Personal Assistance for Seniors Who Are Self-Reliant

Project report

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1. Introduction

1.1. Project Overview
- An app is built for the user (caretaker) which enables him to set the desired time and medicine. These details will be stored in the IBM Cloudant DB.
- If the medicine time arrives the web application will send the medicine name to the IoT Device through the IBM IoT platform.
- The device will receive the medicine name and notify the user with voice commands.

1.2. Purpose

- Sometimes elderly people forget to take their medicine at the correct time.
- They also forget which medicine He / She should take at that particular time.
- And it is difficult for doctors/caretakers to monitor the patients around the clock. To avoid this problem, this medicine reminder system is developed.

2. Literature survey

2.1. Existing problem

Elderly people let slip the medications at the correct time and the existing solutions for this problem is setting reminders or using pill boxes, calendars, Personal Assistance. Though the solutions give reminders, the voice commands or assistance given by this systemis more efficient.

2.2. Reference
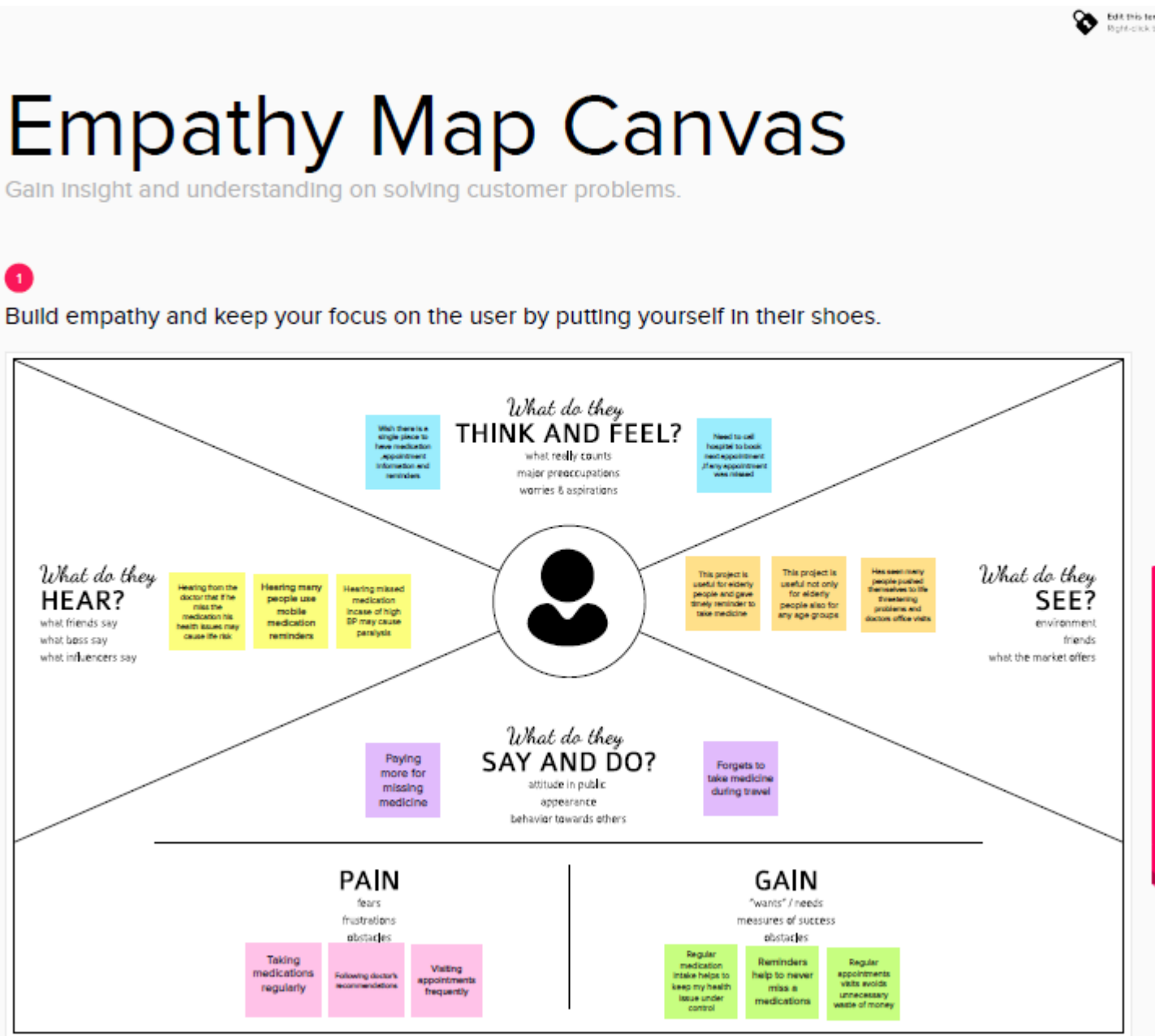- **Various aspects of caring of elderly people in the interest of their self reliance and independence. AUTHORS: ALICJA RÓŻYK-MYRTA, ANDRZEJ BRODZIAK, MARZANNA DERKACZ-JEDYNAK, and MARTA SUDOŁ-MALISZ**
- **Health Care and the Myth of Self-Reliance AUTHORS : NICOLE HUBERFELD, JESSICA L ROBERTS**

