POLITECNICO DI MILANO

MSc Automation and Control Engineering

Software Engineering

Design Document

For the Application of Medicine Reminder

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1. Introduction

From studying the requirements for the medicine reminder, the Feasibility Study document provides evident justifications for developing the same. The development of the mobile applications follows different phases of documentation, starting from the Feasibility Study Document which explains the feasibility of the concept. Further, the next phase involves the study of requirements to develop the concept that makes the Requirement Analysis and Specifications Document (RASD) while the study of software architecture to follow is enclosed in the Design Document (DD). The other phases include the Implementation Document, Testing Document, and User Manual, where the information regarding the documents would be mentioned correspondingly in the later phases of documentation.

Here, this illustrates the Design Document (DD) of the project of the medicine reminder abbreviated and named “MedRem”. The application allows the creation of medicine and stock reminders round the clock with a display of the medicines. Design Document discusses the software architecture with all the necessary diagrams to establish the interaction between the components. Furthermore, this document describes a set of design characteristics required for the implementation by introducing constraints and quality attributes.

1.1 Scope

MedRem is an easy-to-use application that helps people to keep track of their medicines by providing reminders. It has a simplistic design and vintage approach to the features. This application consists of adding, showing, modifying, and deleting the medicine information. Other than that, two kinds of reminders can be added to the medicines, namely a medicine reminder and a stock reminder. The user can set and modify them according to their intake of the medicines. Restock is yet another feature that is added to the application, allowing the user to update the current stock value.

2. Software Architecture

2.1 Overview

The architecture of the application is structured according to three logic layers:

The presentation layer (GUI) handles the interaction with the users. It contains interfaces that can communicate with them and is responsible for rendering the information. Its scope is to make the application's functions understandable to the customers.

The business or application layer (Manager) takes care of the functions to be provided for the users. It also coordinates the work of the application, making logical decisions and moving data between the other two layers.

The data access layer cares for the management of the information, with the corresponding access to the databases. It picks up useful information for the database users and passes it along to the other layers.

2.2 Functionalities

Some of the major functionalities of the medicine reminder, "MedRem" includes the following:

- Add/Modify medicines: The application needs the user to add the medicines, to successfully set reminders according to required schedules and the necessary dosage at the right time. Also, in cases of change in prescriptions, users must be able to modify the information on the medicine itself and further, the timings of reminders.

- Showing/Deleting the medicines: The medicines that are added to the application must be shown as a list alphabetically, in a display, for the user to be sure of which medicines they are taking. It should be listing out all the information regarding the medicine including the name, dosage, and frequency. Also, it shows whether the user sets reminders or not, but the list of medicines should be displayed, nevertheless. Once the user has already finished with the intake of a particular medicine, to avoid confusion and save space, they can delete the medicine from the application.

- Stock Management: During the time of adding medicines or modifying them, a user could be able to mention the number of pills or the stock of it, to keep in account how many medicines are remaining with them. It can be further added or restocked in case of a change in prescriptions.

- Reminders Management: The addition of medicines to the application can be accompanied by setting multiple reminders according to the prescription for each medicine. A medicine reminder can be set to keep track of the medicine intake daily once it reaches the pre-set time by the user. As part of the stock management, a stock reminder can also be set, for it turns on when the number of pills reaches a minimum quantity. Both the reminders use an alarm at the specified time or interval to notify the user.

