IOT BASED SMART CROP PROTECTION SYSTEM FOR AGRICULTURE

Category: INTERNET OF THINGS

A PROJECT REPORT

Submitted by

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In fulfillment of project in IBM-NALAIYATHIRAN 2022

Team Id: PNT2022TMID33098

<u>PROJECT GUIDES</u>

Industry Mentor: Mr.DINESH

INDEX

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. Mr.Pranav shitap, Mr.Jayesh redij, Mr.Shikhar Singh, Mr.Durvesh Zagade, Dr. Sharada Chougule. Department of ELECTRONICS AND TELECOMMUNICATION ENGINEERING, Finolex Academy of Management and technology, ratangiri, India.

2. N.Penchalaiah, D.Pavithra, B.Bhargavi, D.P.Madhurai, K.EliyasShaik,S.Md.sohaib.Assitant Professor, Department of CSE,AITS, Rajampet,India UG Student, Department of CSE,AITS,Rajampet, India.

3. Mr.P.Venkateswara Rao, Mr.Ch Shiva Krishna ,MR M Samba Siva ReddyLBRCE,LBRCE,LBRCE.

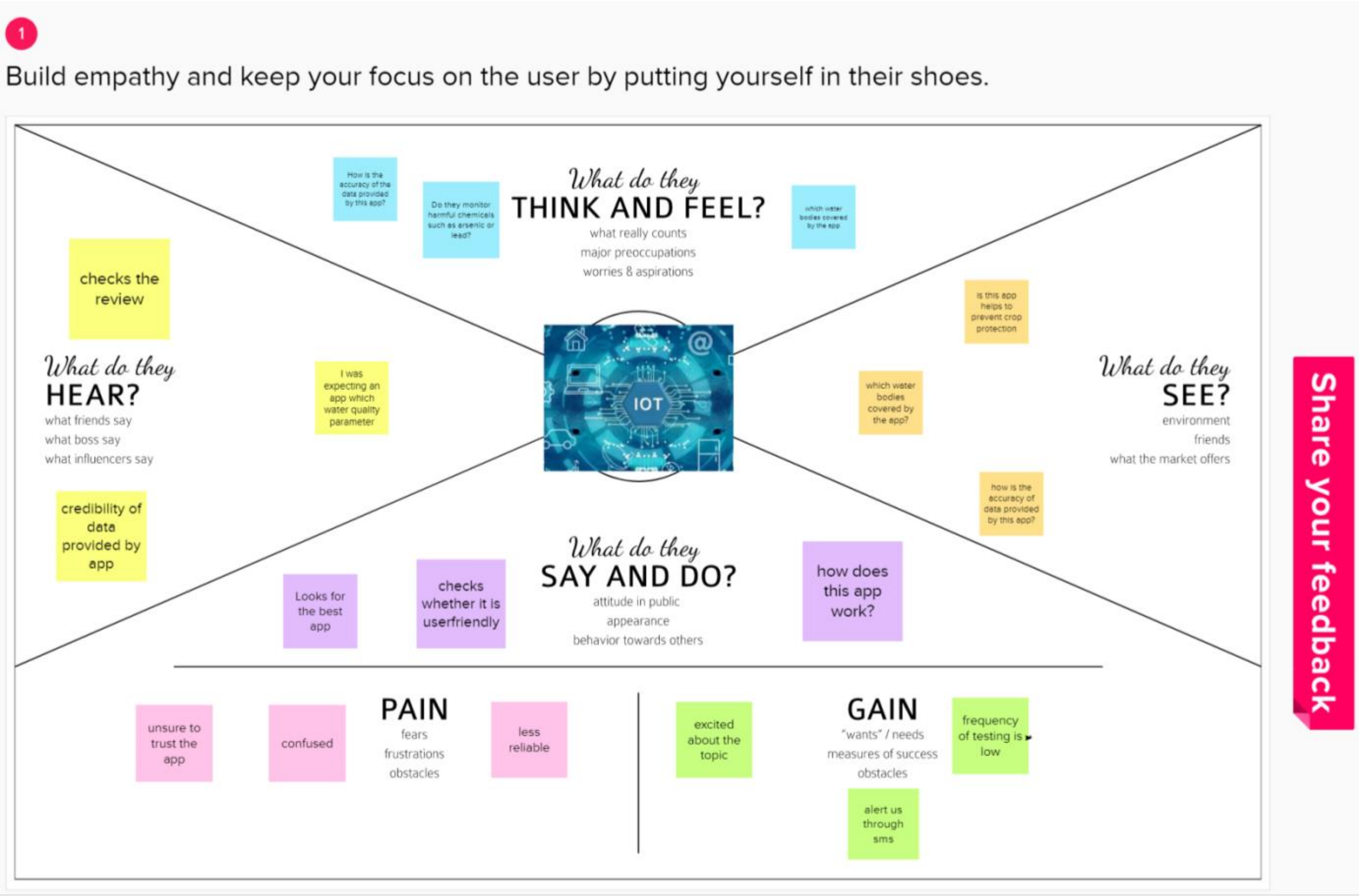
4. Mohit Korche,Sarthak Tokse, ShubhamShirbhate, Vaibhav Thakre,S. P. Jolhe(HOD). Students , Final Year,Dept.of Electrical engineering,Government

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:



1

Build empathy and keep your focus on the user by putting yourself in their shoes.

What do they THINK AND FEEL?

what really counts

major preoccupations

worries & aspirations

How is the accuracy of the data provided by this app?

Do they monitor harmful chemicals such as arsenic or lead?

which water bodies covered by the app

What do they HEAR?

what friends say

what boss say

what influencers say

checks the review

I was expecting an app which water quality parameter

credibility of data provided by app

What do they SEE?

environment

friends

what the market offers

is this app helps to prevent crop protection

which water bodies covered by the app?

how is the accuracy of data provided by this app?

What do they SAY AND DO?

attitude in public

appearance

behavior towards others

Looks for the best app

checks whether it is userfriendly

how does this app work?

