PROJECT REPORT

IOT BASED SMART CROP PROTECTION SYSTEM FOR AGRICULTURE

TEAM ID: PNT2022TMID30647

ROLL NUMBER	NAME
613019106035	S. MONIKA
613019106009	T. CHARU VIKASHINI
613019106006	N. AKSHAYA
612019106064	R.SOORYA PRIYA

CONTENT

ABSTRACT

Agriculture is the most important sectors of Indian economy. Farmers are the backbone of our country. It is important to access the resources that are important. Improvising the agricultural security has become a major threat. This project is to implement the smart crop protection in the field. The aim of the project is to protect the field against animal attacks, insect attacks and climatic changes to enrich the yield.

This can be achieved by IOT. This enhances the standard of agriculture. The implementation of IOT field detects the intruders, monitors suspicious activity and report to the proprietor of the field. It helps farmers for ensuring safety of the farmland and tress passing activities.

This framework runs on an Arduino Uno and makes use of micro controller. This system uses a PIR sensor to detect intruders close to the field, along with smoke sensor to detect emission of smoke from fires and intrusions. Moisture sensor is introduced to detect the water content of the field.

Chapter – 1

INTRODUCTION

A system using sensors to keep track of environmental variables like humidity, temperature, etc. is employed, together with a processor and GUI module. The farmer receives text alerts about the state of the field. This system controls soil moisture, humidity, and energy efficiency. Based on IOT technology, a solution is suggested for intelligent farm monitoring. The main goal of this project is to assist farmers in automating their farms by giving them access to a Web App that allows them to remotely control equipment like water motors and other devices without being physically present in the field while also monitoring field parameters like temperature and humidity.

Low crop productivity is one of the reasons for the frequent destruction of crops on farms by domestic and wild animals. It is impossible to watch over the crops on a farm for a full day. Therefore, an automated perceptive crop defence system leveraging the Internet of Things is suggested to address this problem (IOT). To produce the desired output, the system uses an esp8266 (node MCU), a soil moisture sensor, a dihydrogen monoxide sensor, a GPRS and GSM module, a servo motor, a dihydrogen monoxide pump, etc. The technology will trigger an alarm and turn on the lights in every corner of the farm as soon as any kineticism is detected. No animals will be harmed by this, and the crops will stay forfended.

Chapter-2

LITERATURE SURVEY

IOT based smart agriculture monitoring system.

Rajalakshmi . P and S. Devi Mahalakshmi, “IOT Based Crop Field Monitoring and Irrigation Automation”, 10th International conference on Intelligent systems and control (ISCO), 2016.

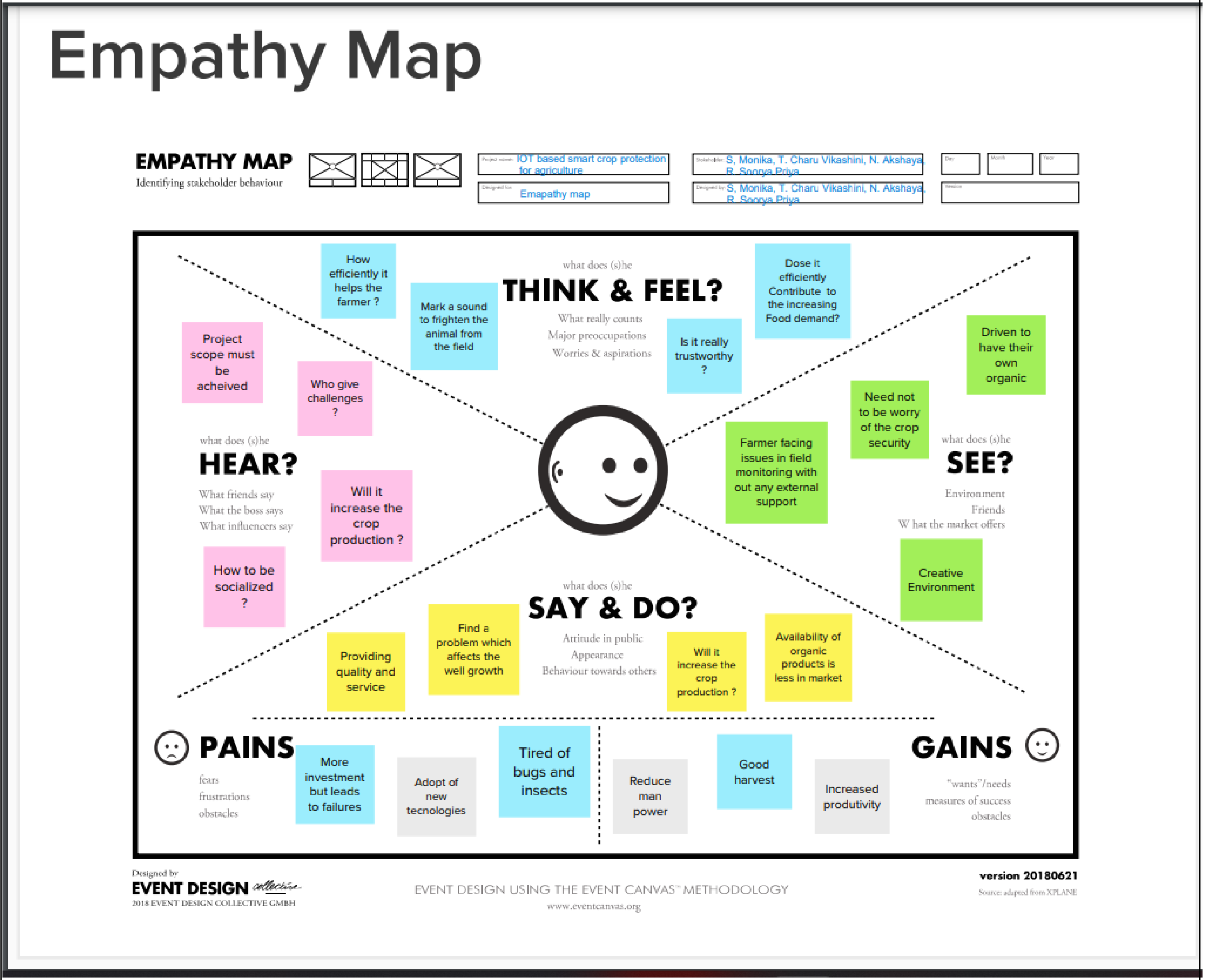
An IOT Based Crop-field monitoring an irrigation automation system describes how to monitor a crop field. A system is developed by using sensors and according to the decision from a server based on sensed data, the irrigation system is automated. Through wireless transmission the sensed data is forwarded to web server database. If the irrigation is automated then the moisture and temperature fields are decreased below the potential range. The user can monitor and control the system remotely with the help of application which provides a web interface to user .

The manual approach of verifying the parameters is one of the earliest methods in agriculture and is monitored by smart agriculture systems. Farmers use this method to independently calculate the reading and check every parameter. The system focuses on creating tools and devices.to control, display, and notify users while taking advantage of wireless sensor network benefits system. It attempts to use automation and IoT technology to make agriculture smarter. The Devices that can form an entire computing system, such as cloud computing, are used at the system's conclusion .Systems that monitor data from the agricultural field, from sensors to implements. It offers a novel a method for smart farming that uses an intelligent irrigation system and smart sensing system using wireless communication technologies. This system is affordable for installation. One can access and control the agriculture system in laptop, cell phone or laptop.

Chapter-3

IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas:



Empathy Map

EMPATHY MAP
Identifying stakeholder behaviour

Project name: IOT based smart crop protection for agriculture

Designed for: Emapathy map

Stakeholder: S, Monika, T. Charu Vikashini, N. Akshaya, R. Soorya Priya

Designed by: S, Monika, T. Charu Vikashini, N. Akshaya, R. Soorya Priya

Day | Month | Year

Version

what does (s)he
THINK & FEEL?
What really counts
Major preoccupations
Worries & aspirations

- How efficiently it helps the farmer ?
- Mark a sound to frighten the animal from the field
- Is it really trustworthy ?
- Dose it efficiently Contribute to the increasing Food demand?

what does (s)he
HEAR?
What friends say
What the boss says
What influencers say

- Project scope must be acheived
- Who give challenges ?
- Will it increase the crop production ?
- How to be socialized ?

what does (s)he
SEE?
Environment
Friends
W hat the market offers

- Driven to have their own organic
- Need not to be worry of the crop security
- Farmer facing issues in field monitoring with out any external support
- Creative Environment

what does (s)he
SAY & DO?
Attitude in public
Appearance
Behaviour towards others

- Providing quality and service
- Find a problem which affects the well growth
- Will it increase the crop production ?
- Availability of organic products is less in market

PAINS
fears
frustrations
obstacles

- More investment but leads to failures
- Adopt of new tecnologies
- Tired of bugs and insects

