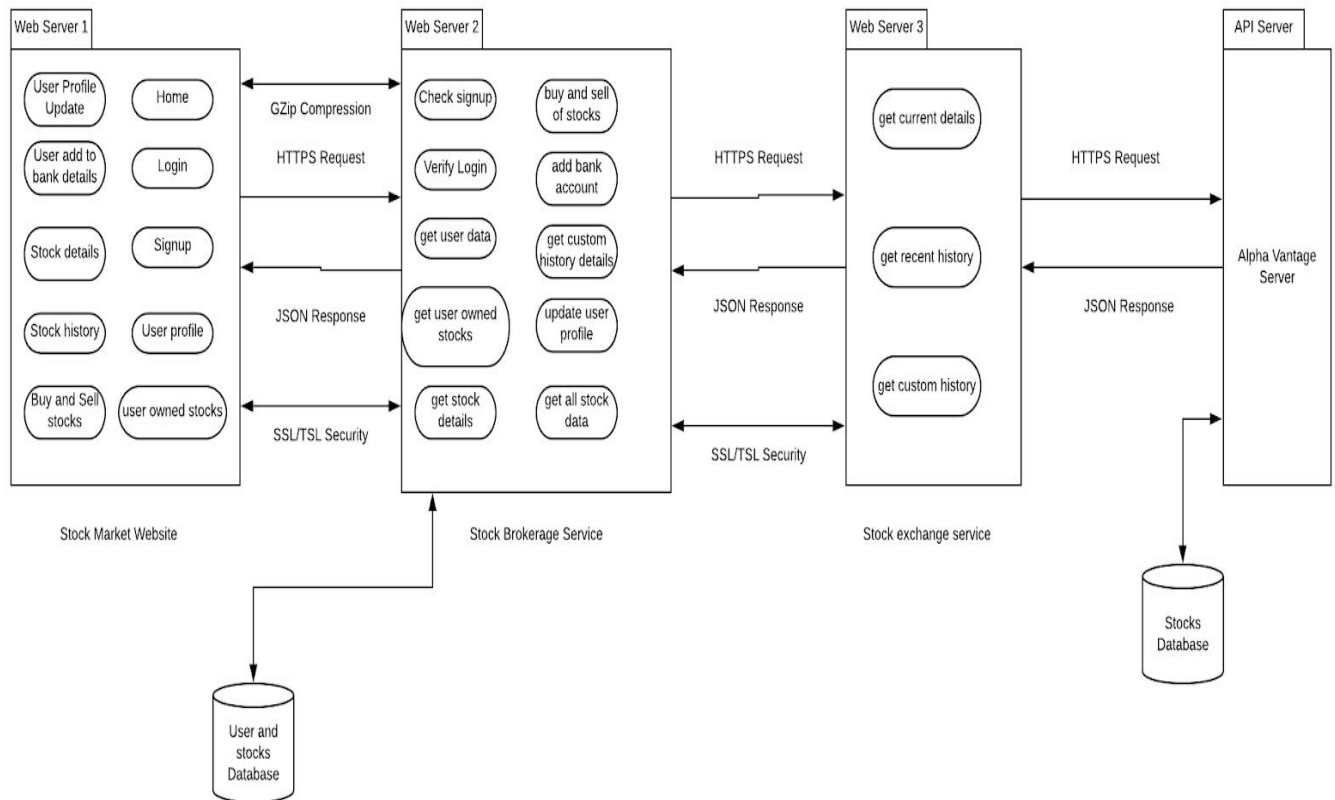# Stock Brokerage Application

Chain Coders

1) Henil Doshi (hxd180025)
2) Ishan Shah (ixs180019)
3) Ankur Gokhale (aag180015)

Architecture Diagram

Technologies used for the project

1) ### Stock Market Website

The stock market website is the face of our application. The stock market website has a clean and easy to use UI. The technologies that we considered are as follows:

1) #### HTML5

HTML is the most fundamental block in the development of any web application. It defines the meaning and structure of web page content. "Hypertext" refers to links that connect web pages to one another either within a single website or between multiple websites. We have considered and used this to implement our website. With the help of HTML we were able to structure our stock market website and define the attributes that we want in our website. HTML5 is the latest version of HTML.