2.3 Class Diagram

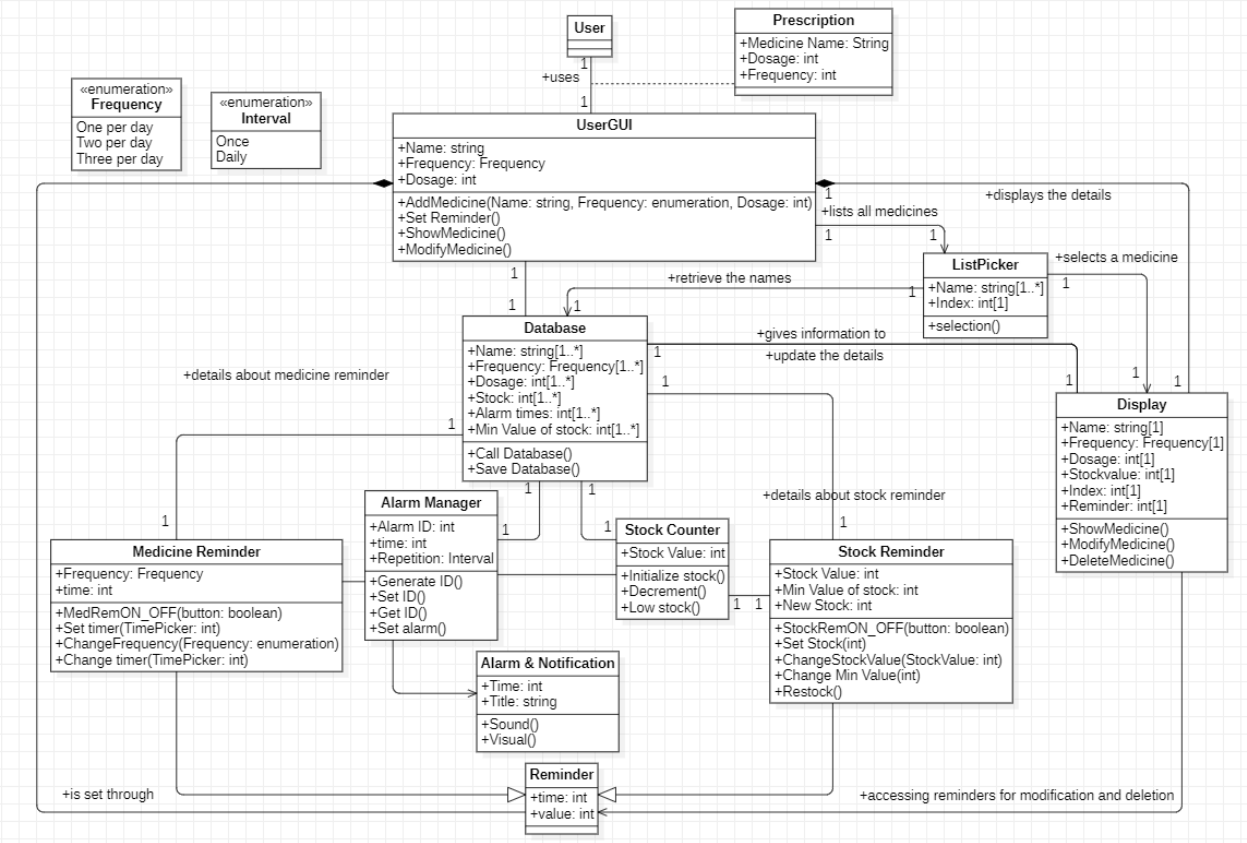


Figure: UML class diagram

2.4 Description

The UML diagram mentioned above is the descriptive version of the system to be developed. It contains various features as mentioned previously. Since it revolves around the user himself, they are the starting point as well as the ending point.

The User is the point of origin of our application. He/she has chosen the application to keep a track of their medicines and give reminders to them in case they forget. The user GUI becomes the medium between the user and the application. The prescriptions that the user already have is filled manually into the application which contains various fields like name, frequency, and dosage of the medicine(s).

The User GUI is the most important part of our application. After the user downloads the application, the Graphical User Interface becomes the bridge between the user and the application. Through the user GUI only, the user can access the application's features like the show and delete medicine and perform various operations like adding or modifying medicines.

When the user decides to add medicine, the user GUI interprets the command and shows a screen to fill in the details like *name*, *frequency*, and *dosage* of the medicine using the necessary components like Textboxes. The *frequency* here is an enumeration spinner limited to a maximum of Thrice a day, making it a constraint for ease of development. Further, the user can also set the Reminders, namely the Medicine Reminders and Stock Reminders, by adding their corresponding attributes. Users can save the details of the medicines, even without setting the reminders by toggling off the respective reminder switches. Once the data is saved, all the information will be stored in the Database.

The Reminder forms an essential component for the user GUI, which includes two types: Medicine Reminders and Stock Reminders.

A Medicine Reminder is a feature assigned by the user to a particular medicine for providing a reminder at a specific time or specific periodicity. It contains the following fields as inputs: *frequency* and *time*. The medicine reminder activates only if the medicine reminder button is toggled ON. The frequency represents the periodic nature of the reminder while the time is pre-set by the user, by adjusting the TimePicker component. This feature stores the time in the Database corresponding to the same medicine. The information about the time is passed on to the Alarm Manager, that deals with the Alarm. In case of the time modification for the medicine reminders, the user also has the option to change it, accordingly, saving the new values to the Database as well.

A Stock Reminder is a feature assigned by the user to a particular medicine for providing a reminder only if a minimum threshold value has been reached. The stock reminder contains the following fields as inputs: *stock value* and *minimum stock value*. The stock reminder activates only if the set reminder button is toggled ON. Once the stock is set, the information is again stored in the Database and the same data is used to initialize a Stock Counter. The Restock is a part of the stock reminder module and is performed when the *current stock value* is needed to be updated.

Stock Counter is a module that deals with decrement counting of the *current stock value* based upon the *dosage* and *frequency* which is also compared with the *minimum value* of the corresponding medicines, calling, and saving back to the Database. In case of low stock of the medicine, the module communicates with the Alarm Manager to give an Alarm. If the user needs to renew the stock value of a medicine, restock feature can be made to use that edits the stock value and save it back to the database.

