

PERSONAL ASSISTANCE FOR SENIORS WHO ARE SELF-RELIANT

A PROJECT COMPONENT REPORT

Submitted by :-

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PROJECT REPORT FORMAT

1. INTRODUCTION

1.1 Project Overview

1.2 Purpose

2. LITERATURE SURVEY

2.1 Existing problem

2.2 References

2.3 Problem Statement Definition

3. IDEATION & PROPOSED SOLUTION

- 3.1 Empathy Map Canvas
- 3.2 Ideation & Brainstorming
- 3.3 Proposed Solution
- 3.4 Problem Solution fit

4. REQUIREMENT ANALYSIS

- 4.1 Functional requirement
- 4.2 Non-Functional requirements

5. PROJECT DESIGN

- 5.1 Data Flow Diagrams
- 5.2 Solution & Technical Architecture
- 5.3 User Stories

6. PROJECT PLANNING & SCHEDULING

- 6.1 Sprint Planning
- 6.2 Sprint Estimation and Delivery Schedule

7. CODING & SOLUTIONING (Explain the features added in the project along with code)

- 7.1 Coding
- 7.2 Database Schema

8. RESULTS

9. ADVANTAGES & DISADVANTAGES

10. CONCLUSION

11. FUTURE SCOPE

12. APPENDIX

GitHub & Project Demo Link

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: -

Users can configure the medicine name, and time through a web application. The web application will send the medicine name to the IoT device at the desired time.

- After using medcare applications customers are taking their medicine properly at correct time.
- Blind people can get to know their time of taking pills.
- The users are satisfied with the proper remainder and intake of pills.
- Vast number of people who are aged can be provided with portable devices to ensure their health conditions by consuming medicines at correct time through audio and message with the help of data fed from the mobile applications which is initiated by web application which stores the user details.

2. LITERATURE SURVEY

As stated by the WHO Poor adherence can lead to serious health risk. For instance, a recent study found out that the risk of hospitalized patients, having diabetes congestive heart failure, mellitus, hypertension, or hypercholesterolemia who actually were non adherent to prescribed remedy was more in comparison with the general population. Non-adherence rate can vary widely, even in the rigid controlled and **monitored environment of a clinical test**. To mention, patients with long term conditions are questionable to follow prescription than those with acute state. The effectiveness of a therapy or treatment directly depends upon a patient's ability and willingness to follow a prescribed regimen. The patient's ability for reading and understanding the instructions for medication is a key factor. Patients who face difficulties in understanding the instructions in a prescription which ultimately results in decreased adherence and poor medication management and consumption. Issues of low literacy must be recognized and strategies designed with this limitation in consideration. A patient with heart failure problem not taking prescribed medication or **who tends to forget to take their medicine**, costs the U.S. health care system an average of almost \$8,000 annually, according to a 2011 analysis published in Health Affairs. The figures are high for other illnesses too almost \$4,000 per patient with high blood pressure, over \$3,700 per patient with diabetes and about \$1,200 per patient with high cholesterol. Dr. Brennan and a

team of researchers at Brigham and Women's Hospital, in Boston, have been studying this issue since 2010 by analyzing pharmaceutical insurance claims data. They've determined several reasons behind not taking proper medication and among those, one of them is: There is a high degree of complications for patients who takes several different drugs for a variety of conditions. There are currently around 80 million U.S. residents with several chronic conditions and multiple medications to manage. Patients who have a several different kind of prescriptions are dubious to follow medications because they may have difficulty managing schedule that involves taking several different medications schedule throughout the day.

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: -

It is very difficult for the senior citizens (elder people) to remember their medicines. To avoid the skipping up the medicines, they can be remembered by using the voice commands of the medicine names at correct time specified. If the voice commands on the medicine name is not available, they are given the reminder of the medicine by SMS on their phone or to their closest person.



Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	Senior citizen who are Self Reliant	Eat medicines at correct time	Fails to eat	No one is there to remind about medicines or forgot by themselves	anxious

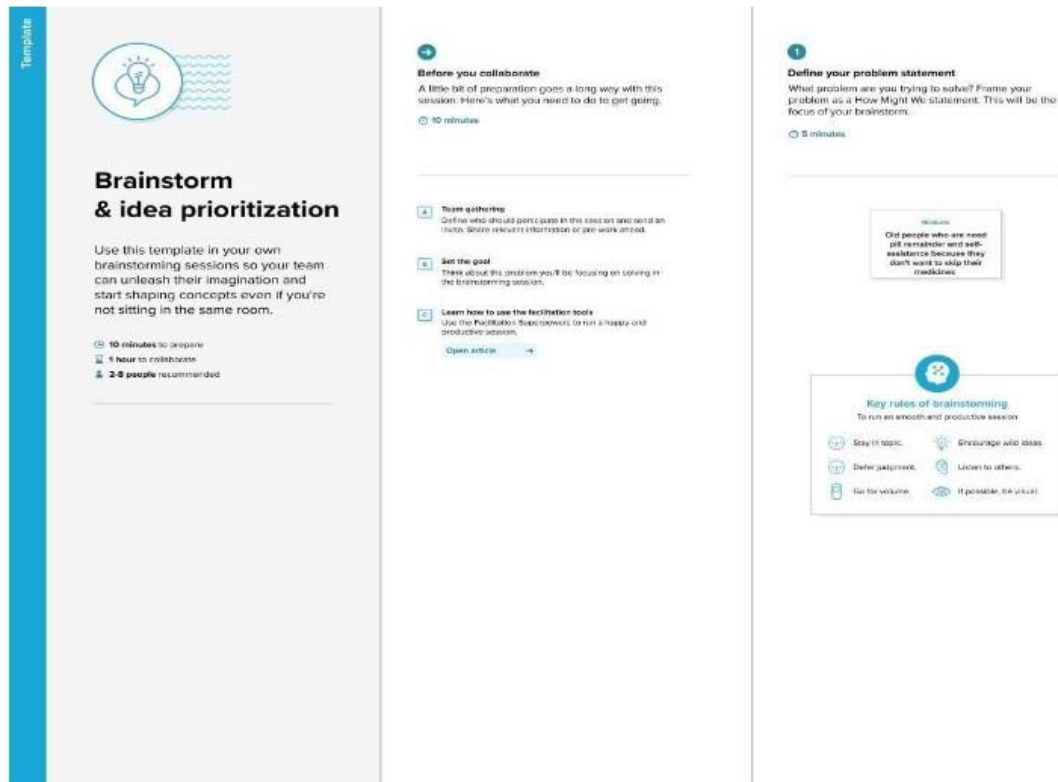
3. IDEATION & PROPOSED SOLUTION

3.1. Empathy Map Canvas:-



3.2 Ideation & Brainstroming:-

If a patient needs to take medicine at 6 a.m. In the morning the box will remind him by making sound and also by sending an alarm. If he forgets the actual time of taking medicine and goes to take medicine at any time the medicine box will not open as a servo motor will make the box locked. While it's the right time to take the medicine then the box will make sound and will give notification until the user takes medicine or open the drawer. Also, if the user is outside of the home, then the medicine box will use the Wi-Fi module to send notification to the user's fixed email address. The system contains also a temperature sensor to measure the temperature of the user as temperature can be a vital element of the monitoring patient's health condition. The temperature and taking medicine data will be stored in a server which can be accessed by both patient and doctor so that when it is time the doctor can review the medicine and can change if needed. Also, it will be helpful for doctors to keep updated about the patient's physical health condition.



