

**Personal Assistance for Seniors who are self
reliant using IOT**

IBM Project

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INDEX

1. INTRODUCTION

1. Project Overview
2. Purpose

2. LITERATURE SURVEY

1. Existing problem
2. References
3. Problem Statement Definition

3. IDEATION & PROPOSED SOLUTION

1. Empathy Map Canvas
2. Ideation & Brainstorming
3. Proposed Solution
4. Problem Solution fit

4. REQUIREMENT ANALYSIS

1. Functional requirement
2. Non-Functional requirements

5. PROJECT DESIGN

1. Data Flow Diagrams
2. Solution & Technical Architecture
3. User Stories

6. PROJECT PLANNING & SCHEDULING

1. Sprint Planning & Estimation
2. Sprint Delivery Schedule
3. Reports from JIRA

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

1. Feature 1
2. Feature 2
3. Database Schema (if Applicable)

8. TESTING

1. Test Cases
2. User Acceptance Testing

9. **RESULTS**

1. Performance Metrics

10. **ADVANTAGES & DISADVANTAGES**

11. **CONCLUSION**

12. **FUTURE SCOPE**

13. **APPENDIX**

Source Code

GitHub & Project Demo Link

1.INTRODUCTION:

Sometimes patients forget to take the medicine at the required time of medicines. • Also forgets which medicine He/ She have to take at required time. • To overcome this, we have tried to design the MEDICINE REMINDER • We are using Arduino to interface the LCD module, buzzer, Real time clock (RTC) 2

Almost half of all people who live in nursing homes are 85 years or older. Relatively few residents are younger than 65 years of age.

1.1.Project overview:

1.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.

2.If the medicine time arrives the web application will send the medicine name to the IOT Device through the IBM IOT Platform.

3.The device will receive the medicine name and notify the user with voice commands.

1.2.Purpose:

1.Sometimes elderly people forget to take their medicine at the correct time.

2.The difficult for doctors/caretakers to monitor the patients around the clock. To avoid this problem,this medicine remainder system is developed.

3. They also forget which medicine He/She should take at that particular time

2.LITERATURE SURVEY

A literature review is a comprehensive summary of previous research on a topic. The literature review surveys scholarly articles, books, and other sources relevant to a particular area of research. The review should enumerate, describe, summarize, objectively evaluate and clarify this previous research.

2.1 Existing problem:

Elderly people let slip the medicagtions at the correct time and the existing solutions for this problem is setting remainders or using pill boxes,calenders,Personal Assistance. Though the solutions give remainder,the voice commands or assistance given by this system is more efficient.

2.2 References:

1.Sawand , S.Djahel, Z.Zhang, and F.Na. Multidisciplinary Approaches to Achieving Efficient and Trustworthy eHealth Monitoring Systems. Commun China(ICCC),2014 IEEE/CIC Int.Conf., pp.187-192; 2014.

2.D.a.Clifton,D.Wong, L. Clifton,S.Wilson,R.Way, R.Pullingar, and L.Tarassenko. a large scale clinical validation of an integrated monitoring system in the Emergency Department.

3.M. Parida, H.C Yang, S.W. Jheng, and C.J Kuo.Application of RFID Technology for In-House Drug Management System.15th Int. Conf. Network-Based Inf.Syst., pp.577581;2012.

4.L. IKKo and J.Karppinen.UbiPILL A Medicine Dose controller of Ubiquitous Home Environment. 2009 Third Int. Conf. Mob. Ubiquitous Comput. syst. Serv. Technol., pp.329-2009.

