Personal Assistance For Seniors Who Are Self-Reliant

PROJECT REPORT

TEAM ID	PNT2022TMID31048
PROJECT TITLE	PERSONAL ASSISTANCE FOR SENIORS WHO ARE SELF-RELIANT

1. INTRODUCTION :

1.1. Project Overview

Elderly people tend to forget which pill should be taken at what time.And also there is much burden placed on thecaregivers.This makes the caregivers and also the patients frustrated.

We developed a Web application integrated with IoT device to provide scheduled voice output and display the medicine name on a microcontroller during intake time.

1.2. Purpose

- To carter to the needs of the elderly lacking physical assistance during their course of medication.
- To provide better quality of life for individuals with chronic disabilities and their caregivers.
- Improved ability to stay self-sufficient at home.

2. LITERATURE SURVEY

2.1. Existing Problem

The existing methodologies include various gadgets available to assist patients in taking their medication either bysimplifying administration or by assisting them in remembering to do so. Pill reminder charts, drug diaries,calendar clocks, telephone prompting service, multi compartment compliance aids (MCAs), talking labels, voice reminders, watch reminders, daily pill boxes, and automated pill dispensers are just a fewexamples.

2.2. References

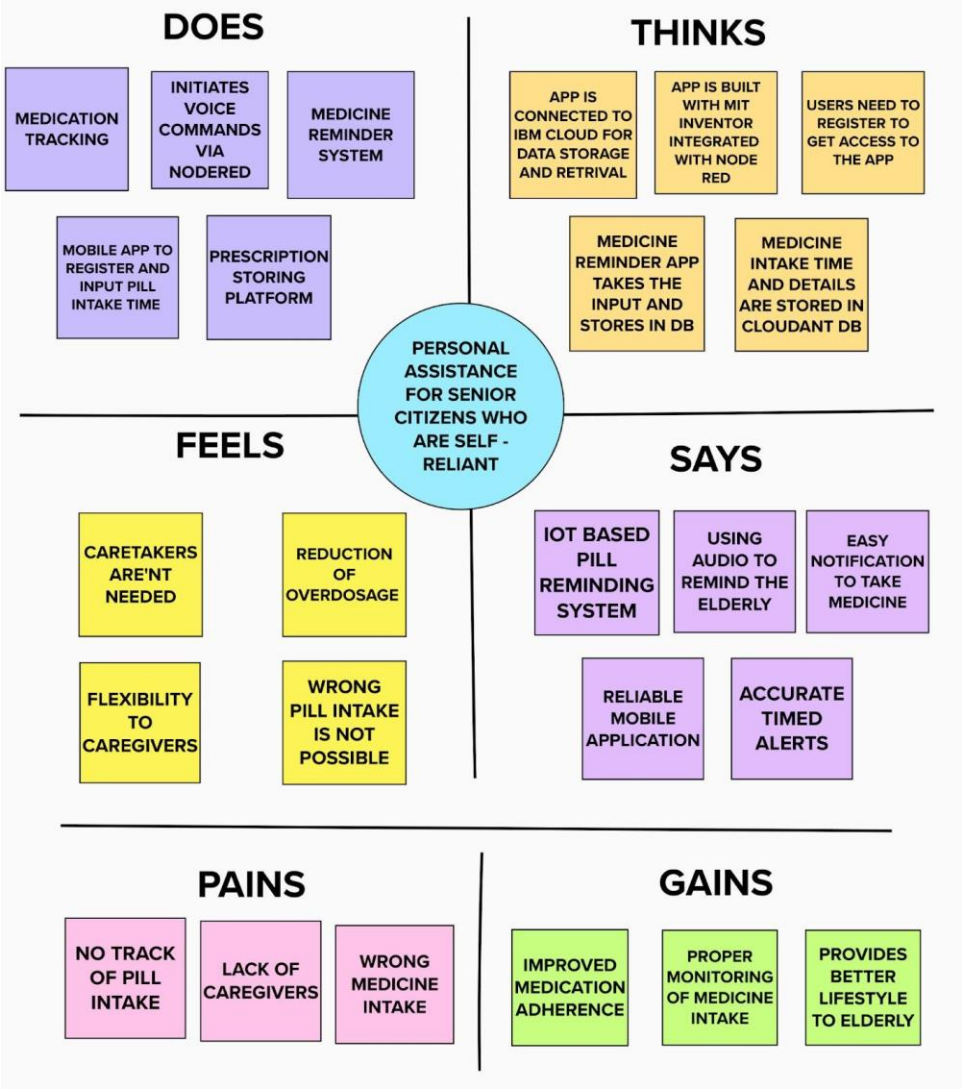
- B. B. Singh, GSM Based Automatic Pill Dispenser, vol. 7, no. 4, pp. 10694-10695, 2017.
- S. Shinde, N. Bange, M. Kumbhar and S. Patil, Smart Medication Dispenser, vol. 6, no. 4, pp. 200-204, 2017.
- S. Shinde, T. Kadaskar, P. Patil and R. Barathe, A Smart Pill Box With Remind And Consumption Using IoT, pp. 152-154, 2017.
- H. K. Wu, C. M. Wong, P. H. Liu, S. P. Peng, X. C. Wang, C. H. Lin, et al., "A Smart Pill Box with Remind and Consumption Confirmation Functions", Conf. Proc. IEEE Consumer Electronics, pp. 658-659, 2015.
- T. L. Hayes, J. M. Hunt, A. Adami and J. A. Kaye, "An Electronic Pillbox for Continuous Monitoring of Medication Adherence", Conf. Proc. IEEE Eng. Med. Biol. Soc, pp. 6400-6403, 2006.
- S. C. Huang, H. Y. Chang, Y. C. Jhu and G. Y. Chen, "The intelligent pillbox - Design and implementation", Conf. Proc. IEEE Consumer Electronics, pp. 235-236, 2014. 7.P. H. Tsai, T. Y. Chen, C. R. Yu, C. S. Shih and J. W. S. Liu, "Smart Medication Dispenser: Design Architecture and Implementation", IEEE Systems Journal, pp. 99-110, 2010.

