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Design and Implementation of Logistics Information Management Platform based on Front-end and Back-end Separation

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Abstract

The new generation of information technology has been gradually applied in China logistics management, but the current level of logistics information is still low. In order to improve the efficiency of logistics management, a logistics information management platform is designed and implemented. This platform is implemented by separating the front-end and the back-end. The back-end is based on Spring Boot + MyBatis to read logistics information and provide front-end data in JSON format. The front-end uses Vue + Bootstrap to realize the layout and display of page information. The front-end and back-end interact with each other through Axios, and the data is stored in the MySQL database. The platform has been applied in the production environment, which proves the feasibility of the system.

Keywords

Logistics information management, front-end and back-end separation, Spring Boot, MyBatis, Vue, Bootstrap.

1. Introduction

Since the 21st century, the adjustment of the world's great changes presents a series of unprecedented new features and new manifestations. With the development of various emerging industries, the world economic landscape has also undergone profound changes. The role of developed countries and developing countries in the international division of labor system has changed significantly. The logistics industry is the lifeblood of the national economy, and its development level has become a yardstick to judge a country's socio-economic development level. The logistics industry is under the seal of a once-in-a-century major change. The entire industry is transforming and upgrading towards the trend of informatization and intelligence [1-2]. The window of industrial chain adjustment and ecosystem expansion is opening at the same time. The logistics industry started late in China, and the level of informatization is low. In today's e-commerce era, the logistics industry has exposed more and more problems.

Most large logistics enterprises have developed logistics management platforms, but some small and medium-sized enterprises still lack logistics management platforms. The traditional logistics management platform is not only expensive, although it has complete functions, but also more complex for SMEs to use. In order to improve the informatization level of logistics management of SMEs, this paper designs and implements a logistics information management platform. The platform is based on the front-end and back-end separation technology. The back-end is based on the Java language. It implements the Restful style interface through Spring Boot and provides JSON data to the front-end. The front-end obtains interface data through Axios and visualizes it through Vue + Bootstrap technology.

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2. System design

2.1. Introduction to relevant technologies

2.1.1. Spring Boot

Spring Boot is a new framework developed by Pivotal team for Spring applications [3]. This framework adopts a simplified configuration method, so that developers do not have to define cumbersome configurations and focus on business logic programming. This platform uses the Spring Boot framework to realize the integration of the configuration of multiple data sources and MyBatis. Multiple data sources include MySQL database and Redis cache.

2.1.2. Vue

Vue is a progressive framework for building user interfaces. The progressive framework is generally understood that it is not necessary to master all its functions and components to use Vue, and it is easy to get started [4]. Vue is based on the MVVM(Model-View-ViewModel) model, which can reduce DOM operations and achieve bidirectional data binding, thus making it easier for developers to focus on business logic.

2.1.3. Bootstrap

Based on Bootstrap's responsive layout, rich plug-ins, and open source and free advantages, the system uses Bootstrap as the development framework for background management of web pages. Bootstrap provides a basic structure with grid system, link style, and background. It integrates HTML, CSS, and JavaScript, and is used to rapidly develop Web applications and websites. Bootstrap, which includes rich Web components and powerful JavaScript plug-ins, is the world's most popular front-end open-source tool library [5].

2.2. Front-end and back-end separation architecture design

As shown in Figure 1, the whole platform is realized by separating the front-end from the back end. The front-end uses Axios to interact with the back-end, and the back-end returns data in JSON format.

