PERSONAL ASSISTANCE FOR SENIORS WHO ARE SELF-RELIANT

TEAM ID: PNT2022TMID48824

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1. INTRODUCTION

1.1 Project Overview

Sometimes elderly people forget to take their medicine at the correct time.An app is built for the user(caretaker) which enables them 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

This project will be very useful for elderly people, because they forget to take their medicine at the correct time.

2. LITERATURE SURVEY

s.no	Paper name	Author name	Published year	Abstract

Project Report

| 1 | A critical analysis of an IoT—aware AAL system for elderly monitoring | Aitor Almeida, Rubén Mulero, Piercosimo Rametta, Vladimir Urošević and Marina Andrić | 2019 | A growing number of elderly people (65+ years old) are affected by particular conditions, such as Mild Cognitive Impairment (MCI) and frailty, which are characterized by a gradual cognitive and physical decline. Early symptoms may spread across years and often they are noticed only at late stages, when the outcomes remain irrevocable and require costly intervention plans. Therefore, the clinical utility of early detecting these conditions is of substantial importance in order to avoid hospitalization and lessen the socio-economic costs of caring, while it may also significantly improve elderly people's quality of life. This work deals with a critical performance analysis of an Internet of Things aware Ambient Assisted Living (AAL) system for elderly monitoring. The analysis is focused on three main system components: (i) the City-wide data capturing layer, (ii) the Cloud-based centralized data management repository, and (iii) the risk analysis and prediction module. Each module can provide different operating modes, therefore the critical analysis aims at defining which are the best solutions according to context's needs. |

| 2 | Elderly Perception on the Internet of Things-Based Integrated Smart-Home System | Tae Hee Jo , Jae Hoon Ma and Seung Hyun Cha | 11 February 2021 | An integrated smart home system (ISHS) is an effective way to improve the quality of life of the elderly. The elderly's willingness is essential to adopt an ISHS; to the best of our knowledge, no study has investigated the elderly's perception of ISHS. Consequently, this study aims to investigate the elderly's perception of the ISHS by comprehensively evaluating its possible benefits and negative responses. A set of sensors required for an ISHS was determined, and interviews were designed based on four factors: perceived comfort, perceived usability, perceived privacy, and perceived benefit. Subsequently, technological trials of the sensor-set followed by two focus group interviews were conducted on nine independently living elderly participants at a senior welfare center in South Korea. Consistent with previous studies, the results of this investigation indicate that elderly participants elicited negative responses regarding usability complexity, and discomfort to daily activities. Despite such negative responses, after acquiring enough awareness about the ISHS's benefits, the elderly acknowledged its necessity and showed a high level of willingness. |

3	IoT Based Pill Reminder and Monitoring System	Sultan Ahmad ,Mahamudul Hasan , Gouse Pasha Mohammed , Mohammad Shahabuddin , Tasnia Tabassum and Mustafa Wasif Allvi	July 2020	There are many people around us who are the victims of chronic disease. Most of them suffering from dementia. Some people overlook to take care of health. Because of the lack of an expert system, people are forced to submit in frequent health related problems. By analyzing the data, an internet of things (IoT) based reminder system has been developed. It is designed to assist the patient who forgets to take medicine. The proposed system consists of an IoT enabled device and an android application. It mainly focuses on dementia patient. But it is beneficial for all. Patients will no longer have to worry about daily medication. The application will send a notification when it's time to take medicine. The mobile application is used for keeping the record in medicine details and reminding the schedule of medicine. We have used the IoT enabled Arduino device for monitoring the whole system. The device can sense whether a patient has taken medicine or not with the help of the infrared (IR) sensor. We have tried to develop a system which will help patients to manage their health care properly.
4	HABITAT: An IoT Solution for Independent Elderly	Elena Borelli, Giacomo Paolini, Francesco Antoniazzi, Marina Barbiroli , Francesca Benassi and Federico Chesani	12 March 2019	In this work, a flexible and extensive digital platform for Smart Homes is presented, exploiting the most advanced technologies of the Internet of Things, such as Radio Frequency Identification, wearable electronics, Wireless Sensor Networks, and Artificial Intelligence. Thus, the main novelty of the paper is the system-level description of the platform flexibility allowing the interoperability of different smart devices. This research was developed within the framework of the operative project HABITAT (Home Assistance Based on the Internet of Things for the Autonomy of Everybody), aiming at developing smart devices to support elderly people both in their own houses and in retirement homes, and embedding them in everyday life objects, thus reducing the expenses for healthcare due to the lower need for personal assistance, and providing a better life quality to the elderly users.

