IBM PROJECT – PNT2022TMID26854

SMART CROP PROTECTION SYSTEM FOR AGRICULTURE

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PROJECT REPORT

1. INTRODUCTION:

Project Overview

- This challenge is primarily based on Internet of Things (iot), that can measure soil moisture, Humidity and temperature stipulations for agriculture and crop safety the use of Wastson IOT service. Iot is network that connects bodily objects or matters embedded with electronics, software program and sensors through community connectivity that collects and transfers records the usage oc loud for communication. Data is transferred through web barring human to human or human to pc interaction.

- In this task we have now not used any hardware. Instead of actual soil moisture, Humidity and Temperature facts bought from sensosrs we make use o IBM IOT simulatore which can transmit these parameters as required.

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:

Existing Problem

- Agriculture is a field which forms the basis of our economy. Yet it faces alot 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 getsdry 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 necessaryto take certain actions.
- Crops grow better in specific conditions, they may get damaged dueto bad weather.

References

[1] ArturFrankiewicz; RafałCupek.” Smart Passive Infrared Sensor - Hardware Platform “Year: 2013 IECON 2013 - 39th Annual
Conference of the IEEE Industrial Electronics Society Pages: 7543 – 7547
[2] Discant, A. Rogozan, C. Rusu and A. Bensrhair, “Sensors for Obstacle Detection” 2007 30th International Spring Seminar on
Electronics Technology (ISSE), Cluj-Napoca, 2007, pp. 100-105. doi: 10.1109/ISSE.2007.4432828 Volume:01 Pages:859-862,
DOI:10.1109/ICCSNT.2015.7490876, IEEE Conference Publications.
[3] Mustapha, Baharuddin, AladinZayegh, and Rezaul K. Begg. “Ultrasonic And Infrared Sensors Performance in A Wireless Obstacle
Detection System” Artificial Intelligence, Modelling and Simulation (AIMS), 2013 1st International Conference on. IEEE, 2013.
[4] Padmashree S. Dhake, Sumedha S. Borde, “Embedded Surveillance System Using PIR Sensor”, International Journal of Advanced
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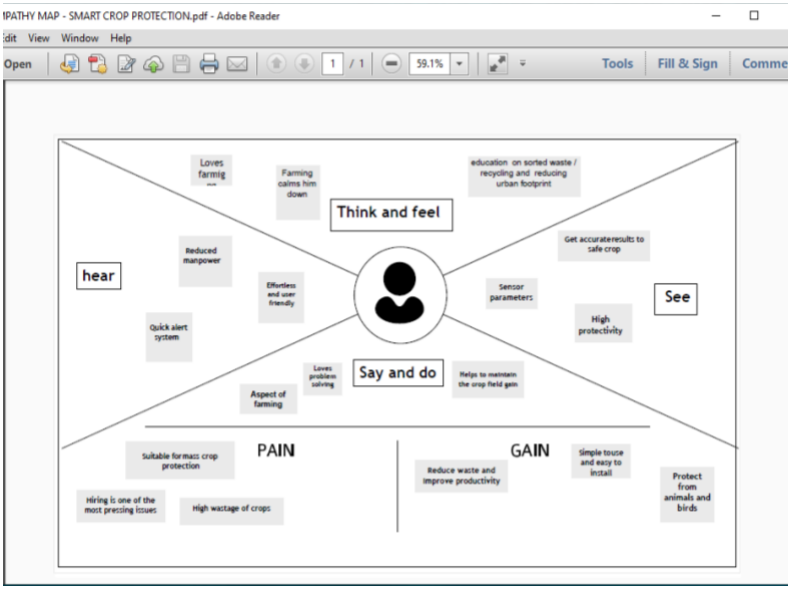
Problem Statement Definition

- Smart Crop Protection System based on IoT can monitor soil moisture andclimatic conditions to grow and yield a good crop.
- The farmer can also get the real time weather forecasting data by usingexternal 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 weatherforecasting details.
- Based on all the parameters he can water his crop by controlling themotors 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:

Empathy Map Canvas



Ideation & Brain Storming

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?

