SOTERIA

Informed Decisions, Safer Experience

CS 30700 Design Document

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Team 26

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1. Purpose

College students, often under constant pressure, rarely get time in their busy schedules. As a way to have some balance between their academics and social life, students take part in many social events that happen around their campuses. Though these social events give students some time off of their work, over the years, some of the happenings at these events suggest a lack of safety in our society.

Through the past couple of years, there has been a marked increase in the number of sexual harassment cases occuring in different social venues across college campuses around the world. Women, specifically, have been the primary victims of these unfortunate incidents. We believe that these often happen due to the lack of resources provided to students to make informed decisions about the social venues that students choose to visit. On college campuses where students are exposed to several opportunities of participating at social events and fall at the mercy of peer pressure, we think that there is a gap of accessibility of appropriate resources in our community to help students with some of the choices they make when planning on going to any social venues.

Using Soteria, users can get an accurate depiction of the safety of social venues across campuses using safety scores for venues to allow them to make informed decisions. Additionally, the heatmap feature will enable users to view areas near them where other users have felt unsafe.

The difference between our app and those that are already available is that these current apps are rather one-dimensional, that is, they serve to aid women safety in only one way. However, our app is based on the belief that one of the keys to women's safety is providing urgent and required care as soon as possible, and in creating an app that has many of these same functionalities all in one place, we can allow for a much more immediate and viable solution than having to individually traverse a plethora of apps. We aim to address these problems by creating a platform that combines many of these different services and a couple of our own proactive safety measures into one swift and easy-to-use package.

1.1 **Functional Requirements**

1. User account
    a. As a user,
        i. I would like to register for a Soteria account so that I have a personalized experience.
        ii. I would like to login to my Soteria account so that I can access full functionality.
        iii. I would like to have the option to create a verified account using my email so that it can raise the validity of my reviews on the platform
        iv. I would like to view and edit my account details so that I can manage my Soteria account.
        v. I would like to reset my password so that I can retain my account in the case I forget my password.
        vi. I would like to stay logged into the app even after it's closed so that I don't have to log in again and again.
2. Emergency Alert System
    a. As a user,
        i. I would like to press and hold the SOS button so that I can call my emergency contacts.
        ii. I would like to tap the SOS button so that just a message is sent to my close friends informing them of my location
        iii. I would like to view emergency contacts so I can view the close friends and family who will be notified of my whereabouts
        iv. I would like to manage my emergency contacts so that I can edit who gets notified of my whereabouts
        v. I would like to tap sos button once to tap the location as unsafe on the map so that I can alert anyone who might pass by that area
        vi. As a user, I would like to use the offline SOS feature of the map so that it enables me to contact emergency authorities, if need be, when I am not connected to Wi-Fi
3. Social Places/Events Viewing
    a. Viewing Information
        i. As a user,
            1. I would like to view star-based rating for a place (only read reviews that gave a place 4 stars, etc.) so that I can gauge general safety reviews of the said place
            2. I would like to view university accredited information about the place so that I can get an official statistical idea about the place's safety

3. I would like to view if the person who reviewed is verified or unverified so that I can gauge the legitimateness of a given review
4. As a user, I would like to view list of places sorted by safety score and user review ratio so that I can better decide to go to a certain place or not

b. Reviewing Places/Events
   i. As a user,
      1. I would like to view reviews and comments about a place so that I can know how other people felt at the said place
      2. I would like to upvote a certain review so that I depict the fact that the particular review resonated with me
      3. I would like to add reviews about a specific place so that I can inform the user base about my experience at the place
      4. I would like to give star-based ratings to a specific place so that another user can gauge general safety of the place in question
      5. I would like to reply to other user's reviews so that I can engage in a conversation / add on to what another might have said
      6. I would like to be anonymous when commenting/reviewing/mark map incident report in case I feel unsafe revealing my identity

4. Petition System
   a. As a user,
      i. As a user, I would like to add a petition about a social place so that I can raise a concern which could bring about actionable changes
      ii. I would like to reply to another user's petition so that I can improve the petition's reach and add on to the conversation
      iii. I would like to upvote another user's petition so that I can improve the petition's reach and depict my approval of said opinion
5. Interactive Map
   a. Visual Aesthetic
      i. As a user,
         1. I would like to see all social hangouts pinned on the map so that I can know potential places to visit
         2. I would like to view heatmap of unsafe places so that I can find an alternative route to avoid those places and be safe
         3. I would like to switch between normal map and heatmap so that I also can get a better sense of my location

4. I would like to view locations on the heatmap with different colors based on the frequency of unsafe reports that have been made at that particular location or in a close vicinity of it so that users can be made aware of unsafe zones
5. I would like to zoom in/out of the map and move map according to the user's preference so that the user can explore the different places on the map easily
6. *If time permits*, I would like to see the nearest safewalk beacon highlighted so that we the user can access the closest beacon available

b. Safety Features
   i. As a user,
      1. I would like to see my location on the homepage map so that I can be aware of my surroundings and the other locations around me
      2. I would like to see the map of the campus on the home page so that I can get an idea of the general layout of my surroundings
      3. I would like to search for a place on the map so that I can use the heatmap and plan my trip to that place accordingly
      4. I would like to mark a location on map as unsafe by pinning the location so that mark a particular landmark or un-identified place as unsafe to alert other people
      5. I would like to mark a location on map as unsafe by searching the location so that I can mark a particular hangout or social event spot in order to alert other people
      6. *If time permits*, I would like to see the locations of the safewalk beacons/signs that are present across the campus so that I have quick access to campus safety resources

6. Bulletin Board
   a. As a user,
      i. I would like to add a women safety event to the bulletin board so that we can build social awareness about women safety in our community and encourage others to participate in such events
      ii. I would like to reply to an event on bulletin board so that feedback can be given and the event can be promoted
      iii. I would like to upvote an event on bulletin board so that the event can be promoted
      iv. I would like to RSVP to event on bulletin board so that I can show my interest in such an event

v. I would like to view different events on women safety on a bulletin board so that users can join these events based on their interests
vi. I would like to view the events by newest/latest and not see events that have occurred so that the users are updated with the events occurring nearby and can plan their schedules accordingly

7. External Help Resources
    a. As a user,
        i. I would like to see links to external resources and mental help so that they can help me cope with incidents
8. Notifications
    a. As a user,
        i. As a user, I would like to receive notification if someone replies on your review so that I can engage in a conversation in a timely manner

1.2 Non Functional Requirements

1. Performance
    a. We would like our application to be able to run smoothly
    b. We would like our application to launch within 4 seconds
    c. We would like our application to be able to support 1000 users
    d. We would like our application to be able to service multiple users concurrently
2. Server
    a. We would like our application to be able to support real-time client-server communication
    b. We would like our server to be able to store user and social venue data in a database
3. Appearance
    a. As developers,
        i. We wish to create a UI that is simple and intuitive for a user to utilize
        ii. We wish to create a map UI that is easily customizable to a user's needs
4. Security
    a. As developers,
        i. We wish to maintain a secure and live database
        ii. We wish to utilize Flutter's robust authentication systems to counteract malicious activities
        iii. We would like to let the users choose whether to enable location data or not

   iv. *If time permits,* we would like to encrypt user's password and personal information that is stored in the database

5. Usability
   a. As developers,
      i. We would like to make our app as user-friendly as possible
      ii. We would like to make the application accessible on different resolutions and screen sizes

2. Design Outline

High level overview:

This project will be a cross-platform mobile application that allows the users to view an accurate depiction of the safety of social venues across campuses using safety scores for venues to allow them to make informed decisions. The users can also use the heatmap features that will help them view the areas near them where other users have felt unsafe.