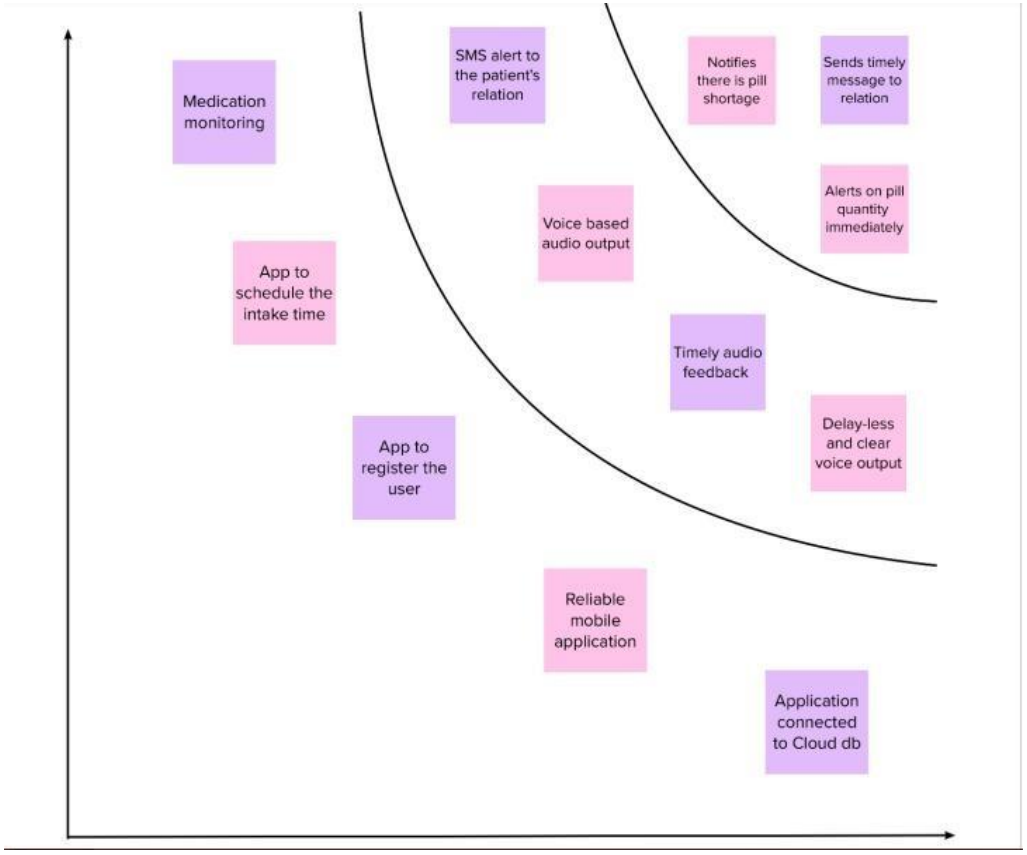
2.3. Problem Statement Definition

Elderly patients will try to intake medicine on prescribed time but fail to intake medicine on prescribed time because there is no caregiver to remind, Which makes them feel insecure about their health.

