LAMI Full-Stack APP

Project Alpha Prototype Report

Logo

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**LAMI Team**

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11/15/2022

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# Introduction

This document serves as a culmination of LAMIs work on the creation of the medication reminder app this far. It provides new and updated details on the team's plans and current state of the LAMI Project. The project will provide extensive details on the project overview, team member bios, project requirements, specifications, solution approach and testing plans. Finally, this document will provide details on the status of the LAMI alpha prototype. Here our team will share our current progress on the alpha prototype as well as describe what the alpha prototype looks like.

# I Project Introduction

The LAMI team has been tasked with the continued construction of the LAMI app for medication reminders for the residents in the LAMI residence. As stated this app will be used for the residents of the LAMI house who have mental illness and will serve as a reminder app that will help them take their medication at specified times. There will be a sign-in for both the caretakers and the residents so the residents can have safety in knowing the only people that can view their medications are the caretakers who will act as a secondary reminder ( in the case that the resident does not take their medication after being prompted by the app). The end goal of this project is to create an app that is easy and enjoyable to use, making the task of remembering to take medication as easy as possible.

# III. Background and Related Work

Previously the LAMI team in Pullman has worked previously on this app and implemented basic reminder functionality. From the progress reports of the previous team, we are able to see that they created the timer and the notification parts of the app. Even so, we see a lot of features we can add to the app to make it even better. Like improvement of the UI, addition of the reward system, and adding surveys about the medications[3]. The staff at LAMI also talked about adding the ability to reset passwords for residents through SMS, since the residents tend to be older and less technologically savvy. That being said, creating a simpler to use UI for the application would go a long way towards making the app enjoyable and helpful. Also, the staff at LAMI have stated that they will ask the residents for additional input on what they would like to see from the app. The previous team constructed the LAMI app using the Flutter framework and is hosting the application on firebase[3]. To make a meaningful contribution to this project, we will have to learn how to use the Flutter mobile application framework along with the firebase database so we can improve on what was already built. In addition to the mobile app improvements, the client wants a web application and if we learn how to use flutter we can use that coding language to program the web application. III. Project Overview One of the largest factors involved in long term successful treatment of people with schizophrenia is regular use of antipsychotic medications. Unfortunately, nonadherence to medication is also one of the most common problems that arises during treatment. When patients infrequently take their medications they are far more likely to relapse, often resulting in rehospitalization, increased remission time, and an increased chance of a suicide attempt [1]. Various methods for increasing adherence to medication have been researched and one that has been successful in studies is an application that gives reminders when it is time to take medications [2]. The goal of our project is to increase the functionalities of an already existing medication reminder application and add a means for the LAMI staff to manage the reminders of each resident of the LAMI house, track their adherence to medications, and allow them to provide feedback with regards as to how they feel about each medication. As stated previously, the basic reminder application has already been created, but currently there is no way for the staff to manage the reminders set by the residents. To solve this problem, we are going to add a staff login page to the app. Once logged in, the user will be taken to a screen where they will be able to view, add, edit, and remove any patient's medication reminders. In addition, we will build a web application that provides the LAMI staff with the same functionalities that will be added to the mobile app. One staff account will be created with the account name, email, and password being managed by the LAMI staff. Along with being able to manage the reminders of the residents, we are also going to add functionality that allows staff to track each resident’s adherence to their medications, as well as allow residents to track their own individual progress and set goals for themselves. In talks with the staff at LAMI, goal setting has been highlighted as a strong motivator for people with schizophrenia and something that the staff believes will be a success among the residents of the house. Another feature for the application we are going to implement is occasional reminders for “as needed” medications. While a lot of the medications residents are going to be using this app for are supposed to be taken on a regular schedule during waking hours, but some are taken “as needed” based on how they are feeling, or what situation they are in. To remind residents about these types of medications, we are going to add an option for a medication reminder to be “as needed”. These reminders will give a notification that asks the user if they feel like they need to take this medication right now (or if they have recently), to which they are able to respond “yes” or “no”. These medications will not count towards the users adherence statistics, but staff will be able to see when residents indicate that they have taken one of their as needed medications. The second feature that will be added to the application is a small survey that will help the staff at LAMI monitor how each resident feels about each of their medications. Every week or so, users with medication reminders will be given the opportunity to rate how they feel about each of their medications on a scale of 1-5. Staff members will be able to see an overview of each resident's responses through the mobile and web applications. As time goes on and different situations arise, the need to make modifications to prescriptions also arises. This feature of the application will be very beneficial in ensuring that the residents are taking into account how they are feeling and helps staff to respond to these changes.

