Design of Online Teaching Platform for Accounting Informatization Course Based on Cloud Computing

Qi-feng Wu(✉)

Guangxi Science and Technology Normal University, Laibin 546199, China

Abstract. In order to solve the problems of low success rate and low performance of traditional online teaching platform, cloud computing technology is used to optimize the design of online teaching platform of accounting informatization course from three aspects of hardware, database and software. The hardware part is mainly combined with cloud computing technology to refit and optimize the CPU, memory and network structure. Collect the course information of accounting informatization, store it in the platform database, and use the internal logic between the data to realize the construction of the platform database. With the support of hardware equipment and database, the optimization design of online teaching platform software function of accounting information course is realized from three aspects of teachers, students and platform administrators. Through the platform test experiment, a conclusion can be drawn: compared with the traditional teaching platform, the function running success rate of the designed teaching platform is improved by 9.3%, and the average response time of the platform is shorter when multiple users are online at the same time, that is, the running performance of the platform is better.

Keywords: Cloud computing · Accounting informatization · Informatization courses · Online teaching · Teaching platform

1 Introduction

Accounting informatization is the combination of accounting and information technology. It is a new requirement of the information society to the enterprise financial information management, and a necessary measure for the enterprise accounting to comply with the information tide. It is the main channel for enterprise leaders to obtain information under the network environment, which helps to enhance the competitiveness of enterprises, solve the "isolated island" phenomenon of accounting computerization, and improve the decision-making ability of accounting management and enterprise management level. In order to provide enterprises with a large number of accounting professionals, accounting confidence flower course is set up. Accounting information teaching method is an extension of traditional accounting teaching method. Accounting teaching not only takes place in the classroom, but also integrates into students'

W. Fu et al. (Eds.): eLEOT 2021, LNICST 389, pp. 644–656, 2021.
https://doi.org/10.1007/978-3-030-84383-0_54

daily life through information means [1]. The foundation of students' cultural courses in higher vocational schools is relatively weak, so they will have great difficulties in accepting accounting theoretical knowledge. There will be problems in the understanding of books and the answers to exercises. In addition, many students are lack of perseverance and are easy to give up when they encounter difficulties. Therefore, higher vocational accounting teaching must change the teaching mode and improve students' enthusiasm. Only by strengthening their understanding of theoretical knowledge, can they apply it better. The information-based teaching method is more vivid and specific than the traditional teaching method. Teachers can teach accounting knowledge through the setting of teaching situation, teaching video and other aspects, which avoids the inflexibility of the traditional teaching method and enlivens the classroom atmosphere to a great extent, In addition, these courseware can be directly transmitted to students' computers, tablets, mobile phones, etc., which is conducive to students' review after class, strengthening the understanding of classroom knowledge, and improving students' autonomy in accounting learning.

At present, in order to break the time and space boundaries of accounting informatization course, colleges and universities at home and abroad have designed and developed the corresponding online teaching platform, which provides auxiliary tools for the development of the course. However, the current platform used in colleges and universities has some problems, such as low efficiency in updating accounting teaching resources, single teaching methods, etc. these problems are mainly due to the low performance of traditional system data processing, so cloud computing technology is introduced.

Cloud computing is a type of distributed computing, which refers to the process of decomposing huge data computing processing programs into countless small programs through the network "cloud", and then processing and analyzing these small programs through a system composed of multiple servers to obtain results And return to the user. In the early days of cloud computing, to put it simply, it was simple distributed computing, solving task distribution, and merging calculation results. The application of cloud computing services in the field of education has significant advantages, which are mainly reflected in the profound impact on the reform of teaching methods [2]. First of all, the school will no longer need to spend a lot of financial resources on the purchase of mainframes and high-performance machines, greatly reducing the hardware cost of its teaching resources. In the cloud computing environment, all kinds of cloud resources can be effectively used only by configuring general computer terminal equipment. Second, cloud computing can provide a data storage center with high security performance to ensure the security of all data. Teachers and students do not need to worry about the loss of data caused by viruses and hacker attacks, and can conduct interactive teaching on the network platform anytime and anywhere. Finally, in the cloud computing environment, the resources of each school can be shared, which is conducive to the balanced distribution of teaching resources and greatly improves the utilization of teaching resources in each college. In view of the application advantages of the above-mentioned cloud computing technology, it is applied to the design of the online teaching platform of accounting information courses in order to enhance the application value of the teaching platform.

