Optimization and Upgrade of Special Database Management System for University Archives Based on Cloud Computing

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Abstract. With the progress of society and the development of science and technology, the data management of archives in colleges and universities has also changed from traditional manual operation to information technology system operation, which has taken a big step forward in the speed of data archive management. At the same time, following in the footsteps of the party and the state, according to the education reform measures issued by them, further implementation and implementation. With the innovation of education model, the reform of management method, and the expansion of teaching scale, the types and quantity of files are also increasing, and the scope is also expanding, which leads to the continuous increase of management difficulty. This requires data management to achieve informatization to meet the needs of society. The purpose of this paper is to study the optimization and upgrading of the special database management system of the archives of colleges and universities based on cloud computing. Based on cloud computing, this paper proposes the establishment of a special database management system for college archives and the methods and key technologies used in the process of optimization and upgrading. First, analyze the characteristics of the database management system, and then conduct demand analysis and functional analysis of the system. Secondly, research the advantages and disadvantages between the traditional data management of colleges and universities and the current latest database management system. Finally, according to the needs of the special database and system function requirements, the overall design of the archives management system is carried out, database modeling tools are used to optimize the database, and then its operation is studied, and system testing is carried out to enable it to meet the needs of university archives management. The experimental results show that the focus of database function optimization in different universities is different. University A prefers timeliness, accounting for 46%. University B thinks security is the most important, accounting for as high as 51%. University C is relatively even, both at 30%. The conclusion is to select the most practical and demanding functions for further optimization, and choose an overall design suitable for the special data of colleges and universities.

Key words: Cloud Computing, File Management, Database, System Optimization
1. Introduction
With the progress of society and the rapid development of science and technology, computer-related technologies have been widely popularized [1]. And it is widely used in life and work [2]. The data management in the archives of colleges and universities has also changed from the traditional manual operation to the operation of the information technology system, which has taken a big step forward in the speed of data archive management [3-4]. At the same time, following in the footsteps of the party and the state, according to the education reform measures issued by them, further implementation and implementation. With the innovation of education model, the reform of management methods, and the expansion of teaching scale, the types and quantity of files are also increasing, and the scope is also expanding, which leads to the continuous increase of management difficulty [5-6]. This requires data management to achieve informatization to meet the needs of society [7-8].

In the research on the optimization and upgrading of the special database management system of the archives of colleges and universities based on cloud computing, many domestic and foreign scholars have studied it and achieved good results. Zheng H has carried out the analysis and design of the archives management system of colleges and universities under the network environment [9]. Based on the actual situation of archives management in our country's universities, it uses large-scale database management technology, multimedia technology, and network technology to uniformly manage university archives resources [10-11]. Based on the file information management system of a certain vocational and technical student, according to the current development trend and existing problems of the file management system, Liang X conducted a demand analysis and system architecture design [12].

Based on cloud computing, this paper proposes the establishment of a special database management system for college archives and the methods and key technologies used in the process of optimization and upgrading. First, analyze the characteristics of the database management system, and then conduct demand analysis and functional analysis of the system. Secondly, research the advantages and disadvantages between the traditional data management of colleges and universities and the current latest database management system. Finally, according to the needs of the special database and system function requirements, the overall design of the archives management system is carried out, database modeling tools are used to optimize the database, and then its operation is studied, and system testing is carried out to enable it to meet the needs of university archives management.

2. Research on Optimization and Upgrading of Special Database Management System of University Archives Based on Cloud Computing

2.1. The Focus of the Optimization of Special Database in Universities

(1) Strengthen learning and improve the quality of staff
Improving the quality of staff archives staff are often older, lower-educated, and not graduated from academic classes. They lack systematic knowledge of archives management, and they don't have much knowledge of modern information technology. In order to build digital archives and ensure the normal operation of digital archives, staff are required not only to learn archive management knowledge and new laws and regulations, but also to learn modern information technology and network technology, and continuously improve their working and practical capabilities. Create a compound high-quality talent team who understands both file management knowledge and modern information technology.

(2) Pay attention to timeliness
If the speed of library building cannot keep up with the rapid development of computer technology, the original advanced hardware equipment will lag behind, resulting in a mismatch between software
and hardware. In addition, the diversification of programming languages and the ever-increasing demand of users for software functions will also make the software continue to be updated and improved to meet the needs of the business. In the database development process, we are required to strengthen management and unite and cooperate. If we do not enter the massive amount of archive information in time, it will definitely affect the efficiency of archive management. In order to produce early results and achieve early results, we must always pay attention to more aspects of development and pay attention to practical results.

