CLEVO - a budding sharemarket investor application
Technical Solution Design - Group 8

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Preface

The purpose of this document is to outline the Technical Solution Design for the Budding Sharemarket Investor application project.This document describes the technical environment, overall project architecture, system architecture, application functionalities and features, database architecture, implementation instructions, non-functional specifications, summary of test results, known issues and risks.

1. Introduction

Summary of the technical solution that was completed including:

- Brief project description
- Brief description of technical environment
- Estimated level of complexity

CLEVO - The Budding Sharemarket Investor game will allow players to learn how the sharemarket works using a virtual share market platform. This will give players the experience required to make informed decisions regarding buying and selling shares in a controlled environment with bogus money before they enter the workforce and begin trading shares using actual money of their clients. The Budding Sharemarket Investor game will allow players to: create an account, log into the web application and use bogus money to simulate buying and selling of shares based on actual ASX data. Data will be retrieved via web service calls to a finance API, and will be used in the buying, selling and tracking of shares in the market.

The budding investor game will be hosted online on an AWS environment and built with a combination of PHP, mySQL, HTML and CSS. Users will be able to navigate to the site, login or register, and begin dealing in the faux marketplace. There will also be admin functionality built into the site. GitHub will be used for a version control tool, and some testing tools such as Unit Testing and PHP Testing.

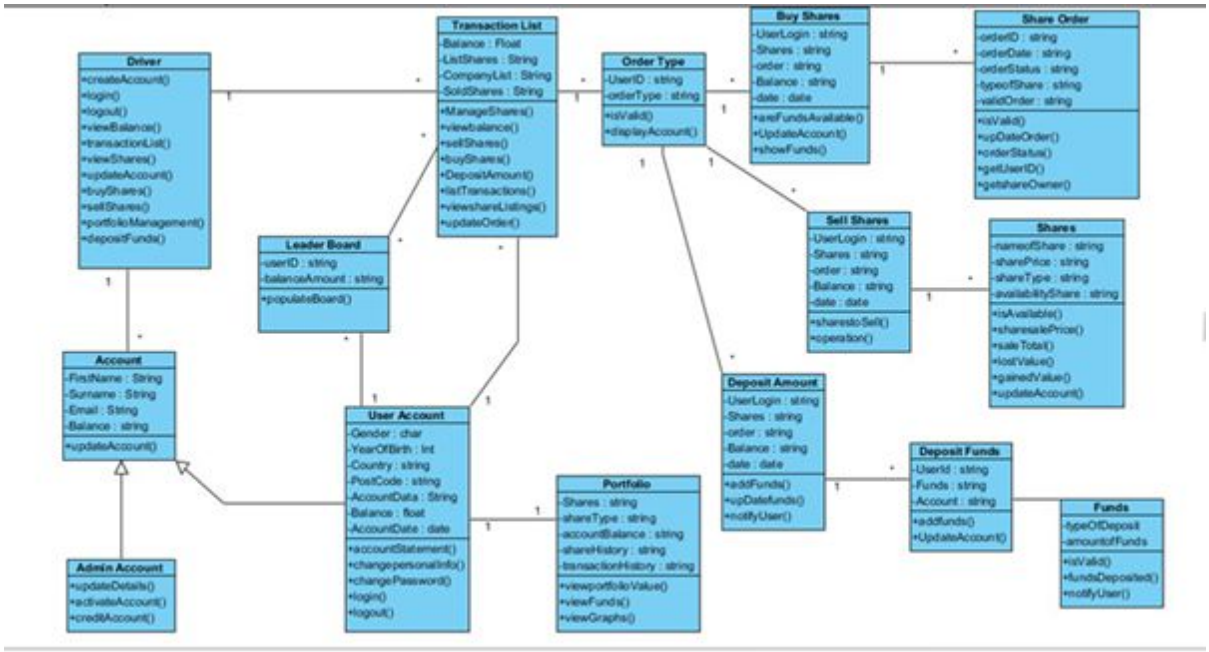
The application will initially display a lower level of complexity and as the project development progresses, it will transition into a moderate level of complexity while remaining objective to the project requirements.

