

SMART FARMER: IOT ENABLED SMART FARMING APPLICATION



PROJECT REPORT

SUBMITTED BY

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TECHNOLOGY**

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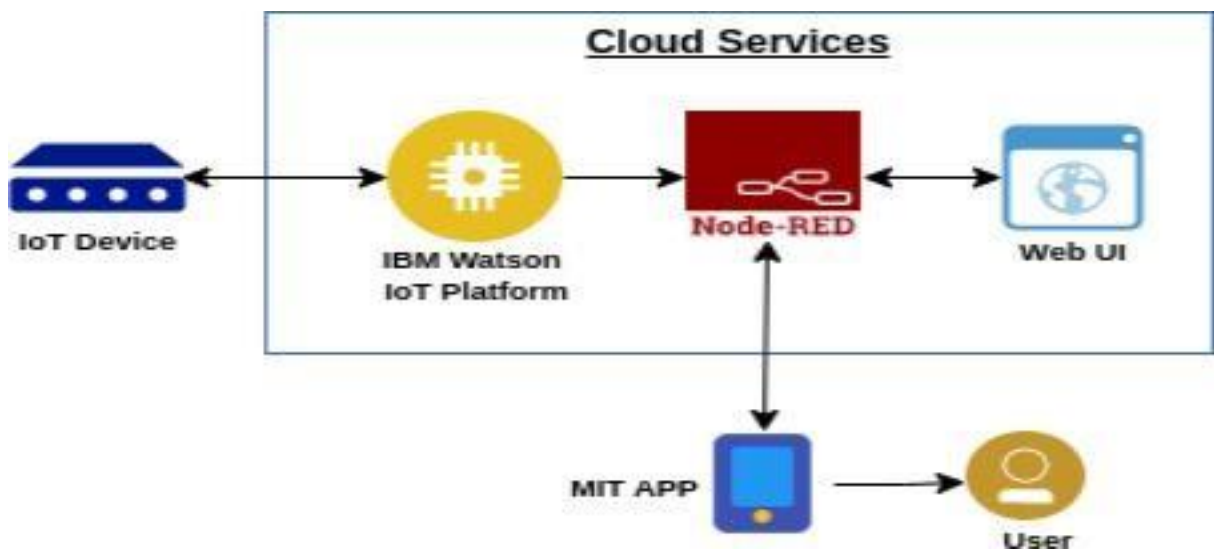
**ANNA UNIVERSITY-CHENNAI 600 025
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SMART FARMING

1.INTRODUCTION:

1.1 PROJECT OVERVIEW:

- IoT-based agriculture system helps the farmer in monitoring different parameters of his field like soil moisture, Temperature, humidity using some sensors.
- This is system that enables framers to monitor and control their forms with a web-based application build with Node-RED.
- It uses the IBM IOT Watson cloud platform as its Backend.



1.2 PURPOSE:

Smart Farming reduce the ecological foot print of farming. Minimized Or SiteSpecific application of inputs, such as fertilizers and pesticides, in precision agriculture systems will mitigate leaching problems as well as the emission of greenhouse gases.

2. LITERATURE SURVEY:

2.1 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.

To successfully deploy a smart agriculture system, consider setting up a communications network that can integrate a limited number of sensors across a large area of farmland. This will require third-party network provisioning or setting up a private network consisting of access points and uplinks to a private backhaul network, which channels all the data traffic to centralized monitoring software or an analytics head-end system • It is not a secure system.

- There is no motion detection for protection of agriculture field.
- Auto Motion is not available.

2.2 REFERENCES:

TITLE	AUTHOR	YEAR	PROJECT DESCRIPTION
SMART FORMING: IOT Based Smart Sensor Agriculture Stick For Live Temperature And Humidity Monitoring	Nirav Rathod, Shreedhar Panigrahi, Vijaya Pinjarkar	2020	Smart forming IOT based agriculture stick for live monitoring of temperature and soil moisture has been proposed using node MCU chip, wifi module and various other hardware devices. The IOT based agriculture stick being developed through this paper will help farmers in increasing the agriculture yield and take efficient care of food production as the stick will always provide helping hand to formers for getting accurate live feed of environmental

