

FindUS

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Abstract:

Social media is the single-most powerful marketing tool available to influencers and small businesses looking to expand their audience and reach more potential online customers. The largest of these platforms (Facebook, Twitter, etc.) are aware of this and reduce the average account's potential reach to pressure businesses to pay for ad-space. According to the 2018 Sprout Social Index, Facebook controlled 84.9% of its social video ad growth. We have designed FindUS, which is an automated service that helps users who lack funding to reach their target audiences. FindUS monitors posts made by accounts under our service and provides statistics based on each post's performance and provides additional services to help reach followers. This includes mailing lists, additional offers, or customizable content a business can notify their audience of. FindUS provides valuable marketing information to expand to small businesses through monitoring and automatic post services.

1 Introduction:

1.1 Problem Statement:

Social media advertising is one of the most natural and organic ways to gain support for your business or product. Social media platforms realize this and have been incentivizing this organic outreach over the past few years to cause businesses to pay for their content to be featured in boosted advertisements. According to the 2018 Sprout Social Index, Facebook controlled 84.9% of its social video ad growth through the use of its paid advertising service and promotion algorithm. This creates a problem for small businesses that lack funding to receive the same public outreach and ultimately stunts business growth.

1.2 Solution:

FindUS will allow small businesses to receive greater organic outreach by developing a service that automates posts to social media accounts for businesses that are relevant and timely in order to bring about the highest possible organic reach. This service will also populate a database with information on users who frequently interact with their social media pages. This information will then be used to populate mailing lists and provide demographic information to the user that is more personal and relevant than the information currently provided by social media sites. This will be done through automated testing languages and our own email server integration. FindUS will monitor posts made by accounts under our service and provide statistics based on each post's performance and provide additional services to help reach followers. This includes mailing lists, additional offers, or customizable content a business can notify their audience of. FindUS provides valuable marketing information to expand their reach or we can begin automating services to assist on their behalf.

1.3 Project Goals:

The goal of FindUS is to provide a low-cost medium for small cap businesses or content creators to reach a greater market space and expand their social media outreach. Many social media platforms have a paywall that prevents many small businesses from expanding their social media footprint, but FindUS attempts to fix this by providing some of the following features. Statistics on when your posts do the best and posts do, automated posting on those times, and mailing lists to provide more information to those who want to know more about the product being offered.

1.4 Project Overview:

The remainder of this final report outlines in detail how the project was completed. The report includes the following sections: design objective, methodology, budget, timeline, problems encountered, and future recommendations.

2 Discussion:

2.1 Project Concept:

A free analytical tool that allows users to maximize their social reach on their business pages.

Social media promotion is currently restricted by a paywall, leaving small businesses behind.

FindUS provides useful tips and analytics to help improve the natural reach for its users through information obtained through automation. FindUS also supplies mailing list functionality alongside posting automation to assist in further reaching your followers.

2.2 Design Objectives:

FindUS will meet the project scope through the following items:

- All the features mentioned above in Project Goals
- Stylish web interface
- JavaScript powered automated users
- Functional web application for user interaction
- Database lives within UniServerZ
- Class C network for a publicly accessible mail server.
- Continually functionality and security tests network servers are on.
- Implement Intrusion Prevention Systems
- Penetration testing the web servers and correct security deficiencies.

2.3 Methodology:

The design methodology the team decided to take was a more agile development approach. This allowed for greater control and quick-change implication. The team laid out some of the basic goals and requirements for the project at the beginning, but quickly had to implement changes to software being used to allow the much of the UI to look more updated. It also allowed us to change frameworks early on to have greater control over the project. The team also had very well-defined roles for each person, which allowed for flawless execution of each person's respective area of responsibility.

3 User Profile:

Figure 1: User Profile below demonstrates the potential users FindUS will have and how the experiences may differ. There are two main potential users for FindUS. Both small business and new influencers will interface with the web-based program the same. Once logged in, they will be presented with information on their last 5 post are doing and will allow posting on behalf of the user.

