HealthLink

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Project Description

This project will be a database-oriented application focused on simplifying the healthcare experience for patients and doctors. The main goal of the project is to improve communication between patients and doctors by allowing real-time tracking and feedback, without frequent in-person appointments. We will keep a secure and complete history of patient health records, treatment plans, and progress over time to support better long-term care. Patients can journal their health and well-being by documenting symptoms, medications taken, test results, and other relevant medical information. Doctors can provide feedback to patients, such as clarifying concerns or making adjustments to prescribed medications. The user interface must be ripe with patient information, but still be intuitive, quick to read, and easy to understand. The project catalyst is to create a collaborative platform between patients and their doctors that promotes communication, without the immediate need for an appointment. The stakeholders will be the patients and doctors who want to use our platform to streamline communication between each other. The application domain is in healthcare technology since that is the area of concern we're targeting.

System Environment

Hardware & Software Used

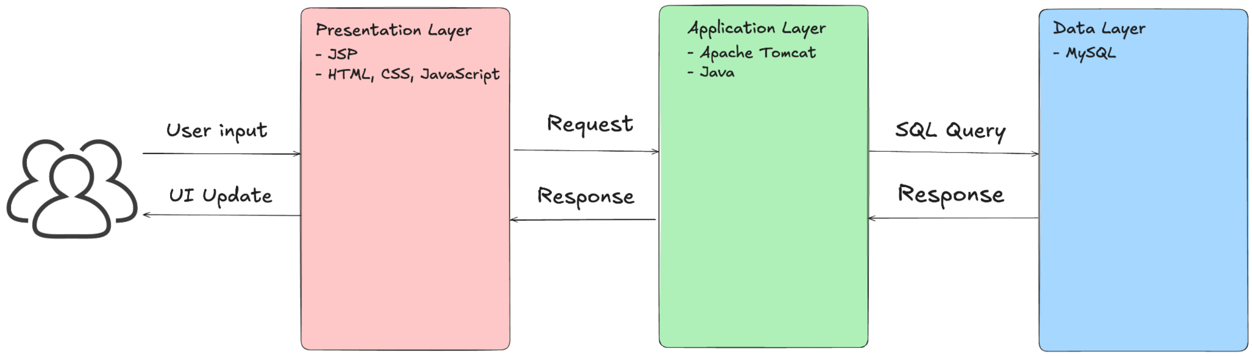
Apache Tomcat will host a virtual three-tier architecture on our local machines.

RDBMS

MySQL Community Server 9.3.0 will be used as our relational database management system solution.

Application Languages

Java, SQL, JavaScript, and HTML will be used to implement core app functionality and build user interfaces.



Functional Requirements

The application will provide functionality for the active user role. A user can have either the role of patient or doctor. A patient and a doctor can communicate with each other directly, without contacting each other in-person-this is the main feature of the app. A patient will be able to record their health information in a convenient platform, such as managing medications, health problems, vaccination history, etc. A patient can also view their medical data, as reported by their doctors, over a period of time. As such, doctors will be able to record and report medical data for their patients. Doctors will be able to respond to their patients directly, providing instant feedback to their questions and comments. Doctors can prescribe their patients new medications, adjust dosages, and also be able to keep notes for their patients. Finally, a separate Admin user will be available for maintenance and testing purposes.

Functions

1. Patients can register and log in securely.
   - The patient can securely register a new account
   - The patient can securely log in and be able to access their information.

2. Doctors can securely register, log in, and view assigned patients.
   - The doctor can register an account
   - The doctor can log in and view patients assigned to them and perform various actions on them

3. Patients can document their health and well-being, and symptoms.
   - The patient can document any of their symptoms, if any
   - The patient can make a note of any other useful information for their doctor, such as questions or concerns they might have
   - The system will then securely save this information in the database.

4. Patients can log medications and dosages.
   - The patient can document when they take a medication, start taking a new medication, and their respective dosages.
   - This helps the doctor make better and more informed decisions for their patients.
   - The system will keep a record of this and save to the database.

5. Patients can upload test results (PDF/image format).
   - The patient can document their medical test reports
   - This helps the doctor make better and more informed decisions for their patients.
   - The system will keep a record of this and save to the database.

6. Doctors can view patients' logs in a dashboard.
   - The doctor can view historical information about their patients and track their health over time
   - This helps the doctor make better and more informed decisions for their patients.