(3) Strengthen the upgrade, maintenance and security of the database
In terms of hardware configuration, the isolation layer is set at the physical level to ensure the safety and reliability of the system; in terms of the system, it provides data authorization and document authorization functions to minimize the probability of incorrect data; in terms of user operation authority, The business authority management of user-controllable business data; establish log records, regardless of whether the user logs in to the system or manipulates the data, it will be recorded in the log file to ensure clear responsibilities and system security. In the work, according to the demand and the development of new technology, strengthen the update, upgrade and maintenance of the database, and constantly improve and update the database structure to achieve the optimal structure.

(4) Be ahead of time
The database's data management capabilities, compatibility, computing speed, ease of use, fault tolerance, safety and reliability, rationality of data structure, and complete integrity of data and information, etc., not only depend on its practicality, but also on its availability. Only databases that have both practicality and development potential can guarantee their advancement and reliability, and will not be eliminated in a short time.

2.2. System Optimization and Upgrade Requirements

(1) System performance requirements
It can respond to the concurrency of users instantly, especially when the number of concurrent users increases, the system must provide a certain load balancing mechanism, load balancing, and a certain coordination mechanism for the system pressure of a large number of group operations. The entire short message group sending platform runs stably, and the short message group sending platform itself needs to provide fault tolerance, which can prompt users for input errors and retrieval errors to avoid potential security threats to the system platform due to user misoperation.

(2) Data processing capability
Perform certain data processing capabilities for system data to ensure effective storage and reading of front-end user data. At the same time, the system must provide certain data backup and restore capabilities to instantly and effectively back up the system database data and provide certain data Disaster prevention function. And the system must have a certain amount of data restoration capability, which can effectively restore the backed up data. The system data is lost due to system damage.

(3) System security requirements
In view of the relatively large number of network viruses, the software should provide a certain security mechanism. Through an effective password authentication mechanism, the identity of the system user can be limitedly authenticated, and different users need to be given different permissions through the means of permission management. In the application protocol, the entire system use link can be encrypted through a secure communication protocol to prevent the user's use information from being stolen and tampered with.
2.3. Basic Principles of Database Optimization and Upgrade

(1) Data storage
The database is also a comprehensive management platform for data. As a storage space, it must support the storage of data. Not only that, the storage should be consistent with the system's default data format. In order to store more data and improve storage efficiency, storage plans and rules are generally formulated in advance. In the actual operation stage, the data required to enter the database is stored in accordance with the preset storage rules.

(2) Security requirements
Database information usually has good privacy and high confidentiality characteristics. Therefore, even if the entire system is terminated or even paralyzed, the normal operation of the database must be ensured to prevent the database from being damaged and unimaginable consequences. In order to achieve the double guarantee of its safety requirements, it is necessary to fully consider its rejection capability and resistance to foreign viruses when designing an application system.

(3) Less redundancy requirements
Efficient system Almost all the information, links, and design codes have practical characteristics. As the data collection center, the database has a considerable workload. If the whole system is disordered in the design process, it will cause data storage distortion. Therefore, messages of the same type should be stored only once. Use less redundancy to ensure the efficiency of the system.

2.4. System Optimization and Upgrade

(1) Help colleges and universities establish a standard system
Electronic file filing management under the conditions of information technology, both in essence and in form, have to undergo varying degrees of change. Therefore, the archives department of colleges and universities should formulate standardized rules and systems in accordance with the development of archives work and the characteristics of electronic documents. The establishment of a special archive database can classify archive data information according to the actual situation of the university archives, which is clear at a glance, easy to archive, and standardizes various business data.

(2) Realize integrated management
Using big data technology, the file management work is standardized and managed, so that all files are in the same system, and the file sharing function is realized, which is convenient for the staff to access. It also solves the problems of slow processing speed and insufficient storage in the past, so that the information is maintained uniformly and updated accurately in time.

(3) Improve work efficiency
When accessing information in the database, there will be records of import and export, so that different workers can understand each other's work process, avoid repetitive work, improve work efficiency, and reduce processing time.

