ADHIPARASAKTHI ENGINEERING COLLEGE,
MELMARUVATHUR.

Smartfarmer - IoT ENABLED SMART FARMING APPLICATION

TEAM ID: PNT2022TMID38652

1. VISHNU PRASATH .S (420419106029)

2. PUGAZHENTHI .K (420419106021)

3.BALASUBRAMANIAN .A (420419106005)

4. SANTHOSH .S (420419106023)

Project Report

Chapter 1

INTRODUCTION:

PROJECT OVERVIEW:

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 labor cost, time and also monitoring cannot be done continuously. In this paper irrigation process is done automatically using different sensors which reduces the manual labor. 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.

Chapter 2
LITERATURE SURVEY

2.1 EXISTING PROBLEM AND REFERENCES

I. **Patil VC, Al-Gaadi KA, Biradar DP, Rangaswamy M (2012) Internet of things (Iot) and cloud computing for agriculture: an overview. Agro Informatics Precis Agric (i):292–296.**

- This research work explains the importance of cloud computing in IoT and the importance of these two technologies in Agricultural System.

- In this paper, it is discussed that IoT is closely correlated to cloud computing. The relation between IoT and cloud computing was explained in such a way that IoT gets influential computing tools with cloud computing.

- In this research work, an agricultural information cloud is assembled. In this agricultural information cloud, smart agriculture system is constructed through the assemblage of the Internet of Things and RFID.

- Component of IoT generates a large amount of data like data generated by using RFID, sensors, wireless communication etc. this large amount of data handled by agricultural information cloud.

- It is concluded that, in the agricultural information network, hardware resources are integrated into the resource pool for achieving the dynamic distribution of resources and to balance the load, it improves the efficiency of resource use.

II. Mohanraj I, Ashokumar K, Naren J (2016) Field monitoring and automation using IOT in agriculture domain. Procedia Comput Sci 93:931–939.

- In this paper, an application prototype for precision farming using a wireless sensor network with an IoT cloud is proposed.

- In this work, an alert system for the control of water stress of plants using IoT technology was presented.

- The first part of this paper described the steps of the creation of the decision support system intended for an agricultural community in order to be able to estimate the quantities of water required.

- For irrigation management, the farmer will on the benefit from a dashboard software in the form of a graph, to monitor in real time the variations of the soil conditions and on the other hand, a process of notification by SMS will be transmitted via the application when a critical level is reached to avoid water stress.

- This application can be improved to make it a very sophisticated one envisages the integration of the method of evapotranspiration to calculate the water requirement of a plant per day in the system of decision support.

III. Yan-E D (2011) Design of intelligent agriculture management information system based on IoT. In: Proceedings of the 4th international conference on intelligent computation technology automation ICICTA 2011, vol 1, pp 1045–1049.

- In this research work, many challenges related to the agricultural domain were, addressed. An architecture was also framed for meeting these challenges.

- According to the text of this paper, farmers should be guided on the right time during different stages of crop growth.

- In this research work, a knowledge base is created. This knowledge base has various crop details. These crop details speak about knowledge acquisition, market availability, geospatial data flow and the weather prediction data.

- Monitoring module includes monitoring of various stages of growing plant, calamity check, planning for irrigation, crop profit calculation, etc. Per day need of water of a plant is calculated using evapotranspiration method.

- This method is based on the devised algorithm. At last, a comparative study was prepared among several applications existing developed system, having properties like efficiency, the knowledge base, reliability and monitoring modules.

IV. Bo Y, Wang H (2011) The application of cloud computing and the internet of things in agriculture and forestry. In: Proceeding of the 2011 international joint conference on service science IJCSS 2011, pp 168–172.

- This paper discusses the various applications of IoT and cloud computing in the field of agriculture and forestry.

- According to the text, the use of IoT plays an important role in smart agriculture.

- The basic technologies of IoT like laser scanner, RFID, photoacoustic electromagnetic sensors, etc. these technologies can be used to make great innovations in agricultural.

- Basically in agricultural information transmission, precise irrigation, intelligent cultivation control, agricultural product safety, and many more. This paper also focuses some applications of IoT in forestry.

- IoT can play an important role in forest identification and wood tracking and its management.

- Finally, this paper concludes that the integration of IoT and cloud computing has become a tendency.

V. **Li J, Gu W, Yuan H (2016) Proceedings of the 5th international conference on electrical engineering and automatic control, vol 367, pp 1217–1224.**

- In this research work, a platform Phenonet is developed using an open-source platform called OpenIoT.

- Phenonet is basically a semantically enhanced digital agriculture use case.

- This paper demonstrated the applications and efficiency of Phenonet in a number of use cases.

- The researchers demonstrated thatbhow an Open IoT platform can help to handle the challenges encountered by thenPhenonet application.

- In project Phenonet, the basic concept of the collection, validation, processing, annotation, and storing of data captured from smart sensors in the field has been proposed.

- The related semantic queries, reasoning, and experimental results are presented.

VI. Dlodlo N, Kalezhi J (2015) The internet of things in agriculture for sustainable rural development. In: 2015 international conference on Emerging trends in networks computer commununication (ETNCC), pp 13–18.

- In this research work, possible applications of the Internet of Things in agriculture for sustainable rural development has been identified.

- Various business opportunities related to agriculture domain and its benefits that can be generated, using the Internet of Things is discussed in this text.

- This literature is intended to stimulus strategy on the acceptance of IoT in agriculture and rural development.

- According to the literature, developers can use IoT technologies to build country-specific technologies based on the agricultural domain.

- Development of technology will uplift the standard of people and support poverty alleviation.

- This application can be improved to make it a very sophisticated one envisages the integration of the method of evapotranspiration to calculate the water requirement of a plant per day in the system of decision support.

VII. Lee M, Hwang J, Yoe H (2013) Agricultural production system based on IoT. In: 2013 IEEE 16th international conference computer science engineering, pp 833–837.

- In this paper, an application for precision agriculture, a customized architecture for agriculture, based on IoT is presented.

- This is a cloud-based IoT architecture. This project is applicable to various precision agriculture applications.

- The research proposed a three-layer architecture.

- The first layer collects the environmental information and supplies for needed actions.

- The second layer is a gateway layer, this layer connects the front-end and back-end via Internet or network in which data can be stored and processed.

- Researchers built a prototype of this architecture to test and illustrate its performance.

- The efficiency of the proposed architecture is demonstrated by the performance evaluation results.

VIII. Patra L, Rao UP (2016) Internet of things-architecture, applications, security and other major challenges. In: 2016 international conference on computing for sustainable global development (INDIACom), pp 1201–1206

- This paper explains the architectural components of Internet of Things, shows some application areas where Internet of Things is applicable, discussed about some challenges that have to be discussed.

- These challanges includes the securities issues that require consideration like extensive deployment, standardization, interoperability, security of data, efficient spectrum usages and unique identification, gathered objectsafety, security, and energy consumption.

- IoT getting rapid momentum due to advances in sensing, actuating, and RFID technologies.

- It aims at blending the virtual world with the real world seamlessly.

Problem Statements:

- This paper focused on a basic trade that is Agriculture, which is closely related to the welfare of any nation and the people's livelihood. In India, Agriculture sector is shrinking day by day which disturbs the ecosystem's production capacity.

- There is a burning requirement to resolve this problem in the area to reestablish vitality and place it back on higher progression.

- The reemerging of the worldwide recession has caused flows across both the developed and the developing economies. Agriculture domain required to be more competent and irrepressible to ensure universal food security. Farmers of India are at excessive detriment in terms of technology, size of farms, government policies, trade, etc. The Internet of Things technology can diminish some of the problems of Indian farmers.

- While in the world, agriculture is experiencing industrialization, it is very significant to develop "agricultural information network". Agricultural information network has become the trend of enlargement for the world's agriculture.

- In concern of the Indian agriculture development, "agricultural information network" is a major concern in stimulating agricultural development and its transformation.

- In India, there are many problems in the agricultural information system. For example, here more importance is given to hardware instead of software and cannot deliver high eminence information to get production requirements of farmers.

- Besides, information is not adequately used by the farmers of India and the influence of information on a rural area, agriculture, and farmers are not remarkable.

