



Bilkent University

Department of Computer Engineering

Senior Design Project

Project short-name: ShareInHappiness

High-Level Design Report

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1. Introduction

Health care is one of the most important human needs. High quality healthcare saves millions of lives and provides people with a sense of safety and security. However, treatment of health problems such as cardiovascular disease, cancer, SMA and etc. can be very expensive and most of the people cannot afford it. [1] These people try to use social media platforms to raise money to pay for the medications. Unfortunately, impostors can also share fake posts on social media to collect money. Many people hesitate to donate money because it is not possible to track how this money will be spent later on.

To solve this problem, our team decided to develop a welfare platform. Each user will have a wallet and he/she will be able to load money into this wallet. If users have sufficient credit in their wallet, they can purchase one or more items listed by the people who need special devices and medications. There will be no direct money transaction between the users so this will prevent the scammers from abusing the platform.

1.1. Purpose of The System

ShareInHappiness is a welfare platform developed for Android. The main purpose of this platform is to create a secure environment in which patients who have diseases with expensive treatment costs can ask for medication donations and users of the platform can donate to these patients. Security features are implemented for the system to make sure that the donators are not getting scammed.

1.2. Design Goals

1.2.1. Efficiency

One of our main goals is to create an efficient platform for users. There is a lack of well developed, dedicated donation platforms. By using *ShareInHappiness*, patients should be able to find the medicines and items they need faster than the

current methods. Donators should also be able to save time and money during the donation process when it is compared to traditional methods.

1.2.2. Security

The program is designed to create a secure environment for both donators and patients. Features such as patient verification and secure payment allows the donators to donate without getting scammed.

1.2.3. Usability

The program is designed to be used by everyone. Therefore, it should have a clean and simple user interface. The program is designed to run on relatively older Android versions to be accessible by most of the people.

1.2.4. Flexibility

The program is easy to modify so that new features can easily be added or some features can be removed without disrupting the operation of other features. In this way, the program can be easily modified to meet future changing needs.

1.2.5. Performance

The program will perform a lot of time consuming operations. Therefore it is designed using the most efficient algorithms. This is very important since the platform will be used by many people.

1.3. Definitions, acronyms, and abbreviations

Account: The personal data of a user such as their username, password, wallet budget are contents of their account. An account can be created and be logged into inside the app.

Access: : Whether someone can reach something or not. In our app, this is used in the context of medical market stock and donation request form.

Client: Patients, donators and medical markets are users of the application.

Server: The back-end of the application. This is where information about accounts, medical market stocks and wallet balances are kept.

1.4. Overview

ShareInHappiness is a welfare platform developed for Android. The main purpose of this platform is to create a secure environment in which patients who have diseases with expensive treatment costs can ask for medication donations and users of the platform can donate to these patients. Patients can register to the platform by providing a medical report. After their account is verified, they can create a donation request and list the medications and medical devices required. After a donation request is created, users can view the request and donate some items from the list to the patient. Medical markets will have accounts in the system to provide the patients with necessary medications.

Main difference between *ShareInHappiness* and other donation platforms is the security. *ShareInHappiness* requires patients to provide a medical report when registering. This prevents the frauds from abusing the platform. However, this is not the only security measure. There will be no direct money transactions in the platform. Patients will only get the necessary medications and medical devices. This will encourage the donors to donate more since they will be certain that they are donating to the people who really need help.

2. Current software architecture

There are many platforms on which people can ask for donations. Main difference of our program is its security. People asking for donations don't directly get the money. Instead they get the medical supplies they need. Platforms that have similar functions can be found below.

2.1. GoFundme

GoFundMe is a crowdfunding platform which allows people to raise funds for events ranging from life events such as celebrations and graduations to challenging circumstances like accidents and illnesses.