3.1 PROJECT: FindUS
3.2 POTENTIAL USERS: • Small businesses • Non-technologically adept individuals
3.3 SOFTWARE, INTERFACE, AND RELATED EXPERIENCE: • This project will introduce a new experience for businesses to advertise. This will include automated mailing lists for new users, and unique ways to advertise to potential customers. • The project will serve as an automated way for organic reach to be applied. Automation is the backbone of this project that will allow businesses to worry less about posting on their social media.
3.4 EXPERIENCE WITH SIMILAR APPLICATIONS: • Users can link social media sites (i.e. Facebook, Twitter) for automated use. FindUS will automatically post at certain times of the day. FindUS also has an integrated mail server, if users opt in to automated emails. • The user experience will be user friendly and easy to set up. This service will allow for the burden of handling Social Media to be automated.

3.5 TASK EXPERIENCE:

No experience is required for the use of this application.

3.6 FREQUENCY OF USE:

This project will be set up for demonstration purposes only, which will display the capabilities of FindUS.

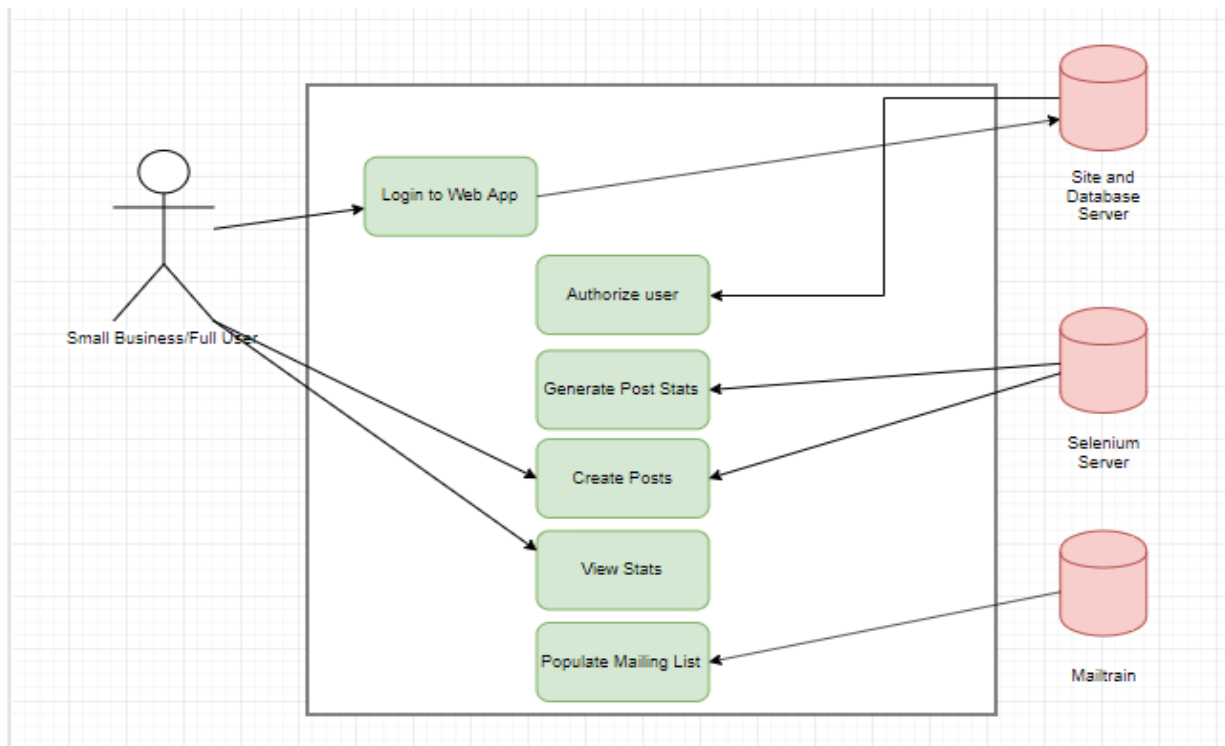
3.7 KEY PROJECT DESIGN REQUIREMENTS THAT THE PROFILE SUGGESTS:

- Friendly and easy to use UI
- Ability to toggle technical features on/off
- Major social media integration
- Quick start/setup

Figure 1: User Profile

4 Use Case Diagrams:

The **Figure 2: Use Case Diagrams** below demonstrates the different cases that can occur depending on what user is using FindUS. The use cases show the different users ranging from the small business owners, individual person and what we see as administrator of the program. This can be seen below.