- The demand and supply of agricultural products has not been controlled properly, because of the demand and the consumption of the agricultural crops could be anticipated quantitatively, nevertheless, the deviation in crop and production by thebweather change, change in cultivated area of farms, damage by insects, disease in crop, etc., could not be truly predicted.

- To change this situation and endorse the speedy development of agriculturalinformation network, it is required to use the Internet of Things to appreciate smart agriculture.

2.3 PROBLEM STATEMENT

PROBLEM STATEMENT :

1. What does smart agriculture mean?

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.

2. What are the impacts of smart agriculture?

Climate-smart agriculture (CSA) improves agricultural productivity and enhance farm income on a sustainable basis, enhance water and nutrients use efficiency, resilient to climatic stresses, and lowering the emissions of Greenhouse Gas (GHG) to a minimum level

3. What are the benefits of smart farming?

Increasing control over production leads to better cost management and waste reduction. The ability to trace anomalies in crop growth or livestock health, for instance, helps eliminate the risk of losing yields. Additionally, automation boosts efficiency.

4. Why do we need a smart irrigation system?

Smart irrigation helps in minimal wastage of water. It allows to reinvest in new and improved technologies which ensure sustainable and responsible irrigation over time.It also allows controlling the amount of water delivered to the plants when it is needed.

5. What is the purpose of irrigation?

Irrigation is the artificial application of water to the soil through various systems of tubes, pumps, and sprays. Irrigation is *usually used in areas where rainfall is irregular or dry times or drought is expected.*

6. Why automatic irrigation is important?

It makes the irrigation process more efficient and workers can concentrate on other important farming tasks. On the other hand, such a system can be expensive and very complex in its design and may needs experts to plan and implement it

Chapter 3

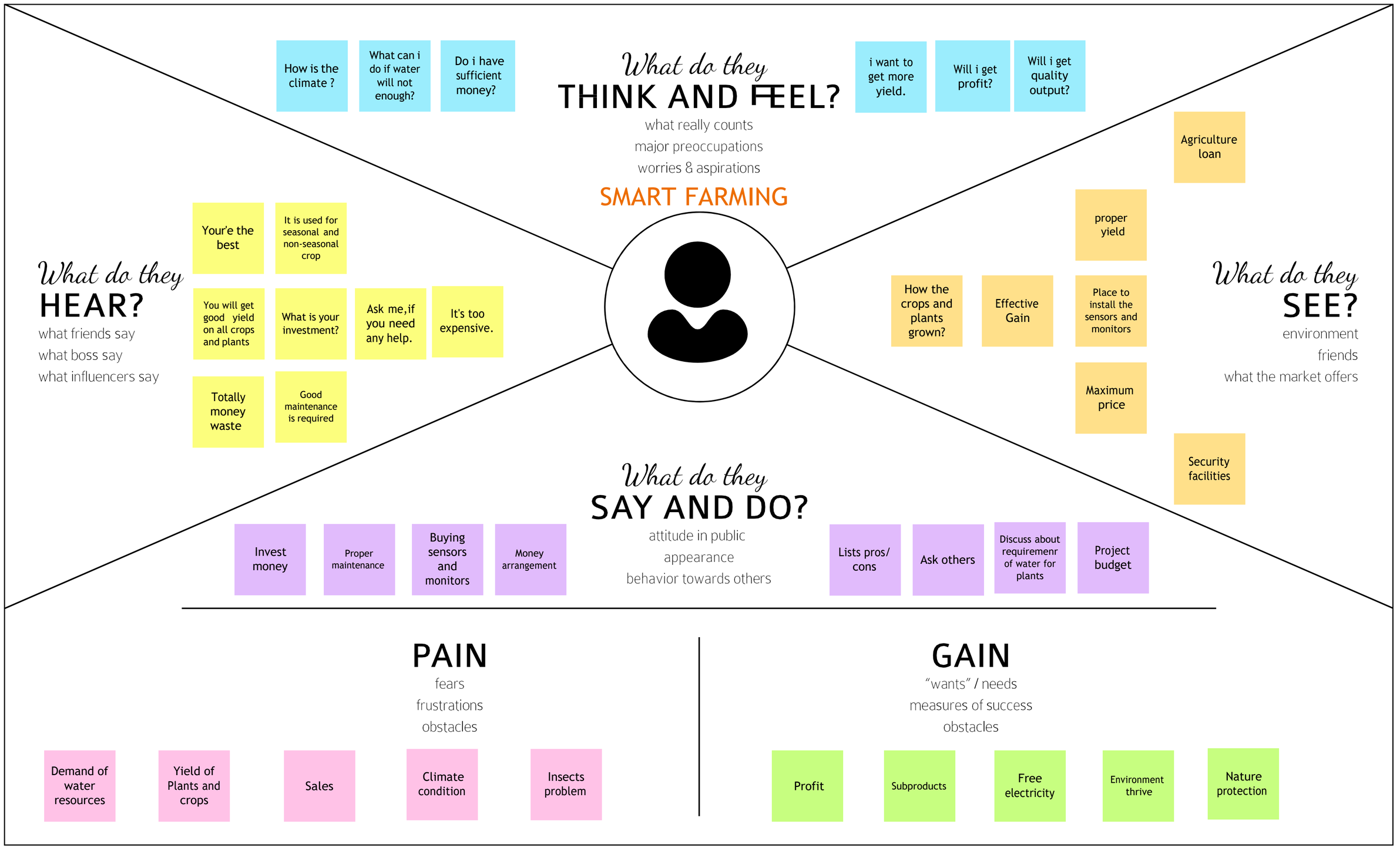
IDEATION & PROPOSED SOLUTION :

Empathy Map Canvas

Gain insight and understanding on solving customer problems.

1

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



Share your feedback

Template

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
2-8 people recommended

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

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

Learn how to use the facilitation tools
Use the Facilitation Superpowers to run a happy and productive session.

Open article

MEMBERS

1. VISHNU PRASATH .S
2. PUGAZHENTHI .K
3. BALASUBRAMANIAN .A
4. SANTHOSH .S

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

PROBLEM

How might we [your problem statement]?

Key rules of brainstorm

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!

VISHNU PRASATH

PUGAZHENTHI

BALASUBRAMANIAN

SANTHOSH

3 Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. In the last 10 minutes, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

20 minutes

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

4 Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

20 minutes

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

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

TIP
Participants can use their cursors to point at where sticky notes should go on the grid. The facilitator can confirm the spot by using the laser pointer holding the M key on the keyboard.

After you collaborate

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

Quick add-ons

Share the mural
Share a view link to the mural with stakeholders to keep them in the loop about the outcomes of the session.

Export the mural
Export a copy of the mural as a PNG or PDF to attach to emails, include in slides, or save in your drive.

Keep moving forward

Strategy blueprint
Define the components of a new idea orstrategy.
Open the template

Customer experience journey map
Understand customer needs, motivations, and obstacles for an experience.
Open the template

Strengths, weaknesses, opportunities & threats
Identify strengths, weaknesses, opportunities, and threats (SWOT) to develop a plan.
Open the template

Share template feedback

Need some inspiration?
See a finished version of this template to kickstart your work.
Open example

3.3 Proposed Solution

Proposed Solution Template:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Farmers are under pressure to produce more food and use less energy and water in the process. A remote monitoring and control system will help farmers effectively with these pressures. Irrigated farms typically deploy a single pump to irrigate 80 to 100 acres of land.
2.	Idea / Solution description	Smart farming is an emerging concept that refers to managing farms using technologies like IoT, robotics, drones and AI to increase the quantity and quality of products while optimizing the human labour required by production.
3.	Novelty / Uniqueness	Unlike genetic resources found in the natural world, agricultural crops are truly a human mediated form of biodiversity. Through the process of domestication, human beings have for over 10,000 years been selecting and breeding plant species from the wild and creating new diversity adapted specifically for cultivation.
4.	Social Impact / Customer Satisfaction	It determines how happy customers are with a company's products, services, and capabilities. Customer satisfaction information, including surveys and ratings, can help a company determine how to best improve or changes its products and services.
5.	Business Model (Revenue Model)	Subscription based application for providing analysis of crops and fields.The smart farming devices designed in such a way that should be profitable compared to traditional farming methods and the device should be reusable.
6.	Scalability of the Solution	Easy and simple setup is required and less number of connections and sensors are used for efficient performance. Everything can be controlled from anywhere through cloud.