7. Doctors can provide comments or advice based on logs.
   - The doctor can directly communicate with the patients, provide comments, and address concerns

8. Doctors can make notes for their patients.
   - The doctor can make notes for a patient, allowing them to maintain an active history for them.
   - The system will be to deliver the doctor's note(s) for a patient. The page will be able to display all the notes the doctor has on the patient, and will be able to create a new note or update an existing note.

9. Role-based access control (patients can't view other patients, etc.).
   - Roles can be a patient or a doctor
   - Patients cannot access sensitive information about each other
   - To protect patients' personal information, ensuring privacy and system security
   - The system must perform checks on the role of the user and whether they are authorized to perform the action.

10. Admin can manage users and monitor activity.
    - To ensure system security, reliability, and performance.
    - The system will keep relevant logs for maintenance purposes, quality assurance, or for metrics

11. A notification system for doctor feedback or missed log entries.

- Brief update system to inform patients if their doctor made a note regarding their medications, health, etc.
- The system will keep track of database changes relevant to the patient, and check if there were any updates
- The page will display a small toast if the doctor has responded to their questions, made adjustments to medications, etc.

12. Patients can view their full medical history, including past symptom logs, medication, and test results.
    - The system will keep track of their medical history (including past symptoms, medications, and test results)
    - The page will have graphical displays of various health data points so they acn look for any trends

13. Doctors can update and manage treatment plans for each patient.
    - Doctors can search for the patient to manage, which could have a filter based on their characteristics
    - Doctors can create/update/delete patient medication dosages
    - The system will keep track of patient medications and their dosage. The page will display a list of the patient's medications and allow the patient's doctor to assign, update, or delete a medication for them.

14. All medical history data is stored securely and accessible only to the respective patient and their doctors.
    - Patients are only able to see pages relevant to them, with their health data
    - Doctors cannot access patient data from other doctors

Non-Functional Issues

Graphical User Interface (GUI):

The application will have a clean and user-friendly interface, comprised of HTML, CSS, and JavaScript; it must be highly functional and practical. There will be a landing login page/account registration page. Based on the user credentials submitted in the form, it will direct the user to the portal, which respects the user's role. There will be a sidebar that acts as the main method of navigating throughout the application, containing quick and direct links to app features. Certain elements, such as input fields, forms, and buttons, are strictly required for user interactions. Some examples of pages will be for patient information, patient medical data and trends, and patient notes and records. Since medical data is tracked, we could create graphical displays for visual representation of trends and changes in a patient's health.

Security:

For an application where user information is highly sensitive, we must ensure the highest levels of user security and privacy. Therefore, all user data will be encrypted before being saved in the RDBMS. Passwords will be hashed and not be stored in plaintext. The app will implement protection against SQL injection attacks and unauthorized access attempts. Since user input is the main source of data, we must ensure that the system cannot be compromised and that all inputs must be validated and sanitized before reaching the database.

Patient and doctor names will be visible throughout the app to ensure patients are speaking with their assigned doctor and doctors are working with their assigned patients. Patients will go through email verification through a trusted email provider platform when registering, as well as ensuring password complexity to avoid the various password cracking attacks, such as dictionary, brute-force, or denial of service attacks. We can also rate limit login attempts, as well as provide a way for users to reset their login credentials.

Access Control:

The system will utilize role-based access control (RBAC). RBAC helps to make sure users can perform the functions assigned to their role only. So, patients can only view and edit their records, and doctors can only access the records of patients assigned to them. Admins can manage user roles and monitor usage logs.

Performance & Scalability:

The app will be optimized to handle multiple concurrent users without performance lags or system instability. For example, there may be situations where a doctor requires immediate access to patient records to appropriately respond to a medical situation.

Reliability

The application should be able to handle errors gracefully, such as failed database connections or invalid inputs from users. In the event of invalid input, the system should be able to inform the user and to help them send valid data. Admins should be notified of system errors, such as failed database errors or runtime exceptions. Error messages will be user-friendly and not expose technical details whatsoever.

Data Privacy

Given the sensitive nature of patient health records, the app will adhere to basic data privacy principles. This way, patient information is treated with the highest level of confidentiality. We will ensure that only authorized users will have access to sensitive data. As earlier mentioned, patients should only be able to create, read, and modify their own information and have no interaction with other patient records. Doctors can only create, read, and modify records of patients assigned to them.