# IV. Client and Stakeholder Identification and Preferences

With all projects there are stakeholders that support the creation of this application and the clients that want to use this application. In this instance, the stakeholders are the LAMI staff that need a way to manage and track medication consumption and also need to find a way to remind the residents when to take medication. Also, with the added survey the staff can see how they feel about their medication so that they can be changed or readjusted. Then the clients of this project would be the residents of the LAMI house. These people need reminders to take their medication because it can be difficult to track all the medication you have to take and it's nice to have something to remind you when you should take each specific medication. WIth the reminders helping the residents take their medication it will help keep the general atmosphere of the house up. Add a brief paragraph to the introduction and explain the purpose of this document as a summary of the project’s progress and technical details about your engineering efforts.

# Team Members - Bios and Project Roles

Jerrel Chapman is a senior computer science student interested in machine learning, computer networks, and music. His most notable work came from his time as an intern for Microsoft over the 2022 summer, where he plans to return as a full-time member of the Air Gapped Cloud Validation team after graduation. Jerrel’s skills include a variety of programming languages (mainly Python, C#, C++), Git version control, and a willingness to tackle any problem thrown at him. For this project, he is focusing on the user/resident side of the application.

Jacob Smith is a senior computer science student interested in systems engineering and programming. His most notable work came from cpts 360 where he created a small-scale terminal system in ubuntu. Jacob’s skills include a variety of computer languages (C/C++, c#, python), GitHub version control, ubuntu experience, and the drive to work through any problem until total understanding and completion of said problem. For this project, I am focusing on the caretaker side and the login part of the application.

# Project Requirements

# Introduction

The LAMI team has been tasked with the continued construction of the LAMI app for medication reminders for the residents in the LAMI residence. As stated, this app will be used for the residents of the LAMI house who have mental illness and will serve as a reminder app that will help them take their medication at specified times. There will be a sign-in for both the caretakers and the residents so the residents can have safety in knowing the only people that can view their medications are the caretakers who will act as a secondary reminder (in the case that the resident does not take their medication after being prompted by the app). The end goal of this project is to create an app that is easy and enjoyable to use, making the task of remembering to take medication as easy as possible.

# System Requirements Specification

* Residents of the house should be able to access/run the application on iOS or Android operating systems.
* Residents of the house should be able to access/run the application on iOS, Android, or in a web browser.

## Use Cases

**Story:** Helene Davids is the employee currently overseeing the house and one of the residents, Oliver James, has just been prescribed a new medication. Helene wants to make sure that Oliver has set a reminder to take his new medication, but Helene isn’t scheduled to go back to the house until 3 days from now. She pulls out her phone and logs on to the LAMI app. She selects Oliver’s name from the list of current residents and sees that he has already set a reminder and thinks “I don’t know why I was worried, Oliver is awesome!”.

**Story:** Micah Ferguson is the employee currently overseeing the house and one of the residents, Brandy Hartford, has been acting a little different than usual. Micah wants to make sure that Brandy has been taking all of the medications she is supposed to. Micah logs on to the LAMI website, selects Brandy from the list of current residents, and opens her progress report. He sees that she has not been very consistent with taking her medications, so he makes a plan to talk to her and see how he can help.

## Functional Requirements

### Improvement of the UI

The main function of this project is to create an alarm and the previous team that worked on this project was able to do just that but didn’t have lots of time to make the app look as nice as the clients wanted. Not to say the UI made from the last team was bad, but they thought it was a bit bland and wanted something that would draw more attention toward the application. The clients want a UI that uses calm colors like the darker blues and greens and that has a nice layout; something like Duolingo’s UI in terms of layout. Like having a side bar for all the parts of the application like settings, calendar, and current medications. As this is something that the client has asked for and the main feature of the app is almost complete this would defiantly be at priority level 1. It’s not essential but it is something that can be worked on and improved as we move through the processes of making this app.

Repeat the above for each requirement.

### Website Implementation

The client wants the application to also be online where other employees of the LAMI house can access their app accounts to check up on residents in the LAMI house. This requirement was added since the client wanted the residents and caretakers to have more accessible platforms to choose from for the application. Additionally, the client wanted the caretakers to be able to be able to check on the client’s medication times and if they took them on the house computer in the house. This was one of the main talking points when talking to the client, so the priority level of this would be 0 since part of their specifications included the website implementation.

### Resident and Caretaker Accounts

While its nice to have the timers for the residents the caretakers can’t tell if the medication has been taken or not so the creation of caretaker and resident accounts will allow for different permissions between users. The client asked for this since they wanted an easy way for the caretaker to see if the medication was being taken by the resident. The creation of this feature is priority 0 since allowing the caretaker of the house to see if the residents have taken their medication is something that was talked about a lot with the client.

