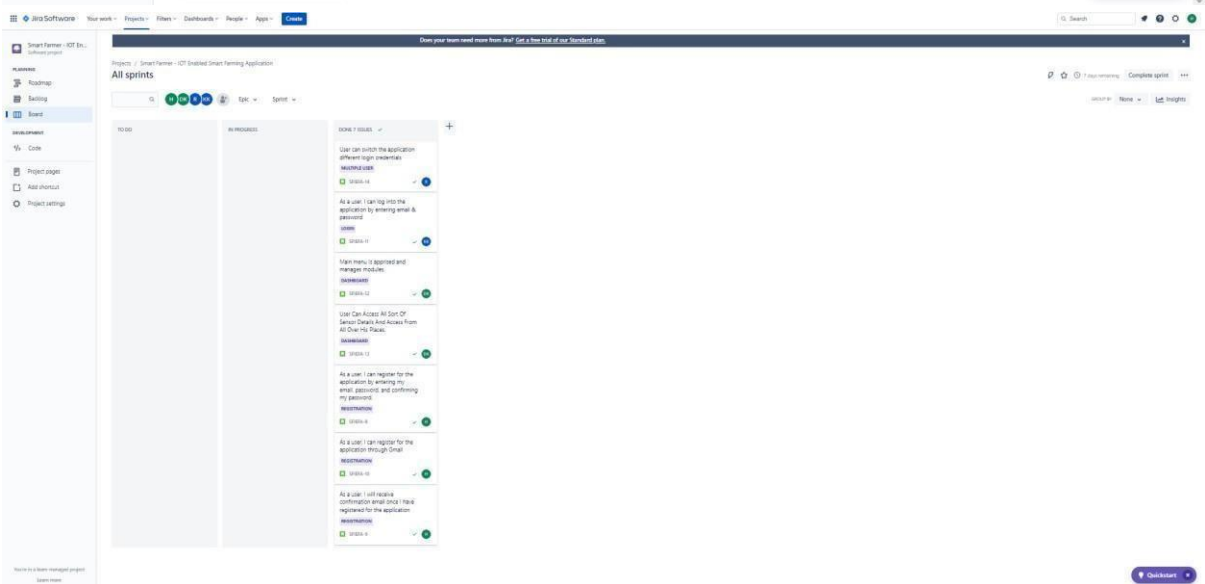
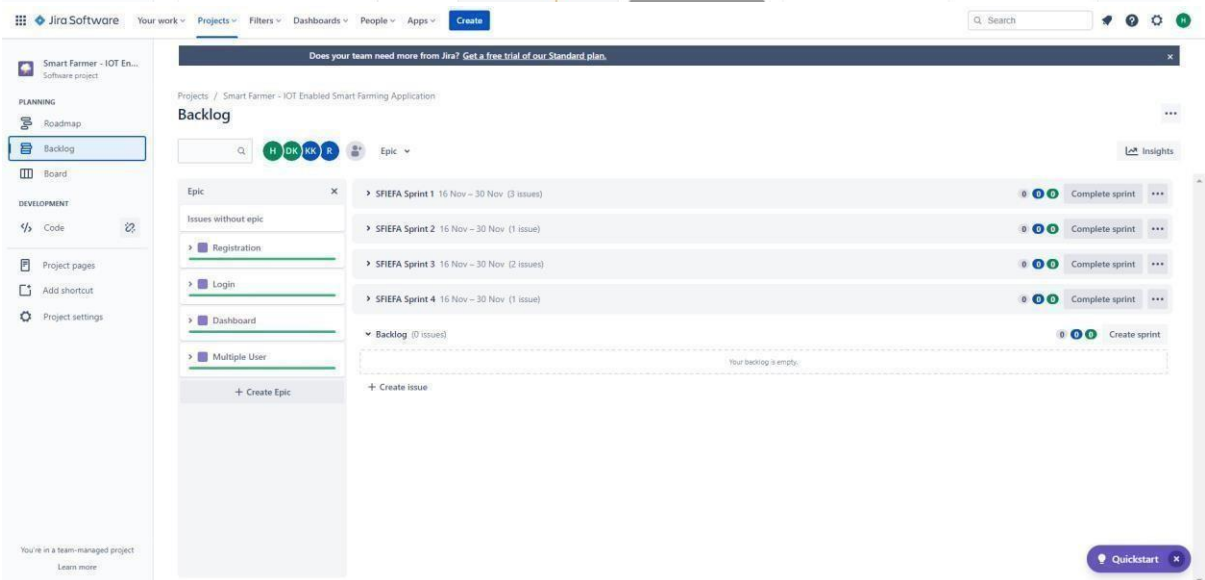
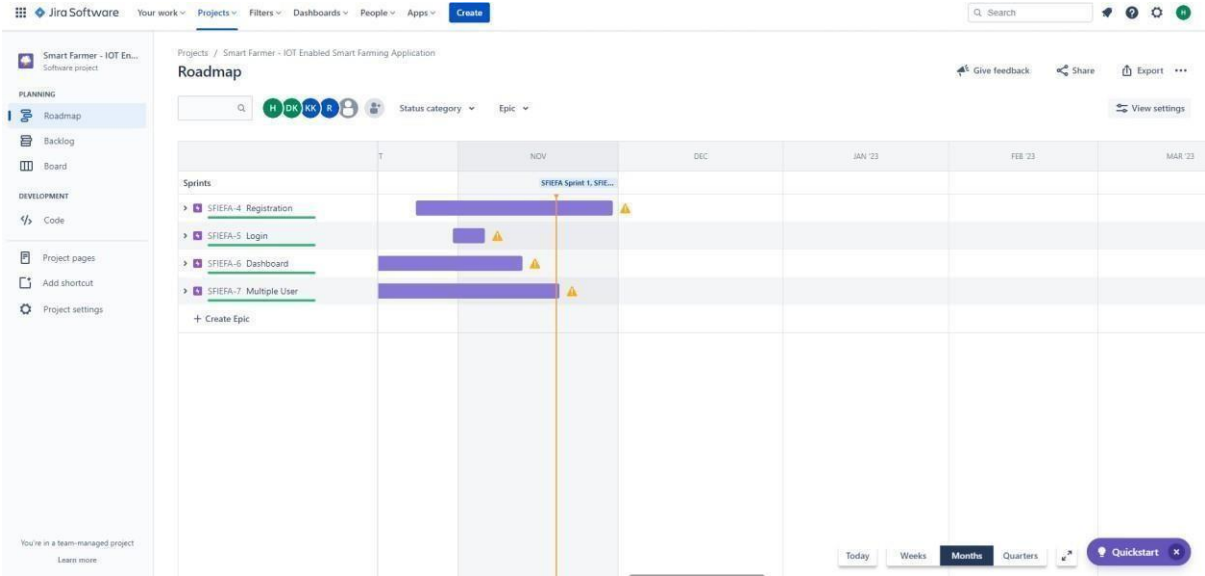
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Hardware	USN-1	Sensors and wi-fi module with python code	2	High	Sri Rajeswari. E Mathibalan. M Thiruponpugazh. P Ruhi Angel. A
Sprint-2	Software	USN-2	IBM Watson IoT platform, Workflows for IoT scenarios using Node-red	2	High	Sri Rajeswari. E Mathibalan. M Thiruponpugazh. p Ruhi Angel. A
Sprint-3	MIT app	USN-3	To develop an mobile application using MIT	2	High	Sri Rajeswari. E Mathibalan. M Thiruponpugazh. p Ruhi Angel. A
Sprint-4	Web UI	USN-4	To make the user to interact with software	2	High	Sri Rajeswari. E Mathibalan. M Thiruponpugazh. P Ruhi Angel. A