3. IDEATION & PROPOSED SOLUTION

3.1. Empathy Map Canvas



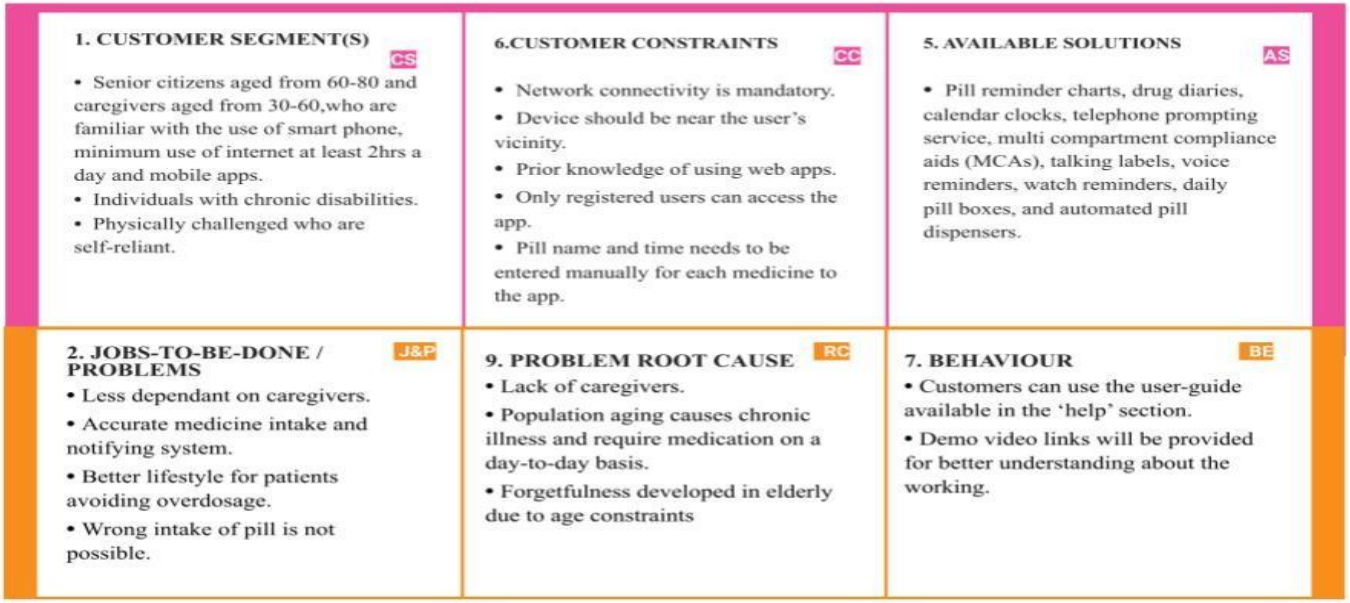


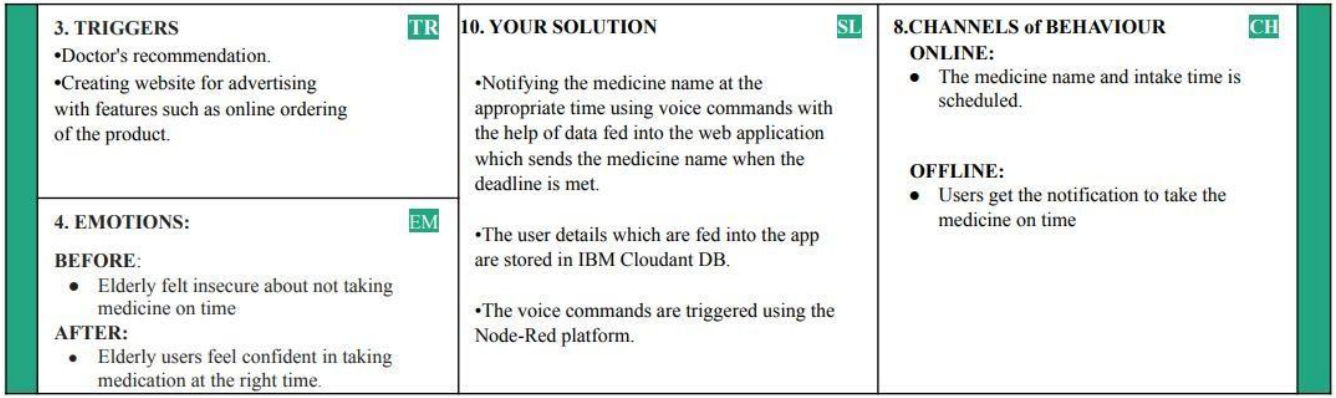
3.2. Proposed Solution

An app is built for the user (caretaker) which enables him to set the desired time and medicine. These details will be stored in theIBM 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.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Elderly patients who are in need of pill reminders for taking medicines on time.
2.	Idea / Solution description	Web application integrated with a microcontroller to provide scheduled voice output of the medicine name during intake time
3.	Novelty / Uniqueness	It avoids over dosage of medication by the patients.
4.	Social Impact / Customer Satisfaction	Improved ability to stay self-sufficient at home.
5.	Business Model (Revenue Model)	Revenue can be generated by selling the app at a cost for the users in playstore/App store and also by using the app to advertise pharmaceutical products.
6.	Scalability of the Solution	The app can be further improved to record and analyze daily activities (such as sleep tracking,step counting)to help maintain a successful diet and lead a healthy lifestyle.

