SMART FARMING APPLICATION

TEAM ID : PNT2022TMID51346

Project Report

1.Introduction:

1.1 Project overview:

Internet of Things Smart technology enables new digital agriculture. Today technology has become a necessity to meet current challenges and several sectors are using the latest technologies to automate their tasks. Advanced agriculture, based on Internet of Thingstechnologies, is envisioned to enable producers and farmers to reduce waste and improve productivity by optimizing the usage of fertilizers to boost the efficiency of plants. It gives better control to the farmers for their livestock, growing crops, cutting costs,and resources

1.2 Purpose:

We have tried to focus on different scientific applications which could be put together in the agricultural field for better accuracy with better productivity using less manpower. Moreover, we include a method for monitoring the agricultural fields from any remote location and assessing the basic condition of the field. This is the project from the motivation of the farmers working in the farmlands who are solely dependent on the rains and bore wells for irrigation of their land. In recent times, the farmers have been using irrigation techniques through manual control in which the farmers irrigate the land at regular intervals by turning the water-pumpON/OFF when required.

LITERATURE SUEVEY:

2.1 Existing Problem:

Agriculture is the foundation of our Nation. In the past, agriculturists used to figure out the ripeness of soil and influenced presumptions to develop which kind of product. They didn't think about the dampness, level of water and especially climate conditions which are more horrifying to an agriculturist. They utilize pesticides in view of a few suspicions which lead a genuine impact to the yield if the supposition isn't right. Profitability relies upon the last phase of the harvest on which agriculturists depend.

2.2 References:

[1] S. S. Gill, I. Chana, C. Science, and R. Buyya, “IoT Based Agriculture as aCloud and Big Data Service: The Beginning of Digital India,” vol. 29, no. 4, pp. 1–23, 2017.

[2] R. K. Kodali and A. Sahu, “An IoT based Weather Information Prototype Using WeMos,” no. 1, pp. 612–616, 2016.

[3] I. Mat, M. Rawidean, M. Kassim, A. N. Harun, I. M. Yusoff, and M. Berhad, “Smart Agriculture Using Internet of Things,” 2018 IEEE Conf. Open Syst., pp. 54–59, 2018.

[4] S. R. Prathibha, A. Hongal, and M. P. Jyothi, “IOT BASED MONITORING SYSTEM IN SMART AGRICULTURE,” pp. 5–8, 2017.

[5] Y. Bo and H. Wang, “The Application of Cloud Computing and The Internet of Things in Agriculture and Forestry,” pp. 168–172, 2011.

[6] Tien Cao Huang and Can Nguyen Duy, “Environment Monitoring for Agricultural Application Based on Wireless Sensor Network.”, April 16-17.

[7] M. K. Gayatri, “Providing Smart Agricultural Solutions to Farmers for better yielding using IoT,” no. Tiar, pp. 40–43, 2015.

[8] S. V. Mukherji, R. Sinha, S. Basak, and S. P. Kar, “Smart Agriculture using Internet of Things and MQTT Protocol,” 2019 Int. Co

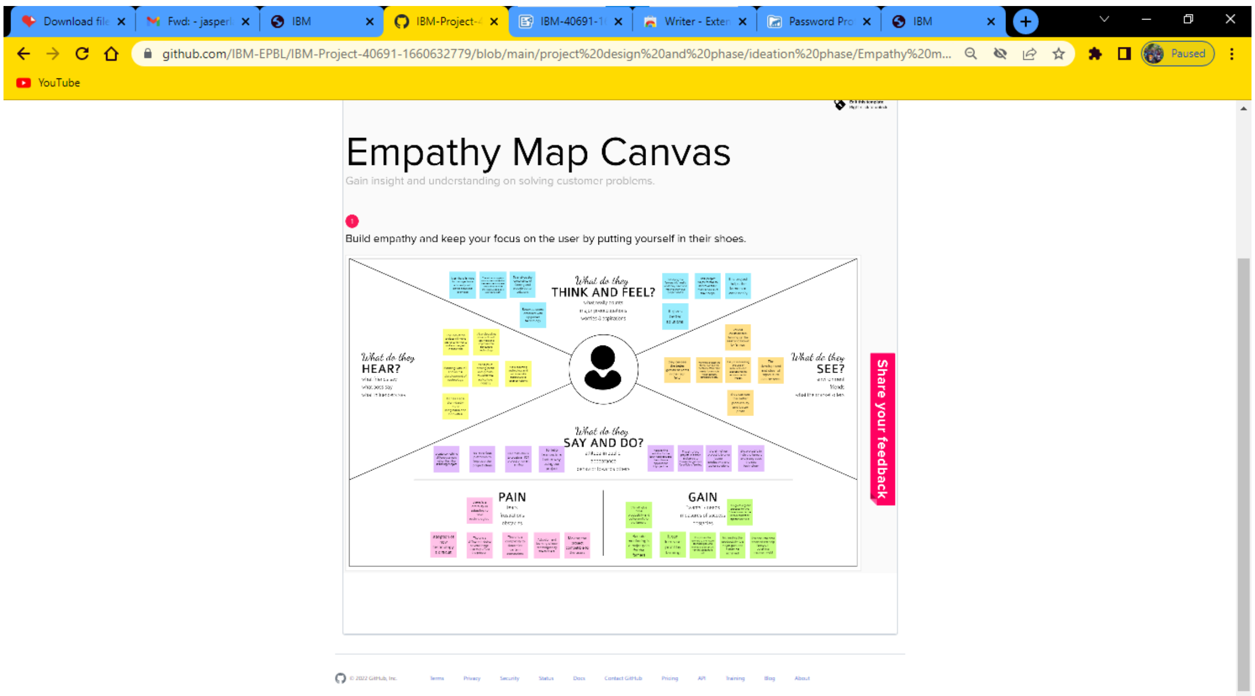
2.3 Problem Statement Definition:

The researcher is supposed to implement an "IoT Based Smart Farming System" with various sensors, which will help to collect the data and analyse it. The proposed system collects information about different agricultural parameters (temperature, humidity, moisture) using an IoT sensor. These values collected are then sent over the mobile via SMS. Farmers can view all the parameters required for a smart farming system through thewebpage.

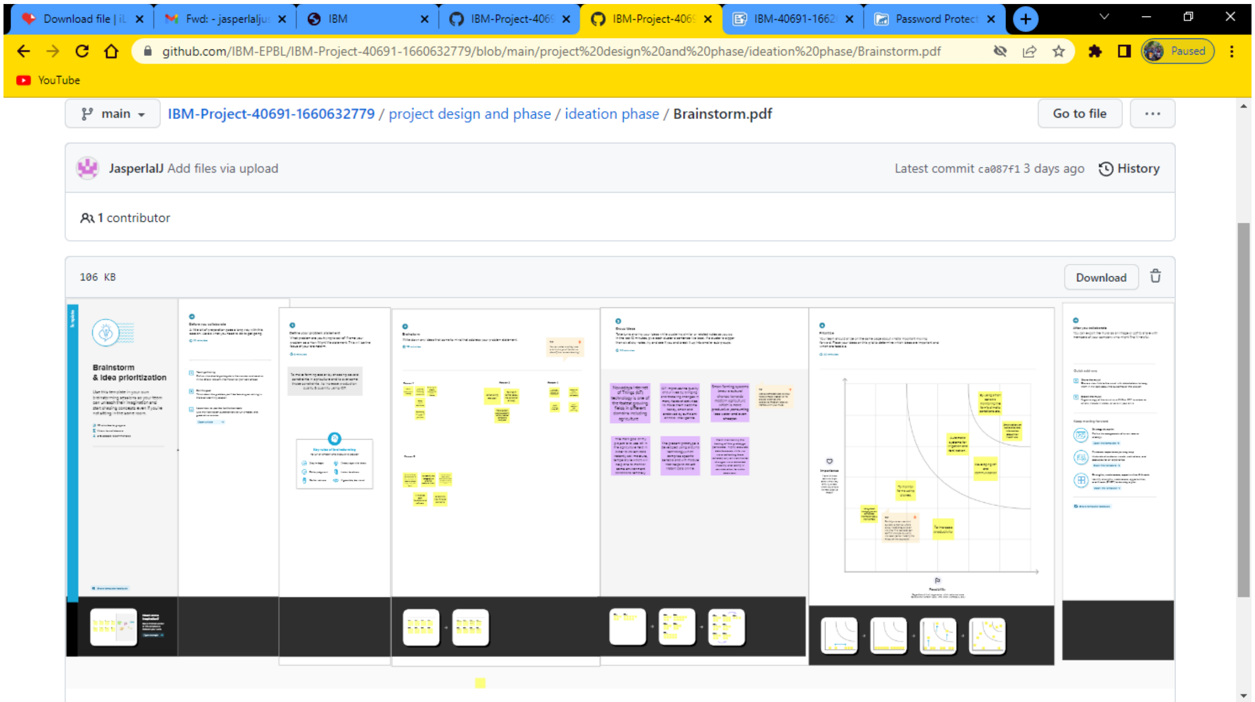
3. IDEATION AND PROPOSED SOLUTION:

3.1 Empathy Map Canvas:

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user’s behaviours and attitudes.