PAIN

fears

frustrations

obstacles

unsure to trust the app

confused

less reliable

GAIN

"wants" / needs

measures of success

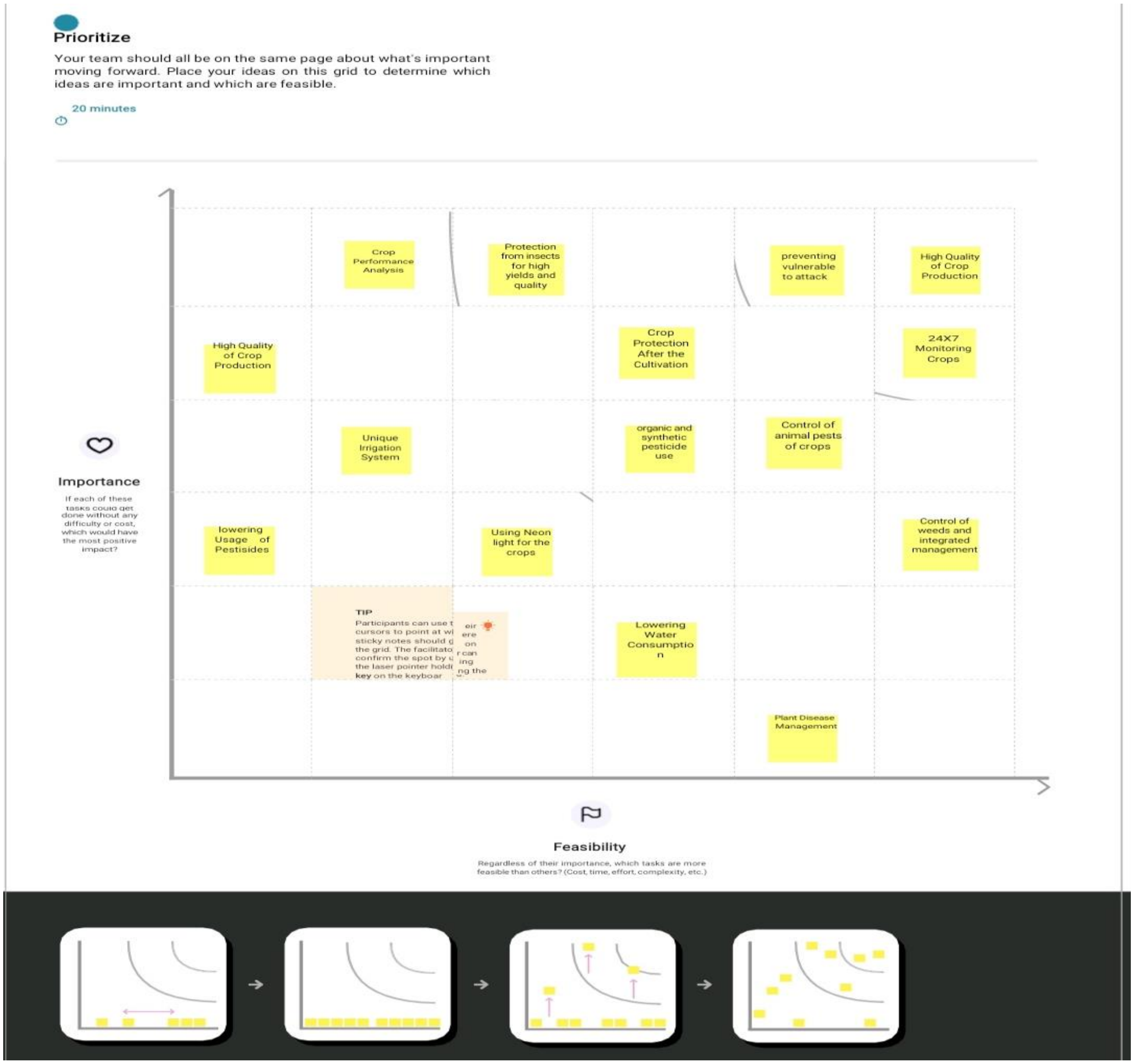
obstacles

excited about the topic

frequency of testing is low

alert us through sms

3.2 IDEATION AND BRAINSTORMING:



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

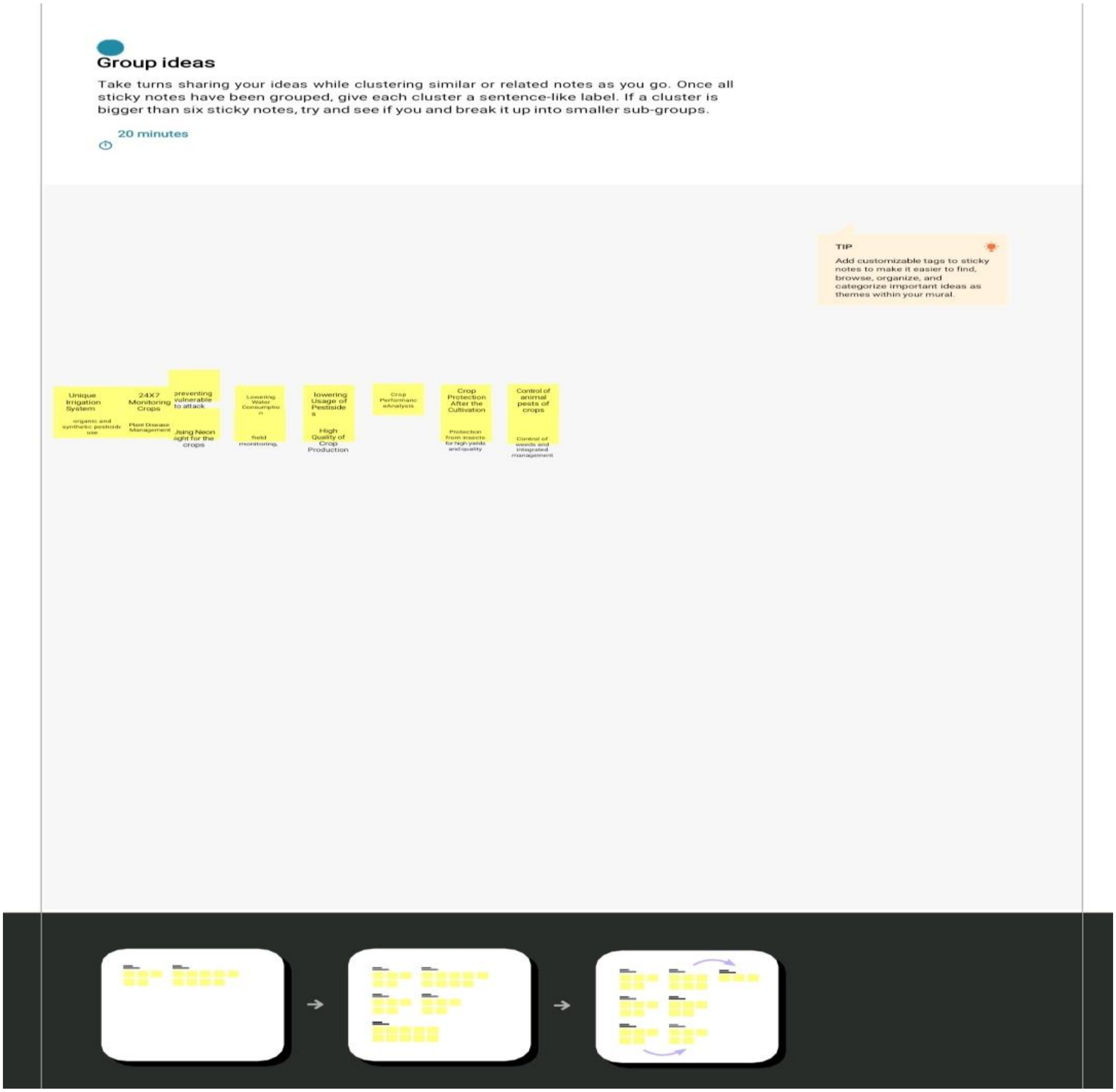
Importance

If each of these tasks could get done without any difficulty or cost, which would have the most positive impact?

	Crop Performance Analysis	Protection from insects for high yields and quality		preventing vulnerable to attack	High Quality of Crop Production
High Quality of Crop Production			Crop Protection After the Cultivation		24X7 Monitoring Crops
	Unique Irrigation System		organic and synthetic pesticide use	Control of animal pests of crops	
lowering Usage of Pestisides		Using Neon light for the crops			Control of weeds and integrated management
	TIP Participants can use t eir cursors to point at wi ere sticky notes should g on the grid. The facilitato r can confirm the spot by u ing the laser pointer holdi ng the **key** on the keyboar		Lowering Water Consumptio n		
				Plant Disease Management	

Feasibility

Regardless of their importance, which tasks are more feasible than others? (Cost, time, effort, complexity, etc.)



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.