GAINS
"wants"/needs
measures of success
obstacles

- Reduce man power
- Good harvest
- Increased produtivity

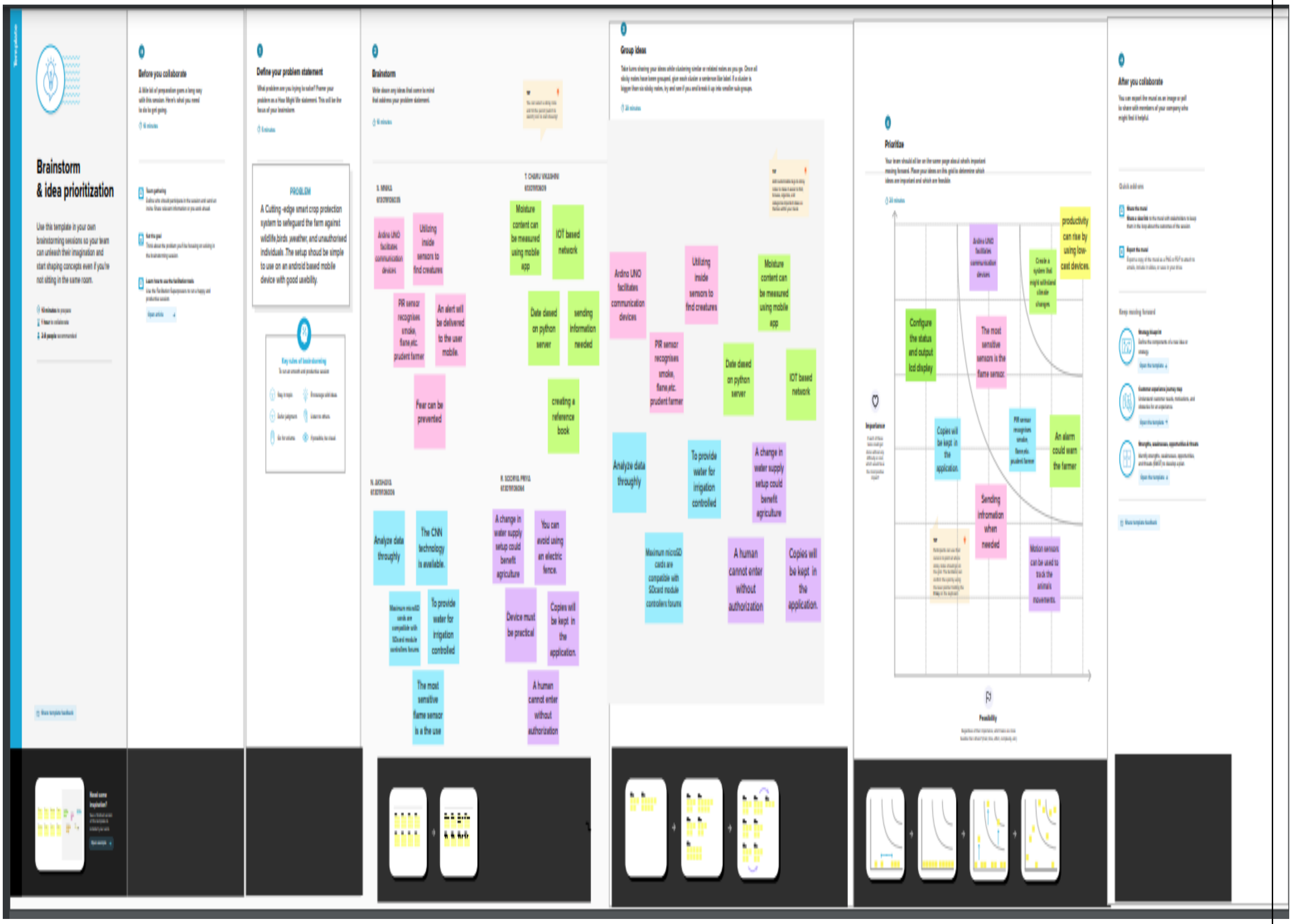
Designed by
EVENT DESIGN collective
2018 EVENT DESIGN COLLECTIVE GMBH

EVENT DESIGN USING THE EVENT CANVAS™ METHODOLOGY
www.eventcanvas.org

version 20180621
Source: adapted from XPLANE

3.2 Ideation & Brainstorming:

Step-1: Team Gathering, Collaboration and Select the Problem Statement



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.

Before you collaborate

Define your problem statement

PROBLEM

A Cutting -edge smart crop protection system to safeguard the farm against wildlife,birds ,weather, and unauthorised individuals .The setup shoud be simple to use on an android based mobile device with good usebility.

Key rules of brainstorming

Brainstorm

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

Ardino UNO facilitates communication devices

Utilizing inside sensors to find creatures

PIR sensor recognises smoke, flane,etc. prudent farmer

An alert will be delivered to the user mobile.

Fear can be prevented

Moisture content can be measured using mobile app

IOT based network

Date dased on python server

sending information needed

creating a reference book

Analyze data throughly

The CNN technology is available.

Maximum microSD cards are compatible with SDcard module controllers forums

To provide water for irrigation controlled

The most sensitive flame sensor is a the use

A change in water supply setup could benefit agriculture

You can avoid using an electric fence.

Device must be practical

Copies will be kept in the application.

A human cannot enter without authorization

Group ideas

Ardino UNO facilitates communication devices

Utilizing inside sensors to find creatures

Moisture content can be measured using mobile app

PIR sensor recognises smoke, flane,etc. prudent farmer

Date dased on python server

IOT based network

Analyze data throughly

To provide water for irrigation controlled

A change in water supply setup could benefit agriculture

Maximum microSD cards are compatible with SDcard module controllers forums

A human cannot enter without authorization

Copies will be kept in the application.

Prioritize

Ardino UNO facilitates communication devices

Create a system that might withstand climate changes

productivity can rise by using low-cast devices.

Configure the status and output lcd display

The most sensitive sensors is the flame sensor.

Importance

Copies will be kept in the application.

PIR sensor recognises smoke, flane,etc. prudent farmer

An alarm could warn the farmer

Sending information when needed

Motion sensors can be used to track the animals movements.

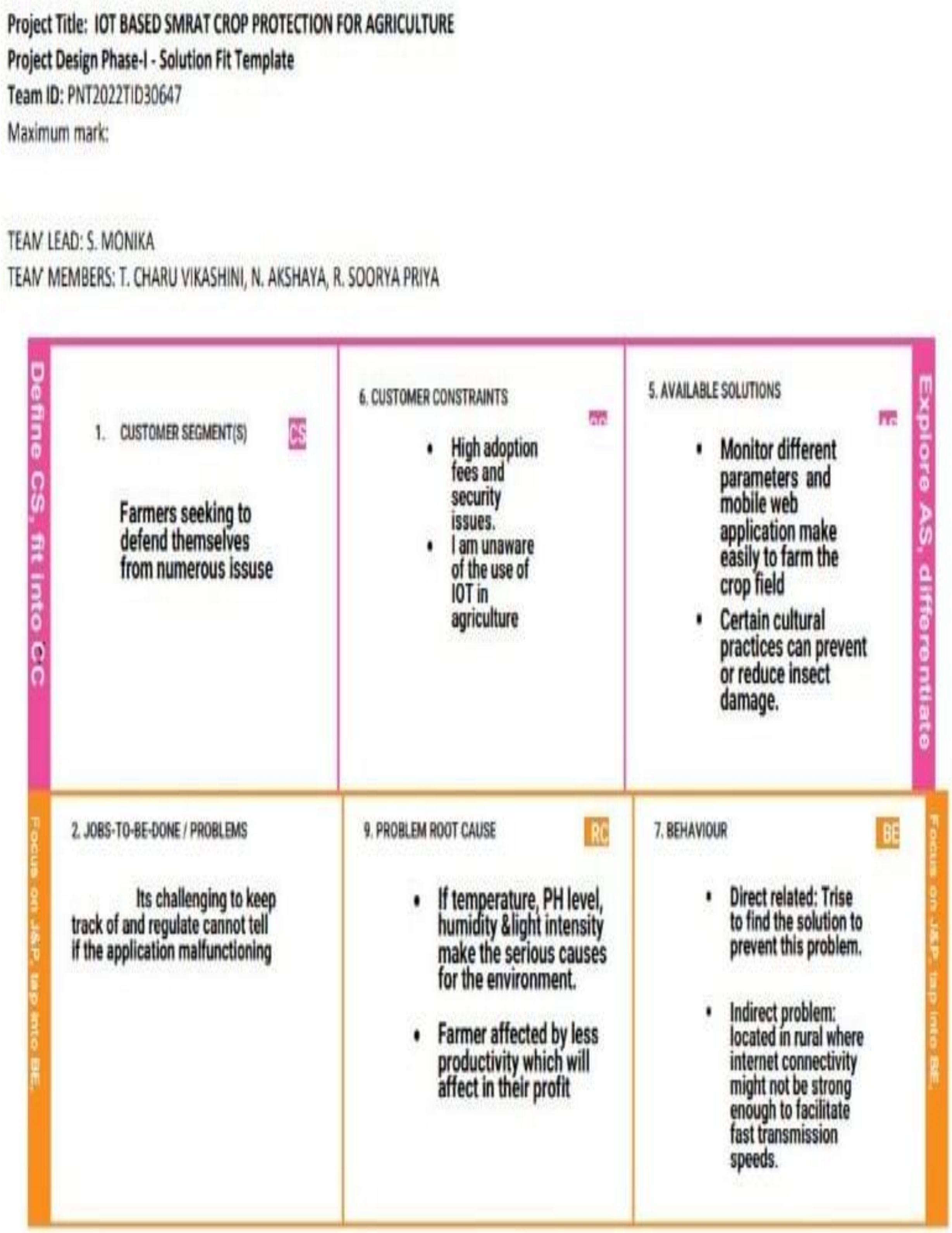
Feasibility

After you collaborate

3.3 Proposed Solution:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Create an effective system and application that can watch over and notify users
2.	Idea / Solution description	➢ This item aids in the field's ability to monitor animal activity and other disturbances. ➢ If any region seems dry or wet less, administrators will be alerted and given the location in the web application. ➢ Several areas will have temperature sensors installed to monitor the temperature and humidity.
3.	Novelty / Uniqueness	➢ Farmers receive the quickest alerts ➢ The rise in desire for wholesome meals User-friendly
4.	Social Impact / Customer Satisfaction	➢ Simple installation and effective performance ➢ Can collaborate without fear
5.	Business Model (Revenue Model)	➢ Since everyone can understand how to utilize the product, it is simple for them to do so for their safest organization. ➢ The item is heavily promoted across all mediums. It even protects small-scale farmed land from calamities because it is affordable.
6.	Scalability of the Solution	➢ Even when there is more disruption, the product detects the precise location and effectively warns the farmers