3.2 Ideation & Brainstorming:

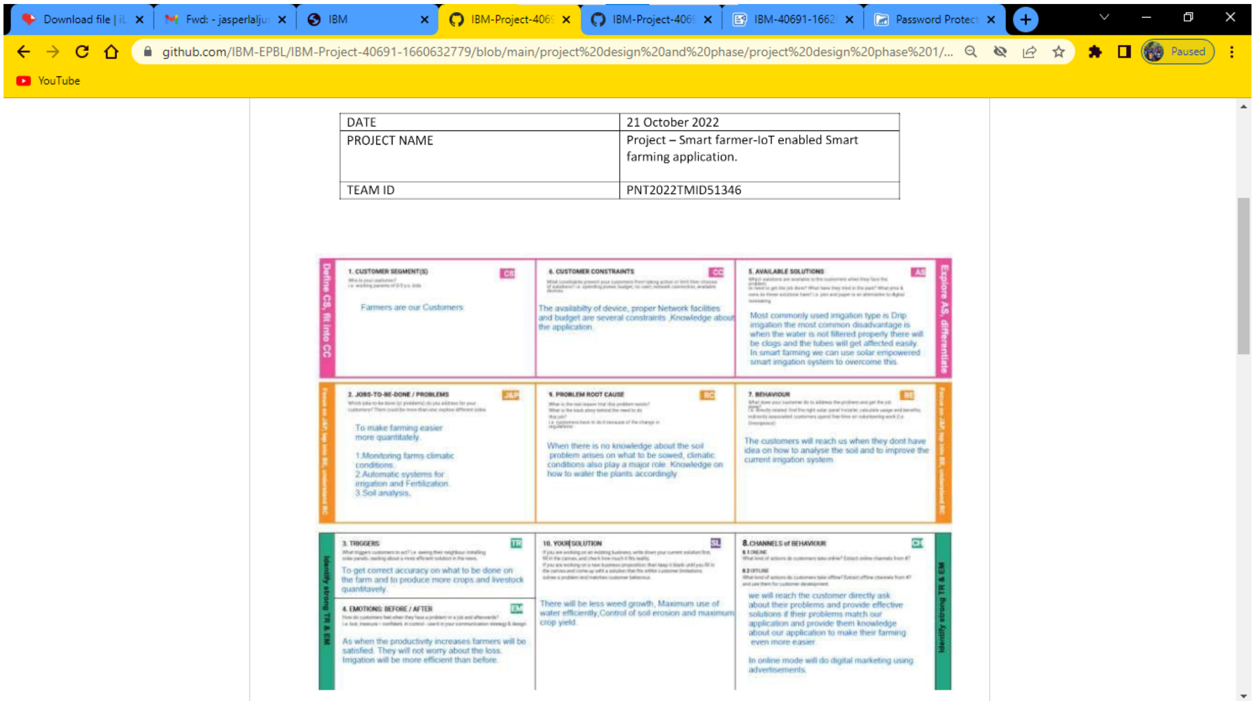


3.3 Proposed Solution:

To improve the efficiency of the product thereby supporting both rancher and country we need to utilize the innovation which appraises the nature of harvest and gives recommendations. The Internet of things (IOT) is revamping agribusiness, engaging farmers by a broad assortment of techniques, for instance, accuracy and conservative cultivation to go up against challenges in the field.

In this project, on a farm, management can monitor different environmental parameters effectively using sensor devices such as temperature sensor, relative humidity sensor and soil moisture sensor. Periodically (30 seconds) the sensors are collecting information of the agriculture field area and are being logged and stored online using cloud computing and Internet of Things. By using wireless transmission, the sensed data is forwarded towards the web server database. If irrigation is automated, then that means if the moisture and temperature fields fall below the potential range. The user can monitor and control the system remotely with the help of an application which provides a web interface to the user.

PROBLEM SOLUTION FIT:



DATE	21 October 2022
PROJECT NAME	Project – Smart farmer-IoT enabled Smart farming application.
TEAM ID	PNT2022TMID51346

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

Farmers are our Customers

6. CUSTOMER CONSTRAINTS CC

The availability of device, proper Network facilities and budget are several constraints ,Knowledge about the application.

5. AVAILABLE SOLUTIONS AS

Most commonly used irrigation type is Drip irrigation the most common disadvantage is when the water is not filtered properly there will be clogs and the tubes will get affected easily. In smart farming we can use solar empowered smart irrigation system to overcome this.

Explore AS, differentiate

2. JOBS-TO-BE-DONE / PROBLEMS J&P

To make farming easier more quantitately.

1.Monitoring farms climatic conditions.
2.Automatic systems for irrigation and Fertilization.
3.Soil analysis.

9. PROBLEM ROOT CAUSE RC

When there is no knowledge about the soil problem arises on what to be sowed, climatic conditions also play a major role. Knowledge on how to water the plants accordingly

7. BEHAVIOUR BE

The customers will reach us when they dont have idea on how to analyse the soil and to improve the current irrigation system

Identify strong TR & EM

3. TRIGGERS TR

To get correct accuracy on what to be done on the farm and to produce more crops and livestock quantitavely.

