Construction of Software Engineering Resource Management System Based on Cloud Computing Technology

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Abstract. This article aimed to study how software engineering can be used to meet user needs, improve service quality, and provide enterprises with more competitive and cost-effective products. Specifically, this article explored the problems faced by cloud computing technology in the development process and corresponding solutions. The article first introduced the background, significance, and current development status of the project. Next, this article analyzed the practical difficulties faced by developing software engineering resource management systems based on cloud computing technology, and proposed corresponding solutions. Finally, based on the above research results, this article designed the program code to implement this system, which can meet user needs and be put into use on the software platform. Afterwards, functional testing was conducted on the system. The test results showed that the resource data security of the system remained above 87%.

Keywords: Cloud Computing Technology, Software Engineering, Resource Management, System Construction

1. Introduction

In traditional software development enterprises, they often only focus on the development of the system itself, while neglecting research on user needs, program functions, and other aspects. However, with the continuous development of the times and the progress of technology, the level of social productivity continues to improve, and the demand for internet application technology by humans is becoming increasingly popular [1-2]. Therefore, in order to make services more convenient and simple, it is necessary to have higher quality and high standard software products to meet customer needs, in order to further improve the management of user information and development of system resources for enterprises.

Before the emergence of cloud computing technology, people generally focused their work on computer software and hardware. However, with the emergence of cloud computing technology, scholars begun to study software engineering resource management system models based on cloud computing. Some scholars, from a system perspective, believed that it is necessary to develop a virtualization platform that targets users and has high concurrency capacity requirements [3-4]. Other scholars

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analyzed and discussed how to improve the efficiency of this application service, considering that it consumes a large amount of manpower and material resources during use, and ensures the maximum data storage during server operation without any security risks. Finally, it is necessary to ensure that the provided software products meet customer needs. In addition, some scholars proposed a new system deployment solution to address the problems of traditional server resource management systems [5]. Therefore, this article built a software engineering resource management system based on cloud computing technology.

Based on cloud computing technology, this article conducted design and research on a software engineering resource management system. Software engineering is a branch of information technology that has been widely applied in fields such as computer technology and network communication, and cloud computing, as one of them, is also becoming more and more widely used. This article mainly introduced the project overview and project design process based on cloud computing technology development. Firstly, this article conducted a system requirement analysis and feasibility study, and then determined the overall system architecture based on the functional requirements of the project. It constructed relevant database models and implemented the required data storage in three aspects. Finally, the simulation and debugging work of the entire software engineering section was completed through the software engineering platform construction tool, providing convenient conditions for later testing and improving user experience and efficiency.

2. Exploration of Software Engineering Resource Management System Based on Cloud Computing Technology

2.1 Overview of Software Engineering

Software engineering is an interdisciplinary discipline that studies the design, development, testing, maintenance, and management of software, as well as the processes and methods related to software [6]. This discipline aims to improve the quality and efficiency of software development, reduce software development costs and cycles, and enhance software maintainability and scalability. Software engineering involves knowledge in computer science, mathematics, engineering, management, and social sciences, and is a interdisciplinary field. The theory and methods of software engineering mainly include software requirements engineering, software design, software testing, software maintenance, software configuration management, software project management, and other aspects. These contents are all aimed at ensuring the smooth progress of software development, thereby improving the quality and efficiency of the software. With the development of computer technology, the scale and complexity of software systems are increasing, and the tools and methods of software engineering are constantly being updated and developed. Software engineering has become an indispensable part of modern computer science and information technology. Cloud computing is a rapidly developing computing model in recent years, which provides computing resources to users in the form of services. Cloud computing service providers provide users with a virtualization platform called software projects [7-8]. Figure 1 shows the software engineering foundation platform.

