SOFTWARE REQUIREMENTS SPECIFICATION
FOR
STOCK MARKET SIMULATOR

STOCK MARKET SIMULATOR

SEUNGWON KEUM, 叶昊林, 罗涵

May 1, 2019

Version 1.5.0

REVISION HISTORY			
DATE	**VERSION**	**DESCRIPTION**	**AUTHOR**
May 1, 2019	1.5.0	Modified System features and added Diagrams	罗涵
April 22, 2019	1.4.1	Modified System Features	Seungwon Keum
April 15, 2019	1.4.0	Added Additional Nonfunctional Requirements	Seungwon Keum
April 8, 2019	1.3.0	Added Requirements of External Interface	Seungwon Keum
April 1, 2019	1.2.0	Added System Features	Seungwon Keum
March 24, 2019	1.1.0	Added Description	叶昊林
March 17, 2019	1.0.0	Added Introduction	Seungwon Keum

Table of Contents

INTRODUCTION

PURPOSE

For students who major in marketing and economics, it is essential to have knowledge about stock market. Because of this need, college offers a course regarding the stock market investment. There are some tools that students can experience the real-world stock market, however, for the course instructor, it is difficult to check each student's performance and history straightforward. Moreover, it is difficult to grade the students based on their actions. Therefore, in order to solve this problem, new web-based program called SMS (Stock Market Simulator) will be introduced. This SMS will provide students to experience real-world stock market simulating as well as to help the course instructor to see the students' performance such as reports and rankings.

This Software Requirements Specification (SRS) outlines the steps taken to create a working solution for the initial deployment of the SMS system. The role of our team will be to design and implement a system that can be used by the students and the instructor as a self-service tool. The first phase of SMS system will allow users to establish a secure connection to the SMS server, user login, check for information, buy and sell stocks, and view wallet and transaction records. As the instructor make a contraction with us, we will distribute the number of accounts to the instructor.

INTENDED AUDIENCE AND PERTINENT SECTIONS

This document is written by Seungwon Keum, 叶昊林, 罗涵 in response to the needs of college instructor in order to educate college students in simulating real-world stock market. This document is intended for use by who are involved in the design of the SMS system. This includes designers, developers, testers, and programmers. It is recommended to read the document from the beginning to end to fully understand how the program is implemented and works. If the reader has interest in specific area of this document, check the table of content to see the detail. Search by keyword may be helpful to locate the right information regarding specific interest.

This document is not intended for use by end users. Separate document for end users will be provided after completing the software.

PROJECT SCOPE

In the first phase of SMS system, the following functions will be included:

- ➢ Establish a secure connection
- ➢ User login
- ➢ User checks the information of him/herself
- ➢ Dashboard – Search for companies
- ➢ Buy stocks
- ➢ Sell stocks
- ➢ View wallet and transaction records

This SMS system will be accessible via any internet browsers which include Chrome, Safari, Opera, Firefox, and IE. We will invite our colleagues to perform the User Acceptance Test.

DOCUMENT CONVENTIONS

➢ Main topics are bolded in a heading and have font size of 16.
➢ Sub topics are also bolded and below the main topic, but have font size of 12.
➢ Bullets are below the sub topics and have font size of 11.
➢ Contents inside the bullets have font size of 10.
➢ All acronyms will be introduced with its full name, however after it is first introduced, only acronyms will be used to replace the full name.
➢ Appendices include any acronyms that used in this document as well as supporting figures and diagrams.

REFERENCES

Stock Market Game - https://www.investopedia.com/simulator/

Virtual Stock Exchange - https://www.marketwatch.com/game

Wall Street Survivor - http://www.wallstreetsurvivor.com/

How the Market Works - http://www.howthemarketworks.com/

Market Watch - https://www.marketwatch.com/game

DESCRIPTION

PRODUCT PERSPECTIVE

The SMS system is a brand-new attempt for introducing the real-world stock market to students, and enable students to test various investment portfolios learned from the lectures. As a small team, our top concerns are about the ensuring the data integrity and system usability. The goal with Phase 1 of the SMS system is to offer students a system with all data retrieved from real world with low latency (less than 3 second), including necessary functions such as querying the stock price, buying & selling stocks, checking account balance & information, as well as their ranking among fellow students. The desired result is a highly-available web system that allows business students to simulate the real-world investment within one month, given 1 million dollars at the beginning. Professors could grade students/ student groups by system-generated evaluation reports on their investment portfolio, at the end of the month.
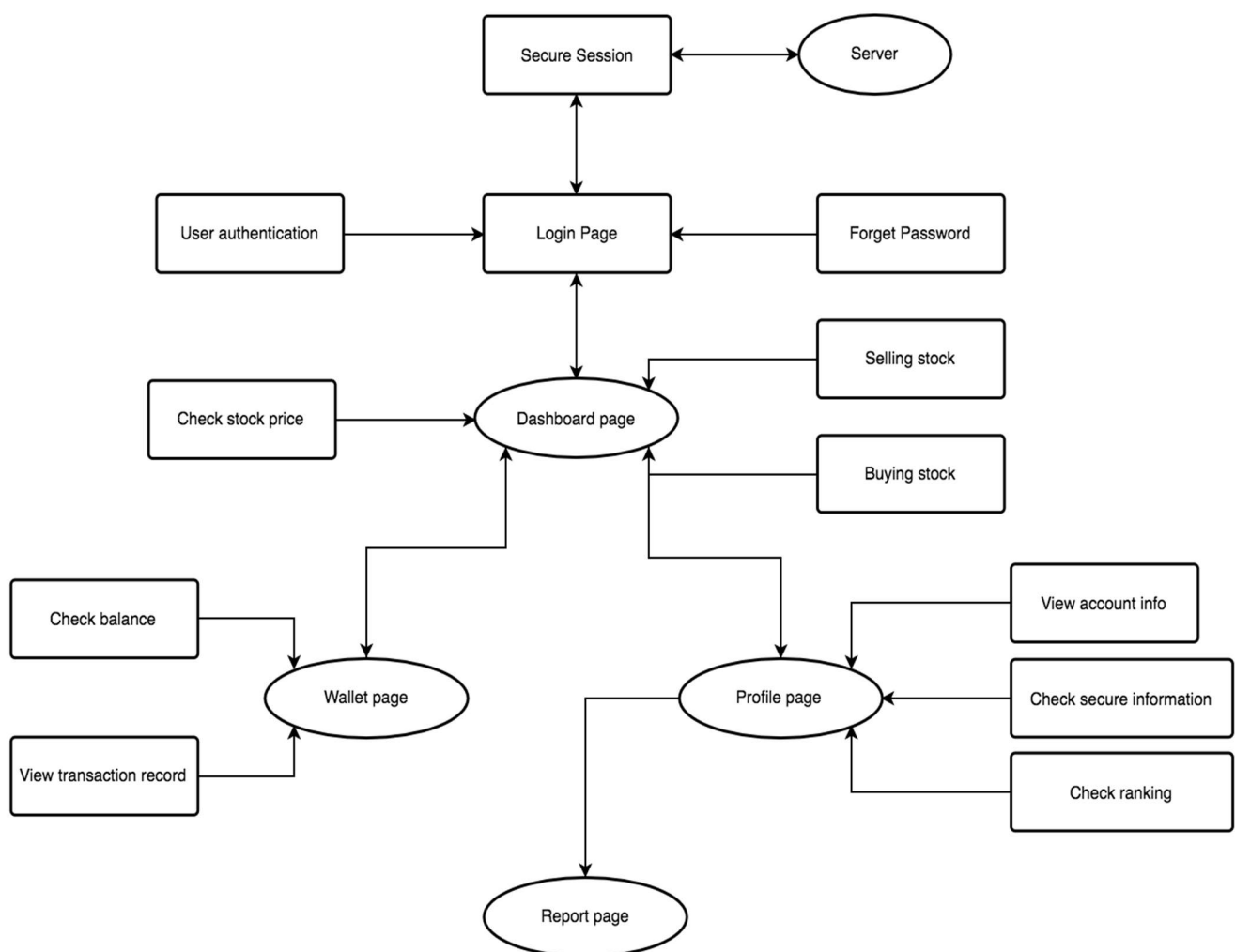