3.3. Problem Solution fit





4.REQUIREMENT ANALYSIS

4.1. Functional requirement

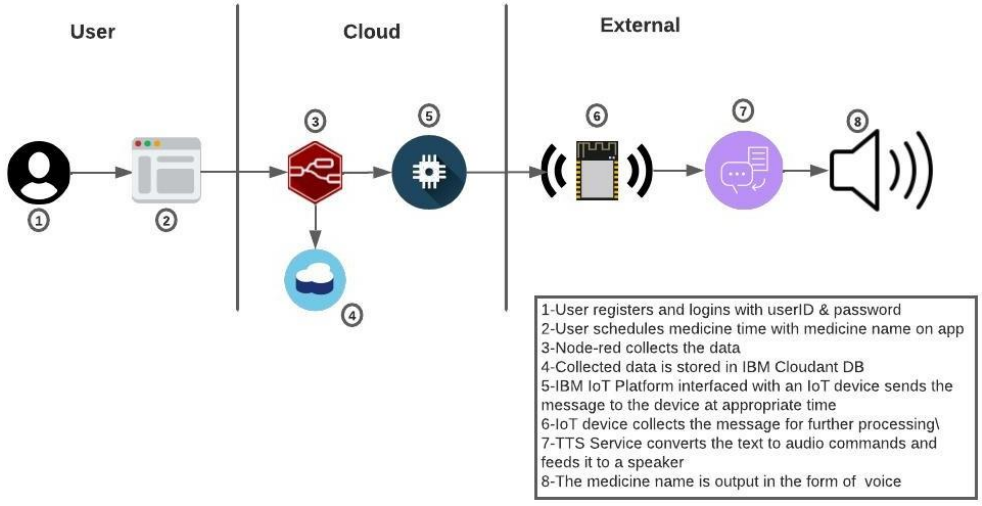
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User Login	Login via username and password
FR-4	Network connectivity	Mobile data/Wi-Fi
FR-5	Node-Red	Sends the message from Web App to Iot device at the scheduled time using MQTT protocol.
FR-6	IBM Cloudant DB	For storing user details and medicine details on cloud.

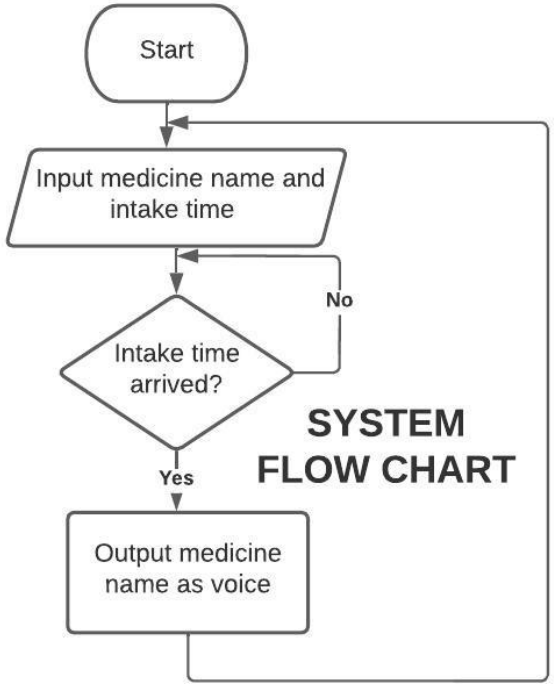
4.2. Non-Functional requirement

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	It tracks the medication time and signals the user when it's time to take the medicine
NFR-2	**Security**	IBM Cloudant DB is highly secure from various attacks
NFR-3	**Reliability**	The app sends scheduled messages to take the medicine on time without any latency.
NFR-4	**Performance**	The system manages the overall user interaction and increases the efficiency of taking the medicine at the right time.
NFR-5	**Availability**	The system functions round the clock when connected to the internet.
NFR-6	**Scalability**	The users can schedule a large number of medicines to be taken in a day using the app

