1) Introduction:

Overview of the Project-

CRUDCare is a comprehensive Blood Bank Management System designed to streamline and manage the entire life cycle of blood donations, requests, and inventory. It allows multiple user roles—admin, hospital representatives, donors, recipients, lab technicians, and inventory managers—to collaborate efficiently within a secure and user-friendly environment. The system ensures that blood donations are tracked, requests are fulfilled promptly, and inventory levels are properly maintained, all while providing real-time data access and management for different stakeholders.

Objectives:

* To provide a centralized platform for managing blood donations, requests, and inventory.

* To enable efficient user role management with secure access control for various stakeholders.

* To track and manage blood units from donation to testing and storage.

* To ensure accurate and timely fulfillment of blood requests.

* To maintain transparency and accountability across all blood bank operations.

* To implement an intuitive and user-friendly interface for streamlined operations and real-time data access.

2) System Design:

Database Design

The database for CRUDCare is designed to efficiently handle the operations related to blood donations, requests, inventory management, and user roles, with a well-structured relational schema. Each table is dedicated to storing relevant data for the different modules of the system, ensuring integrity, consistency, and scalability.

Table Breakdown

Users Table: Central repository for user information and roles. Admins use this to manage system-wide operations without a dedicated admin table.

Blood Requests Table: Manages requests for blood, tracking the type, volume, and status of each request.

Blood Test Results Table: Records test results for blood units to ensure they meet safety standards.

Blood Units Table: Details each blood unit, including its donor, type, and current status.

Donations Table: Tracks donations, linking each one to the donor, blood unit, and location.

Hospital Representative Info Table: Contains information about representatives from hospitals and their associated locations.

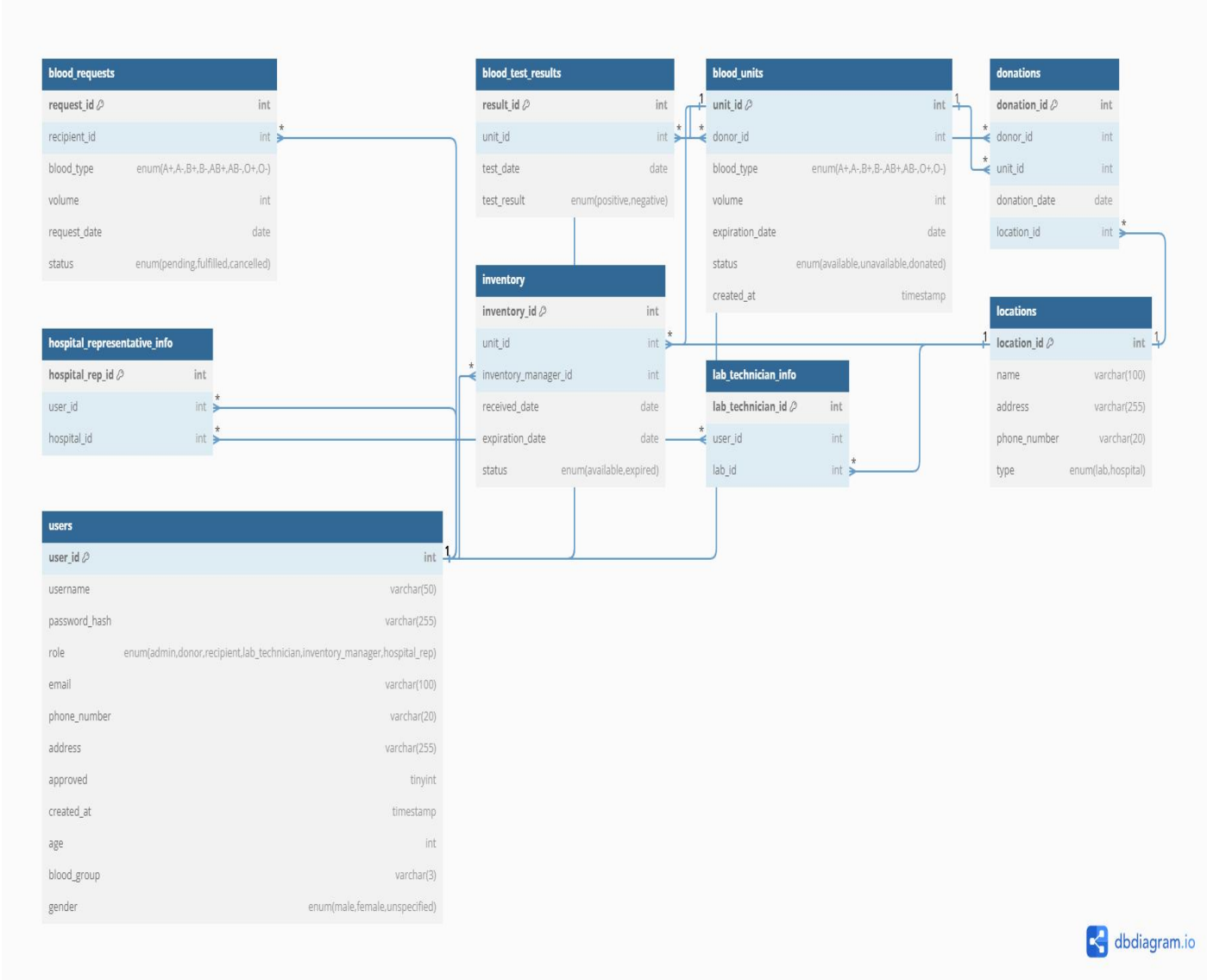
Inventory Table: Monitors blood units in inventory, including their status and expiration dates.

Lab Technician Info Table: Stores information about lab technicians and the labs where they work.

Locations Table: Keeps track of lab and hospital locations, including contact details.

