

Software Requirements and Design Document



for

HemoSys: Blood Management System

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1. Introduction

1.1 Scope:

The scope of this project is to develop a comprehensive blood management system tailored to the needs of healthcare institutions, blood banks, and donors. While there are existing blood management systems, they often lack the versatility and user-friendliness required to efficiently manage the entire blood donation and distribution process. HemoSys will cater to a broader healthcare network, making it easier for donors to contribute and healthcare facilities to access and utilize blood resources effectively.

1.2 Objective:

The primary objectives of the HemoSys management system is as following:

1. To develop a user-friendly platform for people willing to register, schedule donations, and receive reminders making it much more convenient.
2. To implement an inventory management system to monitor blood supplies, expiration dates, and demand prediction.
3. To enhance transparency and traceability by providing real-time information to healthcare facilities about available blood units, reducing wastage, and ensuring timely access to blood.
4. To promote donor engagement through educational resources, awareness campaigns, and incentives which will encourage regular blood donation.
5. To be able to give quick responses to emergencies by facilitating rapid blood requests and deliveries which will save lives.

1.3 Title: "HemoSys: Blood Management System for Enhanced Healthcare"

1.4 Problem Statement and Description:

Motivated by the need for better blood management, HemoSys is a project aiming to revolutionize the process. The current system involves a great deal of paperwork and difficulties in gauging available blood supplies, which can lead to shortages in dire situations. The need for improved management is evident and HemoSys aims to meet that demand. Because of the increase in app and website usage, along with advancing technology, they are optimistic about the potential success of the project. To ensure safety and compliance, collaboration with blood banks and hospitals is a key component.

Using technology to enhance the handling of blood donations and distribution, HemoSys strives to revolutionize blood management and ultimately, save lives.

2. Overall Description

2.1 Use Cases

1. Register Donor
2. Record Blood Donation
3. Manage Blood Inventory
4. Search for Donors
5. Request Blood Transfusion
6. Manage Blood Drives
7. Authenticate Users and Roles
8. Generate Reports and Statistics
9. Notify Donors and Volunteers
10. Manage Donor Rewards Program
11. Blood Component Separation
12. Emergency Response Coordination

2.2 Extended Use Cases

- 1.A) Use case name: Register Donor
- B) Scope: Blood Bank Management System
- C) Level: User goal
- D) Primary Actor: Donor
- E) Stakeholders and Interests:

Blood Bank Staff:

The blood bank staff would be responsible for data accuracy, registration and verification of the donors.

Blood Bank Admin:
Admin would like to access the donor's information to make sure the work flow. They may need to access the information for generation of the reports.

F) Pre conditions:

The donor is getting access to the registration process.

The donor is willing to provide non-public information and clinical history.

G) Post Conditions:

The donor's information is securely saved within the blood bank database.

A unique donor id or registration variety is assigned to the donor.

The donor may additionally choose to agenda a donation appointment.

H) Main success scenario:

The system presents donor with a registration form and the donor provides his/her personal information.

The system checks and validates the donor's information.

The system provides donor with unique ID or registration number.

The donor logs in to the software

The donor gets access to the software.

The donor is offered with the choice to time table a donation appointment or to participate in upcoming blood donation drives if to be had.

Extensions:

The donor provides wrong information while registration. The registration stops and the donor is provided with an error message. The software gives prompt to a user asking to provide correct information.

2.A) Use case name: Record Blood Donation

B) Scope: Blood Bank Management System

C) Level: User goal

D) Primary Actor: Blood Bank Staff

E) Stakeholders and Interests:

Blood Bank Staff:

The blood bank staff initiates and completes the process of recording blood donation for the sake of accuracy in the system.

Admin need access to the donation records for the inventory management.

F) Pre conditions:

The Blood Bank Staff is authorized to record the blood donation.

The donor is willing to donate blood.

The donor has successfully logged in to the system.

G) Post Conditions:

The donation's record is successfully saved into the database.

The donor's history is updated with the new record.

The inventory of the system is updated with the newly collected blood.

H) Main success scenario:

Blood bank starts the "Record Blood Donation" option in the system.

The system selects the donor who is willing to donate the blood.

The staff verifies the donor's account and checks for donor's any recent donation history.

If the donor is authorized, staff prepare the donor for the blood donation process.

The blood bank staff records the vital information.

Once the donation is complete, the system updates the donation history of the donor.

Extensions:

If the donor is found ineligible, system stops the donation process.

3.A) Use case name: Manage Blood Inventory

B) Scope: Blood Bank Management System

C) Level: User goal

D) Primary Actor: Blood Bank Staff

E) Stakeholders and Interests:

Blood Bank Staff:

The blood bank staff initiates and completes the process of recording blood donation and tracking expiration dates.

Donor:

Expects a well-managed blood inventory system when needed for medical treatments.

Blood Bank Admin:
Admin need for the inventory management such as updating.

F) Pre conditions:

The Blood Bank Staff is authorized to update the inventory.

The blood products are available in the inventory that need management.

G) Post Conditions:

The blood's inventory is updated during the use case in the database.

The database is updated correctly. No exception has occurred.

H) Main success scenario:

System displays the inventory to the user. It'll show current status of the inventory.

The staff selects a specific type to manage.

The system provides with different options such as add, update and remove.

The staff enters the specific details for the selected option.

The system updates the inventory accordingly.

Extensions:

The staff tries to do invalid data entry.

The staff tries to remove more blood units than are available.

The staff tries to remove the blood units that are not expired yet.

4.A) Use case name: Search for donors

B) Scope: Blood Bank Management System

C) Level: User goal

D) Primary Actor: Blood Bank Staff

E) Stakeholders and Interests:

Blood Bank Staff:

The blood bank staff initiates and completes the process of searching for the potential owners.

Donor:

Expects to be contacted with blood donation opportunities.

Blood Bank Admin:
Use search results for updating the database.

F) Pre conditions:

The Blood Bank Staff is authorized to record the blood donation.

G) Post Conditions:

The search results are displayed to the Blood Bank staff.

The staff can further contact with the donors.

The search history and results are updated in the database.

H) Main success scenario:

The system provides the staff with an interface to search the donors.

The staff enters the desired search criteria.

The system searches for the desired search criteria and displays a list with names and information of the potential donors.

The staff reviews the profile of the donors who can match the desired search.

The staff contacts with the desired donor via any specific contact method.

Extensions:

No donors with desired search criteria appear on the screen.

There is no contact available of the donor that is selected.

5.a. Use case name: Request blood transfusion
b. Scope the system under design: HemoSys Blood Management System
c. Level: User Goal
d. Primary actor: Healthcare facility
e. Stakeholders and interests: Healthcare facility as they want to request blood transfusion
f. Preconditions: Healthcare facility is registered
g. Post condition: Blood transfusion request is submitted

h. Main success scenario:

Healthcare facility logs in

They select the "Request Blood Transfusion" option.

Required blood type and quantity for the transfusion are specified

Blood transfusion request is

i. Extensions:

The required blood type and quantity is not available

They are given the option to wait and check again

Make a special request on urgent basis

6.a. Use case name: Manage Blood Drives

b. Scope the system under design: HemoSys Blood Management System

c. Level: User Goal

d. Primary actor: Blood Bank

e. Stakeholders and interests: Blood Bank is the stakeholder as they want to organize and manage blood drives.

f. Preconditions: Blood bank is registered.

g. Post conditions: Blood drive is organized and managed within the system.

h. Main success scenario:

1. Blood bank logs in.

2. Blood bank selects the "Manage Blood Drives" option.

3. Blood drive details, including location, date, and time, are entered.

4. Blood drive is successfully organized and managed.

i. Extensions:

If there are any changes in the location, date or time the user is notified.

7. a. Use case name: Authenticate Users and Roles

b. Scope the system under design: HemoSys Blood Management System

c. Level: Sub function

d. Primary actor: System

e. Stakeholders and interests: The System and everyone is the stakeholder as it wants to authenticate users and assign roles.

f. Preconditions: User attempts to log in.

User registration information is available in the system.

g. Post conditions: User is authenticated and assigned a role based on the credentials.

h. Main success scenario:

1. User provides login credentials.

2. System validates the credentials.

3. System assigns the appropriate role to the user based on their credentials.

i. Extensions:

If the provided credentials are invalid, the system prompts the user to retry or recover their account by resetting their password or contacting system support.

8. a. Use case name: Generate Reports and Statistics

b. Scope the system under design: HemoSys Blood Management System

c. Level: User Goal

d. Primary actor: System Administrator

e. Stakeholders and interests: System Administrator is the stakeholder as its interest is to generate reports and statistics.

f. Preconditions:

System Administrator is logged in.

Data required for generation reports is available.

g. Post conditions: Reports and statistics are generated.

h. Main success scenario:

The System Administrator logs into the HemoSys system.

The Administrator selects the "Generate Reports and Statistics" option from the system's menu.

The system presents the Administrator with a set of options to configure the parameters for the desired reports and statistics.

The Administrator selects the desired configuration, which may include date ranges, report types (e.g., donor activity,

blood supply), and output formats (e.g., PDF, CSV).

The system processes the request and generates the specified reports.

The generated reports and statistics are made available for viewing and downloading by the Administrator.

i. Extensions:

If there are errors or issues during report generation, the system provides error messages or notifications to the Administrator and offers options for troubleshooting or reporting the problem

9 a. Use case name: Notify Donors and Volunteers

b. Scope the system under design: HemoSys Blood Management System

c. Level: User Goal

d. Primary actor: System

e. Stakeholders and interests: Donors and Volunteers are the stakeholders who are interested in wanting to receive notifications and updates.

f. Preconditions: Notification event triggers.

g. Post conditions: Donors and volunteers receive notifications.

h. Main success scenario:

A notification event is triggered within the HemoSys system (e.g., an upcoming blood drive is scheduled or an emergency blood request is initiated).

The system generates notifications containing event details and relevant information.

The system uses available contact information (e.g., email addresses or app notifications) to send notifications to donors and volunteers.

Donors and volunteers receive the notifications on their preferred communication channels.

i. Extensions:

If the system encounters issues while sending notifications (e.g., due to incorrect contact information), it logs the errors for further review, and administrators can manually follow up with affected users.

10. a. Use case name: Manage Donor Rewards Program

b. Scope the system under design: HemoSys Blood Management System

c. Level: User Goal

d. Primary actor: Donor Rewards Program Administrator

e. Stakeholders and interests: Administrator is the stakeholder who wants to manage the donor rewards program.

f. Preconditions: Administrator is logged in.

g. Post conditions: Donor rewards program is managed and updated.

h. Main success scenario:

Administrator logs into the HemoSys system.