4. EMOTIONS: BEFORE / AFTER EM

As when the productivity increases farmers will be satisfied. They will not worry about the loss. Irrigation will be more efficient than before.

10. YOUR SOLUTION SL

There will be less weed growth, Maximum use of water efficiently,Control of soil erosion and maximum crop yield

8.CHANNELS of BEHAVIOUR CH

8.1 ONLINE

8.2 OFFLINE

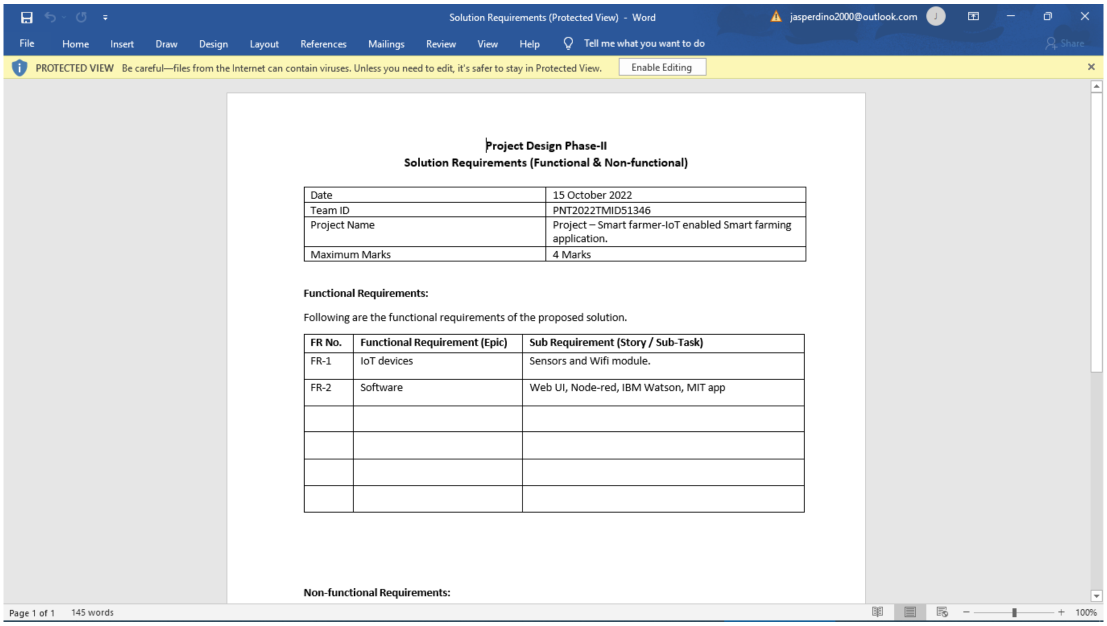
we will reach the customer directly ask about their problems and provide effective solutions if their problems match our application and provide them knowledge about our application to make their farming even more easier.

In online mode will do digital marketing using advertisements.

Identify strong TR & EM

4. REQUIREMENT ANALYSIS:

4.1 Functional requirement



Project Design Phase-II
Solution Requirements (Functional & Non-functional)

Date	15 October 2022
Team ID	PNT2022TMID51346
Project Name	Project – Smart farmer-IoT enabled Smart farming application.
Maximum Marks	4 Marks

