



Design of Online Teaching System of Real Estate Operation and Management Course Based on Cloud Model

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Abstract. In order to improve the performance of the online teaching system for real estate operation and management courses, a cloud model-based online teaching system design for real estate operation and management courses is proposed. The cloud model is applied to the network architecture design of the online teaching system of real estate operation and management courses, and the real estate operation and management courses are realized by designing online management modules, training management modules, course resource management modules, exam resource management modules, and remote video modules Online teaching system design. The test results show that the online teaching system of real estate operation and management courses based on the cloud model has higher performance and speeds up the system's response speed.

Keywords: Cloud model · Real estate operation and management · Online teaching · Teaching system

1 Introduction

In recent years, with the rapid development of the Internet and the development of multimedia, not only the network resources are abundant, but the application of computer combined with multimedia in education has become more and more extensive [1]. According to my country's Ministry of Education, the construction of a national online learning system consists of three parts: the first part is to establish digital learning content; the second part is to reduce the digital gap between urban and rural areas in primary and secondary schools; the third part is to establish a lifelong learning network platform. In addition, the Ministry of Education actively promotes the nine-year consistent curriculum, and one of its nine-year consistent basic concepts is lifelong learning. Lifelong learning includes: active inquiry, problem solving, and the use of information and world languages. Therefore, the rapid development of the Internet has highlighted the importance of students using Internet resources for learning.

With the development of information technology and the enrichment of network resources, China is committed to the development of digital learning, whether in industry or education Since, e-learning has been officially listed as a national plan and vigorously

promoted. The contents include: describing the promotion and planning of China's e-learning environment, the application and Prospect of China's government's e-learning, China's e-learning academic research, the current situation and development of China's e-learning market, and China's e-learning vision and direction. It can be seen that e-learning has become an important factor in the development of national industry or academic education [2]. At present, the teaching methods of integrating information technology into teaching can be divided into three ways. Method 1: the teacher electrizes the textbook, then uses the projector and notebook computer in front of the classroom, and then cooperates with the network in the electronic classroom to teach. This teaching method combining network and self compiled textbook is better than the early school teachers who only use chalk to write blackboard. Our teaching environment, whether in the visual or auditory aspects, has more perfect equipment assistance, which is of great help to teachers and listeners [3, 4]. Method 2: the teacher can set the computer screen of the student seat as the implementation screen of the teacher's computer broadcast teaching. The teacher can let the students clearly participate in the classroom teaching through the computer screen in front of each student. At present, this method is mostly used in information class teaching. Method 3: using the TV and computer equipment in the classroom, the network resources of the classroom will be directly broadcast by the TV through the adapter. With the development of modern science and technology and the enrichment of network resources, the whole teaching mode is no longer a single traditional face-to-face teaching in the past, but changes with the application of teachers. According to the research results, whether or not there is computer-assisted teaching or which computer-assisted teaching mode to choose, the degree that really affects students' learning effectiveness and attitude should be related to the students themselves. And teachers in the classroom to create a learning environment, so a teacher how to make good use of existing resources in the teaching mode to do the most effective teaching, is a very important topic [5, 6].

At present, the commonly used online teaching system mainly includes the online teaching system based on data mining and the online teaching system based on B/S architecture. But in the practical application, it is found that the application effect of the above system is not ideal. Based on the above background, this paper designed an online teaching system of real estate operation and management course based on cloud model. Under the cloud model environment, it built an online management module, training management module, course resource management module, examination resource management module and remote video module.

2 Network Architecture Design of Online Teaching System for Real Estate Operation and Management Course

In order to improve the performance of the system, the database server and system server are deployed on two different servers in the online teaching system of real estate operation and management course [7]. In real estate operation and management course online teaching system server front-end deployment firewall, and then connect the server to the available user access to the LAN. In the early stage of the system operation, the operation mode of single server is adopted temporarily. When a single server can not

meet the system requirements, the system runs slowly and crashes, we add a separate database server to specially manage and process the system data. After one server can not meet the system requirements, it can also add multiple database servers, separate the data reading and writing from multiple internal program processing servers, and request the client to rotate to the internal server for processing.

