

SMARTFARMER - IOT ENABLED SMART FARMING APPLICATION

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1. INTRODUCTION

1.1 Overview:

The backbone of a nation's economic development is agriculture. For the benefit of the future, major scientific developments have recently been applied in a variety of agricultural domains. Despite many studies, accurate evaluation and productivity couldn't be achieved. The IOT Technology and system accessibility that draw in these things are being used by the Agriculture Parameters to gather and distribute information. In addition to acknowledging improved capacity, precision, and financial interconnected preferred stance, the IOT enables things to be selected recognised or potentially forced remotely across existing configuration. It also creates open gateways for all additional obvious merge of the substantial earth into PC-based frameworks. IOT specifically changes into an instance of the all-encompassing category of electronic physical structures when it is expanded with sensors and actuators, which also includes advances like smart grids, beautiful residences, intelligent movement, and smart urban communities.

1.2 Purpose:

We have made an effort to concentrate on several scientific applications that can be combined in the agricultural sector to improve accuracy and productivity while requiring less labour. We also provide a method to monitor agricultural fields from any remote point and evaluate the fundamental state of the farm. This project was inspired by the farmers whose livelihoods in agricultural areas depend entirely on the rain and irrigation from bore wells. Farmers have been irrigating the ground manually in recent years by manually turning the water pump ON/OFF as needed. This practise allows farmers to irrigate the land at regular intervals.

2.LITERATURE & PROPOSED SOLUTION

2.1 Existing Map Canvas

Our country's foundation is horticulture. In the distant past, agriculturalists determined the soil's ripeness and impacted assumptions to develop the type of product. They neglected to consider factors that would have made farming more difficult, such as moisture content, water level, and notably climate conditions. They use pesticides because of some suspicions, which could have a real influence on the crop production if the suspicions are incorrect. The final stage of the crop, which agriculturalists depend on, determines profitability.

2.2 References

1. [https://smartinternz.com/assets/docs/Smart%20Home%20Automation%20using%20IBM%20cloud%20Services%20\(1\).pdf](https://smartinternz.com/assets/docs/Smart%20Home%20Automation%20using%20IBM%20cloud%20Services%20(1).pdf)
2. [https://smartinternz.com/assets/docs/Smart%20Home%20Automation%20using%20IBM%20cloud%20Services%20\(1\).pdf](https://smartinternz.com/assets/docs/Smart%20Home%20Automation%20using%20IBM%20cloud%20Services%20(1).pdf)
3. <https://openweathermap.org/>
4. <https://smartinternz.com/assets/docs/Sending%20Http%20request%20to%20Open%20weather%20map%20website%20to%20get%20the%20weather%20forecast.pdf>
5. <https://www.youtube.com/watch?v=cicTw4SEdxk>
6. [https://smartinternz.com/assets/docs/Smart%20Home%20Automation%20using%20IBM%20cloud%20Services%20\(1\).pdf](https://smartinternz.com/assets/docs/Smart%20Home%20Automation%20using%20IBM%20cloud%20Services%20(1).pdf)

2.3 Problem Statement Definition:

Statement:

The proposed system collects information about different agricultural parameters(temperature, humidity) using an IoT sensor. These values collected are then sent over the mobile. Farmers can view all the parameters required for a smart farming system through the webpage.

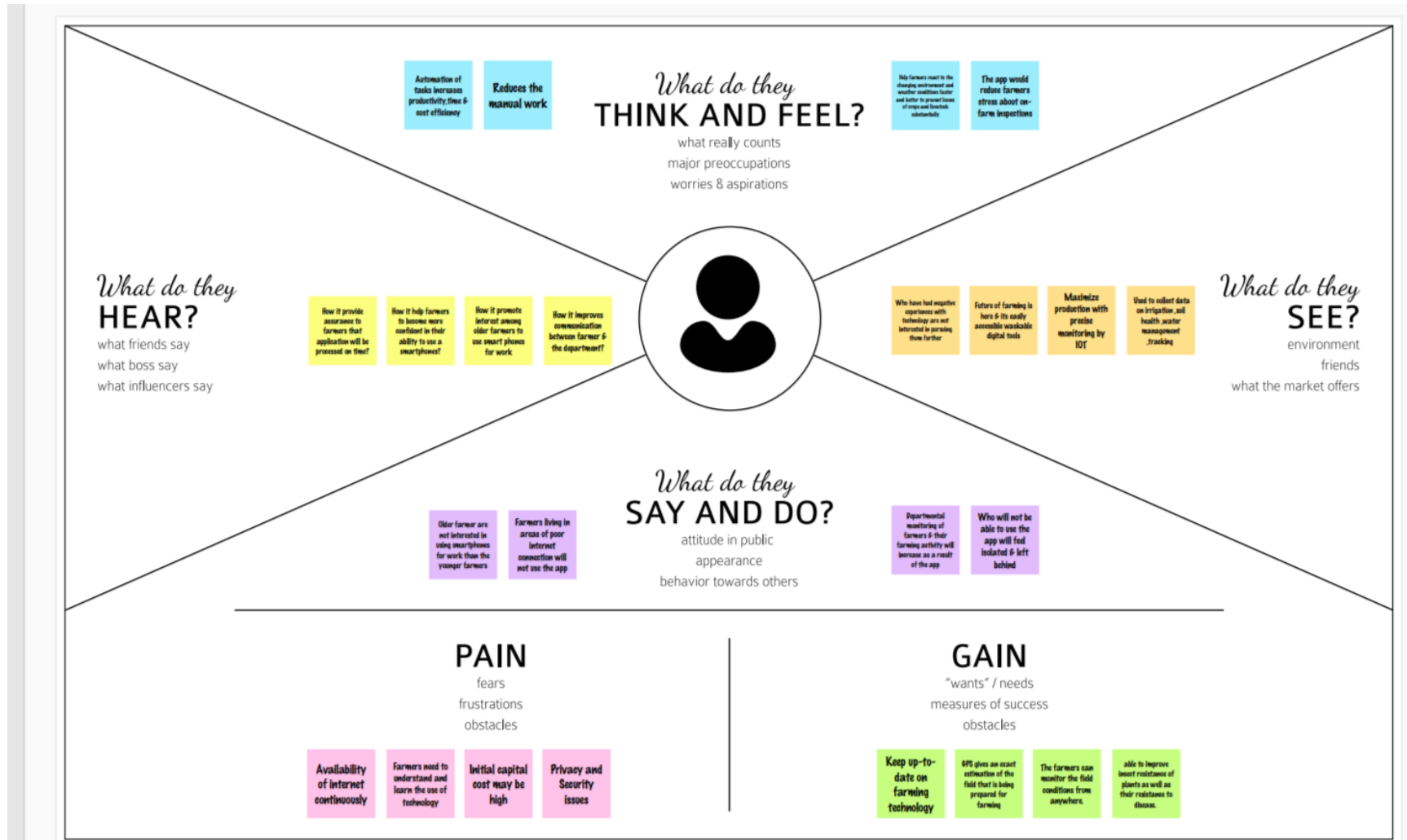
Definition:

The modern agricultural methods allow the use of sophisticated systems to be implemented for the betterment of job quality and increasing productivity. Such systems can provide a helping hand to the farmers and give them a chance to grow.

The proposed "Smart Farming" collects information about different agricultural parameters (temperature, humidity) using wireless sensor networks. These values collected are then sent over the mobile. All the values required by farmers for smart farming are viewing on the webpage which is stored in the databases. The system also facilitates the controlling of pump motors through IoT. This facility helps farmers to turn the motor in their farm on or off at any time.

3. IDEATION & PROPOSED SOLUTION:

3.1 Empathy Map Canvas:



3.2 Ideation & Brainstorming:

Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

- 10 minutes to prepare
- 1 hour to collaborate
- 3 people recommended

Brain template feedback

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

- 10 minutes

Team guidelines: Define who should participate in the session and what to do. Team should brainstorm on your own ahead.

Set the goal: Think about the problem you're trying to solve or what you're looking for in the brainstorming session.

Learn how to use the facilitator's book: Use the Facilitator's Supplement to set up a happy and productive session.

Open editor

Define your problem statement

What problem are you trying to solve? Frame your problem as a clear, brief, life statement. This will be the focus of your brainstorm.

- 10 minutes

PROBLEM: Nurses are under pressure to provide more than just medical care and advice. They need to be able to help patients deal with their problems.

Key rules of brainstorming:

- Focus on needs and potential solutions
- Stay on topic
- Brainstorm with others
- Don't judge
- Listen to others
- Be free to voice
- Expand on ideas

Brainstorm

Write down any ideas that come to mind that address your problem statement.

- 10 minutes

IDEAS: Write down any ideas that come to mind that address your problem statement.

IDEAS: Write down any ideas that come to mind that address your problem statement.

IDEAS: Write down any ideas that come to mind that address your problem statement.

