Construction of University Cloud Classroom Platform Based on Python

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Abstract

In order to speed up the network construction in colleges and universities, realize educational informatization, provide better services for students and improve the efficiency of campus teaching management, this paper establishes a cloud classroom platform based on Python. In the process of building the cloud classroom education platform in colleges and universities, cloud technology is the core, and B/S architecture is adopted to develop it on Django framework with Python language. It provides a learning platform for college students to improve their autonomous learning ability and resource utilization ability. It realizes the output of high-quality standardized educational resources and effectively improves the efficiency of teachers' teaching content management. The platform interface is simple and convenient for teachers and students to use. It sets up an online communication channel between students and teachers and realizes the unified management of teaching resources in colleges and universities. Practice shows that this platform effectively enriches and perfects the network education and teaching system of the school.

Keywords: *Python; cloud technology; cloud classroom; network platform; College education*

1 INTRODUCTION

The Ministry of Education has always attached great importance to the influence of information technology on education, and has successively issued a series of policies to promote the digital transformation of education. Education informatization has become an important part of the national informatization development strategy, and has been highly valued by the educational circles and even the government. In 2022, the National Education Work Conference clearly put forward the strategic action of implementing digital education. This is an important reform measure of China's education, which will inject new impetus into the high-quality development of education. A series of planning documents such as "Ten-year Development Plan of Educational Informatization (2011-2020)" and "Action Plan of Educational Informatization 2.0" have been released one after another. In 2021, the Ministry of Education and other six departments issued "Guiding Opinions on Promoting the Construction of New Education Infrastructure and Constructing High-quality Education Support System", proposing that new education infrastructure should be used to promote the integrated development of online and offline education, promote the digital transformation, intelligent upgrading, integration and innovation of education, and support the high-quality development of education [2].

For colleges and universities, in the process of campus education informatization, there are some problems in teaching resources, such as information island and repeated research, due to different disciplines and different teachers. For students, the traditional way of education and learning is single, and it only absorbs the knowledge content of teachers' unified teaching by listening to lectures in class. Students can't express their ideas and communicate with teachers in time in the process of being educated, resulting in average learning effect for college students as a whole. Students in colleges and universities have more time for self-arrangement, while the classroom teaching time is limited, so the knowledge gained from it is also relatively thin. For teachers, in the traditional integration of teaching resources, teachers need to make inquiries in the network or related teaching books bit by bit. Not only is the progress slow, but the collection of teaching materials is not comprehensive, which greatly affects the teaching effect.

Today, with the continuous development of modern science and technology, many advanced technical means gradually appear, and cloud technology is a common one

with better performance. Cloud technology can be applied to the corresponding hardware and software facilities to transmit data information, so as to achieve the purpose of data sharing [5]. With the continuous combination of cloud technology and information education teaching mode, a brand-new concept, cloud classroom, has gradually formed. Cloud classroom relies on the convenience of network transmission, realizes the sharing of educational resources, and effectively solves the problems of isolated information island and repeated research in teaching resources on campus. Students' subjective will and initiative are fully expressed, and the individual learning effect is strengthened, while the students' knowledge width is expanded. Cloud classroom also provides conditions for students to carry out independent, cooperative and inquiry learning activities. Cloud classroom creates a cloud learning environment, which can provide college students with learning experience anytime and anywhere, save learning data and set up questions related to teaching content, so that college students can analyze and consolidate the knowledge learned in the classroom in time. In the learning process based on cloud classroom learning platform, teachers can provide learners with high-quality and cutting-edge learning resources. In the cloud classroom, teachers can make use of all kinds of teaching materials in the cloud server and combine all kinds of advanced computer network equipment to realize a brand-new teaching method. It provides the possibility for teachers to optimize classroom teaching and improve teaching quality.

The author believes that under this background, according to the present situation of the above problems, exploring and constructing a cloud classroom education platform in colleges and universities based on cloud technology, combining Python language, using Django framework and connecting with My SQL database and storing it on GFS distributed file system can effectively improve teachers' teaching efficiency, improve teaching quality and strengthen the comprehensive cultivation of students.

2 KEY TECHNOLOGY

2.1 *Cloud technology*

Cloud technology is the general name of network technology, information technology, resource integration technology and management platform technology based on the application of cloud computing business model. Cloud technology can integrate all resources into a resource pool, and realize the flexible and convenient functions that can be used on demand. Cloud technology mainly includes cloud computing technology, cloud storage technology and other technologies. Compared with traditional storage, cloud storage has changed the storage mode that data is stored vertically in a physical device. A large number of storage devices are collected through broadband network, and the physical storage resources located on each single storage device are integrated by storage virtualization, distributed file system, and underlying objectification technologies, thus forming a logically unified storage resource pool. Generally, from the technical implementation level of cloud storage, from the bottom up, it can be divided into four levels: storage layer, management and scheduling layer, access interface layer and application service layer, as shown in Figure 1 [9].