Figure 1. Product Features

FEATURES

The SMS system allows users to login on a website and performs a series of actions in real-world stock market. These functions include checking stock price, buying stocks, selling stocks, viewing account information.

USER OVERVIEW

College students studying business and investment portfolios are the target users of the SMS system. Under the guidance of professor or instructor, users will use the simulate stock market to test their investment portfolio. General characteristics of these users are:

➢ Adults age 18 and older
➢ Education level is at least an undergraduate degree
➢ Is familiar with browsing website technics
➢ Hate website errors
➢ May or may not be familiar with stock market
➢ May or may not have experience in investment

OPERATING ENVIRONMENT

The website is compatible with various browsers – Chrome, Safari, Firefox, Opera, Edge, and even Internet Explorer (IE) 8. Credit to the implementation by responsive design, the website layout is also compatible with small windows in mobile browser.
We have chosen the following elements of the environment for SMS system:

➢ The Server is with 16GB RAM, 12 core / 24 threads CPU, with a 16-bit CentOS7 interface.
➢ The database which holds user data and stock market data is SQL. The management of database is through phpMyAdmin software with a GUI interface.

CONTRAINTS: IMPLEMENTATION / DESIGN

➢ The SMS system will be designed only for the college students (group users) and educational purpose.
➢ It is the responsibility of users to be familiar with the basic skills of browsing the internet.
➢ It is the responsibility of users to remember his/her account information. A license code is needed if one wants to reset the password for security issue.
➢ The SMS server is available 24/7, except during scheduled maintenance times.
➢ For the best use experience, we recommend users visit SMS system on personal computers (PC). The application will be designed for use on the 2560 x 1600 screen size that comes standard on the personal computers.
➢ For mobile users, credit to the responsive design, the SMS system could adjust layout to fit small screens on mobile phone. However, it is not recommended.
➢ Any connection/performance restriction applied to web-based application will also applied as usability constraints of SMS system.
➢ IE 8 cannot enjoy full functions of the SMS system due to the lacking support of HTML5 and CSS3. For IE users, we recommend to upgrade the browser to IE 9 or use other browser such as Chrome, Firefox, Safari, or Edge.

- ➢ Secure sessions will be monitored in order to ensure proper closure after 10 minutes of inactivity for security purposes.
- ➢ Website will not record user's cookie for security concerns.

DOCUMENTATION

The SMS system will use a very intuitive design, leaving the following considerations:

- ➢ A Portable Document Format (PDF) User manual will be provided with an overview of the SMS system and its functionalities.
- ➢ It will be the responsibility of the studio to provide users of the SMS system with instructions on usage of the website from a users' standpoint.
- ➢ User acceptance testing materials will be provided by a third-party consulting company.
- ➢ A "Q&A" button will appear in the footer region of the website at all times. When a user clicks on this button, a help center article provided by the studio will open in an external browser tab to provide users with additional instruction.
- ➢ A "Contact us" link will appear in the footer region of the website at all times. When a user clicks on this link, a new email draft will appear with the email address of the studio's customer helpers. Users can contact the studio and start a ticket. A response to the ticket shall be made within 12 hours.

ASSUMPTIONS / DEPENDENCIES

- ➢ The SMS system will be used only by confirmed users through a license code authentication.
- ➢ Users of SMS system are visiting website via browsers that support HTML5 and CSS, such as Chrome, Firefox, Safari, Edge, and IE 9.
- ➢ Users of SMS system are familiar with basic knowledge about browsing the internet.
- ➢ Users will keep the account information such as email and password safely.
- ➢ It is the responsibility of the studio to keep the SMS system updated with the most current technology and ensure its safety.
- ➢ The servers at SMS are up and running for whole time except during maintenance.

SYSTEM FEATURES

This section describes the low-level details of each system function of SMS system. It will provide the priority of each functions. Thus, the developers and programmers can see which functions should be implemented first and what to review first.