2) #### CSS3

CSS is used to add styles to our website. With the help of CSS we enhance the look and feel of our website. CSS is independent of HTML and can be used with

any XML based markup language. This separation of CSS from HTML makes it easy to maintain websites, reduce load time and hence improves the efficiency of website. CSS3 is more advantageous over CSS with a number of add-on properties. Most of these properties are a benefit to the web designer and programmer.We have used the latest version of CSS3 because it allows more modules such as border-radius, box-shadow, etc. that we have used throughout our website.

3) Vanilla Javascript and Javascript

Javascript is used for web development as a client side scripting language for creating web pages. It is used when a web page is to be made more dynamic and add special effects on pages. We have used Vanilla Js for the purpose of validation in Login and Registration. We used Javascript with jquery for display of real time value of stocks in the form of charts with the help of Google Charts.

The Javascript frameworks like AngularJS and ReactJS we considered using them but due to time constraints and issues in dependencies we dropped the idea of using any frameworks for frontend.

4) jQuery

jQuery is Javascript library in order to make it easier to use Javascript in our website. jQuery takes a lot of common tasks that require many lines of JavaScript code to accomplish, and wraps them into methods that you can call with a single line of code. jQuery also simplifies a lot of the complicated things from JavaScript, like AJAX calls and DOM manipulation. We have considered and used jQuery for handling events, for embedding stock data in form of charts, for parsing JSON data and making asynchronous calls.

5) Sass

SASS is an extension of CSS and is also known as css preprocessor. It adds special features like variables, nested rules and mixins. However since our website is simple in terms of aesthetics, we are not using Sass for our final module development.

2) Stock Brokerage Service

1) Spring Boot

Spring Boot provides a good platform for Java developers to develop a stand-alone and production-grade spring application that you can just run. You

can get started with minimum configurations without the need for an entire Spring configuration setup. It is used because it offers following advantages

- Easy to understand and develop spring applications
- It provides a flexible way to configure Java Beans, XML configurations, and Database Transactions.
- It provides a powerful batch processing and manages REST endpoints
- Eases dependency management
- It includes Embedded Servlet Container

2) Tomcat Server

Tomcat is an application server designed to execute Java servlets and render web pages that use Java Server Page coding. We have used Tomcat for all our web/application servers for the following reasons

- Lightweight: Quick load and redeploy times
- Open Source
- Highly Flexible
- Server is Stable
- Extra Level of Security

3) Stock Exchange Service

1) Spring Boot

Spring Boot provides a good platform for Java developers to develop a stand-alone and production-grade spring application that you can just run. You can get started with minimum configurations without the need for an entire Spring configuration setup. It is used because it offers following advantages

- Easy to understand and develop spring applications
- It provides a flexible way to configure Java Beans, XML configurations, and Database Transactions.
- It provides a powerful batch processing and manages REST endpoints
- Eases dependency management
- It includes Embedded Servlet Container

2) Tomcat Server

Tomcat is an application server designed to execute Java servlets and render web pages that use Java Server Page coding. We have used Tomcat for all our web/application servers for the following reasons

- Lightweight: Quick load and redeploy times
- Open Source

- Highly Flexible
- Server is Stable
- Extra Level of Security

4) Alpha Vantage Server

    Alpha Vantage API is used for getting stocks data. The api is grouped into four categories based on different end points provided by the API. We have used Intra day (after 1 hour) ,Daily, Weekly, Monthly. The current price will be given by Global Quote. We will make a call to Alpha Vantage Server from our website to get stocks in JSON format. We are using the Alpha Vantage API for getting real time stock prices as well as historical data for that price.

