Software Architecture and Design

Homework 1

Software Requirements Specification

Macedonian Stock Exchange Analysis Tool

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Project Description 3
Definitions, Acronyms and Abbreviations 3
Personas 3
Requirements 4
Functional requirements 4
Data Retrieval 4
Data Transformation 4
Data Storage 4
Non-Functional Requirements 5
Performance 5
Reliability 5
Usability 5
Scalability 5
User Scenarios 5
First-time data population 5
Daily Update 5

Project Description

The purpose of this document is to define the software requirements for a database-based web application focused on stock market analysis for the Macedonian Stock Exchange (MSE). This application will automate the data retrieval, transformation, and storage of historical daily stock data for all available issuers listed on the MSE. The project aims to facilitate accurate stock data analysis while ensuring the application's efficiency and scalability.

The application will use the Pipe and Filter architecture to retrieve, transform, and store up-to-date stock data for analysis. Using automated processes, the application will retrieve data from the MSE, process and clean it, and store it in a structured database. This project involves automating data handling for at least the past 10 years on a daily basis.

Definitions, Acronyms and Abbreviations

- **MSE**: Macedonian Stock Exchange
- **Pipe and Filter Architecture**: A design pattern where data is processed through a sequence of filters, each performing a transformation and passing the output to the next.

Personas

The primary users are financial analysts, data scientists, and stock market researchers who require structured and up-to-date stock data for analysis.

Financial Analyst

Age: 35

Background: Ana is a financial analyst working at a mid-sized investment firm in Macedonia. She has a background in finance and economics and is responsible for analyzing stock trends and generating investment reports for her clients.

Goals: She needs accurate and up-to-date data on stocks to make data-driven investment recommendations.

Usage: Ana uses the system daily to review any updates in stock data and integrates the information into her analysis tools to generate reports for her clients.

Data Scientist

Age: 30

Background: Bojan is a data scientist at a financial tech startup interested in developing predictive models for stock prices. He has a strong programming background and uses Python to build and train models based on historical stock data.

Goals: Bojan aims to access clean, structured stock data for feature engineering and training machine learning models.

Usage: Bojan runs the system periodically, using it to pull updated stock data whenever he needs to refine or retrain his models. He uses the database output as a primary source for model inputs, focusing on complete datasets and consistent formatting.

Stock Market Researcher

Age: 45

Background: Igor is an independent stock market researcher. He has over 15 years of experience analyzing market trends and specializes in emerging markets, particularly in the Balkans. He publishes research papers and insights for financial journals and consults for local investment firms on stock performance and economic trends.

Goals: Igor needs comprehensive, reliable, and up-to-date stock data for all companies listed on the Macedonian Stock Exchange to conduct deep trend analyses, identify patterns, and predict market movements.

Usage: Igor uses the system weekly to update his database with the latest stock information and fill any gaps in historical data. This allows him to focus on analytical tasks, such as performing statistical analyses, creating visualizations, and generating reports, without worrying about data accuracy or completeness.

Requirements

Functional requirements

Data Retrieval

- The system shall automatically retrieve all issuer codes listed on the MSE website, excluding bonds or codes containing numbers.
- The system shall check the last available date of data for each issuer in the database or file.
- The system shall retrieve missing data for each issuer up to the current date, if needed.

Data Transformation

- The system shall transform raw stock data into a structured format suitable for database input.
- The system shall ensure all dates are formatted consistently (MM-DD-YYYY).
- The system shall format prices with proper delimiters (comma for thousands, period for decimals).

Data Storage

- The system shall store processed data in a database or structured file (CSV, JSON, etc.).

- The system shall merge new data with existing data, avoiding duplicates and ensuring accuracy.

Non-Functional Requirements

Performance

- The application shall process and store data efficiently, with minimal delays.

Reliability

- The system shall ensure that retrieved data is accurately transformed and stored without errors.
- The application shall handle cases where no existing data is available, initiating a full data download if necessary.

Usability

- The application shall present clear success/failure logs for each filter and process, allowing the user to monitor data retrieval and transformation stages.

Scalability

- The system shall handle the addition of new issuers with minimal reconfiguration.

User Scenarios

First-time data population

A data analyst sets up the application for the first time to populate the database with the past 10 years of stock data. The system retrieves issuer codes, identifies the absence of existing data, downloads the necessary data, and processes it for storage.

Daily Update

Each day, the system is scheduled to run, checking for new data. It identifies the latest data in the database, retrieves any missing entries, formats the data, and updates the database, ensuring that it’s up-to-date.