

"Trade Kings"

Report 1

<https://github.com/bsonani/TradeKings>

Software Engineering (14:332:452)

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1 Customer Statement of Requirements

A. Problem Statement

At Trade Kings, our goal is not only to develop an engaging simulation where players gain exposure to the stock market, but also an education platform where users can take their investing know-how and finance knowledge to the next level. Customers will begin by first registering on our website and creating an account. The registration process should be simple, and only consists of the customer's email, age, username, and password. Once this information is put in, the user will automatically receive any email from Trade Kings confirming that his account has been registered.

Upon registering, users will be able to login from our site's homepage, using the username and password that they chose while registering. When a new user logs in to the Trade Kings website for the first time, he/she will automatically be in Tutorial Mode, which essentially shows new users how to navigate the site and use our tools. Specifically, Tutorial Mode will show new users how to create a league, join a league, research the stock/cryptocurrency market, track various securities by setting price alerts, execute trades (buying and selling securities), and taking part in the Investment Forum.

After going through Tutorial Mode, users are ready to get started and begin playing. To make the game more exciting, player will compete in leagues, which can be made up of either 8, 10, 12, or 16 players. Users can either join a public league with open spots or create their own, which can either be private (players must be invited) or public (anyone can join). If a user chooses to join a league, then that user will be taken to a screen that lists all the joinable leagues. The leagues will display how many users are in that league, when it will begin, how much capital each player will start out with, and what mode will users play in (Industry Mode, Traditional, Cryptocurrency Mode, or Equities Mode) and how the winner is decided. Therefore, users can make a decision on which league to join based off their preferences and what is available. If a league is private, then the user can message its League Manager and ask for permission to join the league. If a user chooses to create their own league, then that user is automatically the League Manager, meaning they choose the League name and decide the league settings (described further below). The game will simulate the basic functionality and provide many of the same features as the US stock and cryptocurrency markets, but instead of real money, users of the website will be able to invest with virtual money. This default amount of money that each player starts with is \$10,000, however, this amount can be changed by the League Manager when creating a new league. Players in the same league will all start with the same amount of capital, and will compete with each other to see who can make the smartest investments; their performance will be recorded via a league leaderboard, which is updated daily. Players can

participate in multiple leagues, so that they can play with different friend groups or in leagues with different rules. For example, a particular player who is a student in college might be in one league with his friends, another league with his classmates, and a third league that is with random players where the rule is that users can only invest in cryptocurrencies (“Cryptocurrency Mode”). Likewise, leagues can be set up such that players are only able to invest in equities (common stock), which is called “Equities Mode”. Another mode that we will also create is “Industry Mode”. In this league setting, players are restricted to only investing a maximum of 30% of their initial capital in just one industry/sector. For instance, if a player starts with the default amount of money, \$10,000, then they cannot invest more than \$3000 in one industry(Consumer, TMT, Industrials, etc.) The final mode is called “Traditional”, where users can invest in both Equities and Cryptocurrencies, and their only restriction is the amount of capital they have. There are two different ways that a league winner is decided (this is chosen at the beginning by the League Manager). The first

Users will have the opportunity to invest in the same stocks and cryptocurrencies that are featured on the major exchanges in the US. Users will be able to see recent prices on all securities and buy or sell accordingly. Players will also have multiple tools available to manage their portfolio and to perform research on securities before they make an investment. For example, users should be able to track the performance of individual stocks that they have taken a position in, as well as their overall portfolio. Moreover, when researching equities to buy, users should be able to clearly see the stock’s metrics (such as P/E ratio, EPS, etc.) as well as how the stock’s price has changed over time. Moreover, another feature that we will be introducing is price alerts. When a player is intrigued in taking a position in certain stock, but feels that the current share price is too high, then the player can still track that stock and be alerted via email when the stock’s share price lowers into the player’s target range. Similarly, the player can set up other alerts as well for the different metrics of the stock.

In addition to providing a simulation of real markets, what separates Trade Kings from other products and makes it unique is its commitment to providing a strong educational platform. The first way that we will do this is by providing daily market updates on our homepage. These updates will primarily consist of listing the current values of major indices, commodities, and major currencies (as well as important exchange rates). Furthermore, the market updates will also highlight any large movements in the price of a well known stock or cryptocurrency, and notable events in the US and world economies. Additionally, we will have an Investment Forum, which is a user-driven forum where members can make posts on their investment ideas with other users being able to comment below the posts. By allowing users to present and support investment ideas in a particular stock or cryptocurrency, we can generate insightful community discussions that encourage members to explore other valuation strategies that might be new to them. Finally, the site will also have a “Valuation Strategies” tab, which will present information on how different valuation strategies are performed, such as SWOT analysis, Porter’s 5 Forces, a Discounted Cash Flow Model, and more. This section of the website can only be updated by our

Educational Content Contributor. The Educational Content Contributor, who will also serve as the moderator of the Investment Forum, will be chosen for their experience in investing and for their credentials in the field of finance.

B. Glossary of Terms

Ticker Symbol - A system of letters used to uniquely identify a stock.

Dividend - A payment paid regularly by a company to its shareholders by its profits. It is usually shared as a fixed percent of the shareholder value.

Leaderboard - Ranking system to distinguish the most successful player from the rest.

Share - a unit or miniscule percentage of a company which can be used in transactions whether it be for selling or purchasing.

Share Price - the value equivalent in cryptocurrency that a particular share is worth at any given time.

Equity - a synonym for share price. A term referring to the value of an individual share of a stock.

Security - An asset maintained by a player which include debts, equities and derivatives which will each play different roles throughout this game.

Portfolio - Earnings, losses, averages, performance and other asset analysis are included in a player's portfolio. This will include a player's bio, homepage as well as other features associated to a particular player. The portfolio is basic summary of a player and what they have accomplished.

P/E Ratio - Ratio for the current share price relative to its per-share earnings. This ratio determines the value of a company.

EPS - Earnings per share or EPS is a percentage of stock's profit allocated to an individual who is in ownership of that stock.

Cryptocurrency - Digital asset designed to work as a medium of exchange in which encryption techniques are used to secure its transactions, and to verify the transfer of assets.

Buy - A transaction in which an individual user exchanges an amount of cryptocurrency for an individual or group of stocks. This is an essential component of this game.

Sell - The user no longer needs a stock and wishes to sell it at the desired price.

Limit - User makes an order to buy or even sell a stock at a determined price. A buy limit order can only be completed at the limit price or lower. Also a sell limit order can only be completed at the limit price or higher.

Stop - Operations that take effect if a particular stock rises above or falls below a particular target value. If triggered this operation will effectively purchase or sell the selected stock. This is mainly used to minimize losses for a player.

ROI - Return on Investment

League - A stock market simulation with fixed number of users in which all work to reach the same goal. The goal is to attain the most money at the end. All user, or investors, can choose to participate in a private league, or a public league in which users of 8 are made randomly.

League Manager (or League Moderator) - League Manager is one of the users in the league who is responsible for adding other users as well as selecting the settings for the particular league. The manager can only control the settings of his or her own league.

League Forum - A league chat where the the League Manager can notify all member of anything within the league. Normal league members may have access to sending messages to the forum if the League Manager chooses to give the ability to do so. The League Manager will always have the right to delete anything from the forum for any given reasonable reason.

Member - A member is anyone that plays a role in a league on the fantasy league website. Teams can be owned by multiple members if the that group/team chooses to do so.

Invite - Anyone who has access to do so, can invite other members to join the league. The amount of access given to all members to do so is determined though the rules set by the League Manager/ Moderator.

2 System Requirements

A & B. Enumerated Functional & Non-functional Requirements (Combined)

Identifier	User Story	Priority
ST-1	As a new user (guest visitor), I can only participate in Trade Kings if I register for an account with my email.	5
ST-2	As a newly registered user, I will be given an introduction to the site and the different features offered by it (this is known as Tutorial Mode).	2
ST-3	As a customer, I can research and compare current stocks in order to make a decision on what investment I should make.	4
ST-4	As a competitor, I can view a current leaderboard in order to view the progress of my friends or foes.	2
ST-5	As a competitor, I can observe the profiles of my competition and view their portfolio and list of transactions	2
ST-6	As a league manager, I can create a league with a personalized name and settings.	2
ST-7	As a league manager, I can send invitations to other users via email.	4
ST-8	As a user, I can purchase and sell stocks based on current market prices.	5
ST-9	As a user, I can accept or decline an invitation to join a league.	3
ST-10	As a user, I should be able to clearly see the stock's metrics (such as P/E ratio, EPS, etc.) as well as how the stock's price has changed over time.	4
ST-11	As a user, I will be alerted via email when the stock's share price, which I'm interested in, lowers into my user set target range	3
ST-12	As a user, I will be able to see recent prices on all securities.	3
ST-13	As a user, I can put stocks into watchlists and have the ability to	2

	track how well they do over time.	
ST-14	As a user, I can customize my avatar in my profile to my liking.	1
ST-15	As a user, I can link any social media accounts or any relevant channels in my profile.	1
ST-16	As a user, I can add posts and comments to the Investment Forum.	3
ST-17	As an Educational Content Contributor & Forum Moderator, I can delete inappropriate Forum posts/comments and post educational material on investment strategies.	3

The images below (Figure 1&2) are temporary template of the on-screen requirements for the login page and user interface. Upon final release of this project the user will be able to see a background image with a login pattern that requires each player's username and password. This is to demonstrate what each user can expect upon entering Trade Kings website. Below also lists a forgot password for players who need an email to confirm their password and a signup option for new members. The requirements of this login page is specified in the table above.



Figure 1

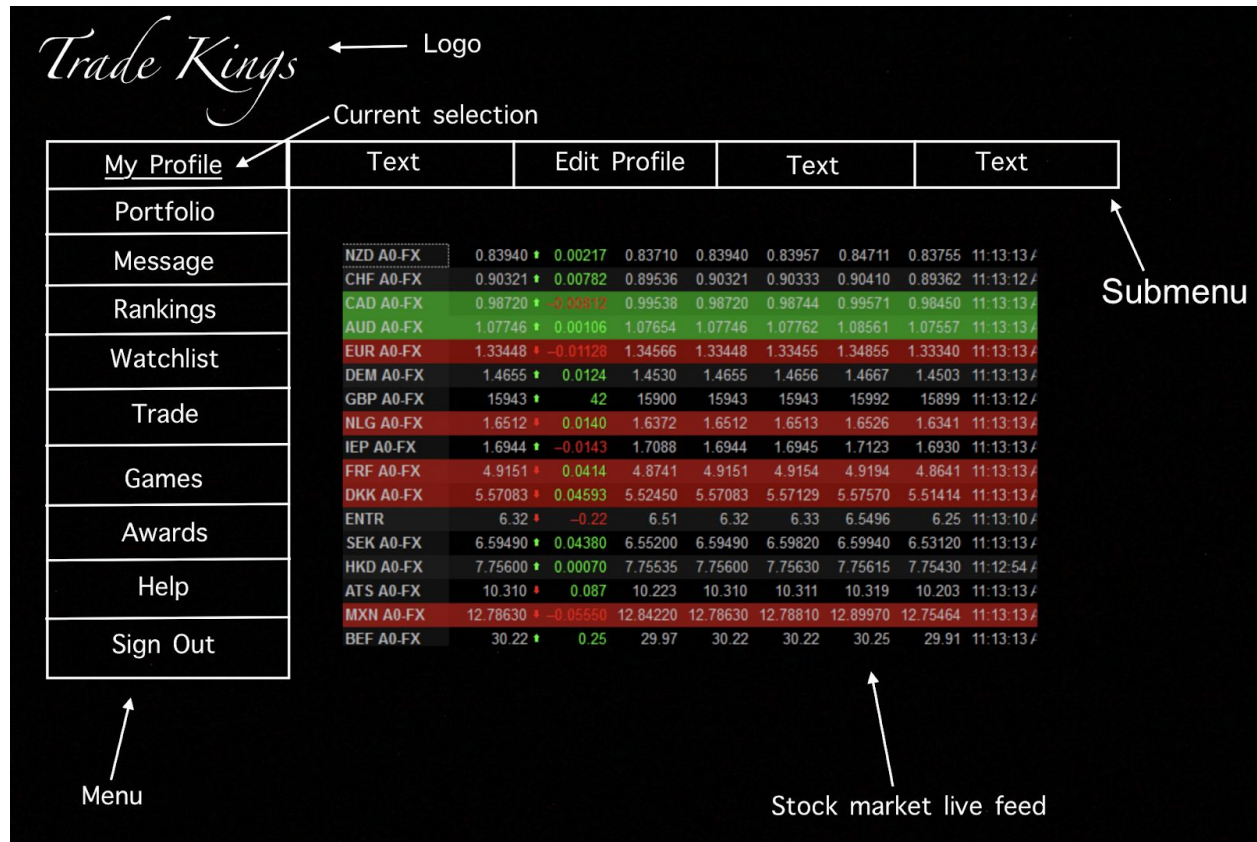


Figure 2

C. On-Screen Appearance Requirements

REQ-X	Description	Priority
OSR-1	The login screen will contain a portion for one to enter their username and password. Also, the option to sign up or recover a forgotten password or username will be present.	5
OSR-2	The in-game screen will contain tabs to show messages, games joined, rankings, portfolio, and stock analysis.	5
OSR-3	There will be a tutorial video for new users in order for them to gain a better understanding on how a stock market functions.	5
OSR-4	A web page will adjust to occupy any computer screen.	4
OSR-5	The main page will contain a stock market live feed.	4
OSR-6	There will be a leaderboard showing the top 5 players at one time.	3

