1. INTRODUCTION:

1.1 Project Overview :

● This project is
based on Internet Of Things (IoT),that can measure soil moisture,
Humidity and temperature conditions for agriculture and crop protection using Watson IoT services. IoT is network that connects physical objects or things embedded with electronics, software and sensors through network connectivity
thatcollects and transfers data using cloud for communication. Data is transferred through internet without human to human or human to computer interaction.

● In this project we have not used any hardware. Instead of real soil moisture, Humidity and Temperature data obtained from sensors we make use of IBM IoT Simulator which can transmit these parameters as required.

2.2 Purpose :

● An intelligent crop protection system helps the farmers in protecting the crop from the animals and birds which destroy the crop.

● This system also helps farmers to monitor the soil moisture levels in the field and also the temperature and humidity values near the field. The motors and sprinklers in the field can be controlled using the mobile application.

2. LITERATURE SURVEY:

2.1 Existing Problem:

● Agriculture is a field which forms the basis of our economy. Yet it faces a lot of problems in terms of availability of resources, Irrigation, increasing rate of Pesticides, Climatic disasters, Insects which ruin the crops and makes a huge loss this sector.

● In agriculture water is needed for the crops for their growth. If the Soil gets dry it is necessary to supply water. But sometime if the farmer doesn't visit the field it is not possible to know the condition of soil.

● Sometimes over supply of water or less supply of water affects the growth of crops.

● Sometimes if the weather/temperature changes suddenly it is necessary to take certain actions.

● Specific crops grow better in specific conditions, they may get damaged due to bad weather.

2.2 References:

[1] J. Padhye, V. Firoiu, andD. Towsley, —A stochastic model of TCP Reno congestion avoidance and control, Univ. of Massachusetts, Amherst, MA, CMPSCI Tech. Rep. 99-02,1999.

[2] Gwo-Jiun Horng ; Min-Xiang Liu Chao-Chun Chen ; The Smart Image Recognition Mechanism for Crop Harvesting System in Intelligent IEEE sensors Journals Year: 2020.

[3] Archana Sahai- Security issues threats in IOT infrastructure international journal of advanced engineering, management and science. International Journal of Advanced Engineering, Management and Science (IJAEMS) Vol4, Issue5 ,May 2018].

[4] Budikartiwa, yayanapriyana & harissyahbuddin, Indonesia Production and Quality enhancement of mango using fan jet sprayer irrigation technique naniheryani. Indonesian Journal of Agricultural Science Vol. 17 No. 2 October 2016: 41–48DOI: http//dx.doi.org/10.21082/ijas.v17n2.2016.p41-48.

[5] Ismail Chahid & Abderrahim Marzouk. A Secure IoT Data Integration in Cloud Storage Systems using ABAC Access Control Policy Journal. Vol-4, Issue-8, August 2017.

[6] Adityashehrwat, NidhiSharma.,pradipshehrwat,&sandeepbhakar-.Awareness and performance of agricultural development schemes in context of farmers welfare in Haryana. Journal article economic affairs India.

[7] Bindu D -,“Basic sciences, Management & Social studies”, International Journal of Engineering Volume 1, Issue 1, 2017.

2.3 Problem Statement Definition:

● Smart Crop Protection System based on IoT can monitor soil moisture and climatic conditions to grow and yield a good crop.

● The farmer can also get the real time weather forecasting data by using external platforms like Open Weather API.

● Farmer is provided a mobile app using which he can monitor the temperature, humidity and soil moisture parameters along with weather forecasting details.

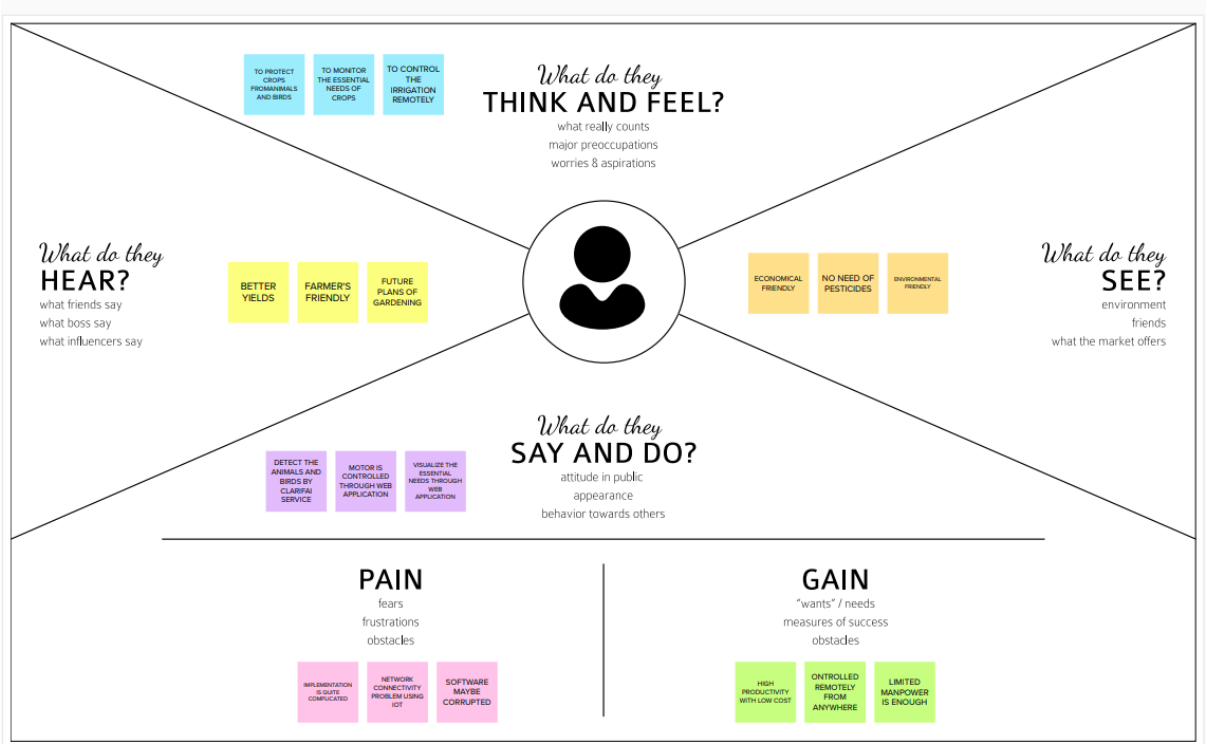
● Based on all the parameters he can water his crop by controlling the motors using the mobile application.

