Project Report Format

1. INTRODUCTION

1.1 Project Overview

The title of our project is **"IOT based Smart Crop Protection"**. The Overview of our Project is to Safeguard the farm from climatic changes like soil erosion, landslide, and birds, animals etc,.So, that we are making a IOT based project to protect the farm from climatic changes and haunting animals. For that we are just making a cloud based project and placing IOT based sensor. over which it will produce sounds and notification and provide results on IOT- MIT app. From which we can protect our farm. And it will provide better yield for us.

1.2 Purpose

- ⇨ The main purpose of our project is to protect the farm from climatic changes animals, birds , pests.
- ⇨ And to make the crop to grow better and provide better yield.

2. LITERATURE SURVEY

2.1 Existing problem

- ⇨ "Food" is the important thing, which is needed for everyone to survive in this world. For that farmers are doing their own part in a effective manner, during which they have to face some problems such as:
- ⇨ There are increasing pressures from climate change, soil erosion and biodiversity loss and from consumers' changing tastes in food and concerns about how it is produced.
- ⇨ And the natural world that farming works with – plants, pests and diseases – continue to pose their own challenges beyond that, they have to
- ⇨ Stay resilient against global economic factors.
- ⇨ Inspire young people to stay in rural areas and become future farmers
- ⇨ The effects of climate change affect farmers' ability to grow the food we all need. Increasingly volatile weather and more extreme events – like floods and droughts – change growing seasons, limit the availability of water, allow weeds, pests and fungi to thrive, and can reduce crop productivity.

2.2 References

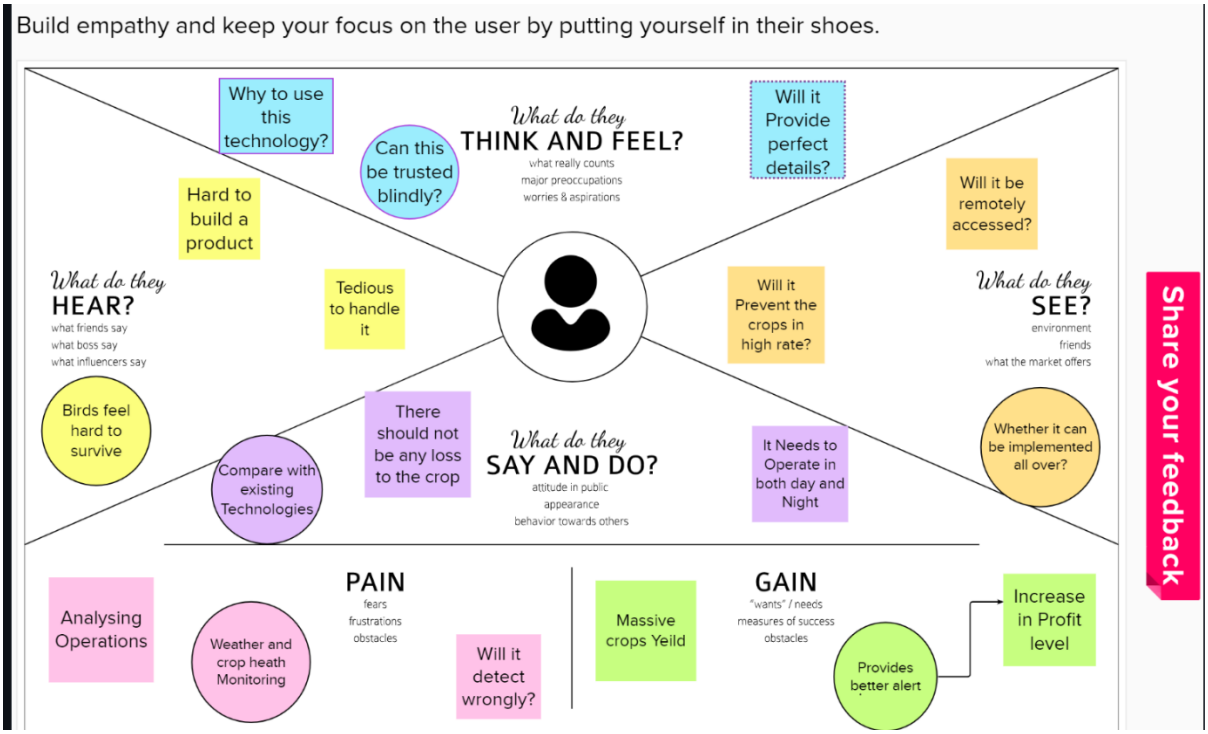
- https://smartinternz.com/assets/docs/Smart%20Home%20Automation%20using%20IBM%20cloud%20Service s%20(1).pdf
- https://smartinternz.com/assets/docs/Smart%20Home%20Automation%20using%20IBM%20cloud%20Service s%20(1).pdf
- https://openweathermap.org/
- https://smartinternz.com/assets/docs/Sending%20Http%20request%20to%20Open%20weather%20map%20web site%20to%20get%20the%20weather%20forecast.pdf
- https://www.youtube.com/watch?v=cicTw4SEdxk
- https://smartinternz.com/assets/docs/Smart%20Home%20Automation%20using%20IBM%20cloud%20Service s%20(1).pdf
- https://github.com/rachuriharish23/ibmsubscribe

2.3 Problem Statement Definition

- Agriculture is one of the Area which required urgent attention and advancement for high yield and efficient utilization of resources.
- In this paper an approach of smart crop monitoring is presented through Internet of things (IOT).
- A 4 Level framework is proposed namely sensing devices, sensor data level, base station level, edge computing and cloud data level for smart crop monitoring.
- In this project, farm is going to get protected from humidity, temperature, and animals. With the help of IOT cloud module.
- The agricultural form is been monitored with the help of MIT app and then, the data will be collected and stored it in cloud.
- It will monitor and sense the humidity level and movement of animals and will send the message as notification to the user.

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation & Brainstorming

What do they think and feel?

As its name may imply, smart farming is the use of technology in animal agriculture, and it's something that's been around since the Industrial Revolution. The biggest difference between then and now, though? "Motorized devices are being replaced with IOT".

What do they hear?

Smart farming is about using the new technologies which have arisen at the dawn of the Fourth Industrial Revolution in the areas of agriculture and cattle production to increase production quantity and quality, by making maximum use of resources and minimizing the environmental impact.

What do they see?