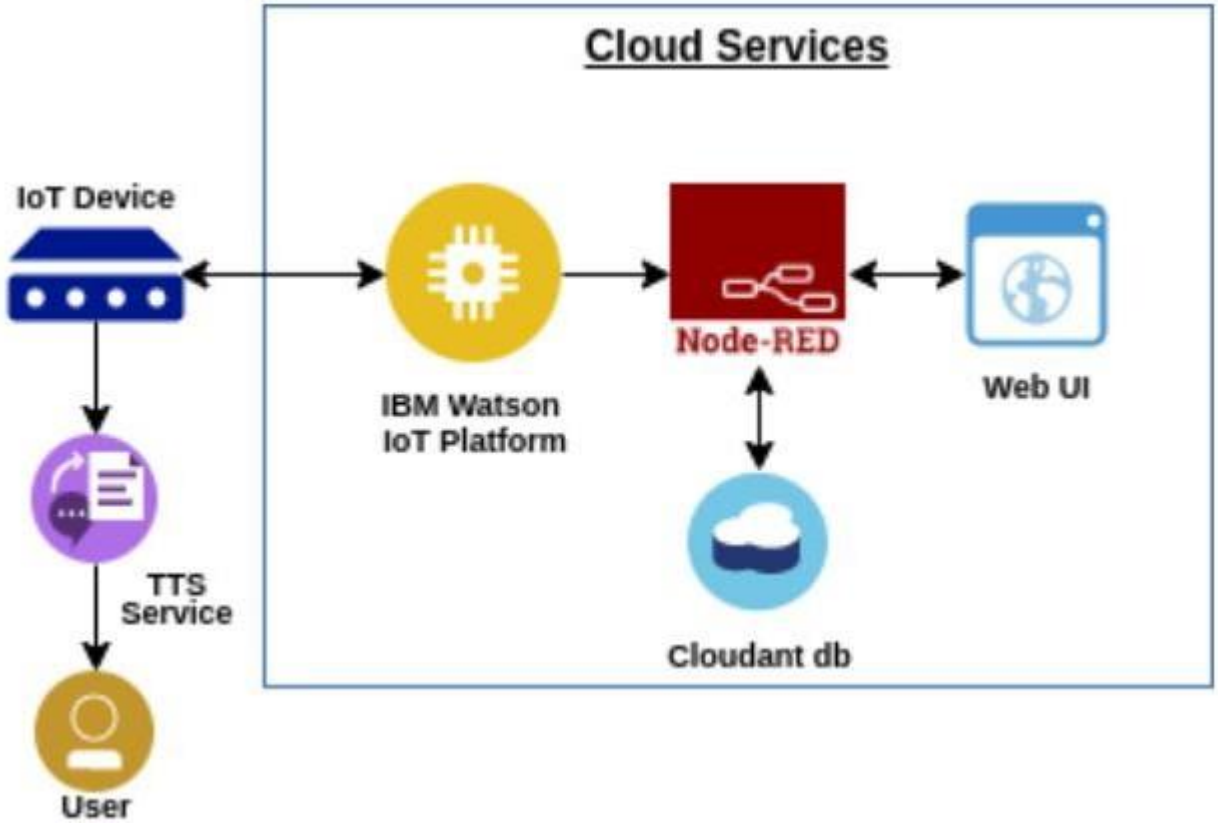
5.Project Design

5.1.Data Flow Diagrams





5.2. Solution & Technical Architecture



5.3. User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Citizen)	Scheduling	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 (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 (Doctor)	Smart medicine box	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
Customer (CareTaker)	Data storage	USN-4	As a user, my patient needs medication time and prescription should load in the database for the upcoming week.	My patient medication time and prescription should be in database list	Medium	Sprint-3
Customer (CareTaker)	Smart medicine box	USN-5	As a user, I need to take my medicine in nearby places with light notification.	I want to access the customer health 24/7	High	Sprint-4
Customer (Patient)	User Experience	USN-6	As a user,the app should be easy and simple to use	I want an easy to handle application	Medium	Sprint-4