Unique Irrigation System

organic and synthetic pestcide use

24X7 Monitoring Crops

Plant Disease Management

preventing vulnerable to attack

Jsing Neon light for the crops

Lowering Water Consumption

field monitoring,

lowering Usage of Pestisides

High Quality of Crop Production

Crop PerformanceAnalysis

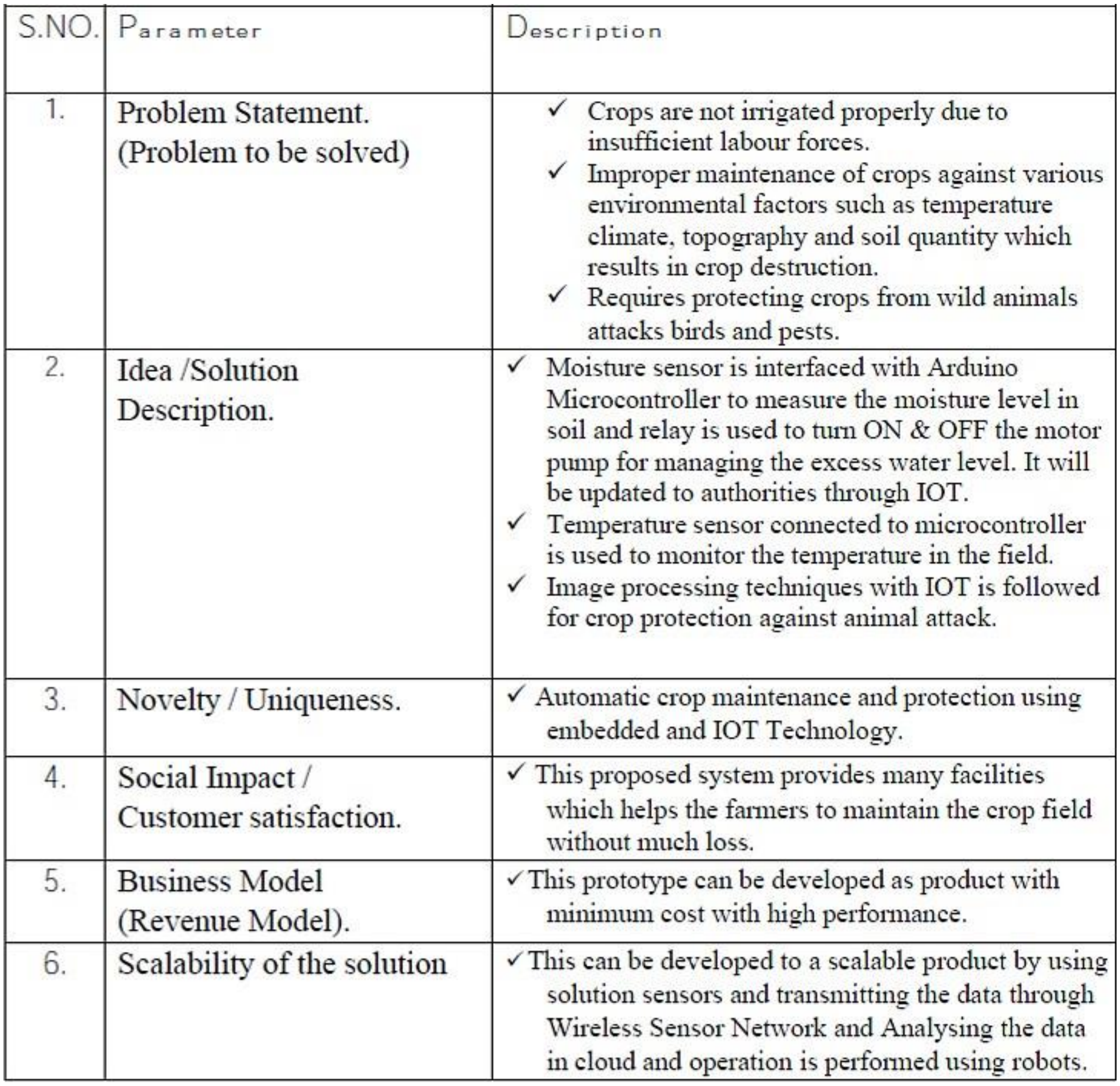
Crop Protection After the Cultivation

Protection from insects for high yields and quality

Control of animal pests of crops

Control of weeds and integrated management

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. ✓ Improper maintenance of crops against various environmental factors such as temperature climate, topography and soil quantity which results in crop destruction. ✓ 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. ✓ Temperature sensor connected to microcontroller is used to monitor the temperature in the field. ✓ 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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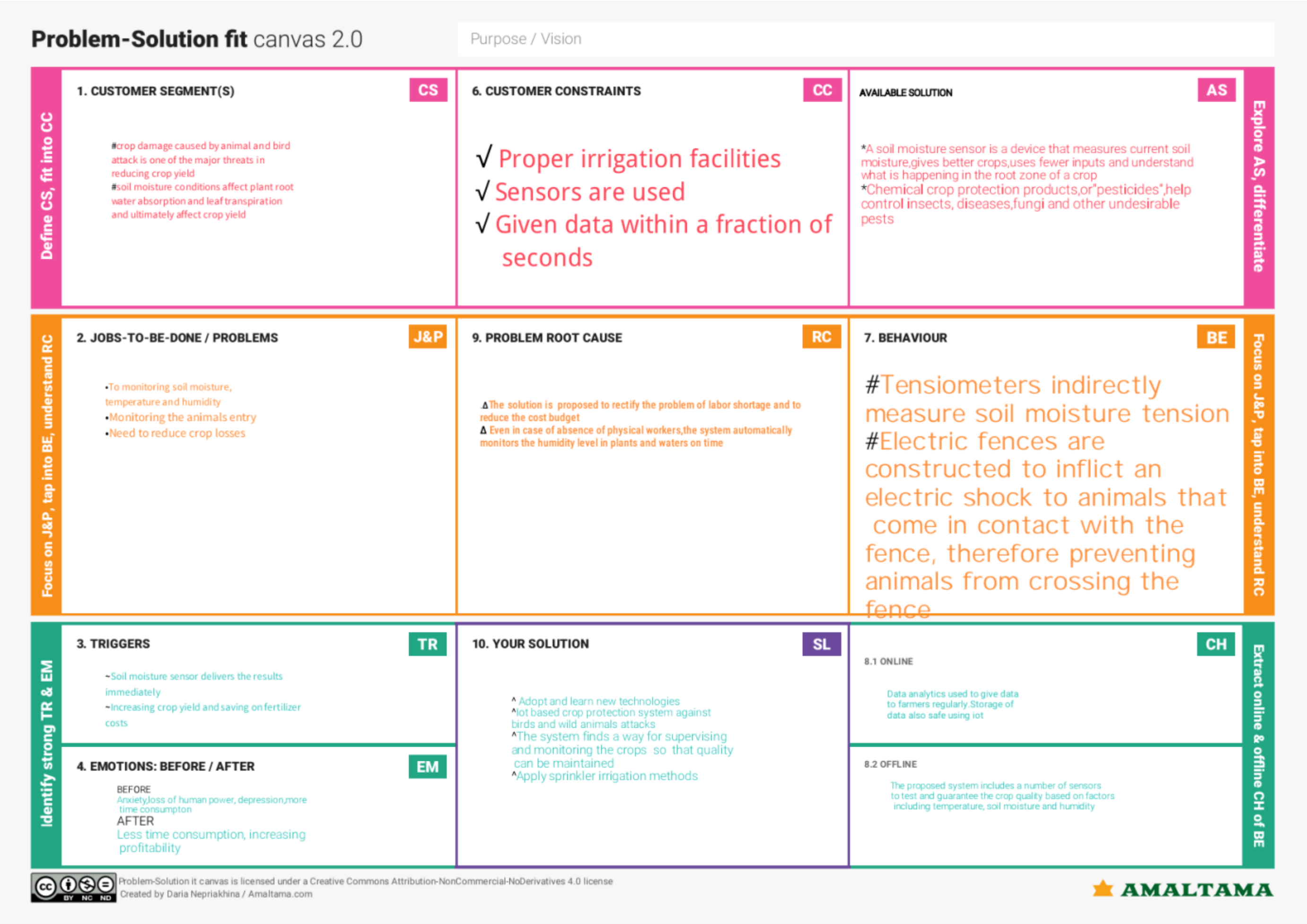
3.4 PROBLEM SOLUTION FIT:



Define CS, fit into CC
Explore AS, differentiate
Focus on J&P, tap into BE, understand RC
Focus on J&P, tap into BE, understand RC
Identify strong TR & EM
Extract online & offline CH of BE

Problem-Solution fit canvas 2.0

Purpose / Vision

1. CUSTOMER SEGMENT(S) CS

#crop damage caused by animal and bird attack is one of the major threats in reducing crop yield
#soil moisture conditions affect plant root water absorption and leaf transpiration and ultimately affect crop yield

6. CUSTOMER CONSTRAINTS CC

√ Proper irrigation facilities
√ Sensors are used
√ Given data within a fraction of seconds

AVAILABLE SOLUTION AS

*A soil moisture sensor is a device that measures current soil moisture,gives better crops,uses fewer inputs and understand what is happening in the root zone of a crop
*Chemical crop protection products,or"pesticides",help control insects, diseases,fungi and other undesirable pests

2. JOBS-TO-BE-DONE / PROBLEMS J&P

- To monitoring soil moisture, temperature and humidity
- Monitoring the animals entry
- Need to reduce crop losses

9. PROBLEM ROOT CAUSE RC

.∆The solution is proposed to rectify the problem of labor shortage and to reduce the cost budget
∆ Even in case of absence of physical workers,the system automatically monitors the humidity level in plants and waters on time

7. BEHAVIOUR BE

#Tensiometers indirectly measure soil moisture tension
#Electric fences are constructed to inflict an electric shock to animals that come in contact with the fence, therefore preventing animals from crossing the fence

3. TRIGGERS TR

~Soil moisture sensor delivers the results immediately
~Increasing crop yield and saving on fertilizer costs

4. EMOTIONS: BEFORE / AFTER EM

BEFORE
Anxiety,loss of human power, depression,more time consumpton
AFTER
Less time consumption, increasing profitability

10. YOUR SOLUTION SL

^ Adopt and learn new technologies
^Iot based crop protection system against birds and wild animals attacks
^The system finds a way for supervising and monitoring the crops so that quality can be maintained
^Apply sprinkler irrigation methods

CH

8.1 ONLINE

Data analytics used to give data to farmers regularly.Storage of data also safe using iot

8.2 OFFLINE

The proposed system includes a number of sensors to test and guarantee the crop quality based on factors including temperature, soil moisture and humidity