3 Functional Requirements Specification

A. Stakeholders:

A stakeholder is an individual, team, or organization with interests in or concerns related to the system-to-be of Trade Kings. The primary stakeholder and main end-user for our Trade Kings platform will of course be the customer, who can be anyone from a student who is a novice investor looking to gain initial exposure to the markets, or a more experienced investor wishing to expand their knowledge to new frontiers. The system architects is simply our nine person development team that will be building the system-to-be and subsequently testing its performance. We will also have a subset of our development team that will comprise the “future maintenance organization” of the system. The responsibilities of this group is mainly to update the different site appearances which will improve the clarity and viewability of the webpage. Furthermore, they will introduce new functionalities to the league, and update the finance API if the current one becomes outdated or defunct (such as the Yahoo Finance API).

The main external system that our Trade Kings system-to-be will interact with is the finance API, which will provide us with real-time stock and cryptocurrency data. Our site will display this data in a clean and organized manner through tables and various graphs which will illustrate not only the numbers but different patterns in order to make the users’ analysis of the market and decision-making process easier. The finance API that we are planning on using is the Alpha Vantage API, which supports both current and past data for equities and digital currencies, as well as numerous technical indicators and metrics that will help users as they make investment decisions.

There are additional potential stakeholders that we hope to introduce in the future after our product hits the market and gains a certain amount of users. After reaching a certain level of success, we hope to add business schools as sponsors, starting with the Rutgers Business School (RBS). Sponsors will have a version of the site specific to their business school, where only students from that particular school can register with their student ID (for example RUID for RBS students) and participate in a league. As a result, these schools can use our site as another educational tool for their students because along with educational content, they will be exposed to a stock market simulation. Moreover, sponsors will have access to premium educational material that is not available to traditional users, as we continue to expand the educational content on our site. This will allow finance classes to incorporate investment fantasy leagues as well as investment forums into their curriculum with ease.

B. Actors and Goals

Player (Initiating and Participating): An end user who is an investor and is either currently in a league(s), was in a league(s), or is looking to join one.

Goals: Joining a league, creating a league (becoming a League Manager), viewing portfolio, executing trades, creating a new discussion in the forum, contributing to an existing forum (becoming an Investment Forum Contributor).

League Manager (Initiating and Participating): Similar to a player, except this user decides to create his/her own league, instead of joining one.

Goals: Deciding the league settings, such as number of players, starting amount of capital of every player, duration of the league, game-play mode, etc.

Guest Visitor (Initiating): An end user who either is not logged in or has not yet registered an account. User will be able to see the open leagues and the forum discussion topics, but cannot join any league or actually read the discussion.

Goals: Registering an account, logging in to account, browsing the website to get some understanding and explore their interest in it

Site Administrator (Initiating): The site administrator will ensure that the website is operating smoothly which includes speed, quality of graphics, accuracy of data, etc.

Goals: Managing and maintaining the performance of the website by monitoring the “error complaints” sent in by users (Trade Kings will have a special inbox dedicated to this) as well as researching, implementing, and testing new opportunities to improve the quality of league as a whole.

Finance API (Participating): The Alpha Vantage Finance API will provide the site with real-time stock and cryptocurrency data.

Goals: Retrieving current market data and updating its database with the market data so that it can be easily transferred to users.

Investment Forum Contributor (Initiating and Participating): Players also have the ability of making posts in the investment forum, where they have community discussions on various discussion topics about the market in general or in relation to their game.

Goals: Making posts on new investment ideas and market developments, commenting on existing forums with opinions, insight, and analytics

Educational Content Contributor & Forum Moderator (Initiating): Specially selected and qualified individuals (not a player) that will be in charge of providing and moderating much of the educational content on the Trade Kings website.

Goals: Moderating investment forum discussions, providing daily Market Updates, making periodic posts on the Investment Strategies page on various valuation methods and investing techniques

Database (Participating): Once a user registers, the user's registration information will be stored in a database. This information will be used to send emails (i.e. for confirming registration, sending price alerts, etc.)

Goals: Storing necessary player information

C. Use Cases

I. Casual Description of Use Cases:

UC-1: Registering: Allows a visitor to set up an account and become a member/user via a quick registration form. User needs to provide first name, last name, age, email address, password, and answers to two security questions. Upon successfully registration, new user will receive a confirmation email to the address that was provided. After registering, the new user will can now start using the site's services (joining leagues, market research, etc.) but the user is initially in Tutorial Mode.

Requirements: ST-1, ST-2

UC-2: Creating and Managing League: Allows a player to form a league with customizable settings that suit the users preferences including the league's name. Users can invite up to 16 friends to a game, in which they compete to buy and sell the latest stocks and cryptocurrencies in order to maximize profits. By creating the league, player becomes "League Manager". League Managers choose the total number of players in the league, each player's starting amount of capital, the league mode (industry mode, traditional, etc.), and how the winner is decided (first to reach certain amount of profit, top player on leaderboard after a certain period of time, etc.).

Requirements: ST-6, ST-7

UC-3: Joining a League: Allows a user to participate in various leagues including those set up by strangers and by friends. Users can only join public leagues, but can join a private league with an invitation. Also users are allowed to join multiple leagues at once as. User must join league before initial capital is distributed to every player (essentially before the "season" begins).

Requirements: ST-9

UC-4: Researching Security/Market Data: Allows users to retrieve live data on both stocks and cryptocurrencies, enabling them to make more informed investment decisions. Players can see the current and past price/value of the security, as well as other metrics such P/E ratio, EPS, volume traded, various graphics (tables and graphs), and more.

Requirements: ST-3, ST-10, ST-12

UC-5: Executing a Trade: Allows a user to perform a market trade such as buying or selling a particular stock/cryptocurrency of interest. The system will automatically check that the user has enough capital to purchase the desired security or enough of the security that the user wants to sell. Trades will be executed at the real-time market prices.

Requirements: ST-8

UC-6: Starting/commenting on an Investment Discussion: Allows users to start a new discussion thread or comment on existing ones in the Investment Forum, regardless of if they are a current player (in an active league) or not. Users will be able to engage in discussions regarding various investment ideas and strategies.

Requirements: ST-16

UC-7: Posting Educational Content: Allows the “Education Content Contributor” and the “Forum Moderator” to post material on investment strategies as well as market trends and developments. Furthermore, the same person will serve as the moderator of the Investment Forum, removing any posts/comments that are deemed inappropriate.

Requirements: ST-17

UC-8: Setting Price/Metric Alerts: Allows a players to track certain securities of interest by setting alerts on them. Player can choose to be sent an email once the criteria of the tracking has been met. For instance, a user might be looking at buying a particular stock but believes that it is currently overvalued based on the current share price and P/E ratio. The player can then set an alert, so that if that stock’s share price and/or P/E ratio decreases to a certain level, the player will be notified in case they want to execute a trade on that stock.

Requirements: ST-11, ST-13

UC-9: Competitor Performance: Allows a player to look at the portfolios of other players in the same league, as well as every competitor’s ranking on the league leaderboard. When a player clicks on a league that he is a part of, the league leaderboard will be displayed. The user can then click on any individual competitor’s name on the Leaderboard to view that competitor’s portfolio.

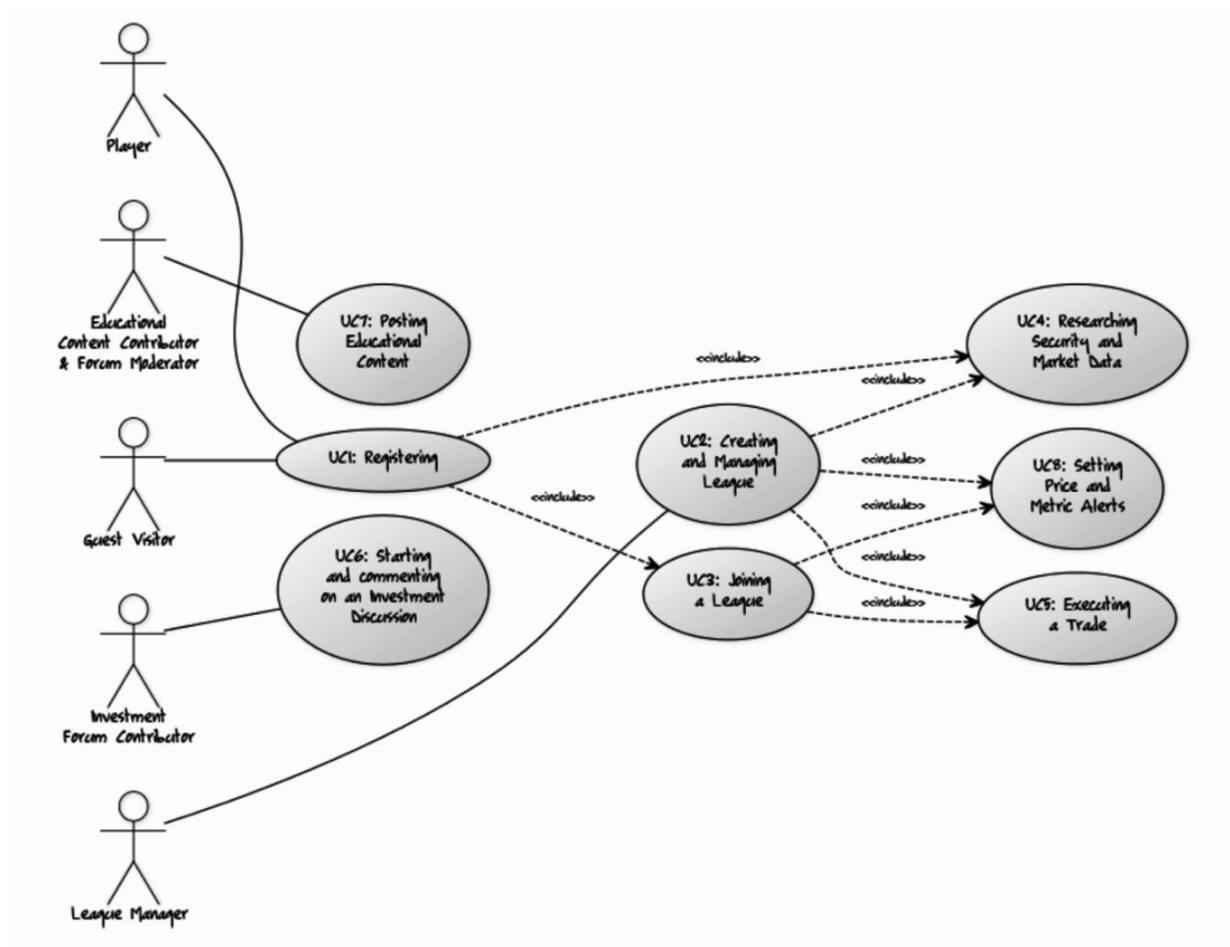
Requirements: ST-4, ST-5

UC-10: Account Customization: Allows players to customize their profiles and make them unique. Players can go to their “My Profile” tab and choose an avatar. Furthermore, users can connect their account to their social media profiles when registering their accounts. This would enable users to login to Trade Kings through their social media accounts.