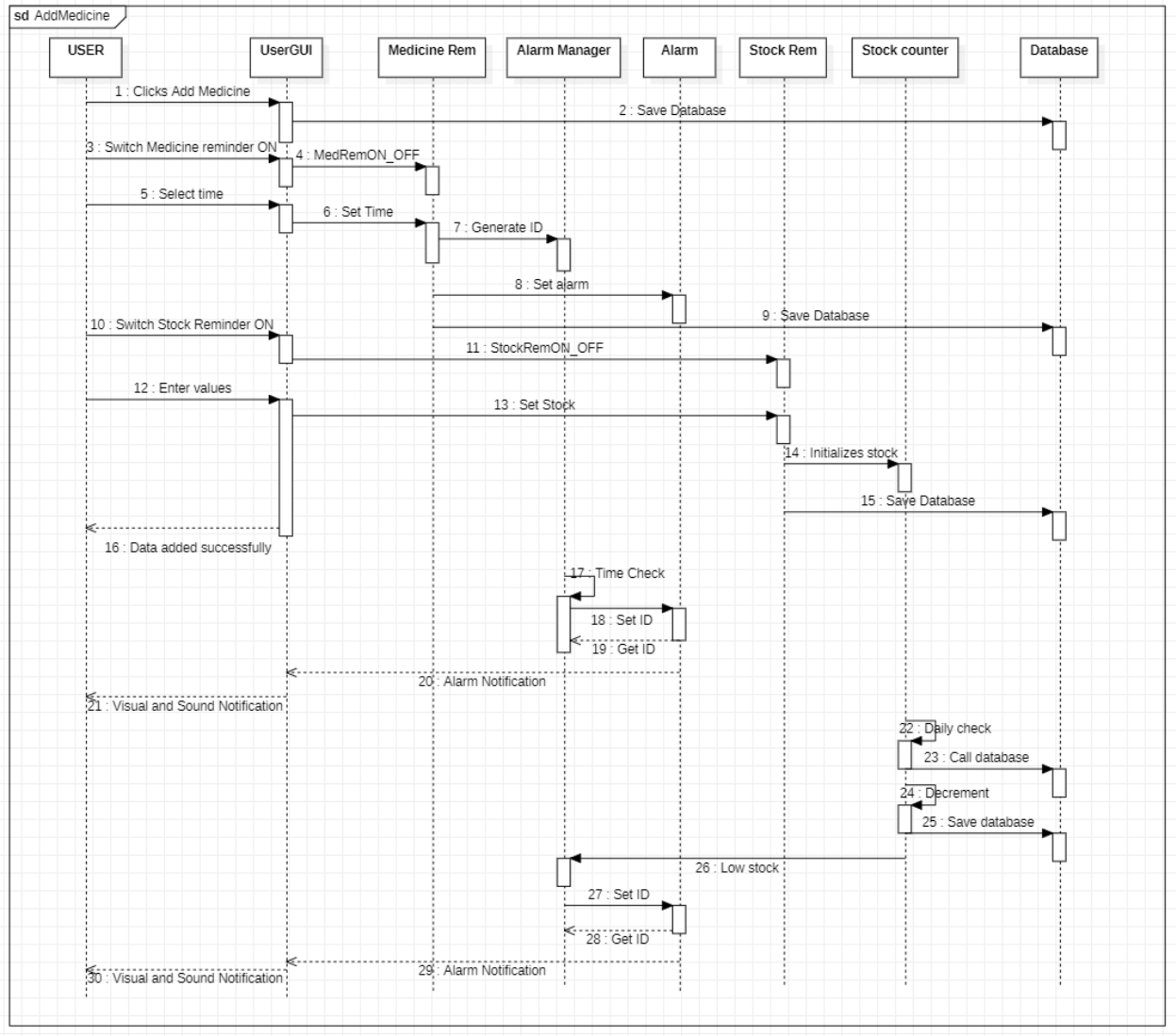
The Alarm Manager deals with all the *alarms* that needed to be set for medicine reminders or stock reminders through the stock counter. In the case of medicine reminders, once the user sets an alarm,

unique *ID*s are generated for each of the alarms based upon the *time*, which are further passed on to the Alarm Clock, where the alarms would be turned on according to the *ID*s.

If the user wants to see the details of all the medicine, the ListPicker shows the list of medicines that are already added to the Database. Further, if the user needs to see detailed information about a particular medicine, the user can also pick the name from the list which takes the user to a Display where the entire information about the selected medicine would be displayed. The ListPicker also helps to get the *index* of the selected medicine that is again used in Display to retrieve the information of medicine in the database. Display, being a part of the requirement, is also the instance where the user wants to proceed with modifying and deleting the medicine details. In case of modification, the user can update the details, which would be replaced in the Database, while changing the reminders take the users through the respective reminder modules to change the corresponding attributes. The deletion of data is performed by removing the entry from the Database.