## SPRINT DELIVERY SCHEDULE

<b>Sprint</b>	<b>Total Story Points</b>	<b>Duration</b>	<b>Sprint Start Date</b>	<b>Sprint End Date (Planned)</b>	<b>Story Points Completed (as on Planned EndDate)</b>	<b>Sprint Release Date (Actual)</b>
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	5 <sup>th</sup> NOV 2022
Sprint -3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 <sup>th</sup> NOV 2022
Sprint -4	20	6 Days	14 Nov 2022	19 Nov 2022	20	14 <sup>th</sup> NOV 2022



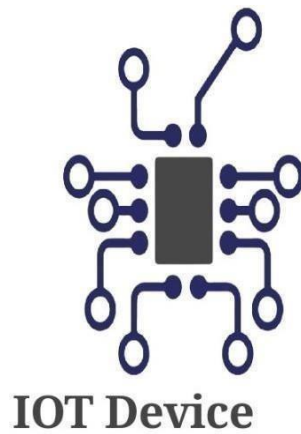
# JIRA REPORTS FROM JIRA



## 7. CODING & SOLUTIONING

### Feature 1

Monitor the Realtime sensor data



### Sensor Data



Temperature (c) : NA



Humidity (%) : NA



SoilMoisture(%) : NA

HOME

← → ↻ <https://node-red-kmvfk-2022-10-09.us-east.mybluemix.net/sensor>

```
{"temp":80,"humid":100,"soilmoist":100}
```

Smart Farmer - IoT enabled | IBM | IBM-Project-16573-16596 | IBM-Project-39940-16603 | MIT App Inventor | MIT App Inventor

Not secure | http://ai2.appinventor.mit.edu/#6687964168847360

MIT APP INVENTOR

Projects | Connect | Build | Settings | Help | My Projects | View Trash | Guide | Report an Issue | English | hemanath.m2002@gmail.com

test123 | Screens3 | Add Screen | Remove Screen | Publish to Gallery | Designer | Blocks

Blocks

- Built-in
  - Control
  - Logic
  - Math
  - Text
  - Lists
  - Dictionaries
  - Colors
  - Variables
  - Procedures
- Screens3
  - VerticalArrangement1
  - HorizontalArrangement1
  - Label1
  - HorizontalArrangement2
  - HorizontalArrangement3

Media

20221108\_103400.jpg

Viewer

when Clock1.Timer do

- set Web1.Uri to https://node-red-kmvR-2022-10-09-us-east.myblue.com
- call Web1.Get

when Web1.GotText do

uri	responseCode	responseType	responseContent
temp	200	text/plain	20.5
humidity	200	text/plain	65
soilmoist1	200	text/plain	0.5

set Label3.Text to look up in pairs key temp

call Web1.JsonTextDecode

jsonText get responseContent

notFound

set Label5.Text to look up in pairs key humidity

call Web1.JsonTextDecode

jsonText get responseContent

notFound

set Label8.Text to look up in pairs key soilmoist1

call Web1.JsonTextDecode

jsonText get responseContent

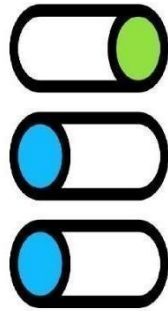
notFound

Show Warnings

80°F Mostly clear | Search | ENG IN | 8:14 PM 11/16/2022

## Feature 2

Control the switch remotely



### Switch Control



#### Switch Controls

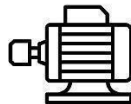
Light



Light On

Light Off

Motor



Motor On

Motor Off

Home

← → ↻ <https://node-red-kmvfk-2022-10-09.us-east.mybluemix.net/command?command=lightoff>

lightoff

← → ↻ <https://node-red-kmvfk-2022-10-09.us-east.mybluemix.net/command?command=lighton>

