Introduction: At this stage, you will **decide on at least 3 primary use cases** to move forward with their design, implementation and testing.

The "Software Architecture and Design" stage of the project is a pivotal phase where the foundational structure and design of the software system are meticulously crafted. It encompasses several key tasks, including

Instructions:

1. Include the **three fully dressed Use Case Scenarios** that your team will move forward with.

   Search Medicine by Scanning Barcode

   1. Scope: Medication Identification System
   2. Level: User goal
   3. Primary Actor: User - Patient
   4. Stakeholders and Interests:
      - User: wants to find some detailed information about a specific medication.
      - System Developers: successfully developed the system so that it could ensure a smooth medication lookup feature for user satisfaction.
   5. Preconditions: User is authenticated and logged into the system.
   6. Success Guarantee: The medication is displayed and added to the user profile.
   7. Main success scenario:
      1. User clicks the Scan button.
      2. User scans the barcode into the system.
      3. System recognizes the barcode.

4. System searches the code information in the RxNorm drug database.
5. System displays detailed medical information.
6. User views the medication details and adds it in the library.

8. Extensions:
    - *a. Anytime when System crashes
        1. User attempts to resolve the issue.
        2. System may attempt to recover from the problem.
        3. If the problem still exists, System should provide an error message or notification informing the user that there is a problem with the camera functionality.
        4. System prompts the user to send a camera-related error report to the developer for further investigation.
        5. If the user chooses to send an error report to the developer, the Developer reviews the error reports and tries to solve the problem.
        6. Developer releases an update once the issue is resolved.
    - 4a. Medication not found due to image quality
        1. System asks the user to scan the medicine again.
    - 4b. Medication not found due to missing information in database
        1. System displays an error message to the user.
9. Special Requirements:
    - System should have access to an up-to-date drug database.
    - Interfaces need to be user-friendly to scan and display medication information.

10. Technology and Data Variations List:
    - Users can scan the barcode.
    - Database formats may vary: collections, fields, firebase, SQL… etc.
    - Data Types may vary: integers, string, XML files… etc.
11. Frequency of Occurrence: This activity occurs commonly as this is the main function of the system.
12. Open Issues/Miscellaneous:
    - May need additional data security considerations when the user provides information on medications that are not available in the database.
    - System response times during database searches should be optimized for a smoother user experience.
    - Integration with external databases or data providers may require ongoing maintenance.

Search Medicine By Inputting Medicine Name

1. Use Case Name **Searching Medicine By Inputting Medicine Name**
2. Scope

   Other related products:

   RxNorm Medicine Database

   Google Firebase database

   iOS system (Develop and assign on the system)

   This is a mobile application which allows patients to access information regarding their medication by searching using the name of the medicine.

The system could set up the profile for the user and then every search result of the user could be connected with their personal profile library, which is later connected to a set of reminders.

3. Level: user goal
4. Primary Actor: User - Patient
5. Stakeholders and Interests

Users: patients with who needs the medicine reminder, who wants the application to reminder their medicine taking and create their medicine profile.

Sponsors:

All responsible engineering and technical persons, such as System engineers, Developer, Test, and Maintenance

Society

Online Data Security management department, database provider

Competitors – The current similar products online

6. Pre-Conditions:

User is authenticated and logged into the system.

The medicine exist and could be found in our database

7. Success Guarantee: Find the medicine and provide its information to the user.
8. Main Success Scenario

• User select the input textbox

• User enter the name of the target medicine or the NDC code of the medicine and click search

• The system identifies the name of the medicine.

• The medicine name information is compared with the RxNorm drug database connected with the system

• A correspond data is found

• The system provides the corresponding medicine information to the user, including the name, description, instructions for use, and potential side effects.

9. Extensions

Anytime when System crashes

User attempts to resolve the issue.

System may attempt to recover from the problem.

If the problem still exists, System should provide an error message or notification informing the user that there is a problem that the system meets.

Medication not found due to vague input name of the medicine

System shows an alternative similar result that is similar to the medication entered, and asks if this is the medication the user is looking for.

If it is the medication that the user is looking for, display the information to the user.

Medication not found due to missing information in database

If the medication does not exist in the database, System notifies the user and asks them if they are willing to provide detailed information about the medication.

If the user provides the information, System adds the medication and the entered information into the database after the related person reviews the information entered.

10. Special Requirements

System should have access to an up-to-date drug database.