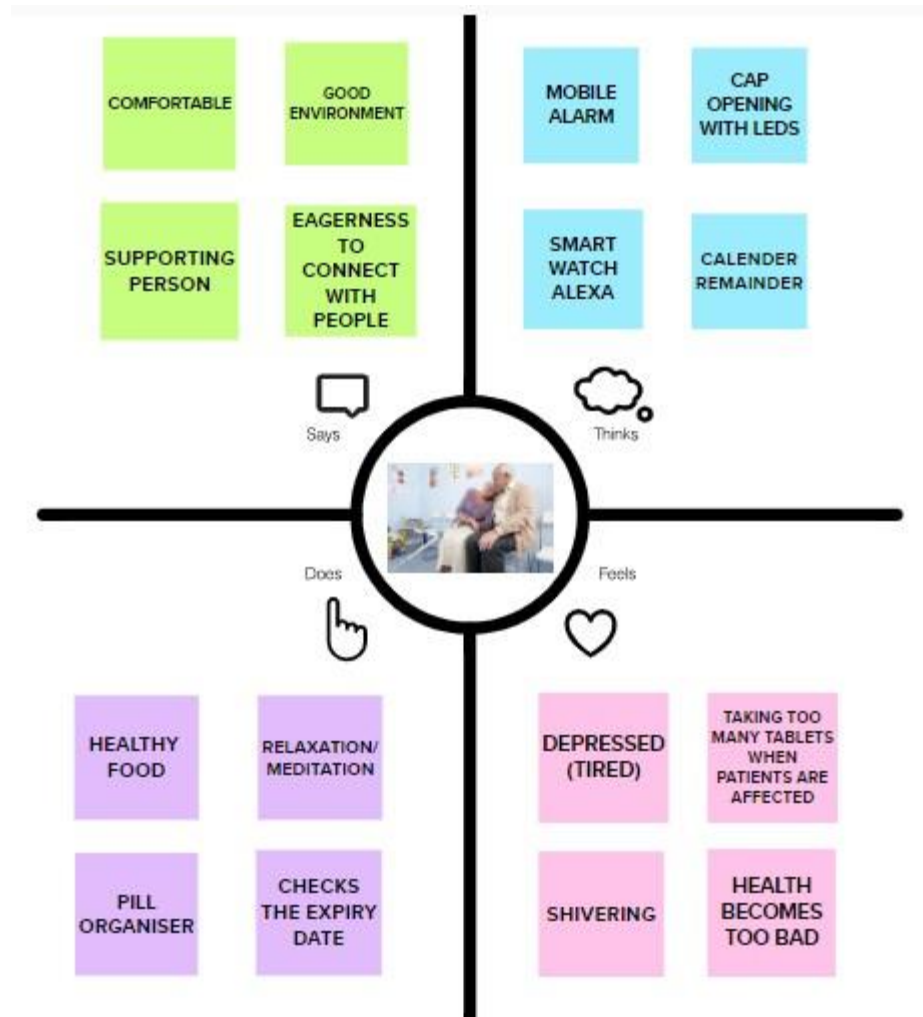
2.3 Problem Statement Definition

Skipping medicines can be serious for some medical health conditions; Sometimes elderly people forget to take their medicine at the correct time. they also forget which medicine one should take at that particular time. and it is difficult for doctors/caretakers to monitor the patients around the clock.

3.IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas:

An empathy map is a collaborative tool teams can use to gain a deeper insight into their customers. Much like a user persona, an empathy map can represent a group of users, such as a customer segment. The empathy map was originally created by Dave Gray and has gained much popularity within the agile community.



3.2 Ideation & Brainstorming:

Brainstorming is a group problem-solving method that involves the spontaneous contribution of creative ideas and solutions. This technique requires intensive, freewheeling discussion in which every member of the group is encouraged to think aloud and suggest as many ideas as possible based on their diverse knowledge



3.3 Proposed Solution:

The proposed solution is to maintain the robot's position inside, but close, to the boundary of the target's field of view. My proposed solution is to refuse these oppositions altogether. Their proposed solution is the use of complex objects, comprising several components, to express structure and relationships.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	senior people forget to take their medicine at the correct time. Sometimes they also forget which medicine he/she should take at that particular time and it is difficult for doctors/caretakers to monitor the patients around the clock.
2.	Idea / Solution description	To avoid this problem, a medicine reminder system is developed. An app is built for the user (caretaker) which enables him/her to set the desired time and medicine. If the medicine time arrives the web application will send the medicine name to the IoT Device. The device will receive the medicine name and notify the user with voice commands.
3.	Novelty / Uniqueness	Digital Voice assistant technology, Time Accuracy.
4.	Social Impact / Customer Satisfaction	All the Seniors will be benefitted, their health status will be improved and maintained.
5.	Business Model (Revenue Model)	Market the developed technology and earn to the profit
6.	Scalability of the Solution	Support future increases in throughput (number of users) Maintains best possible user experiences

3.4 Problem Solution fit:

Problem-Solution canvas is a tool for entrepreneurs, marketers and corporate innovators, which helps them identify solutions with higher chances for solution adoption, reduce time spent on solution testing and get a better overview of current situation.