In this system, the database server is used to process the data, the Web server is used to provide online information browsing service, and the backup server is used to store and backup the data information. At the same time, the system is connected with the Internet through the hardware firewall. The topology of online teaching system for real estate operation and management courses is shown in Fig. 1.

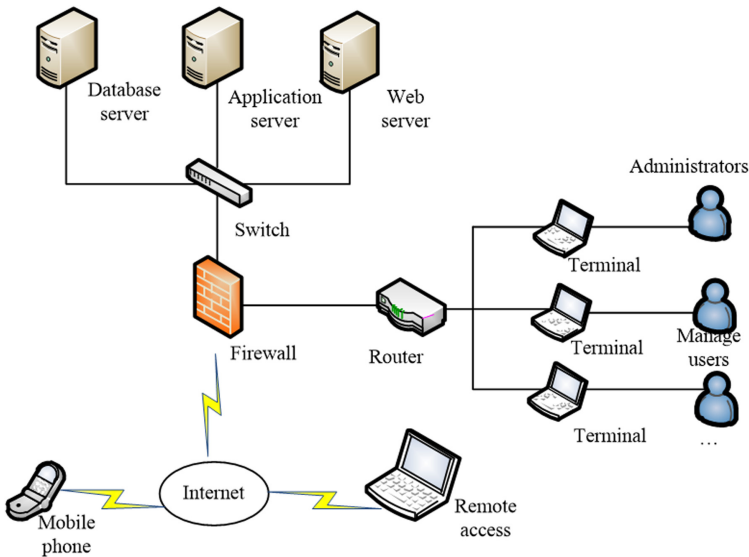


Fig. 1. Network topology

The online teaching system server of real estate operation and management course adopts Windows Server 2008 operating system, and the hardware configuration is 8-core CPU, 16 g memory and 250 g hard disk space. Tomcat 6.0 is the server middleware used in distance education system. The database server adopts Windows Server 2008 operating system, and the hardware configuration is 8-core CPU, 16 g memory and 250 g hard disk space. The database adopts my SQL.

3 The Functional Module Design of Online Teaching System for Real Estate Operation and Management Courses

In the online teaching system component module of real estate operation and management courses, the main users are system administrators and ordinary users [8–10].

3.1 Online Management

Through the administrator to manage the basic information of real estate operation and management online teaching system, such as: student management, role management, portal information management, post qualification classification management, post and post management, etc. Ordinary users can maintain some personal information. As shown in Fig. 2.

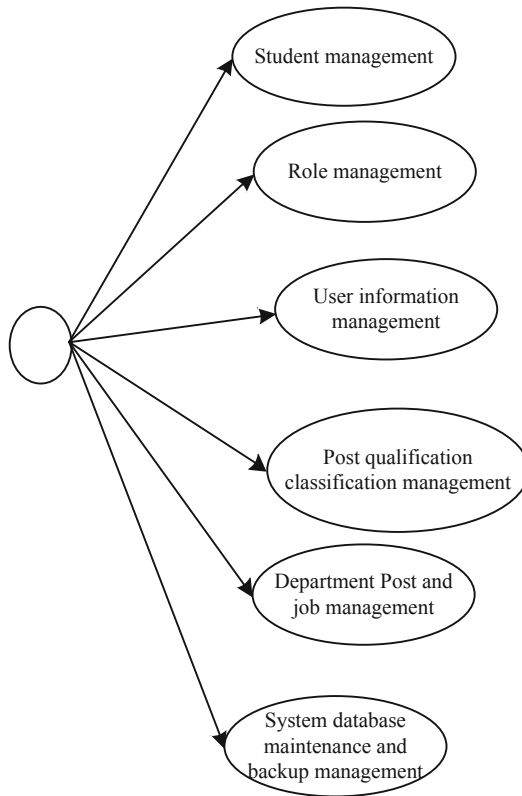


Fig. 2. Use case diagram of distance education system

3.2 Training Management

Training management is mainly divided into two roles: administrator and ordinary user. Management has the right to manage and maintain the system.

An ordinary user can only view it. For example, in the learning point management system, for an ordinary user, he can only see how much his current learning points are and what level he currently belongs to.