The Administrator selects the "Manage Donor Rewards Program" option.

The system provides a comprehensive interface for the Administrator to view and edit various aspects of the donor rewards program, such as point allocation, reward tiers, and incentives.

The system applies the changes to the donor rewards program, and these changes are immediately reflected.

i. Extensions:

If changes to the donor rewards program result in a substantial modification of the existing rules or incentives, the system may notify donors about the updates to ensure transparency and clarity

11. a. Use case name: Blood Component Separation

b. Scope the system under design: HemoSys Blood Management System

c. Level: User Goal

d. Primary actor: Blood Bank Technician

e. Stakeholders and interests: Blood Bank Technician is the stakeholder who wants to separate blood components so they can be categorized accordingly;

f. Preconditions:

Blood units are available for separation.

Blood bank technician is logged into the system.

g. Post conditions: Blood components are successfully separated.

h. Main success scenario:

A Blood Bank Technician logs into the HemoSys system.

The technician selects the "Blood Component Separation" option from the system's menu.

The technician selects the specific components to be separated (e.g., plasma, red blood cells) and specifies quantities.

Upon successful separation, the system updates the inventory to reflect the availability of the separated components

i. Extensions:

If issues arise during the separation process (e.g., equipment malfunctions or inadequate quantities), the system can log these issues for review by administrators or technicians for resolution.

12. a. Use case name: Emergency Response Coordination

b. Scope the system under design: HemoSys Blood Management System

c. Level: User Goal

d. Primary actor: Emergency Response Coordinator

e. Stakeholders and interests: Emergency Response Coordinator is the stakeholder here who wants to coordinate emergency blood responses.

f. Preconditions: Emergency response is required.

g. Post conditions: Emergency blood response is initiated.

h. Main success scenario:

The Emergency Response Coordinator logs into the HemoSys system.

The Coordinator selects the "Emergency Response Coordination" option from the system's menu.

The system presents an interface to specify the nature and urgency of the emergency (e.g., trauma, surgery, disaster).

The Coordinator enters the details of the emergency, including required blood types and quantities.

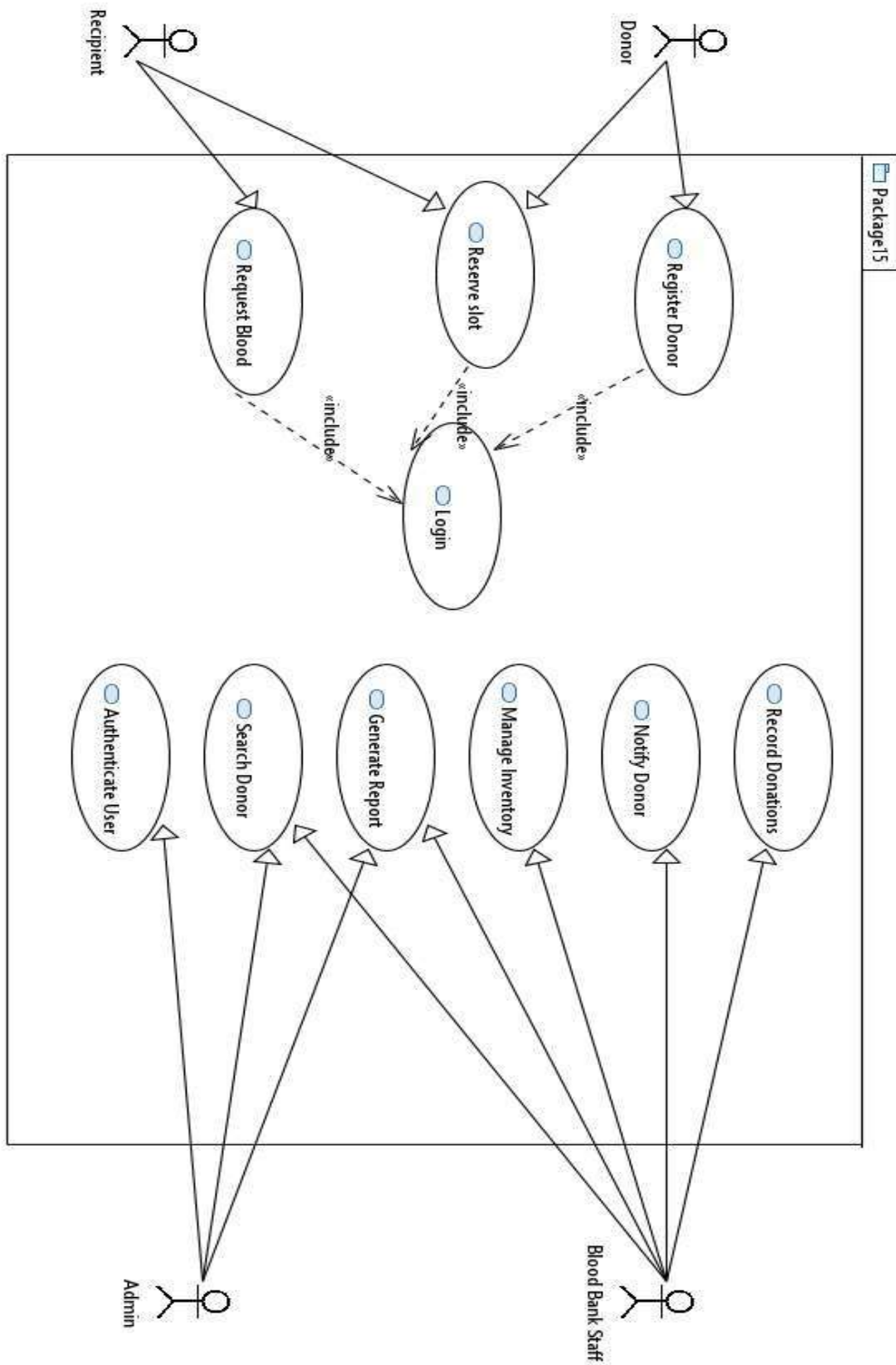
The system processes the request and identifies available blood units that match the emergency requirements.

The system notifies relevant blood banks and healthcare facilities to prepare and deliver the required blood units urgently.

i. Extensions:

If there are delays or complications in coordinating the emergency response, the system can provide updates and escalate the situation to higher authorities or administrators for resolution

2.3 Use Case Diagram



3. Other NonFunctional Requirements

3.1 Performance Requirements

- Response Time: The system should provide responses to user interactions within a maximum response time of 2 seconds to ensure a seamless and efficient user experience.
- Scalability: The system must be able to handle an increasing number of users and data entries without a significant degradation in performance. It should scale to support the growing demands of blood donation activities.

3.2 Safety Requirements

- Data Integrity: The system must ensure the integrity of donor information, blood records, and inventory to prevent data corruption or loss. Regular backups and a robust data recovery plan should be in place.
- User Authentication: To maintain the safety and confidentiality of donor data, the system must implement secure user authentication measures, such as multi-factor authentication, for authorized access.

3.3 Security Requirements

- Data Encryption: All sensitive data, including donor information and medical records, must be encrypted during transmission and storage to protect against unauthorized access.
- Access Control: The system should enforce role-based access control to ensure that only authorized personnel have access to specific functionalities and sensitive data.
- Audit Trail: A comprehensive audit trail should be maintained to track and log all system activities, providing transparency and accountability.

3.4 Software Quality Attributes

- Reliability: The system should operate reliably without frequent failures, ensuring continuous availability for critical blood management tasks.
- Usability: User interfaces should be intuitive and user-friendly to facilitate efficient interaction, reducing the likelihood of user errors.
- Maintainability: The system should be designed for ease of maintenance, allowing for updates, bug fixes, and future enhancements without significant downtime.

3.5 Business Rules

- Donor Eligibility: The system must enforce predefined eligibility criteria for donors, ensuring that only eligible donors are registered and allowed to donate blood.
- Inventory Management: Business rules should govern the appropriate handling of blood units, including expiration date tracking, proper storage conditions, and adherence to regulatory guidelines.

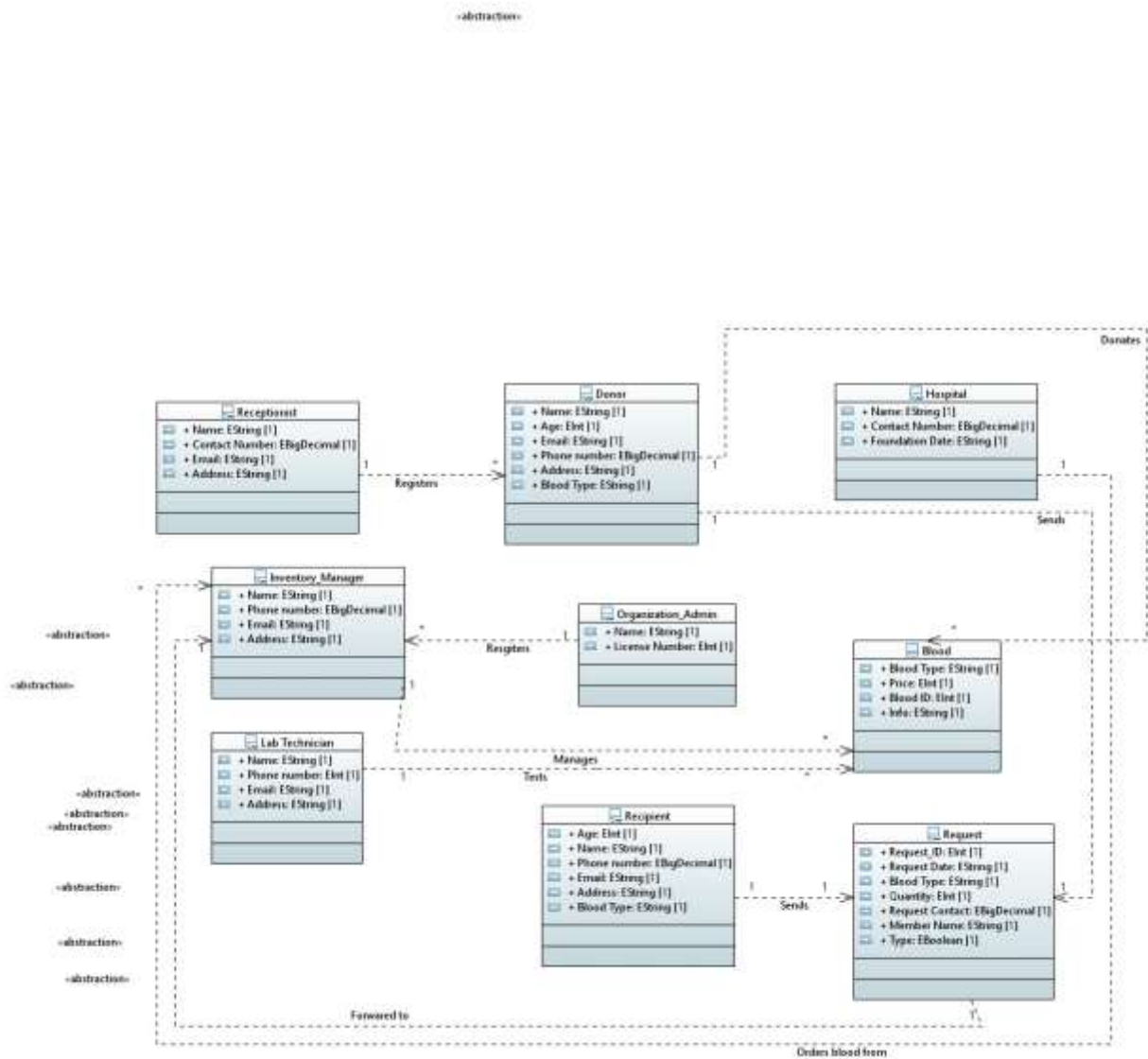
3.6 Operating Environment

- Web Browser Compatibility: The system should be compatible with popular web browsers (e.g., Chrome, Firefox, Safari) to support a diverse user base.
- Platform Independence: The application should be platform-independent, allowing users to access and use the system seamlessly across various operating systems (Windows, macOS, Linux).