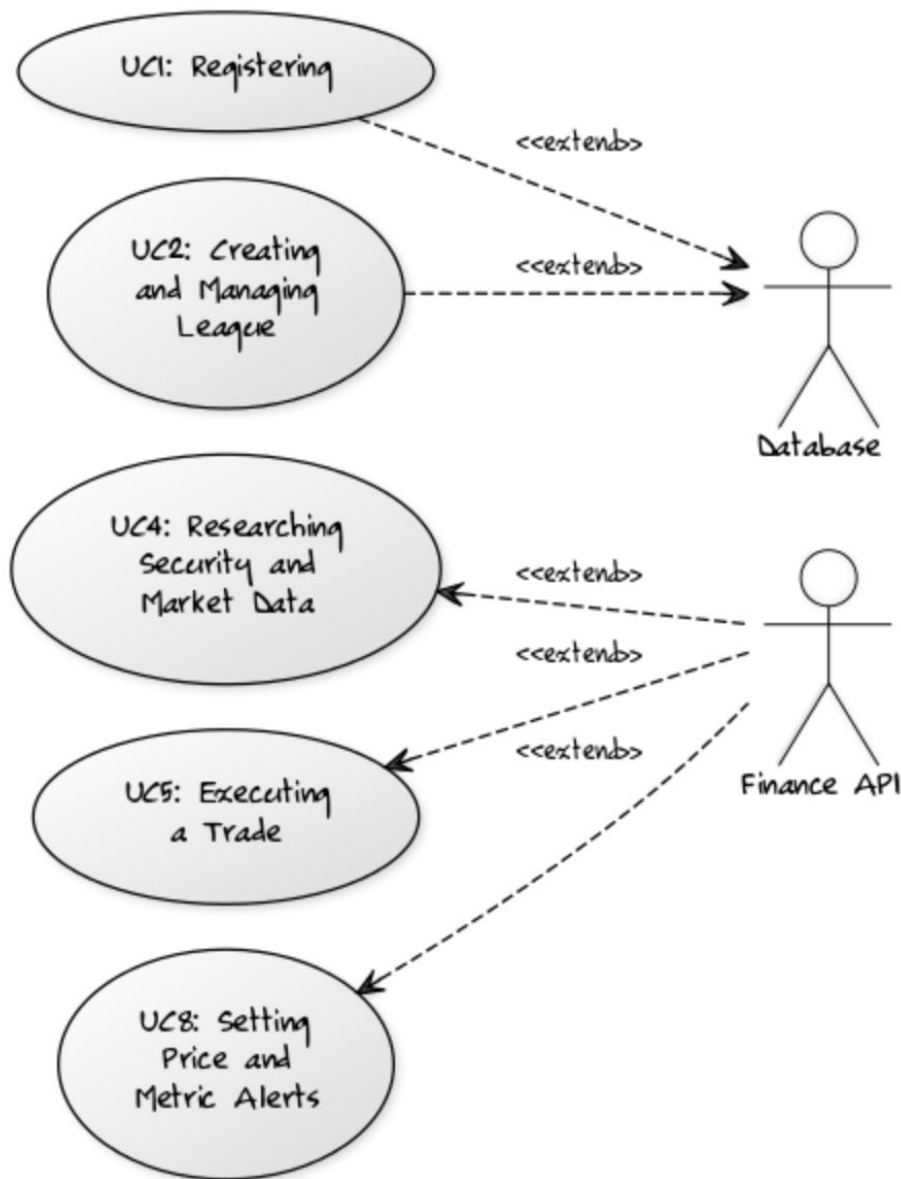
Requirements: ST-14, ST-15

II. Use Case Diagrams:

Note: Use Case Diagrams 1 and 2 are technically one single diagram, but are simply shown here separately for clarity



Use Case Diagram 1



Use Case Diagram 2

III. Traceability Matrix:

Req't	PW	UC-1	UC-2	UC-3	UC-4	UC-5	UC-6	UC-7	UC-8	UC-9	UC-10
ST-1	5	X									
ST-2	2	X									
ST-3	4				X						
ST-4	2									X	
ST-5	2									X	
ST-6	2		X								
ST-7	4		X	X							
ST-8	5					X					
ST-9	3			X							
ST-10	4				X						
ST-11	3								X		
ST-12	3				X						
ST-13	2								X		
ST-14	1										X
ST-15	1										X
ST-16	3						X	X			
ST-17	3							X			
Max PW		5	4	4	4	5	3	3	3	2	1
Total PW		7	6	7	11	5	3	6	5	4	2

IV. Fully-Dressed Description of Use Cases:

Note: Only done for Use Cases 1, 2, 3, 4, 5, and 7 as per instructions because these use cases were deemed to be the most important.

Use Case UC-1:	Registering
Related Requirements	ST-1, ST-2
Initiating Actor	Guest Visitor, Player
Actor's Goals	To successfully input information into Trade Kings site and become a registered user.
Participating Actors	User Database, Email Server
Preconditions	Player's email is not already in the system's user database.
Postconditions	The user's information is loaded into the database. User receives confirmation email in inbox.
Flow of events for Main Success Scenario:	
→	1. Guest Visitor opens browser and visits the Trade Kings website.
→	2. Guest Visitor enters email and password information to attempt login.
←	3. System searches user Database with email and password parameters and does not locate a Player with matching data.
←	4. System prompts Guest Visitor to register and loads registration page.
→	5. Guest Visitor fills out registration fields: name, email, age, password, re-enter password, security question 1, and security question 2.
←	6. System creates new player entry and adds registration information to the User Database .
←	7. System tells mail server to send registration confirmation email to new Player .
Flow of events for Extensions (Alternate Scenarios):	
→	1. Returning user opens browser and visits the Trade Kings website.
→	2. Returning user enters email and password information to attempt login.
←	3. System searches user Database with email and password parameters and is able to locate the Player with matching data.
←	4. System loads the Player's portfolio on the screen.

Use Case UC-2:	Creating and Managing League
Related Requirements	ST-6, ST-7
Initiating Actor	Player
Actor's Goals	Be able to join an existing league or create one's own.
Participating Actors	Players, League Database
Preconditions	Player exists in user database and is currently logged into the Trade Kings website.
Postconditions	League is created with corresponding title and league settings. League entry is added/updated to the League Database with the corresponding information. User Database is updated with league title added under player's League Manager role.
Flow of events for Main Success Scenario (Creating the League):	
→	1. Guest Visitor opens browser and visits the Trade Kings website and logs in.
→	2. Player goes to "My Leagues" section of user profile and selects "Create League".
→	3. Player chooses unique title for league and selects league settings.
←	4. System creates new league entry and adds league settings to the League Database .
←	5. Systems adds League Title under League Manager field for Player in the User Database .
Flow of events for Extensions (Alternate Scenarios - Managing the League):	
→	1. Guest Visitor opens browser and visits the Trade Kings website and logs in.
→	2. Player goes to "My Leagues" section of user profile and selects "Managed Leagues."
→	3. Player chooses specific league by clicking on the title of the league.
→	4. Player edits the league settings and/or invites new players (if season has not started yet).
←	5. System updates data of corresponding league in the League Database .

Use Case UC-3:	Joining a League
Related Requirements	ST-9, ST-7
Initiating Actor	Player
Actor's Goals	To search and join a desired league
Participating Actors	Database, League Manager
Preconditions	Player has enough league slots to join. League has just started.
Postconditions	One of the player's league slots is filled. Player now has capital in that particular league
Flow of Events for Main Success Scenario:	
→	1. Player searches for league via "Join League"
←	2. System searches League Database for with search parameters of public league and open spots
←	3. System outputs a page of joinable leagues
→	4. Player clicks "Join" next to league of interest
→	5. Player joins the league and gains initial amount of capital set by the League Manager
←	6. League Database is updated with new player's name and information
Flow of Events for Extensions (Alternate Scenario - User Invitation):	
←	1. League Manager sends an invitation to Player to join the league
→	2. Player clicks on "Accept Invitation"
→	3. Player joins the league and gains initial amount of capital set by the League Manager
←	4. League Database is updated with new player's name and information

Use Case UC-4: Researching Security/Market Data	
Related Requirements	ST-3, ST-10, ST-12
Initiating Actor	Player
Actor's Goals	To view current and past stock values as well as additional metrics
Participating Actors	Site Administrator, Finance API
Preconditions	Player is logged on to the site with his/her account Player has joined or created a league successfully
Postconditions	Player is more informed about their desired stock(s) and can make an educated decision on whether to buy or sell a stock
Flow of Events for Main Success Scenario (Search via Trade Market):	
→	1. Player searches for desired stock or cryptocurrency through "Stock/Cryptocurrency Market"
←	2. System outputs a page with a list of stocks and cryptocurrencies
→	3. Player picks the desired stock or cryptocurrency to obtain information on
←	4. System displays information obtained from the Finance API on the stock or cryptocurrency
→	5. Player analyzes information provided by the site which will include data and news on that stock or cryptocurrency
Flow of Events for Extensions (Alternate Scenarios - Investment Forums):	
→	1. Player searches for desired information on Investment Forum
←	2. System uses players search as keyword to search forum for related results
←	3. System displays acquired results
→	4. Player selects forum thread to view and understand outside opinions and analysis on the specific subject desired

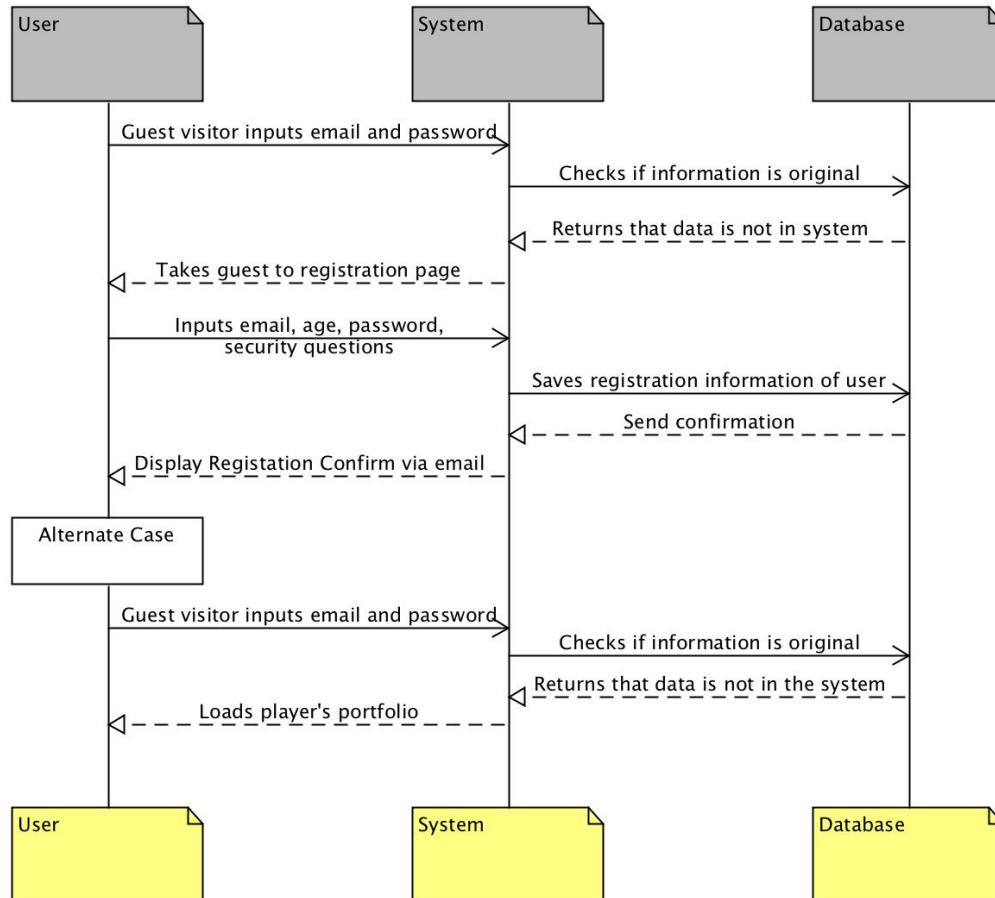
Use Case UC-5: Executing a Trade	
Related Requirements	ST-8
Initiating Actor	Player
Actor's Goals	To search for and buy or sell a stock
Participating Actors	League Database, Finance API
Preconditions	Player must have enough capital to make trade
Postconditions	Trade is stored under Player in League Database and changes in value impact Player's standing
Flow of Events for Main Success Scenario:	
→	1. Player searches for a trade via "Stock/Cryptocurrency Market"
←	2. System outputs a page with a list of stocks and cryptocurrencies
→	3. Player picks the desired stock to view
←	4. System displays information obtained from the Finance API on the stock or cryptocurrency
→	5. Player starts buying or selling a desired stock or cryptocurrency if the player has the necessary capital to make the trade
←	6. System updates user trade history in the League Database with new trade
→	7. Player gets an email (if setup) with trade details
Flow of Events for Extensions (Alternate Scenarios - Via Portfolio):	
→	1. Player opens his or her current stock/cryptocurrency portfolio
←	2. System searches League Database for player's current stocks and cryptocurrencies and displays them
→	3. Player decides on a stock(s) or cryptocurrency he or she wants to buy or sell based on the player's available capital
←	4. System updates user trade history in the League Database with new trade
→	5. Player gets an email (if setup) with trade details