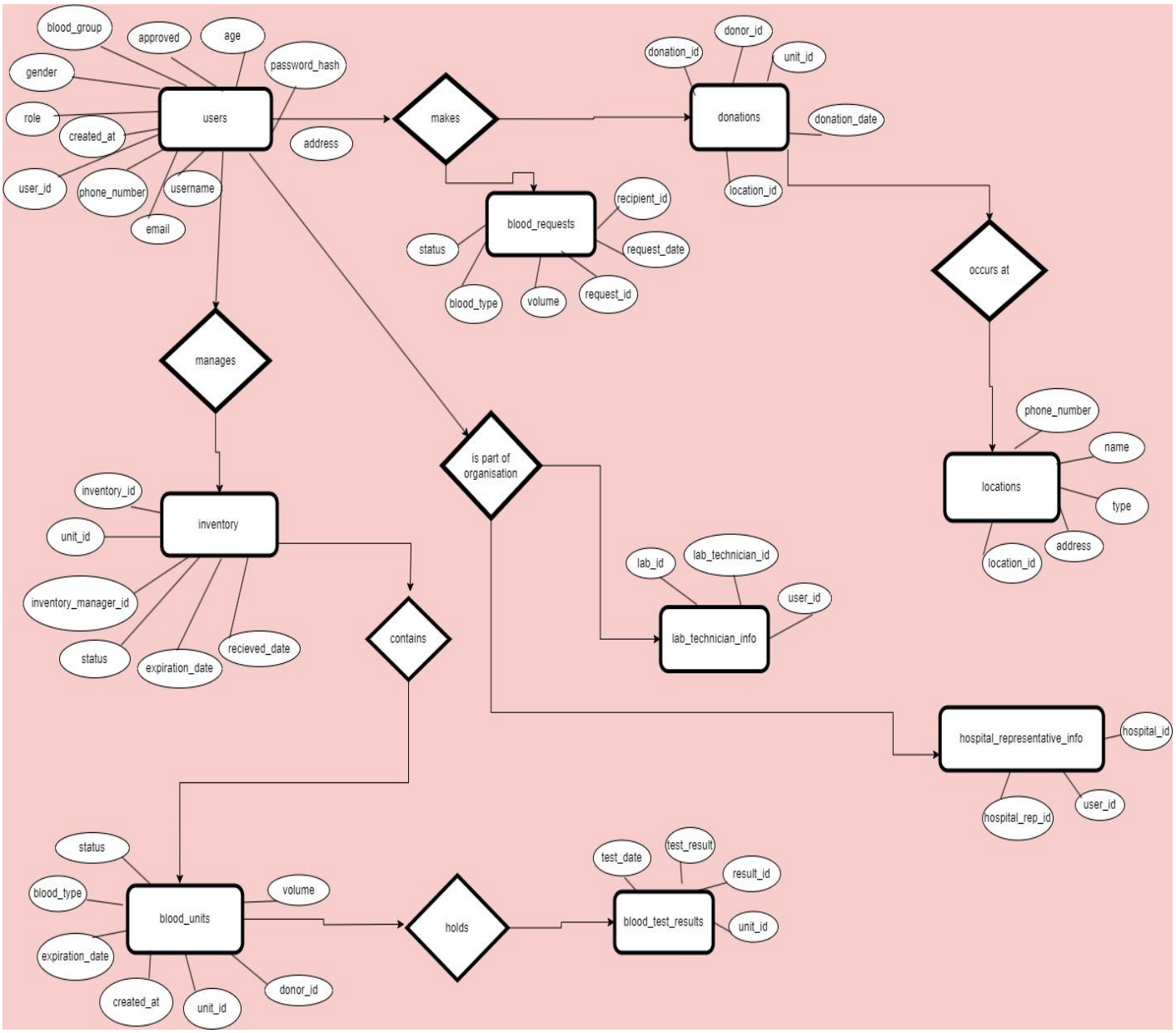
Admin Role: Admins manage the system's overall operations, including user management and overseeing donations and inventory, using their elevated privileges through the users table without a separate admin table.

Relationship Diagram Between the Tables



ER Diagram

The ER diagram for CRUDCare illustrates how the system's entities are connected. It shows users, donations, blood units, requests, and test results as distinct entities, represented by rectangles. Relationships like donations, blood requests, and blood tests are depicted through connecting lines, highlighting how users donate blood, how blood units are linked to test results, and how inventory is managed. Each entity's key attributes are represented, ensuring a clear view of how data flows between different parts of the system.



System Architecture

The system follows a three-tier architecture to efficiently manage and operate the CRUDCare blood bank management system:

Front-End:

Technologies Used: HTML, CSS, JavaScript, and Bootstrap.
Purpose: This tier is responsible for creating the user interfaces for different roles within the system. It ensures a user-friendly experience by presenting data and functionality in a visually appealing and interactive manner.

Back-End:

Technology Used: PHP.
Purpose: PHP handles the business logic of the application, processes user requests, and interacts with the database. It manages the functionality behind operations such as adding donations, managing user accounts, and processing blood requests.

Database:

Technology Used: MySQL.
Purpose: MySQL stores and manages all data related to users, blood requests, blood units, and other system components. It ensures data integrity and provides efficient data retrieval for the front-end and back-end components.

Data Flow

The data flow in the CRUDCare system follows a structured process involving the front-end interfaces, back-end logic, and database. Here's a step-by-step explanation:

User Input: A user interacts with the front-end interface (e.g., a hospital representative submits a blood request via a web form).

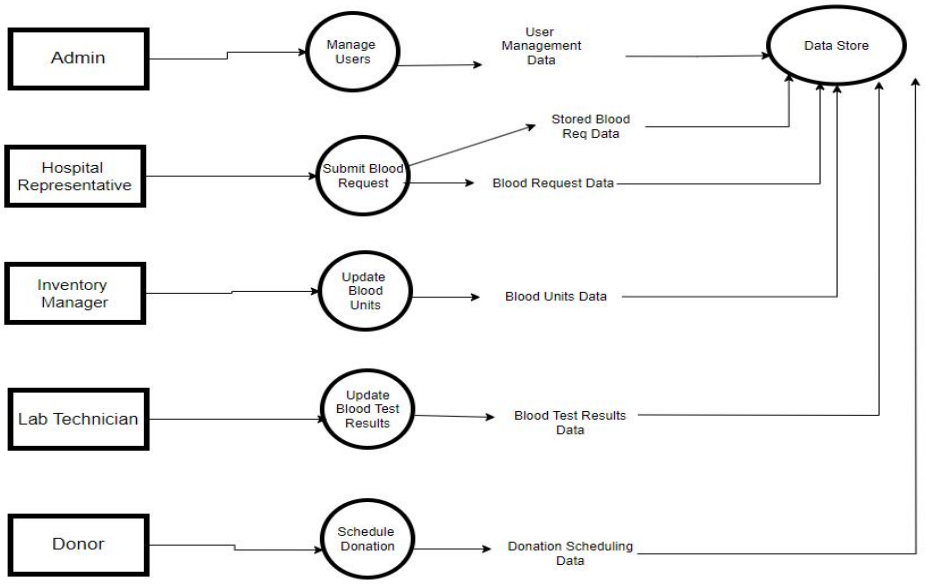
Front-End to Back-End: The data entered in the form is sent to the server using HTTP requests (e.g., via POST method). This request is handled by PHP scripts on the back-end.

Back-End Processing: The PHP back-end receives the data, performs validation checks, and processes the request. This might include sanitizing input to prevent security issues and ensuring all required fields are completed.

Database Interaction: After validation, the processed data is sent to the database. For instance, the PHP script executes an SQL INSERT statement to store the blood request in the blood_requests table.

Response: Once the data is successfully stored, the system might provide feedback to the user, such as a confirmation message or a redirect to another page.

Data Retrieval: For dynamic content, the process can involve fetching data from the database. For example, when a user views a list of blood requests, the PHP back-end executes an SQL SELECT query to retrieve the relevant records and then sends them to the front-end for display.



DBMS Features Used

Data Models:

The CRUDCare system uses a relational data model as it is built on MySQL, which organizes data into structured tables with relationships defined by foreign keys. Each entity in the system, such as users, blood requests, donations, and blood units, is represented as a table. This model ensures data integrity and allows for efficient data retrieval using SQL queries.