Features:

- All registered users can create a fundraiser
- All users can donate to the fundraisers

- Money raised in a fundraiser is transferred to the account of the fundraiser creator

2.2. Social Media Platforms (Instagram, Twitter, Facebook etc.)

Social media platforms like Instagram, Twitter, Facebook allow their users to post anything they want (given that it is within the guidelines of the platform). People share posts to request donations from the people in the platform even though this is not the main purpose of these platforms.

Features:

- All registered users can share anything they want including fundraisers
- All users can contact the fundraiser creator and donate
- No real security measures to prevent impostors from creating fundraisers

3. Proposed software architecture

3.1. Overview

This part of the report introduces software architectural design of the proposed ShareInHappiness.

3.2. Subsystem decomposition

ShareInHappiness is designed using Server/Client model. This allows the application to function flawlessly with a great number of users. Client side of the application is the Android application used by a single user. The client is developed using Flutter. Whenever a user tries to login, register, create donation request, add balance using the application, the information is sent to the Java server using REST API. Server is developed using Java and hosted in AWS. When the server receives the requests, it saves the changes to the database of the application which is developed using MySQL.

Client side is composed of two subsystems: view subsystem and controller subsystem. View subsystem controls how the application is shown to the user. This is the layer with which the user is interacting. It has components that control various

views of the application user interface. Controller subsystem contains a local storage component which is responsible for storing the information received from the server to the local storage of the client device. This is advantageous because storing some information locally will reduce the number of requests made by the client and speed up the application. Controller also contains a Network Manager component. This component is one of the critical parts of the system. It is used to send requests to the server and receive responses from the server.

Server side is composed of three subsystems: input/output subsystem, operation subsystem and storage subsystem. The Input/Output subsystem has a component called Communication Manager. This component handles the requests sent by the client, delivers them to other components of the server and sends responses back to the client. Another subsystem of the server is the operation subsystem. This subsystem is the core of the server and does most of the application backend operations. One of its components is the Database Connector. It manages the database operations on the server. Another component is the Authentication Manager. This component handles the authentication of the users that login. Transaction Manager handles the transactions in the application and makes sure that they are performed correctly. Another component is the Inventory Manager. This component keeps the inventories of medical markets in check. Third subsystem of the server is the storage subsystem. This subsystem holds the database of the application.

3.3. Hardware/software mapping

The clients of the program will be the users using the application in their Android devices. Whenever a user makes a change in the application, the client will send a request to the server to make the necessary change in the database. **Java** will be used to implement the server. **MySQL** will be used for database management. Server and the clients will communicate using **HTTPS** protocol through the **REST API**.

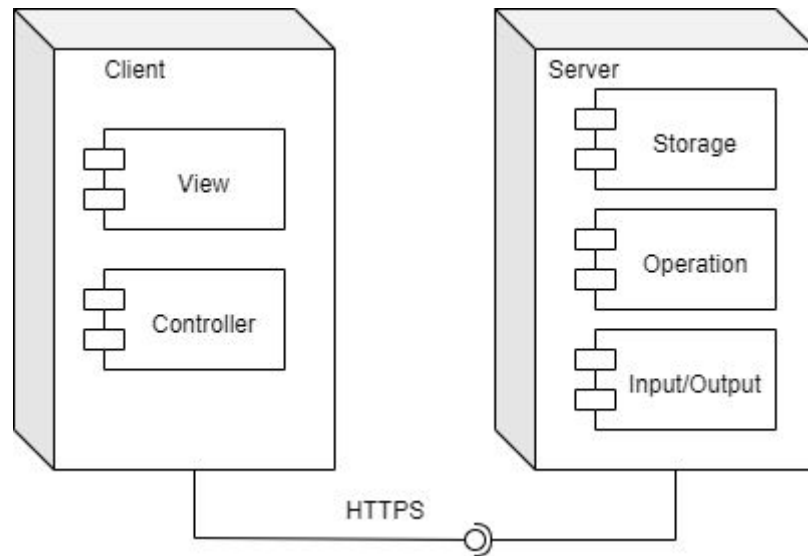


Figure 1: Deployment Diagram

3.4. Persistent data management

User credentials, donation requests, medical market products are the persistent data that will be stored in the database. Whenever a user creates an account, the information will be sent to the server to be stored in the database. If a registered user removes his/her account, the request will be sent to the server to remove the user details from the database. Whenever a new donation request is created by a patient registered in the system, a request will be sent to the server to add the donation request to the database. A request will be sent to the server to remove the donation request if the user deletes the request. If the medical market wants to add or remove a product, the request will be sent to the server to do the respective operation in the database.