● Even if the farmer is not present near his crop he can water his crop by controlling the motors using the mobile application from anywhere.

● Here we are using the Online IoT simulator for getting the Temperature, Humidity and Soil Moisture values.

3. IDEATION & PROPOSED SOLUTION:

3.1 Empathy Map Canvas:



3.2 Ideation & Brain Storming:

Idea 1:

A centralizing method in the area of IoT (Internet of Things) contrived for understanding agriculture which is preceding the arrangements low-power devices [5]. This paper yields a monitoring procedure for farm safety against animal attacks and climate change conditions. IIoT advances are frequently used in smart farming to emphasize the standard of agriculture[6]. It contains types of sensors, controllers. On behalf of WSN, the ARM Cortex-A board which consumes 3W is the foremost essence of the procedure. Different sensors like DHT 11 Humidity & Temperature Sensor, PIR Sensor, LDR sensor, HC-SR04 Ultrasonic Sensor, and camera are mounted on the ARM Cortex-A board. The PIR goes high on noticing the movement within the scope, the camera starts to record, and the data will be reserved on-board and in the IoT cloud, instantaneously information will be generated automatically towards the recorded quantity using a SIM900A unit to notify about the interference with

the information of the weather conditions attained by DHt11. If a variance happens, the announcement of the threshold rate will be sent to the cell number or to the website. The result will be generated on a catalog of the mobile of the person to take the necessary action.

Idea 2:

Low productivity of crops is one of the main problems faced by the farmers in our country. This can be because of two main reasons. Crops destroyed by wild animals and because of bad weather condition. This paper provides a solution to the destruction of crops by animals. This system will provide a complete technical solution using the Internet of things (IOT) to the farmers to prevent their crops from wild animals and provide information to the farmers to maximize their production. Animals are detected using PIR sensors and cameras where animals are identified using TensorFlow image processing Techniques. Raspberry PI is used as the processing unit of the system and sound buzzers are used to emit the ultrasound frequencies.

Idea 3:

The Smart protection system defines that this project help to farmer for the protection of a farm. We have designed this project for the only secure from animals but we this project have the provision to secure from the human begins also. This can achieve by the help of IOT device that we are discuss in this paper. The SCPS work on the battery so that this project can be easily portable and also we are add solar panels and converter modules this can help the battery to charge from solar energy. The IOT device is used to indicate the farmer by a message while someone enter into the farm and we are used SD card module that helps to store a specified sound to fear the animals.

Brainstorming:

2

Brainstorm

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

10 minutes

TIP

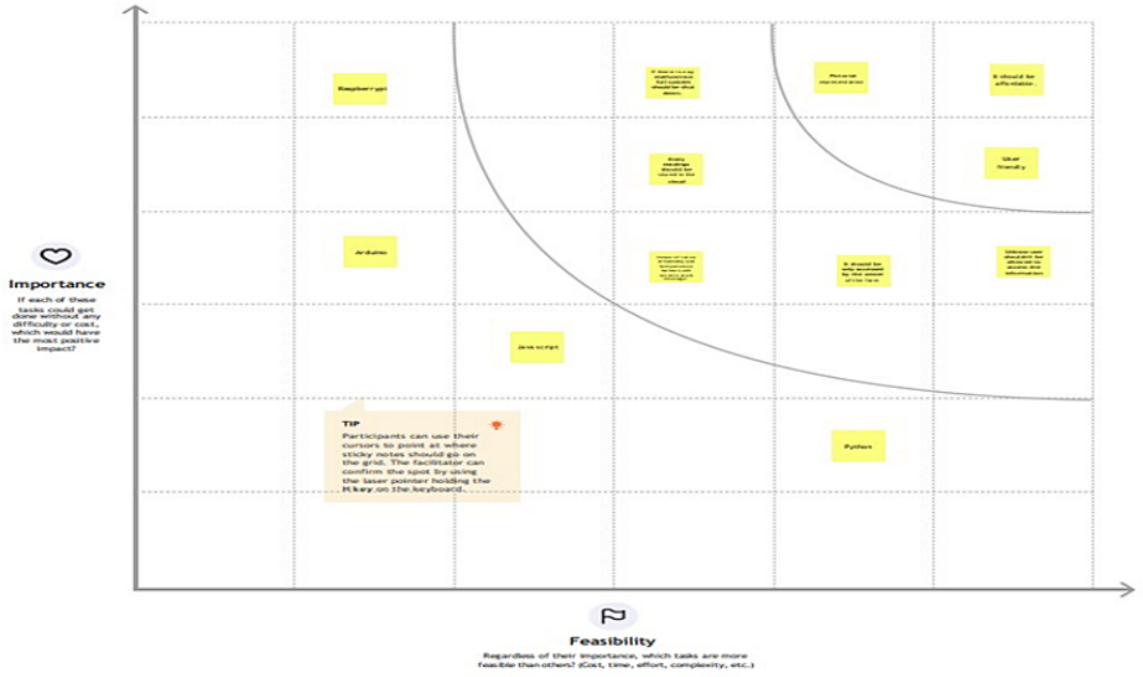
You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!