This application will be using a client-server architecture, where we will be able to access the database and supply this data to multiple, concurrent users on our application.

Mobile-Client:

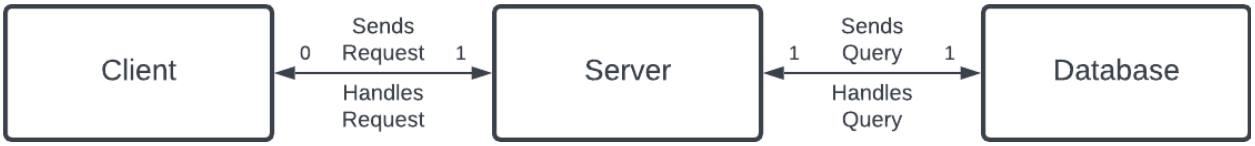
- The user, using an android or an ios device would be able to use the app as an interface to get the required information
- The user will be able to send and receive data to our server by using various web-apis via http requests
- This data will then be presented to the user in the form of maps and reports so that they can get the accurate depiction of safety in various public places.

Web API's:

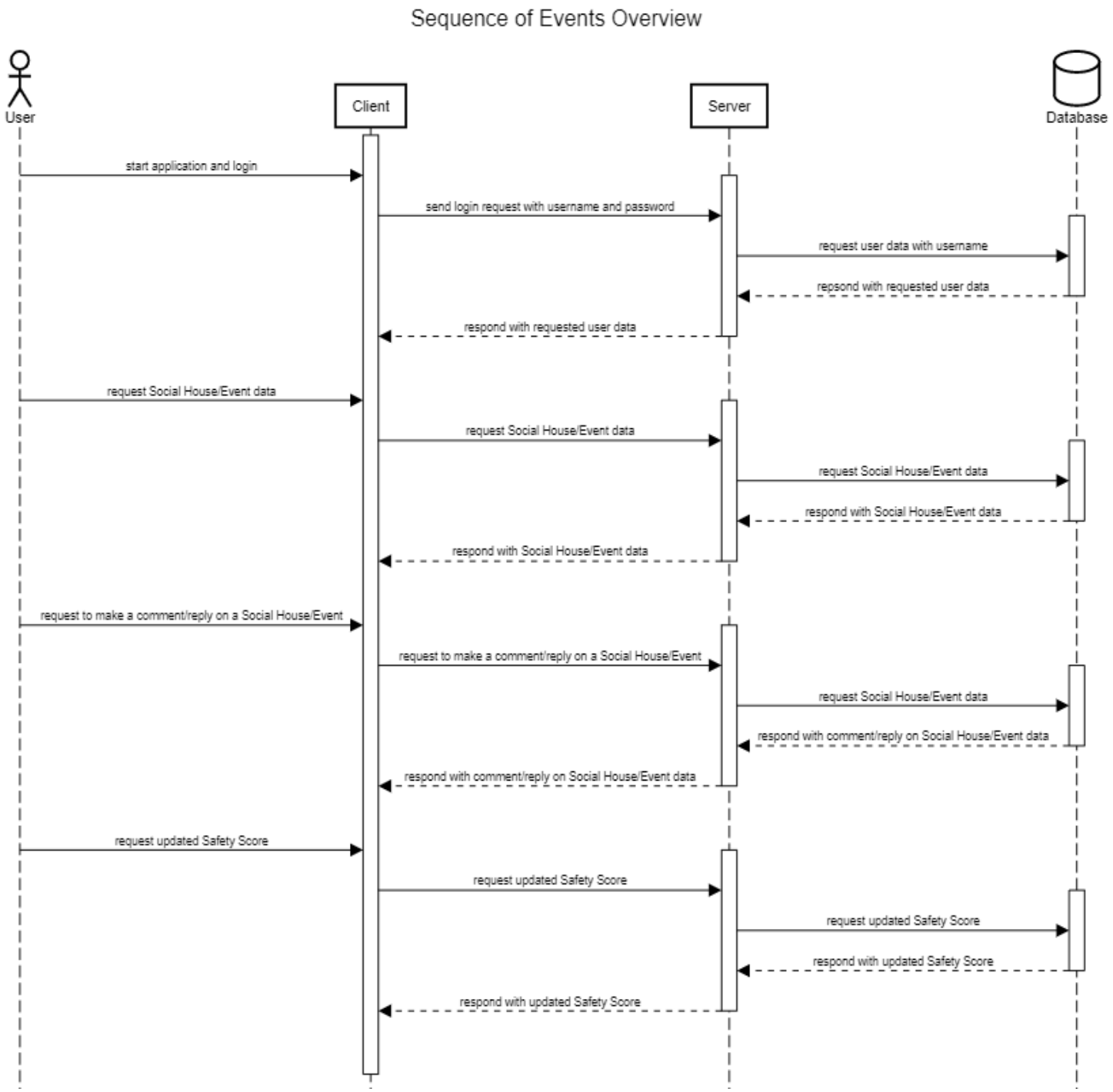
- The app will be using a web api from google maps along with flutter google map package in order to keep a track of locations and create a heatmap so that it can be presented to the users

Database:

- The app will be using a relational database, such as MySql, and this will allow persistence of data so that even when the server or the app is stopped the user data is not lost



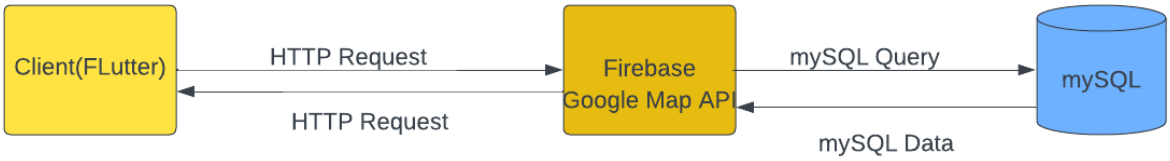
Sequence of Events Overview:



2.2 Different States of System

Overview:

The client (using a flutter based app) would log or sign up into the app and the user is authenticated or stored via a http request to Firebase and the related user data would also be stored in mySql database. Then, the app would display the map with all the social hangouts listed in a sorted manner based on the safety score. The user can choose to toggle between the normal map and the heatmap. Once, after choosing a heat map, rendered by using Flutter packages, all the data of the heat points would be queried from the data and displayed onto the screen. The user can also create a petition or take part in a discussion channel– all this data would be queried to the SQL database and it would be updated in real-time. Finally, since we have a Flutter Client, we will be able to host the app on both App Store and the Play Store.



3. Design Issues

3.1 Functional Issues

1. What information do we need for signing up for an account?
    - Option 1: Username and password only
    - Option 2: Username, password, email address
    - Option 3: Username, password, email address, phone number

    Discussion: It is necessary to have usernames and passwords to identify a specific user with protection. Email is an additional form of verification. It can also be helpful in the event of a password reset.
    Given the nature of data that we would be dealing with in the app, we felt it would be nice to have an extra layer of security in the form of phone number verification as it is pretty easy to create spam email accounts. We would also be requiring a user's phone number in order to be able to connect them with their trusted phone contacts and emergency services so it is convenient to ask for this information at the time of signup itself.