Use Case UC-7: Posting Educational Content	
Related Requirements	ST-17, ST-16
Initiating Actor	Educational Content Contributor (ECC)
Actor's Goals	To provide content to site users in order to educate, provide advice, and expose them to investment strategies, understanding market trends, exploring new developments and frontiers, etc.
Participating Actors	Players
Preconditions	No new educational content has been posted on the site
Postconditions	New educational information can be found and analyzed by the users for the purposes of learning and/or making trading decisions Players can add opinions on forum threads
Flow of Events for Main Success Scenario:	
→	1. ECC enters site as Forum Moderator (Administrator)
←	2. System provides access to ECC if correct credentials provided
→	3. ECC starts new forum thread with a post on a topic (strategies, trends, etc.) under the Investment Forum section of the site
←	4. System makes the new educational content available to the Players for viewing and contributing
Flow of Events for Extensions (Alternate Scenarios - Via News):	
→	1. ECC enters site as Forum Moderator (Administrator)
←	2. System provides access to ECC if correct credentials provided
→	3. ECC takes valuable research (news, magazine articles, etc.) on the various topics and is able to post them on the homepage
←	4. System allows the Players to access the content that is posted

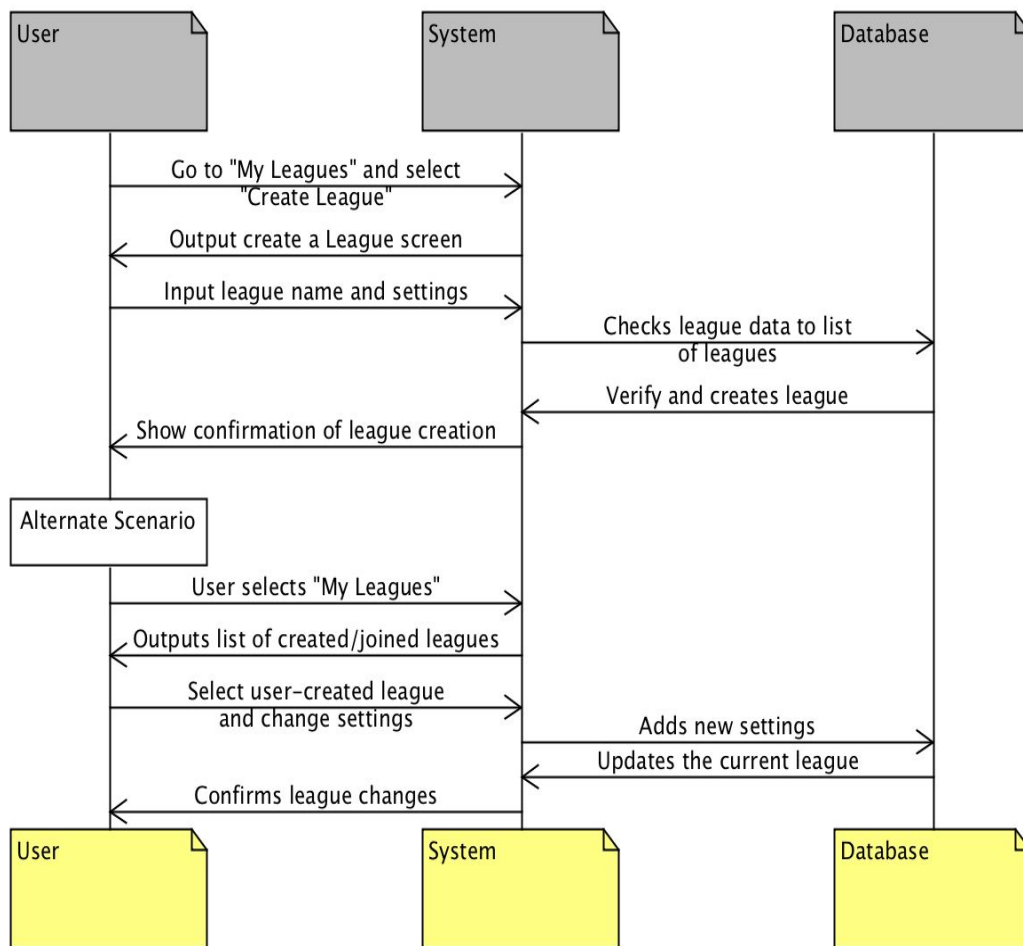
D. System Sequence Diagrams

Note: Only done for Use Cases 1, 2, 3, 4, 5, and 7 as per instructions because these use cases were deemed to be the most important.

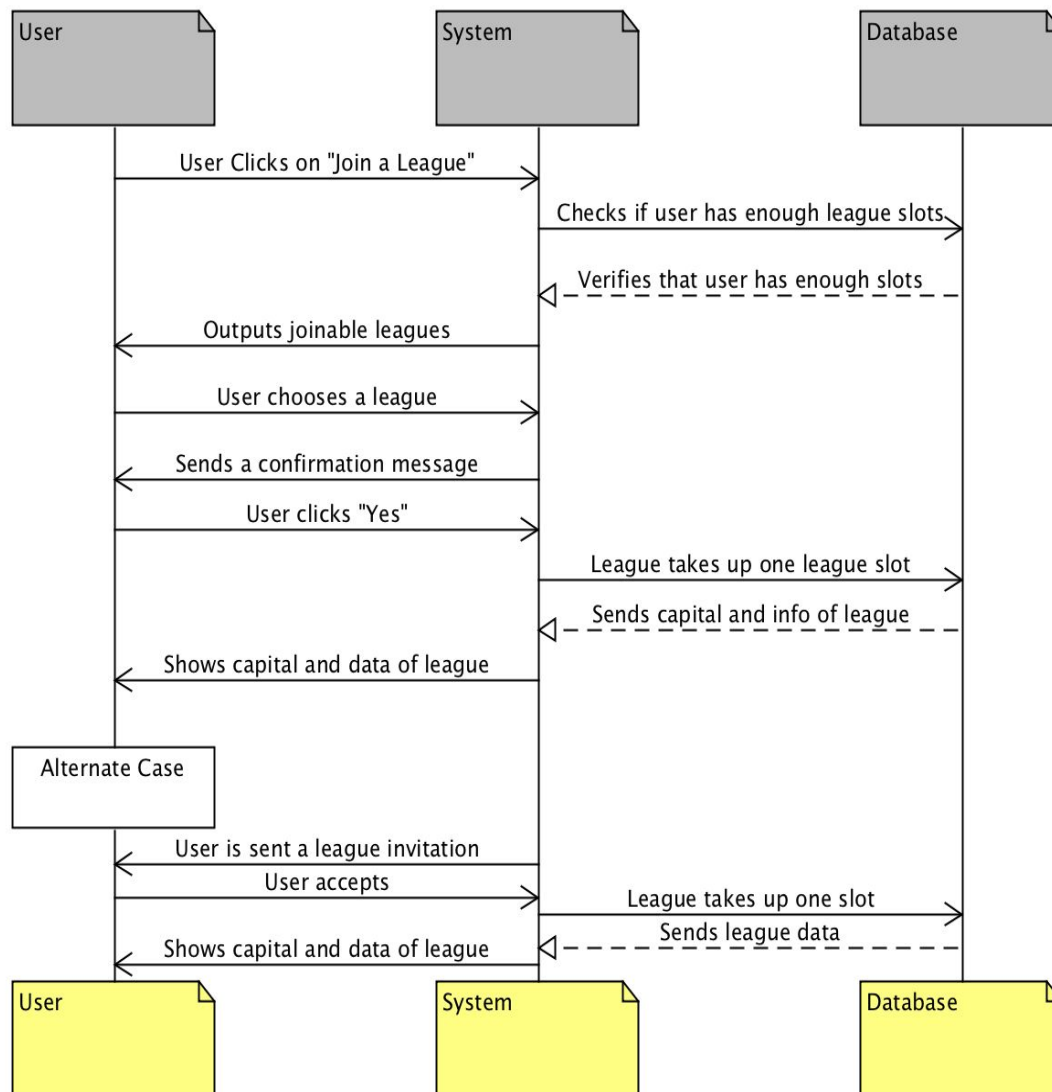
UC-1:



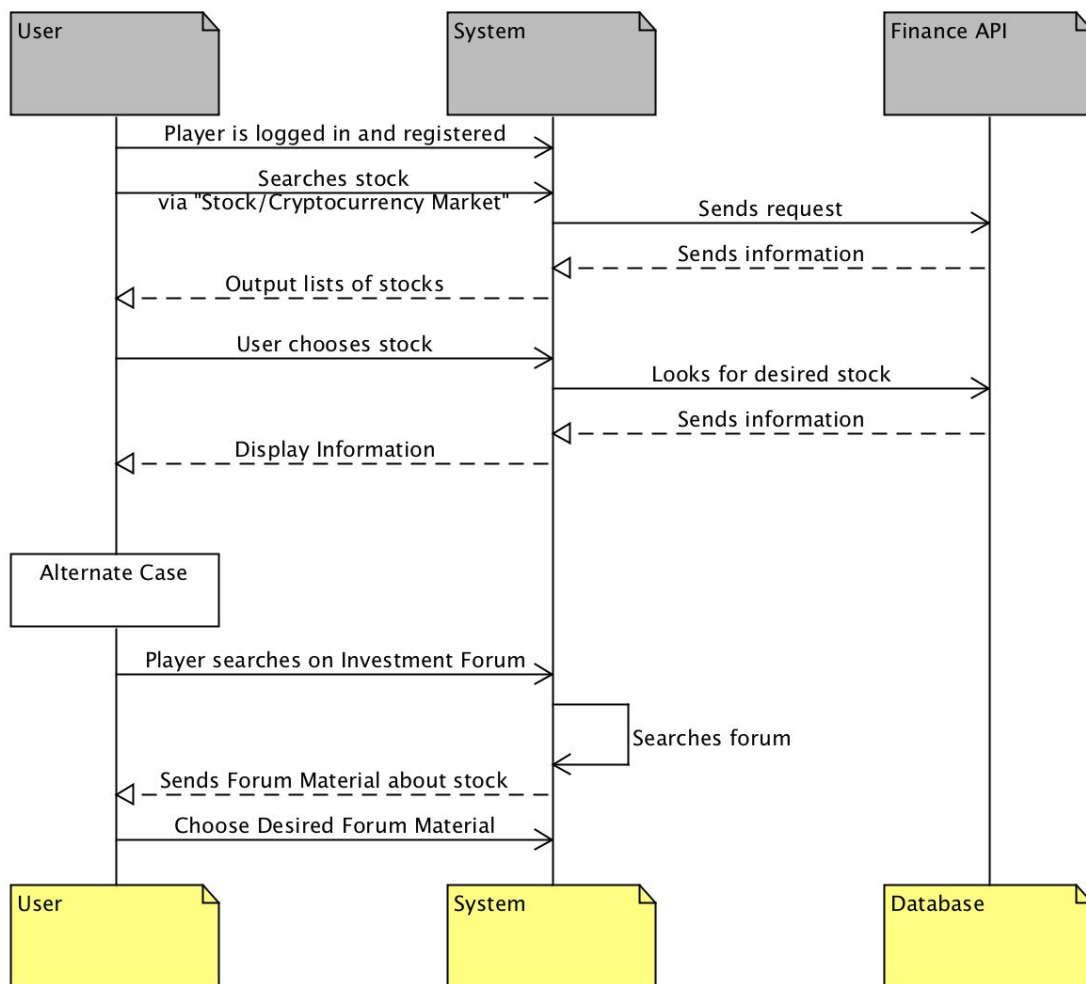
UC-2:



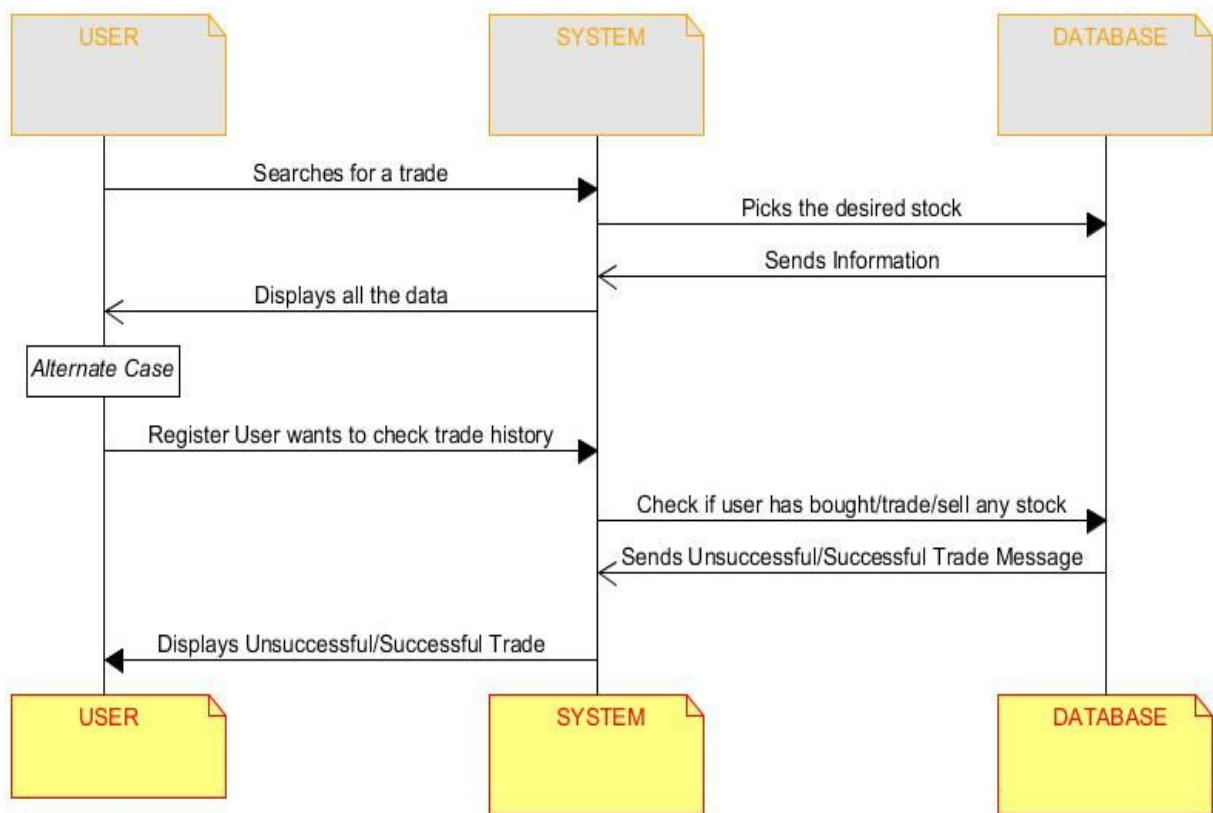
UC-3:



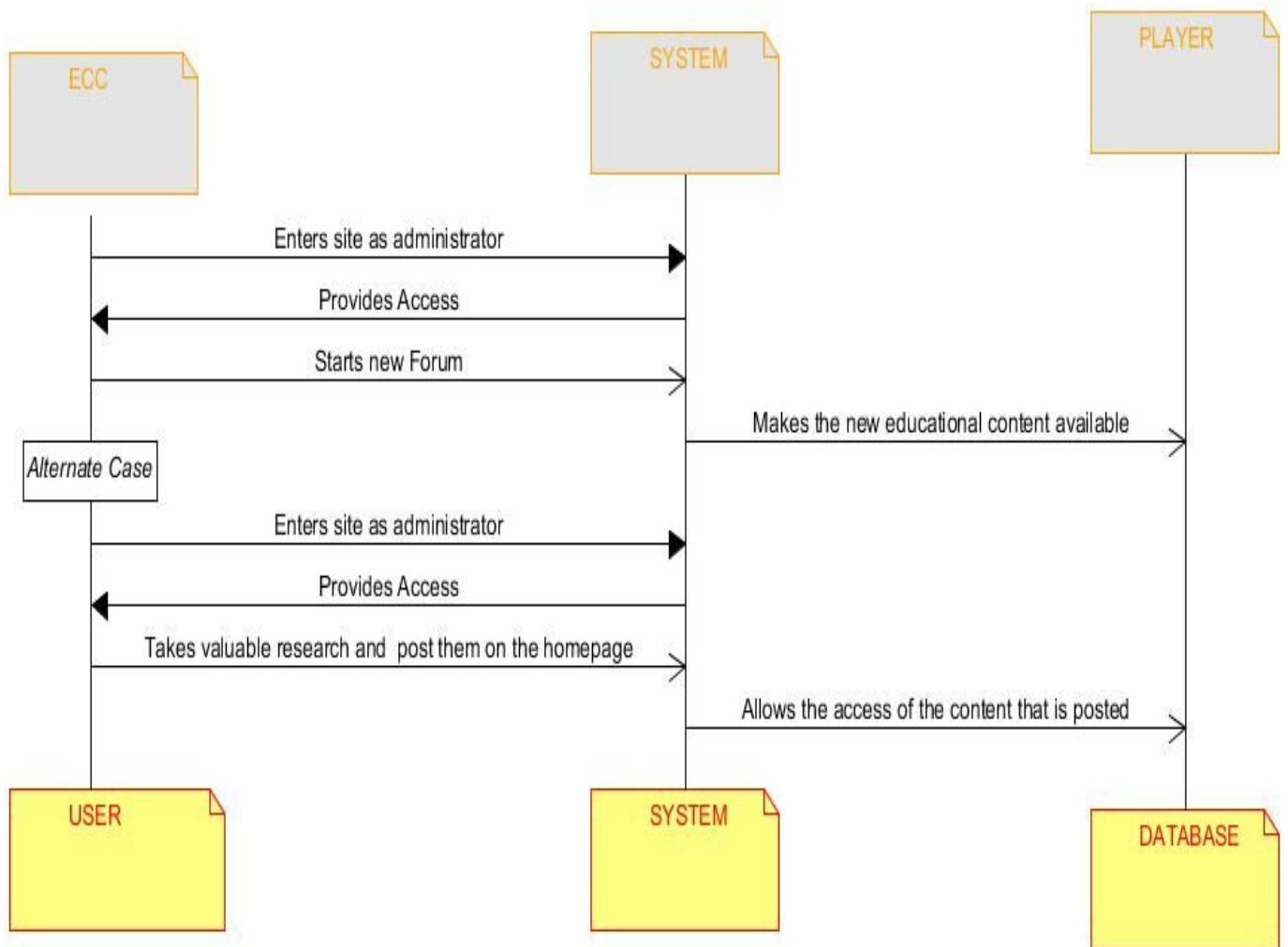
UC-4:



UC-5:



UC-7:



4 User Interface Specification

A. Preliminary Design

Trade Kings user interface will be the primary method of navigating through the website. This UI is specifically designed for simplicity and user convenience. The home page allows the user to execute almost all the actions available from one page including accessing other pages. Whether it is looking at the portfolio, managing the account, or even trading, this is all easily in the reach of the user. Along with this, as soon as the user logs in, the home page will display the information about the user's current stocks as well as the performance of the stocks. This serves as a reminder for every user of how many stocks they have and how well they are doing. At last, the color scheme is thoughtfully designed to make all the important information and options distinct and clearly visible. With black background, and white, green, or red text, the user will not have to look very hard to find something as it will be prominent.

Main Login or Register Page

The preliminary login page can be seen in Figure 4.1. On the bottom of the page, a digital stock ticker tape is displayed to quickly get a glimpse of how some stocks are performing. Users can then see a detailed report for each stock once they login. To login, returning users can simply insert their email address and password . Meanwhile, new users can easily create a new account with their name, email address, password, and two security questions. Another convenient method for logging in is with an existing social media account such as facebook, twitter, or google.



Figure 4.1 - Main Login or Register Page.3.

Home Page

The home page visible in Figure 4.2, displays a leaderboard, showing the users' overall rankings. Along with their rank, it shows each user's account value and how much money they have lost or gained as a percentage of the initial investment. Also on the home page is the header. The header, is in a horizontal container on top, right underneath the title. For consistency and convenience, it will remain the same throughout the website no matter what page the user is on. The header consists of all the options a user will want to use, including My Portfolio, Analyze, and Forum. After clicking an option besides "Home", a submenu will pop up below the menu, displaying more detailed options. The 'Trade Kings' logo will also be existent on all pages on the top of the website and clicking on it, will bring you back to the home page.

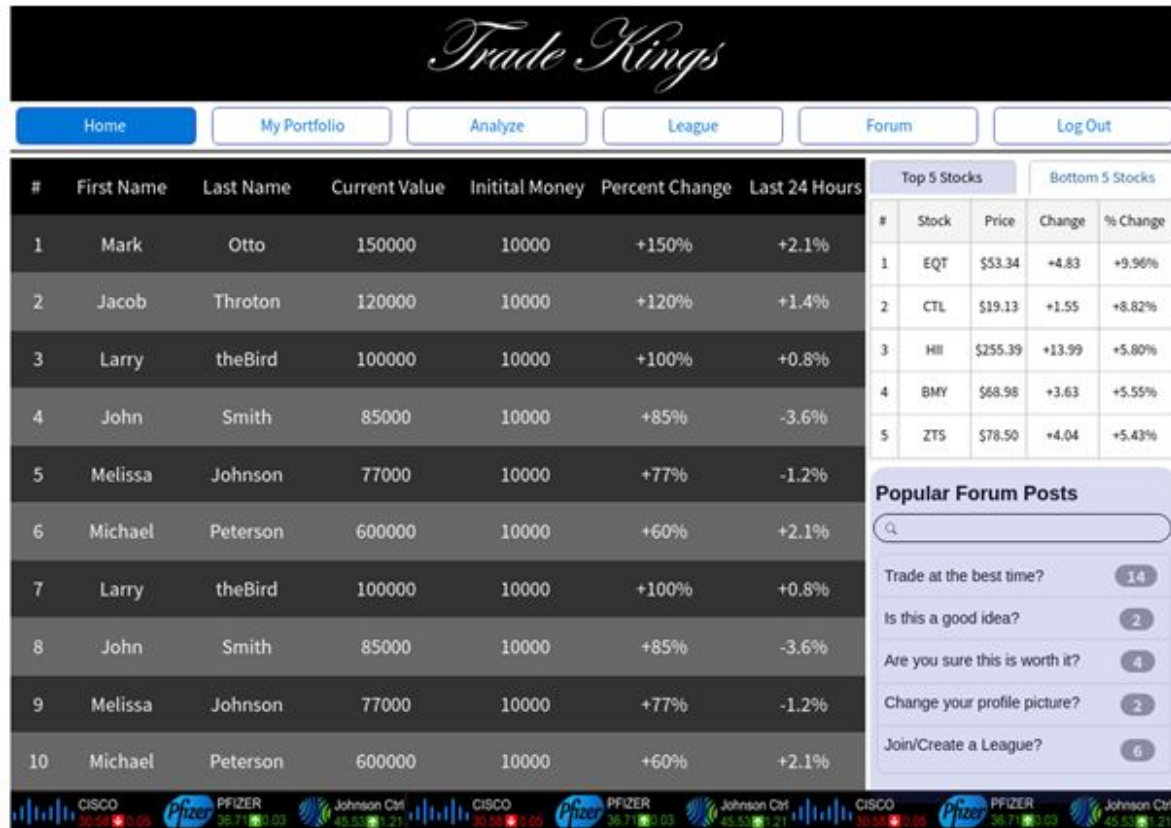


Figure 4.2 - Preliminary design for global header can be seen on top.

