Mobile Cloud Teaching System for Ideological and Political Network Courses Based on P2P Technology

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Abstract. Due to the unreasonable network structure of the traditional online course mobile cloud teaching system, the download rate of the system under complex requests is slow. Therefore, a mobile cloud teaching system for ideological and political network courses based on P2P technology is designed. The system is mainly divided into software design and hardware design. In the hardware design, the P2P topology network structure is mainly designed, and the internal structure of the development board of the mobile terminal and the wireless communication chip are designed. The network structure adopts the P2P hybrid topology structure to realize the complementarity between the advantages of different structures. In the software design, the system adopts haystac's cloud storage solution. Design the access process of database information according to the actual situation. In addition, the joining and exiting of user nodes in the system are managed, and the design of the system is completed so far. The system performance test results show that the download rate of the designed system under simple request is not much different from that of the traditional system. Under complex requests, the download rate of the design system is 3.9 MB/s higher than that of the traditional system.

Keywords: P2P technology · Ideological and political network courses · Mobile cloud teaching · Cloud storage

1 Introduction

Nowadays, electronic information technology is developing at an unprecedented speed. Many traditional fields have been impacted, resulting in various changes. Based on the advanced network communication technology, the distance teaching mode came into being. With the development of distance education, the current teaching mode has diversified. Both teaching mode and teaching content have undergone great changes [1, 2]. Accordingly, the learning mode of students is also changing. In today's classroom, students are no longer simply listening as the main way of learning. They began to turn into the main body of the classroom, with questions purposefully seeking teaching resources. Therefore, the long-distance teaching mode with large teaching materials,

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convenient communication channels and good interaction mechanisms has become the mainstream teaching mode in the field of education. In the study of Ideological and political courses, we also need to adapt to the current mainstream teaching mode. Since the learning resources are provided on the server side, once there is a problem on the server side, the system cannot run. Second, the cost is high. In order to better meet the needs of the system, it is necessary to construct a variety of different teaching services, and at the same time as the number of clients increases. Higher requirements are put forward for both the server and the data. Third, poor scalability. When the number of users increases, the number of expensive servers needs to be increased to provide more stable services.

Currently, the network teaching system is divided into three generations. The first generation is to provide students with teaching materials and related materials through web pages, and to connect with other related education networks. In addition to providing learning materials online, the second generation also requires students to conduct asynchronous two-way communication through e-mails, electronic bulletin boards, online exercises and measurements. In addition to the first and second generations, the third generation requires simultaneous two-way communication through online chat rooms, telephone conferences, video conferences or MUD systems. The current world network courses are developing towards the third generation. In related research, reference [3] designed a wireless network-based ideological and political multimedia network teaching resource integration system. This method clarifies the theoretical elements and the evaluation process of teaching resource management, and uses XML as the data exchange carrier to realize the automatic integration of teaching resources. Call the subscription function of the dSPACE framework to store the subscription information in the database. Reference [4] studied the artificial intelligence model of the real-time monitoring of the ideological and political course teaching system, constructed a real-time monitoring system of the ideological and political classroom based on artificial intelligence algorithms, and constructed the model function module according to the actual needs of the ideological and political course.

During the use of the traditional online course mobile cloud teaching system, due to the inadequate network structure optimization, the system downloads course files at a slower rate under complex requests. Therefore, this paper designs a mobile cloud teaching system for ideological and political network courses based on P2P technology. This article uses P2P technology to design the internal structure of the development board of the mobile terminal and the wireless communication chip. In the software design, the system adopts haystac's cloud storage solution. Design the access process of database information according to the actual situation. In order to improve the quality of mobile teaching of ideological and political network courses.

2 Design of Mobile Cloud Teaching System for Ideological and Political Network Courses Based on P2P Technology

2.1 Hardware Design

In the ideological and political network course mobile cloud teaching system designed in this paper, the hardware is mainly designed for the P2P topology network structure.

Among them, the development board of the mobile terminal is a very important part. The mobile terminal development board is installed on the student's personal host to complete the auxiliary functions of the online course mobile cloud teaching system [5, 6]. Among them, the embedded development board uses stm8l151k4, which can be programmed with one key, has stable performance, and has more expansion interfaces. It has a USART configuration jumper, which can be connected to a five-wire asynchronous serial port. The structure is shown in Fig. 1.