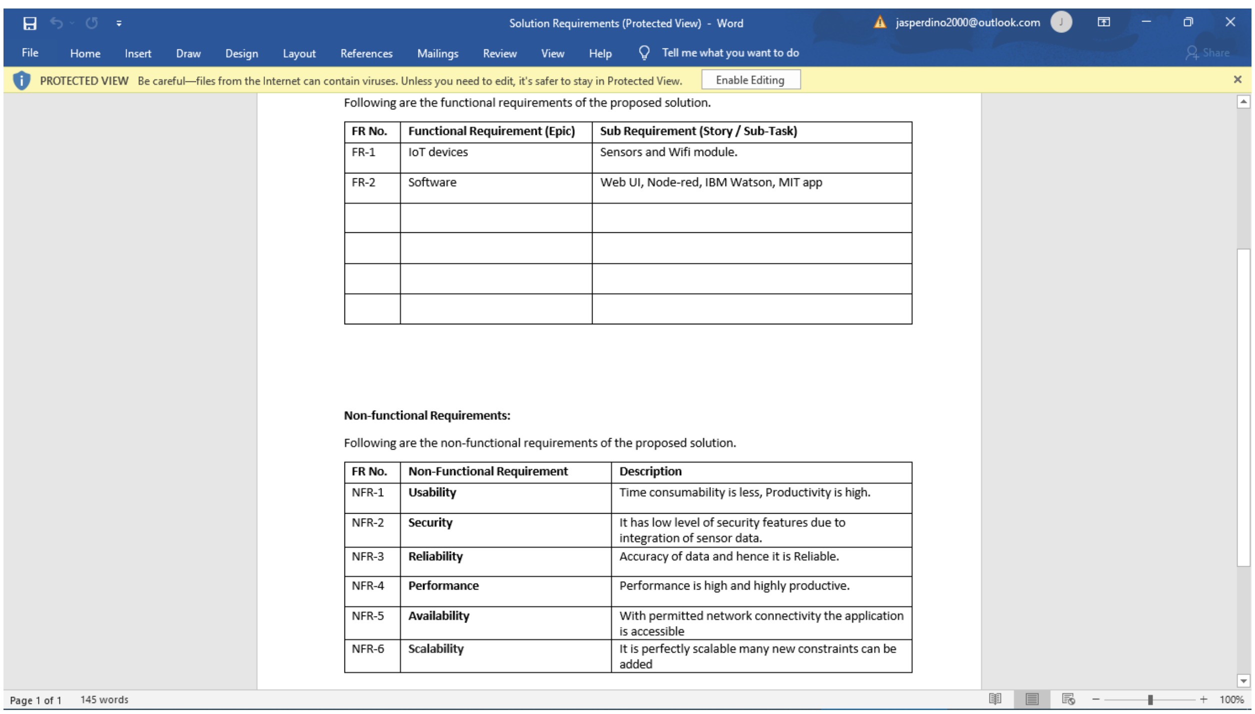
Functional Requirements:

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

Non-functional Requirements:

4.2.NON FUNCTIONAL REQUIRMENTS:



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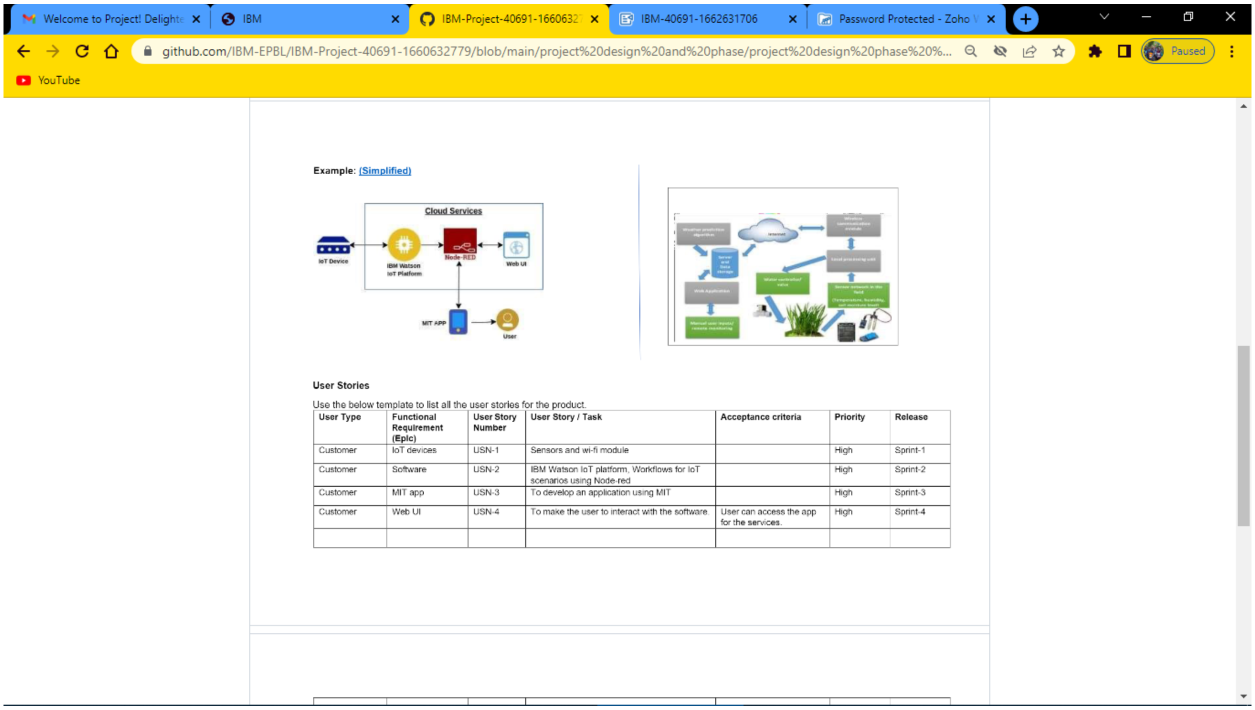
Non-functional Requirements:

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 Diagrams:



Example: (Simplified)

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	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