However, the administrator can set the corresponding points rules in the background or modify the points and levels of ordinary users [11, 12]. As ordinary customers, students

need to apply for an account and password after completing the student registration, and then learn on the system according to the issued teaching plan. But at the same time, in order to ensure the safety of data, every administrator's operation will be recorded in the database for future audit.

3.3 Course Resource Management

Curriculum resource management is one of the important modules of the online teaching system of the real estate business and management course, including course material management, course development management, course content editing, and learning and teaching management. In the course resource management module, the administrator and ordinary users mainly use the system to communicate. The administrator performs operations on the system. After uploading relevant files, ordinary users log in to the system to select and learn courses [13]. As shown in Fig. 3.

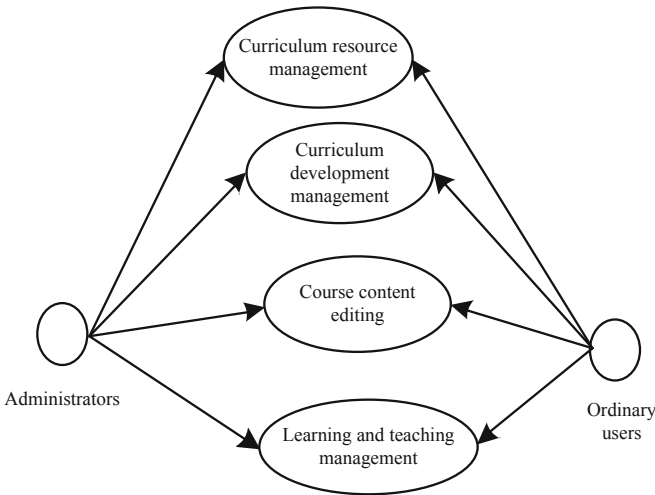


Fig. 3. Use case diagram of curriculum resource system

3.4 Examination Resource Management

Examination is an important standard for online education and training. The exam resource module is one of the modules of the online teaching system for real estate management and management courses, including question bank management, test paper management, online test management, process monitoring management, scoring management, and score management [14]. The entire examination resource management process involves many aspects. In this process, based on past experience in distance education and training, the original operation process is integrated and the above design method is changed, as shown in Fig. 4.

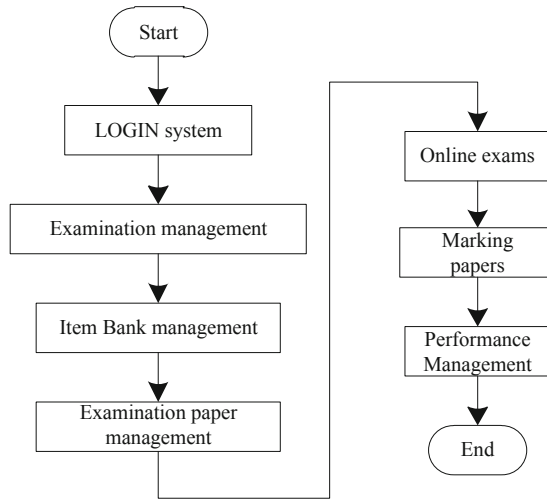


Fig. 4. Flow chart of examination management resource system

3.5 Remote Video

The remote video module is one of the important modules of the online teaching system of real estate management and management courses, including online teaching management, online learning seminars. Students first log in their user names and passwords on the interface to search, browse and download courseware. They can also watch online videos at any time to make up for their own shortcomings. After forgetting the login password, students can follow the system prompts to retrieve the password, and the operation is quick and convenient, and they will not be unable to log in to the system because they have forgotten the password [15]. As shown in Fig. 5.