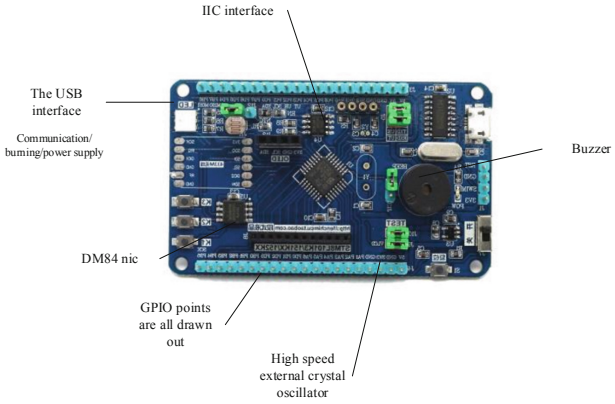

Fig. 1. stm8l151k4 development board structure

In the development board, the external five wire asynchronous serial port is connected to the GPS module, which is responsible for receiving the operation information in the network system. IIC interface is connected with GPRS module, which is mainly responsible for information exchange with management system center. Students or teachers can contact the management system center through the interactive function to report the unexpected situation or the completion of learning tasks in the use process. During this period, it mainly relies on Internet communication to realize the interaction between information. The key hardware used in Internet communication is the wireless communication chip: fibocom, which allows a node to communicate with multiple nodes at the same time, and its wireless communication speed can reach 2 m (BPS). When the wireless communication chip turns on the receiving mode and uses the same channel, it can receive six channels of data that are not transmitted through the data channel. The receiving diagram is shown in Fig. 2.

In Fig. 2, when six different wireless modules appear and are in the system enabled state, they can communicate with a chip in the receiving state. And the receiving chip can accurately identify the signals transmitted by multiple different terminals. After receiving the data, the chip transmits the response signal at the same time after recording the IP address of the transmission. The transmitting IP address and the receiving address need to be consistent to receive the response signal. The internal structure of the wireless communication chip is shown in Fig. 3.

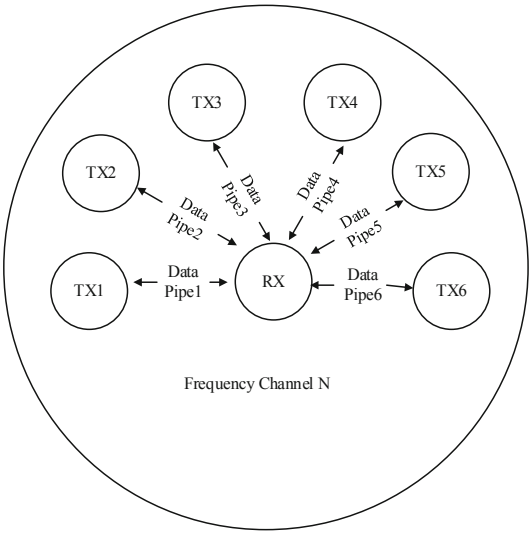

Fig. 2. Schematic diagram of wireless communication reception

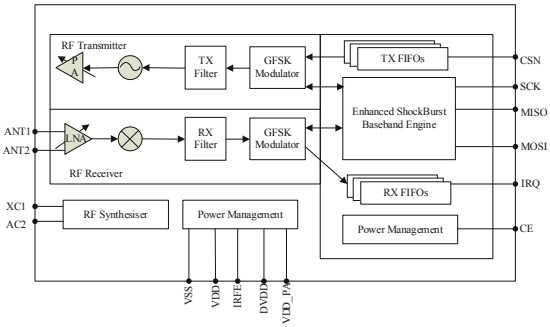

Fig. 3. Internal structure of the wireless chip

From the perspective of micro processing, we only need to design the pins of Ant1, xc1, VSS and IRQ. Ant1 means that the chip is in working state when the chip selection line Ant1 is set to low capacitance. Xc1: SCK clock line controlled by chip. VSS means: the chip controls the power line. IRQ means: when the terminal signal and data are transmitted, the microprocessor will interrupt the communication of the system signal control chip.

In the design of this paper, the main purpose is to optimize the network structure of the system. So we need to introduce P2P technology. P2P is a distributed network architecture, which can divide tasks or workload among peers. In applications, peer nodes are equally important and effective participants. In the traditional mode, users can't even play 50% of the performance of a computer. In this case, the waste of hardware resources is conceivable. After using P2P technology, users can share their hardware resources, including CPU, memory, hard disk, network bandwidth, etc., to other users. On the

contrary, he himself can get the hardware resources shared by other users. In this way, we can allocate resources more reasonably, make full use of resources, and do the most at the least cost [7, 8]. In the process of sharing, it does not need the intervention of the central server or other hosts, only through each participating node to complete the corresponding sharing operation process. The P2P topology established in this paper is shown in Fig. 4.

