App Development Using Dart and the Flutter SDK

CS 4991 Capstone Report 2022

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Abstract

The increased popularity of location-based social media mobile device apps sparked my interest to fill previously untapped market gaps. Flutter is a dart-based Software Development Kit (SDK) used to create hybrid mobile applications. UVAMedia is a location based application for sharing discussion messages, pictures, videos, and polls, available only to those within five miles of the user, making it very college-centric. In order to become proficient in the dart language and the flutter SDK, I first created a time app which determines the time in different locations, changing the background to reflect the expected sun lighting of that location. This taught me the basics of how to use Api's in dart as well as routing multiple pages. Next, I made a password generator app which I deployed to my iPhone to test, giving me the necessary background for password storage.

This gave me enough experience to create the front end of my app. By completing the front end, I've become much more efficient at reading through documentation and finding relevant already-developed packages. Moving forward, I will be creating the backend as my Databases (CS4750) class project. Development and testing will be done using MySQL run on Apache, and later be deployed on AWS Aurora for public accessibility. Upon full completion of the app, I will need to apply to Apple and receive the necessary permissions to make the mobile application available for public use on the App Store.

1. Introduction

Social media apps vary in how they build a user's feed. For example, reddit is a "topic connector" which connects users to topics they enjoy discussing. Different topics are put together in discussion threads, and users can choose to follow specific topics. Snapchat is an example of a "person connector" which connects us to our friends by showing us the posts of those we follow. Twitter and Instagram are hybrids, allowing us to see our friends' posts while also providing algorithms to employ discover pages with content we enjoy.

Recently a new form of social media has risen in popularity: a location-based social media allowing users to see and comment on messages sent by anyone within proximity. Currently, apps such as YikYak (location-based messages) and Wishbone (location-based polls) dominate this sphere, but they lack the ability to produce multi-medias. The vision of UVAMedia is to provide a means for users to post messages, polls, pictures, and combinations of the three all in one place.

In order to achieve this vision, I first needed to research and master the specialized Computer Science skills necessary for app development. I selected Dart and the Flutter SDK to create a hybrid app with a single code base, made possible by Flutter's ability to compile into the native languages used by IOS and Android apps.

An equally important step was to perform research into the pros/cons of anonymous posting and how design decisions would

impact the way users interacted with the app. If correctly implemented, the app would promote societal interaction within small areas (college campuses are a key target audience) while not enabling cyberbullying.

2. Related Works

Bargh, et. al. (2002) argue that the data clearly demonstrates users' increased willingness to speak about personal topics when under the sense of anonymity. He speaks to the psychological players in motion in face-to-face conversations versus online interactions, and the pros and cons of anonymity within a social platform. This helps to dive deep into the design decision of UVAMedia to provide user anonymity while still maintaining a sense of accountability.

Baxter and Sommerville (2010) use the socio-technical framework "Politics of Design" to analyze the design decision of anonymity and its influence on people's behavior. He describes how research should be conducted in order to properly achieve an app's vision. With regard to UVA Media, the goal is to promote curiosity and a general sense of community while fighting against cyberbullying and libel.

YikYak is a location-based message board allowing people to post "yaks" (written messages) to an ongoing feed of those within five miles of the user and can effectively be used as a case study for UVAMedia. Black, et. al. (2015) [No need for first names since the full citation will appear in References.] and his colleagues speak to the rule changes that YikYak underwent in 2014 to increase accountability of their app's users, which had positive effects on the community.

Byrne concludes that anonymous social medias offer a new and unstudied source of data on critical issues like sex, class, and race. These topics have been extensively studied in public settings, but anonymous settings tend to allow people to respond more candidly (Byrne, 2017, p.805).

Anonymous platforms allow adolescents and teens to undergo important identity experimentation and social development (Teo Keipe et al., 2014, p.2).

Vaterlaus (2017) provides an analysis of YikYak's target audience—campus community of young adults—and their accompanying design decisions to effectively reach them. UVAMedia shares an equivalent target audience and employs some of the same features.
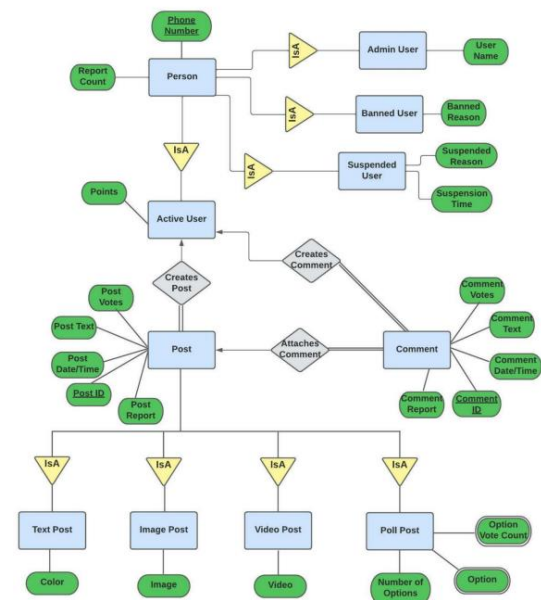
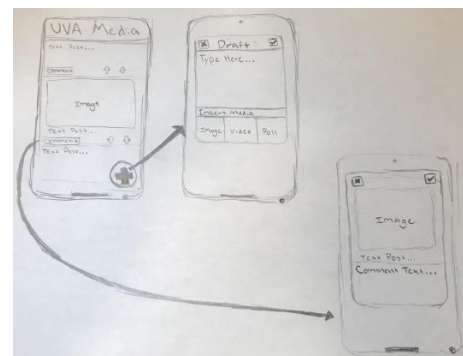## 3. Project Design