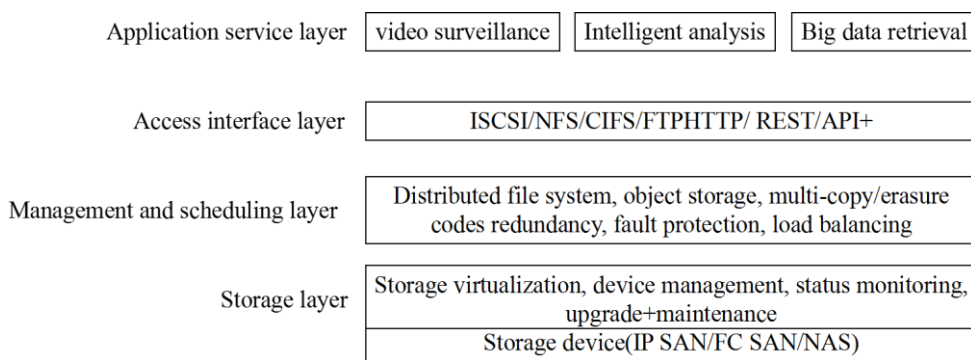| Application service layer	video surveillance	Intelligent analysis	Big data retrieval
Access interface layer	ISCSI/NFS/CIFS/FTPHTTP/ REST/API+		
Management and scheduling layer	Distributed file system, object storage, multi-copy/erasure codes redundancy, fault protection, load balancing		
Storage layer	Storage virtualization, device management, status monitoring, upgrade+maintenance		
	Storage device(IP SAN/FC SAN/NAS)		

Figure 1: Cloud storage technology implementation level

GlusterFS is an open source distributed file system. It consists of storage server, client and NFS/Samba storage gateway. GFS provides fault tolerance, reliability, scalability, availability and performance for large networks and connected nodes. GFS is composed of a number of storage systems constructed by low-cost commodity hardware components [8]. In the author's opinion, there are two biggest highlights of this system.

One is to use the concept of cluster to connect hardware facilities to perform file storage tasks together. The other is to make full use of the advantages of off-the-shelf servers, while minimizing hardware weaknesses. GFS provides a loose consistency model, which can also be called your weak consistency model. It is relatively simple and efficient to implement. The architecture of GFS is shown in Figure 2.
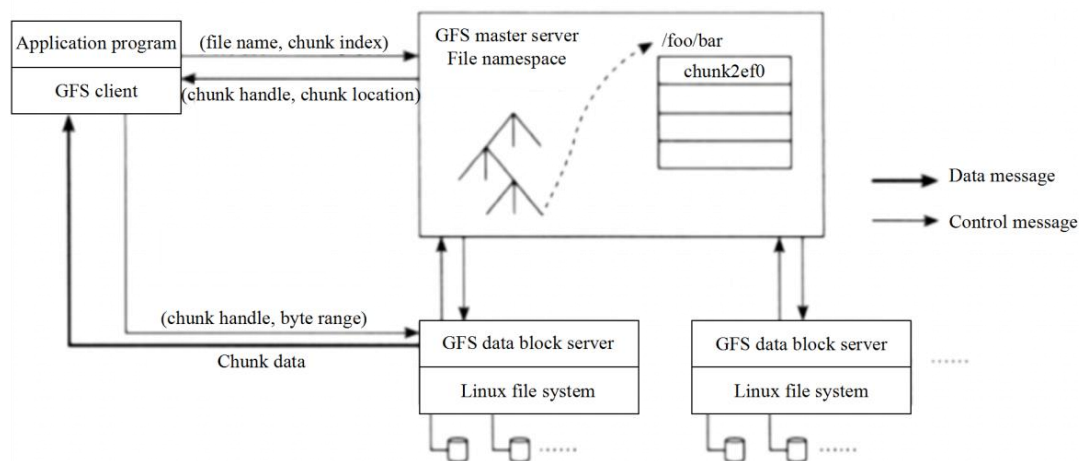
Figure 2: Overall architecture of GFS

2.2 Python

Python is a concise, direct and clear open source programming language that supports both process-oriented and object-oriented. It is also dynamically typed, and there is no need to declare variable types. In Python, everything is an object, and everything can be assigned to variables or passed to functions as parameters. The language itself is the best practice of pseudo-code, which is friendly to programmers and beginners who master other languages. All kinds of advantages make Python widely used in Web development, web crawler, cloud computing data analysis, scientific computing and artificial intelligence, automatic operation and maintenance, graphical GUI and other fields [7].