2. In what format do we want the users to view all the relevant social hangout locations?
    - Option 1: Search Bar
    - Option 2: Dropdown / Basic List
    - Option 3: Map along with Search Bar & Dropdown

    Discussion: A search bar and a dropdown are good ways to navigate to an item in a list. However, when dealing with locations, it is much more intuitive for a user when a map is also present. It can help the users get a mental image of where a given place might be and make the app much more accessible. It can also help the users plan their day/ night out in a much better manner as they will know which social hangouts are located where and what other places might be around it.

3. How do we want to sort the social hangouts by safety score?
    - Option 1: Averaged User Rating
    - Option 2: Number of Reviews
    - Option 3: Custom Ratio of above 2

    Discussion: Averaged User Rating is a good metric but could be misleading when the number of reviews is very low or very high. Similarly, sorting by the number of reviews could produce biased results when comparing a very popular or a not well known hangout location with one of average popularity.

4. What should be the visibility of user profiles?
    - Option 1: Public (Names and Username Visible)
    - Option 2: Private / Anonymous (Names and Username Not Visible)
    - Option 3: Public Accounts with ability to go Anonymous

    Discussion: We want the users to be able to choose their visibility status depending on the situation and their comfort level. Some people who have genuine feedback to give might refrain from doing so due to the fear of getting doxxed, ruling out option 1. On the other hand, some users might want to include their names so as to make their stances feel more genuine.

5. How do we want the users to interact amongst themselves?
    - Option 1: Direct Private Chat
    - Option 2: Group Chats
    - Option 3: Public Chats (Under Reviews, Petitions, and Bulletin Boards)

    Discussion: We decided to restrict private chats so that we can prevent unsolicited advances from one user to another. Group chat functionality did not seem fitting for similar reasons and given that we allow users to engage in conversation, this functionality would feel redundant anyway.

3.2 Non-Functional Issues

1. What mobile app language/software do we use for the app?
    - Option 1: Swift
    - Option 2: Android Studio
    - Option 3: Flutter

    Discussion: No members on our team have any experience with swift and IOS development. Two have beginner level experience with android studio but only one has androids to test the app outside of virtual simulation. Furthermore, given that the usage of iphone is very high, we wanted an app that could function on iphones as well. Thus, we chose Flutter as it provides cross-platform mobile app development features allowing us to easily maintain the app on both iOS and android platforms. Flutter also provides many libraries and tools to build a beautiful custom user interface and uses Dart language which is fairly easy for beginners like us to learn since we have experience with object-oriented programming. Therefore, given the flexibility Flutter provides us with, we chose it over other mobile app development tools like Android Studio and Swift.

2. What type of database should we use?

- Option 1: Relational Database such as mySQL
- Option 2: A NoSQL database
- Option 3: MongoDB - document based database

Discussion: We want to use a relational database over a NoSQL or Mongo/document based database as it provides more rigid structure and enforces a strict schema. Relational databases are also more suitable for complex data relations while the other schemas are for simpler data structures. This makes using the relational database easier as querying and manipulating data is readily available because it is widely used and standardized. It is also simple to integrate MySQL relational databases into a flutter app and also provides inbuilt security features allowing us to keep a lot of data and keep it safe.

3. What backend services is the app going to use?
    - Option 1: Google Cloud Platform (GCP)
    - Option 2: AWS (Amazon Web Services)
    - Option 3: Firebase
    - Option 4: Node.js
    - Option 5: Django

    Discussion: We want to use Firebase for our backend services as it has a simple and intuitive API which can easily be incorporated into the flutter app. Furthermore, Firebase offers us real-time data synchronization which is essential for developing real-time and collaborative apps such as ours. Firebase is also built on Google Cloud Platform so it can handle large traffic and data and can be easily integrated with other Google services making it an ideal choice for developing Flutter apps.

4. Which API should we use to access location and map data?
    - Option 1: Mapbox API
    - Option 2: Google Maps API
    - Option 3: Bing Maps API
    - Option 4: OpenStreetMap API

    Discussion: We decided to choose Google Maps API over the other maps API mainly because it can be integrated fairly easily with other google services making it a good choice for a Flutter app. Furthermore, Google Maps API is a widely-used mapping platform and has multiple resources and support available especially when working with location based data like we plan to. Google Maps API is also constantly updating making it accurate and it can provide us with customization options which will be essential when we make the heatmap feature.

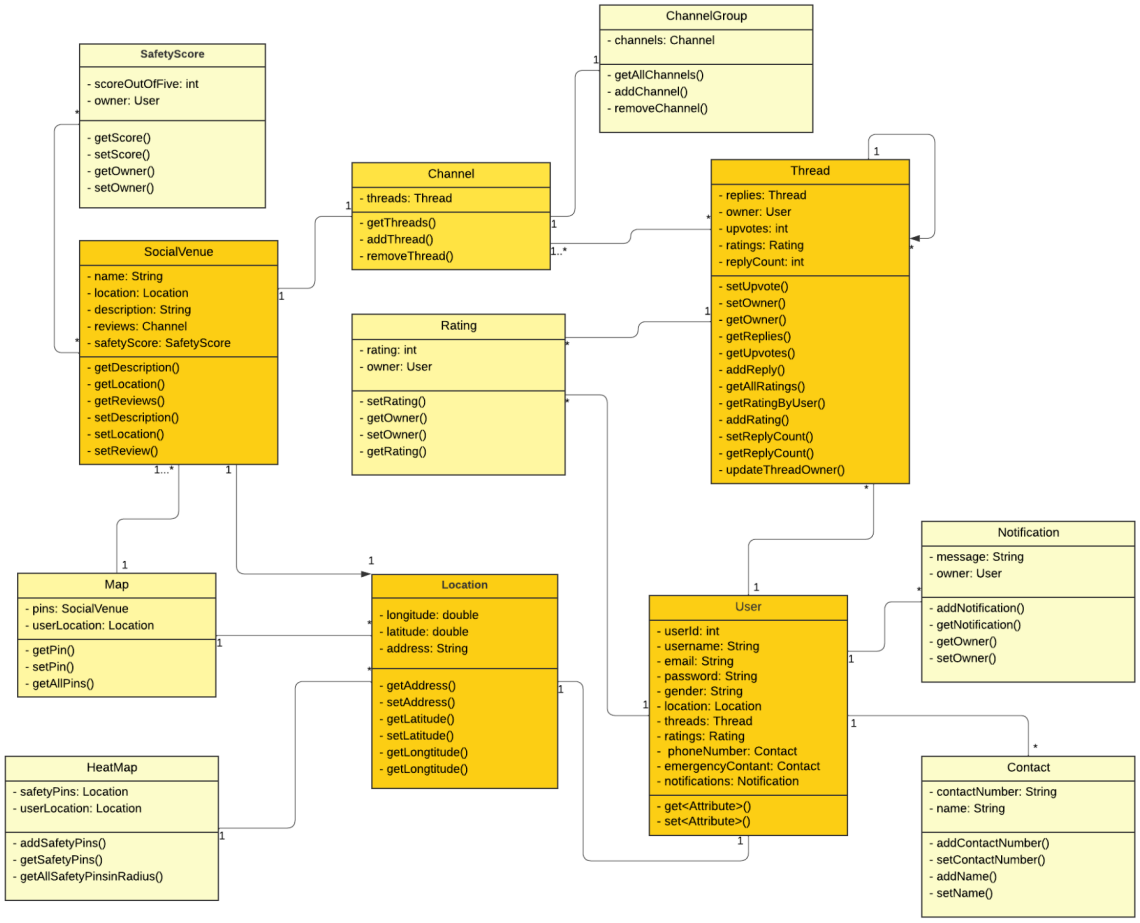
5. How do we host the mobile app?