3.4 Problem Solution fit:



Project Title: IOT BASED SMRAT CROP PROTECTION FOR AGRICULTURE

Project Design Phase-I - Solution Fit Template

Team ID: PNT2022TID30647

Maximum mark:

TEAM LEAD: S. MONIKA

TEAM MEMBERS: T. CHARU VIKASHINI, N. AKSHAYA, R. SOORYA PRIYA

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

Farmers seeking to defend themselves from numerous issuse

6. CUSTOMER CONSTRAINTS CC

- High adoption fees and security issues.
- I am unaware of the use of IOT in agriculture

5. AVAILABLE SOLUTIONS AS

- Monitor different parameters and mobile web application make easily to farm the crop field
- Certain cultural practices can prevent or reduce insect damage.

Explore AS, differentiate

Focus on J&P, tap into BE.

2. JOBS-TO-BE-DONE / PROBLEMS

Its challenging to keep track of and regulate cannot tell if the application malfunctioning

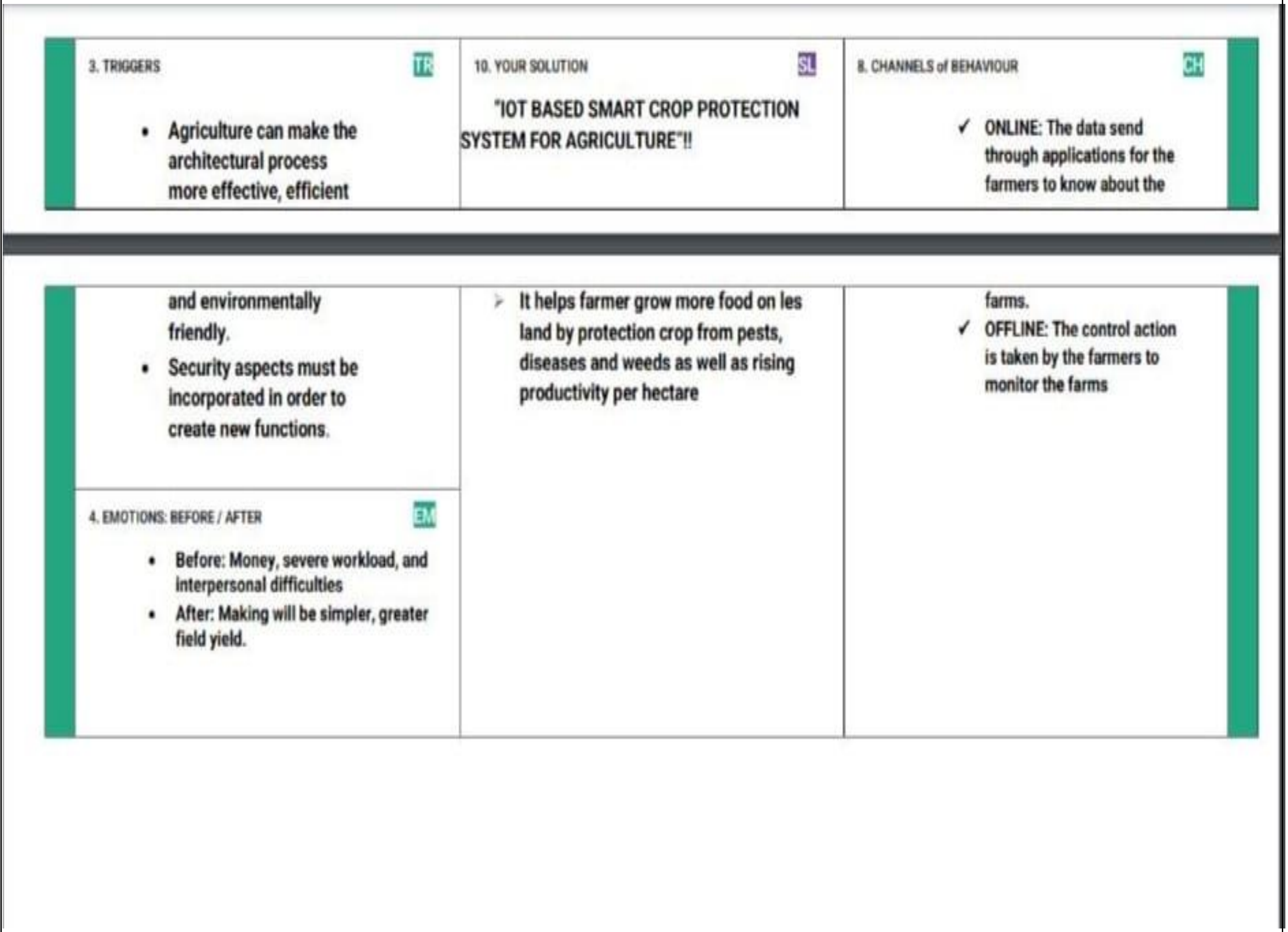
9. PROBLEM ROOT CAUSE RC

- If temperature, PH level, humidity &light intensity make the serious causes for the environment.
- Farmer affected by less productivity which will affect in their profit

7. BEHAVIOUR BE

- Direct related: Trise to find the solution to prevent this problem.
- Indirect problem: located in rural where internet connectivity might not be strong enough to facilitate fast transmission speeds.

Focus on J&P, tap into BE.



3. TRIGGERS TR

- Agriculture can make the architectural process more effective, efficient and environmentally friendly.
- Security aspects must be incorporated in order to create new functions.

4. EMOTIONS: BEFORE / AFTER EM

- Before: Money, severe workload, and interpersonal difficulties
- After: Making will be simpler, greater field yield.

10. YOUR SOLUTION SL

"IOT BASED SMART CROP PROTECTION SYSTEM FOR AGRICULTURE"!!

➢ It helps farmer grow more food on les land by protection crop from pests, diseases and weeds as well as rising productivity per hectare

8. CHANNELS of BEHAVIOUR CH

✓ ONLINE: The data send through applications for the farmers to know about the farms.

✓ OFFLINE: The control action is taken by the farmers to monitor the farms

Chapter-4

REQUIREMENT ANALYSIS

4.1 Functional Requirement:

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User registration	➢ Install the app ➢ signing up with Gmail ➢ Create a profile ➢ Observe the guidelines
FR-2	User Confirmation	• Email confirmation required • Reassurance via OTP
FR-3	Interface sensor	Connect the sensor and the application so that when animals enter the field, an alarm is generated
FR-4	Accessing datasets	Sets of data are obtained from the cloudant DB.
FR-5	Mobile application	Mobile applications can be used to control field sprinklers and motors.