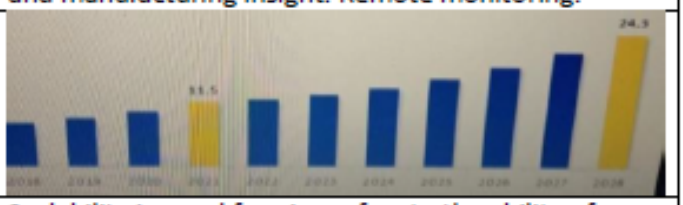
Smart farming is a management concept focused on providing the agricultural industry with the infrastructure to leverage advanced technology – including big data, the cloud and the internet of things (IoT) – for tracking, monitoring, automating and analyzing operations.

What do they say and do?

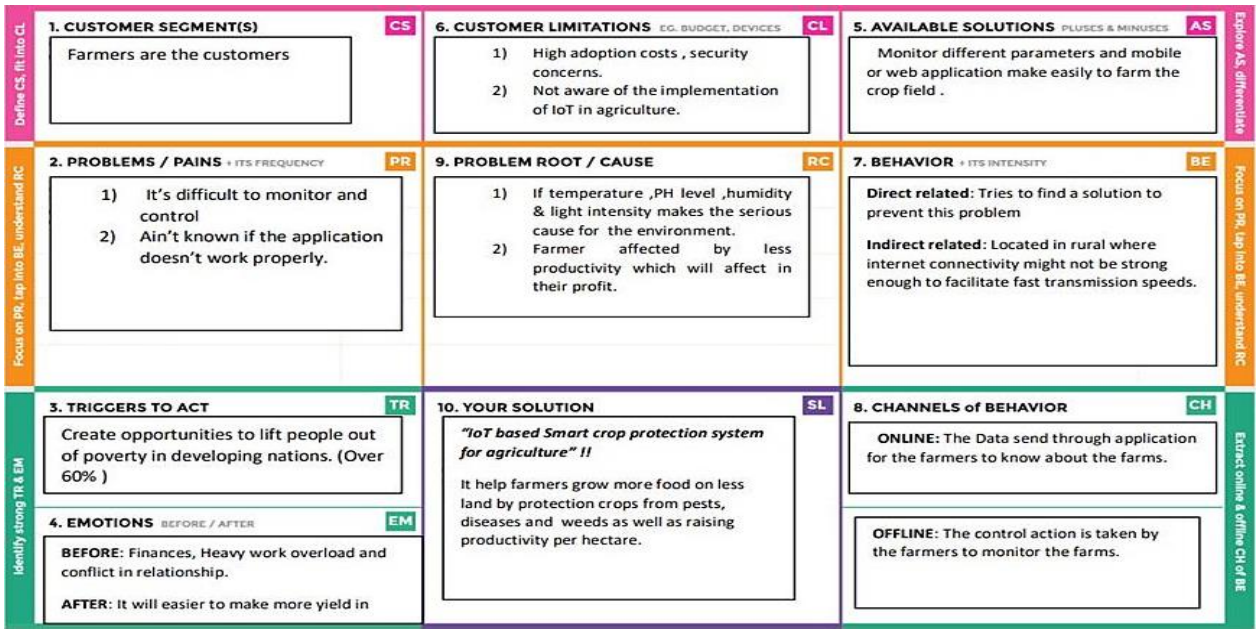
- The aim of this technology is to make the most of all the data collected by various tools, by converting them into real sources of information in order to then define ways of simplifying agricultural work. It also allows for accurate and predictive analysis
- of all situations that may affect the farms, 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 .

Proposed Solution

Proposed Solution – Smart Crop protection system

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Sometimes crops within the fields are protected against birds and different unknown disturbances by humans. This take a vast quantity of time Creating a wise automatic system can profit the farmers in many alternative ways.
2.	Idea / Solution description	Smart Farming has enabled farmers to cut back waste and enhance productivity with the assistance of sensors (light, humidity, temperature, soil moisture , etc..) . any with the help of those sensors, farmers will monitor the sector conditions from anywhere.
3.	Novelty / Uniqueness	Role of SENSORS : IOT clever agriculture merchandise are designed to assist display crop fields the use of sensors and through automating irrigation systems. As a result, farmers and related manufacturers can without problems display the sphere situations from everywhere with none hassle .
4.	Social Impact / Customer Satisfaction	Water conservation . Saves lot of time . Increased exceptional of manufacturing. Real time information and manufacturing insight. Remote monitoring.
5.	Business Model (Revenue Model)	
6.	Scalability of the Solution	Scalability in good farming refers to the ability of a system to extend the capability , the amount of technology devices admire sensors and

Problem Solution Fit



4. REQUIREMENT ANALYSIS:

Functional Requirements

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	Install the app. Signing up with Gmail or phone number Creating a profile. Understand the guidelines.
FR-2	User Confirmation	Email or phone number verification required via OTP.
FR-3	Accessing datasets	Data's are obtained by Cloudant DB.
FR-4	Interface sensor	Connect the sensor and the application When animals enter the field , the alarm is generated.
FR-5	Mobile application	It is used to control motors and field sprinklers.