SECURE SESSION

DESCRIPTION AND PRIORITY	Since the instructor grades each student based on their performance, each student's data is sensitive and keeping them secure is essential. The information contained within each session must remain protected and confidential. Developers are responsible for safeguarding the data transferred by each student's action. Therefore, it is a must to keep the student's information encrypted from malicious intent. This is the highest priority.
STIMULUS / RESPONSE SEQUENCES	The user opens the website via any kinds of internet browser. This initiate the user interface and automatically connects to the server securely.
FUNCTIONAL REQUIREMENTS	1. A secure session is established between the SMS website and the server 2. A pop-up message will be displayed to the user that the secure session has been established 3. If the secure session fails to establish, another pop-up message will show that saying there had been an issue regarding secure connection 4. When the website is closed or the user is inactive for more than 10 minutes, the secure session will be terminated automatically

LOGIN

DESCRIPTION AND PRIORITY	In order to participate in SMS website, the user will be promoted to enter a username and password through the login screen. Upon submission of valid login credentials, the submitted username and password will be verified by the server. Verification of the user is essential, because the action that the student made affect his or her grade in the future. Thus, ensuring that only authorized users can access to his or her own data is crucial. Each student, instructor, and SMS system are responsible for the protection of login credentials. This feature is of highest priority.
STIMULUS / RESPONSE SEQUENCES	After a secure session is established, the user will be asked to login to perform other actions. The user will submit a username and password. Pressing the button "Login" will pass their credential to the server for validation. A pop-up message will display whether the user has logged on successfully or not.
FUNCTIONAL REQUIREMENTS	1. A login page is displayed and asks the user to enter a valid user name and password 2. The password will be masked with asterisk as it is typed into the login interface 3. Clicking the "Login" button submits the log in information of the user to the server 4. The credentials are compared against those stored in the server 5. If login information does not match, a message pops up and notify the user that he or she fails to log in 6. If login information matches, the server returns the confirmation 7. After confirmation of correct login information, the SMS website shows additional menus

CHECK INFORMATION

DESCRIPTION AND PRIORITY	After successfully log on to SMS system, the user can select "PROFILE" to check his or her information from the main menu. This allows users to check their information, such as their personal information and performance. Since this feature has all the important information of the user, it is as crucial as login ability. Thus, this has medium priority.
STIMULUS / RESPONSE SEQUENCES	After a user clicks on "PROFILE" from the main menu, the new page opens. This page includes the user's personal information such as name, ID, and email address along with the user's performance. The user can change some information such as name and email address in general settings section. The user can change password via security settings. Moreover, the user can see his or her performance upon clicking "PERFORMACNE" and analyze stocks via clicking "REPORTS".
FUNCTIONAL REQUIREMENTS	1. The user information page is displayed to the user 2. "GENERAL SETTINGS" button enables user to view and change some personal information 3. "SECURITY SETTINGS" button enables user to change the password 4. If the user edits some information, the SMS website will be refreshed and display the updated user information 5. "PERFORMANCE" button enables user to view his or her performance including rank 6. "REPORTS" button enables user can analyze the stocks that the user has bought

SEARCH FOR COMPANY

DESCRIPTION AND PRIORITY	After successfully log on to SMS system, the user can select "Search Company" from the Dashboard in main menu of the website. This allows users to search for available stocks. This function is one of the main motivators of the website. Just like checking user's information, it has medium priority.
STIMULUS / RESPONSE SEQUENCES	After a user clicks on "Search Stocks" from the Dashboard, the new page with search interface opens. This page accepts an entry of name of the company and the company ID and submits this request to the server. Then the server returns with a list that matches the user's selection. If no exact companies are available, the system will provide to the user with similar name or ID of the company.
FUNCTIONAL REQUIREMENTS	1. A search form will be provided to the user that request the name and the ID of the company 2. Click search button to submit the request 3. The request is validated for completeness and accurate name or ID 4. If matching company exist, the server will display matching company to the user 5. If no matching company exist, the error message will pop up and display the similar company to the user

BUY STOCKS

DESCRIPTION AND PRIORITY	After selecting the desired company, the user can make a purchase for that company's stocks. The user will submit how many stocks he or she wants and how much he or she wants to pay for each stock. Although this feature is a main motivation of SMS, it is not as crucial as establishing the secure session and login option. Thus, its priority is medium.
STIMULUS / RESPONSE SEQUENCES	After a company of user's choice is selected, the server displays a current status and information of the selected company. Upon submission, the SMS website submits the data of user's input to the server's database. If the user is eligible to make a purchase, the system will notify the user that the transaction is on process. If the user is not eligible, for example the user has no money left, an error message will pop up and display to the user. In order to complete the transaction, the desired price per stock must meet the current price. The system will be keep running and comparing even though the user logs out. Upon successful transaction, the user will get notification. The user can cancel anytime if the transaction is on process.
FUNCTIONAL REQUIREMENTS	1. Display a buy form to the user to enter how many stocks he or she wants and how much he or she wants to pay for each stock 2. Click "Buy" button to submit the data 3. Data is validated for completeness 4. If data is missing, an error message is displayed 5. If data is complete, the SMS will submit the data to the server database to check eligibility 6. If the user is eligible to buy, a message is displayed saying that the transaction is on progress 7. If the user is not eligible to buy, an error message is displayed 8. If the desired price per stock matches with the current price of the stock, a successful message is displayed 9. If the user wants to cancel transaction during the transaction is on process phase, the user can cancel transaction

SELL STOCKS

DESCRIPTION AND PRIORITY	After selecting the desired company, the user can sell the selected company's stocks if he or she owns any. The user will submit how many stocks he or she wants to sell and how much he or she wants to receive for each stock. Although this feature is a main motivation of SMS, it is not as crucial as establishing the secure session and login option. Thus, its priority is medium.
STIMULUS / RESPONSE SEQUENCES	After a company of user's choice is selected, the server displays a current status and information of the selected company. Upon submission, the SMS website submits the data of user's input to the server's database. If the user is eligible to sell, the system will notify the user that the transaction is on process. If the user is not eligible, for example the user does not have corresponding company's stocks, an error message will pop up and display to the user. In order to complete the transaction, the current price per stock must meet the desired price. The system will be keep running and comparing even though the user logs out. Upon successful transaction, the user will get notification. The user can cancel anytime if the transaction is on process.
FUNCTIONAL REQUIREMENTS	1. Display a sell form to the user to enter how many stocks he or she wants and how much he or she wants to receive for each stock 2. Click "Sell" button to submit the data 3. Data is validated for completeness 4. If data is missing, an error message is displayed 5. If data is complete, the SMS will submit the data to the server database to check eligibility 6. If the user is eligible to sell, a message is displayed saying that the transaction is on progress 7. If the user is not eligible to sell, an error message is displayed 8. If the current price per stock matches with the desired price, a successful message is displayed 9. If the user wants to cancel transaction during the transaction is on process phase, the user can cancel the transaction