Group ideas

Take turns sharing your ideas with clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence that says if it's a cluster is bigger than six sticky notes, try and use it you and break it up into smaller sub-groups.

- 10 minutes

CATEGORY 1: ...

CATEGORY 2: ...

CATEGORY 3: ...

Prioritize

You're now 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

Feasibility

Brain template feedback

After you collaborate

You can export the mind as an image or pdf to share with members of your company who might find it helpful.

Quick additions:

- Share the mind: Share a link to the mind with stakeholders to keep them in the loop about the outcome of the session.
- Export the mind: Export a copy of the mind as a PDF or PNG to share with stakeholders, or use it as a guide.

Keep moving forward:

- Building blocks: Define the components of a new idea or strategy. [Open the template](#)
- Customer experience journey map: Understand customer needs, motivations, and emotions that drive experience. [Open the template](#)
- Strategy, outcomes, opportunities & threats: Identify strengths, weaknesses, opportunities, and threats (SWOT) to develop a plan. [Open the template](#)

Brain template feedback

3.3 Proposed Solution: -

S. NO	Parameter	Description
1	Problem Statement (Problem to be solved)	<ul style="list-style-type: none">● Farmers often find it difficult to do their personal tasks while monitoring the field.● Farmers spend extra time watering their fields because they have to wait for the water to completely cover the entire area.● Farmers also need to be aware of the soil's moisture, temperature, and humidity levels because these factors have an impact on plant development and crop yield.● The motor's power consumption procedure. Only occasionally is electricity available in communities
2	Idea / Solution description	<ul style="list-style-type: none">● Description of an idea or solution • By using sensors to gather data on temperature, humidity, soil moisture, and other variables and providing that data to farmers, we can simply improve plant productivity.● Precision farming uses drones to monitor crop status and identify which crops need nutrients and water, among other things. We can use time control systems to turn on and off motors and irrigation systems

3	Novelty / Uniqueness	<p>Remote access:</p> <ul style="list-style-type: none"> ● It enables farmers to remotely turn on and off irrigation systems and motors. <p>Alert messages;</p> <ul style="list-style-type: none"> ● IOT sensors, such as those that measure temperature, humidity, soil moisture, and motion, gather data from the farming environment and pass it to a controller unit (such as an Arduino UNO) so that it can be sent to a communication device to reach the farmers (customer).
4	Social Impact/ Customer Satisfaction	<ul style="list-style-type: none"> ● It frequently saves time. ● It lessens the requirement for additional labour. ● It has the potential to boost production efficiency. ● Offer healthy, organic foods. ● IoT can also boost sales in e-commerce businesses. ● It creates a prosperous society.
5	Social Impact/ Customer Satisfaction	Revenue (No. of Users vs Months)
6	Scalability of the Solution	<ul style="list-style-type: none"> ● Scalability in smart farming refers to a system's ability to expand its capacity, such as the number of technological components like sensors and actuators, while allowing for prompt analysis.

3.4 Problem Solution fit: -

Define CS, fit into CC	<div>1. CUSTOMER SEGMENT(S)<div>CS</div></div> <div>Who is your customer? i.e. working parents of 0-5 y.o. kids</div> <div>The intended consumer for this product is a farmer who raises crops. Our goal is to support them by remote field monitoring conditions. This thing avoids the death of agriculture.</div>	<div>6. CUSTOMER CONSTRAINTS<div>CC</div></div> <div>What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices.</div> <div>It is difficult to employ numerous sensors. Success necessitates unrestricted or continuous internet access connection.</div>	<div>5. AVAILABLE SOLUTIONS<div>AS</div></div> <div>Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking</div> <div>The watering procedure is automated via IoT. The watering process will be automated by field elements, as well as meteorological information was gathered, processed. Efficacy is constrained. Data over short distances.Storage is difficult.</div>	Explore AS, differentiate
	<div>2. JOBS-TO-BE-DONE / PROBLEMS<div>J&P</div></div> <div>Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.</div> <div>The purpose of this product is to use sensors to gather various field parameters and process them. Utilising a central processing unit IoT utilises the cloud to transmit data and maintain data. Farmers make use of Weather API to help with selection. By utilising mobile applications judges made by farmers.</div>	<div>9. PROBLEM ROOT CAUSE<div>RC</div></div> <div>What is the real reason that this problem exists? What is the back story behind the need to do this job? i.e. customers have to do it because of the change in regulations.</div> <div>Agricultural operations were challenging for farmers due to the frequently unpredictable and shifting weather, climate. Choosing whether or not to water your plants, because these crucial. Whenever a farmer is absent, it's challenging to monitor the field, which cause harm to crops.</div>	<div>7. BEHAVIOUR<div>BE</div></div> <div>What does your customer do to address the problem and get the job done? i.e. Directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)</div> <div>Use a proper drainage system to offset the effects of additional water from heavy rain via means of hybrid plants resistant to pests.</div>	
<div>3. TRIGGERS<div>TR</div></div> <div>What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.</div> <div>It is difficult for farmers to supply enough irrigation. Reduced yields and lower profits are consequences of inadequate water supplies for farmers. Farmers struggle. Weather forecasting time.</div>	<div>10. YOUR SOLUTION<div>SL</div></div> <div>If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality. If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.</div> <div>Our product gathers information from several sensor kinds and transmits the values to our primary server. As well gathers meteorological information from the Climate API. The ultimate choice to the farmer creates irrigation for the crop. Utilising a smartphone app.</div>	<div>8.CHANNELS of BEHAVIOUR<div>CH</div></div> <div>8.1 ONLINE What kind of actions do customers take online? Extract online channels from #7</div> <div>8.2 OFFLINE What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.</div> <div>ONLINE: Giving the farmer access to information about the pH and moisture content of the soil by way of the internet. Online help will be given to the consumer in using the item.</div> <div>OFFLINE: Awareness campaigns will be held to explain the significance and benefits of the IoT and automation in the creation of agriculture.</div>	Identify strong TR & EM	
<div>4. EMOTIONS: BEFORE / AFTER<div>EM</div></div> <div>How do customers feel when they face a problem or a job and afterwards? i.e. lost, insecure > confident, in control - use it in your communication strategy & design.</div> <div>BEFORE: Poor weather predicting skills-irrational choices-low yield.</div> <div>AFRER: Reliable source of data good judgement-high yield</div>				
Identify strong TR & EM				

4.REQUIREMENT ANALYSIS:

4.1 Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Gmail
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Log in to system	Check Roles of Access Check Credentials
FR-4	Manage Modules	Manage System Admins Manage Roles of User Manage User permission
FR-5	Check whether details	Temperature details Humidity details
FR-6	Log out	Exit