Non Functional Requirements

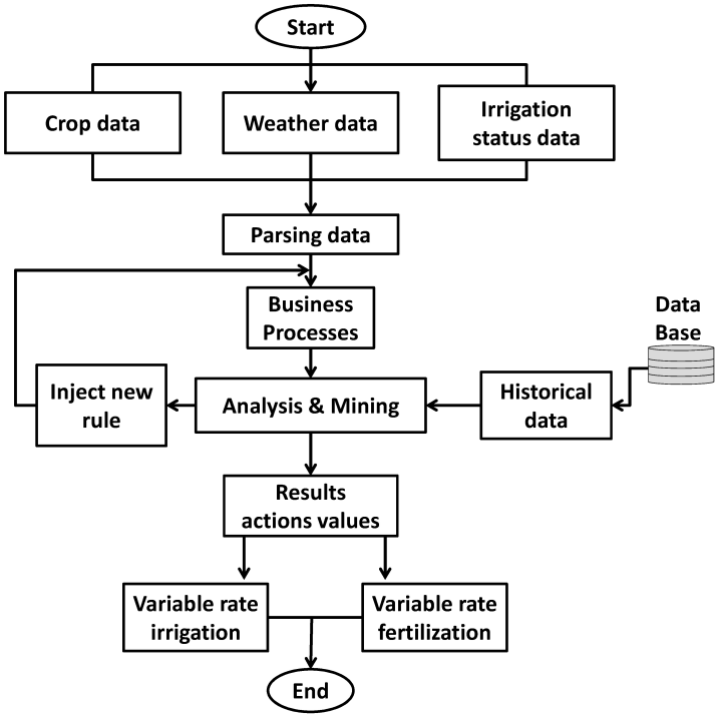
Non-functional Requirements:

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

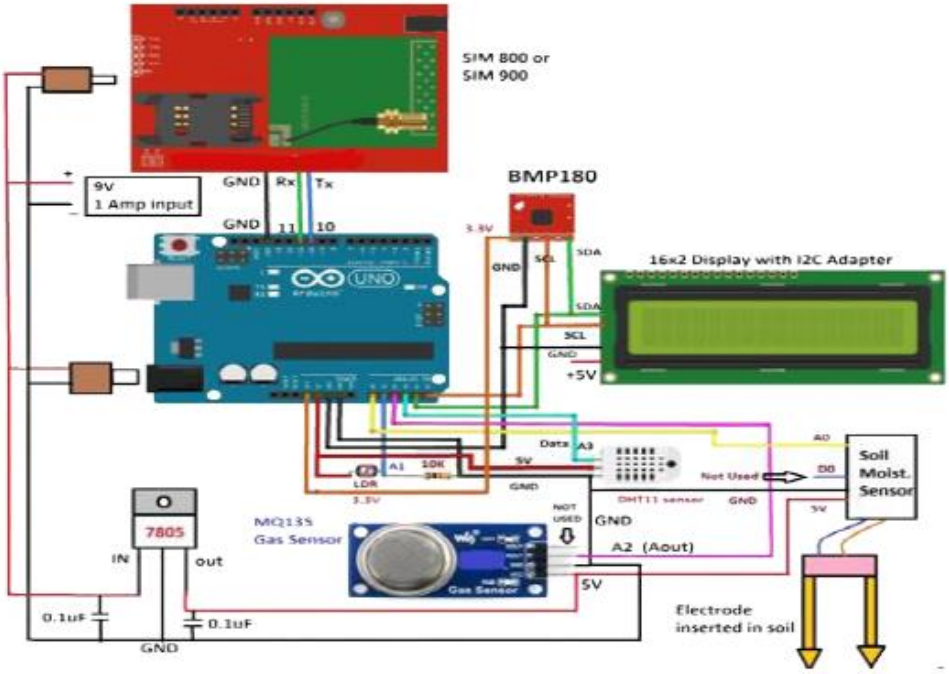
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	This project's contributes the farm safety via the clever safety system.
NFR-2	**Security**	It was created to protect the crops from animals.
NFR-3	**Reliability**	Farmers are capable of protect their lands through assist of this technology. They may even advantages from better crop yields, a good way to enhance our monetary situation.
NFR-4	**Performance**	When animals try to input the field, IOT gadgets and sensors alert the farmer through message.
NFR-5	**Availability**	We can guard the plants towards wild animals with the aid of using growing and enforcing resilient hardware and software.
NFR-6	**Scalability**	Scalability This system's integration of pc imaginative and prescient algorithms with IBM Cloudant offerings makes it greater green to retrieve photographs at scale, improving scalability