Define CS, fit into CC	1. CUSTOMER SEGMENT(S) CS Customer is 75 years old who is suffering with Heart disease who doesn't have a care taker to give prescribed medicine on time	6. CUSTOMER CONSTRAINTS CC The customer is unaware of the prescription due to lack of knowledge to read a particular prescription. He/She is forgetting to take medicine on time before and after food because no care taker to remind, sometimes they also forget which medicine to take and it is difficult for doctors/caretakers to monitor the patients around the clock.	5. AVAILABLE SOLUTIONS AS To avoid this problem, a medicine reminder system is developed. An app is build for the user (care taker) which enables him/her to set the desired time and medicine. If the medicine time arrives the web application will send the medicine name to the IOT device. The device will receive the medicine name and notify the user with voice commands.	Explore AS, differentiate
	2. JOBS-TO-BE-DONE / PROBLEMS J&P By using Digital voice assistant technology the person will be notified to take medicine in a right time, wearing a trendy reminder device like wristwatch, using a pill sorting service with alarms	9. PROBLEM ROOT CAUSE RC The seniors don't have care taker to guide them to take medicine according to the prescription because care taker lead their own life with their busy schedules so there is need of additional source.	7. BEHAVIOUR BE The seniors directly seek for help to allot a person or any other devices which is based on reminding the seniors about the medicines which should be taken and monitor around the clock.	
Focus on J&P, tap into BE	3. TRIGGERS TR Due to physical impediments, poor eyesight or hearing impairments seniors may not be able to take their medications. Seniors with learning disabilities may also find it difficult to take their medicines correctly. They may require care giving assistance to manage their medicine	10. YOUR SOLUTION SL A medicine reminder system is developed it serve as a good way to stay on track and uphold an appropriate schedule. An app is build for the user which enables him/her to set the desired time and medicine name to the IOT device. The device will receive the medicine name and notify the user with voice commands.	8. CHANNELS of BEHAVIOUR CH a1 ONLINE Through google assistance it reminds everyday if once fixed, smart pill organizer and via mobile apps the seniors could be notified. a2 OFFLINE By setting alarm at the right time and with the help of caretaker who always stays with the patient to take care	Focus on J&P, tap into BE
	4. EMOTIONS: BEFORE / AFTER EM The seniors feel self-neglected, Insecure, frustrated, and they may be fearful about the health issues.			

4.REQUIREMENT ANALYSIS:

The first phase in system engineering is requirements analysis. This is an iterative process, and continues as more specific requirements become clear. **4.1. Functional Requirements:**

Functional requirements may involve calculations, technical details, data manipulation and processing, and other specific functionality that define what a system is supposed to accomplish. Behavioral requirements describe all the cases where the system uses the functional requirements, these are captured in use cases.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Enabling user to make registration for the IOT device/application through Gmail
FR-2	User Confirmation	After registration process is done, the user will get confirmation via Email and receive a confirmation via OTP.
FR-3	User Need	User forget to take their medicine at the correct time. Sometimes they also forget which medicine he/she should take at that particular time and it is difficult for doctors/caretakers to monitor the patients around the clock
FR-4	Implementation process	When the medicine time arrives the web application will send the medicine name to the IoT Device. The device will receive the medicine name and notify the user with voice commands.

