

CSCI3100 Software Engineering

High-Level Design Document

Five Stream

Discover Shopping World with Fingers

Version 1.0.0

GROUP B4

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February 3, 2023

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1 Introduction

1.1 Project Overview

TaoDong Mall serves as a virtual marketplace where users can explore and purchase a wide range of products. Within the online mall, users can search for desired products, add and delete items using the shopping cart, pay for goods, track orders' status, and leave comments on purchased items. From an administrator's point of view, TaoDong Mall is also easy to manage resources. Overall, TaoDong Mall is an attractive platform for modern-day shopping needs.

1.2 System Features

The application will be based on a client-server architecture, has its server act as a central repository for all product data and user credentials. To efficiently manage various data types, it employs a combination of databases: Redis and MySQL. These databases are tasked with 4 main types of data: system cache, comment data, user data, and product information.

The foundational features of our system, outlined below, are set for implementation in the initial release.

- **User Interface**

To simplify operation and enhance user experience, users will be provided with six different interfaces to interact with our application.

1. Account Page: Designed for user registration and login, this page is the entry point for users to access the system.
2. Product Page: This page offers product recommendations and allows users to search, select, and add products to their cart.
3. Cart Page: Displaying items chosen for purchase, this page enables users to review and adjust their product selections.
4. Payment Page: Here, users can complete their purchases, selecting a payment method that aligns with their preferences.
5. Purchase History Page: This page presents a record of the user's past purchases, along with order tracking information.
6. Product Evaluation Page: Users can provide feedback and reviews on their purchased items on this page.

- **User Management**

Users have the option to log in and log out of the application.; whereas new users can sign up using their email or phone number. Before shopping, setting up payment and delivery information is required. Users can also deactivate their account in settings, but this action is irreversible.

- **Admin User Operation**

Admin within the application holds the highest level of authority, enabling the viewing

of all product and user information, as well as the ability to add or remove products and users, all while adhering to privacy regulations.

- **Client User Operations**

Basic operations in aspect with users involve four parts, their corresponding and details are elaborated as below:

1. Search for product.
 - a. Each product entry should include a product ID, name, price, category, description, and stock level.
 - b. Users can search for products using the product ID or name.
 - c. Users can also search by category and price range, and the system will display all products that meet these criteria.
2. Add products to cart.
 - a. Users can add products to their cart using the “Add to Cart” button.
 - b. The system will notify users if a product with zero stock is attempted to be added.
 - c. Upon successful addition, the product appears in the user's cart and updates in the database instantly.
3. Show selected products.
 - a. A user can go to his/her cart page to view all the selected products.
4. Remove product from cart.
 - a. Users can remove products from their cart by clicking the "Remove" button.
 - b. The removal of a product from the cart is immediately reflected on the page and updated in the database.

Next, we will introduce more sophisticated features in app along with the potential advanced function which might be developed and released in the later version of our app, which will enhance user satisfaction and participatory significantly.

- **Recommendation**

Implement a recommendation system that suggests related or similar products to users based on (1) product rating or (2) their browsing and purchase history.

- **Simulated Payment System**

Implement a simulated payment system that allows users to go through the process of making a purchase, including entering payment information and completing the transaction.

- **Order tracking**

Implement a comprehensive order tracking system that allows users to track the status and progress of their orders from placement to delivery.

- **Product review and rating**

Users can leave reviews and ratings for the products they have purchased.

- **Points and rewards system**
Reward users with points for actions like purchasing products, writing reviews, referring friends, etc. These points can be redeemed for discounts, gifts, or other privileges.
- **Membership program**
Establish a membership program to offer special treatment and benefits to loyal customers, such as member discounts, exclusive events, and early access to new products.

2 System Architecture

2.1 Technologies

In this online shopping mall project, we used a combination of cutting-edge front-end and back-end technologies to provide a robust and scalable e-commerce solution. In front end, we used React.js to build a reactive user interface and integrated Redux for application state management to ensure a smooth user experience. We also chose Ant Design as our design framework because of its rich set of react components, which can be used to provide an aesthetically pleasing and user-friendly interface that helps us create an appealing and intuitive shopping environment.

In the back end, we used Spring Boot framework to implement a microservice architecture, which separates different services and enhances the modularity and extensibility of the system.

In terms of database, we chose two database systems, MySQL and Redis, to fulfill different needs. MySQL is used to store structured SQL data, such as product information and transaction information, as it provides transactional support and data integrity guarantee. Redis, as a NoSQL database, is mainly used for caching data and non-tabular data, such as product reviews and login information.