3.7 User Interfaces

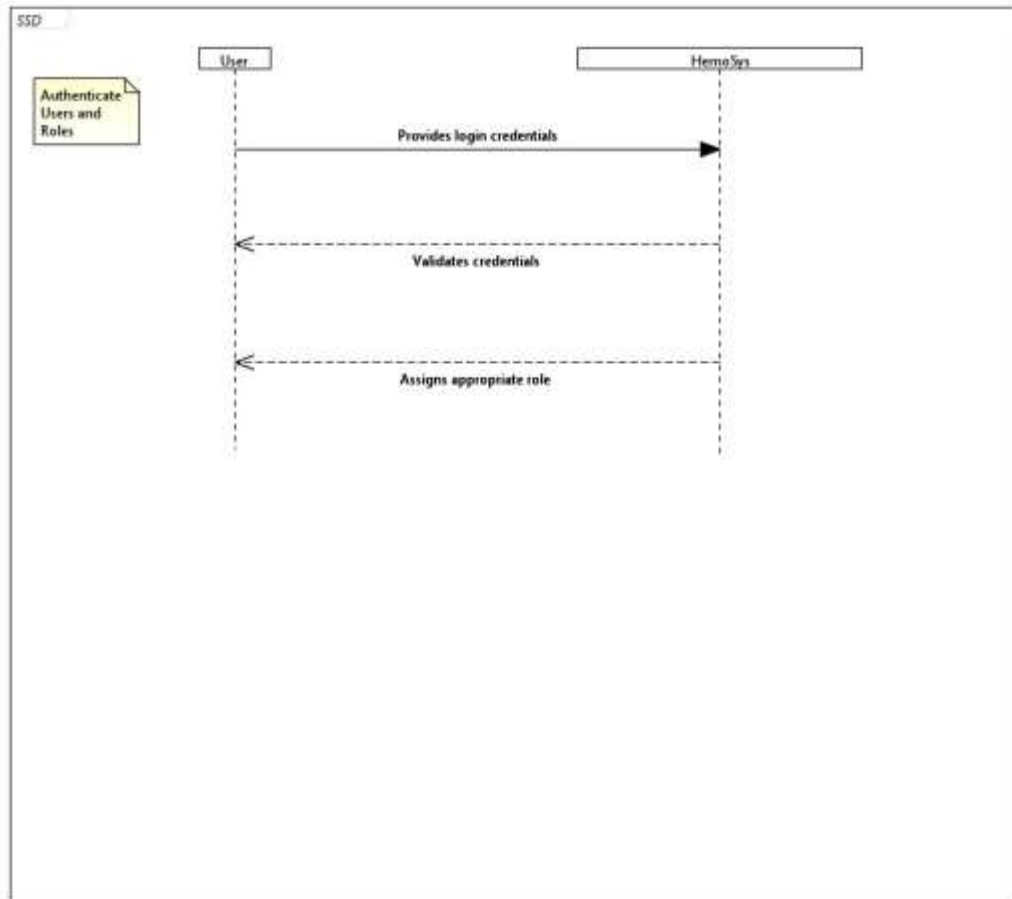
- Intuitive Design: User interfaces should be designed with simplicity and clarity, ensuring that users can navigate and perform tasks with minimal training.
- Accessibility: The system should comply with accessibility standards (e.g., WCAG) to accommodate users with diverse needs and abilities.
- Multi-language Support: User interfaces should support multiple languages to cater to a broad and diverse user community.

4. Domain Model



5. System Sequence Diagrams

(Each SSD has a comment on the top left corner representing its Main Success Scenario)



SSD

Blood
Component
Separation

Blood Bank Technician

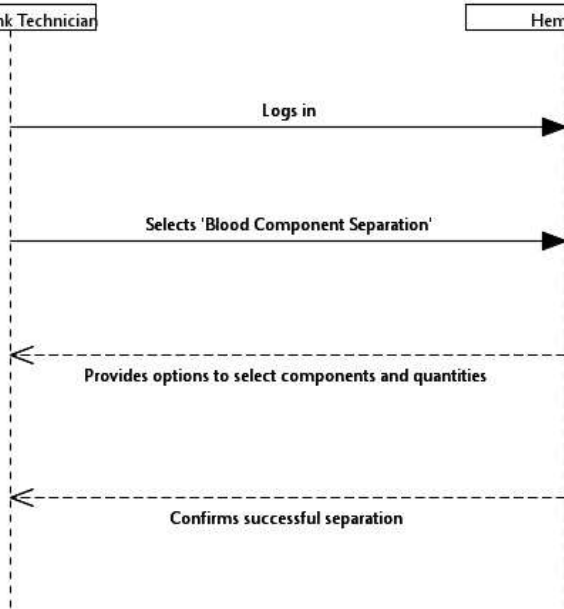
HemoSys

Logs in

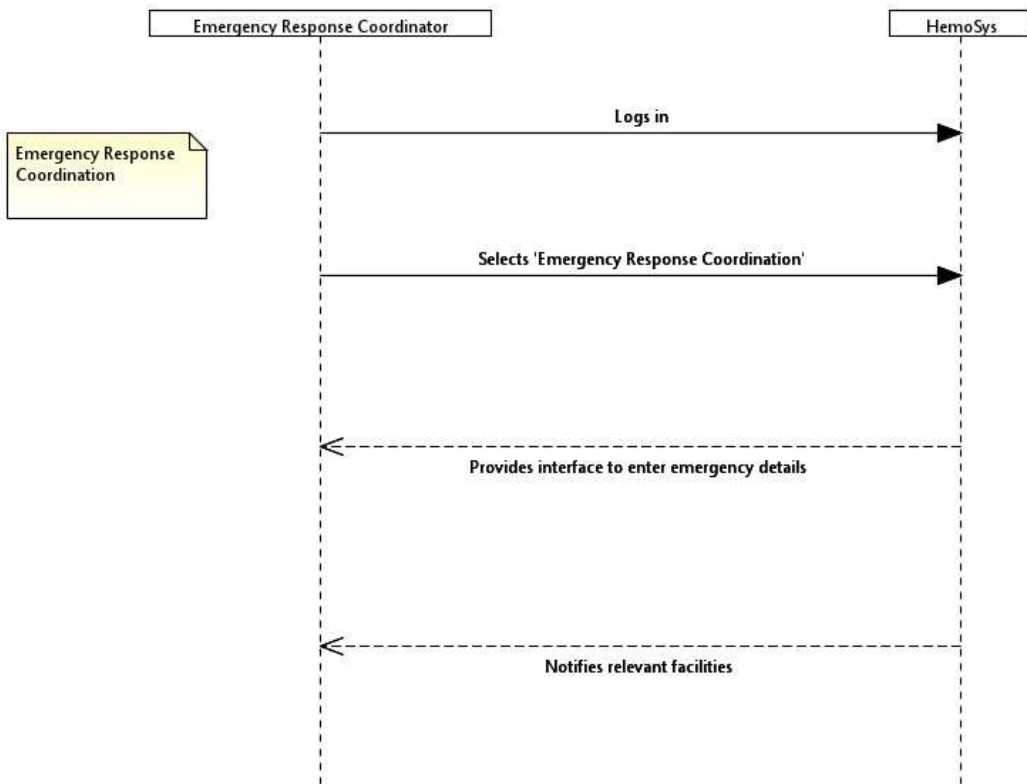
Selects 'Blood Component Separation'

Provides options to select components and quantities

Confirms successful separation



SSD



SSD

Generate
Reports and
Statistics

System Administrator

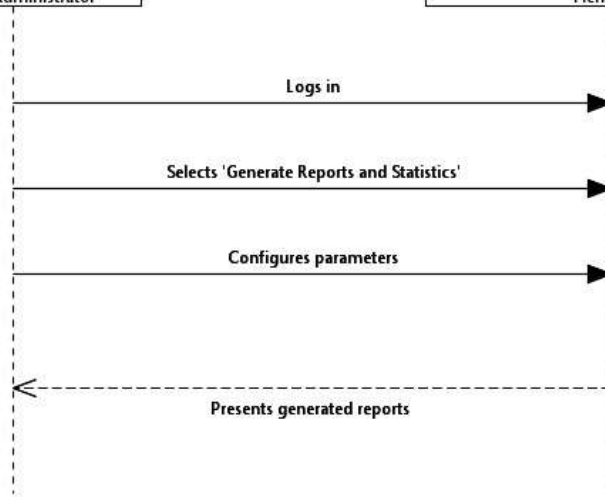
HemoSys

Logs in

Selects 'Generate Reports and Statistics'

