Personal Assistance For Seniors Who Are Self-Reliant
<u>PROJECT REPORT</u>

Team ID	PNT2022TMID27535
Project Name	Project – Personal Assistance for senior citizens 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 the caregivers.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 by simplifying 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 few examples.
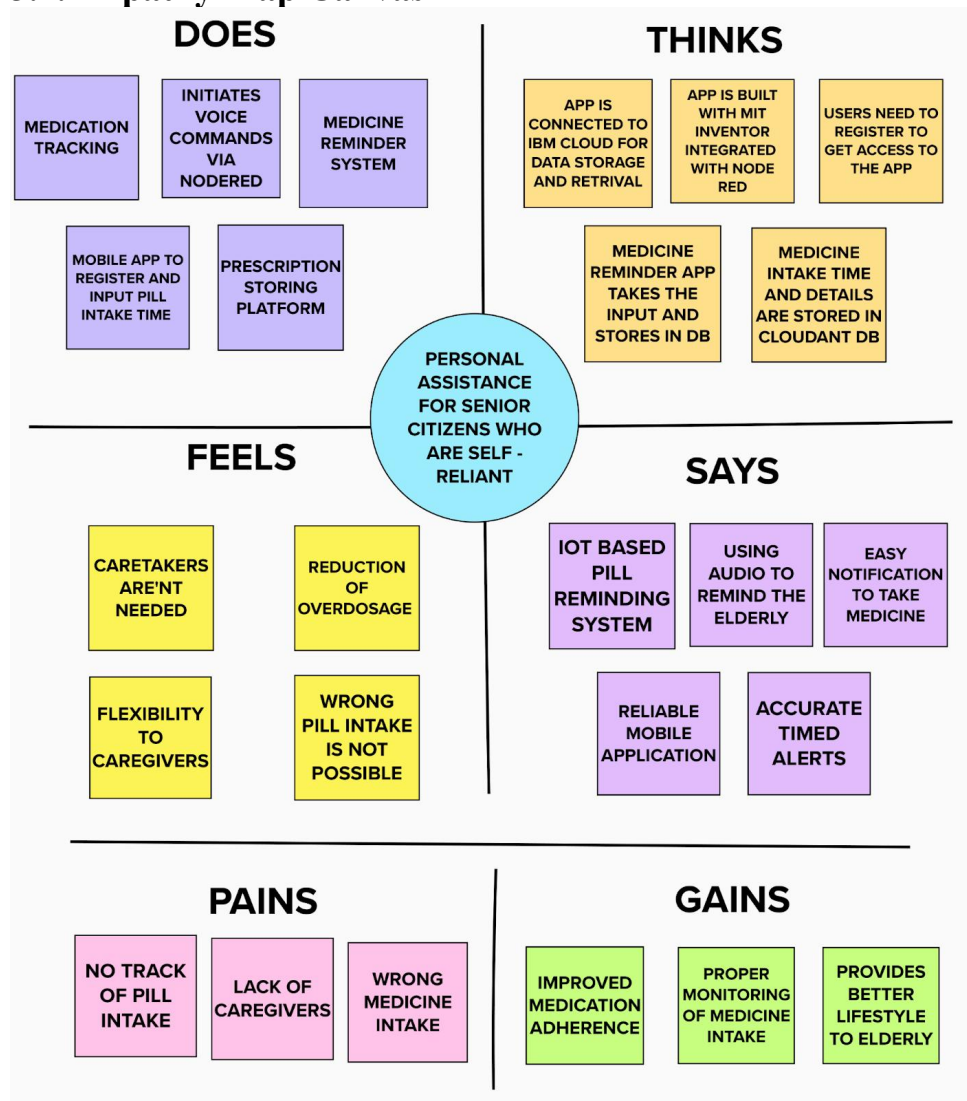
2.2.References

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- 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

DOES

- MEDICATION TRACKING
- INITIATES VOICE COMMANDS VIA NODERED
- MEDICINE REMINDER SYSTEM
- MOBILE APP TO REGISTER AND INPUT PILL INTAKE TIME
- PRESCRIPTION STORING PLATFORM

