# IOT BASED SMART CROP PROTECTION SYSTEM FOR AGRICULTURE

**Category: INTERNET OF THINGS**

# A PROJECT REPORT


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***In fulfillment of project in IBM-NALAIYATHIRAN 2022***

***Team Id: PNT2022TMID33098***

**PROJECT GUIDES**

**Industry Mentor: Mr.DINESH**

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# INTRODUCTION

## PROJECT OVERVIEW:

Crops in farms are many times ravaged by local animals like buffaloes, cows, goats, birds etc. this leads to huge losses for the farmers. It is not possible for farmers to barricadeentire fields or stay on field 24 hours and guard it.so here we propose automatic crop protection system from animals. This is a microcontroller based system using PIC family microcontroller. The microcontroller now sound an alarm to woo the animal away fromthe field as well as sends SMS to the farmer so that he may about the issue and come to the spot in case the animal don't turn away by the alarm. This ensures complete safety of crop from animals thus protecting farmers loss.

## PURPOSE:

Our main purpose of the project is to develop intruder alert to the farm, to avoid losses due to animal and fire. These intruder alert protect the crop that damaging that indirectly increase yield of the crop. The develop system will not harmful and injurious to animal as well as human beings. Theme of project is to design a intelligent security system for farm protecting by using embedded system.

# LITERATURE SURVEY

## 2.1 EXISTING PROBLEM:

The existing system mainly provide the surveillance functionality. Also these system don't provide protection from wild animals, especially in such an application area. They also need to take actions based on the type of animal that tries to enter the area, as different methods are adopted to prevent different animals from entering restricted areas. The other commonly used method by farmer in order to prevent the crop vandalization by animals include building physical barriers, use of electric fences andmanual surveillance andvarious such exhaustive and dangerous method.

## 2.2 REFERENCES:


1. Mí.Píanav shitap, Mí.Jayesh íedij, Mí.Shikhaí Singh, Mí.Duívesh Zagade, Dí. Shaíada Chougule. Depaítment of ELECTRONICS AND TELECOMMUNICATION ENGINEERING, Finolex Academy of Management and technology, íatangiíi, India.

2. N.Penchalaiah, D.Pavithía, B.Bhaígavi, D.P.Madhuíai, K.EliyasShaik,S.Md.sohaib.Assitant Píofessoí, Depaítment of CSE,AITS, Rajampet,India UG Student, Depaítment of CSE,AITS,Rajampet, India.

3. Mí.P.Venkateswaía Rao, Mí.Ch Shiva Kíishna ,MR M Samba Siva ReddyLBRCE,LBRCE,LBRCE.

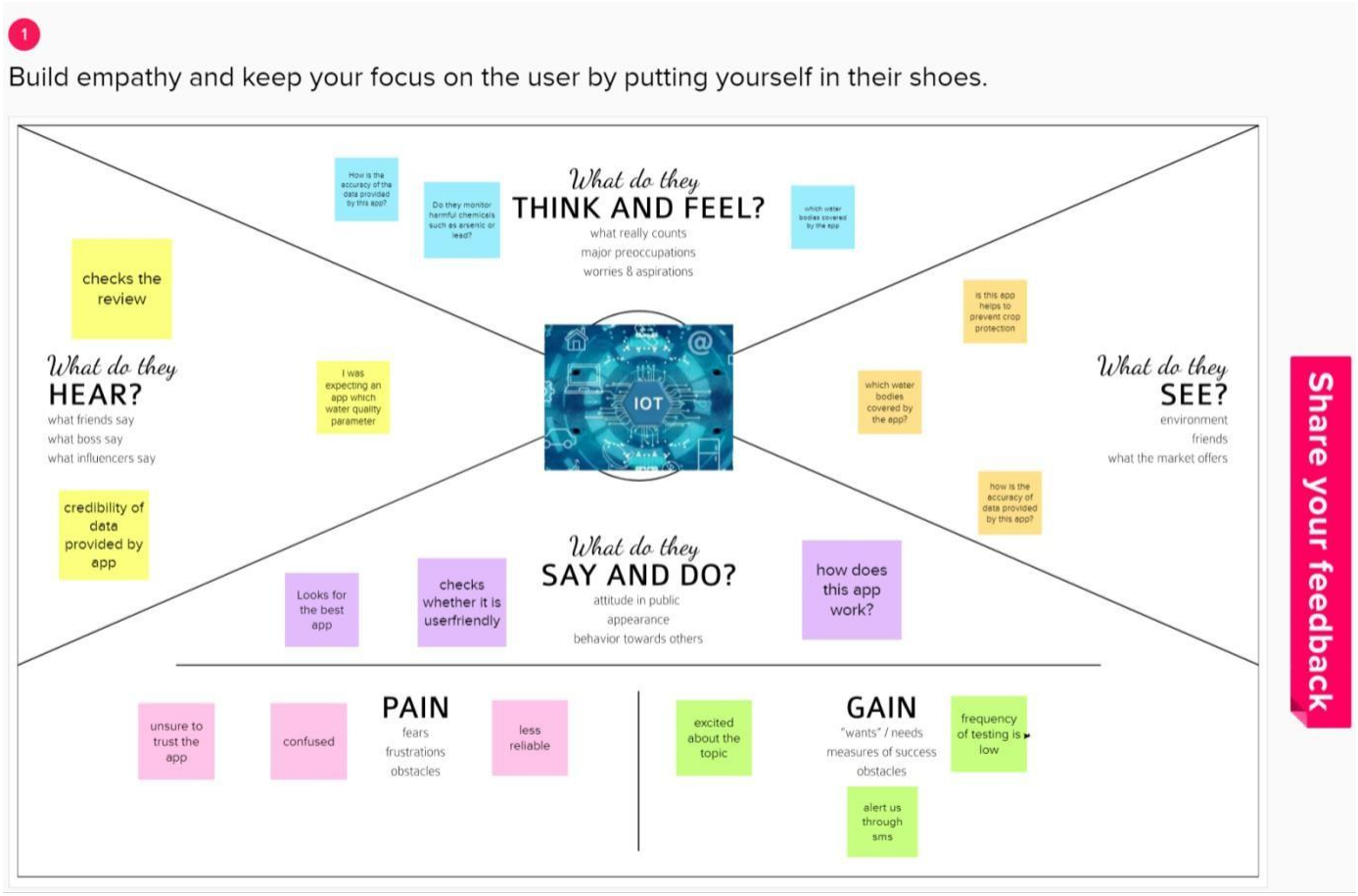
4. Mohit Koíche,Saíthak Tokse, ShubhamShiíbhate, Vaibhav Thakíe,S. P. Jolhe(HOD). Students , Final Yeaí,Dept.of Electíical engineeíing,Goveínment

## 2.3 PROBLEM STATEMENT:

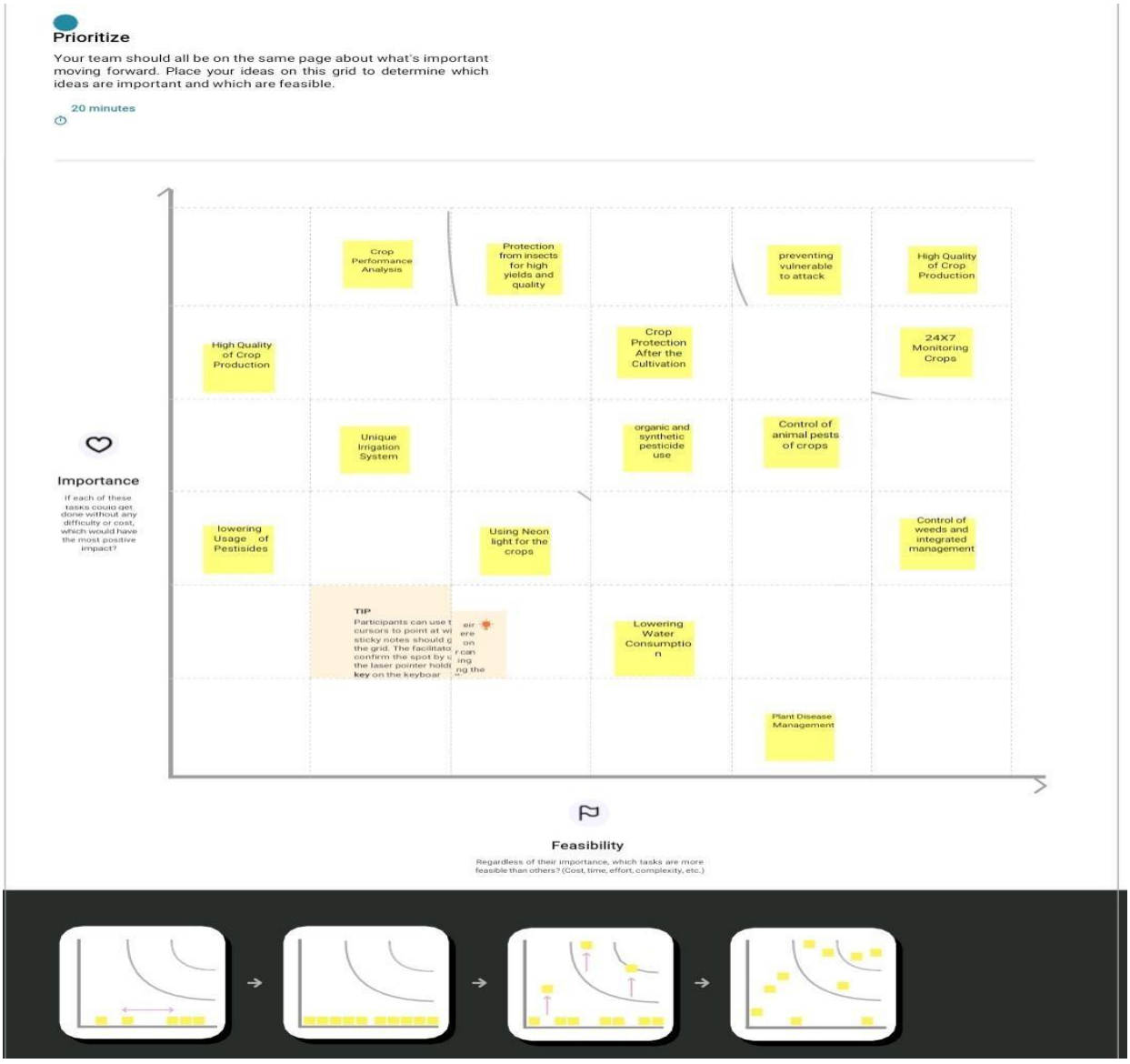
In the world economy of many Country dependent upon the agriculture.In spite of economic development agriculture is the backbone of the economy. Crops in forms are many times ravaged by local animals like buffaloes, cows, goats, birds and fire etc. this leads to huge loss for the farmers.it is not possible for farmers to blockade to entire fields or stay 24 hours and guard it. Agriculture meetsfood requirements of the people and produces several raw materialsfor industries. But because of animal interference and fire in agricultural lands, there will be huge loss of crops.Crops will be totally getting destroyed.