4.2 Non-Functional Requirement:

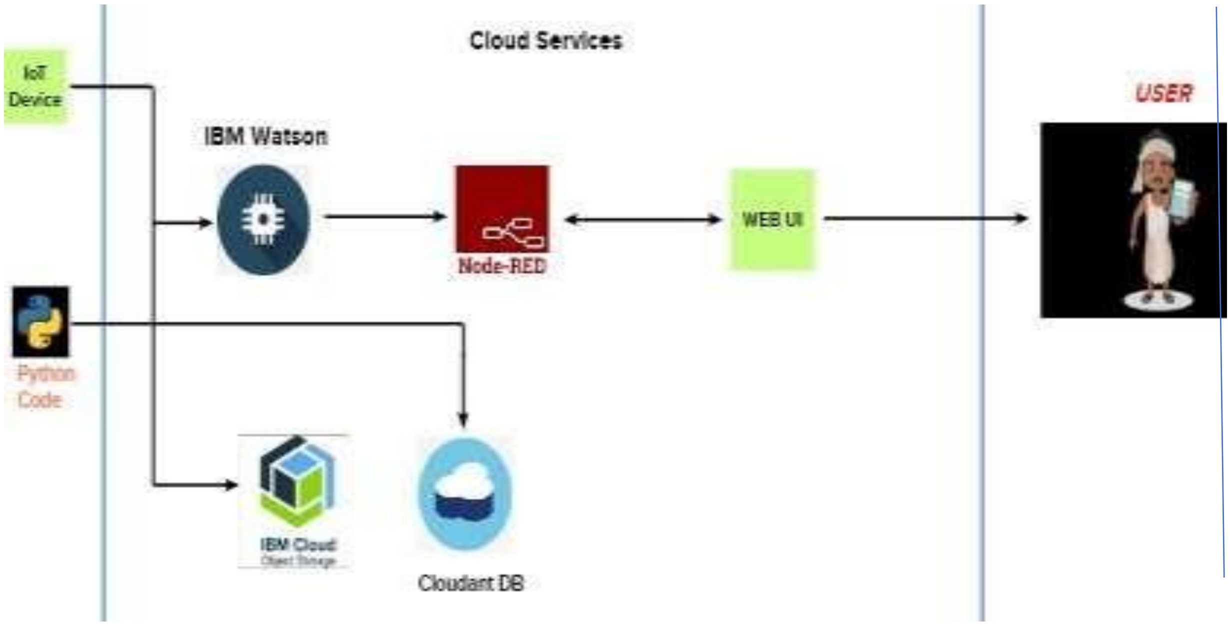
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The project's contribution to farm protection is demonstrated through the smart protection system
NFR-2	Security	This project was created to protect the crops from animals

NFR-3	**Reliability**	When animals attempt to enter the field, IOT devices and sensors alert the farmer via message. We also utilise an SD card module that helps to store a specific sound to frighten the animals.
NFR-4	**Performance**	We can defend the crops against wild animals by creating and implementing resilient hardware and software.
NFR-5	**Availability**	This system's integration of computer vision algorithms with IBM cloudant services makes it more efficient to retrieve photos at scale, enhancing scalability.

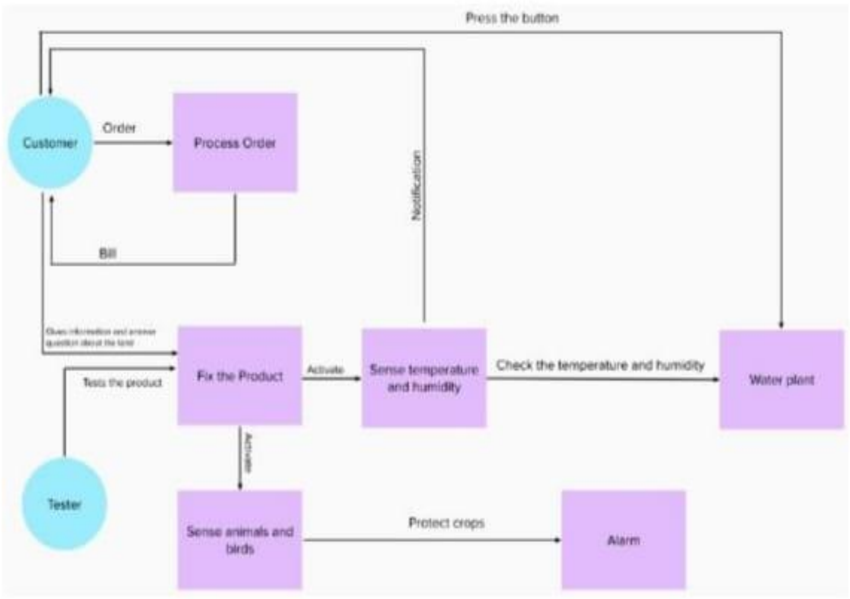
Chapter-5

PROJECT DESIGN

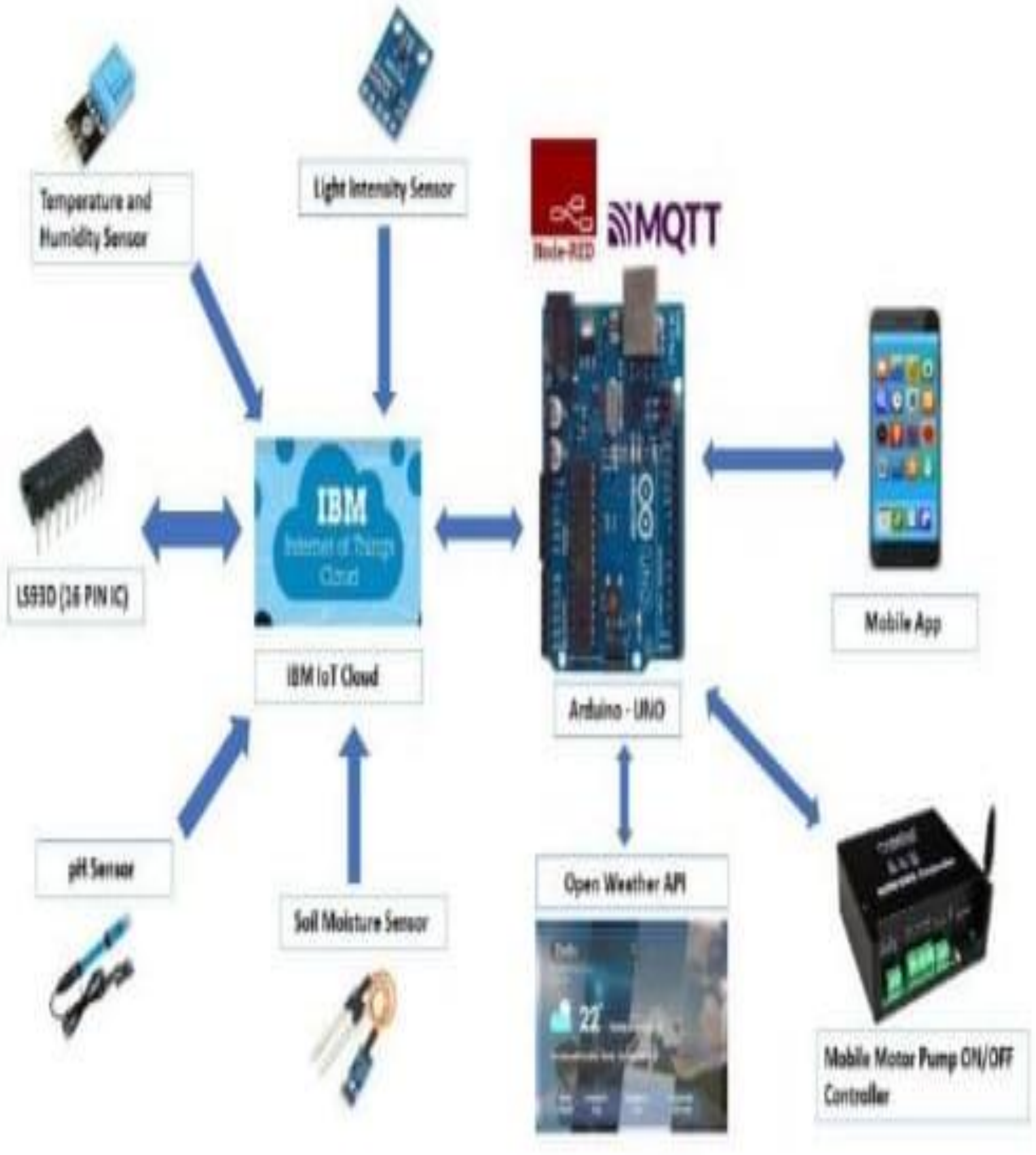
5.1 Data Flow Diagrams:



Data Flow Diagrams:



5.2 Solution & Technical Architecture:



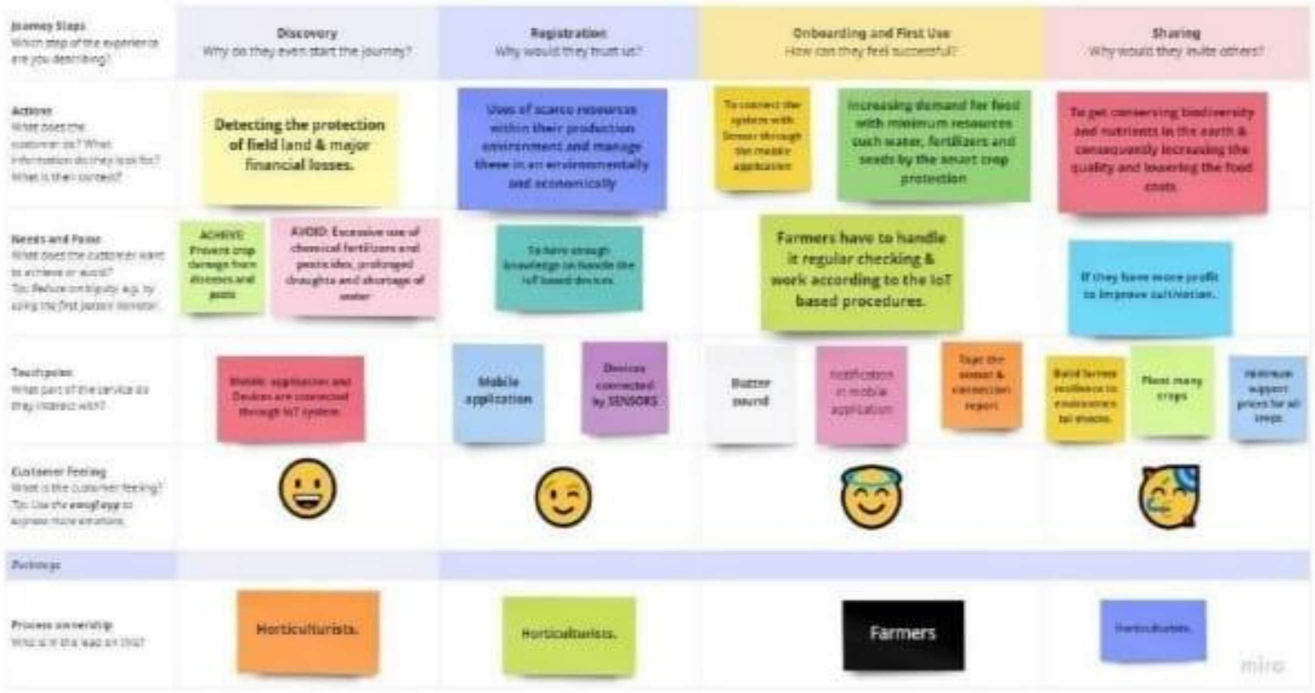
KEY POINTS:

• Different sensors are used to measure the various soil factors (temperature, humidity, light intensity, pH level), and the data is then saved in the IBM cloud.

• An Arduino Uno is utilised as a processing unit to process weather data from a weather API as well as data from sensors. • The hardware, software, and APIs are wired using Node Red, a programming tool. It uses the MQTT protocol for communication.

• A mobile application that was created gives the user access to all the collected data. The crop is watered by a mobile motor pump controller based on the sensor results.

5.3 User Stories:



Journey Steps Which step of the experience are you describing?	Discovery Why do they even start the journey?	Registration Why would they trust us?	Onboarding and First Use How can they feel successful?	Sharing Why would they invite others?
Actions What does the customer do? What information do they look for? What is their context?	Detecting the protection of field land & major financial losses.	Uses of scarce resources within their production environment and manage these in an environmentally and economically	To connect the system with Sensor through the mobile application Increasing demand for food with minimum resources such water, fertilizers and seeds by the smart crop protection	To get conserving biodiversity and nutrients in the earth & consequently increasing the quality and lowering the food costs
Needs and Pains What does the customer want to achieve or avoid? Tip: Reduce ambiguity e.g. by using the first person narrator.	ACHIEVE: Prevent crop damage from diseases and pests AVOID: Excessive use of chemical fertilizers and pesticides, prolonged droughts and shortage of water	To have enough knowledge to handle the IoT based devices.	Farmers have to handle it regular checking & work according to the IoT based procedures.	If they have more profit to improve cultivation.
Touchpoints What part of the service do they interact with?	Mobile application and Devices are connected through IoT system.	Mobile application Devices connected by SENSORS	Buzzer sound Notification in mobile application Test the sensor & connection report	Build farmer resilience to environmental shocks. Plant many crops minimum support prices for all crops.
Customer Feeling What is the customer feeling? Tip: Use the emoji app to express more emotions.	😀	😉	😇	🥳
Backstage				
Process ownership Who is in the lead on this?	Horticulturists.	Horticulturists.	Farmers	Horticulturists.

Chapter – 6

PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation:

7

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirmingmy password.	5	High	Monika. S
Sprint-1	Registration	USN-2	As a user, I will receive confirmation email onceI have registered for the application	5	High	Akshaya. N
Sprint-1	Login page	USN-3	As a user, enter the username and passwordwhich is already existing	5	Medium	Soorya Priya. R
Sprint-1	Forecasting the weather	USN-4	As a user, we can monitor he weather conditions like humidity , temperature etc...	5	High	Charu Vikashini. T
Sprint-2	Sensing moisture condition of the soil	USN-5	As a user, we can know about soil moisture condition , controlling the motor pump for waterflow by using mobile application.	20	High	Monika .S SooryaPriya.R
Sprint-3	Detecting the motionin certain range	USN-6	Fencing system are helpful in providing securityagainst animals and birds.	20	High	Akshaya. N
Sprint-4	Checking the crops conditions.	USN-7	Here farmer needs to update the condition ofcrops.	20	HIgh	Charu Vikashini. T

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

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

7.1 Sprint Delivery Schedule:

TITLE	DESCRIPTION	DATE
Literature Survey on The Selected Project and InformationGathering	A literature survey is a comprehensive summary of earlier study on the subject. A literature survey can be conducted using any source, including books and internet research papers	20 September 2022
Prepare Empathy Map	A visualization tool called Empathy Map can be utilized to gain a deeper understanding of the customer.	22 September 2022
Ideation-Brainstorming	During a brainstorming session, which is a form of collaborative problem-solving, team members exchange, organize, and discuss ideas.	28 September 2022
Define Problem Statement	A Problem Statement is a concise description of the problem or issues a project seeks to address. The problem statement identifies the current state, the desired future state and any gaps between the two.	19 September 2022
Problem Solution Fit	This aids in our comprehension of the customer's thoughts, preferences, actions, and other feelings.	16 October 2022
Proposed Solution	The proposed solution demonstrates the present approach and aids in achieving the goal until it is realised.	19 October 2022
Solution Architecture	Solution Architecture is an extremely intricate process with numerous branches and sub-processes. It aids in comprehending the features and components needed to finish our project.	30 September 2022
Customer Journey	Analyzing from the viewpoint of a customer who uses our project is beneficial to us.	08 October2022
Functional Requirement	Here, the briefing covers both functional and nonfunctional needs. It possesses particular attributes including usability, security,	10 October2022

	performance, dependability, availability, and scalability..	
Data Flow Diagrams	Data Flow Diagram is a graphical or visual representation using a standardized set of symbols and notations to describe a business's operations through data movement.	03 October 2022
Technology Architecture	An improved variant of solution architecture is technology architecture. It aids in the analysis and comprehension of the numerous technologies that must be used in the project.	14 October 2022
Prepare Milestone & Activity List	It enables us to comprehend and assess the level of our own development and correctness	06 November 2022
Spring Delivery Plan	In the scrum process, sprint planning marks the beginning of the sprint. Sprint planning's goal is to specify what can be completed in a sprint and how it will be done.	06 November 2022

Chapter-7 CODING & SOLUTIONING

Feature 1: Coding for Animals or pests enter into the field

```
#include <ESP8266WiFi.h>
#include <WiFiClient.h>
#include  <PubSubClient.h>
#include "DHT.h"


const char* ssid = "project1";

const char* password = "22222222";


#define DHTPIN 12

 #define DHTTYPE DHT22

DHT dht(DHTPIN, DHTTYPE);


#define ID "jpg7s5"
#define DEVICE_TYPE "ESP8266"
#define DEVICE_ID "PRO"
#define TOKEN "JEEVITHAECE"

char server[] = ID ".messaging.internetofthings.ibmcloud.com";
char publish_Topic1[] = "iot-2/evt/Data1/fmt/json";
char publish_Topic2[] = "iot-2/evt/Data2/fmt/json";
char authMethod[] = "use-token-auth";
char token[] = TOKEN;

char clientId[] = "d:" ID ":" DEVICE_TYPE ":" DEVICE_ID;//////a-6758fkgbpgmf1xf8///SyKj8fKYlys)9wQ9at
WiFiClient wifiClient;
PubSubClient client(server, 1883, NULL, wifiClient);


void setup() {
    Serial.begin(115200);
    dht.begin();
    Serial.println();
    WiFi.begin(ssid, password);
    while (WiFi.status() != WL_CONNECTED) {
    delay(500);
```

```
     Serial.print(".");
}

Serial.println("");
 Serial.println(WiFi.localIP());
 if (!client.connected()) {
 Serial.print("Reconnecting client to ");
 Serial.println(server);
 while (!client.connect(clientId, authMethod, token)) {
 Serial.print(".");
 delay(500);
 }
 Serial.println("Connected TO IBM IoT cloud!");
 }
}
long previous_message = 0;
void loop() {
 client.loop();
 long current = millis();
 if (current - previous_message > 3000) {
 previous_message = current;
 float hum = 34;
 float temp = 35;
 float level = 1;
 if (isnan(hum) || isnan(temp) ){
 Serial.println(F("Failed to read from DHT sensor!"));
 return;

}
 Serial.print("Temperature: ");
 Serial.print(temp);
 Serial.print("°C");
 Serial.print(" Humidity: ");
 Serial.print(hum);
 Serial.print("%");

    String payload = "{\"d\":{\"Name\":\"" DEVICE_ID "\"";
            payload += ",\"Temperature\":";
            payload += temp;
            payload += "}}";

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

 if (client.publish(publish_Topic1, (char*) payload.c_str())) {
     Serial.println("Published successfully");
 } else {
     Serial.println("Failed");
 }
 String payload1 = "{\"d\":{\"Name\":\"" DEVICE_ID "\"";
      payload1 += ",\"Humidity\":";
      payload1 += hum;
```

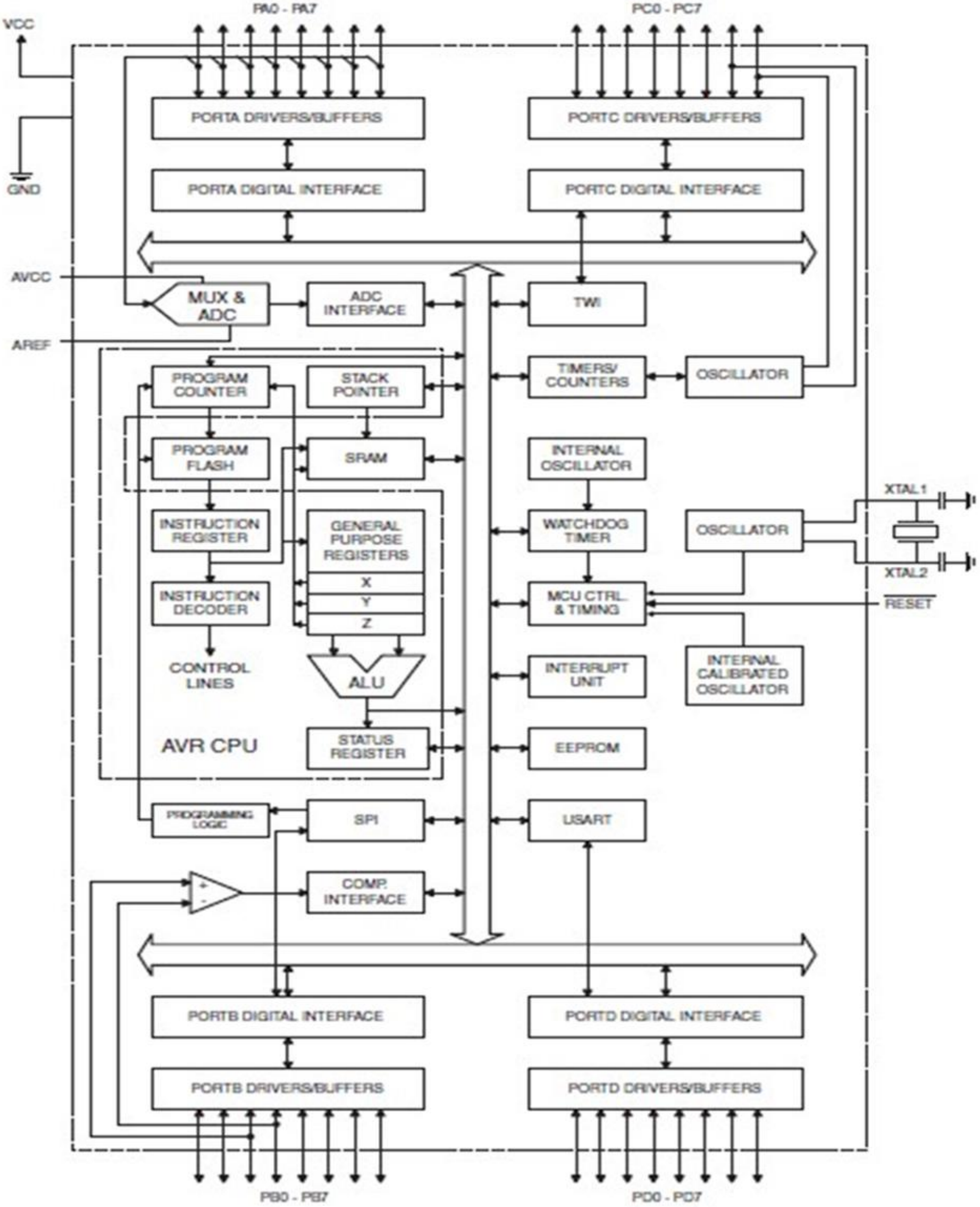
```
       payload1 += "}}";

Serial.print("Sending payload: ");
 Serial.println(payload1);
 Serial.println('\n');

 if (client.publish(publish_Topic2, (char*) payload1.c_str())) {
      Serial.println("Published successfully");
 } else {
     Serial.println("Failed");
 }
String payload2 = "{\"d\":{\"Name\":\"" DEVICE_ID "\"";
           payload2 += ",\"Level\":";
           payload2 += level;
           payload2 += "}}";
           Serial.print("Sending payload: ");
           Serial.println(payload2);
           Serial.println('\n');

 if (client.publish(publish_Topic2, (char*) payload1.c_str())) {
      Serial.println("Published successfully");
 } else {
      Serial.println("Failed");
 }

 }
}
```



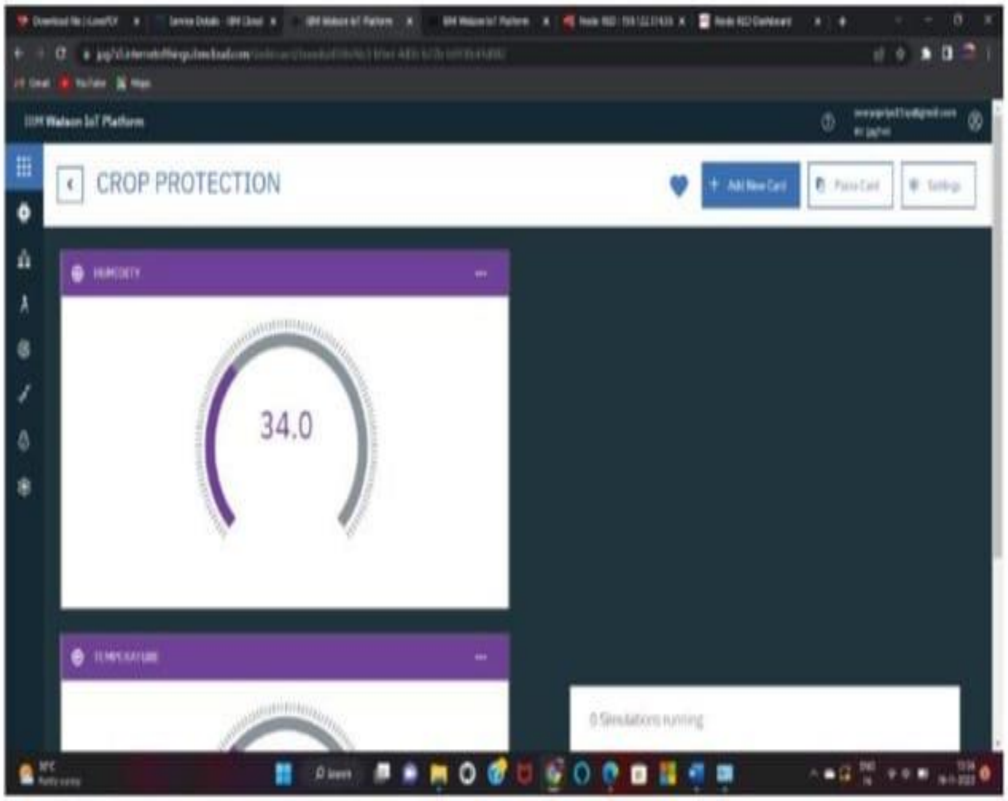
PA0 - PA7
PC0 - PC7
VCC
GND
PORTA DRIVERS/BUFFERS
PORTC DRIVERS/BUFFERS
PORTA DIGITAL INTERFACE
PORTC DIGITAL INTERFACE
AVCC
MUX & ADC
ADC INTERFACE
TWI
AREF
PROGRAM COUNTER
STACK POINTER
TIMERS/ COUNTERS
OSCILLATOR
PROGRAM FLASH
SRAM
INTERNAL OSCILLATOR
XTAL1
INSTRUCTION REGISTER
GENERAL PURPOSE REGISTERS
WATCHDOG TIMER
OSCILLATOR
X
Y
Z
XTAL2
INSTRUCTION DECODER
MCU CTRL. & TIMING
RESET
CONTROL LINES
ALU
INTERRUPT UNIT
INTERNAL CALIBRATED OSCILLATOR
AVR CPU
STATUS REGISTER
EEPROM
PROGRAMMING LOGIC
SPI
USART
+
-
COMP. INTERFACE
PORTB DIGITAL INTERFACE
PORTD DIGITAL INTERFACE
PORTB DRIVERS/BUFFERS
PORTD DRIVERS/BUFFERS
PB0 - PB7
PD0 - PD7

