Design and Implementation of a Resource Sharing Platform based on Cloud Computing

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Abstract: Entering the era of big data, while the amount of resource information is increasing exponentially, it has greatly increased the difficulty of people's resource sharing and searching. The design goal of this resource sharing platform is to gather the power of a large number of netizens to collect and integrate a large amount of resources, so that users can enrich the resource library as resource sharers while searching for resources. This system is an online multi-person resource sharing platform designed based on the Springboot and Vue2.0 framework, which implements functions such as user registration and login, data sharing, search, and comments. It also implements resource and user information management functions in the administrator module, as well as AI image audit image function based on Yolo. This system adopts cloud computing cloud database technology and cloud computing host technology to reduce system operating costs, and uses Sa Token plugin to ensure system security. While providing a resource sharing platform for netizens, it also adds corresponding resource audit functions such as image auditing.

Keywords: Resource Sharing; Cloud Computing; System Security; AI Auditing

1. Introduction

In the era of big data, cloud computing, and fragmented resources, numerous resource sharing systems have emerged. From simple file resource sharing systems such as home shared folders and Ftp in the initial Windows system, to code related resource sharing communities such as GitHub and Google Developers in recent years. However, compared to the current situation of large data volume, rich types, and numerous users, these resource sharing systems have certain limitations. And with the advent of the concept of distributed big data blockchain, the single machine deployment of a single server running a complete system has gradually become powerless in front of the large amount of data on the Internet. As a result, the concept of distributed services has emerged, which means dividing the various functional modules of the system into different servers [1-3].

In response to the problems of insufficient information volume, single type of information, imprecise search, and insufficient performance of a single server on various resource sharing platforms on the market, we plan to design, build, and deploy a cloud computing based image resource sharing platform. The platform will deploy user modules, administrator modules, and image auditing separately on different servers, and there will be no restrictions on resource types, Enable more netizens to easily and quickly input and obtain various resources they need. This platform has a vast amount of various resource information, while reducing users' search time and learning costs.

2. Relevant Technical Principles and Applications

The front-end of the system design adopts the Vue framework based on JavaScript, which provides responsive data binding and componentized development methods, and can build efficient, dynamic, and interactive user interfaces on the browser side. In the development environment, the Node.js platform was used, which provides a rich module library and tool chain, which can help developers more easily implement front-end functions and optimize page performance[4-6].

The backend adopts SpringBoot framework technology [7], which provides many rapid development tools to simplify application configuration, integration, and deployment. At the same time, it also provides an excellent

ORM framework to handle business logic and data persistence. In terms of development mode, the system adopts a front-end and back-end separation architecture, which completely decouples the front-end and back-end. The front-end is responsible for rendering pages and handling user interactions, while the back-end is responsible for processing business logic and data storage, making the entire system more flexible and scalable.

The image audit module adopts a Yolov7 based neural network model [8], which can identify objects, positions, and categories in images, classify and detect them, and has good results and accuracy for image processing and auditing. In order to ensure the data security of the system, MD5 encryption method is used to encrypt the database. This method can convert important information such as user passwords into irreversible hash values, increasing the difficulty and security of password cracking. In order to ensure system efficiency, Redis memory caching technology was used [9].

In order to improve the security and authorization management capabilities of the system, the Sa-Token plugin was used as the authentication plugin. This plugin provides multiple authentication and authorization mechanisms, supporting methods such as Session, Token, JWT [10], etc., which can effectively restrict user access and protect sensitive data. The database is encrypted using MD5 encryption method [11], the data interaction between the front-end and back-end adopts JSON data structure [12], and the caching technology adopts Redis technology [13]. Through the application of these technologies and tools, the performance, security, and scalability of the system can be improved during system design and development, providing better user experience and business value.

3. Analysis of Feasibility and Demand

Thanks to the rapid development of the semiconductor industry, the architecture of computers has evolved iteratively with market demand, and the deployment of a system's applications has shifted from centralized to distributed. The typical architecture of traditional computer systems is centralized, but the emergence of cloud computing has alleviated many unnecessary complex environmental configuration issues, especially after the popularity of cloud computing services, the deployment cost of distributed architecture has begun to decrease, and many tenants can obtain the desired cloud based services at low prices. For example, cloud databases and cloud repositories. This project integrates the system into the cloud computing platform to achieve an easily deployable, open-source, and maintainable resource sharing platform.