5	A Survey on the Internet of Things Solutions for the Elderly and Disabled: Applications, Prospects, and Challenges	Resul Das and	18 May 2017	Advances in technology has not only led to the start of innovative solutions and new business opportunities in different sectors but also reduced manpower needs and operational costs. Furthermore, the quality of provided services has been improved. Therefore, recently, the Internet of Things (IoT) has gained a great momentum as a key enabling technology for a wide range of health care applications, especially for the elderly and disabled. Although, solutions based on IoT technology have started to support the elderly and disabled in many areas of their life and work and the IoT helps improve quality of life for the elderly and disabled, the amount of data collected by the IoT has increased tremendously and surpassed the expectations. This makes it necessary to investigate approaches and solutions in order to efficiently utilise large amounts of data, especially in health care applications. In this paper, we are first going to review existing approaches and IoT solutions specifically proposed and designed for the elderly and disabled. Then, we are going to investigate prospects and research challenges in the use of the IoT in the services designed for elderly people and people with disabilities to provide an insight into future research opportunities.

2.1 Existing problem

By analyzing the data, an internet of things (IoT) based reminder system has been developed. It is designed to assist the patient who forgets to take medicine.

2.2 References

- ➤ https://www.ibm.com/blogs/cloud-computing/2018/10/30/karantis360-elder-care-ibm-cloud/
- ➤ https://coolblindtech.com/introducing-ibm-mera-ibms-multi-purpose-eldercare-robot-assistant/

2.3 Problem Statement Definition

Some people find it difficult to learn new apps in this ever-expanding digital environment, and people nowadays tend to forget things more easily, such as taking their prescriptions. People need a way to remember to take their prescriptions without having to learn how to use sophisticated programs.
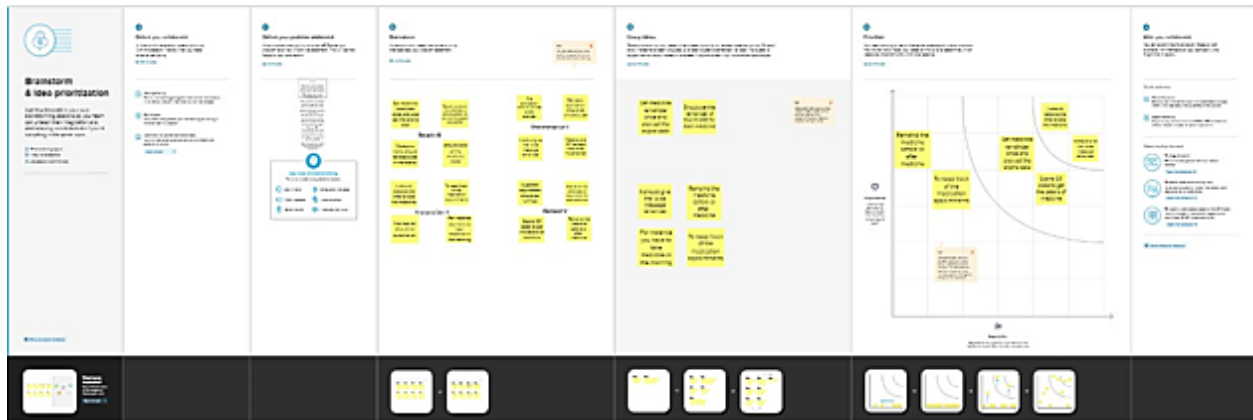
3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas

Personal Assistance for Seniors Who are Self Reliant-Empathy Map

SAYS

That was good idea!	I really like that feature
Easy to reminder my work	How to interact with it?

THINK

Whether I become dependent?	I need to pay for this?
Whether it will be help for all my works?	Whether all the time it will be available?