For this reason, this paper designs the software and hardware parts of the teaching platform under the cloud computing environment. The centerless topology is used to construct the architecture of the network platform. Design cloud server based on TCP/IP protocol. Complete the hardware part of the platform with central processing unit, cloud storage, encoder, timer and counter. The MySQL database is used as the system database. The software part of the system is divided into teacher function module, student function module and administrator function module. In this way, the teaching function of the platform is realized.

2 Design of Online Teaching Hardware Platform for Accounting Information Course

The main task of the online teaching platform of accounting information courses is: the administrator manages various resources through the management background, and the teachers and students achieve the purpose of teaching and learning through their respective spaces. Therefore, users on the platform can be divided into three roles: teacher, student, and administrator, and different roles can perform different functions. According to the above design goals, the online teaching platform of accounting informatization courses should reflect the three characteristics of integration, interaction and networking, from the three aspects of hardware, software and database, in terms of the principle of advancement, characteristic and modularity, Compatibility principle and reliability principle, use cloud computing technology to realize the optimization design of the online teaching platform of accounting informatization courses.

2.1 Cloud Computing Platform Network Architecture

The use of a centerless topology as the cloud computing platform network topology solves the single point of failure problem existing in many service providers and provides good services to customers of heterogeneous terminals distributed in different geographical locations. Figure 1 shows the basic network topology of the cloud computing platform.

The DHT protocol is introduced in the network topology of Fig. 1, that is, a DHT mechanism for nodes and service programs is designed. This mechanism makes full use of the distributed management characteristics of P2P to integrate the nodes in the topology and the applications deployed on the nodes. They are all regarded as the objects of DHT, manage the server group through the agreement, and locate and use services. The introduction of the DHT mechanism not only makes the overall realization of decentralization, but also eliminates the necessity of overall traffic balancing and load balancing [3]. At the same time, the DHT mechanism separates the management of computing tasks, and each node is likely to act as a calculator and a manager at the same time, so that the risk of system crash is greatly reduced and then distributed to different nodes. In the topological results in Fig. 1, the proxy server of the cache framework for multimedia service awareness is deployed, which brings a better user experience for heterogeneous terminals, especially mobile terminals.

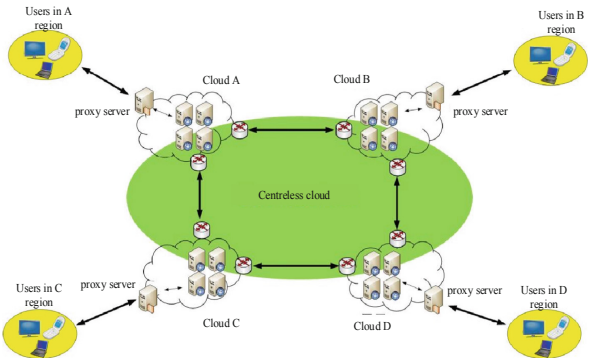

Fig. 1. Basic network topology diagram of cloud computing platform

2.2 Cloud Server

The cloud server protocol is an application layer protocol based on the client/server model and running on top of TCP/IP. One or more cloud servers form a cloud directory tree. The cloud server is composed of three modules: directory service module, copy service module and management module. The service module is mainly composed of two parts: the front-end part is responsible for the normal network communication between the client and the server, and completes the protocol analysis and analysis; the back-end part is responsible for the management of the directory database.The replication service module is responsible for the directory data replication between cloud servers. The management module is responsible for catalog informatization management to ensure that users obtain accurate catalog information at the expected response time, integrity, safety and consistency. The client connects to a cloud server and sends operation requests to it, and is responsible for performing necessary operations on the directory. Once the server has completed these operations, it returns a result or error response to the requesting client, or points to another cloud server by referring to a redirection mechanism.When the directory item requested by the client does not exist on the local server, the server returns a reference to other servers to the client, and the client completes subsequent