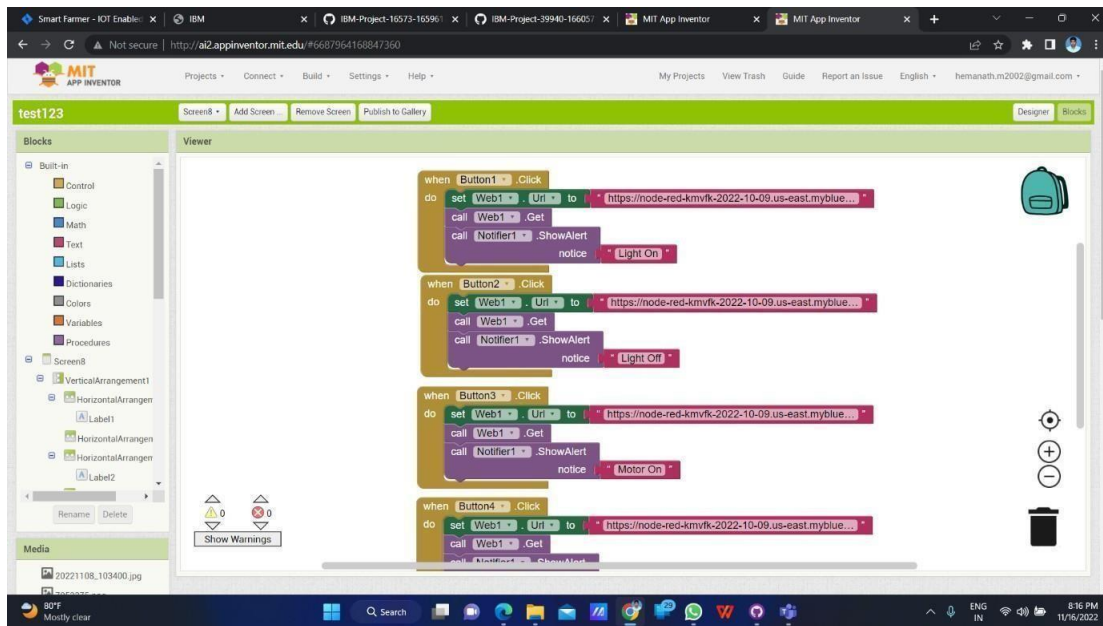
lighton

← → ↻ <https://node-red-kmvfk-2022-10-09.us-east.mybluemix.net/command?command=motoron>

motoron

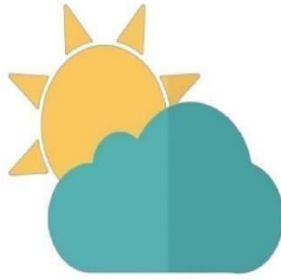
← → ↻ <https://node-red-kmvfk-2022-10-09.us-east.mybluemix.net/command?command=motoroff>

motoroff



## Feature 3

Get the Realtime weather data



### Weather Data

2:24 PM 14.5KB/s

#### Open Weather Data



Temperature : 28 °C



Humidity : 77 %



Pressure : 1010 PSI



Wind Speed : 5.67 KM/H



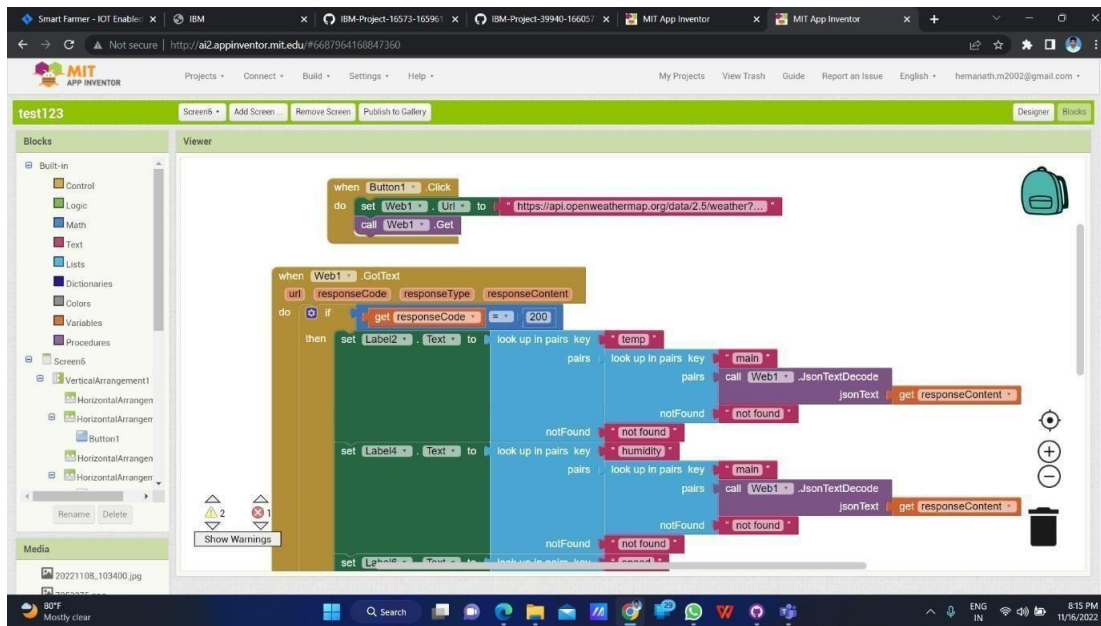
Wind Direction : 54 N



Location : Mahabalipuram

```
← → ↻ https://node-red-kmvfk-2022-10-09-us-east.mybluemix.net/weatherapi
{"temp":29,"humidity":61,"pressure":1009,"location":"Mahabalipuram","windspeed":8.17,"clouds":99,"winddirection":24,"weather description":"The weather in Mahabalipuram at coordinates: 12.6264, 80.1722 is Clouds (overcast clouds)."}

