Senior Design Final Report

The arqive

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1. Introduction:

1.1. Background:

The arqive is a unique social media website and mobile app for the LGBTQ+ community that allows users to document their own stories that celebrate all aspects of queer identity in hopes of preserving and archiving the community's history for future generations. Originally founded in 2014 by Dr. Cynthia Wang and then later revamped in 2019 with the joining of new Co-Founder Zachary Vernon, *the arqive* seeks to provide a common place to share stories and digitally preserve them. It is a digital archive of past and present movements, personal experiences, resources, and organizations. This platform creates and collects these stories and resources from all over the world, and serves as a reminder that this community is here, has always been here, and always will be. By using one of our unique features, the location-based pins, we can document the user's stories either in a precise location or in a certain radius. We are aware that some countries may have stricter LGBTQ+ regulations and that is why we implemented an anonymous mode in order to protect the user's identity while still allowing them to share with the community.

Our co-founders, Professors Cynthia Wang and Zachary Vernon, have been working alongside student volunteers from Cal State LA on developing the app for their passion project. Everyone involved is working pro bono and believes in the project and its potential to become an essential tool for the LGBTQ+ community. The website was redeveloped, redesigned, and relaunched in 2020 by a past Cal State LA development team. Our team this year worked on development and launch of a mobile app for both iOS and Android devices as well as additional features such as automated content moderation and various bug fixes/website improvements.

1.2. Design Principles

When designing the website and mobile app, one of our focuses was on usability. We tried to keep the features and navigation of both the website and mobile app as minimal as possible to prevent users from being overwhelmed. With the help of a UX designer we were able to plan, design, and implement features, as well as modifications while keeping everything functional and visually appealing. The mobile app mirrors the website both visually and functionally.

1.3. Design Benefits:

We designed the automated content moderation algorithm to be its own stand alone program. This allows us to be flexible as we can use it anywhere if we decide to modify or overhaul any part of the backend code. The system we designed for when a post gets flagged is that it goes to the admins and moderators for review. After reviewing the flagged post it gets voted on for whether it should be removed or not. We believe that this system is fair because moderators can keep each other in check.

1.4. Achievements:

Over the course of the academic year, our team has been able to develop and deploy a working mobile app for iOS and Android devices. It will be launched on both the Apple store and Android play store by the end of May and provides the same functionalities as the website. Our mobile team did great work the developing core functions of the mobile app such as the interactive map, user login function, and search function for stories and posts.

We overcame the complex local development environment setup and streamlined the deployment processes. This was done by creating a new detailed setup guide and implementing a new deployment pipeline. This new deployment pipeline allows us to use an advanced version control procedure as well as redundancy check for code review on GitHub which ensures everyone is on the same page and that our pushes are working. Additionally, by making use of GitHub issue tracking we can report bugs and collaborate to fix bugs found on both the website and mobile app.

2. Related Technologies:

Technologies used

Expo is a set of tools and services built around React Native and was used in the mobile development for both iOS and Android. Expo allows us to develop, deploy, and test applications relatively quickly so we can provide the same feature set as the website.

Node.js/Express is a JavaScript API framework. Express is a back end web application framework for Node.js used for building web applications and APIs.

MongoDB is a document database system that stores data in a JSON-like format. We chose to use this database due to the ease of development and scaling. It includes key security features such as authentication, access control, encryption to secure MongoDB deployments. For our case we use serializers to convert JSON into BSON for MongoDB and the serializers ensure that the data being supplied is correctly formatted.

Scikit-learn is a machine learning framework that was used in the development of the automated content moderation bot. We used one of the classifications included in the given library in the development of the AI that is used to moderate spam, solicitation of drugs, unwanted sexual content, etc.