VIEW WALLET

DESCRIPTION AND PRIORITY	Users who have previously made a transaction with company via buying and selling options can view their transaction details by selecting "WALLET" from the main menu. From this page, users can see how much money they have left and see the transaction history. This functionality is not core to the vision of the website as a whole so its priority is low.
STIMULUS / RESPONSE SEQUENCES	After a user clicks on "WALLET" from the main menu, the SMS website will make a request to the database server for how much money the user has currently as well as entire transaction record that the user has made. On the left side of the page will show the current balance and the right side of page will show the transaction history from the most recent. For the transaction that is still on the process, which is indicated by "Pending", the user can cancel that transaction.
FUNCTIONAL REQUIREMENTS	1. The SMS website will request a current balance and entire list of transaction records for the user from the database server 2. If no transaction has been made, the right side of page will be empty 3. If there exist transaction history, a listing of all transaction record will display 4. For the transaction that is still on the process, it displays "PENDING" on status section 5. Other successful transactions it displays "CONFIRMED" 6. The user can cancel the transaction that is on "PENDING" status by clicking "Cancel" button to refund the money

REQUIREMENTS OF EXTERNAL INTERFACE

USER INTERFACES

Describe product / user interface characteristics, including standards, style guides, constraints, functionality, and sample screens if applicable.

The SMS website has 4 main interfaces that users will view. Samples of these interfaces are provided in this section.
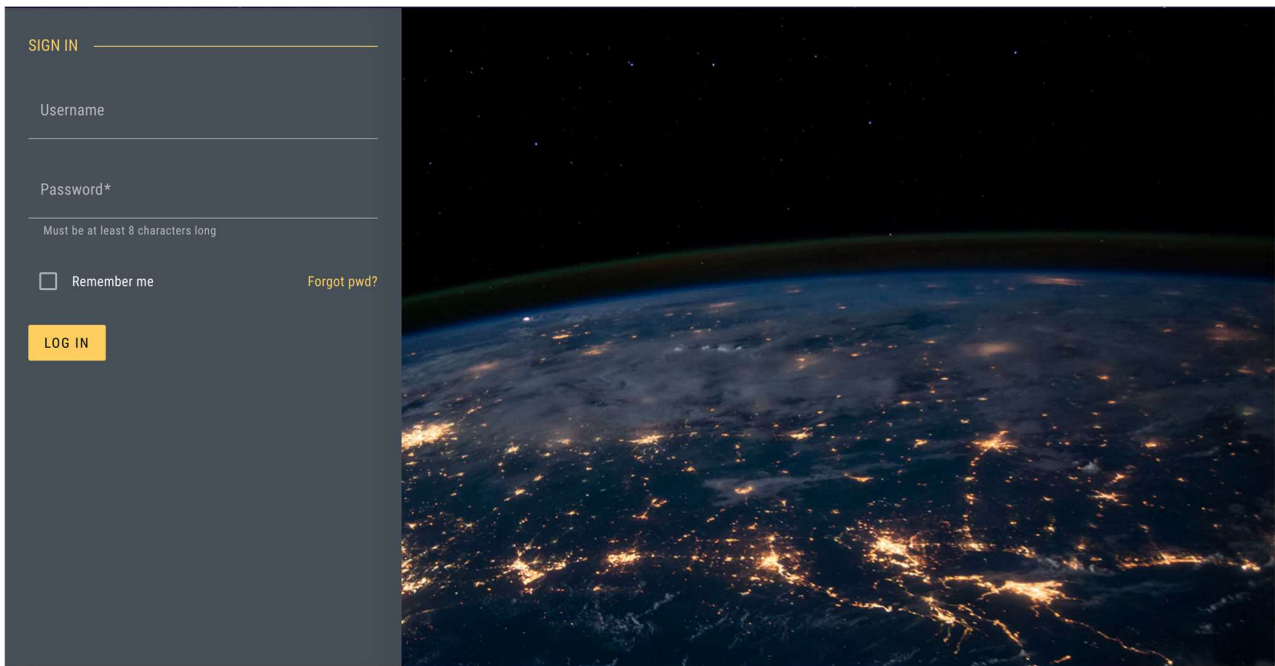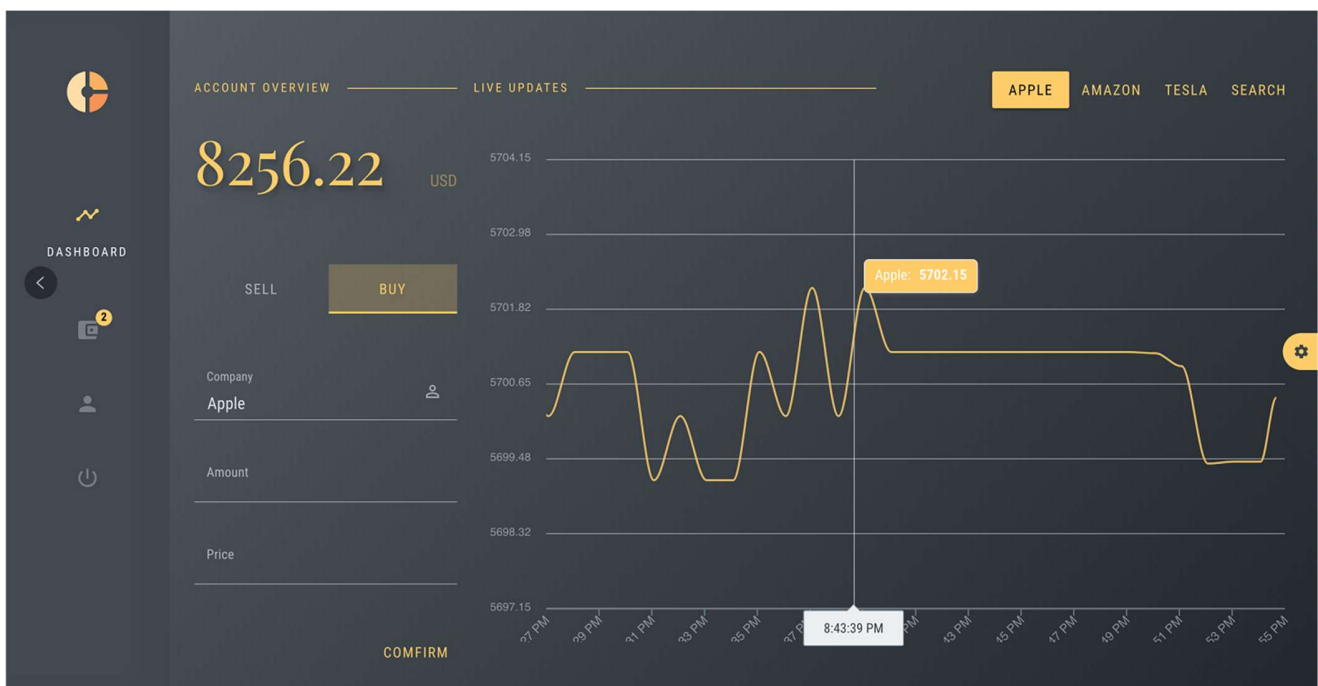