			temperature and soil moisture with accurate results.
IOT in Agriculture: Smart Farming	Dr.S.Kanchana	2018	IOT technology Enchange the existing life style of agriculturalist and farmers by integrating all the devices to a digital level in the extensive directions. Internet technologies, social networks, secured integrated databases and on demand availability of information will facilitate the smart farming and global food Production. The purpose of smart farming is to increase the quality and quantity of agricultural production by using sensing technology to make farmers more intelligent and more connected.
IOT Based Smart Agriculture Towards Making The Fields Talk	Muhammad Ayaz, Mohammad Ammad-Uddin, Zubair Sharif, Ali Mansour	2019	The focus on smarter, better, and more efficient crop growing methodologies is required in order to meet the growing food demand of the increasing world population in the face of the ever – shrinking arable land. The development of new methods of improving crop yield and handling, one can readily see currently; Technology - weaned, innovative younger people adopting farming as a profession, agriculture as a means for independence from fossil fuels, tracking the crop growth, safety and nutrition labeling,

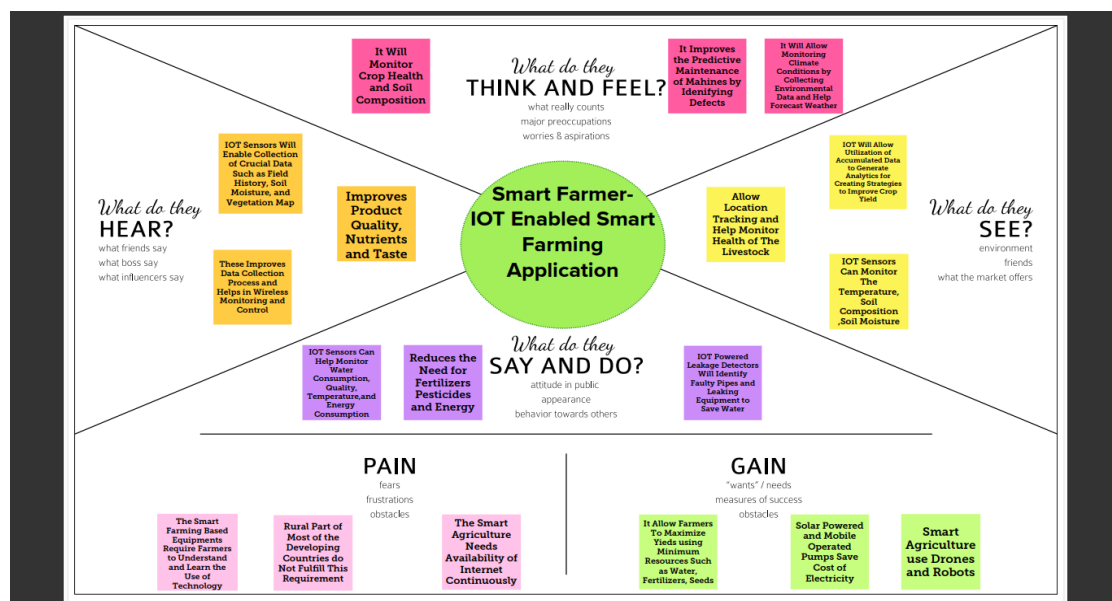
			partnerships between growers, suppliers, and retailers and buyers.

2.3 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.

3. IDEATION & PROPOSED SOLUTION:

3.1 EMPATHY MAP CANVAS:



3.2 IDEATION AND BRAINSTORMING:

Introduction on Internet of Things (IoT), application of IoT in agricultural field to improve the yield and quality by reducing the cost is provided. The sensors which are used in the architecture are discussed briefly and the process of transmission of data from the agriculture field to the central system is explained. The proposed system advantages are included. In addition,

open research issues, challenges, and future of IoT in agricultural field are highlighted. The concept is basically developed on an idea, where there are numerous things or objects - such as Arduino, sensors, GSM models, LCD display, etc., that are connected with the Internet. Each of the objects has a different address and is able to interact with other items. The things or objects co-operate with each other to reach a common goal.

We are going to construct a smart agricultural monitoring system which can collect crucial agricultural data and send it to an IoT platform called Thing speak in real time where the data can be logged and analyzed. The logged data on Thing speak is in graphical format, a botanist or a reasonably knowledge farmer can analyze the data (from anywhere in the world) to make sensible changes in the supplied resources (to crops) to obtain high quality yield.