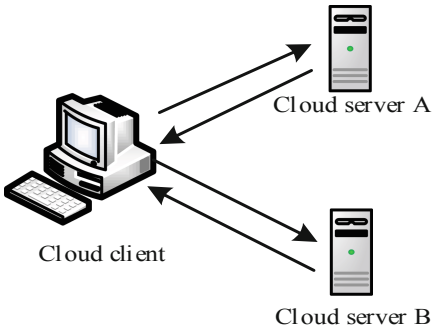

Fig. 2. Schematic diagram of client access to cloud server

operations, which improves performance and the ability of distributed applications. The operation process starts with binding The client to the cloud server sends an information query request, as shown in Fig. 2.

The server returns a response to the client. This response may contain the query result, or may contain error information, or a reference; if it is a reference, return to step 1 and send a new request to other servers.

2.3 Central Processing Unit

Figure 3 shows the basic structure of the central processing unit.

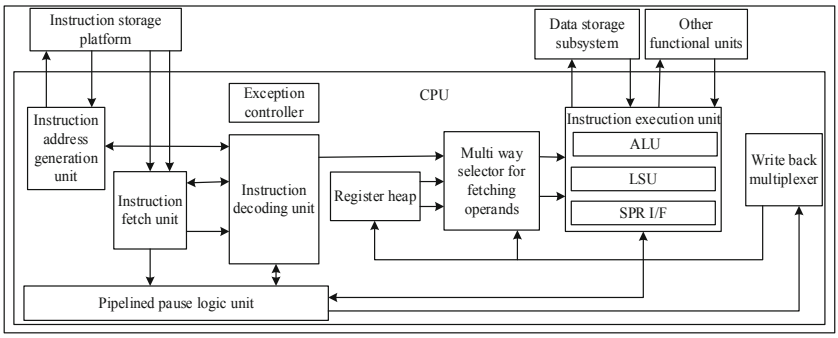

Fig. 3. Central processor structure diagram

The processor uses instruction pipelining to accelerate the execution of instructions. In essence, instruction pipeline decomposes the instruction cycle into several consecutive stages, such as fetching instructions, decoding instructions, determining operand addresses and fetching operands, executing instructions and writing back result operands [4]. The next instruction is executed as soon as the instruction completes the first stage. The instruction moves forward through these segments so that different instructions can work on each segment at the same time. Instructions only need to pass through one stage of the pipeline in each clock cycle. It is not necessary for instructions to pass through the entire data path in one clock cycle like a non-pipelined processor. This makes the clock cycle of a pipelined processor comparable to that of a non-pipelined processor The clock cycle is much shorter. The pipeline processor can also begin to execute an instruction in each clock cycle. At this time, the shortening of the clock cycle means an increase in instruction execution speed and an improvement in microprocessor performance.

2.4 Cloud Shared Storage

Cloud shared storage can be divided into two parts, one is local storage and the other is cloud storage. The local storage is mainly responsible for the storage of local data. When the node cannot communicate with the host or relay node, the collected The data is temporarily stored in the local storage, and when the communication is normal, the

locally stored data is transmitted. The chip selected for local storage is 24LCXXB, which is a series of FLASH memory chips. Their packages and pin numbers are exactly the same. The "XX" in the chip represents the capacity of the chip. You can choose according to the amount of data in use. The actual chip model used [5]. The cloud storage is based on the LINUX shared memory mechanism and is implemented in the user layer of the system, so it has good portability. In the cloud storage structure, a distributed shared memory segment may have cached copies on multiple machines. The cache technology can solve the memory access delay and network delay, making the access time close to the local memory access time. The copy of each distributed shared memory segment is mapped into a local LINUX shared memory segment by the LINUX shared memory mechanism.