My Portfolio

The users portfolio view can be seen in Figure 4.3. A user's username is written on top of the page and his or her personal transactions and stock information is displayed on this page. As of right now, the portfolio will have sub-options of stocks, cryptocurrencies, and transactions history. Along with this, a graph is provided so the user can easily see his or her own performance. This graph will give them an idea of how to improve their rank in the specific league they are in.



Figure 4.3 - Preliminary image of Portfolio

Leagues

In Figure 4.4, users can select between the options of 'Create' or 'Join' in the League settings. If a user creates a league, then he or she will be able to send email invitations to other users and accept other users' requests. When creating a league, the user also has the option to keep the league public or private. Public means that all users can join, and private means users can only join by invitation. If a user selects 'Join', then the user can request to join an open public league which is managed by another user.



Figure 4.4 - Preliminary view of the options given to the user to get in a league.

Analyze

The “Analyze” tool is an option that players can use to research and learn more about their current assets/stocks and use it to decide whether they want to buy new assets. After clicking ‘Analyze’ a submenu will appear and user will have option whether to research on stocks, cryptocurrencies, or look at recent popular trades. While analyzing assets, users can for example lookup a specific stock by ticker. It will then display specific details about the stock such as current price, open and closing price, low and high, P/E ratio, a graph of price history, details of company’s quarterly financials, any related recent news to the company, and finally the status of any related markets. The purpose of this tool is to allow the user to do an in-depth analysis of the stock or cryptocurrency and make an informed trade. This is also facilitated by the “popular trades” option, as the users can get a sense of how the market is currently going. For convenience, users can see how many shares they currently own and can directly click to buy or sell from this page.

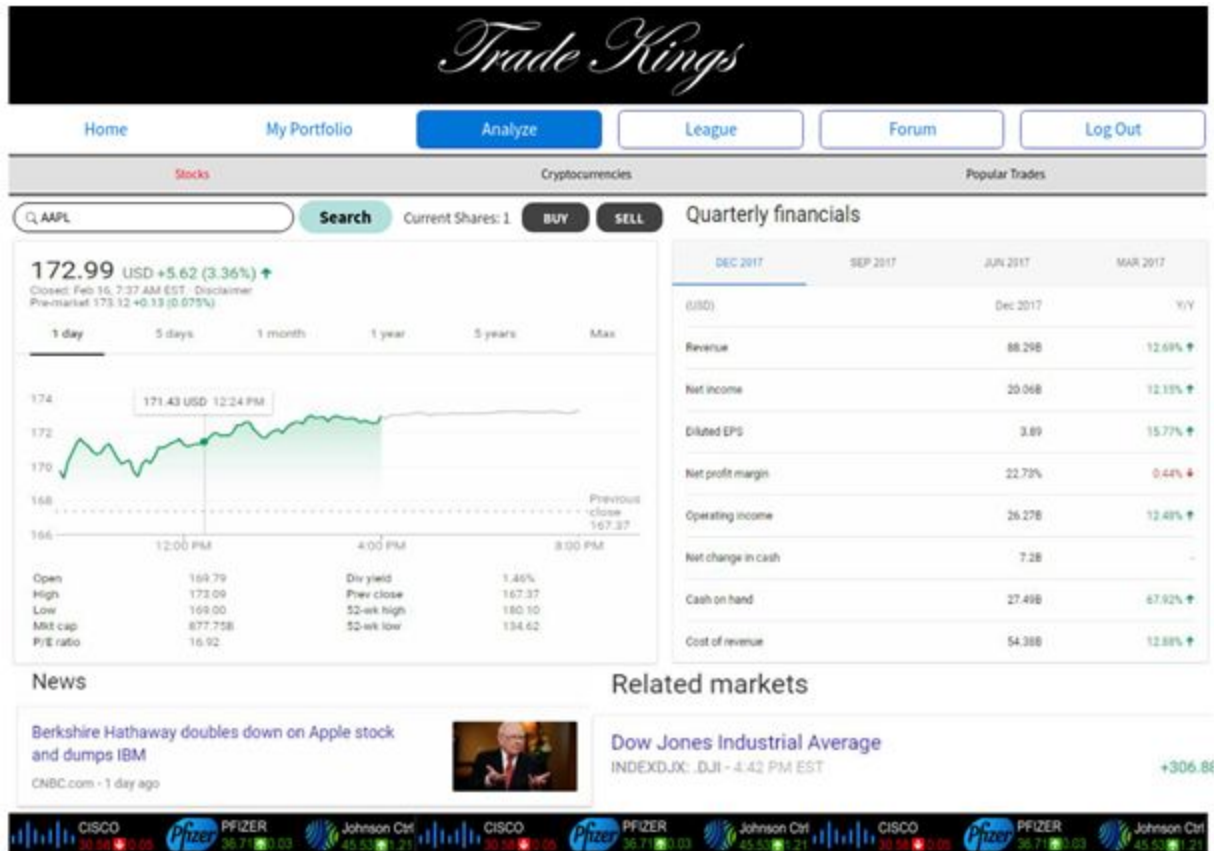


Figure 4.5 - Preliminary view of the Analyze tool

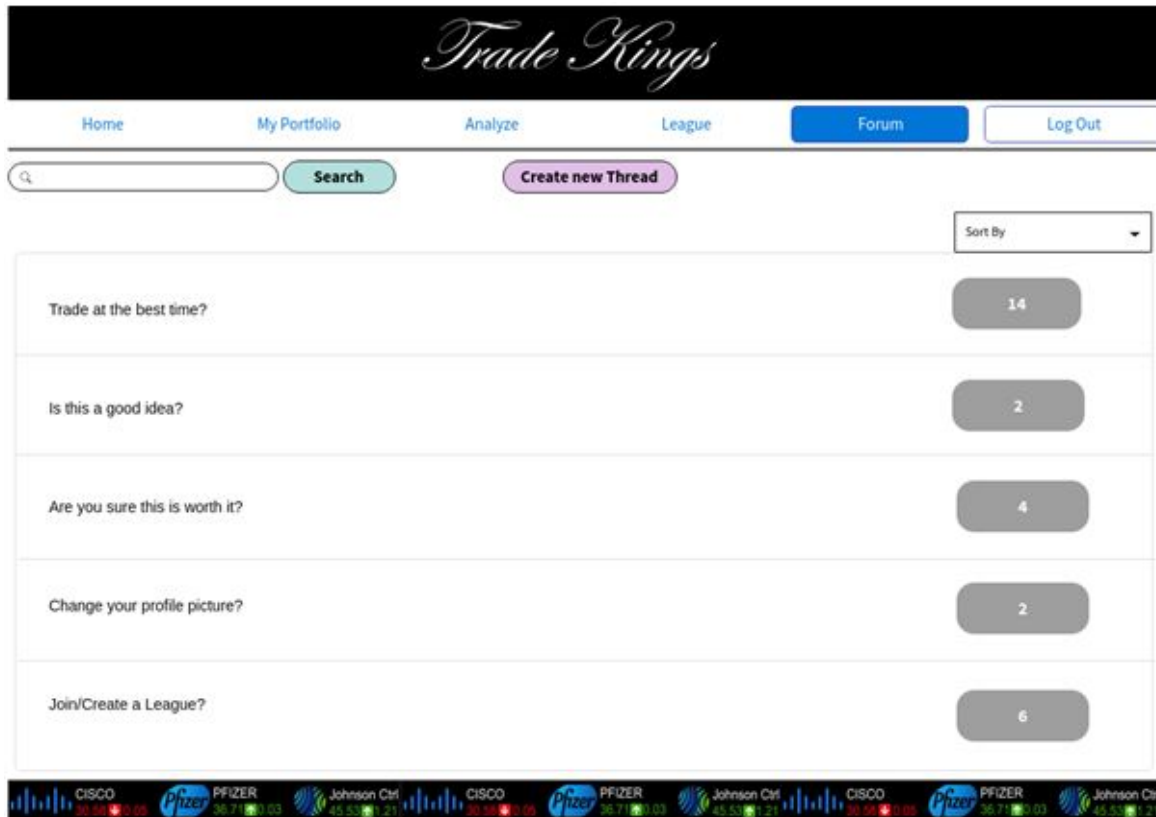


Figure 4.6 - Preliminary view of the Investment Forum

B. User Effort Estimation

User-Interface Navigation vs. Clerical Data Entry Comparison:

Scenario	Number of Clicks	Key input
Login	3	0-79
Register	10	50-80
Trade Stocks	3-4	4-15
Joining a League	2-3	0-20
Creating a League	5-10	20-40
Analyzing Assets	1-2	1-6
View Leaderboard	1	0

Register and Login

Assuming that user visited the website and wants to login if user had already signed up before.

- **Navigation:**

1. Click on email address and type email id, 1 click and approximately 10 key input.
2. Click on password and enter your password, 1 click and approximately 10 key input.
3. Click on Login or hit enter on keyboard, 1 click or 1 key input

Assuming that user has no prior experience with the site and is the first time registering in the site:

- **Data Input:**

1. Click on first name and type your first name, 1 click and up to 10 key inputs
2. Click on last name and type your last name, 1 click and up to 10 key inputs
3. Click on email address and type your email id, 1 click and up to 25 key inputs
4. Click on password and enter your password, 1 click and up to 8 key inputs.
5. Click on confirm password and enter your password again, 1 click and up to 8 key inputs.
6. Click on security questions and select one and enter your answer, 1 click and up to 8 inputs. (Repeat another time for second security question)
7. Click on Register, 1 click or 1 key input.

Trade Stocks

Assuming that user has logged in and wanted to purchase stock.

- **Navigation:**

1. Go to menu and click on Analyze, 1 click
2. Select buy or sell button, 1 click
3. Click on input box to enter number of shares. 1 click
4. Click submit to finalize trade, 1 click

- **Data Input:**

1. Search for stock ticker name, 1-6 key input
2. Enter Number of shares, 1-7 key input

Joining a League

Given that a user is logged in and wants to join a league:

- **Navigation:**

1. Click League, 1 click
2. Click Join, 1 click
3. After finding league, click on it to choose it and finalize, 2 clicks

- **Data Input:**

1. Click on league's name or enter its name on search bar, 1 click or up to 20 key input

Creating a League

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

- **Navigation:**
 1. Click League, 1 click
 2. Click 'Create a League', 1 click
 3. After choosing the settings, click submit, 1 click
- **Data Input:**
 1. Create league's name, approximately 20 key input
 2. Enter in settings for the league, 5-7 clicks

Analyzing Asset

Assuming that user is logged in and wants to analyze a particular asset

- **Navigation:**
 1. Click on Analyze, 1 click
- **Data Input:**
 1. Click on search bar and type or use filter settings, 1-3 clicks and/or up to 4 key inputs.
 2. Click on the stock to be researched, 1 click

Viewing Leaderboard

Assuming that user is logged in and is in the main page.