The user group targeted by this system is all netizens. When a user finds this system from a search engine, the first thing they see is the information and resources shared by other netizens in this system. For users who have a need to publish resources, they need to register first before using the publish resource function.

In order to comply with relevant laws and regulations and ensure the normal operation of this system, it is necessary to remove some resources containing pornography, blood, violence, copyright disputes, etc. So the administrator role requires system functions such as displaying resource information published by users, deleting resources, deleting a certain user, adding resource article classification directories, and managing regular user directories.

In order to better conduct image auditing, this system adopts a manual training method for violating image resource models. After loading into the system, the system automatically annotates the uploaded image resources. And use YOLOV7 for training, and label the content of illegal images using the Labelimg tool. After iterating through several versions, Yolo has come up with a way to save system resources. With a GPU server, it can independently undertake the task of distributing image audits.

4. System Structure and Module Design

The system flowchart is shown in Figure 1.

The database of this system is designed with 5 tables, including account table, user information table, comment information table, directory table, article table, and file information table. The account table is mainly used to store user account data. The user information table is used to store user related information data. The article table is mainly used to store data related to the content of article posts. The comment information table is used to store data on user comment information and comment attribution information.

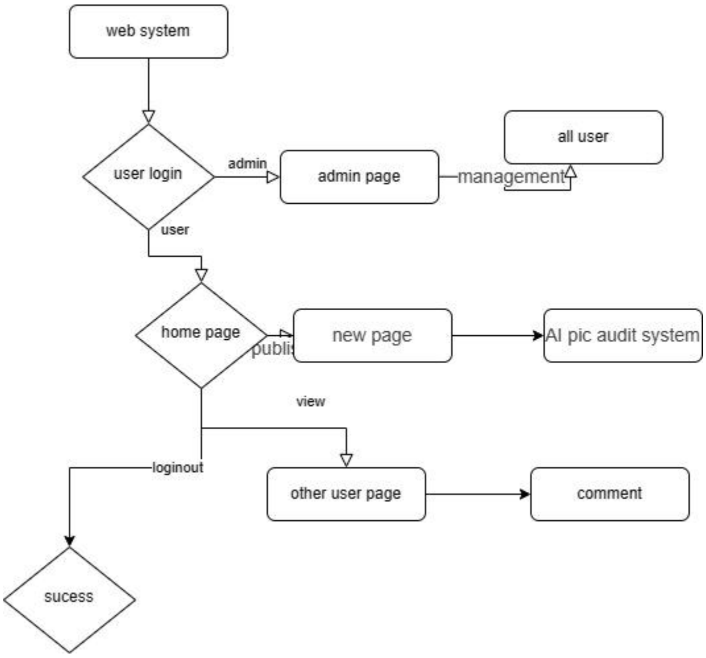

Figure 1. System Structure Diagram

The main flowchart of the user's operation page is shown in Figure 2.