3.4 Solution Fit Template

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

The customers of this product are the farmers who cultivate crops. Our aim is to assist, aid and help them to monitor the field parameters remotely and to keep track of the parameters. This product saves the agriculture from extinction.

6. CUSTOMER CONSTRAINTS CC

Deployment of huge number of sensors is difficult. It requires an unlimited or continuous internet connection to be successful.

5. AVAILABLE SOLUTIONS AS

The irrigation process is automated using IoT. weather data and field parameters were obtained and processed to automate the process of irrigation. The drawbacks are high cost of installation, efficient only for short distance, difficulty in storing the data

Explore AS, differentiate

Focus on J&P, tap into BE, und

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

The objective of this product is to obtain the different field parameters using sensor and process it using a central processing system. Cloud is used to store and transmit the data by using IoT. Weather APIs are employed to assist the farmer in making decision. The farmer could take decision through a mobile application.

9. PROBLEM ROOT CAUSE RC

The frequent change or unpredictable weather and climate, made it difficult for the farmers to do agriculture. These factors play a major role in making decision whether to water the plant or not. The monitoring of the field is hard when the farmer is out of station, thus leading to crop damage.

7. BEHAVIOUR BE

Using proper drain system to overcome the effects of excess water due to heavy rain. Using hybrid varieties of crop that are resistant to pests.

Focus on J&P, tap into BE, und

3. TRIGGERS

TR

Farmers facing issues in providing proper irrigation. No proper supply of water leads to reduced production which affects the profit level of the farmer. Farmer's struggle to predict the weather.

4. EMOTIONS: BEFORE / AFTER

EM

BEFORE: Lack of knowledge in weather forecasting →Random decisions →low yield.

AFTER: Data from reliable source → correct decision →high yield

10. YOUR SOLUTION

SL

Our product collects the data from different types of sensors and it sends the value to the main server. It also collects the weather data from the weather API. The ultimate decision, whether to water the crop or not is taken by the farmer using mobile application.

8. CHANNELS of BEHAVIOUR

CH

8.1 ONLINE

Providing online assistance to the farmer, in providing knowledge regarding the pH and moisture level of the soil. Online assistance to be provided to the user in using the product

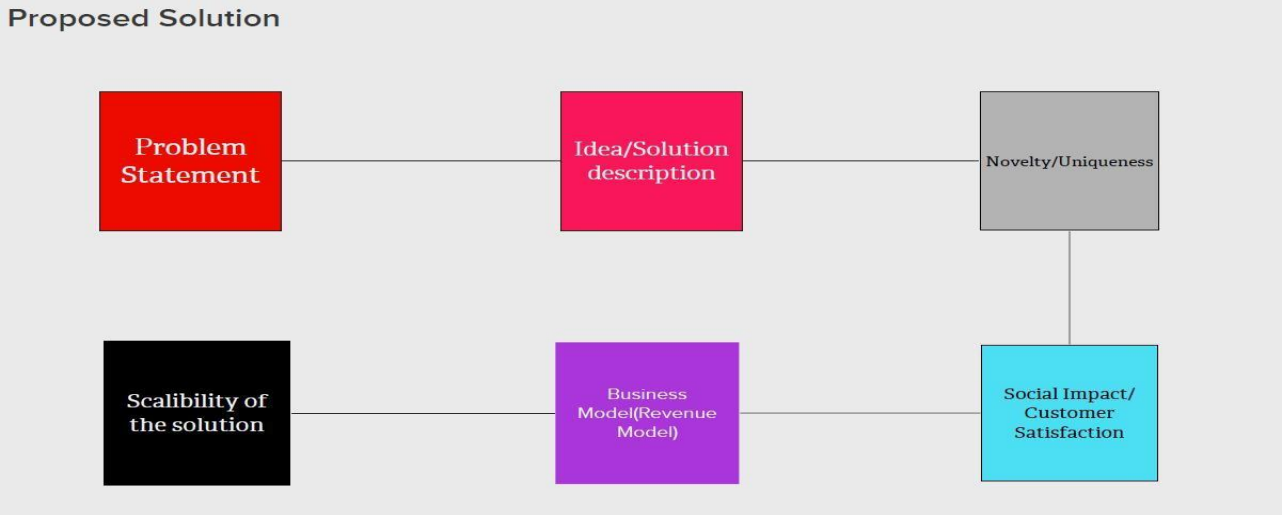
8.2 OFFLINE

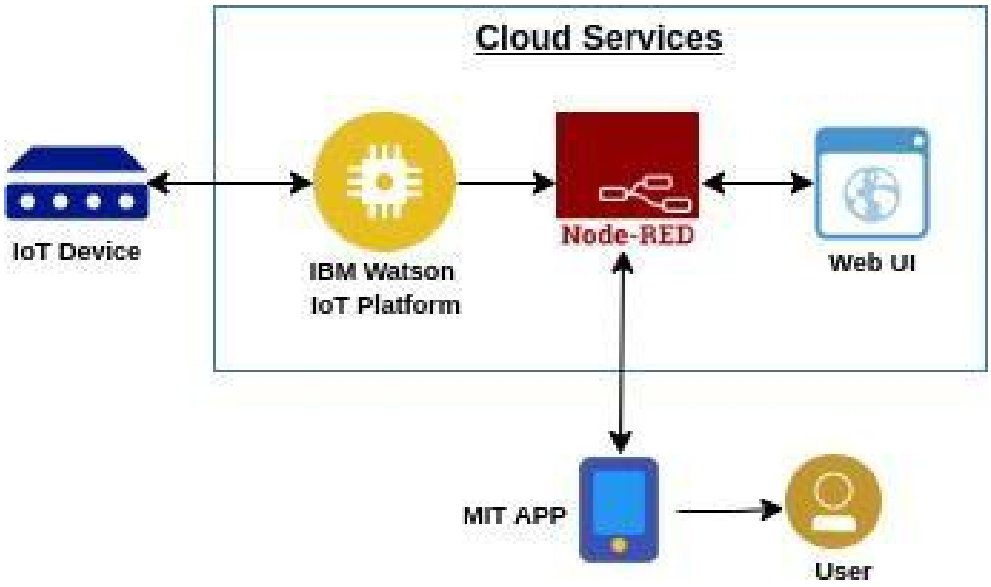
Awareness camps to be organized to teach the importance and advantages of the automation and IoT in the development of agriculture.

Identify strong TR & EM

Identify strong & EM

Solution Architecture





Template

Smart Farmer Application Using IoT Customer Journey Map

Team ID: PNT2022TMID38652

Created in partnership with

Product School

SmartFarmer - IoT Enabled Smart Farming Application

Share template feedback

Need some inspiration?

See a finished version of this template to kickstart your work.

Open example

Smart

SmartFarmer - IoT

Enabled Smart Farming Applicatio

Entice
How does someone initially become aware of this process?

Enter
What do people experience as they begin the process?

Engage
In the core moments in the process, what happens?

Exit
What do people typically experience as the process finishes?

Extend
What happens after the experience is over?

Steps
What does the person (or group) typically experience?

The app first check the weather of particular location
Visit the website or app
The user should navigate to our website or app
The app hygrometer to measure the Humidity
Check the humidity
Check the weather
Login to the app
The user should login to the app by using mail or phone number
Check the soil moisture
Using the app user can check the soil moisture whether it is dry or not
View the humidity of soil
App can intimate the result
Switch on the motor
If the field is dry we can able to switch on the motor
Alert message
Using app user can switch on/ off the motor from anywhere
User can get alert when certain soil humidity level reached
Switch on/off the motor
Ensure the yield of the crop
After the growth of the crop we can ensure the yield of the crop
Submitting feedback
The user can writes are view and gives ideas of the app
Farming in the user profile
In the customer profile they can see the data about the field.
Personalized work
Farmer should not engage themselves fulltime in the field , they can feel relax by using this application

Interactions
What interactions do they have at each step along the way?