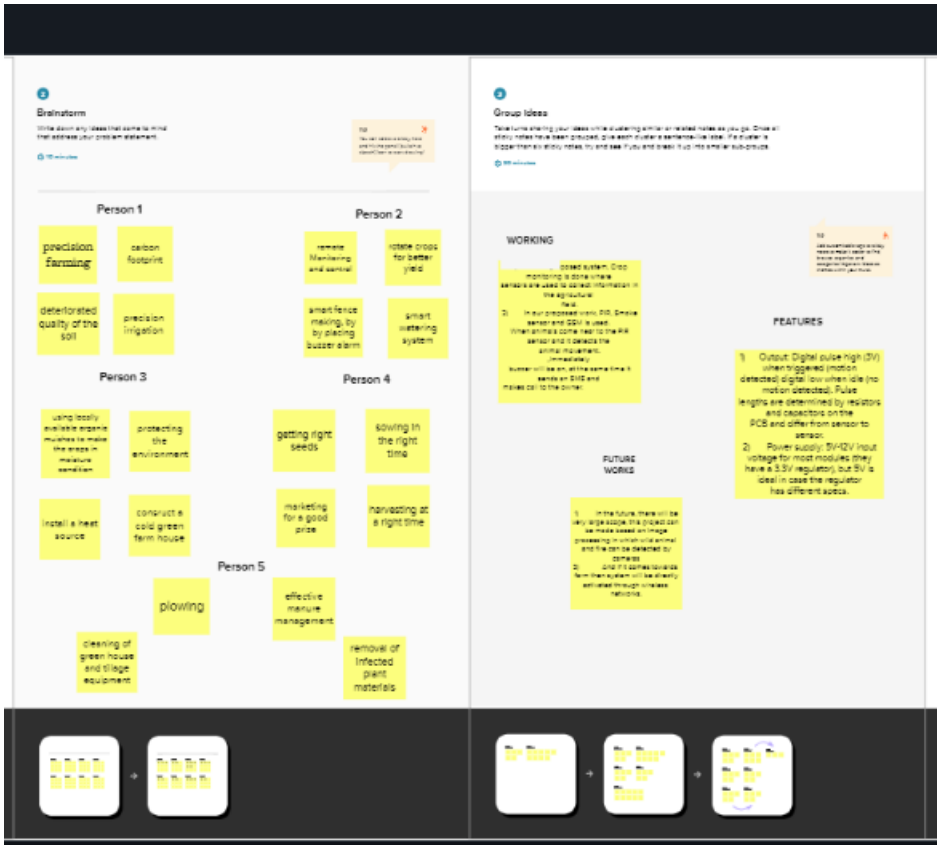
Smart farming is a management concept focused on providing the agricultural industry with the infrastructure to leverage advanced technology – including big data, the cloud and the internet of things (IoT) – for tracking, monitoring, automating and analyzing operations.

What do they say and do?

- The aim of this technology is to **make the most of all the data** collected by various tools, by converting them into real **sources of information** in order to then define ways of simplifying agricultural work. It also allows for **accurate and predictive analysis** of all situations that may affect the farms, such as weather conditions (temperature, humidity, etc.) and sanitary or economic situations, for example. This makes it easier to organize the supply of energy, water, livestock feed and fertilizer.
- In its most advanced form, smart farming facilitates the exchange of information between different farms, creating a real network of connected farms accessible from a smartphone or a computer.

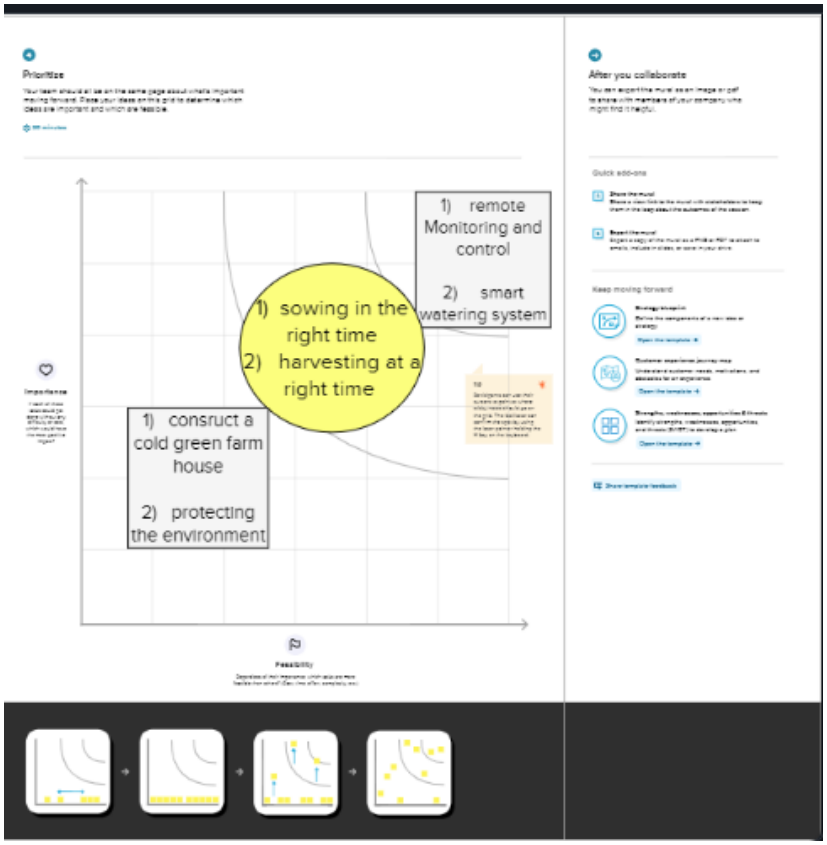
BRAINSTORM:

BRAINSTORM



PRIORITIZATON:

PRIORITIZE



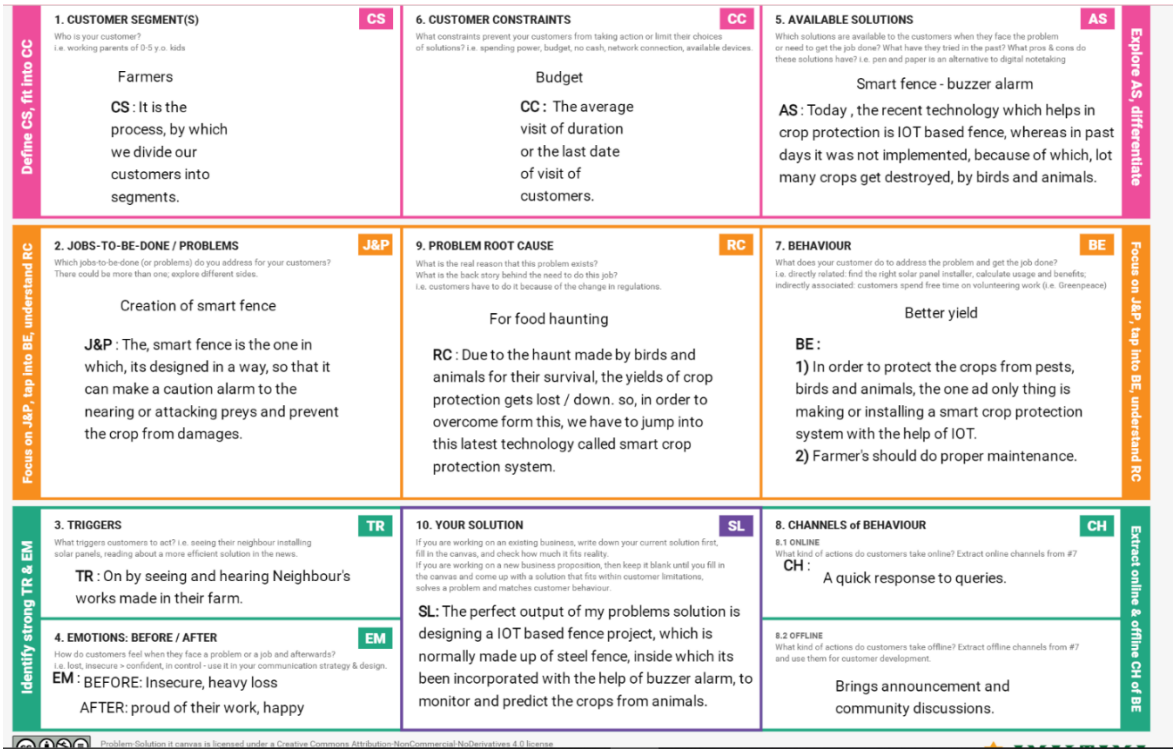
3.3 Proposed Solution

Proposed Solution Template:

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

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Crop protection from animals and pests, for better yield of crops.
2.	Idea / Solution description	Making a fence, which helps in identifying the animals and pests, by buzzer alarm.
3.	Novelty / Uniqueness	Improve productivity, crop variety improvement, crop protection management.
4.	Social Impact / Customer Satisfaction	good export of products, high profit, increase in brand loyalty.
5.	Business Model (Revenue Model)	high production, livestock and crops, direct sales, and advertising.
6.	Scalability of the Solution	by incorporating integrated pests and insect management, by creating smart fence with buzzer alarm, and irrigation.

3.3 Problem Solution fit



4 REQUIREMENT ANALYSIS

3.4 Functional requirement

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through Linked IN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Certification Requirements	Regulation Rules Profession wide.
FR-4	Authorization	Healthcare provider User group.
FR-5	Business rules	Decision making Marketing.
FR-6	External interfaces	Wide Area Network (WAN) Screen layouts.

3.5 Non-Functional requirements

Non-functional Requirements:

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

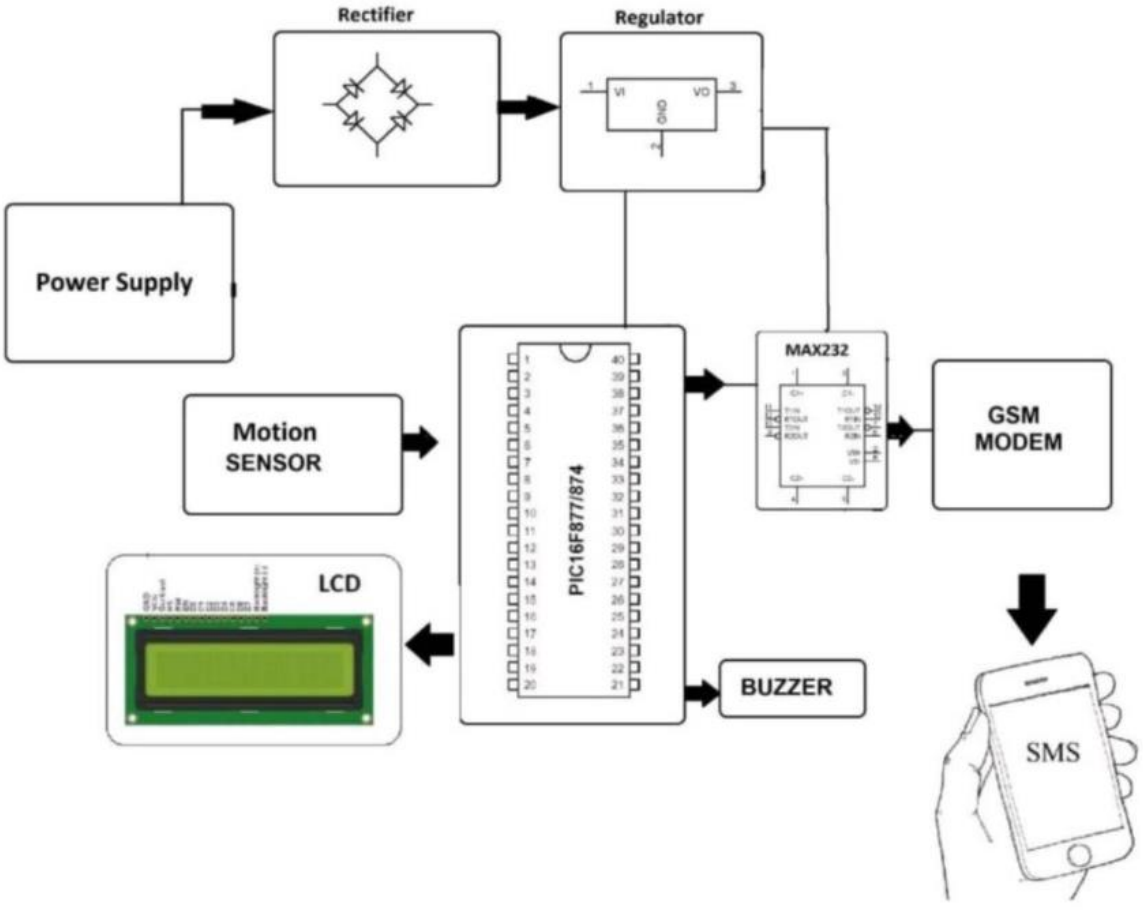
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Use of fertilizers , Irrigation and scheduled planting operation.
NFR-2	**Security**	Crops could be protected from these diseases using pesticides and biocontrol agents.
NFR-3	**Reliability**	Reducing deforestation , conserving natural resources and curbing soil erosion.
NFR-4	**Performance**	Agricultural productivity depends on the quality of seeds with which farmers sow their

		fields.
NFR-5	**Availability**	Farming methods requires growers appropriate plant protection strategy and training.
NFR-6	**Scalability**	Application of sensors and automated irrigation practices can help monitor agricultural land.