### Resident Surveys

Another tool that will help the caretakers of the house is after taking medicine periodically a medication survey will come up to ask the resident if the medication is working well and how they like the medication. The client wants these surveys so that they can make sure that the medications that the residents are taking are not negatively impacting them or that maybe they need some new medication that is either stronger or weaker. This seems like it would be a priority 0 program in the application, but the client specified that this was something that we can do if we get around to it, so I would place it at 2.

## Non-Functional Requirements

List the non-functional requirements in this section. Non-functional requirements define system properties (e.g. reliability, response time and storage requirements, etc.) and constraints (e.g. I/O device capability, system representations, etc.)[[1]](#footnote-1)   
  
Generally, non-functional requirements take the form "system shall be <requirement>."

Process requirements may also be listed here (e.g. specifying a particular programming language or development method.) This will include any general testing plans, but there is a later assignment that will go into much greater depth about testing the product.

Please refer to Section 4.4.7 in the book “Object-Oriented Software Engineering” for example categories of non-functional requirements.

You may use the following template for non-functional requirements (Please remove the color formatting in your final document):

### Must be able to support around 10-15 users

The client wants it so that it is possible to have everyone in the house on the server at once so that no one isn’t reminded to take their medications, or a staff member can’t check if a resident has taken their medication.

# System Evolution

As we go on to finish the application for the client we may run into problems or may need to hang things as to help specific clients. So, as we build the application, and we make the web application we may need to make minor alterations for the web application alteration. On top of that adding the different user profiles may cause a problem on the firebase side of things but that will be solved with time and understanding of firebase. As for the UI, it could be changed multiple times depending on how the residents of the house react to it initial designs so constant restructure may be needed.

# Solution Approach

# Introduction

This document provides details on the structural and technological decisions made in the development of the application. The application serves as a medication reminder for residents of the Alliance House, all of whom are people with schizophrenia. Many people with schizophrenia struggle to adhere to their prescribed medications and the goal of this application is to address and work towards providing a solution to that problem.

# System Overview

The LAMI project is to create and add on to the already existing code and improve upon it, also to implement a website that can access the same things as the app. The coding will be done using the flutter language since it can be used to program apps and websites. Also, the database we will be using to keep track of profiles and personal info will be firebase. With these the users will be able to communicate through a server to add medications, sleep times for tracking when to take medicine, and surveys so the caretakers can check the medications effectiveness.

# Architecture Design

## Overview

The architectural design of the existing application is structured in accordance with the *Client*-*Server* network architecture. With regards to this application, the *Server* refers to a central database and the *Client* refers to two distinct groups, the employees of LAMI and the residents of The Alliance House. Both groups interact with the same server, albeit in slightly different ways. When broken down to its simplest form, the employee group can view and modify any entry in the database through a web or mobile application, whereas the resident group can only view and modify entries associated with their account through the mobile application.

## Subsystem Decomposition

In the application, the *Client* subsystem is implemented with the Flutter application framework and the *Server* subsystem is implemented with Google Firebase. These two technological choices were made because both Flutter and Firebase are two very popular application development tools and are often used in conjunction. Since they are so widely used, they are constantly being updated and improved. In addition, there is an abundance of online documentation and resources for application development with these subsystems.

Diagram

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Frontend

Backend

### [Flutter Multi-Platform Application Framework]

#### Description

#### The Flutter framework provides mechanisms to create user interfaces for both mobile and web applications. A consistent framework for the development of all three UI’s (iOS, Android, Web app) increases readability, cohesion, and structure throughout the entire project. One of the most important services Flutter provides is the ability to communicate with the operating system of the phone to send a push notification outside of the application.

#### Concepts and Algorithms Generated

Flutter makes use of a concept called *widgets* to form and manage each component of an application. Essentially, each widget represents a different aspect of the app, whether it be a UI element, styling choice, or object state.

#### Interface Description

#### Services Provided:

#### Service name: Alarm Widget

*Service provided to:* Flutter

*Description:* The service allows users to add a medication to a list and set a reminder for when the medication should be taken. It takes user input (when a user adds a new alarm/medication to the list) then contacts the backend to save the new information to the users full list of medications.

#### Service name: FlutterFire

*Service provided to:* Firebase

*Description:* FlutterFire is a group of plug-ins for Flutter that provide connectivity between Flutter applications and Google Firebase backend services. The specific functionalities utilized from Firebase are detailed later.

*Services Required:*

Flutter, Firebase, FlutterFire

### [Google Firebase]

#### Description

Google Firebase is a backend application development software that provides storage capabilities. To integrate Firebase with Flutter applications, plugins called FlutterFire have been created to easily accomplish this task. In addition to storage, Firebase also provides other services such as authentication, usage analytics, and monitoring tools.