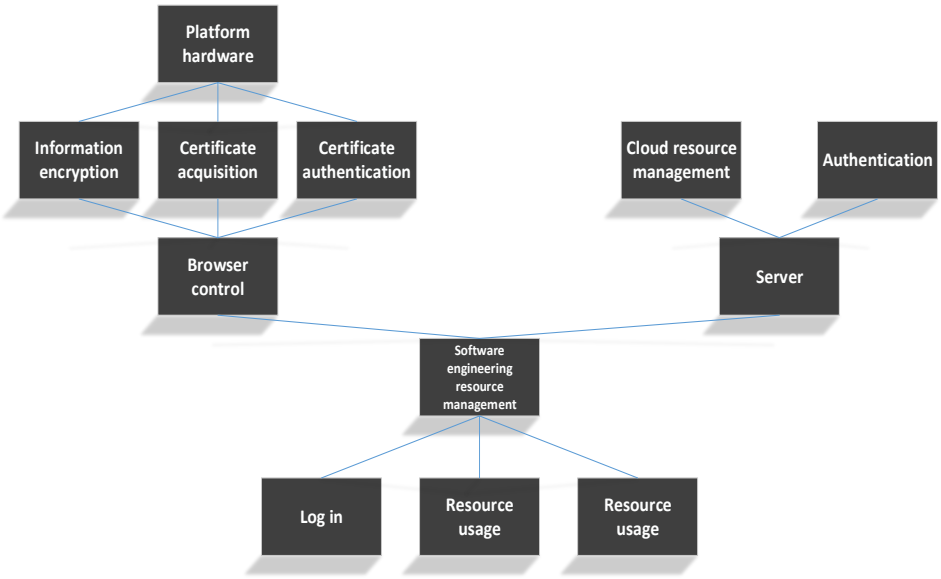

Fig.1 Software engineering foundation platform

The system has a user-friendly interface that is convenient for customers to use. Software developed based on cloud computing technology has friendly design, universality, and scalability. Throughout the entire process, all modules are able to achieve their functional and performance requirements well, and at the same time, the security and reliability of database management can be improved by restricting user access to data. Through software projects, users can freely set related operations or maintain data structures and storage methods. This provides a simple, convenient, fast, and sustainable software platform for enterprises [9-10]. The development and maintenance of software projects are the responsibility of cloud computing service providers, and users only need to pay attention to the use and maintenance of the software. In this way, users can invest more energy into the core business of the enterprise, thereby improving its competitiveness and efficiency. Software engineering and cloud computing technology are two indispensable components in the field of modern information technology. Their combination provides enterprises with an efficient, secure, reliable, and easy-to-use software platform, which can help them improve competitiveness and efficiency, and meet future challenges.