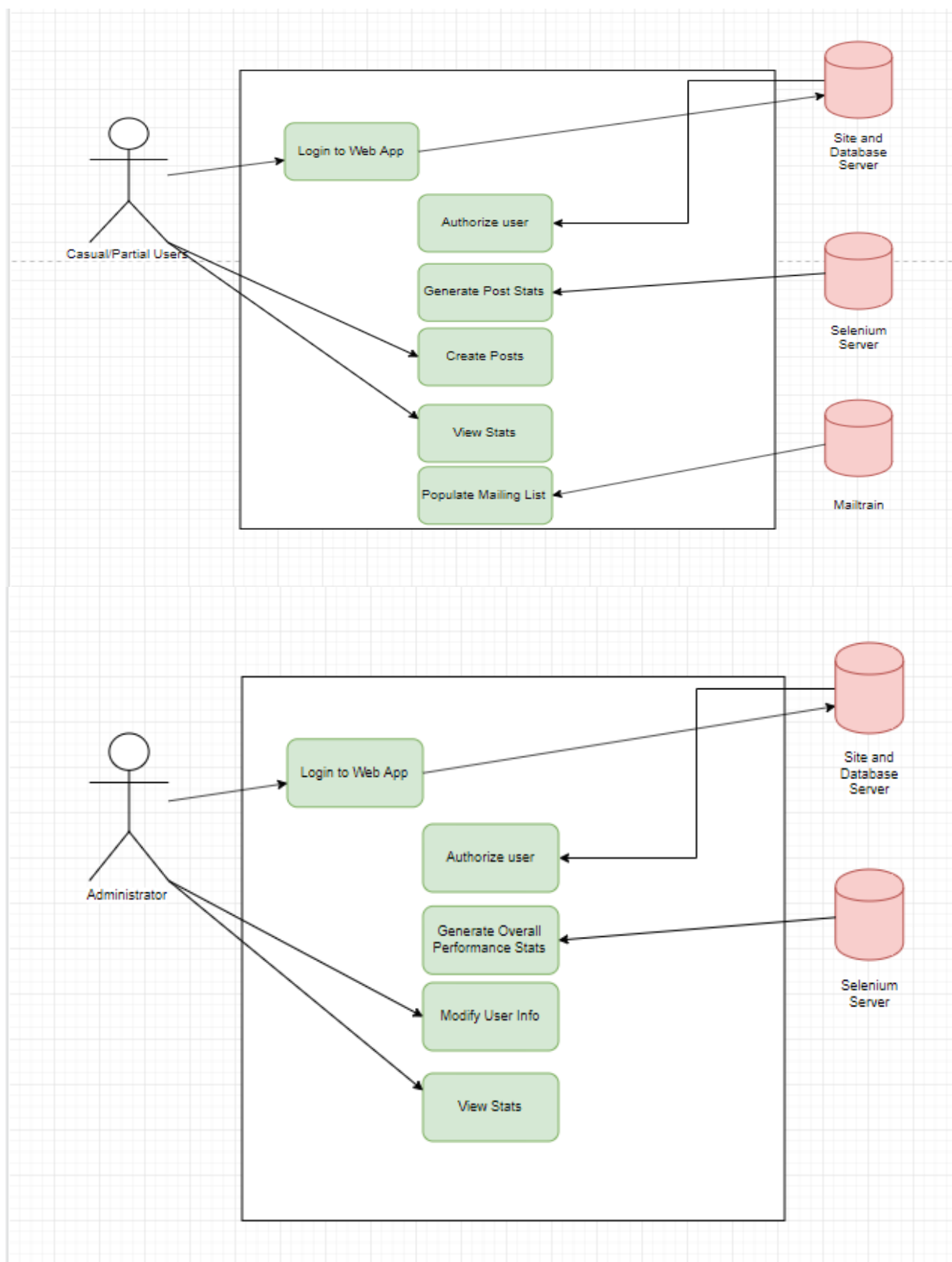


Figure 2: Use Case Diagrams

5 Technical Discussion:

The design of our system and application is the backbone of our operation. A poor design will be prone to bugs and other issues that will plague the process later. Each component has been described in detail below.