Interfaces need to be user-friendly to search and display medication information

11.Technology & Data Variation List（Varying I/O methods and data formats）

Technology variations:

- Phones (iOS)
- Wi-Fi, 4G, 5G, 3G, limited network

Data variations:

- RxNorm Data (online API)
- Google Firebase database

12.Frequency of Occurrence

This activity occurs commonly as this is the main function of the system.

Usually being used when a user has the requirement of having a new medicine.

The used frequency would highly increase during flu seasons.

13.Open Issues/miscellaneous

How to combine different databases

Scanning the databases is slow and inefficiency

May need additional data security considerations when the user provides information on medications that are not available in the database.

System response times during database searches should be optimized for a smoother user experience.

Integration with external databases or data providers may require ongoing maintenance.

Set Up Medication Reminder

1. Use Case Name: **Set Up Medication Reminder**
2. Scope:

   Medication Identification System

   Registered caregivers and patients will be able to use the application to enhance medication adherence, reduce medication errors and thus lead an improved life.
3. Level: User goal
4. Primary Actor: User - Patient
5. Stakeholders and Interests:
   - Patients: Want to maintain adherence of medication and acquire early recovery.
   - System Developers: Develop the application so that the reminder is accurate.
6. Preconditions: User has input or acquires the information of the medicine.

   User select a medication
7. Success Guarantee: Set the reminder corresponding to the certain time.
8. Main success scenario:

   I. Users click the reminder.

   Ii. System turn to setup reminder page

Iii. Input the expected time

IV. When reached the set time, a notification would pop up on the phone.

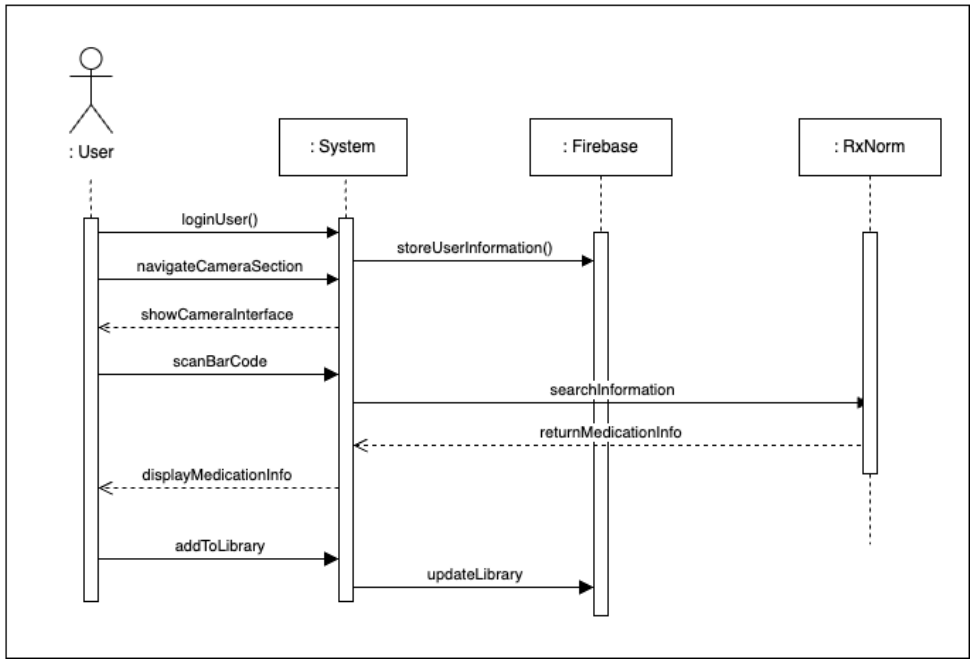
Some sound would be generated as well to attract attention