MySQL database will be used by the server to store the persistent data. The server program will be implemented using Java with REST(Representational State Transfer) API.

3.5. Access control and security

Users need to create an account. To use the app, each user must pick an authentication username and password. When users try to login, each time the client will send a request to the server. The request will be checked in the database. If successful, login will be performed, otherwise login will be denied. Each time the

patient creates a donation request, the client will send a request to the server and the server will add it to the database if the request is concluded successfully. Also, when the medical market adds a new product into their stock, client will send a request to the server. The passwords are stored in encrypted form. Additionally, Medical markets can access only their own stock, they cannot see other markets' stock in the context of security. Furthermore, patients cannot modify others' request forms, they can only access their own request forms.

3.6. Global software control

ShareInHappiness is based on the event-driven software control system. When a new product is added into the medical market, client will send a request to the server. Furthermore, whenever a donation request form is created, a request is sent to the server in the same way. The server request will be successful or unsuccessful and the program will continue according to this response.

3.7. Boundary conditions

3.7.1. Initialization

Users can download **ShareInHappiness** to their Android device from Google Play Store. The application size will be small so this process will not take a long time. Internet connection is required to run the application. When users launch the application, they will see the login screen. If the user has an account, he/she can log in to the system by providing his/her credentials. The entered information will be found in the application database and checked. If the user information exists in the database, login will be successful and the user will be redirected to the main menu. Otherwise, the error message stating that the username or password is wrong will be shown to the user.

If the user does not have an account, he/she can click the “Create Account” button in the “Login” screen to be redirected to the “Create Account” screen. Since the platform has multiple account types (Donator, Patient and Medical Store), users will be asked to choose the account type during account creation. Users will be required to provide necessary credentials in the correct boxes. Additionally, patients will have to upload a verified medical report to the system. When users click the “Create Account” button, the credentials provided will be checked by the system and

if they are correct, the account will be created for donator account type and sent to verification for patient and medical market types. If credentials are incorrect (user already exists, password too short etc.), user will be shown the necessary error message.

3.7.2. Termination

Users can log out easily by clicking the “logout” button in the homepage. If the user closes the application without logging out, he/she will automatically be logged out unless they selected the “remember me” option during login.

3.7.3. Failure

The application requires Internet Connection. If the connection is lost at any point, an error message will be displayed to the user. When the connection is established, application will continue to function.