SOLUTION AND TECNIHICAL ARCHITECTURE:

- **IoT-based agriculture systems help 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 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.**

5.3 User Stories:

User Stories

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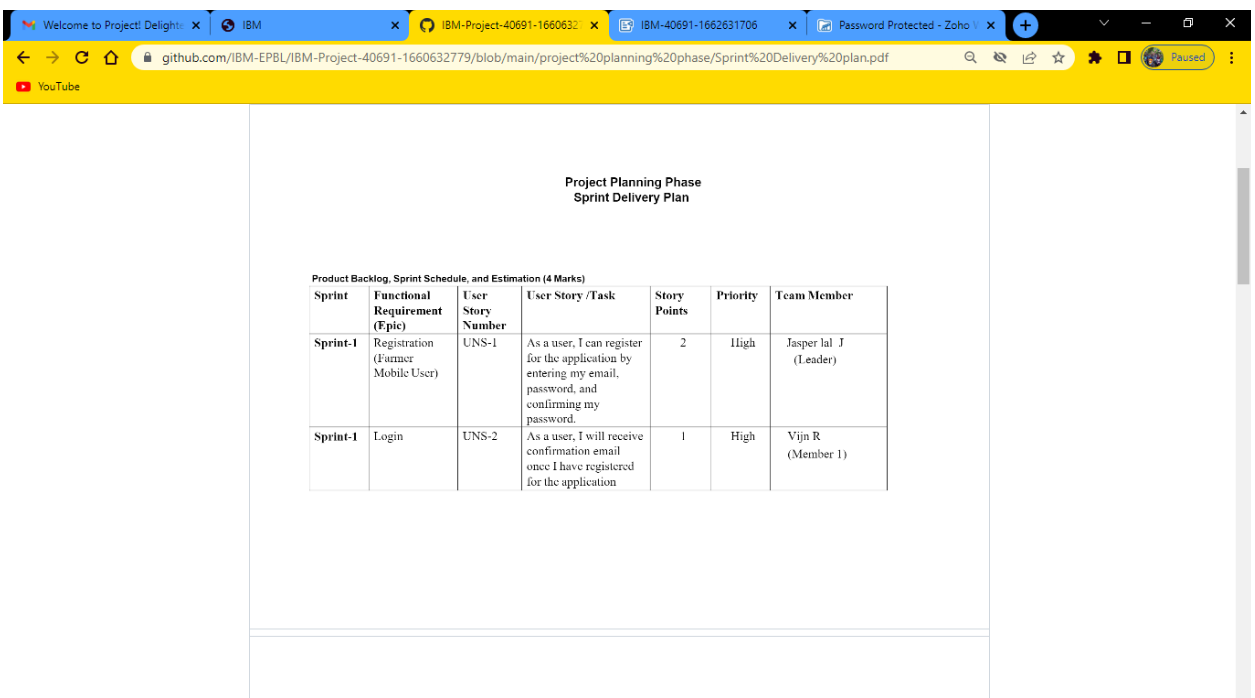
Customer	Software	USN-2	IBM Watson IoT platform, Workflows for IoT scenarios using Node-red		High	Sprint-2
Customer	MIT app	USN-3	To develop an application using MIT		High	Sprint-3
Customer	Web UI	USN-4	To make the user to interact with the software.	User can access the app for the services.	High	Sprint-4