2.5 Encoder

The main function of the encoder is to encode the teaching resources in the online teaching platform of accounting informatization courses, including video resources, audio resources and courseware resources, to ensure the normal upload and download of related teaching resources. The encoder is mainly composed of encoding control, source encoding, video multiplexing encoding, and transmission buffer. In the optimized teaching platform, a gain control module and an analysis filter module are added. The gain control module is a polyphase quadrature filter., Gain detection and gain modification composition. Polyphase quadrature filtering divides its input signal into four frequency bands. Except for the lowest frequency band without gain control, the other frequency bands use gain detection and gain modification to control and attenuate energy. Because it can do a certain degree of control and attenuation of the sound signal, making the energy range of the original signal smaller. After the above-mentioned gain control, the energy of its attenuation change must be converted into gain control parameters, and finally this parameter is passed to the decoding end [6]. In addition, the analysis filter module uses an improved discrete cosine transform to transform the input audio data in the time domain into a frequency domain signal. Discrete cosine transform adopts time-domain aliasing cancellation technology, which can completely eliminate aliasing in theory. The expression of discrete cosine transform is:

$$X(k) = 2\sum_{n=0}^{N-1} x(n)w(n)\cos\left(\frac{2\pi}{N}(n+n_0)\left(k+\frac{1}{2}\right)\right) \tag{1}$$

Where $w(n)$ is the window function, and n_0 is a fixed time offset.

The sine window enables the filter bank to better separate the adjacent spectral components, which is suitable for signals with small spectral component spacing, and KBD window is used when the spectral component spacing is wide. AAC allows continuous and seamless switching between the sine window and the KBD window.

2.6 Timer/Counter

Two 32-bit registers are set up in the timer, namely the mode register and the counting register. The specific description of the mode register is shown in Table 1.

Table 1. Pattern register domain description

Domain	Illustration		
Ttmr [29]	Timer interrupt enable		
ttmr [28]	Timer interrupt		
Ttmr [27:0]	[medical] timing cycle		
Ttmr [31:30]	Counting mode	00	Timer banned
		01	When the count register matches the timing period, the count register restarts
		10	When the count register matches the timing period, the count register stops counting
		11	When the count register matches the timing period, the count register does not stop counting

3 Database Design of Online Teaching Platform for Accounting Informatization Course

Using MySQL database as the system database, because the database is open source, it can reduce the cost of system development, and the database is convenient for data processing, so using MySQL database as the system database is a low-cost and efficient development method [7]. To design the database, the first step is to carry out the logical design of the database, generate the table structure of the database, and physically implement the table structure in MySQL. The educational administration courses used by the online teaching platform are shown in Table 2.

Table 2. Description of storage field for accounting informatization course

Field name	Field description	Data type	Major key
ID	Course ID	uniqueidentifier	Yes
JXKCMC	Course title	nvarchar(200)	No
SSKC	Course of study	uniqueidentifier	No
FMT	Course cover	nvarchar(200)	No
KCJJ	Course Introduction	nvarchar(500)	No
KCZT	Course Status	int	No
JLCJR	Course teachers	uniqueidentifier	No
JLCJSJ	Course creation time	datatime	No

In the same way, it can be concluded that other database tables in the online teaching platform database of accounting informatization courses, combined with the logical relationship between each database data, realize the link between the database tables.

4 Design of Online Teaching Software Platform for Accounting Informationization Courses

4.1 Teacher Function Module

In the teacher space, teachers can compile electronic teaching plans and publish, modify, and delete electronic teaching plans according to the actual teaching situation for students to learn. Teachers can organize Q&A discussions, assign homework and other teaching activities, publish news, manage personal data and information, etc. Administrators and teachers as users can also enter the student space for browsing, but have no right to modify student information. In the student space, students can carry out learning activities such as course study, course discussion, and completion of homework, as well as post messages and manage personal data and information [8]. The administrator can manage system announcements, users, forums, teaching and resources in the administrator studio.

During the operation of the teacher's teaching function, the user issues instruction on-demand instruction on the interface. The interface calls the server-side method according to the user's operation to realize the playback of specific resource streams, while the client needs to realize the resource content through the streaming media resource player. Show. In the multimedia teaching platform, the teaching on-demand information of the relevant content on the multimedia teaching server is stored in the database server and can be read at any time. These data are the basis for resource allocation. During the playback process, the user controls the playback progress by operating the progress bar and volume adjustment control on the interface. In addition, the teacher's processing and management process of the accounting informatization course exercises is shown in Fig. 4.