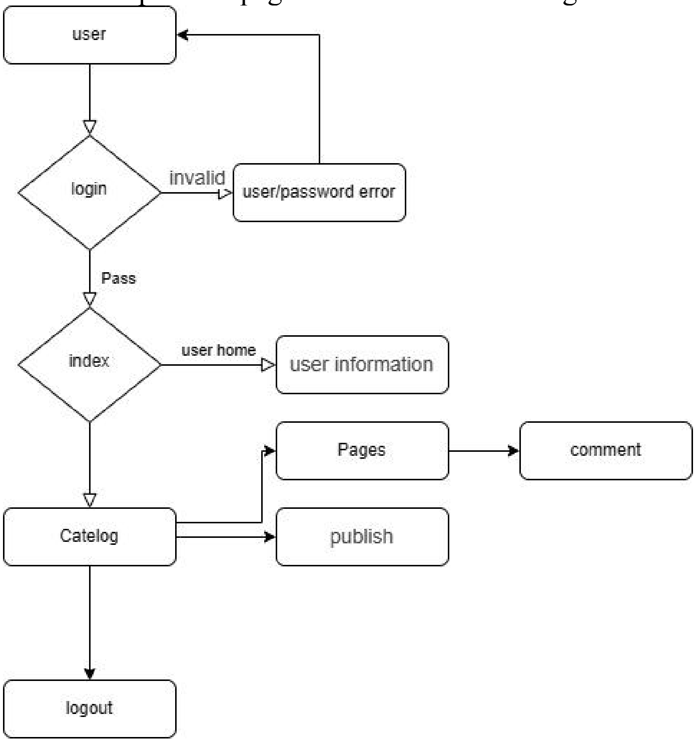

Figure 2. Process Structure Diagram of User Operation Page

Account table (t_account) and the user information table (t_userinfo): there can only be one user information in an account, and each user information can only correspond to one account. Therefore, the account table and the user information table are one-to-one association tables.

The user information table (t_userinfo) and the comment information table (t_comment): a user can have multiple comments, but a comment cannot be owned by multiple users. Therefore, there is a one to many table association relationship between the user information table and the comment information table, while the comment information table and the user information table are many to one associations.

Catalog classification table (t_category) and article table (t_article): A catalog classification can have multiple articles, and multiple articles correspond to a catalog. Therefore, there is a one-to-many relationship between the catalog classification table and the text table.

Article table (t_article) and comment table (t_comment): An article can have multiple comments, and each comment only corresponds to one article, so there is a one-to-many relationship between the article table and the comment table.

User information table (t_userinfo) and article table (t_article): A user can have multiple articles, but an article cannot be owned by multiple users. Therefore, there is a one to many table association relationship between the user information table and the article table, while the article table and the user information table are many to one associations.

The relationship between the tables is shown in Figure 3.

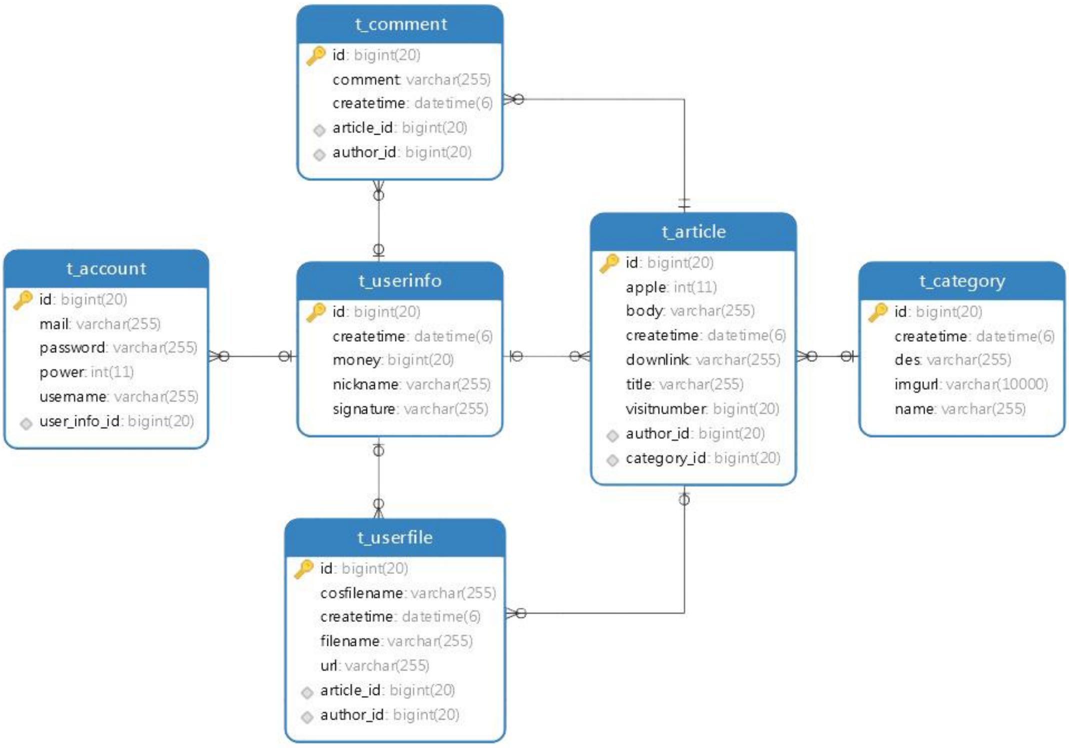

Figure 3. The Relationship between Tables

5. System Function Realization

5.1 User Function Module

5.1.1 Home page

On the system homepage, this page is used for login of non logged in users and tourists. The login status of the user will be displayed in the upper right corner: either not logged in or logged in username. If not logged in, there will be a separate hypertext link to the login interface. There will also be a registered hypertext link.