THINKS

- APP IS CONNECTED TO IBM CLOUD FOR DATA STORAGE AND RETRIVAL
- APP IS BUILT WITH MIT INVENTOR INTEGRATED WITH NODE RED
- USERS NEED TO REGISTER TO GET ACCESS TO THE APP
- MEDICINE REMINDER APP TAKES THE INPUT AND STORES IN DB
- MEDICINE INTAKE TIME AND DETAILS ARE STORED IN CLOUDANT DB

PERSONAL ASSISTANCE FOR SENIOR CITIZENS WHO ARE SELF - RELIANT

FEELS

- CARETAKERS ARE'NT NEEDED
- REDUCTION OF OVERDOSAGE
- FLEXIBILITY TO CAREGIVERS
- WRONG PILL INTAKE IS NOT POSSIBLE

SAYS

- IOT BASED PILL REMINDING SYSTEM
- USING AUDIO TO REMIND THE ELDERLY
- EASY NOTIFICATION TO TAKE MEDICINE
- RELIABLE MOBILE APPLICATION
- ACCURATE TIMED ALERTS

PAINS

- NO TRACK OF PILL INTAKE
- LACK OF CAREGIVERS
- WRONG MEDICINE INTAKE

GAINS

- IMPROVED MEDICATION ADHERENCE
- PROPER MONITORING OF MEDICINE INTAKE
- PROVIDES BETTER LIFESTYLE TO ELDERLY

3.2.Ideation & Brainstorming

Brainstorm & idea prioritization

② Brainstorm
Write down any ideas that come to mind that address your problem statement.
⏱ 10 minutes

Rufus A R
- Medication Tracking
- Voice output of medicine name
- Stores patient's medical record
- App connected with cloud database

Melodina Carnelian D
- Pill reminder support through schedule
- No caregiver needed
- Cloud based APP for storing intake time
- Alerts the patient's closest person

Mark Gerald
- Easy to use application
- Send notification to refill pills
- Accurately timed pill reminder
- Portable system

Kingston Leonard V
- Optimal use of hardware
- Simple design to aid elderly
- monitoring the sufficientcy of medicine
- User friendly interface

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 and break it up into smaller sub-groups.
⏱ 20 minutes

VOICE ASISTANT
- Output medicine intake as voice
- Voice alert when deadline is met
- Easy to understand audio setup
- Timely audio without any delay

NOTIFICATION
- Notifies when its time to refill pill
- Sends SMS of the medicine name
- Timely message alert
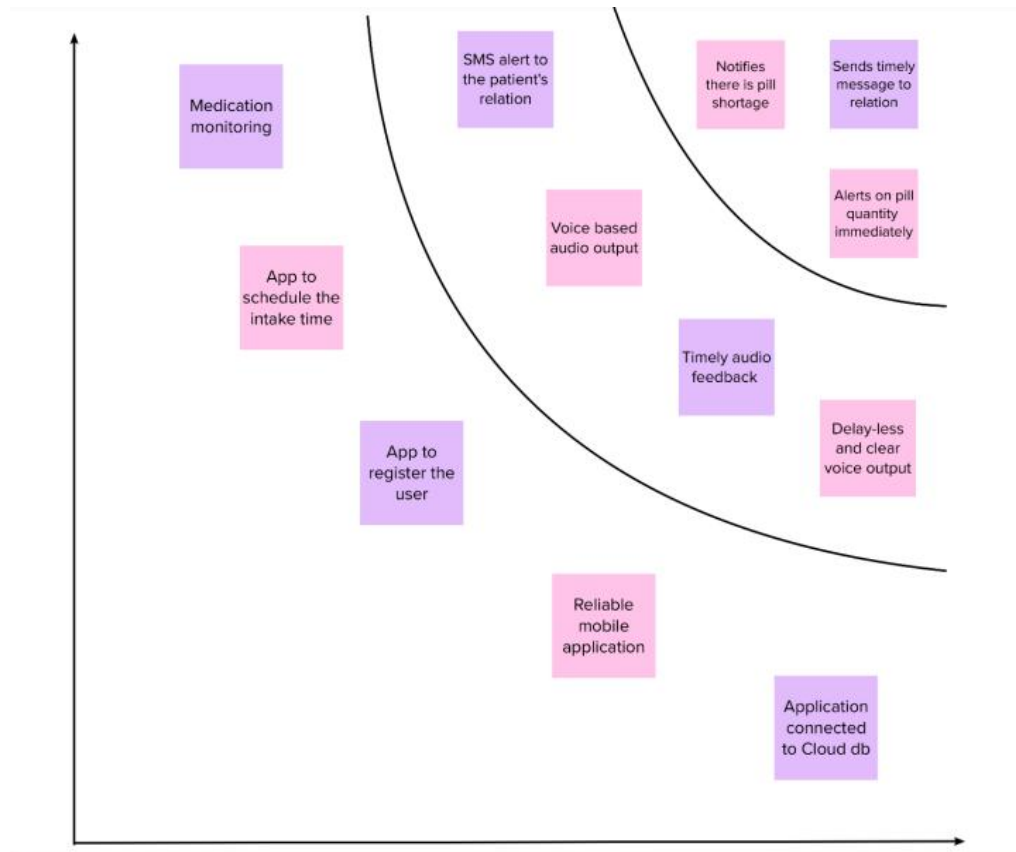- Notifies close person of patient via SMS