SQL Queries:
Here are examples of the key SQL queries used in the CRUDCare system:

SELECT: To retrieve data about available blood units.
Sql

```
SELECT * FROM blood_units WHERE status = 'available';
```

JOIN: To retrieve blood requests along with recipient details.
Sql

```
SELECT br.request_id, u.username, br.blood_type, br.volume, br.status
FROM blood_requests br
JOIN users u ON br.recipient_id = u.user_id;
```

UPDATE: To update the status of a blood request to 'fulfilled'.
Sql

```
UPDATE blood_requests SET status = 'fulfilled' WHERE request_id = 1;
```

DELETE: To delete a specific blood unit that has expired.
Sql

```
DELETE FROM blood_units WHERE expiration_date < CURDATE();
```

Transactions:

In CRUDCare, transactions are used to ensure the ACID properties (Atomicity, Consistency, Isolation, Durability) when performing critical operations like blood unit updates or request fulfillment. For instance, when updating the blood request and the associated inventory in a single operation, a transaction ensures that either both updates succeed, or neither does, to maintain consistency.

Indexes and Optimization:

To improve performance, indexes are used on key columns such as user_id, request_id, and unit_id. Indexing these columns speeds up data retrieval for common queries involving joins or lookups based on primary or foreign keys.

For example:

Sql

```
CREATE INDEX idx_user_id ON users(user_id);
CREATE INDEX idx_request_id ON blood_requests(request_id);
```

These indexing techniques help optimize query performance, particularly in large datasets like user and blood request tables.

System Implementation

Development Tools:

The CRUDCare Blood Bank Management System was implemented using the following tools and technologies:

Programming Languages

PHP: For back-end logic and server-side scripting.

HTML, CSS, JavaScript: For building the front-end user interfaces.

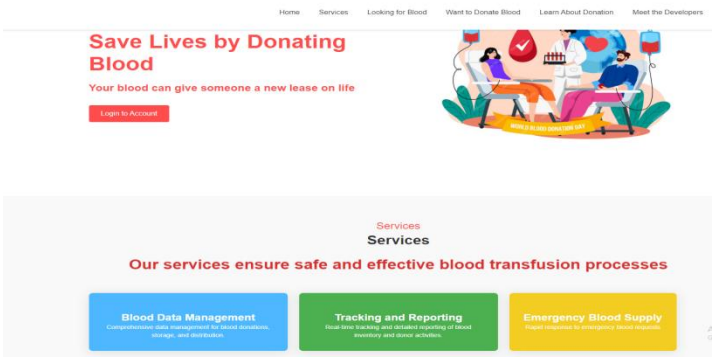
Frameworks

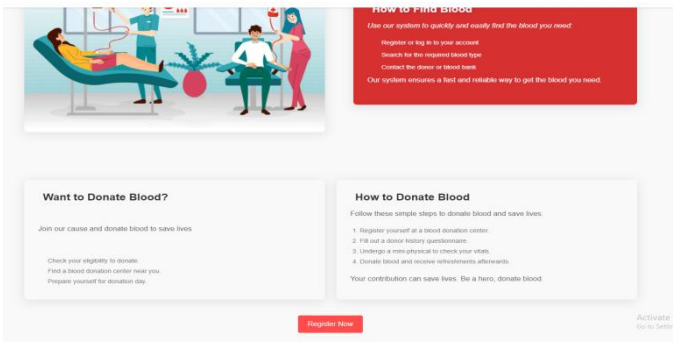
Bootstrap: For responsive design and styling of the user interface.

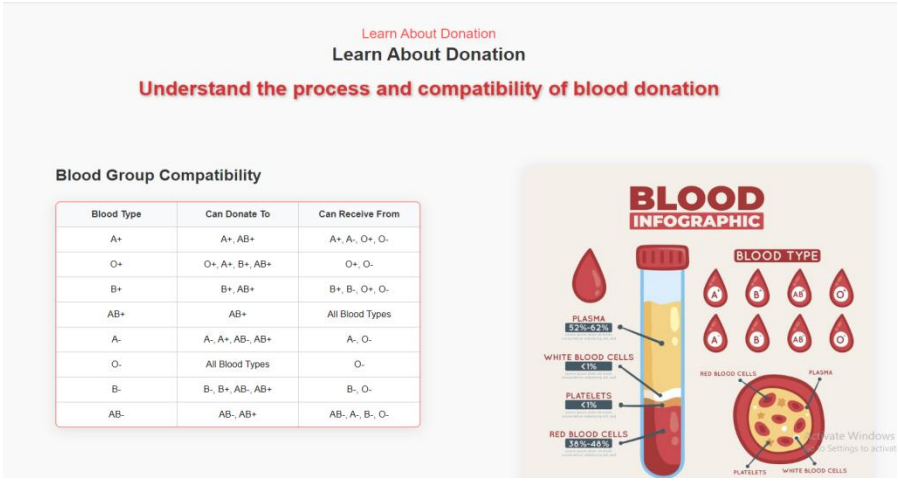
Database Management System (DBMS)

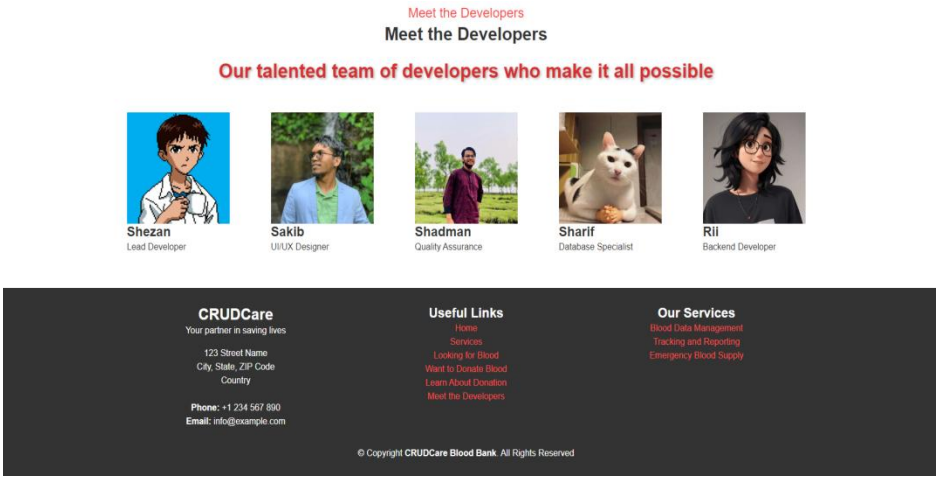
MySQL: Used to store and manage all data, including users, blood units, requests, and donations.