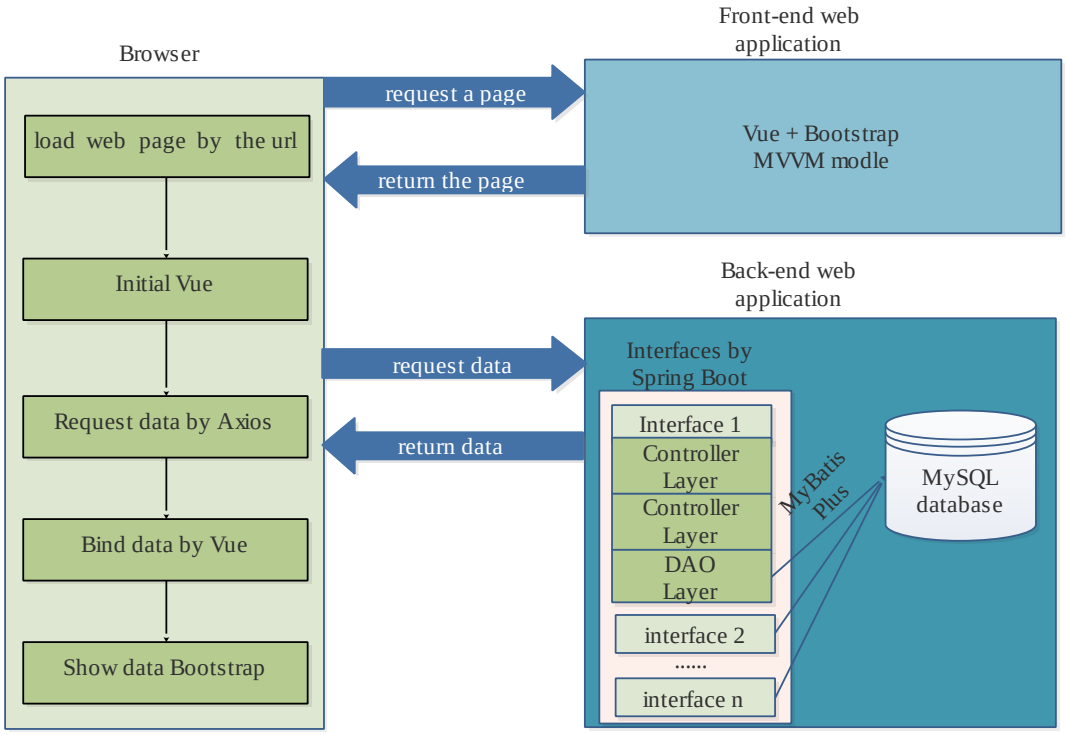

Figure 1: The platform architecture based on the separation of front-end from the back-end

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2.3. Functional module design

The platform is divided into administrator users and general users. Administrator users can manage employees, vehicles and delivery points. Employee users can manage customer, order and logistics information.

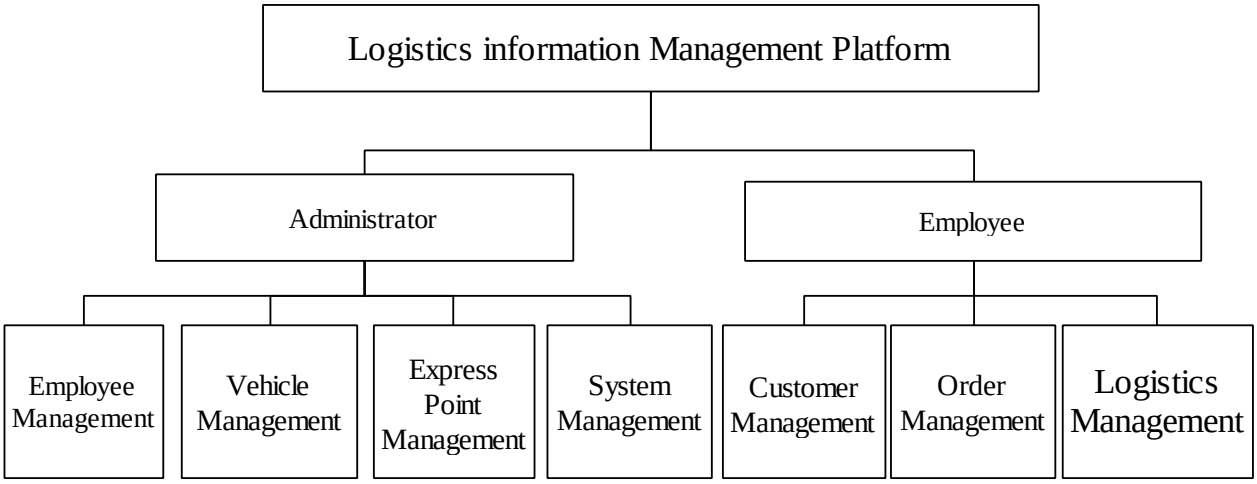

Figure 2: The platform functional module diagram

3. System implementation

3.1. Functional module implementation

Most function modules are implemented in the same way. First, the back-end interface is written, and then the front-end interface is implemented. The system functions are implemented through the front and rear debugging. The back-end Spring Boot adopts a three-layer hierarchical architecture of Controller, Service and DAO. It uses @RequestBody annotation on the Controller layer to receive data. The service layer implements specific business operations, obtains data from different databases, and logically processes data, such as caching, computing, and business rules. The Dao layer mainly operates on the data in MySQL and Doris databases for data addition, deletion, modification and query. Spring Boot simplifies the development configuration. The front-end uses vue-cli scaffolding to create projects. The development process needs to configure vue.config.js to set the access proxy, send asynchronous requests through Axios, obtain various types of data returned by the back-end, and render them to tables, legends, or layers in maps on the page. The login page and main page of the platform are show in Figure 3 and Figure 4.