```



## 8. **TESTING**

### **Test Cases**

1. Verify user is able to see the Login/Signup popup when user clicked on My account button.
2. Verify the UI elements in Login/Signup popup.
3. Verify user is able to log into application with Valid credentials.
4. Verify user is able to log into application with InValid credentials.

### **User Acceptance Testing**

#### **Purpose of Document**

The purpose of this document is to briefly explain the test coverage and open issues of the [ProductName] project at the time of the release to User Acceptance Testing (UAT).

#### **Defect Analysis**

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

<b>Resolution</b>	<b>Severity 1</b>	<b>Severity 2</b>	<b>Severity 3</b>	<b>Severity 4</b>	<b>Subtotal</b>
ByDesign	10	4	2	3	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	24	14	13	26	77



## Test Case Analysis

This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	7	0	0	7
Client Application	51	0	0	51
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

## 9. RESULTS

### 9.1 Performance Metrics

Hence a helpful and useful system is built for farmers to assist them in farming and also prevent them from natural calamities. It also saves farmers time to maintain all these things as this is working on cloud he can turn on/off motor from anywhere so basically it helps farmers and make them relived thus helping our economy to grow.

## 10. ADVANTAGES & DISADVANTAGES

### ADVANTAGE

- Communicating the device at larger distance through web application. It will playan important role in reducing the man power and travellingexpenses of a farmer.
- Monitoring the parameter like temperature, humidity etc will play an importantrole in improving the growth of the plant.
- Integrating the weather station to the web browser will provide the details of status of the cloud, wind speed etc. It will allow the farmer toprevent their plantsfrom natural calamities.

### DISADVANTAGE

1. Since the real time sensor will be connected to the controller, the controller requires continuous supply of internet to transfer the data.
2. Non availability of weather prediction for long period of time. Since the long weather prediction require additional payment to open weather.

## 11. CONCLUSION

The various parameters like temperature, humidity etc were monitored using web application. The data from weather station like wind speed, temperature, humidity etc were displayed in the web browser. The device like motor, light etc can also controlled by the web application.

## 12. FUTURE SCOPE

1. The various data's of soil nutrients is not added in the web browser, that can be added to the web application.
2. Long range forecast is not available in the web application, it can also be added to provide accurate information about weather.
3. Controlling the device through mobile application and voice will play important role in enhancing this project.
4. Providing the GPS and GIS information will also improve productivity of the farmer.

## 13. APPENDIX

### Source Code

#### 1)Python Code

```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random

organization = "22r9m3"
deviceType = "123"
deviceId = "1234567"
authMethod = "token"
authToken = "12345678"

def myCommandCallback(cmd):
    print("Command received: %s" % cmd.data['command'])
    status=cmd.data['command']
    if status=="lighton":
        print ("led is on")
    elif status == "lightoff":
        print("led is off")
    elif status == "motoron":
        print("motor is on")
    elif status == "motoroff":
        print("motor is off")
    else :
        print ("please send proper command")
```

```

#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()

deviceCli.connect()

while True:

    temp=random.randint(0,100)
    humid=random.randint(0,100)
    soilmoist=random.randint(0,100)

    data = { 'temp' : temp, 'humid': humid, 'soilmoist': soilmoist }

    def myOnPublishCallback():
        print ("Published Temperature = %s C" % temp, "Humidity = %s %% " %
humid,"Soilmoisture = %s %% " % soilmoist, "to IBM Watson")

    success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0,
on_publish=myOnPublishCallback)
    if not success:
        print("Not connected to IoT")
        time.sleep(1)

    deviceCli.commandCallback = myCommandCallback

deviceCli.disconnect()

```

## 2) Wokwi Simulator

```

#include <WiFi.h>
#include <PubSubClient.h>
#include "DHT.h"
#define DHTPIN 15
#define DHTTYPE DHT22
#define LED 2