2.3. Problem statement definition

Skipping medicines can be serious for some medical health conditions; Sometimes elderly people forget to take their medicine at the correct time.They also forget which medicine one should take at that particular time. And it is difficult for doctors/caretakers to monitor the patients around the clock.

3. Ideation and proposed solution

3.1. Empathy Map Canvas

3.2. Ideation and Brainstorming

3.3. Proposed solution

S.No.	Parameter	Description
1.	Problem Statement (Problemto be solved)	It is difficult for elderly people to take medicine on their own at allocated time
2.	Idea / Solution description	This project proposes a IOT Based Medicine reminder alarm system. Using IOT webpage ,IR sensor, SMS alert, E-mail alert,esp8266 sensor ,MYSQL database, FTDI board , power supply it will alert the elders either by sending E-mail/SMS alert or by triggering some alarm.

3.	**Novelty / Uniqueness**	The uniqueness of our proposed project is patients need not have to remember their medicine dosage timings as they can set an alarm on their dosage timings. The alert can be set for multiple medicines and timings including date, time and medicine description. A notification will be sent to them through email or message inside the system preferably chosen by the patients.
4.	**Social Impact / Customer Satisfaction**	Using this project, it immensely help elder people to become more conscious to take medicine on time.
5.	**Business Model (Revenue Model)**	This project not only for elders, also useful for young patients who are forgot to take medicine on appropriate time . So the perfect solution for this problem should be a Automatic Medicine Reminder Alarm System.
6.	**Scalability of the Solution**	The main advantage of this project is its scalability. It will be in compact in size and elder people can take anywhere else to take timely medication according to their schedule.

3.4. Problem Solution fit

1. CUSTOMER SEGMENT(S) [CS]

Citizens who are in need of external support to take care of themselves for medical assistance.

6. CUSTOMER CONSTRAINTS

While previous research has focused on the impact of constraints on estimation of costs and benefits of health care interventions ,it is not always realized that such constraints may also influence how optimal decisions conditional on those estimates should be made . The default rules of cost effectiveness analysis are compared to a threshold level of cost effectiveness are derived from an optimization problem with only one

5. AVAILABLE SOLUTIONS

It is supplemented by the development of an advanced technology supported pill dispenser called the GSN based automatic pill dispenser .These simple efficient techniques are supported by advancements like GSM technology to bridge the gap in communication between the supplier or the chemist and the customer or patient, thus aiding the patient. This model summarized the major points about our SMB.

2. JOBS-TO-BE-DONE / PROBLEMS

This application helps the patient to remind medicine through voice assistance. It helps the user to do their daily routine without seeking help from others.

9. PROBLEM ROOT CAUSE [RC]

Attempts to learn from high risk industries such as aviation and nuclear power have been a prominent feature of the patient safety movement since the late 1990s. One practice adopted from such industries , endorsed by health care systems worldwide for the investigations of serious incidents , 1-3 is root cause anlavsis

7. BEHAVIOUR [BE]

The patient need to update the informations about their medication ,life routines to the application

3. TRIGGERS [TR]

People simply forget,skip or stop taking medications..which leads to non adherence .Trigger helps people to integrate healthy behavior by technology in avery simple way

10. YOUR SOLUTION [SL]

The solution is supplemented by the development of an advanced technology supported pill dispenser called the GSM based automatic pill dispenser. These are advancements like GSM technology to bridge the gap between the supplier and the customer or patient .This model summarized major points about our SMB