5. PROJECT DESIGN:

Data Flow Diagram



Solution & Technical Architecture



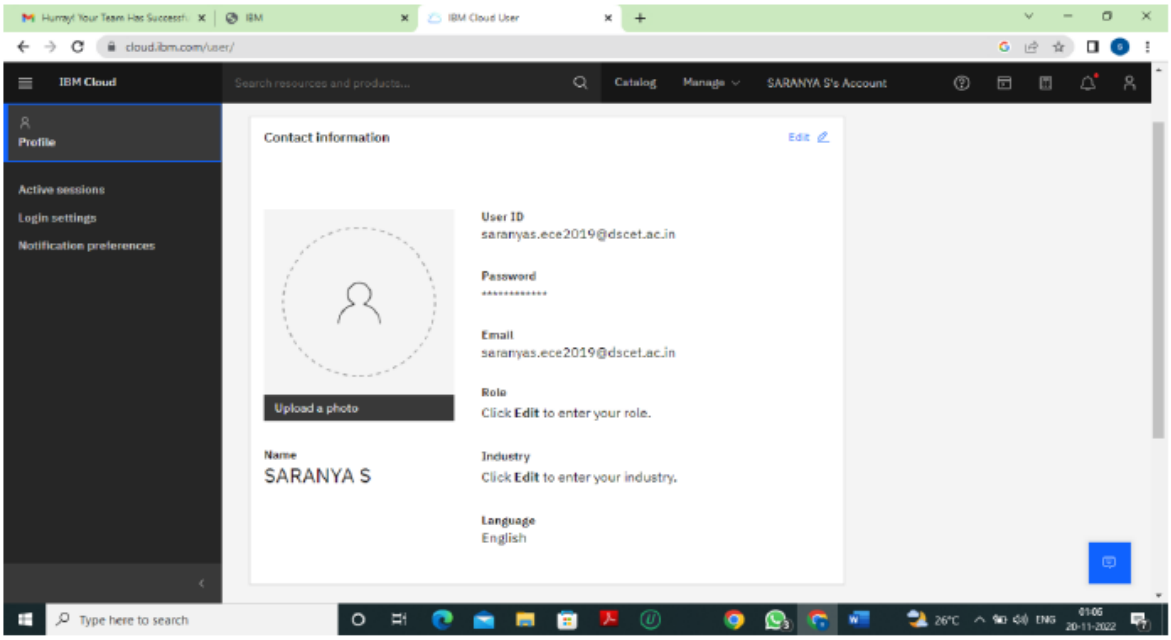
User Stories

User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer	Registration	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	Sprint-1
Customer	Registration	USN-2	As a user, I will receive confirmation message once I have registered for the application.	I can receive confirmation message & click confirm.	High	Sprint-1
Administrator	Login page	USN-3	As a user entering the username and password which is already existing.	Redirecting to user account.	Medium	Sprint-1
Weather station	Forecasting the current weather	USN-4	As a user, we can monitor the weather fundamentals like (humidity, wind speed, wind direction and rainfall).	Notified about weather conditions.	High	Sprint-1
Controlling the Motor Pump	Controlling	USN-5	It is used to control motors and field sprinklers.	Switching on and off the motor pump manually via mobile application	High	Sprint-2
Fencing	Detecting the motion in certain range	USN-6	Fencing system are helpful in providing security against unauthorized access of human and animal.	I can receive notification; prevention has been taken.	High	Sprint-3
Warehouse management	Collecting database of crops	USN-7	Here famer need to update about expire date of fertilizer and seeds.	Generate the popup message about expire date and stocks and offers	High	Sprint-4

