INTRODUCTION

1. Project Overview

The Smart protection system defines that this project help to farmer for the protection of a farm. We have designed this project for the only secure from animals but we this project have the provision to secure from the human begins also.

2. Purpose

This project is smart crop protection system for **protect the farm from animals as well as unknown person**.

LITERATURE SURVEY

3. Existing problem

Technology involves a lot of machines, there are chances where the data might get wrong at times.

4. References

AUTHOR: Ipseeta Nanda-Gopal Narayan Singh University

AUTHOR: **Sahithi Chadalavada**

5. Problem Statement Definition

Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	FARMER 1	PROTECT THE CROP FROM ANIMAL'S	THE INFORMATION THAT THE ANIMAL IS NEAR TO OUR FARM IN NOT PERCEIVABLE TO ME	MOST OF OUR CROP ARE DESTROYED	HARD
PS-2	FARMER 2	MAKE AN AUTOMATIC SPRINKLER IRRIGATION	IN CASE OF OVERFLOW OF WATER IT MAY SPOIL THE CROP	OUR CROP PRODUCTION WILL BE REDUCED	QUITE DIFFICULT

IDEATION & PROPOSED SOLUTION

6. Empathy Map Canvas
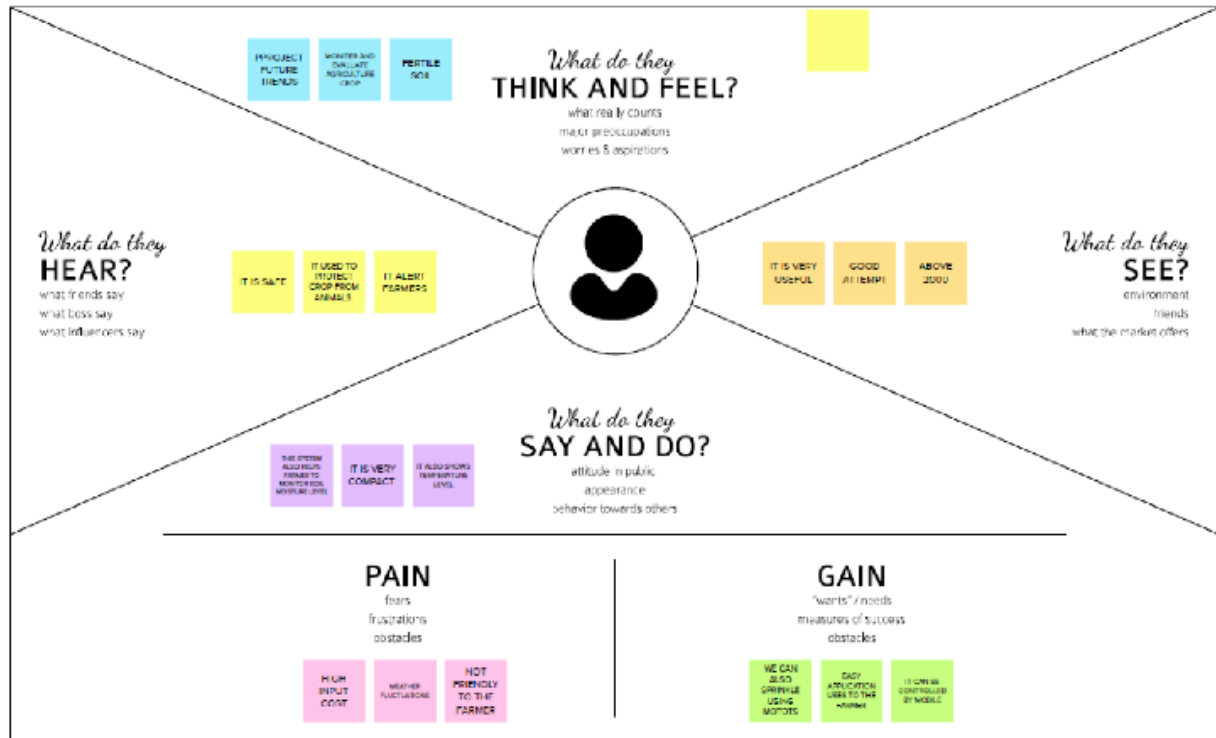
7. Ideation & Brainstorming

8. Proposed Solution

Proposed Solution Template:

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

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Develop an efficient system & an application that can monitor and alert the users(farmers)
2.	Idea / Solution description	*This product helps the field in monitoring the animals other disturbance *in several area,the temperature sensors will be integrated to monitor the temperature &humidity *If in any area feel dry or wetless is detected by admins,will be notified along with the location in the web application *Access all the sensor remotely and change the sensors
3.	Novelty / Uniqueness	*Fastest alerts to the farmers *The increasing demand for quality food *Providing good quality product for customer *Avoid all unwanted products and animals
4.	Social Impact / Customer Satisfaction	*Easy installation and provide efficient results *The optimization of all the processes related to agriculture and live stock rearing increases production rate *Weather forecast and sensors that measure soil moisture mean watering only when necessary and for the right length of time
5.	Business Model (Revenue Model)	*As the product usage can be understood by everyone it is easy for them to use it properly for the safest organization
6.	Scalability of the Solution	*The role of crop protection in an integrated system is , additional to all the other methods , to efficiently control the residual harmful

9. Problem Solution fit

Problem Solution Fit template:IoT based smart crop protection for agriculture

<table>
<tr>
<td rowspan="3">Define CS, fit into CC</td>
<td>

1. CUSTOMER SEGMENT(S) `CS`

- Customer who are unable to foresee animals entering their fields are farmers
- Animal intrusion on agricultural property results in crop loss,thus our target

</td>
<td>

6. CUSTOMER CONSTRAINTS `CC`

- The difficulties that customers encounter when animals interfere with agricultural life, and these we term as constraints.
- Also, the loss that is encountered and lack of resources from government.

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5. AVAILABLE SOLUTIONS `AS`

- Customers use barrier and other boundary tools to avoid animals from trespassing

</td>
<td rowspan="3">Explore AS, differentiate</td>
</tr>
</table>

<table>
<tr>
<td rowspan="2">Focus on J&P, tap into BE, understand RC</td>
<td>

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

- When animals enter agricultural grounds, a sensor will detect them and alert the consumers .
- Thus we need to eliminate the threat for our customer without causing any collateral damage

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<td>

9. PROBLEM ROOT CAUSE `RC`

- Farmers suffer , also it affects when animals tamper with the growth of the crops, thus a better solution must be taken place so that the root problem can be eliminated

</td>
<td>

7. BEHAVIOUR `BE`

- A customers work of locating an animal ingress into the farming grounds is never easy

</td>
<td rowspan="2">Focus on J&P, tap into BE, understand RC</td>
</tr>
</table>

<table>
<tr>
<td rowspan="2">Identify strong TR & EM</td>
<td>

3. TRIGGERS `TR`

- Television commercials and expert information from outsource are some of the triggering measures that can be adopted

4. EMOTIONS: BEFORE / AFTER `EM`

- ➢ **BEFORE** : Frustration, helplessness
- ➢ **AFTER** : Satisfaction, Calm state of mind

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<td>

10. YOUR SOLUTION `SL`

- Proposing an automated method for judicious crop defense system by utilizing the internet of things(IoT) to address this problem and also get the proper approach from farmer

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8. CHANNELS of BEHAVIOUR `CH`

Online:

- Farmers can purchase IoT based solutions with the aid of numerous online channels

Offline:

- Trying to purchase IoT based devices from authorized vendors any officially whole sale stores

</td>
<td rowspan="2">Identify strong TR & EM</td>
</tr>
</table>

REQUIREMENT ANALYSIS

10. Functional requirement

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement	Sub Requirement
1	User understanding	*To obtain information about the current state of farming land based on sensor data value
2	User Visibility	*Sends an SMS to the farmer via cloud service when it detects animals approaching the crop field and sounds an alert to entice them away
3	User Reception	*The values of the Data, the SMS messages are delivered from temperature, humidity and soil moisture sensors.
4	User Action	*Actions that user must take include agricultural residue destruction , deep ploughing , crop rotation, fertilisers, strip cropping, and scheduled planting activities
5	User Registration	*Directly can get from shop. *Order through online shopping application *Order through call
6	User confirmation	*Confirmation via email *Confirmation via call

11. Non-Functional requirements

Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
1	Usability	*Can make a alarm sound by detecting the animals *The user will also get alert by the alarm sound
2	Security	*We can use sensors to detect the animals *This will not harm any animals and crops will be safe
3	Reliability	*We can use the cloud to store the monitoring data of the children *We can use the wifi modules to send the monitoring data
4	Performance	*Regardless of the amount of data that is saved and the background analytics, it must offer users acceptable response speeds .communications that