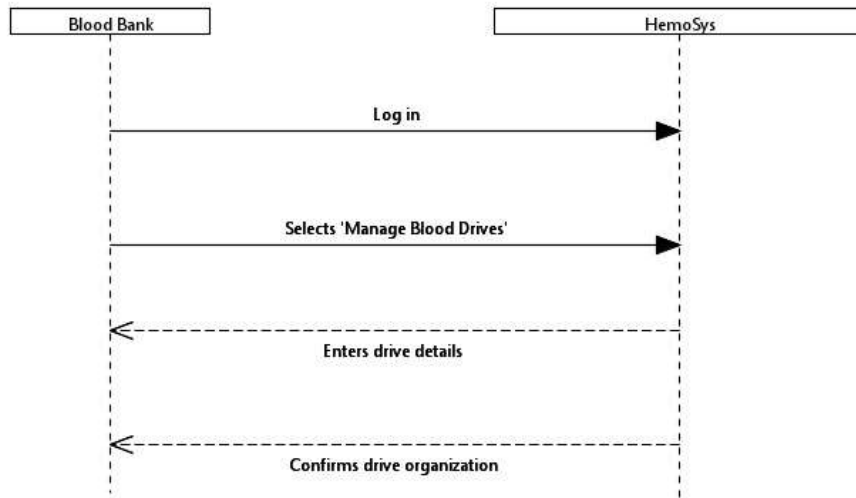
Configures parameters

Presents generated reports

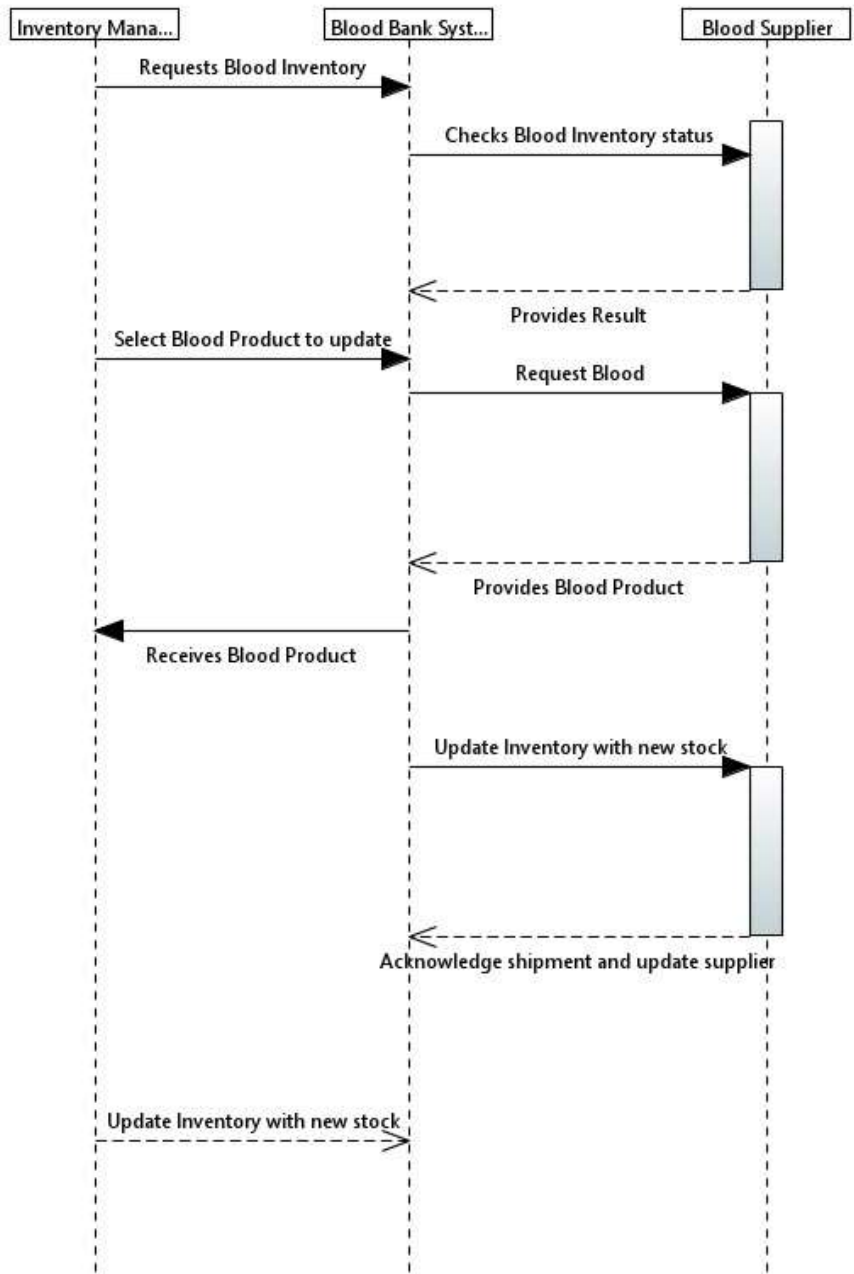


SSD

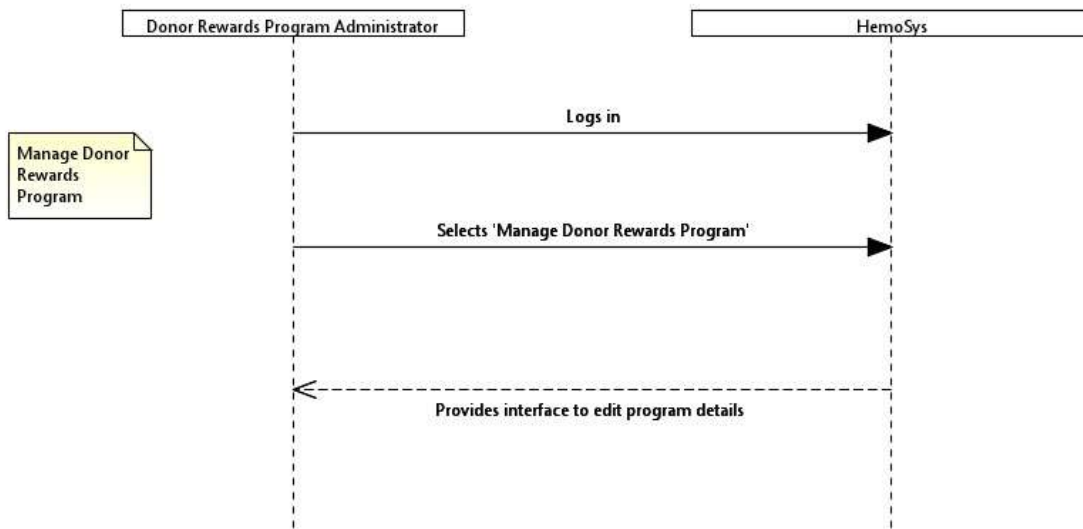
Manage Blood
Drives



Manage Blood Inventory:

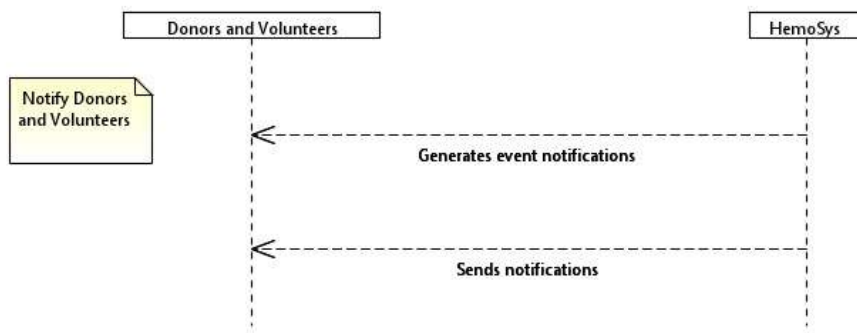


SSD

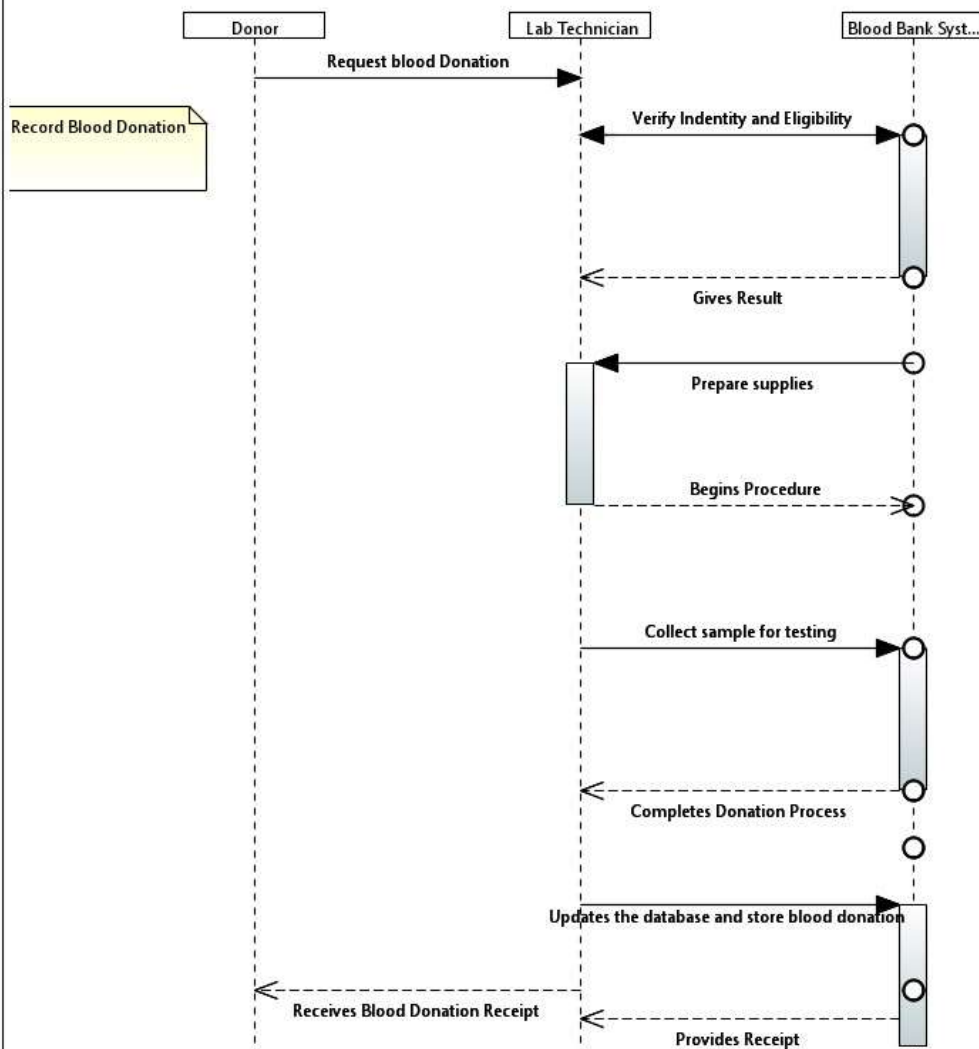


Manage Donor Rewards Program

SSD



SSD



SSD

Register Donor

Donor

Registration Page

Blood bank data...