4.2 Non-functional Requirements:

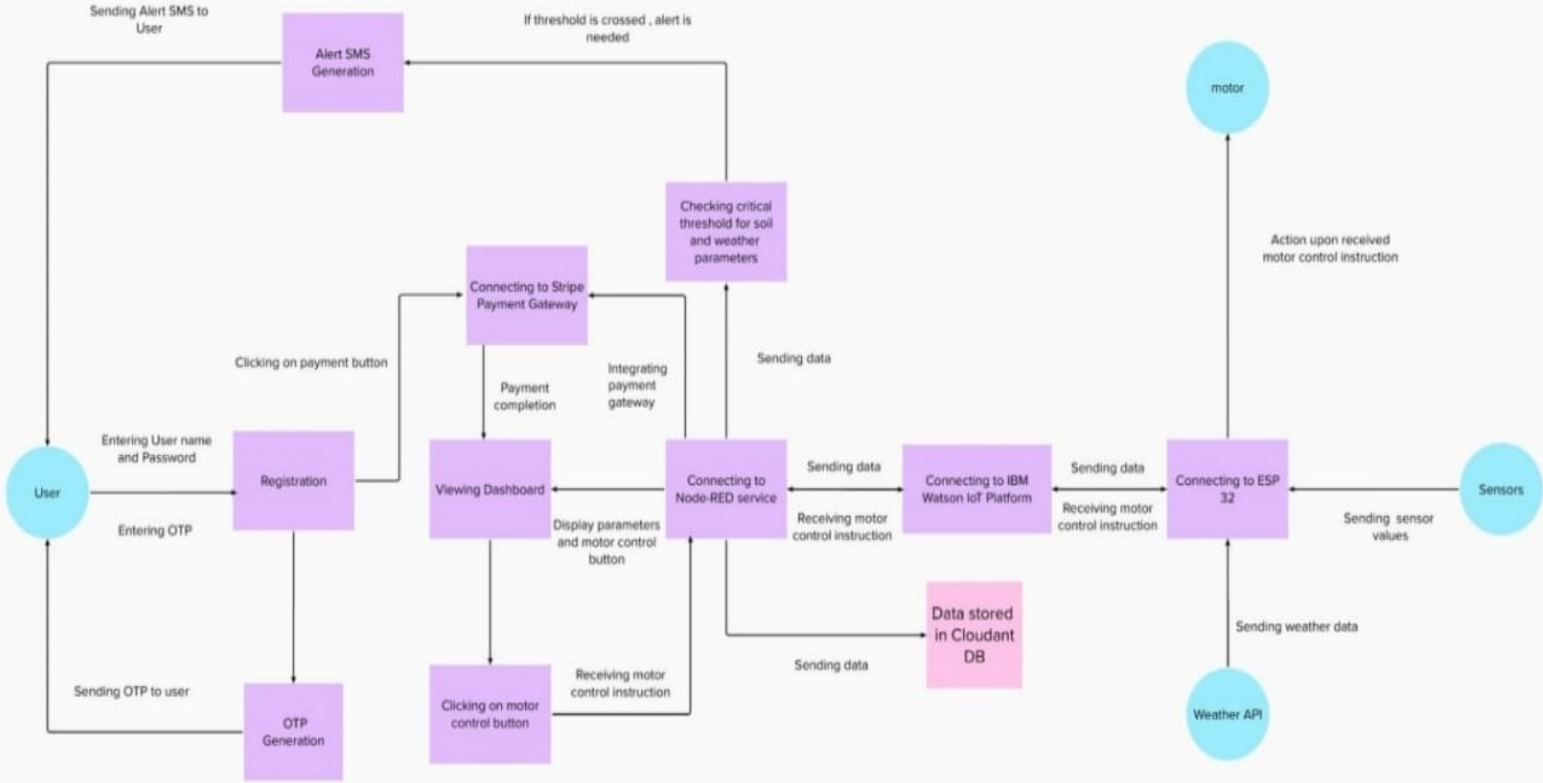
Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	Usability is the capacity to pick something up fast, utilise it efficiently, retain it, use it without making a mistake, and enjoy it.
NFR-2	Security	Information that is private or confidential must always be kept secure, including when being gathered, processed, and stored.
NFR-3	Reliability	With shared protection, a better cost-to-reliability trade-off is realised. The strategy makes use of specialised and shared protective techniques to prevent interruptions in agricultural service.
NFR-4	Performance	If integrated sensors are employed to monitor soil and environmental features, farming operations will be monitored more successfully overall.
NFR-5	Availability	It is possible to automatically change temperature, humidity, and other aspects of farming equipment by connecting data about crops, weather, and equipment.
NFR-6	Scalability	Scalability for IoT platforms is a significant concern. It has been shown that different architectural choices made for IoT platforms affect the scalability of the system and that automatic real-time decision-making is feasible even in a situation with a large number

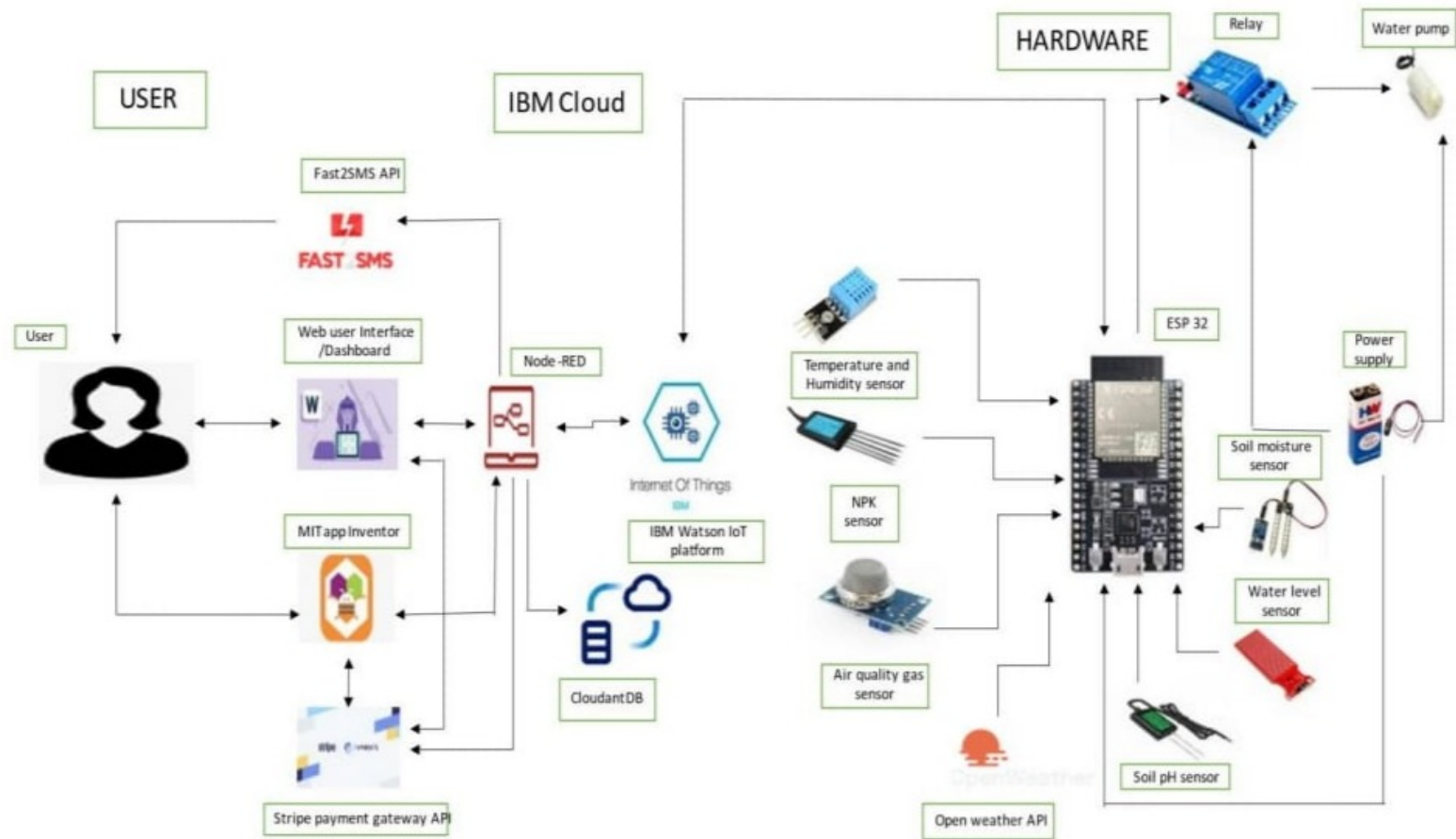
		of users
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5.PROJECT DESIGN:

5.1 Data flow Diagram



5.2 Solution & Technical Architecture:



1. Different sensors and APIs are used to sense the various soil and environmental factors (temperature, humidity), which are then connected to an ESP32, from which the obtained value is sent over MQTT to IBM's cloud.
2. A web application or mobile application made with MIT App Inventor collects data via MQTT, allowing a farmer to monitor the parameters even when the farmer is far from his field and utilizing Fast2SMS to send the farmer important alert messages.
3. One of the most important duties for farmers is watering the crops, and they may decide whether to water the crops now or later by keeping an eye on the sensor parameters and managing the motor pumps directly from the mobile or online application using MQTT.
4. Node-RED is a flow-based programming tool that is used to wire and connect hardware, APIs, and online services together. In the design, coordination is carried out between applications (web and mobile), hardware (ESP32, sensors and actuators), and services (SMS).

Table-1: Components & Technologies:

S.No	Component	Technology	Description
1.	User Interface-1	NodeRED Dashboard	NodeRED dashboard is utilized to display values from the IBM Watson IoT Platform, from which the user can note sensor values and run motors.
2.	User Interface-2	MIT App Inventor	The user can note sensor values and operate a motor by applying a mobile application that shows values from the IBM Watson IoT platform.
3.	Hardwarecomponent-1	ESP32 board (ESP32 Devkit V1),C++	ESP32 board (ESP32 Devkit V1),C++ Sensor values are sent to the IBM Watson IoT Platform, and operations are performed via button clicks in the user interface.
4.	Hardware component -2	Waterlevel Sensor (FS-37A)	used to measure the water level in a container where water is dispensed
5.	Hardwarecomponent-3	Soil pH sensor	Soil pH sensor used to determine soil acidity using the pH level of the soil
6.	Hardware component-4	Soil moisture sensor (AR 605)	Soil moisture sensor (AR 605) utilized to calculate the volumetric water content of

			soil
7.	Hardwarecomponent-5	Temperatureand Humidity sensor (DHT 11)	used to measure the humidity and of the environment
8.	Hardware component-6	NPK sensor	used to estimate soil fertility by measuring nutrients in soil such as nitrogen, phosphorus, and potassium.
9.	Hardwarecomponent-7	Airquality gas sensor (MQ135)	used to identify airborne pollutants including smoke, CO2, and ammonia
10.	Hardwarecomponent-8	Relay	used to boost the output of an ESP32 with an external power supply in order to power a pump.
11.	Hardwarecomponent-9	Water pump (EK1893)	used to release water from a container and hydrate soil
12.	Hardwarecomponent-10	Power supply (5V battery)	used to supply the ESP32 board and the Relay with electricity
13.	Application Logic-1	IBM Watson IoT Platform	The IBM Watson IoT platform collects data from the devices handles device connections, and aids in the development of software applications.
14.	Application Logic-2	Node RED Service, NodeJS	The NodeRED service offers a means to analyze data acquired, present information online, and use APIs to integrate external

			services and communicate with mobile applications.
15.	Cloud Database	IBM Cloudant DB	Sensor data is kept in a cloud database service.
16.	External API-1	Fast2SMS API	enables the farmer to receive warnings when a sensor parameter value threshold is reached
17.	External API-2	OpenWeather API	used to offer analysis with precise local weather information such as temperature, humidity, pressure, wind speed, etc.
18.	External API-3	Stripe Payment Gateway API	uses a single API to take a multitude of payment methods for subscription payments.