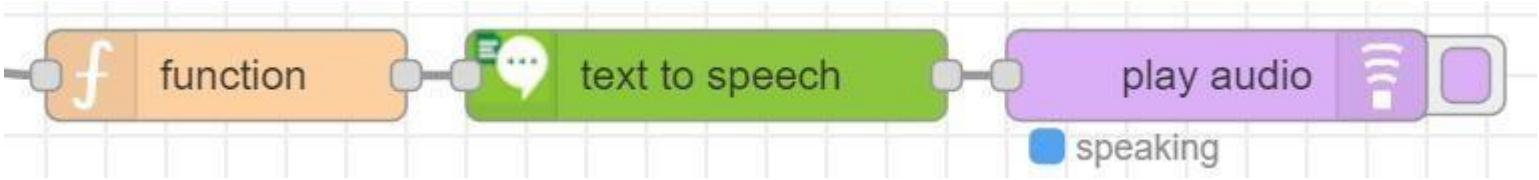
6.CODING & SOLUTIONING

Features

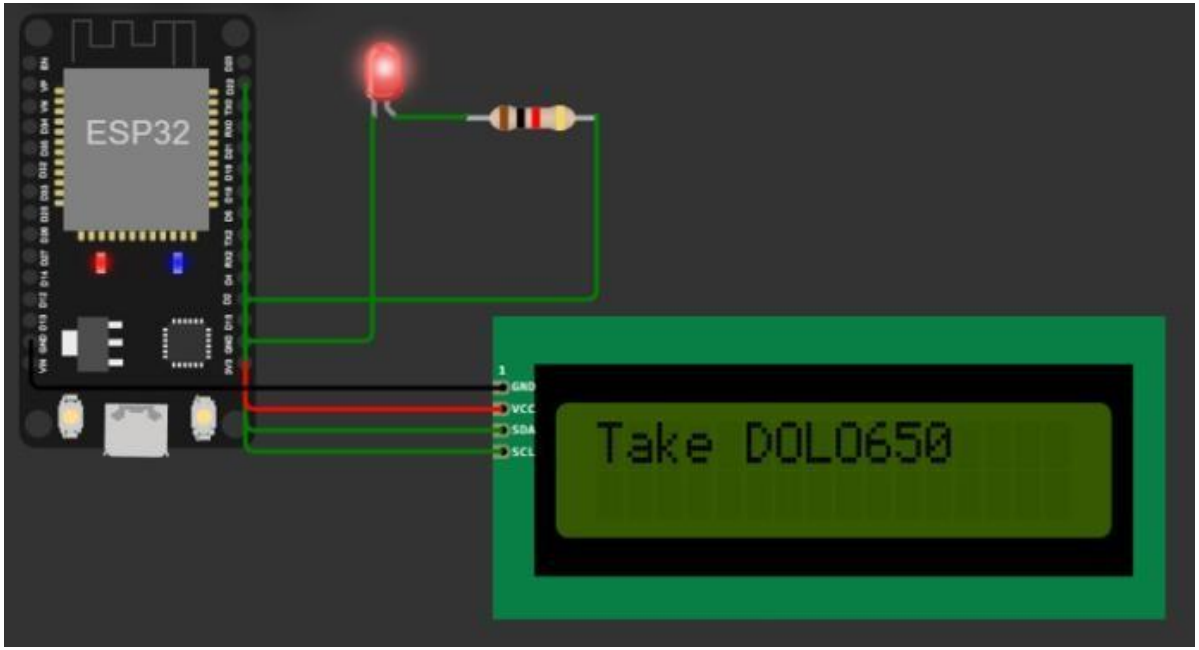
#1 Web UI to schedule medicine name and intake time:

Web page UI **APP UI**

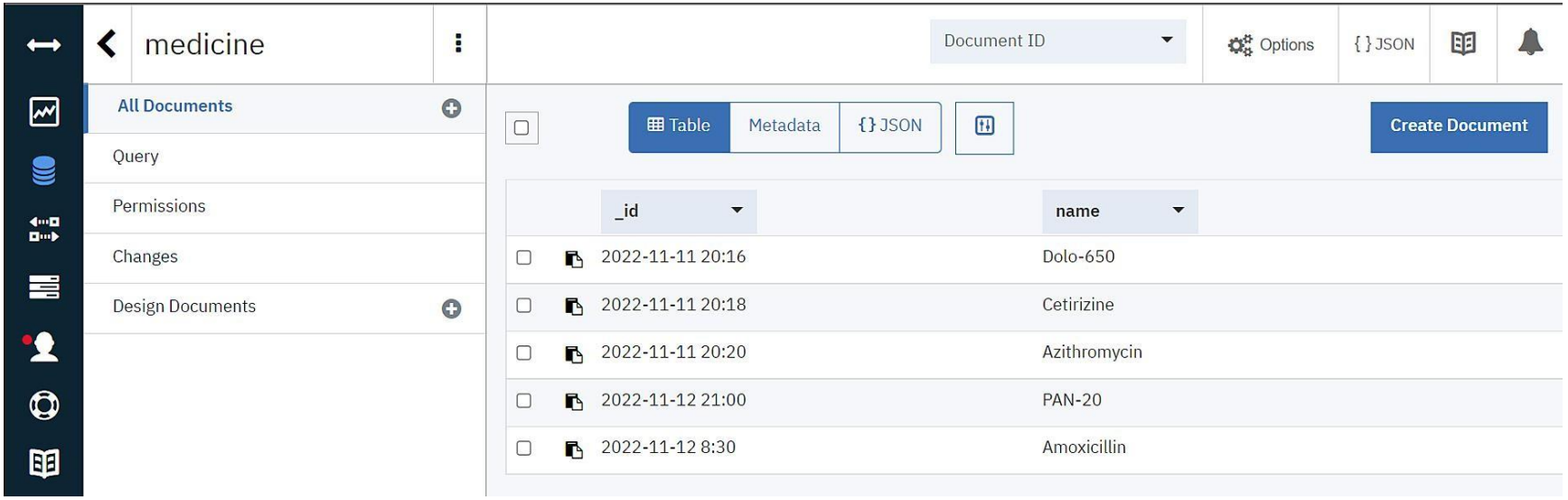
#2 Sending the medicine name as Voice output at the scheduled time



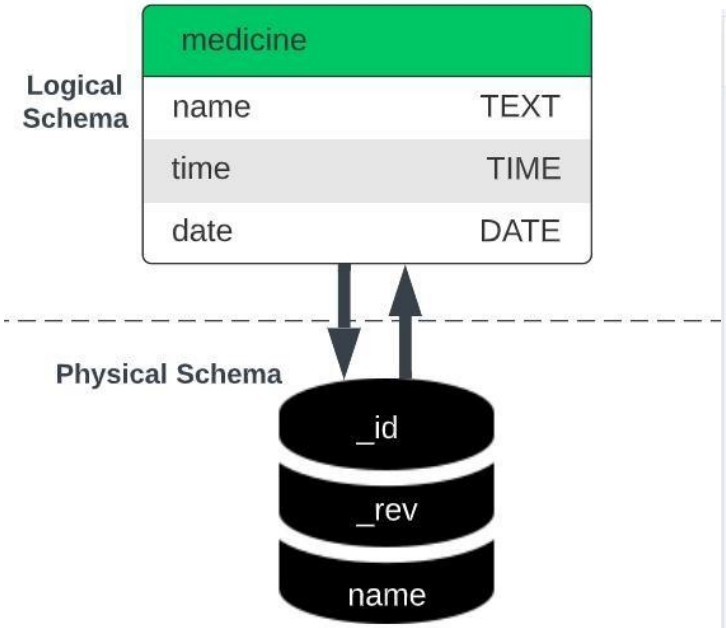
#3 Displaying the medicine name on the IoT device at the scheduled time



#4 Secure data transmission and storage with IBM Cloudant database



Database Schema



id "2022-11-11 20:16"


```
{
 "id": "2022-11-11 20:16",
 "key": "2022-11-11 20:16",
 "value": {
  "rev": "1-4910298aee742c3f200a0e4191701a3a"
 },
 "doc": {
  "_id": "2022-11-11 20:16",
  "_rev": "1-4910298aee742c3f200a0e4191701a3a",
  "name": "Dolo-650"
 }
}
```

6.1. User Acceptance Testing(UAT):

Purpose of Document:

The purpose of this document is to briefly explain the test coverage and open issues of the Personal assistance for seniors who are Self-Reliant project at the time of the release to User Acceptance Testing (UAT).