4.2. Non-functional Requirements:

Nonfunctional Requirements (NFRs) define system attributes such as security, reliability, performance, maintainability, scalability, and usability. They serve as constraints or restrictions on the design of the system across the different backlogs

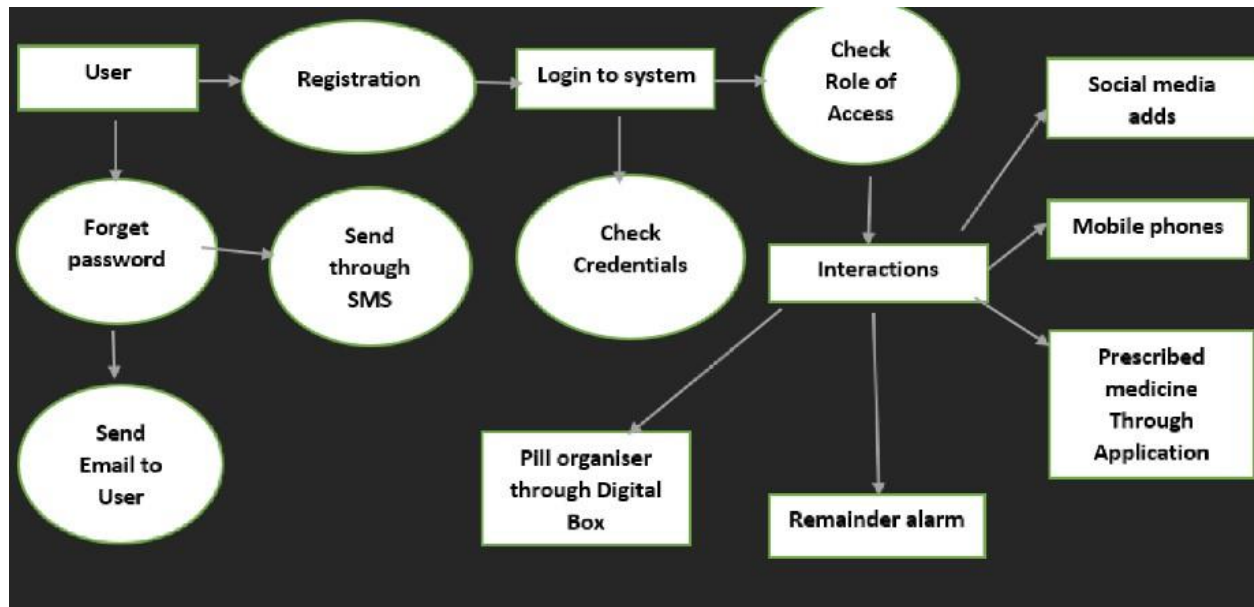
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The device is user friendly and users will be notified to take the prescribed medicine at the right time.
NFR-2	Security	All the important data will be kept safe which is stored to remind the patient , in case of crash appears the device should be able to backup and recover the data.
NFR-3	Reliability	The device will be quality of being trustworthy and performing consistently well in giving all functionalities.
NFR-4	Performance	Performance of the device depends on the response time and speed of the data to be transferred. The device is faster and direct which depends on the efficiency of implemented algorithm.
NFR-5	Availability	The device will be available for 24x7 for users without any interruption.
NFR-6	Scalability	Support future increases in throughput (number of users) Maintains best possible user experiences.

5.PROJECT DESIGN

Project design is an early phase of the project lifecycle where ideas, processes, resources, and deliverables are planned out. A project design comes before a project plan as it's a broad overview whereas a project plan includes more detailed