KEERTHANA		APARNA		SNEHA		SURUTHIPRIYA	
Precise Farming	Carbon Footprint	Remote monitoring & control	Rotate crops for better yield	Install a heat source	Use locally available organic mulches to make crop in moisture condition	Getting right seeds	Sowing at right time
Detoirated quality of soil	Precision Irrigation	Smart watering system	Smart fencing system by placing alarm	Construct a Cold green farm house	Protect the environment	Marketing for a good price	Harvesting at right time

Prioritize

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

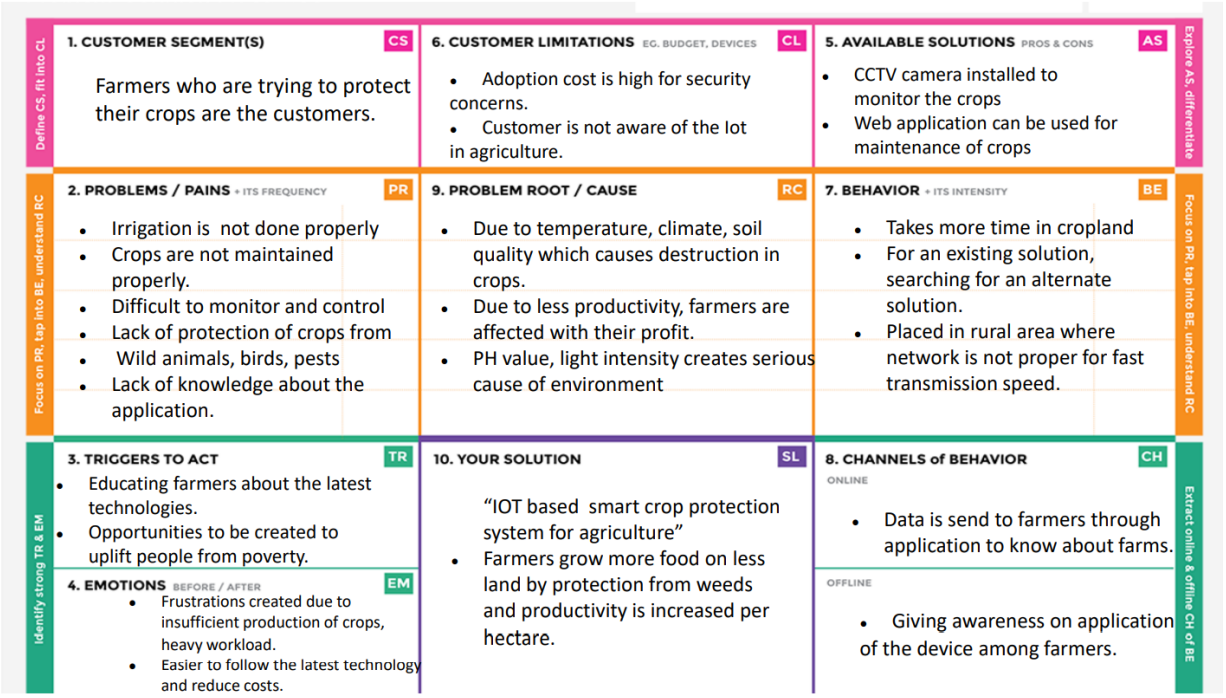
20 minutes



3.3 Proposed Solution

S.NO.	PARAMETER	DESCRIPTION
1.	Problem Statement	Crops are attacked by the animals and birds often.So, the farmers decide to leave the areas barren due to such frequent animal attacks. Another major problem faced by the farmer is their dependency on nature and poorly maintained irrigation system. Current agricultural practice are neither economically nor environmentally sustainable and yields for many agricultural commodities are low. Poorly maintained irrigation system and almost universal lack of good extension service are among the factor responsible.This lead to poor yield of crops and significant financial loss to the owners of the farmland.
2.	Idea/ Solution description	Here we propose an automatic crop protection system from animals. This is a microcontroller-based system.This system use a motion sensor to detect wild animals approaching near the field. In such a case the sensor signals the microcontroller to take action.
3.	Novelty/ Uniqueness	Using IOT and embedded technology,crops are monitored and maintained automatically.
4.	Social Impact/ Customer satisfaction	Farmers get benefitted using this proposed system since this helps in remote monitoring and at the same time maintains the fields.
5.	Business Model	Prototype type helps in efficient growth of crops and also prevents financial losses and yields high performance.
6.	Scalability of the solution	With the help of solution sensor and transmission of data through wireless sensor network ,the data is processed in the cloud and operation is performed by robots.