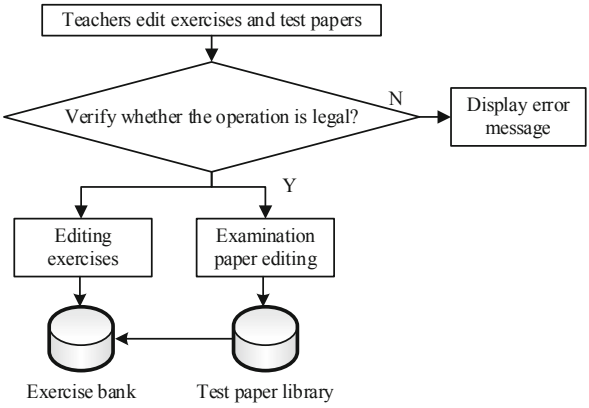

Fig. 4. Flowchart of teacher management exercises

4.2 Student Function Module

According to functional needs, the system is divided into modules such as online learning, online examination, online classroom, skill map, study group and personal space. The system is divided into modules. Students can study network resources, such as video, OFFICE, PDF, SCORM, and online simulation test of question bank. Through the study of resources, interactive learning is reflected, such as learning record tracking, learning reminders, notes, questions and answers, Comments, site letters, concerns, collections, etc. According to the operation of the platform navigation bar, you can realize the jump of the platform interface and realize the online learning function of students' accounting informatization courses.

After a stage of study, students can perform the question bank test function, select a category according to the category of the existing test paper, and then click to view all test papers under that category, select the test paper to be tested, and click to start the mock test, The user enters the examination interface [9]. In the test interface, the system will automatically write the reminders contained in the test paper at the top of the test paper. The user can answer in categories or in order. At the same time, when the user enters the test paper, the system starts to enter the test time statistics status. On the right side of the side timing mark, there are "pause" and "do it next time". Users can control the answering speed according to their own schedule. In the course of the user's answering paper, if you encounter a test question, you can choose to mark the test question individually or bookmark it, and there will be a record in the user's personal center in the future, which is convenient for viewing at any time. After completing the answer, click to submit the test paper, and the system will automatically enter to modify the paper and automatically pop up the user's test score. In addition, students can realize the functions of course inquiry, course preview, course material download, questioning, and feedback information inquiry in the online teaching platform of accounting informatization courses, so as to realize the information exchange and sharing of the platform.

4.3 Administrator Function Module

The basic functions of the platform administrator are shown in Fig. 5.

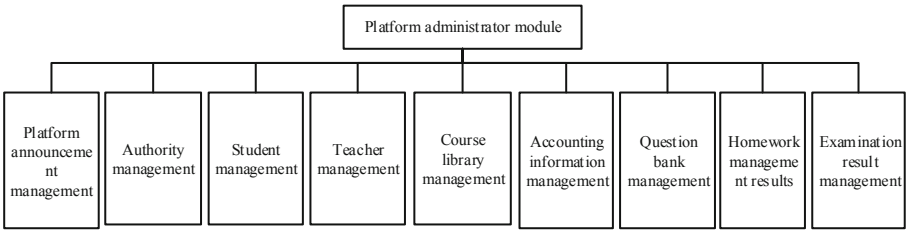

Fig. 5. Function block diagram of system administrator module

System administrators can manage user information and user rights, and maintain and manage the teaching platform [10]. The system administrator opens an account for

the teacher, and then the teacher adds a new class, then imports the student's information and adds the list of elective students to start accounting training and teaching.

5 Platform Test

In order to test the operating function and application performance of the designed online teaching platform of accounting informatization courses based on cloud computing, the platform test experiment was designed, and the traditional teaching platform and the teaching platform based on big data analysis were set as the two comparison platforms of the experiment. Develop and run in the same experimental environment to ensure the uniqueness of the platform test experimental variables.