4. PROJECT DESIGN

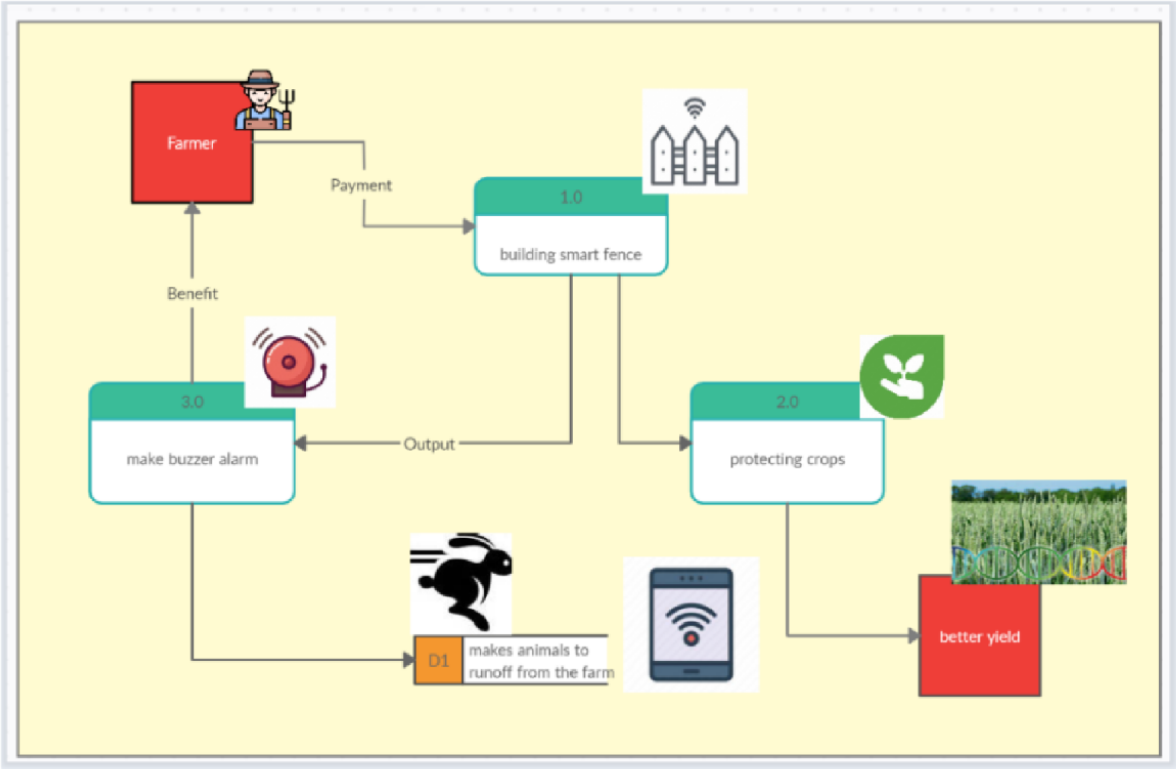
4.1 Data Flow Diagrams

Flow diagram of Smart Crop Protection in IOT:

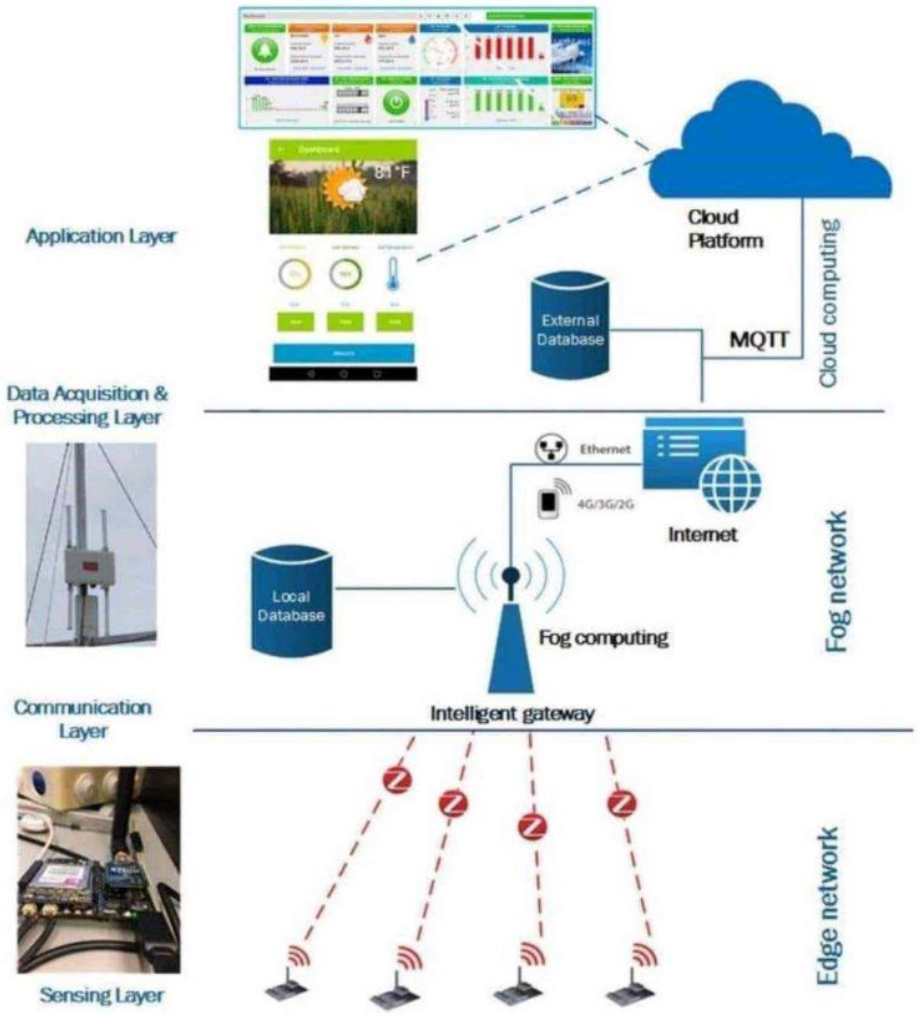


4.2 Solution & Technical Architecture

SOLUTION ARCHITECTURE:



TECHNICAL ARCHITECTURE:



4.3 User Stories

USER STORIES:

User Type	Functional Requirement (Epic)	User Story Number	User Story/Task	Acceptance criteria	priority
Customer (Mobile user)	Download the database	USN-1	As a user I can register for the application by entering my email, password and confirming my password.	I can access my account/ dashboard	High
	Register	USN-2	As a user I can register for the application by entering my email, password and confirming my password.	I can receive confirmation email and click confirm	High
	Login	USN-3	As a user I will receive confirmation email once I have registered for the application.	I can register and access the dashboard with Facebook login	Low
	Upload the image	USN-4	As a user I must upload the image to identify the problem and works on it.		Medium
Customer (Web user)	The functional requirements are same as	Same as mobile user	Same as mobile user.	Same as mobile user	High when compare

5. PROJECT PLANNING & SCHEDULING

PROJECT PLANNING PHASE

(PROJECT MILESTONE)

Date	22 October 2022
Team ID	PNT2022TMID04076
Project Name	IOT Based Smart Crop Protection System
Maximum Marks	4