Figure 2. Login Page

Figure 3. Main Page with menus

Alienware Area-51

Processor	AMD Ryzen™ Threadripper™ 2920X(12-Core/24-Thread, 38MB cache, up to 4.3GHz Boost Frequency)
Hard drive	128GB M.2 SATA SSD (Boot) + 2TB 7200RPM SATA 6Gb/s (Storage)
Memory	16GB DDR4 at 2666MHz Dual Channel
Graphic card	Liquid Cooled NVIDIA® GeForce® GTX 1080 8GB GDDR5X
Memory slots	4x 288-Pin DDR4 UDIMM Slots
Internal expansion slots	Slot 1: PCI-Express (mechanical x16, electrical up to x16) Slot 3: PCI-Express (mechanical x16, electrical up to x8) Slot 4: PCI-Express (mechanical x16, electrical up to x16) Slot 5: PCI-Express (mechanical x16, electrical up to x8) Slot 6: PCI-Express (mechanical x4, electrical x4) Slot 7: PCI-Express (mechanical x16, electrical up to x8)
Chipset	AMD X399 Chipset w/Unlocked BIOS for Overclocking, CPU socketTR4 (4094 pins)
Front ports	2 SuperSpeed USB 3.1 Gen 1 Type-A with PowerShare 2 SuperSpeed USB 3.1 Gen 1 Type-A
Rear ports	2 RJ-45 Killer Networks E2500 Gigabit Ethernet Port 2 Hi-Speed USB 2.0 6 SuperSpeed USB 3.1 Gen 1 Type-A 1 SuperSpeed USB 3.1 Gen 2 Type-A 1 SuperSpeed USB 3.1 Gen 2 Type-C with 15W PowerShare 1 SPDIF Digital Output (TOSLINK) 1 Line-In (blue port)
Power	1500 Watt Multi-GPU Approved Power Supply with modular cabling

SOFTWARE INTERFACES

Operation System - CentOS7

Kernel foundation	Linux 3.10.0
Compiler / toolchain	GCC 4.8.5
Logical Volume Manager	LVM2
Auditing	audit
Compatibility libraries (toolchain)	CentOS 5 & CentOS 6
LSB support	4.1
Web Server	Httpd 2.4.6 (apache)
Server Message Block (SMB)	Samba-4.1.x
eMail Client	Evolution 3.22, Thunderbird 60
Graphics	X.org 7.7
Database	MariaDB 5.5.x, PostgreSQl 9.2.x
Additional features	SELinux, Ext3 Performance Enhancements, NPTL, Autofs V4, Hyperthreading scheduler

COMMUNICATION INTERFACES

The Secure Socket Layer (SSL) protocol will be hard coded into the website to provide encryption and security and prevent unauthorized access to the system.

The Hypertext Transfer Protocol Secure (HTTPS) will use an SSL Digital certificate protocol to encrypt communication between the website, SMS server, and database.

ADDITIONAL NONFUNCTIONAL REQUIREMENTS

PERFORMANCE

Requirement	Description
System Availability	The application will have no more than 10% of downtime within a given month. Each first day of the month there will be scheduled maintenance for minimum of 6 hours. Unscheduled downtime and maintenance must be addressed and resolved in as little time a possible.
System Response	The website must take no more than 3 seconds to respond to any request and return data from the SMS database.
System Responsiveness	The system must display a loading indicator to signify any requests of retrievals of data between the website, the SMS server, and the database.
System Load Balancing	The system must be able to support 5 classes, which is about 500 users without any degradation. The system must support 10 classes, about 1,000 users with no more than 10% degradation.
System User Session Timeout	If the user has been idle for 10 minutes, the system will recognize the situation. At this period, the user will be logged out and must log in again to restore a secured session.

SAFETY

Requirement	Description
System Accessibility	The website will react to the web browser accessibility settings that the current user is running. This includes default setting and special accommodations provided by the browser that the user is using.
Soft Color Scheme	The website will use a color scheme that does not include high contrast colors in order to reduce eye strain.
Controls	The website will not override the safety functions of the deice that currently in use.
Unintended Shut Down	The website will close when the device happens to shut down or reboot. This will require that the user re-open the website and restart a secure session after restarting the device.
Device High Jack	The website and user accounts will have the capacity to be deactivated in cases where someone else try to access.

SECURITY

Requirement	Description
Data Encryption	All communication between the server and the user will be encrypted using 129-bit standards. This protects the machine, data, and the personal information of users from interception.
Automatic Logout	If the user is idle for 10 minutes, the user will be logged out. In order to establish a secure session, the user is required to log in again.
Cache	The website will not store any personal data on the machine.
SSL Certification	The website requires that a valid SSL certificate be maintained at all times to allow trusted and secure communication.
Memory Protection	The website will perform garbage collection of the session data upon closure of the website.
Proactive Response	A trace log will be used to capture all interactions between the SMS website and server. Suspect activity will alert the SMS administrator to take further action.