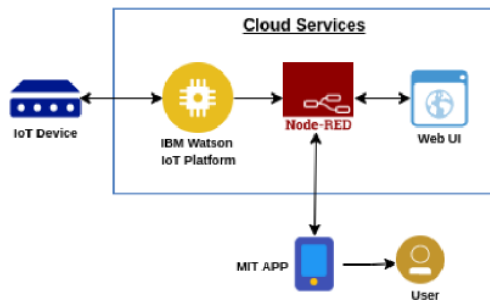|		are bidirectional and nearly real time must be supported.
5	**Availability**	*This system is sensor based system which detects the movement of animals. *It is available both in online and offline
6	**Scalability**	*It is clear by using IoT we can sense the animals and help the users to take necessary steps * production of agricultural products will be increased

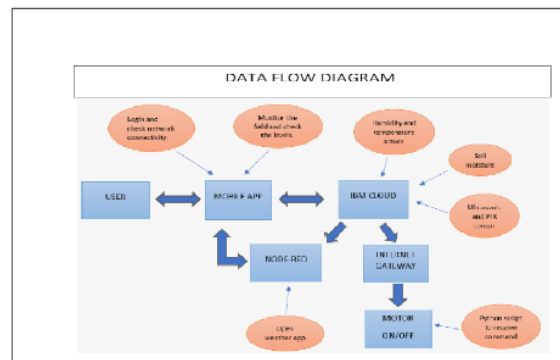## PROJECT DESIGN

12. Data Flow Diagrams

Data Flow Diagrams:

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

13. Solution & Technical Architecture

Technical Architecture:

The Deliverable shall include the architectural diagram as below and the information as per the table1 & table 2
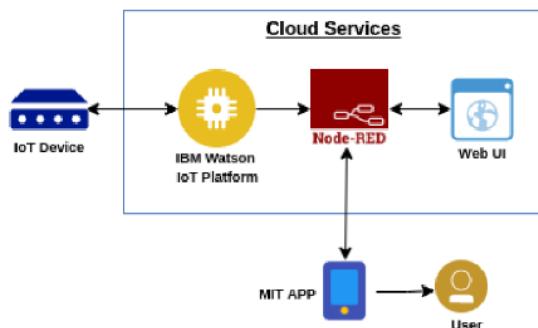
Guidelines:

1. Include all the processes (As an application logic / Technology Block)
2. Provide infrastructural demarcation (Local / Cloud)
3. Indicate external interfaces (third party API's etc.)
4. Indicate Data Storage components / services
5. Indicate interface to machine learning models (if applicable)

Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	Web UI, Mobile App, etc.	Python
2.	Application Logic-1	Logic for a process in the application	Java / Python
3.	Application Logic-2	Logic for a process in the application	IBM Watson STT service
4.	Application Logic-3	Logic for a process in the application	IBM Watson Assistant
5.	Database	Data Type, Configurations etc.	MySQL, NoSQL, etc.
6.	Cloud Database	Database Service on Cloud	IBM DB2, IBM Cloudant ,nodered etc
7.	File Storage	File storage requirements	IBM cloudant
8.	External API-1	Purpose of External API used in the application	IBM Weather API, etc.
9.	External API-2	Purpose of External API used in the application	Aadhar API, etc.
10.	Machine Learning Model	Purpose of Machine Learning Model	Object Recognition Model, etc.
11.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud Local Server Configuration: Cloud Server Configuration :	Local, Cloud Foundry, Kubernetes, etc.

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	*The internet of things system(IoT) refers to the set of devices and systems that systems that stay interconnected with real word sensors and actuators to the internet	Internet of things
2.	Security Implementations	*We can use sensors for detecting surroundings	Sensing technology

S.No	Characteristics	Description	Technology
		*We can use buzzer to alert the farmer	
3.	Scalable Architecture	*it is clearly explained the IoT concept ,crop Damage issues and the need of using smart crop protection system	Internet of things
4.	Availability	*This system is developed using board programmed in embedded C and interfaced with sensing the surroundings	Microchip technology
5.	Performance	*The novelty of the work is that the system automatically alert the farmer by sending sms ,when animals enter into the fields	PIR sensor