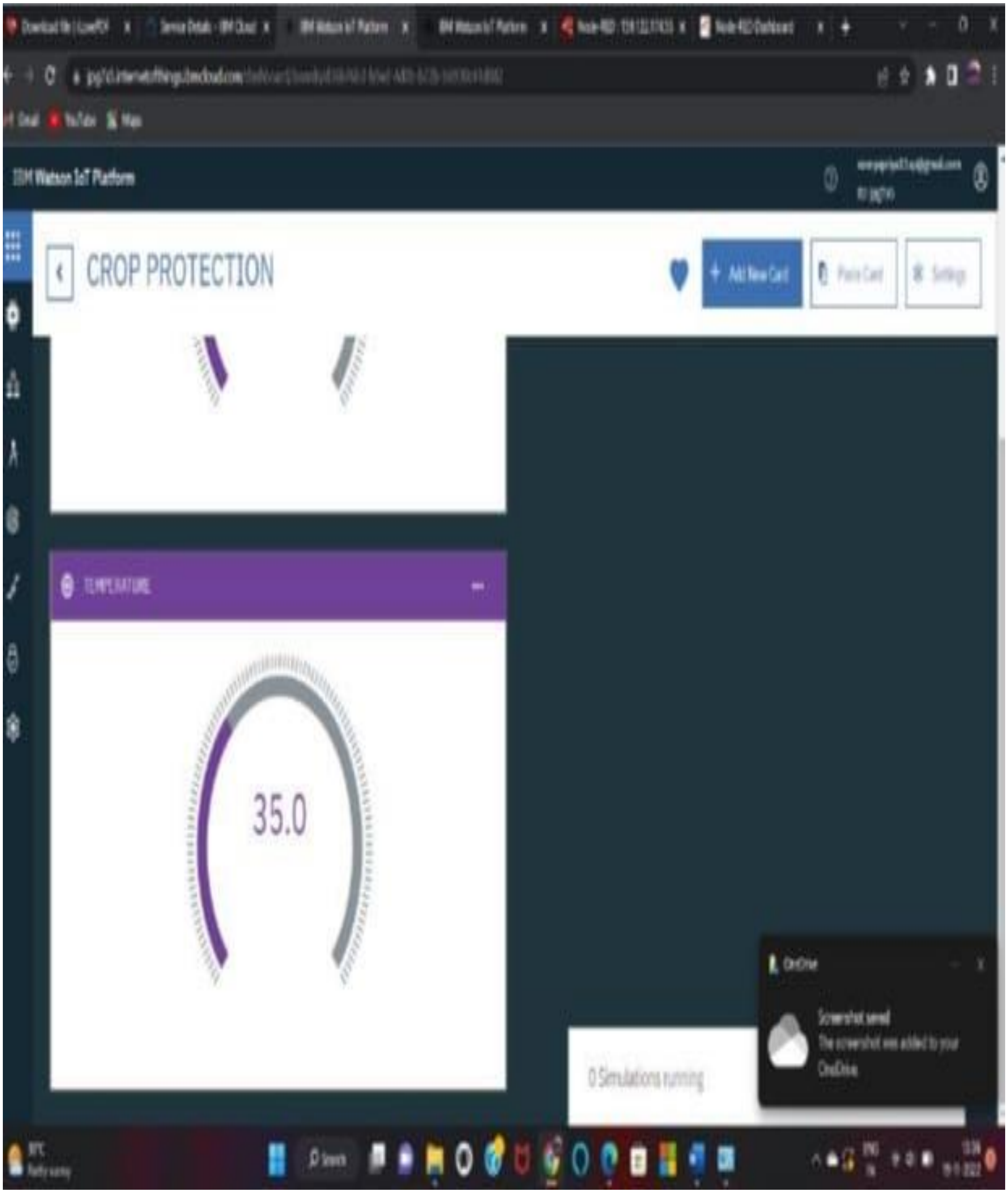
Chapter-8

RESULTS

SOIL MOISTURE

ANIMAL AND BIRD DETECT

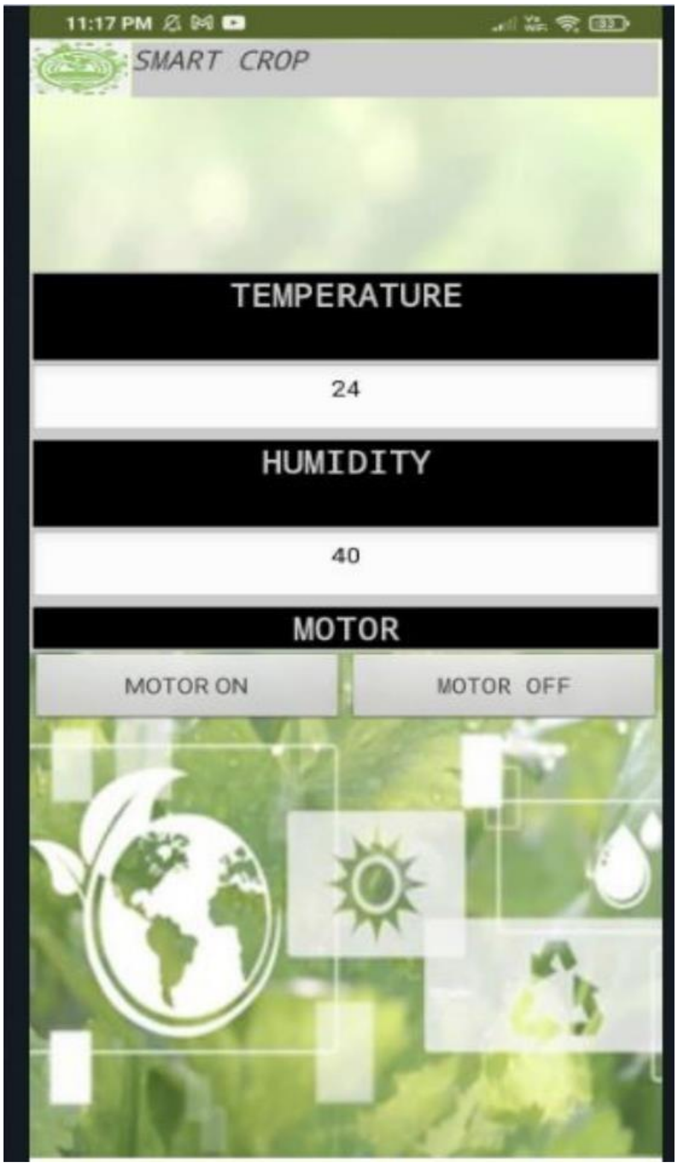




0 Simulations running

Screenshot saved
The screenshot was added to your OneDrive

MOBILE APP



SMART CROP

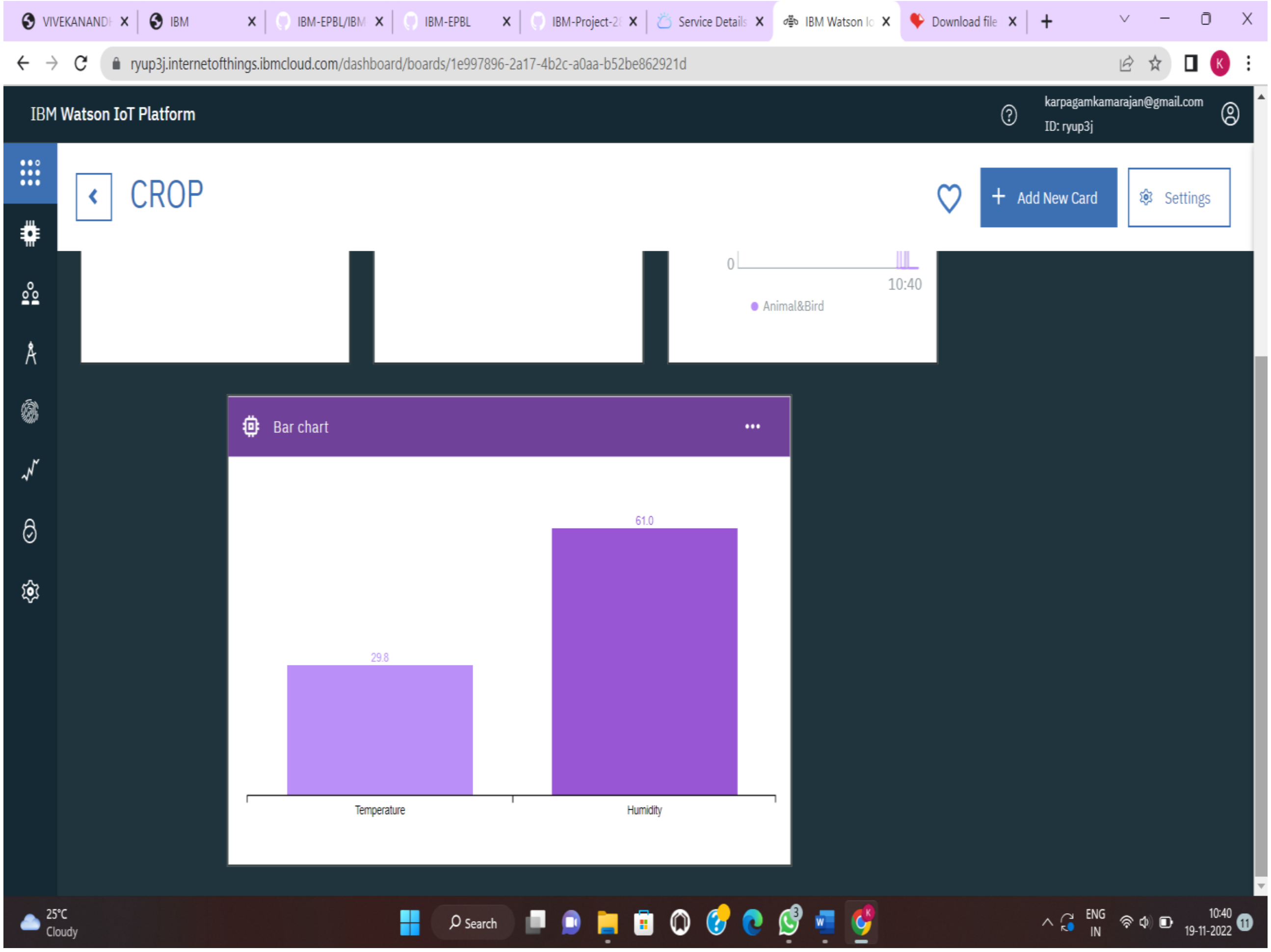
TEMPERATURE

24

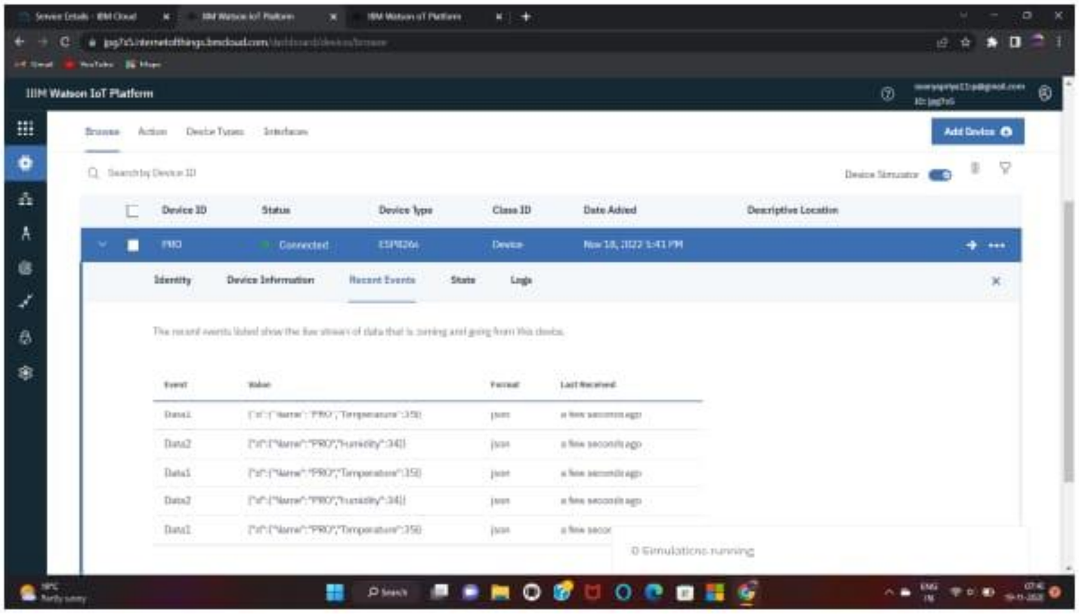
HUMIDITY

40

MOTOR



TEMPERATURE AND HUMIDITY



Device ID	Status	Device Type	Class ID	Date Added	Descriptive Location
PRO	Connected	ESP8266	Device	Nov 18, 2022 5:41 PM	

The recent events listed show the live stream of data that is coming and going from this device.

Event	Value	Format	Last Received
Data1	{"d":{"Name":"PRO","Temperature":35}}	json	a few seconds ago
Data2	{"d":{"Name":"PRO","Humidity":34}}	json	a few seconds ago
Data1	{"d":{"Name":"PRO","Temperature":35}}	json	a few seconds ago
Data2	{"d":{"Name":"PRO","Humidity":34}}	json	a few seconds ago
Data1	{"d":{"Name":"PRO","Temperature":35}}	json	a few secon

Chapter – 9

ADVANTAGES AND DISADVANTAGES

Advantages:

- Farms can be monitored and controlled remotely.
- Increase in convenience to farmers.
- Less Manpower.
- Better standards of living.

Disadvantages:

- Lack of internet/connectivity issues.
- Added cost of internet and internet gateway infrastructure.
- Farmers wanted to adapt the use of WebApp.

Chapter – 10

CONCLUSION

This system focuses on developing devices and tool to manage, display andalert the users using the advantages of a wireless sensor network system. It aims at making agriculture smart using automation and IoT. The cloud computing devices are used at the end of the system that can create a whole computing system from sensors to tools that observe data from agriculture field. It proposes a novel methodology for smart farming by including a smart sensing system and smart irrigator system through wireless communication technology. Thus, the objective of the project to implement an IoT system in order to help farmers to control and monitor their farms has been implemented successfully.

Chapter – 11

FUTURE SCOPE

Agriculture faces many challenges such as soil parameters, seeds, crop growth and quality, weed control, disease control, crop harvesting and storage. Technologies based on artificial intelligence, along with other available tools and automation, can meet these challenges and prove to be a revolution in agriculture. The use of robots and drones to do almost any task faster and more accurately. From the literature review, it seems likely that precision agriculture will become possible through the integration of sensors, cameras, data analytics, GPS and remote sensing. Image recognition software and IoT sensors can be used to detect disease at an early stage and monitor plant health to minimize waste and increase quality production. Table 1 shows various applications of smart agriculture for advanced evolution and advantage. Still, there are some challenges when it comes to applying AI and IoT to smart agriculture, a promising future field for researchers. Some of the biggest challenges are:

□ Perception issues □ Hardware implementation challenges □ Software and hardware costs □ Network management □ Energy management □ Privacy concerns □ Security challenges □ System interoperability with the introduction of computer vision, deep learning and big data The agricultural sector has also had many implications.Researchers can integrate IoT sensors with intelligent systems and computational optimization algorithms to overcome limitations and shortcomings. Smart agriculture has burgeoning potential for productivity, precision, optimization, adaptive resource management, and intelligent food traceability. It also contributes to environmental protection through efficient use of water, disease prevention, and appropriate use of

Chapter – 12

APPENDIX

```
#include <ESP8266WiFi.h>
#include <WiFiClient.h>
#include  <PubSubClient.h>
#include "DHT.h"


const char* ssid = "project1";

const char* password = "22222222";


#define DHTPIN 12

 #define DHTTYPE DHT22

DHT dht(DHTPIN, DHTTYPE);


#define ID "jpg7s5"
#define DEVICE_TYPE "ESP8266"
#define DEVICE_ID "PRO"
#define TOKEN "JEEVITHAECE"

char server[] = ID ".messaging.internetofthings.ibmcloud.com";
char publish_Topic1[] = "iot-2/evt/Data1/fmt/json";
char publish_Topic2[] = "iot-2/evt/Data2/fmt/json";
char authMethod[] = "use-token-auth";
char token[] = TOKEN;

char clientId[] = "d:" ID ":" DEVICE_TYPE ":" DEVICE_ID;//////a-
6758fkgbpgmf1xf8///SyKj8fKYlys)9wQ9at
WiFiClient wifiClient;
PubSubClient client(server, 1883, NULL, wifiClient);


void setup() {
    Serial.begin(115200);
    dht.begin();
    Serial.println();
    WiFi.begin(ssid, password);
    while (WiFi.status() != WL_CONNECTED) {
    delay(500);
```

```
      Serial.print(".");
}

Serial.println("");
 Serial.println(WiFi.localIP());
 if (!client.connected()) {
 Serial.print("Reconnecting client to ");
 Serial.println(server);
 while (!client.connect(clientId, authMethod, token)) {
 Serial.print(".");
 delay(500);
 }
 Serial.println("Connected TO IBM IoT cloud!");
 }
}
long previous_message = 0;
void loop() {
 client.loop();
 long current = millis();
 if (current - previous_message > 3000) {
 previous_message = current;
 float hum = 34;
 float temp = 35;
 float level = 1;
 if (isnan(hum) || isnan(temp) ){
 Serial.println(F("Failed to read from DHT sensor!"));
 return;

}
 Serial.print("Temperature: ");
 Serial.print(temp);
 Serial.print("°C");
 Serial.print(" Humidity: ");
 Serial.print(hum);
 Serial.print("%");

     String payload = "{\"d\":{\"Name\":\"" DEVICE_ID "\"";
              payload += ",\"Temperature\":";
              payload += temp;
              payload += "}}";

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

 if (client.publish(publish_Topic1, (char*) payload.c_str())) {
      Serial.println("Published successfully");
 } else {
      Serial.println("Failed");
 }
 String payload1 = "{\"d\":{\"Name\":\"" DEVICE_ID "\"";
```

```
       payload1 += ",\"Humidity\":";
       payload1 += hum;
       payload1 += "}}";

Serial.print("Sending payload: ");
 Serial.println(payload1);
 Serial.println('\n');

 if (client.publish(publish_Topic2, (char*) payload1.c_str())) {
      Serial.println("Published successfully");
 } else {
     Serial.println("Failed");
 }
String payload2 = "{\"d\":{\"Name\":\"" DEVICE_ID "\"";
           payload2 += ",\"Level\":";
           payload2 += level;
           payload2 += "}}";
           Serial.print("Sending payload: ");
           Serial.println(payload2);
           Serial.println('\n');

 if (client.publish(publish_Topic2, (char*) payload1.c_str())) {
      Serial.println("Published successfully");
 } else {
      Serial.println("Failed");
 }

 }
}
```

GITHUB LINK :

https://github.com/IBM-EPBL/IBM-Project-15908-1659606057

YOUTUBE FINAL DELIVERABLE LINK:

https://youtu.be/S1SW9ZxYKtg