3.3 Proposed Solution :-

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	<ul style="list-style-type: none"> To assess the effectiveness of personal assistance for older adults with impairments, and the impacts of personal assistance on others, compared to other interventions. This can make completing everyday tasks challenging, including things like meal preparation and feeding, bathing, dressing.
2.	Idea / Solution description	<ul style="list-style-type: none"> Smart shoes, Multifaceted speakers, Paralysis healthcare system, Fall detection system, ICE.
3.	Novelty / Uniqueness	<ul style="list-style-type: none"> Intelligent data collection. In ICE human vital signs are measured. Smart speakers provide innumerable features.
4.	Social Impact / Customer Satisfaction	<ul style="list-style-type: none"> User friendly with huge features. Results in safety monitoring.
5.	Business Model (Revenue Model)	<ul style="list-style-type: none"> Day by day projects get demand in market, hence growth will be best.
6.	Scalability of the Solution	<ul style="list-style-type: none"> Good as working application at all condition.

3.4 Problem Solution Fit :-

1. CUSTOMER SEGMENT(S) CS Our customers are people who require medical support; Also, our alert system can be used in hospitals and old age homes where people will require medical assistance.	6. CUSTOMER CONSTRAINTS CC Healthcare costs, lack of financial support, Difficulty with everyday tasks and mobility, Finding the right care provision and seclusion.	5. AVAILABLE SOLUTIONS AS The existing solutions for this project is setting reminders or using pill boxes, calendar, Personal Assistance. Though, the solutions give reminders, the voice commands or assistance given by this system is more efficient.
2. JOBS-TO-BE-DONE / PROBLEM J&P Skipping of medicines can be serious for some medical health conditions; In such cases this system would help the individual to take their medication on time.	9. PROBLEM ROOT CAUSE RC 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. To avoid this problem, this medicine reminder system is developed.	7. BEHAVIOUR BE Directly related: To download the web application so that the user can receive voice notifications on the connected IoT device. Through this application, the user can set the details of the medicine name and other details. Indirectly associated: Customers can be carefree and don't need a person round the clock to check on them.
3. TRIGGERS TR There are applications which already exist that give regular reminders to take medicines. 4. EMOTIONS: BEFORE / AFTER EM With this application built, which gives voice commands and alerting system which is more efficient in helping the elderly to take their medicines on time and can be carefree.	10. YOUR SOLUTION SL 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.	8. CHANNELS of BEHAVIOUR CH 8.1 ONLINE The customers should have the mobile application on their devices so that they can get regular voice commands. 8.2 OFFLINE The customer should have the device or mobile near them. Also, the customer should update the schedule.

4. REQUIREMENT ANALYSIS

Functional Requirements:-

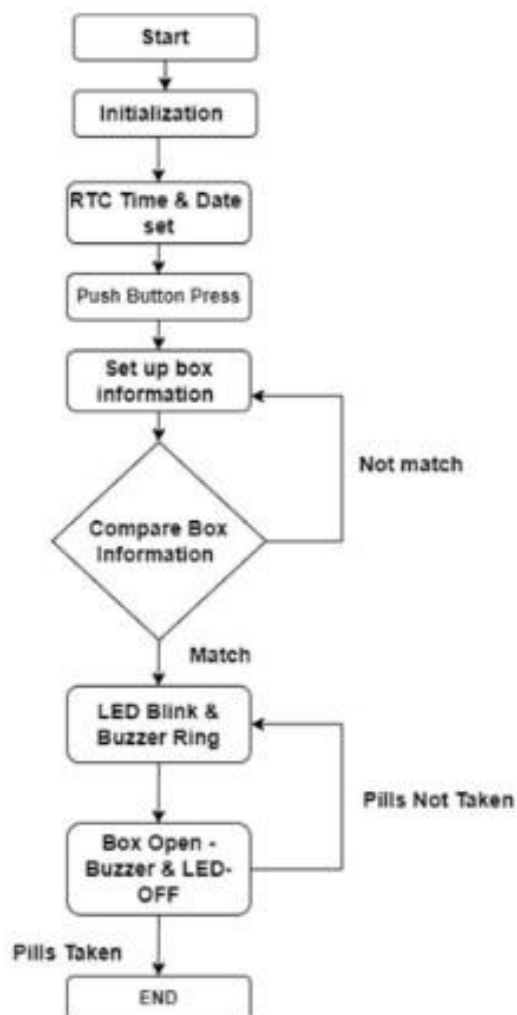
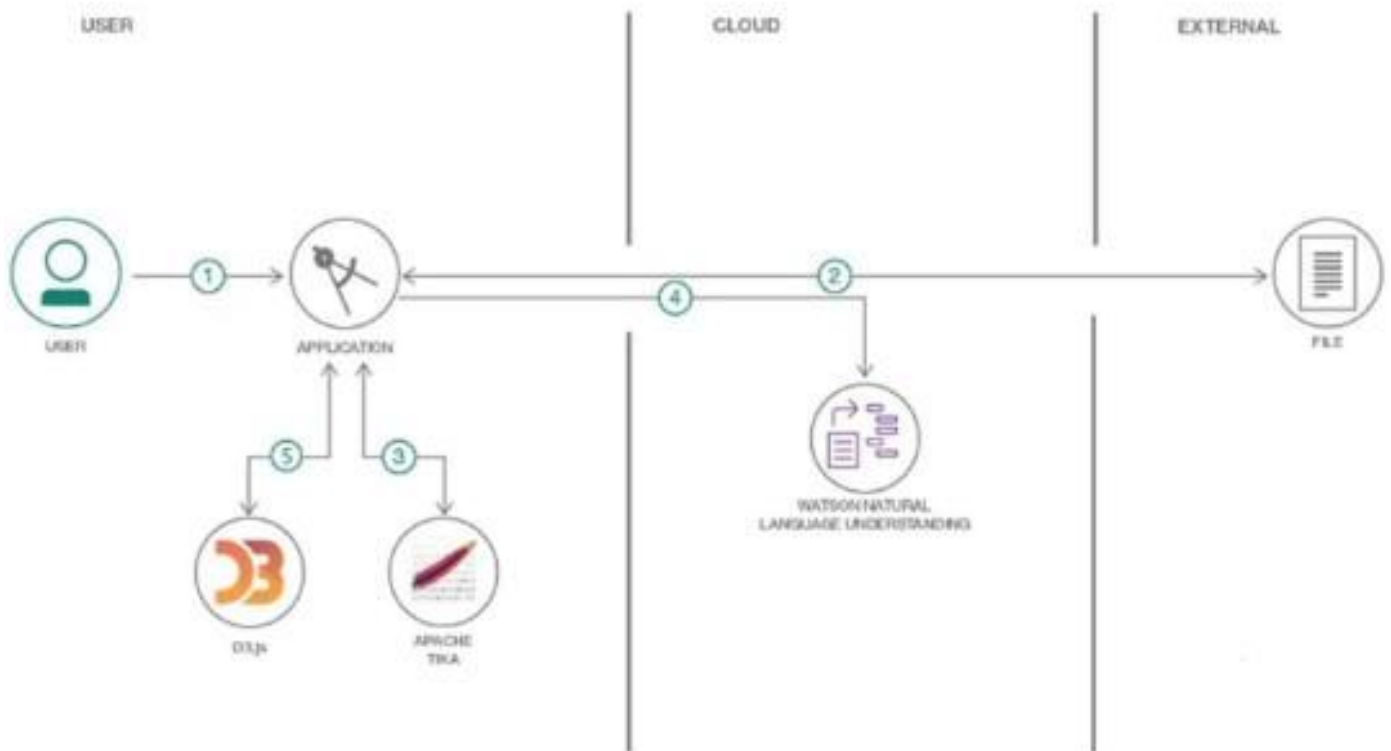
FR No.	Functional Requirement(Epic)	SubRequirement(Story/Sub-Task)
FR-1	UserRegistration	Registration through Form RegistrationthroughGmail
FR-2	UserConfirmation	ConfirmationviaEmail ConfirmationviaOTP
FR-3	AccessCloudservices	Access the cloud service with correct credentialsStorethedetailsinthedatabase
FR-4	IOTconfiguration	FineTuningtheIOTdevicebasedonAccessthe Cloud DB via device Manage the requestandresponseeffectively

