SRI LANKA TECHNOLOGICAL CAMPUS
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இலங்கை தொழில்நுட்ப பல்கலைக்கழகம்

Web-Based Text Chat Application

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Project Supervisor	:	Mr. Yohan Pandigama
Team Members	:	AA1931 – D.C.Kahawearachchi
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1. Abstract

A chat application is a feature or a program on the Internet to communicate directly among Internet users who are online or who were equally using the internet. Chat applications allow users to communicate even though from a great distance. Therefore, this chat application must be real-time and multi-platform to be used by many users.

We used the agile methodology to create this web-based chat application. This chat app includes google and Facebook authentication, online status, image support sound notification, and also can create multiple rooms. It took us 3 months to complete this and 472,000LKR was spent on the working hours of the Project Manager, Tech Lead, and two developers.

This web-based chat application includes these technologies; React routing, Social Auth, Firebase, React Context API (we use it to link user's state between various pages with the react-router), Chat Engine, and Rest APIs.

2. Introduction

The purpose of this project is to implement a web-based chat application that includes private chatting, public chatting, and group chatting. Furthermore, a message protocol allows the application to properly log in users, send messages, and perform system maintenance.

In the front-end phase, we used HTML, CSS, JavaScript and JSON. The UI frameworks we used were React and the package managers were Yarn.

2.1 Project Overview

This requirements document will provide the requirements for a chat application. Both functional and nonfunctional requirements will be documented.

This project is to create at web-based text chat application and enable the users to chat with each other. To develop an instant messaging solution to enable users to seamlessly communicate with each other.

Applications

- Chat applications are in scope.

Assumptions

- n/a

Risks

- Technological Risks

Functional Requirements (Matthew Martin, October 6, 2021)

Table 1 Functional Requirements

Requirement ID	Statement	Must/ Want
001	This application must have a user list	Want
002	Users must be able to clear chat history	Must
003	Admin must be able to add and remove users	Must
004	Users must be able to create and delete a chat group	Must
005	The online status must be showed	Must

Non-functional Requirements (Wikipedia, 3 October 2017)

Table 2 Non-functional requirements

Requirement ID	Statement	Should/ Want
006	Chat application should be secure from hackers	Nice to have
007	All data must be backed up	should
008	Chat application will be ready to launch within 90 days	want
009	Must be user friendly	Nice to have

3. Individual Contribution

3.1 Introduction

Table 3 Project Introduction

Project Name: Develop Web Based chat application	
Group name: Deep Finders	
Team Members	
Name	Roles & Responsibilities
D.C.Kahawearachchi	Project Leader
Ramesha Geethan	Team member (UI Design)
Lakmini Anuruddhika	Team member (Researcher and Business Analyst)
Tharushi De Silva	Team member (The planner and the creative)

3.2 Background and Personal Contribution/ Experience for This Project

D.C.Kahawearachchi - Project Leader

First, as a leader when we start the project, I take the first meeting to identify my team members and their interests/unique skills. I had to maintain the log book of our every meeting. This log book maintains the detail of our weekly/monthly meeting information (data & time, reason for the meeting, discussed details).

I create a google form for this.

Link: https://forms.gle/9o68v5b943rF8o1b9

Next, for the project idea selection, it takes several days to choose right project idea for our team. There are many benefits to group projects:

They encourage students to learn to work in groups (stressing co- operation, teamwork, and negotiation); projects enable better learning by having students learn from each other, motivate each other, rely on each other, have to work at agreed-upon times, etc. Projects enable students to develop larger or more complex systems than would otherwise be possible, due to division of labor; projects also allow students to gain experience working as part of a team, as is normally the case in industry.

My Roles & Responsibilities (as the leader):

- Identify the team members skills and interest.
- Take the right decision with my team.
- Give a clear idea to the team about our end goal.
- Take the fully responsibility of any failure of the project.
- Keep up the good communication and understand with each member.
- Always take the advice and other member's ideas.
- Break down the project activities according to the skills and interest.
- Keep motivate the team members no matter what.
- Maintain the log book.
- Take the responsibility of developing part along with my team members.

Ramesha Geethan - UI Design

Starting with making the application UI, I had to effectively communicate the intended function of each element I have designed with the client. It was one of the biggest parts of my role. Also had to collaborate with the developers and at every level.

With the help of the planner and the team lead, I made the document-based graphical representation of web application architecture. Therefore, I worked with all three members in the group by doing my favor through searching standard design and prototyping tools, fundamental methods, theories and practices about the basics of UI design as my hard skills.

I had to design each individual screen with which the user will interact, including the layout, various screen sizes, design UI elements such as buttons, icons, sliders and scrollbars, had to choose the correct fonts and typesetting, and had to create animations.

Hope I completed my own tasks for the group project in a timely and responsible manner and directly contributed to reaching the group goal.

Lakmini Anuruddhika - Researcher and Business Analyst

Each individual in a team have their own strengths and weaknesses. When learning teams are properly structured and everyone is contributing 100 percent, it can be an effective method of developing skills and sharpening existing ones.

Within this Paragraph, I will summarize my contribution to the team project and evaluate the effectiveness of my contribution as the Researcher and Business Analyst to the success of the team project. When we started creating applications, I had to show up in IT, support, content, etc. A successful application needs more information to complete the project, it's important to have a strong researcher who can get it for others, so I was always asking questions and then finding their answers. Therefore, I worked with all three members in the group by doing my favor by assisting in defining the project, gathering requirements from business units or users, documenting technical and business requirements, verifying that project deliverables meet the requirements, and testing solutions to validate objectives. I helped to maximize the value of the project deliverables. And also, I am responsible for writing content using Plain Language and search optimization techniques, developing content style guides. Hope I completed my tasks for the group project in a timely and responsible manner and directly contributed to reaching the group goal.

Tharushi De Silva - The planner and the creative

Starting with making the project team organizational chart, with the help of the team lead I made the document-based graphical representation of the team to outline specific roles, duties and responsibilities of the team members participating in the course of the project implementation process.

Planning is about organizing, arranging, designing, preparing and scheduling, so I worked with all three members in the group by giving my favor through searching tutorials, designing the application architecture, creating the time planners costing the budget. Hope I completed my own tasks for the group project in a timely and responsible manner and directly contributed to reaching the group goal.

4. Methodology

We believe that an agile methodology was exactly what we needed to work on this project. Back when we started, our project requirements were incomplete, mostly because we did not have a clear idea of what exactly we wanted to achieve, even after writing about the Ideal technology platform. (Guru99.com, 2019)

Moreover, a 3 weeks sprint review worked well to analyze the work done during a moderate period of time and get professor's feedback about new features, as well as being a time to stop and think about new priorities.

There are 4 main phases in this project. There are,

1. Research
2. Planning, Prototype and Technology
3. Implementation
4. Deployment

4.1 Research

The aim of this project is to build a functional real-time web based text chat application for students by using modern web technologies.

Prior to getting started with the application development, we did some research on the current messaging platforms out there. We already knew of the existence of several messaging applications, and a few chat applications that students used. However, never before had we done an in- depth analysis of their tools to find out whether they were good enough for students. Soon, we realized that none of the sites were heading in our direction. We were looking forward to building a unique experience, rather than an exact clone of an existing chat platform.

4.2 Planning, Prototype and Technology

Table 4 Technologies we used for our Web Based Chat Application

Technologies we used for our Web Based Chat Application	
Front End	HTML, CSS, JavaScript, React, JSON
Back End	ChatEngine.io API
Package Managers	Yarn

Libraries / Frameworks

Having worked with a few web development dependencies, some of which were new to us, for a few months, we believe we are ready to review them, whether they met our expectations, how difficult they were to learn, whether we would pick them again in the future,

This Chat web application include these technologies,

- React routing
- Social Auth
- Firebase
- React Context API (we use it to link user's state between various pages with the react router)
- Chat Engine
- Rest APIs

The main dependencies we are making use of are

- chatengine.io
- React (the library that powered our web client),
- Universal cookies (node package that allows to store and get cookies with the least possible confusion)
- Axios: (is a promise-based HTTP client for the browser and Node. js. Axios makes it easy to send asynchronous HTTP requests to REST endpoints and perform CRUD operations. It can be used in plain JavaScript or with a library such as Vue or React)
- Firebase:

- Web vitals library is tiny library for measuring the Web Vitals metrics on real users, in a way that accurately matches how they're measured by Chrome and reported to other Google tools.

4.3 Implementation

This part explains about the most important parts of the app development, decision taken and algorithms. This explains the design and most important features and brief overview of our web application. This chat app includes google and Facebook authentication, online status, image support sound notification and also can create multiple rooms.

4.3.1 Design of the Application

API

Chat Engine is an API which makes it easy to build chat services. Building a chat from scratch takes a lot of time, code, and is expensive. Chatengine.io provide a Rest API to host your chats, and NPM components to help with your Chat UI. Servers can host all your chat needs, and we spent time making pretty chat components. (“Introduction to chat engine”,2021)

Users

To start, we needed somewhere to store our users. Since we were expecting a significant number of entries, an individual collection for the users’ themselves was the most appropriate. Every user has these properties,

(Username, New Secret, Email, First Name, Last Name, new Avatar

Chats

We were expecting to create more Chat rooms. So, the room properties are,

(ID, Title, Members, Admin, Access Key)

4.3.2 Features

Setting up the Development Environment

In this part we are going to look up the how we manage to set up the folder structures of the project. First, we have to install Node.js and react for the project. We use VS code for our text editor for our project. We have to create folder and install dependencies for configuration. Having decided

the technologies, we were going to use, how we were going to communicate with the client and using chatengine.io is make our project little bit easy.

This is our final folder structure. (Majid,2021)

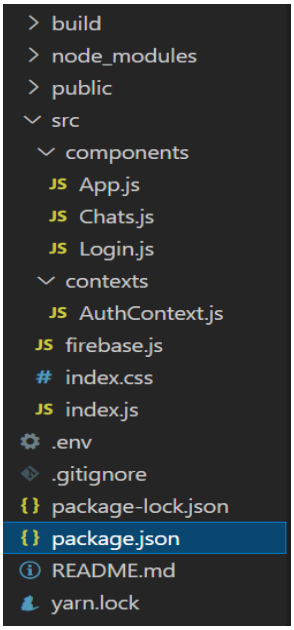

Figure 1 Final Folder Structure.

Node modules contain the NPM modules. Components include the chat application's main JS components (chats, login and app). Files in the contexts folder manage user information using user context. Src folder contains the web application logic.

Authentication

Authentication was our first feature to implement. We wanted to give support to Facebook and Google authentications. For the OAuth authentications we configured the following two routes: '/auth/google' & '/auth/facebook'

Google Firebase is a Google-backed application development software that enables developers to develop iOS, Android and Web apps. Firebase provides tools for tracking analytics, reporting and fixing app crashes, creating marketing and product experiment. ("Firebase Authentication", 2019)

We create a firebase application and connecting it to our web chat application to work our authentication. Config part of the firebase gives us the config object that we can use inside of our code. Then, we are going to export as the auth object. Then, we pass this object in using function.

Now we can export auth created by firebase include apiKey, authDomain, projectID, storageBucket, messagingSenderID and appId. After that we apply the goggle and Facebook authentication.

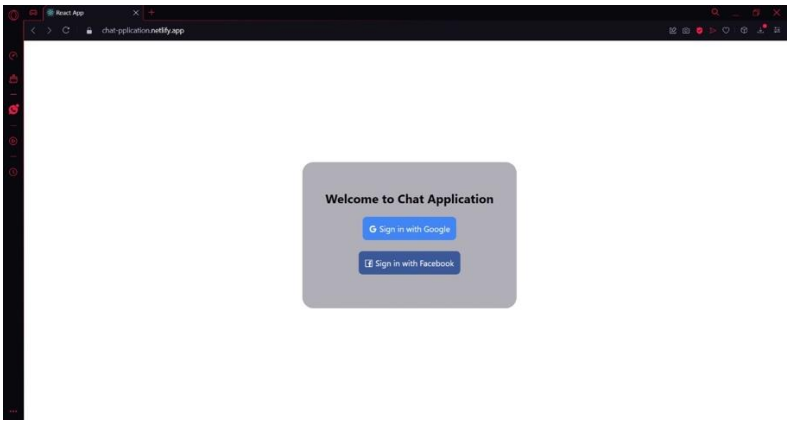

Figure 2 Logging Page

Rooms, Chats and Message

Once the authentication part was ready, it was time to move on onto the Rooms, Chats, and Messages that users will Create, Read, Update and Delete (CRUD). All the operations done by chatengine.io API.

It was an long process. Each operation involved database operations, a client to server request, specific validation, UI (a form or grids of data), and displaying the result of each operation back to the user when it was complete.

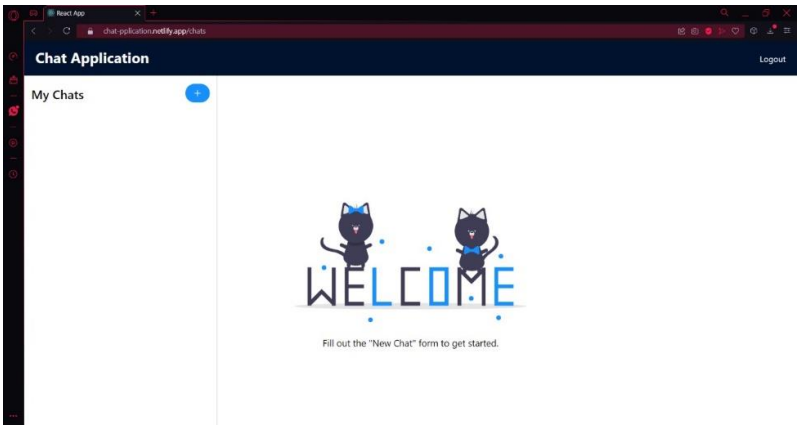

Figure 3 Chat Application Interface

Testing

Table 5 Testing

Test Scenario	Test Case	Test Steps	Expected Results	Actual Results	Pass/ Fail
Check Login Function	Check response on clicking sign in with google.	1. Launch application. 2. Click the sign in with google. 3. Select the Email u want to sign in.	User must be able to join the chat application.	Login successful	Pass
	Check response on clicking sign in with Facebook.	1. Launch application. 2. Click the sign in with Facebook. 3. Select the Facebook account user want to sign in.	User must be able to join the chat application.	Login unsuccessful	Fail
Check Logout function	Check response on clicking Logout button.	1. Launch application. 2. Enter the chat room. 3. Click the Logout button.	User must be able to log out from the chat application.	Logout successful	Pass

4.4 Deployment

Users would be able to access web-based chat application anytime without having to install themselves any special software. Although we marked the deployment as Phase 4, we began deploying our product at the end of Phase 3, when the platform was already usable through the UI. Our first attempt to deploy our chat application is we had to fetch the source code from Git Hub repository and install the all the dependencies. In our case, dependencies were easy to obtain. All the application modules referred to the NPM packages repository, so we could easily get them all installed by running "npm install" after the Node.js installation.

When we had all dependencies installed, we adjusted the production details to fit our server specifications, such as host or ports, and we started the application. At that point, our application was live and accessible to anyone with Internet access. The fact that we did all deployment steps manually was a problem. It was going to be very time-consuming in the long-term run, and it would be even more if we want to update the source code. Netlify and Heroku is the best solution for this problem.

Netlify

Netlify is a cloud computing company that offers hosting and serverless backend services for web applications and static websites. (“Everything you need”, 2021)

We can easily build our react chat application using “npm build” in your terminal (client folder). Then we can easily drag and drop to the Netlify platform. Then, it starting to deploy application to the internet. We also can change the site name if we want to.

5. Project Management

We used some techniques and strategies to manage our project. We planned to gather members for our group with several skills. Then we made a discussion about SWOT and write down each point. After that, we knew about what the strengths, weaknesses, opportunities and threats were.
Then we had a brainstorming session and chose the most suitable topic. We avoided physical interacts due to the covid-19 situation, just because of the long-distance of our team members. Therefore, we decided to create a web-based chat application as our project because we can do it through a virtual platform. (Project Management Docs, 2021)

Finally, we used the PERT technique to do the program evaluation and the review. Many organizations use this technique to analyze and represent the activities in a project and to illustrate the flow events. (Project Evaluation Review Technique (PERT), 2021)

5.1 Team Management

Team management includes the processes required to make the most effective use of the people who involved with the project. The project team includes the project manager and the project staff who have been assign the responsibility to work on the project.

We had a different plan to move on to this project, so we have discussed the project and shared the topics based on our skills. Therefore, we had no issue with certain topics. Project members took responsibility for their topic to depend on their skills. Therefore, members are responsible for their own certain topics. Because of this method, each member in the team not only develop their leadership skills but also it will be a betterment for their career. We have a team of several capabilities, such as designing, researching, report writing and programming. While we doing this project who has researching skills, writing skills, designing skills and programming skills can share their knowledge with each other. Therefore, we gained more knowledge on this project.

5.2 Time Management

Time management is defined as the time spent progress, which has been makeover the project. It is one of the major components of project management and the most concern of project managers. Time management helps you to schedule and examine the completion of the project.

We have followed some techniques to manage the project timeline. We have created a to-do list and prioritized each important task. Then we have created a logbook to track the activities, which we have done in a week. Then we have chosen an agile software development cycle to initiate this project. After, we had to research that and create the timeline according to the agile method. We have used four sprints to complete this project. After we have done with the project proposal and requirement gathering, then we started to initiate our development process. (Time Management, 2021)

5.3 Budget

Table 6 Budget

Estimated Budget				Final Budget			
Position	Salary		Total (LKR)	Position	Salary		Total (LKR)
	Cost	Week			Cost	Week	
Project Manager	23400	9	210,600	Project Manager	20000	9	180,000
Tech Lead	16800	8	134,400	Tech Lead	15500	8	124,000
Developer (P3)	13440	6	80,640	Developer (P3)	12000	6	72,000
Developer (P4)	13440	8	107,520	Developer (P4)	12000	8	96,000
Total			533,160	Total			472,000

6. Conclusions

6.1 Discussion

The main objective of the project is to develop a Web- based Chat Application. We had taken a wide range of literature reviews in order to achieve all the tasks, where We came to know about some of the products that are existing in the market. We made a detailed research in that path to cover the loopholes that existing systems are facing and to eradicate them in our application. In the process of research, we came to know about the latest technologies and different algorithms.

6.2 Future Improvements and Developments

There is always room for improvements in any development project.

We analyzed various encryption algorithms (DES, AES, IDEA…), Integrity algorithms (MD5, SHA), key-exchange algorithms, and authentication but we couldn't implement those functionalities in our application.

We researched some of the latest JSSE technologies. but we couldn't implement those functionalities using the JSSE api's. We went through core and security concepts of java (JSSE, JCA) packages.

With the knowledge We have gained by developing this application, We are confident that in the future We can make the application more effective by adding this service.

- Extending the security concepts using encryption methods
- Extending this application by providing Authorization service.
- Creating Databases and maintaining users.
- Increasing the effectiveness of the application by providing Voice Chat.
- Extending it to Mobile App Support.

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8. Appendix A: Abbreviations

Rest API - Application programmed Interface

UI - User Interface

Src - Source

HTTP - Hyper Text Transfer Protocol

SWOT - Strength, Weakness, Opportunities, Threats

PERT - Program Evolution Review Techniques

DES - Data Encryption Standard

AES - Advanced Encryption Standard

IDEA - International Data Encryption Diagram

JSSE - Java Secure Socket Extension

JCA - Java Cryptography Architecture

MD5 - Message Digest Hashing Algorithm

SHA - Secure Hash Algorithm

N/A - not Applicable