- **Navigation:**
 1. If not on the home page, click "home" 1 click
 - a. Otherwise, no clicks required because after log-in, it defaults to home page with leaderboard

5 Domain Analysis

Domain Model

I. Concept Definitions:

Responsibility	Type	Concept Name
R1. Allow new users to register and existing users to login on homepage. Send confirmation email upon successful registration of new user via Mailing Queue.	D	User Controller
R2. Send data of newly registered users and updated data of existing players to Player Database Connection. Check status of player (whether or not they are a league manager or if they are a member in a league) when enabling player with certain controls of over a particular league.	K	User Controller
R3. Send data of leagues to League Database Connection regarding the settings that have been chosen and/or updated by League Manager.	K	League Controller
R4. Relay data between User Controller and Player Database. Send player data from User Controller to database. Respond to requests from User Controller to check if player is part of certain league and/or if they are the league manager.	D	Player Database Connection
R5. Send league data from League Controller to League Database.	D	League Database Connection
R6. Allows player actions based on league settings by checking league data via the League Database Connection (i.e. player cannot invest in equities if league settings is such that players can only trade cryptocurrencies).	D	League Controller
R7. A “scoreboard” with the rankings of all the players in a particular league.	K	Leaderboard
R8. Pulls real-time stock/cryptocurrency data from Finance API to allow users to research, trade, and track securities.	K	Finance API Adapter
R9. Sends new price/metric alerts (and corresponding data) to the Price Alert Database. System will frequently go through every “active” entry in the database to see if any alert has been triggered.	D	Price Alert Database Connection
R10. Queue requests for triggered price alert emails and registration confirmation emails.	K	Mailing Queue
R11. Record and execute various equity/cryptocurrency trade orders.	D	Trade System

R12. Displays the initial page of the website for users to login or create an account.	K	Home Page View
R13. Displays general information about the user's portfolio and profile.	K	Profile View

II. Association Definitions:

Concept pair	Association description	Association name
Home Page View ↔ User Controller	Once the login/registration form is filled on the Home Page, the information is sent to the User Controller to verify the information and take the next steps accordingly.	conveys login data
User Controller ↔ Player Database Connection	User Controller verifies login data with Player Database Connection or sends data for registering user.	sends, stores
User Controller ↔ Mailing Queue	Upon successful registration of new user, User Controller enqueues a request for a confirmation email to be sent by the Mailing Queue	ends registration data
League Controller ↔ League Database Connection	League Controller add/updates league settings in the League Database via the League Database Connection. League Controller also checks settings stored in database when deciding the allowed actions a player has (i.e. if the league settings are such that players are only able to invest in cryptocurrencies, then the league controller will know this setting and implement this restriction by receiving the settings data from the database).	sends, stores
User Controller ↔ Profile View	Send information needed to display user's account and portfolio.	sends
League View ↔ League Controller	Join and create leagues from "League" page.	stores data
League Controller ↔ Leaderboard	Update leaderboard frequently to list the standings (rank) of every player in any particular league.	stores
Finance API Adapter ↔ Trade System	Updates interface with trades and data that are occurring in the user's league	stores
Finance API Adapter ↔ Price Alert Database Connection	Update Prices with a Price Alert to the database that will be stored and used by the system for users	sends, stores

Price Alert Database Connection ↔ Mailing Queue	Send EPS, stock price or other stock related details to users via email assuming the price values have reached the target values initially set by the user.	sends
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III. Attribute Definitions:

Responsibility	Attribute	Concept
R14. Used to determine the actor's credentials involving how long they have been in the system. This may determine which data this actor will receive. If the user has registered (isRegisteredUser), but has never logged in (this will be recorded in the database), then when the user first logs in, the site will be in "Tutorial Mode".	isNewUser	User Controller
R15. Used to determine if the actor has an account in the site's database. If the user's username exists in the Player Database, then isRegisteredUser is "true" and the system will check the associated password when allowing the user to log in.	isRegisteredUser	User Controller
R16. Needed to determine if an actor is currently engaged in the system.	isLoggedIn	User Controller
R17. Needed to determine if an actor is not currently engaged in the system.	isLoggedOut	User Controller
R18. A method of determining whether an actor is currently in charge of hosting a stock fantasy league.	isLeagueManager	League Controller
R19. A method to determine whether an actor currently resides and is taking part in a stock league.	isInLeague	League Controller
R20. A method to check if user is the Educational Content Contributor. If "isECC" is true, then this user will be given additional privileges such as moderating the investment forum, and updating the "Market Updates" and "Valuation Strategies" tabs.	isECC	User Controller
R21. Allows an actor to check what stocks they	stocksOwned	Trade System

currently have in ownership in their portfolio and it is viewable by other actors.		
R22. List of current stocks being watched by a user including their EPS, share price and other financial statistics.	stocksTracked	Trade System
R23. Allows an actor to check what stocks they previously have sold in their portfolio and it is viewable by other actors.	stocksSold	Trade System
R24. Describes an actor's current performance relative to other actors participating in various stock fantasy leagues.	rank	Leaderboard
R25. Permission is given by the user to allow Trade Kings to access and verify the user through another account they own on a different social media application	isloggedinSC	User Controller
R26. The Mailing Queue will store the email address of the user that will be contacted when a price/metric alert is triggered or for registration confirmation emails.	email_address	Mailing Queue
R27. Displays all the information regarding, league, rankings, stocks, and any other actions that may have been taken within the account	display	Profile View
R28. Every league will have its own "leagueID". Each league will be stored in the League Database by its leagueID. Whenever the system needs to pull league data from the database via the connection, it will refer to the specific league based on its leagueID.	leagueID	League Database Connection
R29. Every user will have its own "playerID". Each player will be stored in the Player Database by its playerID. Whenever the system needs to pull league data from the database via the connection, it will refer to the specific league based on its playerID.	playerID	Player Database Connection

The concept of 'user controller' has many attributes. Once the login or registration form is filled on the home Page, the information is sent to the user controller and the attribute "isNewUser" is set. Then, to check if the user's account is in the database, "isRegisterUser" attribute is set. Also, if the user successfully logs in or logs off, the attributes "isLoggedIn" and

"isLoggedOff" are set, respectively. So to summarize, the user controller verifies login data with player database connection and sends data for registering user.

After a user joins and enters the *Trade Kings* league, he or she has the ability to become a manager of a specific league. So, it is very important to have 'league controller' attributes. League Controller adds league settings in the League Database via the League Database Connection and also checks settings stored in database when deciding the allowed actions a player has. So firstly, if an actor currently resides and is taking part in the stock league then "isInLeague" attribute will be set. On top of that, if an actor is currently in charge of hosting a stock fantasy league, then the "isLeagueManager" attribute is set.

This fantasy league deals with trading and buying stocks so it makes sense to add a concept of 'trade system'. This concept consists of four attributes. First, the "stocksOwned" attribute allows the user to see all the stocks that he or she owns as well as other users in that league. Then if a user want to keep track of a specific stock, then the "stocksTracked" attribute will be turned on. Also, if a user ever sold a stock in the past, then that user along with others in the league are able to see it with the "stocksSold" attribute.

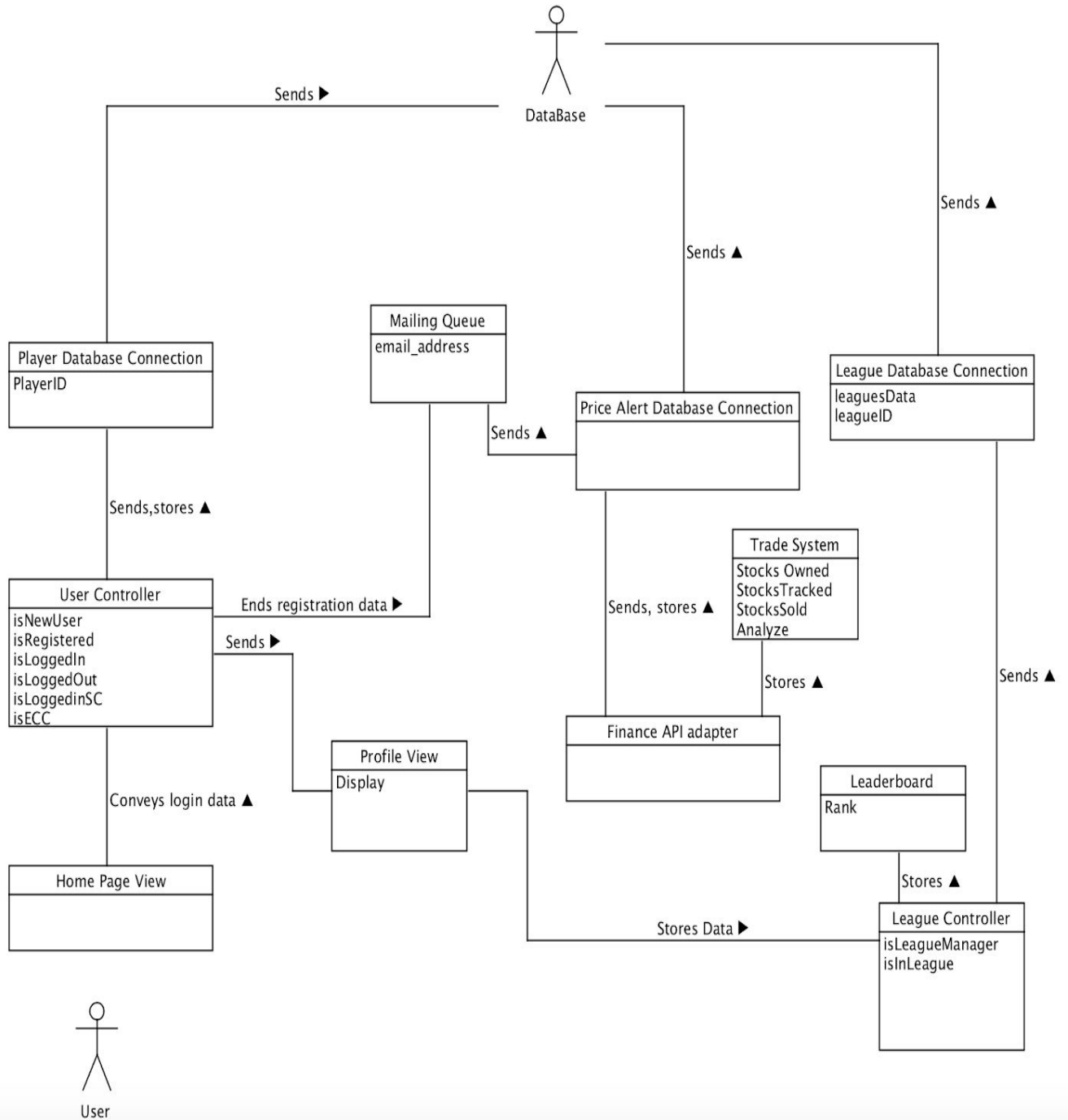
Within Trade Kings the 'Leader Board' concept enlists the "rank" attribute to assign individual users a numerical representation of their performance relative to other users. This attribute will allow the user to not only understand how they compare to their peers ,but also know which peers are performing the best. A user can then use this information to talk to their high performing peers in order to get tricks and tips in order to increase their own prominence. Another concept that will be used frequently by players is the 'Mailing Queue' which uses a "mail server" attribute in order to send notifications and alerts to users if for example a stock has reached a certain price. Another, example being a stocks EPS has reached a certain value.

The fantasy league also takes use of the 'Profile View' concept which uses the "display" attribute which displays all the information regarding, league, rankings, and stocks. Also, any other actions that may have been taken within the account are displayed in the Profile View. Essentially, a user can scroll through their profile using this attribute and view all relevant information regarding their stock fantasy leagues. One final concept in use would be the 'League Database Connection' concept that makes full use of the "leaguesData" attribute. The league's data attributes stores all information that was given by either the manger or invested stocks that deal with either league options or trade investment regulations.