3. Sequence Diagrams

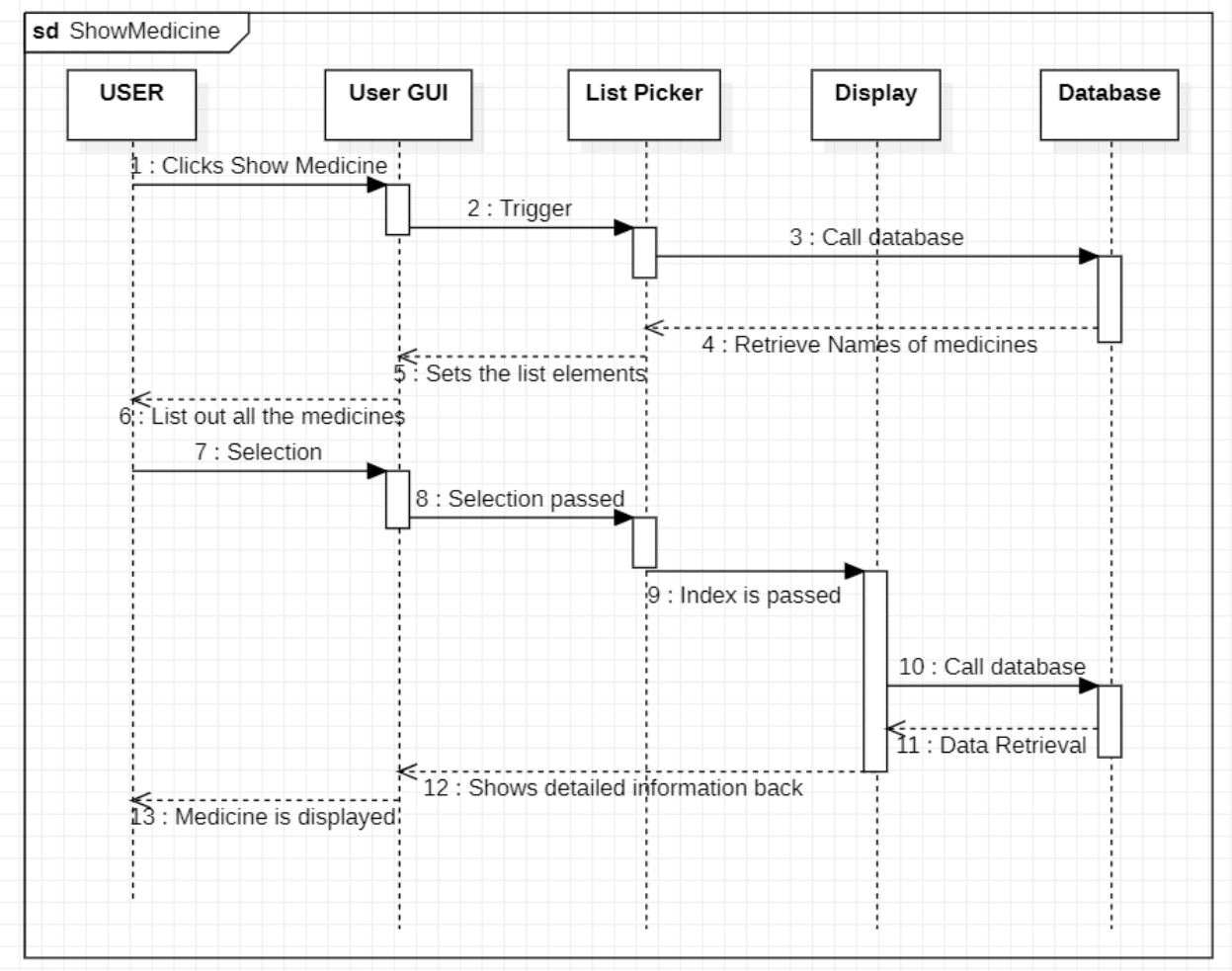
3.1 Add Medicine



In the sequence diagram mentioned above, once the user clicks on add medicine, they can fill in the details such as the name, frequency, and dosage value. After the user toggles ON the medicine reminder and stock reminder button, the time value based on the frequency and the stock value and minimum stock value based on the dosage is set to the medicine. All the data is stored successfully in the database. The medicine reminder generates unique IDs for each reminder and the alarm manager sets them. Notification for the medicine intake is provided through an alarm to the user. The stock counter performs a daily check on the stock value and decrements it based on the dosage value and

saves it in the database. If the current stock value becomes less than the specified minimum stock value, it reminds the user in form of an alarm notification.