3.4 Problem Solution Fit



4.REQUIREMENT ANALYSIS

4.1 Functional requirements

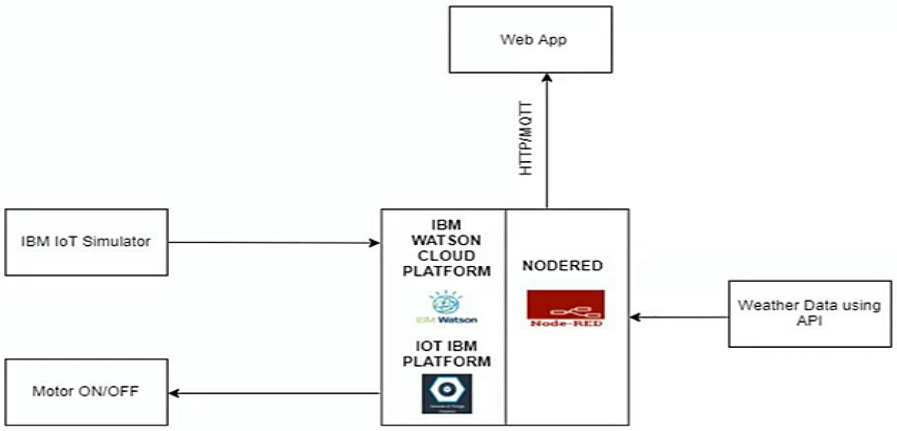
S.No.	Functional Requirement	Description
1.	User Visibility	Cloud services are used to send SMS to farmers and sound an alert when it detects animals approaching the field to entice them away.
2.	User Reception	Data such as sensor readings for soil moisture, humidity, and temperature are obtained by SMS.
3.	User Understanding	Using sensor data values, information on the current state of farming land is obtained.
4.	User Action	The user must take action by destroying crop residues, deep ploughing, rotating crops, applying fertilizers, and planting crops on a set schedule.

4.2 Non-functional requirements

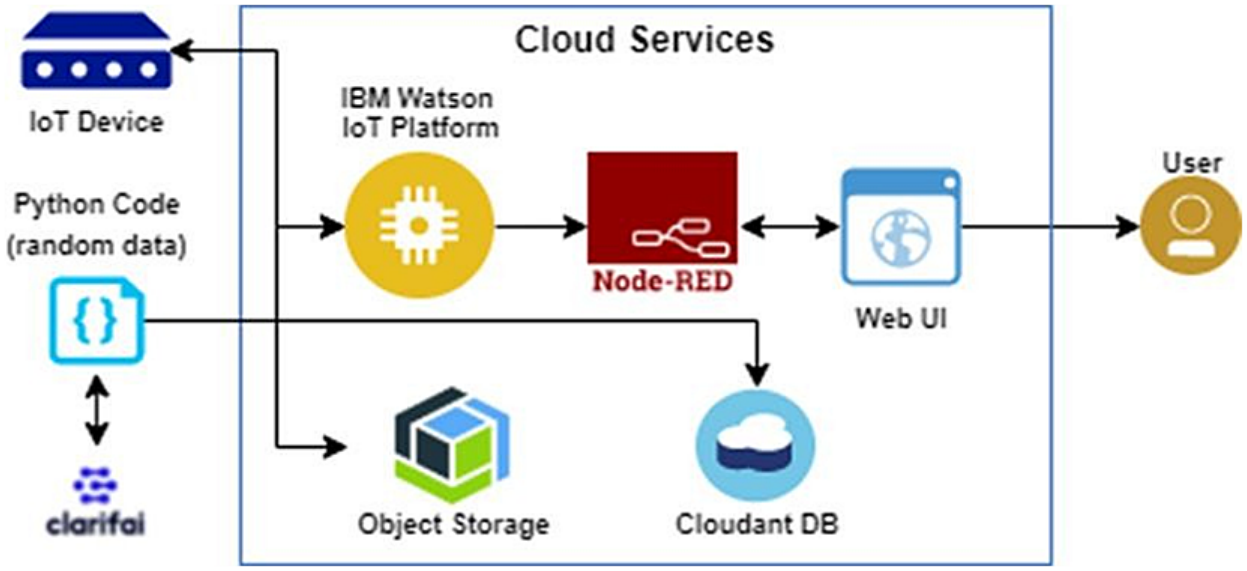
S.NO.	Non-Functional Requirement	Description
1.	Usability	Users should experience the same interaction in mobile support as that of being experienced via computer devices
2.	Security	Implementation of secure access of data for the authorized users to communicate and exchange data.
3.	Reliability	It has the ability to detect the disturbance with accuracy.
4.	Performance	Responses in considerable amount of time irrespective of the quantitative data that need to be processed in backend.Acting as a bidirectional and real time communication.
5.	Availability	Provides 24/7 functioning as IOT solutions and domains are widely used and production does not get delayed even if the IOT solution is down.
6.	Scalability	System handles the upcoming extra load depending on the needs of upscaling of the solution scope for instance, adding extra features.