Homepage


Home
Services
Looking for Blood
Want to Donate Blood
Learn About Donation
Meet the Developers
Save Lives by Donating Blood
Your blood can give someone a new lease on life
Login to Account
Services
Services
Our services ensure safe and effective blood transfusion processes
Blood Data Management
Tracking and Reporting
Emergency Blood Supply

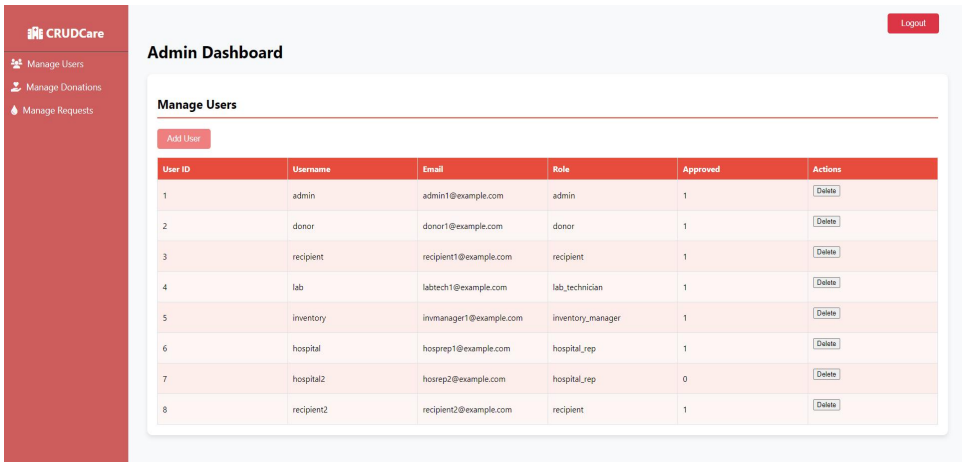

How to Find Blood
Use our system to quickly and easily find the blood you need:
Register or log in to your account
Search for the required blood type
Contact the donor or blood bank
Our system ensures a fast and reliable way to get the blood you need.
Want to Donate Blood?
Join our cause and donate blood to save lives
Check your eligibility to donate.
Find a blood donation center near you.
Prepare yourself for donation day.
How to Donate Blood
Follow these simple steps to donate blood and save lives:
1. Register yourself at a blood donation center.
2. Fill out a donor history questionnaire.
3. Undergo a mini-physical to check your vitals.
4. Donate blood and receive refreshments afterwards.
Your contribution can save lives. Be a hero, donate blood.
Register Now


Learn About Donation
Learn About Donation
Understand the process and compatibility of blood donation
Blood Group Compatibility
Blood Type
Can Donate To
Can Receive From
A+
A+, AB+
A+, A-, O+, O-
O+
O+, A+, B+, AB+
O+, O-
B+
B+, AB+
B+, B-, O+, O-
AB+
AB+
All Blood Types
A-
A-, A+, AB-, AB+
A-, O-
O-
All Blood Types
O-
B-
B-, B+, AB-, AB+
B-, O-
AB-
AB-, AB+
AB-, A-, B-, O-
BLOOD INFOGRAPHIC
BLOOD TYPE
PLASMA 52%-62%
WHITE BLOOD CELLS <1%
PLATELETS <1%
RED BLOOD CELLS 36%-46%
RED BLOOD CELLS
PLASMA
PLATELETS
WHITE BLOOD CELLS

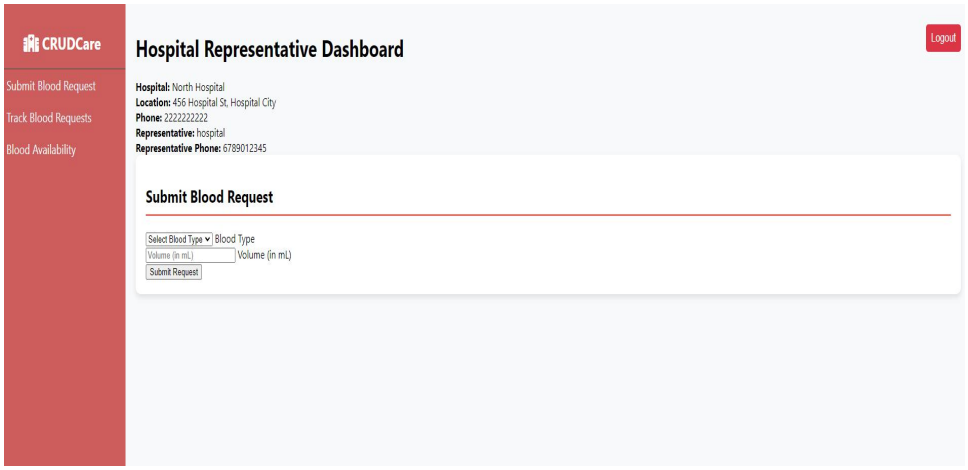

Meet the Developers
Meet the Developers
Our talented team of developers who make it all possible
Shezan
Lead Developer
Sakib
UI/UX Designer
Shadman
Quality Assurance
Sharif
Database Specialist
Rii
Backend Developer
CRUDCare
Your partner in saving lives
123 Street Name
City, State, ZIP Code
Country
Phone: +1 234 567 890
Email: info@example.com
Useful Links
Home
Services
Looking for Blood
Want to Donate Blood
Learn About Donation
Meet the Developers
Our Services
Blood Data Management
Tracking and Reporting
Emergency Blood Supply
© Copyright CRUDCare Blood Bank. All Rights Reserved