3. User Stories

User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	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
	Mail confirmation	USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
	Facebook access	USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
	register	USN-4	As a user, I can register for the application through Gmail	I can register for the application	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	I can log into the required application	High	Sprint-1
Customer (Web user)	Same as mobile user	Same as mobile user	Same as mobile user	Same as mobile user	High	Sprint-1
Customer Care Executive	Farmer welfare department	USN-1	As a user, I managing a team of representatives offering customer support	I can communicate to them in proper manner	High	Sprint-1

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
	Agriculture extension department	USN-2	As a user ,I provide administrative support for farmers	I can implementation of agriculture extension activities	High	Sprint-1
Administrator	Farm administrator	USN-1	As a user , I provide administrative support for farmers	I informed about the financial and physical performance	High	Sprint-1
		USN-2	As a user ,I live and work on the farm or an estate	I take responsibility	Medium	Sprint-1

PROJECT PLANNING & SCHEDULING

14. Sprint Planning & Estimation

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

Use the below template to create product backlog and sprint schedule

| Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Login & Registration	USN-1	Login: As a user, I can log into the application by entering email & password. Registration: As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	Dharani R
Sprint-1	Python code	USN-2	Python code to detect animals and birds , temperature , humidity , soil moisture , motor sprinkler on and off	1	High	Whole team
Sprint-2	wokwi code	USN-3	To stimulate temperature and humidity	2	Medium	Kaviya R
Sprint-3	IoT watson and Node-RED	USN-4	To create code and to caluclate temperature and humidity in IoT watson and node red service	2	High	Praveena V
Sprint-4	MIT app	USN-5	To create an app and connect Bluetooth to on or off the motor and connect with node red and show the temperature	1	High	Leenasri S

15. Sprint Delivery Schedule

Project Tracker, Velocity & Burndown Chart: (4 Marks)

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	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

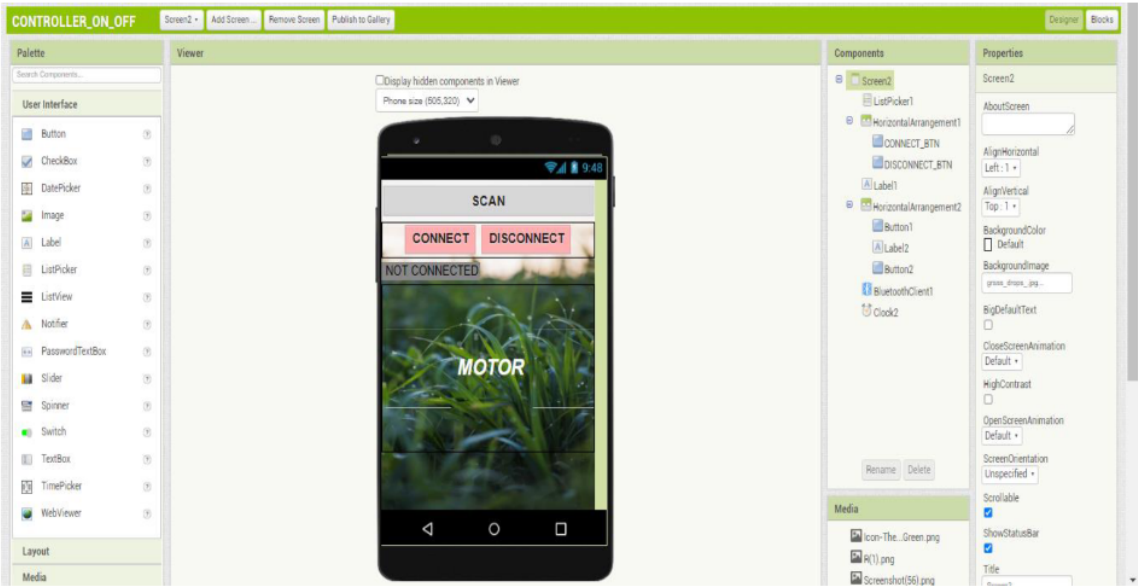**CODING & SOLUTIONING (Explain the features added in the project along with code)**