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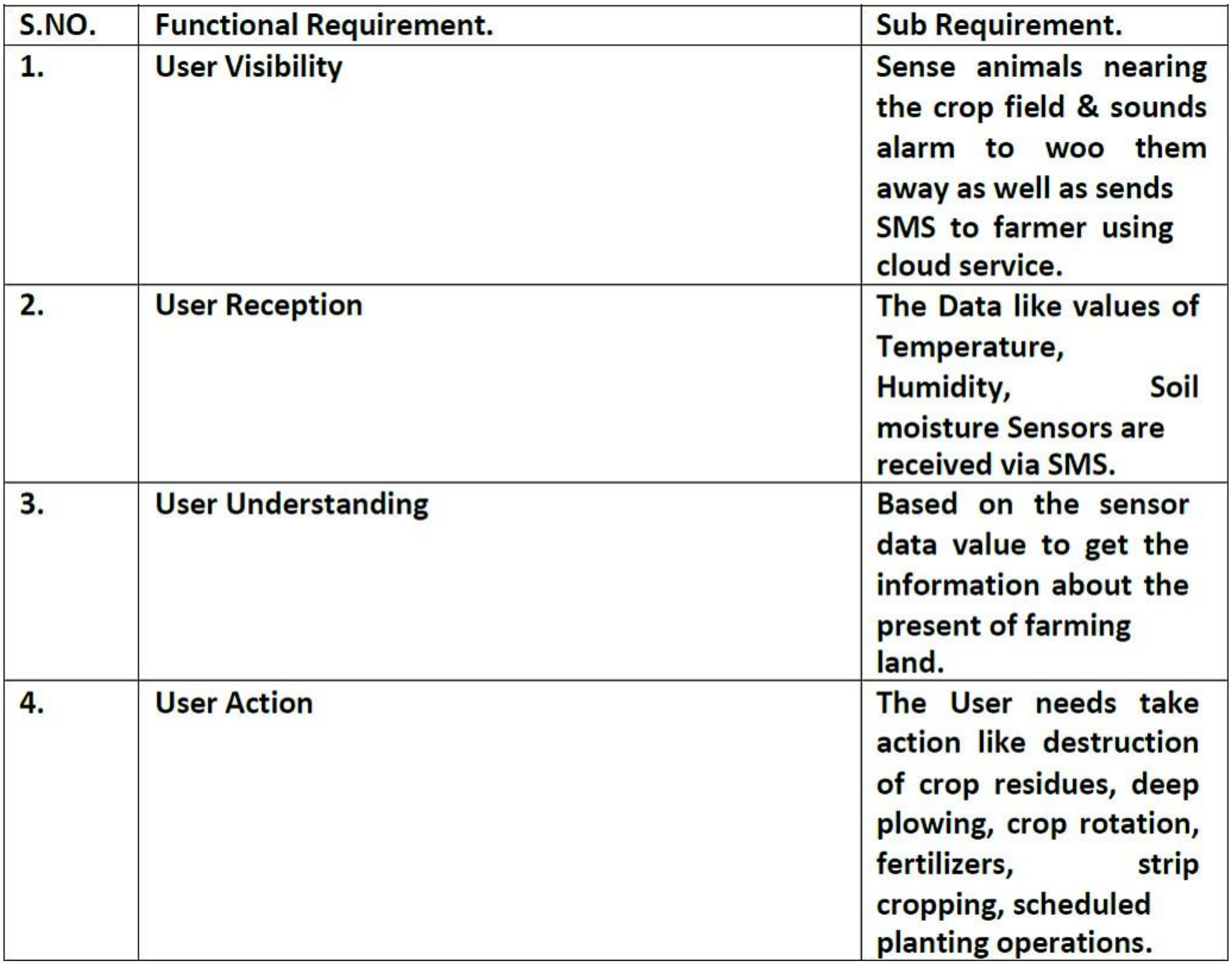
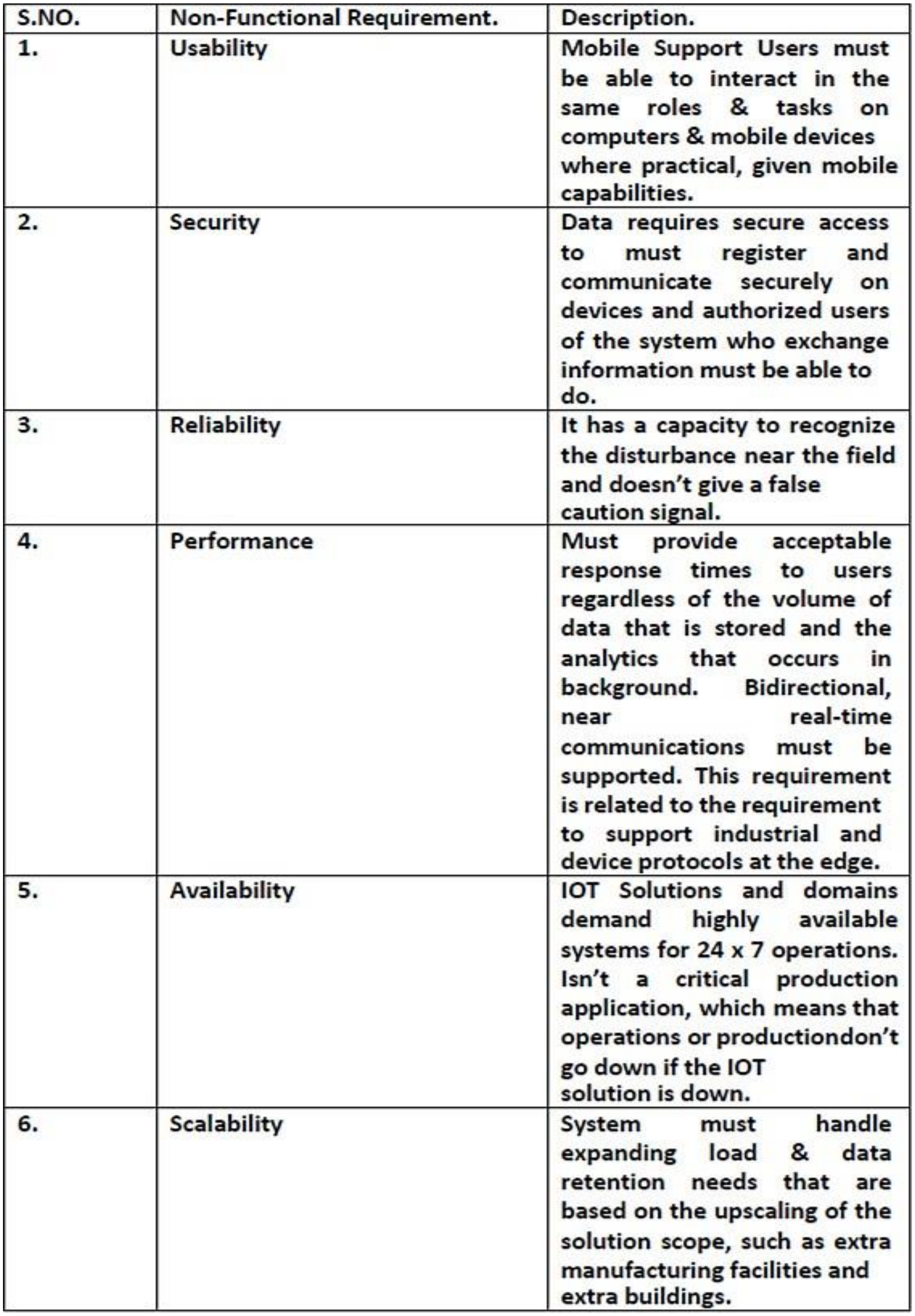
4.REQUIREMENT ANALYSIS

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.

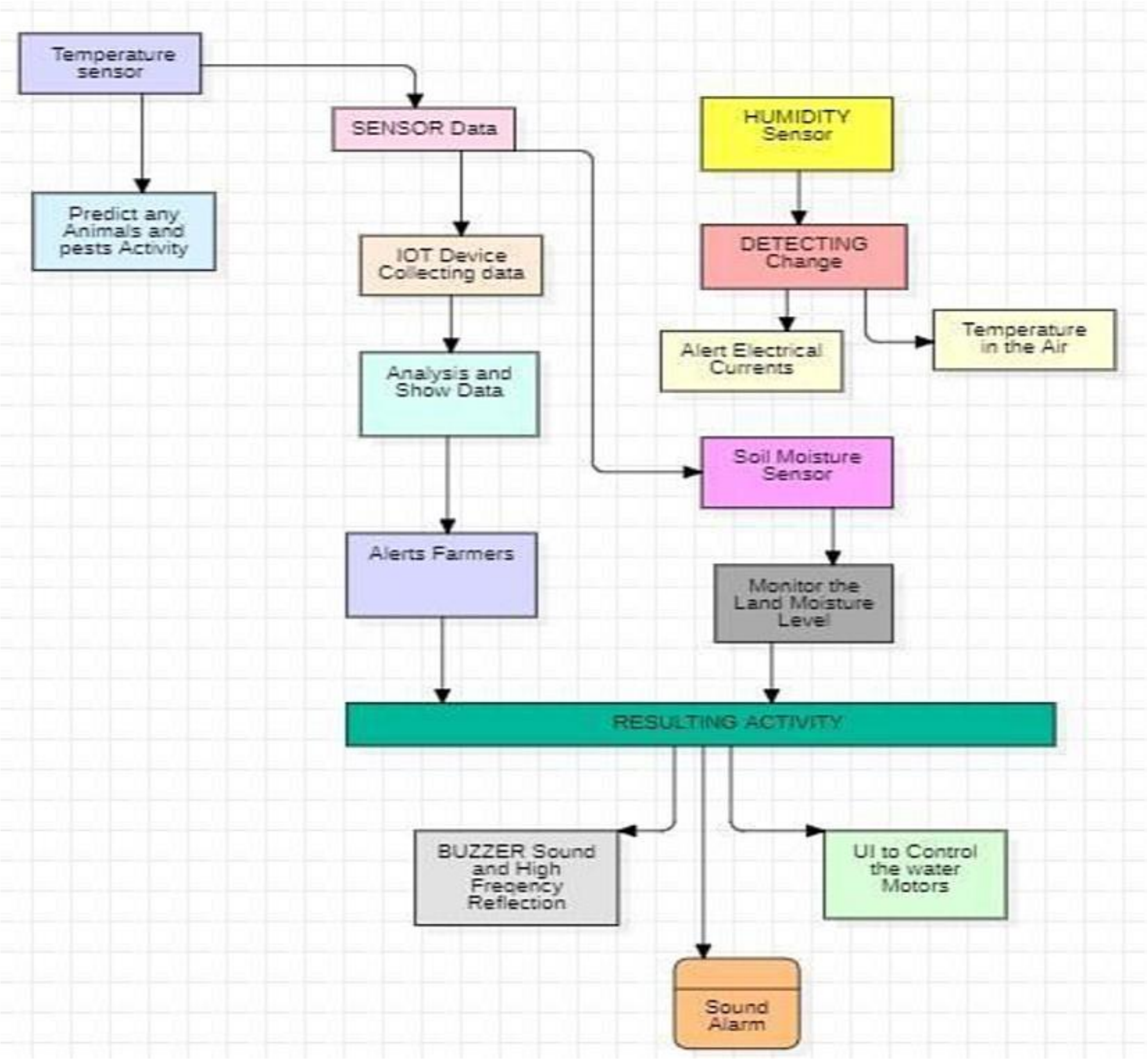
4.2 NON FUNCTIONAL REQUIREMENT:



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

5.1 DATA FLOW DIAGRAM:


Temperature sensor
SENSOR Data
HUMIDITY Sensor
Predict any Animals and pests Activity
IOT Device Collecting data
DETECTING Change
Alert Electrical Currents
Temperature in the Air
Analysis and Show Data
Soil Moisture Sensor
Alerts Farmers
Monitor the Land Moisture Level
RESULTING ACTIVITY
BUZZER Sound and High Freqency Reflection
UI to Control the water Motors
Sound Alarm

5.2 SOLUTION AND TECHNICAL ARCHITECTURE:

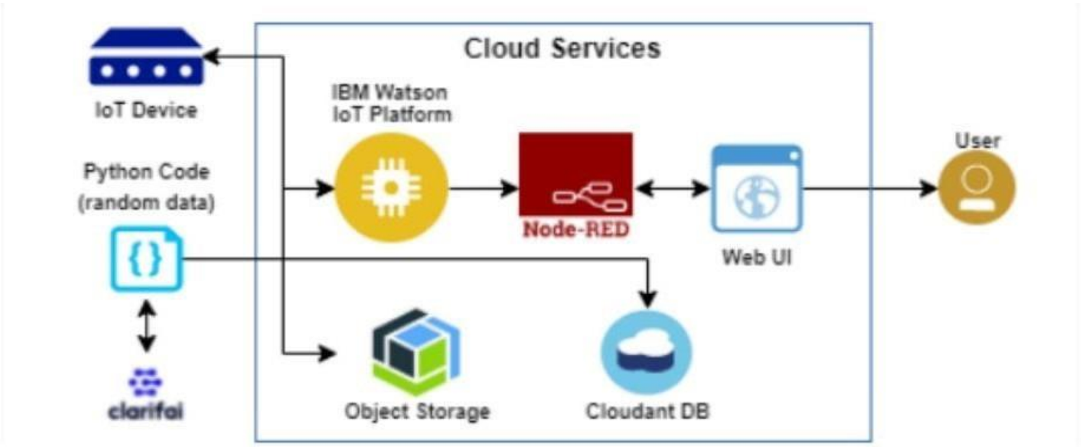


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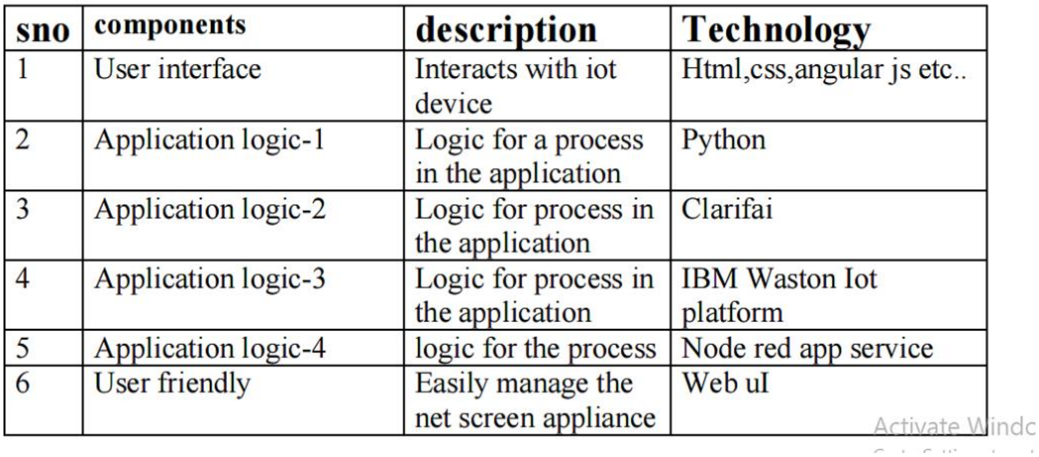
TABLE-1:



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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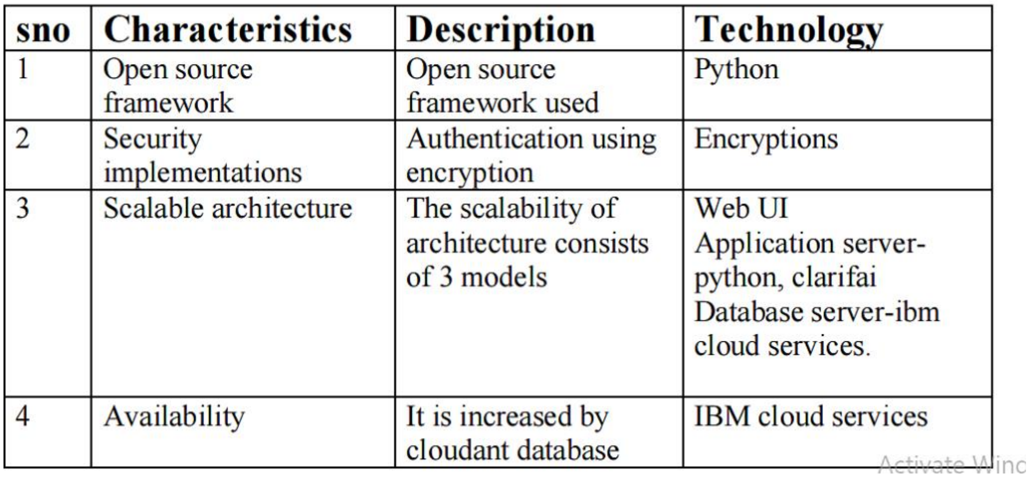
TABLE-2: APPLICATION AND CHARACTERISTICS



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 Application server-python, clarifai Database server-ibm cloud services.
4	Availability	It is increased by cloudant database	IBM cloud services