8. CHANNELS of BEHAVIOUR [CH]

The data stored in the application can be accessed with the help of internet

Define CS, fit into CC — Explore AS, different

Focus on J&P, tap into BE, understand RC — Focus on J&P, tap into BE, understand RC

4. Requirement analysis

4.1. Functional Requirements:

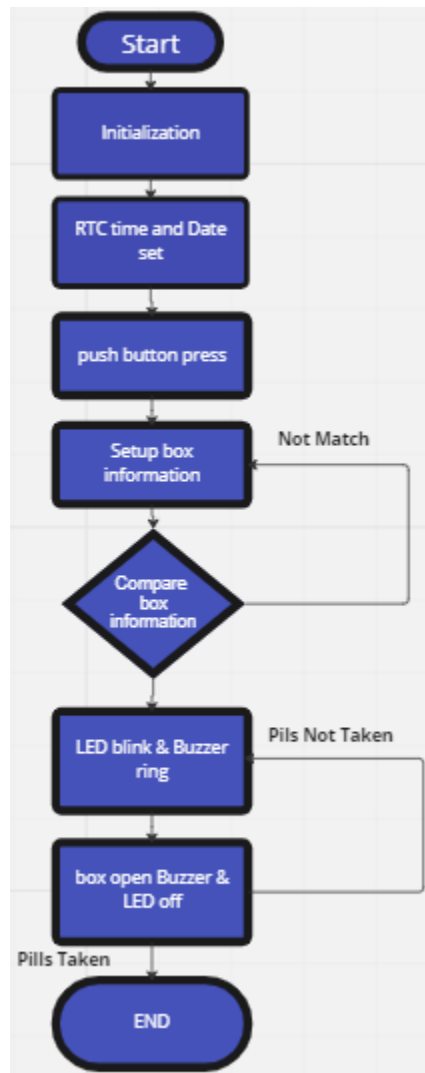| FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through SMS
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Access Cloud services	All the data are stored in the cloud via app and acknowledgement will be given to the user
FR-4	IOT configuration	Fine tuning the IOT device based on preference access the cloud database through device manager that manage the request and response effectively

4.2. Non-functional Requirements:

| FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Smart medicine box usability is the characteristics of the user that facilitate . Use to make it easier for the user to perceive the information presented by the user interface to understand and decide based on that information
NFR-2	**Security**	Smart medicine box ,like other computer systems ,can be vulnerable to security breaches , potentially ,impacting the safety and effectiveness of the device
NFR-3	**Reliability**	The probability of medicine box will perform a required function without failure understand conditions for a specific period

NFR-4	**Performance**	The probability of medicine box will perform a required function without failure understand conditions for a specific period
NFR-5	**Availability**	Medicine box is availability over all the conditions of weather and atmosphere pressure and be carried out with us.
NFR-6	**Scalability**	In feature we can upgrade the smart medicine box to the health care assistant to monitor our health care and book appointments to doctor.

5. Project Design

5.1. Data Flow Diagrams

5.2. Technical architecture
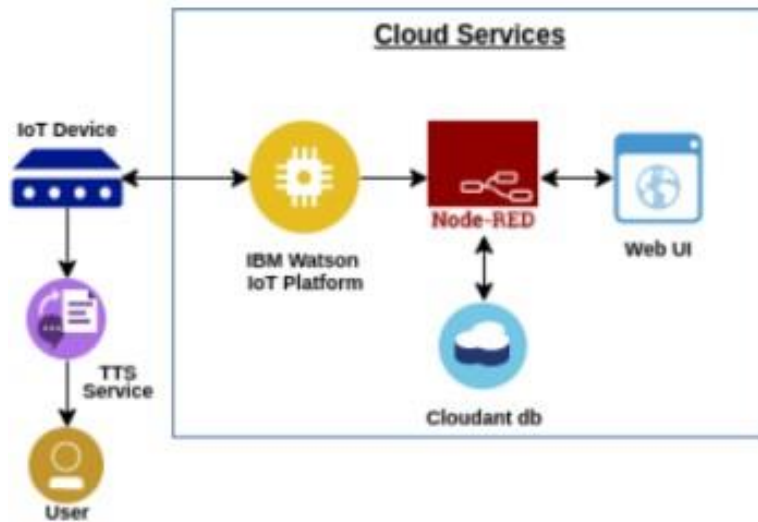
5.3. User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Senior citizen)	Care taker	USN-1	As a user, I want to take medicines on time and monitor my health	I want to take medicines on time	High High	Sprint-1
Customer (Alzheimer Patient)	Smart medicine box	USN-2	As a user, I want to take my tablets on time by voice command	I want to take tablets on time medicines on time	High	Sprint-1
Customer (Mentally idled patient)	Care taker	USN-3	As a user, my patient needs to take medicines on time and monitoring the activity	My patient needs to take medicines on time	Low	Sprint-2