People: Who do they see or talk to?

Places: Where are they?

Things: What digital touchpoints or physical objects would they use?

Sign up /sign in page for the users
Weather forecast shows the weather for routine days
It show the temperature and humidity of our field
Customer's email (website like Gmail)
"Leave a feedback" model window within the profile on the website , IOS app, or android app
Completed experiences section of the profile on the website , IOS app or android app

Goals & motivations
At each step, what is a person's primary goal or motivation? ("Help me..." or "Help me avoid...")

Help me get the field temperature
Access from anywhere at any time
Help me understand our land field and climate condition
Remotely we can access the motor switch
Help me to see what could be doing next
Fulfilled mind

Positive moments
What steps does a typical person find enjoyable, productive, fun, motivating, delightful, or exciting?

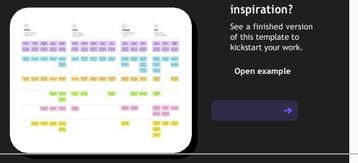
Increased quality of production
It saves time and reduce labor cost
Modern technology has made water supply simple
It gives motivation for the design
People love to remote access control ,we have a 96% satisfaction rating

Negative moments
What steps does a typical person find frustrating, confusing, angering, costly, or time-consuming?

Some people don't known how to use the smart device
In some rural areas the network connectivity was poor
rural people express a bit of fear to use technology
Fear of Failure
Hard to handle
Easy to handle

Areas of opportunity
How might we make each step better? What ideas do we have? What have others suggested?

Provide a similar information about smart farming
By these technology literate peoples are ready todo farming
More cost
More Reliable



CHAPTER 4
REQUIREMENT ANALYSIS

Solution Requirements (Functional & Non-functional)

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 Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User Location	Share the Location through the Mobile Phones Share the Location through the System
FR-4	User Enter the No. of Acres	Mention the Number of Acres through Smart Farming Applications
FR-5	User Select the Category	Select the Display Option like Weather, Drone Services, Soil Testing etc..
FR-6	Confirmation of User Details & Payment Process	Enter the Valid Data and Payment through Online Transaction

Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	User Friendly Guidelines are Available for the User in the Application
NFR-2	**Security**	User Data Should be More Securable in the Application from Unknown Person
NFR-3	**Reliability**	Once the Database is Updated the User can Access the Data at Anytime
NFR-4	**Performance**	The Front-Page Load Time Must be no More Than 5 Seconds for the User Based on the Network Connection
NFR-5	**Availability**	In Future Any Modification in the Application it will not Affected the User Data also Front-end & Back- end of the Application
NFR-6	**Scalability**	The Website Traffic Limit Must be Scalable

Chapter 5

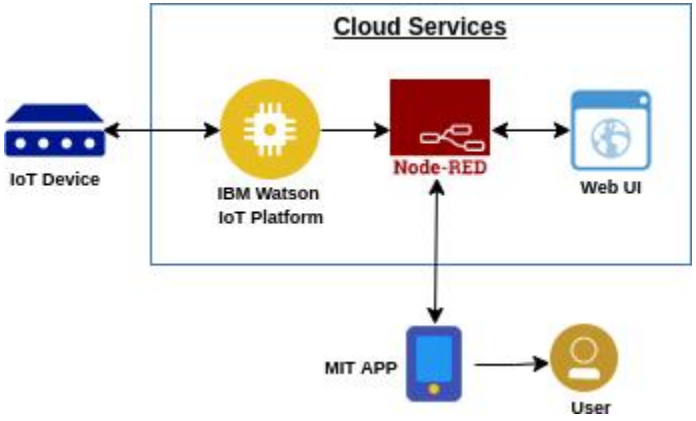
PROJECT DESIGN:

Project Design Phase-II
Data Flow Diagram& User Stories

Data Flow Diagrams:

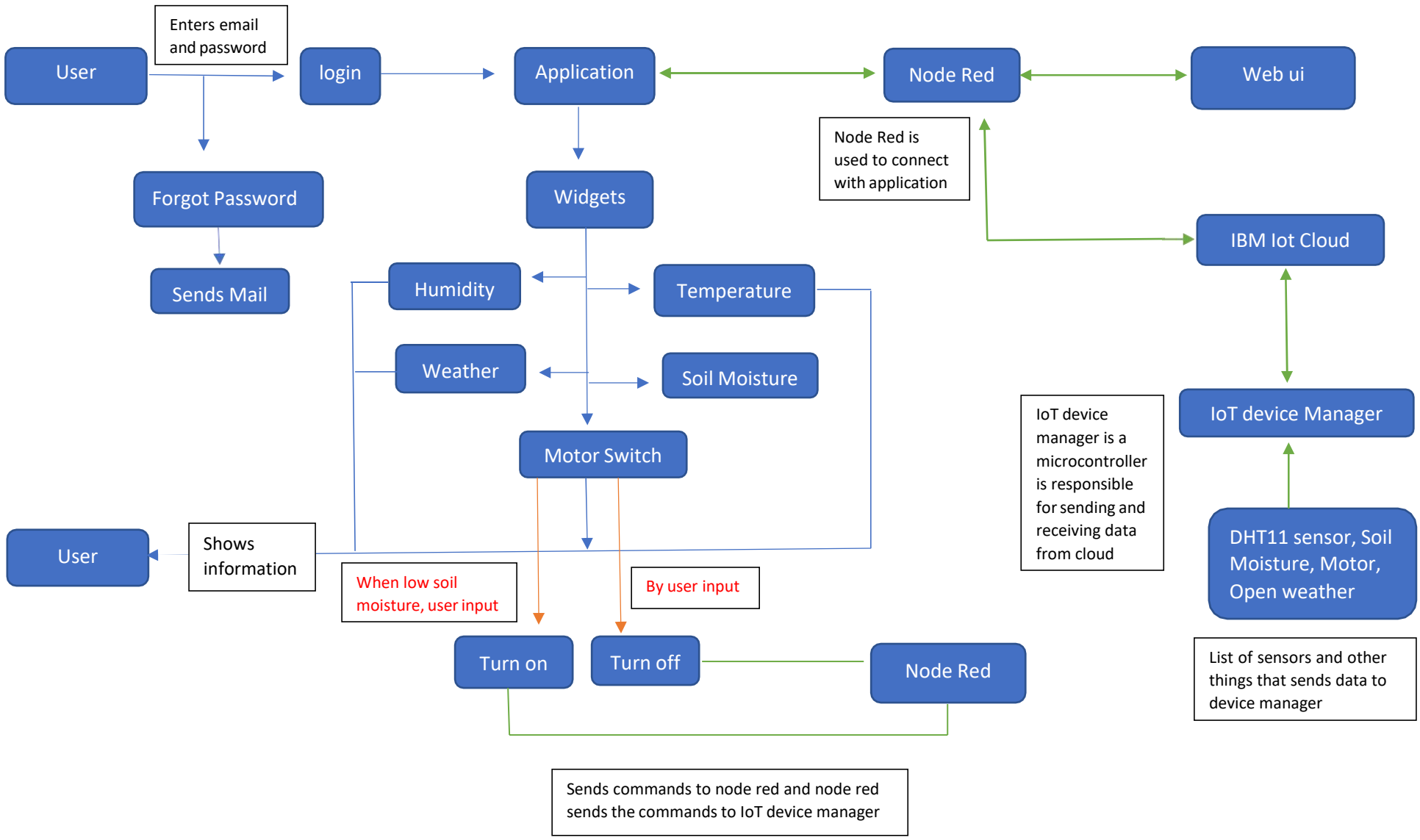
A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the rightamount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

Example: (Simplified)



- Different parameters such as temperature, humidity, soil moisture are sensed using the sensors.
- Open weather API is used for collecting the weather information.
- Above data are processed with the help of microcontroller which is connected to internet.
- The processed data is updated to cloud for further process
- The IBM Watson IoT Platform is connected with node red services which is connected to the application.
- In application, user can see the parameters/data that obtained from sensors and APIs.
- With the help of application user can interact with IoT devices to perform some functions such turning ON & OFF motor.
- Web UI is also used for visualization of data.