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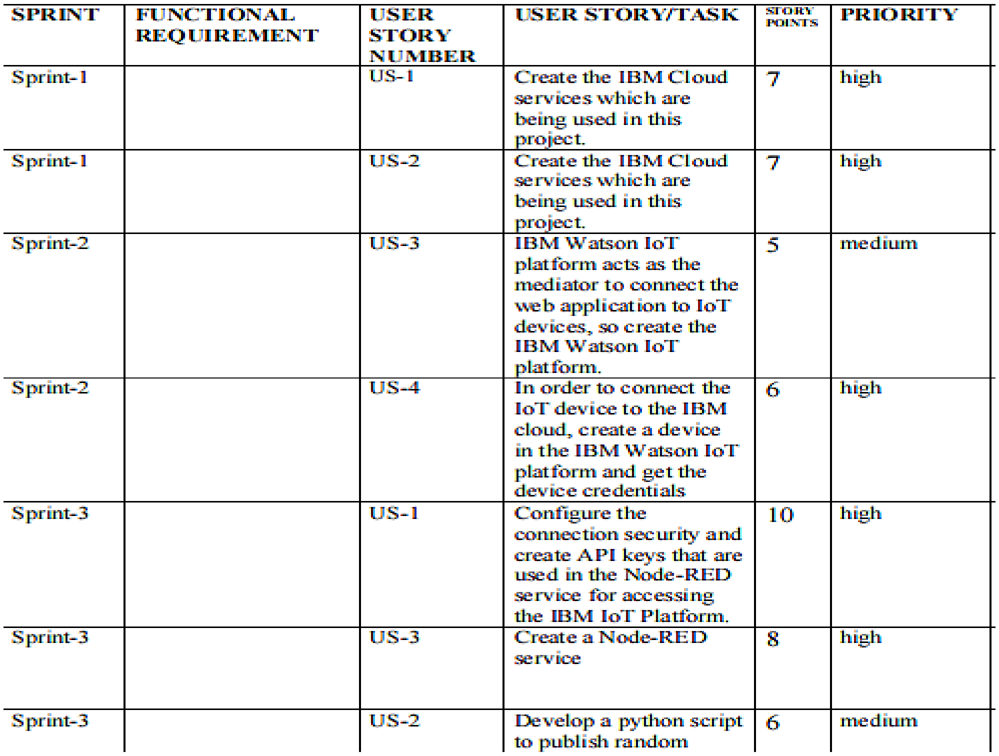
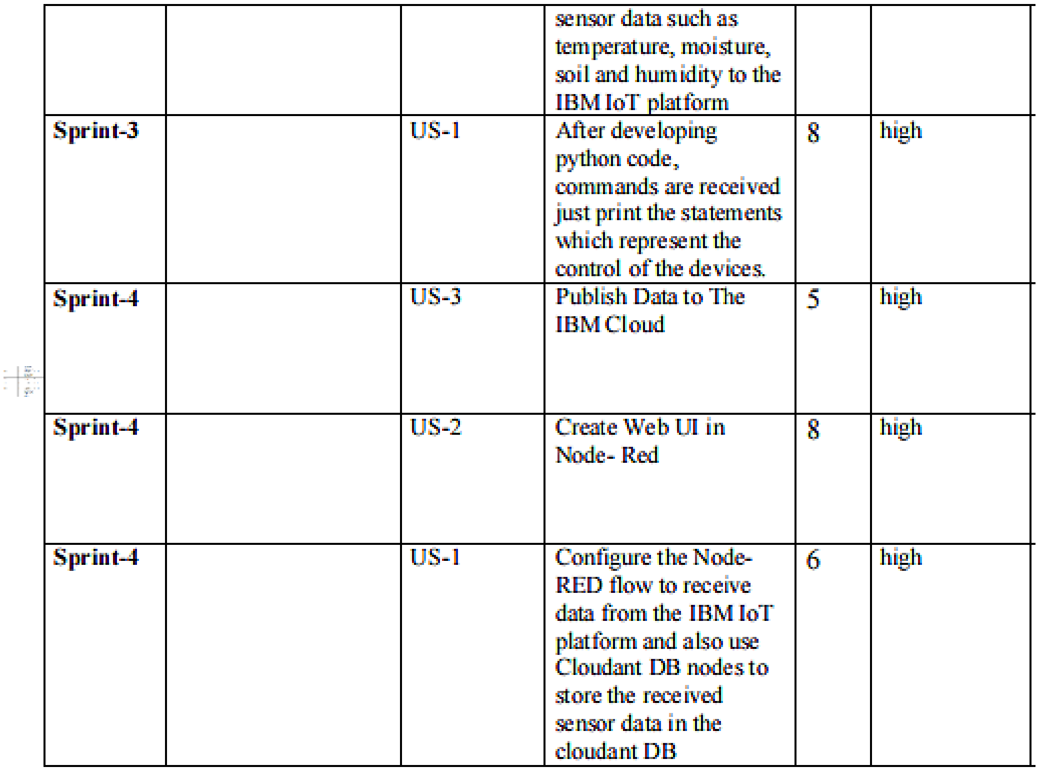
5.3 USER STORIES:

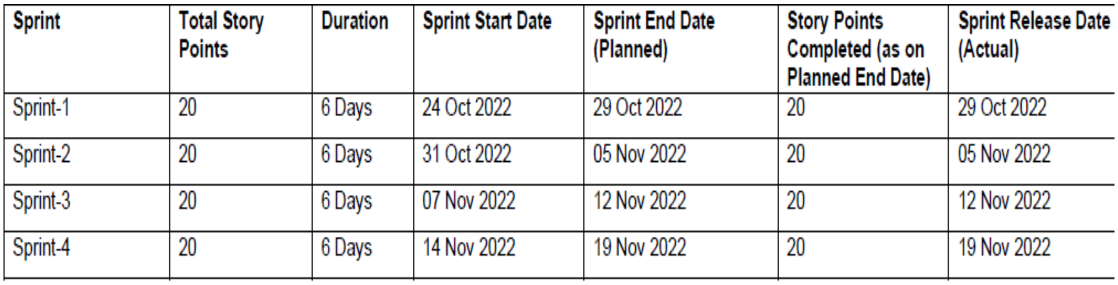



SPRINT	FUNCTIONAL REQUIREMENT	USER STORY NUMBER	USER STORY/TASK	STORY POINTS	PRIORITY
Sprint-1		US-1	Create the IBM Cloud services which are being used in this project.	7	high
Sprint-1		US-2	Create the IBM Cloud services which are being used in this project.	7	high
Sprint-2		US-3	IBM Watson IoT platform 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

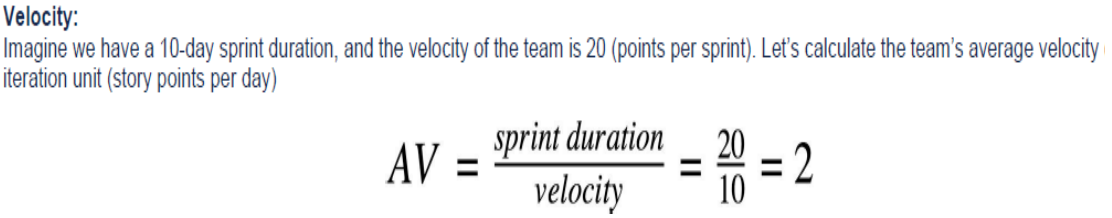
6.PROJECT PLANNING AND SCHEDULING

6.1 SPRINT PLANNING AND ESTIMATION:

Project Tracker,Velocity & BurnChart:



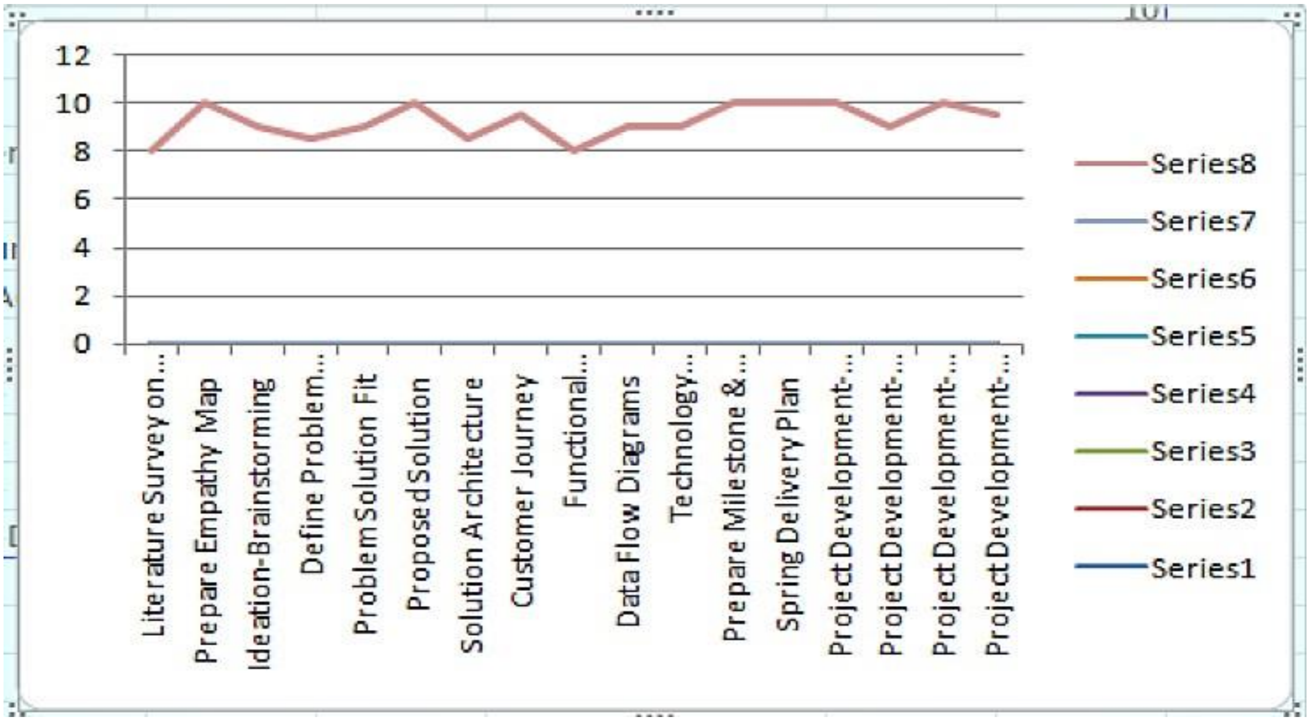
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	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)