6. PROJECT PLANNING& SCHEDULING :

6.1 Sprint Planning & Estimation



Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	IBM Cloud services	US-1	Create the IBM Cloud services which are being used in this project.	6	High	SARANYA S SANDHIYA M SHARMILA R
Sprint-1	IBM Cloud services	US-2	Configure the IBM Cloud services which are being used in completing this project.	4	Medium	SARANYA S SANDHIYA M SHARMILA R
Sprint-2	IBM Watson IoT platform	US-3	IBM Watson IoT platform acts as the mediator to connect the web application to IoT devices, so create the IBM Watson IoT platform.	5	Medium	SARANYA S SANDHIYA M SHARMILA R
Sprint-2	IBM Watson IoT platform	US-4	In order to connect the IoT device to the IBM cloud, create a device in the IBM Watson IoT platform and get the device credentials.	5	High	SARANYA S SANDHIYA M SHARMILA R
Sprint-3	IBM Watson IoT platform & Node-RED service	US-1	Configure the connection security and create API keys that are used in the Node-RED service for accessing the IBM IoT Platform.	10	High	SARANYA S SANDHIYA M SHARMILA R

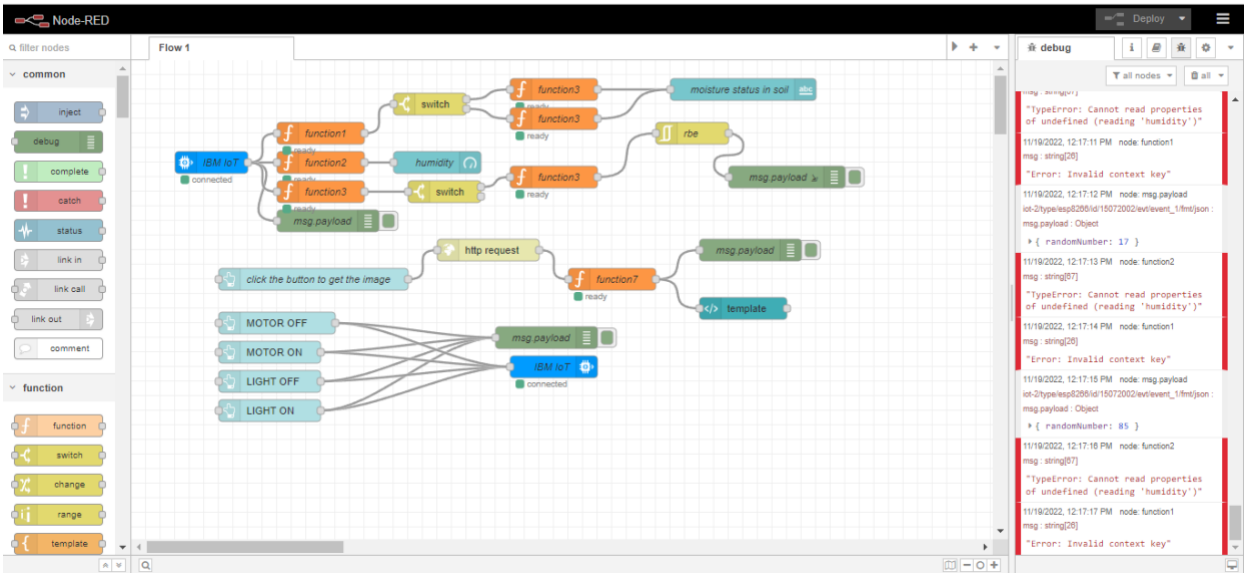
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-3	Node-RED service	US-2	Create a Node-RED service.	10	High	SARANYA S SANDHIYA M SHARMILA R