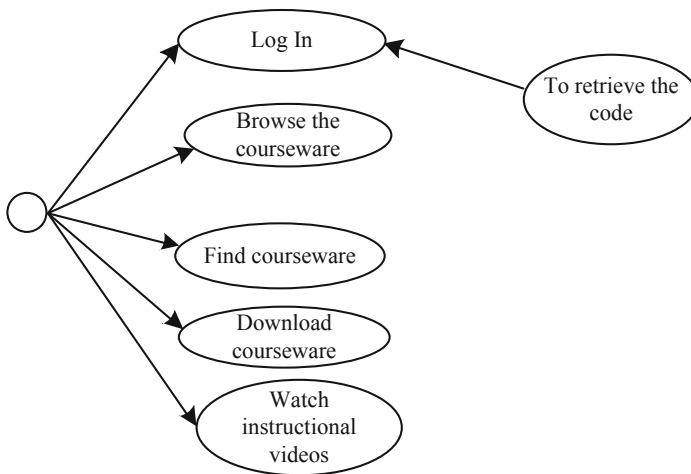


Fig. 5. Use case diagram of remote video system

To sum up, on the basis of designing the network architecture of online teaching system of real estate operation and management course, combined with online management, training management, course resource management, examination resource management, remote video and other module design, the online teaching system of real estate operation and management course is realized.

4 System Testing and Performance Analysis

A perfect system, in order to make the system run normally, testing is an essential part. Although strict technical review has been adopted in the whole system development process, it is inevitable to leave errors. If errors and loopholes in the system are not found and corrected before they are put into operation, then these loopholes and errors will directly affect the operation of the system. If problems are corrected after they occur, the cost of manpower and material resources will be greatly increased. Unit testing and function testing are both part of system testing. Unit testing is to make developers know that the code is being executed correctly, and the goal of function testing is to verify whether the code plays a given role. Unit tests are written from a developer's perspective. The goal of each test is that the output we get is what we want when we input. It is called function test, which is written for users. The purpose of the test is to make the system run in line with the requirements of users. The so-called software testing mainly focuses on the function and performance. According to the process plan and related testing tools, the results are analyzed and solved. To sum up, in order to improve the quality of software, many related software detection is indispensable.

4.1 Testing Environment

The test requirements of the system mainly include hardware requirements and software requirements. The specific configuration is as follows:

1. Hardware requirements
Test terminal: Recommend Intel Pentium 4 or higher processor, 8GB memory or more, hard disk 300G or more, support USB interface, support multiple network access methods.
2. Software requirements
Test software: loaderrunner
Test browser: IE, firefox
Test record: excel, Bugzilla

4.2 Function Test

User Management Test Cases

Table 1 mainly describes the user management test case, which focuses on viewing and editing user information.

Table 1. User management test cases

Test case description	View user information	Edit user information
Operation process and data	Click user management to view user information	Add, modify and delete user information
Expected results	Display user information, including: user name, user's gender, user's phone, user's picture information	Add, modify and delete user information according to relevant operation
Result	√	√

Permission Management Test Case

Table 2 mainly describes the permission management test case, which mainly includes viewing user information and editing permission information.

Table 2. Permission management test cases

Test case description	View permission information	Edit permission information
Operation process and data	Click authority user management to view the relevant information of authority	Add, modify and delete permission information
Expected results	Display permission information, including permission name, permission content, permission specific meaning and other information	Add, modify and delete permission information according to relevant operation
Result	√	√

Online Teaching Test Cases

Table 3 mainly describes the online teaching test case, which mainly includes viewing user information and editing the online teaching information.

Table 3. Online teaching test cases

Online teaching test cases	View online teaching	Editing online teaching
Operation process and data	Information	Information
expected outcome	Click online teaching management to view the online teaching content	Add, modify and delete online teaching information
Result	√	√

Online Test Case

Table 4 mainly describes the online test case, which consists of the following two parts: viewing user information and editing online test information. The operation process and expected results of these two parts are described in detail in Table 4.

Table 4. Online exam test cases

Test case description	View online exam	Edit online exam
Operation process and data	Information	Information
expected outcome	Click online exam management to view the online exam	Add, modify, and delete online exam information
Result	√	√

Survey Management Test Cases

Table 5 mainly describes the survey management test cases, which mainly include two parts: viewing user information and survey information. Table 5 describes the operation process and expected results of these two parts in detail.

Table 5 Survey management test cases

Test case description	View survey information	Edit survey information
Operation process and data	Click Survey Management to view related information about the survey	Add, modify, and delete survey information
expected outcome	Display survey information, including: test survey	Follow related operations to add, modify,
result	√	√

4.3 Performance Testing

In order to better test the performance of the system under high load, the system uses the Loader Runner tool to create multiple groups of different numbers of users to perform simultaneous operations and record the system's response time.

The items tested in this test are: login to the system, online communication, and online teaching.