- Option 1: Web Hosting
- Option 2: Private Servers
- Option 3: App Services

Discussion: Once the app is built, we would like to host it on mobile app services such as Google Play Store, or Apple App Store, because of the reach they can provide. With billions of devices and users that use these app services, it is essential when trying to reach a large audience quickly and easily. App services also have solid security and quality standards for the apps they host, which provides a level of trust for users and developers. Mainly, app services are a centralized place for discovering and downloading new apps making it easier for the users to find and download our app.

4. Design Details

4.1 Class Design



Description of Classes and their Interactions

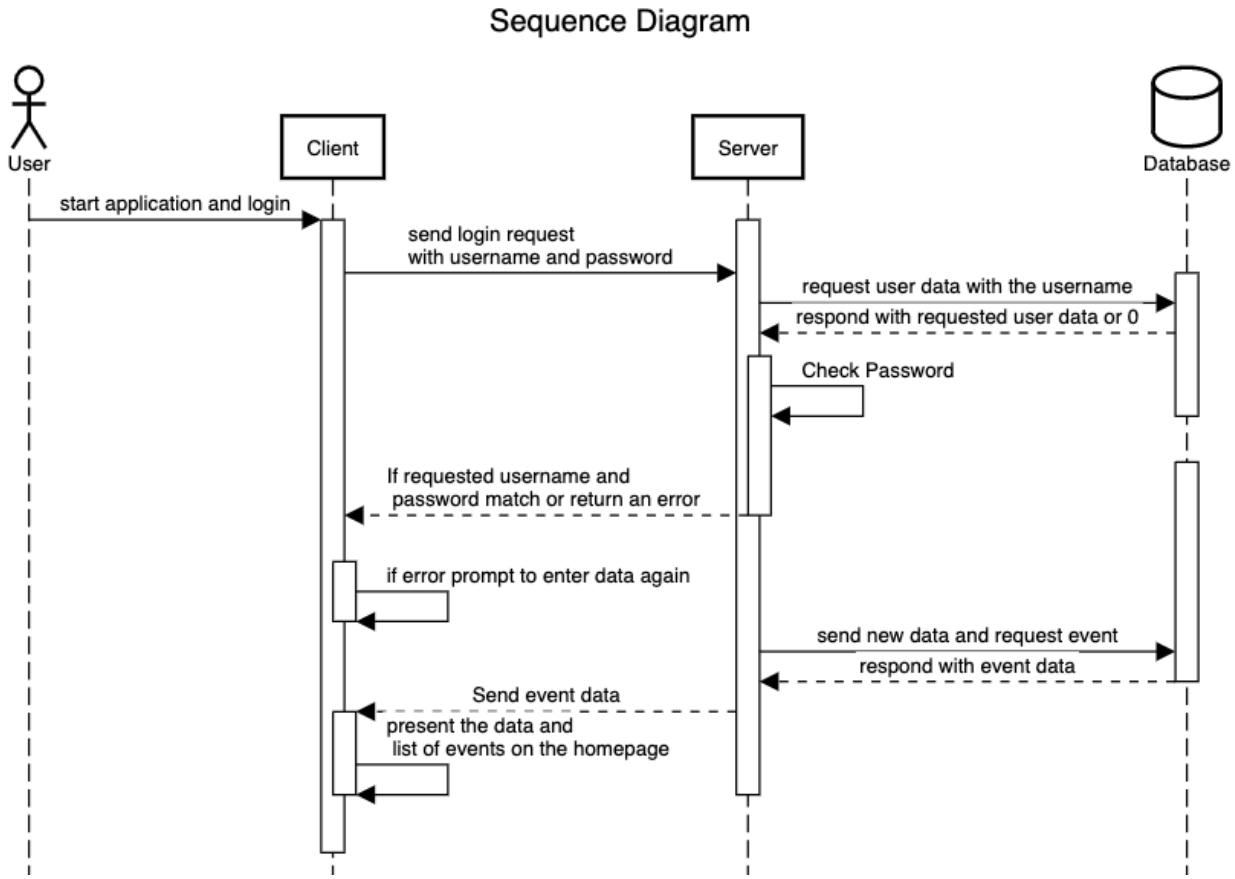
- User
    - An object created when someone registers/sign up on our app
    - Each user will have a unique userId
    - Each user will have an email, username, and password for authentication
    - Each user will enter in details regarding their gender and location
    - Each user will have a set of threads that they have made
    - Each user will have a set of ratings that they have given
    - Each user will input emergency contacts into the app
    - Each user will have a set of notifications based on their activity in various channels and thread
- Notification
    - This object is created when there some user replies to a thread
    - This object is used to notify the users who owns the thread in the event of some user replying to their thread
- Contact
    - This object is created when the User object is made
    - This object is used to store the contact information
    - This object will have one name and a phone number that corresponds to that name according to the user input
    - This object will be used to not only store the contact information of the user, but it will also be used to store the emergency contacts that the user will input
- Location
    - This object is created when the User, Map, HeatMap, or Social Venue objects are created
    - This object will have a specific longitude, latitude, and an address string to get information about the location of a particular data point
    - These location objects will be used to pair up each social venue with a location so that they can be pinned/marked on the maps (Map and HeatMap objects)
- HeatMap
    - This object has only one instance among all the users of the app, meaning that one HeatMap for all the users of our app
    - This map will have a set of pins that are displayed on it on the basis of users marking a particular location as unsafe
- Map
    - This object has only one instance among all the users of the app, meaning that one Map for all the users of our app
    - This map will have a set of pins that display the social venues featured on the app and their locations on the map
    - The map will also display the location of the user gathered from the User object

- Rating
    - Each user will have a unique rating object for every thread which they choose to rate.
    - All user Ratings will be added up to calculate the upvotes for a thread
    - Using Rating objects ensures a user can upvote / take away their upvote at any time and a user only adds to the upvote count for a thread once
- Thread
    - Thread objects are the building blocks of our review, petition, and bulletin board.
    - Each time a user makes a new post (be it a review, a petition, or any other form), it starts a new thread within a Channel
    - Every reply to a given thread is treated as another new thread
- Channel
    - A Channel object aggregates multiple threads together
    - It will help provide a forum for users to make reviews and reply to the reviews made by other users
- ChannelGroup
    - A ChannelGroup object will have multiple Channel objects in it
    - By aggregating multiple channels where each channel represents a review area for a social venue, it will make it easier to handle project organization particularly on the backend
- SafetyScore
    - An object of this class would be associated with each SocialVenue
    - Will inform the user of assigned safety rating calculated on the basis of individual user reviews
- SocialVenue
    - A single SocialVenue object is used to describe each social hangout.It will make use of the Location, Rating, Channel, and SafetyScore classes as its attributes.
    - SocialVenues will be visible in both list and map forms where users will be able to see the associated reviews and ratings for any given venue