Main Page

Resgiter(Input)

Input Verification

Verification Result

Add user

Redirection

Dsisplay Error

Valid

Non-Valid

SSD

Blood
transfusion
request

Healthcare Facility

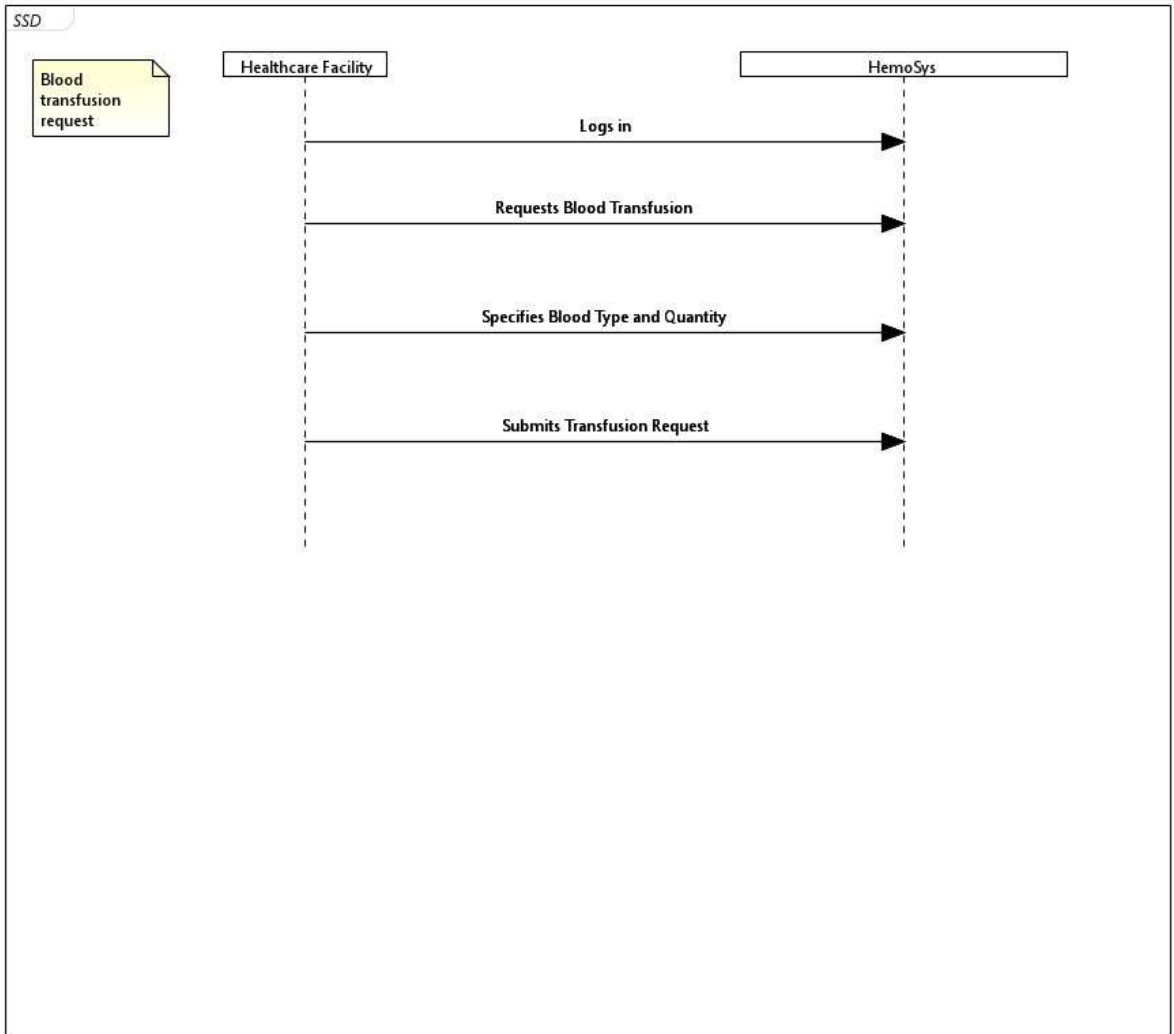
HemoSys

Logs in

Requests Blood Transfusion