Defect Analysis:

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	5	3	1	2	11
Duplicate	2	1	0	0	3
External	2	2	0	0	4
Fixed	10	2	3	15	30
Not Reproduced	0	1	0	0	1
Skipped	0	0	2	0	2
Won't Fix	0	2	4	5	11
Totals	19	10	8	22	62

Test Case Analysis:

This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	5	0	0	5
Client Application	42	0	0	43
Security	1	0	0	1
Outsource Shipping	0	0	0	0
Exception Reporting	2	0	0	2
Final Report Output	6	0	0	6
Version Control	1	0	0	1

7.Results

9.1.Performance Metrics:

			NFT - Risk						
S.No	Project Name	Scope	Functional Changes	Hardware Changes	Software Changes	Impact of Downtime	Load/Volume Changes	Risk Score	Justification
1	Personal Assistance For Seniors who are Self-Reliant	Existing	Low	Moderate	Moderate	Causes delay in runtime	>10 to 30%	ORANGE	As we have seen the changes, it adds the setup time

	NFT - Detailed				
	S.No	Project Overview	NFT Test approach	Assumptions/Dependencies/Risks	Approvals/SignOff
	1	Personal Assistance For Seniors who are Self-	LOAD	Dependencies	SignOff

			End Of Test					
S.No	Project Overview	NFT Test approach	NFR - Met	Test Outcome	GO/NO-GO decision	Recommendations	Identified Defects (Detected/Closed/Open)	Approvals/SignOff
1	Providing Assistance to Seniors by developing a Software application to remind their medicine intake time	LOAD	MET	Able to Support in Other Platforms	GO	To have browsers to have enhanced capabilities	Closed	Approval

NFT - Detailed				
S.No	Project Overview	NFT Test approach	Assumptions/Dependencies/Risks	Approvals/SignOff
1	Personal Assistance For Seniors who are Self-	LOAD	Dependencies	SignOff

			End Of Test				
S.No	Project Overview	NFT Test approach	NFR - Met	Test Outcome	GO/NO-GO decision	Recommendations	Ide (Detec
1	Providing Assistance to Seniors by developing a Software application to remind their medicine intake time	LOAD	MET	Able to Support in Other Platforms	GO	To have browsers to have enhanced capabilities	

8. ADVANTAGES & DISADVANTAGES

Advantages:

- Helpful for people who have no caretakers.
- Helps people to take medicines on time by voice command.

Disadvantages:

- Elderly people should be aware of how to use the application.
- There is no way to determine what actually happened as it only gives the remainder to take the medicineInternet connection is required.

9. Conclusion

Our project's goal is to see how successful an automated pilldispenser will be in assisting individuals in better self-managing their medications. This might be demonstrated by the following:

- Better quality of life for individuals with chronic disabilities and their caregivers.
- Improved ability to stay self-sufficient at home.
- Social impact on the pharma sector .
- Less dependency on health-care and social-services.

The device is intended for those with memory impairments, and several of the medical diagnoses recorded for trial participants, including Alzheimer's and dementia, the elderly and persons with
long-term medical conditions who must take many prescriptions every day, backed up this claim.

In conclusion, we used technology to have a social effect in the pharmaceutical industry.

10. Future scope:

- We will further extend the app where the prescriptions of the patients will be directly uploaded to the database.
- When your medicine runs low, we will reach out to third parties so you can get it delivered at your door.
- Touch sensors can be incorporated on each compartment to track the number of times the compartment has been opened so that refill time can be calculated.

11. APPENDIX

LINKS:

GITHUB: https://github.com/dineshguna2002/IBM-Project-44862-1660727126

NODE-RED:https://node-red-psifx-2022-11-13.au-syd.mybluemix.net/red/#flow/3f5f4d5d449854ae

WOKWI:https://wokwi.com/projects/348142722743272020

DEMO LINK:https://www.youtube.com/watch?v=K0hxZFNTQ1Y

SOURCE CODE:

```
#include <WiFi.h>//library for wifi
#include <PubSubClient.h>//library for MQtt
#include <LiquidCrystal_I2C.h>
#define LED 2
void callback(char* subscribetopic, byte* payload, unsigned int payloadLength);


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

#define ORG "ok5c7o"//IBM ORGANITION ID
#define DEVICE_TYPE "ESP"//Device type mentioned in ibm watson IOT Platform
#define DEVICE_ID "ESP32"//Device ID mentioned in ibm watson IOT Platform
#define TOKEN "LC!x?+V9etumdVMaSR"     //Token
String data3="";


//-------- 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);
  pinMode(LED,OUTPUT);
  delay(10);
  Serial.println();
  wificonnect();
  mqttconnect();
}

void loop()// Recursive Function
{
  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("Please take "+ data3);
  if(data3 != "")
  {
    lcd.init();
    lcd.print("Take"+ data3);

digitalWrite(LED,HIGH);
delay(20000);
digitalWrite(LED,LOW);
```

}

```
  else
  {
digitalWrite(LED,LOW);

  }
data3="";


}
```