4.2 Sequence Diagram

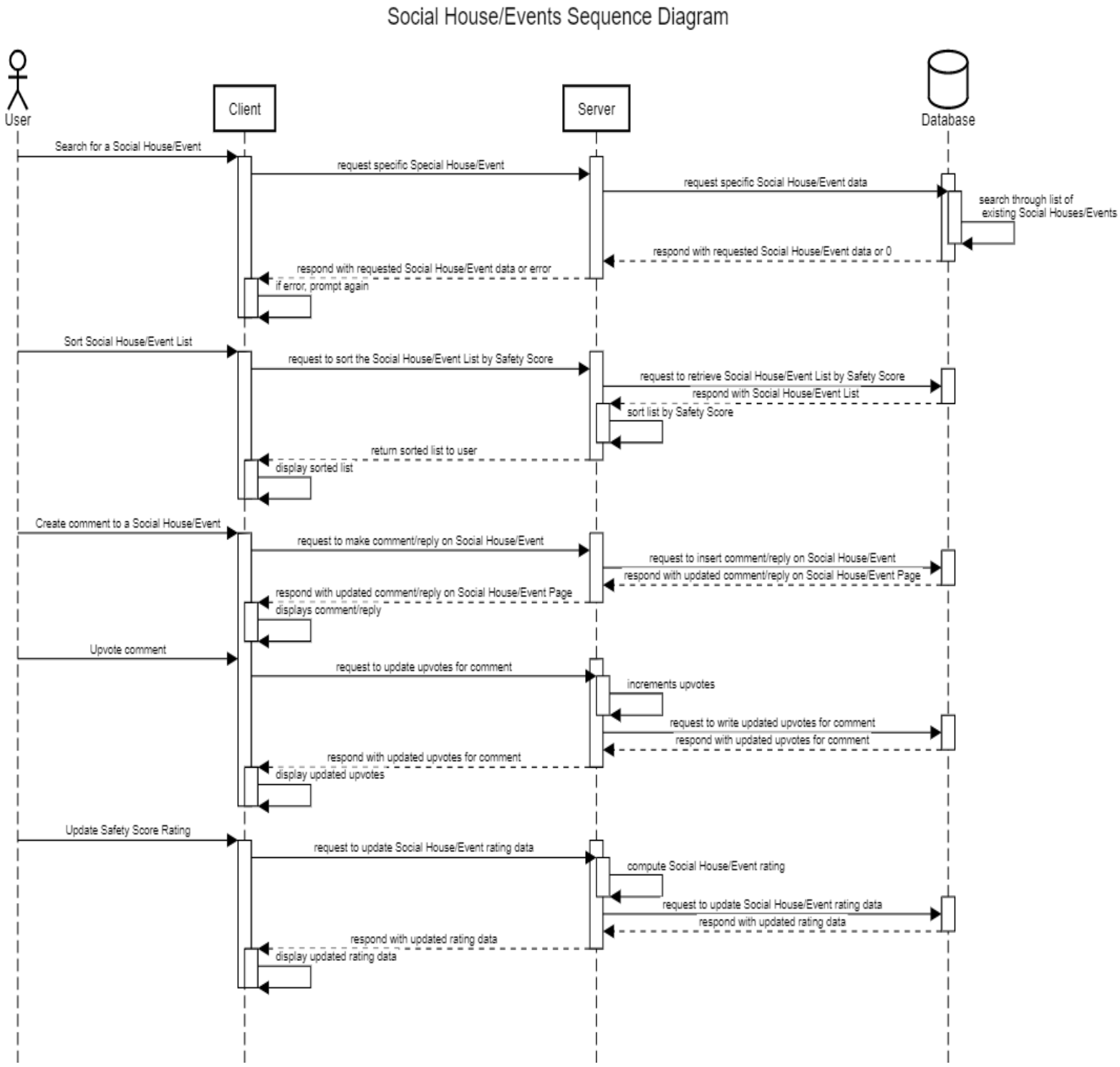
1) User

→ Starting the application and logging in



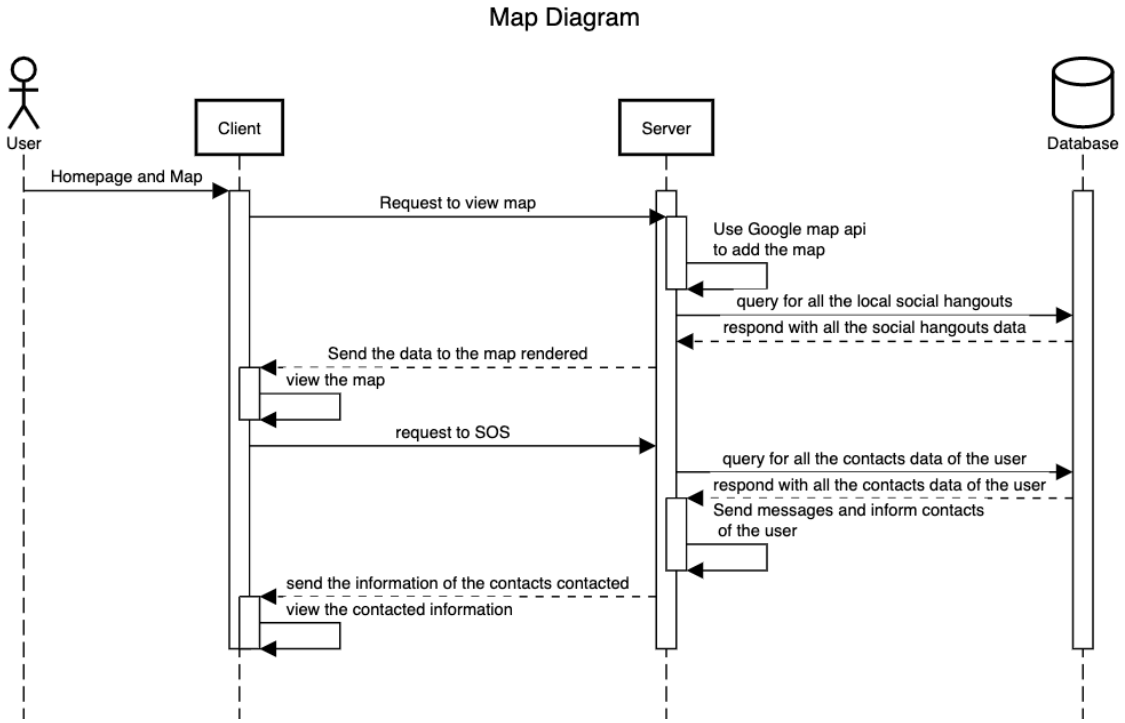
2) Social House/Event Viewing

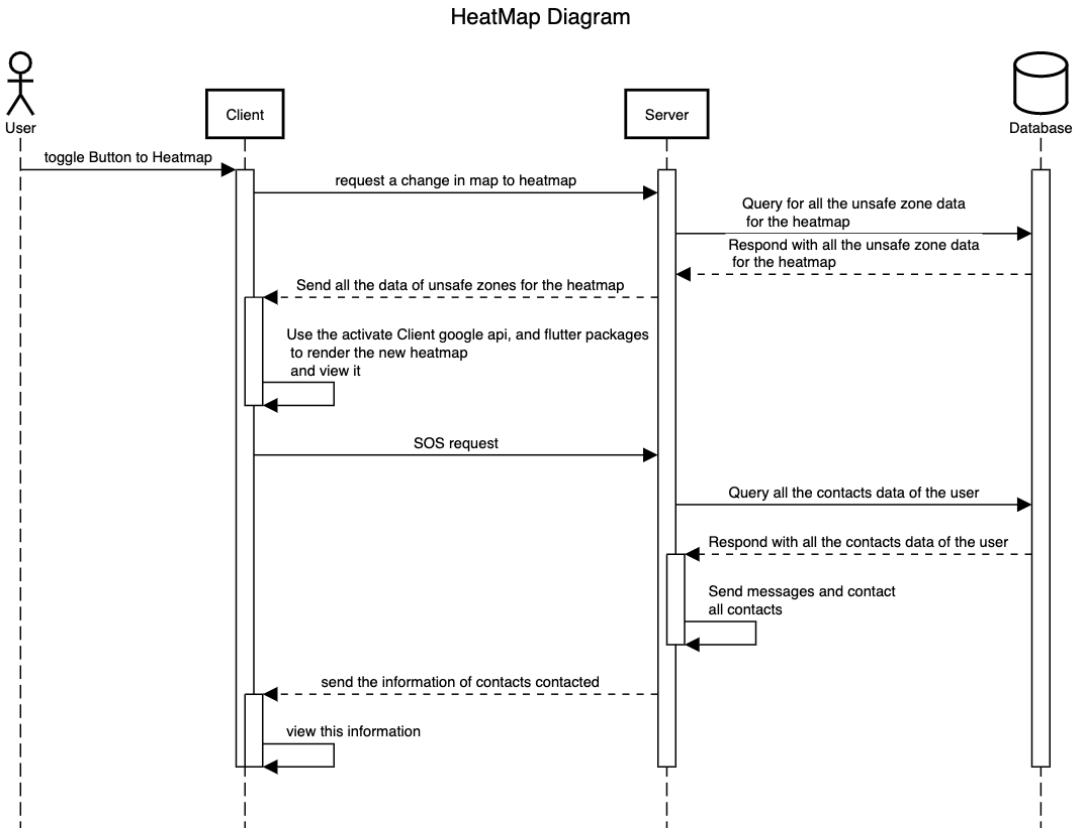
→Viewing and rating the page for a particular social venue.