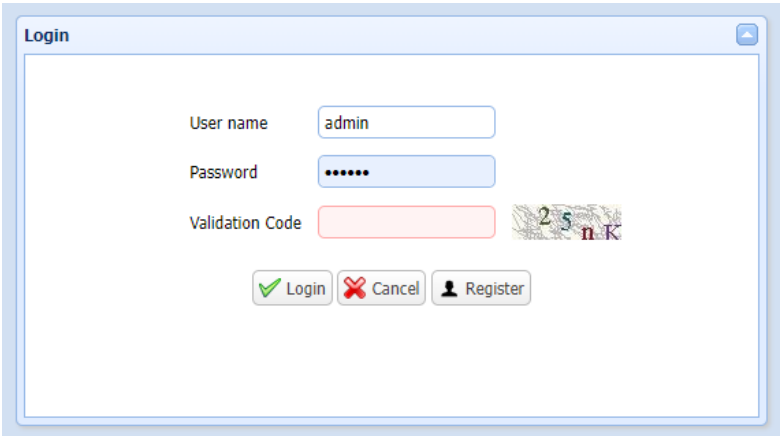

Figure 3: The login page

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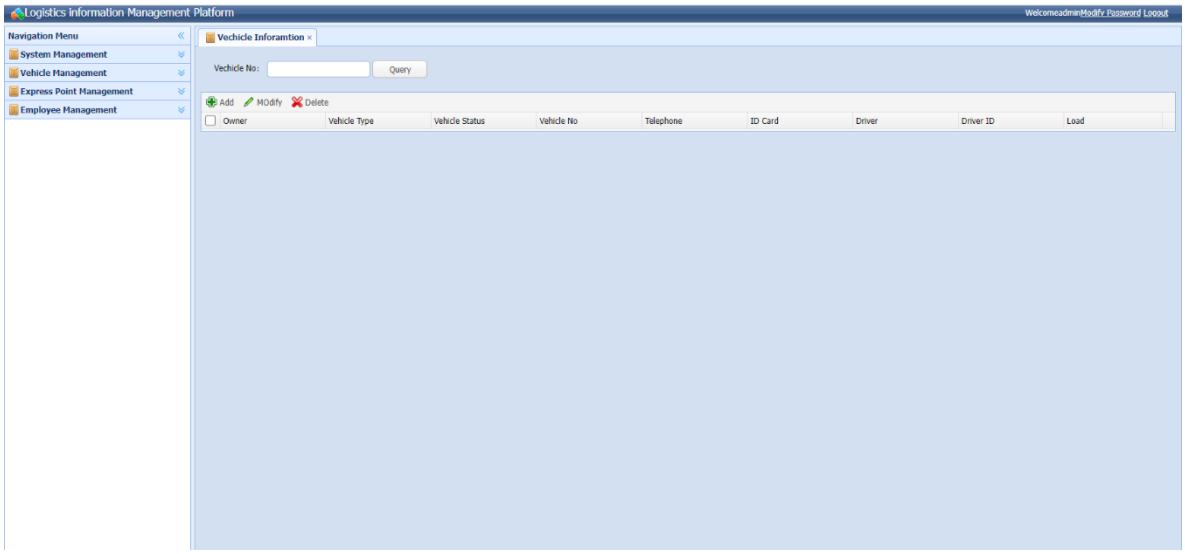

Figure 4: The page of vehicle manament

3.2. Realization of technical difficulties

3.2.1. Implementation of load balancing

The number of users in this platform is large, and the greater the real-time access, the greater the pressure on the server. In order to prevent the server from crashing due to excessive pressure, Nginx is used to realize load balancing to share the pressure of the server. The main functions implemented are: forwarding function, fault removal, recovery and addition [6]. The system uses polling mode to distribute the requests sent by users to back-end servers in turn, reducing the pressure on a single server and increasing the system concurrency. If one of the servers fails, the request will be automatically sent to other application servers. When the server recovers, it will be automatically added to the team that handles user requests. Figure 5 shows the Nginx load balancing architecture.