Smart agriculture monitoring system or simply smart farming is an emerging technology concept where data from several agricultural fields ranging from small to large scale and its surrounding are collected using smart electronic sensors. The collected data are analyzed by experts and local farmers to draw short term and long-term conclusion on weather pattern, soil fertility, current quality of crops, amount of water that will be required for next week to a month etc.

We can take smart farming a step further by automating several parts of farming, for example smart irrigation and water management. We can apply predictive algorithms on microcontrollers or SoC to calculate the amount of water that will be required today for a particular agriculture field. Say, if there was rain yesterday and the quantity of water required today is going to be less. Similarly, if humidity was high the evaporation of water at upper ground level is going to be less, so water required will be less than normal, thus reducing water usage.

3.3 PROPOSED SOLUTION:

- To develop a Smart Agricultural System based on IOT which can give real time data and can help farmers in a very efficient manner.

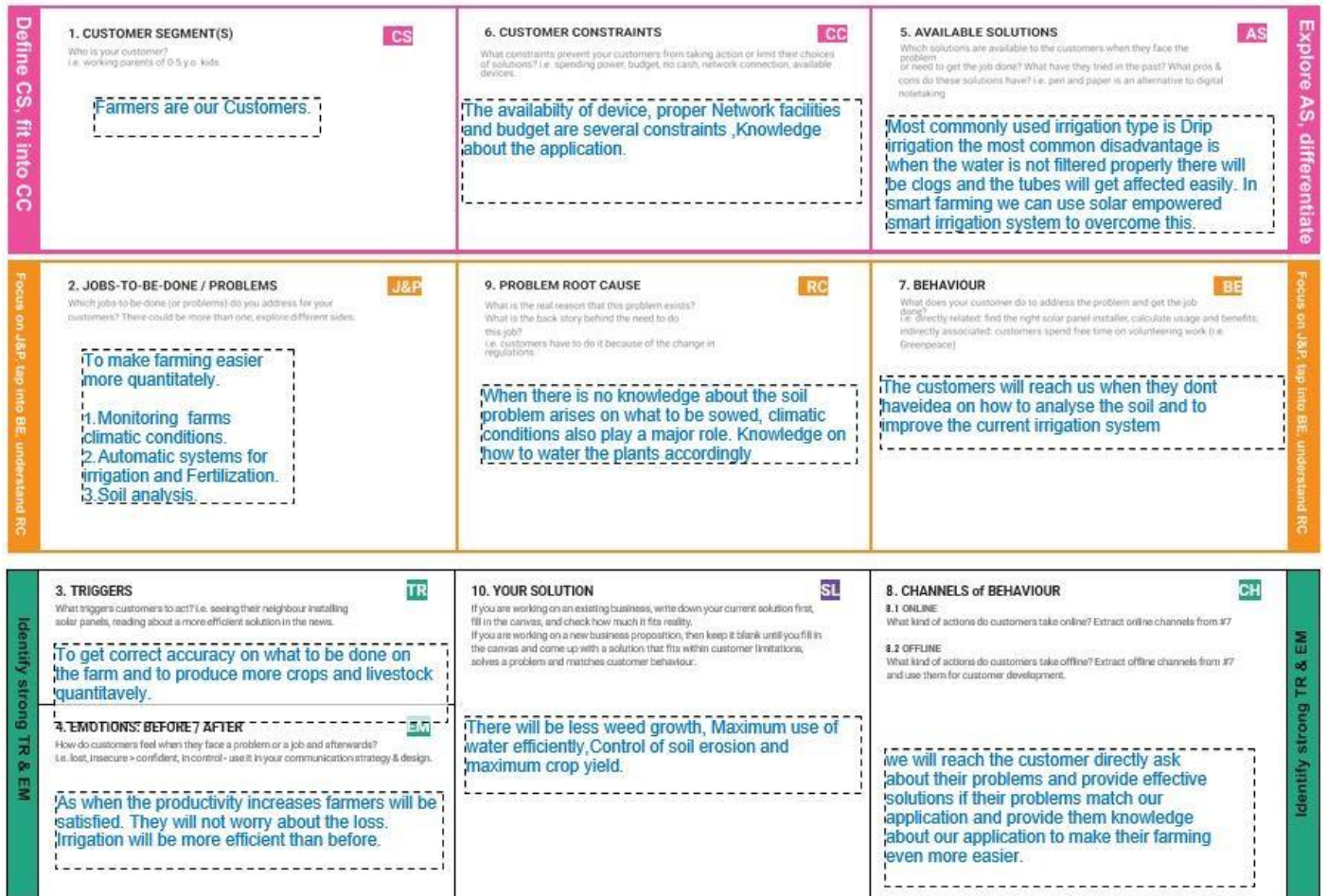
- Soil Moisture can be checked by using the sensors that can sense the soil condition and send the data (moisture content in the soil) over the cloud services to the web application.