3) Map Interaction

→ user interacting with the map and using the SOS button

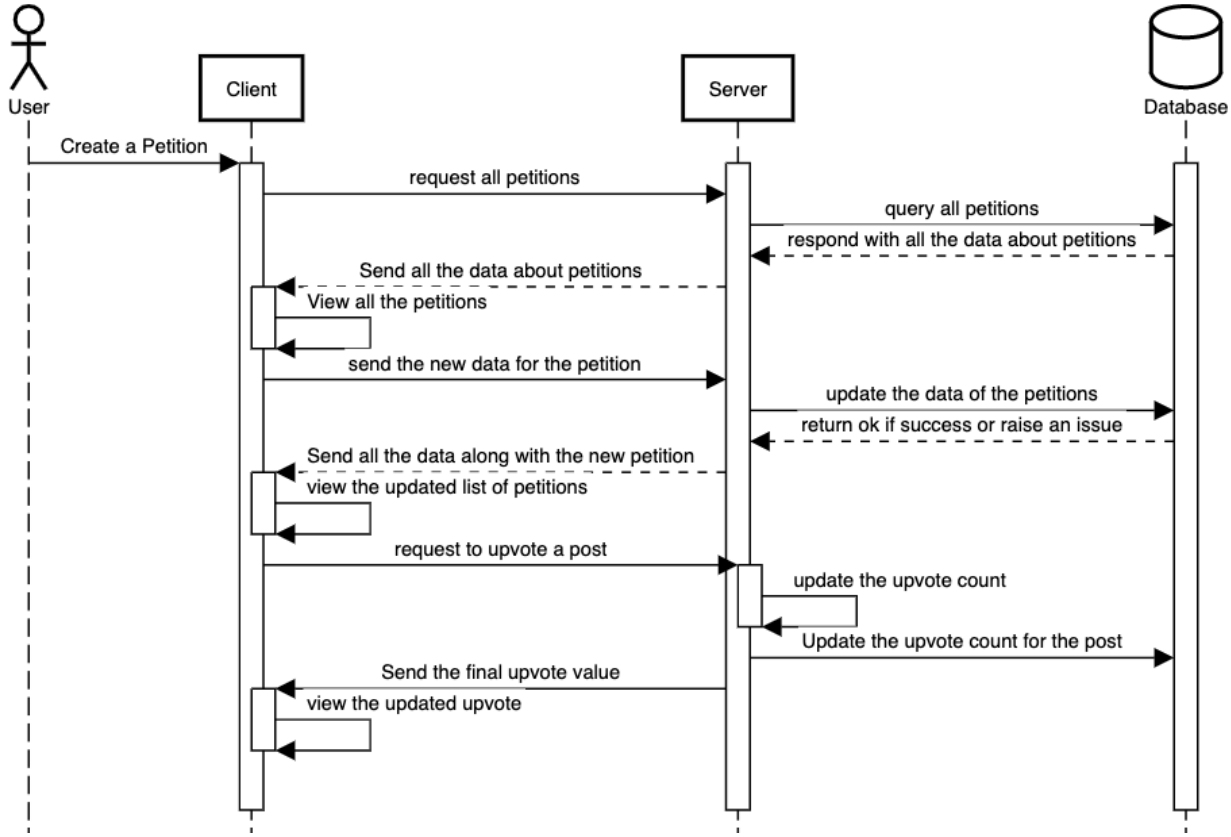




The user using the heatmap to look at safety status for various locations