SOFTWARE QUALITY

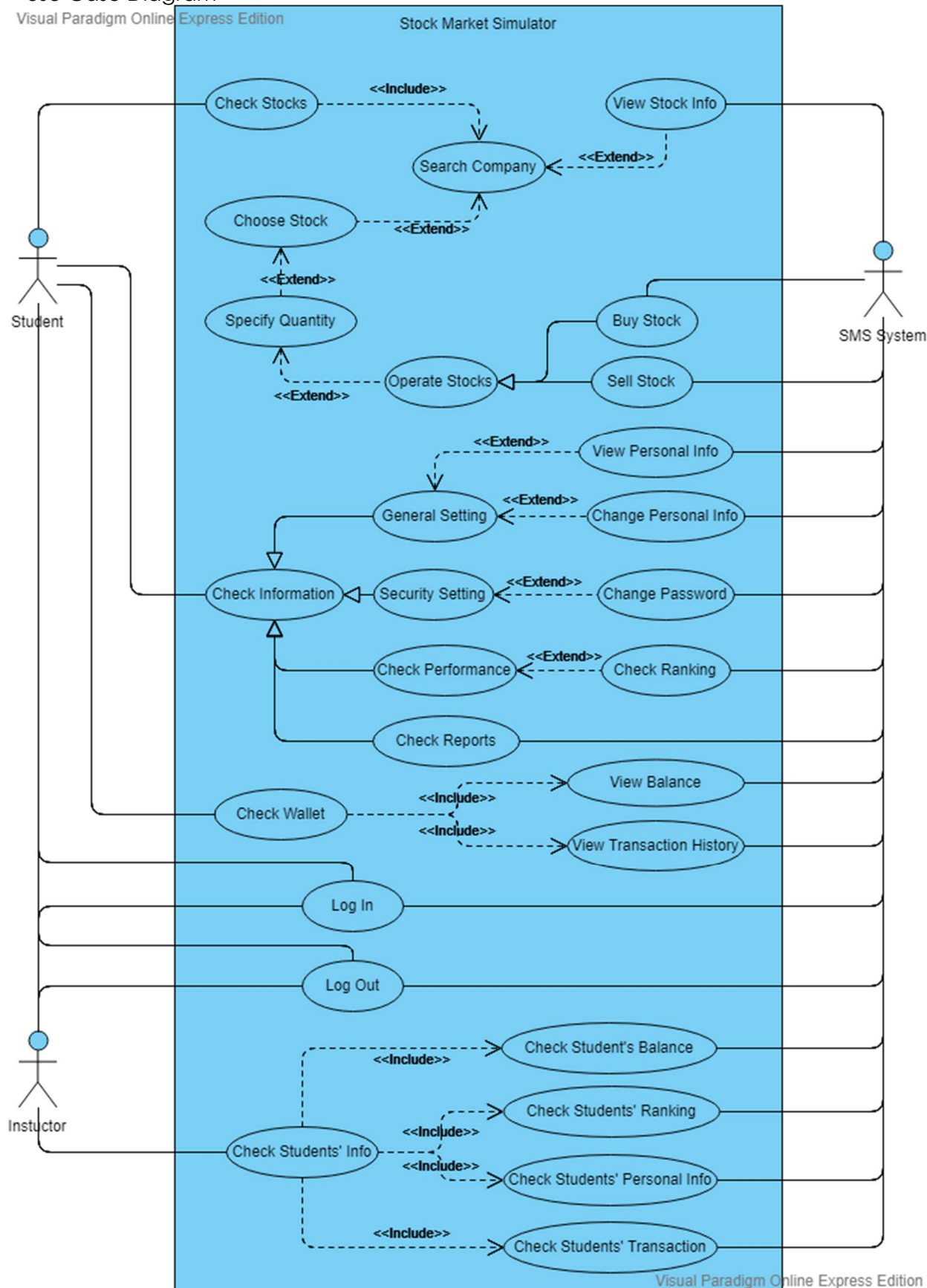| Requirement	Description
Font Family	The website will use the two types of font, which are Playfair Display and Roboto Condensed to display to the users.
Font Size	Regular text will use the font size of 18. The font size will increase to 24-point for all headers and decrease to 12-point for description and footers.
Images	Team logo will be present on all screens in the upper left corner with exception of the loading screen.
Usability	The website will score no less than 7 on ease of using during usability tests.
Updates	Each update to the website will include versioning for troubleshooting and traceability purposes. The version number can be found on the log in page of the website.
Reusability	The website will be developed using Object Oriented Programming. This platform allows for design features to be reused.

APPENDICES

APPENDIX A: GLOSSARY OF TERMS

Terms and acronym which may not be familiar to all readers are provided in this section. Definitions provided are limited to their scope within this document. All terms are listed in alphabetical order for easy reference.

Term	Definition
OS – Operating System	The software that support the basic functions of the device on which it is installed, including executing applications and controlling peripherals
SMB – Server Message Block	A network file sharing protocol that allows applications on a computer to read and write to files and to request services from server programs in a computer network
SMS – Stock Market Simulator	A website that allows users to simulate the real-world stock market system
SRS – Software Requirements Specification	A description of software to be developed
TCP/IP – Transmission Control Protocol/Internet	A set of networking protocols that allows two or more computers to communicate

APPENDIX B: ANALYSIS DOCUMENTATION

➢   Use Case Diagram

➤ Use Case Description

System	Stock Market Simulator
Use Case	Login
Actors	Student, Instructor, SMS system
Description	The user will enter a username and password through the login screen. Upon submission of valid login credentials, the submitted username and password will be verified by the server. Verification of the user is essential, because the action that the student made affect his or her grade in the future. Thus, ensuring that only authorized users can access to his or her own data is crucial. Each student, instructor, and SMS system are responsible for the protection of login credentials.
Stimulus	After a secure session is established, the user will be asked to login to perform other actions. The user will submit a username and password. Pressing the button "Login" will pass their credential to the server for validation.
Response	A pop-up message will display whether the user has logged on successfully or not. If the user has logged in successfully, the website will automatically transfer to the main page for the user.
Comments	The user needs to log in every time they close the website or log out.

System	Stock Market Simulator
Use Case	Log out
Actors	Student, Instructor, SMS system
Description	After the user log out, the website will automatically transfer to the log-in page. The browser will not be able to keep the previous user's information. User can start log in to change account or just to leave the website.
Stimulus	There is a LOGOUT button on the menu.
Response	A pop-up message will display whether the user has logged out successfully or not. If the user has logged out successfully, the website will automatically transfer to the log-in page for the user.
Comments	Log out will remove session cookies

System	Stock Market Simulator
Use Case	Check Profile
Actors	Student, SMS system
Description	After successfully log on to SMS system, the user can select "PROFILE" to check his or her information from the main menu. This allows users to check or modify their information, such as their personal information and performance, as well as changing their password.
Stimulus	There is a button called "PROFILE" on the main menu. In the profile page, there are buttons for users, "GENERAL", "SECURITY", "PERFORMANCE", and "REPORTS".
Response	After a user clicks on "PROFILE" from the main menu, the new page opens. This page includes the user's personal information such as name, ID, and email address along with the user's performance. The user can change some information such as name and email address in general settings section. The user can change password via security settings. Moreover, the user can see his or her information regarding purchased stocks upon clicking "REPORTS". Via clicking "PERFORMANCE", the user can see this or her performance.
Comments	Profile includes personal information.