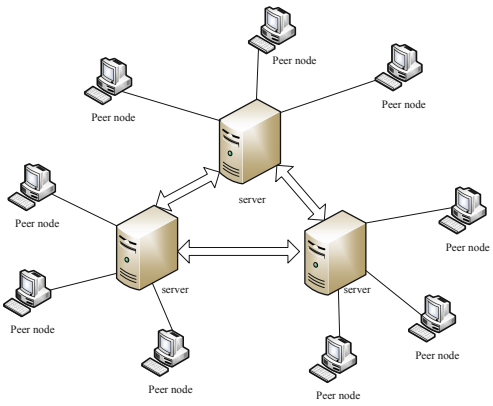

Fig. 4. Mixed topology

The mixed topology is a combination of centralized topology and all-distributed non-structured topologies. By combining their advantages, its maximum potential can be played. A hybrid topology selects some performance nodes as a super node, which manages a part of the node, and the super node is found through a certain discovery algorithm in the entire topology. Then forward the various nodes under each node by the super node. In such a structure, efficiency can be improved. The hardware design of the system is completed.

2.2 Software Design

Design Database Information Access Process

The main feature of mobile cloud teaching in this paper is cloud storage, which has PB level scalability, can share PC computing resources, open, programmable. Given that the cloud storage framework is relatively mature, stable. In the technique selection, the system takes the Haystac's cloud storage scheme, as shown in Fig. 5.

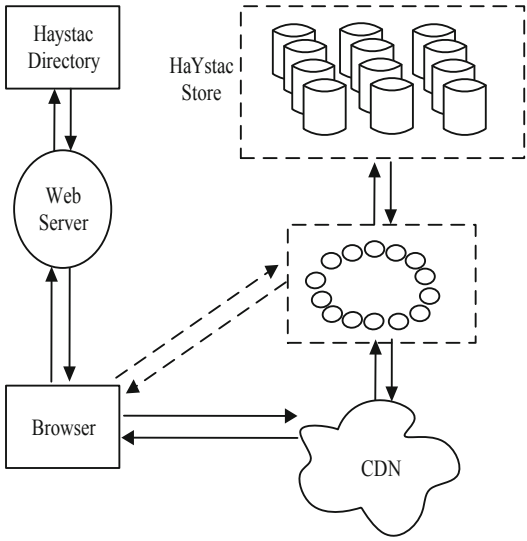

Fig. 5. Haystack cloud storage solution

The platform system involves the cloud storage of file formats including audio and video, compressed text, pictures and other unstructured files. The database module of web teaching website is the most important module in the platform system. All JSP pages are written around the operation of database. The following will briefly introduce the design process of the system database process. The user registration module stores the personal information submitted by the user into the database, and can enter the information display module, information operation module and user management module through the user login module. The data access flow between these modules is shown in Fig. 6.

The operation of each module for the database is usually not directly acting on the underlying physical database, but is connected to the database through the connection pool. The connection pool is connected to the current partial connection. The registration module operates the same database table with the login module. When registering, the system is connected through the connection in the pool (if there is no need to connect, you need to access the database to establish the connection. At the same time, the connection to the connection pool will get the data of the data, write the information to the database. The login module is just the contrary. After the connection pool is connected, the system reads the data from the database, verifying the user's correctness of the login information by the user login module [9–11]. When the user logs in success, you can enter the information display, information operation, information management module, and obtain the corresponding service. The display, operation, and management of information are also connected to the database through the connection pool. The design of the data access process is completed.