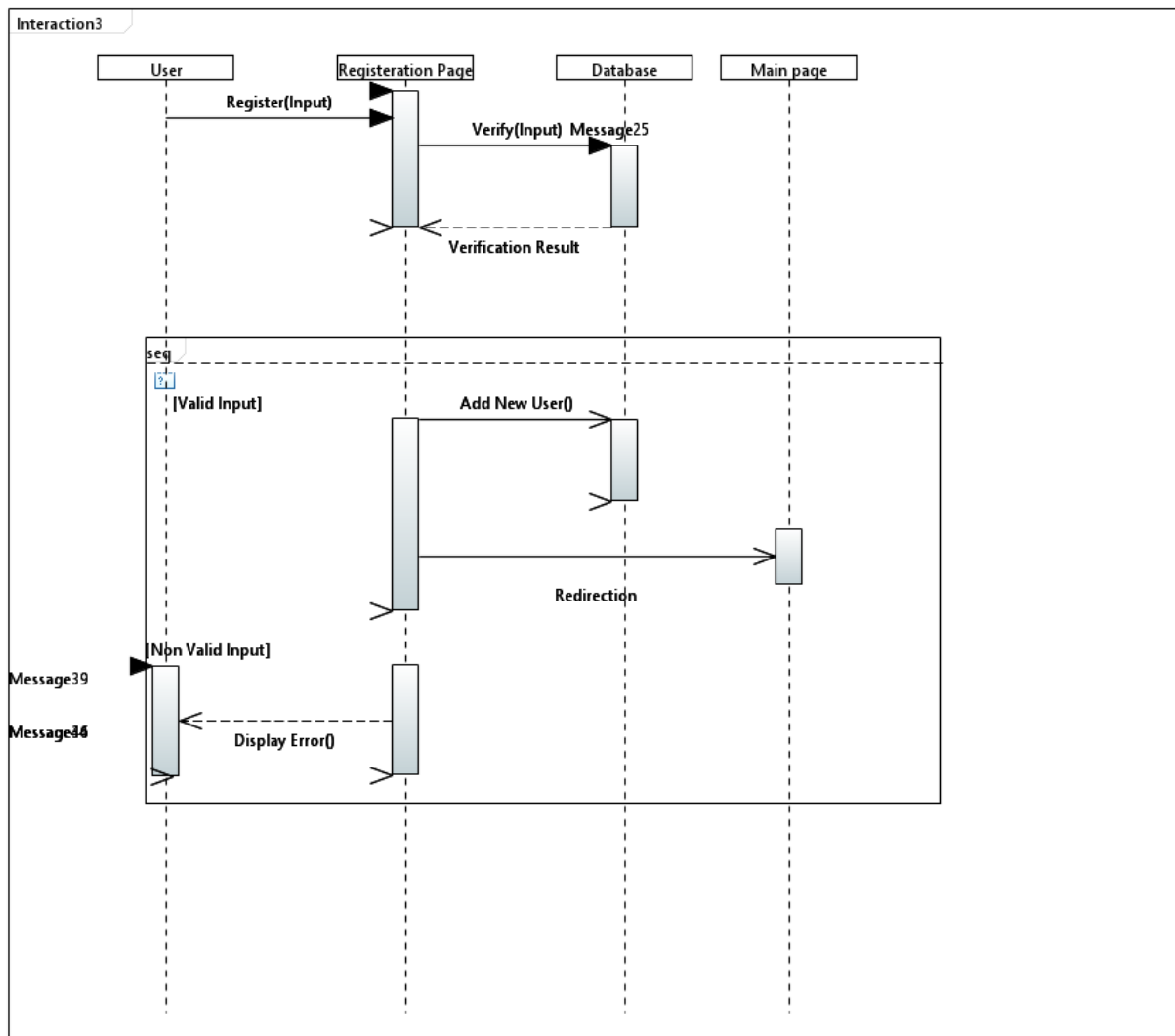
Specifies Blood Type and Quantity

Submits Transfusion Request

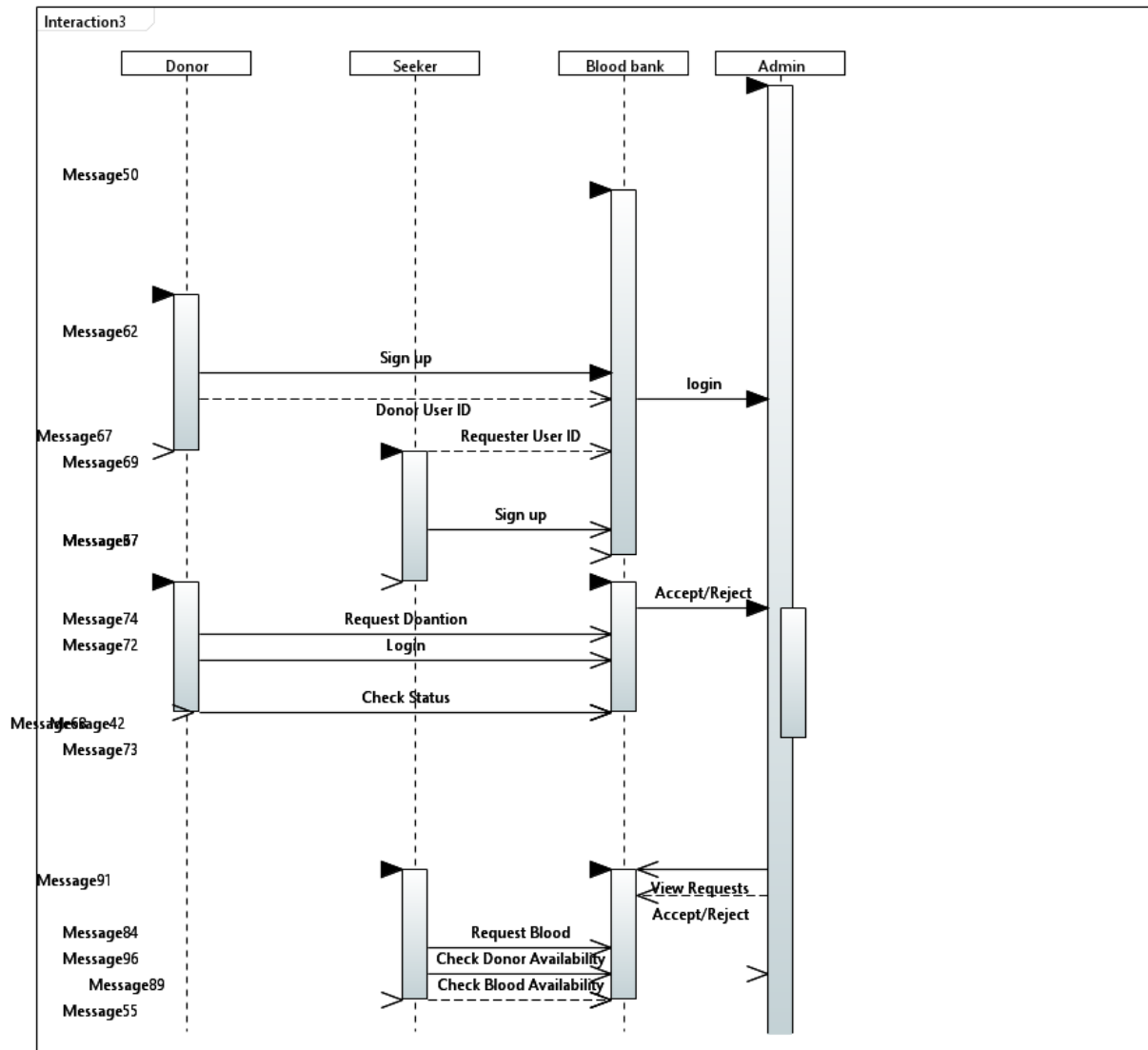


6. Sequence Diagrams

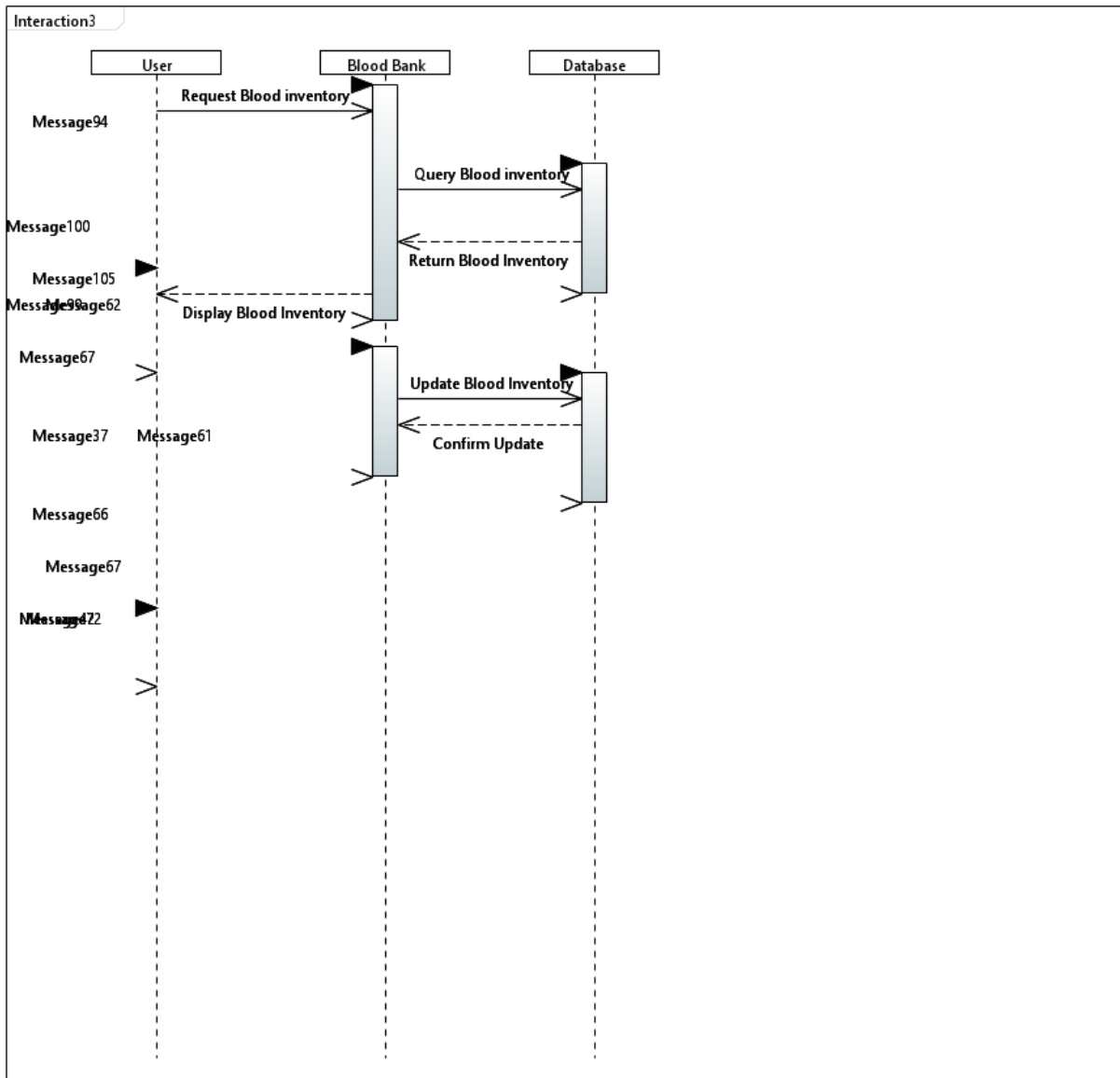
1.



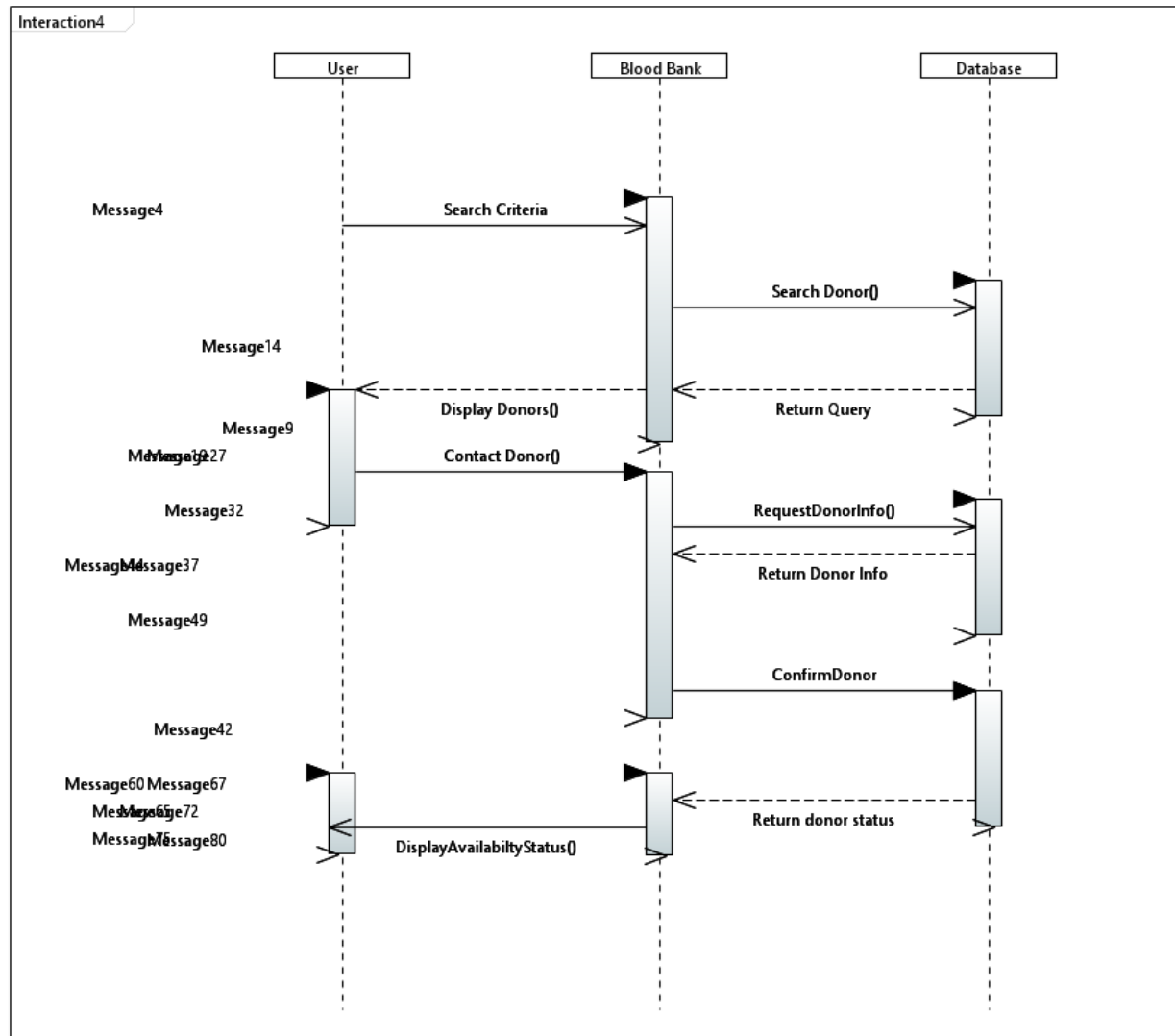
2.