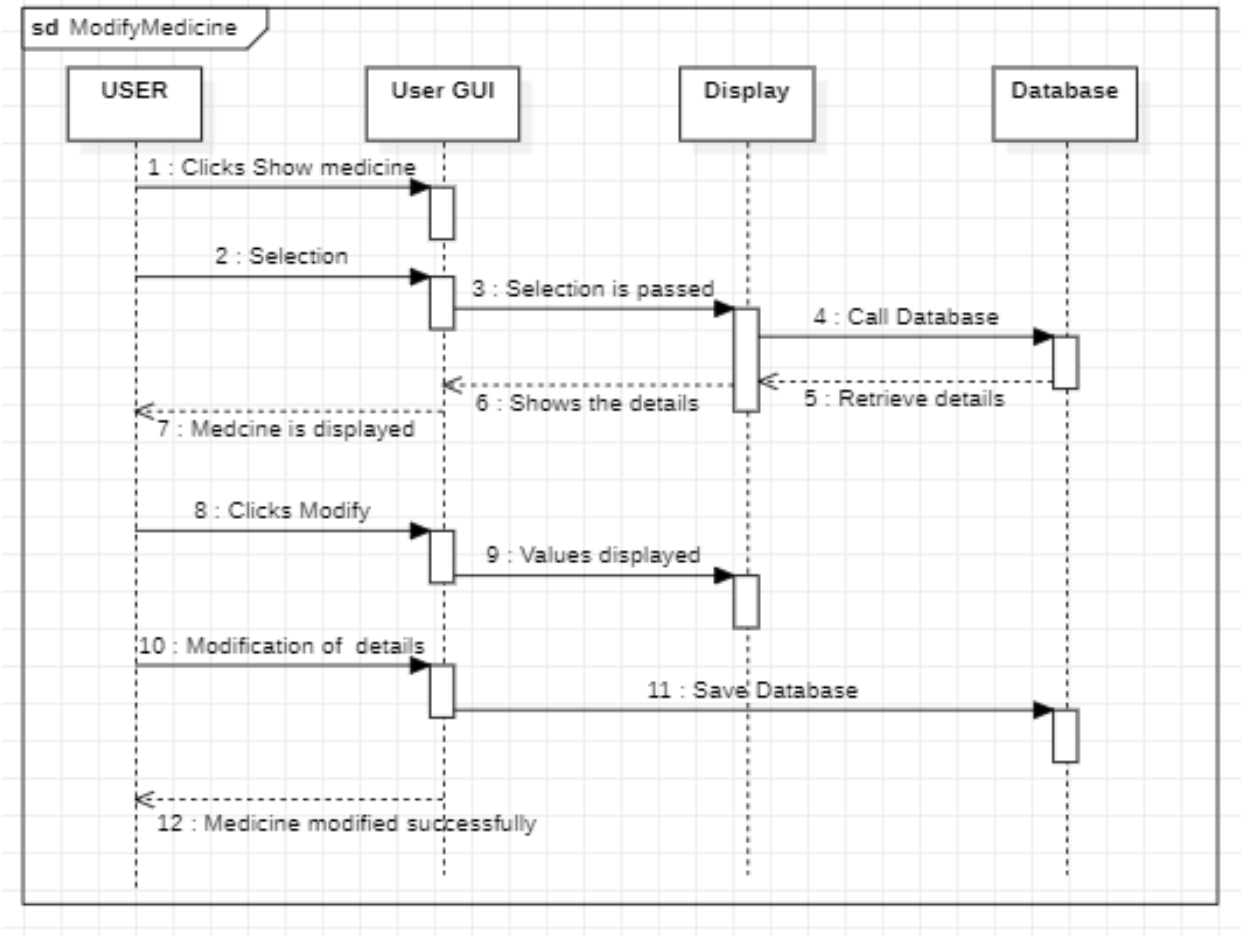
3.2 Show Medicine



The sequence diagram represents showing of a medicine. The user clicks on the button and is directed to the next screen. The trigger generated by the user lets them see the added medicines in the form of a list. The ListPicker acts as a compressed version of the database, where only the names containing index value is called. When the user selects a medicine, the selection and the index values are passed to the database. The database returns the related information regarding the selected medicine and display showcases it.

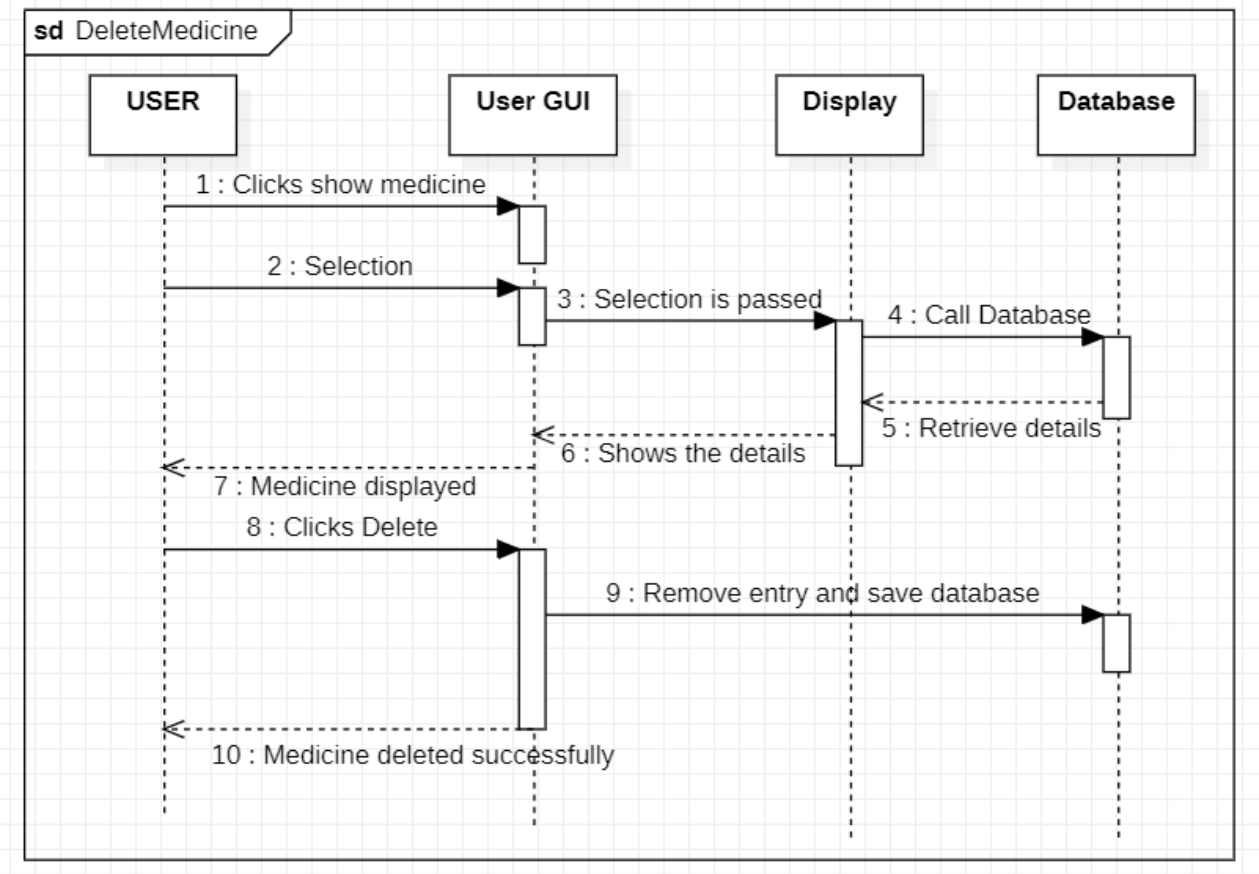
Note: All these sequences including the ListPicker is intricate by nature. Other sequence diagrams which routes through the show medicine will not be showing the ListPicker module.