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

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To make farming easier by choosing several constraints in agriculture and to overcome those constraints, to increase production quality and quantity using IOT.
2.	Idea / Solution description	Using smart techniques like monitoring farms climate, smart irrigation and soil analysis.
3.	Novelty / Uniqueness	Solar power smart irrigation system which helps you to monitor temperature, moisture ,humidity using smart sensors.
4.	Social Impact / Customer Satisfaction	It is better than the present modern irrigation system by using this method we can control soil erosion. There will be better production yield.
5.	Business Model (Revenue Model)	As the productivity increases customer satisfaction also increases and hence need for the application also increases, which increases the revenue of the business.
6.	Scalability of the Solution	It is definitely scalable we can increase the constraints when the problem arises.

3.4 PROBLEM SOLUTION FIT:

- With the help of the IoT devices, you can know the real-time status of the crops by capturing the data from sensors.
- Using predictive analytics, you can get an insight to make better decisions related to harvesting.



4. REQUIREMENT ANALYSIS:

4.1 FUNCTIONAL REQUIREMENTS:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	IoT devices	Sensors and Wifi module.
FR-2	Software	Web UI, Node-red, IBM Watson, MIT app

4.2 NON -FUNCTIONAL REQUIREMENTS:

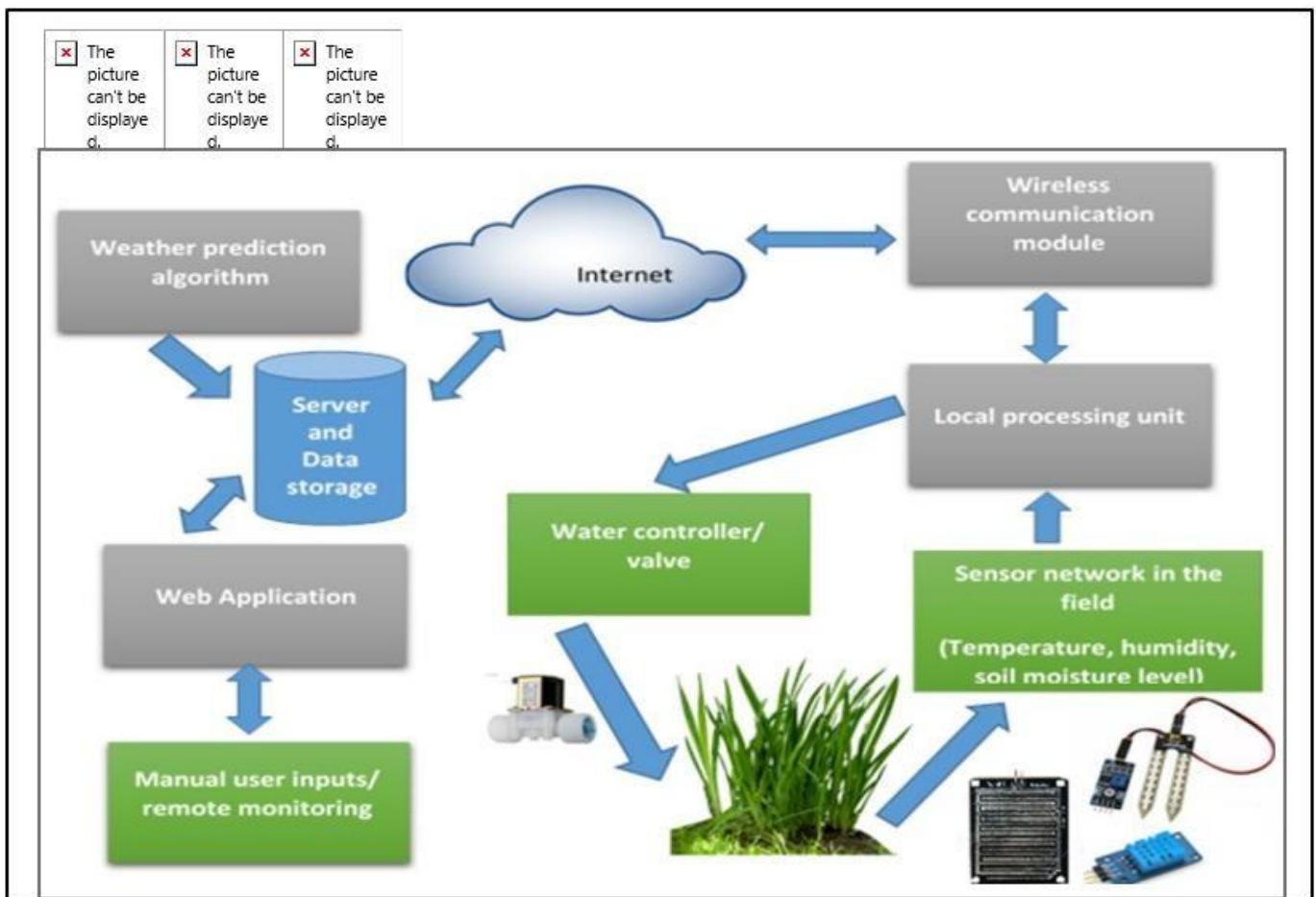
Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	Time consumability is less, Productivity is high.
NFR-2	Security	It has low level of security features due to integration of sensor data.
NFR-3	Reliability	Accuracy of data and hence it is Reliable.
NFR-4	Performance	Performance is high and highly 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