DOES

More Research	List pros/cons
Check the reviews	Ask friends and family for opinions

FEELS

Feeling Insecure	Excited
Reduce loneliness thoughts	Overwhelmed

3.2 Ideation & Brainstormin

3.3 Proposed Solution

   The proposed system consists of an IoT enabled device and an android application. It mainly focuses on dementia patient.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Today, most people can expect to live into their seventies and beyond. In modern society, busy life has made people forget many things in day to day life. The older adults and the people victims of chronicle disease who need to take the medicines timely without missing dementia, forgetting things in their daily routine. This application is used to remind tablets on time.
2.	Idea / Solution description	It is created in such a way that older or normal people can use it easily for their prescription reminders.
.	Novelty / Uniqueness	It is a user friendly app that sends users medication and alert reminders, it help caretakers to manage prescription for their loved ones.
4.	Social Impact / Customer Satisfaction	Promotes safe independent living, leading to happier and healthier cared-for individuals.

5.	Business Model (Revenue Model)	Sell it as subscription service. The model you will select will depend on your target market, business objectives, and the resources you already have available.
6.	Scalability of the Solution	Since the IOT technology is in improving stage, emerging new technology can be easily implemented in this project. This technology provides communication between care taker, doctor and family members.

3.4 Problem Solution fit

4. REQUIREMENT ANALYSIS
4.1 Functional requirement

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Mobile number Registration through Gmail Registration throughGmail
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP

FR-3	Personal Information	Gathering patient's bio data and medicine history
FR-4	Scheduling	Doctor medicine prescription Doctor's appointment. Suggestion of food plan by nutritionist.

FR-5	Reminding the medicine timings	Alert the person to take medicine with the correct dosage and medicine name. Remind the doctor's appointment. Remind everyday's diet plan.
FR-6	Emergency alarm	Doctor and caretaker gets the alarm when the person's health is abnormal, which is indicated by heart rate fluctuations or if any fall is detected. Caretaker gets the alarm for the person's missed medicine.

4.2 Non-Functional requirements

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Caretaker/doctor can easily schedule medicine timings through his/her dashboard.The person can acknowledge the medicine intake using a simple UI.

NFR-2	**Security**	The person's information is secured by providing access permission only to the

		corresponding registered caretaker and doctor.
NFR-3	**Reliability**	The application is reliable because of authentication of users and providing database updates regularly.
NFR-4	**Performance**	The application uses virtual sensors, so the performance will be high. The modularization helps in improving the performance of the application.
NFR-5	**Availability**	The services provided are available to the registered users.

NFR-6	**Scalability**	As we are using IBM cloud, our application supports many users at the same time.Hence, it is scalable.

5. PROJECT DESIGN
5.1 Data Flow Diagrams

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

Data Flow Diagram
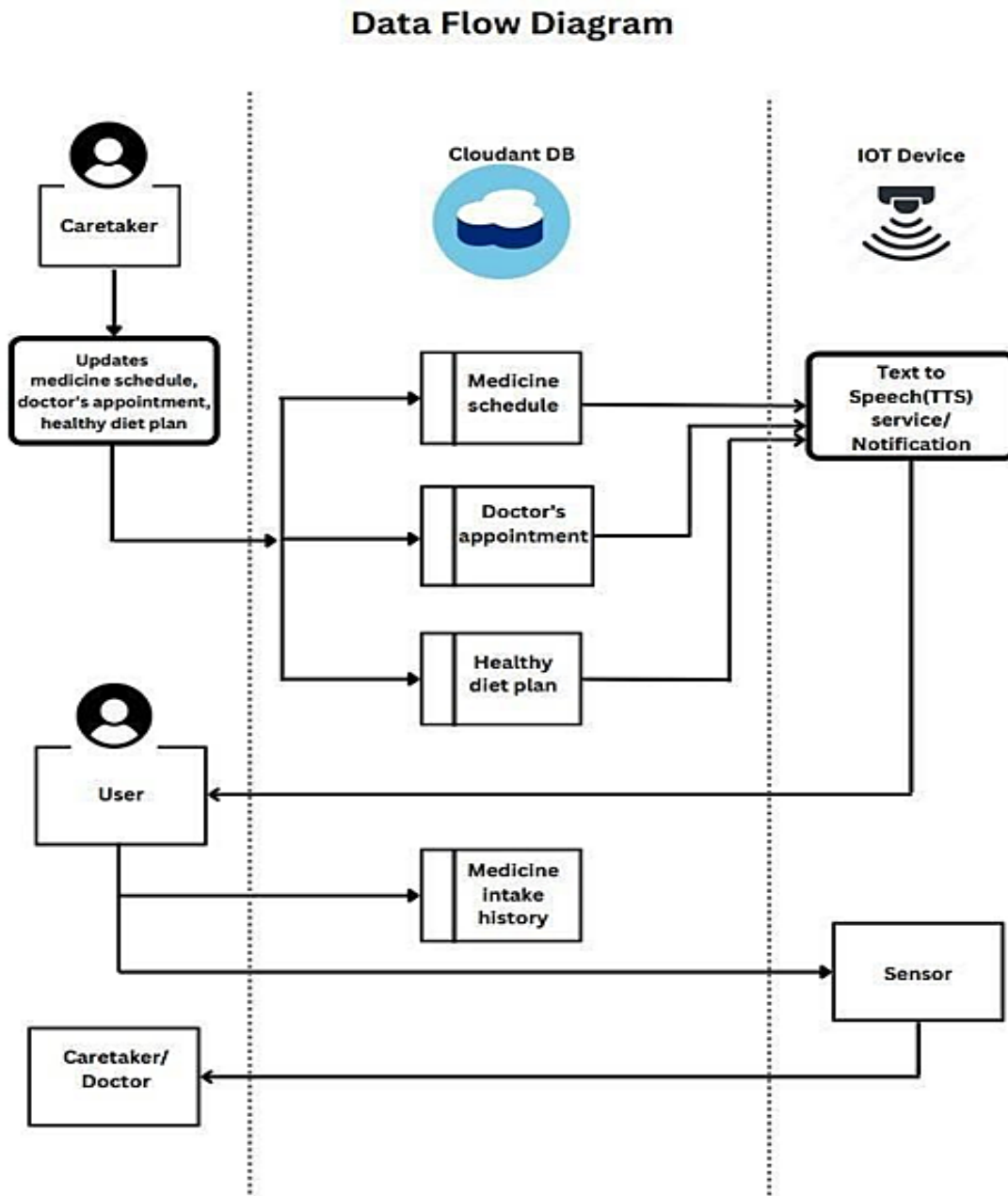
5.2 Solution & Technical Architecture

          Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

❖ Medicine Remainders serve as good way to stay on track and uphold appropriate schedule.

❖ It is used to organize your medication doses for a certain length of time.

❖ It helps in decreasing medication dispensing errors and wrong dosages.

❖ Provide specifications according to which the solution is defined, managed, and delivered.

Solution Architecture Diagram
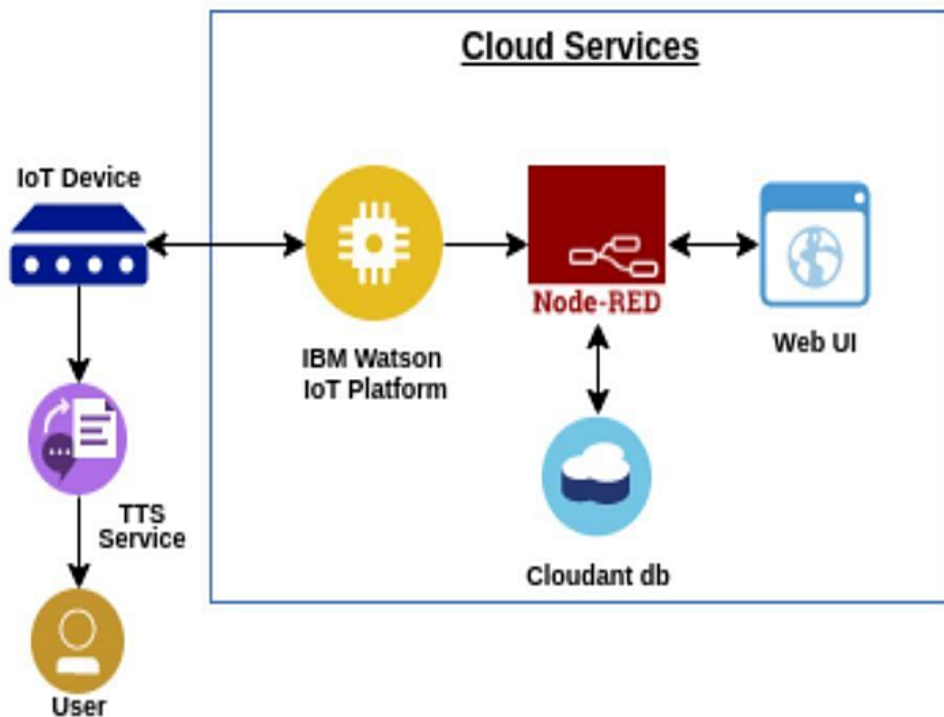
5.3 User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Caretaker)	Registration	USN-1	As a user, I can register for the application by entering my email, 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 & password		High	Sprint-1
	Dashboard	USN-5	As a user, I can set medicine schedules..		High	Sprint-1

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		USN-6	As a user, I can update doctor's appointments.		High	Sprint-3
		USN-7	As a user, I will receive emergency notification if a senior citizen's health is abnormal.	I can contact the senior citizen directly.	High	Sprint-3
		USN-8	As a user, I can view medicine intake history.		Medium	Sprint-2
Customer(Senior citizens)	Dashboard	USN-9	As a user, I will receive medicine reminder notification at the scheduled time.	I can click confirm.	High	Sprint-2

		USN-10	As a user, I can view medicine intake history		Medium	Sprint-2
Customer(Doctor)	Dashboard	USN-11	I can suggest a diet plan.		Medium	Sprint-3

6. PROJECT PLANNING & SCHEDULING
6.1 Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, and password, and confirming my password.	3	High	saranya

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Confirmation Email	USN-2	As a user, I will receive a confirmation email once I have registered for the application	4	High	Jayaram
Sprint-1	Authentication	USN-3	As a user, I can register for the application through Gmail and mobile app.	4	Medium	Yuva sree
Sprint-1	Login	USN-4	As a user, I can log into the application by entering email & password	3	High	Magesh Kannan
Sprint-1	Dashboard	USN-5	As a user, I need to be able to view the functions that I can perform	4	High	Saranya Jayaram

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Sprint-2	Notification	USN-1	As a user, I should be able to notify my parent and guardian in emergency situations	10	High	Yuva sree Magesh kannan
Sprint-2	Store data	USN-2	As a user, I need to continuously store my location data into the database.	10	Medium	Jayaram
Sprint-3	Communication	USN-3,1	I should be able to communicate with user	6	Low	Magesh kannan
Sprint-3	IoT Device – Watson communication	USN-1,4	The data from IoT device should reach IBM Cloud	7	Medium	saranya
Sprint-3	Node RED-Cloudant DB communication	USN-5,2	The data stored in IBM Cloud should be properly integrated with Cloudant DB	7	High	Jayaram
Sprint-4	User – WebUI interface	USN-1,4	The Web UI should get inputs from the user	6	High	Jayaram Magesh kannann
Sprint-4	Alarm	USN-2,3,5	The Alarm of the remainder should be done based on the medication time	7	High	Yuva sree Saranya

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	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

6.3 Reports from JIRA

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

7.1 Feature 1

Node-Red

It is built on Node. js, which is a none-blocking, lightweight I/O model, making it lightweight and efficient. Flows created in Node-RED are stored using JSON, and can imported and exported and shared with ease
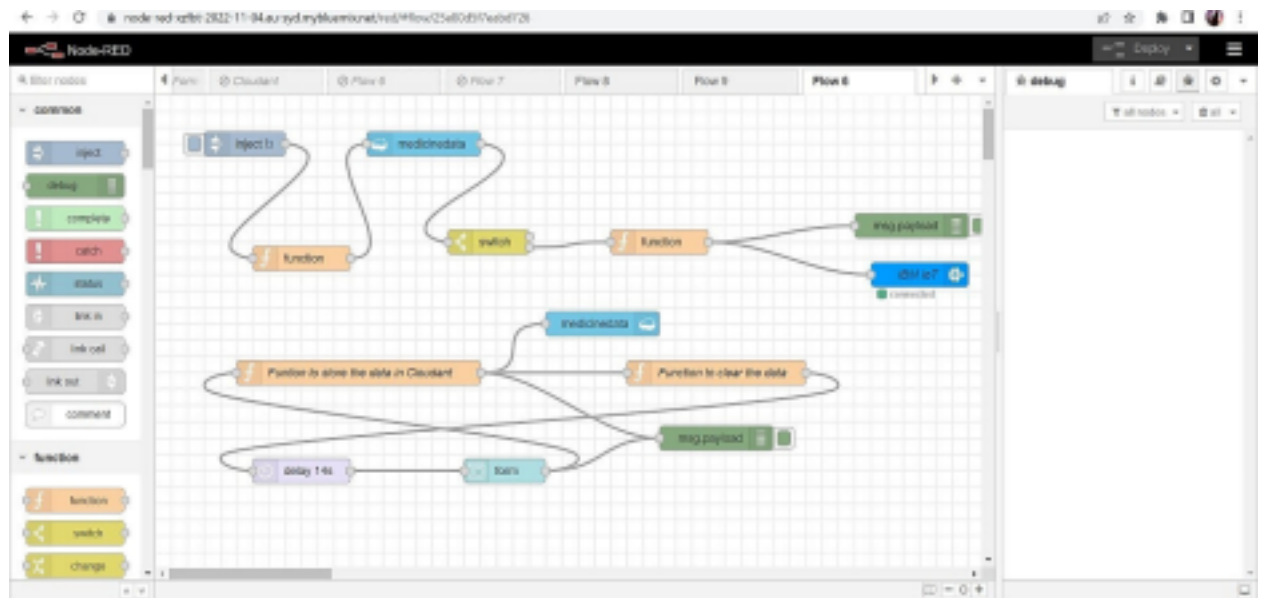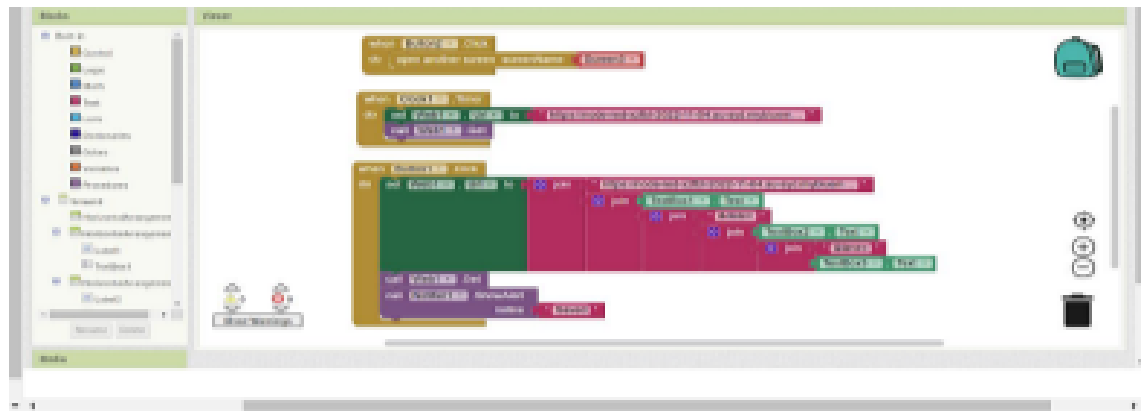

7.2 Feature 2

MIT App inventor

MIT App Inventor is an online platform designed to teach computational thinking concepts through development of mobile applications. Students create applications by dragging and dropping components into a design view and using a visual blocks language to program application behavior

7.3 Database Schema (if applicable)

8. TESTING
8.2 User Acceptance Testing

1.**Purpose of Document**

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

2.**Defect Analysis**

This reportshows the numberof 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	10	4	2	3	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37

3.**Test Case Analysis**

This report showsthe number of test casesthat have passed,failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	2	0	0	2
Client Application	2	0	0	2
Security	1	0	0	1

9. RESULTS
9.1 Performance Metrics

NFT - Risk Assessment								
S.No	Project Name	Scope/feature	Functional Changes	Hardware Changes	Software Changes	Impact of Downtime	Load/Voluem Changes	Risk Score	Justification
	Personal Assistance	New	Low	Moderate	Moderate	Low	<10 to 30%	GREEN	As we had made this project in
	for Seniors Who Are								MERN stack With Industry Mentor Aproval
	Self-Reliant								

NFT - Detailed Test Plan				
S.No	Project Overview	NFT Test approach	Assumptions/Dependencies/Risks	Approvals/SignOff
1	Medicine Reminder Web-UI	Stress	App Crash/Developer team/ Site Down	Approved
1	Medicine Reminder Web-UI	Load	Server Crash/Developer team/ Server Down	Approved

End Of Test Report								
S.No	Project Overview	NFT Test approach	NFR - Met	Test Outcome	GO/NO-GO decision	Recommendations	Identified Defects (Detected/Closed/Open)	Approvals/SignOff
1	Medicine Reminder Web-UI	Stress	Performance	CPU-01	GO	High Performance/Netlify Cloud server	Closed	Approved
2	Medicine Reminder Web-UI	Load	Scalability	DB Storage - 01	NO-GO	Use MongoDB instance for free	Closed	Approved

10. ADVANTAGES & DISADVANTAGES

Advantages:

➤ Patients will no longer have to worry about daily medication.The application will send a notification when it's time to take medicine. The mobile application is used for keeping the record in medicine details and reminding the schedule of medicine.

Disadvantages:

➤ Security and privacy remain a major concern deterring users from using IoT technology for medical purposes, as healthcare monitoring solutions have the potential to be breached or hacked.

11. CONCLUSION

➤ This application prevents wrong dosage of the patient and also safe to the patient. It will reduce the effort of patient as well as the caretaker of the patient in remembering medicine and patient will get alert of medication along with medicine name at appropriate time.

12. FUTURE SCOPE

➤ IoT has a lot of potentials and it's not only in healthcare. In future challenges of IoT in healthcare, many companies are working on new ways to solve the challenges with the help of this technology to help our medical world.

➤ It can reach every patient from all over the world and connect doctors with patients.There is no denying that IoT has already made a huge impact and is only set to grow further.

➤ It is a matter of time before the future use of IoT in healthcare medical industry will be run mostly by IoT technology and will be treating patients in less time and low cost of treatment.

13. APPENDIX Source Code GitHub & Project Demo Link

source code

```
#include <WiFi.h>//library for wifi
#include <PubSubClient.h>//library for MQtt
#include <LiquidCrystal_I2C.h>
#include "DHT.h"// Library for dht11
#define DHTPIN 15 // what pin we're connected to
#define DHTTYPE DHT11 // define type of sensor DHT 11
#define LED 2
DHT dht (DHTPIN, DHTTYPE);// creating the instance by passing pin and typr of
dht connected
void callback(char* subscribetopic, byte* payload, unsigned int payloadLength);
//-------credentials of IBM Accounts------
#define ORG "94a9ri"//IBM ORGANITION ID
#define DEVICE_TYPE "sample"//Device type mentioned in ibm
watson IOT Platform
#define DEVICE_ID "1901"//Device ID mentioned in ibm watson IOT
Platform
#define TOKEN "19012002" //Token
String data3="";
int buzz= 13;
//------- Customise the above values -------
char server[] = ORG ".messaging.internetofthings.ibmcloud.com";// Server Name
char publishTopic[] = "iot-2/evt/Data/fmt/json";// topic name and type of event
perform and format in which data to be send
char subscribetopic[] = "iot-2/cmd/command/fmt/String";// cmd REPRESENT
command type AND COMMAND IS TEST OF FORMAT STRING
```

```
char authMethod[] = "use-token-auth";// authentication method
char token[] = TOKEN;
char clientId[] = "d:" ORG ":" DEVICE_TYPE ":" DEVICE_ID;//client id
LiquidCrystal_I2C lcd(0x27,32,2);
//---------------------------------------
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 = 13; i < payloadLength-2; i++) {
//Serial.print((char)payload[i]);
data3 += (char)payload[i];
}
Serial.println("Medicine Name: "+ data3);
if(data3 != "")
{
lcd.init();
lcd.print(data3);
digitalWrite(LED,HIGH);
tone(buzz, 100, 1000);
delay(2000);
digitalWrite(LED,LOW);
noTone(buzz);
```

```
delay(1000);
}
else
{
digitalWrite(LED,LOW);
}
data3="";
}
```

github link: https://github.com/IBM-EPBL/IBM-Project-26887-1660039225