Detailed DFD Level 0 (Industry Standard)



User Stories

Use the belowtemplate to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account /dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation emailonce I have registered for the application	I can receive confirmation email & click confirm	Medium	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-1
		USN-4	As a user, I can register for the application through Gmail		Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password		High	Sprint-1
	Dashboard	USN-6	As a user I want to see everything in single widget		Medium	Sprint-2
		USN-7	As a user I want a organised widgets section		High	Sprint-2
		USN-8	As a user I want a graphical/pictorial representation		Low	Sprint-2
Customer (Web User)	Dashboard	USN-9	As a user I want a graphical representation ofdata for better understanding		High	Sprint-2
		USN-10	As a user I want to see a dashboard where Ican customise myself	Dashboard with customisation	Low	Sprint-2
Customer (Mobile and Web)	IoT Device Setup	USN-10	Have to use a least sensor and get better output		High	Sprint-2
		USN-11	As a user, I need a low cost IoT devices for farming		High	Sprint-2
		USN-12	As a user, I need a multiple sensors for various data		High	Sprint-2

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer Care Executive	User Problems	USN-13	As a user, I don't howto use the application	Manual guide will be there	Medium	Sprint-3
		USN-14	As a user, I need my application to work onmost of the mobiles		High	Sprint-3
		USN-15	As a user, I am facing issue in the application	Query form will be there	High	Sprint-3
Administrator	Query Clarification	USN-16	As a admin, I give solutions to their queries		High	Sprint-3
	Particular Access	USN-17	As a admin, I give access only to authorised person		High	Sprint-3
	Connection with IoTdevices	USN-18	As a admin, I ensure the correct working ofthe devices. If any problem arises it will be sharedto user		Medium	Sprint-4
Customer (Mobile user)	Application	USN-19	As a user, I need to control my devices	Commands for devices	High	Sprint-4
		USN-20	As a user, I need a events for better productivity		Low	Sprint-4
		USN-21	As a user, I need a more info about plantsinside a application		Medium	Sprint-4

Project Design Phase-II Technology Stack (Architecture & Stack)

Technical Architecture:

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

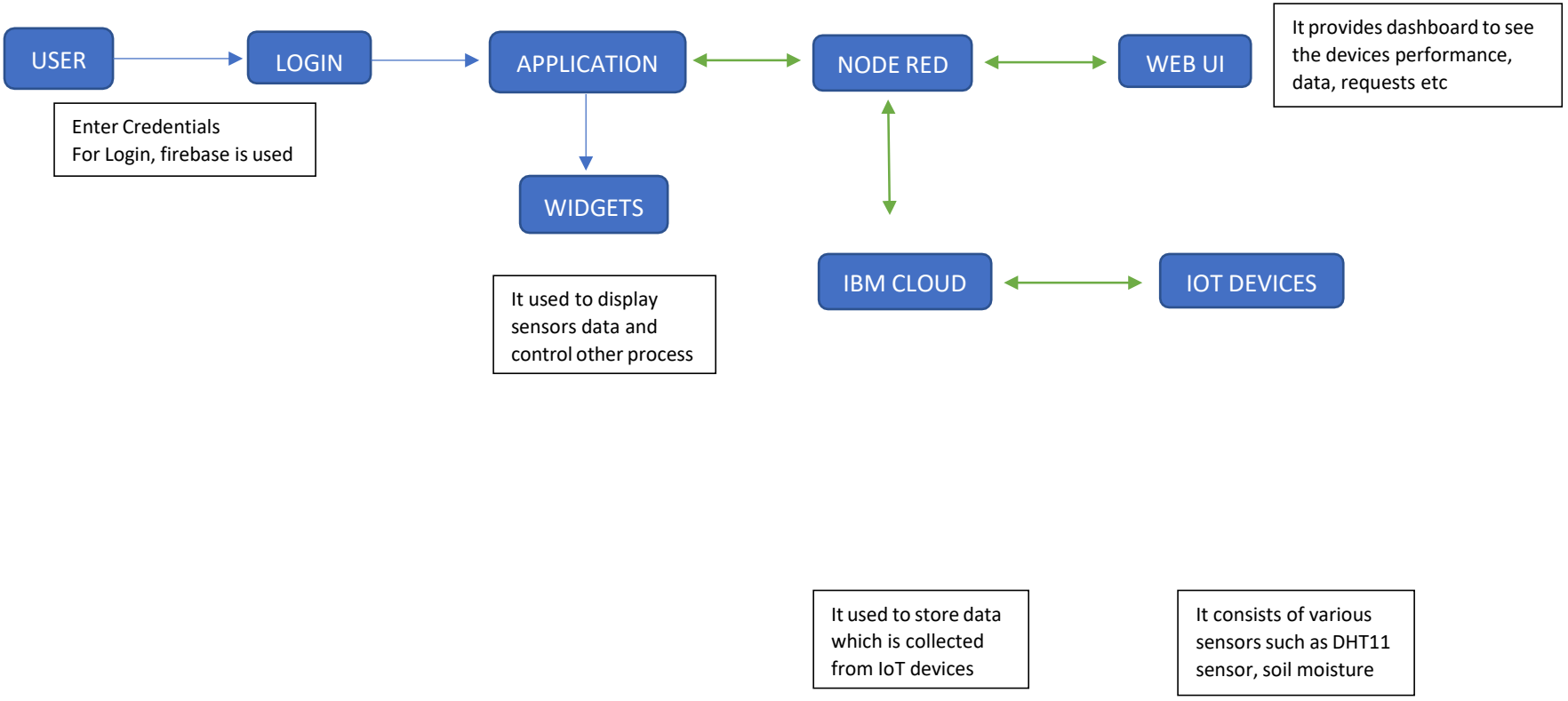


Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	Mobile app. In our application, were data are displayed using widgets like structure. Users interacts with widgets to additional info	MIT App Inventor
2.	Application Logic-1	Logic for a process in the application	Python
3.	Application Logic-2	Logic for a process in the application	IBM Watson STT service
4.	Application Logic-3	Logic for a process in the application	IBM Watson Assistant
5.	Database	Data base type	Firebase is Nosql database
6.	Cloud Database	Database Service on Cloud	Firebase, IBM Watson IoT Cloud Platform
7.	File Storage	File storage requirements	IBM Block Storage or Other Storage Service or Local Filesystem
8.	External API-1	Purpose of the API is get to weather information	Open Weather API
9.	External API-2	Purpose of the API is to connect with firebase forlogin purpose	Firebase API
10.	Infrastructure (Server / Cloud)	Application Deployment on Local System / CloudLocal Server Configuration: Cloud Server Configuration :	Local, IBM Cloud, Firebase
11.	DHT11 sensor, Soil Moisture sensor	It used to monitor the soil, temperature, humidity.	

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Node Red, MIT App Inventor, Arduino IDE Node Red for connecting with application, MIT App Inventor for building app, Arduino is open source electronics platform to build hardware and software.	It is a software, which helps in connecting and building application. Node Red, MIT App Inventor, ArduinoIDE.
2.	Security Implementations	HTTPS Connections, X-Force Red IoT Testing	Encryptions, Secured Connection
3.	Scalable Architecture	Architecture is scalable from 10 devices to 300 devices easily and account is also scalable upto thousand connections. For very high scalability weneed to upgrade our cloud plan.	Firebase, IBM Cloud
4.	Availability	Availability of our application is 24/7 because which use a cloud technology. Firebase will use commercially reasonable efforts to make Firebaseavailable with a Monthly Uptime Percentage of at least 99.95% and distributed servers.	Firebase, IBM Cloud
5.	Performance	No of requests is 2 requests per 20 seconds or 4 requests per 30 second and sometimes user requestwill be added with respective to the requests	MIT App Inventor, Node Red, Cloud

Chapte 6

PROJECT PLANNING & SCHEDULING:

:

Project Planning Phase

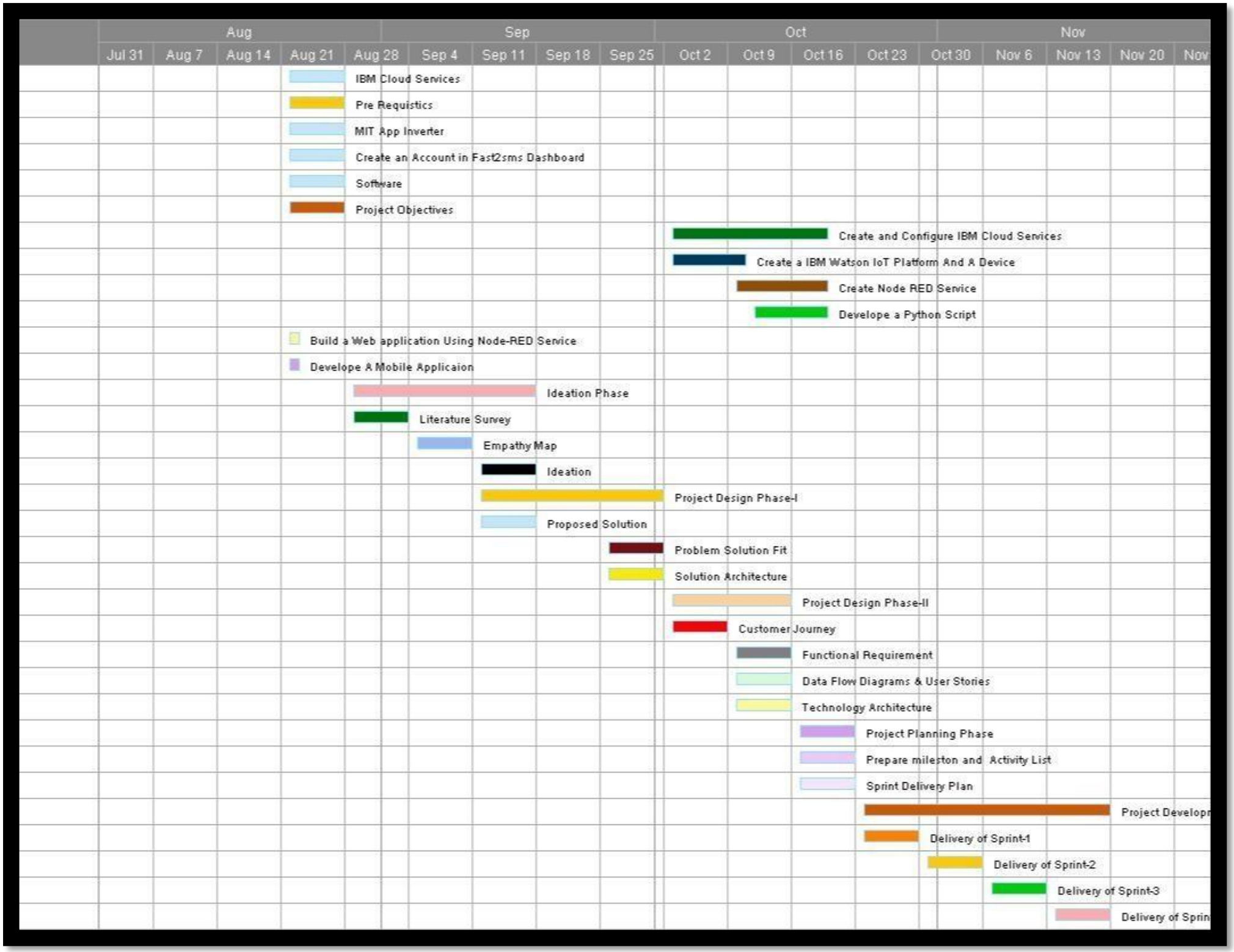
Milestone and Activity List

S.No	Milestone	Activities	Start	Finish	Status
1.	IBM Cloud Services	Create an IBM account	22/08/22	27/08/22	Complete
	• Pre Requistics		22/08/22	27/08/22	Complete
	• MIT App Inverter	Sign up for MIT app Inverter for Creating Apps	22/08/22	27/08/22	Complete
	• Create an Account inFast2sms Dashboard	Create an Account in Fast2sms	22/08/22	27/08/22	Complete
	• Software	Install Python IDLE 3.7.0	22/08/22	27/08/22	Complete
2.	Project Objectives	Prepare the Project Objectives	22/08/22	27/08/22	Complete
3.	Create and Configure IBM CloudServices		03/10/22	19/10/22	Complete
	• Create a IBM Watson IoTPlatform And A Device	Create a IBM Watson IoT Platform And A Device	03/10/22	10/10/22	Complete
	• Create Node RED Service	Create Node RED Service	10/10/22	19/10/22	Complete

4.	Develope a Python Script	Develope a Python code	12/10/22	19/10/22	Complete
5.	Build a Web application UsingNode-RED Service	Build a Web application Using Node-RED Service	22/08/22		In Progress
6.	Develope A Mobile Applicaion	Develope A Mobile Applicaion	22/08/22		In Progress
7.	Ideation Phase		29/08/22	17/09/22	Complete
	• Literature Survey	Literature Survey On the selected Project &Information Gathering	29/08/22	03/09/22	Complete
	• Empathy Map	Prepare Empathy Map Canvasto Capture the User'sPain & Gain,Prepare List of Problem Statement	05/09/22	10/09/22	Complete
	• Ideation	List the Ideas by organizing the Brainstormingsession & Importance	12/09/22	17/09/22	Complete
8.	Project Design Phase-I		12/09/22	01/10/22	Complete
	• Proposed Solution	Prepare the proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc.	12/09/22	17/09/22	Complete
	• Problem Solution Fit	Prepare problem - solution fit document	26/09/22	01/10/22	Complete
	• Solution Architecture	Prepare Solution Architecture	26/09/22	01/10/22	Complete
9.	Project Design Phase-II		03/10/22	15/10/22	Complete
	• Customer Journey	Prepare the customer journey maps to understandthe user interactions & experiences with the application	03/10/22	08/10/22	Complete
	• Functional Requirement	Prepare the Functional Requirement Document	10/10/22	15/10/22	Complete
	• Data Flow Diagrams & UserStories	Prepare the Data Flow Diagram Document & UserStories	10/10/22	15/10/22	Complete

	• **Technology Architecture**	**Prepare Technology Architecture of the solution**	**10/10/22**	**15/10/22**	**Complete**

10.	**Project Planning Phase**		**17/10/22**	**22/10/22**	**Complete**
	• **Prepare mileston and ActivityList**	**Prepare Milestone & Activity List**	**17/10/22**	**22/10/22**	**Complete**
	• **Sprint Delivery Plan**	**Prepare Sprint Delivery Plan**	**17/10/22**	**22/10/22**	**Complete**
11.	**Project Development Phase**		**24/10/22**	**19/11/22**	**In Progress**
	• **Delivery of Sprint-1**	**Attend the AMA / Expert Session- 1, ProjectDevelopment - Delivery of Sprint-1**	**24/10/22**	**29/10/22**	**Not Started**
	• **Delivery of Sprint-2**	**Attend the AMA / Expert Session-2,ProjectDevelopment - Delivery of Sprint-2**	**31/10/22**	**05/11/22**	**Not Started**
	• **Delivery of Sprint-3**	**Attend the AMA / Expert Session-3,ProjectDevelopment Delivery of Sprint-3**	**07/11/22**	**12/11/22**	**Not Started**
	• **Delivery of Sprint-4**	**Attend the AMA / Expert Session-4,ProjectDevelopment - Delivery of Sprint-4**	**14/11/22**	**19/11/22**	**Not Started**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Oct 30
Nov 6
Nov 13
Nov 20
IBM Cloud Services
Pre Requistics
MIT App Inverter
Create an Account in Fast2sms Dashboard
Software
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Create a IBM Watson IoT Platform And A Device
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Develope a Python Script
Build a Web application Using Node-RED Service
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Proposed Solution
Problem Solution Fit
Solution Architecture
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Functional Requirement
Data Flow Diagrams & User Stories
Technology Architecture
Project Planning Phase
Prepare mileston and Activity List
Sprint Delivery Plan
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Project Planning Phase

Project Planning Template (Product Backlog, Sprint Planning, Stories, Storypoints)