When opening the homepage again, the first step is to display the classification directory of resources. Here, the classification directory set in the background will be displayed to guide users and visitors to easily find the classification directory of the resource module they need. After entering the specific classification directory, relevant resource information will be displayed in the form of a list. The top level of the classification directory will display the latest 5 resource information released under this directory, and there will be a pagination button at the bottom. There is a bulletin board on the left side of the system, which will prompt for the latest announcements or notifications from the system. In the resource details page, users can view the author's nickname, the time when the resource was published, the uploaded information, and the specific content of the information. In addition, the article resource page also displays the response information of users related to this article, including the name of the respondent, user ID, and response time. Finally, a response panel is provided at the bottom of the page for users to comment and leave messages.

5.1.2 Registration login interface and user personal information interface

Integrating login and registration functions into the login interface allows users to easily authenticate and create accounts. This design enables users to quickly and safely enter the system and start using various functions and services provided by the system. After successful login, we will return the user's last login time and IP address, making it easy for the user to determine whether the account has been illegally stolen or logged in.

Click on the personal space in the upper right corner of the system to enter the user's personal information interface, which is used to modify user information such as password, email address, user nickname, personal signature, etc. Here, you can make modifications to resources previously published by users, such as deleting, modifying, hiding, etc. At the same time, there will be a dedicated comment management link, which can be clicked on to filter or delete comments that users have previously posted through fuzzy search and time filtering.

5.1.3 Resource list and resource publishing function under specific directories

At the top level of this interface, there is a simplified display box that displays the latest hot topics in the form of a lantern. The following will display the title, publisher, number of replies, number of clicks, last reply person, and time of the resource in a list format. By default, 10 resources are displayed on each page, with a pagination button at the bottom that can be changed according to specific needs to find the required information.

After entering the specific classification directory, users can see a publish link below the pagination button. Click this link to enter the resource publishing interface. In this publishing interface, users can upload files, images, titles, and specific content, and finally click Publish.

5.1.4 Resource Content Interface

Firstly, there will be a title for the resource. Below the title, there will be specific content information posted by the publisher. The content information page will display the specific content replied by other users, as well as the user profile and nickname.

5.2 Administrator Function Module

5.2.1 Instrument panel

In the administrator module, there is an independent address for the system backend: default admin. This login address is not publicly available to ordinary users and can only be used by administrators. After the administrator successfully logs in to the backend by entering their username and password, they will first see a dashboard that includes key indicators such as the number of users, posts, and directories. Through the overview information of the dashboard, administrators can have a clear understanding of the overall operation of the website and make corresponding decisions and adjustments based on these indicators. This helps optimize user experience, improve website operational efficiency, and increase user engagement.

5.2.2 Managing User Information and Resources

There are user information management and resource information management buttons on the left side of the dashboard. After entering the user information management interface and searching for users, the specific operations include mandatory modification of illegal user nicknames, resetting user passwords, and modifying personalized signatures. Click the Manage Resources button on the left side of the dashboard to enter the exclusive page for managing resources. All resource information and classified directory information will be displayed here. Administrators can add or reduce directories, delete or prompt to modify resources based on actual operational needs.

6. System Testing

The testing section is used to verify whether the entire system meets the specifications and requirements in the actual environment. This article will use system functional testing, stress testing, and compatibility testing in sequence.

Before conducting system functional testing, white box testing should be conducted on each module of the system. White box testing is an input and output test conducted with a good understanding of the source code and structure of each functional module [14], making it easier to modify the source code and solve bugs. Perform system functional testing after white box testing. For example, the login function, authentication function, resource audit function, etc. of the system monitor and detect the operation of the system in the input and output. For more convenient testing, the software will be executed in debug mode, which can give the program breakpoints. When the code is executed to a certain line, we can see the passed parameters and the specific actual values of variables through single step execution of the breakpoints. We conduct verification testing by analyzing the specific actual values.