5.PROJECT DESIGN:

5.1Data Flow Diagram



5.2 Solution &Technical Architecture



5.3 User Stories

User Type	Functional requirement(Epic)	User Story number	User Story/Task	Acceptancecriteria	Priority	Release
Customer (Mobil user)	Registration	USN-1	User can enter into the web application	I can accessmy account /dashboard	High	Sprint 1
		USN-2	User can register their credentials likeemail id and password	I can receive confirmation email & click confirm	High	Sprint 1
	Login	USN-3	User can log into theapplication by entering email & password	I can login tomy account	High	Sprint 1
	Dashboard	USN-4	User can view the temperature	I can view the data given by the device	High	Sprint 2
		USN-5	User can view thelevel of sensor monitoring value	I can view the data given by the device	High	Sprint 2
Customer(Web user)	Usage	USN-1	User can view the web page and get theinformation	I can view the data given by the device	High	Sprint 3
Customer	Working	USN-1	User act according to the alert given by thedevice	I can get thedata work according to it	High	Sprint 3
		USN-2	User turns ON Buzzer/Sound Alarm when the disturbancewill occur on field.	I can get thedata work according toit		Sprint 4
Administration	Administration	USN-1	User store every information	I can store the gained information	High	Sprint 4

6.PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

TITLE	DESCRIPTION	DATE
Literature Survey on The Selected Project and Information Gathering	A Literature Survey is a compilation summary of research done previously in the given topic. Literature survey can be taken from books, research paper online or from any source.	20 September 2022
Prepare Empathy Map	Empathy Map is a visualization tool which can be used to get a better insight of the customer	22 September 2022
Ideation-Brainstorming	Brainstorming is a group problem solving session where ideas are shared, discussed and organized among the team members.	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.	20 September 2022
Problem Solution Fit	This helps us to understand the thoughts of the customer their likes, behaviour, emotions etc.	01 October 2022
Proposed Solution	Proposed solution shows the current solution and it helps is going towards the desired result until it is achieved.	18 October 2022
Solution Architecture	Solution Architecture is a very complex process I.e it has a lot of sub-processes and branches. It helps in understanding the components and features to complete our project.	18 October 2022
Customer Journey	It helps us to analyse from the perspective of a customer, who uses our project.	01 November 2022
Functional Requirement	Here functional and nonfunctional requirements are briefed. It has specific features like usability, security, reliability, performance, availability and scalability.	01 November 2022
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 November 2022
Technology Architecture	Technology Architecture is a more well defined version of solution architecture. It helps us analyze and understand various technologies that needs to be implemented in the project.	03 November 2022
Prepare Milestone & Activity List	It helps us to understand and evaluate our own progress and accuracy so far.	06 November 2022
Spring Delivery Plan	Sprint planning is an event in scrum that kicks off the sprint. The purpose of sprint planning is to define what can be delivered in the sprint and how that work will be achieved.	06 November 2022

6.2 Sprint Delivery Schedule

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 theapplication by entering my mail,password,confirming my password	4	High	Keerthana
Sprint 1	Registration	USN-2	As a user, I will receive confirmation email once I have registered for the application	3	High	Suruthipriya
Sprint 1	Login page	USN-3	As a user, enter the username and password which is already existing	3	Medium	Aparna
Sprint 1	Forecasting the weather	USN-4	As a user ,we can monitor he weather conditions like humidity,temperature etc	12	High	Sneha
Sprint 2	Sensing moisture condition of the soil	USN-5	As a user ,we can know about soil moisture, controlling the motor pump for water flow by using mobile application.	10	High	Suruthipriya
Sprint 3	Detecting the motion in certain range	USN-6	Fencing system are helpful in providing security against animals and birds.	12	High	Sneha
Sprint 4	Checking the crops conditions	USN-7	Here farmer needs to update the condition of crops.	9	High	Aparna

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	8	6 Days	24 Oct 2022	29 Oct 2022	22	29 Oct 2022
Sprint-2	1	6 Days	31 Oct 2022	05 Nov 2022	10	05 Nov 2022
Sprint-3	2	6 Days	07 Nov 2022	12 Nov 2022	12	12 Nov 2022
Sprint-4	1	6 Days	14 Nov 2022	19 Nov 2022	9	19 Nov 2022

Velocity:

Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

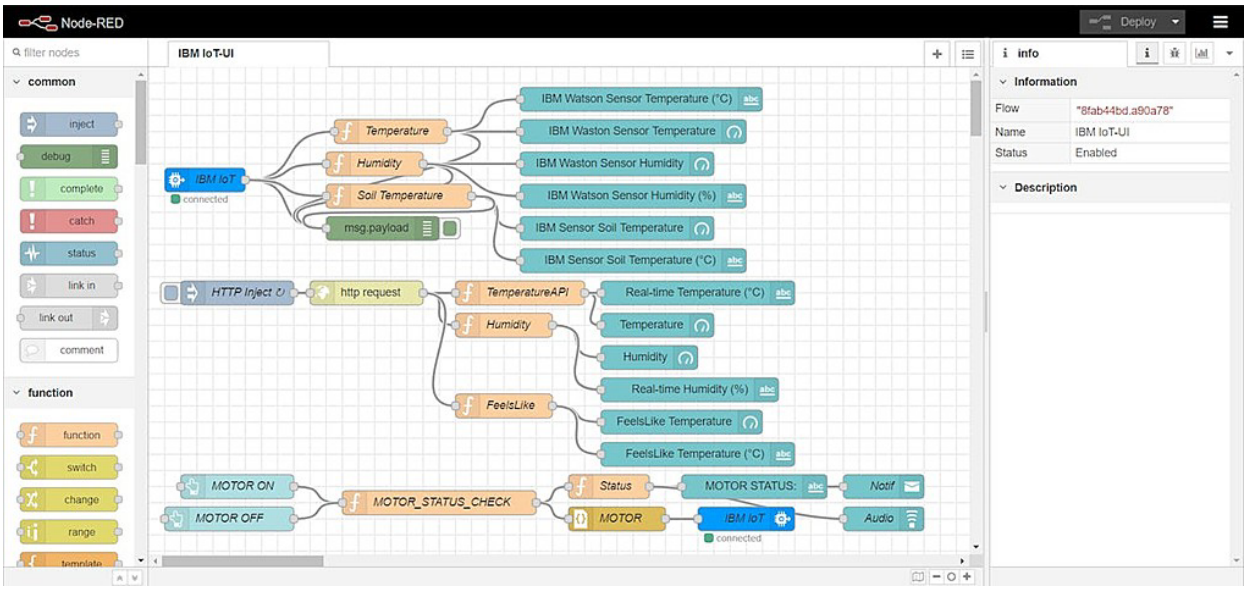
$$AV = \frac{sprint\ duration}{velocity}$$