S.NO	ACTIVITY TITLE	ACTIVITY DESCRIPTION	DURATION
s 1	**Understanding the Project Requirement**	1)Assign the team members and create repository in the GitHub. 2)Assign the task to each Members and teach how to use and access the GitHub and	1 week

2	**Starting of Project**	1)Advice students to attend classes of IBM portal. 2)Create and develop a rough diagram based on project description. 3)Team leader assign task to each member of the project.	1 week
3	**Attend Classes**	Team members and team lead must watch and learn from classes provided by IBM and Nalaiya Thiran.	3 weeks
4	**Prerequisites**	1) Create an account in clarifai. 2)Register in IBM Cloud Services. 3)Software installed	1 week

5	**Task Assigned**	1)Develop the python Script. 2)Develop a web Application Using Node RED Service. 3)Ideation Phase 4)Project Design Phase-I. 5)Project Design Phase-II. 6)Project Planning Phase. 7)Project Development Phase.	5 weeks
6	**Scope Of the Project**	It helps the farmers grow more food on less land by protecting crops from pests, diseases and weeds as well as raising productivity per hectare.	1 week

6.

6.1 Sprint Planning & Estimation

Project Planning Phase
Sprint Delivery Plan

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

Use the below template to create product backlog and sprint 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 the application by entering my email, password, and confirming my password.	2	High	Sakthi Meenakshi S
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	Rindhiya
Sprint-2		USN-3	As a user, I can register for the application through Facebook	2	Low	Swathi
Sprint-1	Dashboard	USN-4	As a user, I can register for the application through Gmail	2	Medium	Saranya
Sprint-2	Query solving - Bot	USN-5	As a user, if i have struggle in accessing my account, then Bot will try to solve it	1	Low	Priyadharshini

6.2 Sprint Delivery Schedule

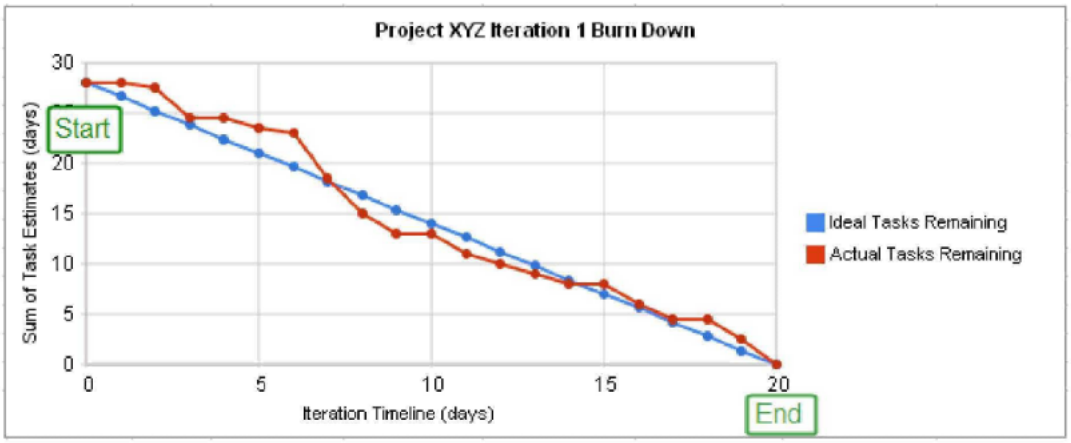
SPRINT	TOTAL STORY POINTS	DURATION (DAYS)	Sprint Start Date	SPRINT END DATE (PLANNED)	STORY POINTS COMPLETED	SPRINT RELEASE DATE
Sprint 1	20	6	24 Oct 2022	29 Oct 2022	25	29 Oct 2022
Sprint 2	20	6	31 Oct 2022	05 Nov 2022 2	15	30 Oct 2022
Sprint 3	20	6	7 Nov 2022	12 NOV 2022	14	6 NOV 2022
Sprint 4	20	6	14 NOV 2022	19 NOV 2022	20	7 Nov 2022

Velocity:

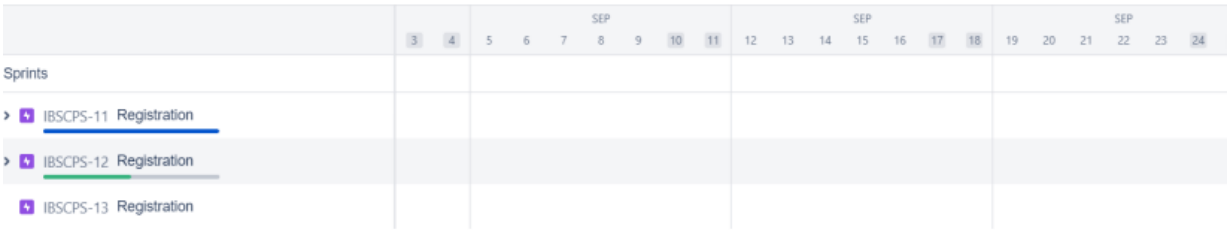
AV for sprint 1= Sprint Duration /velocity =20/6=3.3
AV for sprint 2= Sprint Duration/Velocity=6/6=3.3
AV for Sprint 3=Sprint Duration/Velocity=6/6=3.3
AV for Sprint 4=Sprint Duration/Velocity=6/6=3.3