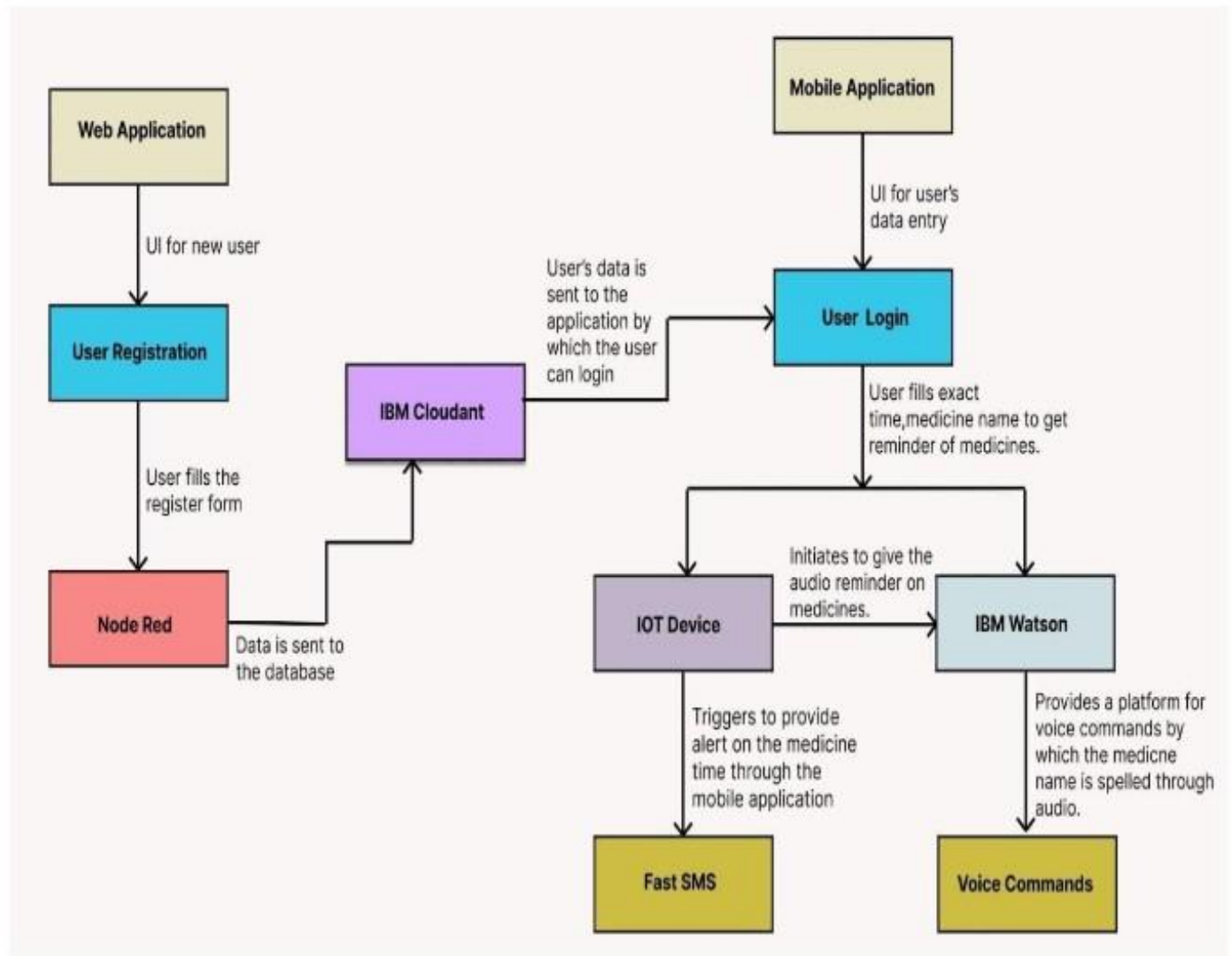
Non-Functional Requirements:-

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	App can be used by anyone who has knowledge about internet and computer.
NFR-2	Security	For security, TFA is enabled and biometrics are also added for user safety.
NFR-3	Reliability	Highly reliable since, it uses Trusted cloud services like IBM.
NFR-4	Performance	Performance is better compared to other market products.
NFR-5	Availability	Available on mobile app.
NFR-6	Scalability	Using Cloud services, makes the scalability higher than using traditional database.

