

# **Personal Assistance for Seniors Who Are Self-Reliant - Project Report**

## **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 system is more efficient.

### **2.2. References**

- 1) Visual Health Reminder: A Reminder for Medication Intake and Measuring Blood Pressure to Support Elderly People ; René Baranyi; Sascha Rainer; Stefan Schlossarek; Nadja Lederer; Thomas Grechenig
- 2) Cloud Computing based Medical Assistance & Pill Reminder ; A. Chinnasamy; Ram Prasad J; Syed Rafeeq Ahmed; Akash S

## 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

### 2 Brainstorm

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

10 minutes

**Yuvan Shankar**

- If a hazard situation, to notify the patients name or doctor
- Patients information should be kept recording
- Privately and on the basis of medical condition, making it a cloud
- Before the next cabinet gets over, text clinic

**Ramesh**

- Order access to the hospital information system
- First alerts are sent to the phone handset of the caregivers
- Arrangement of medicine taking on time
- Stock availability alert

**Kavi Arasu**

- Get order access to patient information by using the barcode scanner
- Use doctors' name to view the patients name or history of the drug
- Use doctors' name to view the patients name or history of the drug
- Use doctors' name to view the patients name or history of the drug
- Use doctors' name to view the patients name or history of the drug

**Shakeeb Jani Shanavas**

- Android based application
- Obtain the doctors contact information if it is available
- Look for doctor's contact information
- IBM Cloudant Database

**Udaya Kumar**

- Reminders should be sent to the patients name or doctor's name
- Obtain access to the hospital information system
- Obtain the doctors contact information if it is available
- Use doctors' name to view the patients name or history of the drug

**Gunasekaran**

- First alerts are sent to the phone handset of the caregivers
- Before the medication gets over, text clinic
- Obtain the doctors contact information if it is available
- Android-based application

### 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.

20 minutes

## 3.3. Proposed solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Sometimes elderly people forget to take their medicine at the correct time. They also forget which medicine should be taken at that particular time. And it is difficult for doctors/caretakers to monitor the patients around the clock.
2.	Idea / Solution description	<ul style="list-style-type: none"> <li>➤ A medicine reminder system is developed. An app is built for the user (caretaker) which enables him to set the desired time and medicine.</li> <li>➤ 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.</li> </ul>

		➤ The device will receive the medicine name and notify the user with voice commands.
3.	Novelty / Uniqueness	➤ Keeping track of the medicines taken by the user at each time interval. ➤ Information is stored in the secured IBM cloud.
4.	Social Impact / Customer Satisfaction	The reminder system enables the user to take tablets at regular intervals prescribed by the physicians.
5.	Business Model (Revenue Model)	<b>Direct Mode:</b> We gain revenue from selling the medical reminder system to hospitals, medical health centres and even in old age homes. <b>Indirect Mode:</b> We gain profit by having partnership with pharmaceutical companies.
6.	Scalability of the Solution	The medical alert system can be used in hospitals, medical health centres and even in old age homes for dispensing medicines.

### 3.4. Problem Solution Fit

Define CS, fit into CC	<b>1. CUSTOMER SEGMENT(S)</b> <span>CS</span> Who is your customer?  According to our problem statement, doctors' active patients are elderly people.	<b>6. CUSTOMER CONSTRAINTS</b> <span>CC</span> What constraints prevent your customer from taking action or limit their choices of solutions?  Within healthcare systems, these constraints may show up as bottlenecks within the process. While the bottleneck is evidence of a constraint, the constraint is usually related to equipment, staff or a policy which is stopping the process from functioning effectively.	<b>5. AVAILABLE SOLUTIONS</b> <span>AS</span> Which solutions are available to the customers when they face the problem?  When the notification option is not working, then an emergency call or message will be passed on to the customers as an alternative to digital notetaking.	Explore AS, differentiate