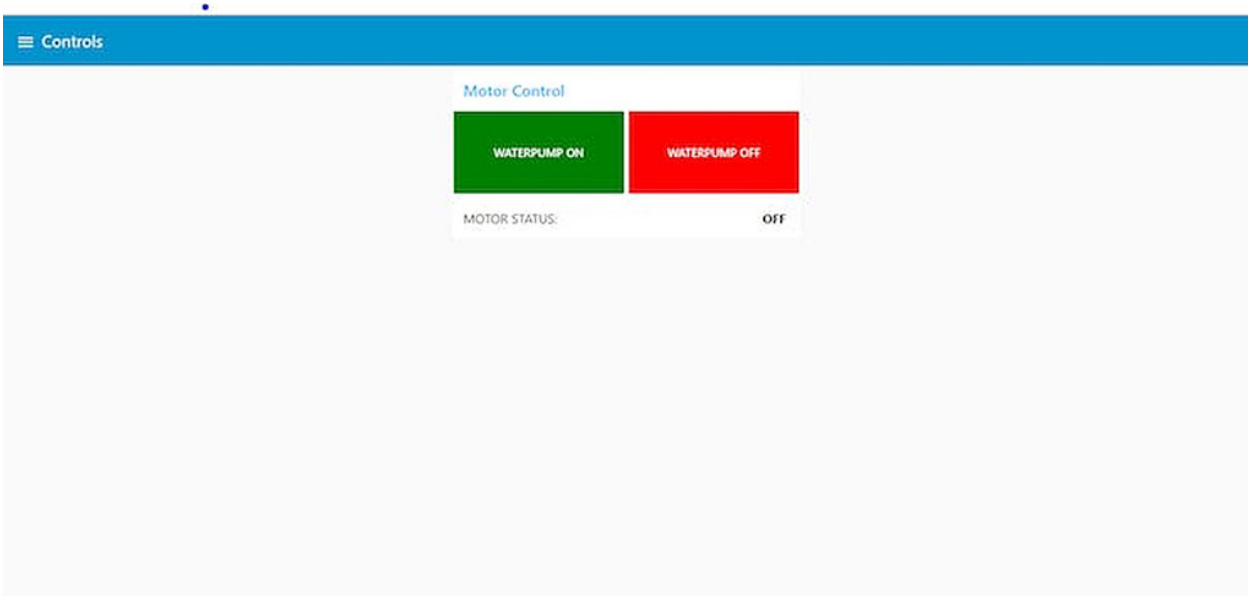
=6/13.25

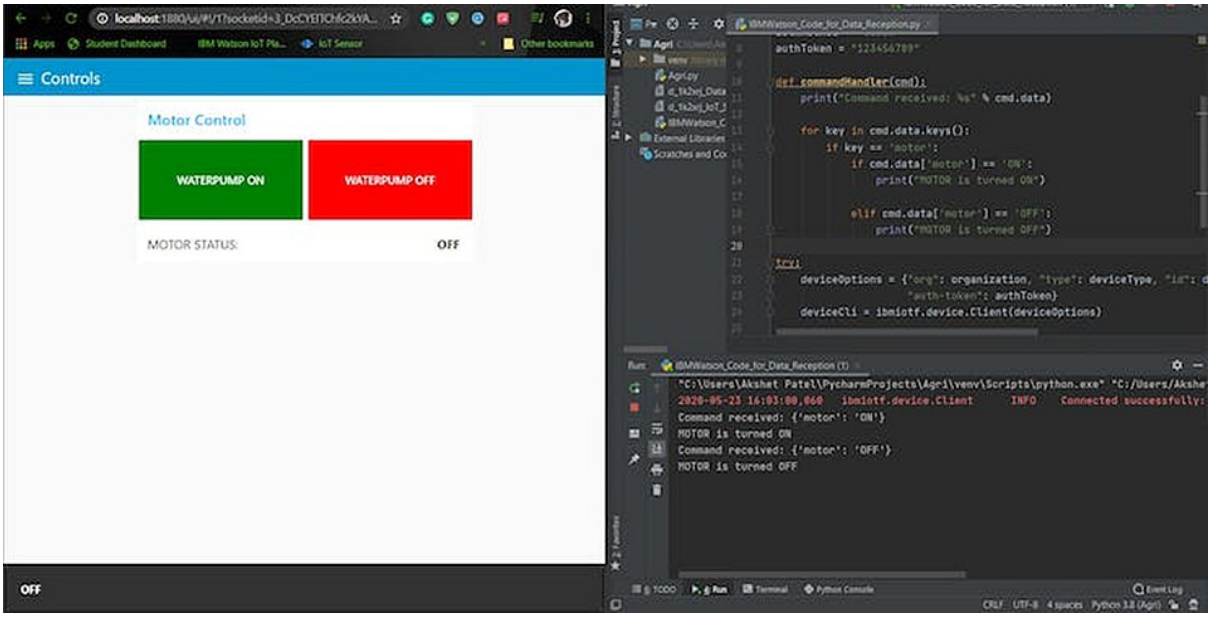
=0.45

7.CODING & SOLUTIONING

7.1 Feature 1

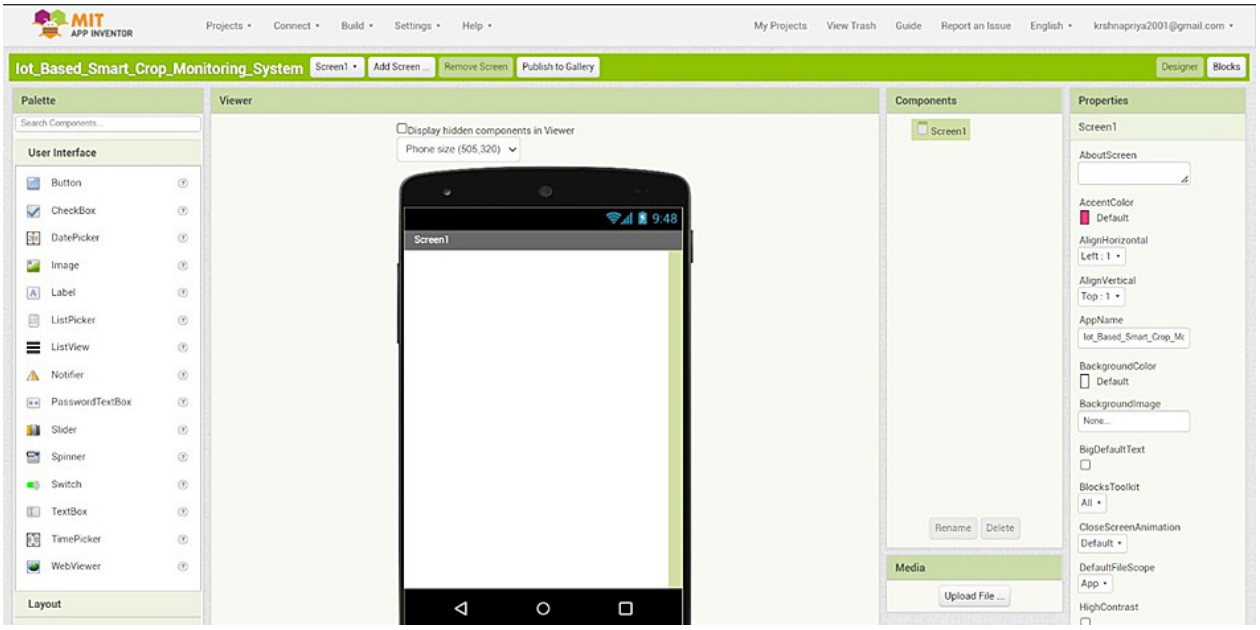




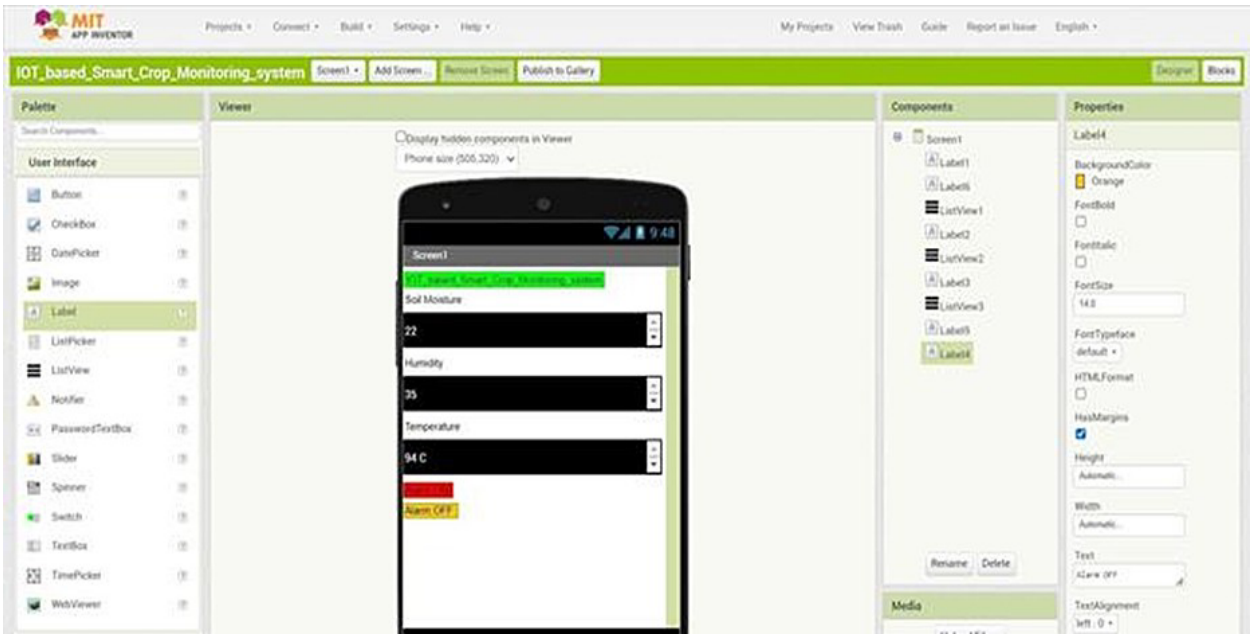

Controls
Motor Control
WATERPUMP ON
WATERPUMP OFF
MOTOR STATUS:
OFF
OFF
authToken = "123456789"
def commandHandler(cmd):
print("Command received: %s" % cmd.data)
for key in cmd.data.keys():
if key == 'motor':
if cmd.data['motor'] == 'ON':
print("MOTOR is turned ON")
elif cmd.data['motor'] == 'OFF':
print("MOTOR is turned OFF")
try:
deviceOptions = {"org": organization, "type": deviceType,
"auth-token": authToken}
deviceCli = ibmiotf.device.Client(deviceOptions)
2020-05-23 16:03:00,860 ibmiotf.device.Client INFO Connected successfully:
Command received: {'motor': 'ON'}
MOTOR is turned ON
Command received: {'motor': 'OFF'}
MOTOR is turned OFF

7.2 Feature 2

MIT APP inventor to design the APP



Customize the App interface to Display the Values



8. TESTING

Defect Analysis

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

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	11	4	2	2	19
Duplicate	1	1	2	0	4
External	2	3	0	1	6
Fixed	10	2	3	20	35
Not Reproduced	0	0	2	0	2
Skipped	0	0	2	1	3
Won't Fix	0	5	2	1	8
Totals	24	15	13	25	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	5	0	1	4
Client Application	47	0	2	45
Security	3	0	0	3
Outsource Shipping	2	0	0	2
Exception Reporting	11	0	2	9
Final Report Output	5	0	0	5
Version Control	3	0	1	2

9.RESULT

We have successfully built an IOT Based Smart Crop Protection System forAgriculture 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 cropconditions everything can be easily monitored.
- Risk of crop damage can be lowered to a greater extent.
- Many difficult challenges can be avoidedmaking the processautomated and thequality of crops can be maintained.