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Coma patient)	caretaker	USN-4	As a user, my patient need to take medicines on time and monitoring the activity	My patients medication time and prescription should be in database history	Medium	Sprint-2
Customer (Disabled people's)	Smart medicine box	USN-5	As a user, I need to take my medicine nearby places with light notification	I need to take my medicines in nearby places with light notification	High	Sprint-3

6. Project Planning and Scheduling

6.1. Sprint Planning and Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, and password, and confirming my password.	3	High	Aravind B
Sprint-1	Confirmation	USN-2	As a user, I will receive a confirmation email once I have registered for the application	4	High	Dineash T
Sprint-1	Authentication	USN-3	As a user, I can register for the application through Gmail and mobile app.	4	Medium	Athi kesavan B

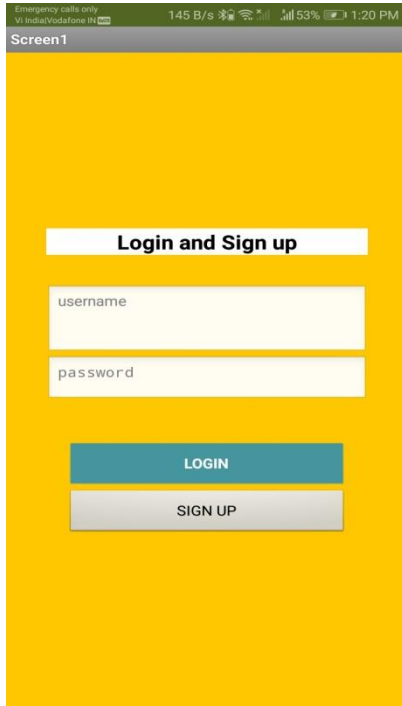| Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Login	USN-4	As a user, I can log into the application by entering email & password	3	High	Elwin D subin E
Sprint-1	Dashboard	USN-5	As a user, I need to be able to view the functions that I can perform	4	High	Athi kesavan B Aravind B
Sprint-2	Notification	USN-1	As a user, I should be able to notify my parent and guardian in emergency situations	10	High	Dinesh T Elwin D subin E
Sprint-2	Store data	USN-7	As a user, I need to continuously store my location data into the database.	10	Medium	Dinesh T
Sprint-3	Communication	USN-8	I should be able to communicate with user	10	Low	Elwin D Subin E

6.2. Sprint Delivery Schedule

Sprint	Total Story Points	Duration Sprint Start Date End Date (Planned)	Sprint	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 07Nov 2022 12 Nov 2022		20	12 Nov 2022
Sprint-4	20	6 Days 14 Nov 2022 19 Nov 2022		20	19 Nov 2022

7. Coding and Solutioning

7.1 Feature 1
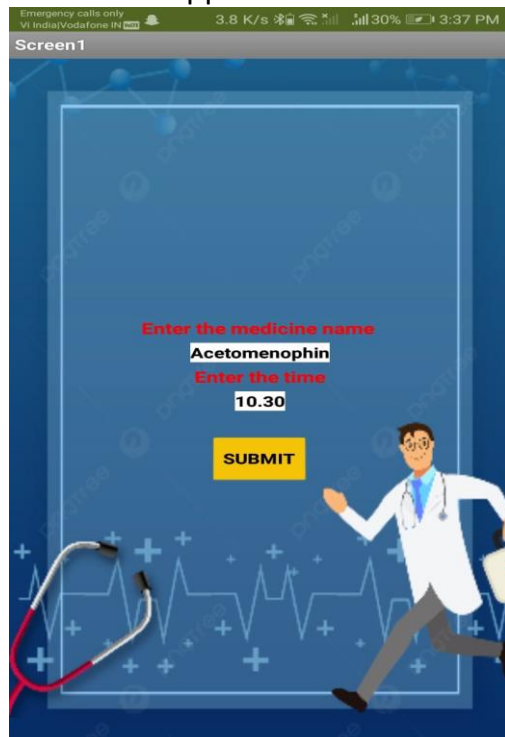
The mobile application developed has a feature of individual login by different users.