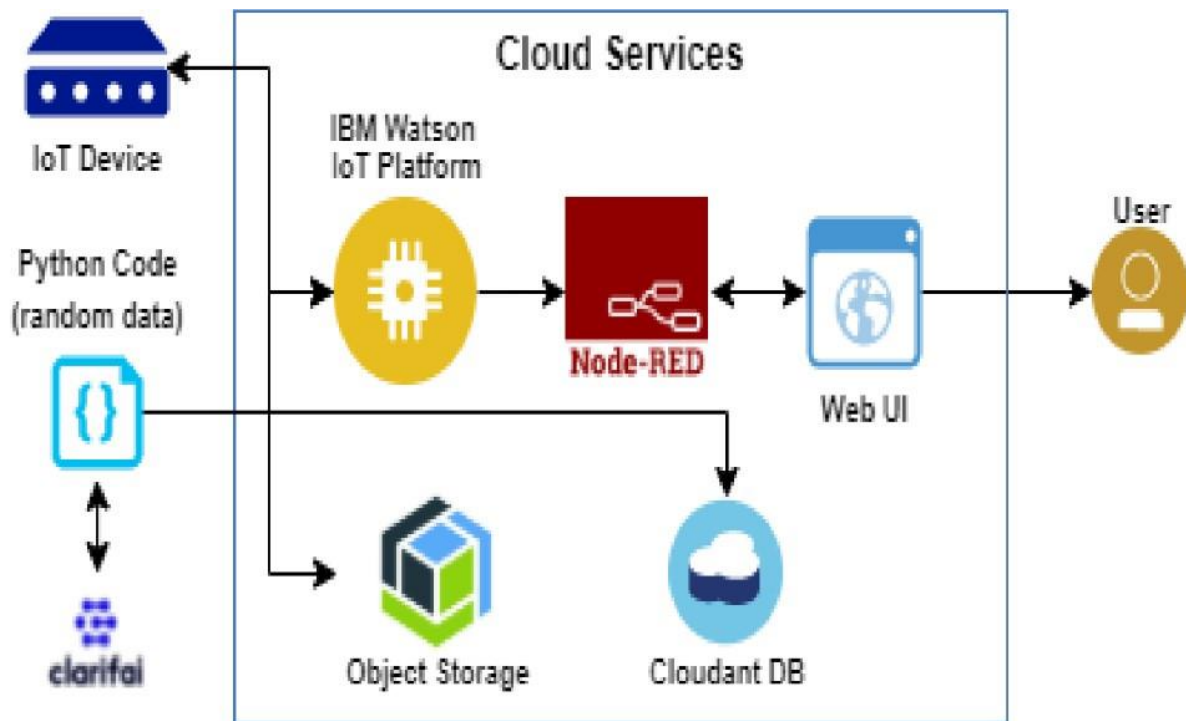
5.1. Data Flow Diagrams :

data flow diagram (DFD) is a graphical or visual representation using a standardized set of symbols and notations to describe a business's operations through data movement. They are often elements of a formal methodology such as Structured Systems Analysis and Design Method (SSADM).



5.2 Solution & Technical Architecture

An architectural diagram is a visual representation that maps out the physical implementation for components of a software system. It shows the general structure of the software system and the associations, limitations, and boundaries between each element. Software environments are complex—and they aren't static.



5.3 User stories:

user story is an informal, general explanation of a software feature written from the perspective of the end user or customer. The purpose of a user story is to articulate how a piece of work will deliver a particular value back to the customer.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile number)	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
	Authentication	USN-2	As a user, I will receive confirmation email once I have	I can receive confirmation email & click confirm	High	Sprint-1

	Registration	USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook login	Low	Sprint-2
	Registration	USN-4	As a user, I can register for the application through Gmail	I can register & access the dashboard with Gmail login	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	I can log in to the application	High	Sprint-1
	Dashboard	USN-6	As a user, I can access the dashboard (story,reports) by logging in	I can access my dashboard	High	Sprint-1
Customer(Web user)	Mobile phones	USN-7	As a user, I can upload everything in Mobile	I can access my Mobile phones	High	Sprint-1
			phones for remaining process			
	Prescribed	USN-8	User can prescribe the medicine through the Applications	I can access through Application	High	Sprint-1
Customer Care Executive	Pill organiser	USN-9	User can take medicine through the pill organiser in the digital Box	I can access the Digital Box	High	Sprint-1
Administrator	Administration	USN-10	Does technical support and trouble shoot	Maintain the application,support the users	High	Sprint-1