PROJECT DESIGN

5.1 Data Flow Diagrams :-



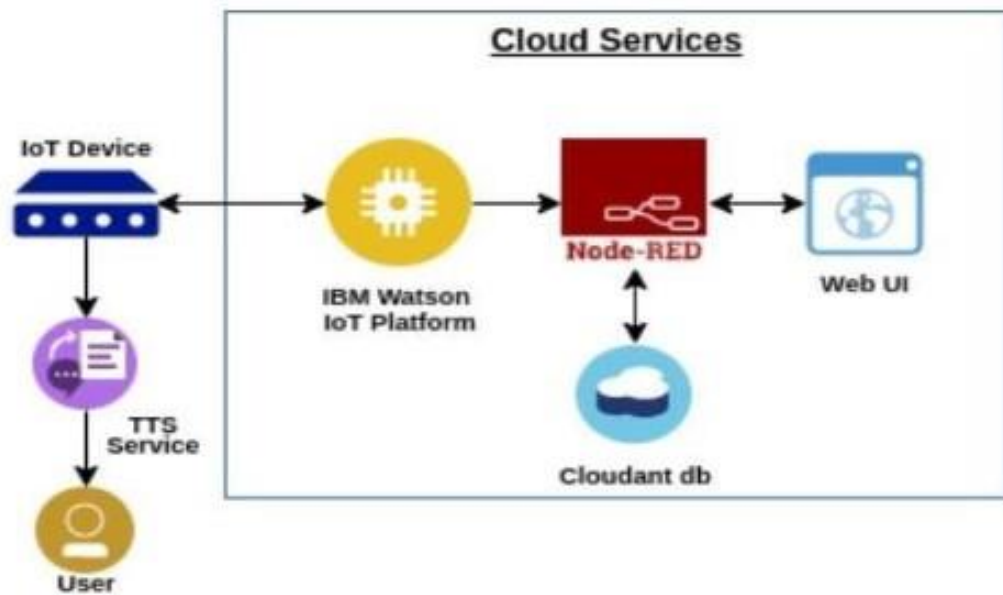


User Stories :-

UserType	Functional Requirement(Epic)	UserStoryNumber	UserStory/Task	Acceptancecriteria	Priority	Release
Customer (Senior citizen)	Caretaker	USN-1	As a user, I want to take Medicines on time and monitor my health	I want to Take Medicines On time	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 my tablets on time by voice command	High	Sprint-1
Customer (Mentally ill patient)	Caretaker	USN-3	As a user, my patient needs to take medicines on time and monitoring their activity	My patient needs to take medicines on time	Medium	Sprint-2
Customer (Coma patient)	Caretaker	USN-4	As a user, my patient medication time and prescriptions should load in database for up to 6 weeks	My patient medication time and prescriptions should be in database list	Low	Sprint-4
Customer (Disabled people's)	Smart medicine box	USN-5	As a user, I need to take my medicine in nearby places with light notification	I need to take my medicine in nearby places with light notification	Medium	Sprint-3

Solution Architecture :-

- Old people who are in need of pill reminders and self-assistance because they don't want to skip their medicines.
- Create a web application which reminds the tablets name and time & Create a smart watch which can be able to ring an alarm and vibrate on time.
- It reminds the medication time through alarm and vibrations.



IOT Device :-

- Getting the information from the application about the time and name of the medicines.
- Sending an SMS to the persons.
- Gathering the user information from the web application in which the user

Create and Configure IBM Cloud Services :-

- Create IBM Watson IOT platform
- Create a device & configure the IBM IOT Platform
- Create Node-Red service
- Create a database in IBM Cloudant DB to medicine names and time.

Develop a Web application using Node-RED Services :-

- Develop the web application using Node-RED.
- Develop a python script to publish the medicine names and time to remind details to the IBM IOT Platform.

Develop an application :-

- Develop an application in which the user can feed the data on the medicine name and time.
- Develop an application which can transmit the signal on the reminder of the medicines at the time specified.

Technical Architecture :-

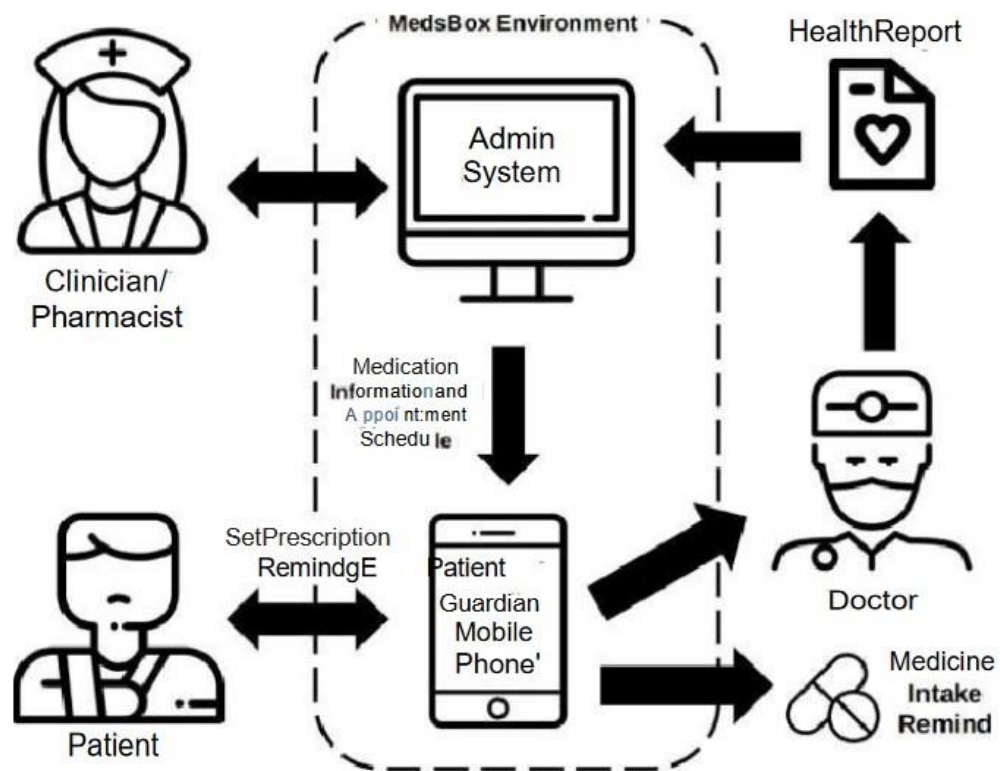


Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	Mobile App	HTML, CSS, JavaScript