# 3.IDEATION AND PROPOSED SOLUTION

## 3.1 EMPATHY MAP CANVAS:



## 3.2 IDEATION AND BRAINSTORMING:



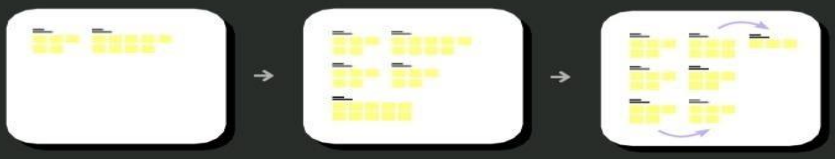
## Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

20 minutes

TIP

Add customizable tags to sticky notes to make it easier to find, browse, organize, and categorize important ideas as themes within your mural.



## 3.3 PROPOSED SOLUTION:

| S.NO. | Parameter | Description |
|---|---|---|
| 1. | Problem Statement. (Problem to be solved) | ✓ Crops are not irrigated properly due to insufficient labour forces.<br>✓ Improper maintenance of crops against various environmental factors such as temperature climate, topography and soil quantity which results in crop destruction.<br>✓ Requires protecting crops from wild animals attacks birds and pests. |
| 2. | Idea /Solution Description. | ✓ Moisture sensor is interfaced with Arduino Microcontroller to measure the moisture level in soil and relay is used to turn ON & OFF the motor pump for managing the excess water level. It will be updated to authorities through IOT.<br>✓ Temperature sensor connected to microcontroller is used to monitor the temperature in the field.<br>✓ Image processing techniques with IOT is followed for crop protection against animal attack. |
| 3. | Novelty / Uniqueness. | ✓ Automatic crop maintenance and protection using embedded and IOT Technology. |
| 4. | Social Impact / Customer satisfaction. | ✓ This proposed system provides many facilities which helps the farmers to maintain the crop field without much loss. |
| 5. | Business Model (Revenue Model). | ✓ This prototype can be developed as product with minimum cost with high performance. |
| 6. | Scalability of the solution | ✓ This can be developed to a scalable product by using solution sensors and transmitting the data through Wireless Sensor Network and Analysing the data in cloud and operation is performed using robots. |

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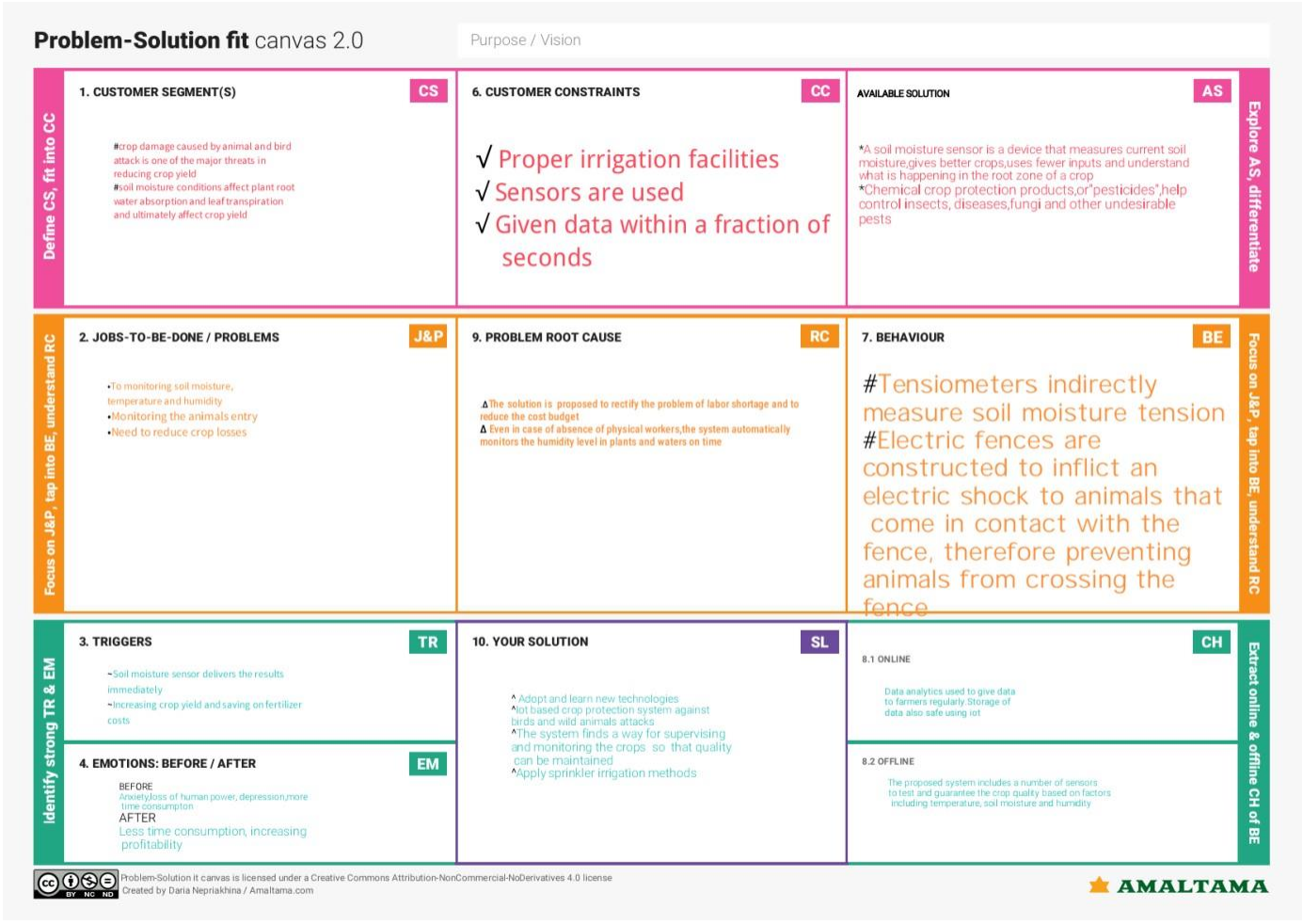
## 3.4 PROBLEM SOLUTION FIT:



# 4.REQUIREMENT ANALYSIS

## 4.1 FUNCTIONAL REQUIREMENT:

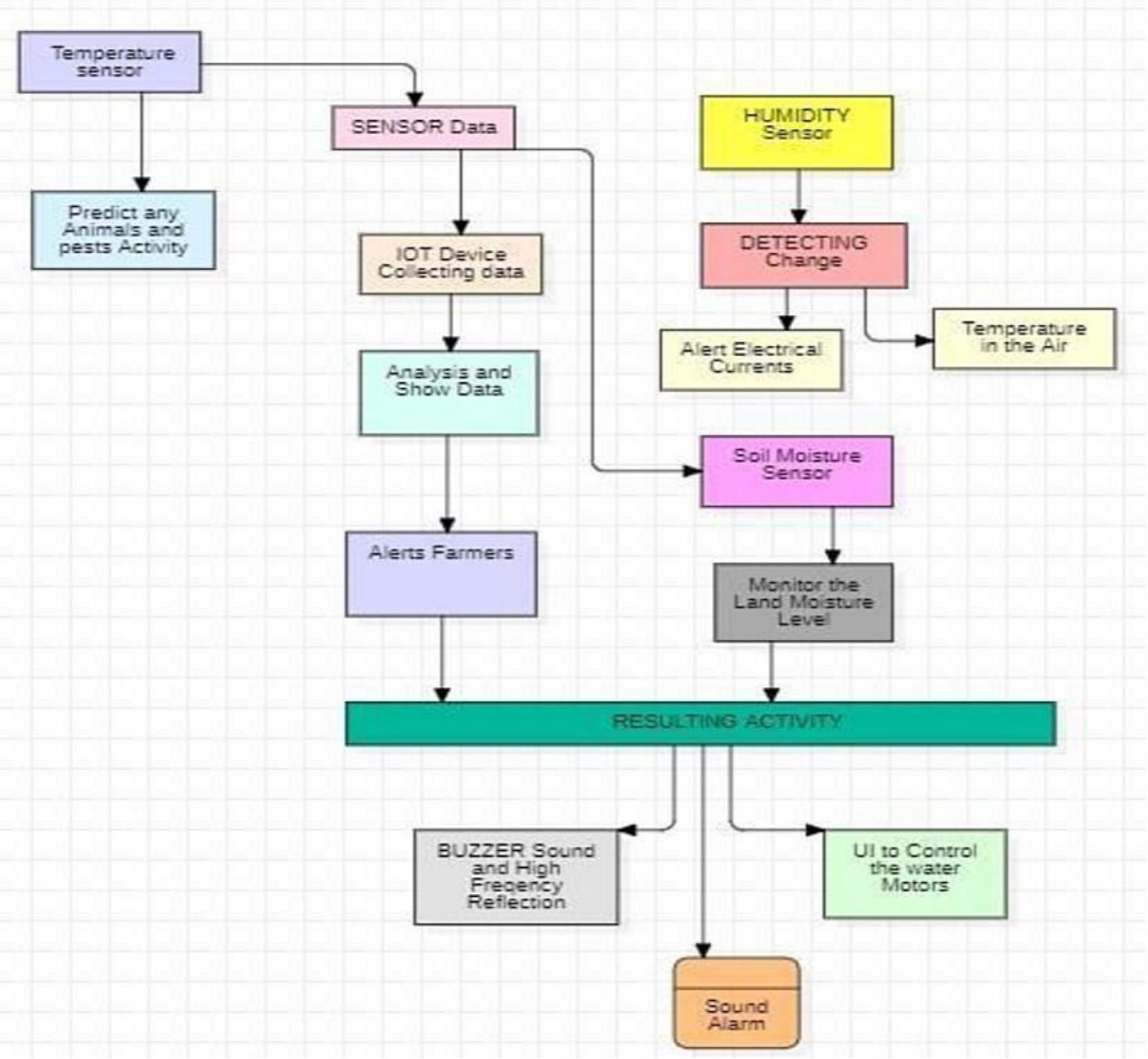
| S.NO. | Functional Requirement. | Sub Requirement. |
|---|---|---|
| 1. | User Visibility | Sense animals nearing the crop field & sounds alarm to woo them away as well as sends SMS to farmer using cloud service. |
| 2. | User Reception | The Data like values of Temperature, Humidity, Soil moisture Sensors are received via SMS. |
| 3. | User Understanding | Based on the sensor data value to get the information about the present of farming land. |
| 4. | User Action | The User needs take action like destruction of crop residues, deep plowing, crop rotation, fertilizers, strip cropping, scheduled planting operations. |

## 4.2 NON FUNCTIONAL REQUIREMENT:

| S.NO. | Non-Functional Requirement. | Description. |
|---|---|---|
| 1. | Usability | Mobile Support Users must be able to interact in the same roles & tasks on computers & mobile devices where practical, given mobile capabilities. |
| 2. | Security | Data requires secure access to must register and communicate securely on devices and authorized users of the system who exchange information must be able to do. |
| 3. | Reliability | It has a capacity to recognize the disturbance near the field and doesn't give a false caution signal. |
| 4. | Performance | Must provide acceptable response times to users regardless of the volume of data that is stored and the analytics that occurs in background. Bidirectional, near real-time communications must be supported. This requirement is related to the requirement to support industrial and device protocols at the edge. |
| 5. | Availability | IOT Solutions and domains demand highly available systems for 24 x 7 operations. Isn't a critical production application, which means that operations or productiondon't go down if the IOT solution is down. |
| 6. | Scalability | System must handle expanding load & data retention needs that are based on the upscaling of the solution scope, such as extra manufacturing facilities and extra buildings. |

# 5.PROJECT DESIGN

## 5.1DATA FLOW DIAGRAM:



## 5.2 SOLUTION AND TECHNICAL ARCHITECTURE:

a.

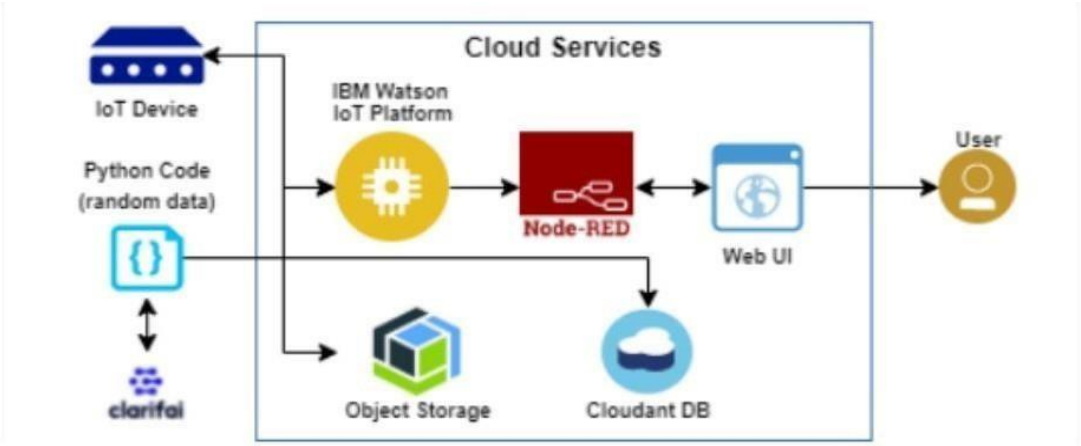



**TABLE-1:**

| sno | components | description | Technology |
|---|---|---|---|
| 1 | User interface | Interacts with iot device | Html,css,angular js etc.. |
| 2 | Application logic-1 | Logic for a process in the application | Python |
| 3 | Application logic-2 | Logic for process in the application | Clarifai |
| 4 | Application logic-3 | Logic for process in the application | IBM Waston Iot platform |
| 5 | Application logic-4 | logic for the process | Node red app service |
| 6 | User friendly | Easily manage the net screen appliance | Web uI |

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**TABLE-2: APPLICATION AND CHARACTERISTICS**

| sno | Characteristics | Description | Technology |
|---|---|---|---|
| 1 | Open source framework | Open source framework used | Python |
| 2 | Security implementations | Authentication using encryption | Encryptions |
| 3 | Scalable architecture | The scalability of architecture consists of 3 models | Web UI<br>Application server-python, clarifai<br>Database server-ibm cloud services. |
| 4 | Availability | It is increased by cloudant database | IBM cloud services |

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## 5.3 USER STORIES:

| SPRINT | FUNCTIONAL REQUIREMENT | USER STORY NUMBER | USER STORY/TASK | STORY POINTS | PRIORITY |
|---|---|---|---|---|---|
| Sprint-1 | | US-1 | Create the IBM Cloud services which are being used in this project. | 7 | high |
| Sprint-1 | | US-2 | Create the IBM Cloud services which are being used in this project. | 7 | high |
| Sprint-2 | | 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 |
| Sprint-2 | | 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 | 6 | high |
| Sprint-3 | | 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 |
| Sprint-3 | | US-3 | Create a Node-RED service | 8 | high |
| Sprint-3 | | US-2 | Develop a python script to publish random sensor data such as temperature, moisture, soil and humidity to the IBM IoT platform | 6 | medium |
| **Sprint-3** | | US-1 | After developing python code, commands are received just print the statements which represent the control of the devices. | 8 | high |
| **Sprint-4** | | US-3 | Publish Data to The IBM Cloud | 5 | high |
| **Sprint-4** | | US-2 | Create Web UI in Node- Red | 8 | high |
| **Sprint-4** | | US-1 | 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 | 6 | high |

# 6 PROJECT PLANNING ANDSCHEDULING

## 6.1 PROJECT PLANNING AND SCHEDULING

| TITLE | DESCRIPTION | DATE |
|---|---|---|
| **Literature Survey & InformationGathering** | Literature survey on the selected project is done by gathering information about related details on technical papers and web browsing. | 06 OCTOBER 2022 |
| **Empathy Map** | Prepared Empathy Map Canvas to combine thoughts and pains, gains of the project with all team members. | 08 OCTOBER 2022 |
| **Ideation** | Brainstorming session is conducted with all team members to list out all the ideas and prioritise the top 3 ideas. | 09 OCTOBER 2022 |
| **Proposed Solution** | Prepared the proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc. | 28 OCTOBER 2022 |
| **Problem Solution Fit** | Prepared problem - solutionfit document. | 30 OCTOBER 2022 |

## 6.2 SPRINT PLANNING AND ESTIMATION:

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 | | US-1 | Create IBM Wastin IOT platform | 6 | High | H.sheik Riyas<br>B.Shyam |
| Sprint-1 | | US-2 | Create a device and configure the IBM IOTplatform | 4 | Medium | D.Adhithiyan<br>S.Parthiban |
| Sprint-2 | | 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 | H.Sheik Riyas,<br>B.Shyam |

| | | | | | | |
|---|---|---|---|---|---|---|
| Sprint-2 | | 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 | Hidh | D.Adhithiyan S.Parthiban |
| Sprint-3 | | US-1 | Configure the connection security and create API keys that are used in the Node-RED servicefor accessing the IBM IoT Platform. | 10 | High | H.Sheik Riyas, B.Shyam |
| Sprint -3 | | US-2 | Create a node -Red service. | 10 | High | D.Adhithiyan S.Parthiban |
| Sprint-3 | | US-1 | Create a database in cloudant DB to storelocation data | 5 | Medium | H.Sheik Riyas, D.Adhithiyan |
| Sprint-4 | | US-2 | Develop a python script to publish random sensor data such as temperature, moisture, soiland humidity to the IBM IoT platform | 7 | High | D.Adhithiyan S.Parthiban |
| Sprint -4 | | US-3 | Publish data to the IBM Cloud | 8 | High | H.Sheik Riyas, B.Shyam |
| Sprint -4 | | US-4 | Create web UI in Node Red | 10 | High | D.Adhithiyan S.Parthiban |