6.PROJECT PLANNING &SCHEDULING

6.1 Sprint planning & Estimation:

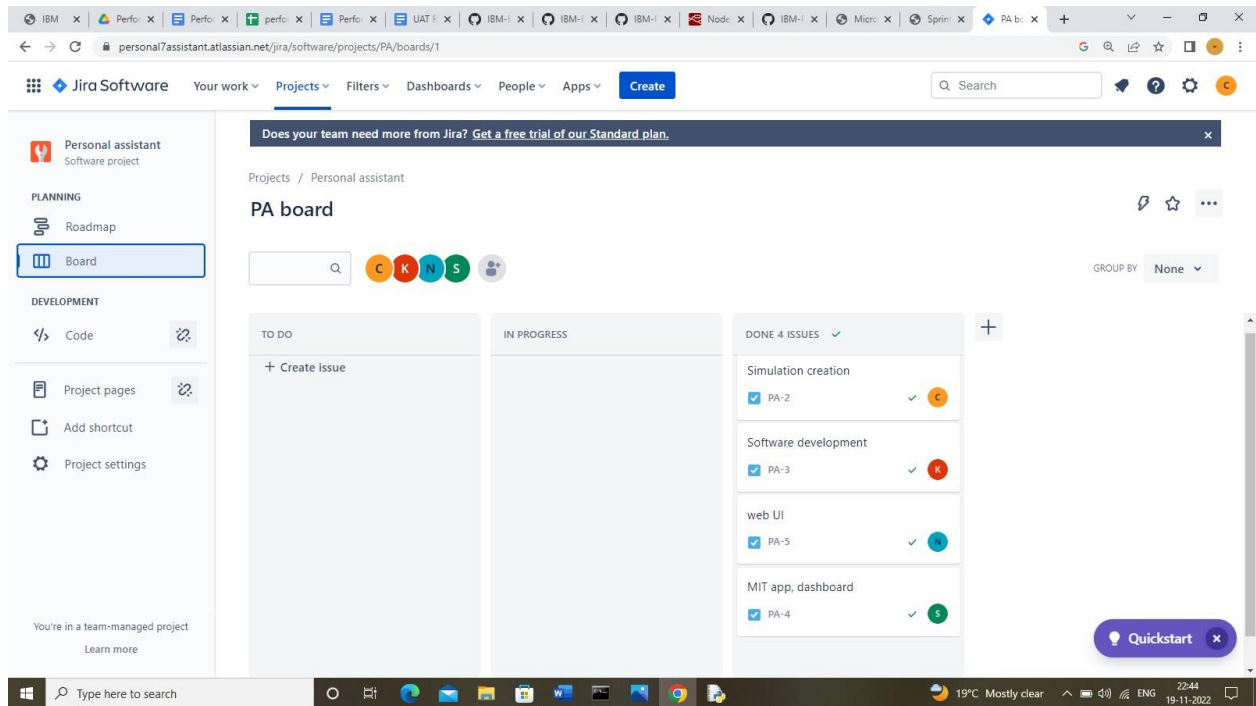
In Scrum Projects, Estimation is done by the entire team during Sprint Planning Meeting. The objective of the Estimation would be to consider the User Stories for the Sprint by Priority and by the Ability of the team to deliver during the Time Box of the Sprint.

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Cloud services	USN-1	Create and configure the IBM Cloud services which are being used in this project.	7	High	C Chithra, S Janani, D Komala, M Nandhini.
Sprint-1		USN-2	To connect the IOT devices to IBM cloud, create IBM Watson IoT platform which acts as the mediator to connect the web application to IoT devices.	6	Medium	C Chithra, S Janani, D Komala, M Nandhini.
Sprint-2	Node-Red Service	USN-3	Create a Node-RED service.	6	High	C Chithra, S Janani, D Komala, M Nandhini.
Sprint-2		USN-4	Configuring the connection security and create API keys that are used in the Node-RED service for accessing the IBM IoT Platform.	8	High	C Chithra, S Janani, D Komala, M Nandhini.
Sprint-3	MIT App Inventor	USN-5	Develop an Application that reminds elders to take their medicines.	5	Medium	C Chithra, S Janani, D Komala.
Sprint-3		USN-6	After developing an application upload the data's to the device that reminds them to take their medicine on time as scheduled.	7	High	C Chithra, S Janani, D Komala, M Nandhini.
Sprint-4	Web UI	USN-7	Create Web UI using Node- Red and Configure the Node-RED flow to receive data from the IBM IoT platform and also use Cloudant DB nodes to store the received sensor data in the cloudant DB	6	Medium	C Chithra, S Janani, D Komala, M Nandhini.