2.2 Cloud Computing Technology

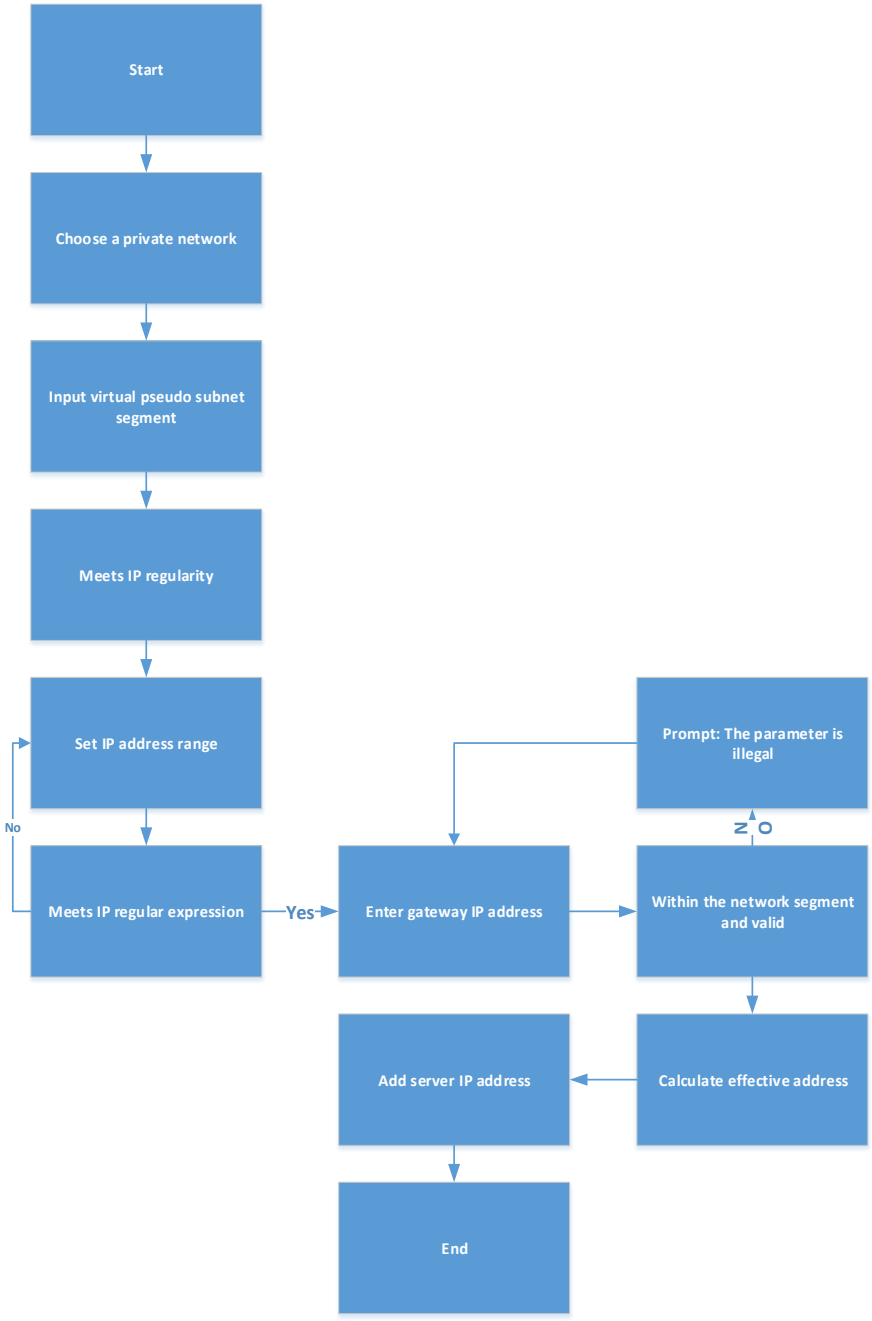

Fig.2 Cloud computing runs the process

Cloud computing technology is an internet-based computing model. It provides

efficient, secure, and convenient computing and data services by distributing a large amount of computing resources, storage resources, and applications to cloud server clusters worldwide. This technology can be accessed through the network and provide services on an on-demand basis [11-12]. Cloud computing technology is widely used in enterprise level applications, large-scale data processing, artificial intelligence, the Internet of Things, finance, healthcare, government, and many other fields. The advantages of cloud computing technology include high flexibility, low cost, strong scalability, and ease of management and maintenance. Among them, high flexibility mainly refers to the ability of cloud computing technology to provide resources of different scales and types according to user needs. The low cost is because cloud computing technology can achieve resource sharing, avoiding the purchase of expensive hardware devices and software authorization. Strong elastic scalability means that the system can automatically increase or decrease resources based on actual needs, thereby meeting different business needs. Easy to manage and maintain is because cloud computing technology can be managed through a unified management platform, thereby reducing the difficulty and cost of management and maintenance. Cloud computing technology is a virtualized and distributed service model [13-14].

Figure 2 shows the operational process of cloud computing. It manages the entire network as a massive 'entity'. Users can choose the resources they need based on their own needs. In this environment, the system can provide various types and scales of applications. Cloud technology has laid the foundation and supporting tools for software engineering development [15-16]. At the same time, it has also promoted the pace of the computer software and hardware industry towards the development trend of the Internet and the improvement process. The virtualization service model refers to a new way of connecting users through the construction of the entire network architecture, where relevant information is centrally processed by servers. Although cloud computing technology has many advantages, it is also influenced by various factors during operation. This includes changes in physical environment, software configuration, and application environment that result in system performance degradation or crashes. The resource utilization rate in cloud environment data centers is:

$$u_{DC} = \sum_{k=1}^{x} u_k / \sum_{k=1}^{x} j \tag{1}$$

So, the imbalance degree of the k-th physical server is calculated as:

$$NB_k = \sqrt{\sum_{z=1}^{l} [u_{k(z)} - u_k] * J_k} \tag{2}$$

The load imbalance of the entire cloud environment data center is:

$$NB_{DC} = \sqrt{\sum_{z=1}^{t}[u_{k(z)} - u_k]^2 \bullet \sum_{k=1}^{x} J_k \bullet N_{WPM}{}^{(-1)}} \quad (3)$$

The defects and deficiencies inherent in the software itself may also result in situations such as inability to function properly or inability to provide complete and reliable services. In addition, the network resource management system is a huge and complex engineering project that requires time and effort to deploy when integrated. Cloud computing technology is a very promising technology that has been widely applied in various fields [17-18]. With the continuous development and maturity of technology, cloud computing technology would become more perfect and popular.

