



UNIVERSITY OF PISA  
School of Engineering

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LARGE SCALE AND MULTI-STRUCTURED DATABASES

## STOCKSIM: STOCK PORTFOLIO SIMULATOR

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# Part I

## Documentation



# Chapter 1

## Introduction

StockSim is a Java application which, as main feature, allows users to simulate stock market portfolios. The StockSim application is composed by two main programs:

- **StockSim Server:** supposed to be running 24/7 to ensure historical data is always up-to-date;
- **StockSim Client:** can be launched in either **admin** or **user** mode.

The StockSim Server is not thought to be distributed to end users, whereas the StockSim Client can be used by both administrators and normal users. The choice was made to provide the same program to both administrators and normal users with different running modes. Administrators can add new ticker symbols, new administrator accounts, delete both administrator and normal user accounts. Normal users have access to stocks and ETFs historical data, day by day, starting from 2010. They can create their own stock portfolios, run simulations and visualize the resulting statistics.

Before continuing with what follows, the following terms should be clarified:

- the **stock market** is any exchange that allows people to buy and sell stocks and companies to issue stocks; a stock represents the company's equity, and shares are pieces of the company;
- a collection of investments owned by an investor makes up his or her **portfolio**; you can have as few as one stock in a portfolio, but you can also own an infinite amount of stocks or other securities;
- a **stock symbol** is a one- to four-character alphabetic root symbol that represents a publicly traded company on a stock exchange; Apple's stock symbol is AAPL, while Walmart's is WMT;
- the NYSE and Nasdaq are open from Monday through Friday 9:30 A.M. to 4:00 P.M. (eastern time);

- the NYSE and Nasdaq close at 4 P.M., with after-hours trading continuing until 8 P.M.; the close simply refers to the time at which a stock exchange closes to trading;
- trading stocks after normal market hours through an electronic market, typically between 4:05 and 8:00 P.M., is **after-hours trading**.
- the **high** is the highest price at which a stock traded during a period;
- the **low** is the lowest price of the period;
- **open** means the price at which a stock started trading when the opening bell rang; it can be the same as where the stock closed the night before, but not always; sometimes events such as company earnings reports that happen in after-hours trading can alter a stock's price overnight;
- **close** refers to the price of an individual stock when the stock exchange closed shop for the day; it represents the last buy-sell order executed between two traders; in many cases, this occurs in the final seconds of the trading day;
- the **adjusted closing price** amends a stock's closing price to reflect that stock's value after accounting for any corporate actions; a stock's price is typically affected by some corporate actions, such as stock splits, dividends, and rights offerings; adjustments allow investors to obtain an accurate record of the stock's performance;
- **volume** is the total number of shares traded in a security over a period; every time buyers and sellers exchange shares, the amount gets added to the period's total volume.



## Chapter 2

# Actors and requirements

Blablabla.

### 2.1 Actors

Something about requirements in general.

### 2.2 Requirements

#### 2.2.1 Functional requirements

Something about functional requirements.

#### 2.2.2 Non-functional requirements

Something about non-functional requirements.

## Chapter 3

# UML diagrams

Blablabla.

### 3.1 Use Case diagram

Something about functional requirements.

### 3.2 Class diagram

Something about functional requirements.

# Chapter 4

## Database

Something in general about the dataset and then about the choice of the DB architectures we choose (e.g. "We decided to use a documentDB because blablabla and a column DB because financial analytics on these volumes of data are performed

### 4.1 Dataset

#### 4.1.1 Yahoo! Finance

#### 4.1.2 NasdaqTrader

### 4.2 MongoDB

#### 4.2.1 Aggregations

#### 4.2.2 Indexes

### 4.3 Apache Cassandra

#### 4.3.1 Aggregations

#### 4.3.2 Indexes

### 4.4 Sharding and Replicas

### 4.5 Apache Cassandra vs MongoDB

## Chapter 5

# Software architecture

## Chapter 6

# Conclusions

Content.



# **Part II**

## **User Manual**





## Chapter 7

# StockSim Server Manual

For an application dealing with the stock market, it is essential to always provide up-to-date, consistent and reliable data. This is the purpose of the **StockSim Server** program. It is not intended to be distributed to end users. It is thought to be run 24/7.

## Chapter 8

# StockSim Client Manual

Content.