5.1 Network:

FindUS will be hosted locally on a Dell PowerEdge T610. This machine was handed down from a company that no longer needed it. This allows us to have almost 0 cost when it comes to operation. The services we are running will make use of the Dual Xeons to handle all requests. All members can remotely access this server via RDP (also the ability to remotely wake the server). This will make maintenance easy, since (similar to AWS) the server is accessible from anywhere. Modifying the database, domain or mail server will be quite simple. The mail server will be hosted on AWS and will utilize the open source software Mailtrain. This application can be used to create mailing lists, email templates, and manage email campaigns. Mailtrain will have all of its information stored in a MySQL database on our server. All automated software and bots will run on a selenium server and test code will be stored on the server as it contains sensitive information.

5.2 Application:

The application will be accessible by users through a firebase domain and be built using VueJS. It will utilize the CodeceptJS tests to automate and scan social media accounts to obtain statistics and allow the tool to accurately assess your stats and provide useful information. User's have the option of opting into a more sophisticated tier of usage for our tool if they provide

access to their social media accounts. This includes automated posting, automated messaging to followers, as well as more in depth analytics regarding their current reach. These features are entirely optional and free for the user to upgrade.

5.3 Database:

There will be two databases for FindUs. The database hosted on our server will be a MySQL database accessible by PHPmyAdmin on UniServer Z. This will work efficiently with Mailtrain and our other components and create a local environment only accessible through our server. MySQL is lightweight in normal operation; this will put minimal strain on our server. This database will be constantly updated as our application grows. Firebase will serve as our main storage for all information about the user's account, posts, and statistical information. We will be constantly updating this manually and through our site as time goes by to further expand the information we gather.

5.4 Security:

Mailtrain requires a database to store personal information about potential clients/customers. This means it is of extreme importance that the information is secured. The database and network were penetration tested to determine its security status. The software that was used to test our components was Kali Linux and the tools it provides. The database was tested primarily against SQL injection using sqlmap and was done both dependently and independently of the other tests performed to the network. Nmap was used to scan the network and determine any open ports and the network's status as a whole. Aircrack-ng was used to attempt to access the network itself from a wireless access point. Metasploit Framework was used to exploit the found weaknesses in the network.

6 Testing:

6.1 Overview

This section will give a complete overview of the testing methodologies used for FindUS.

Complete with a listing of applications and software used. Our testing methodologies and results will be recorded in this document. FindUS can be run on any device with a web browser.

6.2 Scope of Testing

The scope of our testing was from the developer level down to a small independent test party.

The goal of this testing was to find and correct any bugs in the software. This included from the server and database level up to the website's functionality and usability. The tests were also designed to determine any coding or parsing errors throughout the software.

6.3 Objective

The goal of our testing was to see if our application completed the job as proposed. We aim to determine the plausible flaws with our design to help reduce problems in the long term. We will also utilize testing to look out for complex or redundant steps in any individual process to reduce the opportunities in which an error can occur. By effectively and thoroughly testing our systems and application, we can ensure the presented product is in its best state.

6.4 System Testing

The testing of FindUS will be conducted on multiple computers, of varying hardware types. The server will remain static throughout the entire testing period. Testing to ensure quality before rollout is a must.

6.5 Testing Procedures

The following is required to begin application testing:

- Successfully navigate Social Media sites with automated users.
- Connect application to server
- Record data

Tests that will be performed:

- 1) Launch Test: Ensure user can connect to the FindUS domain
- 2) Stability Test: Determine server uptime and any errors involved
- 3) User Interface Test: Sweep the website for potential bugs/glitches
- 4) Functionality Test: Ensure peak functionality

6.6 Testing Scenarios

Multiple computers, from varying hardware manufacturers, will be used to test the stability and functionality of the FindUS service. **Table 1: Launch Test** below demonstrated the two tests that performed to determine if the program will launch and stay launched. **Table 2: Stability Test** seen below shows the test of how long the server and program can remain stable for. **Table 3: Functionality Test** below shows the test results of the program and server's ability to function per testing requirements.

6.6.1 Launch Test

This launch test will consist of a few key factors:

- System stress test
- Initial functionality

The questions asked for this scenario are:

- 1.) Will the system crash?
- 2.) Did the service perform as advertised?

Launch Test	Time Elapsed	Results
Server	24 hours	Pass
FindUS domain	24 hours	25 minute downtime

Table 1: Launch Test

- System did not crash over a 24 hour period.
- FindUS domain - An early error we detected during our automated testing through Codecept involved filling in the login field for Facebook. An identifier was mistyped in our steps file leading to the failure.

6.6.2 Stability Test

The stability test will once again stress the server, but will also run scenarios at the code to see for potential issues.

- 1.) Can the server hold up with many requests at a time?
- 2.) Any code related bugs?

Stability Test	Time elapsed	Results
Automated Process Test	32s	Success
Form Submission Test	6s	Success
Simultaneous Process Test	1 min 23s	Success

Table 2: Stability Test

6.6.3 Multiple Device Testing

Multiple Device Testing will consist of using devices from multiple varying manufacturers. These devices will include (all Windows based devices are running Windows 10)

- Windows Custom PC
- Apple Macbook Pro (MacOS Catalina)
- Acer Windows Laptop
- Apple iPhone X

6.6.4 Functionality/ User Interface Test

This test was initially done by our group members only until we determined that the site functioned according to our specifications. After this initial testing was completed, we pushed the testing to a closed independent user group to determine the functionality could be done by individuals who have never seen it before. Given a general background of what the site is, the test had to work on their own to achieve the three steps above. The pass condition is satisfied once a user is successfully able to complete the three tests above. The fail condition is met if the user cannot achieve the desired result.

Functionality Test	Description	Results
User Creation/Login	Creation of User Profile	Pass
Enter Business Info	Inputting Business Info	Pass
Select Advertising Platform	Ex: Twitter, Facebook	Pass

Table 3: Functionality Test

6.7 Pass / Fail Conditions

Test failures will be logged and investigated. These bugs are to be expected and will be dealt with accordingly. These tests were to determine any bugs in our site, the stability of our server, and the overall functionality and usability of the site.

6.8 What We Learned

After completing our scheduled tests and getting to work, we discovered the redundancies and small flaws in our system that could have led to bigger issues in the long term. By dissecting problems, many local environment issues were discovered, allowing us to learn what could potentially affect the configuration of our project. By also testing small components using different languages, we were able to find better alternatives for options we previously suggested for structuring the back end of our project (Switching to VueJS for some components). The functionality tests determined if the site worked how it was intended to, as well as, how feasible it was for others to use it with no prior experience with it. Overall, the testing process brought out the best version of our system and improved the effectiveness of our service, without going through these necessary steps, the launch of our service could have ran into unexpected obstacles.

7 Budget:

Figure 3: Budget Breakdown sorts the expenses into two categories: materials and upkeep. The server will be hosted on Nick Stalf's personal server using CentOS, a free Open source operating system, to reduce costs to just an annual electric fee. All other software components are anticipated to be free and open source, but we have included a small budget if other paid components work better. There is also a small budget to reserve the Find US domain name and electricity usage costs.

CATEGORY	ITEM	DESCRIPTION	EXPECTED COST	ACTUAL COST
Materials	Hardware	This includes any physical server materials to run, maintain and test FindUS.	\$0	\$0
	Software	This includes any plugins, operating systems, databases, and testing components.	\$40	\$0
Upkeep	Server	This includes any costs to keep the server and its assets operational	\$60	\$0
	Licenses/ Rights	This includes any costs to maintain the right to use software or domain names.	\$10	\$0
TOTALS			\$110	\$0

Figure 3: Budget Breakdown

8 Gantt Chart:

Figure 5: Gantt Chart illustrates the Find US project schedule. It breaks down when each stage of the project needs to be completed by and roughly how long each section will take. Below is the completed gantt chart for both semesters.

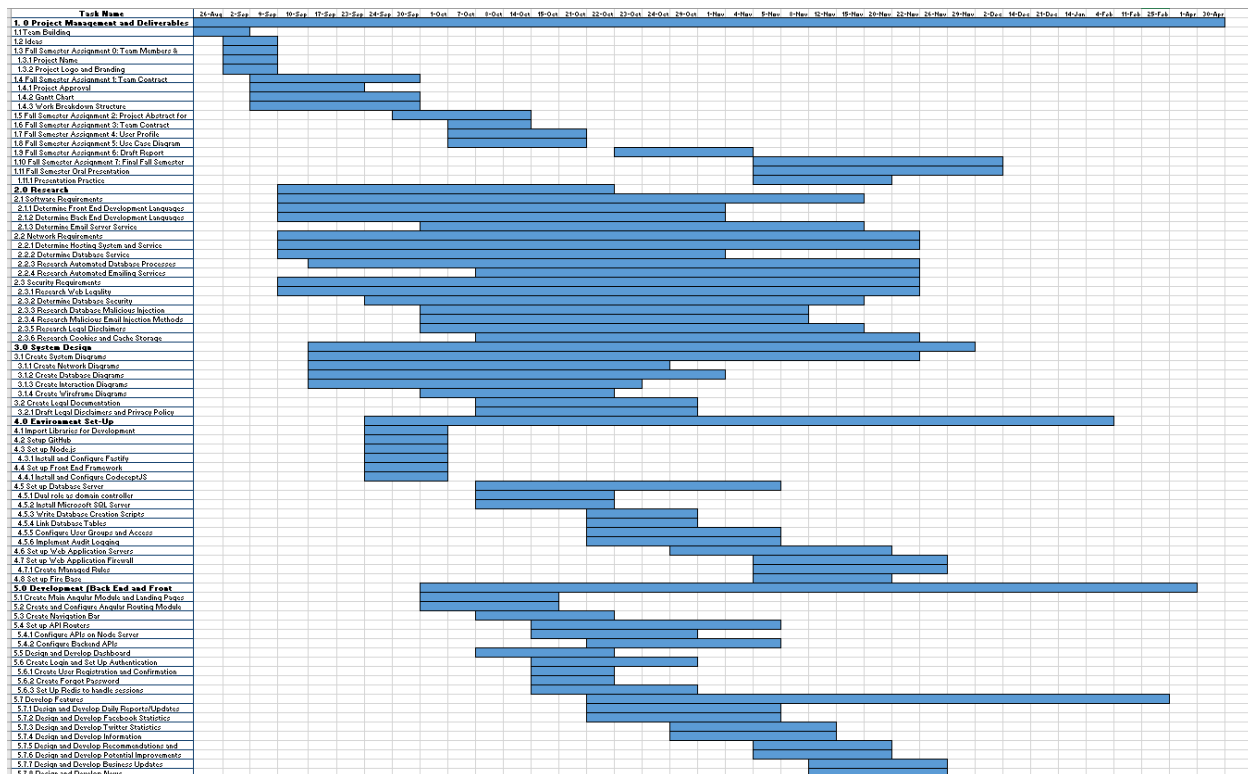


Figure 5: Gantt Chart

9 Problems Encountered:

9.1 Problem One: mySQL and Mailtrain

Outdated version of Microsoft Visual Studio C++ Redistributable caused problems connecting Mailtrain to mySQL. This caused quite a setback related to even starting the Mailtrain service. Updating to the latest version fixed this issue.

9.2 Problem Two: Server Intrusion

The server that houses our Mailtrain program and databases was hacked before there was any sensitive or important information on the server. The intruder gained access to the admin account and changed the credentials to the account preventing the team from logging in. We reverted the server to a previous backup and changed the credentials to the admin account. Through extensive penetration testing the team discovered the previous credentials to be on many brute force dictionaries and an open SSH port.

10 Future Recommendations:

The FindUS team was not using a lot of outside resources, going mainly off current knowledge.

Our recommendation would be to find outside sources to help make our project more efficient and straightforward.

Second, our document handling was somewhat all over the place throughout the course. We used Discord as our primary communication platform, and while that does offer a place to store your files, it can get somewhat erratic. We would recommend the use of a file share/cloud storage for future documents, for easy referencing.

11 Conclusion:

We have completed many of the initial goals set by our timeline by the end of Fall semester 2019. Although we made changes in our approach throughout the project's duration, ultimately we created a product that holds true to our original sentiment: to create a tool that provides helpful information and features for those who are trapped behind the paywalls on social media.

We have successfully set up the server to host our service components and have added those service components to the server as well. Those components include mailtrain and codeceptJS.

We have a functioning site hosted on Firebase with a fully integrated user system and user authentication managed through FirebaseUI. FindUS is now a working tool integrated with the separate components needed by utilizing VueJS. We did encounter some difficulties setting up the server and meeting early goals, but the final product is not only a functioning proof of concept, it's an effective tool that accomplishes its purpose.

APPENDIX A. REFERENCES

Zote, Jacqueline. “65 Social Media Statistics to Bookmark in 2019.” *Sprout Social*, 26 Nov. 2019, <https://sproutsocial.com/insights/social-media-statistics/>.

Reinman, Andris. “Self Hosted Newsletter App.” *Mailtrain*, <https://mailtrain.org/>.

“Basics · CodeceptJS.” *CodeceptJS*, <https://codecept.io/basics>.

APPENDIX B. EQUIPMENT SPECIFICATIONS

- Dell PowerEdge T610

- Dual Xeon E5645 @ 2.4GHz
- 16GB DDR3
- 2TB Mechanical Storage

- Ubiquiti Edge Router X

APPENDIX C. PROGRAMMING CODE

CodeceptJS - Automated user software used to obtain social media statistics.

VueJS - Javascript framework used to build the application/UI.

Firebase - utilizing Firestore for file sharing, their databases, and FirebaseUI for authentication.

Mailtrain - mailing list software used to contact followers

AWS - Amazon Web Services, providing us an email server.

MySQL - stores all Mailtrain data.

Uniserver - local server that hosts Mailtrain.

APPENDIX D. POSTER

As shown in **Figure 6: IT Expo Poster** the FindUS team created a poster to demonstrate the pertinent information in an easily digestible format.

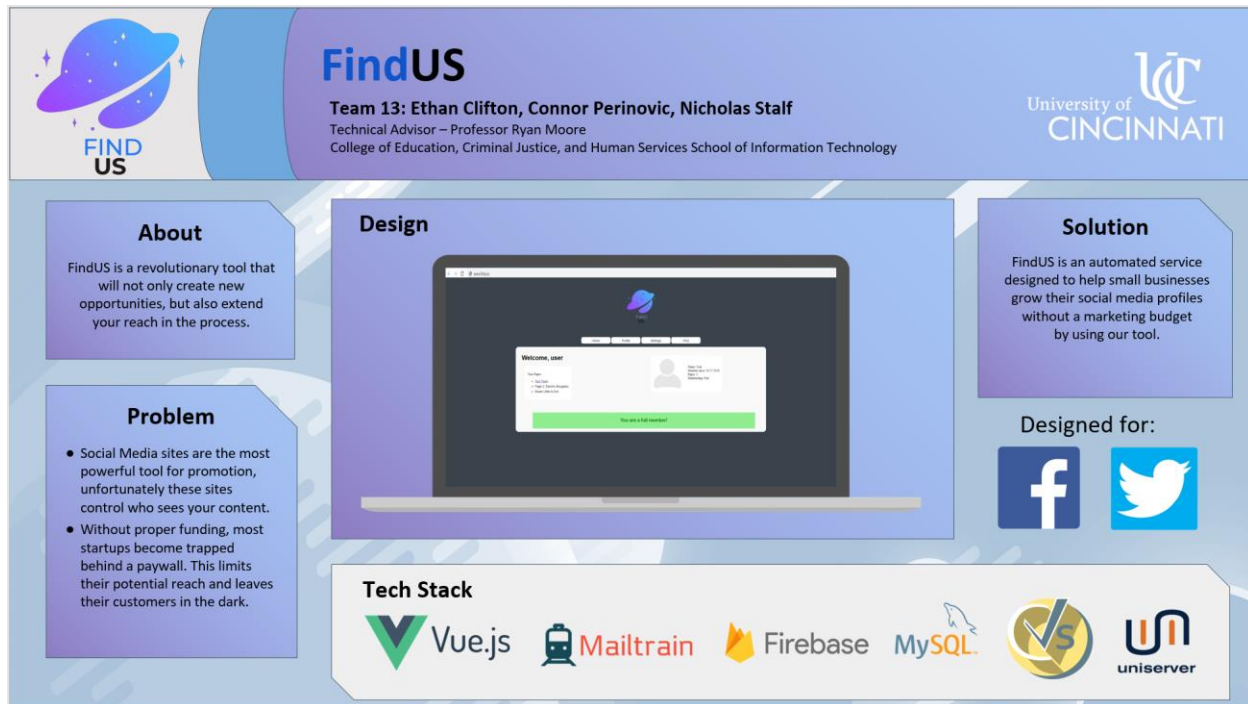


Figure 6: IT Expo Poster