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

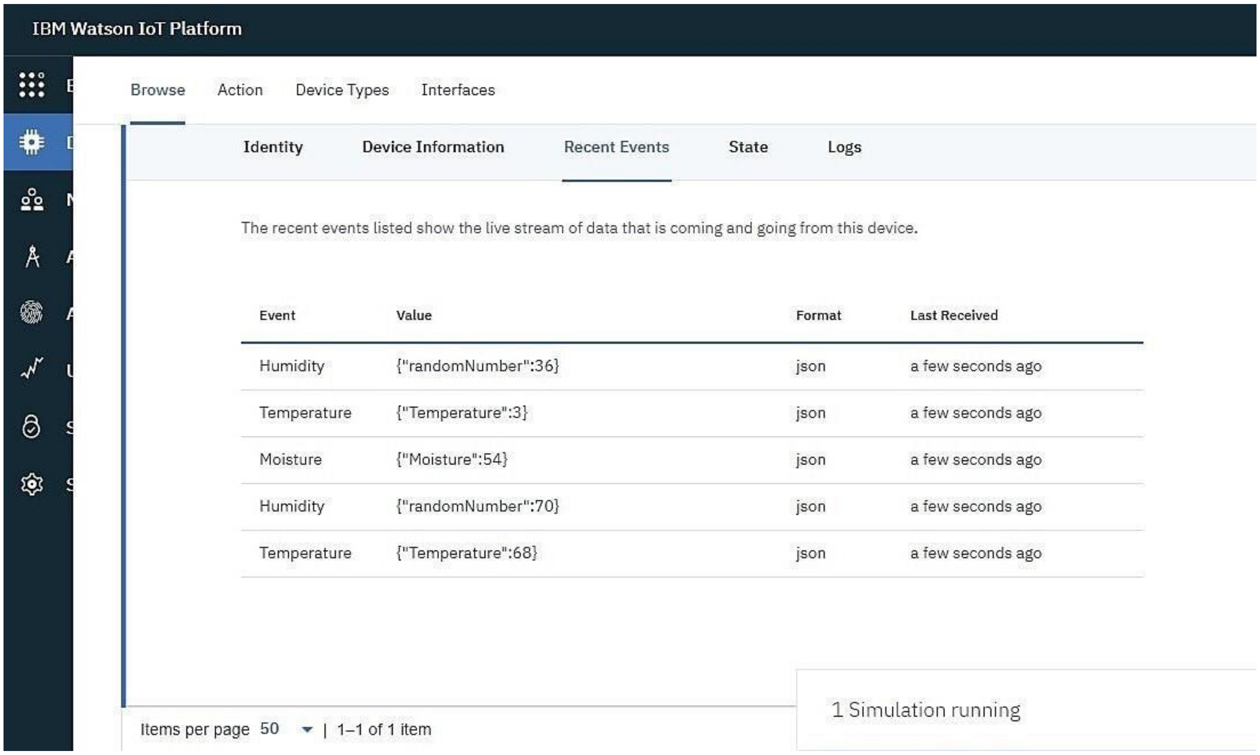


7.CODING AND SOLUTIONING

7.1 FEATURE-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()
```



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

Event	Value	Format	Last Received
Humidity	{"randomNumber":36}	json	a few seconds ago
Temperature	{"Temperature":3}	json	a few seconds ago
Moisture	{"Moisture":54}	json	a few seconds ago
Humidity	{"randomNumber":70}	json	a few seconds ago
Temperature	{"Temperature":68}	json	a few seconds ago

Items per page 50 | 1–1 of 1 item

7.2 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:

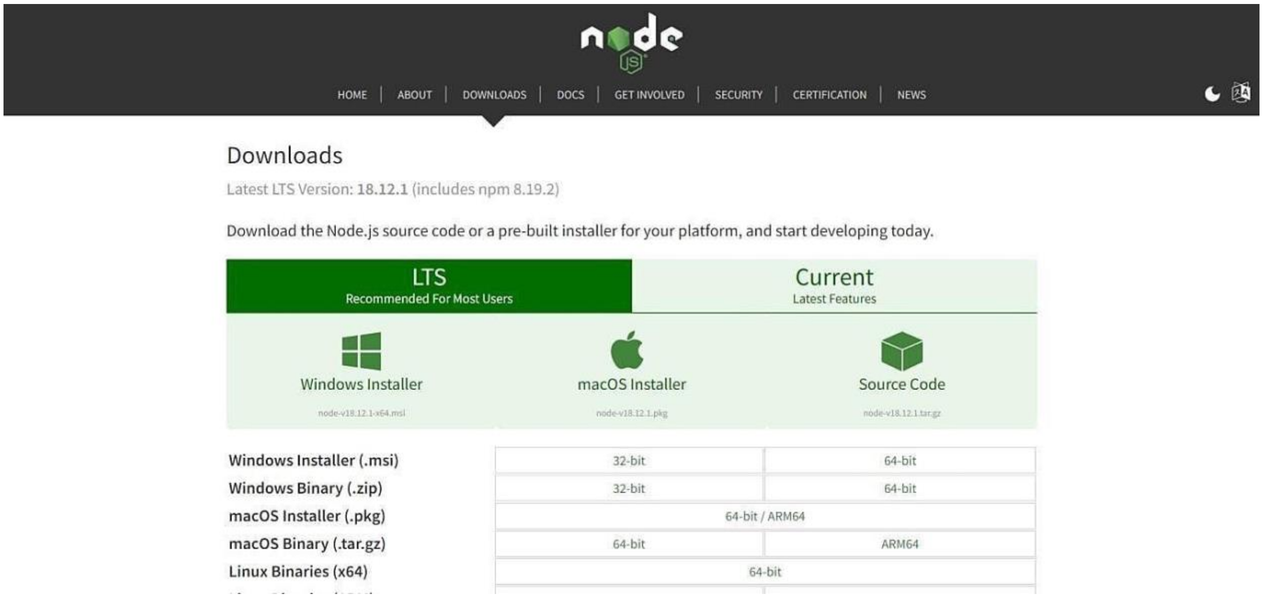
1. Goodsensitivity to Combustible gas in wide range .
2. Highsensitivity to LPG, Propane and Hydrogen .
3. Longlife and low cost.
4. Simpledrive circuit.

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:



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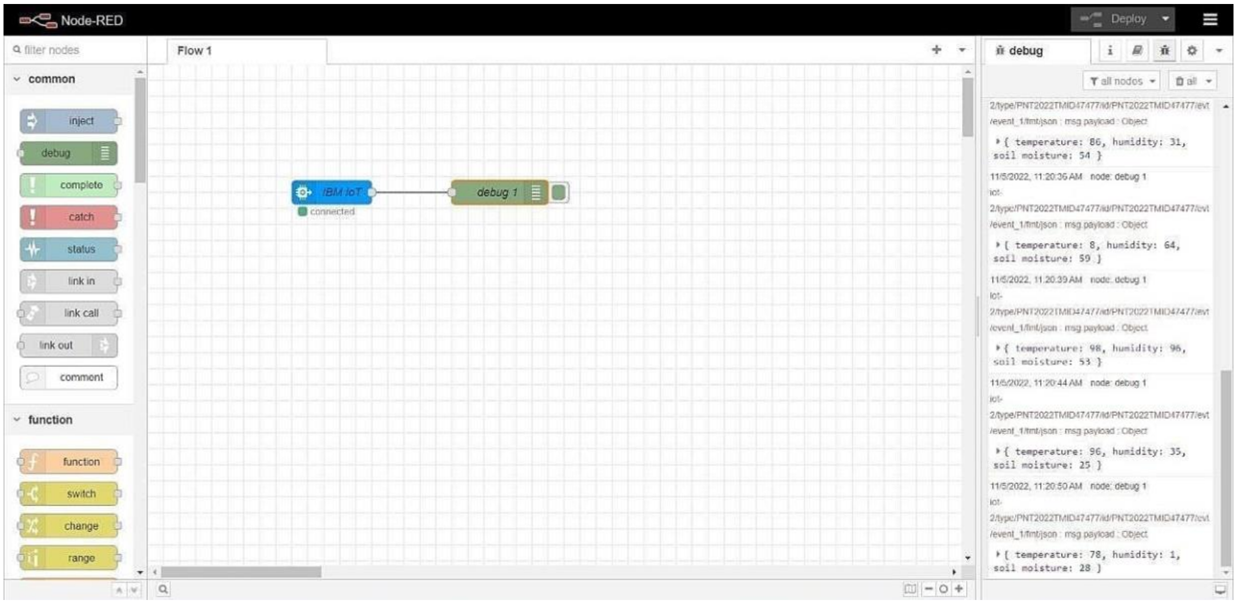
Downloads

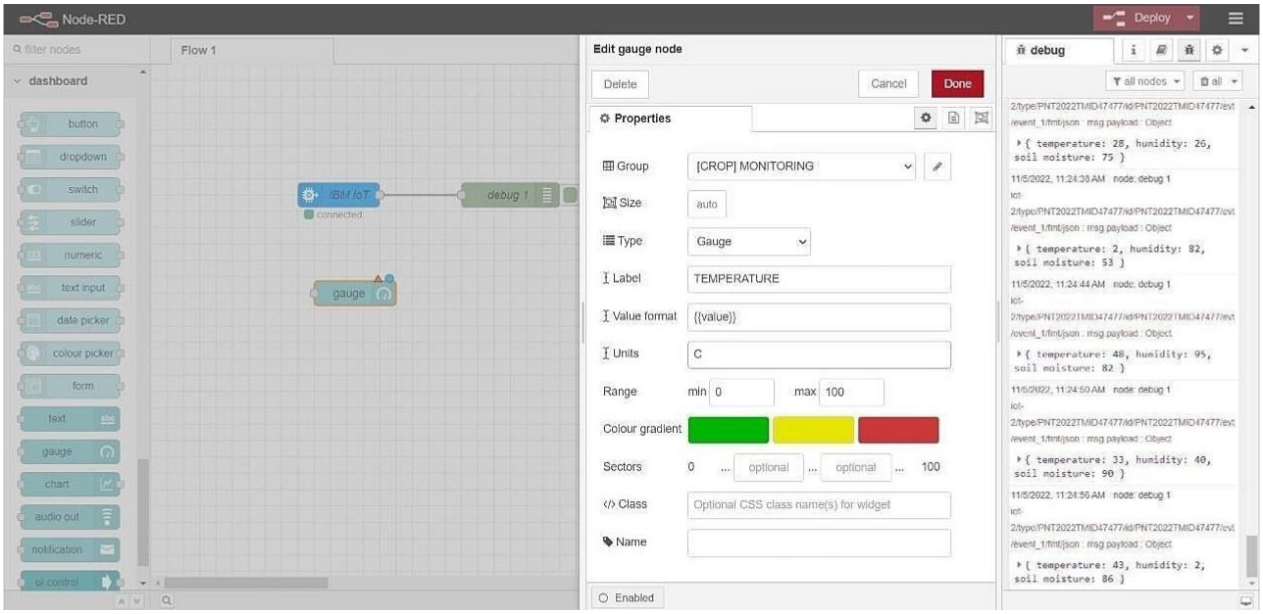
Latest LTS Version: **18.12.1** (includes npm 8.19.2)

Download the Node.js source code or a pre-built installer for your platform, and start developing today.

Windows Installer (.msi)	32-bit	64-bit
Windows Binary (.zip)	32-bit	64-bit
macOS Installer (.pkg)	64-bit / ARM64	
macOS Binary (.tar.gz)	64-bit	ARM64
Linux Binaries (x64)	64-bit	