5.1 Build Platform Development and Testing Environment

The accounting informatization course teaching platform in the cloud computing environment is a typical distributed system. In order to realize the simple deployment of the client, the system adopts a browser/server-based development model. The specific technology used is Microsoft's ASP.NET technology. With Silver light technology, the integrated development environment is Visual Studio 2012, the platform support required for development is.NET Framework 4.0, and the operating system based on development is Windows 7.For any system, relying solely on personal manual testing is far from achieving the ideal performance test state. Therefore, with certain testing tools, the platform mainly uses two testing tools: one is the performance testing tool LoadRunner and the defect management tool BugFree. Among them, LoadRunner is a load testing tool that predicts system behavior and performance. Mainly by simulating tens of millions of users to implement concurrent load and real-time performance monitoring to confirm and find problems, LoadRunner can test a wide range, including the entire enterprise architecture.Therefore, LoadRunner will be the first choice for performance testing in enterprises, which can minimize testing time, optimize performance and accelerate the release cycle of application systems. It is also an automatic load testing tool suitable for various architectures, which can predict system behavior and evaluate system performance. BugFree is a bug management system written independently using PHP + MySQL based on Microsoft's R&D process and bug management concept. In the process of testing the online teaching platform of accounting informatization courses, LoadRunner is used as a testing tool for platform operating performance, and BugFree is used as a testing tool for platform operating functions.

5.2 Determination of Test Methods and Content

The platform principle is to provide the basis for the tester, to restrain the defects and problems, and to promote the online implementation of the software. The main principles used in testing are as follows: testing should trace back to original requirements. The requirement analysis document is the most intuitive embodiment of the user's initial requirements, and the most serious problem for user-oriented software is that it can not meet its needs. The test is carried out by an independent third party. Software testers

should not be developers. Only independent third parties can ensure the objective and fairness of the results to the greatest extent. The platform's operating function selects the white box test method, that is, running the platform with known results, and observing whether the platform's operating results are consistent with the set known results, so as to judge the success of the platform function. Prepare users with three different roles respectively, and import relevant user information into the platform environment, and set test content and standard output results for different users. The specific settings are shown in Table 3.

Table 3. Platform test sample setting table

User role	Student	Teacher	Manager
User name	UserName1	UserName2	admin
Test Type	48000029	48000029	48000037
Number of user samples	500	500	500
Input content	Course selection, download course resources, ask questions, upload assignments, query course information, play course video, accounting informatization course examination, query test results	Set up accounting informatization course, inquire student information, upload course resources, answer student questions, issue examination questions, correct examination papers, issue examination results	Grant user rights, course resource scheduling, issue course announcement

In addition, the performance test of the platform is mainly to test the product under various pressure and extreme conditions, and to test the endurance and stability of the system.

5.3 Platform Function Test Analysis

Different users operate on different platform environments according to their own learning habits, enter corresponding content, and observe the implementation of platform functions. In order to avoid the impact of a single experiment on the experimental results, the method of averaging multiple experiments is selected to obtain the test results of the platform functions, as shown in Table 4.

It can be seen from Table 4 that the function operation success rates of the three teaching platforms are 89.1%, 95.2%, and 98.4%, respectively. In contrast, the function of the online teaching platform of the cloud computing-based accounting informatization course is successfully operated The rate is higher.

Table 4. Test results for platform functionality

User number	Number of functional tasks	Traditional teaching platform		Teaching platform based on big data analysis		Design of accounting informatization course online teaching platform	
		Number of successful tasks/number	Number of failed tasks/number	Number of successful tasks/number	Number of failed tasks/number	Number of successful tasks/number	Number of failed tasks/number
1	55	48	7	52	3	54	1
2	29	25	4	27	2	28	1
3	38	34	4	36	2	38	0
4	42	38	4	40	2	41	1
5	57	51	6	53	4	55	2
6	51	46	5	50	1	50	1
7	46	42	4	45	1	46	0
8	44	39	5	42	2	44	0

5.4 Platform Operation Performance Test Analysis

The main performance indicators of platform operation are the concurrent use of the platform by multiple users, the concurrent amount of access to the system database, the response speed of the system and the processing performance of the database server when the number of users accessing data gradually increases. According to the current business conditions, the equipment support system requires that the largest number of users be online at the same time. The response time test result is shown in Fig. 6.