2.5. Cloud Computing Model

(1) Cloud computing performance modeling
Assuming that the cloud computing center is composed of multiple heterogeneous components, the maximum number of heterogeneous components can be created on the i-th PM. Therefore, the total number of VMs in the cloud computing center can be expressed as:

\[ \text{vm}_{\text{total}} = \sum_{i=1}^{\text{PM}} m_i \]  

(1)
(2) Time interval queuing system calculation
G/M/n queueing system. In this queueing system, the arrival of customers obeys the general distribution, and the subtasks (customers) obey the independent arrival mode of order quantity. Therefore, the time interval between two successively arriving subtasks is an independent and identically distributed random variable, which obeys the general distribution A. We use \( A(t) \) to represent the cumulative distribution function of the time interval, and \( a(t) \) to represent its probability density function. The Laplace transform of the time interval can be expressed as:

\[
A^*(s) = \int_0^\infty e^{-st}A(t)dt
\]

MX/G/n/L queueing system. In this queueing system, task arrival obeys Poisson distribution and arrival rate, and customers (subtasks) follow the batch arrival mode. Therefore, we assume that the time interval of the task obeys the exponential distribution \( C \), the CDF is, the PDF is \( c(t)=\), and the LST of the interval time can be expressed as:

\[
C^*(S)=\int_0^\infty e^{-St}C(t)dc
\]

3. Experimental Research on Optimizing and Upgrading Special Database Management System of University Archives Based on Cloud Computing

3.1. Experimental Subjects and Methods
This experiment takes the system optimization and upgrade test users and university databases as experimental objects, researches their functional requirements, selects the functions that should be optimized for the system, and upgrades the overall design. This experiment focuses on on-site investigations, conducting face-to-face interviews with users, going to a university for actual experience, and getting the survey results.

3.2. Data Collection
In the era of big data, more storage devices and faster I/O mechanisms are needed to access data. In order to achieve more convenient and rapid access to data in big data applications, academia and industry continue to propose new technologies and methods to shorten the gap between high-performance CPU and low-speed I/O. Secondly, although solid-state drives achieve efficient random I/O and alleviate storage difficulties, they cannot achieve efficient sequential I/O at the same time. High-efficiency and low-cost storage devices are still in the continuous development process.

4. Experimental Research and Analysis of Optimizing and Upgrading the Special Database Management System of University Archives Based on Cloud Computing

4.1. Key Analysis of Users' Needs for System Optimization and Upgrade
This experiment takes the system optimization upgrade test user as the experimental object, analyzes which aspect of the user's functional requirements for the database management system is optimized. This experiment focuses on the four aspects of system performance, storage capacity, data processing capacity and security performance. The experimental results are shown in Table 1:

|                      | Test user A | Test user B | Test user C |
|----------------------|------------|------------|------------|
| System performance   | 22%        | 16%        | 21%        |
| Storage capacity     | 18%        | 21%        | 27%        |
| Data processing      | 25%        | 38%        | 40%        |
| Data processing      | 25%        | 25%        | 22%        |

Table 1. Proportion of user demand
4.2. Comparative Analysis of the Functions of Other University Databases

In this experiment, three university database systems are used as the research objects to investigate the three general aspects of security, timeliness and storage. The experimental results are shown in Table 2:

|                | University database A | University database B | University database C |
|----------------|-----------------------|-----------------------|-----------------------|
| Safety         | 33%                   | 51%                   | 31%                   |
| Timeliness     | 46%                   | 21%                   | 30%                   |
| Storage        | 21%                   | 28%                   | 39%                   |
Figure 2. Comparison of database functions of other universities

As shown in Figure 2, the focus of the database function of each college is different. College A tends to be timeliness, accounting for 46%, college B feels that security is the most important, accounting for 51%, and college C is relatively even, all in More than 30%. The conclusion is to select the most practical and demanding functions for further optimization, and choose an overall design suitable for the special data of colleges and universities.

5. Conclusions
With the acceleration of my country's informatization process, the way people contact information is increasingly dependent on computer networks. As an important resource of social information, archive information has great social value. Therefore, in the context of the rapid development of computing network technology, how to make archive information, especially college archive information, play a greater value in social construction, is the starting point of this article. Combined with the actual situation of the university management system, firstly, a serious and detailed investigation was made on the current file management system of the university, and combined with the relevant information found on the Internet, the demand analysis of the optimization and upgrading of the system was completed. Use cloud computing to standardize file management and improve the speed of file processing. Finally, a more systematic and complete test work was carried out on the optimization and upgrade of the system. The test results were basically consistent with the expectations, and the design requirements were met, which can fully meet the requirements of the archives work of colleges and universities.

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