In addition, the project uses Elasticsearch as a search engine component, which provides search functionality within the platform. Its powerful full-text search capabilities and analytics engine provide users with fast and accurate search results, enhancing the shopping experience.

2.2 Architecture Diagram

Client-server architecture is implemented in our system design, as shown in Figure 1.

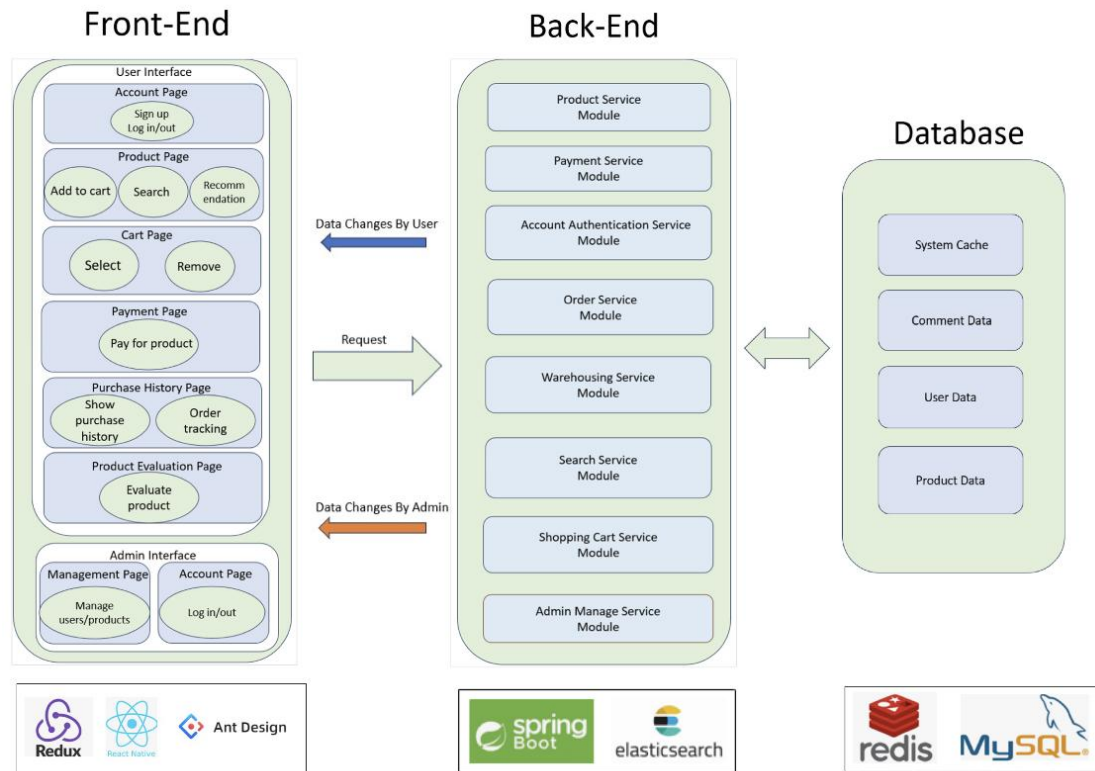


Figure 1. System Architecture

2.3 System Components

The online shopping mall is comprised of two main components: the front end and the back end. The front end can be further divided into the User Interface and the Administrator Interface. The back end is composed of eight modules.

In the User Interface, there are six pages displayed with corresponding functionalities.

- On the Account Page, users can choose to sign up (for new users) or log in (for existing users). The new user account collection and authentication process is supported by the Account Authentication Service Module in the back end.
- On the Product Page, users can browse through all the products or search for products based on specific requirements such as product ID, product name, category, price range, and so on. The Search Service Module will be responsible for the search functionality. Users can also add their favorite products to the shopping cart, supported by the Product Service Module. In addition, the recommended products will be displayed to the user within product page and Product Service Module, Payment Service Module and Warehousing Service Module will push the recommendation functionality.
- On the Cart Page, the user can view the selected products and remove unwanted products

from the shopping cart, which is controlled by the Shopping Cart Service Module.

- On the Purchase History Page, history of purchased products and status of the orders will be displayed to users, which is pushed by Payment Service Module and Order Service Module respectively.

While for Administrator Interface, two pages are designed for the administrator to manage resources

- On the Account Page, the administrator can log in with their account, and Account Authentication Service Module will take in charge of the account authentication process.
- On the Management Page, the administrator is capable of viewing all products/users information and manage (add or delete) products/ users, which is supported by Admin Management Service Module.