2. Technical Environment

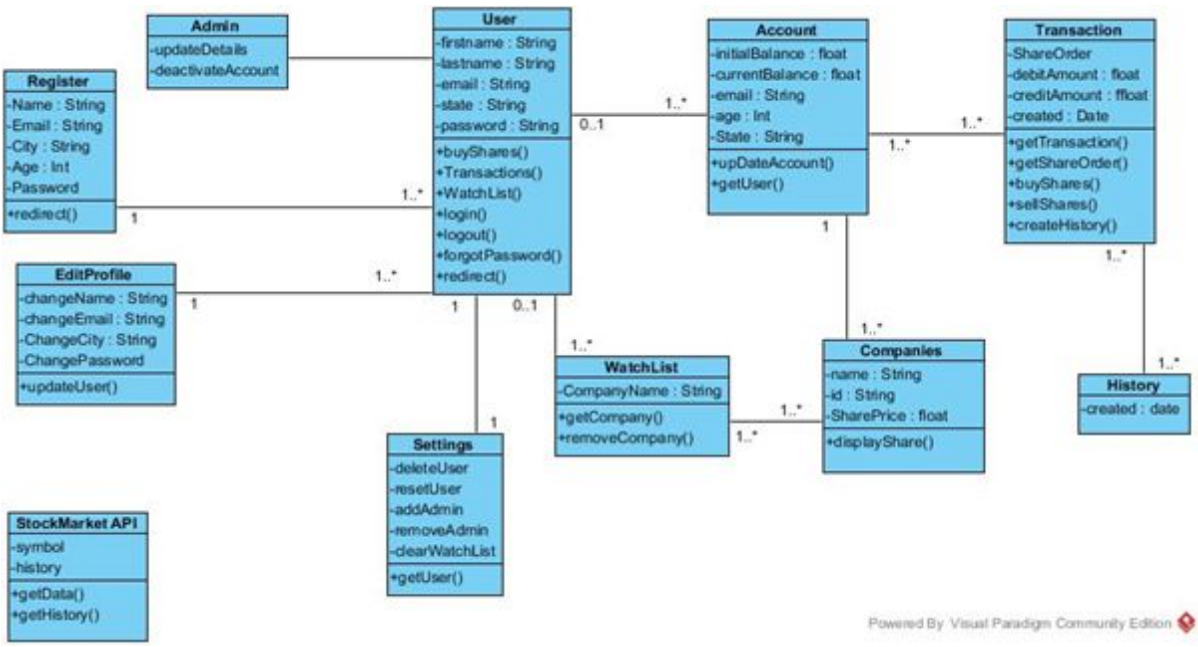
Component	Description
PHP	PHP is used for all server-side scripting to ensure secure access and modification of data. It also has the ability to do database queries and has a more secure login.
HTML5	Used to create the web pages of the project
CSS3	Used to style the web pages
AJAX	Used to communicate with server-side scripts including JSON
Laravel	The main framework used to build the PHP project including structuring the location of pages, styling, scripts and databases.
GitHub	Used for hosting our source control. GitHub integrates with other software used such as Source Tree and can also have more than 5 users connected to it at no charge unlike BitBucket which is limited to 5 users.
SourceTree	Local Git client used to pull, commit, push, merge and create other branches, whilst connected to the GitHub source control.
Sublime Text, Notepad++	Tools of choice, used individually by group members to perform coding tasks.
Composer	A tool for dependency management in PHP.
AWS	AWS will be used to host the project. It will allow tracking of different versions of our project and where the client can interact with the product: http://clevo-rmit.space/public
Lean Testing	Used to plan, track and record tests and bugs.
Trello	Online tool used to manage the project sprints - current in progress, coming up next week, completed, and ongoing.
Slack	Tool used for group communication, structured into multiple channels such as API, UI, General etc.
XAMPP	used locally to run the project individually before pushing to GitHub

Google Drive, Docs, Sheets	Used to storage and collaboration of all documentation related to the project.
PHPUnit	Used to create unit tests for the project
SQLite	A lightweight and portable SQL database engine used for storing all user and company data

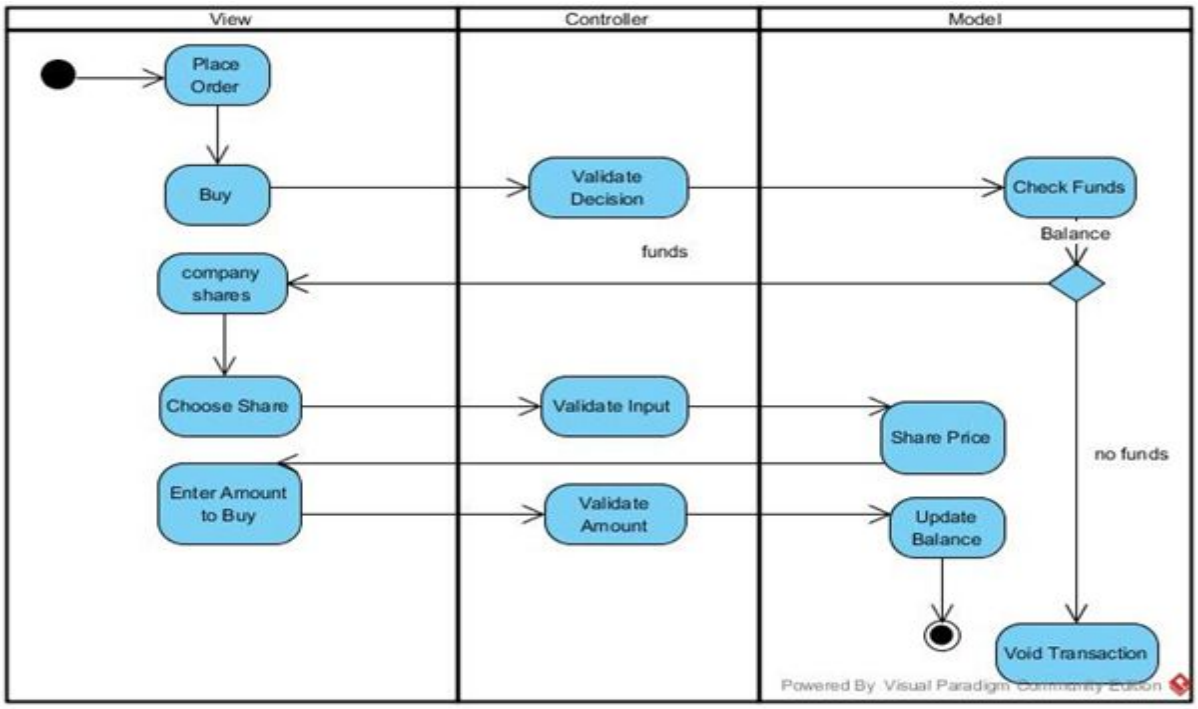
3. Overall Architecture



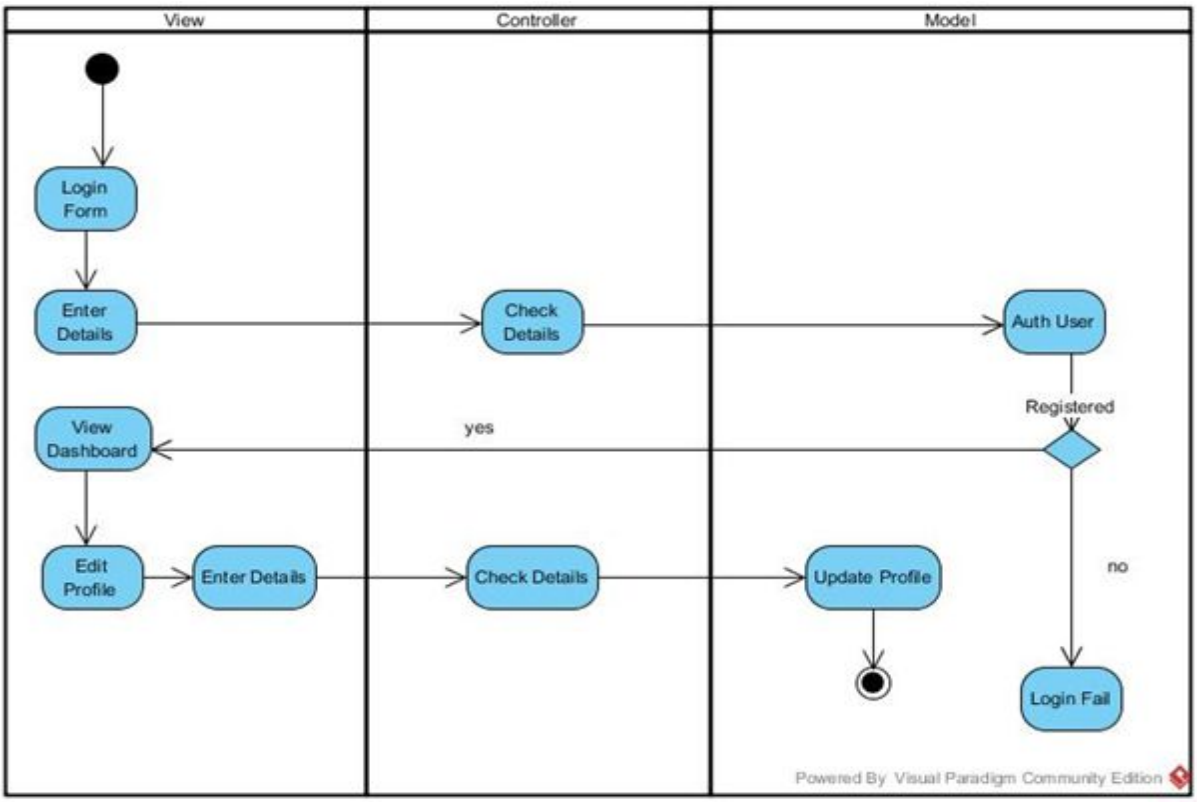
Class Diagram



Activity Diagram



Activity Diagram

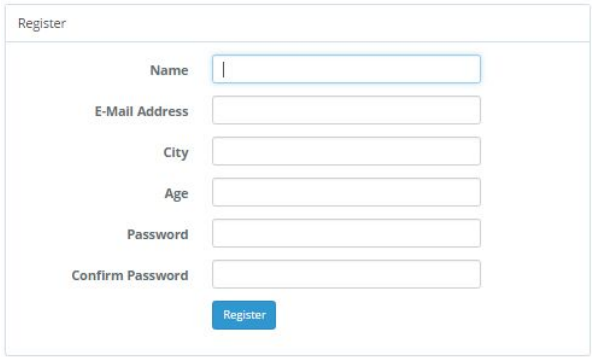


4. System Architecture

4.1 Functionalities/features

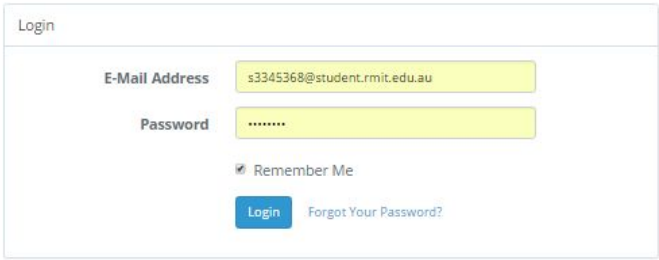
1. User Account - Register
2. User Login / Logout
3. User buying of shares
4. User selling of shares
5. Applications provides live updates of share price and fluctuations
6. Application provides a history of purchased shares
7. Application provides player's current balance
8. Application maintains an updated leader board
9. Application offers appropriate admin functionality

4.1.1 Register



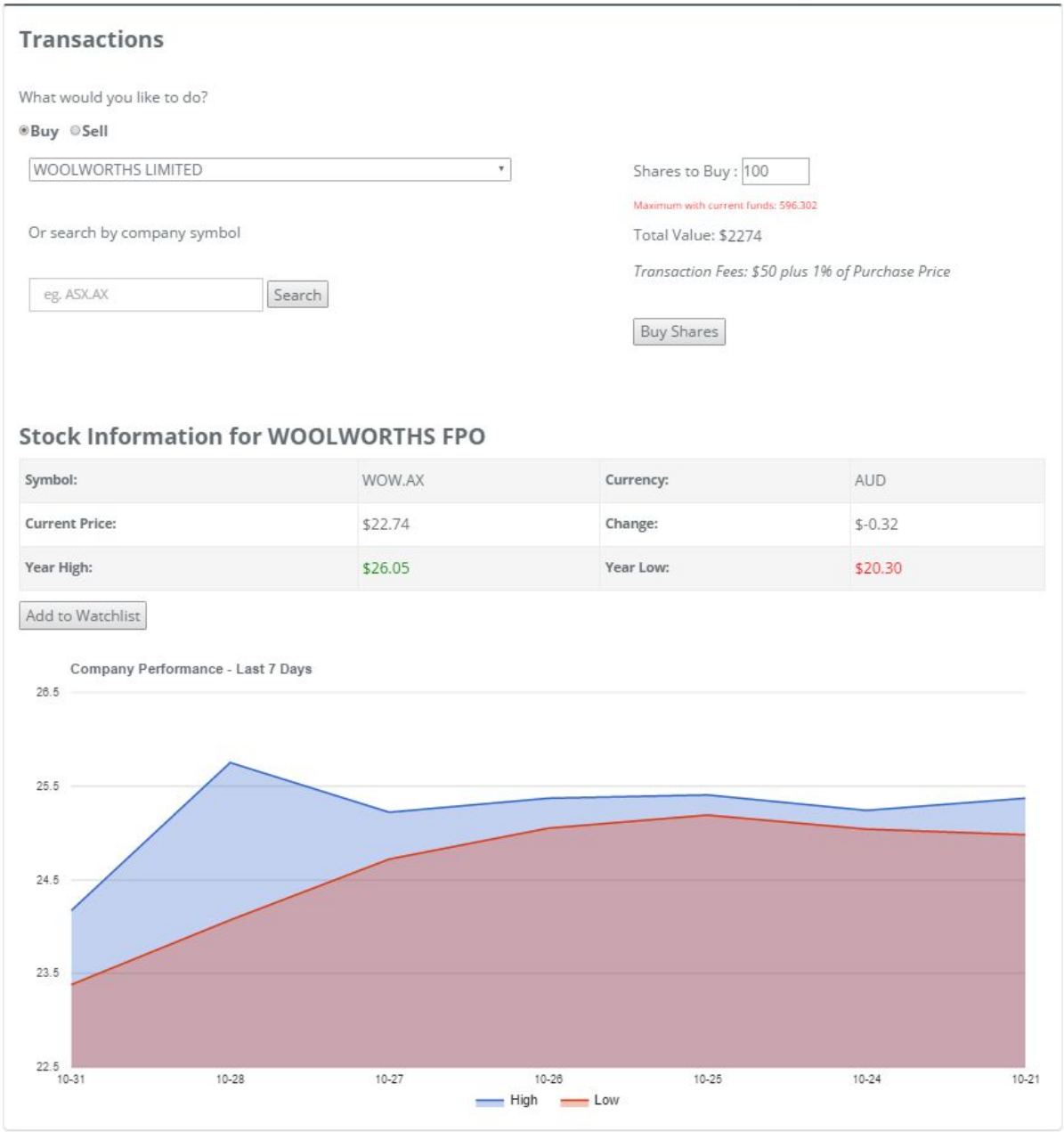
1. User navigates to the website: http://clevo-rmit.space/public
2. User clicks on the register button
3. User fills out the Name field
4. User fills out the Email Address field
5. User fills out the City field
6. User fills out the Age field
7. User chooses a password and inputs it into the Password field
8. User confirms password chosen by typing it again into the Confirm Password field
9. User registers the account by pressing the Register button
    a. If successful, will be redirected to the Dashboard page
    b. If validation fails, user will be notified on the form requirements such as: minimum age must be 18, password must be at least 8 characters long and must contain at least a letter, a number and special character.

4.1.2 Login/Logout



1. User navigates to the homepage: http://clevo-rmit.space/public
2. User fills out the Email Address field
3. User fills out the Password field
4. User has the option to tick the "Remember Me" radio box for fast access next time user logs in
5. User clicks on Login and will be redirected to the Dashboard page
6. While user is logged in, throughout the website has the option to logout by clicking/pressing the Logout button located on top right of the page, which will redirect user back to the Login page
7. User is presented with a "Forgot Your Password" option to reset the forgotten password via link sent by email.

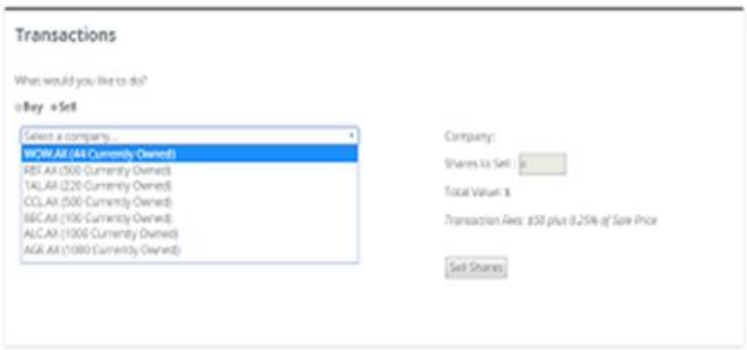
4.1.3 Buy Shares

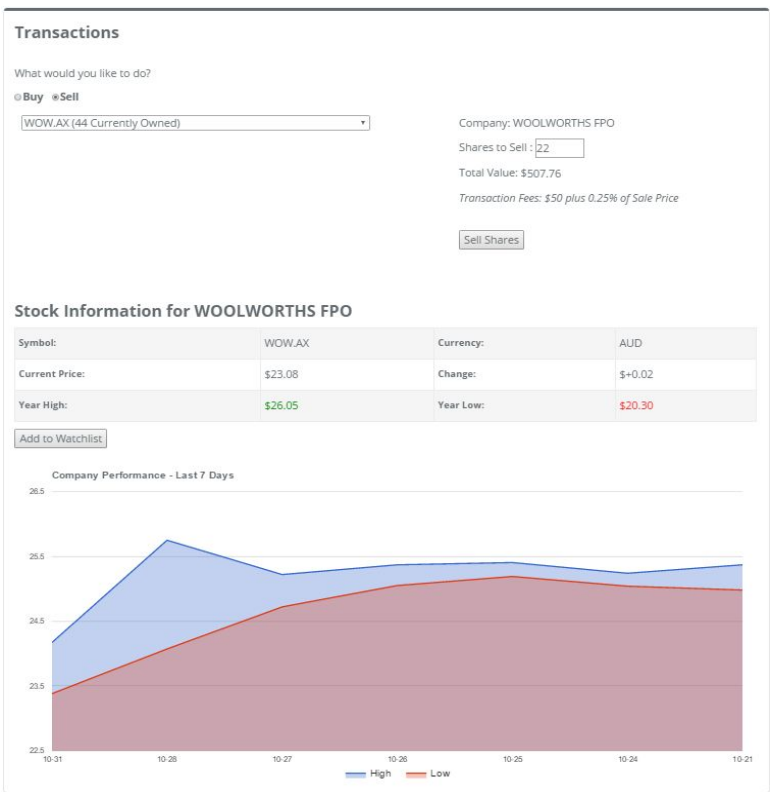


1. User logs in
2. User navigates to Transactions page
3. User will select the Buy radio button
    a. This will present user with an option to select a company from a complete list in a dropdown form and also an option to search for a company by its unique sharemarket code
    b. The buy box will present user with the current share value and latest price changes and also gives user the option to add the company to the watch list
    c. User is also presented with a history chart of previous week share values
    d. The buy box will update with the maximum number of shares that can be purchased based on user's current balance.

4. User will select number of the shares to be purchased
5. Total value of shares will update accordingly
6. Transaction fees are being displayed for user's reference
7. User will press the 'Buy Shares' button
8. Application to check if the user has sufficient funds to make transaction.
    a. If insufficient funds error message will show.
    b. If sufficient funds will proceed to step 9.
9. Application calculates the total cost of the transaction and updates the 'current_balance' field in the database.
10. Application will update the current_holdings field in the database with the new stock This will be hashed to increase security of the information.
11. User will be notified of the success of purchase and the amount deducted from their balance.

4.1.4 Sell Shares



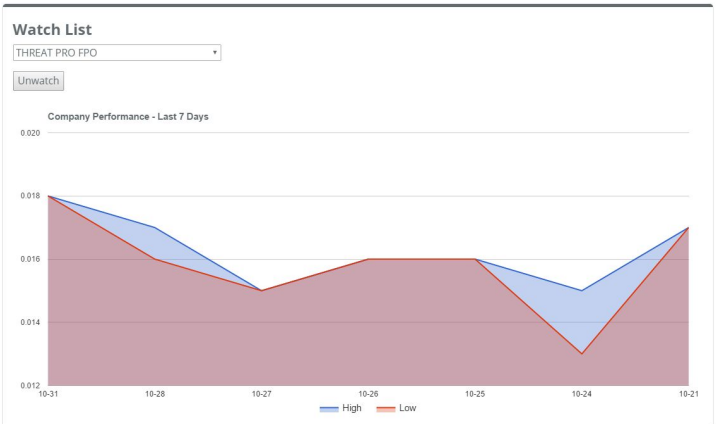


1. User logs in
2. User navigates to Transaction page
3. User selects the Sell radio button
4. User will select desired stock from the Currently Owned shares' dropdown menu, this will update the sell box with company information
5. User will enter the number of shares to be sold
6. Total value of shares to be sold updated
7. User will push the 'Sell Shares' button
8. Application confirms the number of shares entered is equal to or less than the number currently owned.
    a. If too many shares entered error message will be displayed
    b. If number of shares are being sold is valid will proceed to step 9
9. Application calculates the amount to be added to the user balance and update the

'current_balance' field in the database.

10. Application updates the 'current_holdings' field in the database with the new stock information.
11. User is notified of the success of the sale, with a complete transaction summary and option to return to the Dashboard or Transactions page

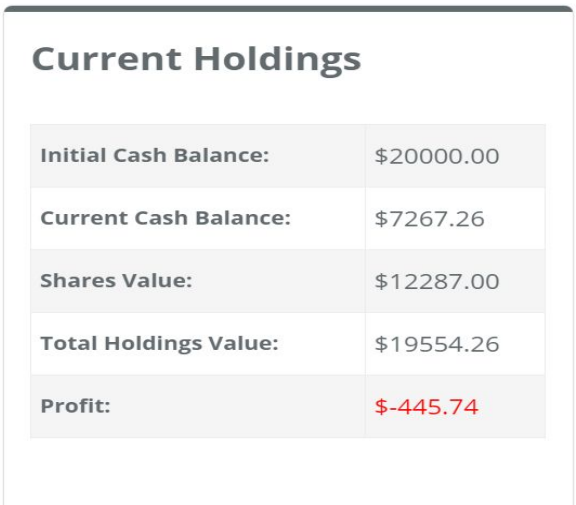
4.1.5 Application provides live updates of share pricing and fluctuations



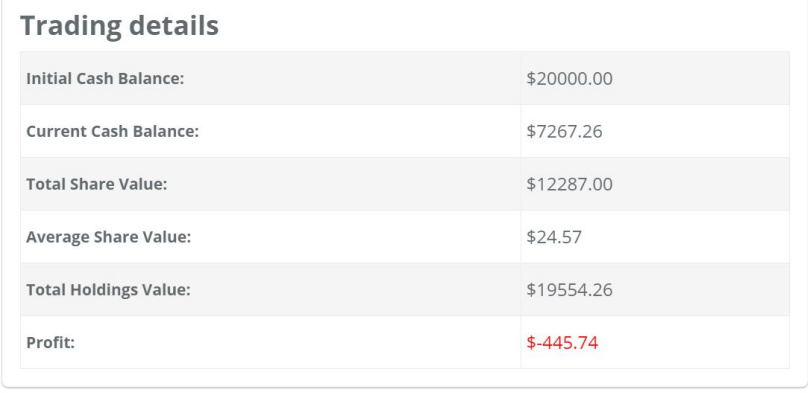
a. Application presents user with a live share prices on the dashboard page when a company is selected from the Watch List drop down menu

b. Application presents user with a live share price when the buy or sale option is selected and a company chosen from the drop down under the transactions page

4.1.6 Application provides player's current balance

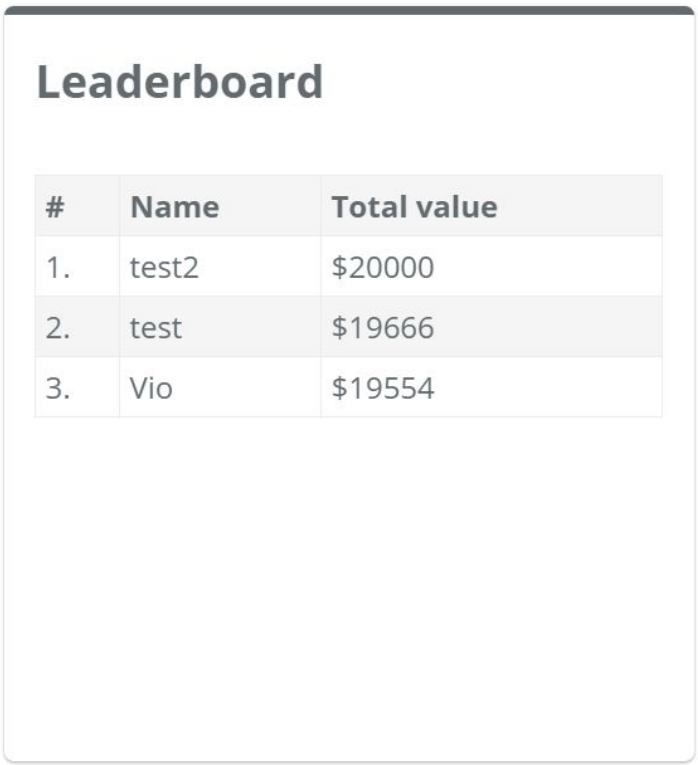


1. User logs in
2. Views current holdings section in the middle of the dashboard which includes the cash balance, the shares values and the total holdings value.



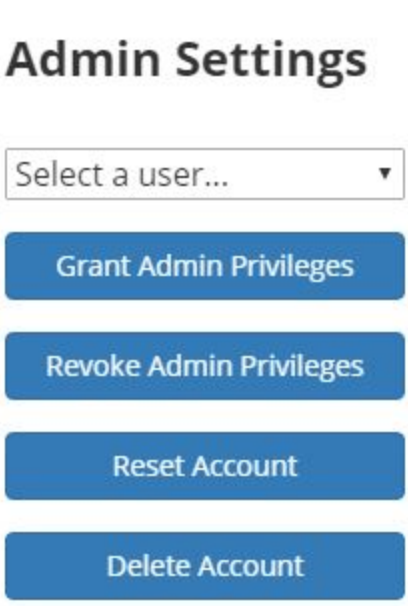
1. User logs in
2. User navigates to profile page
3. User views trading details in the bottom section of the page which includes the current cash balance, total share value the average share value and the total holdings value

4.1.7 Application maintains an updated leader board



1. User logs in
2. User views the leaderboard section on the righthand side of the dashboard. The leaderboard is populated with all registered users total holdings including cash and share value.

4.1.8 Application offers appropriate admin functionality



1. Admin logs in
2. Navigates to settings page
3. Selects a user from the drop down menu
4. Admin can perform the following actions on the selected user: Grant or Revoke admin privileges, Reset Account or Delete Account

5. Database Architecture

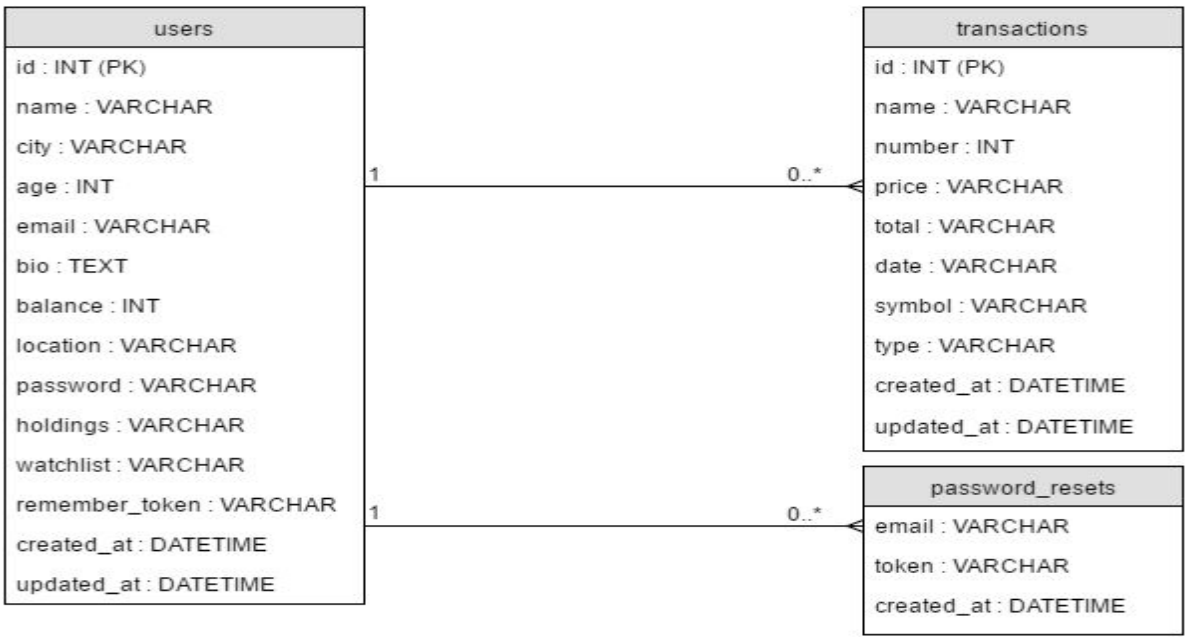
SQLite has been used as the database solution for a number of reasons. The simplicity and portability of SQLite saves time during development as it allows the database to be embedded in the project files allowing easy access for all developers.The traffic of the final product is expected to be classified as low which also makes SQLite a suitable solution. Laravel, the PHP framework used to develop the application has built-in support for SQLite including the ability to have multiple databases being used concurrently. Due to the nature of the project it is unlikely that the application will be expanded to the point where a more powerful database solution would be needed.

The project features two separate databases:

Main database	Contains user account information, user owned shares, balance, transaction history
ASX database	Contains a complete list of all companies trading on the Australian stockmarket. Includes company name and symbol to be used in API requests.

Main database

The main database is where all user data is stored. This includes registration information, balance, transactions history and currently owned shares.



ASX database

This database contains the name and symbol of all companies trading on the Australian sharemarket. This data has been kept separate because it does not need to be modified and can safely be set to read-only. Instead of being modified the whole database file can be replaced when the ASX list needs updating. Another reason this data was isolated from the main database was to facilitate the addition of data from different markets. The entire database can also be replaced allowing the project to be switched to a different market with zero modification to the rest of the project.

6. Implementation Instructions

The application only requires basic hardware since it is not requiring many CPU or RAM resources (i5, or a Xeon double core with 8GB RAM will be sufficient) and either a Windows or MAC environment. It can be deployed on a cloud environment such as AWS free of charge (or a very minimum fee of $0.75 - $1.5/week for additional features such as adding a custom domain name).

Migrating data from a local environment to a cloud environment consists of a simple task of uploading a zipped folder, which contains the entire project, to a cloud environment such as AWS, followed by deployment which consists of selecting the most current version of the app and choosing the deploy option. The AWS systems will enable the most recent version of the website when the user navigates to the homepage.

To ensure there was no data loss, we kept the source code in a cloud environment called GitHub and also, each member of the group kept a local copy of the entire project.
Within GitHub and SourceTree, we have a number of commits since the beginning of the project and at any given time we can reverse changes if proven undesirable.

Within AWS we have a number of versions deployed with a short description against each version. This gives us an idea of what each version represents, and again we can reverse the online version to any previous version at any time in a matter of minutes. This is another way of backing up our work environment.

7. Summary of test results

We used the Testing Register form to document the tests performed. We also used the Lean Testing tool to conduct tests and identify bugs.Here is a summary of the test results:

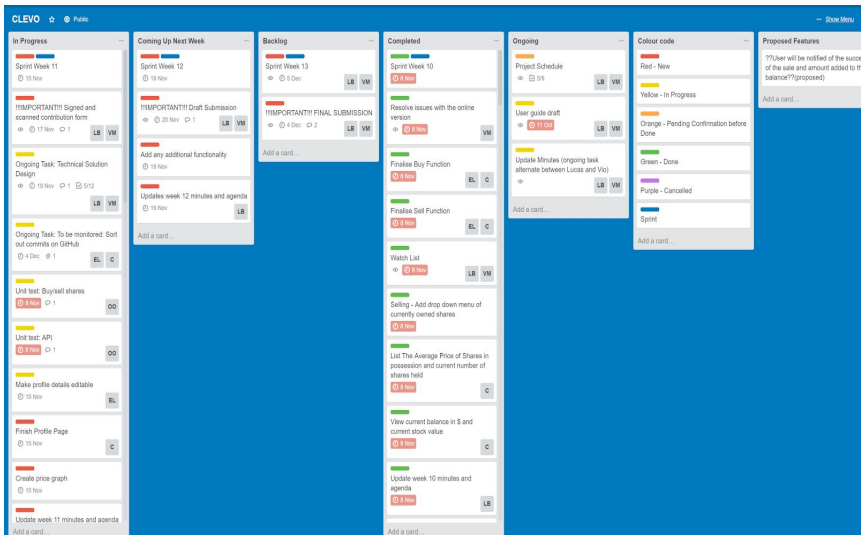
Integration Test
Test Login Url
Test Register Link Functions
Test Wrong Values
Test Mismatch data
Test correct Data
Test can Create user
Test fields are Validated
Test for forgot Password
Test can not send reset email to invalid address
Shares. Guest can not access transactions
Test Can buy Shares
Test Buying Shares is Validated
Test can sell Shares
Routes Auth routes return 200
Test to get transaction page return 200
Test History Controller
Test Database Controller

8. Known Issues & Risks

The Risk Register form is used to record risks related to the project. The Issue Register form is used to record issues related to the project and are attached in the appendices.

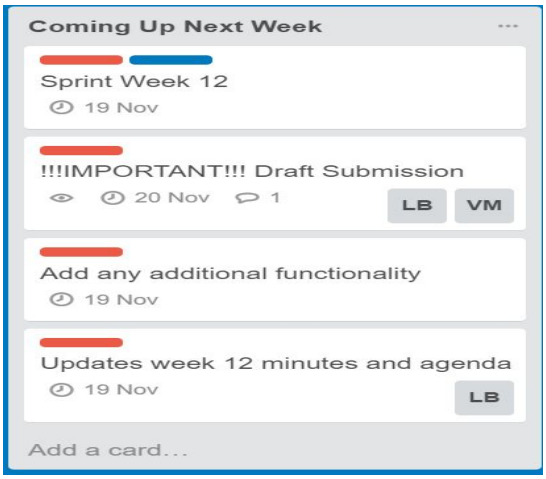
9. Appendix

Trello

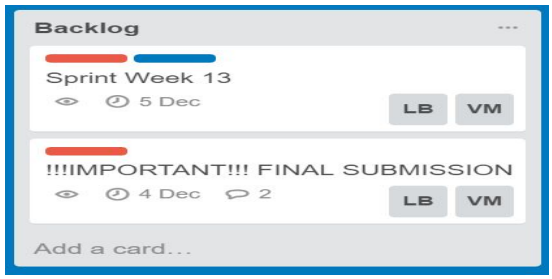


We used Trello as a tool for managing the project.
We have structured Trello in Sprints according to the Scrum methodology, and grouped the sprints into columns named in a way to make it easier to track the progress of each sprint and see upcoming sprints and the completed ones.

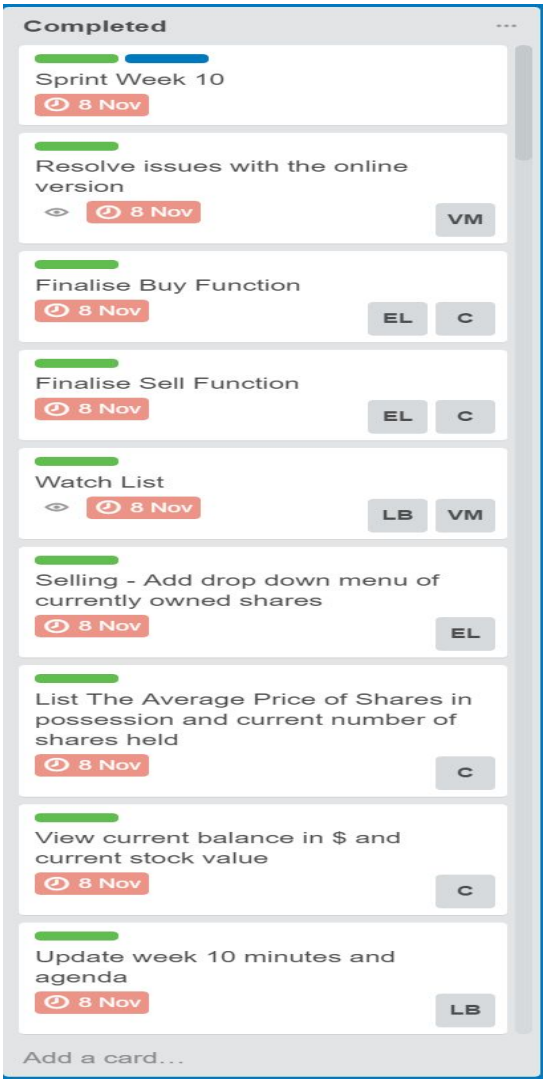
We have setup a “In Progress” column which contains the weekly sprint that we work on and all tasks the sprint contains. Each task is assigned to one or multiple group members, contains a due date and a colour status. The colour legend is described in its own column.



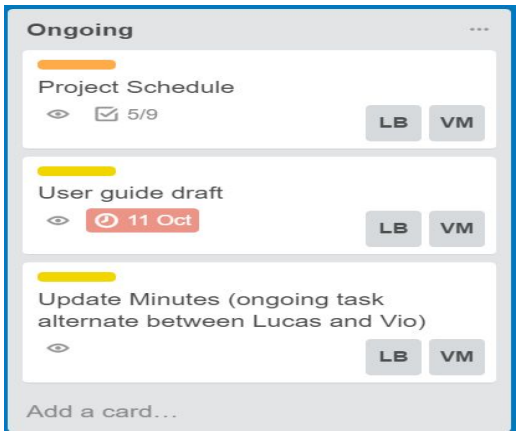
We have setup a “Coming Up Next Week” column which contains the following week’s sprint with its tasks. The tasks under this sprint as well contain a due date, is assigned to a group member or might still be



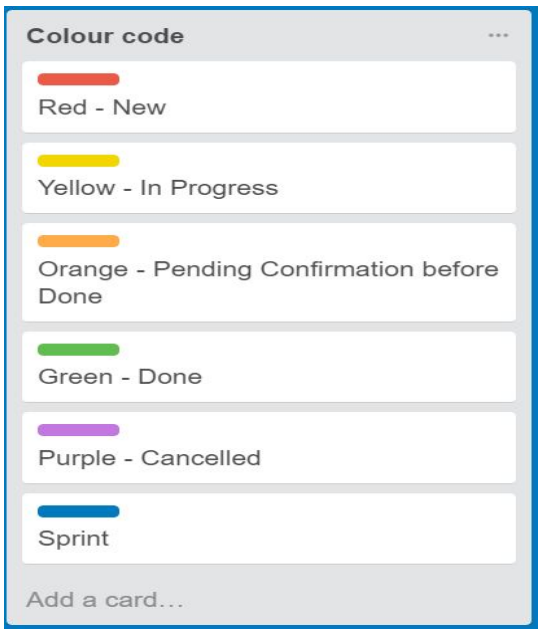
We have setup a “Backlog” column which contains all known future sprints and tasks till the end of the project, also assigned to a group member and a due date against each task



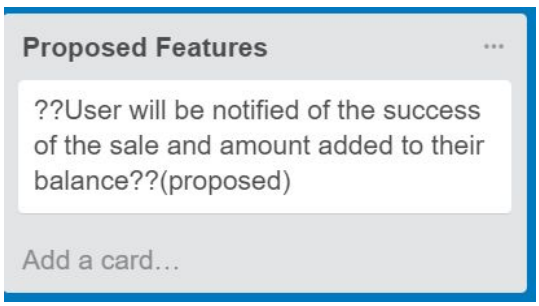
We have also setup a completed column where all completed sprints move to from the “In Progress” column structured in a Sprint due date order so we can refer back to task that was completed as part of a sprint in the past



We have setup an “Ongoing” column which contains the ongoing tasks such as Project schedule which require weekly even daily updates, or the minute taking task from which an instance is being created on weekly sprints.



We have setup a “Colour code” column which is the colour legend which describes the colour codes that each sprint and tasks are tagged with.



We have setup a “Proposed Features” column which contains additional features proposed by our group.

10. Code Standard

- Functions, variables and classes are named using camelcase.
- Indentation is one tab per nesting.
- Commenting written above important functions describing their purpose.
- Code kept simple and easy to understand, complex functions broken into smaller, reusable functions.
- Methods and functions kept simple with small amount of parameters.
- Code measured and tested extensively to ensure a high standard.
- Naming is unambiguous.
- Words are spelled correctly and grammar is adhered to in comments.
- Errors are detected and dealt with.
- Disused/commented code is removed.
- Source control used throughout development.