7.2 Feature 2

The mobile application also has the feature of uploading medicine names in the cloud.

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7.3. Feature 3

The project includes a cloud database system.
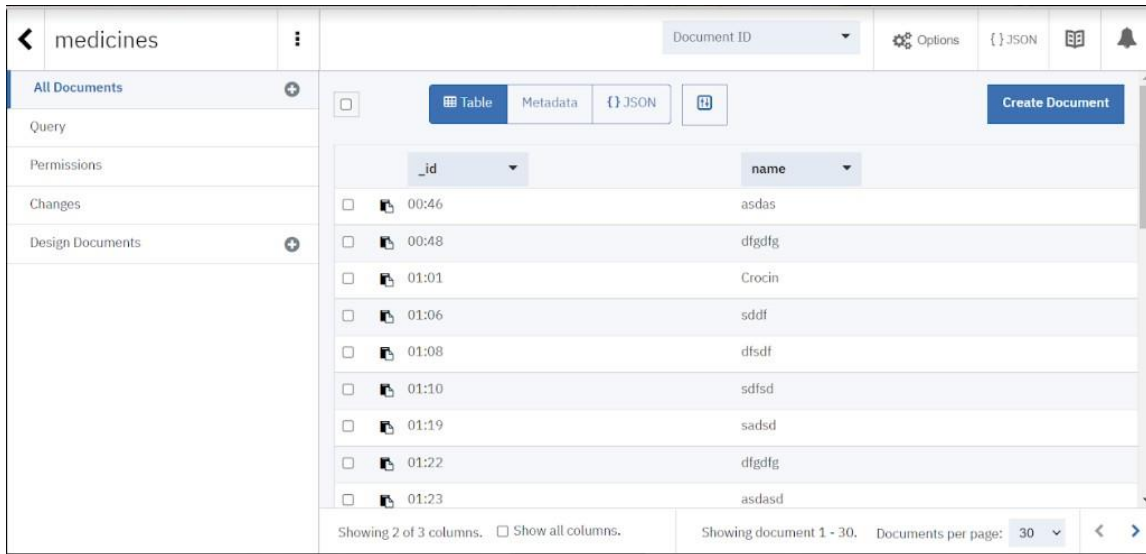
8. Testing

8.1. Test cases

Test case	Precondition	Test steps	Test data	Expected result
Verify login with valid credentials	User should have a network connection	1. Launch URL 2. Enter valid username. 3. Enter valid password. 4. Click on the "Login" button.	Username: athi Password: kesavan	Users should be able to login successfully.
Verify login with invalid credentials	User should have a network connection	1. Launch URL 2. Enter valid username. 3. Enter invalid password. 4. Click on the "Login" button.	Username: athi Password: Kesavan23	Users should not be able to login.
Update the medicine name with the time.	User should have a network connection	1. Enter valid medicine name. 2. Enter the time when the medicine has to be consumed. 3. Click on the "Submit" button.	Medicine Name: acetomenophin Medicine Time: 10.30	Users should be able to update it successfully.

8.2. User acceptance testing

Login page testing   Incorrect login attempt

Medicine page testing

9. Results
9.1. Performance Metrics

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S. NO	Parameter	Performance
1.	Response Time	0.2s (Average of 10 trials)
2.	Workload	500 users (Calculated based on Cloud Space)
3.	Revenue	Individual users and pharmaceutical industries.
4.	Efficiency	Simple and straightforward workflow, which makes theprocess efficient.
5.	Down Time	Almost no down time due to IBM Cloud enabled solution.

10. Advantages and Disadvantages

Advantages
- Help the elderly people to take their medicine at the correct time.
- Avoid personal assistants or caretakers needed for medically sick people.
- Cost efficient.
- Can store multiple data and many notifications can be generated.
- Since it includes voice assistance, even blind people can use our device.

Disadvantages
- Makes people lethargic and makes them dependent always on others.
- Requires a stable internet connection.

11. Conclusion

The project offers the elderly or medically sick people a personal assistant which reminds them of the medicines to be consumed at the particular time. Skipping tablets may lead to serious problems if the person has a severe illness and this can be avoided. Since the cloud is integrated with the mobile application, numerous data can be fed into the database and notifications can be generated. The mobile application developed is highly customisable by the user and easy to use.