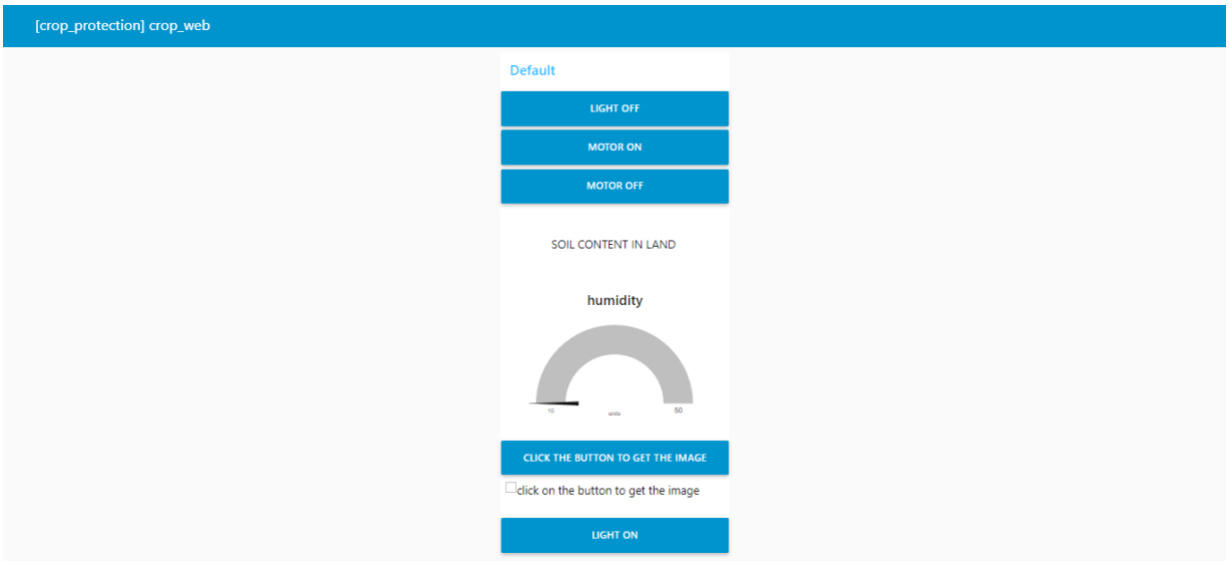
Sprint-3	IBM IoT platform	US-1	Develop a python script to publish random sensor data such as temperature, moisture, soil and humidity to the IBM IoT platform	7	High	SARANYA S SANDHIYA M SHARMILA R
Sprint-3	IBM IoT platform	US-2	After developing python code, commands are received just print the statements which represent the control of the devices.	5	Medium	SARANYA S SANDHIYA M SHARMILA R
Sprint-4	IBM Cloud Services	US-3	Publish Data to The IBM Cloud	8	High	SARANYA S SANDHIYA M SHARMILA R
Sprint-4	Webpage	US-1	Create Web UI in Node- Red	10	High	SARANYA S SANDHIYA M SHARMILA R
Sprint-4	IBM IoT platform	US-2	Configure the Node-RED flow to receive data from the IBM IoT platform and also use Cloudant DB nodes to store the received sensor data in the cloudant DB	10	High	SARANYA S SANDHIYA M SHARMILA R

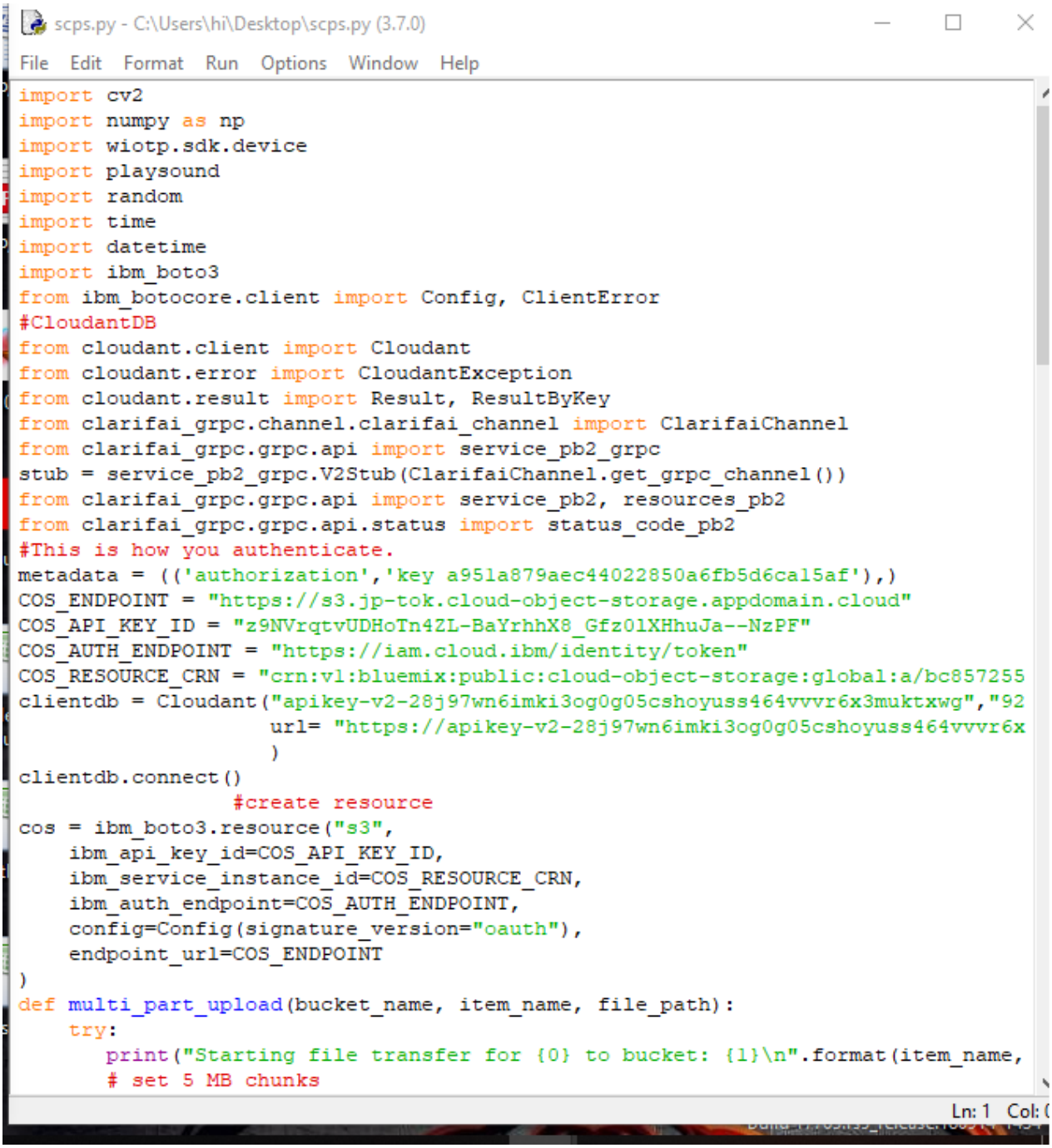
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	14 NOVEMBER 2022	19 NOVEMBER 2022	20	29 Oct 2022
Sprint-2	20	6 Days	14 NOVEMBER 2022	19 NOVEMBER 2022	20	05 Nov 2022
Sprint-3	20	6 Days	14 NOVEMBER 2022	19 NOVEMBER 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 NOVEMBER 2022	19 NOVEMBER 2022	20	19 Nov 2022

7. CODING & SOLUTIONING:

Feature 1






scps.py - C:\Users\hi\Desktop\scps.py (3.7.0)
File Edit Format Run Options Window Help
import cv2
import numpy as np
import wiotp.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, resources_pb2
from clarifai_grpc.grpc.api.status import status_code_pb2
#This is how you authenticate.
metadata = (('authorization','key a95la879aec44022850a6fb5d6cal5af'),)
COS_ENDPOINT = "https://s3.jp-tok.cloud-object-storage.appdomain.cloud"
COS_API_KEY_ID = "z9NVrqtvUDHoTn4ZL-BaYrhhX8_Gfz0lXHhuJa--NzPF"
COS_AUTH_ENDPOINT = "https://iam.cloud.ibm/identity/token"
COS_RESOURCE_CRN = "crn:vl:bluemix:public:cloud-object-storage:global:a/bc857255
clientdb = Cloudant("apikey-v2-28j97wn6imki3og0g05cshoyuss464vvvr6x3muktxwg","92
url= "https://apikey-v2-28j97wn6imki3og0g05cshoyuss464vvvr6x
)
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"),
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,
set 5 MB chunks
Ln: 1 Col:

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 & DISADVANTAGES:

Advantages

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

Disadvantages

- Smart Crop Protection requires internet connectivity continuously, butrural part scan not full fill this requirement.

1. Any faults in the sensors can cause great loss in the agriculture, due towrong records and 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 using Node Red and IBM Cloud Platform. The System has 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 the agriculture yield and take efficient care of food production as the System will always provide helping hand to farmers for getting accurate live feed of environmental temperature and soil moisture with more than 99% accurate results. Therefore, the project proposes a thought of consolidating the most recent innovation 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 reducing the usage of extravagant resources like electricity and water IoT can be implemented in most of the places.

13. APPENDIX:

GITHUB LINK: https://github.com/IBM-EPBL/IBM-Project-38035-

1660368379