The role of stress testing is to help evaluate the efficiency of a system in actual usage environments, evaluate system performance, and determine whether optimization of the application system is necessary. During the system execution process, we use the system's resource manager to record the CPU usage, network conditions, status of hard disk I/O, and GPU usage during system operation, and then analyze and summarize them. To achieve stress testing, we need an automated script that randomly simulates user behavior. By simulating the behavior of multiple users, we can obtain a summary of the system's stress situation.

System compatibility testing is a type of software testing used to ensure the compatibility of the built system, application, website, and various other objects (such as other web browsers, hardware platforms, users, operating systems, etc.). There may be compatibility issues with system interfaces across different operating systems, browsers, mobile devices, or PCs. This article conducts tests on different browsers on PC and mobile devices to determine the compatibility of user platforms.

Through comprehensive analysis and evaluation of white box testing, stress testing, and compatibility testing, after passing the evaluation, the system can be declared to have passed the test and can operate normally.

7. Conclusions

This project objectively studied the current situation of resource supply platform systems from both theoretical and practical perspectives, summarized the shortcomings of similar systems at present, and explored the necessity of integrating resource websites. We have conducted comparative analysis and research on the development technology platform, deployment mode of application servers, software framework structure, and development tools of the resource sharing platform, and developed a reasonable solution; A detailed investigation was conducted on the business process of the system, and a requirement analysis of the system was completed. The construction goals and principles of the system were determined, and the overall framework and functional architecture of the system were designed. Based on research and analysis, detailed design was carried out for each functional module of the system, in order to complete the development and deployment of the system.

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References

[1] Fan, J., Han, F., & Liu, H. (2014). Challenges of big data analysis. National science review, 2, 293-314.

[2] Qian, L., Luo, Z., Du, Y., & Guo, L. (2009). Cloud computing: An overview. Cloud Computing: First International Conference, CloudCom 2009, Beijing, China, December 1-4, 2009. Proceedings 1, 626-631.

[3] Franks, G., Majumdar, S., Petriu, N. D., Rolia, J., & Woodside, M.. (1999). Performance Analysis of Distributed Server Systems. Carleton University.

[4] Pšenák, P., & Tibenský, M. (2020). The usage of Vue JS framework for web application creation. Mesterséges intelligencia, 2(2), 61-72.

[5] Jensen, S. H., Møller, A., & Thiemann, P. (2009). Type analysis for JavaScript. In Static Analysis: 16th International Symposium, SAS 2009, Los Angeles, CA, USA, August 9-11, 2009. Proceedings 16, 238-255.

[6] Stark, E., Bistak, P., Kozak, S., & Kucera, E. (2017, June). Virtual laboratory based on Node. js technology. International Conference on Process Control, 386-391. IEEE.

[7] Zhao, Y.P., (2020). Design and Implementation of a Bank Knowledge Base Management System Based on Spring Boot and MyBatis. Doctoral dissertation,

Jinan: Shandong University.

[8] Wang, C. Y., Bochkovskiy, A., & Liao, H. Y. M. (2023). YOLOv7: Trainable bag-of-freebies sets new state-of-the-art for real-time object detectors. In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, 7464-7475.

[9] Liu, Q., & Yuan, H. (2019). A high performance memory key-value database based on redis. Journal of Computers, 14(3), 170-183.

[10] Jones, M., Bradley, J., & Sakimura, N. (2015). Rfc 7519: Json web token (jwt).

[11] Dhany, H. W., Izhari, F., Fahmi, H., Tulus, M., & Sutarman, M. (2017). Encryption and decryption using password based encryption, MD5, and DES. In International Conference on Public Policy, Social Computing and Development 2017 (ICOPOSDev 2017), 278-283.

[12] Peng, D., Cao, L., & Xu, W. (2011). Using JSON for data exchanging in web service applications. Journal of Computational Information Systems, 7(16), 5883-5890.

[13] Lerner, R. M. (2010). At the forge: Redis. Linux Journal, 2010(197), 5.

[14] Verma, A., Khatana, A., & Chaudhary, S. (2017). A comparative study of black box testing and white box testing. International Journal of Computer Sciences and Engineering, 5(12), 301-304.