5 PROJECT DESIGN:

5.1 DATA FLOW DIAGRAM:

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.



User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer	IoT devices	USN-1	Sensors and wi-fi module		High	Sprint-1
Customer	Software	USN-2	IBM Watson IoT platform, Workflows for IoT scenarios using Node-red		High	Sprint-2
Customer	MIT app	USN-3	To develop an application using MIT		High	Sprint-3
Customer	Web UI	USN-4	To make the user to interact with the software.	User can access the app for the services.	High	Sprint-4

5.2 SOLUTION AND TECHNICAL ARCHITECTURE:

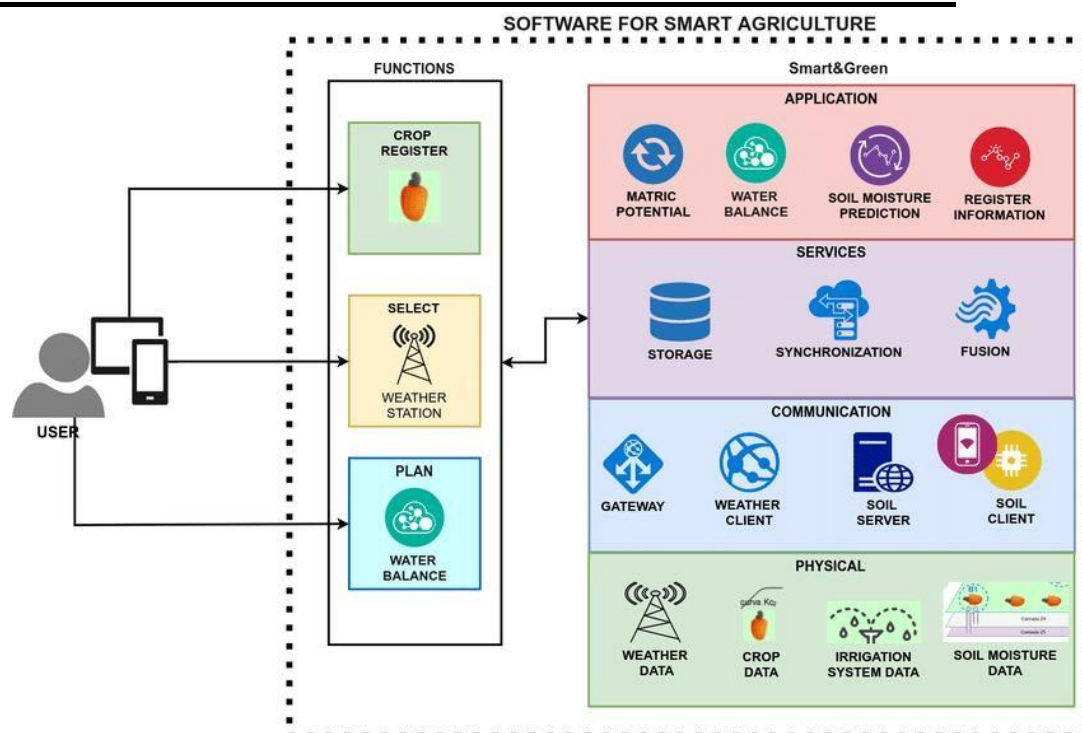


Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	How user interacts with application e.g. Web UI, Mobile App, Chatbot etc.	MIT app
2.	Application Logic-1	Logic for a process in the application	Node red/IBM Watson/MIT app
3.	Application Logic-2	Logic for a process in the application	Node red/IBM Watson/MIT app
4.	Application Logic-3	Logic for a process in the application	Node red/IBM Watson/MIT app
5.	Database	Data Type, Configurations etc.	MySQL, NoSQL, etc.
6.	Cloud Database	Database Service on Cloud	IBM cloud.

7.	Temperature sensor	Monitors the temperature of the crop	
8.	Humidity sensor	Monitors the humidity	
9.	Soil moisture sensor (Tensiometers)	Monitors the soil temperature	
10.	Weather sensor	Monitors the weather	
11.	Solar panel		
12.	RTC module	Date and time configuration	
13.	Relay	To get the soil moisture data	

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	MIT app,Node-Red	Software
2.	Scalable Architecture	Drone technology, pesticide monitoring ,Mineral identification in soil	Hardware

6.PROJECT PLANNING AND SCHEDULING :