2.3 Resource Management

Resource management is an important management behavior for enterprises or organizations to plan, allocate, schedule, and control various resources reasonably. These resources include human resources, material resources, financial resources, etc. Effective resource management can improve the efficiency of resource utilization in enterprises or organizations, reduce resource waste, and thus enhance overall efficiency and competitiveness. In practical operations, commonly used resource management tools include resource planning software, resource scheduling software, resource optimization software, etc. These tools can help enterprises or organizations better manage their various resources, achieve maximum utilization of resources, and improve the efficiency of the entire management process. It is worth noting that resource management is not limited to the maintenance and updating of IT resources such as software and hardware devices, but also includes other resources. Therefore, when conducting resource management, it is necessary to comprehensively consider the needs of various resources to meet the economic, technological, human, material, information, and other needs of enterprises or organizations [19-20]. In order to better manage resources, a unified database can be established using the system platform. Firstly, a file model needs to be created to store this data information. Then, it is necessary to select appropriate attribute types based on the actual situation to define their relationship with the corresponding elements in the database. Finally, all entities are added to the corresponding surfaces, and the relevant entities are saved and recorded. Resource management is an important management behavior of enterprises or organizations, which can improve resource utilization efficiency and reduce resource waste. Effective resource management tools can help enterprises or organizations better manage their various resources, improve the efficiency of the entire management process, and establish a unified database to better achieve resource management. Therefore, enterprises or organizations need to attach importance to resource management and continuously improve their resource management strategies.

3. Experimental Process of Software Engineering Resource Management System Based on Cloud Computing Technology

3.1 Composition of Software Engineering Resource Management System Based on Cloud Computing Technology

The software engineering resource management system based on cloud computing technology (as shown in Figure 3) is a system composed of multiple components, aimed at providing comprehensive resource management and scheduling services. The components of this system are as follows: the first is a cloud computing platform, which provides various cloud computing services, including virtualization, automation, and elastic computing capabilities. These capabilities help to achieve flexible scheduling and management of software engineering resources. Next is the data storage and management component, which is responsible for storing data related to software engineering resources. These data include project data, user data, and resource usage. In addition, this component also provides data query and analysis functions, so that users can better understand the usage of resources. The third component is resource management, scheduling, and monitoring, which is the core part of the entire system. This component is responsible for unified management, scheduling, and monitoring of software engineering resources to ensure efficient utilization and reliability of resources. Next is the user interface and mobile support components, which provide users with a friendly interactive interface that can be used on both the desktop and mobile ends. This helps users operate and manage the system more conveniently. Another very important component is security and permission management, which ensures the security and permission management of software engineering resources. This component ensures that project data is not improperly accessed or leaked by restricting access permissions. The report and analysis system is another component that provides efficient data analysis functionality for the system. Through this component, users can better understand the usage of resources and project progress, providing data support for decision-making. Finally, there is the third-party tool integration component, which provides the system with an integration interface with third-party tools. This allows users to easily use familiar tools for development and project management. The software engineering resource management system based on cloud computing technology is a powerful system composed of multiple components. These components work together to achieve comprehensive management and scheduling of software engineering resources.