2.	Application Logic-1	Mobile App to enter the Medicine details weekly	Python
3.	Application Logic-2	Gets the medication data from database	IBM Watson IOT API call data
4.	Application Logic-3	Converts the text to speech to pronunciation for the user	IBM Watson Assistant
5.	Database	Medication time and tablets name on daily basis	MySQL
6.	Cloud Database	Call the data IBM cloudant is used and user login credentials	IBM DB2, IBM Cloudant
7.	File Storage	App code and IOT credentials are stored and API keys	IBM Block Storage
8.	External API-1	To get the medicine box status Open or not	IBM box status API
9.	External API-2	To get the login credentials in IBMDB2	Username and Password API
10.	Machine Learning Model	To convert the text into speech for voice command the tablet details	Text to speech
11.	Infrastructure (Server / Cloud)	To host the server and application	Cloud Foundry, Node Red

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	To develop the application interface, we use MIT App inventor.	MIT App inventor

6.PROJECT PLANNING AND SCHEDULING

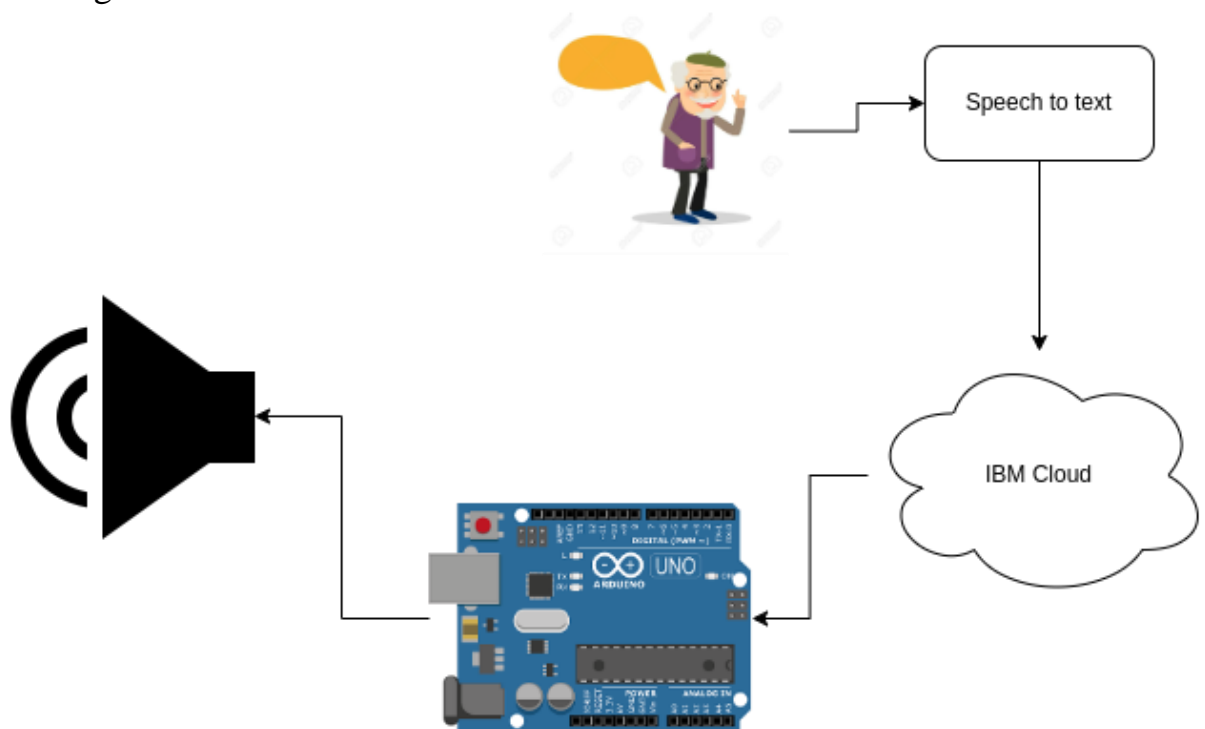
Project Planning:

Milestones:

1. Configure IBM cloud

2.	Security Implementations	To secure the users login credentials and personal information.	SHA-256,OWASP
3.	Scalable Architecture	To scale the application database	IBM auto scaling
4.	Availability	To make use the application and data are available 24x7	IBM Cloud load balancer
5.	Performance	To increase the performance of the application hosted in the high performance instance.	IBM instance

2. Connect device with IBM Watson Iot
3. Create Node red service
4. Create text-to-speech service
5. Create a database in cloudant db
6. Create code for alert in IOT device
7. Testing the code



TITLE	DESCRIPTION	DATE
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6.1 Sprint

Literature Survey & Information Gathering	Gathering information by referring technical papers research publications which describes literature survey.	10 october 2022
Prepare Empathy Map	To establish users pain and gain prepare the empathy map canvas on problem statement.	11 october 2022
Ideation	Establishing brainstorm sessions and emphasize the top ideas based on the importance of scalability and feasibility.	13 october 2022
Proposed Solution	Prepare the proposed solution which describes idea,uniqueness,customer satisfaction,business model and scalability of solution.	14 october 2022
Problem Solution Fit	Prepare problem solution fit which describes the existence of problem.	17 october 2022
Solution Architecture	Defining process of developing solution based on predefined processes.	18 october 2022
Customer Journey	Prepare a customer journey map which understand the customers on users interaction and experiences from scratch to finding solution.	20 october 2022
Functional Requirement	Prepare the functional requirement document which specifies the requirements.	21 october 2022
Data Flow Diagrams	Draw the data flow diagrams based on problem statement.	22 october 2022
Technology Architecture	Prepare a technology architecture diagram which describes the working.	24 october 2022
Prepare Milestone & Activity List	Prepare the milestone and activity list of the project.	24 october 2022
Project Development - Delivery of Sprint-1, 2, 3 & 4	Develop and submit the developed code by implementing and testing it.	In progress

planning :-

Sprints are the backbone of any good Agile development team. And the better prepared you are before a sprint, the more likely you are to hit your goals. Spring planning helps to refocus attention, minimize surprises, and (hopefully) guarantee better code gets shipped. The main event during agile methodology is the sprint, the stage where ideas turn into innovation and valuable products come to life. On one hand, agile sprints can be highly effective and collaborative. At the same time, they can be chaotic and inefficient if they lack proper planning and guidance. And for this reason, making a sprint schedule is one of the most important things you can do to ensure that your efforts are successful.