Front-End Interface

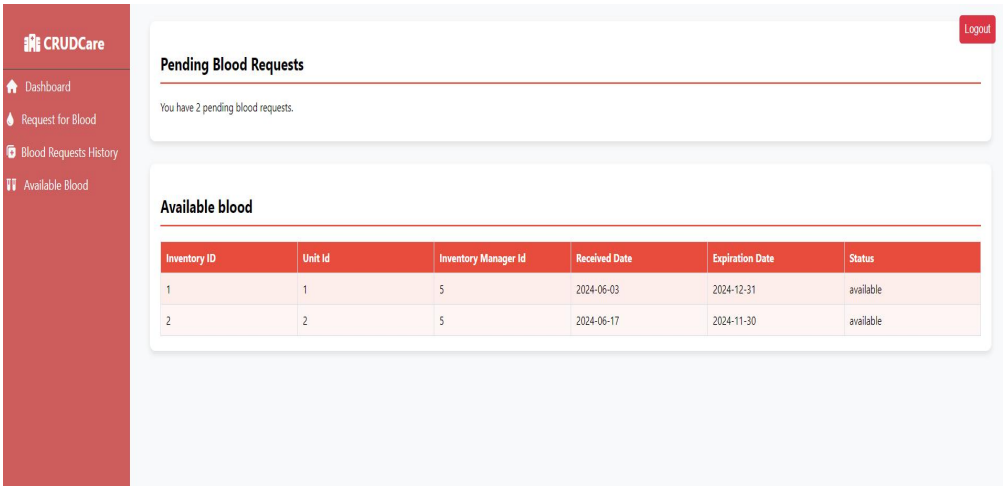
Admin Dashboard



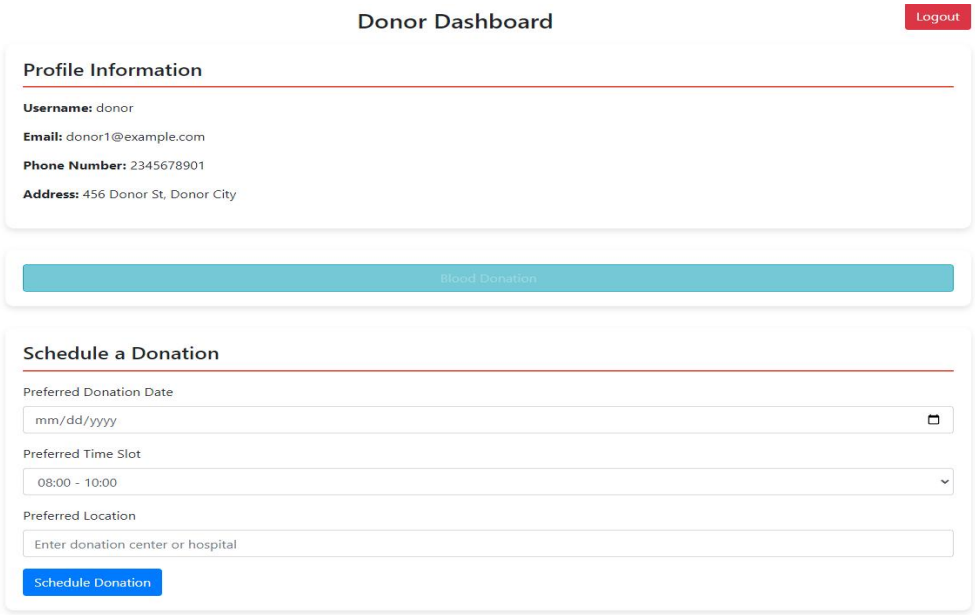
Hospital Representative Dashboard



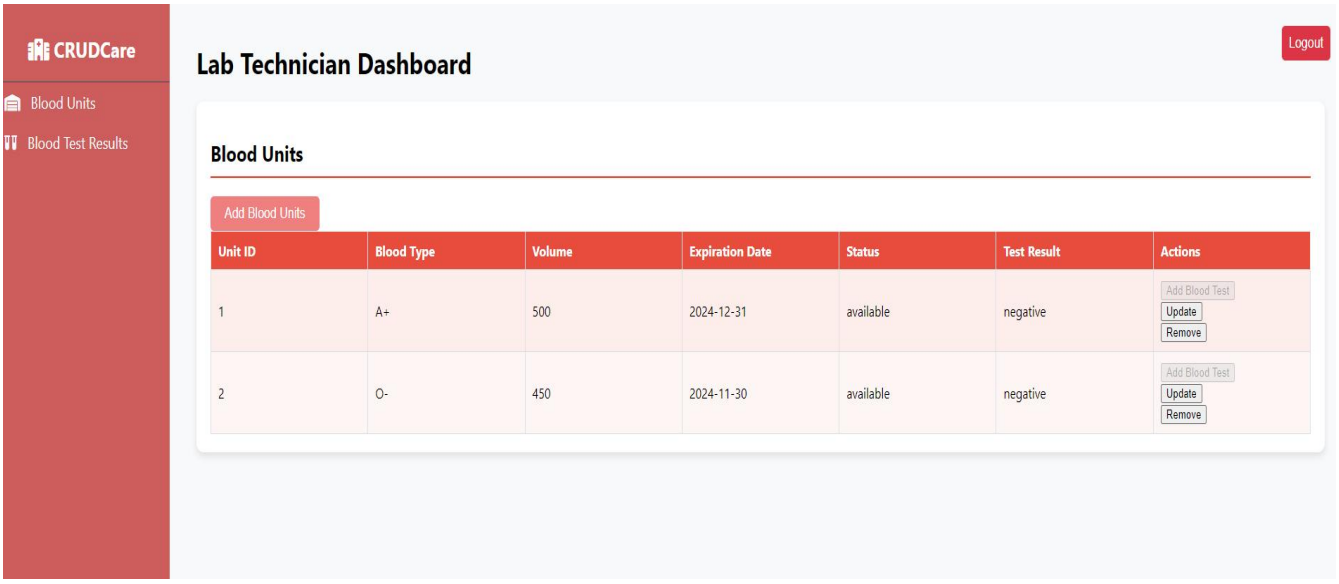
Recipient Dashboard



Donor Dashboard

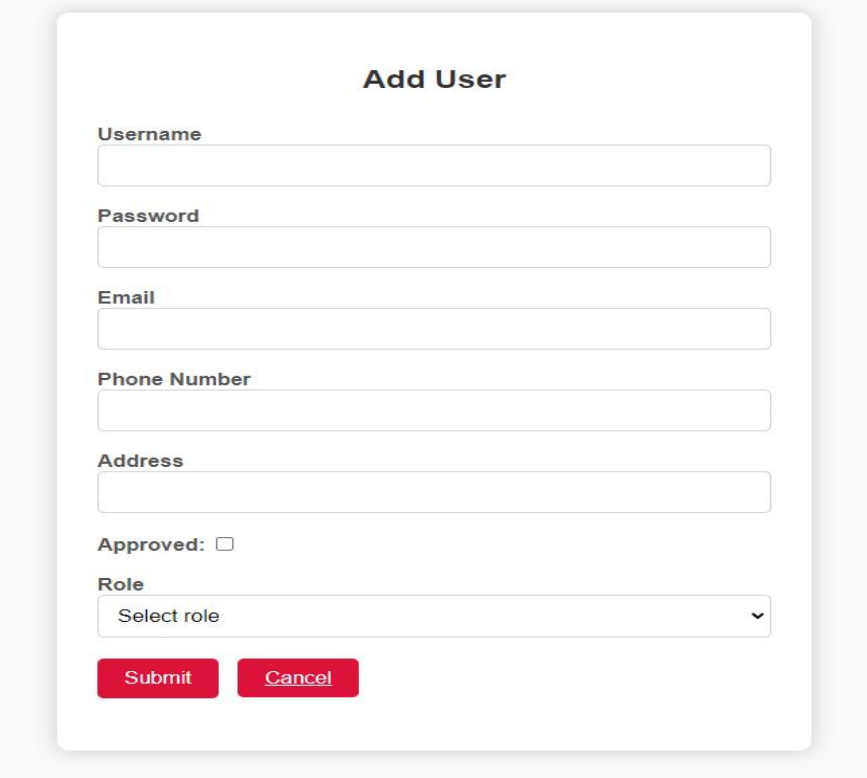


Lab Technician Dashboard

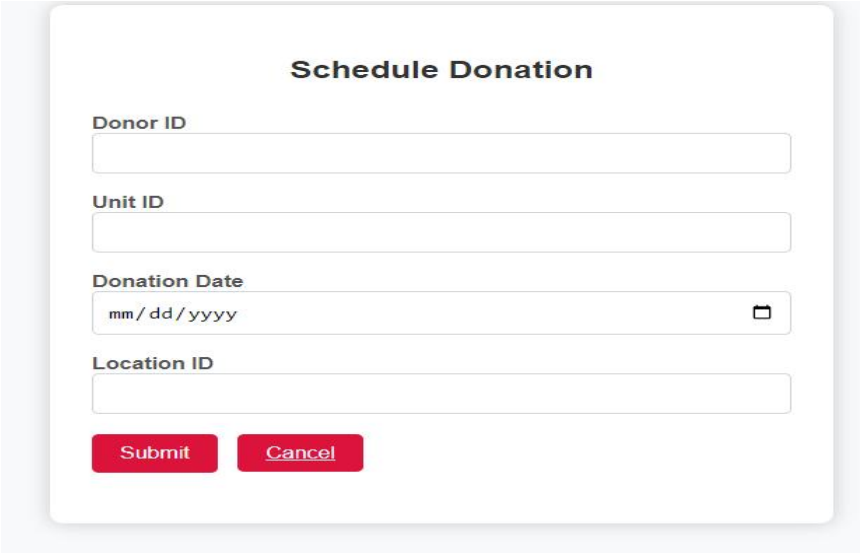


Back-End Components

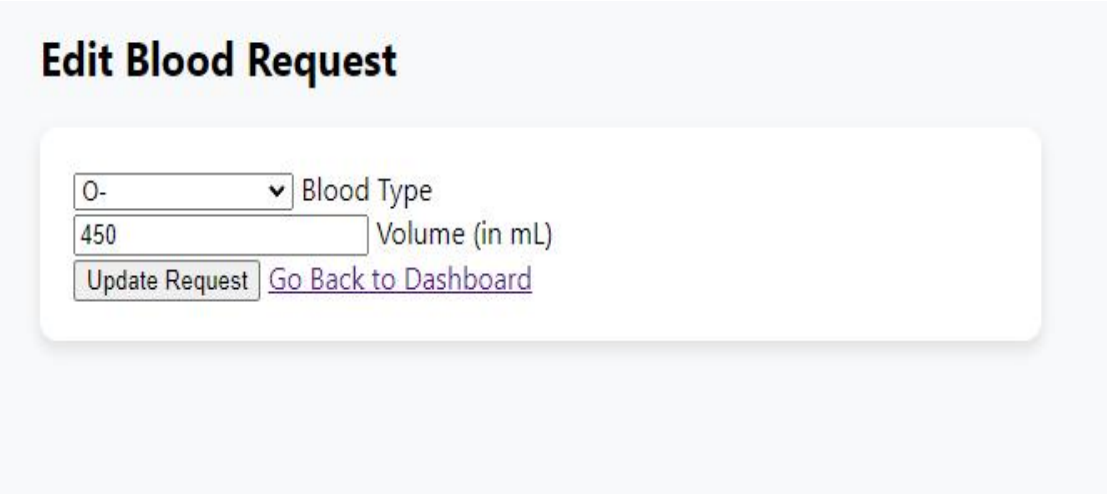