#### Concepts and Algorithms Generated

#### Cloud Firestore is a NoSQL document database. A document database is different than a relational database in that all information about an object (in this case a resident of the Alliance house) is stored in its own document.

#### Interface Description

#### Services Provided:

#### Service name: Firebase Cloud Firestore

*Service provided to:* Flutter

*Description:* Firebase Cloud Firestore provides a database for the storage of user information, medications, and medication reminders. On login, a user’s locally stored data is synced with the data from Cloud Firestore, and any necessary changes are applied.

#### Service name: Firebase Authentication

*Service provided to:* Flutter

*Description:* Firebase Authentication allows the addition, authentication, and deletion of users from the application. Users can also choose to reset their password and Firebase Authentication provides the backend services, allowing a user to reset a password through email.

*Services Required:*

Flutter, Firebase Authentication, Cloud Firestore, FlutterFire

# Data design

As stated previously we will be using firebase to keep track of user profiles and information since the last team to work on the application used firebase. In addition to firebase already being implemented into the code it is an easy-to-use database storage that will be easy to insert new users if there ever happen to be new people added to the LAMI house.

# User Interface Design

Graphical user interface, application

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In the above screen shots are rough looks at what the LAMI application will look like; at least the login and beginning pages for both the resident and caretaker. For the resident it is the middle picture where it will display the calendar for the week of what they must take and below that, it shows them their daily schedule for medicine. Then for the caretaker screen on the right it shows all the patients accounts and below that it shows the weekly schedule with all the patients appointed medication times. For both those screens there is a menu button on the top left which will show setting and for the residents will have a medication tab where they can change times it needs to be taken and change medication. For the caretaker it will show medications used in the house and who is using that medication. Now this is for the application and the website, however the only difference there will be is that the calendar will be bigger to plan out the month of medication.

# Test Plan

# Introduction

## Project Overview

The software that will be tested is the LAMI full-stack medication reminder application. Some components of this application will be tested like the apps alert component where we will test the ability to alert the user of medication times and see if they can be reminded of multiple medications on the same time. Also, to test the sig in feature to make sure the database is registering people correctly. So that the residents and caretakers can access their accounts.

## Test Objectives and Schedule

We plan to test the soon, however at present we would only be testing things that were tested by last years team that worked on this project. There will be tests, but it will be mostly edge case tests that the previous tests didn’t tackle. The test will most likely be created by some time next month when we get farther into our implementations of the application. When the tests are finished, we will output a code file that will be for testing features and most likely a video displaying some full application tests.

## Scope

The purpose of this document is to give insight into what we are going to test and how we will test those things. Through this document we will discuss testing strategies we will be implementing to test functions and implementation of our code. However, as previously started we will most likely nit be making test since much of the logical code is implemented from last years LAMI team. So, we will be only adding minimal tests since the majority of what we will work on is UI based which is hard to test.

# Testing Strategy

Describe the overall approach to testing and provide the overall flow of the testing process. An example is provided in Appendix A.

Will you be using Continuous Integration (CI) and/or Continuous Delivery (CD) in your testing? If you’re not using CI or CD, make a \*very\* strong case for your decision.

# Test Plans

Describe the plan for testing your project in the context of the following testing activities. You may include additional test activities, if necessary.

For each of the following activity, describe how the testing will be conducted. What would be the sequence of events, and how will the testing activity take place? Please refer to the CptS422 class notes for details on testing strategies.

## Unit Testing

The methods for the following functional requirements for each client will be unit tested using the Flutter test package:

House Residents

* + Log-in to an existing account
  + Sign-in up a new account
  + Add an alarm
  + Turn an alarm on/off
  + Edit an alarm
  + Delete an alarm

Staff

* + View a user’s alarms
  + View all existing user accounts

## Integration Testing

A Flutter package for integration testing exists that allows us to test each widget in the application. With this testing framework, rightfully named integration\_testing, we will test each button by triggering it and checking for the correct response.

## System Testing

## Functional testing:

As stated previously, the major functional testing requirements for each client are as

follows:

House Residents

* + Sign-up for a new account
  + Log-in to an existing account
  + Add an alarm
  + Turn an alarm on/off
  + Edit an alarm
  + Delete an alarm

Staff

* + View all existing user accounts
  + View a user’s alarms

## Performance testing:

To test the performance of the application, we will register enough accounts to ensure the free Firebase Firestore database plan can handle the quantity of accounts needed for all residents at the house.