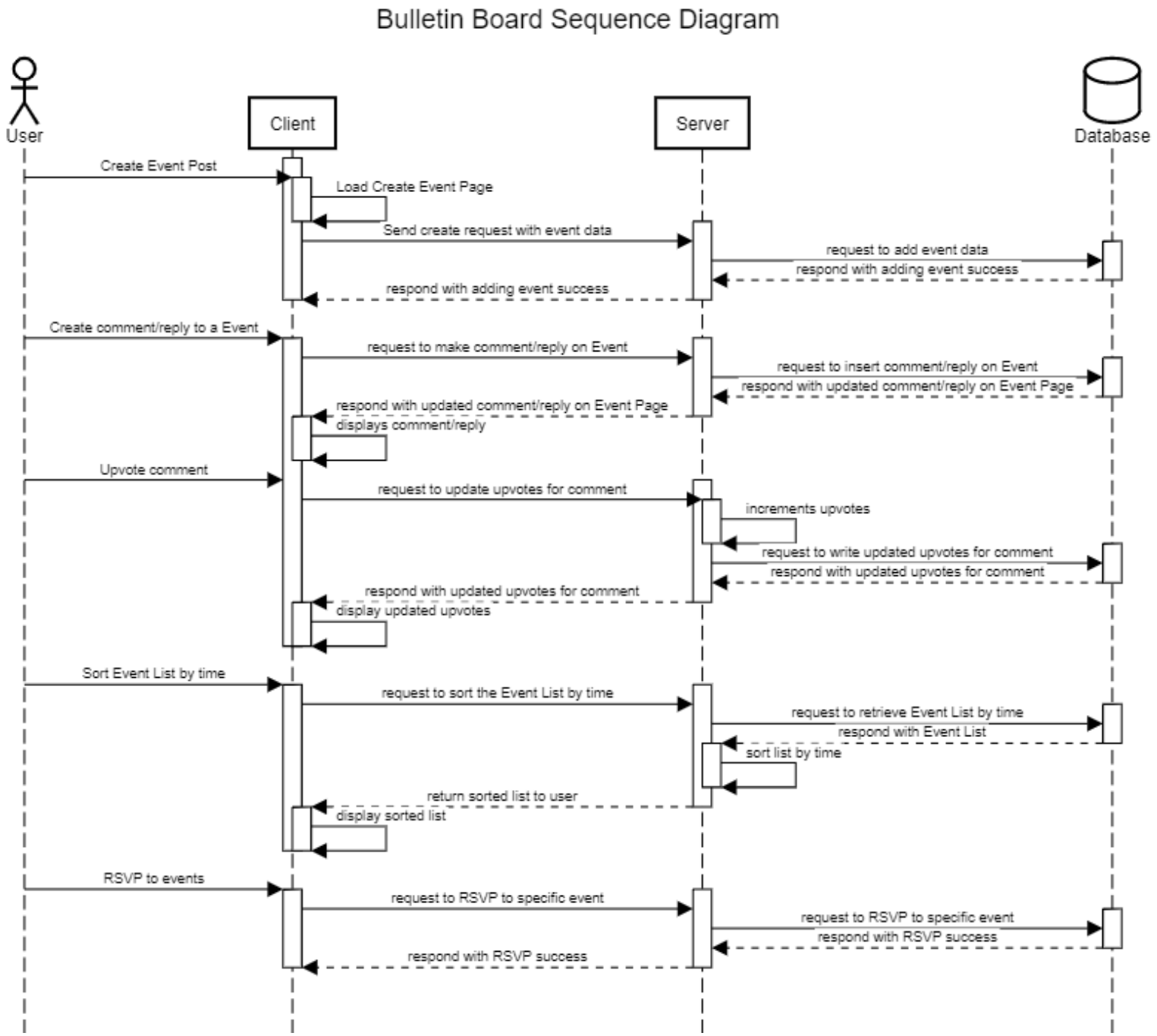
4) Petition

→Creating a petition

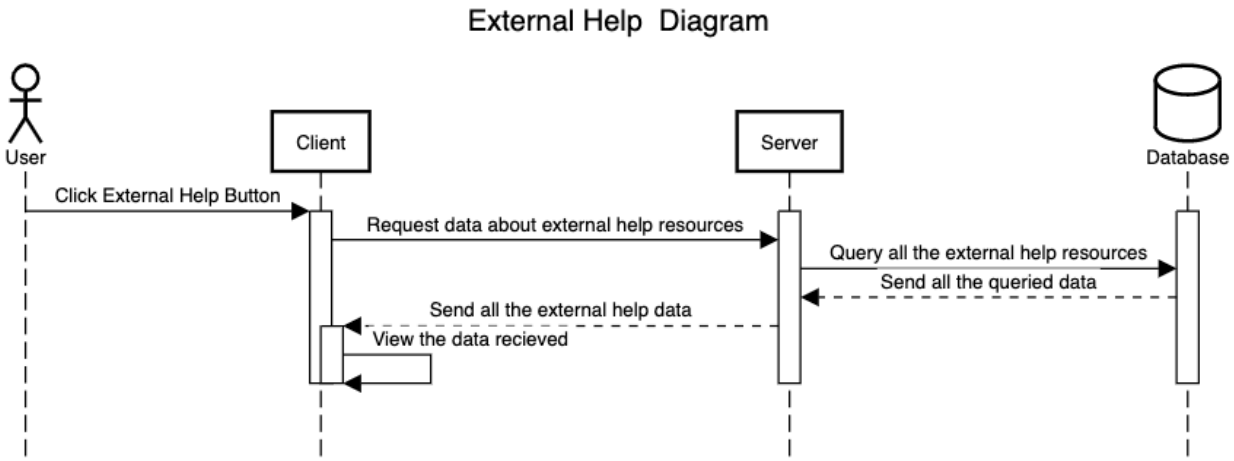


5) Bulletin Board

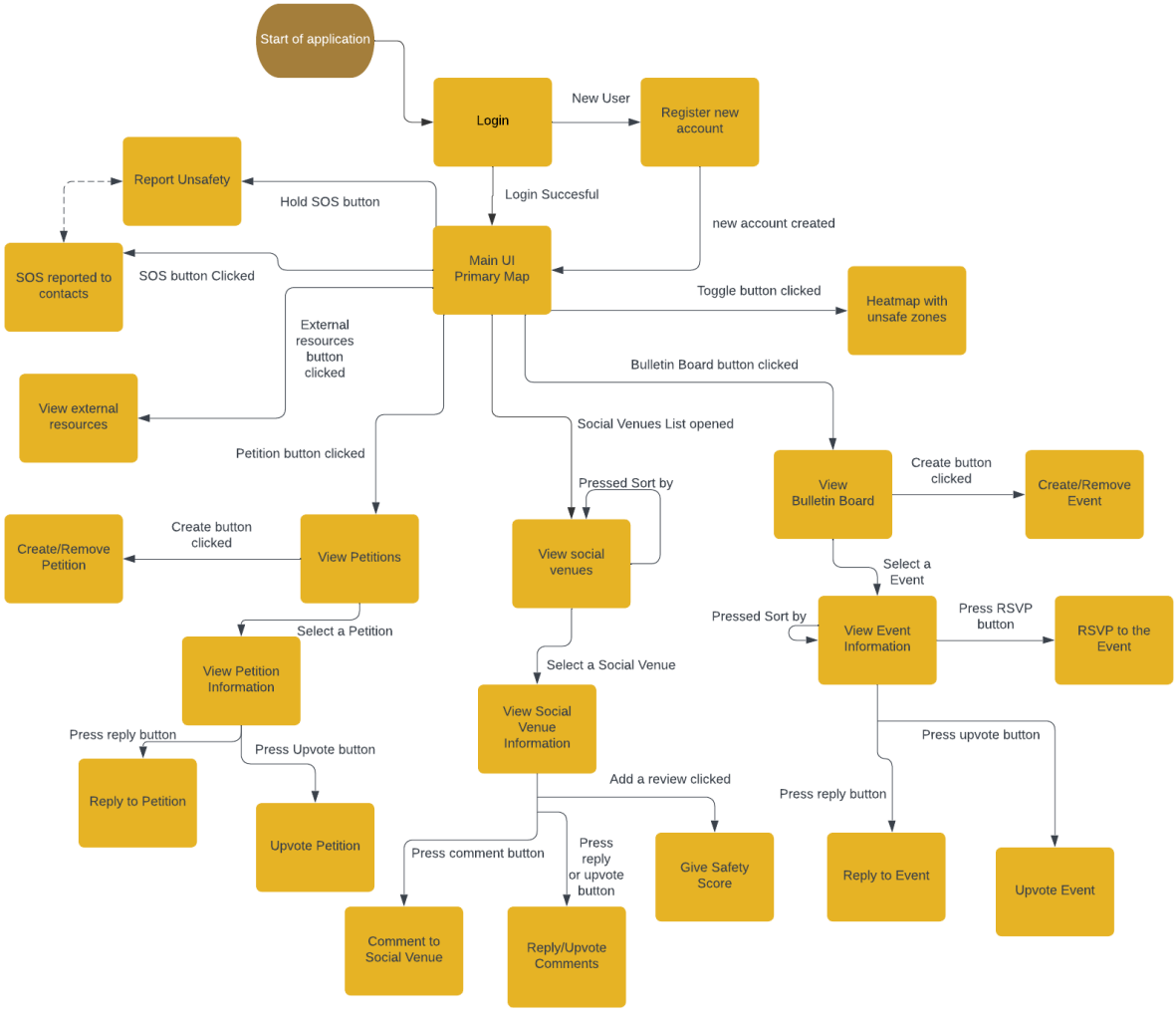
→Creating and rating a Bulletin Board Event