System	Stock Market Simulator
Use Case	Check Wallet
Actors	Student, SMS system
Description	Users can view their transaction details by selecting "WALLET" from the main menu. From this page, users can see how much money they have left and see the transaction history.
Stimulus	There is a button called "WALLET" on the main menu.
Response	After a user clicks on "WALLET" from the main menu, the SMS website will make a request to the database server for how much money the user has currently as well as entire transaction record that the user has made. On the left side of the page will show the current balance and the right side of page will show the transaction history from the most recent. For the transaction that is still on the process, which is indicated by "Pending", the user can cancel that transaction.
Comments	At first, the transactions displayed are limited. But the user can check more transactions by click "read more" button.

| System	Stock Market Simulator
Use Case	Check Stocks
Actors	Student, SMS system
Description	After successfully log on to SMS system, the user can select "Search Company" from the main menu of the website. This allows users to search for available stocks. This function is one of the main motivators of the website.
Stimulus	There is a button called "SEARCH STOCKS" on the main menu. Each item of searching result is linked to the information page of that stock.
Response	After a user clicks on "Search Stocks" from the main menu, the new page with search interface opens. This page accepts an entry of name of the company and the company ID and submits this request to the server. Then the server returns with a list that matches the user's selection. If no exact companies are available, the system will provide to the user with similar name or ID of the company. After click on one of the searching results to check more details about that company's stock, like its historical stock price flow.
Comments	The stocks of the companies in the searching results will be updated with the update of all stock price in the system. After the user has searched for the company, they can choose whether to buy or sell the chosen stock.

System	Stock Market Simulator
Use Case	Assign Group
Actors	Student, Instructor, SMS system
Description	The instructor can assign a bunch of students in a same group, so that later the ranking will be generated based the information of everyone in the group. After assignment, students can view their group information from their profile page.
Stimulus	Instructor can enter the students' information to assign them into a group. And there will be a submit button to submit the assignment.
Response	After entering the students' information and submitting them, the group will be formed. Each student will receive a confirmation notification when they log in the website. After students' confirmation, the assignment is completed and the instructor can view their students' information.
Comments	Grouping students of same course to distinguish from the other courses.

| System	Stock Market Simulator
Use Case	Buy Stocks
Actors	Student, SMS system
Description	After selecting the desired company, the user can make a purchase for that company's stocks. The user will submit how many stocks he or she wants and how much he or she wants to pay for each stock.
Stimulus	The system has established a program to check the purchase eligibility of the user and a transaction process program. There is a button "submit" for user to submit their buying decision.
Response	After a company of user's choice is selected, the server displays a current status and information of the selected company. Upon submission, the SMS website submits the data of user's input to the server's database. If the user is eligible to make a purchase, the system will notify the user that the transaction is on process. If the user is not eligible, for example the user has no money left, an error message will pop up and display to the user. In order to complete the transaction, the desired price per stock must meet the current price. The system will keep running and comparing even though the user logs out. Upon successful transaction, the user will get notification. The user can cancel anytime if the transaction is on process.
Comments	The stocks of the companies in the searching results will be updated with the update of all stock price in the system. After the user has searched for the company, they can choose whether to buy or sell the chosen stock.

System	Stock Market Simulator
Use Case	Sell Stocks
Actors	Student, SMS system
Description	After selecting the desired company, the user can sell the selected company's stocks if he or she owns any. The user will submit how many stocks he or she wants to sell and how much he or she wants to receive for each stock.
Stimulus	The system has established a program to check the purchase eligibility of the user and a transaction process program. There is a button "submit" for user to submit their selling decision.
Response	After a company of user's choice is selected, the server displays a current status and information of the selected company. Upon submission, the SMS website submits the data of user's input to the server's database. If the user is eligible to sell, the system will notify the user that the transaction is on process. If the user is not eligible, for example the user does not have corresponding company's stocks, an error message will pop up and display to the user. In order to complete the transaction, the current price per stock must meet the desired price. The system will be keep running and comparing even though the user logs out. Upon successful transaction, the user will get notification. The user can cancel anytime if the transaction is on process.
Comments	The stocks of the companies in the searching results will be updated with the update of all stock price in the system. After the user has searched for the company, they can choose whether to buy or sell the chosen stock.

System	Stock Market Simulator
Use Case	Check personal information
Actors	Student, Instructor, SMS system
Description	After completing assigning groups, the instructor can view the information of his students, including their personal information, current balance, current ranking, and transactions history.
Stimulus	The system provides the instructor with an access to their students' data. In the list of students in the group, each record is linked to student's information.
Response	After clicking on the student's name on the group list, the system website will make a request to the database server for the information of the student. The personal information, current balance, current ranking, and transactions history will be displayed.
Comments	Mainly used for the instructor for grading purpose.