Add User: A form used by administrators to add new users to the system, including assigning roles and setting initial information.



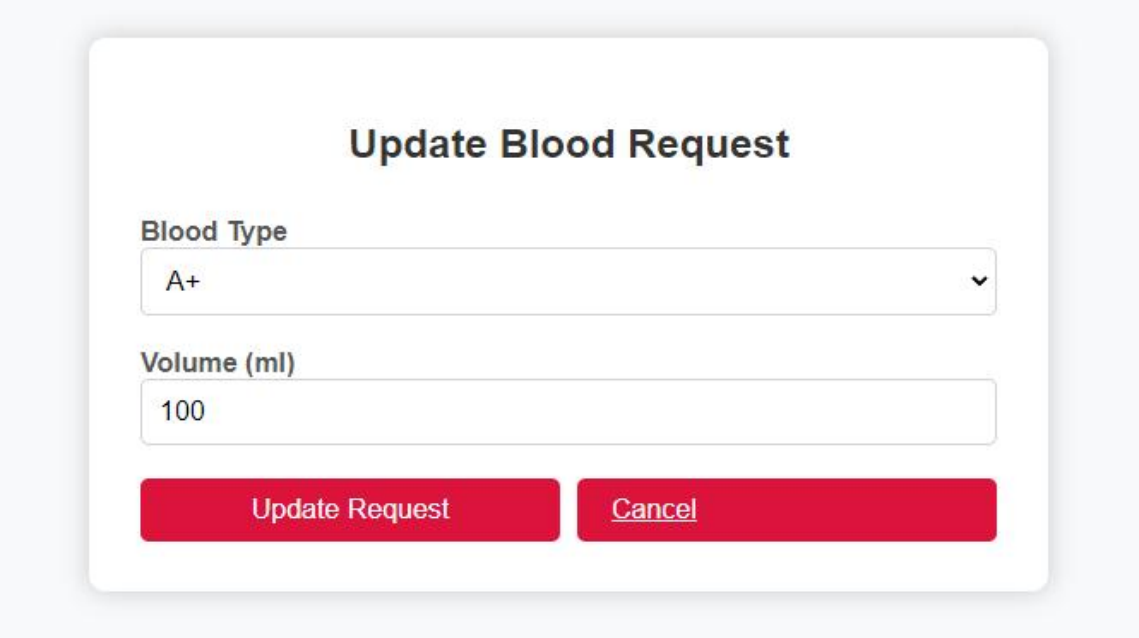
Schedule Donation: Allows admins and users to schedule blood donations, capturing details like the donor, donation date, and location.



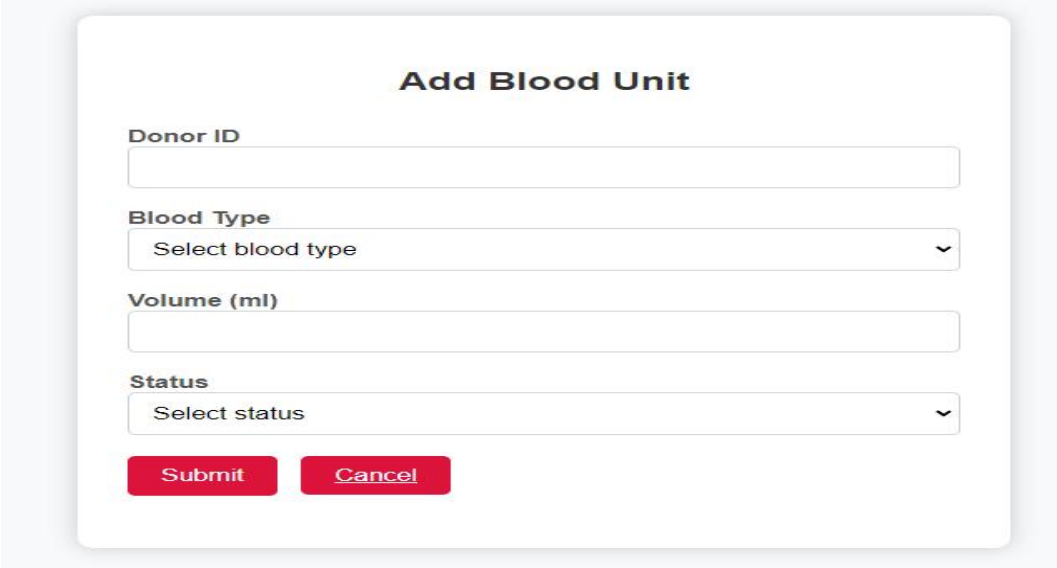
Edit Blood Request: Provides functionality for modifying existing blood requests, including changes to request volume, status, and blood type.