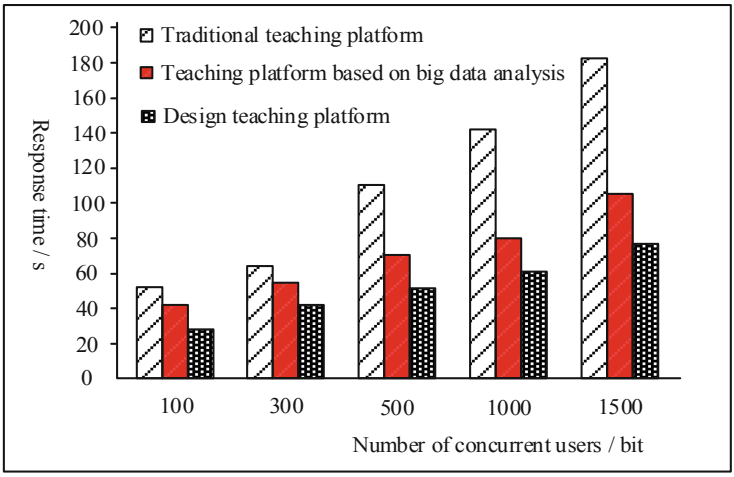

Fig. 6. Comparison results of platform response time test

It can be seen from Fig. 6 that as the number of users on the platform increases, the response time for login increases. The platform can meet the basic requirements of users when each user is concurrent. After horizontal comparison, it can be seen that compared

with the two comparison platforms, the average response time of the design platform is shorter, and there are no abnormal phenomena, which proves that the designed teaching platform has higher operating performance.

6 Conclusion

The method in this paper designs the hardware part and software part of the online teaching platform based on cloud computing. The teaching effect is optimized. The construction and application of an online teaching platform for accounting informatization courses based on cloud computing is a requirement for the rapid development of accounting and information technology, as well as a requirement for continuous improvement of open education itself. Through the continuous deepening of accounting practice teaching, a more comprehensive practice teaching system will be gradually established, which will play a key role in imparting knowledge, cultivating abilities, and improving quality. Follow-up research will improve the core literacy of the accounting profession through informatization teaching.

References

1. Xin, C., Wang, X.: Research on the application of college physical education teaching mode in the cloud computing environment. J. Phys. Conf. Ser. **1624**(2), 022068 (2020). (4pp)
2. Zhang, Z., Min, H.: Analysis on the construction of personalized physical education teaching system based on a cloud computing platform. Wirel. Commun. Mob. Comput. **2020**(3), 1–8 (2020)
3. Tian, X.: Research on co-construction and sharing of higher vocational education information resources based on cloud computing. Revista De La Facultad De Ingenieria **32**(11), 984–989 (2017)
4. Wang, Q.: Strategy of enterprise network security protection based on cloud computing. IOP Conf. Ser. Mater. Sci. Eng. **750**, 012234 (2020)
5. Li, S.: Analysis on the teaching reform of college physical education informationization based on computer technology. J. Phys. Conf. Ser. **1648,** 032042 (2020)
6. Melo, G.C.V.D., Nascimento, C.S.D., Costa, W.P.L.B.D., et al.: Technology and the teaching of accounting: an analysis of teaching-learning in the courses of accounting sciences in the modality EaD. Custos e Agronegocio **14**(1), 22–44 (2018)
7. Liu, S., Bai, W., Zeng, N., et al.: A fast fractal based compression for MRI images. IEEE Access **7**, 62412–62420 (2019)
8. Liu, S., Li, Z., Zhang, Y., et al.: Introduction of key problems in long-distance learning and training. Mob. Netw. Appl. **24**(1), 1–4 (2019)
9. Liu, S., Glowatz, M., Zappatore, M., et al. (eds.): e-Learning, e-Education, and Online Training, pp. 1–374. Springer, Cham (2018)
10. Luo, Y.J., Li, Y., Liu, M.L., et al.: Reform and application of biochemistry teaching based on formative evaluation of mobile network platform. J. Phys. Conf. Ser. **1533,** 022037 (2020)