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	Set Alarm	USN-1	As a user, I can set an alarm to alerting a medicine through medicine remainder system	10	High	M.Prabha
Sprint 1		USN-2	As a user, I can Activate and Deactivate the alarm	10	High	A Saranya
Sprint 2	Notification	USN-3	As a user once I can the set the alarm then I gets the notification	10	High	C.Sakthivel
Sprint 2		USN-4	As a user, If I requires this system then a notification will be sent into his device.	10	High	M.Nandhini
Sprint 3	Medication Details	USN-6	As a use, have 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	M.Prabha
Sprint 3		USN-7	As a user, I can store the name of the medicine with its description.	10	High	A.Saranya
Sprint 4	GPS Tracking	USN-8	As a user, they can also help large hospitals and clinics manage their inventory more effectively.	5	low	M.Nandhini
Sprint 4	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	C.Sakthivel

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	8 days	29-10-2022	5-11-2022	20	4-11-2022
Sprint 2	10	8 days	7-11-2022	14-11-2022	10	13-11-2022
Sprint 3	20	8 days	16-11-2022	23-11-2022	20	23-11-2022
Sprint 4	10	8 days	23-11-2022	30-11-2022	10	30-11-2022

Velocity:

Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let us calculate the team's average velocity (AV) per iteration unit (story points per day)

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

7. CODING & SOLUTIONING

7.1 Code for Simulation:

```
#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 type of
dht connected void callback(char* subscribetopic, byte* payload, unsigned int
payloadLength);

//-----credentials of IBM Accounts-----
#define ORG "64yf7x"//IBM ORGANIZATION ID
#define DEVICE_TYPE "b11m3edevicetype"//Device type mentioned in ibm watson
IOT Platform
#define DEVICE_ID "b11m3edeviceid"//Device ID mentioned in ibm watson IOT
Platform
#define TOKEN "-&EMtr7l-v-Gz2G))e" //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(0x27,16,2);
//-----
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();
    } } 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("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="";
}

```

Output:

WOKWI

SAVE

SHARE

Medicine Remainder

Docs

PNT2022TMD50622.ino

diagram.json

libraries.txt

Library Manager

```
1 #include <wifi.h> //library for wifi
2 #include <PubSubClient.h> //library for MQTT
3 #include <LiquidCrystal_I2C.h>
4 #include "DHT.h" // library for dht11
5 #define DHTPIN 15 // what pin we're connected to
6 #define DHTTYPE DHT11 // define type of sensor DHT 11
7 #define LED 2
8 DHT dht (DHTPIN, DHTTYPE); // creating the instance by passing pin and type of dht
9 void callback(char* subscribtopic, byte* payload, unsigned int payloadLength);
10
11
12 //-----credentials of IBM Accounts-----
13
14 #define ORG "6dyf7x" //IBM ORGANIZATION ID
15 #define DEVICE_TYPE "b1m3edevicetype" //Device type mentioned in ibm watson IOT
16 #define DEVICE_ID "b1m3edeviceid" //Device ID mentioned in ibm watson IOT Platform
17 #define TOKEN "-&Ehtr7L-v-Gz2G)e" //Token
18 String data3="";
19 int buzz= 13;
20
21 //----- Customise the above values -----
22 char server[] = ORG ".messaging.internetofthings.ibmcloud.com"; // Server Name
23 char publishTopic[] = "iot-2/evt/Data/fmt/json"; // topic name and type of event
24 char subscribtopic[] = "iot-2/cmd/command/fmt/String"; // cmd REPRESENT command
25 char authMethod[] = "use-token-auth"; // authentication method
26 char token[] = TOKEN;
27 char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID; //client id
28 LiquidCrystal_I2C lcd(0x27,16,2);
29
30 //-----
31 WiFiClient wificlient; // creating the instance for wificlient
32 PubSubClient client(server, 1883, callback ,wificlient); //calling the predefined
33
34 void setup() // configuring the ESP32
35 {
36 }
```

Simulation

00:21.421

89%

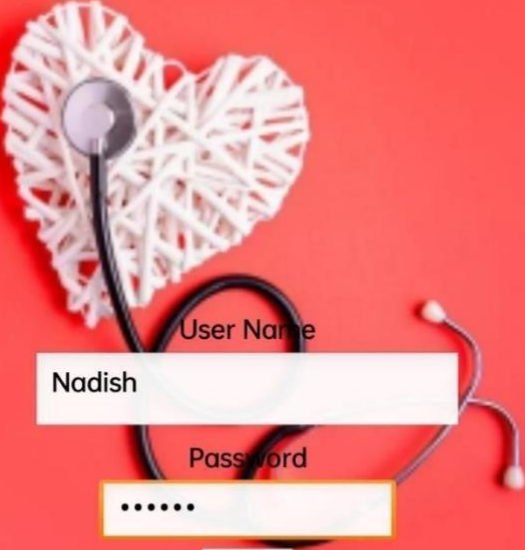
Medicine Name: acetaminophen
callback invoked for topic: iot-2/cmd/command/fmt/String
Medicine Name: acetaminophen
callback invoked for topic: iot-2/cmd/command/fmt/String
Medicine Name: acetaminophen
callback invoked for topic: iot-2/cmd/command/fmt/String
Medicine Name: acetaminophen

7.2 Database Schema

23:36 VoLTE 4G 100

Screen1

Medicine Remainder



User Name

Nadish

Password

.....