The test results are shown in Tables 6, 7 and 8.

Table 6. Login system test

Login system test case			
Precondition	In the normal login interface		
Test target	Understand the performance of the system under simultaneous login of multiple users		
method	Use LoadRunner tools to simulate multi-user login scenarios and execute test scripts		
Number of concurrent tests	Average time to complete business(s)	Maximum time-consuming business completion(s)	Average use of network packets
30	1.045	2.345	67
60	4.231	6.892	68
200	5.123	9.352	100

Table 7. Online communication test

Online communication test cases			
Precondition	Normal login system		
Test target	Understand the performance of the system in simultaneous online communication with multiple users		
Method	Use the LoadRunner tool to simulate multi-user online communication scenarios and execute test scripts		
Number of concurrent tests	Average time to complete business(s)	Maximum time-consuming business completion(s)	Average use of network packets
30	1.235	2.231	64
60	3.123	6.234	66
200	5.123	11.233	79

4.4 Test Conclusion

After unit testing and functional testing of the online teaching system, the system has reached the standard of design requirements. The system has stable speed and good performance under the condition of less than 200 users, but when there are more than 200 users online at the same time, the system efficiency is low and the response is slow. At present, it has been optimized by adopting the following methods:

Table 8. Online teaching test

Online teaching test cases			
Precondition	Normal login system		
Test target	Understand the performance of the system under simultaneous online teaching by multiple users		
Method	Use LoadRunner tools to simulate multi-user online teaching scenarios and execute test scripts		
Number of concurrent tests	Average time to complete business(s)	Maximum time-consuming business completion(s)	Average use of network packets
30	1.892	3.123	72
60	5.122	8.213	75
200	6.781	13.112	129

1. Database access performance optimization

Establishing, opening and closing links is a common operation method for users to access database resources. In the process of these operations, information exchange is necessary to ensure that the database can pass the authentication. When users open and close such operations, hibernate can use the connection pool to change the impact of these operations on the system. The user's database connection is stored in the connection pool. The user can take it out when needed and put it back when not needed, and then wait for the customer to use and request it again. However, the carrying capacity of connection pool is also limited. If it is still required to be used when the connection pool is running at full load, it will have a great impact on the function of connection pool.

2. Data caching

Hibernate has some simple mechanisms to store them when there is no need to dynamically calculate page output or data for each page request. In addition, sorting out cached pages and data requests can improve the efficiency of these pages.

3. Tomcat server optimization

Tomcat 7.0 server is a common web server, which is widely used in web applications. However, the server needs to be optimized according to different scenarios to ensure the best use effect. In order to improve the response speed of the system, the system can be optimized as follows:

Memory Optimization

Because the business logic processing of the web server is put into the memory, the insufficient memory will lead to the data need to be put into the hard disk. When necessary, it will be taken out from the hard disk and put into the memory. In order to improve the hit rate of the memory, the system improves the Tomcat server's memory configuration

to 4G. Since this web server has 8g of memory, the 4G memory overhead is completely affordable.

Connector Optimization

In the Tomcat server, a thread needs to be opened for each request to serve it. When there are too many users, due to the limited number of threads, it is necessary to wait for the completion of other business processing before continuing to use the thread, which results in slow user response. In order to ensure that the system is connected quickly, it is necessary to first recommend a connection pool with sufficient number of connections. This pool can well support the requirement of 1000 people online at the same time. Therefore, the system defines the number of connection pools as 1000, which is much more than The original 800, but from the test results, it does solve the current problem of tight connection threads.

Enable Tomcat7.0 Compression (HTTP Compression) Function

In order to reduce the amount of data during system transmission, this system uses HTTP compression, which can greatly reduce the number of HTTP packets and improve the response speed of web pages. Specific compression algorithms can include GZIP, etc., which are supported by current browsers.

After using it, it can be clearly seen that the browsing performance of the browser is improved by more than 4 times after using the page cache.

5 Conclusion

In this paper, based on the real estate business and management courses online teaching system architecture, from the online management, training management, curriculum resource management, resource management, exam remote video, etc., the design based on cloud model of the real estate business and management courses online teaching system, and through the experimental results show that the performance of the system is good.

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