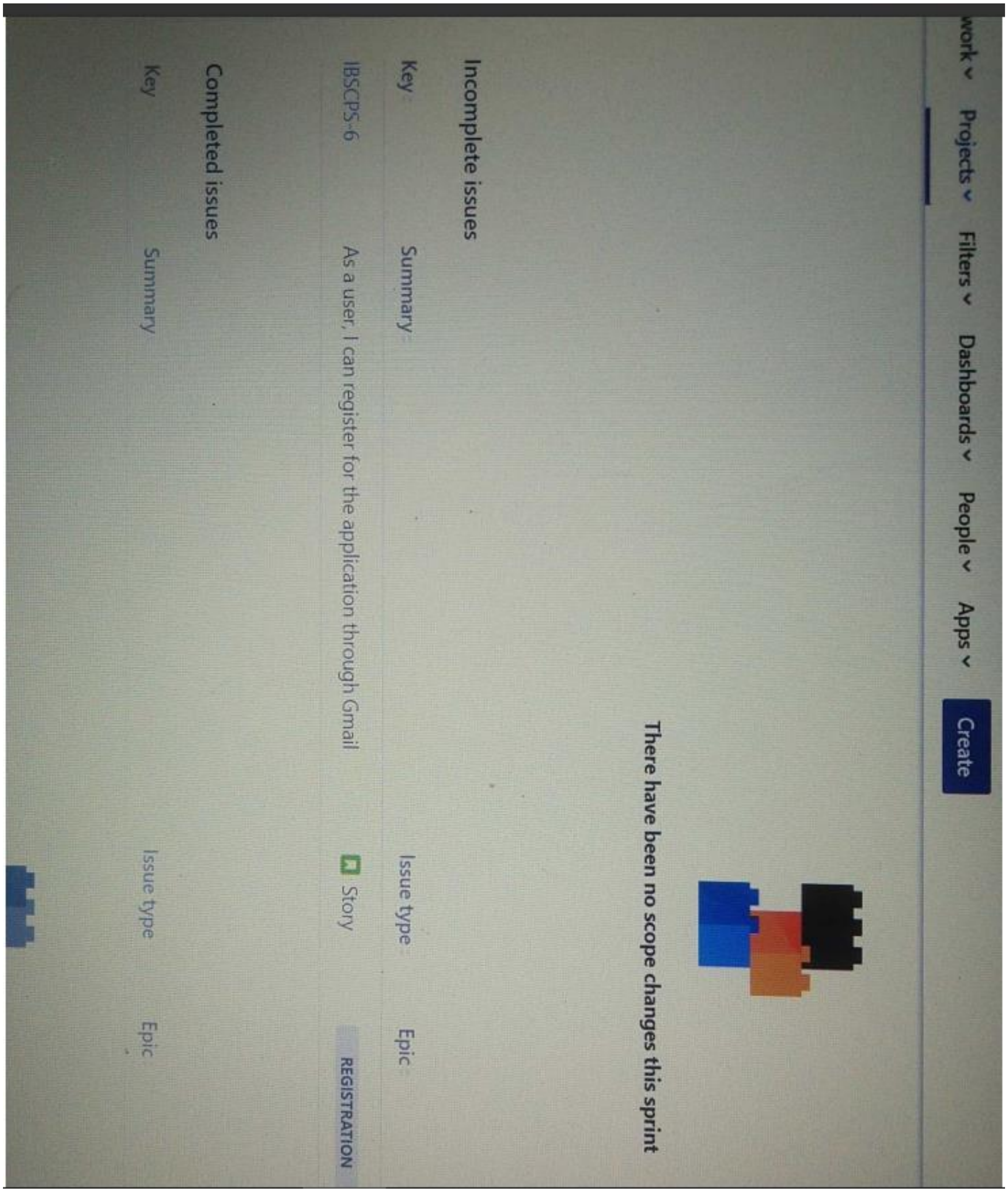
BURNDOWN CHART:

Burndown Chart



6.3 Reports from JIRA





7. CODING & SOLUTIONING

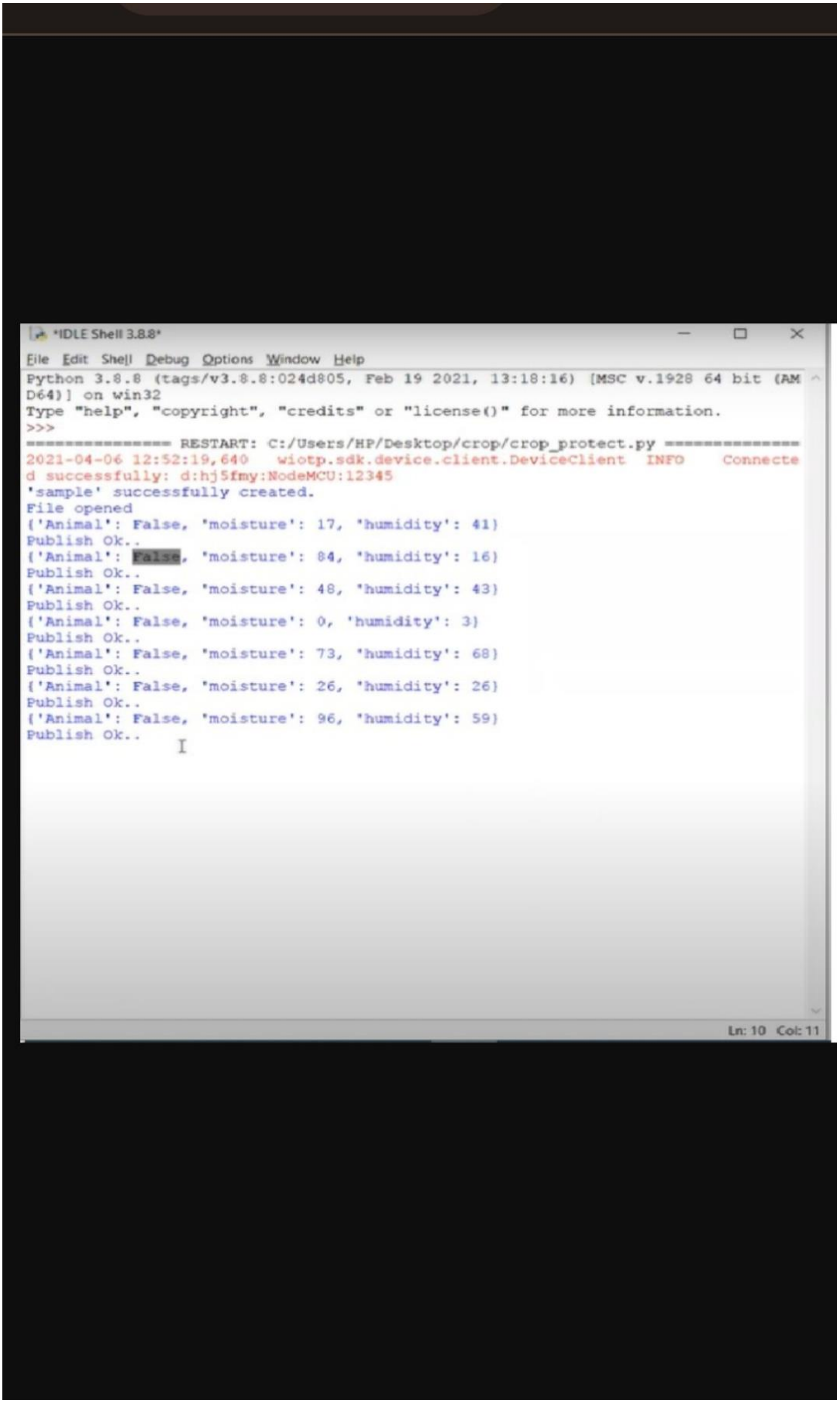
7.1 Feature 1

```
Python 3.10.7 (tags/v3.10.7:6cc6b13, Sep  5 2022, 14:08:36) [MSC v.1933 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
import cv2
import numpy as np
import wiot.sdk.device
import playsound
import random
import time
import datetime
import ibm_boto3
from ibm_botocore.client import Config, ClientError

#CloudantDB
from cloudant.client import Cloudant
from cloudant.error import CloudantException
from cloudant.result import Result, ResultByKey
from clarifai_grpc.channel.clarifai_channel import ClarifaiChannel
from clarifai_grpc.grpc.api import service_pb2_grpc
stub = service_pb2_grpc.V2Stub(clarifaiChannel.get.grpc_channel())
from clarifai_grpc.grpc.api import service_pb2, resource_pb2
from clarifai_grpc.grpc.api.status import status_code_pb2

#This is how you authenticate
metadata = (('authorization', 'key 0620e202302b4508b90eab7efe7475e4'),)
COS_ENDPOINT = "https://s3.jp-tok.cloud-object-storage.appdomain.cloud"
COS_API_KEY_ID = "g5d4qO8EIgv4TWUCJj4hfEzgalqEjrDbE82AJDWlAOHo"
COS_AUTH_ENDPOINT = "https://iam.cloud.ibm.com/identity/token"
COS_RESOURCE_CRN = "crn:v1:bluemix:public:cloud-object-storage:global:a/c2fa2836eaf3434bbc8b5b58fefff3f0:62e450fd-4c82-4153-ba41-ccb53adb8111::"
clientdb = cloudant("apikey-W2njldnwtjO16V53LAVUCqPwc2aHTLmlj1xXvtdGKJBn", "88cc5f47c1a28afbfb8ad16161583f5a", url="https://d6c89f97-cf91-48b7-b14b-c99b2fe27c2f-bluemix.clouda
clientdb.connect()

#Create resource
cos = ibm_boto3.resource("s3",
                         ibm_api_key_id=COS_API_KEY_ID,
                         ibm_service_instance_id=COS_RESOURCE_CRN,
                         ibm_auth_endpoint=COS_AUTH_ENDPOINT,
                         config=Config(signature_version="oauth"),
```

```
                         config=Config(signature_version="oauth"),
                         endpoint_url=COS_ENDPOINT
                         )
def = multi_part_upload(bucket_name, item_name, file_path):
    try:
        print("Starting file transfer for {0} to bucket: {1}\n".format(item_name, bucket_name))
        #set 5 MB chunks
        part_size = 1024 * 1024 * 5
        #set threadhold to 15 MB
        file_threshold = 1024 * 1024 * 15
        #set the transfer threshold and chunk size
        transfer_config = ibm_boto3.s3.transfer.TransferConfig(
            multipart_threshold=file_threshold,
            multipart_chunksize=part_size
            )
        #the upload_fileobj method will automatically execute a multi-part upload
        #in 5 MB chunks size
        with open(file_path, "rb") as file_data:
            cos.Object(bucket_name, item_name).upload_fileobj(
                Fileobj=file_data,
                Config=transfer_config
                )
        print("Transfer for {0} Complete!\n".format(item_name))
    except ClientError as be:
        print("CLIENT ERROR: {0}\n".format(be))
    except Exception as e:
        print("Unable to complete multi-part upload: {0}".format(e))

def myCommandCallback(cmd):
    print("Command received: %s" % cmd.data)
    command=cmd.data['command']
    print(command)
    if(commamd=="lighton"):
        print('lighton')
    elif(command=="lightoff"):
        print('lightoff')
    elif(command=="motoron"):
        print('motoron')
```