Manage User Nodes

The user node management module includes two functions of the user node and the exit function of the user node. We set a configuration file for each user node, which is

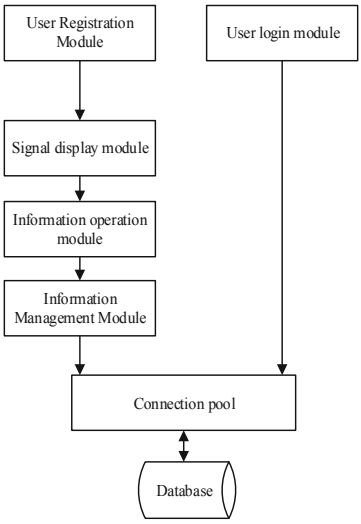

Fig. 6. Database module data process

specifically used to store user node information. When the user node is added to the system, we need to connect to the system server for registration of the relevant node, so you need to know the IP address of the system server. There are two kinds of dynamic states of user nodes. One is the joining of user nodes. User nodes should be added according to the type of file nodes in the user node. Each user node may be a file of Mn, SCN or WCN. Therefore, the user node needs to distinguish between different file nodes. User nodes also need to determine if the user node is a new user node during the joining process, which has never been incorporated out of the system. Because the files when the system is preserved in the old user node, it is necessary to perform different processing according to the various file types in the user node during the user node. By viewing the user_type field in the user node information profile, we can determine the new and old situations of the user node.

Another dynamic state of the user node is an exit of the user node. The exit requirement of the user node is discussed. For the normal exit of the user, in the source node information table, the new joined node authentication and allocate the teaching group, and update node information. When the node is properly exiting, a request is issued to the source node, and the source node deletes the node information table corresponding information and feeds back to the corresponding teaching group. The group leader stops the request to exit the group of node services to delete the corresponding group information.

When the user uses the system, if a network failure or power off is encountered, the system will determine whether the user is unusually exiting, and the group length node does not receive an exit request from the user node. Therefore, the transmission system needs to be judged through the heartbeat mechanism to survive. The normal node sends a status information to the source node to the source node to survive. If the source node does not receive a node status information in N specific time t, the node

has been exited. Feedback to the corresponding group length node, stopping the Node topology to the unresponsive node, updating the node topology. If the group leader node is not responded, the group length node is deleted, and the replacement team leads to the new node length and configure the corresponding group of node information to the new group.

3 System Test

This paper implements the design of the mobile cloud teaching system under the P2P technology. Based on the traditional network architecture, the user node expansion layer is added, mainly implementing the coexistence of different modules of the system. In the performance test of the system, it is mainly to download the download rate between the two by comparison in the system, and download the download rate between the two in the traditional system, indicating the advantages of the system.

3.1 Construction System Test Environment

The entire system test environment deployment is divided into a central cloud storage server and user node expansion cloud, where the central cloud storage server uses an open source Moosefs distributed file system. Due to the limited conditions, the server test environment is deployed on the laboratory server, and the Windows Server 2012 operating system and VMware Workstation Pro are installed in this server, 5 virtual machines via VMware virtual. One of them as MASTER, one as a MetaLogger, three as Chunk Servers, each virtual machine configuration is basically the same, hardware is 2.5 GHz CPU, 2 GB memory, operating system is Debian8, and deployment is shown in Table 1.

Table 1. Test environment deployment

Server	Name	IP
Metadata server	mfs-master	172.20.156.120
Backup server	mfs-metalogger	172.20.156.121
Data storage server	mfs-chunkserver-1	172.20.156.122
Data storage server	mfs-chunkserver-2	172.20.156.123
Data storage server	mfs-chunkserver-3	172.20.156.124
Mobile terminal	Kyd-user-1	172.20.156.130
Mobile terminal	Kyd-user-2	172.20.156.131
Mobile terminal	Kyd-user-3	172.20.156.132
Mobile terminal	Kyd-user-4	172.20.156.147
Mobile terminal	Kyd-user-5	172.20.156.148
Mobile terminal	Kyd-user-6	172.20.156.149

User node expansion cloud test requires a large number of terminals to test. Due to the limited conditions, there are not enough personal terminals. So in the lab server, 20 virtual machines are virtualized for testing. Each virtual machine is configured substantially the same, the hardware is 2.5 GHz CPU, 1 g memory, 40 G disk space. The operating system is a text of Windows 10. Its IP address is 172.20.156.130-172.20.156.149. The entire test environment architecture is shown in Fig. 7.