4. Subsystem services

4.1. Client

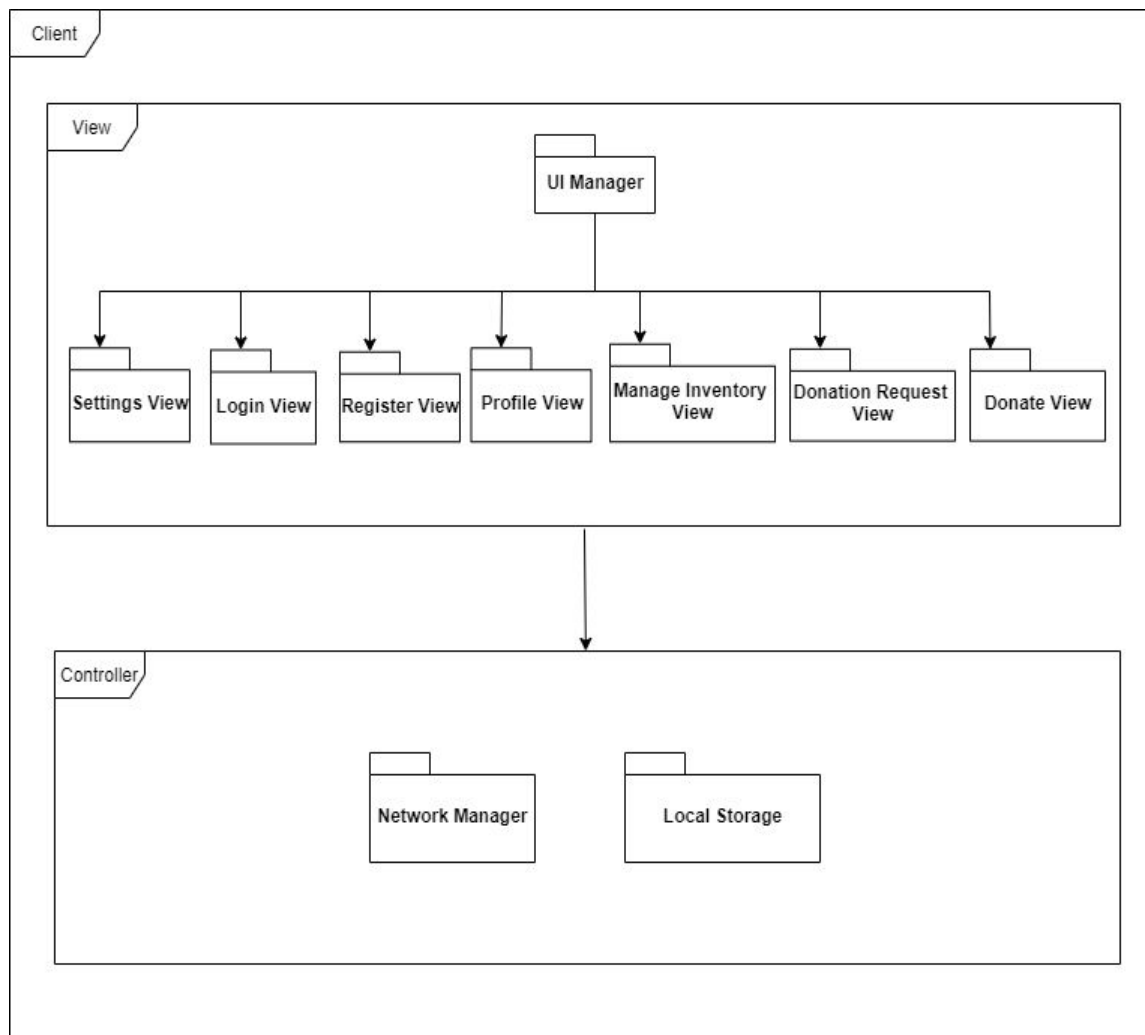


Figure 2: Client Structure

4.1.1. View

View subsystem controls how the application is shown to the user.

Settings View: A view class for account settings.

Login View: Login page of the application. The users who already have an account can proceed after the credential check.

Register View: A view class for each type of user. Gets credentials and sends them to the server.

Profile View: A view class where all types of users can see their account details.

Manage Inventory View: This view class is specified for medical market accounts. Each medical market will be able to see and manage their inventory.

Donation Request View: The last step of donation process. Completing the process on this view page will lead a transaction request.

Donate View: View page where the users see the list of patients.

4.1.2. Controller

Controller subsystem controls the received requests, delivers them to the view subsystem, stores data to local storage and sends the requests to the server.

Network Manager: Sends requests to the server and receives responses from it.

Local Storage: Keeps some information like profile details in mobile devices' local storages. This reduces the amount of server requests.