```
2/type/PNT2022TMID47477/id/PNT2022TMID47477/evt
/event_1/fmt/json : msg.payload : Object
 ▸{ temperature: 86, humidity: 31,
 soil moisture: 54 }
11/5/2022, 11:20:36 AM   node: debug 1
iot-
2/type/PNT2022TMID47477/id/PNT2022TMID47477/evt
/event_1/fmt/json : msg.payload : Object
 ▸{ temperature: 8, humidity: 64,
 soil moisture: 59 }
11/5/2022, 11:20:39 AM   node: debug 1
iot-
2/type/PNT2022TMID47477/id/PNT2022TMID47477/evt
/event_1/fmt/json : msg.payload : Object
 ▸{ temperature: 98, humidity: 96,
 soil moisture: 53 }
11/5/2022, 11:20:44 AM   node: debug 1
iot-
2/type/PNT2022TMID47477/id/PNT2022TMID47477/evt
/event_1/fmt/json : msg.payload : Object
 ▸{ temperature: 96, humidity: 35,
 soil moisture: 25 }
11/5/2022, 11:20:50 AM   node: debug 1
iot-
2/type/PNT2022TMID47477/id/PNT2022TMID47477/evt
/event_1/fmt/json : msg.payload : Object
 ▸{ temperature: 78, humidity: 1,
 soil moisture: 28 }
```



Group [CROP] MONITORING

Size auto

Type Gauge

Label TEMPERATURE

Value format {{value}}

Units C

Range min 0 max 100

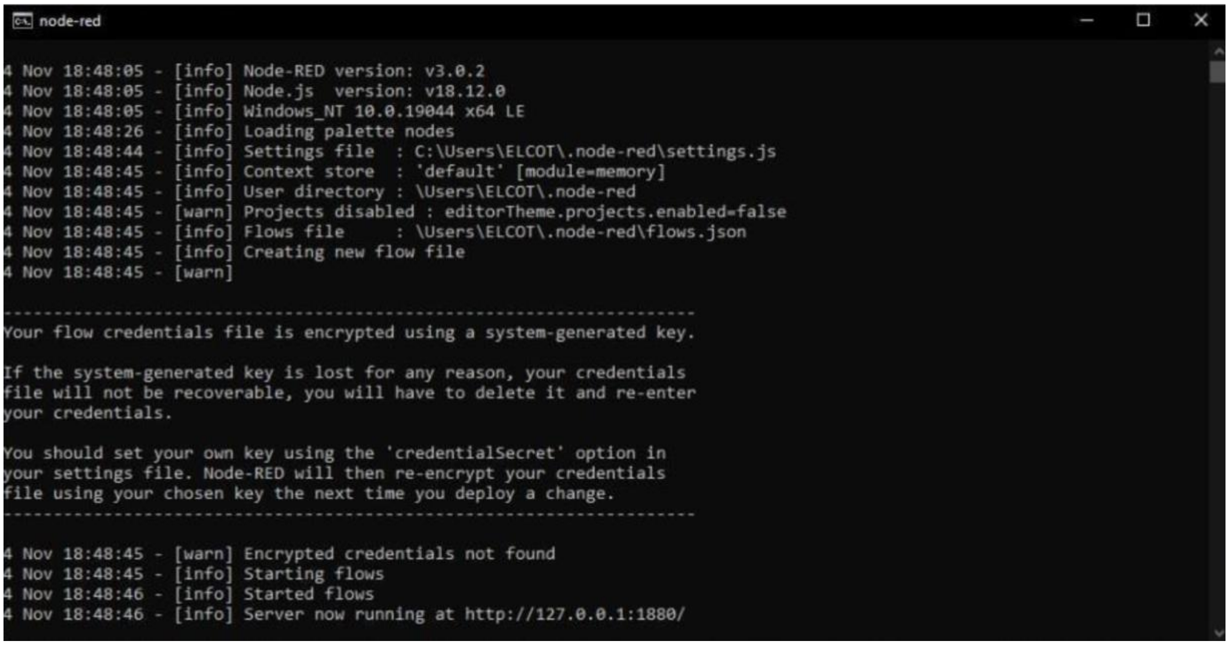
Colour gradient 🟩 🟨 🟥

Sectors 0 ... optional ... optional ... 100

Class Optional CSS class name(s) for widget

Name

```
2/type/PNT2022TMID47477/id/PNT2022TMID47477/evt
/event_1/fmt/json : msg.payload : Object
 ▸{ temperature: 28, humidity: 26,
 soil moisture: 75 }
11/5/2022, 11:24:38 AM  node: debug 1
iot-
2/type/PNT2022TMID47477/id/PNT2022TMID47477/evt
/event_1/fmt/json : msg.payload : Object
 ▸{ temperature: 2, humidity: 82,
 soil moisture: 53 }
11/5/2022, 11:24:44 AM  node: debug 1
iot-
2/type/PNT2022TMID47477/id/PNT2022TMID47477/evt
/event_1/fmt/json : msg.payload : Object
 ▸{ temperature: 48, humidity: 95,
 soil moisture: 82 }
11/5/2022, 11:24:50 AM  node: debug 1
iot-
2/type/PNT2022TMID47477/id/PNT2022TMID47477/evt
/event_1/fmt/json : msg.payload : Object
 ▸{ temperature: 33, humidity: 40,
 soil moisture: 90 }
11/5/2022, 11:24:56 AM  node: debug 1
iot-
2/type/PNT2022TMID47477/id/PNT2022TMID47477/evt
/event_1/fmt/json : msg.payload : Object
 ▸{ temperature: 43, humidity: 2,
 soil moisture: 86 }
```



```
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 :

13.1SOURCE CODE

```
  import time importsys

   import ibmiotf.application

  # toinstallpip install 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":"",
"className
":"",
"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":"",
"className
":"",
"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 }
```

13.2GitHub & 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**