WARNING
- Reminds patient's relation
- Alerts when medicines need to be refilled
- Accurate notification
- Immediate warning for pill shortage

Share template feedback

3.3. 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 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.

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.

3.4.Problem Solution fit

1. CUSTOMER SEGMENT(S) `CS`	6.CUSTOMER CONSTRAINTS `CC`	5. AVAILABLE SOLUTIONS `AS`
• Senior citizens aged from 60-80 and caregivers aged from 30-60,who are familiar with the use of smart phone, minimum use of internet at least 2hrs a day and mobile apps. • Individuals with chronic disabilities. • Physically challenged who are self-reliant.	• Network connectivity is mandatory. • Device should be near the user's vicinity. • Prior knowledge of using web apps. • Only registered users can access the app. • Pill name and time needs to be entered manually for each medicine to the app.	• 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.
2. JOBS-TO-BE-DONE / PROBLEMS `J&P`	9. PROBLEM ROOT CAUSE `RC`	7. BEHAVIOUR `BE`
• Less dependant on caregivers. • Accurate medicine intake and notifying system. • Better lifestyle for patients avoiding overdosage. • Wrong intake of pill is not possible.	• Lack of caregivers. • Population aging causes chronic illness and require medication on a day-to-day basis. • Forgetfulness developed in elderly due to age constraints	• Customers can use the user-guide available in the 'help' section. • Demo video links will be provided for better understanding about the working.

3. TRIGGERS `TR`	10. YOUR SOLUTION `SL`	8.CHANNELS of BEHAVIOUR `CH`
•Doctor's recommendation. •Creating website for advertising with features such as online ordering of the product.	•Notifying the medicine name at the appropriate time using voice commands with the help of data fed into the web application which sends the medicine name when the deadline is met. •The user details which are fed into the app are stored in IBM Cloudant DB. •The voice commands are triggered using the Node-Red platform.	**ONLINE:** • The medicine name and intake time is scheduled. **OFFLINE:** • Users get the notification to take the medicine on time
4. EMOTIONS: `EM` **BEFORE:** • Elderly felt insecure about not taking medicine on time **AFTER:** • Elderly users feel confident in taking medication at the right time.		

4.REQUIREMENT ANALYSIS
4.1.Functional requirement

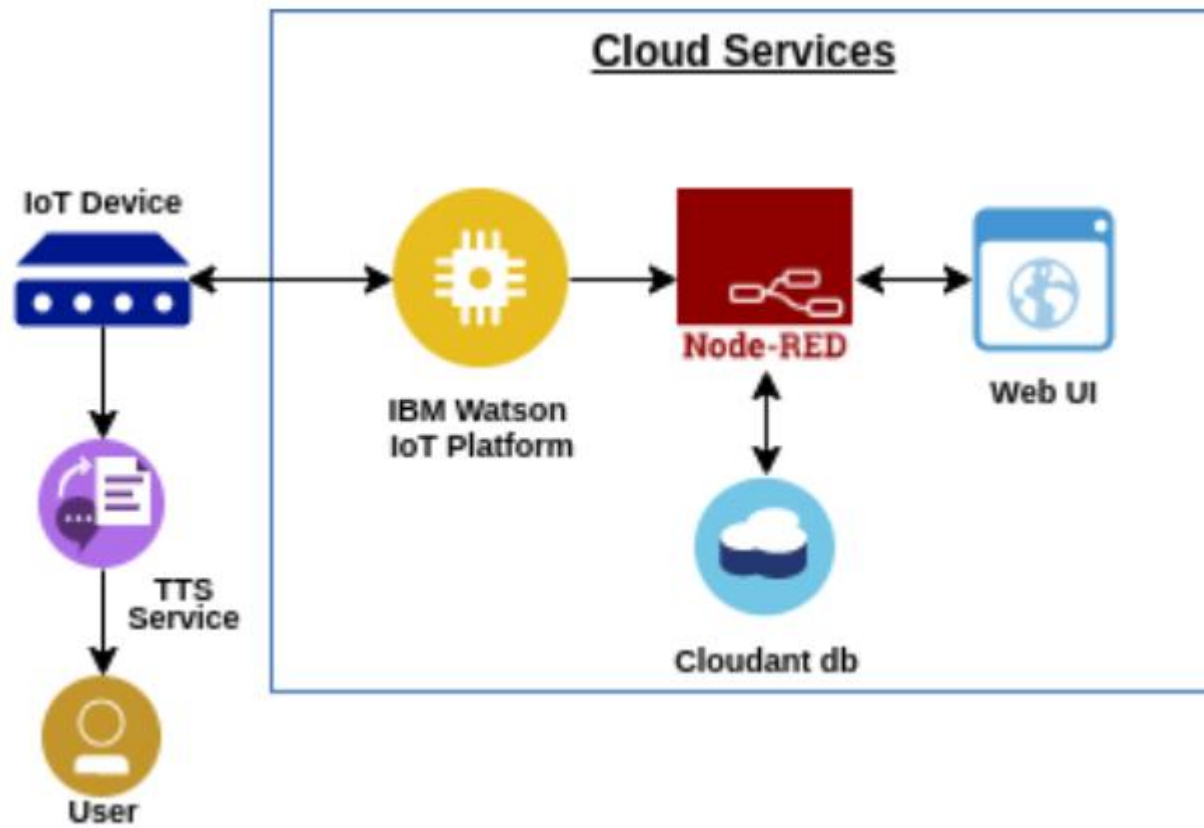| FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User Login	Login via username and password
FR-4	Network 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

User   **Cloud**   **External**

1-User registers and logins with userID & password
2-User schedules medicine time with medicine name on app
3-Node-red collects the data
4-Collected data is stored in IBM Cloudant DB
5-IBM IoT Platform interfaced with an IoT device sends the message to the device at appropriate time
6-IoT device collects the message for further processing\
7-TTS Service converts the text to audio commands and feeds it to a speaker
8-The medicine name is output in the form of voice

Start

Input medicine name and intake time

Intake time arrived?   No

Yes

Output medicine name as voice

SYSTEM FLOW CHART

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.PROJECT PLANNING & SCHEDULING
Sprint Planning & Estimation

Browser Tabs
M Folde | UNIT | Case | Eleva | Ebike | Self-r | Evalu | IBM | Node | leads | IBM-I | Eleva | (9) W | IBM | Eleva | What | P/ x | New Tab | +

alphawing.atlassian.net/jira/software/projects/PAF/boards/1/roadmap

Bookmarks

Update

Jira Navigation
Jira | Your work ˅ | Projects ˅ | Filters ˅ | Dashboards ˅ | People ˅ | Apps ˅ | **Create**

Search

Projects / PAFSCII

Roadmap

Give feedback · Share · Export · •••

Status category ˅ · Epic ˅

	OCT	NOV	DEC
Sprints	PAF S... PAF S... PAF S... PAF S...		
⚡ PAF-10 Sprint 1			
⚡ PAF-11 Sprint 2			
⚡ PAF-12 Sprint 3			
⚡ PAF-13 Sprint 4			
+ Create Epic			

Today | Weeks | **Months** | Quarters

Quickstart
- ✓ Create a project ˅
- ✓ Map out your project goals ˅
- ✓ Identify small chunks of work ˅
- ✓ Monitor and manage risk ˅
- ✓ Create an issue ˄

Issue

Issues are individual pieces of work that you assign to teammates.

Issues can be tasks or stories.

Show me · View issue tutorial

Dismiss Quickstart

29°C Cloudy · ENG IN · 12:36 PM 11/14/2022

	T	NOV	DEC	
Sprints		PAF Sp... PAF... PAF Sp... PAF...		
⚡ PAF-10 Sprint 1	DONE ▮			
⚡ PAF-11 Sprint 2	DONE	▮		
⚡ PAF-12 Sprint 3	DONE	▮		
⚡ PAF-13 Sprint 4	DONE	▮		

7.CODING & SOLUTIONING
Features
#1 Web UI to schedule medicine name and intake time:

Medicine Reminder

Medicine Name *
DOLO650

Time *
23:00 🕐

Date *
13-11-2022 📅

SUBMIT   CANCEL

MEDICATION REMAINDER

Medicine name:

Hint for TextBox1

Date:

YYYY:MM:DD

Time:

HH:MM

SUBMIT

Web page UI   **APP UI**

#2 Sending the medicine name as Voice output at the scheduled time
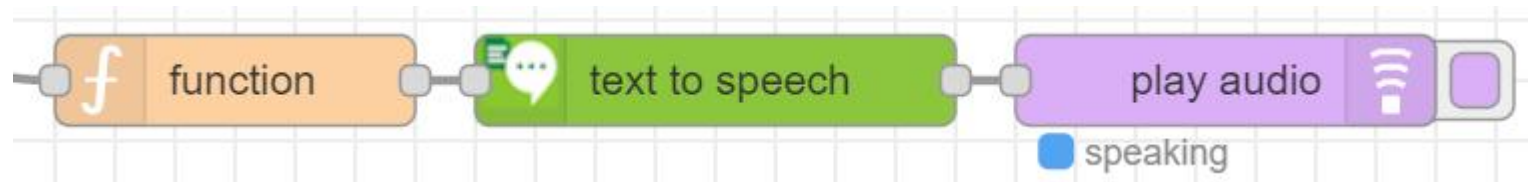
#3 Displaying the medicine name on the IoT device at the scheduled time

#4 Secure data transmission and storage with IBM Cloudant database
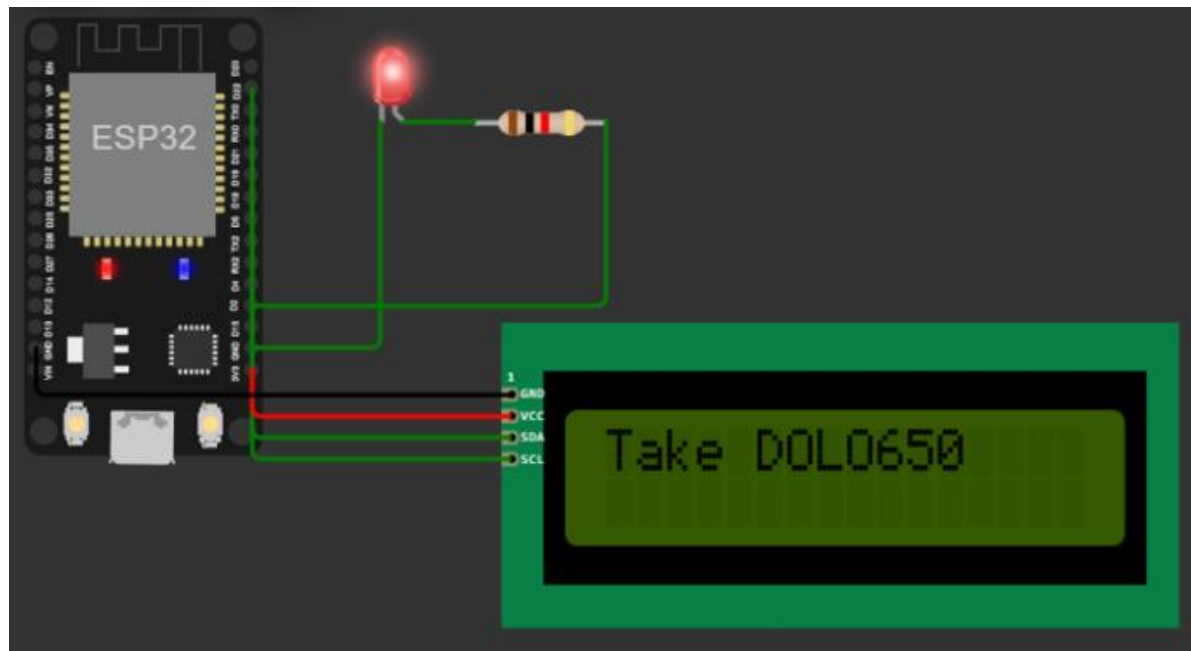
| medicine | | Document ID ▼ | ⚙ Options | { } JSON | 📖 | 🔔 |

All Documents ⊕	
Query	
Permissions	
Changes	
Design Documents ⊕	

☐ | ⊞ Table | Metadata | { } JSON | ⇅ | **Create Document**

	_id ▼	name ▼
☐ 📄	2022-11-11 20:16	Dolo-650
☐ 📄	2022-11-11 20:18	Cetirizine
☐ 📄	2022-11-11 20:20	Azithromycin
☐ 📄	2022-11-12 21:00	PAN-20
☐ 📄	2022-11-12 8:30	Amoxicillin

Database Schema

Logical Schema

medicine	
name	TEXT
time	TIME
date	DATE

Physical Schema

_id

_rev
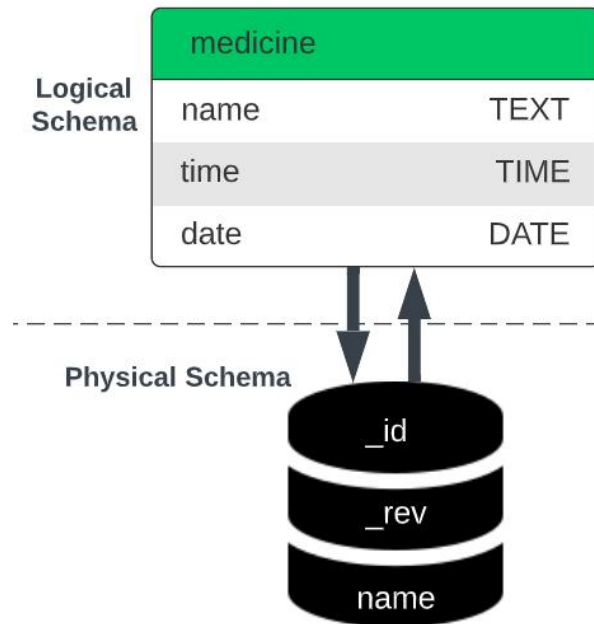
name

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"
 }
}
```

8.Testing:

8.1.Test cases Reports:

Test case ID	Feature Type	Component	Test Scenario	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Commnets	TC for Automation	BUG ID	Executed By
LoginPage_TC_OO1	UI	Home Page	Verify whether user is able to access the URL	https://node-red-psifx-2022-11-13.au-syd.mybluemix.net/ui/#!/0?sock	URL	Able to access the URL	failed to access in mobile	Fail	Wrong Browser selected	NO	101	RUFUS AR
LoginPage_TC_OO2	UI	Home Page	Verify whether user is able to access the URL	https://node-red-psifx-2022-11-13.au-syd.mybluemix.net/ui/#!/0?sock	URL	Now User able to access the URL	Able to access in mobile	Pass	Able to access in Chrome and Edge	YES		MARK GERALD
LoginPage_TC_OO3	Functional	Home page	User can enter the data in specified	To have browsers to have enhanced capabilities	URL	enter a data in specified format	specified input is not	Fail	Specify the User formats	NO	110	KINGSTON LEONARD V
LoginPage_TC_OO4	Functional	Home page	User can enter the data in any format	User can enter the data in required format	Time(HH:MM): DATE(YYYY-MM-DD):	User can enter the data in	Input received	Pass	Format specified	YES		MELODINA CARNELIAN D
CLOUD_STORAGE_TC_005	Functional	Cloud	Verify if User input is stored in the cloud	User is able to access the URL with the given link. User has to enter the data(name,time and date) and click the SUBMIT button.Data to be stored in IBM cloud	MEDICINE NAME: Time(HH:MM) : DATE(YYYY-MM-DD):	User inputs has to be stored in cloud	Failed to storing the inputs	Fail	Cloud not connected properly	YES	111	RUFUS AR
CLOUD_STORAGE_TC_OO	Functional	Cloud	Verify if User input is stored in the cloud	User is able to access the URL with the given link. User has to enter the data(name,time and date) and click the SUBMIT button.Data to be stored in IBM cloud	MEDICINE NAME: Time(HH:MM) : DATE(YYYY-MM-DD):	User inputs has to be stored in cloud	Inputs are stored in the cloud	Pass	Cloud connected properly	YES		KINGSTON LEONARD V
OUPUT_TC_007	Functional	Iot device	Verify if it reminds the medicine intake to the user	Comparing the UTC time and medicine intake time	Real time and medicine intake time	Gives True when both times match	Null	Fail	Check the input	YES	113	RUFUS AR

Test case ID	Feature Type	Component	Test Scenario	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Commnets	TC for Automation	BUG ID	Executed By
OUPUT_TC_007	Functional	Iot device	Verify if it reminds the medicine intake to the user	Comparing the UTC time and medicine intake time	Real time and medicine intake time	Gives True when both times match	Null	Fail	Check the input	YES	113	RUFUS AR
OUPUT_TC_007	Functional	Iot device	Verify if it reminds the medicine intake to the user	Comparing the UTC time and medicine intake time	Real time and medicine intake time	Gives True when both times match	TRUE	Fail	verified	Yes		MARK GERALD
TTS_TC_008	Functional	Iot device	Verify if it gives voice notifications	When True it gives a voice notifications	Voice notifications	Voice notifications	Voice notifications service didn't work	Fail	In program, commands are as object instead of string	NO	121	KINGSTON LEONARD V
TTS_TC_009	Functional	Iot device	Verify if it gives voice notifications	When True it gives a voice format notifications	Voice notifications	Voice notifications	Voice notifications	Pass	New string functions were added	YES		RUFUS AR
ACK_TC_010	Functional	URL	Verify whether the patient has taken the medicine or not	The TAKEN button has been included	The status of the medicine intake	The User clicks the TAKEN button to show that medicine has	Button is unfunctional	Fail	Error occurs due to failure of call and connect function of the "taken " button`	NO	132	MELODINA CARNELIAN D
ACK_TC_011	Functional	URL	Verify whether the patient has taken the medicine or not	The TAKEN button has been included	The status of the medicine intake	The User clicks the TAKEN button to show that	The Taken status is updated in	Pass	The status of the medicine intake is updated in the cloud	Yes		KINGSTON LEONARD V

8.2.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

9.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 (Dete
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	

10.ADVANTAGES & DISADVANTAGES

Advantages:

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

Visual support	Easy mode of operation	Safe and Secure	Dose Reminder
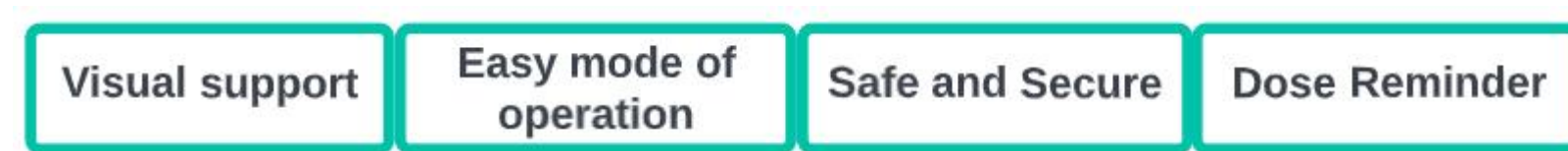
Disadvantages:
- Elderly people should be aware of how to use the application.
- There is no way to determine what actually happened as it only gives the remainder to take the medicineInternet connection is required.

11.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.

12.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.

13.APPENDIX

LINKS:
GITHUB:https://github.com/IBM-EPBL/IBM-Project-9874-1659082281
NODE-RED:https://node-red-psifx-2022-11-13.au-syd.mybluemix.net/red/#flow/3f5f4d5d449854ae
WOKWI:https://wokwi.com/projects/348142722743272020

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);
```

```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);
  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);
```

```cpp
  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));
```

```cpp
    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="";


}
```