3.3 Modify Medicine



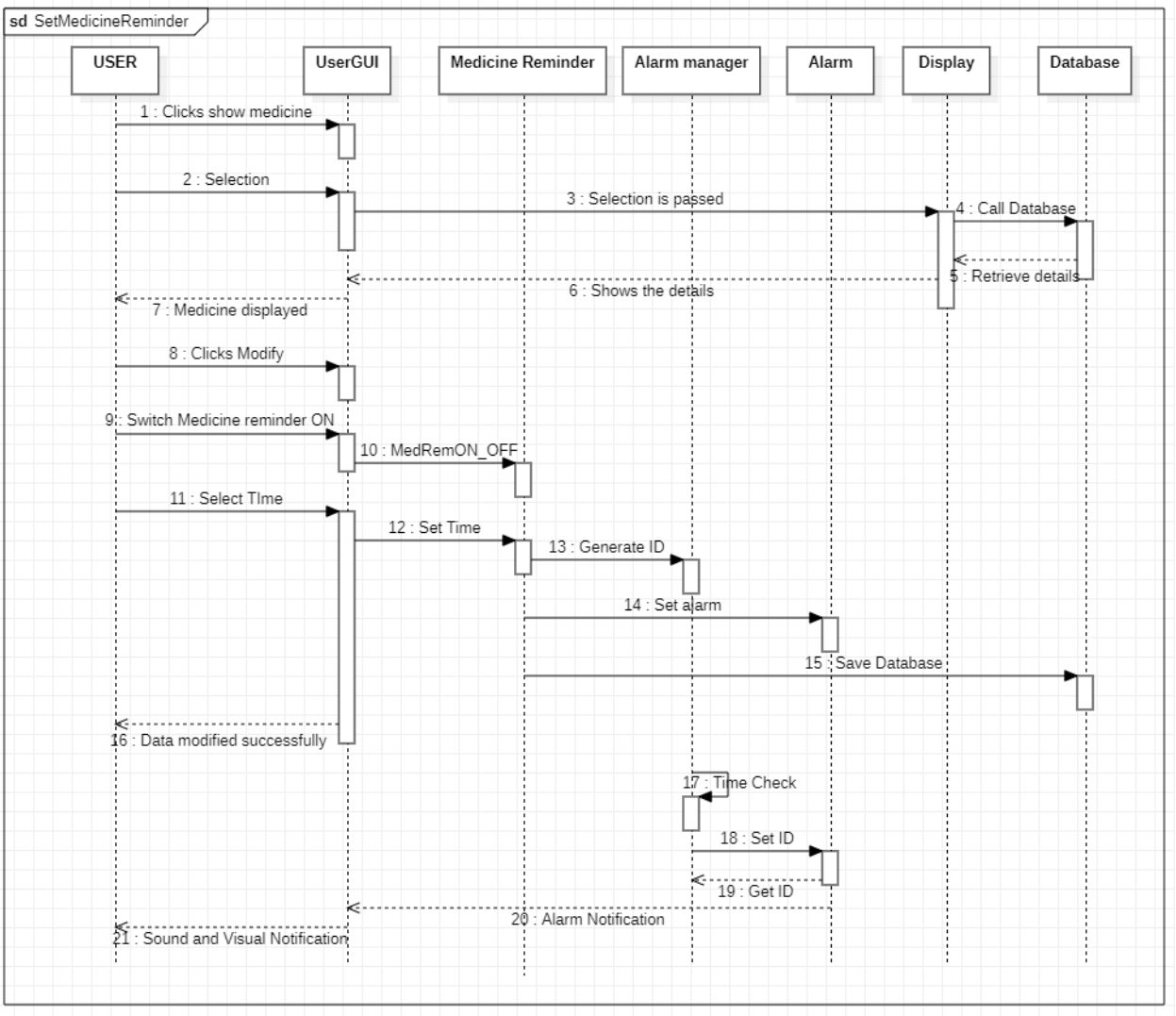
This sequence diagram describes the medicine modification. An assumption is to be considered here is that the user has already added a medicine to the database. The user clicks on show medicine. From the GUI, the user is directed to the display, referring to the database. Once the data is returned, the user clicks on the modify. All the previously stated fields are displayed to be modified. Modification of previous details is performed by the user and then saves the new data to the database. The new data is thus saved, and the user receives the notification of successful modification.