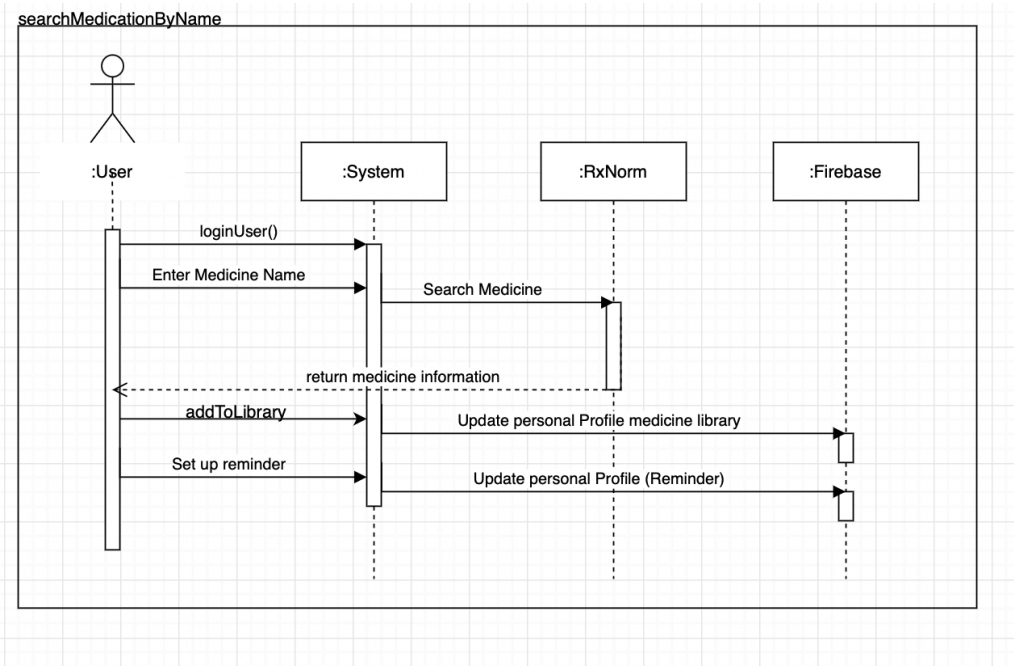
V. User clicks the reminder to check the information

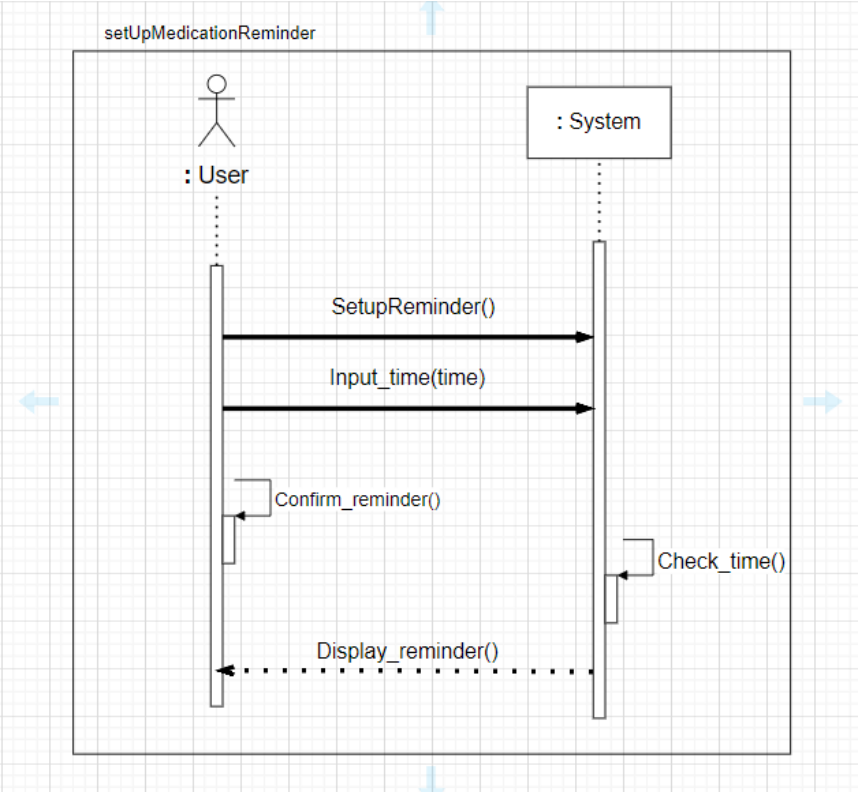
9. Extensions:
    - Time zone changes due to travel
        - The reminder time would be changing accordingly to the local time
10. Special Requirements:
    - System would have access to notification permissions
11. Technology and Data Variations List:
    - Access global time by following system time.
    - Refresh the time every minute
12. Frequency of Occurrence:
    - This activity occurs commonly as this is the main function of the system as well.
13. Open Issues/Miscellaneous:
    - Conditions for stopping the reminder.
    - Integration with Calendar Apps:
        - Integrating the reminder function with popular calendar applications to streamline scheduling and improve overall time management for users.

2. System Sequence Diagram (SSD): Create **3 System Sequence Diagrams** that illustrate the **main success scenarios** of the selected use cases. The SSDs should clearly depict the interactions between the actor(s) and the system, showcasing the sequence of messages exchanged during the use case execution.