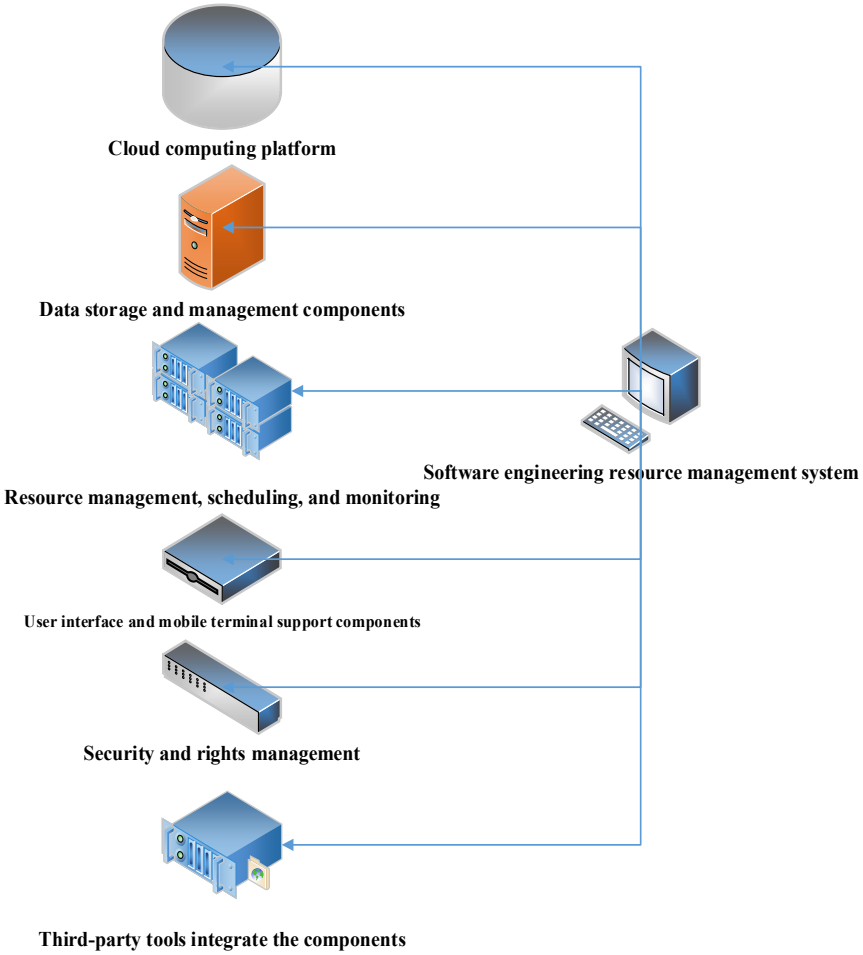

Fig.3 Software engineering resource management system based on cloud computing technology

3.2 Simulation of Software Engineering Resource Management System Function Based on Cloud Computing Technology

After system engineering management, a software system based on cloud computing technology has been successfully developed, and its functional modules and implementation process have been completed. The program is mainly divided into two parts: the user interaction interface for managing permissions and the login interaction interface. Administrators can add, delete, modify, and query the entire project through this system. However, administrators can only check whether the functions within the corresponding roles that already exist in the user are complete or have not been used, and cannot enter their corresponding pages to display relevant information and other content. When adding a new account password, the administrator needs to enter the old account or email to complete this function. The main functions of a software engineering resource management system include

system login, user management, historical data modification, and addition of database file information. The implementation of these functions requires a rigorous testing process. The testing process includes preparation work before running and simulating program operation in actual environments. Before running, it is necessary to set and configure the program accordingly. Then, running the program in a simulated actual environment can ensure that the entire system can operate more comprehensively and stably. Through this cloud computing technology based software system, software engineering resources can be more efficiently managed. It not only improves management efficiency, but also ensures the security and integrity of data. At the same time, the system also has good scalability and maintainability, providing strong support for the development of software engineering.

4. Experiment on Software Engineering Resource Management System Based on Cloud Computing Technology

Table 1. Functional Testing of the Software Engineering Resource Management System

Test module	Data processing time (s)	Data processing efficiency(%)	Resource occupancy rate(%)
Cloud computing platform	3	95	12
Data storage and management components	6	97	14
Resource management, scheduling, and monitoring	4	96	15
User interface and mobile terminal support components	2	94	13
Third-party tools integrate the components	2	94	14

This article aimed to conduct a comprehensive test of the system to verify whether the functions of user creation, modification, deletion, query, etc. are normal, and to test whether the system can manage and approve user permissions, and verify whether user permissions are correct. In addition, the functions of task creation, modification, deletion, query, and task progress tracking were tested for correctness and effectiveness, and the ability to complete tasks on time was verified. Key indicators such as task priority and task control ability were also verified to meet the requirements. In terms of testing the allocation, scheduling, and recycling of resources, validation was also conducted to ensure that the system can meet the needs of various computing and storage resources, and to verify whether resource utilization is reasonable. Table 1 shows the performance data of this system test. Through these tests, it was found that the system performs well in various functions, meets design requirements, and has high stability and reliability. In terms of user management, the system can accurately identify user permissions and provide corresponding approval processes to ensure that user operations are fully authorized and approved. In terms of task management, the system can comprehensively track and control tasks, ensuring that they can be completed on time and can be appropriately assigned and scheduled

based on priority. In terms of resource management, the system can flexibly allocate, schedule, and recycle resources to meet the needs of different users and ensure reasonable resource utilization. The system performs well in various functions and has high practical and commercial value.