Figure 1: Database used by UVA Media
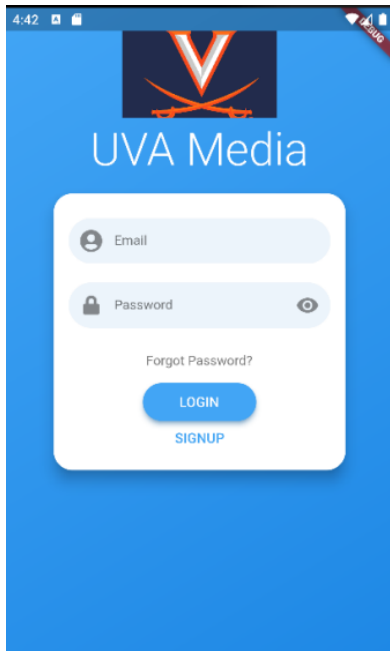

Figure 2: UVA Media Page Layouts
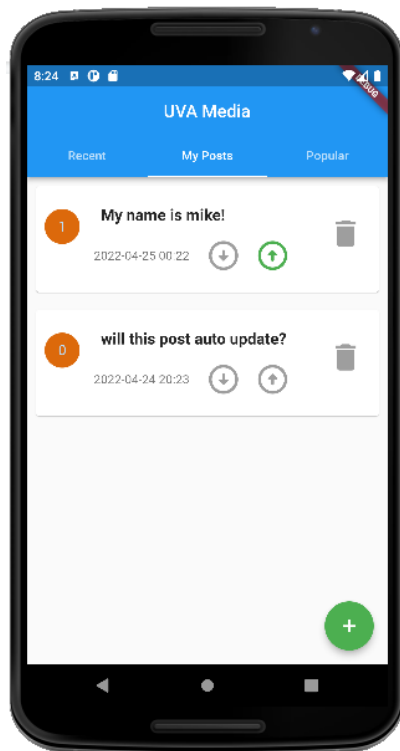
Figure 3: Login Page of UVA Media
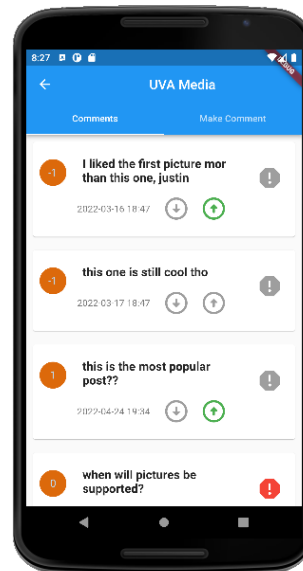

Figure 4: "My Posts" Page

Figure 5: Comment Page

UVA Media uses the database schema described in Figure 1 to store users, posts, and comments. Each post consists of a Text field in addition to an optional image, video, or poll. Each post has comment objects attached to it, which any user can add to. Each user signs in using the login page shown in Figure 3. On the front end, Data is displayed using a continuous scrolling "widget." This gives it a similar feel to that of twitter or Instagram. The page layouts can be seen in Figure 2.

While names are not displayed on the app, users' accounts are still connected to their emails which they must verify, to enforce community guidelines and prevent bullying. This enables permanent banning of accounts that break the guidelines, which dissuades users from abusing the anonymity of the app.

5. Results

The app is still in development; however currently the login page is functioning and storing user information into the backend. Once logged in, the user is redirected to the home page, which displays the most recent posts. As seen in **Figure 4**, the user can choose to see recent posts, their ow created posts, or the most popular posts. The like/dislike/report buttons are fully

functioning, with the number of likes each post has shown to its left. Users can click any post to be taken to its comment page (**Figure 5**), and can add their own comments. There is a "+" icon in the bottom right corner of the post pages (Figure 4) which redirects the user to the "create a post" page, which directly interacts with the backend. The backend has checks in place to ensure that only a user who is actively logged in can create a post. I will be putting in checks to make sure that users cannot spam the system with thousands of posts by using a cooldown method.

6. Conclusion
This project gave me a deep understanding of the work that goes into building the front end and back end for a mobile application. I learned a lot about security risks when connecting a front end and backend, about the importance of planning ahead and having designs, and about having a routine. This app will connect the UVA student body once it is complete, and I'm looking forward to releasing it to the AppStore once it is completed.

7. Future Work
Currently, the app has security issues due to flutter's limitations surrounding the use of a MySQL database, especially regarding creation of a persisting connection to the database for logged in users. In the future, the back end should be shifted to a NoSQL database, which flutter offers a lot of packages and support for. Over this upcoming summer I will be shifting the database to firebase and use the FlutterFire plugin to help with security issues. This should also enable me to implement the location-based aspect of the app.

8. UVA Evaluation
UVA did a good job of teaching me Python, Java, and C++, which also gives me a lot of confidence in learning new languages by myself (such as Dart for this project). CS 4414 Operating Systems did a good job of hammering down C++ concepts and how

they are used by the operating systems, however perhaps it should be split into two classes, or the goals of the class should be shortened. I believe that the STS 4500 and 4600 could be combined into one class, allowing for students to take another CS class.

9. Acknowledgements

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