Focus on AS, tap into BE, understand RC	<b>2. JOBS-TO-BE-DONE / PROBLEMS</b> <span>TSB</span> Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.  Patient care is the core responsibility of a medical practitioner. They have to assure that the patient is given the best possible care. In hospitals or any other medical institution, the doctors and care takers take care of their patients very carefully.	<b>9. PROBLEM ROOT CAUSE</b> <span>RC</span> What is the real reason that this problem exists? What is the back story behind the need to do this job? i.e., customers have to do it because of the change in regulations.  If there is no internet connection, there would be no sharing of information from one person to another and GPS would be no use in the absence of a network connection. Due to these flaws, the problem exists. The world functions with the help of networks, so our patient tracker application also operates on an internet connection.	<b>7. BEHAVIOUR</b> <span>BE</span> What does your customer do to address the problem and get the job done? i.e., directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e., Greenpeace)  The patients could get help from the help options in the settings of the application and if they are facing any issues, they can make a report on that option and the authorities will look into the problem.	Focus on AS, tap into BE, understand RC

Identify strong TR & EM	<b>3. TRIGGERS</b> <span>TR</span> What triggers customers to act? i.e. seeing their neighbours installing solar panels, reading about a more efficient solution in the news. For Example - Something that either sets off a disease in people who are genetically predisposed to developing the disease, or that causes a certain symptom to occur in a person who has a disease.	<b>10. YOUR SOLUTION</b> <span>SL</span> If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality. Here we introduce a smart medicine reminder system based on IOT. The proposed scheme was particularly created for the Android platform. For our system, we implement a heart monitoring system which in case lowers it provides an alarm in correct time to be notified by the caretakers.	<b>8. CHANNELS of BEHAVIOUR</b> <span>CH</span> <b>8.1 ONLINE</b> If it is in online mode, the patients can make a report in the help section present in the setting option. <b>8.2 OFFLINE</b> If it is in offline mode, the patients can directly send a feed a mail or message to the receiver.	
	<b>4. EMOTIONS: BEFORE / AFTER</b> <span>EM</span> How do customers feel when they face a problem or a job and afterwards? The patients would feel anxious at first, then they would try to think of a solution to solve it themselves.			

## 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
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Access Cloud services	Accessing the cloud service with correct credentials. Storing the details in the cloud database.
FR-4	IOT configuration	Fine Tuning the IOT device based Cloud DB access via device. Manage the data request and response effectively

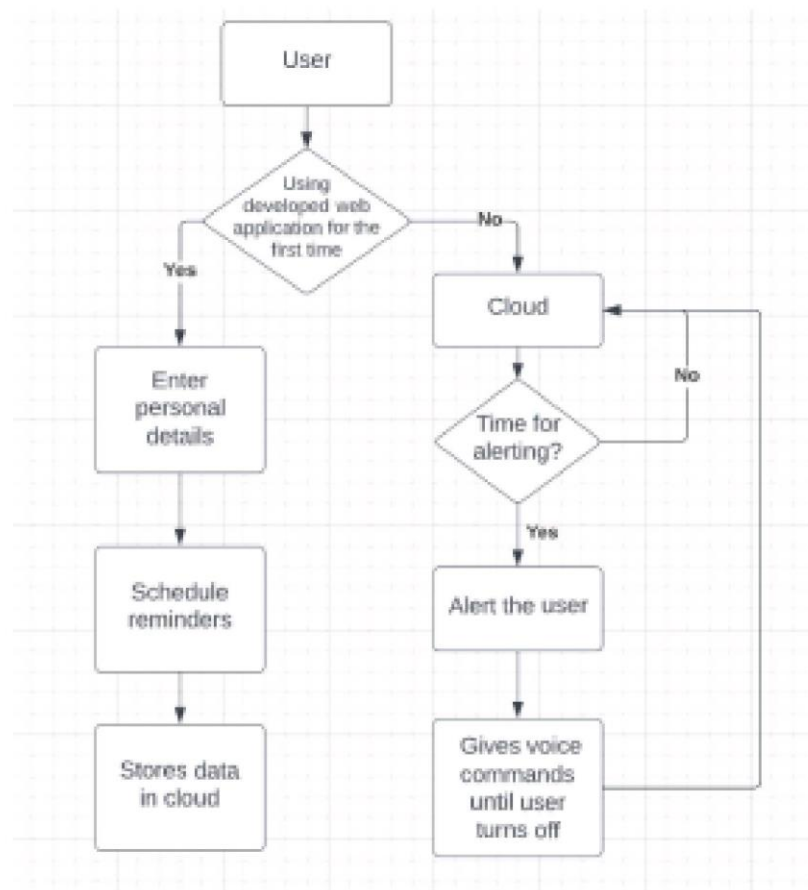
### 4.2. Non-functional Requirements:

FR No.	Non-Functional Requirement	Description
NFR-1	<b>Usability</b>	App can be used by anyone who has knowledge about applications and computers.
NFR-2	<b>Security</b>	For security, TFA is enabled and biometrics are also added for user safety.
NFR-3	<b>Reliability</b>	Highly reliable since, It uses trusted and authentic cloud services like IBM

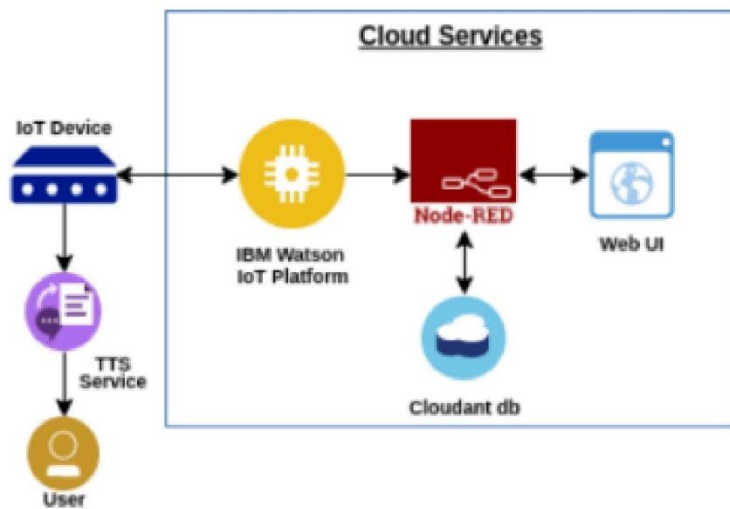
NFR-4	<b>Performance</b>	Performance is better compared to other marketproducts.
NFR-5	<b>Availability</b>	Available on mobile app.
NFR-6	<b>Scalability</b>	Using Cloud services, makes the scalability higher the using traditional locally stored database.

## 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 (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email or mobile number, 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 Gmail		Medium	Sprint-1
	Login	USN-4	As a user, I can log into the application by entering email or mobile number & password	I can access my account / dashboard	High	Sprint-1



User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
	Dashboard	USN-5	As a user, I can update my reminders and medicines wherever required		High	Sprint-2
		USN-6	As a user, I can check the application whether the medicine dosage is completed.		Medium	Sprint-2
Customer Care Executive		USN-7	For any troubleshooting, the user can send a mail to the technical team.		Low	
Administrator		USN-8	Ensures smooth functioning and data warehousing strategies		Medium	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	Set Alarm	USN-1	As a user, I can set an alarm to alerting a medicine through medicine remainder system	10	High	Shakeeb Jani Shanavas
Sprint 1		USN-2	As a user, I can Activate and Deactivate the alarm	10	High	Yuvan Shankar
Sprint 2	Notification	USN-3	As a user once I can the set the alarm then I gets the notification	10	High	Ramesh
Sprint 2		USN-4	As a user, If I requires this system then a notification will be sent into his device.	10	High	Udaya Kumar
Sprint 3	Medication Detail	USN-5	As a user, I have multiple medications each day, I can put each pill in the box for the corresponding day.	10	High	Kavi Arasu



Sprint 3		USN-6	As a user, between setting an alarm and using a pillbox, I'll be able to stay on top of your medications and not miss a dose.	5	low	Yuvan Shankar, Shakeeb J.S, Kavi Arasu
Sprint 3		USN-7	As a user, I can store the name of the medicine with its description	10	High	Udaya Kumar, Gunasekaran, Ramesh
Sprint 4	GPS Tracking	USN-8	As a user, they can also help large hospitals and clinics manage their inventory more effectively	5	Low	Yuvan Shankar, Udaya Kumar, Kavi Arasu
	Sensor	USN-9	As a user ,they used for keeping the record in medicine details the reminding the schedule of medicine. We have used the IoT enabled Arduino device for monitoring the System.	10	High	Shakeeb J.S, Gunasekaran, Kavi Arasu