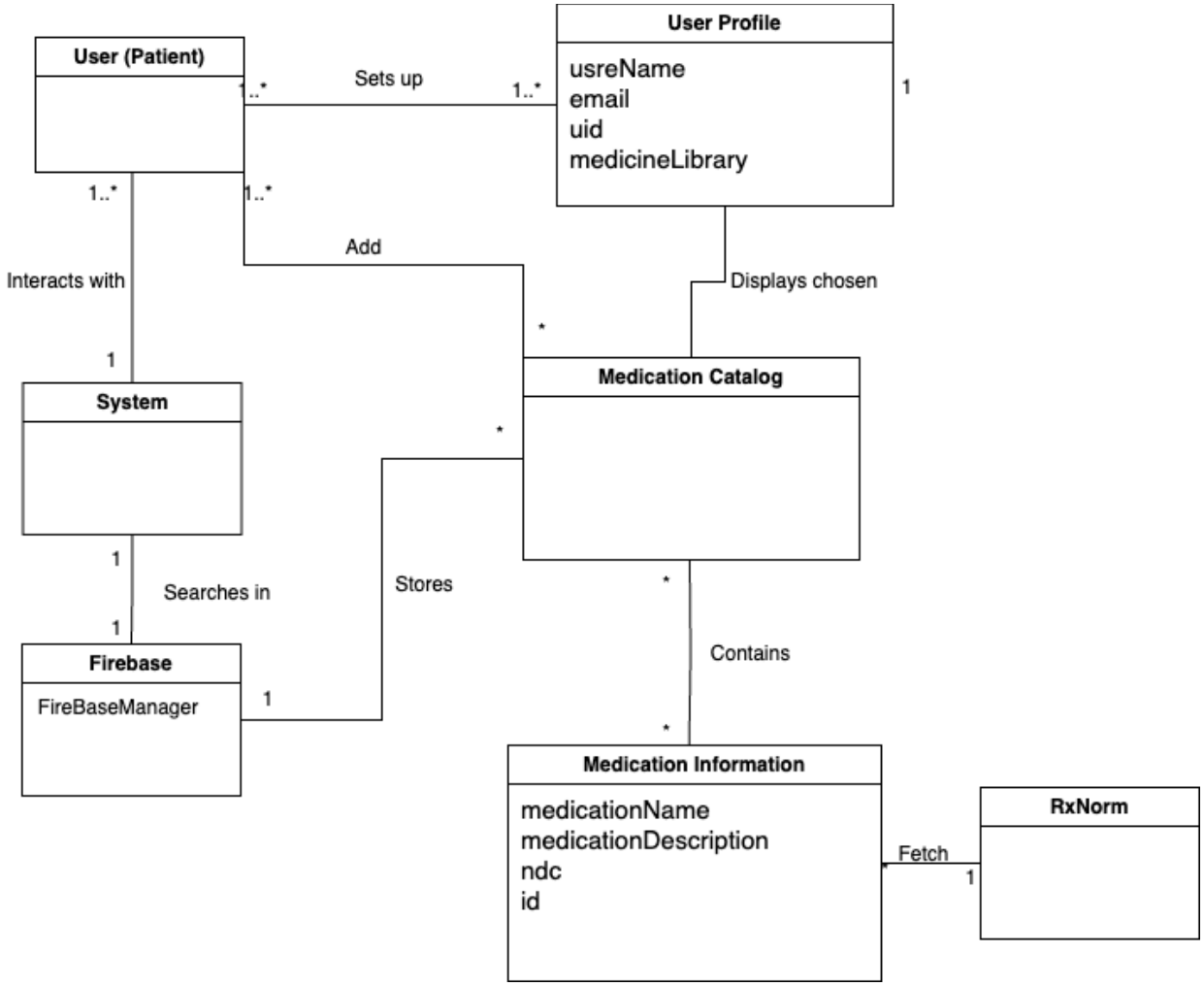
searchMedicationByBarcode







3. Domain Model: Develop **one domain model** that encompasses the fundamental concepts and associations relevant to the chosen use case scenarios. The domain model should include all significant concepts, their attributes along with data types, and associations. Each association within the domain model should be well-defined with a name and multiplicity.



4. Operation Contracts: Based on the SSDs, write different **operation contracts** for the main significant operations using the provided template. In the post-conditions section of the operation contract, explicitly describe any of the following: the creation of an object instance, the formation of an association, or the modification of an attribute (20 points).

Search Medicine by Scanning Barcode

contract

Name: searchMedicationByBarcode

Responsibilities: Search for medication information in the database based on the code that the user scans.