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

Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Simulation Creation	USN-1	Connect sensors, Arduino andesp8266	10	High	Vishnu Prasath.S, Balasubramanian.A
Sprint-1	Software	USN-2	Develop an application with MIT App inventor(Login page)	10	High	Pugazhenthi.K, Santhosh.S
Sprint-2	Software and Hardware	USN-3	Connect the hardware with IBM Cloudand API Integration	10	Medium	Vishnu Prasath.S, Balasubramanian.A
Sprint-2	Software	USN-4	Application development for project	10	High	Pugazhenthi.K, Santhosh.S
Sprint-3	Software	USN-5	Establishing Node-Red connection	10	Medium	Vishnu Prasath.S, Balasubramanian.A
Sprint-3	Software	USN-6	Connecting application with Node-Redand further application development	10	High	Pugazhenthi.K, Santhosh.S
Sprint-4	Testing	USN-7	Testing developed application andworking model of hardware	20	High	Vishnu Prasath.S, Balasubramanian.A, Pugazhenthi.K, Santhosh.S

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

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

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)

Total Sprint Points = 80
Total Sprint = 4

Average Velocity = 80/4 = 20

Chapter 7

Coding and solutioning

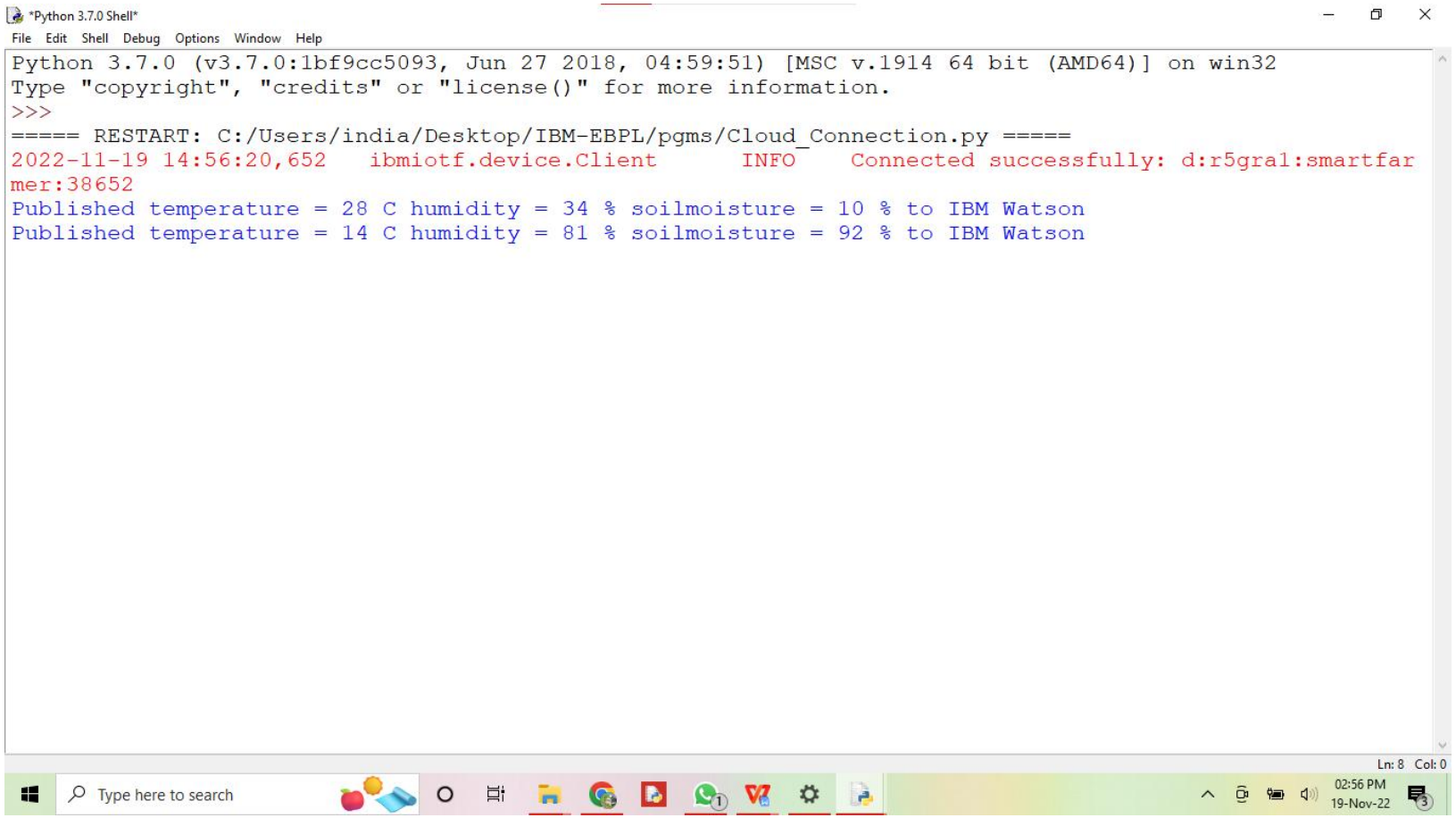
Feature 1:

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

#vishnu IBM
organization = "r5gra1"
deviceType = "smartfarmer"
deviceId = "38652"
authMethod = "token"
authToken = "12345678"

#Gpio

def mycommandCallback(cmd):
    print("Command Received: %s" %cmd.data['command'])
    status = cmd.data['command']
    if status=="motoron":
        print("MOTOR is ON")
```

```
    elif status=="motoroff":
        print("MOTOR is OFF")
    else:
        print("please send proper command")
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()

#CONNECCT
deviceCli.connect()

while True:
    temperature=random.randint(0,50)
    humidity=random.randint(0,100)
    soilmoisture=random.randint(0,100)
```

```
    data={'temperature':temperature,'humidity':humidity,'soilm
oisture':soilmoisture}

    def myOnPublishCallback():
        print("Published temperature = %s
C"%temperature,"humidity
= %s %%" %humidity,"soilmoisture = %s %%" %soilmoisture,
"to IBM Watson")