6.1 SPRINT PLANNING AND ESTIMATION:

S.NO	ACTIVITY TITLE	ACTIVITY DESCRIPTION	DURATION
1	Understanding the project	Assign the team members after that create repository in the GitHub and then assign task to each member and guide them how to access the GitHub while submitting the assignments	1 week
2	Staring The Project	Team Members to Assign All the Tasks Based on Sprints and Work on It Accordingly.	1 week
3	Completing Every Task	Team Leader should ensure that whether every team member have completed the assigned task or not	1 week
4	Stand Up Meetings	Team Lead Must Have a Stand-Up Meeting with The Team and Work on The Updates and Requirement Session	1 week
5	Deadline	Ensure that team members are completing every task within the deadline	1 week
6	Budget and Scope of project	Analyze the overall budget which must be within certain limit it should be favorable to every person	1 week

6.2 SPRINT DELIVERY SCHEDULE:

Sprint	Functional Requirement (Epic)	User Story Number	User Story /Task	Story Points	Priority	Team Member
Sprint-1	Registration (Farmer Mobile User)	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	J.Anupriya
Sprint-1	Login	USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	v. Vasuki (Member 1)

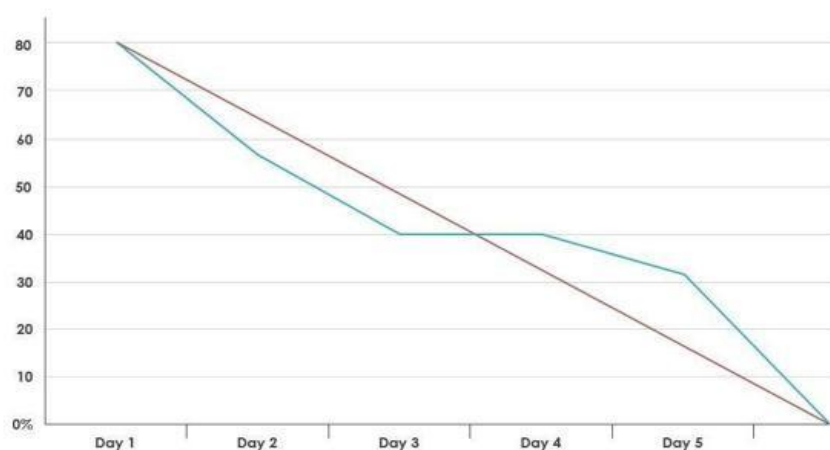
Sprint-2	User Interface	USN-3	As a user, I can register for the application through Facebook	3	LOW	M.Sudali (Memer2)
Sprint-3	Registration (Farmer - Web User)	USN - 1	As a user, I can log into the application by entering email and password	3	High	D.Mathava shanmugam (Member3)
Sprint - 2	Login	USN -2	As a registered user, I need to easily login log into my registered	3	High	J.Anupriya (Leader)