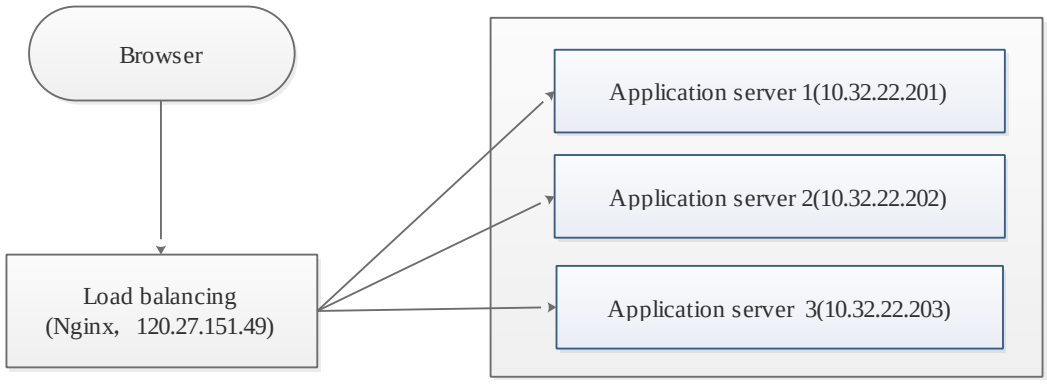

Figure 5: Nginx load balancing architecture

3.2.2. MySQL master-slave cluster

In a high concurrency scenario, the amount of data in a joint document table is large. There are a large number of complex queries for regulatory users and enterprise users. Ship users only need to operate based on transactions. A cluster is built based on MySQL's bin log synchronization mechanism. The master database is only responsible for writing, and the slave database is only responsible for reading. Figure 6 shows the flow chart of MySQL master-slave cluster.

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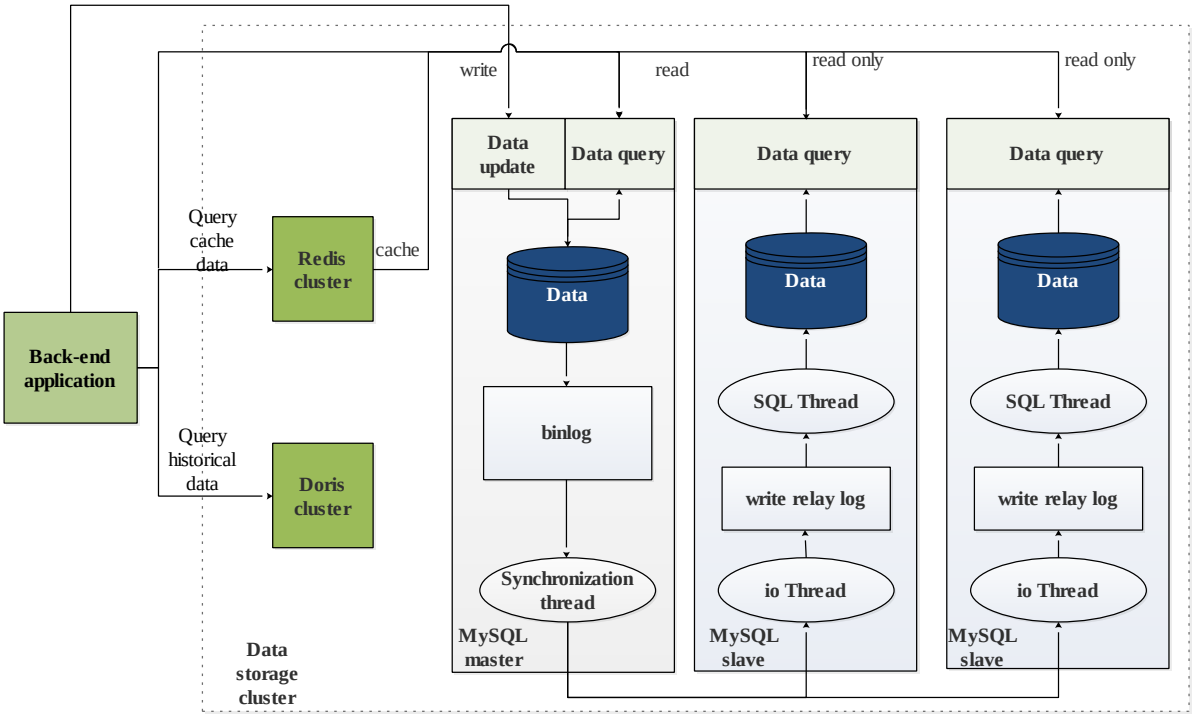

Figure 6: MySQL master-slave cluster architecture diagram

4. Conclusion

Traditional small and medium-sized logistics enterprises exchange information through paper documents or Excel forms, which is inefficient and error prone. In order to improve the efficiency of logistics information management, this paper designs and implements a logistics information management platform. The platform is developed and implemented using the mainstream front-end and back-end separation technology, which not only ensures the stability of the platform, but also ensures the scalability of the platform. In order to ensure concurrent access, the platform robustness is improved through Nginx load balancing and MySQL master-slave set, allowing more than 100 users to access at the same time.

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