3.4 Delete Medicine



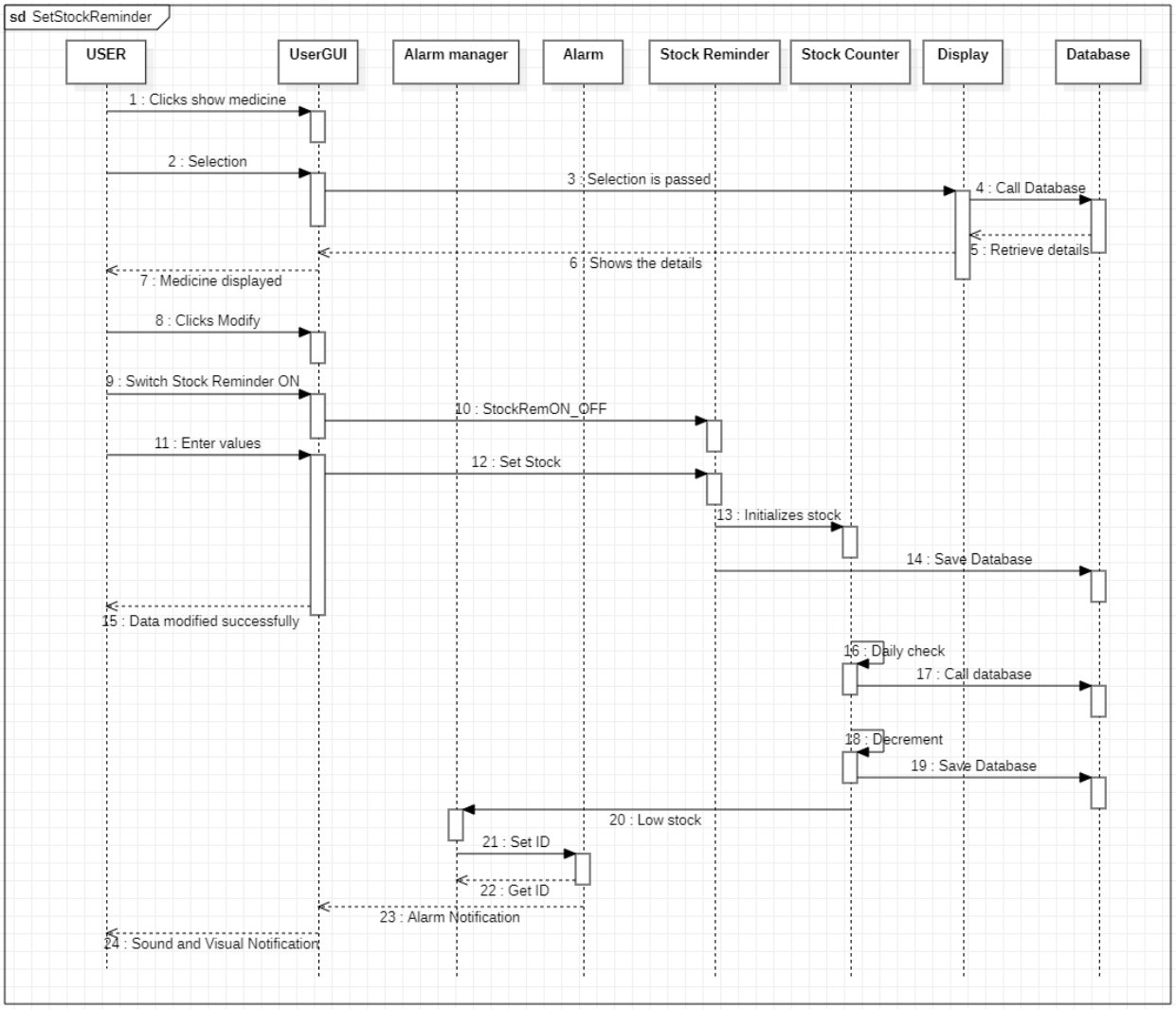
This sequence diagram describes the medicine deletion. An assumption is to be considered here is that the user has already added a medicine to the database. The user clicks on show medicine. From the GUI, the user is directed to the display, and further to the database. Once the data is returned, the user clicks on the delete. As soon as the GUI receives the command to delete the medicine, the operation is successful.

3.5 Set medicine reminder



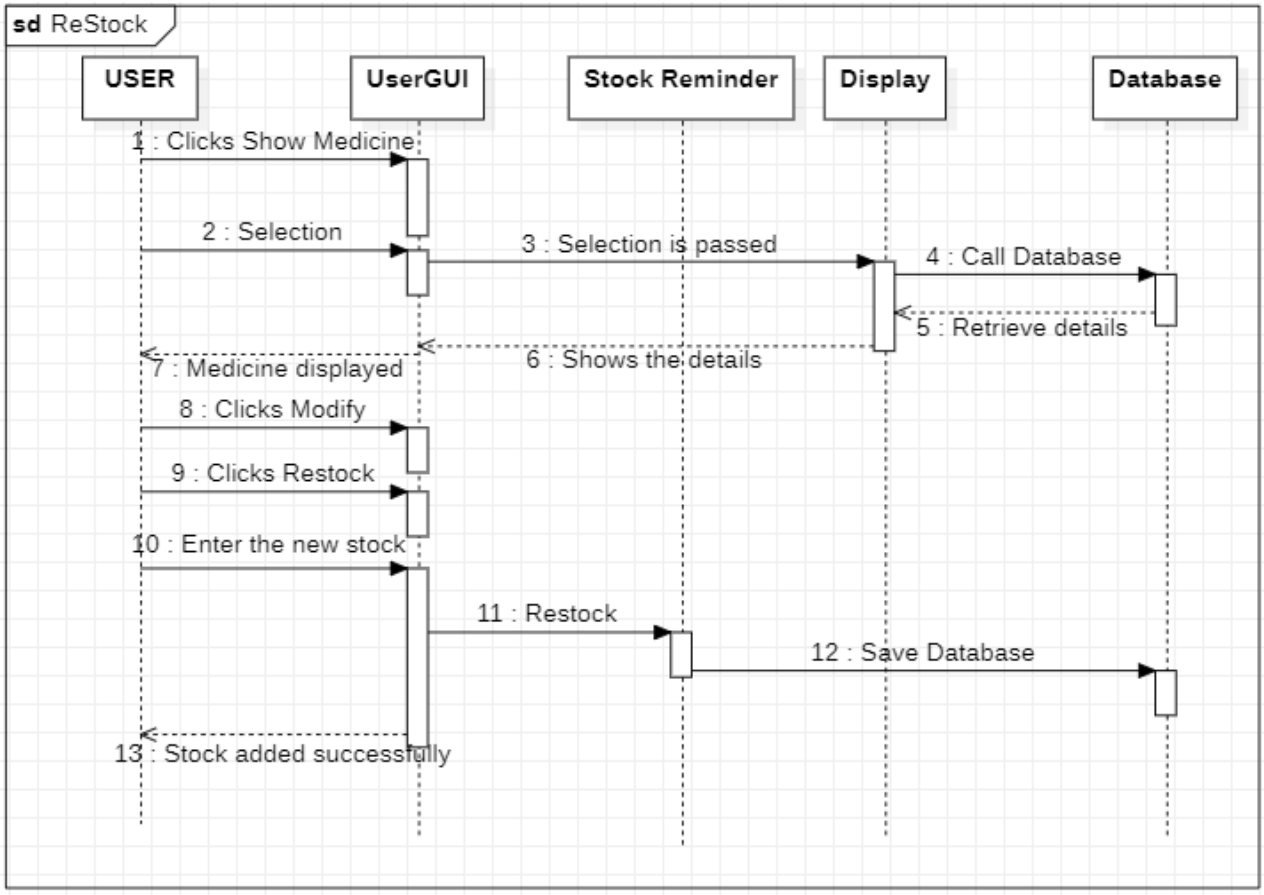
For the sequence diagram shown above, the user must have already saved medicine details in the database with the medicine reminders turned off. Thus, the sequence diagram starts with all the necessary operations to show the list of medicines and make the selection of the required medicine to see the complete details. The user can then go on with the modify button to proceed with turning ON the toggle switch for Medicine Reminder and set the time for the reminder with the corresponding TimePickers. On saving the details to the database, the alarms would be set according to the uniquely generated ID by the Alarm Manager, which is passed on to the Alarms at the event of reaching the time, ringing, and pushing notifications to the user to take medicine.