6) **External Help Resources:**
   →Exploring external help resources



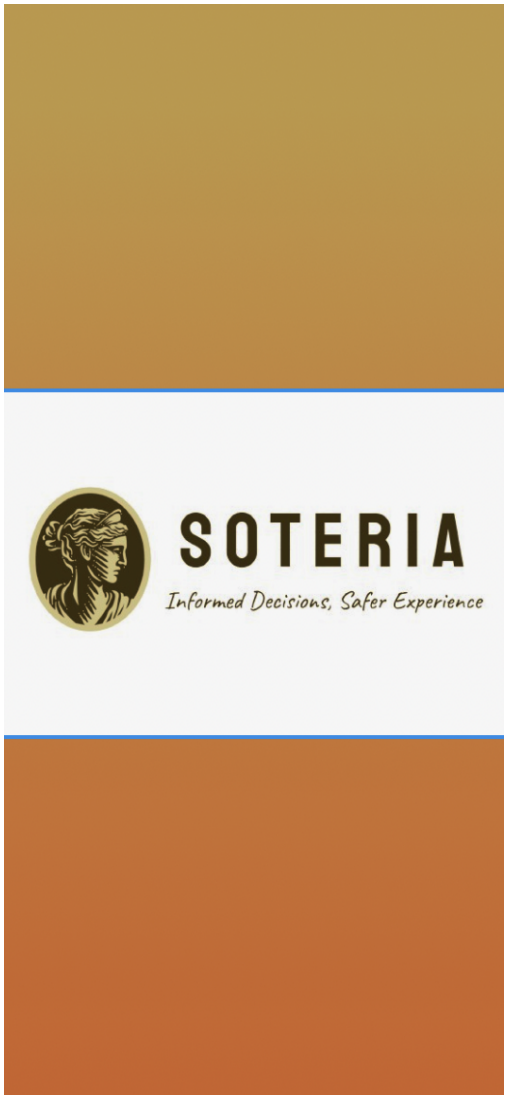
4.3 Navigation Flow Map

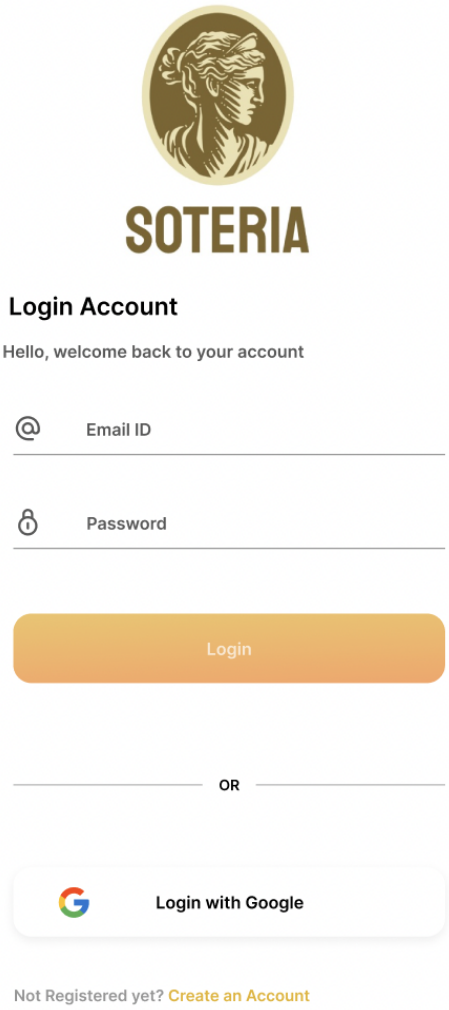


If the back button is pressed, move in the opposite direction of the arrows.

4.4 UI Mockup

Login/Register page:

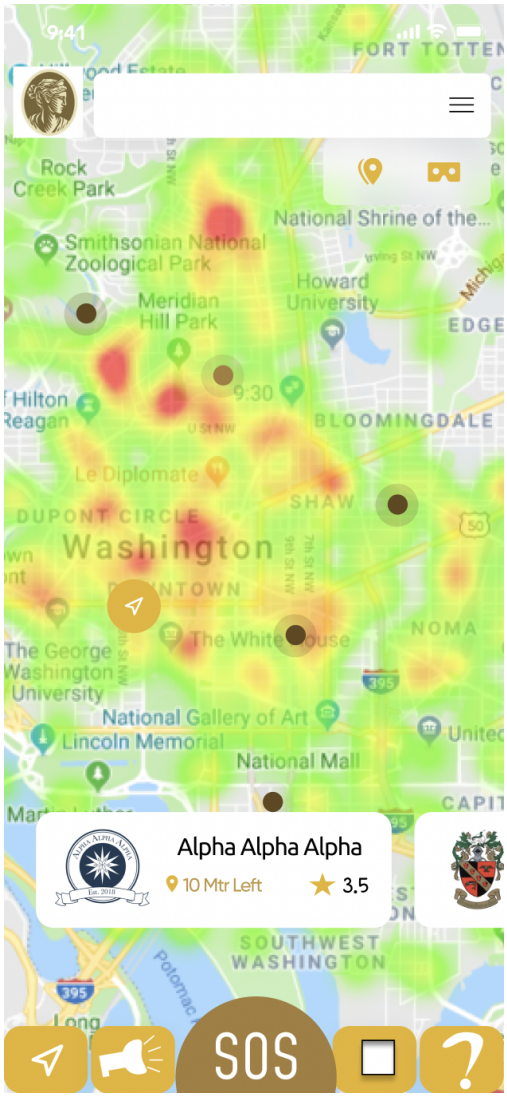




Home page:

This is the page from which all users will navigate to the different options we have in our map

With Heat Map Enabled

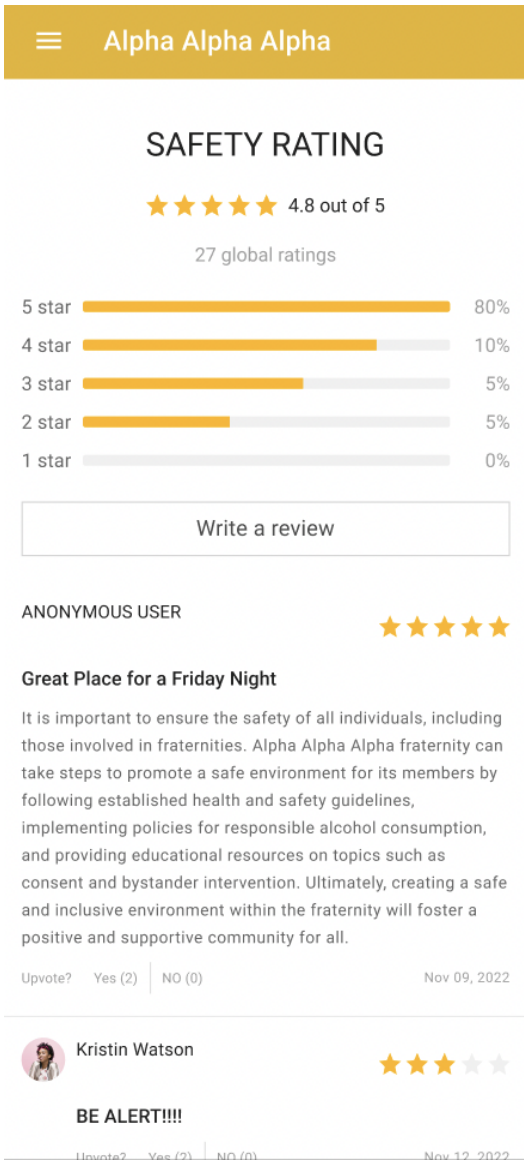


With Normal Map enabled

Social House/Event Home page:

This page holds the description of the specific Social House/Event chosen, the Safety Score for the Social House/Event, and the comments discussing experiences there

Home Page for Social House/Event



Create Comment/Review Page