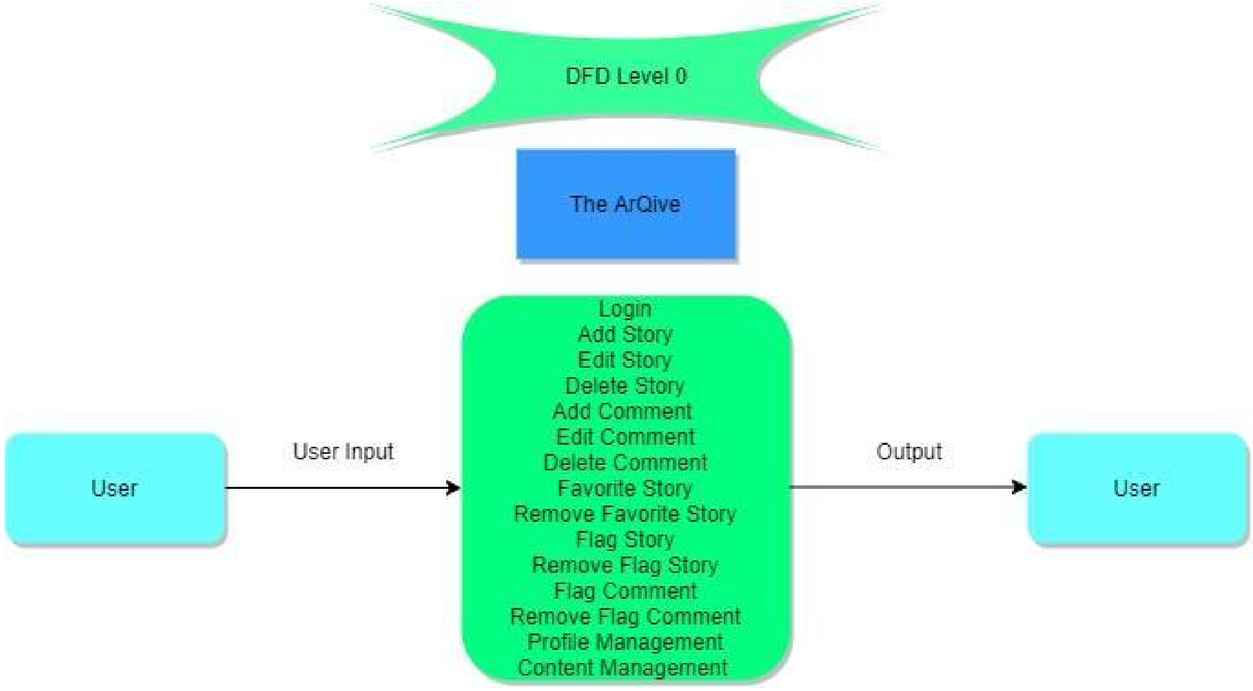
Docker is a containerization platform that containerizes the API framework so that we can deploy it quickly on any server that supports it. We chose to use this concurrently along with the server Linode since it is easy to use as we can just drag and drop any updates.

3. System architecture:

3.1. Overview:

The architecture website and app is the same and can be broken down into two main factors: the users and the arqive app.

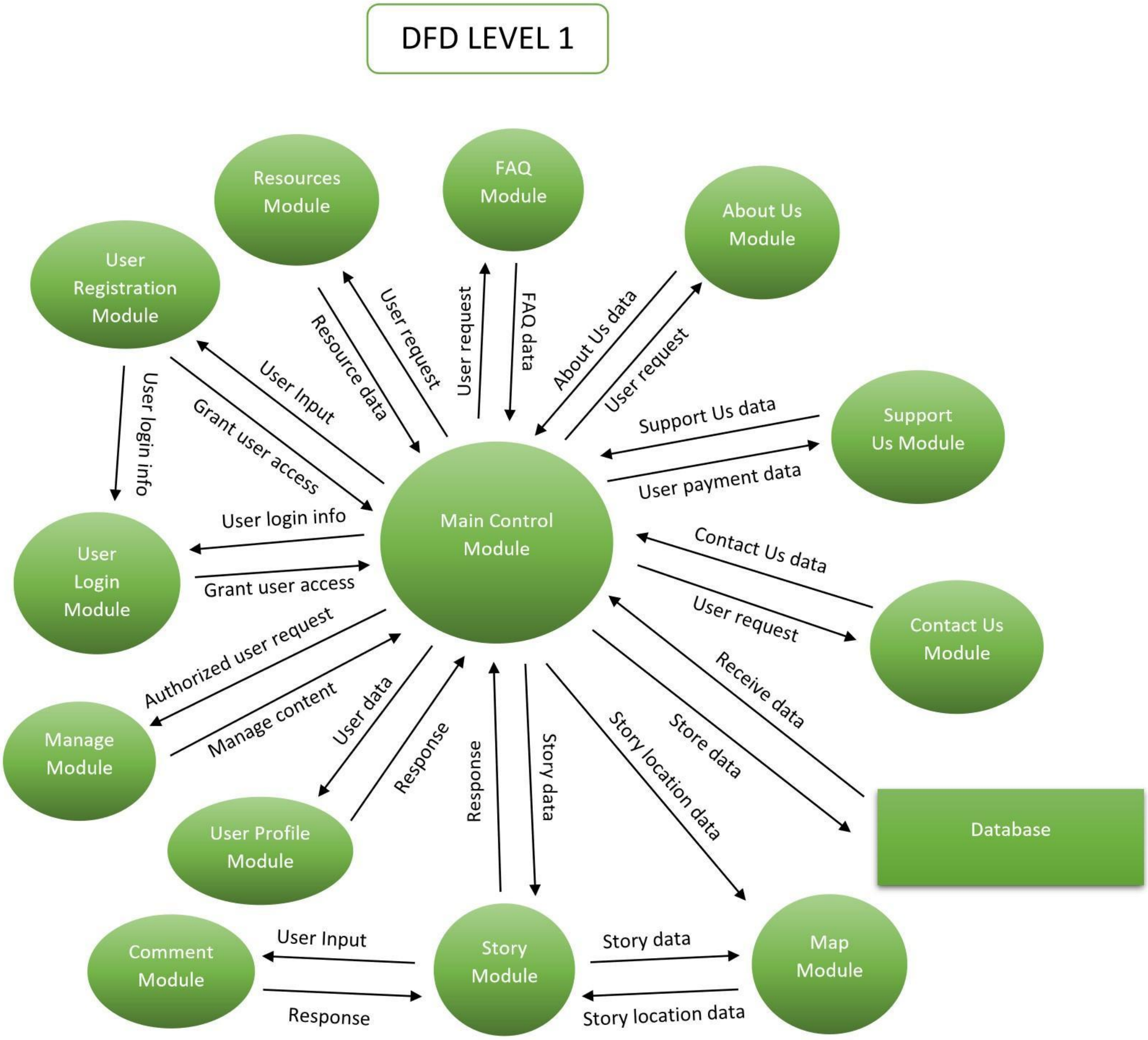
Here is a diagram (DFD level 0) that shows how this architecture works at a high level:



- **The User:** the user sends an input and it goes though the arqive app and then receives an output
- **The ArQive :** the arqive app includes basic functionalities such as adding, editing and deleting stories. As well as management functionalities such as flagging and content moderation.

3.2. Data Flow:

Here is an overview of the our DFD level 1:



More details on each individual module can be found on the software design document.

3.3. Implementation:

The project was split into 3 major sections to allow for efficient development: Mobile development for iOS and Android, Django REST/Automated content moderation, Website improvements/Bug fixes. Each section plays a key role in presenting the progression of the project.

3.3.1. Mobile development

The mobile app was developed and launched on both the Apple app store and Android play store. Features implemented to ensure that the mobile app functions similarly to the website include the search function and login function. The search function allows users to search stories by story type categorized from personal, resources, or historical. The login function allows unregistered users to create an account and logged in users to be able to create posts anonymously. We chose to use React Native for the mobile development due to the fact that the reusable code provides native functionality and once an app is built, it can be deployed on both iOS and Android. Updates done with React Native can be done instantly and easily implemented.

3.3.2. Django REST/Automated content moderation

An automated content moderation bot was developed to be used to moderate posts posted on the website and mobile app. Since *the arqive* can post anonymous stories, we implemented this algorithm in the backend to flag suspicious posts such as spam, solicitation of drugs, unwanted sexual content to be reviewed manually by a site moderator or admin.

3.3.3. Bug fixes/Website improvements

For both the website and mobile app we were able to identify various bugs and address them. Our team has been beta testing the mobile app in preparation for its release by the end of May. This is critical for the progression of the project as we want to ensure that everything is functional and working as intended before it is released for the public and passed on to next year's team. We also implemented additional features to improve user experiences and flow when navigating through the app and website.

4. Conclusions:

4.1. Results:

We have developed an iOS and Android app that is currently available on both the Apple app store and Android Play store. Both apps are functional and have the same features that are currently on the website. Some features include categorical stories buttons, a custom icon font, a login function, and registering users.

We have developed the initial Automatic Content Moderation module that will be used to moderate posts. This feature will be running from the admin page and flagged posts can be reviewed within the admin search function. The AI uses scikit-learn and trains a Naïve Bayesian Classifier to learn how to read inputs. However this feature has not been fully implemented with the website and mobile app.

Finally, these parts have been brought together with an aesthetically pleasing and well-designed user interface with collaboration with a UX designer student from another discipline. They provide us the necessary visual guidelines and cues on which to base our decisions, ensuring that everything follows a consistent language and is user friendly.

4.2. Future:

There were many features and additions we wanted to develop and implement that we hoped to do this year but we were not able to do everything. However, what we did was an important and significant contribution as we laid the groundwork through which the project can be improved greatly upon. There were many complex challenges throughout the project and there is still so much to do, but we are happy with what we have accomplished and are confident that the next year design group will be able to finish what we set out to do.

Our future goals include the following:

- Complete the automated content moderation
    - Currently we have a proof-of-concept algorithm within the backend structure of the code as well as tested the algorithm with posts that are randomly flagged. The algorithm is ready to be implemented to flag suspicious posts and to be manually reviewed

by a site moderator or admin. One feature that we have not yet started on is the reward/punishment system for correct and incorrect flags.

- Gamification - Badge system
    - We have researched this topic as well as tested various free open-source python badge systems but the idea was put off and the automated content moderation was more prioritized. We believe that this feature will be beneficial to keeping users engaged and want to keep using the website/app due to the fact that they will be able to earn individual and community achievements.
- Additional robust mobile features
- Improved security/Bug fixes
    - Bug fixes will be done as the team comes across them so that the app is functional and working as intended. With the threat of being targeted due to being a LGBTQ+ platform, the security of the site and mobile app will be constantly evolving to ensure that the user's information is safe and that our servers are secure and well equipped to defend against any potential attacks.

5. References:

- Expo - https://docs.expo.io/
- React Native - https://reactnative.dev/docs/getting-started
- Node.js/Express - https://nodejs.org/en/docs/
- MongoDB - https://docs.mongodb.com/
- Scikit-learn - https://scikit-learn.org/0.21/documentation.html
- Docker - https://docs.docker.com/