➤ State Diagram
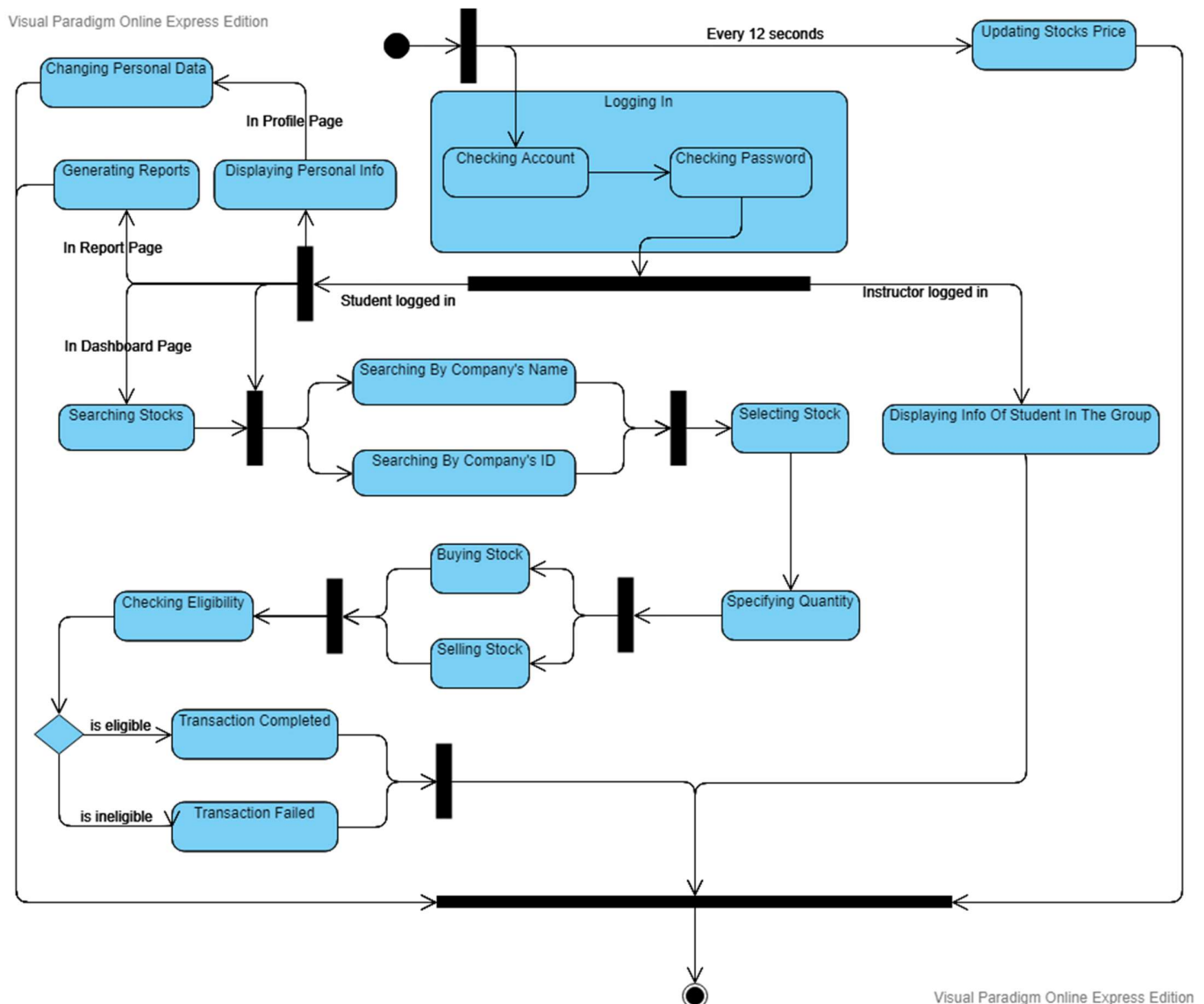
Activity Diagram
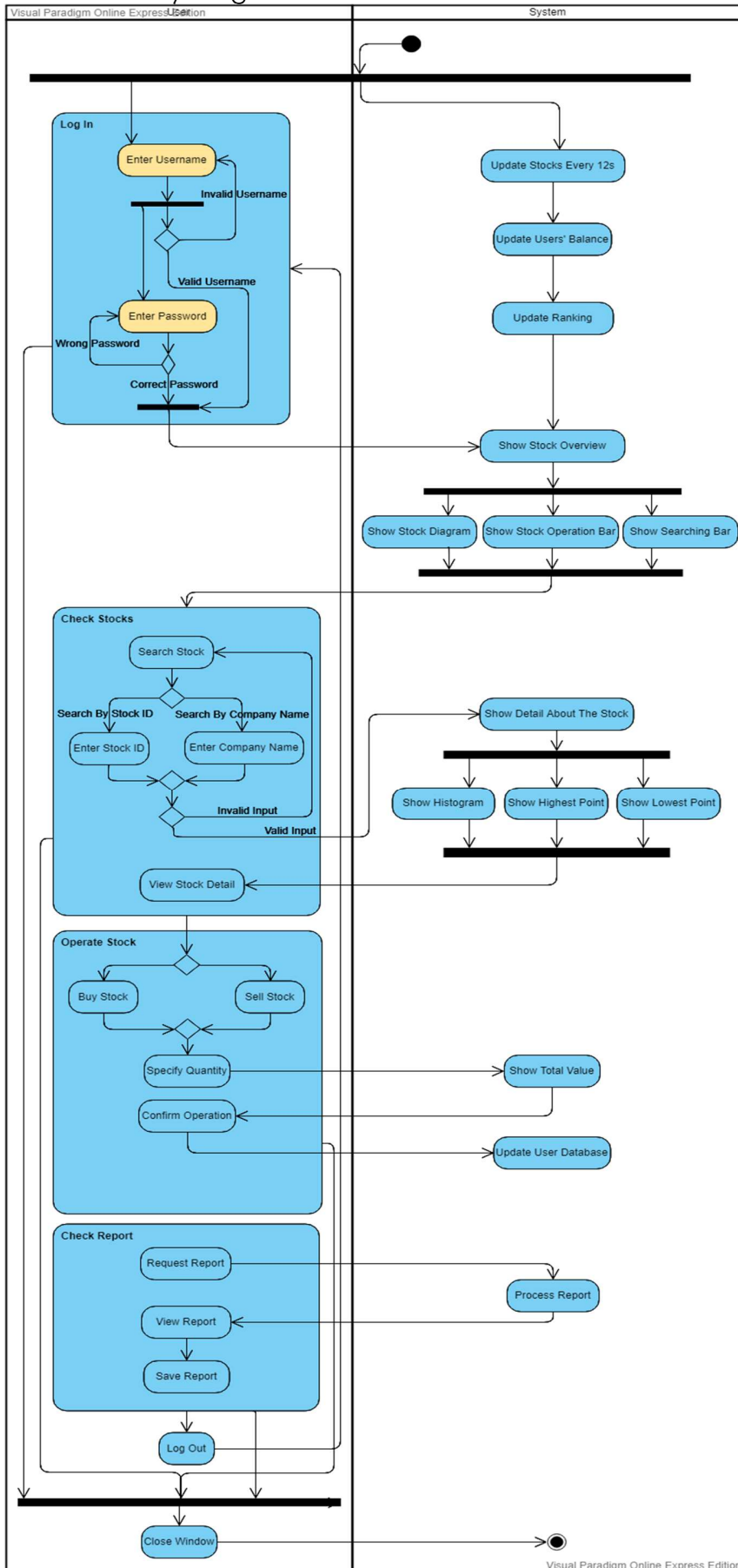
APPENDIX C: ISSUES

ISSUES		
ID	DESCRIPTION	PARTY RESPONSIBLE
1000	Add new theme for main menu	Designer
1001	Make an additional menu for the instructor user	Programmer
1002	Pages sometimes load at 4 seconds (not frequently)	Engineer
2000	Add different menus from the instructor to distinguish from students	Engineer / Programmer