IV. Traceability Matrix:

Domain Concepts								
Use Cases	PW	Account Controller	League Controller	Order System Controller	Login View	User Profile View	API Adaptor	Database Connection
UC1	7	X			X			X
UC2	6		X			X		X
UC3	7		X			X		
UC4	11		X				X	X
UC5	5		X	X		X	X	X
UC6	3					X		X
UC7	6							X
UC8	5			X		X	X	X
UC9	4	X	X				X	
UC10	2	X			X	X		X
Max PW		7	11	5	7	7	11	11
Total PW		13	28	10	9	28	25	45

Domain Diagram



B. System Operation Contracts

UC-1 Registering/Creating an Account

- *Preconditions*
 - Guest has no prior registrations to Trade Kings
- *Postconditions*
 - After registration, user data is inputted and stored in the player database
 - After clicking register, user is sent an account verification email
 - Subsequently, user is able to login via email and password

UC-2 Creating and Managing a League

- *Preconditions*
 - User must be registered on the Trade Kings website to continue further
 - Once the user has registered into the system, they will be presented with the option of creating and Managing the league.
 - User will then proceed to My League section and then Create League
 - After selecting the previous tabs, user then selects their Title and setting options for their newly created league
 - User will then proceed to My League section and then Manage Leagues
- *Postconditions*
 - Database is updated
 - My League section is updated

UC-3 Joining a League

- *Preconditions*
 - User has at least one league slot to join a league
 - User is registered with the website
- *Postconditions*
 - Once user joins a league, one of their league slots is taken up
 - User is sent a verification email
 - User's profile is updated with current leagues

UC-4 Researching Security/Market Data

- *Preconditions*
 - User is logged in to Trade Kings with his account
 - User was able to join/create a league
 - User must be registered on the Trade Kings website
- *Postconditions*
 - One of the players who joined the league is planning to buy stocks to make his initial investment

UC-5 Executing a Trade

- *Preconditions*
 - Player must have enough capital in cryptocurrency to make any trade
- *Postconditions*
 - After trading, user data is stored in the database
 - System updates user trade history
 - User receives an email with trade details

UC-7 Posting Educational Content

- *Preconditions*
 - Poster must be either an “Education Content Contributor” or a “Forum Moderator”
- *Postconditions*
 - Investment Forum and Strategies tab is updated with the newly posted content

C. Economic and Mathematical Models

Perfect Competition:

One of the most extensive concepts in Economics, the structures of perfect competition requires that no one player of our site will have an advantage over another which exists when has enough resources or power to control the market.

To fulfill the requirements of the Economic model of our project the following needs to be met:

- Players will have access to the same information regarding any stock via the Investment Forum and other educational content provided by the Educational Content Contributor(s).
- None of the players even the league creator can influence the market or the industries involved.

- No extra costs such as the commission of a broker or taxes will be charged when executing a trade.
- There will be an equal starting capital for every player in the league which is set by the League Manager. This ensures that every player starts at the same level and no one has an unfair advantage.

Understanding that these requirements can't be met in the real world is important because certain problems which are not in our control can cause the market to not be a perfect competition.

Stock/Cryptocurrency Pricing & Trading:

The method we use in determining the stock and cryptocurrency prices that the players will use is crucial because in reality the prices for buying the same stock (or cryptocurrency) can vary depending on various factors, but for our purposes every player should have to pay the same to preserve the principle of perfect competition.

- The stock and cryptocurrency prices used for trading will not require any modeling because the prices will be directly obtained from the Finance API (Alpha Vantage) as they change and be used as the trading price.
- When the player attempts to either buy or sell, the price taken from the Finance API will be multiplied by the number shares to determine the **cost** of buying or the **payout** for selling.
 - **cost** or **payout** = (price of stock/cryptocurrency) * (number of shares)
 - In the case of buying, the **cost** determined will be compared to the players capital, and only if the player has enough capital to carry out the transaction will the trade go through.
 - In the case of selling, the **payout** determined will be added to the players capital while the stock or cryptocurrency will be removed from the player's current portfolio.

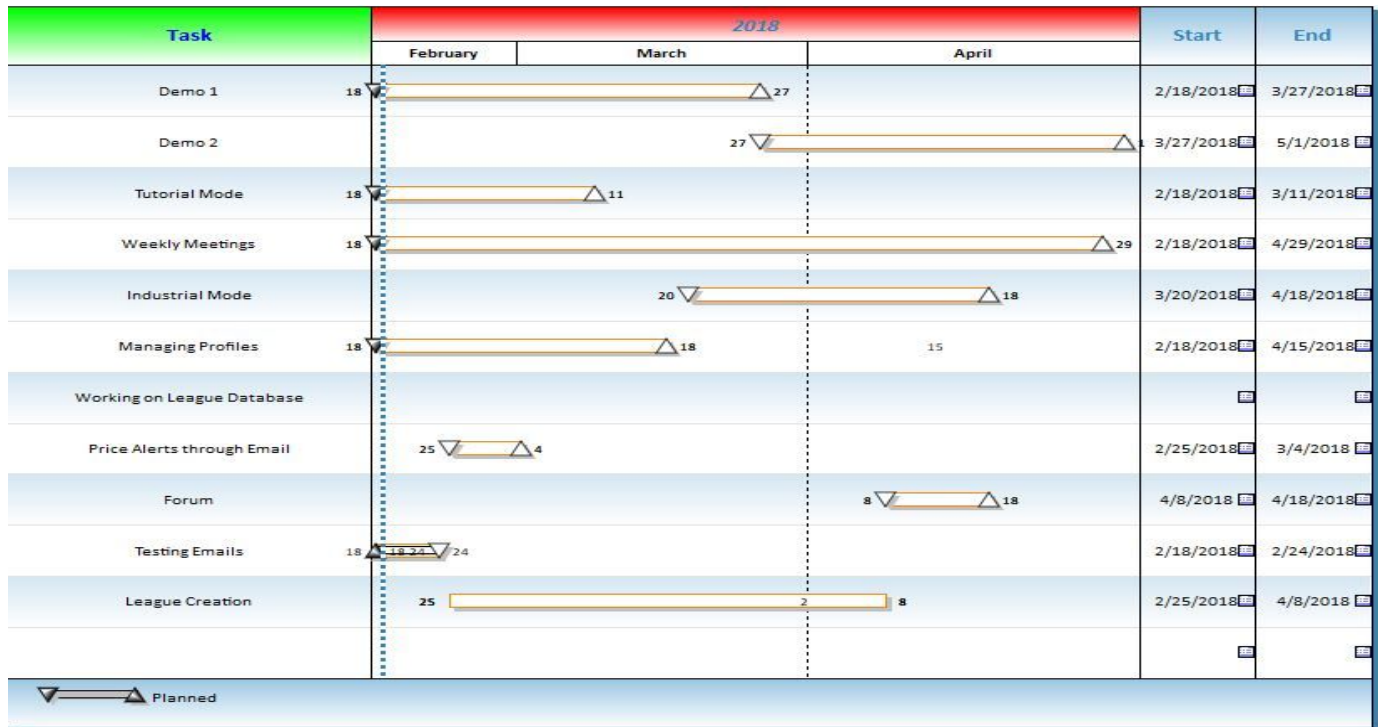
Determining Rankings:

The rankings of players within a league or in general are determined by figuring out the value of the player's **total assets**. This value is determined by combining the player's currently available capital along with current value of all their holdings in the stock market and cryptocurrency exchange. The value of current holdings is determined by summing the product of each holding with its current price.

$$\text{Total Assets} = \text{current capital} + \text{value of current holdings}$$

Once the **total assets** for each player is determined, the rankings can be determined by simply ordering the players by the value of their **total assets** from greatest to least. Since the market is constantly changing, we will be updating the calculations and these rankings very frequently to make sure the players can see the most accurate evaluation of their ranking.

6 Plan of Work



Gantt Chart for the Trade Kings' Future

Goals for Demo 1

- **Tour on the Website:** Site navigation should be possible, as well as user login/registration/logout.
- **Integration of Database and website:** Site should be able to recognize: registered users and new users, updated information of any current/new Leagues, user info and portfolio.
- **Working Forum:** Site should have a Forum tab in which it will take users to a page full of interactive chat rooms. Also will give users an option to create their own forum or join an active one.
- **Integration of Finance API and website:** Site should display and interact with finance API (Alpha Vantage API) in which it will provide users to have updated information on real-time stock and cryptocurrency data. This will help users to analyze, plan and make wise decisions when it comes on trading/buying/selling stocks (investment).
- **Email System:** Site should allow users to reset/change password, change email, and receive confirmation emails.

- **Registration/Log-in:** Give the user the opportunity to create an account on Trade Kings and receive an email of confirmation.

Breakdown of Responsibilities

During the process of creating the project, the group decided to divide individual parts for teams within the group. This is due to the time limit the group has in order to accomplish the main task for the semester. The divided sets of 3 members for each individual task is seen below in the Product Ownership section.

The first section was about User Registration the database to store all information need. This was done by Bhargav Sonani, Karlo Fernandez, and Raymond Del Rosario. During the process, the group was able to create a User Interface that would be both look nice and be easy to use. Along with adding key new functions like creating profiles through other social media applications.

With the Stock and Cryptocurrency Information, the set group of Nakul Patel, Krutant Patel, and Akarsh Sardana did a phenomenal job with allowing the program to gather data of stock information and store it into the program. Another accomplishment for the group was figuring out how display the the current status of each stock for the users of Trade Kings. This portion will be one of the main focuses for the Trade Kings later as the project further develops.

The final main mini project deals with alerts and email conformations as well as updates. The team of Christopher Cena, Diego Ordonez, and Christopher Salandra were able to accomplish the task of allowing the users to receive certain alerts that were dealing with their profile on the account. The main focus was on confirmation emails for registration the moment, to allow the user to be notified when they account would be usable on Trade Kings.

Projected Milestones

Over the past month, the team has come together to meet the demand for a fantasy stock market league project for users. The projected is focused on creating a website that would be usable for any no matter their level of knowledge on the stock market. Each week, the group has gotten together to focus on key parts that would contribute to the final overall program.

- **User Interface**
 - The group were able to create a user interface that would allow the user to access any option within the project with easy use.
- **User Options**

- With several options to choose from, the group wanted to make sure the user had a variety of options no matter what their knowledge or skill level is.

- **Financial API Adapter**

- The group wants to obtain crucial data and metrics on both stock market

- **Alerts/Emails regarding Information**

- A way to allow the user to be updated on anything that maybe happening within the account. The emails/alerts can vary from account confirmation to stock updates.

Product Ownership

Below we have shown the Project Ownership Table, which has been updated since the Proposal. The three functionalities that are highlighted are the ones that we are currently working on and have prioritized for our first demo.

Functionality	Members
User Registration (and Player Database)	Bhargav Sonani Karlo Fernandez Raymond Del Rosario
Executing Trades	Nakul Patel Krutant Patel Akarsh Sardana
League Modes (Industry, Equities, Cryptocurrency, and Traditional)	Bhargav Sonani Karlo Fernandez Raymond Del Rosario
Stock/Cryptocurrency Indices Information (Finance API)	Nakul Patel Krutant Patel Akarsh Sardana
Managing Portfolio	Nakul Patel Krutant Patel Akarsh Sardana
Email Queue	Christopher Salandra Christopher Cena Diego Ordonez

Leagues (and League Database)	Bhargav Sonani Karlo Fernandez Raymond Del Rosario
Price Alerts	Christopher Salandra Christopher Cena Diego Ordonez
Investment Forum/Valuation Strategies Tab/Market Updates	Christopher Salandra Christopher Cena Diego Ordonez

Project Management & Responsibilities Breakdown

Requirements	Raymond	Akarsh	Bhargav	Chris Cena	Chris Salandra	Diego	Karlo	Krutant	Nakul
Project Management (10 points)		45%	30%						25%
Customer Statement of Requirements (9 points)	10%	45%		15%	10%			10%	10%
System requirements (6 points)	30%			5%		25%	5%	25%	10%
Functional Requirements Specification (30 points)		35%		20%			20%		25%
User Interface Specs (15 points)	30%		45%			5%	5%	15%	
Domain Analysis (25 points)	5%	35%		20%	5%		15%		20%
Plan of Work (5 points)	5%				40%	40%	15%		

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