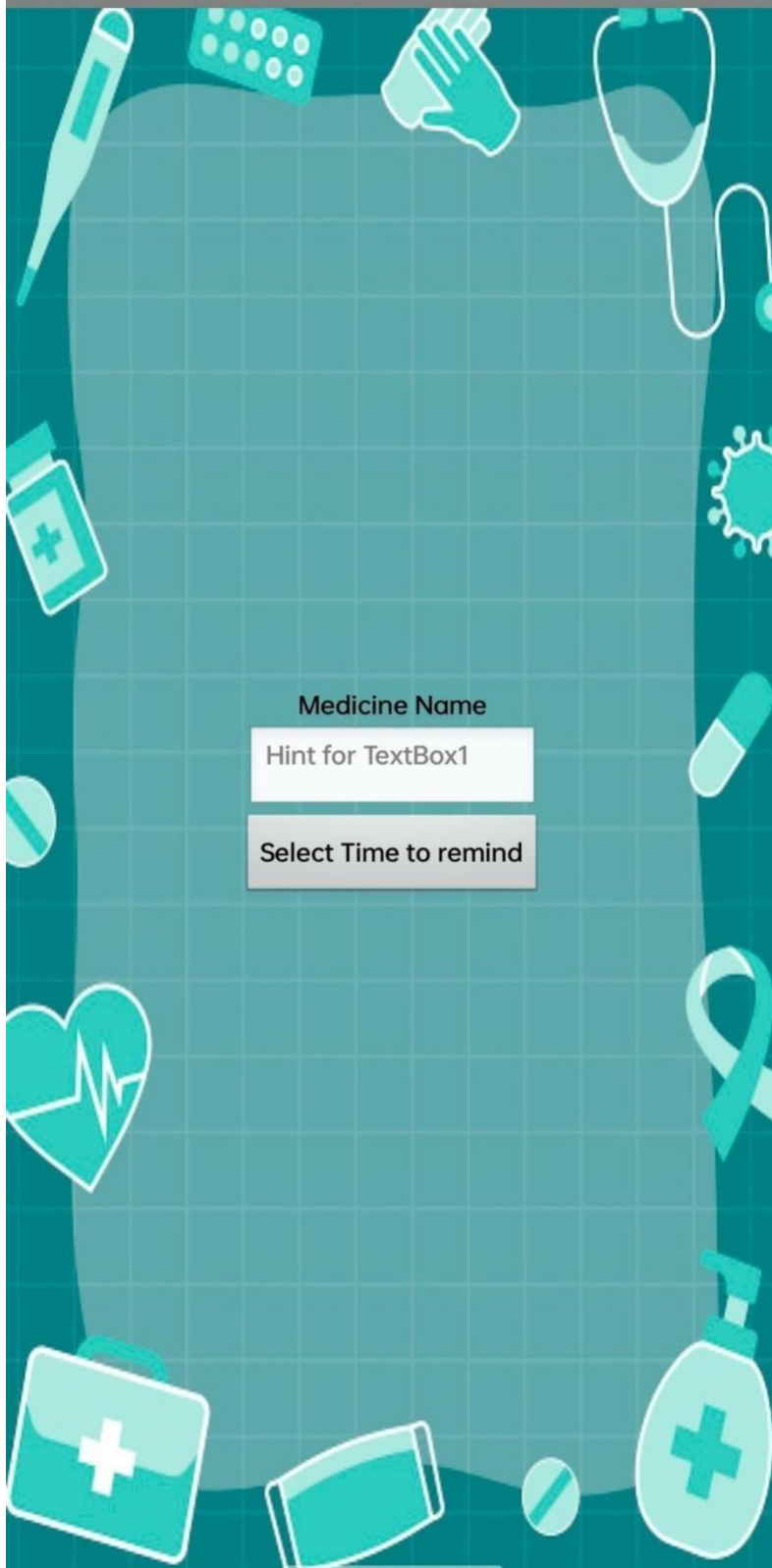
Enter

You don't have any medications yet.
Would you like to create one

No Medicines added



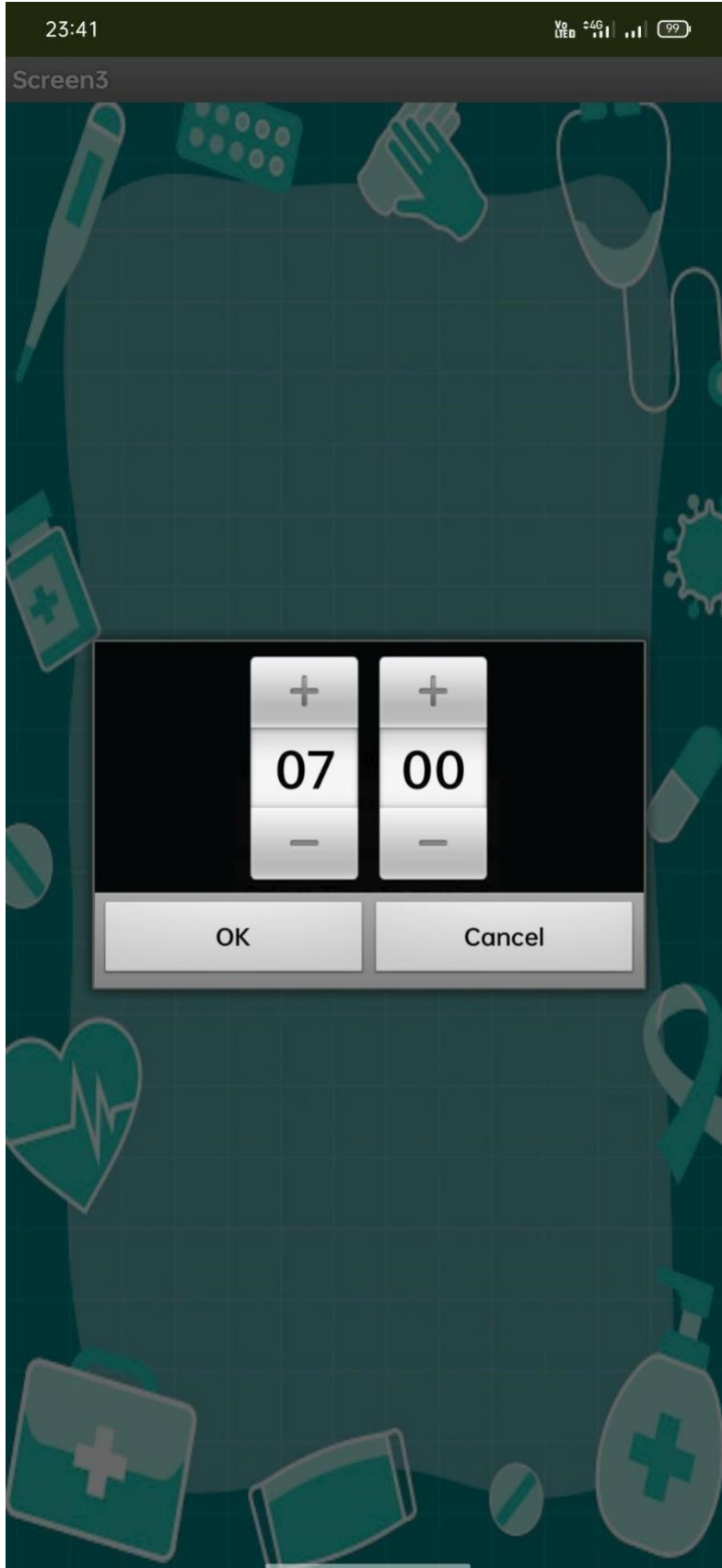
Click to add Medicine



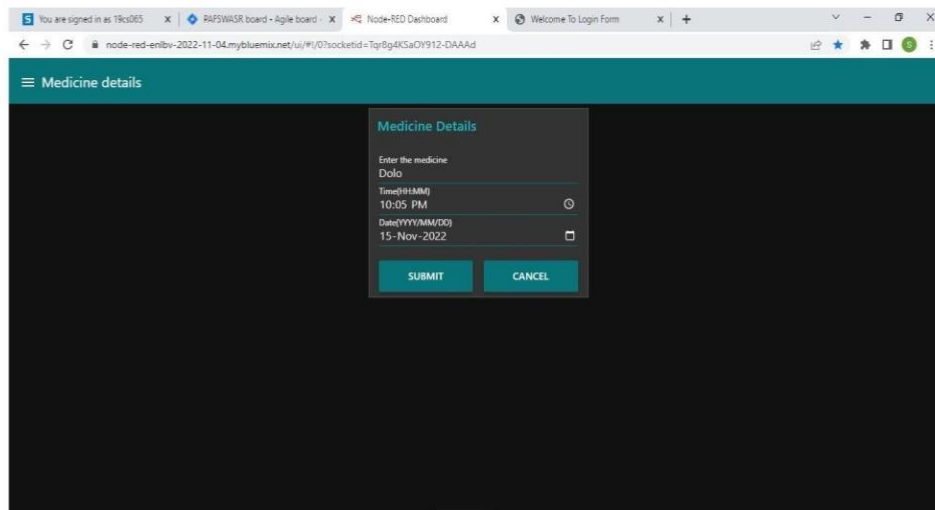
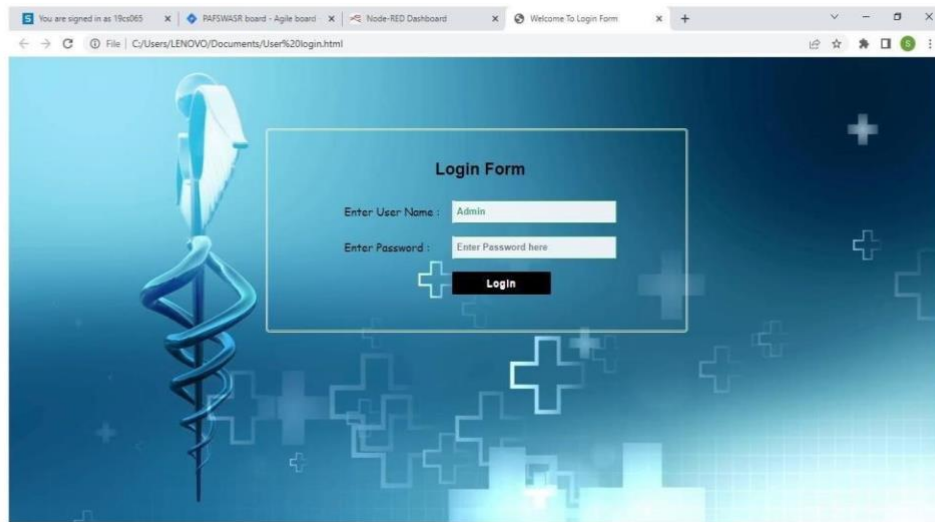
Medicine Name

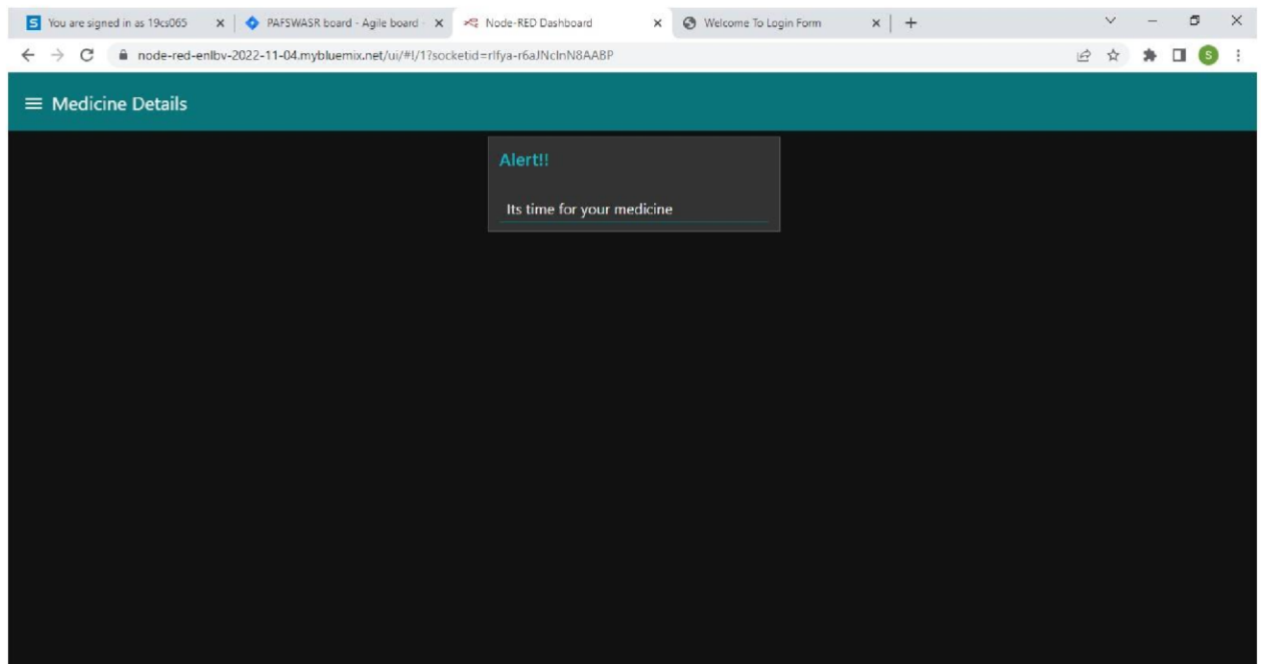
Hint for TextBox1

Select Time to remind



8. RESULT *Screen Layouts*





9. ADVANTAGES & 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.

Appendix :-

GitHup link :-

<https://github.com/IBM-EPBL/IBM-Project-36506-1660295618>

Demo link :-

https://drive.google.com/file/d/1EXBzrJx_0s-4wuTcWpRbRv9dx6gVR82a/view?usp=drivesdk