6. PROJECT PLANNING & SCHEDULING:

6.1 Sprint:

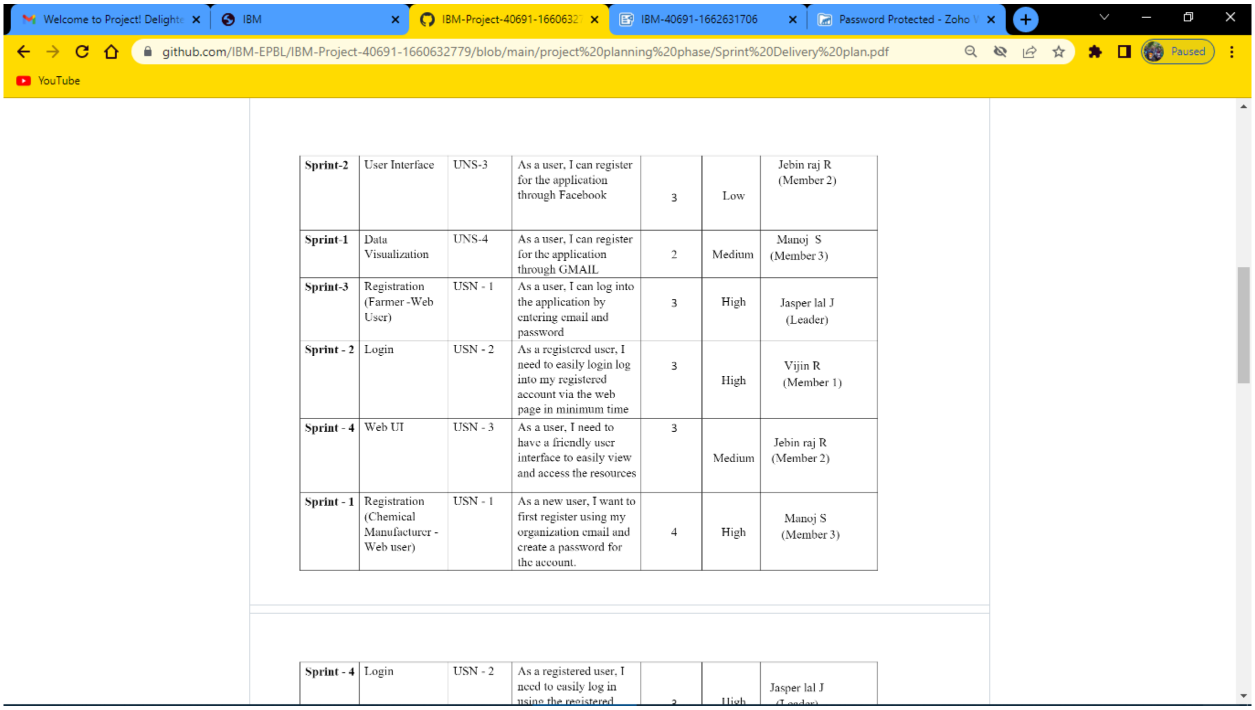
Planning & Estimation:



Project Planning Phase
Sprint Delivery Plan

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

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



Sprint-2	User Interface	UNS-3	As a user, I can register for the application through Facebook	3	Low	Jebin raj R (Member 2)
Sprint-1	Data Visualization	UNS-4	As a user, I can register for the application through GMAIL	2	Medium	Manoj S (Member 3)
Sprint-3	Registration (Farmer -Web User)	USN - 1	As a user, I can log into the application by entering email and password	3	High	Jasper lal J (Leader)
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	Vijin R (Member 1)
Sprint - 4	Web UI	USN - 3	As a user, I need to have a friendly user interface to easily view and access the resources	3	Medium	Jebin raj R (Member 2)
Sprint - 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.	4	High	Manoj S (Member 3)
Sprint - 4	Login	USN - 2	As a registered user, I need to easily log in			Jasper lal J

7. CODING & SOLUTIONING (Explain the features added in the project along with code)

PYTHON CODE:

To develop the python code to publish and subscribe to the commands from the IBM cloud.

PROGRAM:

```
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random
#Provide your IBM Watson Device
Credentials organization = "olwipo"
deviceType = "abcd" deviceId = "12345"
authMethod = "token" authToken =
"12345678"
# Initialize GPIO
```

```
def myCommandCallback(cmd): print("Command
received:
%s" % cmd.data['command']) m=cmd.data['command']
if (m=="motoron"):
print ("motor is switched on") elif
(m=="motoroff"):
print ("motor is switched off") else :
print ("please send proper command")
try: deviceOptions = {"org": organization, "type":
deviceType, "id":
deviceId, "auth-method": authMethod, "auth-token":
authToken}
deviceCli = ibmiotf.device.Client(deviceOptions)
#..............................................
except Exception as e:
print("Caught exception connecting device: %s" % str(e))
sys.exit()
# Connect and send a datapoint "hello" with value "world"
into the
cloud as an event of type "greeting" 10 times
deviceCli.connect()
while True:
#Get Sensor Data from DHT11
moist=random.randint(0,100)
temp=random.randint(-20,125)
Humid=random.randint(0,100)
data = { 'moist' : moist , 'temp' : temp ,'Humid': Humid}
#print data def
myOnPublishCallback():
print ("Published moist = %s C" % moist, "temp= %s %%" %
temp, "Humid = %s %%" % Humid, "to IBM Watson")
success = deviceCli.publishEvent("IoTSensor", "json", data,
qos=0, on_publish=myOnPublishCallback)
if not success: print("Not connected
to IoTSensor") time.sleep(10)
deviceCli.commandCallback = myCommandCallback
# Disconnect the device and application from the cloud
deviceCli.disconnect()
```

8. TESTING

8.1 Test Cases:

1. IBM Watson IOT service:

To create an IBM Watson IOT service Steps to create an IBM Watson
IOT service: and create a device using it.
● Click on catalog in IBM cloud account.
● Click on services.
● Click on sign in.
● Enter IBM Id.
● Enter Password.
● Then you can access IBM Watson IOT platform.