- The process included in farming can be controlled using the web applicationsfrom anywhere, anytime.

10.2 Disadvantages

- Smart Crop Protection requiresinternet connectivity continuously, but rural partscan not fulfill this requirement.

1. Any faults in the sensors can cause great loss in the agriculture, due to wrong recordsand the actions of automated processes.
2. IoT devices need much money to implement.

11.CONCLUSION

IoT based smart Crop Monitoring System for Agriculture for Live Monitoring of Temperature and Soil Moisture and to control motor and light remotely has been proposed usingNode Red and IBM CloudPlatform. The Systemhas high efficiency and accuracy in fetching the live data of temperature and soil moisture.The IoT based smart farming System being proposed via this project will assist farmers in increasing theagriculture yield and take efficient care of food production as the System will always provide helpinghand to farmers for gettingaccurate live feed of environmental temperature and soil moisture with more than 99% accurate results. Therefore, the project proposesa thought of consolidating the most recentinnovation into the agrarian field to turn the customary techniques for water system to current strategies in this way making simple profitable and temperate trimming.

12.FUTURE SCOPE

In future due to more demand of good and more farming in less time, for betterment of the crops and reducingthe usage of extravagant resourceslike electricity and water IoT can be implemented in most of the places.

13.APPENDIX

GITHUB LINK:https://github.com/IBM-EPBL/IBM-Project-18698

1659688585

SOURCE CODE:https://github.com/IBM-EPBL/IBM-Project-

18698-
1659688585/tree/main/Final%20Deliverables/Final%20Code

DONE BY : KEERTHANA.E

APARNA.S

SNEHA.S.N

SURUTHIPRIYA K