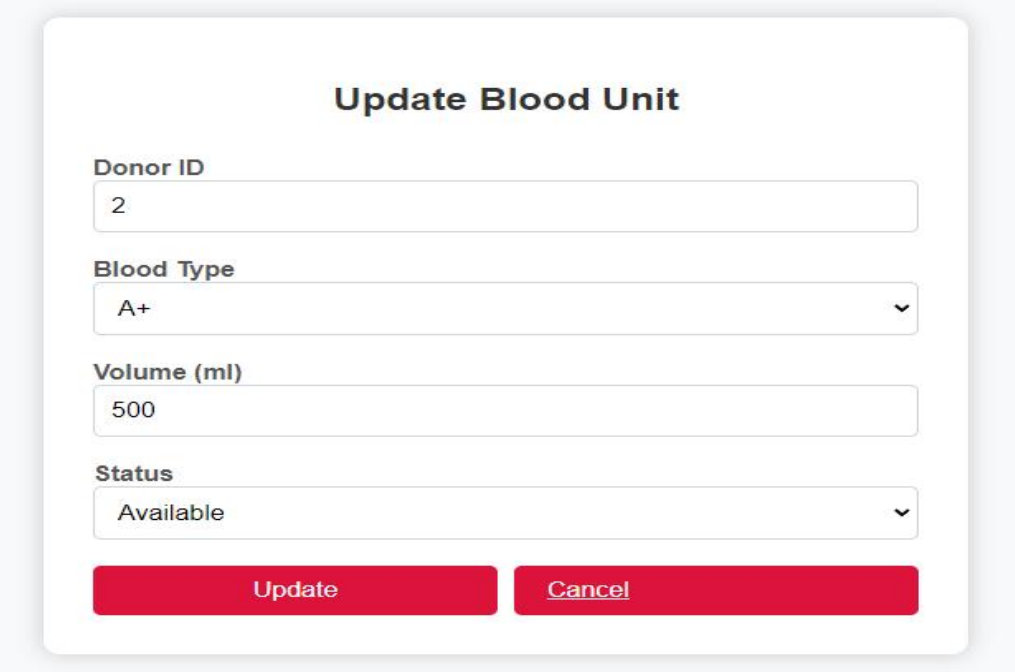
Update Blood Request: Allows for changes to existing blood requests, including adjustments to volume and blood type.



Add Blood Unit: Used to add new blood units to the system, including details such as the donor, blood type, volume, and expiration date.

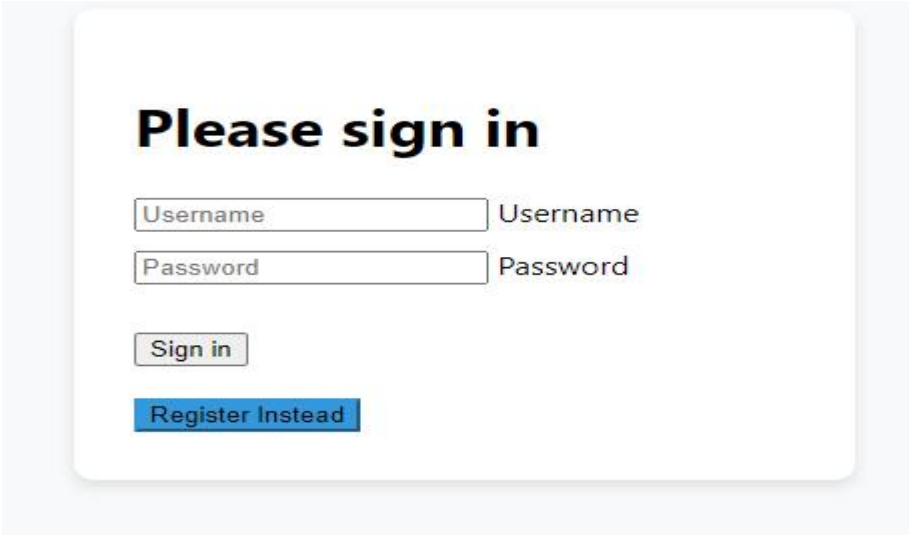


Update Blood Unit: Allows for updates to existing blood units, including adjustments to volume, expiration date, and status.

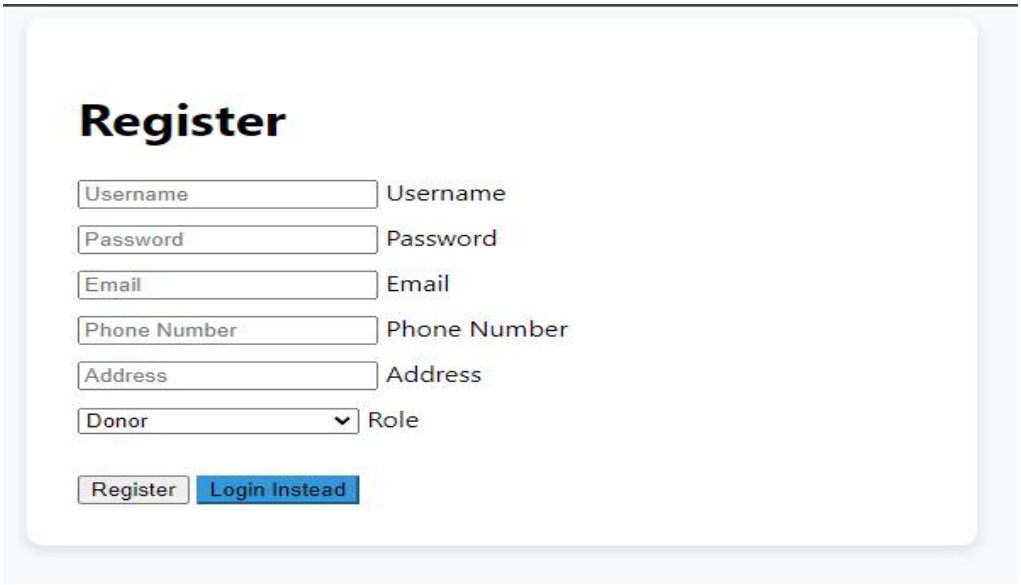


User Authentication & Security

Login: Users enter their credentials (username and password) to access the system. Authentication is handled by verifying the provided credentials against stored hashed values in the database. Successful login grants access to user-specific features and data based on their role.