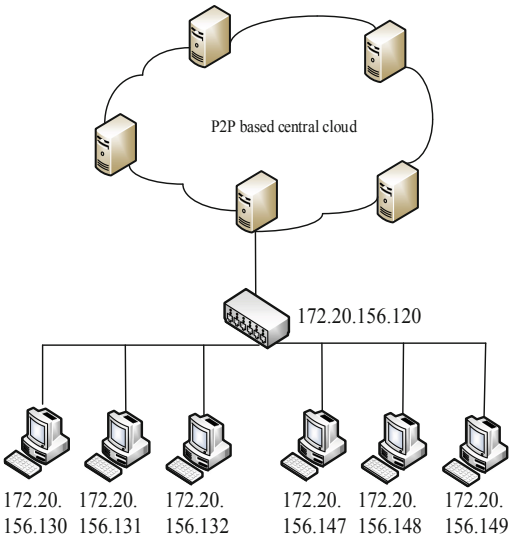

Fig. 7. Test environment architecture

The performance test of this article is to test a variety of normal, peaks, and abnormal load conditions by automated test tools to test system download rates. By load testing, it is determined that the download performance of the system under various workloads is to test the change of the download rate when the load is gradually increased. The system uses Jmeter to simulate the actual situation for pressure testing. Simply use two test cases: simple requests and complex requests. In a simple request, set up 30 concurrent users every 20 s to request five simple download services. Repeat 30 times, a total of 4,500 requests.

In complex requests, 30 complicated users are requested for five complex download services every 20 s. Repeat 30 times, a total of 4,500 requests. It is equivalent to adding 90 online users per minute, and accesses 10 min according to each person, which is equivalent to 900 at the same time online processing power. Under the same experimental conditions, the system and conventional systems designed in this paper are tested and the test results are compared and analyzed.

3.2 Comparative Analysis of Experimental Results

In the above system test environment, the two systems are obtained under a simple request, and the test results of 4000 times are tested, as shown in FIG.

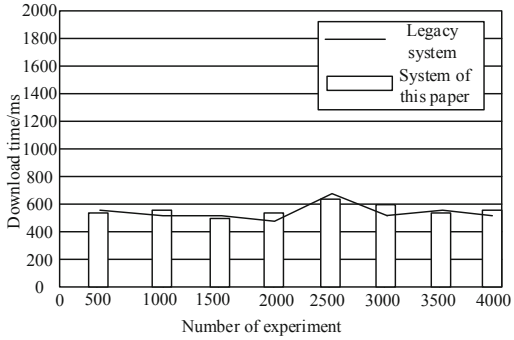

Fig. 8. Simply request download time comparison of two systems

It can be seen from the results in Fig. 8 that under a simple request, the test download time of the two systems is not much different. After calculation, the average download rate of the traditional system is 5.3 MB/s, and the average download rate of this article is 5.5 MB/s. The above test results show that under the simple request test, the performance difference between the two systems in terms of downloading is relatively small. In order to further clarify the advantages of the method in this paper, the download time of the two systems under complex requests was tested, and the test results of 4000 tests were obtained, as shown in Fig. 9.

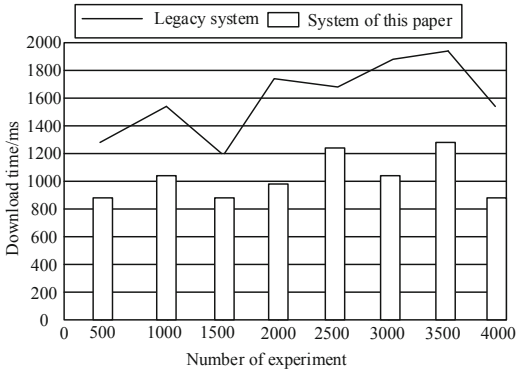

Fig. 9. Comparative download time comparison of two systems under comprehensive request

It can be seen from the results in Fig. 9 that under complex requests, the test download time of the two systems has a significant gap. The average download rate of the traditional system is 7.2 MB/s, and the average download rate of this article is 11.1 MB/s. The above test results show that in the case of complex request testing, the download rate of the system designed in this paper is significantly improved compared with the traditional system. Because the network structure of the method in this paper adopts the P2P hybrid topology structure to realize the complementarity between the advantages of different

structures, thereby effectively increasing the download rate, and verifying the advantages of the system designed in this paper.

4 Conclusion

This article is designed and described with a P2P technology-based network course mobile cloud teaching system, and is designed in detail from both hardware and software. In the experiment, the performance and advantages of the system were verified. The design of the P2P technology-based thinking network curriculum mobile cloud teaching system is far better than the traditional system under complex request, which will bring a new experience to the distance education model. Solve problems that are difficult to control in network teaching. With the improvement and wide application of the network, the mobile cloud teaching system based on P2P technology will provide a better platform for distance teaching.

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