

TEAM ID: PNT2022TMID12850



# SMART FARMER-IOT ENABLED SMART FARMING APPLICATION SYSTEM

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# **CHAPTER 1**

## **INTRODUCTION**

# INTRODUCTION

The objectives of this report is to proposed IoT based Smart Farming System which will enable farmers to have live data of soil moisture environment temperature at very low cost so that live monitoring can be done. Monitoring systems are used in the field to collect information on farming conditions (e.g., light intensity, humidity, and temperature) with the aim of enhancing crop productivity. Internet of things (IoT) technology is a recent trend in numerous fields, including monitoring systems for agriculture. In conventional farming, farmers need manual labor to handle crops and livestock, often leading to inefficient resource use. This downside can be addressed through the concept of smart farming, whereby farmers receive training in the use of IoT, access to the global positioning system (GPS), and data management capabilities to increase the quantity and quality of their products.

## 1.1 Project Overview

IoT based SMART FARMING SYSTEM is regarded as IoT gadget focusing on Live Monitoring of Environmental data in terms of Temperature, Moisture and other types depending on the sensors integrated with it. The system provides the concept of “Plug & Sense” in which farmers can directly implement smart farming by as such putting the System on the field and getting Live Data feeds on various devices like Smart Phones, Tablets etc. and the data generated via sensors can be easily shared and viewed by agriculture consultants anywhere remotely via Cloud Computing technology integration. The system also enables analysis of various sorts of data via Big Data Analytics from time to time.

## **1.2 Purpose**

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

## **CHAPTER 2**

# **LITERATURE SURVEY**

## **2.1 ABSTRACT**

One of the important applications of Internet of Things is Smart agriculture. Smart agriculture reduces wastage of water, fertilizers and increases the crop yield. In the current agriculture system the specification such as temperature, moisture, humidity are detected manually which increases the labour cost, time and also monitoring cannot be done continuously. In this paper irrigation process is done automatically using different sensors which reduces the manual labour. Here a system is proposed to monitor crop-field using sensors for soil moisture, humidity and temperature. By monitoring all these parameters the irrigation can be automated.

## **2.2 ABSTRACT**

Internet of Things (IoT), Agriculture, Agriculture Precision, Raspberry Pi, Temperature Sensor, Smart Farming, Soil Moisture Sensor.

## **2.3 INTRODUCTION**

Most important factors for the quality and productivity of plant growth are temperature, humidity and light. Continuous monitoring of these environmental variables provides valuable information to the grower to better understand, how each factor affects growth and how to maximize crop productiveness [1] The optimal greenhouse micro climate adjustment can enable us to improve productivity and to achieve remarkable energy savings especially during the winter in northern countries [2]. WSN composed of hundreds of nodes which have ability of sensing, actuation and communicating, has great advantages in terms of high accuracy, fault tolerance, flexibility, cost, autonomy and robustness compared to wired ones. Moreover, with the onset of IoT and M2M communications, it is poised to

become a very significant enabling technology in many sectors, like military, environment, health, home and other commercial areas [3]. IoT is a general term, covering a number of technologies that allows devices to communicate with each other, with or without human intervention. This paper presents a novel approach to implement wireless greenhouse automation and monitoring system which in a timely manner provides a possibility for screen monitoring of detailed data about the conditions of the greenhouse. Furthermore, the suggested setup can be incorporated with other internet and messaging services (i.e. Web, WAP, SMS) to provide communication for farmers. The wireless sensor network (WSN) is one of the most significant technologies in the 21st century and they are very suitable for distributed data collecting and monitoring in tough environments such as greenhouses. The other most significant technologies in the 21st century is the Internet of Things (IoT) which has rapidly developed covering hundreds of applications in the civil, health, military and agriculture areas. In modern greenhouses, several measurement points are required to trace down the local climate parameters in different parts of a large-scale greenhouse in order to ensure proper operation of the greenhouse automation system. Cabling would make the measurement system expensive, vulnerable and also difficult to relocate once installed. This paper presents a WSN prototype consisting of MicaZ nodes which are used to measure greenhouses' temperature, light, pressure and humidity. Measurement data have been shared with the help of IoT. With this system farmers can control their greenhouse from their mobile phones or computers which have internet connection.

## **2.4 IOT TECHNOLOGY AND AGRICULTURE**

### **2.4.1 Raspberry Pi:**

The Raspberry Pi is a credit card sized single-board computer developed in the UK by the Raspberry Pi Foundation with the intention of stimulating the teaching of basic computer science in schools. The Raspberry Pi has a Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF-S 700MHz processor (The firmware includes a number of "Turbo" modes so that the user can try to attempt over clocking, up-to 1GHz, without affecting the warranty), Video Core IV GPU, [5] and 256 megabytes of RAM.

### **2.4.2 Arduino:**

The Arduino UNO is a widely used open-source microcontroller board based on the ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.[1] The board features 14 Digital pins and 6 Analog pins. Soil Moisture Sensor: The Moisture sensor is used to measure the water content (moisture) of soil. When the soil is having water shortage, the module output is at high level else the output is at low level. This sensor reminds the user to water their plants and also monitors the moisture content of soil. It has been widely used in agriculture, land irrigation and botanical gardening. This DHT11 Temperature & Humidity Sensor features a temperature & humidity sensor complex with a calibrated digital signal output. By using the exclusive digital-signal-acquisition technique and temperature & humidity sensing technology, it ensures high reliability and excellent long-term stability.



## 2.5 LITERATURE SURVEY

In the literature there are numerous examples of versatile IoT application oriented studies. In [4], an example of control networks and information networks integration with IoT technology has been studied based on an actual situation of agricultural production. A remote monitoring system with combining internet and wireless communications is proposed. Furthermore, taking into account the system, an additional information management sub-system is designed. The collected data is provided in a form suitable for agricultural research facilities. In their work Liu Dan et al. [5] take a CC2530 chip as the core and present the design and implementation of an Agriculture Greenhouse Environment monitoring system based on ZigBee connectivity. Additionally, the wireless sensor and control nodes take CC2530F256 as a core to control the environment data. This system comprises front-end data acquisition, data processing, data transmission and data reception. The ambient temperature is real-time processed by the temperature sensor of the terminal node and is send to the intermediate node through a wireless ZigBee based network. Intermediate node aggregates all data, and then sends the data to the PC through a serial port. At the same time, staff may view, and analyse the data, storage of the data on a PC is also provided. The real-time data is used to control the operation of fans and other temperature control equipment and achieve automatic temperature control in the greenhouse. Kun Han et al. [6] proposed the design of an embedded system development platform based on GSM communications. Through its application in hydrology monitoring management, the authors discuss issues related to communication reliability and lightning protection, suggest detailed solutions, and also cover the design and realization of middleware software. Greenhouse technology was started by Dr APJ Abdul Kalam with the help of Swaminathan. It was first started in LehLadakh to grow vegetables for the defence during extreme climatic conditions. A greenhouse (also called a

glasshouse) is a structure with walls and roof made chiefly of transparent material, such as glass, in which plants requiring regulated climatic conditions are grown.

## **2.6 SYSTEM MODULE**

Arduino module: It is used to interface with moisture, temperature & humidity sensor. Send these values to the Raspberry pi through the serial port. Raspberry Pi: It receives data from Arduino and takes the decision to start/stop the motor. Sends wireless data to the user. Application server module: Receives data from Raspberry pie and records it into the database. Displays real time graph of the received data Android Module: Displays real time data (temperature, humidity, moisture) on the interface to the user remotely.

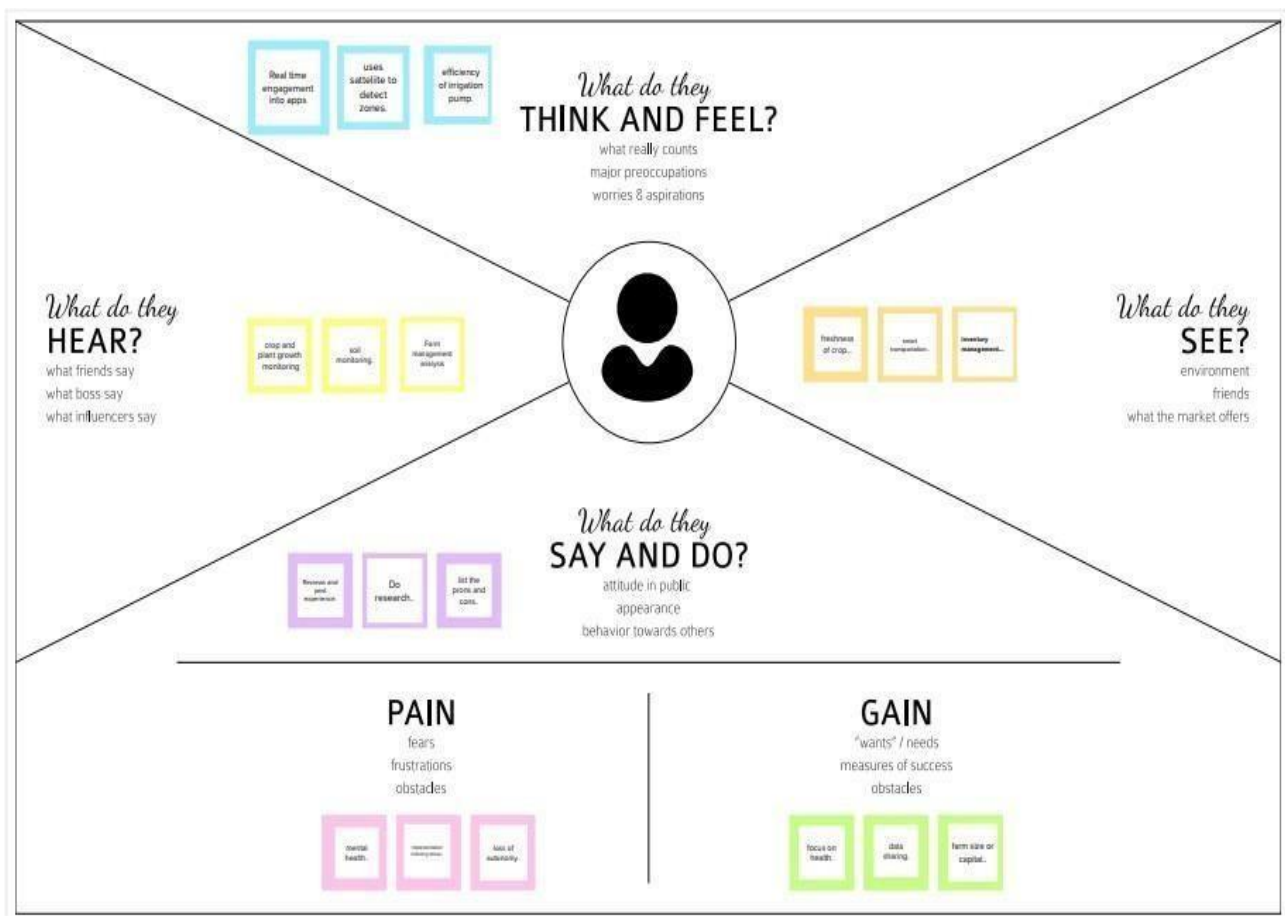
## **2.7 IMPLEMENTATION**

This project can be implemented in a real greenhouse for growing good agricultural produce like ornamental flowers (Gerbera, Carnation, Anthurium etc.), which can be of export quality. The system will take care of automatic irrigation control and various parameters of the greenhouse can be monitored like Temperature, Humidity and Soil Moisture. The Android Application will form the user interface and to record the parameter details we use an application server module. This recorded data can be used for analysis and help in taking decisions. Application Server.

## **CHAPTER 3**

# **IDEATION & PROPOSED SOLUTION**

### 3.1 Empathy Map Canvas



## 3.2 Ideation & Brainstorming



### 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

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**A**

#### Team gathering

Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

**B**

#### Set the goal

Think about the problem you'll be focusing on solving in the brainstorming session.

**C**

#### Learn how to use the facilitation tools

Use the Facilitation Superpowers to run a happy and productive session.

Open article



1

## Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

🕒 5 minutes

### PROBLEMS

\*T.o. identify the weather  
\*To identify humidity, temperature  
\*to identify the production of crops



#### Key rules of brainstorming

To run an smooth and productive session



Stay in topic.



Encourage wild ideas.



Defer judgment.



Listen to others.



Go for volume.



If possible, be visual.

2

## Brainstorm

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

🕒 10 minutes

### TIP

You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!

### J Sajitha

In farming watering, the plants is one of the difficult process and they have to wait for the whole field to poor water. he had to check the field for thirty mins once

Majority of Indian farmers use traditional tools for agriculture such as plough, sickle etc... this leads to wastage of energy and manpower less yield per capital labor force. only little use of machine is seen in irrigation harvesting and transportation

The biggest challenges face by IoT in the agricultural sector are lack of information high adaption costs and security concern etc... Most of the farmers are not aware of the implementation IoT in agriculture

### Jegadeesh Kumar V

Remote sensing in agriculture is revolutionizing the way data is acquired from different nodes farm IoT based remote sensing utilizes sensors placed along with the farms like weather stations for gathering data which is transmitted to analytical tools for analysis

sensors placed along the farms monitor the crops changes in light, humidity, temperature, shape and size and a normally detected by the sensors is analyzed in the farmers is notified

The data calculate by sensors in terms of humidity temperature moisture precipitation and clear detection helps in determining the weather pattern in farms so that cultivation is done for suitable crops

### Kalaimani M

Overuse of the pesticides and fertilizer in agricultural fields leads to destruction of the crop as well as reduces the efficiency of the field increasing the soil vulnerability toward pest IoT applications may be used to update the farmer user about type quantity of pesticide required by the crop.

smart farming based on IoT technologies enables grows and farmers to reduce waste and enhanced productivity ranging from the quantity of fertilizer utilized to the number of journeys the farm vehicles have made and enabling efficient utilization of resources such as water electricity etc....

Soil health analysis helps in determining the nutrient value and drier areas of farm soil drainage capacity or acidity which allows to adjustment of the amount of water needed irrigation

### Priyadarshini S

It consists of temperature sensor moisture sensor water level sensor, DC motor and GPRS module. when the IoT based agriculture monitoring system starts it checks the water level humidity and moisture level

Hope with climate change soil erosion and biodiversity loss, safety consumers charging testes and expectation.

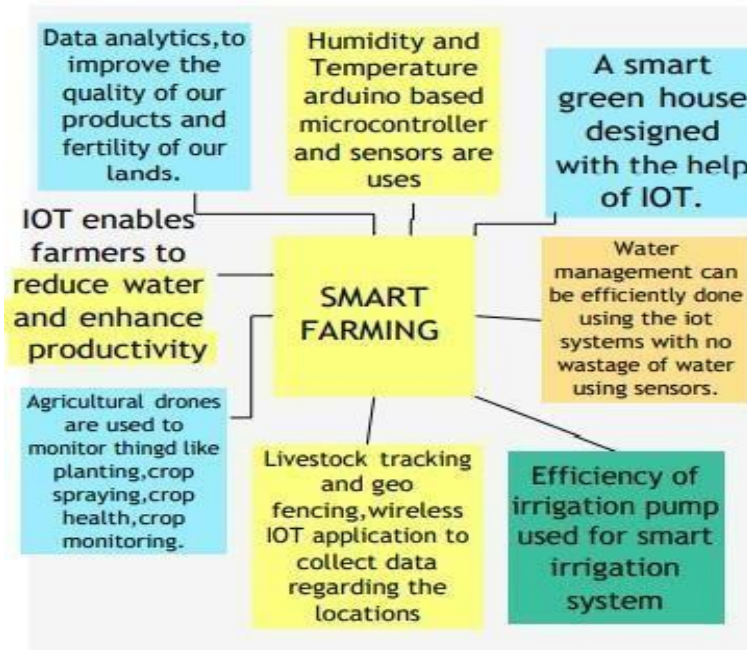
One of the biggest biodiversity problems is the farming history, most rising demand for more food of higher quality. invest in farm protectivity

3

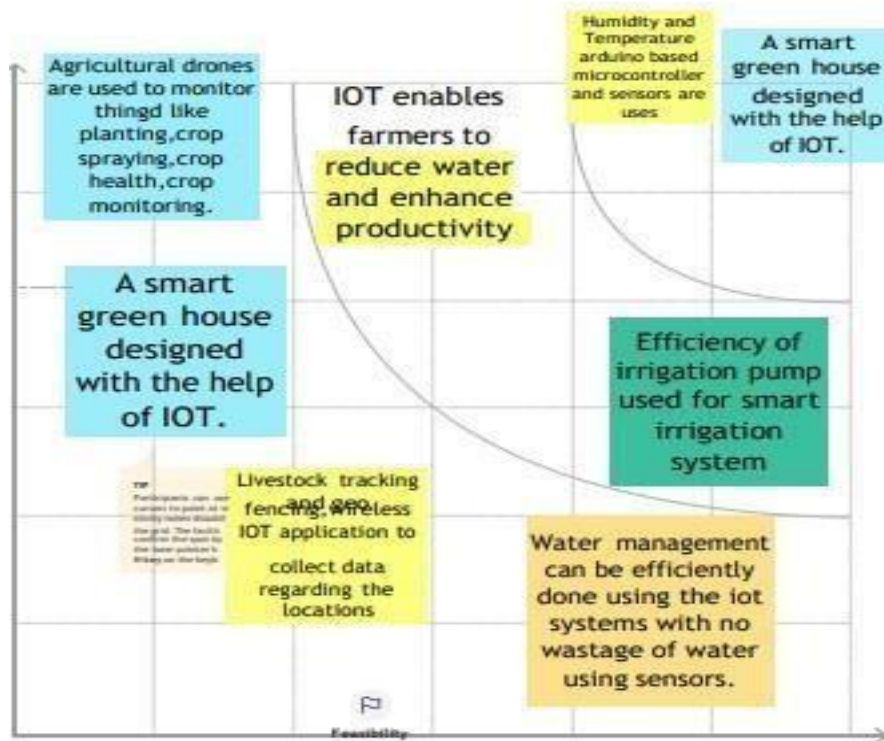
### Group Ideas

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 can break it up into smaller sub-groups.

15 minutes



15 minutes







### 3.3 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)	lot devices interact with older equipment they have access to the internet connection , there is no guarantee that they would be able to access drone mapping data or sensors readouts by taking benefit of public connection.
2.	Idea / Solution description	Data, tons of data, collected by smart agriculture sensors. Better control over the internal processes and as a result, lower production risks. Cost management and waste reduction to the increased control over the production. Increased business efficiency through process automation.
3.	Novelty / Uniqueness	It is powered by Arduino, it consists of temperature sensor, moisture sensor, water level sensor, DC motor and GPRS module. It checks the water level, moisture level. It sends SMS alert to phone about levels.
4.	Social Impact / Customer Satisfaction	It gains the knowledge about the sensors. Cost management and waste reduction to the increased control over the production.
5.	Business Model (Revenue Model)	To enable producers and farmers to reduce waste and improve productivity by optimizing the usage of fertilizers to boost the efficiency of plants. It gives better control to the farmers for their livestock.
6.	Scalability of the Solution	It is consists of temperature sensor, moisture sensor and check the water level. It sends SMS alert to phone about levels

## 3.4 Problem Solution fit

Project Title: SMART FARMING AGRICULTURE

Project Design Phase-I - Solution Fit Template

Team ID: PNT2022TMD01028

Define CS, fit into CC	<b>1. CUSTOMER SEGMENT(S)</b> <span>CS</span> It is undertaken based on the bank's loan exposure to the client, the client's profile or turnover.	<b>6. CUSTOMER CONSTRAINTS</b> <span>CC</span> Because we use the internet to provide alert messages in our project, certain clients may be unfamiliar with utilizing it. So, these were shown to be some of the significant limitations.	<b>5. AVAILABLE SOLUTIONS</b> <span>AS</span> As it reduces the human effort then it definitely saves out time. Improve security. It is possible to monitor soil quality humidity, temperature, automate the irrigation process.	Explore AS, differentiate
	<b>2. JOBS-TO-BE-DONE / PROBLEMS</b> <span>J&amp;P</span> Use sensors to monitor soil quality, humidity, temperature, automate the irrigation process. PROBLEMS: we use internet to provide alert messages in our project, certain clients may be unfamiliar with utilizing it.	<b>9. PROBLEM ROOT CAUSE</b> <span>RC</span> The alarming decline in the area under cultivation needs to be addressed amidst rising food security concerns.	<b>7. BEHAVIOUR</b> <span>BE</span> Understanding farmers' behavior regarding disease control is essential to successfully implement behavior change interventions that improve uptake of best practices.	
Identify strong TR & EM	<b>3. TRIGGERS</b> <span>TR</span> High hardware costs, disrupted connectivity to the cloud, it encourages farmers to improve knowledge.	<b>10. YOUR SOLUTION</b> <span>SL</span> Sensors are used to find the soil temperature, humidity. To alarm and alert messages to find out temperature, humidity.	<b>8. CHANNELS of BEHAVIOUR</b> <span>CH</span> <b>8.1 ONLINE</b> Agriculture technology, soil humidity, temperature, moisture sensors. <b>8.2 OFFLINE</b> someone needs to manually check the temperature, humidity, climate condition.	Identify strong TR & EM
	<b>4. EMOTIONS: BEFORE / AFTER</b> <span>EM</span> BEFORE: There are not aware of sensors to find out humidity, soil temperature. AFTER: After implementing this, they aware of sensors to find humidity, temperature.			

# **CHAPTER – 4**

## **REQUIREMENT ANALYSIS**

## 4.1 Functional requirement

Following are the functional requirements of the proposed solution.

<b>FR No.</b>	<b>Functional Requirement (Epic)</b>	<b>Sub Requirement (Story / Sub-Task)</b>
FR-1	User Registration	Registration through Phone number Registration through Gmail
FR-2	User Confirmation	Confirmation via Phone number Confirmation via OTP
FR-3	Observation	Sensors record observational data from the, soil, temperature, humidity and atmosphere.
FR-4	Diagnosis	The sensor values are fed to a cloud-hosted IoT platform that ascertain the condition of the examined object and identify the needs.
FR-5	Action	Shows the real time data and when the soil moisture content is reduced the water pump irrigate the field until the required moisture is achieved.
FR-6	Monitor	User can monitor the data online from anywhere.

## 4.2 Non-Functional requirements

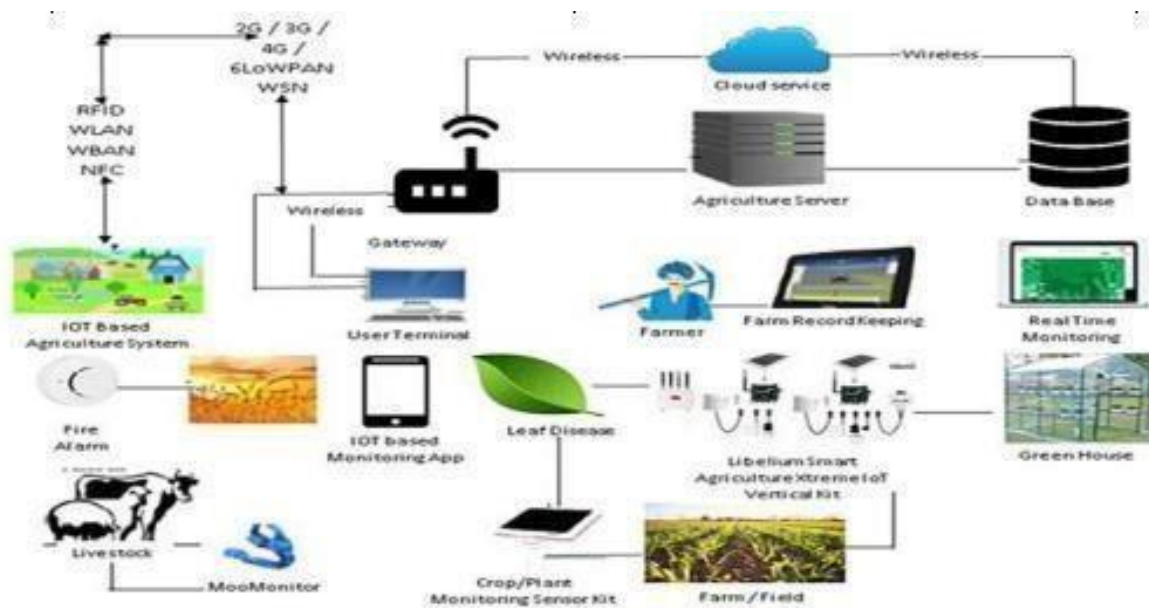
Following are the non-functional requirements of the proposed solution.

<b>FR No.</b>	<b>Non-Functional Requirement</b>	<b>Description</b>
NFR-1	<b>Usability</b>	Usability includes easy understanding and efficiency in use. With real-time monitoring and analytics systems, data collected by smart sensors allows farmers to better control processes.
NFR-2	<b>Security</b>	Device and data security includes authentication of devices and confidentiality.
NFR-3	<b>Reliability</b>	Smart farming platforms require reliable and robust technologies such as the physical safety of IOT devices for precision agricultural systems should be ensured in different environmental conditions to avoid communication failures.
NFR-4	<b>Performance</b>	High performance which includes the recurrent tasks on the field can be replaced by automatized modes of monitoring.
NFR-5	<b>Availability</b>	Automatic adjustment of farming equipment made possible by linking information like weather
NFR-6	<b>Scalability</b>	Automatic real time decision-making system is feasible in an environment composed of sensors continuously transmitting the real time data efficiently

# **CHAPTER – 5**

## **PROJECT DESIGN**

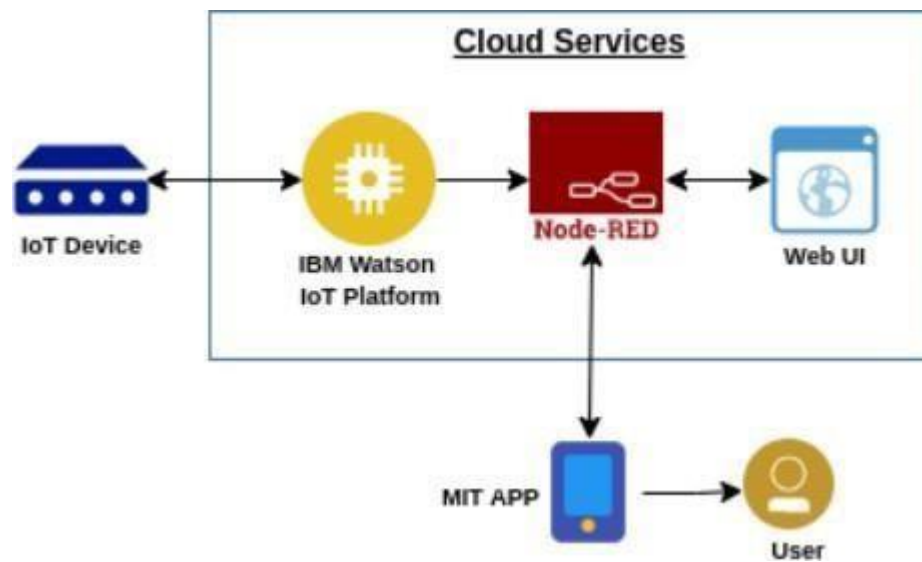
## 5.1 Data Flow Diagrams



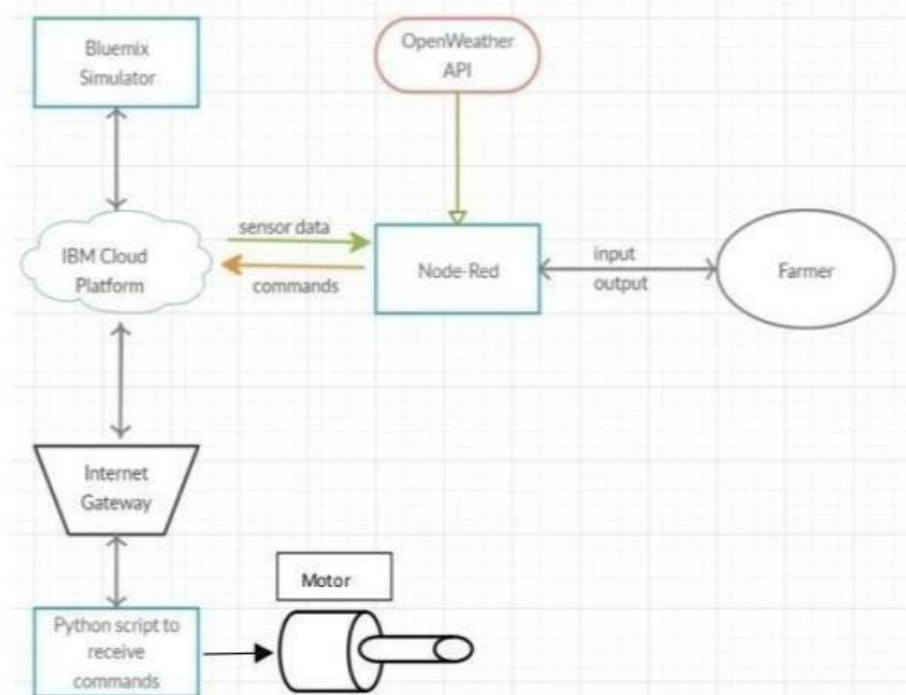


## 5.2 Solution & Technical Architecture

### 5.2.1 Solution Architecture



### 5.2.2 Technical Architecture



## 5.3 User Stories

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
		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
		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
		USN-4	As a user, I can register for the application through Gmail	I can register & access the dashboard with Gmail Login	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	I can access dashboard with email login	High	Sprint-1
	Dashboard	USN-6	As a user I can enter into dashboard by using navigation panel	I can access the dashboard by using navigation panel	High	Sprint-1
Customer (Web user)	Registration	USN-1	As a user, I can register for the web application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the web application	I can receive confirmation email & click confirm	High	Sprint-1
	Login	USN-3	As a user, I can log into the web application by entering email & password	I can access dashboard with email login	High	Sprint-1
	Dashboard	USN-4	As a user I can enter into web dashboard by using navigation panel	I can access into dashboard by using navigation panel	High	Sprint-1
Customer Care Executive	Registration	USN-1	As a user I can contact the customer care service through phone or mail medium	I can receive confirmation SMS or email	High	Sprint-1
		USN-2	As a user I want customer care to answer the questions related to product and services	I can get the problem solved within a day	High	Sprint-1
		USN-3	As a user I want customer care to register my complaints	I can receive a confirmation message stating my complaint is registered	High	Sprint-1
		USN-4	As a user I want customer care to collect and analyse consumer feedback	I can get the status of my feedback	High	Sprint-1
		USN-5	As a user I want customer care to troubleshoot technical problems	I can get the problem solved within a day	High	Sprint-1
Administrator		USN-1	As a user I want the administrator to use good working hardware	I can get a guarantee and warranty card	High	Sprint-1
		USN-2	As a user I want the administrator to sell the product in a reasonable rate	I can get the cost of bill of materials	High	Sprint-1
		USN-3	As a user I want the administrator to refund my amount if I am not satisfied with the product	I can get an assurance stating I will get my amount back	High	Sprint-1

# **CHAPTER-6**

## **SPRINT DELIVERY PLAN**

## Product Backlog, Sprint Schedule, and Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High
Sprint-1		USN-3	As a user, I can register for the application through Facebook	2	Low
Sprint-1		USN-4	As a user, I can register for the application through Gmail	2	Medium
Sprint-1	Login	USN-5	As a user, I can log into the application by entering email & password	1	High
Sprint-1	Dashboard	USN-6	As a user, I can log into the application by entering email & password and access all the resources and services available	2	High
Sprint-2	Login	USN-1	As a weather data controller, I log into my profile and start monitoring the weather updates	3	High
Sprint-2	Dashboard	USN-2	I receive all the information about weather from web from weather API. Whenever there is change in weather, corresponding updates are made on sign boards.	2	Medium
Sprint-3	Login	USN-1	As a image controller, I keep note of all the images received from various areas and detect traffic in that particular area.	3	High
Sprint-3	Dashboard	USN-2	With the traffic, updates I change the status of sign board as "take diversion".	2	Medium
Sprint-4	Login	USN-1	As a zonal officer, I ensure that boards near school display "slow down" and near hospitals display "no horn".	3	High
Sprint-4	Login	USN-1	As an administrator, I ensure that all departments work co-ordinated and ensure the accuracy and efficiency.	2	Medium

**Project Tracker, Velocity & Burndown Chart:**

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		
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022		
Sprint-4	20	6 Days	14 Nov 2022	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 (AV) per iteration unit (story points per day)

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

# JIRA REPORT





## SPRINT 1:

Sprints	IESF...
> ⚡ IESFAS-7 Registration	
> ⚡ IESFAS-8 LOGIN	
> ⚡ IESFAS-9 DASHBOARD	






## SPRINT 2:

Sprints	IESF...
> ⚡ IESFAS-7 Registration	
> ⚡ IESFAS-8 LOGIN	
> ⚡ IESFAS-9 DASHBOARD	

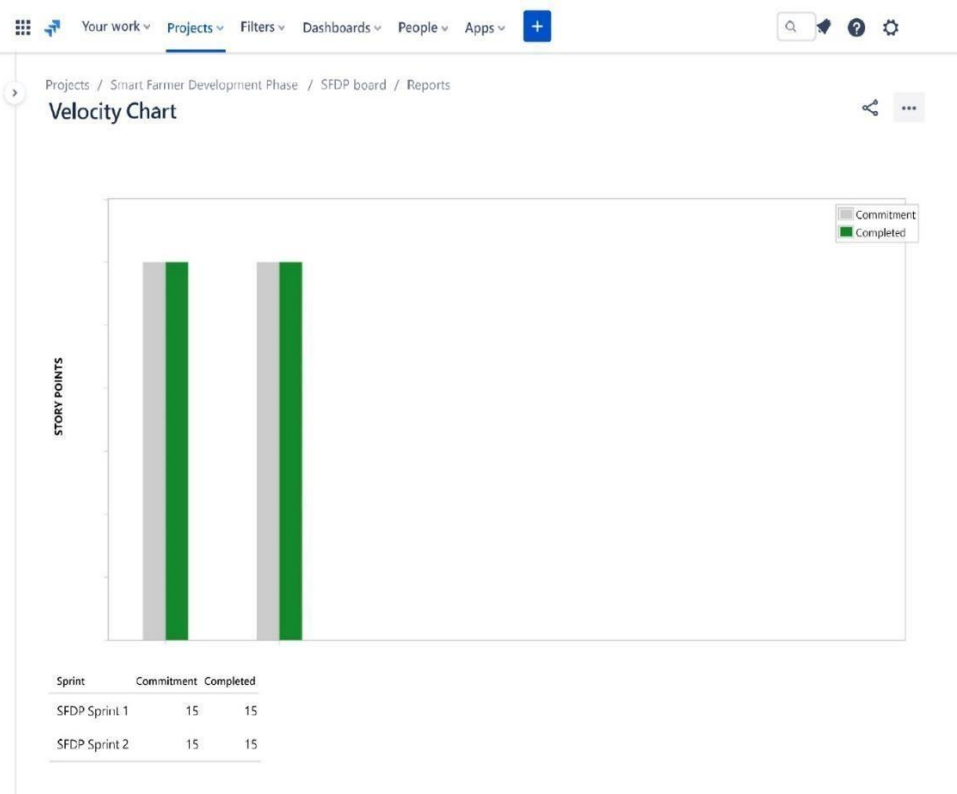
## SPRINT 3:

	7	8	9	10	11	12
	NOV					
Sprints	IESFAS Sprint 3					
>  IESFAS-7 Registration						
>  IESFAS-8 LOGIN						
>  IESFAS-9 DASHBOARD						
>  IESFAS-15 LOGIN						

## SPRINT 4:

	14	15	16	17	18	19
	NOV					
Sprints	IESFAS Sprint 4					
>  IESFAS-7 Registration						
>  IESFAS-8 LOGIN						
>  IESFAS-9 DASHBOARD						
>  IESFAS-15 LOGIN						
>  IESFAS-18 LOGIN						

# VELOCITY:



# BURDOWN CHART:



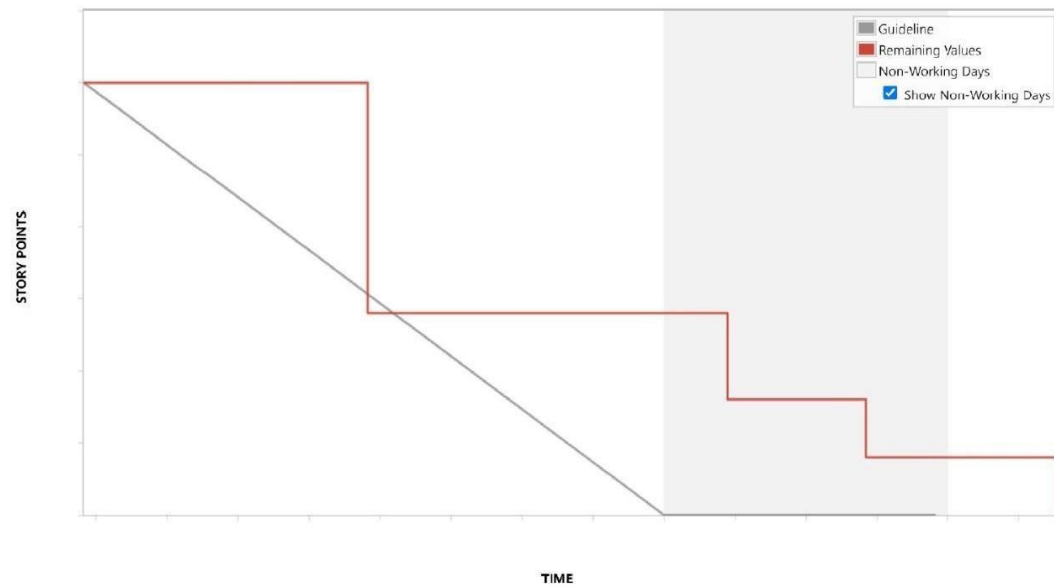
Projects / Smart Farmer Development Phase / SFDP board / Reports

## Burndown Chart

SFDP Sprint 2

Story Points ▾

Create Hardware working model and Node-red Connection



# **CHAPTER-7**

## **CODING & SOLUTIONING**

# CODING & SOLUTIONING

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

#Provide your IBM Watson Device Credentials
organization = "kv09p4"
deviceType = "Groot"
deviceId = "13"
authMethod = "token"
authToken = "12345678"
global y
# Initialize GPIO

def myCommandCallback(cmd):
    print("Command received: %s" % cmd.data['command'])
    status=cmd.data['command']
    if status=="motoron":
        print ("motor is on")
    if status=="motoroff" :
        print ("motor is off")
    if status=="manual" :
        print ("Motor Control is in Manual Mode")
    if status=="automatic" :
        print ("Motor control is in Automatic Mode")
        if soilmoisture > 600:
            print ("motor is on")

# 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)
    soilmoisture=random.randint(0,1023)
    Phlevel=random.randint(0,14)
    y=soilmoisture

    data = { 'temp' : temp, 'Humid': Humid,'soilmoisture' : soilmoisture ,'Phlevel' : Phlevel }
    #print data
    def myOnPublishCallback():
        print ("Published Temperature = %s C" % temp, "Humidity = %s %" % Humid,"Soil Moisture is %s %" % soilmoisture,"PH level is %s" %Phlevel , "to IBM Watson")

    success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0, on_publish=myOnPublishCallback)
    if not success:
        print("Not connected to IoT")
        time.sleep(10)

    deviceCli.commandCallback = myCommandCallback

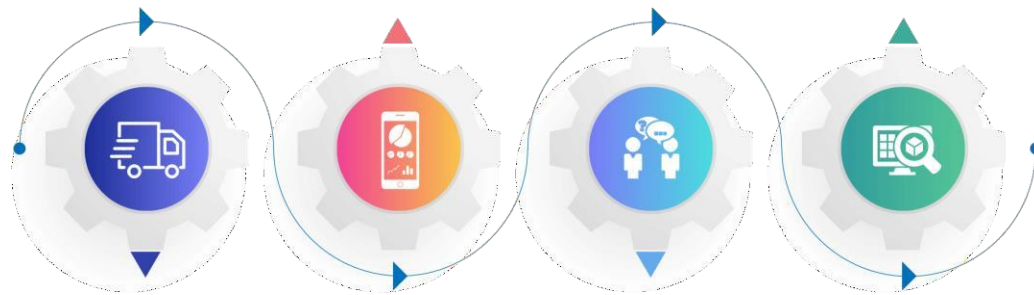
# Disconnect the device and application from the cloud
deviceCli.disconnect()

```

# FEATURES:

- Scheduled automatic off times – diesel and electric pumps
- Rain gauge triggered automatic shutdowns
- Soil moisture level threshold automatic shutdowns
- “All Off” pump command feature
- based on standing water levels

Field operator specific automation scheduling access rights



## Climate monitoring and forecasting

- Nature is a fickle friend of the farmers. Climate change, weather forecasts are now key features in in precision farming. They alert the farmer of the impending changes and help ensure preventive measures. With sensors in place to predict and analyze the weather, crops can be saves from being destroyed.

## Predictive analytics for crops and livestock

IoT in smart farming is not restricted to a particular section. Smart farming sensors can be placed right in the ground. There, it shall read and analysis the derived data and help improve farming practices. Primarily, the leaf to soil ratio and soil humidity help increase quantity and quality of the produce. Wearables for cattle are the best bet against poaching and cattle napping.

### **Remote crop and soil monitoring**

With the help of smart farming system, moisture and fertility of soil along with crops growth rate can be monitored remotely through real time animation and graphics via a smartphones. This helps the farmer make environmental variables and informed decisions for the farm.

### **Automated Sprinkler System**

The weather, humidity in the air, analysis of the soil goes a long way in determining if there is a need for water dispersion. Precise and controlled water dispersion through IoT enabled water meter sensors helps in ensuring that there is no risk of damaging crops due to over watering.

### **Weather forecast:**

Weather forecast is very crucial to agriculture activities and is a very important feature that farmers look for in the farming mobile app. The accuracy of this data can help farmers be prepared for anything unforeseen.



# **CHAPTER-8**

## **ADVANTAGES AND DISADVANTGES**

## **Advantages:**

- Increased production and its quality.
- Water is used effectively.
- Remote monitoring.
- Automatic controlling of irrigation.
- Cost Effective.
- IOT technologies enables growers and farmers to reduce waste and enhance productivity

## **Disadvantages:**

**Lack of Infrastructure:** Even if the farmers adopt IoT technology they won't be able to take benefit of this technology due to poor communication infrastructure. Farms are located in remote areas and are far from access to the internet. 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.

**High Cost:** Equipment needed to implement IoT in agriculture is expensive. However sensors are the least expensive component, yet outfitting all of the farmers' fields to be with them would cost more than a thousand dollars. Automated machinery cost more than manually operated machinery as they include cost for farm management software and cloud access to record data. To earn higher profits, it is significant for farmers to invest in these technologies however it would be difficult for them to make the initial investment to set up IoT technology at their farms.

**Lack of Security:** Since IoT devices interact with older equipment they have access to the internet connection, there is no guarantee that they would be able to access drone mapping data or sensor readouts by taking benefit of public connection. An enormous amount of data is collected by IoT agricultural systems which is difficult to protect. Someone can have unauthorized access IoT providers database and could steal and manipulate the data.



## **CHAPTER-9**

## **CONCLUSION**

***IoT based SMART FARMING SYSTEM for Live Monitoring of Temperature and Soil Moisture has been proposed using Arduino and Cloud Computing .***

***The System has high efficiency and accuracy in fetching the live data of temperature and soil moisture.***

***The IoT based smart farming System being proposed via this report will assist farmers in increasing the agriculture yield and take efficient care of food production as the System will always provide helping hand to farmers for getting accurate live feed of environmental temperature and soil moisture with more than 99% accurate results.***

***the IoT agricultural applications are making it possible for ranchers and farmers to collect meaningful data.***

***Large landowners and small farmers must understand the potential of IoT market for agriculture by installing smart technologies to increase competitiveness and sustainability in their productions.***

***With the population growing rapidly, the demand can be successfully met if the ranchers, as well as small farmers, implement agricultural IoT solutions in a prosperous manner.***

***Thus the smart agriculture using IoT will revolutionized the world of farming and it will increase the productivity as well as improve the quality and can save lives of farmer. There is an urgent need for a system that makes the agricultural process easier and burden free from the farmer's side.***

***With the recent advancement of technology it has become necessary to increase the annual crop production output of our country India, an entirely agro centric economy. The ability to conserve the natural resources as well as giving a splendid boost to the production of the crops is one of the main aims of incorporating such technology into the agricultural domain of the country. To save farmer's effort, water and time has been the most important consideration.***

## **CHAPTER- 10**

### **FUTURE SCOPE**

Data collected by smart agriculture sensors, **in this approach of farm management, a key component are sensors, control systems, robotics, autonomous vehicles, automated hardware, variable rate technology, 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. The ability to foresee the output of production allows to plan for better product distribution.

**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. This information helps to prevent the spread of disease and also lowers labor costs.

**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** Crop predication plays a key role, it helps the farmer to decide future plan regarding the production of the crop, its storage, marketing techniques and risk management. 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.

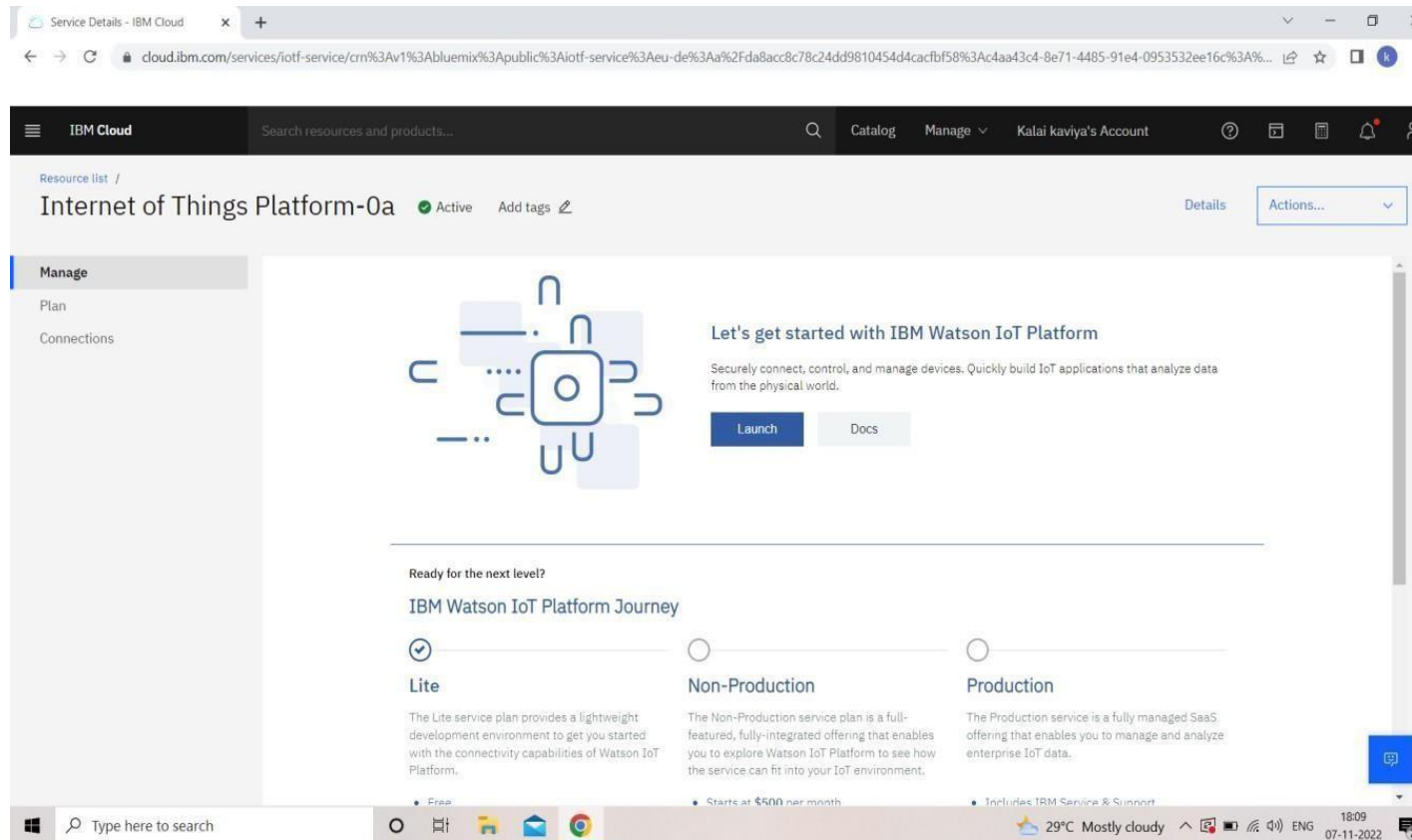
Future work would be focused more on increasing sensors on this system to fetch more data especially with regard to Pest Control and by also integrating GPS module in this system to enhance this Agriculture IoT Technology to full-fledged Agriculture Precision ready product.

# **CHAPTER-11**

## **APPENDIX**

# CREATION OF IBM CLOUD SERVICES:

## SCREENSHOT OF CLOUD ACCOUNT CREATION:



## **Create a IBM Watson IOT platform and device**

Step 1: login into IBM CLOUD account

Step2: click on catalog and search for IOT platform

Step 3: Then search for IOT Watson platform then click on create

Step 4: Then click on add device and give the device type and necessary details then click finish

Step 5: Finally, IOT Watson platform is successfully created

## **Screenshots of IBM Watson IOT platform and device:**

IBM Watson IoT Platform

?

kalaikaviyaveebee@gmail.com

ID: nbe00p

← Back

Device Drilldown - kalaikaviya

Device Credentials

Connection Information

Recent Events

State

Device Information

Metadata

Diagnostics

Connection Logs

Device Actions

Device Credentials

You registered your device to the organization. Add these credentials to the device to connect it to the platform. After the device is connected, you can navigate to view connection and event details.

Organization ID

nbe00p

Device Type

kalaikaviya

Device ID

kalaikaviya

Authentication Method

use-token-auth

Authentication Token

swsY@kf4DwZXruDzq7

!

Authentication tokens are non-recoverable. If you misplace this token, you will need to re-register the device to generate a new authentication token.

Find out how to add these credentials to your device

Windows Taskbar

Type here to search

27°C Cloudy

20:06

07-11-2022





## **Create Node Red service**

Step 1: Login into IBM CLOUD account

Step2: In catalog, search for node red application

Browser tabs: Inbox (5,205) - kalaikaviyaveeb... x IBM x Catalog - IBM Cloud x +

Address bar: cloud.ibm.com/catalog

Navigation bar: IBM Cloud Search resources and products... Catalog Manage Kalai kaviya's Account

Top right: Sell on IBM Cloud Catalog settings

# Catalog

Search: node

- Node-RED App
- Node.js Express App
- Natural Language Understanding Node.js App
- Code Engine
- Natural Language Understanding
- CloudHedge App Modernization Platform

AI / Machine Learning (17)

Analytics (10)

Blockchain (1)

Databases (28)

Customize your Spark applications as needed and customize the Spark runtimes to satisfy the requirements of your application.

Lite • Free • HIPAA Enabled • IAM-enabled • Service Endpoint Supported • IBM supported

**AnonTech ViziVault Platform**  
By Anon Technology, Inc.

Manage personal information as-a-service safely, securely, and in compliance with data privacy regulations using ViziVault

Lite • Free • HIPAA Enabled • IAM-enabled • Third party supported

**API Connect**  
By IBM

An enterprise-grade platform for creating, securing, managing, sharing, monetizing, and analyzing custom APIs located on-premises and on the cloud.

Lite • Free • EU Supported • IAM-enabled • IBM supported

Alphabetically

https://cloud.ibm.com/developer/appservice/starter-kits/59c9d5bd-4d31-3611-897a-f94eea80dc9f/nodored

Windows taskbar: Type here to search 28°C Cloudy 13:14 08-11-2022

Step 3: Enter the project details and click on create

Step 4: click on deploy option and deploy

## Step 5: Set up the environment for deploying and click on create

The screenshot shows the IBM Cloud Developer console interface. At the top, there's a navigation bar with the IBM Cloud logo, a search bar, and user account information. Below this, a message states "deployment process is started automatically." The main section is titled "Deployment target" and displays four options: Kubernetes Service, Red Hat OpenShift, Cloud Foundry (highlighted with a blue border and a checkmark), and Code Engine. Each option includes a brief description of its capabilities. A notification banner below the options states "IBM Cloud Foundry Public is deprecated." with a link to learn more. The configuration section below the banner includes a field for the "IBM Cloud API key" (marked as required), a "Number of instances" dropdown set to 1, and a "Memory allocation per instance" field. On the right side, a sidebar provides additional information about IBM Cloud Foundry, including a description, a "Before you begin" section with a bullet point about creating a Cloud Foundry org, and a "Steps" section with two numbered instructions. At the bottom, there's a taskbar with various application icons and system information like temperature, weather, and time.

Inbox (5,206) - kalaiaviyaveeb... x IBM x IBM App Development x +

cloud.ibm.com/developer/appservice/apps/3d0efc66-a710-4e08-b66a-b2b9035bb7c0

IBM Cloud Search resources and products... Catalog Manage Kalai kaviya's Account

deployment process is started automatically.

Deployment target

**Kubernetes Service**  
IBM  
Deploy, scale, and manage your containerized application workloads to highly available clusters.

**Red Hat OpenShift**  
IBM  
Deploy your apps on highly available clusters that come installed with Red Hat OpenShift on IBM Cloud.

**Cloud Foundry**  
IBM  
Deploy and run your applications without managing servers or clusters. A Lite plan is available for quick and easy deployment.

**Code Engine**  
IBM  
Run your app, job, or container on a managed serverless platform. Auto-scale workloads, and pay only for the resources that you consume.

**IBM Cloud Foundry Public is deprecated.** [Learn more](#)

IBM Cloud API key

IBM Cloud API key

The value is required.

Number of instances

1

Memory allocation per instance

Select your deployment target, and then provide the configuration information.

**IBM Cloud Foundry**

Cloud Foundry is the premier industry standard Platform-as-a-Service (PaaS) that ensures fast, easy, and reliable deployment of cloud-native apps. Cloud Foundry ensures that the build and deploy aspects of coding remain carefully coordinated with any attached services — resulting in quick, consistent and reliable iterating of applications. Cloud Foundry has a Lite plan that allows quick deployments for testing purposes.

Before you begin

- If your account doesn't have a Cloud Foundry org, you must create one. [Create org.](#)

Steps

- Select the number of instances, memory allocation, **region**, **org**, and **space**.
- Select the **domain** and provide a **host** name.

ASK A QUESTION

## Step 6: Now drag and drop the nodes and connect nodes with IOT Watson platform


The screenshot displays the Node-RED web interface within a browser. The browser's address bar indicates the URL: `node-red-ktsgd-2022-11-08.eu-gb.mybluemix.net/red/#flow/cd2a84c750274c77`. The Node-RED interface features a left sidebar with node categories, a central workspace for 'Flow 1', and a right sidebar with information and flow details. In the workspace, a 'Hello Node-RED!' node is connected to a 'msg.payload' node. The right sidebar shows the flow ID 'cd2a84c750274c77' and provides instructions on how to import a flow by dragging its JSON or using `ctrl-i`.

Step 7: setup the settings that connects node red service with Watson IOT

Step 8: Finally, output can be seen in node red service

## **Create a MIT APP INVENTOR**

Screenshots of MIT APP INVENTOR:



Projects ▾ Connect ▾ Build ▾ Settings ▾ Help ▾

My Projects View Trash Guide Report an Issue English ▾ kalaikaviyaveeb@gmail.com ▾

ibm

Screen1 ▾ Add Screen ... Remove Screen Publish to Gallery

Designer Blocks

Search Components...

User Interface

Button

CheckBox

DatePicker

Image

Label

ListPicker

ListView

Notifier

PasswordTextBox

Slider

Spinner

Switch

TextBox


TimePicker

WebView

Viewer

☐ Display hidden components in Viewer

Phone size (505,320) ▾



Components

Screen1

Rename Delete

Media

Upload File ...

Properties

Screen1

AboutScreen

AccentColor

AlignHorizontal

AlignVertical

AppName

BackgroundColor

BackgroundImage

BigDefaultText

BlocksToolkit

CloseScreenAnimation

DefaultFileScope

Type here to search

29°C Cloudy

11:54

08-11-2022



Start new project Move To Trash View Trash Login to Gallery Publish to Gallery

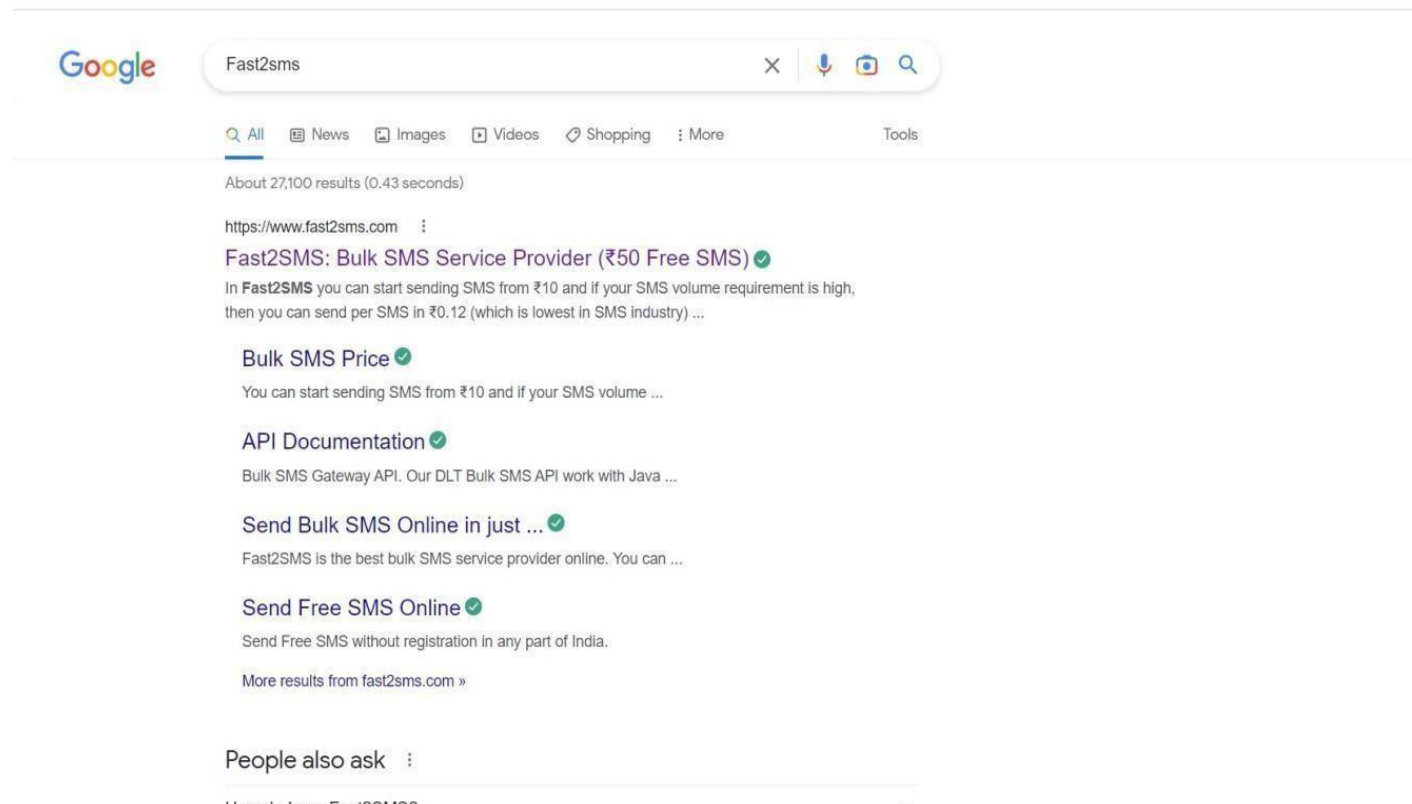
Projects			
<input type="checkbox"/>	Name	Date Created	Date Modified ▾
<input type="checkbox"/>	ibm	Nov 8, 2022, 11:54:32 AM	Nov 8, 2022, 11:54:32 AM



# CREATE AN ACCOUNT IN FAST2SMS

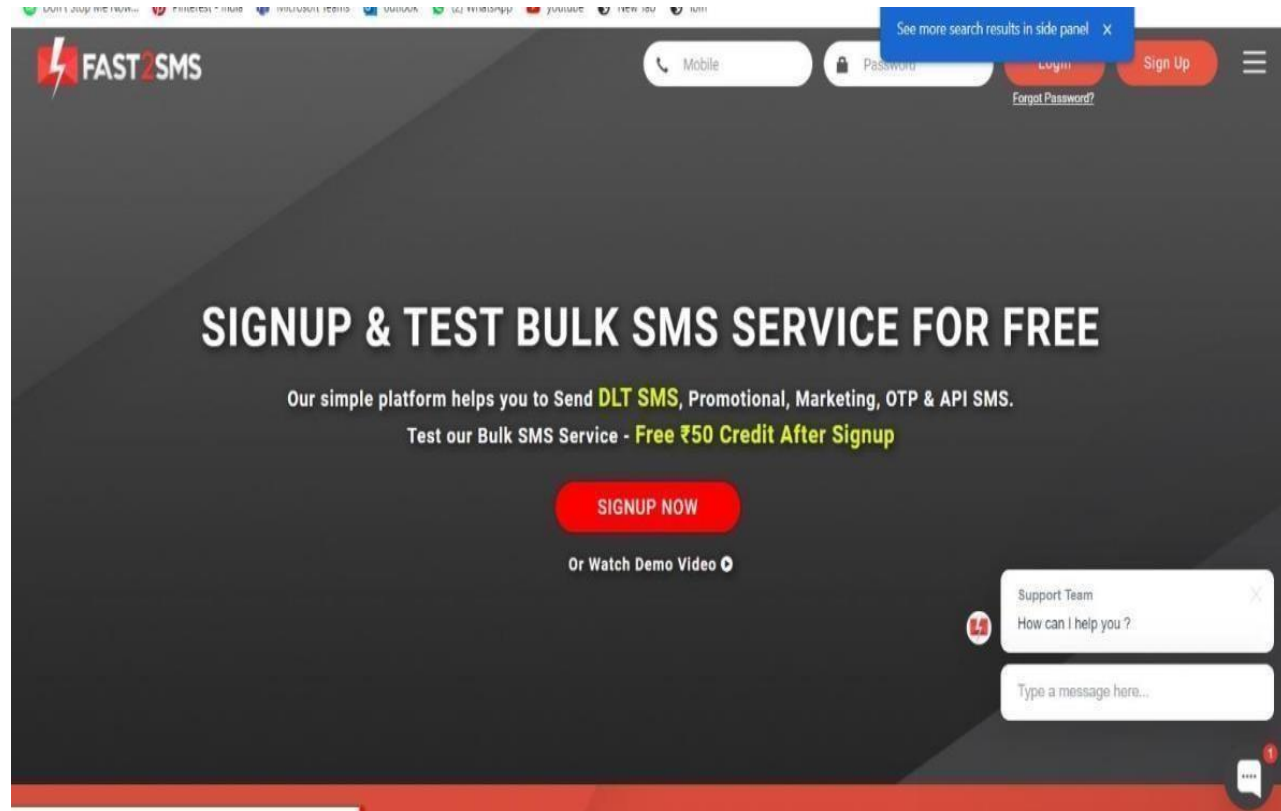
## Step 1:

Type fast2sms in google and click on the first link



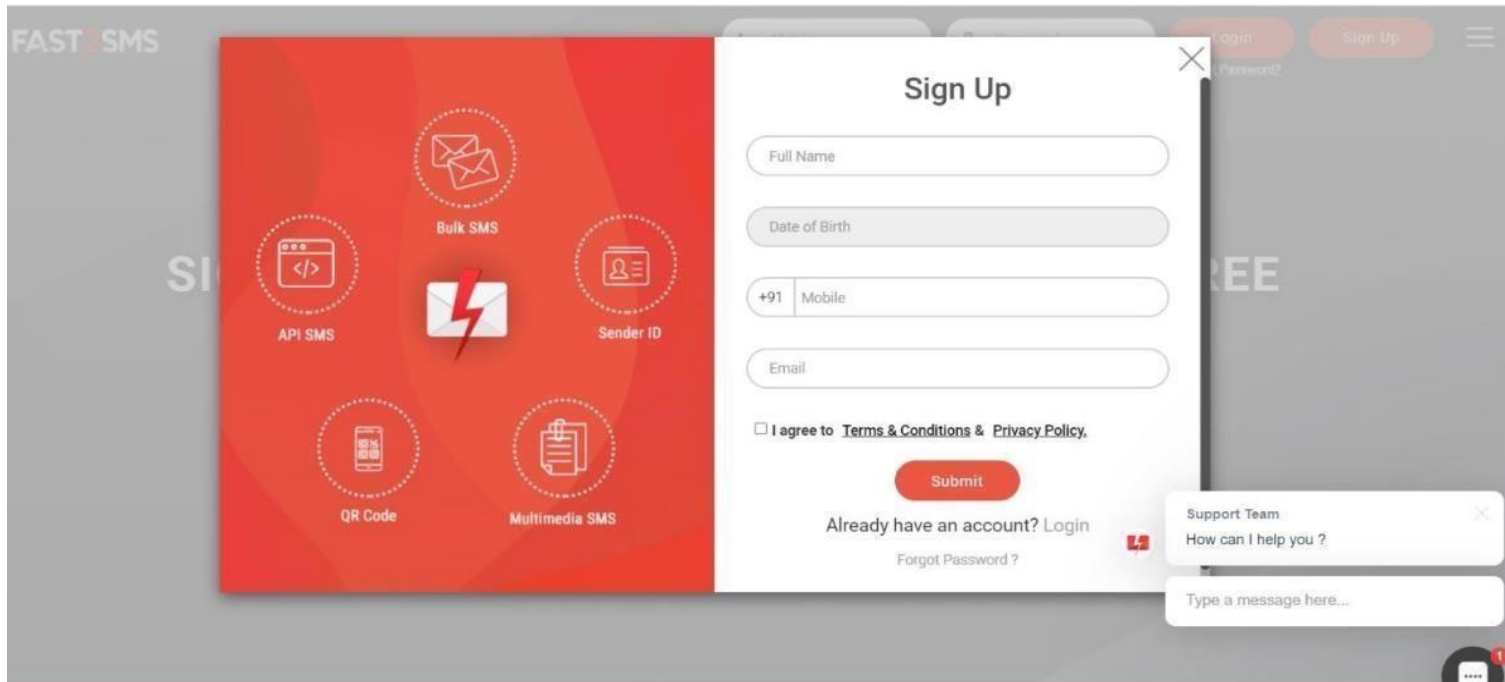
## Step 2:

click on sign up now



## Step 3:

Give your details and click on the check box, then click the submit button.



The screenshot shows the FAST2SMS website with a 'Sign Up' modal form open. The background features a red panel with icons for API SMS, Bulk SMS, Sender ID, QR Code, and Multimedia SMS. The 'Sign Up' form includes fields for Full Name, Date of Birth, Mobile number (with a +91 country code), and Email. Below the fields is a checkbox for agreeing to Terms & Conditions and Privacy Policy, followed by a red 'Submit' button. At the bottom of the form, there are links for 'Already have an account? Login' and 'Forgot Password?'. A support chat window is visible in the bottom right corner with the text 'Support Team How can I help you?' and a message input field.

FAST2SMS

Sign Up

Full Name

Date of Birth

+91 Mobile

Email

☐ I agree to [Terms & Conditions](#) & [Privacy Policy](#).

Submit

Already have an account? [Login](#)

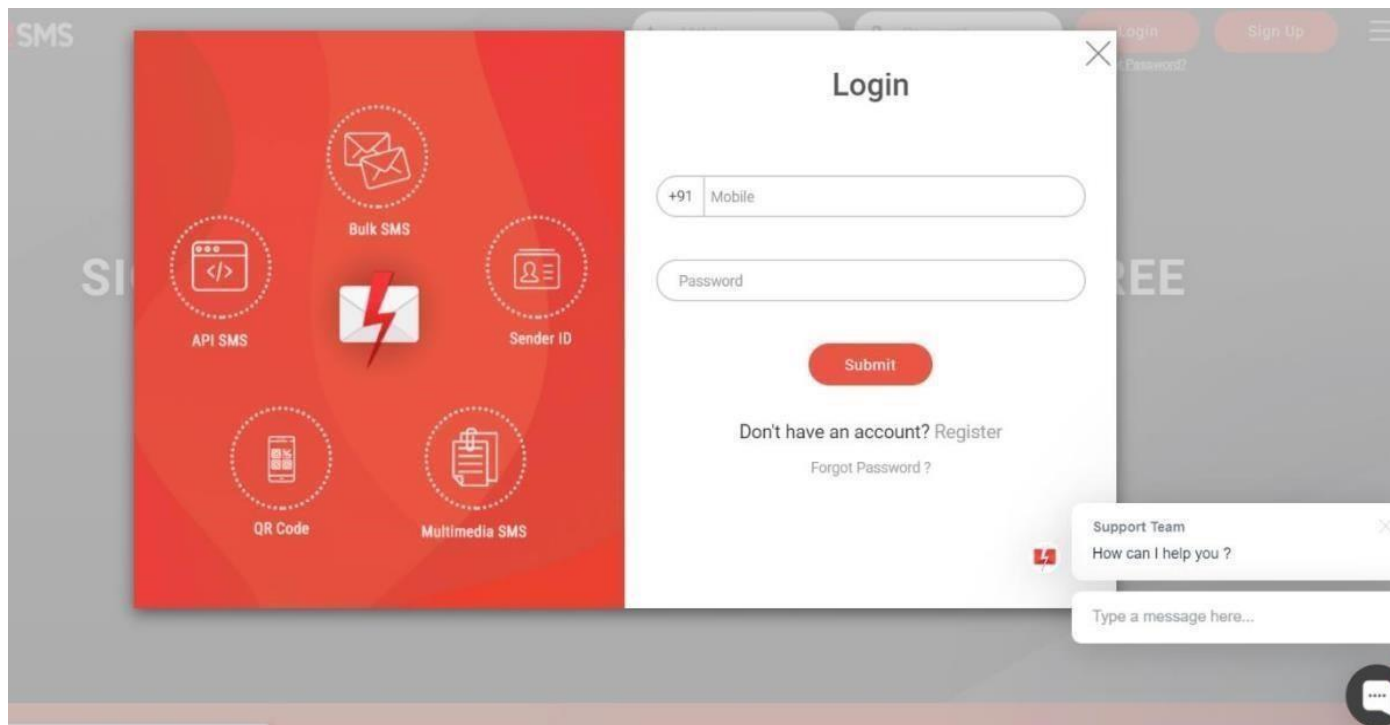
[Forgot Password?](#)

Support Team  
How can I help you?

Type a message here...

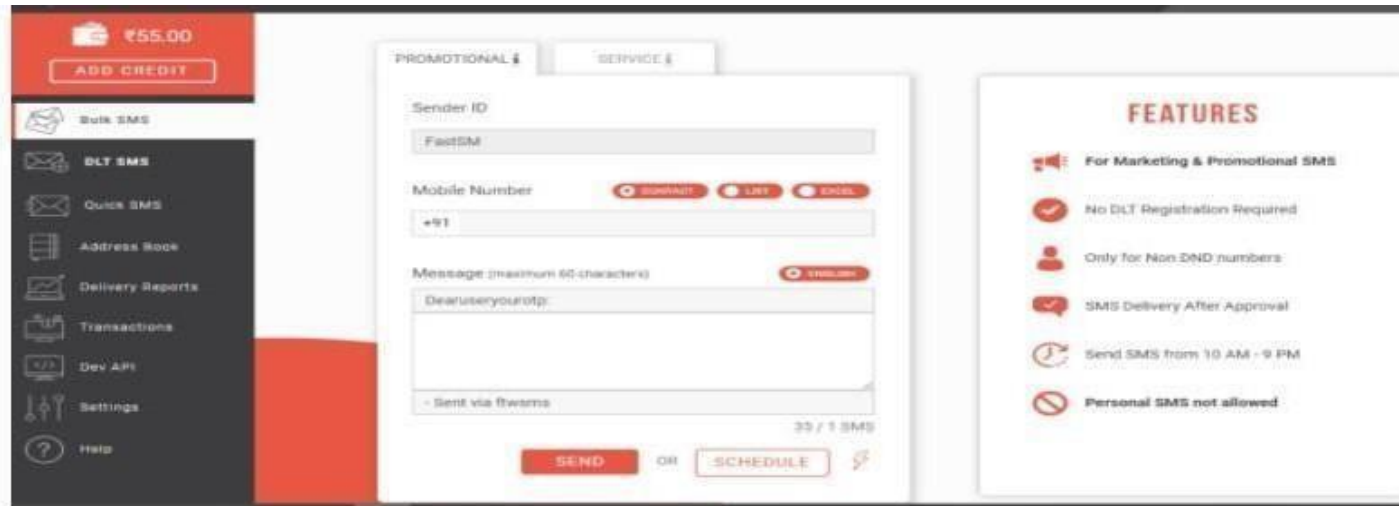
## Step 4:

You will get the SMS with your password. Type your mobile number and the password then click on the submit button.



## Step 5:

Click on the Dev API



The screenshot displays a web interface for an SMS service. On the left, a dark sidebar contains a menu with options: Bulk SMS, DLT SMS, Quick SMS, Address Book, Delivery Reports, Transactions, Dev API (highlighted), Settings, and Help. The top of the sidebar shows a balance of ₹55.00 and an 'ADD CREDIT' button. The main content area is divided into two tabs: 'PROMOTIONAL' and 'SERVICE'. The 'PROMOTIONAL' tab is active, showing a form with fields for 'Sender ID' (containing 'FastSM'), 'Mobile Number' (with a dropdown for '91'), and 'Message' (containing 'Dearuseryourotp:'). There are buttons for 'SEND' and 'SCHEDULE' at the bottom. A 'FEATURES' section on the right lists benefits for marketing and promotional SMS, such as 'No DLT Registration Required' and 'SMS Delivery After Approval'.

## Step 6:

Select the Route as Quick SMS and type the message in Messagebox.

Browser tabs: Email Verific x, Developer Ap x, web.whatsa x, IBM x, IBM-Proje x, IBM-Proje x, Verify Email x, +

Address bar: fast2sms.com/dashboard/dev-api

FAST2SMS

How Developer API Works Account Info 06:54:01 PM Nandhini R...

₹55.00 ADD CREDIT

Bulk SMS

DLT SMS

Quick SMS

Address Book

Delivery Reports

Transactions

Dev API

Settings

Help

Dev API

API Key

Security

For OTP Based SMS use 'OTP SMS API'

READ API DOCS

Method

GET

Route

Select Route

Sender ID

Select Sender ID

Flash Message

☐ Yes ☒ No

GET https://www.fast2sms.com/dev/bulkV2

Query Parameter :

authorization =  
USQ3BipYa7EWh581yosJcdgmDNb4rw6CfGqtOVMnH  
2jKuzPk9vecsZz967MN5TbvK1CIPuyUiqVkdREO

route =

sender\_id =

message =

variables\_values =

language =

numbers =

flash =

Overall URL =


## Step 7:

Select your language and type your Mobile number in contact

Email VerificDeveloper Aweb.whatsaIBMIBM-ProjeIBM-ProjeVerify Email

fast2sms.com/dashboard/dev-api

AppsYouTubeMaps



How Developer API WorksAccount Info06:54:57 PMNandhini R...

₹55.00

ADD CREDIT

Bulk SMS

DLT SMS

Quick SMS

Address Book

Delivery Reports

Transactions

Dev API

Settings

Help

Dev API

API Key

Security

Language

☒ English☐ Unicode

Flash Message

☐ Yes☒ No

Contact

Mobile Numbers888888888899999999997777777777

READ API DOCS

GET https://www.fast2sms.com/dev/bulkV2

Query Parameter :

authorization = USQ38IpYa7EWh581yosJcdgmDNb4rw6CfGqtOVMnH2jKuzPk9vecsZz967MN5TbvK1CIPuyUiqVkDREO

route = q

message = hello

language = "english"

numbers =

flash = "0"

Overall URL = https://www.fast2sms.com/dev/bulkV2?authorization=USQ38IpYa7EWh581yosJcdgmDNb4rw6CfGqtOVMnH2jKuzPk9vecsZz967MN5TbvK1CIPuyUiqVkDREO&route=q&message=hello&language=english&flash=0&numbers=

## Step 8:

Copy the URL and paste it in the new tab

The screenshot shows the Fast2SMS developer API dashboard. The left sidebar contains navigation links: Bulk SMS, DLT SMS, Quick SMS, Address Book, Delivery Reports, Transactions, Dev API (selected), Settings, and Help. The main content area has three tabs: Dev API, API Key, and Security. The Dev API tab is active, showing a form to configure an API request. The form includes a 'Method' dropdown set to 'GET', a 'Route' dropdown set to 'Quick SMS', and a 'Message' text area containing 'hello'. A note states 'Per SMS cost ₹ 3.50'. A red box highlights the 'READ API DOCS' button. On the right, a black box displays the 'GET https://www.fast2sms.com/dev/bulkV2' request details, including query parameters: authorization, route, message, language, numbers, and flash. The overall URL is shown at the bottom of this box. The browser's address bar at the bottom shows the full URL: <https://www.fast2sms.com/dev/bulkV2?authorization=USQ3BipYa7EWh581yosJcdgmDNb4rw6CfGqtOVMnH2jKuzPk9vecsZz967MN5TbvK1CIPuyUiqVkdREO&route=q&message=hello&language=english&flash=0&numbers=8838638956>

FAST2SMS

How Developer API Works Account Info 07:02:29 PM Nandhini R...

₹55.00 ADD CREDIT

Bulk SMS DLT SMS Quick SMS Address Book Delivery Reports Transactions Dev API Settings Help

Dev API API Key Security

For OTP Based SMS use 'OTP SMS API' READ API DOCS

Method GET

Route Quick SMS

Message (NOTE: Per SMS cost ₹ 3.50) hello

GET https://www.fast2sms.com/dev/bulkV2

Query Parameter :

authorization = USQ3BipYa7EWh581yosJcdgmDNb4rw6CfGqtOVMnH2jKuzPk9vecsZz967MN5TbvK1CIPuyUiqVkdREO

route = q

message = hello

language = "english"

numbers = 8838638956

flash = "0"

Overall URL = https://www.fast2sms.com/dev/bulkV2?authorization=USQ3BipYa7EWh581yosJcdgmDNb4rw6CfGqtOVMnH2jKuzPk9vecsZz967MN5TbvK1CIPuyUiqVkdREO&route=q&message=hello&language=english&flash=0&numbers=8838638956

https://www.fast2sms.com/dev/bulkV2?authorization=USQ3BipYa7EWh581yosJcdgmDNb4rw6CfGqtOVMnH2jKuzPk9vecsZz967MN5TbvK1CIPuyUiqVkdREO&route=q&message=hello&language=english&flash=0&numbers=8838638956



### Step 9:

You will get the SMS in the new tab