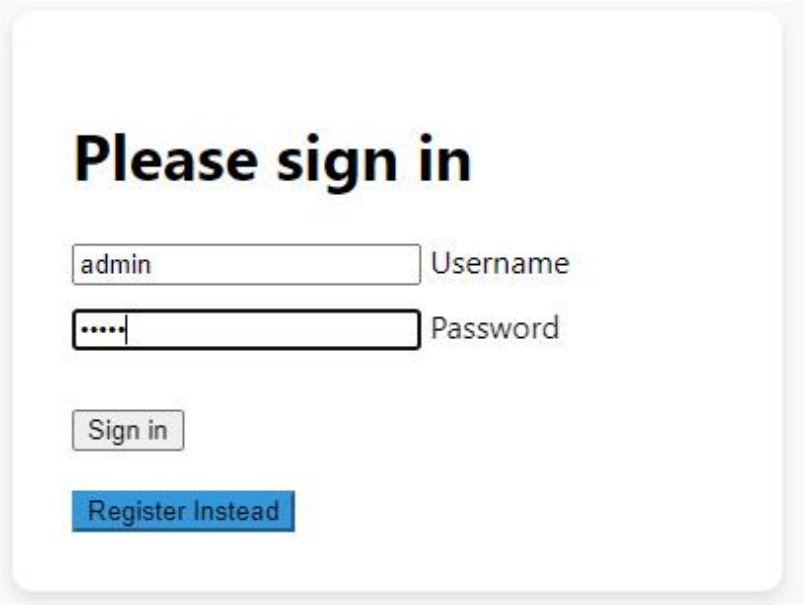
Register: New users can create an account by providing necessary details such as username, email, password, and role. Registration involves validating the input data, hashing the password, and storing the new user information in the database. Newly registered users must be approved (if applicable) before they can fully access the system.



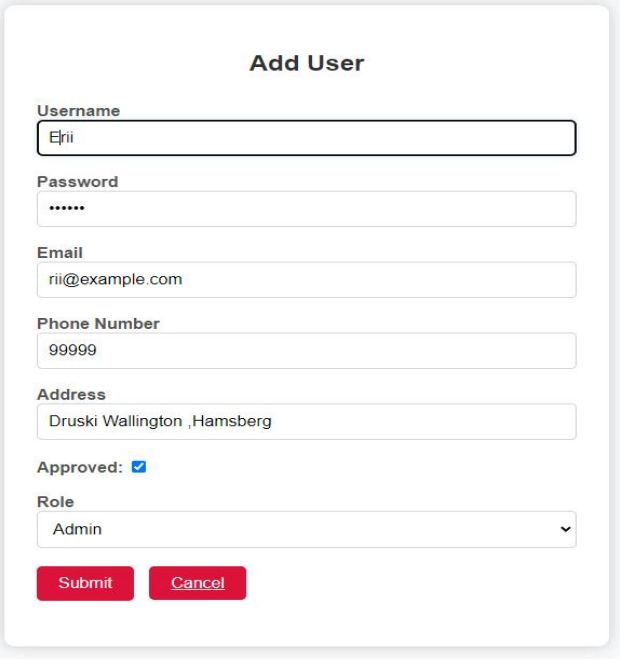
Testing

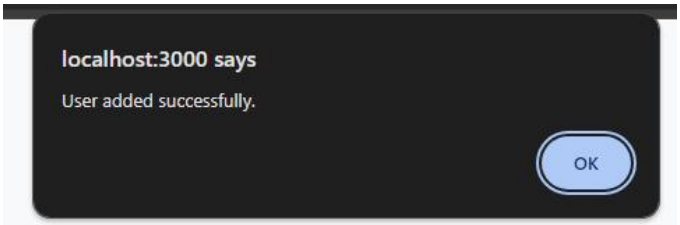
Key test cases were designed to ensure the proper functionality of CRUDCare:

User Login: Testing for correct username and password combinations, and appropriate error messages for incorrect login attempts.

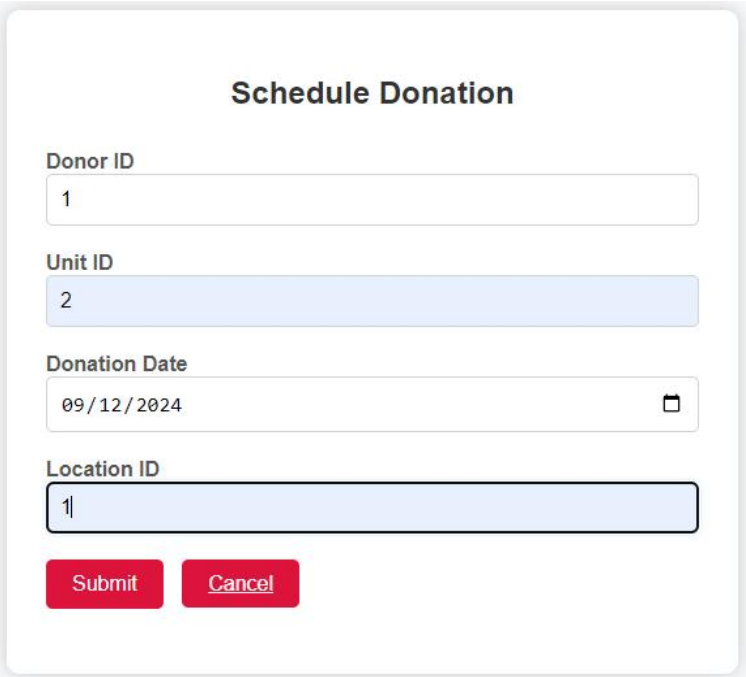


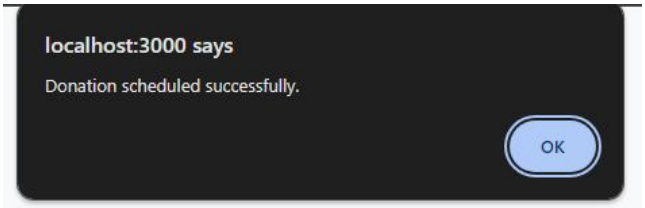
User Management: Testing adding, editing, and deleting user accounts to confirm proper handling of user roles and information.





Blood Donation Scheduling: Verifying that donation schedules are saved correctly and associated with the donor's information.





Error Handling:
The system includes robust error handling mechanisms:

Invalid Inputs: User input validation is performed on both the client-side (using JavaScript) and server-side (PHP) to prevent invalid data from being submitted.
Database Errors: For issues like database connection failures or query errors, custom error messages are shown, and critical errors are logged for further investigation.

Performance Testing:
Query Execution Time: Database queries were tested for performance using SQL EXPLAIN to ensure that JOIN operations and SELECT queries retrieve data efficiently.
System Load Handling: Simulated multiple concurrent users to test the system's ability to handle data loads, ensuring it maintains performance under high user traffic.