5) User Database

1) MySQL

    MySQL is the most popular relational DBMS. We are using it to store both the user data as well as stocks data. We are using it for the following reasons:

- On demand scalability: Easy to scale when users are large or for customization of database servers for additional functionalities
- High Availability: Available to users round the clock
- High Reliability: Since we are dealing with sensitive data of users. MySQL handles that pretty well.

6) Stocks Database

1) MySQL

    MySQL is the most popular relational DBMS. We are using it to store both the user data as well as stocks data. We are using it for the following reasons:

- Secure Money Transactions
- High Reliability
- High Capability

Functionalities available to user on website

1. **Register:** The user have to sign up in order to use our application. The user data will be stored in the user database. The User has to provide full name , valid email address, valid physical address, password and security question.

2. **Login:** Once registration is done user can login. The user has to provide the correct email address and password so that server can authenticate it and move forward for the dashboard.

3. **Forgot Password:** In case the user forgets the password. We will ask security one question and based on the answer provided by the user during registration it will authenticate the user.

4. **Get Profile:** The user will be able to see his/her profile. The user can update his information as well as password. If the password is changed then the server will authenticate based on new password.

5. **Show Stocks:** In the dashboard the user will see table consisting of 100 stocks with its ticker symbol, name, currency and region it belongs to.

6. **Show Stocks Historical Data:** When the user clicks on particular Stock Ticker Symbol, the user will be able to see the current price of that particular stock. Plus historical data of that stock. There are 4 ways to see the data; today, daily, weekly and monthly. This allows to view stock data for the last 5 years.

7. **Buy Stocks:** We allow the user to buy stocks. The user has to specify the ticker symbol that he/she wants to buy and the quantity. Our platform will provide stocks of that price to user and will take money from user bank account that is registered with our application. The user cannot buy stocks if it has 0 money in his account.

8. **Sell Stocks:** We allow the user to sell stocks. The user has to specify the ticker symbol that he/she wants to sell and the quantity. Our platform will provide money according to stocks current price to user's bank account registered with our application and take stocks from the user. The user cannot sell stocks if it does not have any stock of that particular ticker symbol.

9. **Bank Account:** The user has to provide his/her account number and routing number in order to trade stocks. The bank account will be linked to user profile. User has to add a bank details (name, account number and routing number) in its profile first to start trading.

10. **My Stocks:** The user can see the stocks owned by him/her.

Web Services used by our application

1. **Bank Service**
    This service allows the user to make transactions (buying and selling of stocks) with the help of their associated Bank Account. In this service each user has a bank account and the transactions are made with the help of bank account number and routing number.

2. **Forgot Password Service**
    This service allows the user to login to his account without registering again. During registration we provide user to answer one security question. This security question will be stored in the database. This service uses the answer to the security question as a key for authenticating the user in case he/she forgets the password.

3. **Historical Data Service**
    This service provides the historical data of stocks for a period of 5 years. We broke it down into daily, monthly and intraday. The value of stocks is aggregated and represented it in the form of charts using Google Charts

4. **Login Service**
    This service is used for authenticating the user. It takes the username and password provided by the user and matches it with the value stored in the database.

5. **My Stock Service**
    This service allows the user to see the stocks he/she had bought, their buying price and volume of stocks bought.

6. **Stock Service**
    This service makes call to the Alpha Vantage Server in or to retrieve all the current stock data that we want.

7. **User Registration Service**
    User Registration service takes username and password from the user and stores it in the User and Stocks database. It also takes other information like Physical Address and Security question for forgot password.

Problems encountered during the workflow
1. Deciding which technology to use

During the initial phase of the project we were confused about which technologies to use for backend. We resolved this issue by considering the pros and cons of each technology and decided to go with Java Spring Boot because of its flexibility and MVC architecture.

2. Which API to use for getting the stocks data.

   We struggle to find an API that would provide us real time stock values for each stock. We found that some API's were asking for money to provide the data and some other API's were deprecated. After trying each of them we found out the Alpha Vantage API that provided us with the relevant historical data and the representation of data matched with our requirements.