4.2. Server

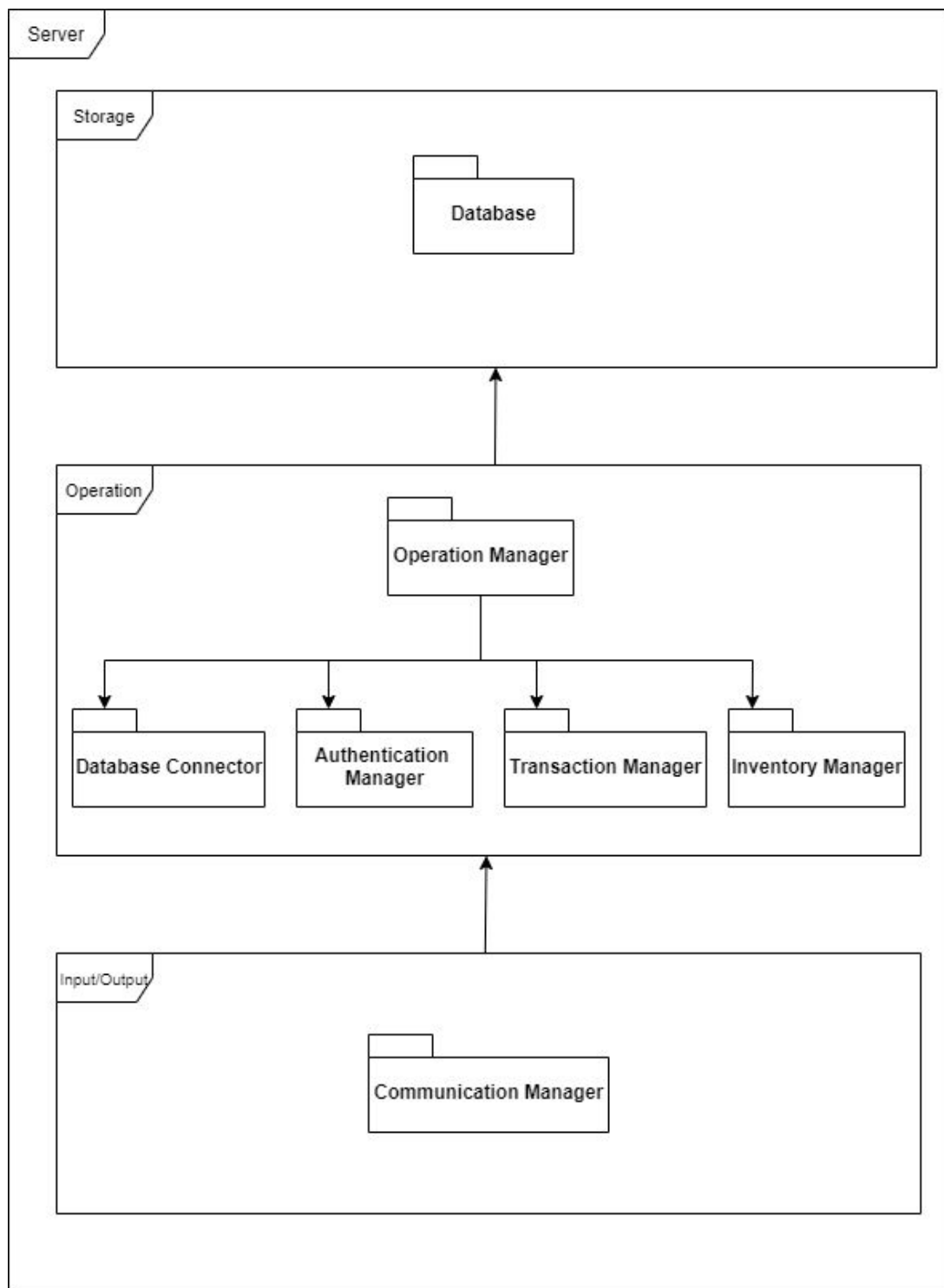


Figure 3: Server Structure

4.2.1. Input/Output

Input/Output subsystem controls the requests received and responses sent.