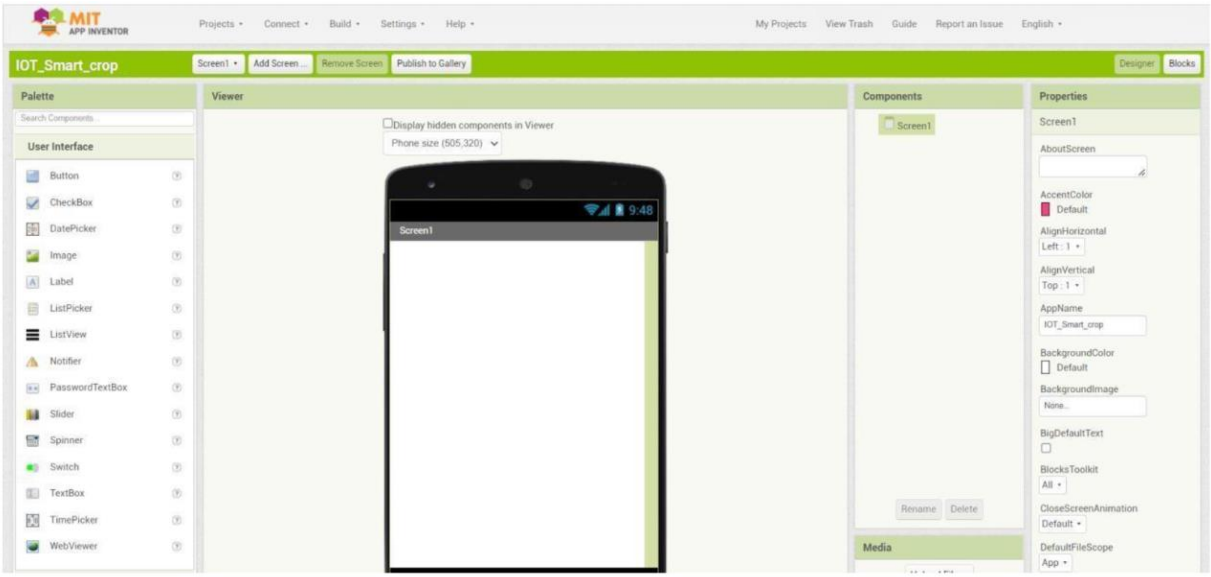
```
        print('motoron')
    elif(command=="motoroff"):
        print('motoroff')
myConfig = {
    "identity": {
        "orgId": "chytun",
        "typeId": "NodeMCU",
        "deviceId": "12345"
        },
    "auth": {
        "token": "12345678"
        }
    }
client = wiot.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
client.connect()

database_name = "sample"
my_database = clientdb.create_database(database_name)
if my_dtabase.exists():
    print(f"'(database_name)' successfully created.")
cap=cv2.VideoCapture("garden.mp4")
if(cap.isOpened()==True):
    print('File opened')
else:
    print('File not found')

while(cap.isOpened()):
    ret, frame = cap.read()
    gray = cv3.cvtColor(frame, cv2.COLOR_BGR@GRAY)
    imS= cv2.resize(frame, (960,540))
    cv2.inwrite('ex.jpg',imS)
    with open("ex.jpg", "rb") as f:
        file_bytes = f.read()
    #This is the model ID of a publicly available General model. You may use any other public or custom model ID.
    request = service_pb2.PostModeloutputsRequest(
        model_id='e9359dbe6ee44dbc8842ebe97247b201',
...         inputs=[resources_pb2.Input(data=resources_pb2.Data(image=resources_pb2.Image(base64=file_bytes))
```

```
...         inputs=[resources_pb2.Input(data=resources_pb2.Data(image=resources_pb2.Image(base64=file_bytes))
...                                     )])
...     response = stub.PostModelOutputs(request, metadata=metadata)
...     if response.status.code != status_code_pb2.SUCCESS:
...         raise Exception("Request failed, status code: " + str(response.status.code))
...     detect=False
...     for concept in response.outputs[0].data.concepts:
...         #print('%12s: %.f' % (concept.name, concept.value))
...         if(concept.value>0.98):
...             #print(concept.name)
...             if(concept.name=="animal"):
...                 print("Alert! Alert! animal detected")
...                 playsound.playsound('alert.mp3')
...                 picname=datetime.datetime.now().strftime("%y-%m-%d-%H-%M")
...                 cv2.inwrite(picname+'.jpg',frame)
...                 multi_part_upload('Dhakshesh', picname+'.jpg', picname+'.jpg')
...                 json_document={"link":COS_ENDPOINT+'/'+'Dhakshesh'+'/'+picname+'.jpg'}
...                 new_document = my_database.create_document(json_document)
...                 if new_document.exists():
...                     print(f"Document successfully created.")
...                 time.sleep(5)
...                 detect=True
...     moist=random.randint(0,100)
...     humidity=random.randint(0,100)
...     myData={'Animal':detect,'moisture':moist,'humidity':humidity}
...     print(myData)
...     if(humidity!=None):
...         client.publishEvent(eventId="status",msgFormat="json", daya=myData, qos=0, onPublish=None)
...         print("Publish Ok..")
...     client.commandCallback = myCommandCallback
...     cv2.imshow('frame',imS)
...     if cv2.waitKey(1) & 0xFF == ord('q'):
...         break
... client.disconnect()
... cap.release()
```