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

    deviceCli.commandCallback = mycommandCallback

#Disconnect

deviceCli.disconnect()
```

Output:


Python 3.7.0 Shell
File Edit Shell Debug Options Window Help
Python 3.7.0 (v3.7.0:1bf9cc5093, Jun 27 2018, 04:59:51) [MSC v.1914 64 bit (AMD64)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
===== RESTART: C:/Users/india/Desktop/IBM-EBPL/pgms/Cloud_Connection.py =====
2022-11-19 14:56:20,652 ibmiotf.device.Client INFO Connected successfully: d:r5gra1:smartfarmer:38652
Published temperature = 28 C humidity = 34 % soilmoisture = 10 % to IBM Watson
Published temperature = 14 C humidity = 81 % soilmoisture = 92 % to IBM Watson
Ln: 8 Col: 0
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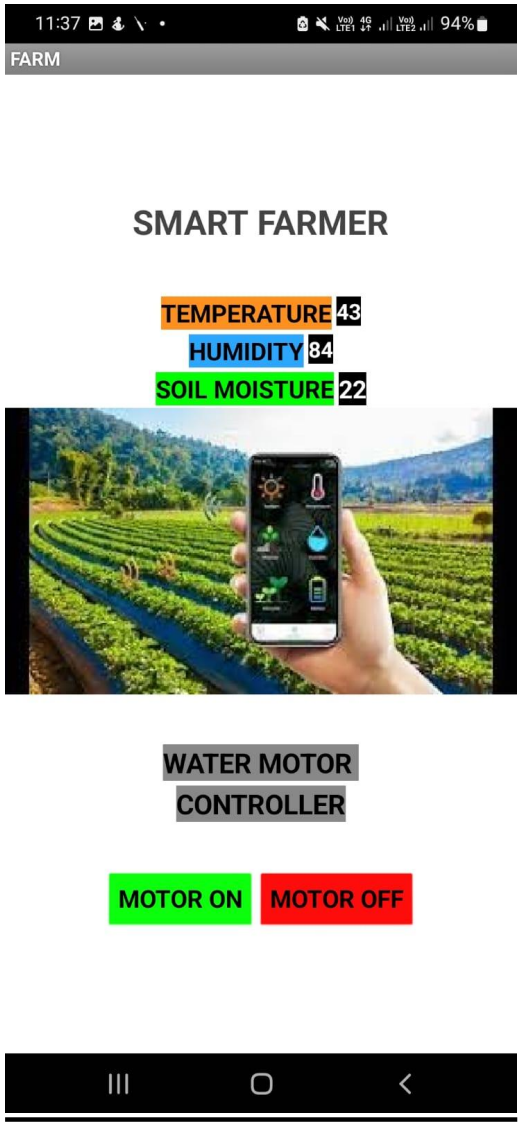
19-Nov-22

Feature 2: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94%
FARM
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HUMIDITY 84
SOIL MOISTURE 22
WATER MOTOR
CONTROLLER
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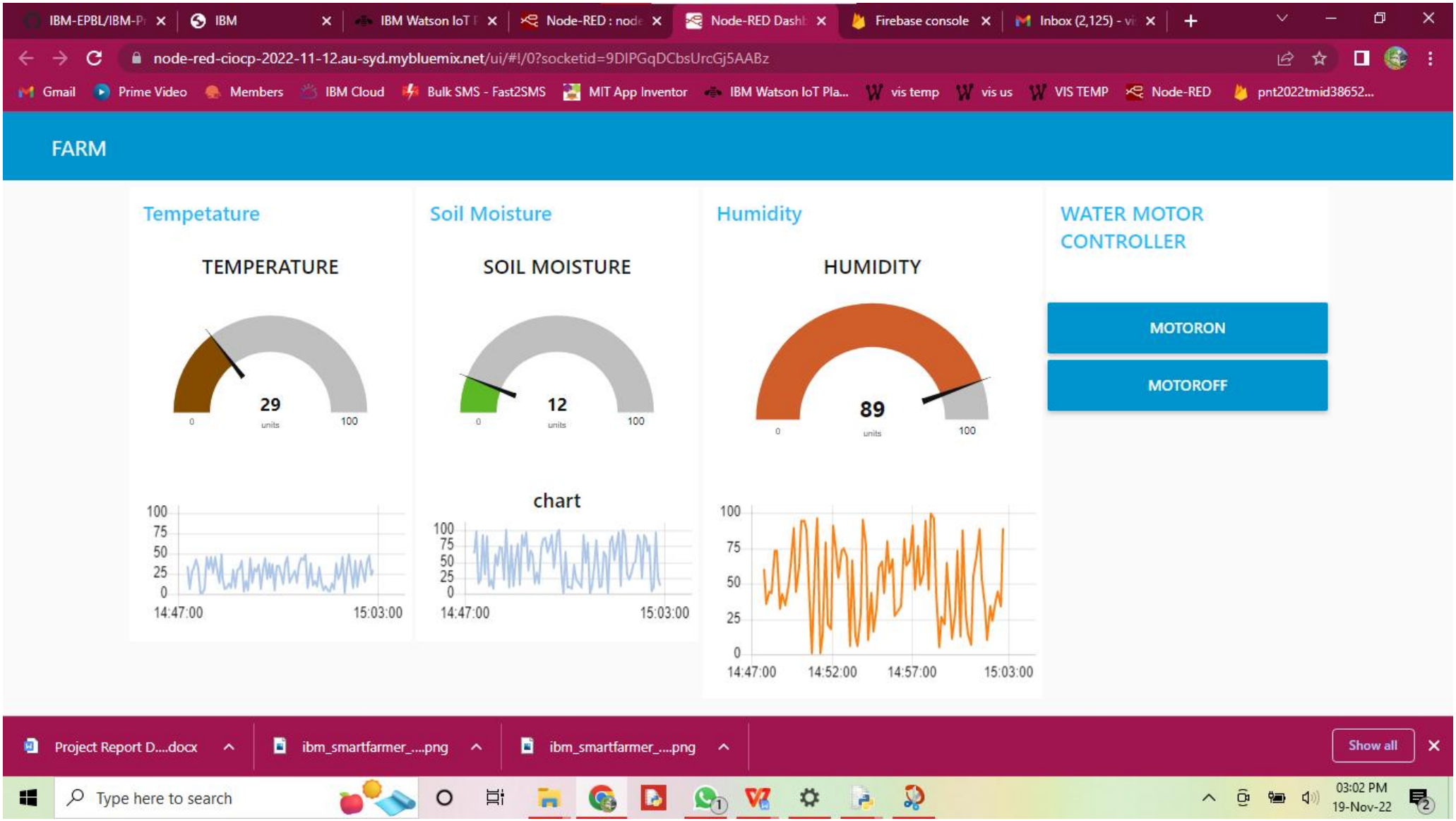
MOTOR OFF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Prime Video
Members
IBM Cloud
Bulk SMS - Fast2SMS
MIT App Inventor
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19-Nov-22

CHAPTER 9,10

TESTING AND RESULTS

Date	19/Nov/22
Team ID	PNT2022TMID38652
Project Name	Smart Farmer – IOT Enabled S
Maximum Marks	4marks

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Commnets	TC for Automation(Y/N)	BUG ID	Executed B
LoginPage_TC_002	UI	Home Page	Verify the UI elements in Login/ Signup popup	Android application	elements: a. Username text box b.password text box c. Submit button	http://ai2.appinventor.mit.edu/#6609723655585792	a.Username text box b.password text box c. Submit button with green colour	Working as expected	Pass	No issues faced			
LoginPage_TC_003	Functional	Home page	Verify user is able to log into application with Valid credentials	Login credentials	1.Enter the app and click NEXT 2.Enter Valid username in Username text box 3.Enter valid password in password text box	Username: Pugazhenthi k password: abcd	User should navigate to user account homepage	Working as expected	Pass	No issues faced			
LoginPage_TC_004	Functional	Login page	Verify user is able to log into application with InValid credentials	Login credentials	1.Enter the app and click NEXT 2.Enter Valid username in Username text box 3.Enter valid password in password text box	Username: vishnuprasath s password: 1234	Application should show 'Incorrect email or password ' validation message.	Working as expected	pass	No issues faced			
LoginPage_TC_004	Functional	Login page	Verify user is able to log into application with InValid credentials	Login credentials	1.Enter the app and click NEXT 2.Enter Valid username in Username text box 3.Enter valid password in password text box	Username: vishnuprasath s password: 1234	Application should show 'Incorrect email or password ' validation message.	Working as expected	pass	No issues faced			
MonitoringPage_TC_005	Functional	Monitoring page	Verify the simulated sensor data is displayed on the Android application	name and location of the child	1.Enter the app and click NEXT 2.Enter Valid username in Username text box 3.Enter valid password in password text box	name:pugazhenthi k lat:17.4219272 lon:78.5488783	Application should display the values that has been generated from the python code	Working as expected	pass	No issues faced			

Chapter 10

Advantages and dis advantages :

Advantages:

- Farms can be monitored and controlled remotely.
- Increase in convenience to farmers
- Less labour cost.
- Better standards of living.

Disadvantages:

- Lack of internet/connectivity issues
- Added cost of internet and internet gateway infrastructure
- Farmers wanted to adapt the use of WebApp.

Chapter 11

Conclution :

Conclution:

To overcome these problems, our team are on discussion and taking some better ideas in the upcoming brainstroming sessions and on planning to do IoT-based agriculture system helps the farmer in monitoring different parameters of his field like soil moisture, temperature, and humidity using some sensors. On our project, we are planning for each of the farmer can make the decision whether to water the crop or postpone it by monitoring the sensor parameters and controlling the motor pumps from the mobile application itself.

CHAPTER 12
FUTURE SCOPE

1. **Smart farming is certainly a leading enabler in producing more food with less for an increasing world population**. In particular, smart farming enables increased yield through more efficient use of natural resources and inputs, and improved land and environmental management.

2. Smart farming" is an emerging concept that refers to managing farms using technologies like IoT, robotics, drones and AI to increase the quantity and quality of products while optimizing the human labor required by production.

CHAPTER 13
APPENDIX

REFERENCES

GIT REPO:
https://github.com/IBM-EPBL/IBM-Project-3618-1658584411

IBM WATSON:
https://r5gra1.internetofthings.ibmcloud.com/

NODE RED:
https://node-red-ciocp-2022-11-12.au-syd.mybluemix.net/red/