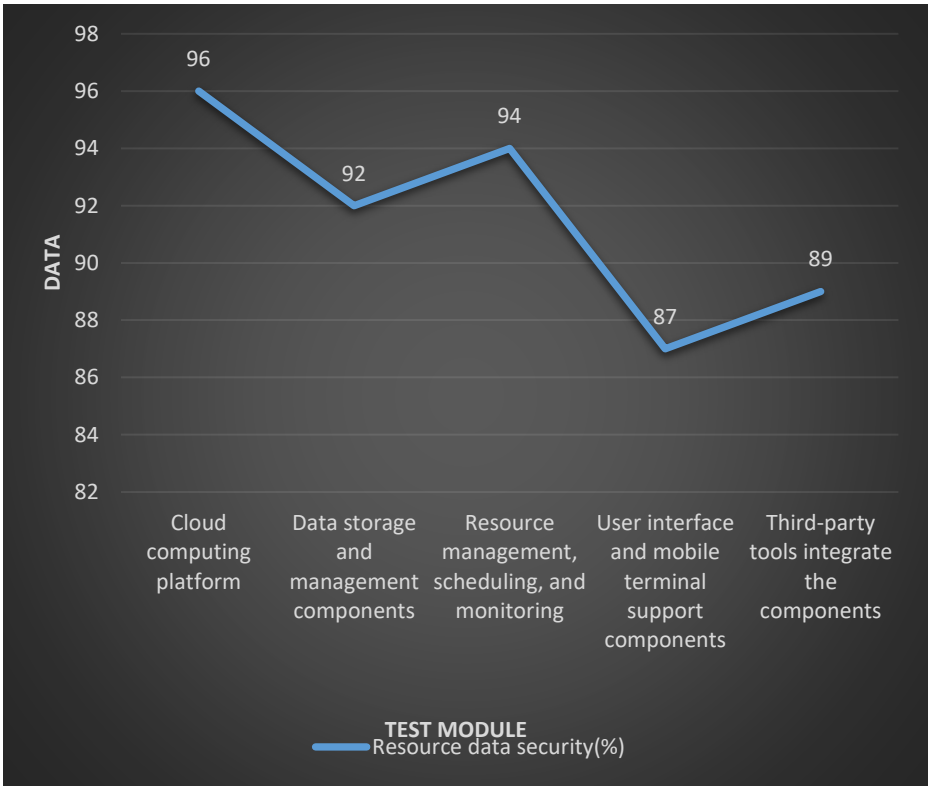

Fig.4 Data resource security testing

This article rigorously tested the security of the system to ensure compliance with regulations and effective protection of user privacy. In addition, this article also verified whether the system's data encryption and tamper prevention technologies are truly effective, and evaluated the accuracy and reliability of data recovery. In the process of testing, this paper used a variety of means to simulate various attacks, including but not limited to network attacks, physical attacks, social engineering attacks, etc., to ensure that the security of the system is comprehensively tested. At the same time, this article evaluated the anti virus and firewall functions of the system to ensure that they can detect and block any potential threats in a timely manner. In addition, this article also conducted detailed tests on the system's data encryption and tamper prevention technologies to ensure that they can effectively protect the confidentiality and integrity of data. This article used various encryption algorithms and technologies to test the encryption performance of the system, and made modifications and tampering attempts to the data to verify the effectiveness of the system's anti tampering technology. This article tested the data recovery function of the

system to ensure that it can accurately recover lost or damaged data. This article simulated various situations of data loss and damage, and tested the recovery speed and accuracy of the system. Through these tests, this article ensured that the system's security meets the specifications and can effectively protect user privacy. From Figure 4, it can be seen that the resource data security of the system remained above 87%. At the same time, this article also provided valuable suggestions and guidance for system optimization to further improve its security and reliability.

5. Conclusion

Software engineering is an extremely practical technology that can provide developers with high-quality, efficient, and low-cost development tools. In traditional project management, software engineering records are mainly operated on paper media. However, the research focus of this article was on information construction based on cloud computing technology. This article explored the functional modular structure design, optimization scheme analysis, and improvement of data information resource management systems, and proposed corresponding solutions and guarantee measures to solve various difficulties encountered in practical applications, thereby improving the practicality, availability, and reliability of the system project.

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