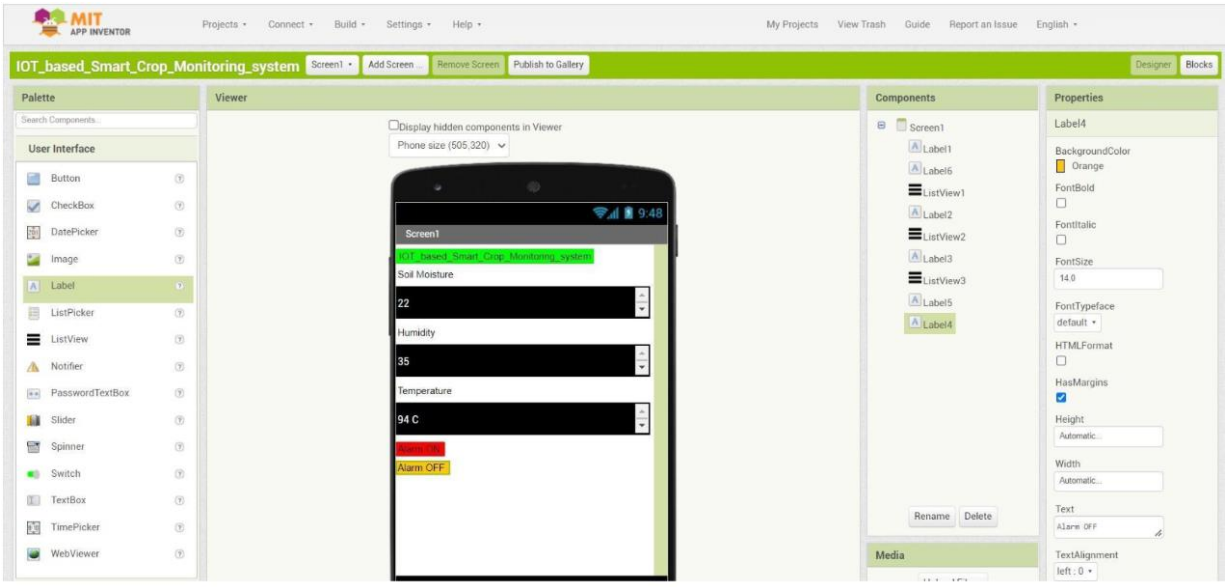

IDLE Shell 3.8.8
File Edit Shell Debug Options Window Help
Python 3.8.8 (tags/v3.8.8:024d805, Feb 19 2021, 13:18:16) [MSC v.1928 64 bit (AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
========== RESTART: C:/Users/HP/Desktop/crop/crop_protect.py ==========
2021-04-06 12:52:19,640 wiotp.sdk.device.client.DeviceClient INFO Connected successfully: d:hj5fmy:NodeMCU:12345
'sample' successfully created.
File opened
{'Animal': False, 'moisture': 17, 'humidity': 41}
Publish Ok..
{'Animal': False, 'moisture': 84, 'humidity': 16}
Publish Ok..
{'Animal': False, 'moisture': 48, 'humidity': 43}
Publish Ok..
{'Animal': False, 'moisture': 0, 'humidity': 3}
Publish Ok..
{'Animal': False, 'moisture': 73, 'humidity': 68}
Publish Ok..
{'Animal': False, 'moisture': 26, 'humidity': 26}
Publish Ok..
{'Animal': False, 'moisture': 96, 'humidity': 59}
Publish Ok..
Ln: 10 Col: 11

7.2Feature 2

MIT app inventor to design the app:



Customizing the app interface to display the values:



8 TESTING

8.2Test Cases

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 RESULTS

Thus the IOT based Smart Crop Protection has been build successfully with the help of MIT app, Node.Js, and node red. And the output has been tested and verified using MIT app.

ADVANTAGES :

- ⇨ Sensors in Agriculture invented to meet the increasing demand for food with minimum resources such water, fertilizers and seeds.
- ⇨ They are easy to operate and use and easy to maintain.
- ⇨ Sensors are cheaper in price and best in quality.
- ⇨ They can used for measuring pollution and global warming for their fields and crops.

DISADVANTAGES:

- ⇨ Farms are located in remote areas and are far from access to the internet.
- ⇨ A farmer needs to have access to crop data reliably at any time from any location, so connection issues would cause an advanced monitoring system to be useless.
- ⇨ High Cost: Equipment needed to implement IoT in agriculture is expensive.

10 CONCLUSION:

Smart farming reduces the ecological footprint of farming. Minimized or site-specific application of inputs, such as fertilizers and pesticides, in precision agriculture systems will mitigate leaching problems as well as the emission of greenhouse gases

11 FUTURE SCOPE

IoT smart agriculture products are designed to help monitor crop fields using sensors and by automating irrigation systems. As a result, farmers and associated brands can easily monitor the field conditions from anywhere without any hassle.

12 APPENDIX

- **GitHub Link**

  https://github.com/IBM-EPBL/IBM-Project-18564-1659686936

- **Source Code**

  https://github.com/IBM-EPBL/IBM-Project-18564-1659686936/blob/main/Final%20Deliverables/Final%20Code/Source%20code

Prepared by:

- SAKTHI MEENAKSHI S
- RINDHIYA S
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- SWATHI R

THANK YOU!