## User Acceptance Testing:

We will test the app by using it on our personal phones and computers for an extended period, as well as messing with it to try and cause errors. In addition, we are also able to post the web app early, to let the staff look at and use both the resident and staff sides of the application. We are also able to do this for free, as every Firebase project is provided with a free subdomain on the web.app and firebaseapp.com domains.

# Environment Requirements

To do our tests we will only need the phones and the website connected to the application so that we can test our implementation. By having both the android and the iPhone we can test both phones application to make sure there isn’t any problems with one or the other. Then the website will need a computer component to be able to be tested so a laptop or computer will be needed to run these tests for the website application.

# Alpha Prototype Description

As it’s been stated in the previous sections, the work to be done on this application are mainly to make the UI of the better for both the caretakers and the residents of the LAMI house. So, the functions and interfaces that will be discussed will mainly be UI based, this means that the testing that will be discussed is mainly going to be describing the output onto the screen after implementation.

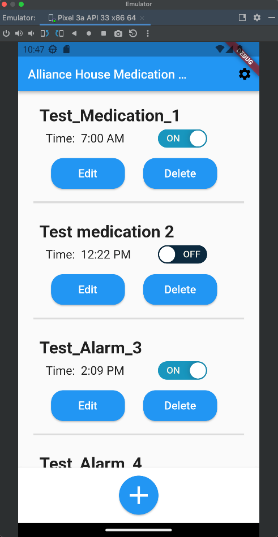
## Resident Home Page

### Functions and Interfaces Implemented

For the home page there has been significant improvements to the UI. One being the color scheme being more modern compared to the old application. Another UI improvement would be the separation of the delete and edit button. We did this since the old button was a press and hold function to choose between the two options and it was decided that as to much for the residents, so we simplified it to make it better for the user. On top of this we added a switch that allows the user to turn on and off an alarm without deleting it. Lasty, we created new button for adding alarms since the spot it was in before was to small and hard to click. So, it is now a big button on the bottom of the screen.

### Preliminary Tests

Since this is mainly a UI implementation, we just constantly run the program to see if it works or not since if it works will be dependent if it shows up on the screen what I can show below this is what all these additions look like on a screen.



## VI.2. Add/Edit/Delete Alarm Pages

### Vl.2.1 Functions and Interfaces Implemented

These pages are lumped together since they so closely related. For the edit/add page we coded a repeat day’s feature that allows for the repetition of alarms for medications. Also, we improved the repeat hours feature so that the user can be more specific with how many hours they want it to repeat at. Lastly, we added the current alarm time so users can see the alarm without pressing the set time button.

### Vl.2.2 Preliminary Tests

Since this is mainly a UI implementation, we just constantly run the program to see if it works or not since if it works will be dependent if it shows up on the screen what I can show below this is what all these additions look like on a screen.

Graphical user interface, application

Description automatically generatedGraphical user interface, text, application

Description automatically generated

# Alpha Prototype Demonstration

1. Summary of what you showed to your mentor. In the December meeting with our client, we demonstrated the changes made to the app with the purpose of increasing ease of use, as well as a color scheme change. There were three main features demonstrated for increasing ease of use, the first of which being the new feature allowing users to choose the days they would like the alarm to repeat. The second feature demonstrated was the addition of edit and delete buttons for each alarm on the user’s main page. The final feature was the addition of a switch for each alarm on the user’s main page that allows them to turn their alarms on and off without having to go to the “edit alarm” page.
2. The client was very pleased with the changes made to the application and also believes that these changes will encourage users to utilize the application and increase adherence to their alarms.
3. The client did not have any questions for us and believes that we are on the right track.

# Future Work

As a team we have gotten a lot of work done but still have some main features that we would like to add to the application. For instance, after to talking to the client with what they would like to see in the next semester is the creation of a motivation system. This would just be a simple addition of setting up an animation every day that they consecutively use the app to track their medication usage. Another thing that will need to be added in the future is to allow for only single factor authentication instead of two factor authentication so that they resident have less to remember when signing in. Lastly, we need to add some more features for the caretaker page. This mainly entails being able to see all residents alarms and what they are for on their home page.

# Glossary

[1] J. Kreyenbuhl, E. J. Record, S. Himelhoch, M. Charlotte, J. Palmer-Bacon, L. B. Dixon, D. R. Medoff, and L. Li, “Development and feasibility testing of a smartphone intervention to improve adherence to antipsychotic medications,” Clinical schizophrenia & related psychoses, 2019. [Online]. Available: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5910284/. [Accessed: 21-Sep-2022].

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# Appendices

1. https://en.wikipedia.org/wiki/Non-functional\_requirement [↑](#footnote-ref-1)