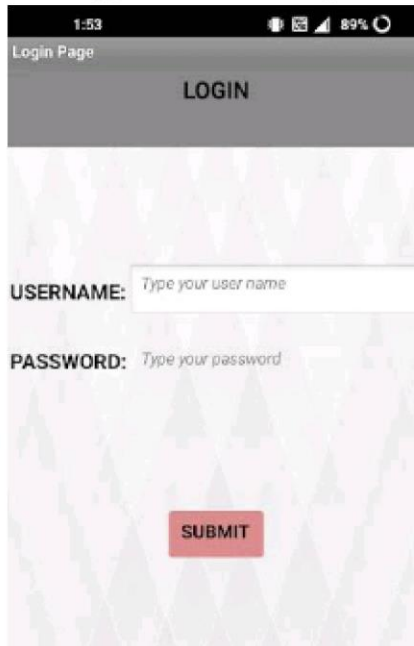
## 6.2. Sprint Delivery Schedule

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	7 days	12-11-2022	19-11-2022	20	19-11-2022
Sprint 2	10	4 days	15-11-2022	19-11-2022	10	19-11-2022
Sprint 3	20	3 days	16-11-2022	19-11-2022	20	19-11-2022
Sprint 4	10	2 days	17-11-2022	19-11-2022	10	19-11-2022

## 7. Coding and Solutioning

### 7.1 Feature 1

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



The screenshot shows a mobile application interface for a login page. At the top, the status bar displays the time 1:53, signal strength, and battery level at 89%. The app's title bar is labeled "Login Page". Below the title bar, there is a dark grey header with the word "LOGIN" in white capital letters. The main content area has a light pink background with a subtle geometric pattern. It contains two input fields: "USERNAME:" with a placeholder "Type your user name" and "PASSWORD:" with a placeholder "Type your password". A red "SUBMIT" button is positioned below the password field.

### 7.2 Feature 2

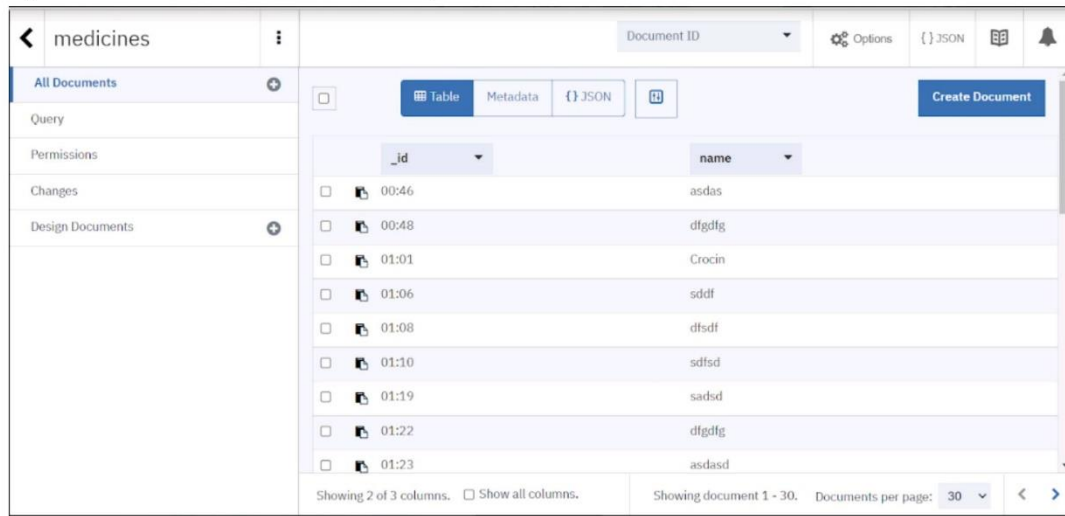
The mobile application also has the feature of uploading medicine names in the cloud.



The screenshot shows a mobile application interface for a "Medicine Details" page. The status bar at the top shows the time 2:00, signal strength, and battery level at 88%. The app's title bar is labeled "Medicine Details". The main content area is white. It starts with a "Welcome!!!" message, followed by the instruction "Please enter the medicine name and time below". There are two input fields: "Medicine Name:" with the text "Crocin" and "Medicine Time:" with the text "14:01". A green "SUBMIT" button is located below the time field. Below the button, the text "Updated Successfully" is displayed. At the bottom, there is a grey "Logout" button.

### 7.3. Feature 3

The project includes a cloud database system.