```

```
#define MOTOR 4
```

```
DHT dht (DHTPIN, DHTTYPE);
```

```
void callback(char* subscribetopic, byte* payload, unsigned int payloadLength);
```

```
#define ORG "22r9m3"//IBM ORGANITION ID
```

```
#define DEVICE_TYPE "123"//Device type mentioned in ibm watson IOT Platform
```

```
#define DEVICE_ID "1234567"//Device ID mentioned in ibm watson IOT Platform
```

```
#define TOKEN "12345678" //Token
```

```
String data3;
```

```
float h, t;
```

```
char server[] = ORG ".messaging.internetofthings.ibmcloud.com";// Server Name
```

```
char publishTopic[] = "iot-2/evt/Data/fmt/json";// topic name and type of event perform and  
format in which data to be send
```

```
char subscribetopic[] = "iot-2/cmd/command/fmt/String";// cmd REPRESENT command  
type AND COMMAND IS TEST OF FORMAT STRING
```

```
char authMethod[] = "use-token-auth";// authentication method
```

```
char token[] = TOKEN;
```

```
char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID;//client id
```

```
WiFiClient wifiClient;
```

```
PubSubClient client(server, 1883, callback ,wifiClient);
```

```
void setup()
```

```
{  
  Serial.begin(115200);  
  dht.begin();  
  pinMode(LED,OUTPUT);  
  pinMode(MOTOR,OUTPUT);  
  delay(10);  
  Serial.println();  
  wificonnect();  
  mqttconnect();  
}
```

```
void loop()
```

```
{  
  
  h = dht.readHumidity();
```

```

t = dht.readTemperature();
Serial.print("temp:");
Serial.println(t);
Serial.print("humid:");
Serial.println(h);

PublishData(t, h);
delay(1000);
if (!client.loop()) {
    mqttconnect();
}
}

```

```

void PublishData(float temp, float humid) {
    mqttconnect();

```

```

    String payload = "{\"temp\":";
    payload += temp;
    payload += "," "\"humid\":";
    payload += humid;
    payload += "," "\"soilmoist\":";
    payload += humid;
    payload += "}";

```

```

    Serial.print("Sending payload: ");
    Serial.println(payload);

```

```

    if (client.publish(publishTopic, (char*) payload.c_str())) {
        Serial.println("Publish ok");
    } else {
        Serial.println("Publish failed");
    }

```

```

}

```

```

void mqttconnect() {
    if (!client.connected()) {
        Serial.print("Reconnecting client to ");
        Serial.println(server);
        while (!client.connect(clientId, authMethod, token)) {
            Serial.print(".");

```

```

    delay(500);
}

    initManagedDevice();
    Serial.println();
}
}
void wificonnect()
{
    Serial.println();
    Serial.print("Connecting to ");

    WiFi.begin("Wokwi-GUEST", "", 6);
    while (WiFi.status() != WL_CONNECTED) {
        delay(500);
        Serial.print(".");
    }
    Serial.println("");
    Serial.println("WiFi connected");
    Serial.println("IP address: ");
    Serial.println(WiFi.localIP());
}

void initManagedDevice() {
    if (client.subscribe(subscribetopic)) {
        Serial.println((subscribetopic));
        Serial.println("subscribe to cmd OK");
    } else {
        Serial.println("subscribe to cmd FAILED");
    }
}

void callback(char* subscribetopic, byte* payload, unsigned int payloadLength)
{
    Serial.print("callback invoked for topic: ");
    Serial.println(subscribetopic);
    for (int i = 0; i < payloadLength; i++) {
        data3 += (char)payload[i];
    }
    Serial.println("data: "+ data3);
    if(data3=="lighton")
    {
        Serial.println(data3);
        digitalWrite(LED,HIGH);
    }
    else if(data3=="motoron")
    {

```

```
Serial.println(data3);
digitalWrite(MOTOR,HIGH);
}
else if(data3=="motoroff")
{
Serial.println(data3);
digitalWrite(MOTOR,LOW);
}
else
{
Serial.println(data3);
digitalWrite(LED,LOW);
}
data3="";
}
```

## **GitHub & Project Demo Link**

**GitHub :** <https://github.com/IBM-EPBL/IBM-Project-53453-1661407479/tree/main>