Preconditions: User is authenticated and logged into the system.

System successfully recognizes the barcode.

System is functional and has access to the RxNorm medication database.

Medication exists in the database.

The barcode is a valid barcode.

Postconditions:

- A medication search is displayed with the detailed information about the medication, including its name, description, instructions for use, and potential side effects. (*MedicationInformation*)
- The medication searched is associated with this *User* and stored in the user profile.
- The *UserProfile* is modified to include the newly added medication.

Search Medicine By Inputting Medicine Name

contract

Name: searchMedicationByManullyInput

Responsibilities: Search for medication information in the database based on the name user input. If searched, present the medicine information (e.g., name, brand, price and others) to the user.

Preconditions: User is authenticated and logged into the system.

System is functional and has access to the RxNorm medication database.

Medication exists in the database.

Postconditions:

- A medication search is displayed with the detailed information about the medication, including its name, description, instructions for use, and potential side effects. (*MedicationInformation*)
- The medication searched is associated with this *User* and stored in the user profile. (AddUserProfile)
- The *UserProfile* is modified to include the newly added medication.
- If the barcode is not kept in the database, that we couldn't search it,

  Present a window that we couldn't search for the information of the medicine.

Set Up Medication Reminder

contract

Name: setUpMedicineReminder

Responsibilities:

- Set up reminder according to the requirement of user
- Remind the user at the assigned time: Ensure that the system sends timely reminders to the user according to the set schedule.

Preconditions:

- User is authenticated and logged into the system.
- User has searched for the information of the medicine

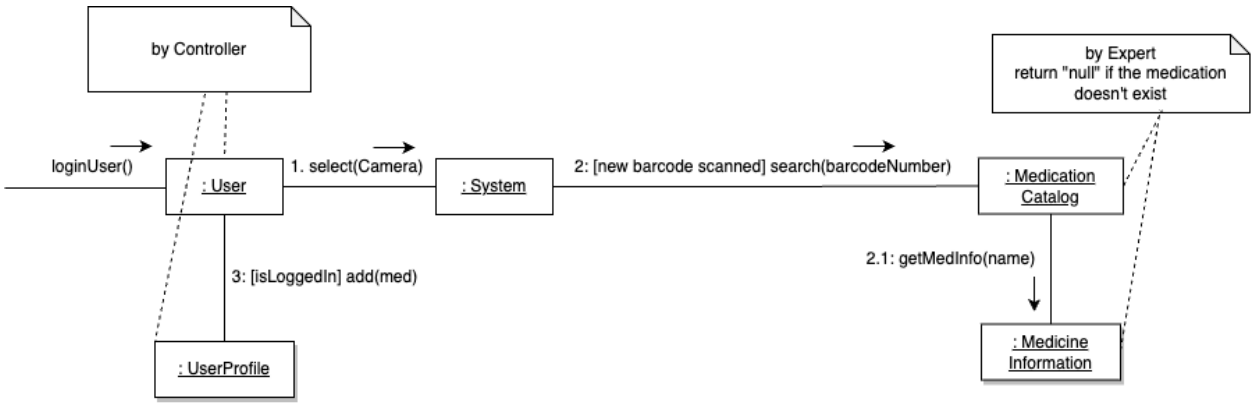
- Medication exists in the database.
- The time module of the phone is accurate.
- User selected one medication

Postconditions:

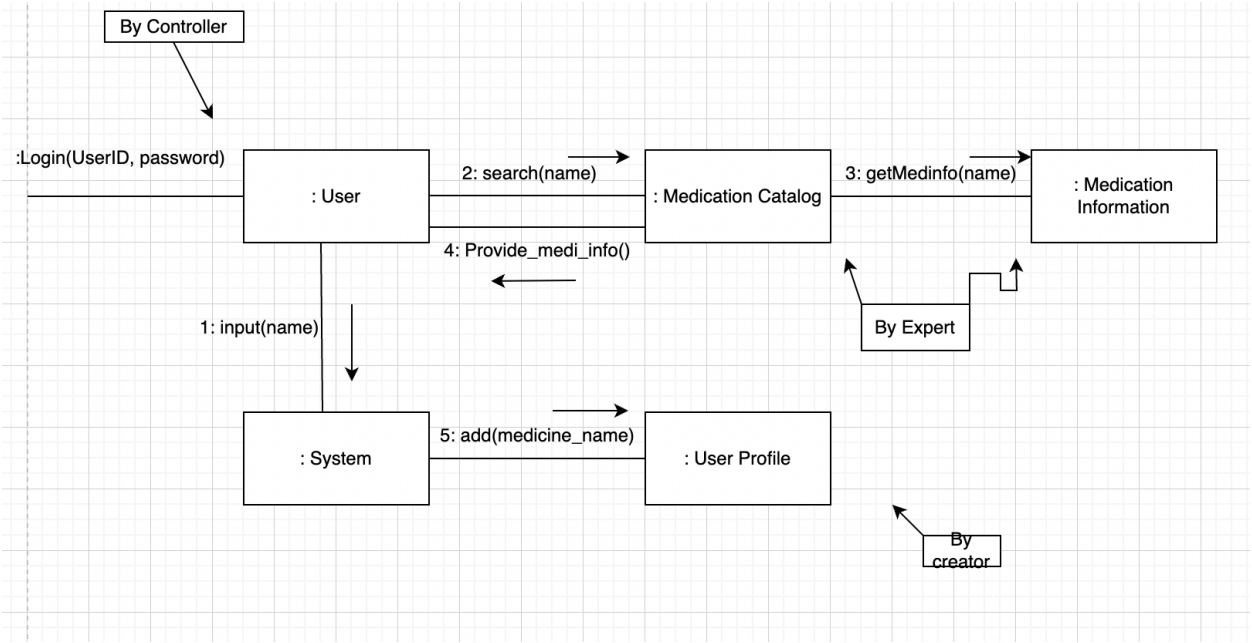
- A medication reminder is created
- The user's phone rings and a message pop up at the assign time.
- The user is reminded for the medication

5. UML Interaction Diagram: Utilize the operation contracts developed in the previous step as a reference. **Create a UML interaction diagrams** that visualizes the interactions between objects during the execution of the selected operation. Annotate the messages in the diagram with GRASP patterns such as Expert, Creator, etc., where applicable.

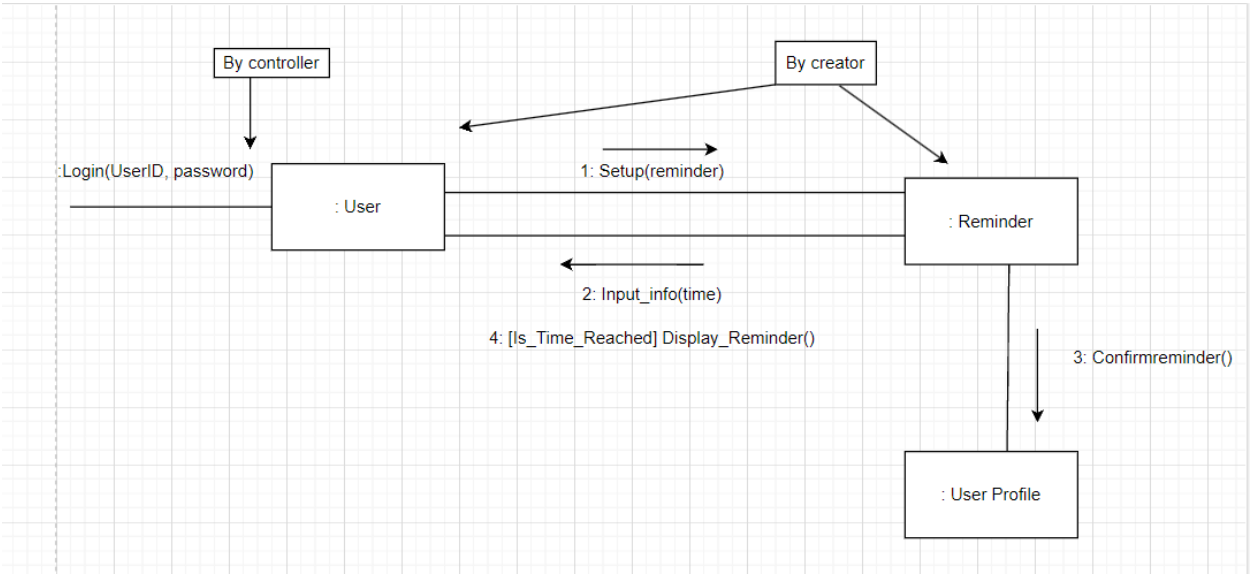
Search Medicine by Scanning Barcode



Search Medicine By Inputting Medicine Name



Set Up Medication Reminder



6. Bounded by the domain model, operation contracts and the interaction diagrams, create the final **class diagram** that you will move forward with for this system.