Communication Manager: A manager that controls the received requests, delivers them to the operation subsystem of the server and sends responses to the client.

4.2.2. Operation

Operation subsystem does most of the application backend operations.

Database Connector: Connects server operations to the database.

Authentication Manager: Secures communication by authorization.

Transaction Manager: Calculates the results of transaction operation. This operation occurs between donator account and medical market account.

Inventory Manager: Handles the requests to make changes on an inventory for a medical market account.

4.2.3. Storage

Storage subsystem holds the database of the application.

Database: This represents the database of the application.

5. Consideration of Various Factors in Engineering Design

5.1. Public health

ShareInHappiness is a platform that directly supports and affects the health of the public. It aims to extend the life of the patient thanks to the medical needs conveyed to the patient. In fact, the practice directly affects the increase in public health. The patient will be able to specify his own needs and ensure that it is provided to the patient by the person willing to donate. In this way, it is aimed to meet the needs of patients and contributes to the decrease in the number of patients.

5.2. Public Safety

The application ensures the accuracy and safety of patients, donaters and markets. Movements other than their intended use will be monitored, accounts can be verified and, in possible cases, accounts will be removed. In addition, the patient's

sign-up with the patient report provides safety for users during registration. It is important for security that this report is entered with the doctor's approval and signed document. The application provides an environment for its users to feel more confident and comfortable. The sending of the money to the medical market, rather than the direct delivery of the money to the patient, prevent fraudulent use. In other words, the donator will not transfer money directly to the patient, in this way, the medical market will be sent to be used as a donation. In this way, the donator will be able to donate in a healthier and more reliable way, knowing that his money goes to a medical need. At the same time, a confirmation notification will be sent when the product is sent to the patient from the medical market and when the product is delivered to the patient.

5.3. Public welfare

The use of this platform by volunteer donors for patients in need of help will increase the life of the patient's family. Medicals that the family or the patient himself/herself has to use for a lifetime or that they can obtain the products that they cannot afford, thanks to this application, provide welfare for these people. makes it easy to support each other socially and contribute to the lives of those people. It makes donators feel better as they donate and touch a patient's life. This solidarity between people increases the welfare of the society by providing a healthier and happier life for the users. At the same time, these aids made through medical markets increase the welfare of these markets.

5.4. Global Factors

ShareInHappiness will be able to filter patients and medical shops according to their city. If we expand out of Turkey, we will add other countries and cities so the foreign users will be able to search for patients or medical shops that are in their city or country.

5.5. Social Factors

ShareInHappiness has a donation score feature where a donator will gain points when they help a patient according to how much they helped which will be displayed in their profile and in patients profile people who helped will be displayed which will encourage donors to help more with some kind of a gamification.

Furthermore this profile can be shared with others and displayed by others which may give that person social prestige.

6. Teamwork Details

6.1. Contributing and functioning effectively on the team

Throughout this project, we divided the work to be done into subheadings and everyone was divided equally to avoid injustice. We put deadlines for each part and when these parts were over, we had a meeting and consulted each other about our ideas. Thus, everyone contributed at every stage of the project. In addition, we have worked more effectively in this way.

6.2. Helping creating a collaborative and inclusive environment

As we mentioned in the previous title, firstly everyone was working on their own part and then other group friends expressed their thoughts about that part or the parts that need to be changed by making meetings. Also, when someone needed help with their part, other group members helped or changed their part.

6.3. Taking lead role and sharing leadership on the team

In the beginning of the project, we divided the project into smaller tasks and assigned a different person as a leader for different tasks. This strategy provided a fair workload distribution and also made sure that no one was left out of the project. Leader of a task monitored the progress of the task, and distributed the workload equally between the members.

7. References

[1] “What is spinal muscular atrophy(SMA)?”. [Online]. Available: <https://www.zolgensma.com/what-is-spinal-muscular-atrophy>. [Accessed:11-Oct-2020].