16. Feature 1

SCREEN 1:
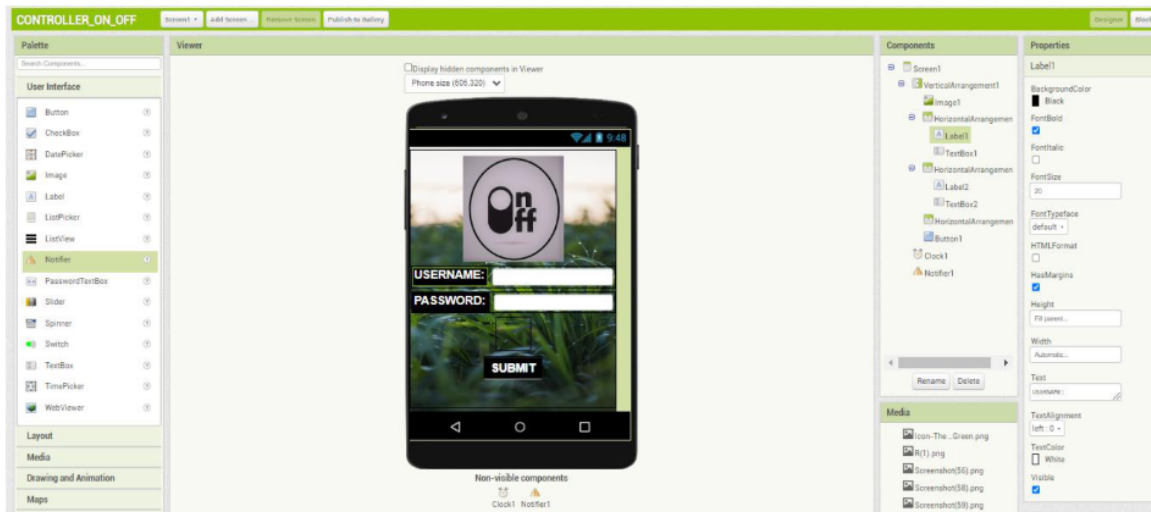
17. Feature 2

SCREEN 2 :

TESTING

18. Test Cases

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status
LoginPage_TC_O04	Functional	Login page	Verify user is able to log into application with InValid credentials		Enter InValid username/email in Email text box Enter valid password in password text box Click on login button	Username: chalam@gmail password: Testing123	Application should show 'Incorrect email or password ' validation message.	Working as expected	
LoginPage_TC_O04	Functional	Login page	Verify user is able to connect with bluetooth		if bluetooth was connected it will show connected		bluetooth will connected	Working as expected	
LoginPage_TC_O05	Functional	Login page	Verify user is able to control the motor button and it will show the temperature, humidity and soil moisture		click the button motor on or off		if the user click on button the motor will on and otherwise it will off	Working as expected	

19. User Acceptance Testing

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the [IoT based smart crop protection system for agriculture] project at the time of the release to User Acceptance Testing (UAT).

2. 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	10	4	2	3	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	24	14	13	26	77

3. 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	7	0	0	7
Client Application	51	0	0	51
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

RESULTS

20. PerformanceMetrics

This **ensures complete safety of crops from animals and from fire thus protecting the farmer's loss**.

ADVANTAGES & DISADVANTAGES

ADVANTAGES:

-These sensors equipped with wireless chips so that they can be controlled remotely.

-To help farmers monitor vital information like humidity, air temperature and soil quality using remote sensors, and to improve yields, plan more efficient irrigation, and make harvest forecasts.

DISADVANTAGES:

-Soil structure may be deteriorated.

A farmer needs to have access to crop data reliably at any time from any location, so

connection issues would cause an advanced monitoring system to be useless.-

CONCLUSION

Smart farming can make agriculture more profitable for the farmer. Decreasing resource inputs will save the farmer money and labor, and increased reliability of spatially explicit data will reduce risks

FUTURE SCOPE

      -Increase agriculture

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

APPENDIX

Source Code

```python
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random


#Provide your IBM Watson Device Credentials
organization = "bxobbs"
deviceType = "b5ibm"
deviceId = "b5device"
authMethod = "token"
authToken = "b55m1eibm"


# Initialize GPIO


def myCommandCallback(cmd):
    print("Command received: %s" % cmd.data['command'])
    status=cmd.data['command']
    if status=="lighton":
        print ("motor is on")
```

```python
    else :
        print ("motor 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()


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


while True:
        #Get Sensor Data from DHT11

        temp=random.randint(0,100)
        Humid=random.randint(0,100)

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

        success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0,
on_publish=myOnPublishCallback)
```

```python
        if not success:
            print("Not connected to IoTF")
        time.sleep(1)


    deviceCli.commandCallback = myCommandCallback


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

GitHub & Project Demo Link

GitHub-link: https://github.com/IBM-EPBL/IBM-Project-40941-1660637581/blob/main/project%20development%20phase/Sprint%204.pdf

Project demo link: