Overview

The sotravel application is designed to aid the startup sotravel.me manage their trips.

Context

Sotravel.me organises group adventure travel for young adults. The aim of the startup is to allow young adults to go on adventurous trips such as skiing or diving and make friends in the process. The company has a ski trip slated for April 2023. The goal of the application is to allow trip hosts to publish events within the trip and invite participants to these within-trip events, track the physical location of participants, and allow trip hosts and participants to communicate with each other.

Features and Specifications

Host features

- Log in/Register with Telegram
- View all traveller locations on a map (in real-time)
- Send app-wide notifications to all users

Traveller features

General

- Log in/register with Telegram
- View all nearby traveller locations on a map (in real-time)
- Add friend on the app
- People on the same sotravel trip will automatically be friends
- Create and send out event to people nearby, friends only or selected people
- RSVP to events via telegram or on the app
- User profile page that can be edited

Ski Specific

- View the ski lifts and routes around the area (colour coded by difficulty)
- Map to take into account elevation
- Bonus: User can select a desired destination and map can tell the user how to get to destination

Map

- Depending on where the user is at, load the correct map. Mountain map vs street map.

In-app instant messaging

- Provides an easy means of communication between group members
- Helps to ensure a degree of privacy as users do not need to share more personal information like Telegram handle or phone number

User Manual

Please see User Manual

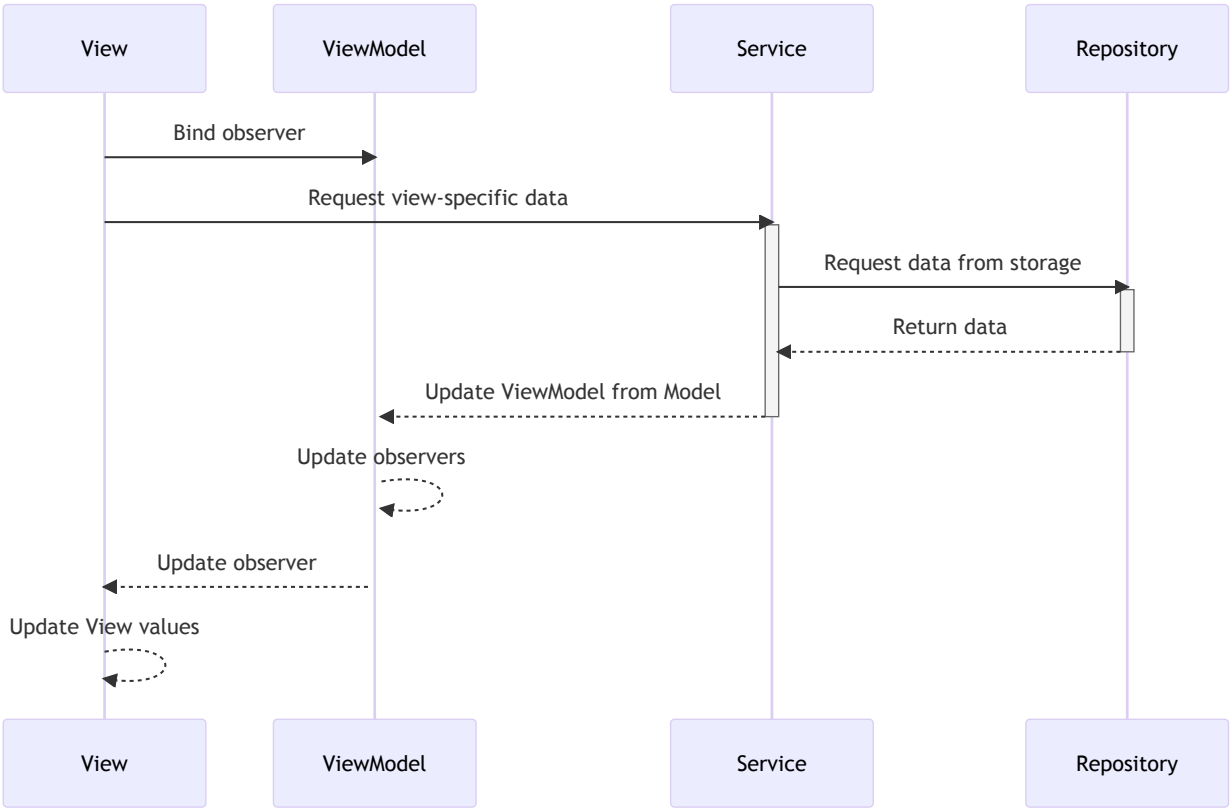
Designs

We will break down the applications design into 2 parts, the backend and frontend. For ease of understanding, the backend specifically refers to the part of the codebase that does not directly deal with the views. This can be thought of as the components that do not directly deal with the views. The frontend is the set of components that do deal with the views (and presentation more broadly).

Backend

Flow of data

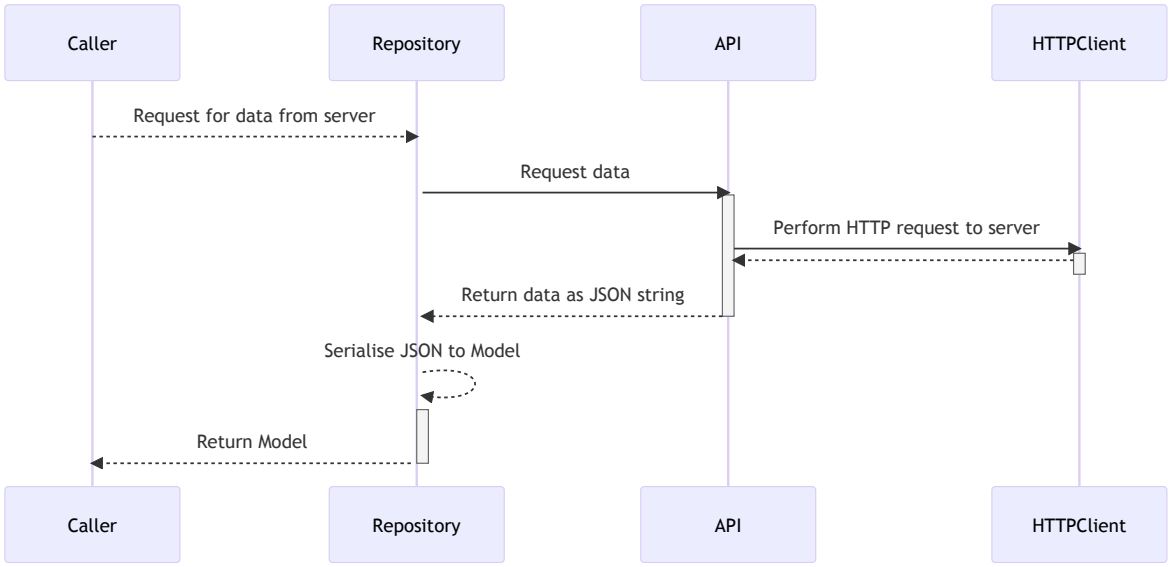
The backend of the application adopts a 3 layer architecture approach. A generic model of how the backend obtains data is shown below



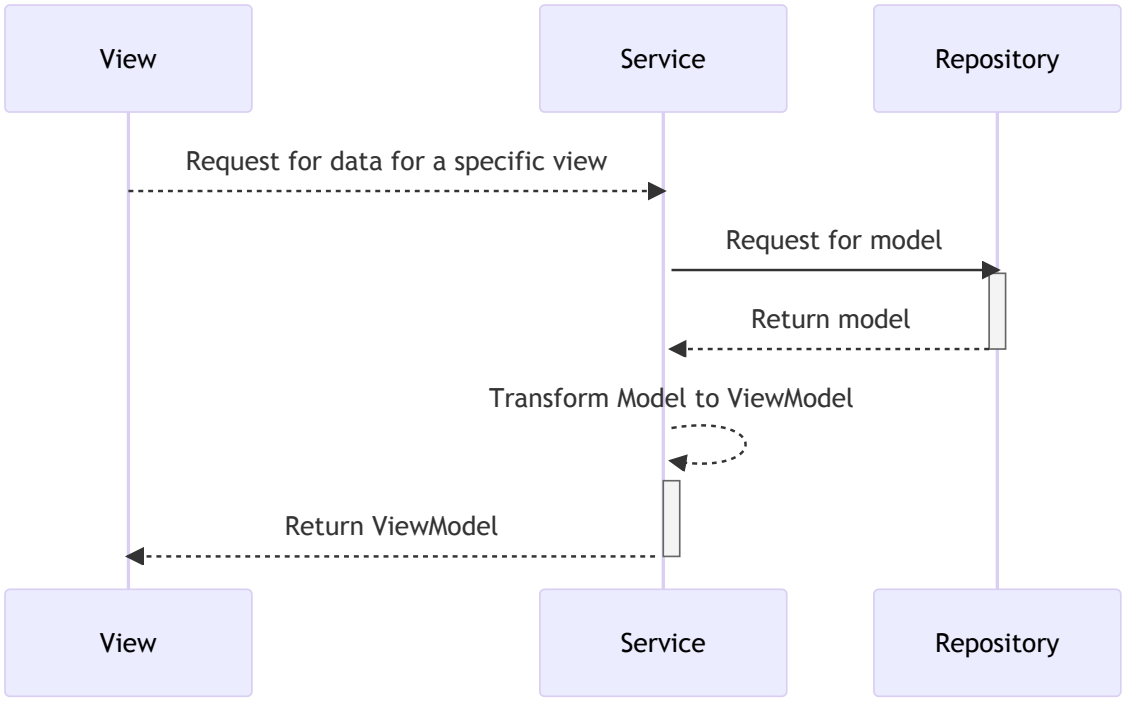
The high level idea is as follows:

- A repository for each data model exists to retrieve information from a data access layer. The repository conforms to an interface so that it can easily be swapped out later in favour of a repository

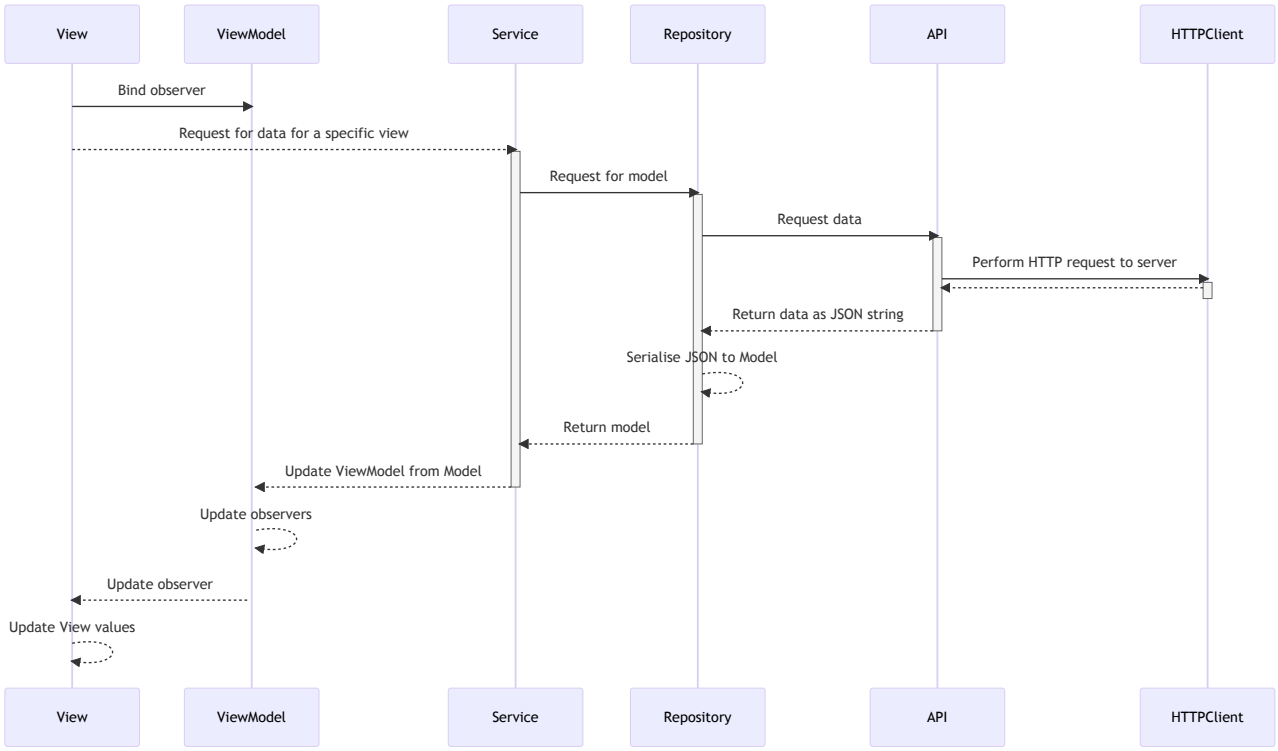
that pulls information from a different data source.



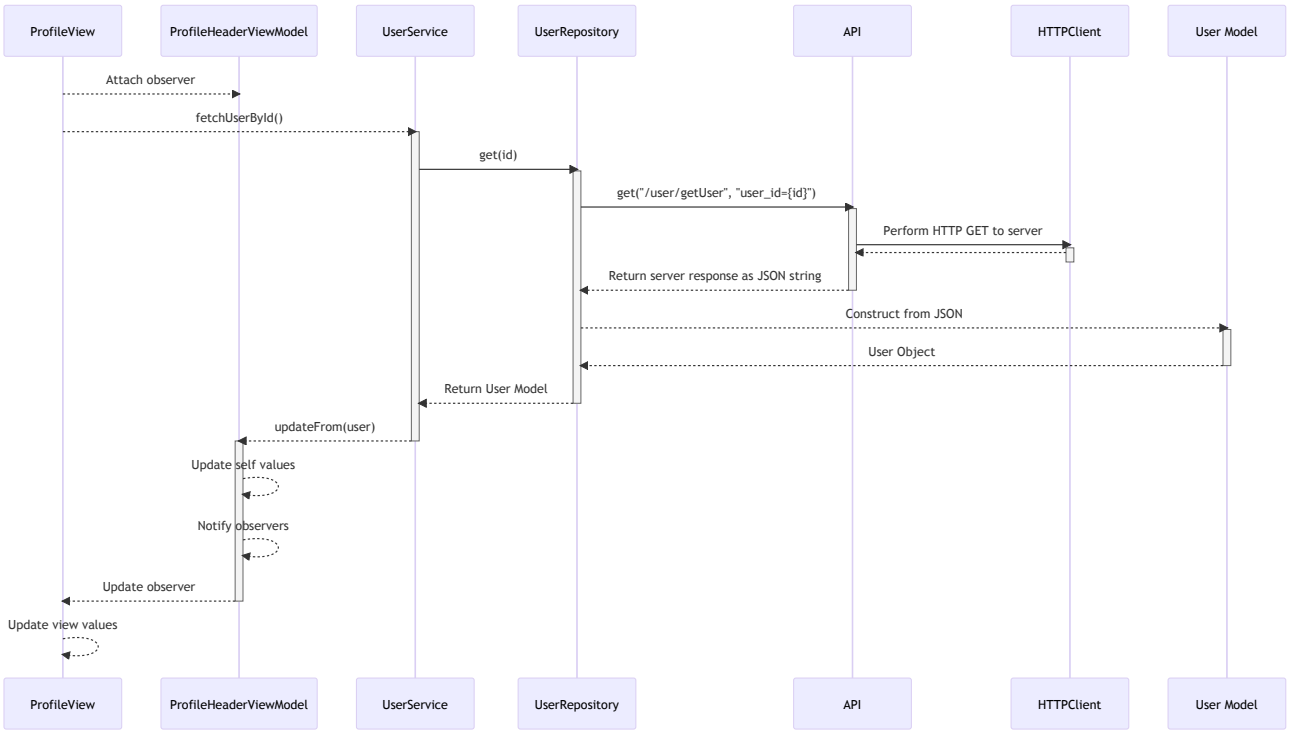
- A service exists for that data model. It contains a dependency-injected repository. The service converts the model into a view model which the view can consume
- A view contains a reference to a service which generates a view model. The view observes the viewmodel to reflect changes to the data.



The 3 layers put together show how data is called from each layer



This generic pattern was adopted across each of the key models of `Trip`, `User`, `Event` and `Chat`. Thus, each model has it's own Service and Repository as well. We will see a concrete implementation for how this works in the case of the Get User Profile flow:

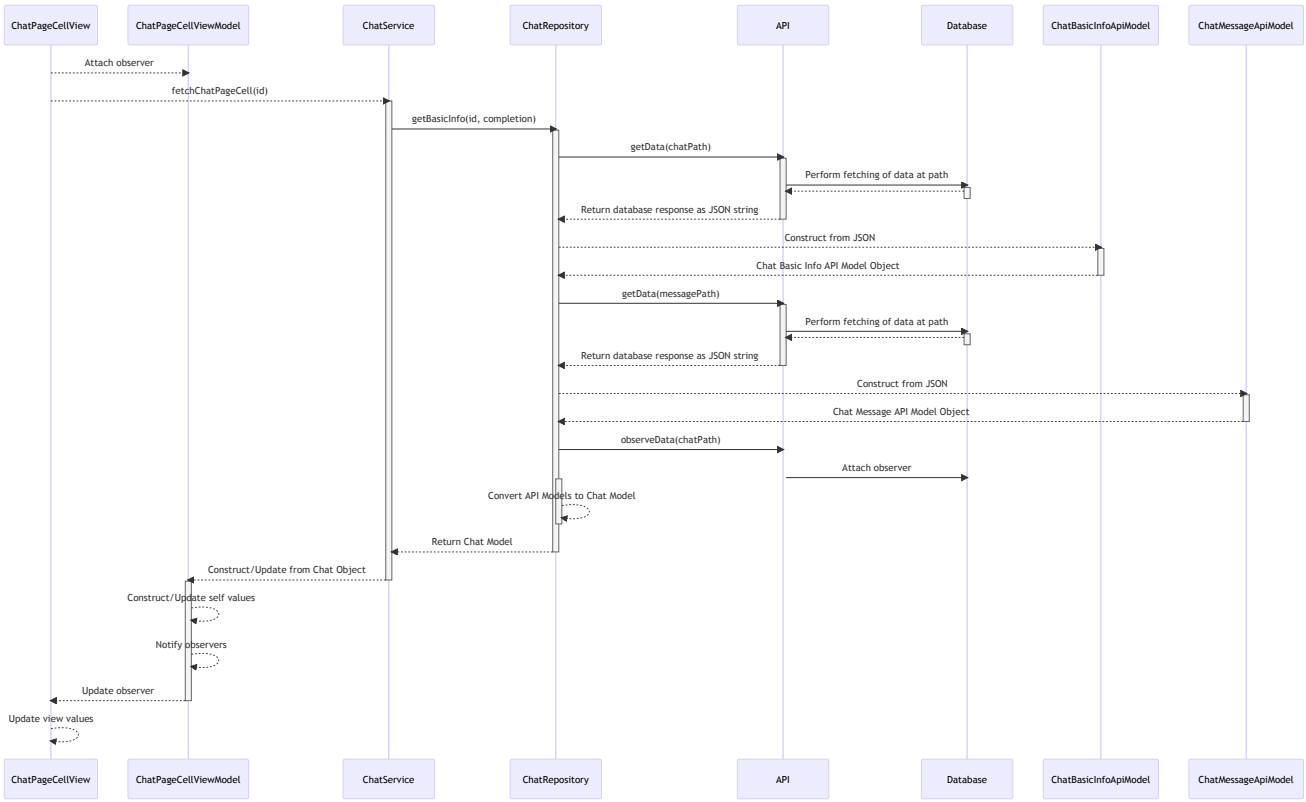


The `Repositories` for each model conform to an interface and are dependency injected into each `Service`. Dependency injection is done through property wrappers. This allows for the following benefits:

- Repository implementation can easily be changed. Today we suffix many of the concrete implementations with "Node" since our data source is essentially a Node API, but in the future the data source may change

- Dependencies are not injected through constructors, preventing a "carrying" effect where each layer needs to pass dependencies down
- Testability is greatly increased as dependencies can easily be replaced with stubs/mocks. We already use such stubs/mocks of repositories such as the `UserRepository` to provide mock data during testing.

We present another concrete implementation for how this works in the case of the Get Chat Page Cell flow:

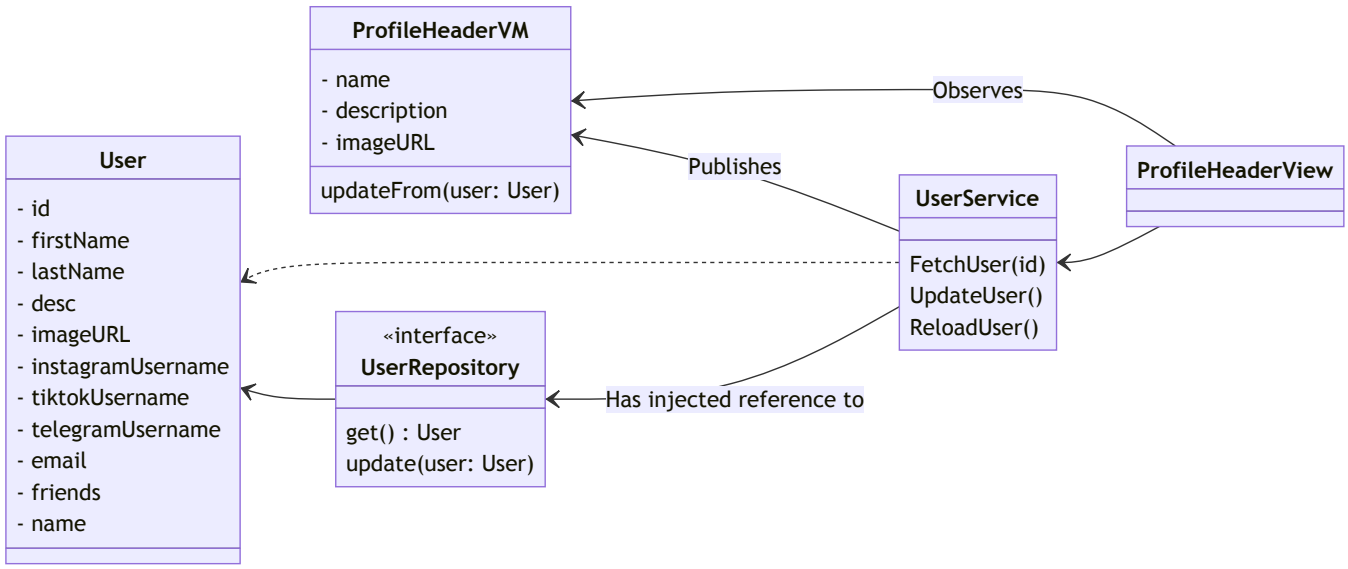


Here, we see how the repository acts as an Adapter in its conversion from the API model in the database to the model used in the application. Thus, the repository helps the application and the database collaborate with each other. The repository also acts as a Facade to the database by only exposing a few of the API methods required, as well as a Proxy through the repository interface.

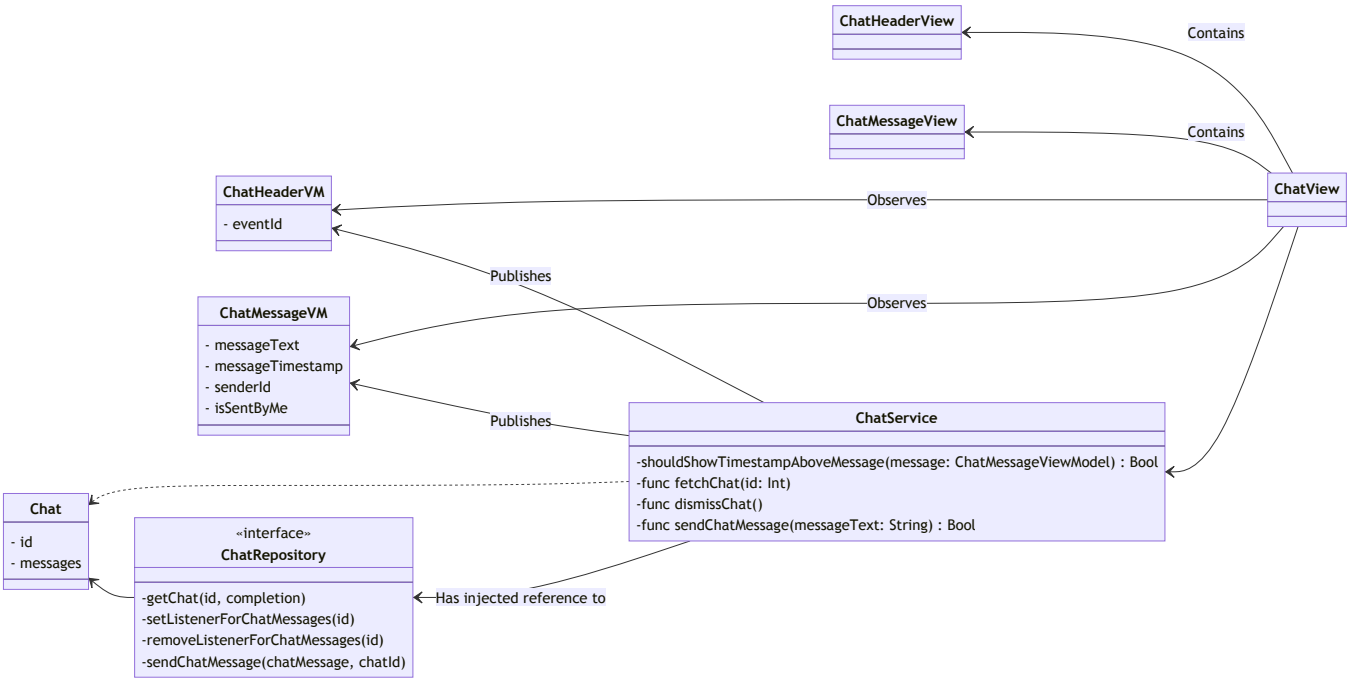
Frontend

The frontend is relatively straightforward, following an MVVM architecture. A service is injected into each view, and the view observes a view model in the service that it cares about. As and when the service updates a view model (usually through a method call to the service) the view will propagate the updated information.

A concrete example of how this works for the `User` model can be seen below:



Another concrete example can be seen with the Chat views:



Notice how both the service and the repository act as Mediators to the viewmodel and the model respectively. The view collaborates with the viewmodel via the service, and the service collaborates with the model (to get the viewmodel) via the repository.

Live location sharing

The live location sharing is one of the key features of the application. The goal is to allow the user to update their location and save that to the database, as well as allow the user to view the live locations of all of their friends.

Location Management: Key responsibilities

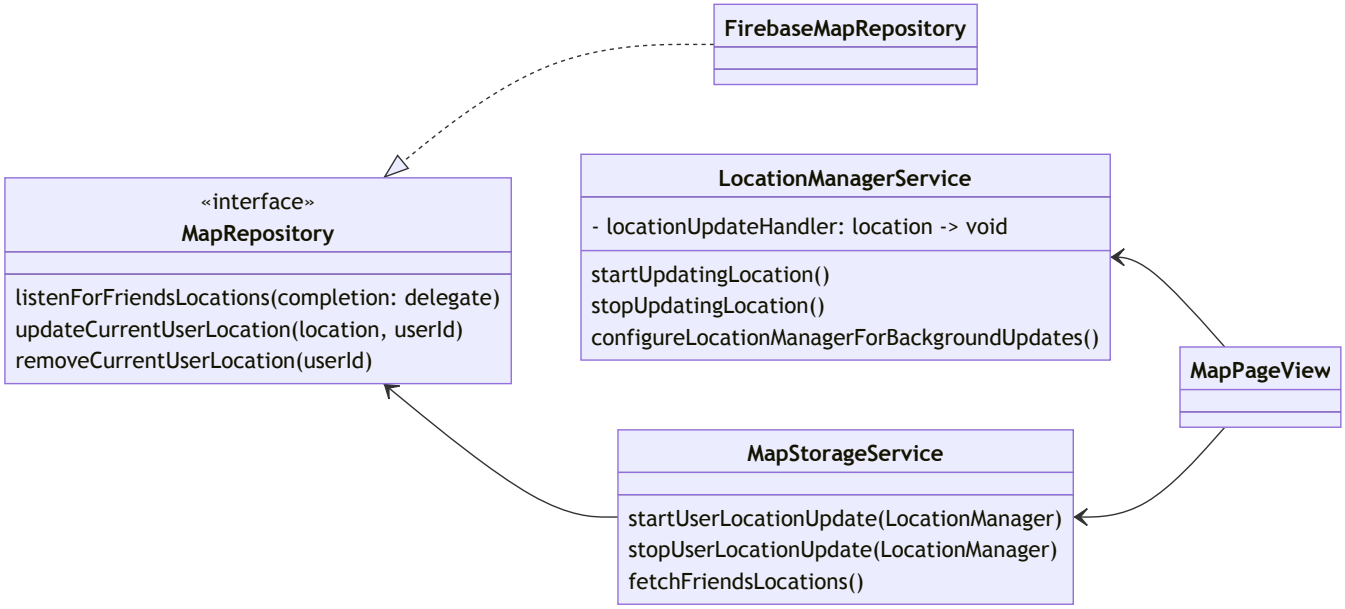
The location management functionality has three key parts:

1. Getting the user's current location via GPS

2. Persisting the user's location to the real-time database
3. Pulling all the friends' locations onto the map

Part (1) is handled by the `LocationManager` while parts (2) and (3) are handled by the `MapStorageService` which relies on the `MapRepository`.