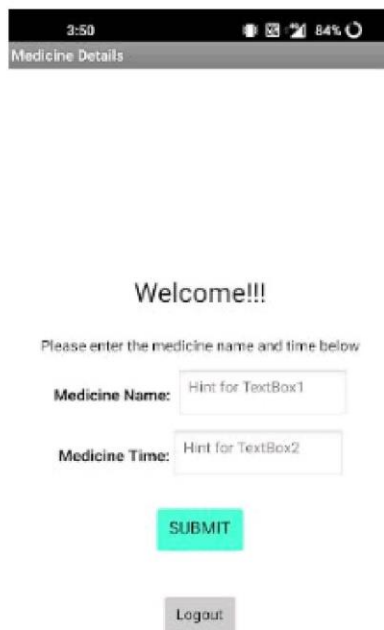
## 8. Testing

### 8.1. Test cases

Test Case	Preconditions	Test Steps	Test Data	Expected Result
Verify login with valid credentials	User should have a network connections	1. Launch Url 2. Enter valid username. 3. Enter valid password. 4.Click on the "Login" button	Username: Shakeeb Password: 12345	Users should be able to login successfully.
Verify login with invalid credentials	User should have a network connections	1. Launch Url 2. Enter valid username. 3. Enter invalid password. 4.Click on the "Login" button	Username: Shakeeb Password: Shak123	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: Cetrizine Medicine Time:20.00	Users should be able to update it successfully.

## 8.2. User acceptance testing

### Login page testing



3:50 84%

Medicine Details

Welcome!!!

Please enter the medicine name and time below

Medicine Name:

Medicine Time:

### Incorrect login attempt

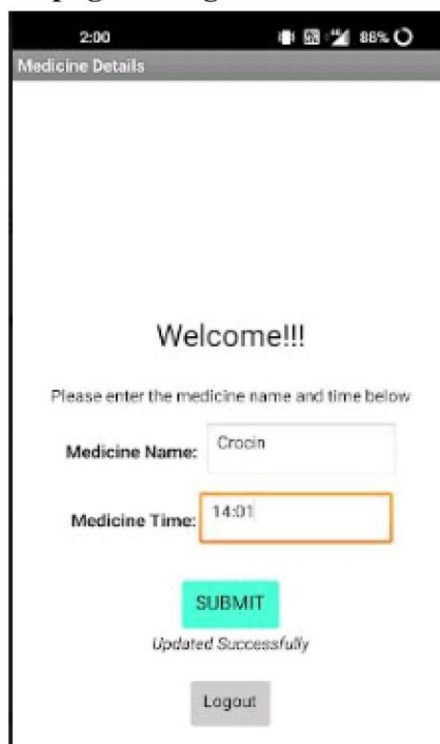


3:51 84%

Wrong Password

Try again!

### Medicine page testing



2:00 88%

Medicine Details

Welcome!!!

Please enter the medicine name and time below

Medicine Name:

Medicine Time:

Updated Successfully

## 9. Results

### 9.1. Performance Metrics

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 the process 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 "SoundData.h"
#include "XT_DAC_Audio.h"
XT_Wav_Class Sound("voice_command.wav");
XT_DAC_Audio_Class DacAudio(2,0);
uint32_t DemoCounter=0;

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

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

#define ORG "ut4tn5" //IBM ORGANIZATION ID
#define DEVICE_TYPE "b11m3edevicetype"//Device type mentioned in IBM Watson IOT platform
#define DEVICE_ID "b11m3edevicetype_1"//Device ID mentioned in IBM Watson IOT platform
#define TOKEN "12345678" //Token
String data3;
Float h, t;

//----- 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/test/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
```

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

```
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);
```

```
  delay(10);
```

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

```
  wificonnect();
```

```
  mqttconnect();
```

```
}
```

```
void loop()// Recursive Function
```

```
{
```

```
  delay(1000);
```

```
  if (!client.loop()) {
```

```
    mqttconnect();
```

```
  }
```

```
}
```

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

```
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();
}
}
void wificonnect() //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 = 0; i < payloadLength; i++) {
    //Serial.print((char)payload[i]);
    data3 += (char)payload[i];
}

Serial.println("data: "+ data3);
if(data3=="announce")
{
Serial.println(data3);
for(int i=0;i<5;i++){
DacAudio.FillBuffer();
if(Sound.Playing==false)
    DacAudio.Play(&Sound);
Serial.println(DemoCounter++);
}
}

else
{
    pass;

}
data3="";

}

```