12. Future Scope

The project can be further developed by bringing into the feature of informing the medicine name during the notification. The voice assistance which is given can be customized by adding the user's voice or the caretaker's voice. Further the mobile application can update medicines by taking voice commands as an input from the user.

13. Appendix

Source Code:

```
#include <WiFi.h>//library for wifi
#include <PubSubClient.h>//library for MQtt
#include <LiquidCrystal_I2C.h>
#include "DHT.h"// Library for dht11
#define DHTPIN 15     // what pin we're connected to
#define DHTTYPE DHT11   // define type of sensor DHT 11
#define LED 2
DHT dht (DHTPIN, DHTTYPE);// creating the instance by passing pin and typr of dht connected
void callback(char* subscribetopic, byte* payload, unsigned int payloadLength);


//-------credentials of IBM Accounts------

#define ORG "mjse7u"//IBM ORGANITION ID
#define DEVICE_TYPE "abcddevicetype"//Device type mentioned in ibm watson IOT Platform
#define DEVICE_ID "12345edeviceid"//Device ID mentioned in ibm watson IOT Platform
#define TOKEN "1234567890"     //Token
String data3="";
int buzz= 13;

//-------- Customise the above values --------
char server[] = ORG ".messaging.internetofthings.ibmcloud.com";// Server Name
char publishTopic[] = "iot-2/evt/Data/fmt/json";// topic name and type of event perform and format in which data to be send
char subscribetopic[] = "iot-2/cmd/command/fmt/String";// cmd  REPRESENT command type AND COMMAND IS TEST OF FORMAT STRING
char authMethod[] = "use-token-auth";// authentication method
char token[] = TOKEN;
char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID;//client id
LiquidCrystal_I2C lcd(0x27,32,2);

//----------------------------------------
```

```cpp
WiFiClient wifiClient; // creating the instance for wificlient
PubSubClient client(server, 1883, callback ,wifiClient); //calling the predefined client id by passing
parameter like server id,portand wificredential

void setup()// configureing the ESP32
{

  Serial.begin(115200);
  dht.begin();
  pinMode(buzz, OUTPUT);
  pinMode(LED,OUTPUT);
  delay(10);
  Serial.println();
  wificonnect();
  mqttconnect();
}

void loop()// Recursive Function
{
  if (!client.loop()) {
    mqttconnect();
  }

}



/*.................................retrieving to Cloud.............................*/

void PublishData(float temp, float humid) {
  mqttconnect();//function call for connecting to ibm

}
void mqttconnect() {
  if (!client.connected()) {
    Serial.print("Reconnecting client to ");
    Serial.println(server);
    while (!!!client.connect(clientId, authMethod, token)) {
      Serial.print(".");
      delay(500);
    }

    initManagedDevice();
    Serial.println();
```

```cpp
  }
}
void w28connect() //function defination for wificonnect
{
  Serial.println();
  Serial.print("Connecting to ");

  WiFi.begin("Wokwi-GUEST", "", 6);//passing the wifi credentials to establish the connection
  while (WiFi.status() != WL_CONNECTED) {
    delay(500);
    Serial.print(".");
  }
  Serial.println("");
  Serial.println("WiFi connected");
  Serial.println("IP address: ");
  Serial.println(WiFi.localIP());
}

void initManagedDevice() {
  if (client.subscribe(subscribetopic)) {
    Serial.println((subscribetopic));
    Serial.println("subscribe to cmd OK");
  } else {
    Serial.println("subscribe to cmd FAILED");
  }
}

void callback(char* subscribetopic, byte* payload, unsigned int payloadLength)
{

  Serial.print("callback invoked for topic: ");
  Serial.println(subscribetopic);
  for (int i = 13; i < payloadLength-2; i++) {
    //Serial.print((char)payload[i]);
    data3 += (char)payload[i];
  }

  Serial.println("Medicine Name: "+ data3);
  if(data3 != "")
  {
    lcd.init();

    lcd.print(data3);
    digitalWrite(LED,HIGH);
```

```
  tone(buzz, 100, 1000);
   delay(2000);
   digitalWrite(LED,LOW);
  noTone(buzz);
  delay(1000);

  }

  else
  {
digitalWrite(LED,LOW);

  }
data3="";
}
```

Github link: https://github.com/IBM-EPBL/IBM-Project-20246-1659715419
Project demo link : https://youtube.com/watch?v=LijW5MXY5hc&feature=share