print - 1	Registration (Chemical Manufacturer - Web user)	USN - 1	As a new user, I want to first register using my organization email and create a password for the account.	2	High	M. Sudali (Member2)
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Sprint - 3	Web U1	USN-3	As a user, I need to have a user friendly interface to easily view and access the resources	3	Medium	D.Mathava sanmugam(Me mer3)
Sprint -1	Registration (Chemical Manufacturer - Mobile User)	USN-1	As a user, I want to first register using my email and create a password for the account.	1	High	j.Anupriya(Lead er)
Sprint -1	Login	USN - 2	As a registered user, I need to easily log in to the application	2	Low	V.Vasuki(Mem ber 1)

Sprint - 2	Login	USN -2	As a registered user, I need to easily login log into my registered account via the web page in minimum time	3	High	J.Anupriya (Leader)
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Sprint -4	Web UI	USN -3	As a user, I need to have a friendly user interface to easily view and access the resource	3	Medium	V.Vasuki (Member1)
print - 1	Registration (Chemical Manufacturer - Web user)	USN - 1	As a new user, I want to first register using my organization email and create a password for the account.	2	High	M. Sudali (Member2)



7. CODING AND SOLUTIONING:

8.

7.1 CODING:

```
_import time
```

```
import sys
```

```
import
```

```
ibmiotf.Application
```

```
import ibmiotf. Device
```

```
import random
```

```
#Provide your IBM Watson Device organization =
```

```
"r8cpvf" Device Type = "farming" device Id = "12345"
```

```
auth Method = "token" auth Token ="87654321" #
```

```
Initialize GPIO def my Command Callback (c md):
```

```
    print ("Common received: %s" % cmd. data['command'])
```

```
status=cmd. data['command'] if status=="m o t o r o n":
```

```
    print ("motor is on")
```

```
    e l if status == "m o t o r o f f":
```

```
        print ("motor is off")
```

```
    else: print ("please send proper
```

```
        command")
```

```
try:
```

```
    device Options = {"org": organization, "type": device Type, "id": device Id,
```

```

"auth-method":
    auth Method, "auth-token": auth Token}
device C li = IBMIOT f. device. Client (device Options)
#.....
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 device C li. Connect () while True:
#Get Sensor Data fromDHT11
temp=random. Rand int (90,110) Humid=random.
    Rand int (60,100) Mo is=random. Rand int (20,120)
    data = {'temp': temp, 'Humid': Humid, 'Mo is': Mo is}
#Print data def
my On Publish Callback ():
    print ("Published Temperature = %s C" % temp, "Humidity
= %s %" %Humid, "Moisture =%s deg c" % Mo is, "to IBM Watson")
    success = device li. Publish Event ("IoT Sensor", "j son",
data, q s=0, on_ publish=my On Publish
Callback) if not success
    print ("Not connected to Io TF")
time. Sleep (10) device C li. Command Callback = my
Command Callback
#Disconnect the device and application from the
cloud device C li. Disconnect ()

```


7.2 SOLUTION:

```
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\HP\Downloads\ibmiot.py =====
Published data Successfully: %s2022-11-18 10:26:00.629   wiotp.sdk.device.client.DeviceClient INFO   Connected successfully: d:r0cpvf:farming:12345
{'temperature': 60, 'humidity': 51, 'moisture': 16}
Published data Successfully: %s {'temperature': 36, 'humidity': 74, 'moisture': 6}
Published data Successfully: %s {'temperature': 29, 'humidity': 14, 'moisture': 13}
Published data Successfully: %s {'temperature': 15, 'humidity': 65, 'moisture': 76}
|
```

8. TESTING:

Browse | Action | Device Types | Interfaces
Add Device

Browse Devices

All Devices
Diagnose

This table shows a summary of all devices that have been added. It can be filtered, organized, and searched on using different criteria. To get started, you can add devices by using the Add Device button, or by using API.