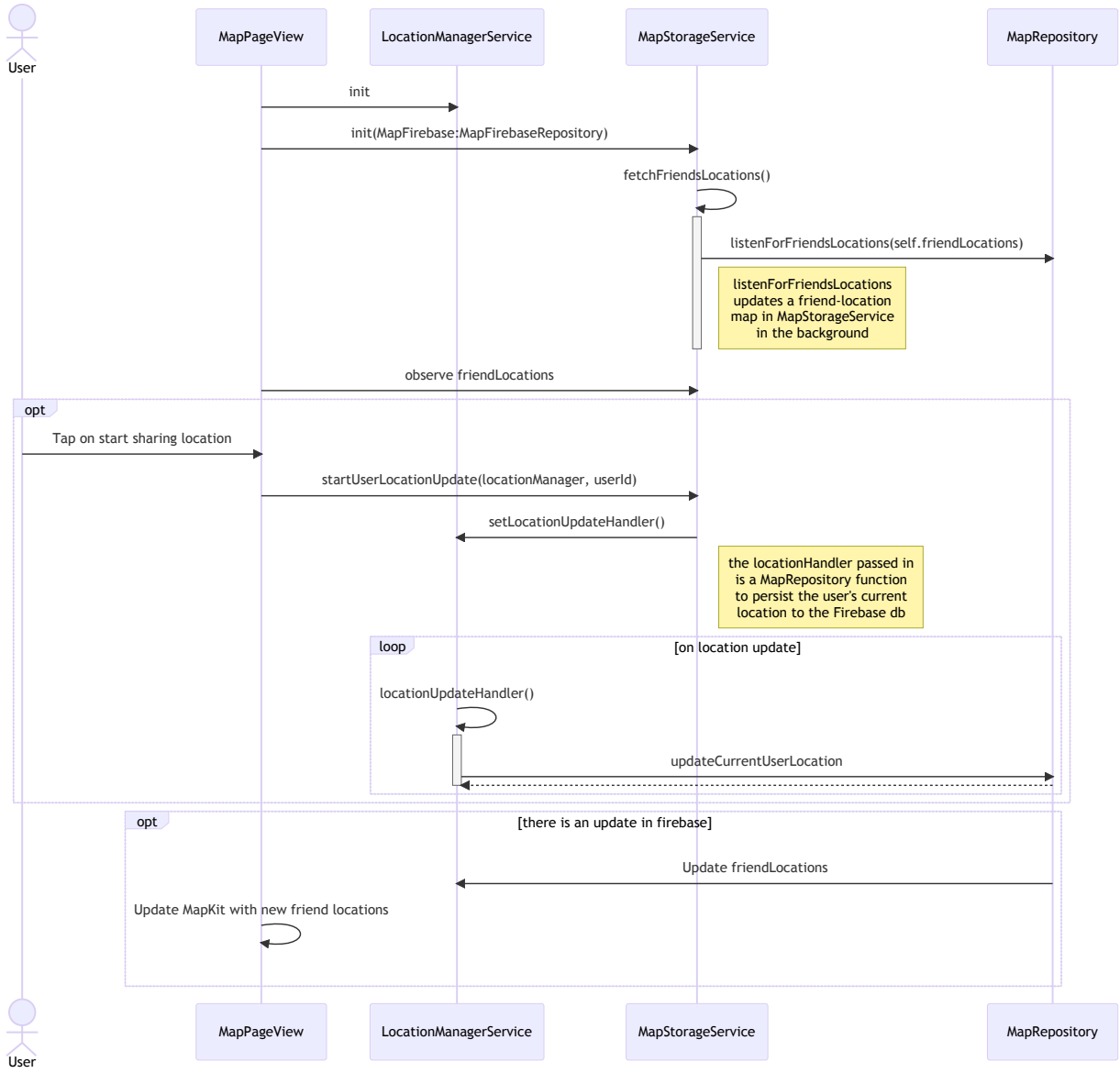
The class diagram for how these 3 key classes interact with the `MapView` is shown below:



Location Management: Flow of data

The `LocationManager` resolves the user's current location via GPS, while the `MapStorageService` sends and receives information from the persistent data store. The delegate pattern is employed here, where the `MapStorageService` passes a delegate function to the `LocationManager` to call to when the user's location is updated. This allows the app to easily swap out the desired behaviour when the user's location changes, decoupling it from the GPS service itself as well as allowing flexibility on the actions to be taken when the user is moving around.

The flow of how the user's GPS coordinates are stored in the data storage as well as how friends' locations are retrieved and updated on the map can be seen below:



Error handling

The app defines a custom `SotravelError` class which is thrown at all layers. If exceptions caught are from other function calls (e.g. decoding JSON throws a `DecoderError`) the enforced convention is to wrap the error within a `SotravelError` and throw that instead. There are custom types defined such as `NetworkError` and `AuthroizationError`, with more to be added as more development takes place.

The key benefit of this is that errors being bubbled up will only be of one specific type, with a finite set of reasons. This will make it easier to design an error handler at the presentation layer that only needs to know of a single (or a few) fixed error types.

Ideally, we hope to ensure that there is an exception handler that automatically triggers when errors are bubbled to the view layer.

Reflection

Evaluation

What's done so far

- The app is (more or less) fully functional. We are bugfixing at the moment
- All interactions conform to the 3 tier architecture that we designed

What's next

- More bugfixing
- End to end testing

Known Bugs and Limitations

- There are some bugs in interacting with the backend api that occasionally pop up. We are doing tests to resolve these issues.

Tests

Please see Tests