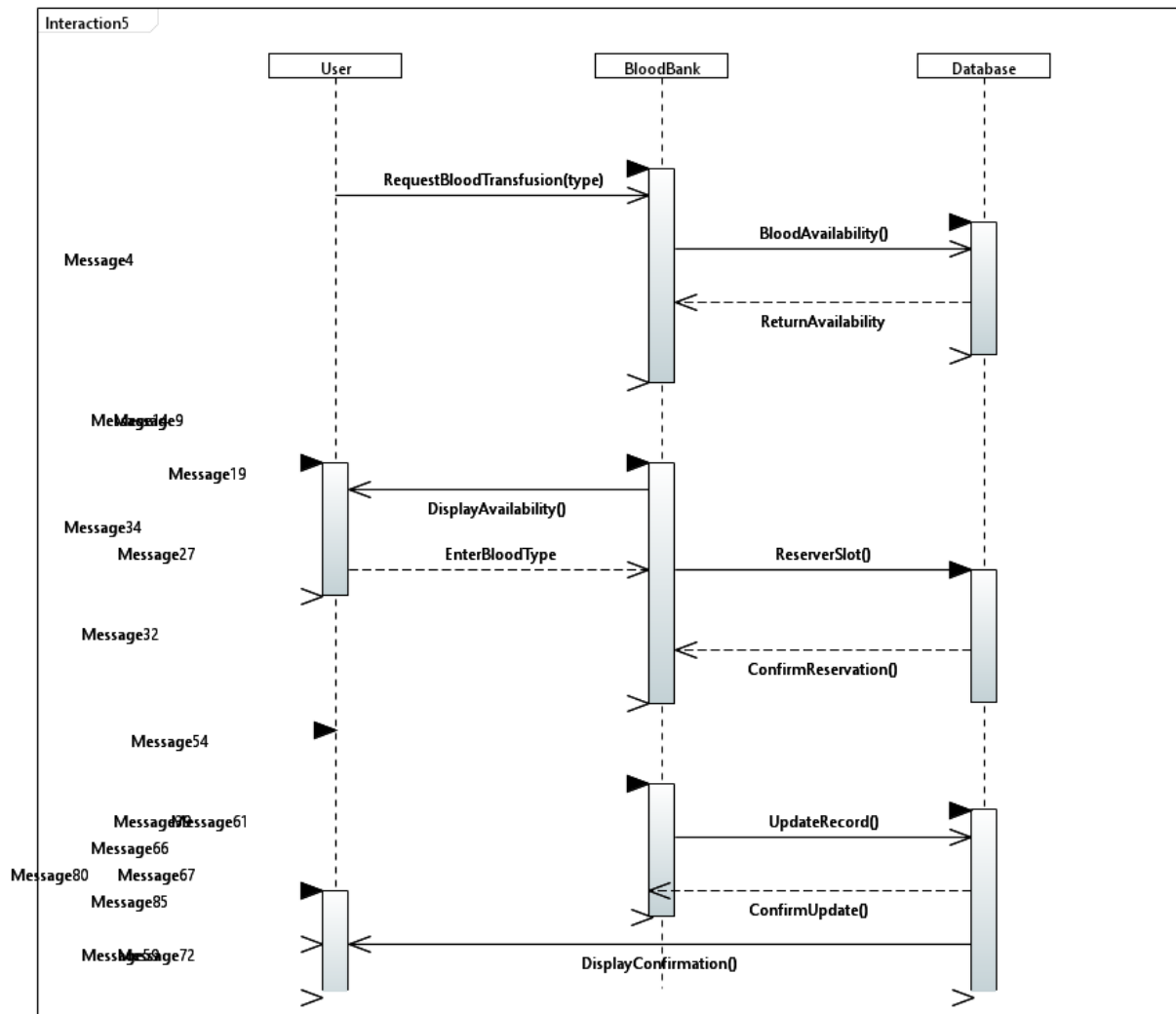
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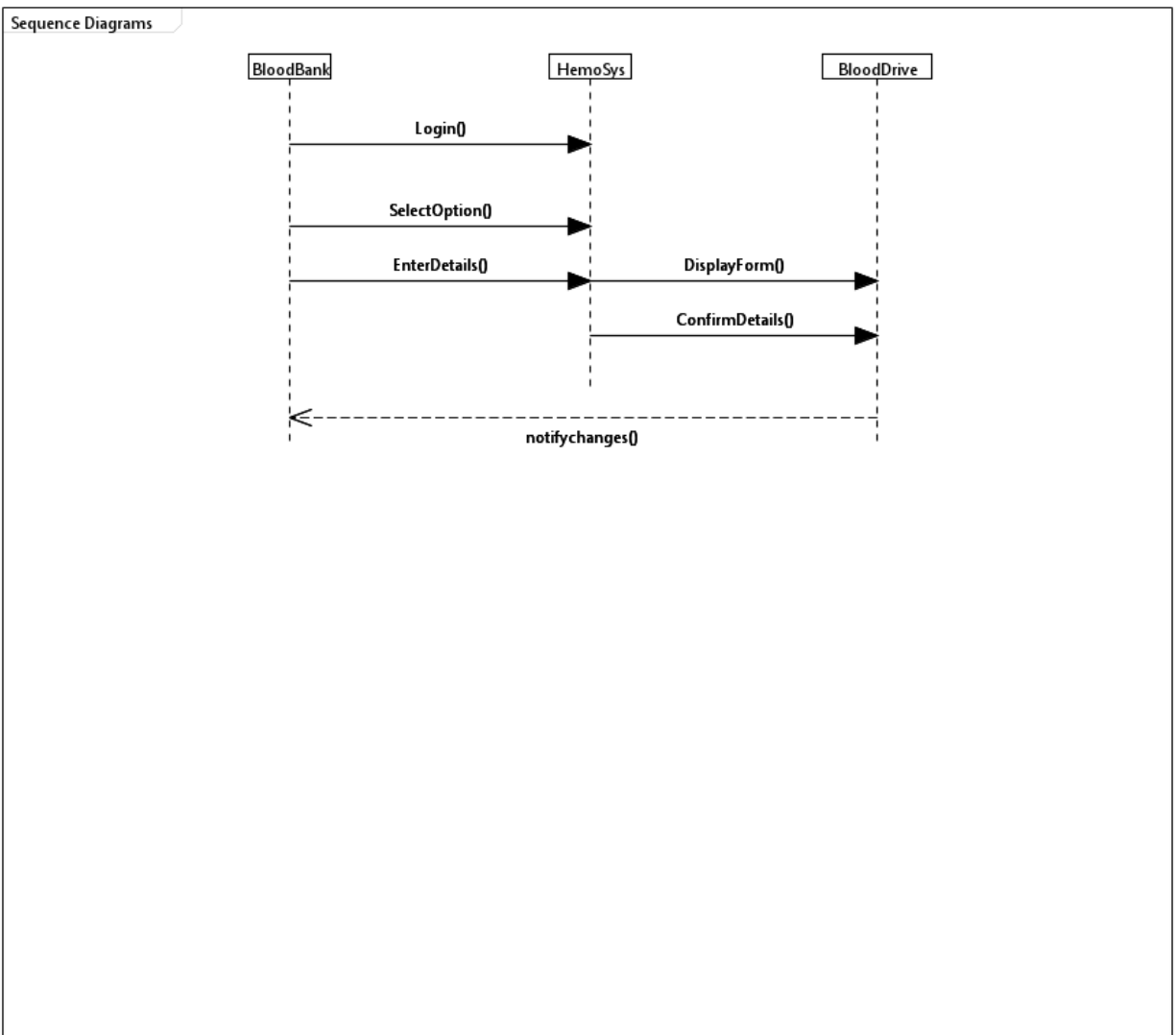
4.



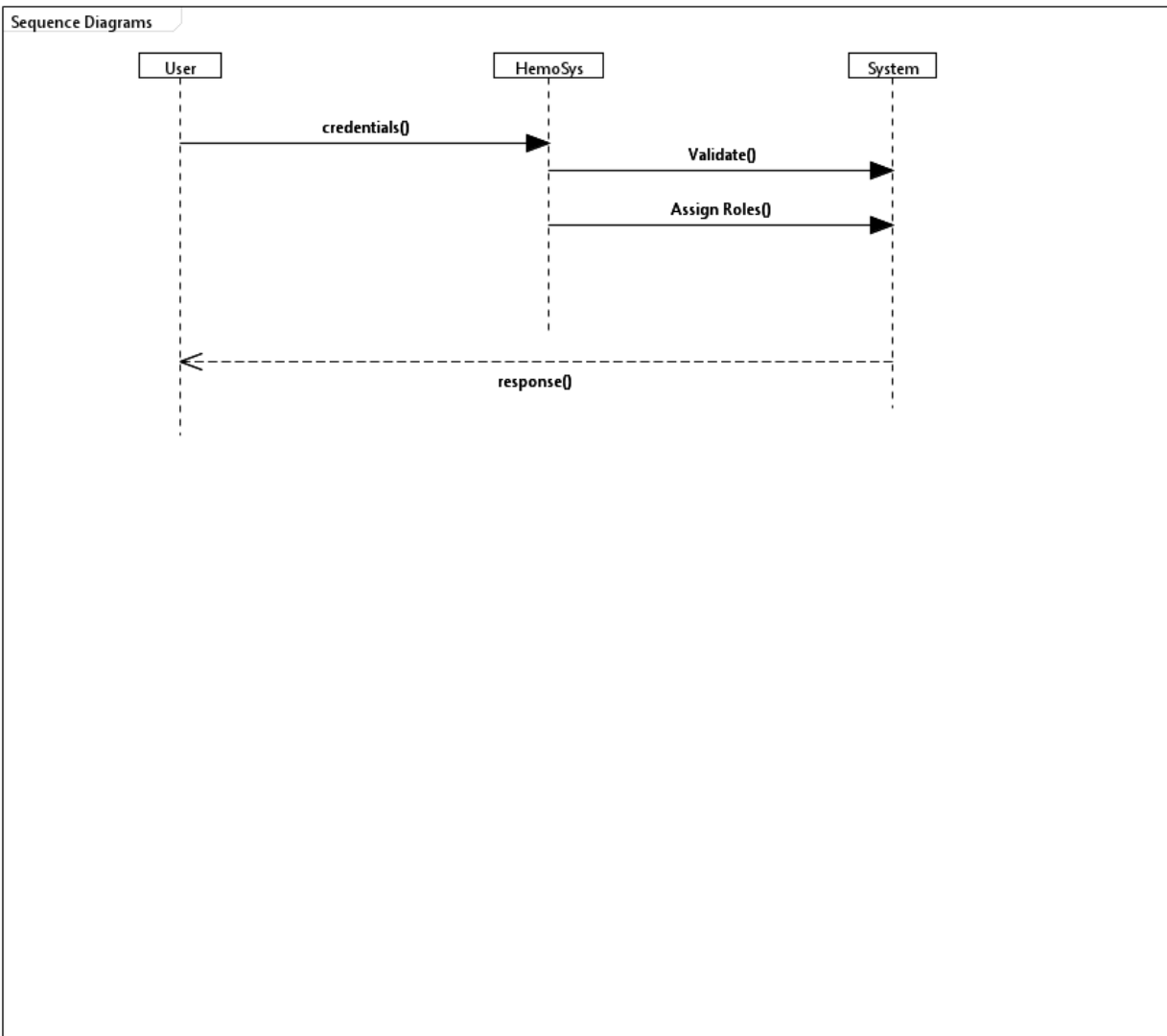
5.