Search by Device ID

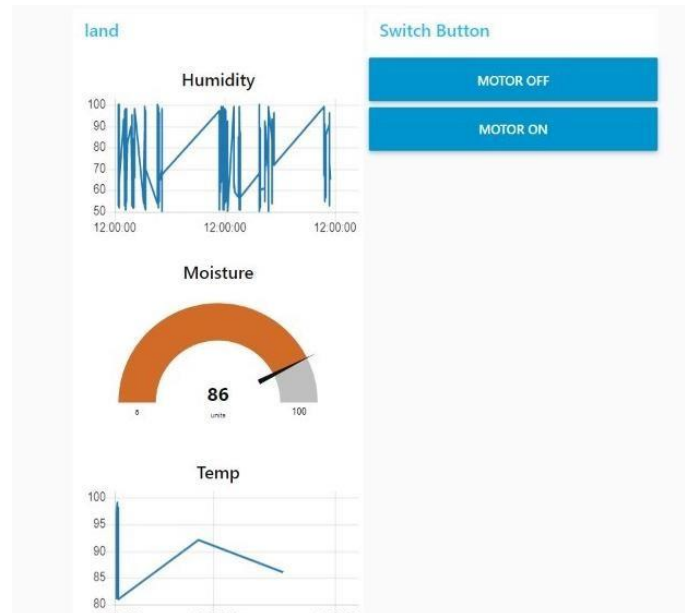
Device Simulator ☒

	Device ID	Status	Device Type	Class ID	Date Added	Descriptive Location
▼	12345	● Connected	farming	Device	Nov 17, 2022 11:38 AM	→ ...
	Identity	Device Information	Recent Events	State	Logs	×
	Device ID	12345				
	Device Type	farming				
	Date Added	Nov 17, 2022 11:38 AM				
	Added By	510419104025@smartinternz.com				

1 Simulation running

9. RESULTS:

We have successfully build a web based UI and integrated all the services using Node-RED.



10. ADVANTAGES AND DISADVANTAGES:

10.1 ADVANTAGES:

- All the data like climatic conditions and changes in them, soil or crop conditions everything can be easily monitored.
- Risk of crop damage can be lowered to a greater extend
- Many difficult challenges can be avoided making the process automated and the quality of crops can be maintained.
- The process included in farming can be controlled using the web applications from anywhere, anytime.

10.2 DISADVANTAGES:

- Smart Agriculture requires internet connectivity continuously, but rural parts cannot fulfill this requirement.
- IoT devices need much money to implement.

11. CONCLUSION:

An IOT based smart agriculture system using Watson IOT Platform, Watson simulation, IBM cloud and Node-RED.

12. 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.

13. APPENDIX :

13.1 SOURCE CODE:

```
import time
import sys
import ibmiotf.application
import IBM IOT f. device
import random

#Provide your IBM Watson Device organization =
"r8cpvf" device Type = "farming" device Id = "12345"
auth Method = "token" auth Token = "87654321" #
Initialize GPIO def my Command Callback (c md):
    print ("Command received: %s" % cmd. data['command'])
    status=cmd. data['command'] if status=="m o t o r o n":
        print ("motor is on")
```

```

    elif status == "motor off":
        print ("motor is off")
    else:
        print ("please send proper command")
try:
    device Options = {"org": organization, "type": device Type, "id": device Id,
"auth-method": auth Method, "auth-token": auth Token}
    device Cli = IBMIOT f. device. Client (device Options)
#.....
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 device Cli. Connect () while True:
#Get Sensor Data fromDHT11
temp=random. Rand int (90,110)
Humid=random. rand int (60,100)
Mo is=random. Rand int (20,120) data = {'temp': temp,
'Humid': Humid, 'Mo is': Mo is}
# Print data def
my On Publish Callback ():
    print ("Published Temperature = %s C" % temp, "Humidity
= %s %" %Humid, "Moisture =%s deg c" % Mo is, "to IBM Watson")
    success = device Cli. publish Event ("IoT Sensor", "j son",
data, q s=0, on _publish=my On Publish
Callback) if not success:

```

```
print ("Not connected to IoT F")  
time. Sleep (10) device C li. Command Callback =  
my Command Callback  
#Disconnect the device and application from the cloud device C li. Disconnect ()
```

DEMO LINK:

https://drive.google.com/file/d/10ekVcK0U9eltZq0Bj617S3UkTDMtuoc/view?usp=share_link