6.2 Sprint Delivery schedule:

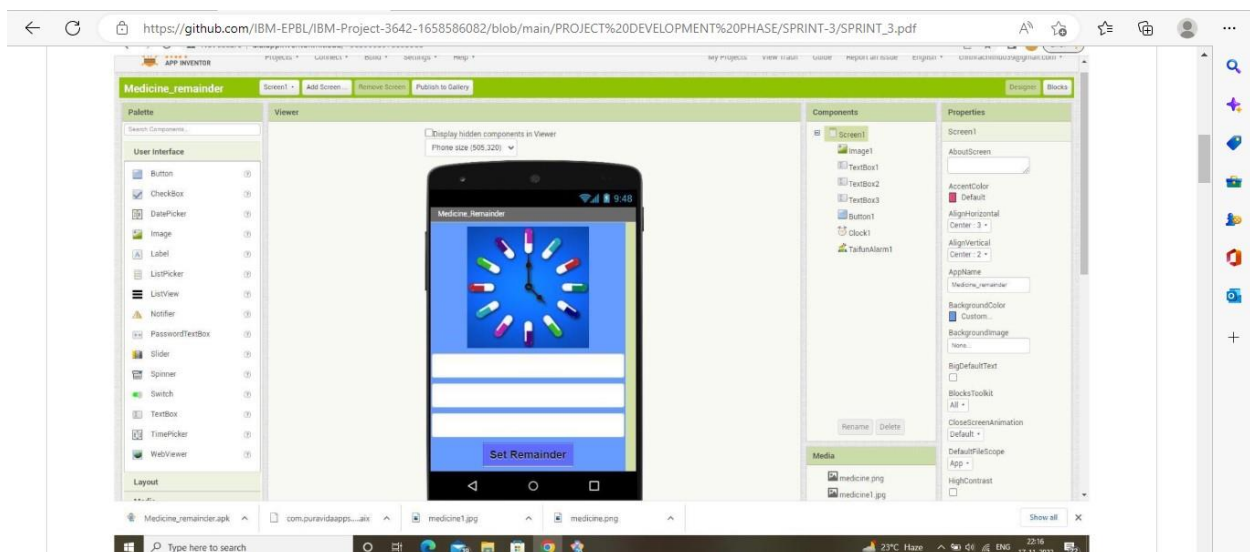
Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	06 Nov 2022	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

7.1 Feature 1



7.2 Feature 2

10:36 PM 4G 11

Medicine_Remainder



Hours

No of Times

Alert Message

Set Remainder

8.TESTING

A method of software testing that examines the functionality of an application without peering into its internal structures or workings. This method of test can be applied to virtually every level of software testing: unit, integration, system and acceptance.

8.1 Test Cases:

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

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

8.2 User Acceptance Testing:

The User Acceptance Testing (UAT) phase is likely to be the most expensive type of testing undertaken due to the number of people, timescales, and repeated cycles involved.

It is well worth optimizing UAT testing to get the best outcome and do it in the most efficient and cost-effective way.

9. RESULTS

9.1 Performannce Metrics:

S. NO	Parameter	Performance
1.	Response Time	0.2s (Average of 10 trials)
2.	Workload	500 users (Calculated based on Cloud Space)
3.	Revenue	Individual users and pharmaceutical industries.
4.	Efficiency	Simple and straightforward workflow, which makes the process efficient.
5.	Down Time	Almost no down time due to IBM Cloud enabled solution.

10. ADVANTAGES & DISADVANTAGES

Advantages:

1. Help the elderly people to take their medicine at the correct time.
2. Avoid personal assistants or caretakers needed for medically sick people.
3. Cost efficient
4. Can store multiple data and many notifications can be generated.
5. Since it includes voice assistance, even blind people can use our device.

Disadvantage

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.