Table-2: Application Characteristics:

S. No	Characteristics	Technology	Description
1.	Open-SourceFrameworks	Fast2SMSAPI, OpenWeather API,Stripe Payment gatewayAPI	Describe the utilized open-source frameworks.

2.	Security Implementations	Twostep authentications (Password and OTP)	List every security and access control measure used, including firewalls.
3.	ScalableArchitecture	3 tierarchitecture	User interface, cloud services, and hardware are all implemented using a three-layer design.
4.	Availability	IBM WatsonIoT Platform, IBM loadbalancer	The IoT platform offers global application availability so that users can remotely access data from anywhere in the world. A load balancer balances the availability of information for several users at once.
5.	Performance	IBMWatson IoT Platform, MQTT, ESP32 Board	The usage of MQTT for data transfer aids in maximizing data transfer performance, and the use of the multi-core, fast-processing ESP32 processor aids in offering high performance.

5.3 User Stories:

User Type	Functional Requirement	User Story No	User story/Task	Acceptance Criteria	Priority	Release
Customer(Mobile User)	Registration	USN-1	As a user, I can register for application by entering my email, mobile number, password, and confirming my password.	I can access my account/dashboard	High	Sprint-2
		USN-2	As a user, I will receive OTP	I can authenticate my account by submitting the OTP.	High	Sprint-2
		USN-3	As a user, I can register for the application through Facebook	I can register and access account using Facebook	Low	Sprint-2
		USN-4	As a user, I can opt for different subscription plans available in the app and make payment for that.	I will go to payment gateway to pay for subscription	Medium	Sprint-3

	Login	USN-5	As a user, if I can log into the application by entering email/mobile number& password	I can access my Dashboard	High	Sprint-2
		USN-6	As a user, if I forget my password I will receive an auto-generated password through my email.	I will receive my new password through email.	High	Sprint-2
	Dashboard	USN-7	As a user, I can enter into dashboard by using navigation panel.	I can access the dashboard by using the navigation panel.	High	Sprint-2
Custom er(web user)	Registration	USN-1	As a user, I can register for the application by entering my email, mobile number, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive an email to confirm my registration.	I can authenticate my account by confirming through the mail sent.	High	Sprint-1

		USN-3	As a user, I can register for the application through Facebook	I can register and access account using Facebook	Low	Sprint-1
		USN-4	As a user, I can opt for different subscription plans available in the website and make payment for that.	I will go to payment gateway to pay for subscription	Medium	Sprint-3
	Login	USN-5	As a user, I can log into the application by entering email & password	I can access my Dashboard	High	Sprint-1
		USN-6	As a user, if I forget my password I will receive an auto-generated password through my email.	I will receive my new password through email.	High	Sprint-1
	Dashboard	USN-7	As a user, I can enter into dashboard by using navigation panel.	I can access the dashboard by using the navigation panel	High	Sprint-1

6.PROJECT PLANNING & SCHEDULING:

6.1 Sprint Planning & Estimation:

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Simulation creation	USN-1	Connect Sensors and Arduino with python code	2	High	Jaishree P, Sowmiya M
Sprint-2	Software	USN-2	Creating device in theIBM Watson IoT platform, workflow for IoT scenarios using Node-Red	2	High	Sowmiya M, Jaishree P
Sprint-3	MIT AppInventor	USN-3	Develop an application for the Smart farmerproject using MIT App Inventor	2	High	Sowmiya M Mahalakshmi E
Sprint-3	Dashboard	USN-3	Design the Modules and test the app	2	High	Yerramachetty Puja, E.Mahalakshmi
Sprint-4	Web UI	USN-4	To make the user to interact with software.	2	High	Yerramachetty Puja, E.Mahalakshmi

6.2 Sprint Delivery Schedule

Sprint	Total Story Points	Duration	Sprint StartDate	Sprint End Date(Planned)	Story Points Completed (as on PlannedEnd 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		05 Oct 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022		12 Oct 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022		15 Oct 2022

Velocity:

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

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 (AV) per iteration unit (story points per day)

6.3 REPORTS FROM JIRA:

The screenshot displays the Jira Roadmap interface. The left sidebar shows the project navigation menu with sections for PLANNING (Roadmap, Backlog, Board) and DEVELOPMENT (Code, Project pages, Add shortcut, Project settings). The main area shows the Roadmap view for the project 'Smart Farming-lot Enabled Smart Farming Application'. It features a timeline with columns for NOV '21 and DEC '21. Under the 'Sprints' section, there are five items: SFIEA-2 sprint1, SFIEA-3 sprint2, SFIEA-4 sprint3, SFIEA-5 sprint4, and SFIEA-9 get the output from mit inventer. Each sprint item has a green 'DONE' status and a purple bar representing its duration. A '+ Create Epic' button is at the bottom of the sprint list. The right sidebar shows a 'Quickstart' panel with a list of tasks: 'Create a project', 'Map out your project goals', 'Identify small chunks of work', 'Monitor and manage risk', 'Create an issue', and 'Invite your teammates'. Below the list, there is a section titled 'Issues are individual pieces of work that you assign to teammates. Issues can be tasks or stories.' with buttons for 'Show me' and 'View issue tutorial'. The bottom of the screen shows the Windows taskbar with the search bar, taskbar icons, and system tray information including temperature (27°C), weather (Haze), and time (06:45 PM, 19-11-2022).

Projects / Smart Farming-lot Enabled Smart Farming Application

Roadmap

Search: [] Status category: [] Epic: []

	NOV '21	DEC '21
Sprints		
> + SFIEA-2 sprint1 DONE	[Bar]	
> + SFIEA-3 sprint2 DONE	[Bar]	
> + SFIEA-4 sprint3 DONE	[Bar]	
+ SFIEA-5 sprint4 DONE	[Bar]	
+ SFIEA-9 get the output from mit inventer	[Bar]	
+ Create Epic		

Today Weeks Months Quarters

Quickstart

- ✓ Create a project
- ✓ Map out your project goals
- ✓ Identify small chunks of work
- ✓ Monitor and manage risk
- ✓ Create an issue
- ✓ Invite your teammates

Issues are individual pieces of work that you assign to teammates. Issues can be tasks or stories.

Show me View issue tutorial

Dismiss Quickstart

7.CODING AND SOLUTION :

Python Code

```
import wiotp.sdk.device
import time
import random
myConfig = {
    "identity": {
        "orgId": "a4peyu",
        "typeId": "Nodered_123",
        "deviceId": "56789"
    },
    "auth": {
        "token": "_QisKFkGI4WapUP1CP"
    }
}
client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
client.connect()
```

```

def myCommandCallback(cmd):
    print("Message received from IBM IoT Platform: %s" % cmd.data['command'])
    m=cmd.data['command']
    if (m=="motoron"):
        print ("Motor is switched on")
    elif (m=="motoroff"):
        print("Motor is switched OFF")
    print(" ")

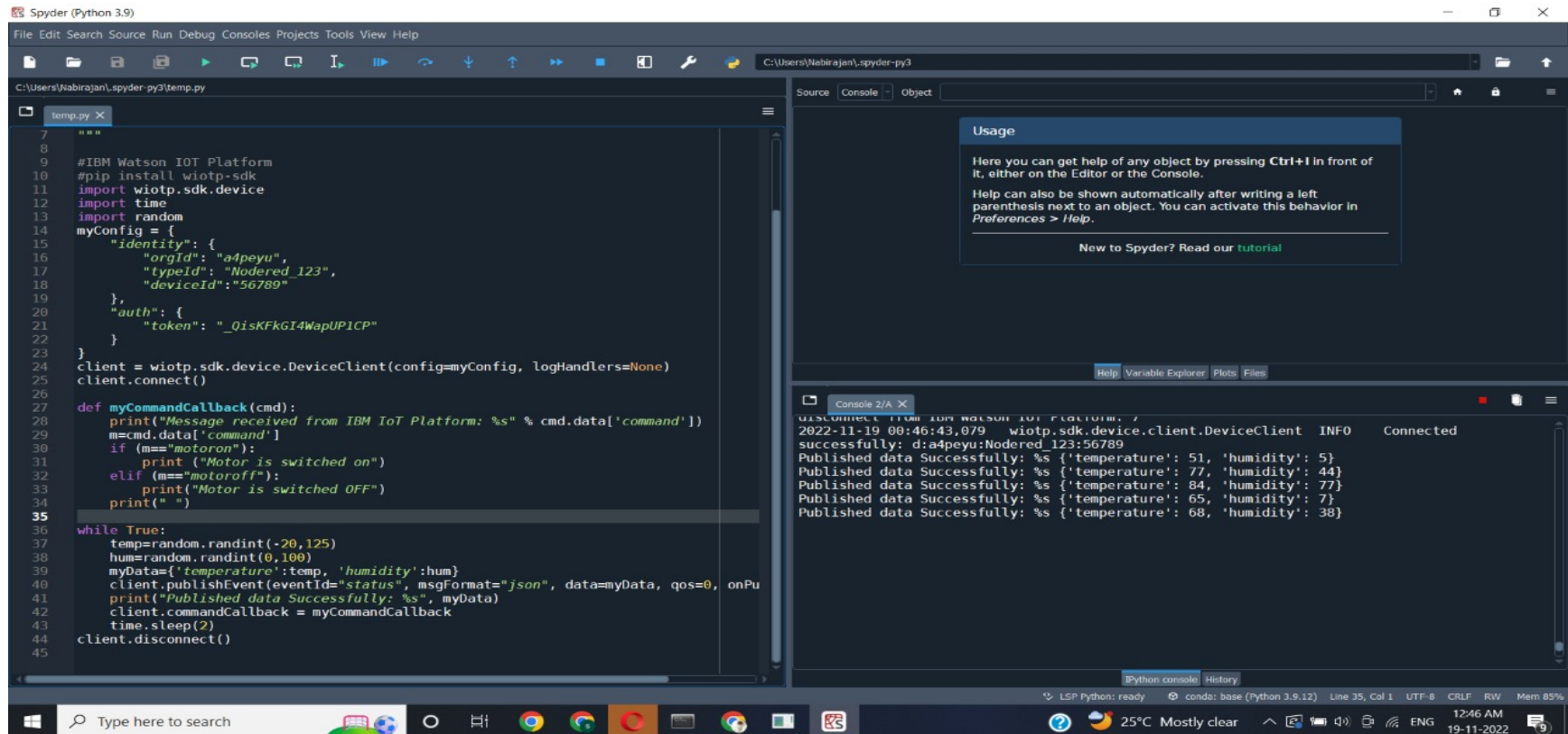
while True:
    temp=random.randint(-20,125)
    hum=random.randint(0,100)
    myData={'temperature':temp, 'humidity':hum}
    client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0, onPublish=None)
    print("Published data Successfully: %s", myData)
    client.commandCallback = myCommandCallback

```

time.sleep(2)

client.disconnect()

Output:



The screenshot shows the Spyder Python IDE interface. The main editor window displays a Python script named `temp.py`. The script imports `wiotp.sdk.device`, `time`, and `random`. It defines a configuration dictionary `myConfig` for an IBM Watson IoT Platform device. A `DeviceClient` is created and connected. A callback function `myCommandCallback` is defined to handle incoming commands like 'motoron' and 'motoroff'. A `while True` loop generates random temperature and humidity data, publishes it to the IoT platform, and sleeps for 2 seconds before disconnecting.

The console window on the right shows the execution output. It starts with a 'Usage' message, followed by a 'Connected' status. Subsequent lines show successful data publishing with specific temperature and humidity values.

```
7 """
8
9 #IBM Watson IoT Platform
10 #pip install wiotp-sdk
11 import wiotp.sdk.device
12 import time
13 import random
14 myConfig = {
15     "identity": {
16         "orgId": "a4peyu",
17         "typeId": "Nodered_123",
18         "deviceId": "56789"
19     },
20     "auth": {
21         "token": "_QisKFkGI4WapUP1CP"
22     }
23 }
24 client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
25 client.connect()
26
27 def myCommandCallback(cmd):
28     print("Message received from IBM IoT Platform: %s" % cmd.data['command'])
29     m=cmd.data['command']
30     if (m=="motoron"):
31         print("Motor is switched on")
32     elif (m=="motoroff"):
33         print("Motor is switched OFF")
34     print(" ")
35
36 while True:
37     temp=random.randint(-20,125)
38     hum=random.randint(0,100)
39     myData={'temperature':temp, 'humidity':hum}
40     client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0, onPu
41     print("Published data Successfully: %s", myData)
42     client.commandCallback = myCommandCallback
43     time.sleep(2)
44 client.disconnect()
45
```

Console 2/A X

```
Disconnect from IBM Watson IoT Platform: /
2022-11-19 00:46:43,079 wiotp.sdk.device.client.DeviceClient INFO Connected
successfully: d:a4peyu:Nodered_123:56789
Published data Successfully: %s {'temperature': 51, 'humidity': 5}
Published data Successfully: %s {'temperature': 77, 'humidity': 44}
Published data Successfully: %s {'temperature': 84, 'humidity': 77}
Published data Successfully: %s {'temperature': 65, 'humidity': 7}
Published data Successfully: %s {'temperature': 68, 'humidity': 38}
```

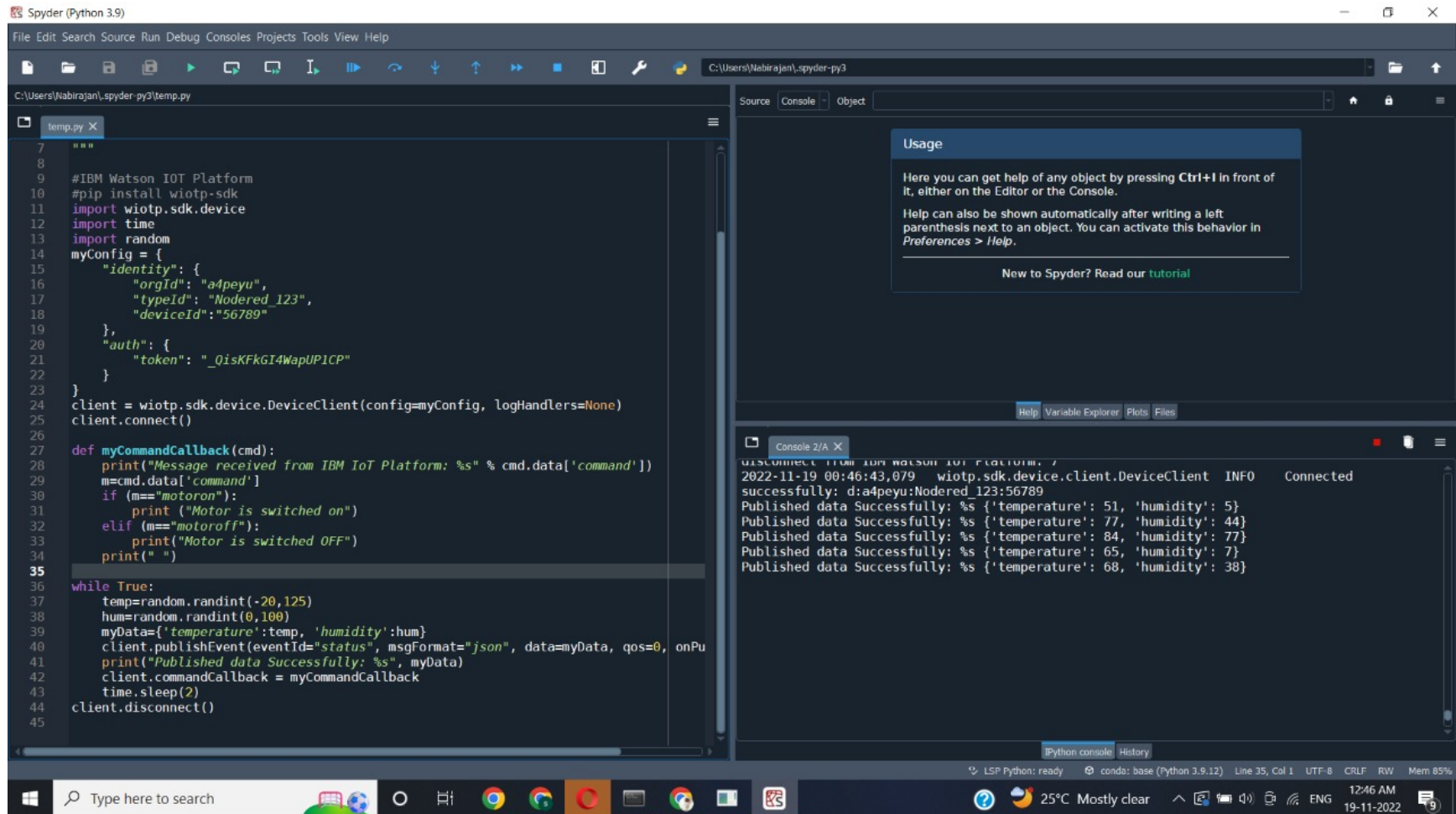
Python console History

LSP Python: ready conda: base (Python 3.9.12) Line 35, Col 1 UTF-8 CRLF RVM Mem 85%

Type here to search 25°C Mostly clear 12:46 AM 19-11-2022

8.TESTING:

PYTHON CODE TO GET CONNECTED WITH IBM IOT WATSON PLATFORM:



The screenshot displays the Spyder Python IDE interface. The left pane shows a Python script named `temp.py` with the following code:

```
7 """
8
9 #IBM Watson IoT Platform
10 #pip install wiotp-sdk
11 import wiotp.sdk.device
12 import time
13 import random
14 myConfig = {
15     "identity": {
16         "orgId": "a4peyu",
17         "typeId": "Nodered_123",
18         "deviceId": "56789"
19     },
20     "auth": {
21         "token": "_QisKFkGI4WapUP1CP"
22     }
23 }
24 client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
25 client.connect()
26
27 def myCommandCallback(cmd):
28     print("Message received from IBM IoT Platform: %s" % cmd.data['command'])
29     m=cmd.data['command']
30     if (m=="motoron"):
31         print ("Motor is switched on")
32     elif (m=="motoroff"):
33         print("Motor is switched OFF")
34     print(" ")
35
36 while True:
37     temp=random.randint(-20,125)
38     hum=random.randint(0,100)
39     myData={'temperature':temp, 'humidity':hum}
40     client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0, onPu
41     print("Published data Successfully: %s", myData)
42     client.commandCallback = myCommandCallback
43     time.sleep(2)
44 client.disconnect()
45
```

The right pane shows the console output, which includes a usage message and the execution results:

```
Usage
Here you can get help of any object by pressing Ctrl+I in front of
it, either on the Editor or the Console.
Help can also be shown automatically after writing a left
parenthesis next to an object. You can activate this behavior in
Preferences > Help.
New to Spyder? Read our tutorial

Help | Variable Explorer | Plots | Files

Console 2/A X
DISCONNECT FROM IBM WATSON IOT PLATFORM. /
2022-11-19 00:46:43,079 wiotp.sdk.device.client.DeviceClient INFO Connected
successfully: d:a4peyu:Nodered_123:56789
Published data Successfully: %s {'temperature': 51, 'humidity': 5}
Published data Successfully: %s {'temperature': 77, 'humidity': 44}
Published data Successfully: %s {'temperature': 84, 'humidity': 77}
Published data Successfully: %s {'temperature': 65, 'humidity': 7}
Published data Successfully: %s {'temperature': 68, 'humidity': 38}
```

The bottom status bar indicates the environment is ready: LSP Python: ready, conda: base (Python 3.9.12), Line 35, Col 1, UTF-8, CRLF, RW, Mem 85%.

IBM Watson IoT Platform

Search by Device ID

Device Simulator ☒

Device ID	Status	Device Type	Class ID	Date Added	Descriptive Location
56789	Connected	Nodered_123	Device	Nov 18, 2022 9:32 PM	

Identity Device Information Recent Events State Logs

Device ID: 56789

Device Type: Nodered_123

Date Added: Nov 18, 2022 9:32 PM

Added By: sowmiyamanickam248@gmail.com

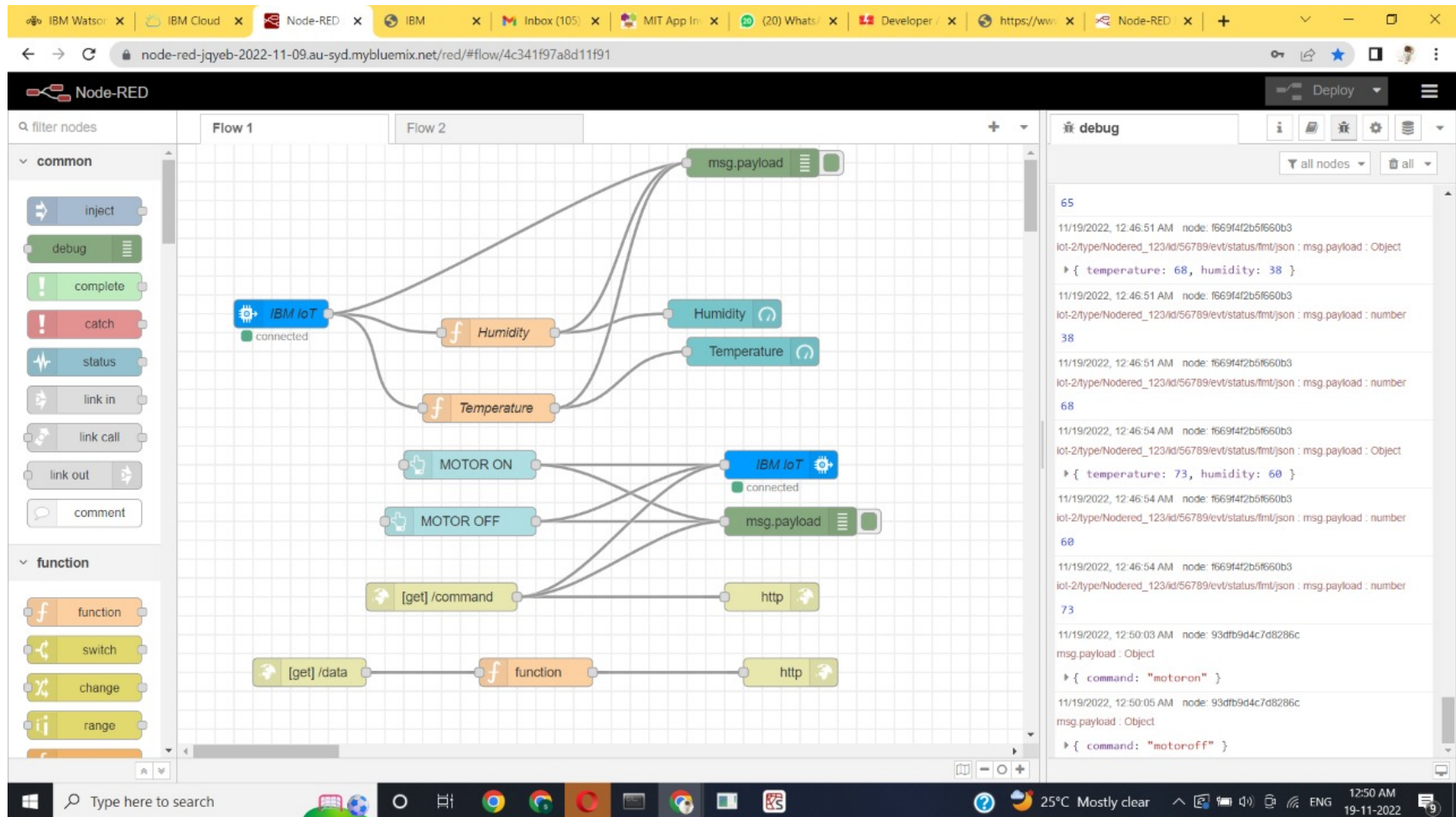
Connection Status: **Connected**
Connection Time: Nov 19, 2022 12:22 AM
Client Address: 115.247.148.38 SecureToken

Items per page 50 | 1-1 of 1 item

1 of 1 page

1 Simulation running

WEB APPLICATION: NORERED CONNECTION:



node-red-jqyeb-2022-11-09.au-syd.mybluemix.net/ui/#!/?socketid=-Yl6ZZt59dgGamSMAAAX

New dashboard

lot UI

MOTOR ON

Humidity

11
percentage

MOTOR OFF

Temperature

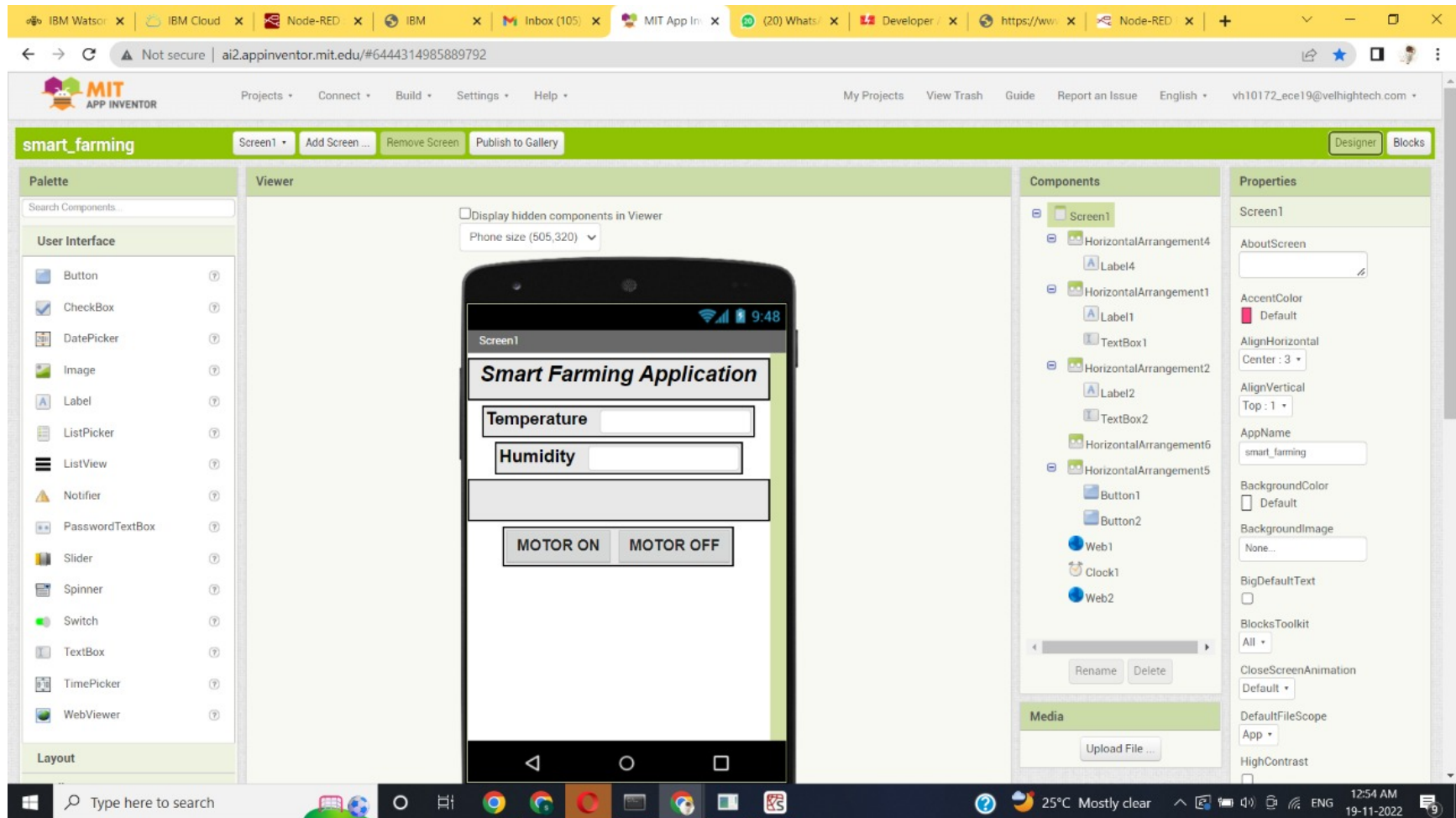
-5
centigrades

Type here to search

25°C Mostly clear

12:44 AM
19-11-2022

MOBILE APPLICATION: MIT APP INVENTOR FRONT END:



MIT APP INVENTOR BACK END:

The screenshot displays the MIT App Inventor web interface for a project named "smart_farming". The interface is divided into several sections:

- Top Bar:** Contains navigation links like "Projects", "Connect", "Build", "Settings", and "Help". It also shows the user's name "vh10172_ece19@velhighitech.com".
- Project Bar:** Shows the project name "smart_farming" and buttons for "Screen1", "Add Screen...", "Remove Screen", and "Publish to Gallery".
- Blocks Palette:** Located on the left, it lists various built-in blocks categorized by function: Control, Logic, Math, Text, Lists, Dictionaries, Colors, Variables, Procedures, and Screen1. The "Screen1" category is expanded, showing "HorizontalArrangemen", "Label4", "Label1", and "TextBox1".
- Viewer:** The central area where the code is written. It contains three main event-driven blocks:
 - when Clock1.Timer:** A "do" block containing:
 - set Web1.Uri to "https://node-red-jqyeb-2022-11-09.au-syd.mybluem..."
 - call Web1.Get
 - when Web1.GotText:** A block with a table for response data (url, responseCode, responseType, responseContent). The "do" block contains:
 - set TextBox1.Text to look up in pairs key "temperature" (using Web1.JsonTextDecode and get responseContent)
 - set TextBox2.Text to look up in pairs key "humidity" (using Web1.JsonTextDecode and get responseContent)
 - when Button1.Click:** A "do" block containing:
 - set Web2.Uri to "https://node-red-jqyeb-2022-11-09.au-syd.mybluem..."
 - call Web2.Get
 - when Button2.Click:** A "do" block containing:
 - set Web2.Uri to "https://node-red-jqyeb-2022-11-09.au-syd.mybluem..."
 - call Web2.Get
- Media Section:** Located at the bottom left, it includes an "Upload File..." button.
- Bottom Bar:** Shows the Windows taskbar with various application icons and system information like "25°C Mostly clear" and "12:54 AM 19-11-2022".

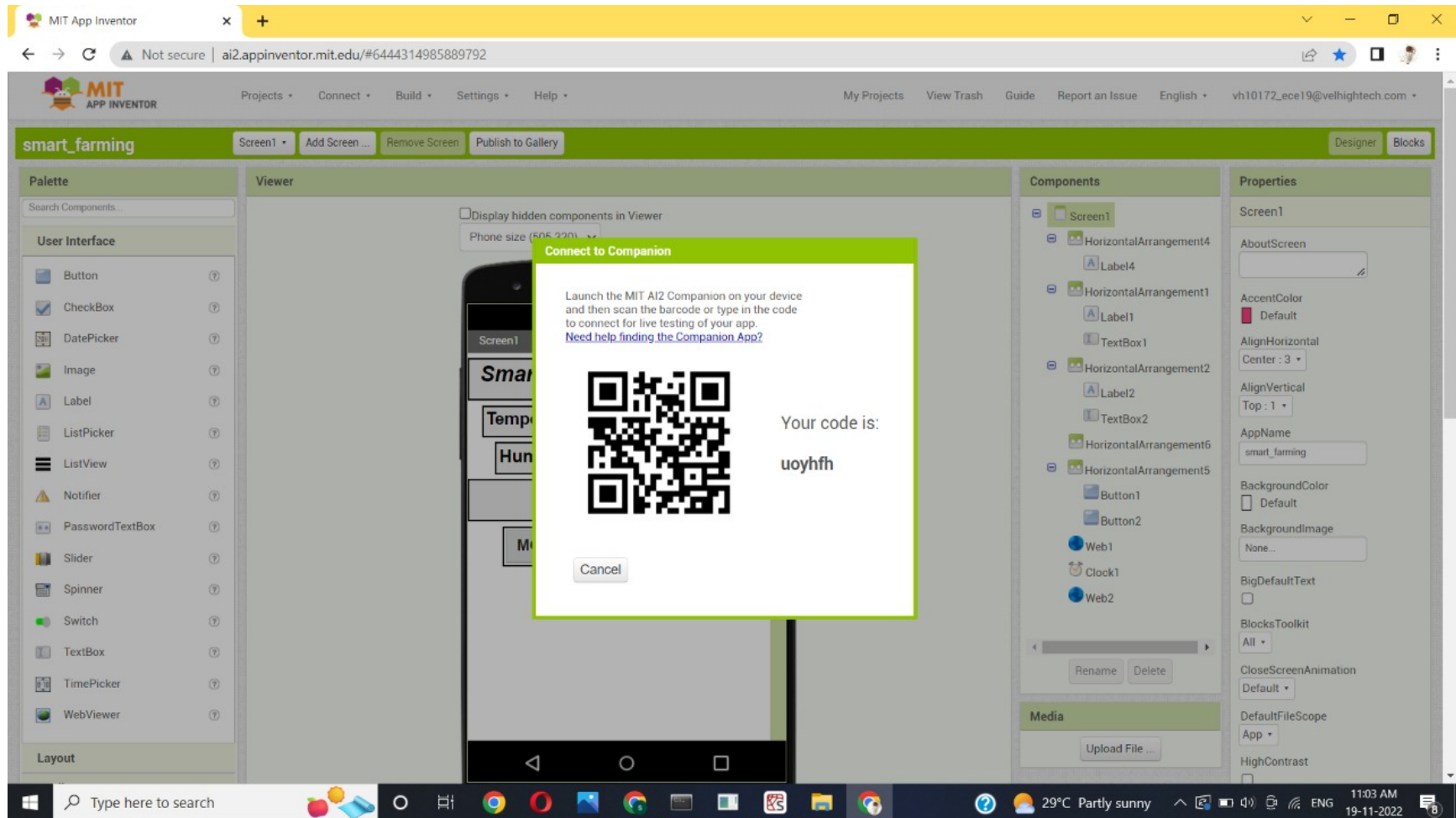
QR CODE FOR APK DOWNLOAD

The screenshot displays the MIT App Inventor web application interface. At the top, the browser's address bar shows the URL `ai2.appinventor.mit.edu/#6444314985889792`. The interface includes a top navigation bar with the MIT App Inventor logo and various menu items like Projects, Connect, Build, Settings, and Help. Below this, a green header bar for the current project, `smart_farming`, contains buttons for Screen1, Add Screen..., Remove Screen, and Publish to Gallery, along with Designer and Blocks tabs.

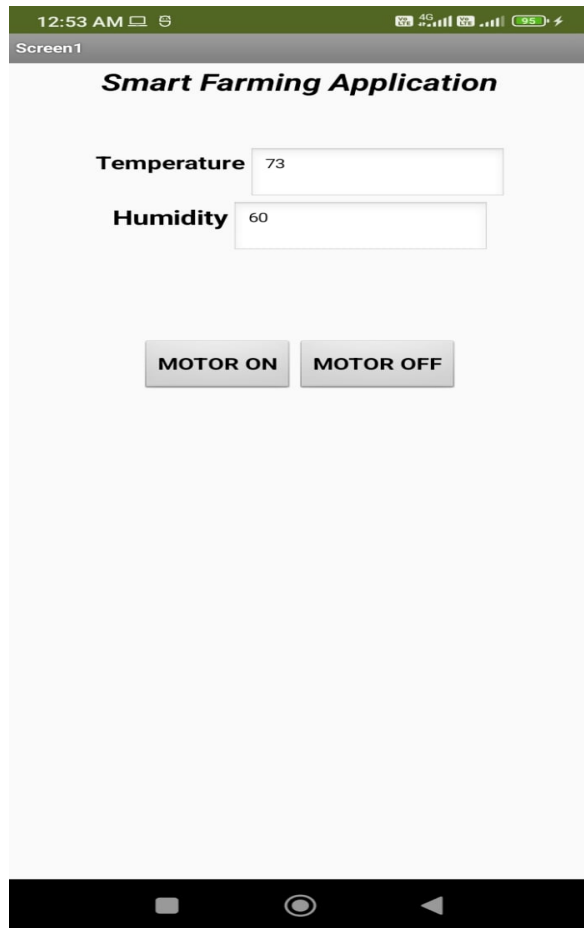
The main workspace is divided into three sections: Blocks, Viewer, and a central canvas. The Blocks section on the left lists categories such as Built-in, Control, Logic, Math, Text, Lists, Dictionaries, Colors, Variables, and Procedures. The Viewer section on the right shows a preview of the app's interface, which includes a large QR code and a button labeled "Download .apk now". Below the QR code, a text box provides instructions: "Click the button to download the app, right-click on it to copy a download link, or scan the code with a barcode scanner to install. Note: this link and barcode are only valid for 2 hours. See the FAQ for info on how to share your app with others." A "Dismiss" button is located below the text.

The central canvas shows a block of code: `call Web2 .Get`. At the bottom of the canvas, there are warning icons (a yellow triangle and a red X) and a "Show Warnings" button. The bottom of the screen shows the Windows taskbar with the search bar, system clock (14:22, 18-11-2022), and temperature (29°C).

QR CODE FOR ACCESSING THE APPLICATION:



OUTPUT:



The image shows a mobile application interface for a 'Smart Farming Application'. At the top, there is a status bar with the time '12:53 AM', signal strength, and battery level at '95%'. Below the status bar is a header bar labeled 'Screen1'. The main title of the application is 'Smart Farming Application'. Below the title, there are two input fields: 'Temperature' with the value '73' and 'Humidity' with the value '60'. At the bottom of the interface, there are two buttons: 'MOTOR ON' and 'MOTOR OFF'. The entire interface is displayed on a black background, which is the Android navigation bar.

12:53 AM 4G 95%

Screen1

Smart Farming Application

Temperature 73

Humidity 60

MOTOR ON MOTOR OFF

9.RESULT

9.1 PERFORMANCE METRICES

	A	B	C	D	E	F	G
1							
2							
3							
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21							
22							
23							
24							

NIT Risk assesment						
S.No	Project Name	Scope/feature	Functional changes	Hardware changes	Software changes	volume changes
1	IOT-ENABLED-SMART-FARMING-APPLICATION	Agriculture	Moderate	No changes	Low	No changes
1	IOT-ENABLED-SMART-FARMING-APPLICATION	smart grid	No changes	Moderate	No changes	Low
1	IOT-ENABLED-SMART-FARMING-APPLICATION	water supply	Low	No changes	No changes	Moderate
1	IOT-ENABLED-SMART-FARMING-APPLICATION	Temperature	No changes	Low	No changes	Moderate
1	IOT-ENABLED-SMART-FARMING-APPLICATION	Humidity	Moderate	No changes	Low	No changes

NIT-Detailed test plan				
S.No	project overview	NFT test approach	Assumption/dependencies/Risks	Approval/Signoff
1	IOT weather reporting system	Tests the weather condition	Weather	Edge capabilities
2	Weather monitoring using temperature sensor	Temperature is monitored	Temperature	Network security
3	Weather monitoring using humidity sensor	Humidity is monitored	Humidity	Device security

End of test report						
S.No	project overview	NFT test approach	Assumption/dependencies/Risks	NFR.Met	Test outcome	Recommendation
1	IOT weather reporting system	Tests the weather condition	Weather	Privacy interoperability	Access weather conditions	Designing techniques
2	Weather monitoring using temperature sensor	Temperature is monitored	Temperature	Performance	specify the temperature	Developind devices
3	Weather monitoring using humidity sensor	Humidity is monitored	Humidity	Maintainability	Trace the humidity level	Developing sensor

10.ADVANTAGES:

- Equipped Monitoring:

Farming equipment can be monitored and maintained according to production rated, labor effectiveness and failure prediction.

- **Real-Time Data and Production Insight :**

Farmers can visualize production levels, soil moisture, sunlight intensity and more in real time and remotely to accelerate decision making.

- **Lowered Operation Costs :**

Automation processes in planting, treatment and harvesting can reduce resource consumption, human error and overall cost.

- **Accurate Farm and Field Evaluation:**

Accurately tracking production rates by field over time allows for detailed predicting of future crop yield and value of a farm.

11.CONCLUSION:

For live monitoring of agricultural parameters including temperature, humidity, detection with both the IoT technology by using cloud, the proposed smart farming system is used. The proper use of water is also managed by it. Thus, this system provides high efficiency and accuracy in fetching live data of parameters. This will help farm workers in increasing agricultural yields and take efficient care of food production. Using Node Red and IBM Cloud Platform, an IoT-based smart agriculture system for Live Monitoring of Temperature and Remote Control of Motor has been proposed. The System is highly efficient and accurate in retrieving live temperature and humidity data. The IoT-based smart farming System proposed in this project will assist farmers in increasing agriculture yield and taking efficient care of food production by providing farmers with accurate live feed of environmental temperature and humidity with more than 99% accuracy results. As a result, the project proposes the idea of incorporating the most recent innovation into the agrarian field in order to transform the traditional water system techniques.

12.FUTURE SCOPE:

IoT have the potential to transform agriculture in many aspects and these are the main ones:

- **Data collected by smart agriculture sensors**, in this, a key component are sensors, autonomous vehicles, automated hardware, motion detectors, button camera, and wearable devices. This data can be used to track the state of the business in general as well as staff performance, equipment efficiency.
- **Agricultural Drones** Ground-based and aerial-based drones are being used in agriculture in order to enhance various agricultural practices: crop health assessment, irrigation, crop monitoring, crop spraying, planting, and soil and field analysis.
- **Livestock tracking and geofencing Farm** owners can utilize wireless IoT applications to collect data regarding the location, well-being, and health of their cattle.
- **Smart Greenhouses** A smart greenhouse designed with the help of IoT intelligently monitors as well as controls the climate, eliminating the need for manual intervention.
- **Predictive analytics for smart farming** To predict production rate of the crop artificial network use information collected by sensors from the farm. This information includes parameters such as soil, temperature, pressure, rainfall, and humidity. The farmers can get an accurate soil data either by the dashboard or a customized mobile application.

APPENDIX:

Source Code Link: <https://github.com/IBM-EPBL/IBM-Project-18900-1659691204/blob/main/Final>

Github Link: <https://github.com/IBM-EPBL/IBM-Project-18900-1659691204>

Nodered Link: <https://node-red-jqyeb-2022-11-09.au-syd.mybluemix.net/red/#flow/4c341f97a8d11f91>

Demo Link:https://drive.google.com/file/d/1O4vyZxwmin-QaeluhLDF90Tcza_n28pI/view?usp=drivesdk