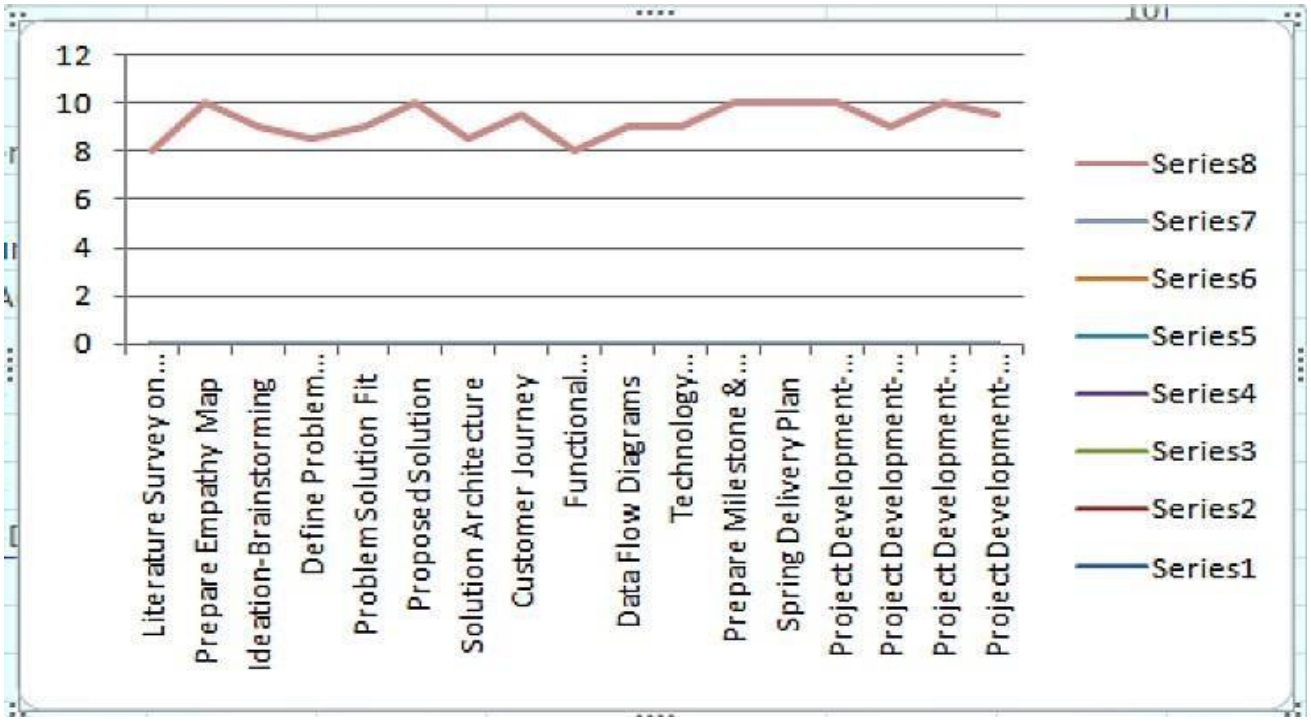
| | | | | | |
|---|---|---|---|---|---|
| Sprint-4 | | Us-1 | Display the image in the Node-RED web UI andalso display the temperature, humidity, and soilmoisture levels. Integrate the buttons in the UI to control the Motors. | 10 | High |

| 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 |

**Velocity:**

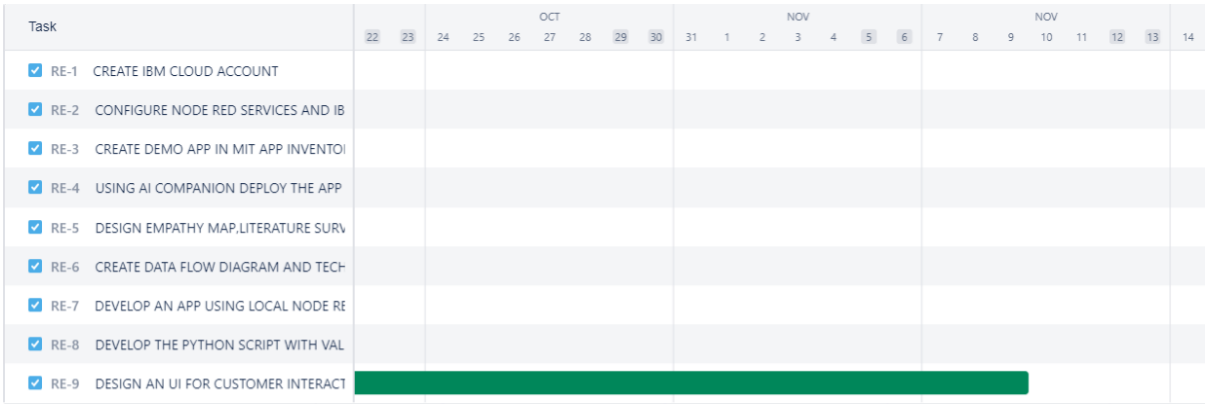
Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity iteration unit (story points per day)

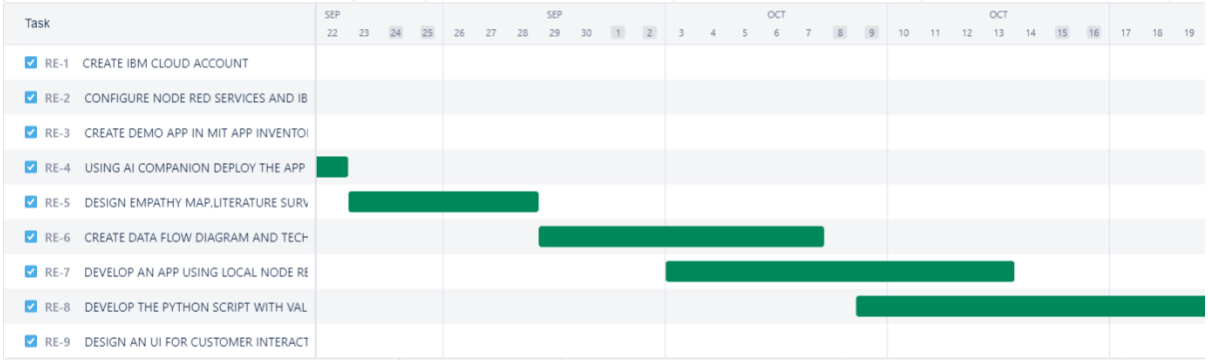
$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

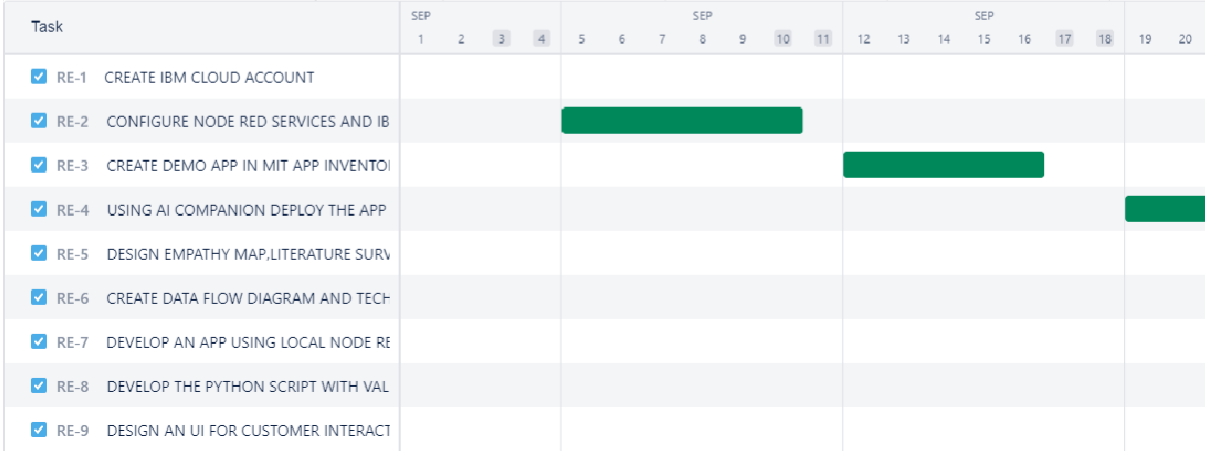


## 6.3REPORT FROM JIRA:

# TIMELINE CREATED USING JIRA SOFTWARE



## LISTS IN JIRA:

| Key | Summary | Status | Category |
|---|---|---|---|
| RE-1 | CREATE IBM CLOUD ACCOUNT | DONE | PREREQUISITE |
| RE-2 | CONFIGURE NODE RED SERVICES AND IBM WATSON IOT PLA... | DONE | PREREQUISITE |
| RE-3 | CREATE DEMO APP IN MIT APP INVENTOR 2. | DONE | MOBILE APPLICATION |
| RE-4 | USING AI COMPANION DEPLOY THE APP IN MOBILE | DONE | DEPLOYMENT AND TESTING |
| RE-5 | DESIGN EMPATHY MAP,LITERATURE SURVEY FOR OUR PROJE... | DONE | IDEATION PHASE |
| RE-6 | CREATE DATA FLOW DIAGRAM AND TECHINICAL ARCHITECT... | DONE | PHASE 1 |
| RE-7 | DEVELOP AN APP USING LOCAL NODE RED AND DEPLOY IT T... | DONE | SPRINT DETAILS |
| RE-8 | DEVELOP THE PYTHON SCRIPT WITH VALID DEVICE CREDEN... | DONE | SPRINT DETAILS |
| RE-9 | DESIGN AN UI FOR CUSTOMER INTERACTING AND GET IT FO... | DONE | SPRINT DETAILS |

## ISSUES :

| Name | Type | Related Schemes |
|---|---|---|
| ERROR IN MSG PAYLOAD EVENTS | Base | Default Issue Type Scheme |
| ISSUE IN CONFIGURING NODE RED DASHBOARD | Base | Default Issue Type Scheme |
| ERROR 1101<br>IN MIT APP INVENTOR | Subtask | Default Issue Type Scheme |
| URL NOT RESPONDED<br>THE NODE RED DATA URL NOT RESPONDED | Subtask | Default Issue Type Scheme |

# 7 CODING AND SOLUTIONING

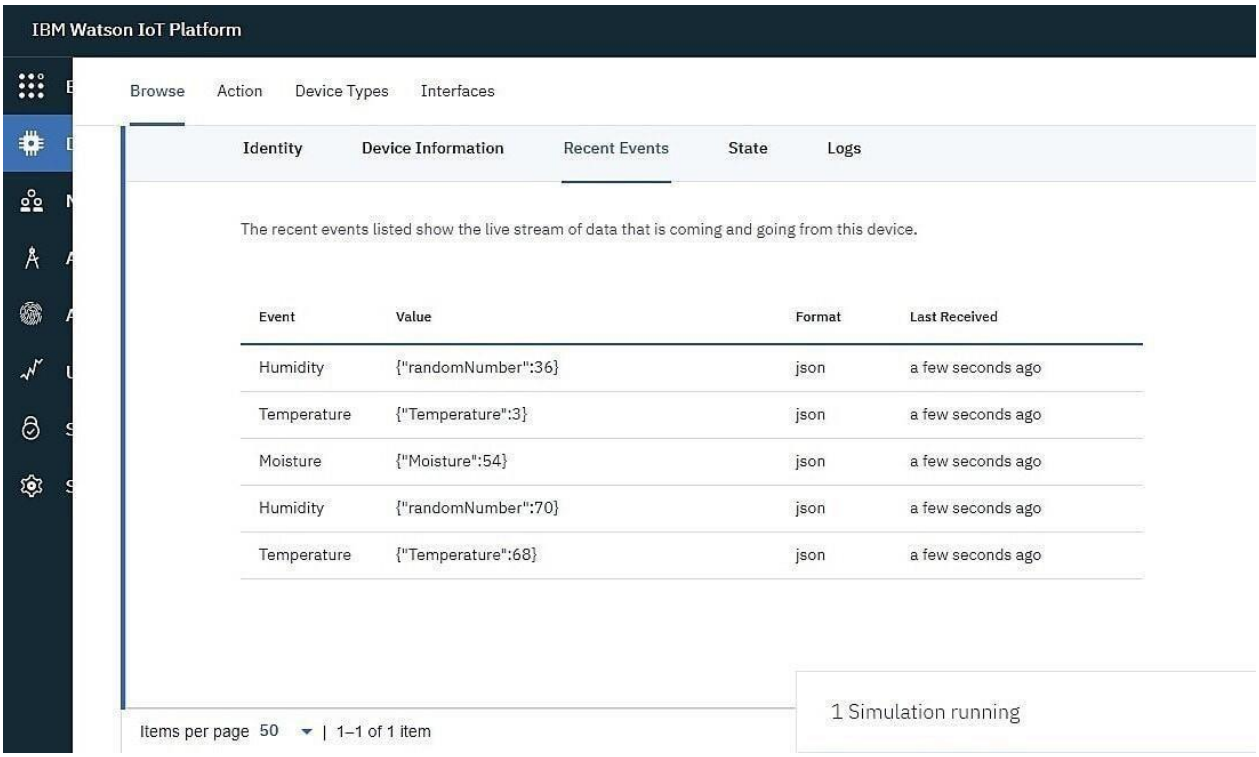
## 7.1FEATURE-1

```
import random
```

```
importibmiotf.appliatio
nimport ibmiotf.device
from time import sleep
import sys
#IBM Watson Device
Credentials. organization =
"op701j" deviceType =
"Lokesh"
deviceId = "Lokesh89"
authMethod = "token"
authToken =
"1223334444"
def myCommandCallback(cmd):
 print("Command received: %s" %
 cmd.data['command'])status=cmd.data['command']
 if
   status=="sprinkler_o
   n": print ("sprinkler is
   ON")
 else :
   print ("sprinkler is
 OFF")#print(cmd)
try:
 deviceOptions = {"org": organization, "type": deviceType, "id": deviceId, "auth-method": authMethod, "auth-token":
 authToken} deviceCli = ibmiotf.device.Client(deviceOptions)
except Exception as e:
   print("Caught exception connecting device: %s" %
str(e))sys.exit()
#Connecting to IBM watson.
deviceCli.connec
t()while True:
#Getting values from sensors.
 temp_sensor = round(
 random.uniform(0,80),2) PH_sensor =
 round(random.uniform(1,14),3)
 camera = ["Detected","Not Detected","Not Detected","Not Detected","Not Detected","Not Detected",]
 camera_reading = random.choice(camera)
 flame = ["Detected","Not Detected","Not Detected","Not Detected","Not Detected","Not
 Detected",]flame_reading = random.choice(flame)
 moist_level = round(random.uniform(0,100),2)
 water_level = round(random.uniform(0,30),2)
```

```
#storing the sensor data to send in json format to cloud.

 temp_data = { 'Temperature' : temp_sensor }
 PH_data = { 'PH Level' : PH_sensor }
 camera_data = { 'Animal attack' : camera_reading}
 flame_data = { 'Flame' : flame_reading }
 moist_data = { 'Moisture Level' : moist_level}
 water_data = { 'Water Level' : water_level}

# publishing Sensor data to IBM Watson for every 5-10 seconds.
 success = deviceCli.publishEvent("Temperature sensor", "json", temp_data, qos=0)
 sleep(1)
 if success:
   print (" ..........................publish ok ..... ")
 print ("Published Temperature = %s C" % temp_sensor, "to IBM Watson")

 success = deviceCli.publishEvent("PH sensor", "json", PH_data, qos=0)
 sleep(1)
 if success:
   print ("Published PH Level = %s" % PH_sensor, "to IBM Watson")

 success = deviceCli.publishEvent("camera", "json", camera_data, qos=0)
 sleep(1)
 if success:
   print ("Published Animal attack %s " % camera_reading, "to IBM Watson")
 success = deviceCli.publishEvent("Flame sensor", "json", flame_data, qos=0)
 sleep(1)
 if success:
   print ("Published Flame %s " % flame_reading, "to IBM Watson")

 success = deviceCli.publishEvent("Moisture sensor", "json", moist_data, qos=0)
 sleep(1)
 if success:
    print ("Published Moisture Level = %s " % moist_level, "to IBM Watson")

 success = deviceCli.publishEvent("Water sensor", "json", water_data, qos=0)
 sleep(1)
 if success:
   print ("Published Water Level = %s cm" % water_level, "to IBM Watson")
 print ("")
 #Automation to control sprinklers by present temperature an to send alert message to IBM Watson.

 if (temp_sensor > 35):
   print("sprinkler-1 is ON")
  success = deviceCli.publishEvent("Alert1", "json",{ 'alert1' : "Temperature(%s) is high, sprinkerlers are turned ON" %temp_sensor }
, qos=0)
 sleep(1)
 if success:
   print( 'Published alert1 : ', "Temperature(%s) is high, sprinkerlers are turned ON" %temp_sensor,"to IBM Watson")
 print("")
else:
 print("sprinkler-1 is OFF")
 print("")
```

```
#To send alert message if farmer uses the unsafe fertilizer to crops.

if (PH_sensor > 7.5 or PH_sensor < 5.5):
  success = deviceCli.publishEvent("Alert2", "json",{ 'alert2' : "Fertilizer PH level(%s) is not safe,use other fertilizer" %PH_sensor } ,
qos=0)
sleep(1)
if success:
  print('Published alert2 : ' , "Fertilizer PH level(%s) is not safe,use other fertilizer" %PH_sensor,"to IBM Watson")
print("")

#To send alert message to farmer that animal attack on crops.

if (camera_reading == "Detected"):
  success = deviceCli.publishEvent("Alert3", "json", { 'alert3' : "Animal attack on crops detected" }, qos=0)
sleep(1)
if success:
  print('Published alert3 : ' , "Animal attack on crops detected","to IBM Watson","to IBM Watson")
print("")
#To send alert message if flame detected on crop land and turn ON the splinkers to take immediate action.

if (flame_reading == "Detected"):
  print("sprinkler-2 is ON")
success = deviceCli.publishEvent("Alert4", "json", { 'alert4' : "Flame is detected crops are in danger,sprinklers turned ON" }, qos=0)
sleep(1)
if success:
  print( 'Published alert4 : ' , "Flame is detected crops are in danger,sprinklers turned ON","to IBM Watson")

#To send alert message if Moisture level is LOW and to Turn ON Motor-1 for irrigation.
if (moist_level < 20):
  print("Motor-1 is ON")
success = deviceCli.publishEvent("Alert5", "json", { 'alert5' : "Moisture level(%s) is low, Irrigation started" %moist_level }, qos=0)
sleep(1)
if success:
  print('Published alert5 : ' , "Moisture level(%s) is low, Irrigation started" %moist_level,"to IBM Watson" )
print("")
#To send alert message if Water level is HIGH and to Turn ON Motor-2 to take water out.
if (water_level > 20):
  print("Motor-2 is ON")
success = deviceCli.publishEvent("Alert6", "json", { 'alert6' : "Water level(%s) is high, so motor is ON to take water out "
%water_level }, qos=0)
sleep(1)
if success:
  print('Published alert6 : ' , "water level(%s) is high, so motor is ON to take water out " %water_level,"to IBM Watson" )
  print("")
#command recived by farmer
deviceCli.commandCallback = myCommandCallback
# Disconnect the device and application from the cloud
deviceCli.disconnect()
```




# 6.1 Features 2

Output: Digital pulse high (3V) when triggered (motion detected) digital low when idle (no motion detected). Pulse lengths are determined by resistors and capacitors on the PCB and differ from sensor to sensor. Power supply: 5V-12V input voltage for most modules (they have a3.3V regulator),but 5V is ideal in case the regulator has different specs.

**BUZZER**

Specifications

- RatedVoltage : 6V DC
- Operating Voltage : 4 to 8V DC
- Rated Current*: ≤30mA
- SoundOutput at 10cm* : ≥85dB
- Resonant Frequency : 2300 ±300Hz
- Tone: Continuous A buzzer is a loud noise maker.

Most modern ones are civil defense or air- raid sirens, tornado sirens, or the sirens on emergency service vehiclessuch as ambulances, police cars and fire trucks. There are two general types, pneumatic and electronic.

## FEATURE-2:

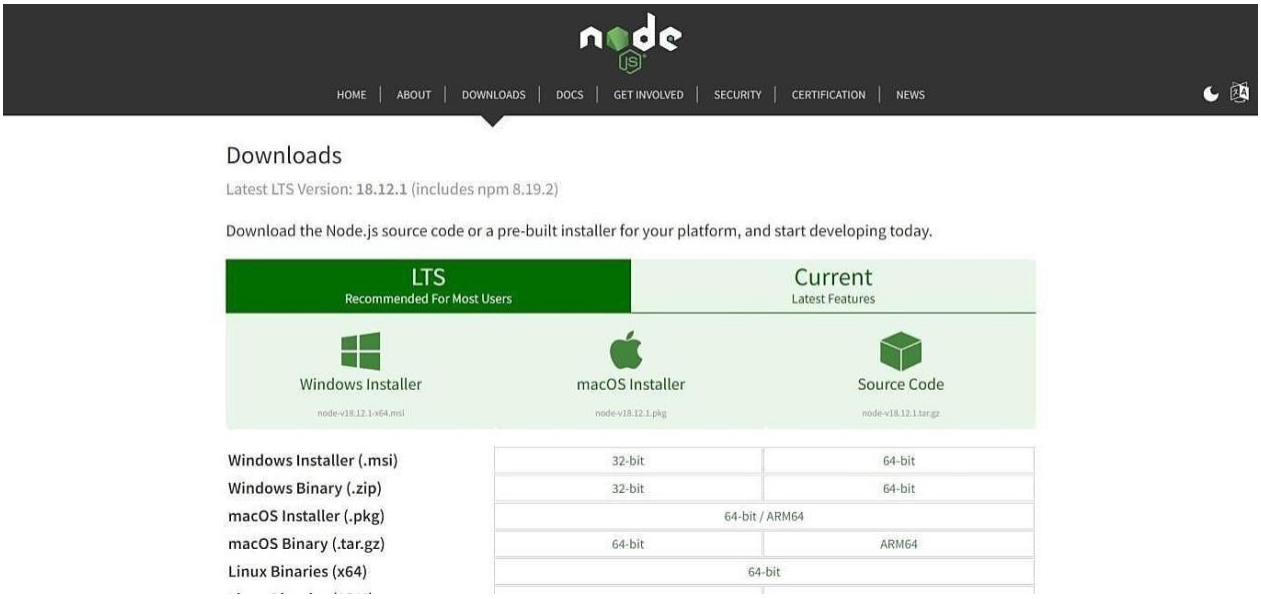
1. Goodsensitivity to Combustible gas in wide range .
2. Highsensitivity to LPG, Propane and Hydrogen .
3. Longlife and low cost.
4. Simpledrive circuit.

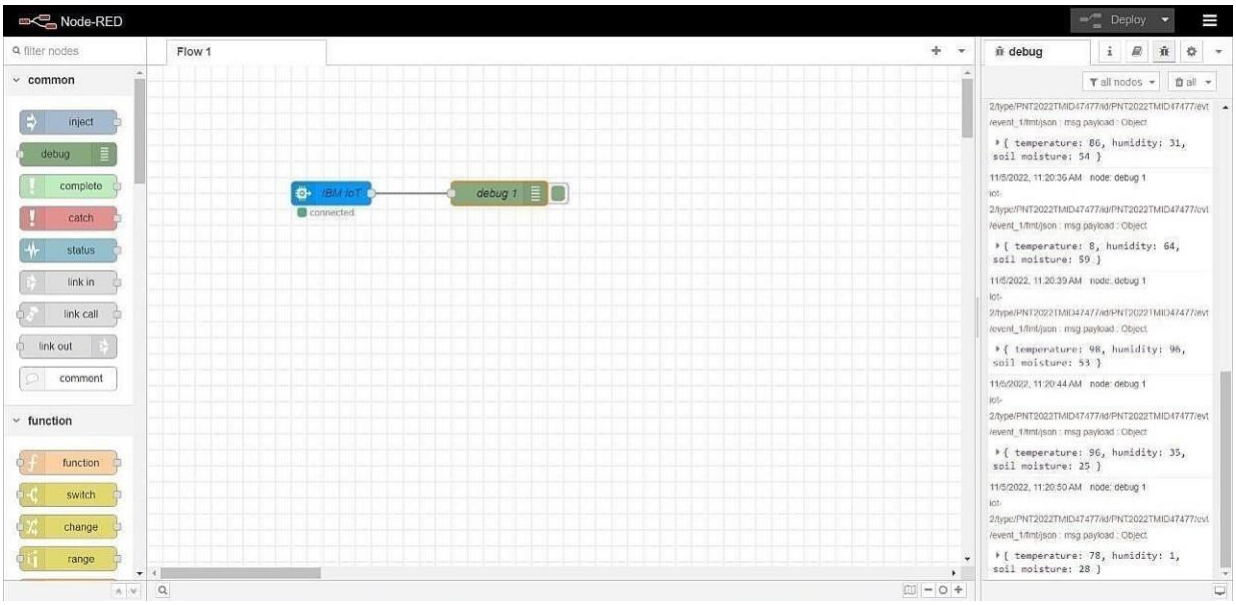
# 8. TESTING

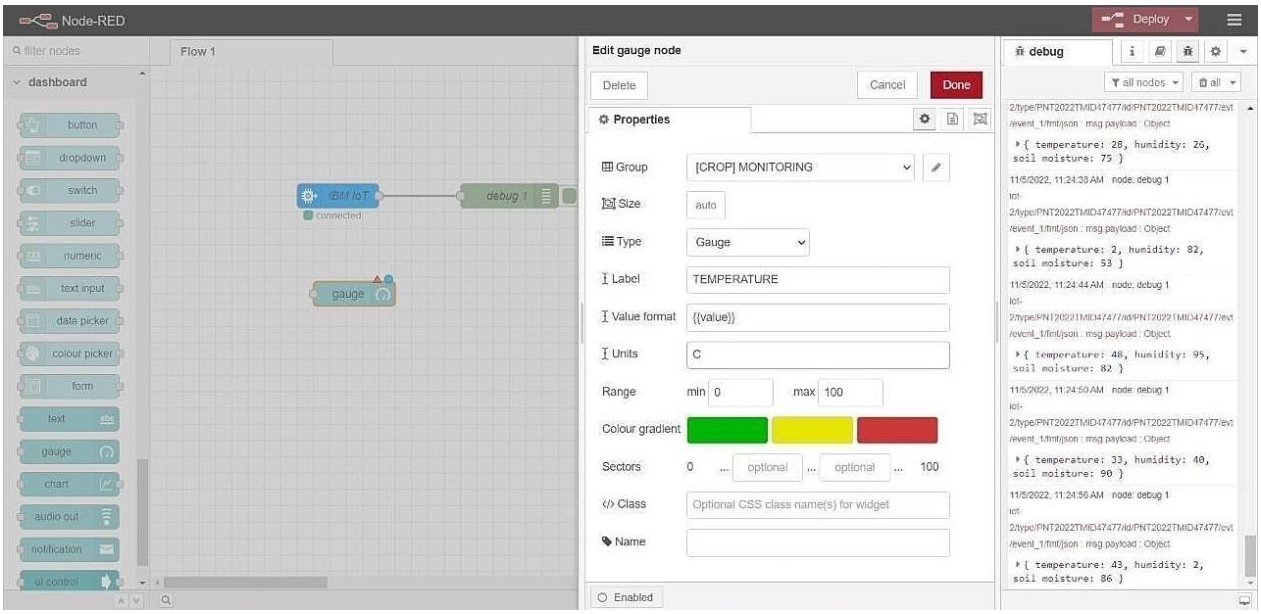
## 8.1 TEST CASES:

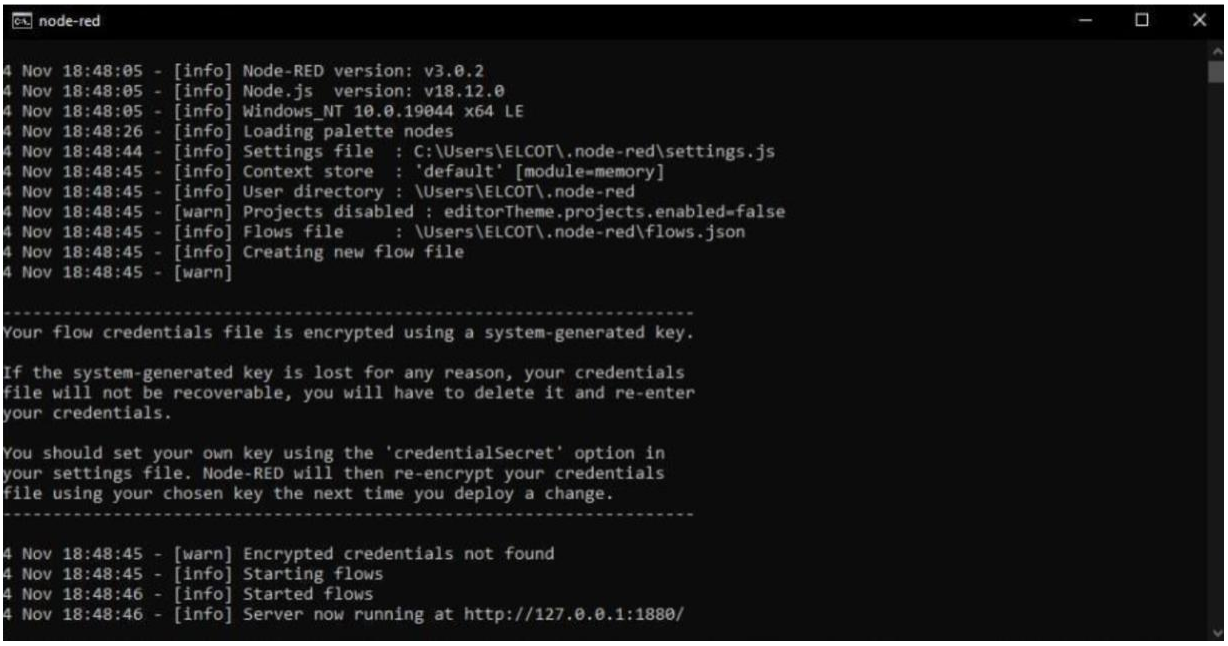
| Sno | Parameter | Values | Screenshot |
|---|---|---|---|
| | | | |
| 1 | Model summary | - | |
| 2 | Accuracy | Training accuracy-95% Validation accuracy-72% | |
| 3 | Confidence score | Class detected-80% Confidence score-80% | |

# 8.2 User Acceptance Testing:




Node-RED
Deploy
Flow 1
dashboard
button
dropdown
switch
slider
numeric
text input
date picker
colour picker
form
text
gauge
chart
audio out
notification
ui control
connected
debug 1
gauge
Edit gauge node
Delete
Cancel
Done
Properties
Group
[CROP] MONITORING
Size
auto
Type
Gauge
Label
TEMPERATURE
Value format
{{value}}
Units
C
Range
min 0
max 100
Colour gradient
Sectors
0
optional
optional
100
Class
Optional CSS class name(s) for widget
Name
Enabled
debug
all nodes
all
{ temperature: 28, humidity: 26, soil moisture: 75 }
{ temperature: 2, humidity: 82, soil moisture: 53 }
{ temperature: 48, humidity: 95, soil moisture: 82 }
{ temperature: 33, humidity: 40, soil moisture: 90 }
{ temperature: 43, humidity: 2, soil moisture: 86 }


node-red
4 Nov 18:48:05 - [info] Node-RED version: v3.0.2
4 Nov 18:48:05 - [info] Node.js version: v18.12.0
4 Nov 18:48:05 - [info] Windows_NT 10.0.19044 x64 LE
4 Nov 18:48:26 - [info] Loading palette nodes
4 Nov 18:48:44 - [info] Settings file : C:\Users\ELCOT\.node-red\settings.js
4 Nov 18:48:45 - [info] Context store : 'default' [module=memory]
4 Nov 18:48:45 - [info] User directory : \Users\ELCOT\.node-red
4 Nov 18:48:45 - [warn] Projects disabled : editorTheme.projects.enabled=false
4 Nov 18:48:45 - [info] Flows file : \Users\ELCOT\.node-red\flows.json
4 Nov 18:48:45 - [info] Creating new flow file
4 Nov 18:48:45 - [warn]
Your flow credentials file is encrypted using a system-generated key.
If the system-generated key is lost for any reason, your credentials
file will not be recoverable, you will have to delete it and re-enter
your credentials.
You should set your own key using the 'credentialSecret' option in
your settings file. Node-RED will then re-encrypt your credentials
file using your chosen key the next time you deploy a change.
4 Nov 18:48:45 - [warn] Encrypted credentials not found
4 Nov 18:48:45 - [info] Starting flows
4 Nov 18:48:46 - [info] Started flows
4 Nov 18:48:46 - [info] Server now running at http://127.0.0.1:1880/

## 9. RESULTS

- The problem of crop vandalization by wild animals andfire has become a major social problem in current time.
- It requires urgent attention as no effective solution existstill date for this problem. Thus this project carries a greatsocial relevance as it aims to address this problem. This project will help farmers in protecting their orchards and fields and save them from significant financial losses andwill save them from the unproductive efforts that they endure for the protection their fields. This will also helpthem in achieving better crop yields thus leading to their economic well being.

## 10. ADVANTAGES AND DISADVANTAGES

**Advantage:**

- Controllable food supply. you might have droughts or floods, but if you are growing the crops and breeding them to be hardier, you have a better chanceof not straving.
- It allows farmers to maximize yields using minimum resources such as water,fertilizers.

**Disadvantage:**

- The main disadvantage is the time it can take to process the information.in order to keep feeding people as the population grows you have to radically change theenvironment of the planet

# 11. CONCLUSION:

- A IOT Web Application is built for smart agricultural system using Watson IoT platform, Watson simulator, IBM cloud and Node-RED.This property allows the farmer to develop the crop in the way that the crop needs. It leads to higher, longer crop yields production time, better quality and less use of protective chemicals
- By using IoT, we can increase crop yields agricultural farms. With this IoT platform, we can beware of weather conditions such as humidity and Temperature. We can also change important things farm requirements; moisture and dryness of the soil can be seen by this. Using an IR sensor, we can see insects and humans along the way in the field.
- Sensory detection and microcontrollers are connected to each other IoT support and wireless communication between senses. This can alleviate the farmer\'s challenges facing climate. So, farmers can monitor farm conditions using a mobile phone or computers.
- These programs provide excellent yields produces and produces the best results. Use these plans to increase the excellent crop yields agricultural production in India. IoT you can control of crop yield and growth. It it can also reduce farm workers\' work.

# 12. FUTURE SCOPE:

- In the future, there will be very large scope, this project can be made based on Image processing in which wild animaland fire can be detectedby cameras and if it comes towards farmthen system will be directly activated through wireless networks.

- Wild animals can also be detected by using wireless networks such as laser wireless sensors and by sensing this laser or sensor’s security system will beactivated.

# 13. APPENDIX :

## 13.1 SOURCE CODE

```
import time importsys

 import ibmiotf.application

# toinstallpipinstall ibmiotf importibmiotf.device

# Provide your IBM Watson Device Credentials
organization"8gyz7t" # replace the ORG ID deviceType =
"weather_monitor"
 #replace the Device type deviceId = "b827ebd607b5"
# replace Device ID authMethod = "token"
authToken="LWVpQPaVQ166HWN48f"
 # Replace the authtoken
def myCommandCallback(cmd): # function for Callbackif

 cm.data['command'] == 'motoron':

 print("MOTOR ON IS RECEIVED")

 elif cmd.data['command'] == 'motoroff':print("MOTOR

OFF IS RECEIVED")if cmd.command == "setInterval":


 else:

if 'interval' not in cmd.data:
print("Error - command is missing requiredinformation: 'interval'")

interval =

cmd.data['interval']elif

cmd.command ==

"print":
 if 'message' not in cmd.data:
        print("Error - commandis missing
```

```
        requiredinformation: 'message'")else:output =
        cmd.data['message']
 print(output) try:

 deviceOptions = {"org": organization, "type": deviceType, "id":
 deviceId,"authmethod": authMethod,
 "auth-token": authToken}      deviceCli
= ibmiotf.device.Client(deviceOptions)#
.....

 exceptException as e:
  print("Caught exception connecting device: %s" % str(e))sys.exit()

 # Connect and send a datapoint "hello" with value "world" into the cloud as an
 event oftype "greeting" 10 times
 deviceCli.connect()

 while True:
 deviceCli.commandCallback = myCommandCallback

# Disconnect the device and application from the cloud deviceCli.disconnect()
```

**SENSOR.PY**

```
import time
importsys
importibmiotf.a
pplicationon
importibmiotf.d
eve
import random


# Provide your IBM Watson Device Credentials organization
= "8gyz7t"
# replace the ORG ID deviceType = "weather_monitor"
#replace the Device type deviceId = "b827ebd607b5"
# replace Device ID authMethod ="token"authToken =
"LWVpQPaVQ166HWN48f"
# Replace the authtoken def myCommandCallback(cmd):
print("Command received: %s" % c            md.data['command']) print(cmd)


try:
deviceOptions = {"org": organization, "type": deviceType, "id": deviceId,
"auth-method": authMethod, "auth-token":
authToken} deviceCli =
ibmiotf.device.Client(deviceOptions)
            #.....
```

```
exceptException as e:
print("Caught exception connecting device: %s" % str(e))sys.exit()

# Connect and send a datapoint "hello" with value "world" into the cloud as an event
oftype "greeting" 10 times
deviceCli.connect()


 while True:
        temp=random.randint(0,1
  00)
  pulse=random.randint(0,1
        00)
        soil=random.randint(
        0,100)


 data = { 'temp' : temp, 'pulse': pulse
 ,'soil':soil}#print data def
 myOnPublishCallback():
 print ("Published Temperature = %s C" % temp, "Humidity = %s %%"
 %pulse,"Soil Moisture = %s %%" % soil,"to IBM Watson")


success = deviceCli.publishEvent("IoTSensor", "json", data,
qos=0, on_publish=myOnPublishCallback) if not success:
print("Not connected to
 )IoTF")time.sleep(1)
deviceCli.commandCallback = myCommandCallback
# Disconnect the device and application from the cloud deviceCli.disconnect()
```

# Node-RED FLOW :


```
[
{
"id":"625574ead9839b34
",
"type":"ibmiotout", "z":"630c8601c5ac3295",
"authentication":"apiKey",
"apiKey":"ef745d48e395ccc0",
"outputType":"cmd",
"deviceId":"b827ebd607b5",
"deviceType":"weather_monitor",
"eventCommandType":"data",
"format":"json",
"data":"data",
"qos":0,
"name":"IBM IoT",
"service":"registere
d","x":680,
"y":220,
"wires":[]
},
{
"id":"4cff18c3274cccc4","type":"ui_button",
"z":"630c8601c5ac3295",
"name":"",
"group":"716e956.00eed6c",
"order":2,
"width":"0",
"height":"0",
```

```
 "passthru":false,
"label":"MotorON",
 "tooltip":"",
 "color":"",
 "bgcolor":"",
 "className":"",
 "icon":"",
 "payload":"{\"command\":\"motoron\"}",
 "payloadType":"str",
 "topic":"motoron",
 "topicType":"s
 tr","x":360,
 "y":160, "wires":[["625574ead9839b34"]]},
 {
 "id":"659589baceb4e0b0",
 "type":"ui_button", "z":"630c8601c5ac3295",
 "name":"",
 "group":"716e956.00eed6c",
 "order":3,
 "width":"0",
 "height":"0",
 "passthru":true,
 "label":"MotorOF
 F",
 "tooltip":"",
 "color":"",
 "bgcolor":"",
 "className":"",
 "icon":"",
 "payload":"{\"command\":\"motoroff\"}",
 "payloadType":"str",
 "topic":"motoroff",
 "topicType":"s
 tr","x":350,

 "y":220, "wires":[["625574ead9839b34"]]},
```

{"id":"ef745d48e395ccc0","type":"ibmiot",
"name":"weather_monitor","keepalive":"60",
"serverName":"",
"cleansession":true,
"appId":"",
"shared":false},
{"id":"716e956.00eed6c",
"type":"ui_group",
"name":"Form",
"tab":"7e62365e.b7e6b8
","order":1,
"disp":true,
"width":"6",
"collapse":fal
se},
{"id":"7e62365e.b7e6b8",
"type":"ui_tab",
"name":"contorl",
"icon":"dashboard
","order":1,
"disabled":false,
"hidden":false}
]

[
{
"id":"b42b5519fee73ee2", "type":"ibmiotin",
"z":"03acb6ae05a0c712",
"authentication":"apiKey",
"apiKey":"ef745d48e395ccc0",

"inputType":"evt",
"logicalInterface":"",
"ruleId":"",
"deviceId":"b827ebd607b5",
"applicationId":"",
"deviceType":"weather_monitor",

```
"eventType":"+",
"commandType":"",
"format":"json",
"name":"IBMIoT",
"service":"registered",
"allDevices":"",
"allApplications":"",
"allDeviceTypes":"",
"allLogicalInterfaces":"",
"allEvents":true,
"allCommands":"",
"allFormats
":"",
"qos":0,
"x":270,
"y":180,
  "wires":[["50b13e02170d73fc","d7da6c2f5302ffaf","a949797028158f3f","a71f164bc3 78bcf1"]]
},
{
"id":"50b13e02170d73fc
",
"type":"function",
"z":"03acb6ae05a0c712
","name":"Soil
Moisture",
  "func":"msg.payload = msg.payload.soil;\nglobal.set('s',msg.payload);\nreturn msg;",
  "outputs":1,
"noerr":
0,
"initialize
":"",
"finalize":"",
"libs":[],

"x":490,
"y":120,
"wires":[["a949797028158f3f","ba98e701f55f04fe"]]
},
```

```
{
"id":"d7da6c2f5302ffaf","type":"function",
"z":"03acb6ae05a0c712",
"name":"Humidity",
   "func":"msg.payload = msg.payload.pulse;\nglobal.set('p',msg.payload)\nreturn msg;",
   "outputs":1,
"noerr":
0,
"initialize
":"",
"finalize":"",
"li
bs
":[
],
"x
":
48
0,
"y":260, "wires":[["a949797028158f3f","70a5b076eeb80b70"]]
},
{
"id":"a949797028158f3f
",
"type":"debug",
"z":"03acb6ae05a0c712
","name":"IBMo/p",
"active":true,
"tosidebar":true,
"console":false,
"tostatus":false,
"complete":"payload",
"targetType":"msg",
"statusVal":"",
"statusType":"auto",
"x":780,
"y":180,
"wires":[]
},
```

```
{
"id":"70a5b076eeb80b70",
"type":"ui_gauge",
"z":"03acb6ae05a0c712",
"name":"",
"group":"f4cb8513b95c98a4",
"order":6,
"width":"0",
"height":"0",
"gtype":"gage",
"title":"Humidity",
"label":"Percentage(%)",
"format":"{{value}}
","min":0,
"max":"100",
"colors":["#00b500","#e6e600","#ca3838"], "seg1":"",
"seg2":"",
"className
":"","x":86
0,
"y":260,
"wires":[]
},
{
"id":"a71f164bc378bcf1","type":"function",
"z":"03acb6ae05a0c712",
"name":"Temperature",
   "func":"msg.payload=msg.payload.temp;\nglobal.set('t',msg.payload);\nreturn msg;","outputs":1,
"noerr":
0,
"initialize
":"",
"finalize":"",
"li
bs
":[
],
```

```
"x
":
49
0,
"y":360,

"wires":[["8e8b63b110c5ec2d","a949797028158f3f"]]
},
{
"id":"8e8b63b110c5ec2d",
"type":"ui_gauge",
"z":"03acb6ae05a0c712",
"name":"",
"group":"f4cb8513b95c98a4",
"order":11,
"width":"0",
"height":"0",
"gtype":"gage",
"title":"Temperature",
"label":"DegreeCelcius",
"format":"{{value}}",
"min":0,
"max":"100",
"colors":["#00b500","#e6e600","#ca3838"],"seg1":"",
"seg2":"",
"classNam
e":"",
"x":790,
"y":360,
"wires":[]
},
{
"id":"ba98e701f55f04fe",
"type":"ui_gauge",
"z":"03acb6ae05a0c712",
"name":"",
"group":"f4cb8513b95c98a4",
"order":1,
```

"width":"0",
"height":"0",
"gtype":"gage",

"title":"Soil Moisture",
"label":"Percentage(%)",
"format":"{{value}}
","min":0,
"max":"100",
"colors":["#00b500","#e6e600","#ca3838"],"seg1":"",
"seg2":"",
"classNam
e
":"",
"x":790,
"y":120,
"wires":[]
},
{
"id":"a259673baf5f0f98
","type":"httpin",
"z":"03acb6ae05a0c712
","name":"",
"url":"/sensor",
"method":"ge
t",
"upload":fals
e,
"swaggerDoc"
:"","x":370,
"y":500,
"wires":[["18a8cdbf7943d27a"]]
},
{
"id":"18a8cdbf7943d27a","type":"function",
"z":"03acb6ae05a0c712",
"name":"httpfunction",
"func":"msg.payload{\"pulse\":global.get('p'),\"temp\":global.get('t'),\"soil\":global.get( 's')};\nreturn
msg;",

```
"outputs":1,
"noerr":0,

"initialize":"",
"finalize":"",
"li
bs
":[
],
"x
":
63
0,
"y":500, "wires":[["5c7996d53a445412"]]
},
{
"id":"5c7996d53a445412
",
"type":"httpresponse",
"z":"03acb6ae05a0c712
","name":"",
"statusCode":"",
"header
s":{},
"x":870,
"y":500,
"wires":[]
},
{
"id":"ef745d48e395ccc0",
"type":"ibmiot",
"name":"weather_monitor",
"keepalive":"60",
"serverName":"",
"cleansession":true,
"appId":"",
"shared":false},
{
```

"id":"f4cb8513b95c98a4","type":"ui_group",
"name":"monitor",
"tab":"1f4cb829.2fdee8
","order":2,
"disp":
true,
"width
":"6",

"collapse":f
alse,
"className
":""
},
{
"id":"1f4cb829.2fdee8",
"type":"ui_tab",
"name":"Home",
"icon":"dashboard
","order":3,
"disabled":false,
"hidden":false }

## 13.2 GitHub & Project Demo Link :

1. https://github.com/IBM-EPBL/IBM-Project-38111-1660372521

2. **https://drive.google.com/file/d/1_eSqDZV5QwwA2xgiWTPvVIp_Hn3888VV/view?usp=sharing**