Source Code:

```
import json
import wiotp.sdk.device
import time
import random

myConfig = {
    "identity": {
        "orgId": "ja4s7f",
        "typeId": "abc12",
        "deviceId": "3456"
    },
    "auth": {
        "token": "12345678"
    }
}

client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
client.connect()
for i in range(0,20):
    tablet=["crosin","Aspirin","Paracetamol","Nitrest"]
    medicinetime=[1.30,4.10,7.40,9.70,15.00,22.00,23.00]
    name = "Chandru"
    medicine=random.choice(tablet)
    medicinetime=random.choice(medicinetime)
    mydata = {'Patient Name': name, 'Medicine Name': medicine, 'Time': medicinetime}
    client.publishEvent("IoTSensor", "json", data=mydata, qos=0, onPublish=None)
    print("Data published to IBM IOT platform :", mydata)
    time.sleep(5)
client.disconnect()
```

```
Python 3.7.0 Shell
File Edit Shell Debug Options Window Help
Python 3.7.0 (v3.7.0:1bf9cc5093, Jun 27 2018, 04:59:51) [MSC v.1914 64 bit (AMD64)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
RESTART: C:/Users/Chithra/AppData/Local/Programs/Python/Python37/medical_reminder.py
2022-11-19 20:34:20,249 wiotp.sdk.device.client.DeviceClient INFO Connected successfully: d:ja4s7f:abc12:3456Data published to IBM IOT platform :
{'Patient Name': 'Chandru', 'Medicine Name': 'Paracetamol', 'Time': 7.4}
Data published to IBM IOT platform : {'Patient Name': 'Chandru', 'Medicine Name': 'crosin', 'Time': 7.4}
Data published to IBM IOT platform : {'Patient Name': 'Chandru', 'Medicine Name': 'Aspirin', 'Time': 7.4}
Data published to IBM IOT platform : {'Patient Name': 'Chandru', 'Medicine Name': 'Aspirin', 'Time': 23.0}
Data published to IBM IOT platform : {'Patient Name': 'Chandru', 'Medicine Name': 'Aspirin', 'Time': 9.7}
Data published to IBM IOT platform : {'Patient Name': 'Chandru', 'Medicine Name': 'Paracetamol', 'Time': 1.3}
Data published to IBM IOT platform : {'Patient Name': 'Chandru', 'Medicine Name': 'crosin', 'Time': 23.0}
Data published to IBM IOT platform : {'Patient Name': 'Chandru', 'Medicine Name': 'Nitrest', 'Time': 4.1}
Data published to IBM IOT platform : {'Patient Name': 'Chandru', 'Medicine Name': 'crosin', 'Time': 15.0}
Data published to IBM IOT platform : {'Patient Name': 'Chandru', 'Medicine Name': 'crosin', 'Time': 4.1}
Data published to IBM IOT platform : {'Patient Name': 'Chandru', 'Medicine Name': 'Paracetamol', 'Time': 4.1}
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Data published to IBM IOT platform : {'Patient Name': 'Chandru', 'Medicine Name': 'Nitrest', 'Time': 1.3}
Data published to IBM IOT platform : {'Patient Name': 'Chandru', 'Medicine Name': 'Nitrest', 'Time': 22.0}
Data published to IBM IOT platform : {'Patient Name': 'Chandru', 'Medicine Name': 'Nitrest', 'Time': 1.3}
Data published to IBM IOT platform : {'Patient Name': 'Chandru', 'Medicine Name': 'Nitrest', 'Time': 1.3}
2022-11-19 20:36:00,870 wiotp.sdk.device.client.DeviceClient INFO Disconnected from the IBM Watson IoT Platform
2022-11-19 20:36:00,880 wiotp.sdk.device.client.DeviceClient INFO Closed connection to the IBM Watson IoT Platform
>>>
```

Github link:[GitHub - IBM-EPBL/IBM-Project-3642-1658586082: Personal Assistance for Seniors Who Are Self-Reliant](https://github.com/IBM-EPBL/IBM-Project-3642-1658586082:PersonalAssistanceforSeniorsWhoAreSelf-Reliant)