Steps to create a device:

● Click on devices in IBM Watson IOT platform.
● Choose to create a device● Enter the device type as abcd.
● Enter the device ID as 12345.
● Click next.
● Enter device credentials (optional).
● Click next.
● Enter the authentication token as 12345678
● Click on continue.
● Click on next.
● Click finish Device is created successfully, and we can see
device credential.

2. Creation of Node – Red Service:

To create a Node Red service.

Steps to create a Node-Red service:

● Click on catalog in IBM cloud account.
● Click on services.
● Enter the Node red service.
● Node red app opens click on get started.

- Click on deploy your app.
- Choose cloud foundry.
- Enter IBM API key (by clicking new+).
- Choose memory size as default.
- Enter the region as London.
- Click next.
- Click create.
- Status will be updated after creation
- Click on App URL.
- Click next.
- Choose not recommended.
- Click next.
- You will see the Node red page.
- Go to your node red flow editor.
- In the left panel choose nodes.

RESULTS:

The yield appearing beneath signifies the temperature, soil moisture and humidity data received from the IoT simulator sensor and open weather API. The web app displaysall this data for the past one hour. Thereare a setof buttons on the web application that can be used to control the motor and light on the farm to turn themON/OFF remotely.

ADVANTAGES & DISADVANTAGES:ADVANTAGES:

1. Communicating the deviceat a larger distance throughweb application. It will play an important role in reducingthe manpower and traveling expensesof a farmer.

2. Monitoring parameters like temperature, humidityetc. will play an important role in improving the growth of theplant.
3. Integrating the weatherstation to the web browserwillprovide the details of status of the cloud,wind speed etc.It will allow thefarmer to protect their plants from naturalcalamities.

DISADVANTAGE:

1. Since the real time sensor will be connected to the controller, the controller requires continuous supply of theinternetto transfer the data.
2. Non availability of weather prediction for a long periodof time.Since the long weather prediction requires additional paymentto open weather.

CONCLUSION:

IoT based SMART AGRICULTURE SYSTEM for Live Monitoring of Temperature and Soil Moistureand
to
control motor and light remotely have been proposed using Node Red and IBM Cloud Platform. The System

hashigh efficiencyand accuracy in fetching the live data of
temperature and soil moisture.The IoT based smart farming System being proposedvia this projectwill assist farmers in increasing the agriculture yield and take efficient care of food production as the System will alwaysprovide a helpinghand to farmers for gettingaccurate livefeed of environmental temperature and soil moisture withmore than 99% accurateresults. Therefore, the project
proposes a thought of consolidating the most recent innovation into the agrarianfield to turn the customary techniques for water systemsto current strategies in this way making simple profitable and temperate trimming.

1. FUTURE SCOPE:

The project has vast scope in developing the system andmaking it more user friendly and the additional features ofthe system like:

1. By installing a webcam in the system,photos of

thecrops can be captured and the data can be sent to adatabase.

2. Speech based optionscan be implemented in thesystem for the peoplewho are less literate.
3. GPS (Global Positioning System) can be integrated to

provide specificlocation of the farmer and more accurateweather reports of agriculture fields and gardens.

4. Regional language features can be implemented to make it easy for the farmers who are awareof only theirregional language.

APPENDIX:

```
Import timeimport sys
import ibmiotf.application
import ibmiotf.device
importrandom
#Provide your IBM Watson Device
Credentials organization = " olwipo "
```

```
deviceType= "abcd" deviceId = "12345"
authMethod = "token" authToken =
"12345678"
# Initialize GPIO
def myCommandCallback(cmd): print("Command
received: %s" % cmd.data['command'])
status=cmd.data['command'] if status=="motoron":
print ("motor is on")
elif status==
"motoroff":print("motor
is off")
else : print ("please send proper

command
")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()
# Connectand send a datapoint "hello" with value "world"
into
the cloudas an event of type "greeting" 10
timesdeviceCli.connect()
while True:
#Get Sensor Data from DHT11

temp=random.randint(90,110)
Humid=random.randint(60,100)
moist=random.randint(10,80)

data = { 'temp': temp, 'Humid': Humid, 'moist': moist}
```

```
#printdata def
myOnPublishCallback():
print ("Published Temperature = %s C"% temp, "Humidity =
%s
%%" % Humid, "moisture = %s %%"% moist, "toIBM
Watson")
success  =  deviceCli.publishEvent("IoTSensor",  "json",
data,qos=0, on_publish=myOnPublishCallback)
if not success:
print("Not connectedto IoTF")
time.sleep(10) deviceCli.commandCallback

=myCommandCallback

# Disconnect the device and application from the cloud

deviceCli.disconnect()
```

github :

IBM-Project-40691-1660632779

PROJECT DEMO LINK

https://drive.google.com/file/d/16zuYgYej4W0SQZX_bHXzXVt5EhGM9nSQ/view?usp=drivesdk