3.6 Set stock reminder



For the diagram shown above, the user must have already saved medicine details in the database with the stock reminders turned off. Thus, the sequence diagram starts with all the necessary operations to show the list of medicines and make the selection of the required medicine to see the complete details. The user can then go on with the modify button to proceed with turning ON the toggle switch for Stock Reminder. On entering the details of stock value and the minimum threshold value, the stock reminder would be set, and the values are stored in the database. Furthermore, the values are also used to initialize the stock counter to decrement the stock daily based on dosage and frequency. When the stock reaches less than the minimum value, the alarm manager is triggered to generate a unique ID to set an alarm for the Low stock of medicine.

3.7 Restock



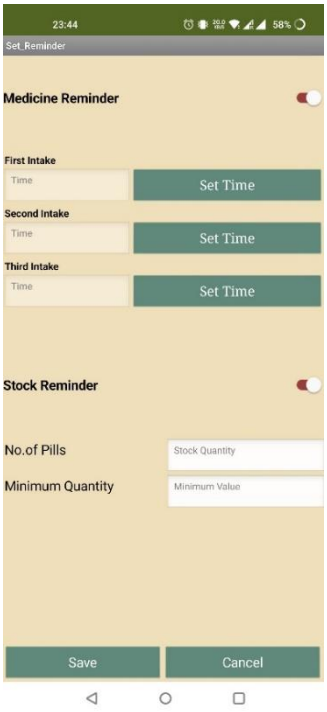
The sequence diagram for the restock feature starts with the assumption that the user has already added the medicine to the database. From the Home Screen in the GUI, the user clicks on the Show Medicine button to list out all the medicines added. On selecting the medicines to perform the restock operation, the entire information about the medicine saved in the database is shown through the display, where the user can click on Modify button. Further, the user can proceed by clicking on Restock button to enter the new stock value to be added to the current stock and saved in the database.

4. User Interface Design

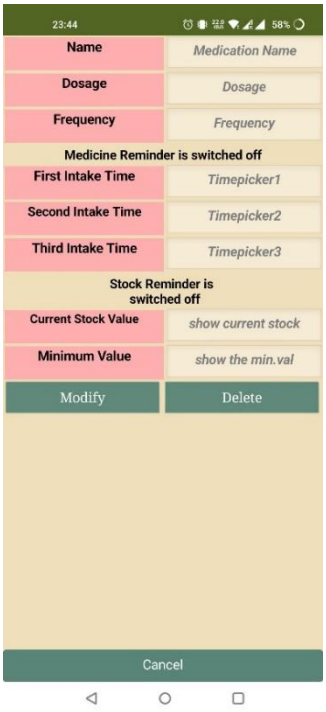
Home Screen:

Add Medicine Screen:

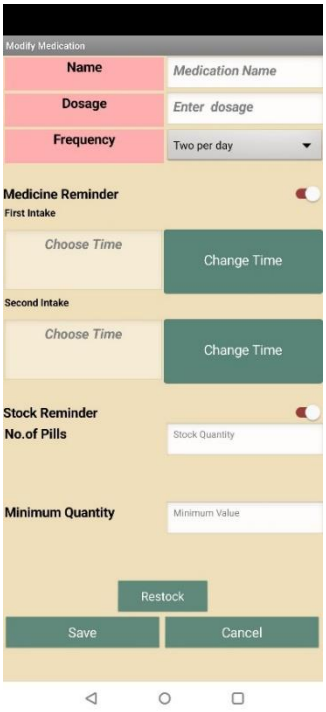
Set Reminder Screen:



Show Medicine Screen:



Modify Medicine Screen:



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