# The Paramount Investments League

Report 1
Software Engineering
14:332:452

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Reports Repository

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# Contents

# 1 Customer Statement of Requirements

## 1.1 Problem Statement

The stock market, more specifically the New York Stock Exchange(NYSE) and the Nasdaq play a pivotal role in the American economy today. Both are signals of the strength of the private sector and consumer confidence. It is thus no surprise that more and more people want to be involved in these markets and attempt to increase their own wealth.

There is however a barrier to entry for many people, both young and old in participating. That is why with Paramount Investments League we are interested in a platform for interacting with these markets and providing educational interfaces for breaking down these barriers. Users should be able to easily register with the system and begin participating immediately. They should be given an imaginary cash portfolio where they can perform basic market orders such as buy and sell. These orders to should mimic real market orders as closely as possible and should include a brokers fee. More sophisticated market maneuvers should be unlocked as the user progresses through an achievements ladder.

Paramount Investments League is geared towards a wide array of audiences and expects a variety of users with varying knowledge levels to participate. In order to maintain appeal amongst these users the platform should provide rewards to users for acheiving particular goals. We would like to replicate the idea of achievements or trophies similar to the Microsoft xBox and Sony Playstation family of systems. These achievements can award users with new abilities or additional cash to their portfolio as they rise up the achievements ladder. Users should also be able to create leagues to help further enhance the competitiveness of the game.

Leagues exist to allow multiple users to compete against a subset of the global user base with individual league rules. This allows leagues to set particular goals in order to be declared the winner. Leagues will require a cash buy-in that will be pooled together and distributed to the winner(s) as seen fit by the league creator. To help facilitate these leagues, a leader board will be created for each individual league such that users can see their progress. In addition to league leader boards, mutliple global leaderboards will be available providing specific metrics of comparison.

To help facilitate a better understanding of markets, market metrics should be available to the user through news feeds of companies in their portfolio, interactive charts, and a live ticker of current trades happening on our platform. Users should be able to have granular control of email and social media updates.

The entire experience should be unified across mobile, tablet, and the desktop and combined with the above features provide an enthralling core experience for users to learn about the stock market.

## 1.2 Glossary of Terms

**Achievement** – Any set goal reached by an investor. Achievement rewards can be managed by a league manager and may include badges, capital, equity, etc.

**Transaction Ticker** – Constantly updating scroll of most recent trades across the market. Users can observe market trends from global equities which may or may not already be in their portfolio.

**Leaderboard** – Global or league based ranking system determined by overall net worth of player.

**Security** – A tradable asset of any kind. Can include debts, equities, or derivatives. For the purpose of this game, we will be dealing primarily with equities.

**Dividend** – A payment made by a corporation to its shareholders, generally as a distribution of profit. It is usually distributed as a fixed percent of shareholder value.

**Derivative** – Any financial contract which derives its value from another asset or index.

- **Option** – Gives the user the option to buy or sell an asset at a specified price on or before a given date. The buyer and seller are both obligated to fulfill the transaction on the given date if the option is taken.

- **Future** - Allows the buyer to buy an asset at its current price and pay for it at that price in the future. A future is generally exchange traded. The buyer and seller are both obligated to fulfill the transaction on the given date if the future is taken.

- **Forward** – Allows the buyer to buy an asset at its current price and pay for it at that price in the future. A forward is a private agreement between buyer and seller not necessarily based around market equity. The buyer and seller are both obligated to fulfill the transaction on the given date if the future is taken.

**League** – A market simulation with a pre-determined rule set and several investors with a common goal to determine a winner. Goals can vary across leagues as determined by league managers. Investors can choose to opt into a private league, public league, or no league at all.

**Portfolio** – A detailed account of assets associated with a particular investor in a given league. Portfolios are unique to each user and will contain specific details such as earnings, losses, performance, averages, as well as detailed asset performances of equities within the given portfolio.

**League manager** – The league manager will have the responsibility of adding and/or removing investors from the league. League managers control settings, and victory conditions for a particular league. League managers maintain their manager status only for the league in which they have created.

**Order** – An investor must place an order for the purchase or sale of an asset.

**Stock** – A type of asset that represents equity in a company.

- **Ask Price** – The price at which a trader is willing to sell a stock.
- **Bid Price** – The price a trader is willing to pay for a stock.
- **Bid-Ask Spread** – The bid-ask spread describes the difference in price between the bid and the ask. These two prices are marginally different, but always with the ask being the more expensive of the two. It represents the friction inherent in trading a stock.

**Ticker Symbol** – an abbreviation used to uniquely identify publicly traded shares of a particular stock on a particular stock market.

**Symbol List** – a list of a market/several market's ticker symbols.

**Market Order** – Any order placed for immediate market transaction.

- **Buy** – User has elected to purchase a particular stock and has placed a bid for that stock.
- **Sell** – User has elected to sell a particular stock and has posted an ask price for it.
- **Short** – Typically used by an investor who expects the value of a stock to decrease. The investors borrows shares of a particular stock and sells them at market price. The investor is responsible for the increased value as well should the stock's value increase.

**Limit** - An investment which will only take place at a given price. An investor placing a buy limit will place a maximum amount the pay and an investor place a sell limit will place a minimum value for which the stock be sold. Limit orders are not guaranteed to ever process, and only do when the particular limit is reached.

**Stop** – Orders which are activated if a particular stop falls below or rises above a particular price. It is used to minimize gains and losses for the investor.

**Share** – A small percentage of a given company which can purchased or sold from other traders.

# 2 System Requirements

## 2.1 User Stories

| Identifier | User Story | Weight |
|---|---|---|
| ST-1 | As a user, I can create an account without registering with the website in order to participate in Paramount Investment League. | 10 pts |
| ST-2 | As a user, I can access the application across multiple platform paradigms so that I may continue to participate when I don't have access to a desktop computer. | 10 pts |
| ST-3 | As a user, I can join or create leagues with self-selected goals so that I may compete with others in a simulated stock market environment based on near real-time stock data. | 10 pts |
| ST-4 | As a user, I can search for companies by stock symbol and be presented with their current financial information so that I may research future investments. | 6 pts |
| ST-5 | As a user, I can browse a companies profile and view the performance data over a configurable span of time so that I may determine whether or not I want to invest in them. | 6 pts |
| ST-6 | As a user, I can buy or sell stocks so I may build my portfolio. | 10 pts |
| ST-7 | As a user, I can earn badges(achievements) that reward me with additional capital or new features for accomplishing predefined tasks. | 10 pts |
| ST-8 | As a user, I can manage my portfolio within a league to track my investments. | 8 pts |
| ST-9 | As a user, I can visually track my finances via graphs and charts so I may more easily manage my portfolio. | 4 pts |

| | | |
|---|---|---|
| ST-10 | As a user new to the stock market, I will have access to an educational interface that teaches me about the stock market via pop-up dialogues. | 6 pts |
| ST-11 | As a user, I can see trades being made by all other users in real-time via a stock-ticker like marquee so I may have a quick overview of current trends. | 3 pts |
| ST-12 | As a user, I can see the performance of other users' portfolios so I may observe the investment habits of others. | 2 pts |
| ST-13 | As a user, I can view a portfolio leader board so I may have a summary of relative performance between users in my league. | 1 pt |
| ST-14 | As a user, I can opt to receive periodic e-mail notifications of my stock performance or trades so I may be kept up to date even when not actively viewing the site. | 3 pts |
| ST-15 | As a user, I can additionally link my account with social media sites so I may share my fantasy league experience with friends. | 1 pt |
| ST-16 | As a league manager, I can add league rules, a league name, and a league logo to personalize my league. | 8 pts |
| ST-17 | As a league manager, I may invit I want to join,and assign. | 8 pts |
| ST-18 | As a league manager, I can create league announcements. | 4 pts |
| ST-19 | As a site administrator, I can view reports of and delete leagues that are inactive. | 2 pts |
| ST-20 | As a site administrator, I may post front page news or announcements. | 3 pts |
| ST-21 | As a site administrator, I may have access to a user count, number of active leagues, total leagues, quantity of daily transactions, the most/least popular stocks, and newly created so I may have reliable site statistics. | 9 pts |

## 2.2 Nonfunctional Requirements

### Functionality

Additional features for security will be enabled through the use of a OpenID and OAuth through a third-party library. There exists several packages for the purpose of authentication and authorization of users. Key authentication features are the ability to encrypt and store passwords, provide recovery options for users that have forgotten their password, and store a cookie to validate the session.

### Usability

A key point in the design of this application is ease of use and appeal to the users. The application should be interactive, informative and consistent across multiple platform paradigms. Additionally the application will be used to provide the educational interfaces noted in ST-9 which should be able to be toggled on and off so that users can always view the information again.

### Reliability

In order to ensure that there is no confusion to the user in the case of the internet or server failure, all transactions end with a final confirmation, and no changes to the account are made until after this confirmation. The user's portfolio will thus always be in a consistent state and will be restored when the user is able to log back in. A user that leaves the application and returns later will still be logged in. Server failure should also be dealt with by keeping backups of user data. Proper care should also be taken to handle a situation where a particular stock source is not available (i.e. Yahoo Finance).

### Performance

In order to have a great performance, the website should be as lightweight as possible by keeping hardware demands to a minimum on both the client and server sides. For it to be efficient, any task initiated by the user should be completed in a timely manner. The web server should be able to serve concurrent requests especially when a large number of users are logged in. Any frameworks used should be lightweight but consideration should be taken not to prematurely optimize.

### Supportability

It should be feasible to extend pr update any server components and include improved versions of modules which can be installed only by administrators. For scaling purposes, it should be made easy to include an additional number of servers to achieve load balancing. The system should be platform independent so that it is easy to move to newer technologies or the next versions of web server. The system itself should also be backed up to a remote server for the sole purpose of extending functionality and testing new features in a controlled environment.

## 2.3 On-Screen Appearance Requirements

There are a few on screen requirements that will be universal to the entire site:

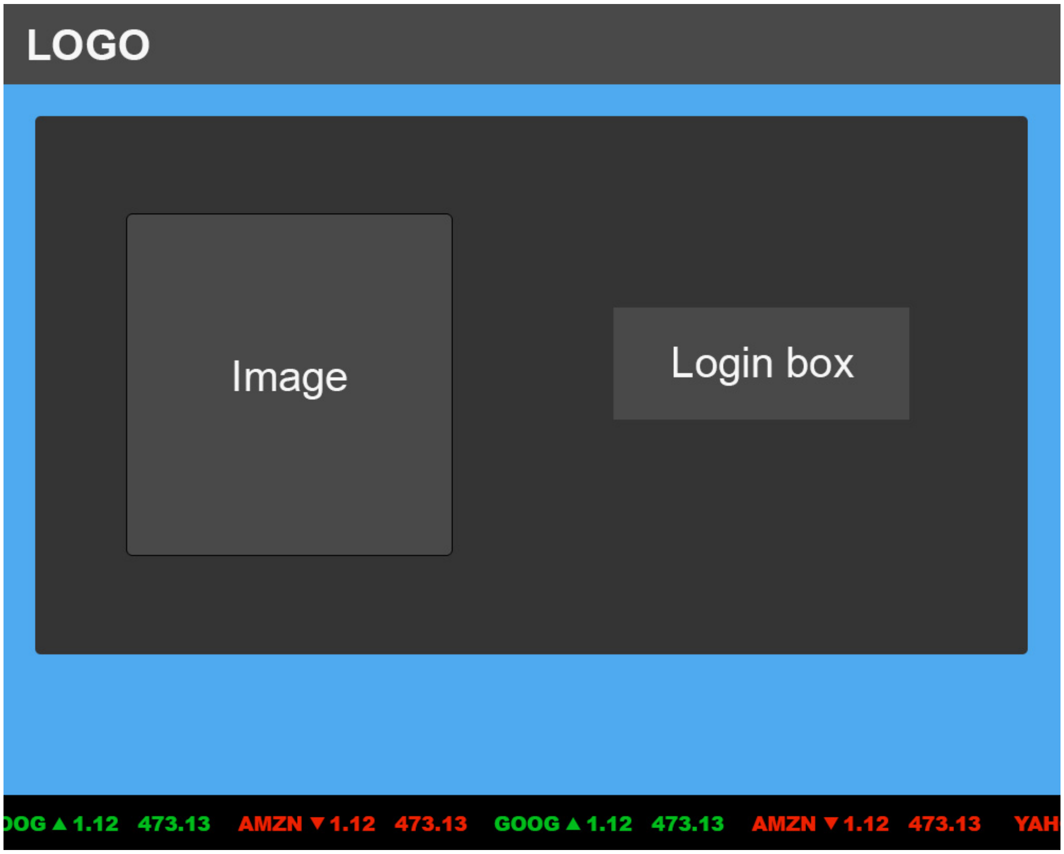

LOGO
Image
Login box
OOG ▲ 1.12 473.13 AMZN ▼ 1.12 473.13 GOOG ▲ 1.12 473.13 AMZN ▼ 1.12 473.13 YAH

Figure 2.1: Basic on screen requirements of login page

| Identifier | Requirement |
|---|---|
| OSR-1 | Every page has a scrolling ticker across the bottom of the page to update the user on stock movement. |
| OSR-2 | Every page, with the exception of the login page, will have navigational links across the top, the user's username and their current position in the leaderboard. |

There are also the following requirements for specific pages:

| Identifier | Requirement |
|---|---|
| OSR-3 | A custom 404 not found page will be displayed to a user when they try to access a URL/URI that doesn't exist or is not designed for them to be accessing. |
| OSR-4 | On the portfolio page users will find currently owned stocks, charts and graphs, trade transcations, and a news feed. |
| OSR-5 | The leaderboard view will contain users ranked by the top networth from their respective portfolios. |

# 3 Functional Requirements Specification

## 3.1 Stakeholders

The target demographic for the software described tends to be centered on students and first time investors. That being said, it is likely to see the software expand to take a large role in both university and pre-university classrooms, as a means of teaching general financial concepts. It would not be unlikely to see the game further expand to a larger range of users than other similar software due to increased functionality, addition of achievement and leaderboards, and ability to join with or without league functionality. Specifically, the addition of achievements leaves the user with the desire to return and spend additional time trading on the software.

The league will be a free service with the intention of eventually moving to a subtle-advertisement platform which will have no impact on the user. Once a substantial enough user-base is generated, it will not be unlikely to see advertisements begin to commence in order to bring revenue to the company. As a free service (with eventual advertisements) we expect the platform to attract the greatest number of users, and due to increased functionality, keep said users on the platform for the greatest amount of time. The software is targeted not only at students and potential investors, but at nearly everyone who desires to gain a greater understanding of the financial industry as well as those who would simply like to practice trading before executing in the real market.

## 3.2 Actors and Goals

### Guest

A visitor to the website who has either not logged in or just a simple visitor

- Register and create an account using OpenID/OAuth2

- View the latest trades

### Investor

A user who has an account in our servers and is logged in to their account

- Research the latest updates in the market

- View their portfolio

- Execute orders of any kind
- Join/create a league
- Take part in competitions

### League Administrator

Manages the leagues that they have created

- Can set league to be public/private
- Set the rules for the league

### Database System

Holds the information for the accounts of all users

- Insert information as accounts are created
- Push data back to views about users/events
- Store new data about about users/events

### Financial API

Gives the stocks in our database up to date prices

- Fetch real world information and update our database accordingly

### Site Administrator

Manages the overall website

- Ensure fair competition between leagues/players

### Browser

The middleman between user and system

- Present data to the user
- Retrieve data from the user

### Yahoo! Finance

The unit that knows about current financial statistics

- Retrieve data about stocks

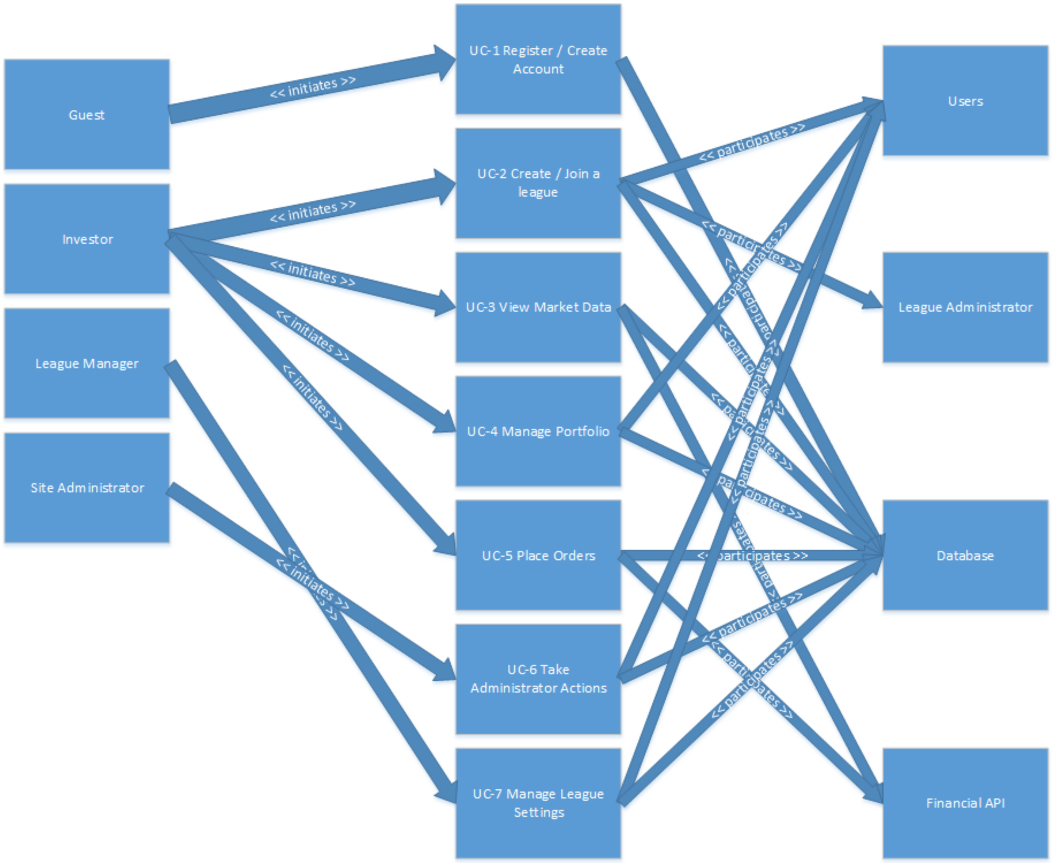


Figure 3.1: This graphic illustrates the relationships between the core actors of our platform.

### Queueing System

A subsystem for scheduling orders so as not to block user interactions.

– Place orders to be executed or canceled asynchronously

– Schedule events and mailings for system

## 3.3 Use Cases

### Preface

PLACEHOLDER TEXT:

From our user stories, we have derived seven use cases to be fully elaborated upon. These use cases do not necessarily fully encompass all of the requirements for our application, but they touch upon the most important functionalities while also covering a breadth of different aspects. Justification for why each use case was included is written along with it. Another thing worth noting is that the browser is an actor in each of the use cases as it is the medium through which the user interacts with the system. As such, it will be included under the term ”System” for the fully-dressed use cases to avoid redudancy and superfluous or wordy additions to the flow of each event.

### Fully-Dressed Use Cases

PLACEHOLDER TEXT:

Before a user can participate in most of the functionality of our site, the user must first join or create a league. To the user, creating a league is very similar to joining a league, the notable differences being that the user becomes League Manager of a league that they create and then must also invite users to join said league. Therefore, we detail joining/creation as a single use case. User invitation, as a responsibility of the League Manager, will be explored in a later use case. One relevant aspect of the responsibily of a League Manager to the use case though, is whether a league is made public or private; that is, whether it shows up in a public league listing page or can only be joined by direct invitiation from the League Manager. Thus, our first use case involves a business policy:

**CG-BP01:** So that a user may create a join leagues with only their friends, leagues marked as private will not show up on the league listings unless a user is a current or pending member.

Thus, a user will only be able to browse listings of public leagues or private leagues to which they have access.

| Use Case UC-1 | Register/Create an account using OpenID/OAuth2 |
|---|---|
| Related Requirements: | ST-1, ST-2 |
| Initiating Actor: | Guest |
| Actor's Goal: | Register with our servers |
| Participating Actors: | Guest, Database |
| Preconditions: | -Guest must not be a registered user |
| Postconditions: | -The **Database** is updated with guests information and logs the guess in as an **Investor** |
| | Flow of Events for Main Success Scenario: |
| → | 1. **User** navigates to leagues listing page |
| ← | 2. **System** displays public and pending private leagues available for the **User**, sorted by date created |
| → | 3. **User** selects join on a league in which they are interesting in joining and to which they have access |
| ← | 4. **System** authorizes user and registers **User** into that league, notifying **Database** to update to reflect this change |
| | Flow of Events for Extensions (Alternate Scenarios): |

| | |
|---|---|
| 3a. The **user** selects create league rather than join league | |
| → | 1. **User** inputs desired league name and settings |
| ← | 2. **System** (a) creates the league and inputs it to the **Database** and (b) registers the **User** into that league as **League Manager** |
| 4a. The **user** attempts to join or create a league without permission | |
| ← | 1. **System** rejects request and delivers reason for rejection |

It is important here to note another business policy of our site relevant to the user's experience:

**CG-BP02:** A user is able to join an unlimited number of leagues and become League Manager for as many leagues as the user wishes to create.

Though the settings are selected when creating the league, any League Manager can change certain settings of their league at any time. These settings are comprehensive, including such items as name, privacy, number of spots, and duration. In addition, the League Manager can also manage members from the settings. However, certain settings cannot be changed after the league enters active competition, such as starting capital, commission rate, and margin, because changing primary competition rules mid-game would be unfair.

| Use Case UC-2 | Create/Join a League |
|---|---|
| Related Requirements: | ST-3, ST-8, ST-16, ST-17, ST-18 |
| Initiating Actor: | Investor |
| Actor's Goal: | Create or join a league to compete in |
| Participating Actors: | Database, other Investors |
| Preconditions: | -Investor is logged in |
| | -league is not created or user hasn't joined league |
| Postconditions: | -The league is created with the appropriate settings or |
| | -The **Investor** has joined the league |
| | -The **Database** has been updated |
| Flow of Events for Main Success Scenario: | |
| → | 1. **League Manager** selects the league settings option from the league page |
| ← | 2. **System** requests the current settings from the **Database** and presents them to the **League Manager** along with options to change select settings |
| → | 3. **League Manager** updates the settings, such as privacy, league name, number of spots, and managing users |
| ← | 4. **System** sends the updated settings to the **Database** |
| Flow of Events for Extensions (Alternate Scenarios): | |

| | |
|---|---|
| 1a. The **User** selecting league settings is not the **League Manager** | |
| ← | 1. **System** requests the current settings from the **Database** and displays them, but does not provide ways to change them |
| 4a. The **League Manager** has altered the status of a league member | |
| ← | 1. **System** will request the **Database** to update the **User**'s status in the league, be it becoming league manager or removing that **User**'s instance from this league (banned) |

It is of some concern that League Managers may become abusive of their powers, and therefore it is important to create on a policy to explicitly state how this power is treated. In modern fantasy leagues (such as football, baseball, etc.), the League Manager does not typically have their power moderated, and this has not caused any problems in the success of these fantasy websites. The ability to leave a league and join another is left to the users if they feel that their league manager has become abusive. Their joining of the league acts as an implicit contract to accept of the League Manager's settings. However, if this League Manager becomes a problem and users bring it to an administrator's attention, disciplinary action may be taken. Thus we generate the next site policy:

**CG-BP03:** A League Manager is able to change the status of users in their league without moderation. However, if a League Manager is deemed abusive, a site administrator may take disciplinary action against them.

Core to our site is the ability of the user to have access to information about companies so that the user may make informed decisions on how he would like to invest. As this is so crucial to the functionality of this project, it is absolutely necessary to make information easily available to the user and presented in a way that is clear and easy to understand. Therefore, the search of companies as mentioned in ST-3 should be simple to use and intuitive and the display of company profiles as mentioned in ST-4 should be such that a user can easily access any desired information about the company's financial performance.

| **Use Case UC-3** | **View Market Data** |
|---|---|
| Related Requirements: | ST-4, ST-5, ST-10, ST-11 |
| Initiating Actor: | Investor |
| Actor's Goal: | View the latest information about stocks, companies, and trades |
| Participating Actors: | Database, Yahoo! Finance |
| Preconditions: | -Yahoo! Finance is accepting inquiries |
| | -Investor is logged in |
| Postconditions: | -None worth mentioning |
| Flow of Events for Main Success Scenario: | |
| → | 1. **User** begins entering a search term |

| | |
|---|---|
| ← | 2. **System** makes suggestions for companies in real-time |
| → | 3. **User** enters search term or selects a suggestion |
| ← | 4. **System** (a) requests information from **Yahoo! Finance** and (b) displays the information to the user in a clear and interactive manner |
| Flow of Events for Extensions (Alternate Scenarios): | |
| 1a. The **User** selects a direct link to a company rather than enter a search term | |
| ← | 1. Same as step 4 above |
| 3a. The search term is invalid, i.e. the company does not exist | |
| ← | 1. System informs user company does not exist and offers similarly titled companies as links |

Note that the exact way in which the information requested from the Yahoo! Finance is displayed to the user is not specified in this use case. This will be described instead in later sections about on-screen appearance requirements as to try to separate the functionality of the site and design of the site as separate as possible.

The goal of browsing companies ultimately is for the user to gain the knowledge needed to place market orders. Market orders are the atomic action of our site; i.e. the center point of every league is the user's ability to initiate transactions in an attempt to invest their money as best they can.

| **Use Case UC-4** | **Manage Portfolio** |
|---|---|
| Related Requirements: | ST-8, ST-9, ST-10, ST-12, ST-13, ST-14 |
| Initiating Actor: | Investor |
| Actor's Goal: | Manage portfolio by viewing current standings/stocks/securities |
| Participating Actors: | Database, Yahoo! Finance |
| Preconditions: | -Yahoo! Finance is accepting inquiries |
| | -User is logged in |
| Postconditions: | -**Investor**'s portfolio is updated to reflect change in position |
| Flow of Events for Main Success Scenario: | |
| → | 1. **User** selects the league in which they would like to place the order |
| ← | 2. **System** displays prompt for market order, including type, amount, and company |
| → | 3. **User** fills out form and requests the order be placed |
| ← | 4. **System** (a) requests market price from **Yahoo! Finance** and (b) places the order into the **Database** |
| ← | 5. The order either resolves or expires, and the **System** updates the **User**'s position in the **Database** accordingly |
| Flow of Events for Extensions (Alternate Scenarios): | |

| 1a. The **User** chooses to place a market order from a company's profile rather than from the league page | |
|---|---|
| → | 1. The **User** selects which league in which to place the order |
| ← | 2. The **System** takes the **User** to league marker order prompt as described in Step 2 above, with the prompt for company already filled out |
| → | 3. Go to Step 3 above |
| 4a. The **User** does not have enough money or margin to place the order | |
| ← | 1. **System** informs the **User** that they do not have enough money or margin to place the order and returns them to the market order prompt |

The potential kinds of orders referenced in the above use case are defined in the glossary. The details on the necessary computations to enact these orders will be defined in a section later on.

In order to keep track of their own finances and any of their fellow league member's finances, a user must be able to view member portfolios. This keeps with the competitive nature of our site in addition to allowing the user to track their own progress.

| **Use Case UC-5** | **Place a Market Order** |
|---|---|
| Related Requirements: | ST-6, ST-11 |
| Initiating Actor: | Investor |
| Actor's Goal: | Place orders to buy/sell/short stocks, or place a stop/limit order |
| Participating Actors: | Database, Yahoo! Finance API |
| Preconditions: | -Investor is logged in |
| | -Yahoo! Finance is accepting inquiries |
| Postconditions: | -**Database** us updated with the users position |
| Flow of Events for Main Success Scenario: | |
| → | 1. **User** selects a league member's profile |
| ← | 2. **System** requests that member's information from the **Database** and displays it in an organized and graphical manner to the **User** |
| Flow of Events for Extensions (Alternate Scenarios): | |
| 2a. **User** is viewing their own portfolio | |
| ← | 1. **System** gives the **User** options to place market orders related to their existing positions |

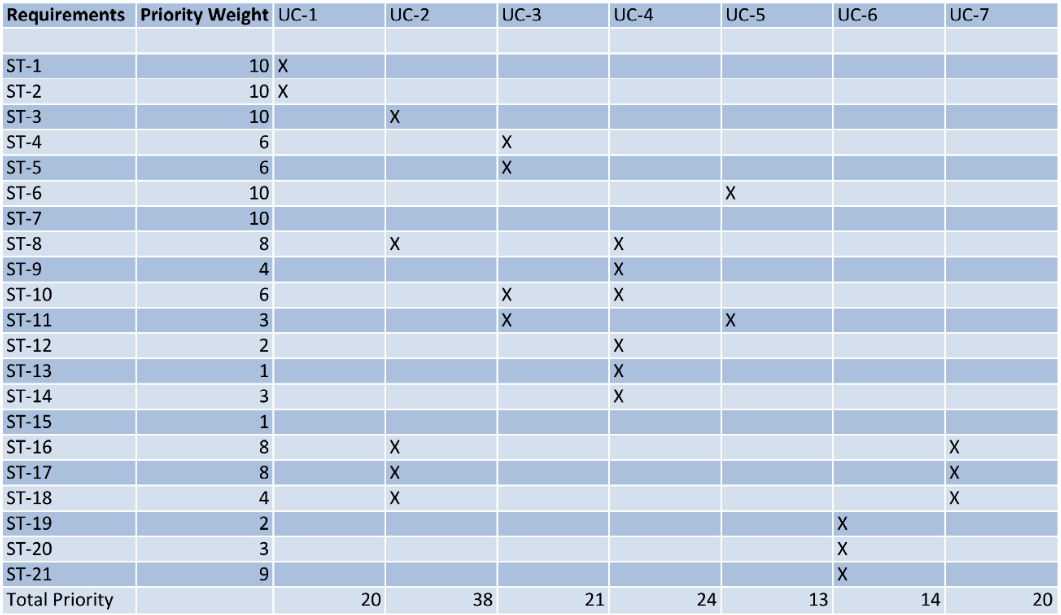
Once again, the exact display of information is not defined in the use case, but rather will be explored further in the section about user interface specifications. Next to discuss is the tutorial as referenced in ST-8. We consider this to be one of the main aspects that separates us from previous iterations of fantasy stock leagues; our site will educate users new to finance and enable them to learn all about the world of finance and how to invest, in addition to how to these subjects relate to the use of our site.

| **Use Case UC-6** | **Take Administrative Actions** |
|---|---|
| Related Requirements: | ST-19, ST-20, ST-21 |
| Initiating Actor: | Site Administrator |
| Actor's Goal: | Perform administrative work for the website, manage database |
| Participating Actors: | Database, Investors, League Manager |
| Preconditions: | -User is the site Administrator |
| | -Administrative actions need to be taken |
| Postconditions: | -Conflicts/Issues have been resolved |
| Flow of Events for Main Success Scenario: | |
| → | 1. **User** selects the tutorial option from the site's main page |
| ← | 2. **System** displays possible topics on which the **User** may be educated on |
| → | 3. **User** selects topic |
| ← | 4. **System** presents an interactive tutorial to the **User**, which will be further elaborated upon in a later section |

In order to maintain a clean fantasy finance experience for our regular users, site administrators will reserve the ability to moderate other users–issuing warnings, suspensions, or even bans for abusive activity. To put it explicitly:

**CG-BP04:** Site administrators will warn, suspend, or ban users for abusive activity–this includes aggressive behavior on league comments or user messages, spamming users, joining numerous leagues without active participation, and anything else that is deemed to harm the experience for other users.

| **Use Case UC-7** | **Manage League Settings** |
|---|---|
| Related Requirements: | ST-16, ST-17, ST-18 |
| Initiating Actor: | League Manager |
| Actor's Goal: | Change league settings to the League Mangers preference |
| Participating Actors: | Database, other Investors |
| Preconditions: | -Initiating actor is the **League Manager** |
| | -There are outstanding abuse reports |
| Postconditions: | -The **Database** is updated to reflect the chagnes made. |
| | The abuse report shows that it has been resolved on the administration page |



| Requirements | Priority Weight | UC-1 | UC-2 | UC-3 | UC-4 | UC-5 | UC-6 | UC-7 |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| ST-1 | 10 | X | | | | | | |
| ST-2 | 10 | X | | | | | | |
| ST-3 | 10 | | X | | | | | |
| ST-4 | 6 | | | X | | | | |
| ST-5 | 6 | | | X | | | | |
| ST-6 | 10 | | | | | X | | |
| ST-7 | 10 | | | | | | | |
| ST-8 | 8 | | X | | X | | | |
| ST-9 | 4 | | | | X | | | |
| ST-10 | 6 | | | X | X | | | |
| ST-11 | 3 | | | X | | X | | |
| ST-12 | 2 | | | | X | | | |
| ST-13 | 1 | | | | X | | | |
| ST-14 | 3 | | | | X | | | |
| ST-15 | 1 | | | | | | | |
| ST-16 | 8 | | X | | | | | X |
| ST-17 | 8 | | X | | | | | X |
| ST-18 | 4 | | X | | | | | X |
| ST-19 | 2 | | | | | | X | |
| ST-20 | 3 | | | | | | X | |
| ST-21 | 9 | | | | | | X | |
| Total Priority | | 20 | 38 | 21 | 24 | 13 | 14 | 20 |

Figure 3.2: The traceability matrix for the given use cases.

| Flow of Events for Main Success Scenario: | |
|---|---|
| → | 1. **Site Administrator** selects the site administration page option from the main screen (only viewable by **Site Administrators**) |
| ← | 2. **System** makes a request to the **Database** and displays all outstanding abuse reports |
| → | 3. **Site Administrator** (a) selects an abuse report, (b) reviews the report, and (c) selects what action is to be taken (if any) |
| ← | 4. **System** implements the action selected by the **Site Administrator** and updates the **Database** accordingly |
| ← | 5. **System** notifies the offending **User** of any actions taken against them |

### Traceability Matrix

The traceability matrix presented in *Figure 3.2* is based on only the full dressed use cases above and thus is only a partial representation of the complete project.

## 3.4 System Sequence Diagrams

# 4 User Interface Specification

## 4.1 Preliminary Design

The user interface (UI) for Paramount Invesments Leagues will act as a command center for users to interact with their portfolio, leagues they are a part of, and conduct research on potential orders. More specifically, the command center will act as the primary; but not the only; view for users to interact with the system. The command center will provide a snapshot of the users current portfolio and its value, their global rank, a dash to perform market orders, a news feed, and a graphing dash in order to quick analysis of stock performance. The UI will persist a users global rank across all views as well as a ticker of current trades being placed through the Paramount Investment League.

The UI should be lightweight so as not to burden our more restrictive target platforms of mobile and tablet. The colorscheme will be chosen to be easy on the viewer, though this is subjective, the colorscheme will be a basic pallet of grey/black/white/blue, tending toward pastel and web supported colors.

The UI will be built on top of Twitter's open source Bootstrap CSS framework to help facilitate deleriving content to the three target platforms, desktop, mobile, and tablet. Bootstrap provides a mobile first design philosophy, but can be customized to target specific platforms.

### Landing Page and Login

Paramount Invesment League is designed around allowing users to easily begin using the service, also know as "zero effort" resgistration. In order to accomplish this, the system does not require the user to register a new user name/account with our system, but instead piggybacks on OpenID and OAuth allowing users to use their Google, Facebook, Twitter, and other OpenID/OAuth accounts to login. You'll also notice that upon initial visit, the header is empty providing no navigation, this may be relaxed in the future to allow the user to explore some of the features of the website that don't require user authentication such as stock research. (*See figure 3.1* )

### Global Header

The header (*see Figure 3.2* )across the website will remain persistant across the website once the user is logged into the system. Navigation is done between essentially 4 views in the following order, My Portfolio, Stock, League, Leaderboard,. These names are placeholders and will most likely be

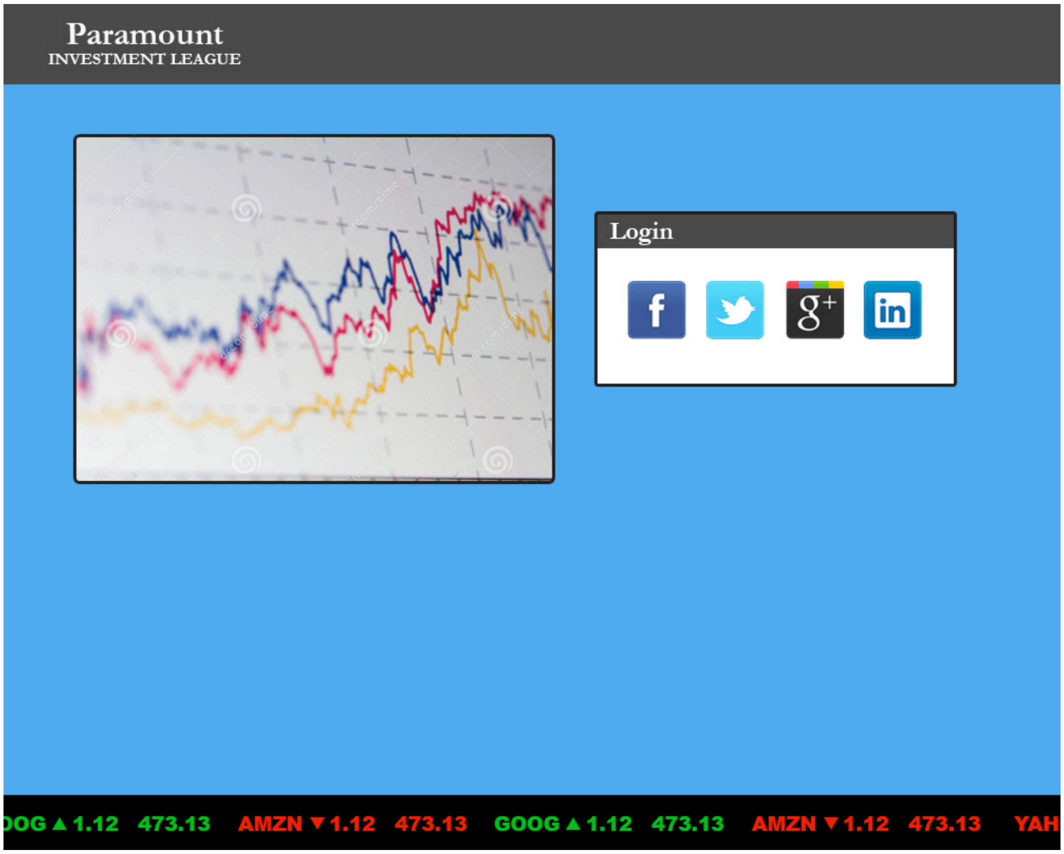


Figure 4.1: First iteration of Landing/Login page.

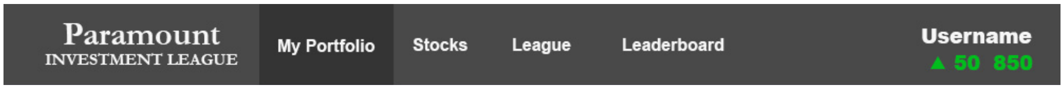


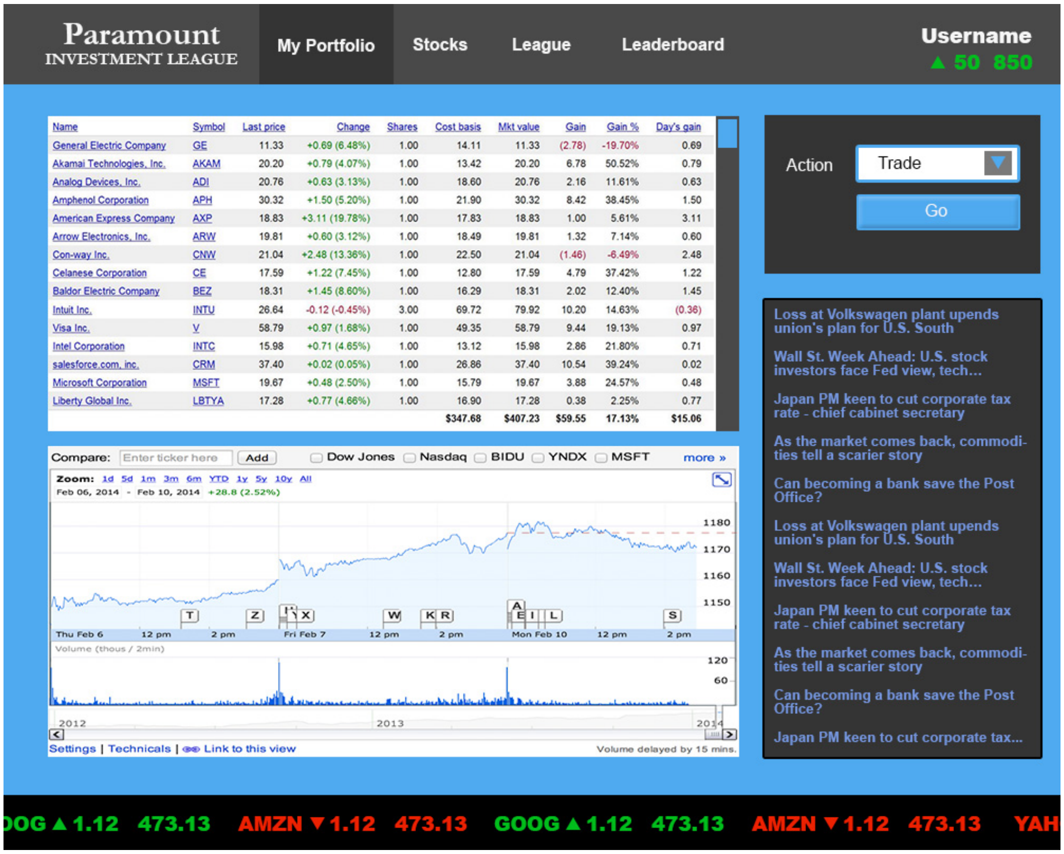
Figure 4.2: Preliminary design for a global header. This users is up 50 spots for the day.

My Portfolio, My Leauges, Leaderboards, Analyze Assets. The 'My Leagues' and 'Leaderboards' will be turned into drop downs as users expand into leagues to allow quick navigation.

The website name will also navigate to My Portfolio. The username will be replaced by the users actual username, and below it will be the users global rank. The rank will be highlighted in red or green depending on whether they have improved their position on the day, or it has declined. It will also indicate how many spots they have moved.

## Global Ticker

One interesting feature of Paramount Investment Leagues will be its active ticker at the bottom of the website. This ticker will be seen in all views, including the Landing Page once there is enough volume to keep the ticker full. The ticker serves two goals, one for new users, and one for existing users. The first goal is to entice new users to participate by demonstrating that the app is being widely used. The second goal is to give a snapshot to existing users of assets that are "on


Paramount
INVESTMENT LEAGUE
My Portfolio
Stocks
League
Leaderboard
Username
▲ 50 850
Action
Trade
Go
Compare: Enter ticker here Add
□ Dow Jones □ Nasdaq □ BIDU □ YNDX □ MSFT more »
Zoom: 1d 5d 1m 3m 6m YTD 1y 5y 10y All
Feb 06, 2014 - Feb 10, 2014 +28.8 (2.52%)
1180
1170
1160
1150
Thu Feb 6
12 pm
2 pm
Fri Feb 7
12 pm
2 pm
Mon Feb 10
12 pm
2 pm
Volume (thous / 2min)
120
60
2012
2013
2014
Settings | Technicals | Link to this view
Volume delayed by 15 mins.

| Name | Symbol | Last price | Change | Shares | Cost basis | Mkt value | Gain | Gain % | Day's gain |
|---|---|---|---|---|---|---|---|---|---|
| General Electric Company | GE | 11.33 | +0.69 (6.48%) | 1.00 | 14.11 | 11.33 | (2.78) | -19.70% | 0.69 |
| Akamai Technologies, Inc. | AKAM | 20.20 | +0.79 (4.07%) | 1.00 | 13.42 | 20.20 | 6.78 | 50.52% | 0.79 |
| Analog Devices, Inc. | ADI | 20.76 | +0.63 (3.13%) | 1.00 | 18.60 | 20.76 | 2.16 | 11.61% | 0.63 |
| Amphenol Corporation | APH | 30.32 | +1.50 (5.20%) | 1.00 | 21.90 | 30.32 | 8.42 | 38.45% | 1.50 |
| American Express Company | AXP | 18.83 | +3.11 (19.78%) | 1.00 | 17.83 | 18.83 | 1.00 | 5.61% | 3.11 |
| Arrow Electronics, Inc. | ARW | 19.81 | +0.60 (3.12%) | 1.00 | 18.49 | 19.81 | 1.32 | 7.14% | 0.60 |
| Con-way Inc. | CNW | 21.04 | +2.48 (13.36%) | 1.00 | 22.50 | 21.04 | (1.46) | -6.49% | 2.48 |
| Celanese Corporation | CE | 17.59 | +1.22 (7.45%) | 1.00 | 12.80 | 17.59 | 4.79 | 37.42% | 1.22 |
| Baldor Electric Company | BEZ | 18.31 | +1.45 (8.60%) | 1.00 | 16.29 | 18.31 | 2.02 | 12.40% | 1.45 |
| Intuit Inc. | INTU | 26.64 | -0.12 (-0.45%) | 3.00 | 69.72 | 79.92 | 10.20 | 14.63% | (0.36) |
| Visa Inc. | V | 58.79 | +0.97 (1.68%) | 1.00 | 49.35 | 58.79 | 9.44 | 19.13% | 0.97 |
| Intel Corporation | INTC | 15.98 | +0.71 (4.65%) | 1.00 | 13.12 | 15.98 | 2.86 | 21.80% | 0.71 |
| salesforce.com, inc. | CRM | 37.40 | +0.02 (0.05%) | 1.00 | 26.86 | 37.40 | 10.54 | 39.24% | 0.02 |
| Microsoft Corporation | MSFT | 19.67 | +0.48 (2.50%) | 1.00 | 15.79 | 19.67 | 3.88 | 24.57% | 0.48 |
| Liberty Global Inc. | LBTYA | 17.28 | +0.77 (4.66%) | 1.00 | 16.90 | 17.28 | 0.38 | 2.25% | 0.77 |
|  |  |  |  |  | $347.68 | $407.23 | $59.55 | 17.13% | $15.06 |

Loss at Volkswagen plant upends union's plan for U.S. South

Wall St. Week Ahead: U.S. stock investors face Fed view, tech...

Japan PM keen to cut corporate tax rate - chief cabinet secretary

As the market comes back, commodities tell a scarier story

Can becoming a bank save the Post Office?

Loss at Volkswagen plant upends union's plan for U.S. South

Wall St. Week Ahead: U.S. stock investors face Fed view, tech...

Japan PM keen to cut corporate tax rate - chief cabinet secretary

As the market comes back, commodities tell a scarier story

Can becoming a bank save the Post Office?

Japan PM keen to cut corporate tax...

OOG ▲ 1.12 473.13 AMZN ▼ 1.12 473.13 GOOG ▲ 1.12 473.13 AMZN ▼ 1.12 473.13 YAH

Figure 4.3: The preliminary design of the 'My Portfolio' view.

the move" so that they can attempt to remain competetive. The ticker can be seen at the bottom of all the figures.

## My Portfolio

The 'My Portfolio' (*see Figure 3.3* ) view of the website will act as the command center for a user wanting to get news about companies/assets in their portfolio, perform an order, or conduct quick graphical anaylsis of assets in their portfolio and compare them to any other asset available for trade through the platform.

More importantly, it provides a snapshot of the users portfolio including a scrollable list of all the assets inside the portfolio and a summary of said assets. In the future, assets will be 'clickable' and will take the user to a summary page of that asset, but that is not planned for the initial 2 iterations.

## Leagues

The 'League' (*see Figure 3.4* ) view will present a user that isn't a part of a league the ability to create a new league of join an existing league. Not shown in *Figure 3.4* is the view that a user

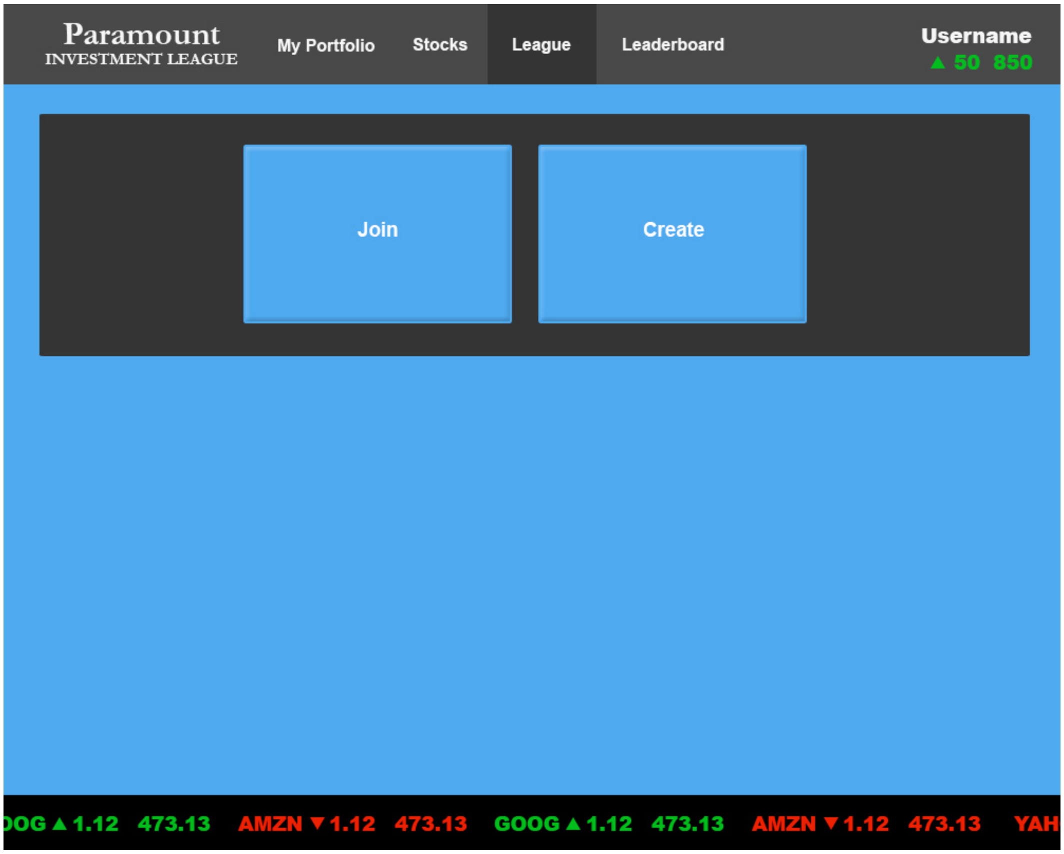


Figure 4.4: This is the league creation/join view. This would be the view presented to a user that is a part of no league yet.

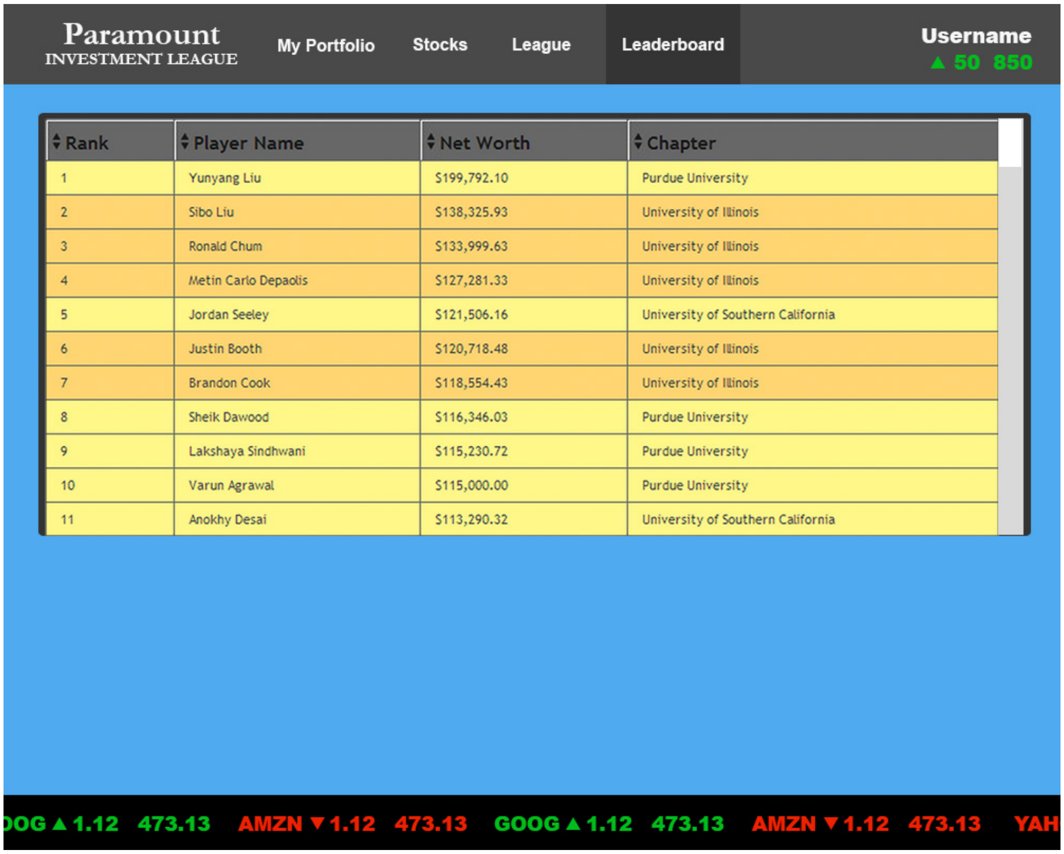
who is a part of a league. This view will still persist the join/create dialogues, but will also present a list of all the leagues that user is a part of, their rank within said league, and their movement within said league.

### Leaderboards

The 'Leaderboards' (*see Figure 3.5* ) view will present the user with a partial view of the full leaderboard for a given league, or for every user. It will show their rank, their movement, the value of their portfolio as well as the same stats for all other users around them. The view will be scrollable if there are more records then can be displayed, and will center the user in the middle of the view unless they are at the top or bottom of the board.

### Asset Analysis

The 'Stocks' view (*see Figure 3.5* ) will be renamed to more align its function with its name, which is to analyze assets. It will a more in depth way of anaylzing an asset versus what is available in the 'My Portfolio' view. There will be a news feed at the bottom of assets that you are searching for. There will also be a more formal analysis of asset data presented including P/E ratio, 52 week



| Rank | Player Name | Net Worth | Chapter |
|---|---|---|---|
| 1 | Yunyang Liu | $199,792.10 | Purdue University |
| 2 | Sibo Liu | $138,325.93 | University of Illinois |
| 3 | Ronald Chum | $133,999.63 | University of Illinois |
| 4 | Metin Carlo Depaolis | $127,281.33 | University of Illinois |
| 5 | Jordan Seeley | $121,506.16 | University of Southern California |
| 6 | Justin Booth | $120,718.48 | University of Illinois |
| 7 | Brandon Cook | $118,554.43 | University of Illinois |
| 8 | Sheik Dawood | $116,346.03 | Purdue University |
| 9 | Lakshaya Sindhwani | $115,230.72 | Purdue University |
| 10 | Varun Agrawal | $115,000.00 | Purdue University |
| 11 | Anokhy Desai | $113,290.32 | University of Southern California |

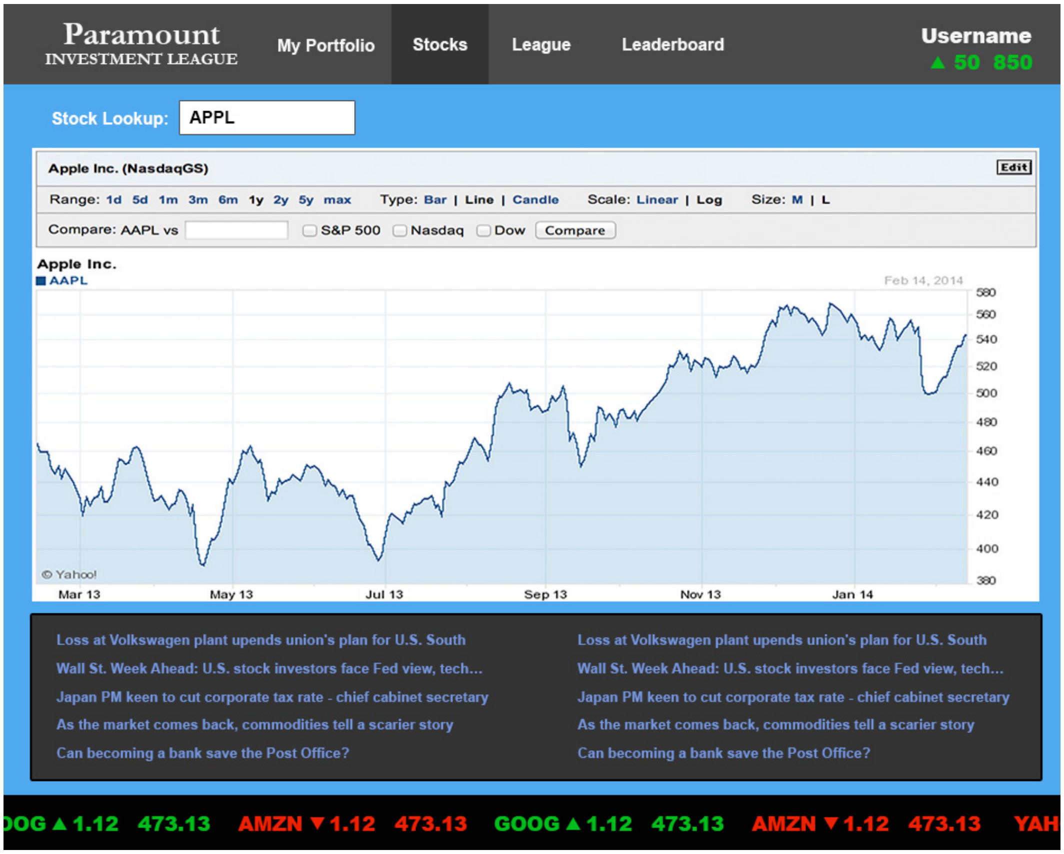
Figure 4.5: Here is the leaderboard view which will be the same for both leagues and global leaderboards. This view represents a global leader board. The colorscheme of this view here is incomplete and will fall inline with the remainder of the site.

range, Volume, EPS, etc. This isn't shown in the figure, but will one-half to two-thirds of the space that has been set aside for the news feed.

This is also one of the views and functionalities that has been identified to not require the user to be logged in. While it will not be availble to non-users in the intial product, it can be made available in future releases.

## 4.2 User Effort Estimation

Several of the most common usage scenarios for Paramount Investment Leagues:



Stock Lookup: APPL

Apple Inc. (NasdaqGS)

Compare: AAPL vs

Loss at Volkswagen plant upends union's plan for U.S. South
Wall St. Week Ahead: U.S. stock investors face Fed view, tech...
Japan PM keen to cut corporate tax rate - chief cabinet secretary
As the market comes back, commodities tell a scarier story
Can becoming a bank save the Post Office?

Loss at Volkswagen plant upends union's plan for U.S. South
Wall St. Week Ahead: U.S. stock investors face Fed view, tech...
Japan PM keen to cut corporate tax rate - chief cabinet secretary
As the market comes back, commodities tell a scarier story
Can becoming a bank save the Post Office?

Figure 4.6: The preliminary view for asset anaylsis.

| **Usage Scenario** | **Clicks** | **Keystrokes** |
|---|---|---|
| Login & Register | 2-3 | 0-1 |
| Place an Order | 4-6 | 2-12 |
| Join a League | 3-4 | 0-50 |
| Create a new League | 6-7 | 11-100 |
| Analyze Asset | 2 | 2-5 |
| View Leaderboard | 2 | 0 |

## Login & Register

Assume the user has come to the domain and wishes to Login if already registered, or register if already a user:

- **Navigation:**
  1. Click on OpenID icon (Google, Facebook, Twitter, etc).
  2. Click on your account (optional for multiaccounts).
  3. Click on login, or hit enter.

### Place an Order

Assume the user has already logged in and they wish to place an order:

- **Navigation:**
  1. Navigate to 'My Portfolio', 0-1 clicks.
- **Data Entry:**
  1. Select order type from drop down, 2 clicks
  2. Click textbox to enter asset name. 1 click
  3. Enter assets name eg: 'G', 'O', 'O', 'G', 1-4 keystrokes
  4. Press tab to specify number of shares, 1 keystroke (user could also execute 1 click)
  5. Enter the number of shares, 1-7 keystrokes
  6. Click execute, 1 click

### Join a League

Assume that the user wishes to join a league and is logged in:

- **Navigation:**
  1. Click on League, 1 click
  2. Click on Join, 1 click
- **Data Entry:**
  1. Click on a League, or enter its name, 1 click or up to 50 keystrokes
  2. Click on confirmation dialogue, 1 click

### Create a League

Assume that the user wishes to create a league and is logged in:

- **Navigation:**
  1. Click on League, 1 click
  2. Click on Create, 1 click

- **Data Entry:**

    1. Enter its name, 1-50 keystrokes
    2. Select ruleset from dropdown, 2 clicks
    3. Fill in parameters, 1-2 clicks and 10-50 keystrokes
    4. Click on confirmation dialogue, 1 click

### Analyze an Asset

Assume that the user is logged in and they want to start an in depth analysis of an asset:

- **Navigation:**

    1. Click on Stock, 1 click

- **Data Entry:**

    1. Click on the textbox for entering an asset name, 1 click
    2. Enter an asset name, 1-4 keystrokes
    3. Hit enter, 1 keystroke

### View Leaderboard

Assume that the user has logged in and wants to veiw a leaderboard:

- **Navigation:**

    1. Click on Leaderboard, 1 click
    2. Click on Select Legue/Global, 1 click

# 5 Domain Model

## 5.1 Economic and Mathematical Models

### Perfect Competition

One of the prevalent concepts in the stock market is the economic concept of perfect competition, which says that not any single participant has enough resources/power to control the market. To apply the concept of perfect competition to our project we will need the following requirements:

- Not one person can control the market or industries, segment, etc.
- Users can feel free to execute trades at their convenience without having to worry about extra costs
- Every individual has access to same stock information as other investors
- The selling price is the same as the buying price.

In the real world, none of these requirements can be met, as there is always some problem that prevents the market from being in perfect competition. The following are just some of the problems:

- There are high net worth individuals/companies who have enough capital to change the tide of a certain sector of the market. If one of these individuals suddenly decides to leave a particular market, the move may suddenly shift the market and effect other investors in that market.
- In the real world, users typically dont have direct access to stocks. They have a broker (electronic or human) who they interact with, who then have direct access to stocks. Users cant usually execute trades/buy stocks without worrying about extra costs because of the commissions charged by brokers when trading stocks.
- The world is not a fair place, and neither is the stock market. There are individuals who because of the field that they work in, have much more insight into a particular industry/stock. These individuals then sell this information to potential buyers in hopes that it gives them an edge in trading. This gives a huge disadvantage to those that dont have access to more information bout stocks.
- Lastly, in the real world, the selling price is never usually the same as the bid price. The Bid-Ask spread, the difference between the buying and selling price tends to be greater than 0.

All these factors lead the stock market away from perfect competition.

How do we plan to fix these issues to ensure a near-perfect competition?

- All investors start with the same amount of money, this way no one person by default has more power than anyone else
- No commission will be charged when the trades are executed for any investor
- Insider trading will be avoided by standardizing the stock information across the board

- The ask-bid spread will be 0, so the selling price is the same as the buying price

Mathematical Model:

- Stock Prices
  - There are no complicated mathematical models behind how the stock prices are determined in our platform. The market prices that are retrieved from Yahoo Finance are the prices that are available to users in Paramount Investments
- Achievements
  - Achievements in Paramount Investments each have their own mathematical model. There are no complicated algorithms behind how these achievements are attained. If the user has met the required conditions for a certain achievement, then they will be given that specific award.
  - For example: Buy stocks whose P/E Ratio ¿ 1

# 6 Project Management

## 6.1 Report 1 Contributions

| | | Names | | | | | |
|---|---|---|---|---|---|---|---|
| Category | Points | David P | David K | Jesse Z | Evan B | Eric J | Chris M |
| Project Management | 10 Points | 0% | 0% | 0% | 0% | 0% | 0% |
| Customer Requirements | 9 Points | 0% | 0% | 0% | 0% | 0% | 0% |
| System Requirements | 6 Points | 0% | 0% | 0% | 0% | 0% | 0% |
| Functional Requirements | 30 Points | 0% | 0% | 0% | 0% | 0% | 0% |
| User Interface Specifications | 15 Points | 0% | 0% | 0% | 0% | 0% | 0% |
| Domain Analysis | 25 Points | 0% | 0% | 0% | 0% | 0% | 0% |
| Plan of Work | 5 Points | 0% | 0% | 0% | 0% | 0% | 0% |