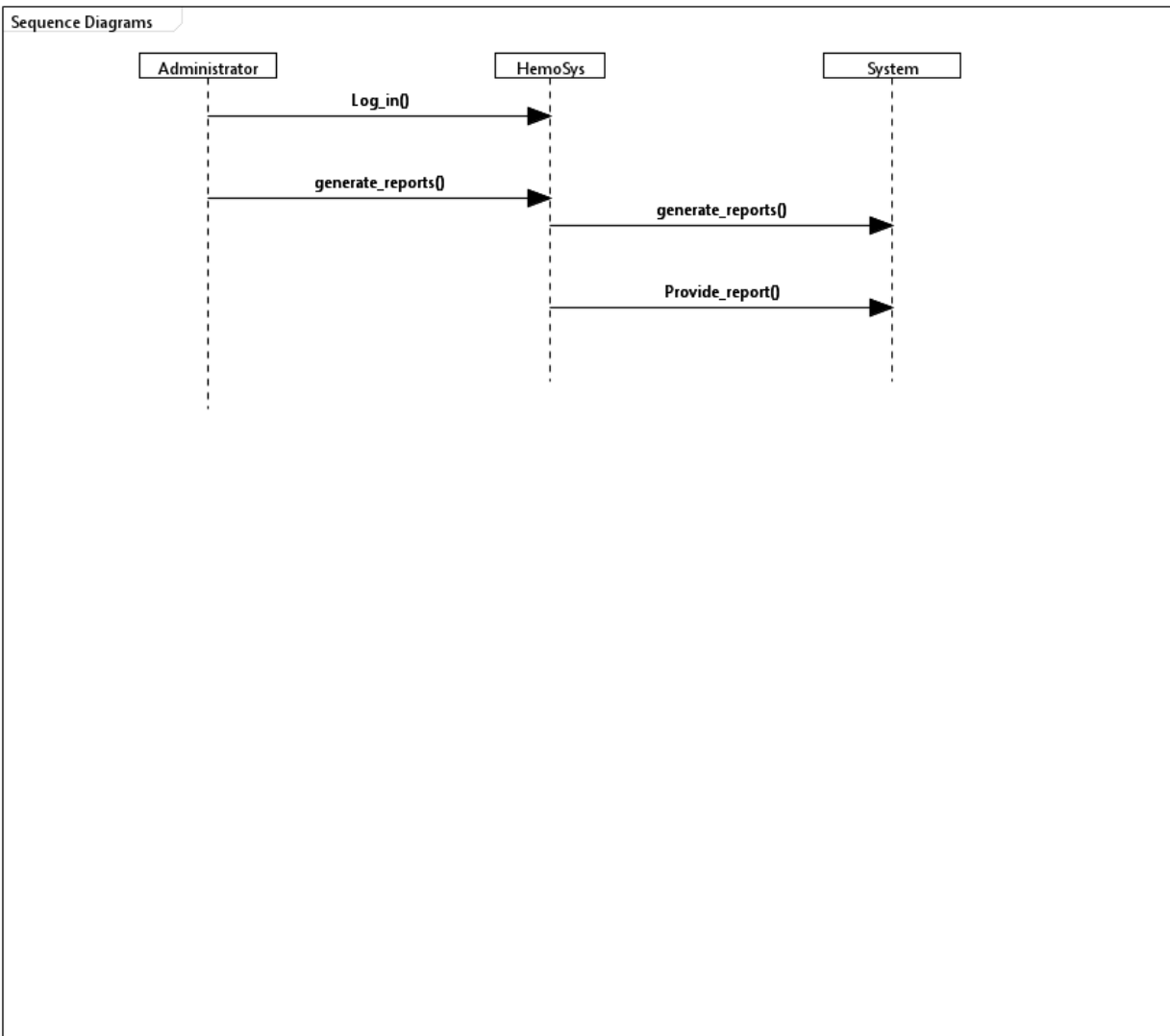
6.



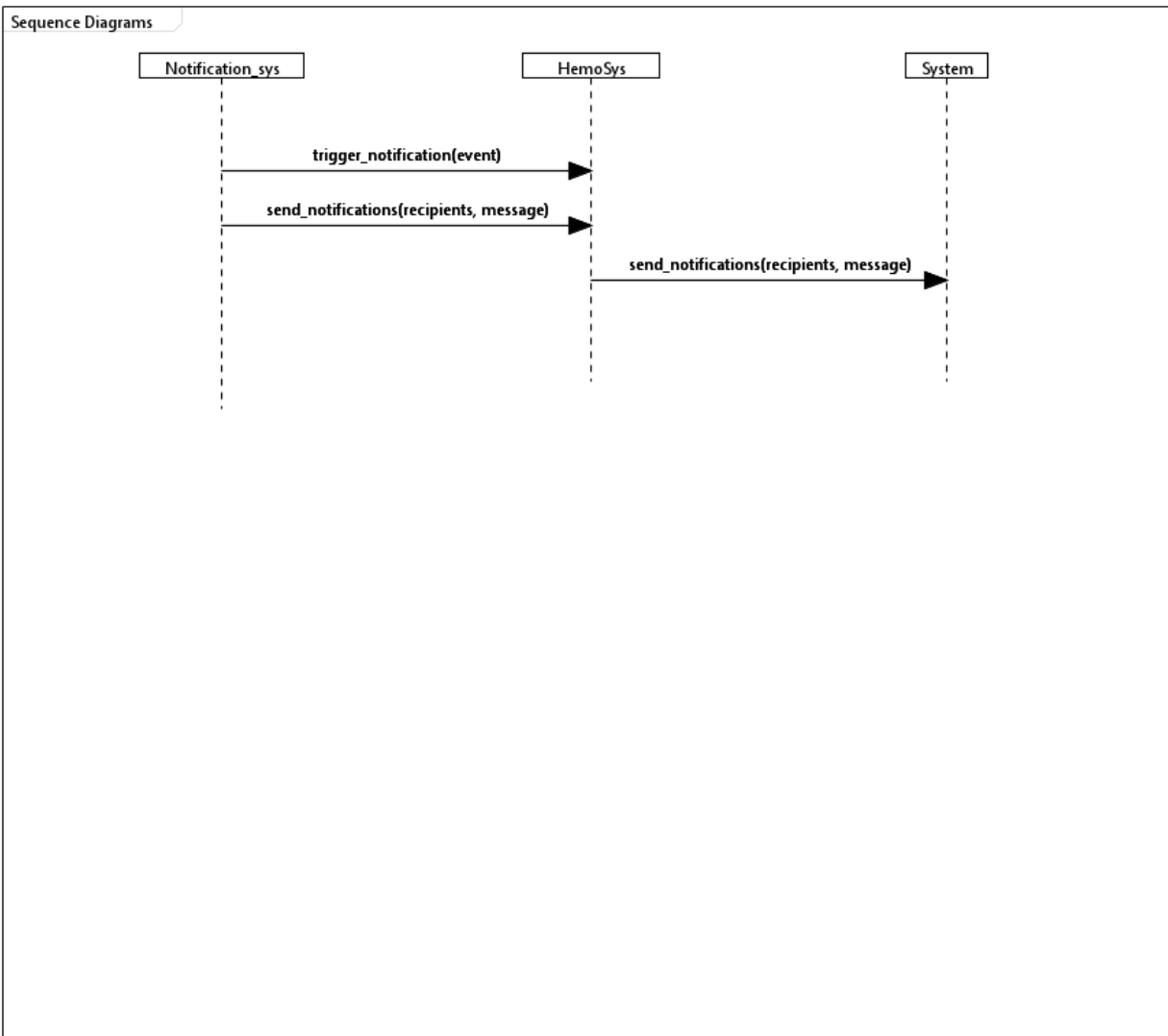
7.



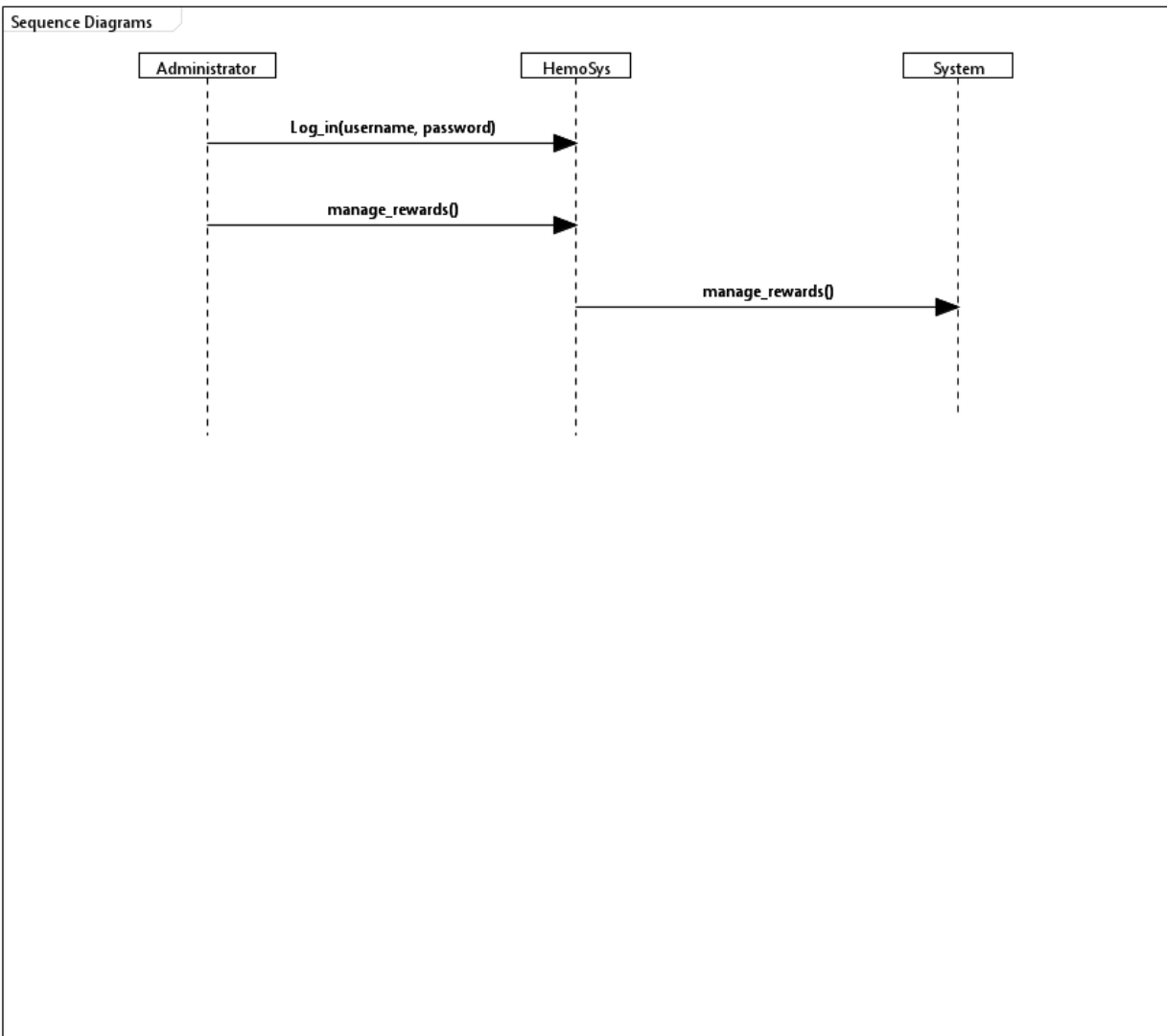
8.



9.



10.



7. Class Diagram