2.3 Development environment

Cloud classroom platform is mainly developed locally under the Windows operating system, with the operating system version of 10.13.2. The platform is based on the Django framework to connect the relational database MySQL5.7.27, and is developed with Python 3.7.4 as the main development language, using the 2019.2 version of Pycharm tool. During the development of the project, a virtual environment is established by Virtualenv 20.11.1, which is used to maintain a clean and independent development environment without any third-party packages, and the problem of multi-version conflicts among different applications is solved. The database of this system uses a compatible MySQL database, and the specific data forms of the database are generated by means of object relation mapping (ORM). UWSGI is selected as a simple Web container instead of Django, which leads to incomplete functions. At the same time, Nginx is used for port forwarding to realize the communication between browser and Django project. GFS distributed file system is adopted for file storage in the development process and subsequent. In order to give users a better operating experience, it is necessary to deploy the projects in the local development environment, which are composed of related databases and GFS file systems, to the cloud server, and rent Huawei cloud server to match the data in the database for storage.

Name	Attribute
Operating system	Windows 10
Development language	Python 3.7.4
Development tools	Pycharm 2019.2
Database	MySQL 5.7.27
Web framework	Django 2.0.13

Figure 3: Development environment

3 REQUIREMENT ANALYSIS

3.1 Functional requirement

The Python-based cloud classroom platform in colleges and universities will divide the business scenarios of the overall functional requirements of the system into the client for students and teachers, and the administrator for the system [1]. For student user end, the video course part of cloud classroom is the core requirement. Students can overview the knowledge points of chapters anytime and anywhere, make a concentrated breakthrough in key and difficult subject courses by browsing the video of cloud classroom, and conduct exercises in time to give immediate feedback on the learned knowledge. Confusion encountered in the learning process can be consulted by teachers through online communication modules, and questions can also

be asked by other students through the comment area of related subject videos. On the use conditions of the main users, college students have a higher cognitive level, and their effective learning procedures, plans, methods and control levels in learning activities are obviously better than those of middle school students. College students have a strong grasp of the basic knowledge of computer and network and basic operation skills, and have the soft power to cultivate autonomous learning ability by accepting online cloud classroom. For teacher user end, the platform simplifies and integrates a large number of redundant teaching resources, realizes teachers' targeted search for teaching resources, facilitates teachers' lesson preparation, and improves the efficiency of teachers' teaching content management. Teachers can provide students with homework test banks and video classroom resources needed for online teaching, and quickly answer questions raised by students online [4]. For administrator end, administrators should have the authority to publish, modify and delete teaching content, information of

teachers and students, and can control and manage the authority of teachers and students.

3.2   Global design

In view of the functional requirements of cloud classroom college education platform system, combined with the application and configuration of the above-mentioned related technologies, the overall design of the system is completed. It adopts a brief introduction of functional design, develops a B/S architecture with low difficulty, and adopts the working mode of browser request and server response. In this system, user requests are transmitted to Django project through Nginx and uWSGI web servers, and related data information elements are obtained from MySQL database in combination with the requests, uploaded to the cloud storage system, and then responded to users. The overall system architecture diagram is shown in Figure 4.
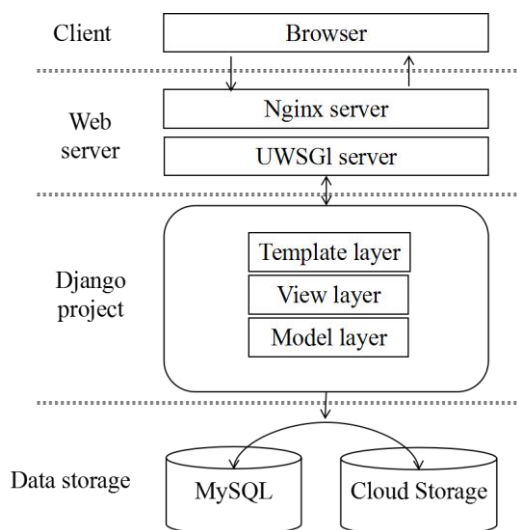

Figure 4: System Design Architecture

Through the overall system architecture diagram, we can clearly realize that the cloud classroom college education platform system can be divided into three main parts: Web server layer, Django project layer and the lowest data storage layer. The Web server layer consists of Nginx server and uWSGI server. Ngx has the corresponding processing function of static resources. Nginx sends the dynamic Response logic, such as form submission and dynamic rendering, to uWSGI. uWSGI uses WSGI protocol to process the request and passes the key information to the web application Django for communication and deployment, and then returns the response to Nginx via uWSGI, and Nginx sends it to the server client. According to different problems, we give targeted response methods, and finally realize the user's request. Django framework mainly focuses on Model, Template and Views, which is called MTV pattern. The model layer accesses data, the view layer decides which

data needs to be retrieved, and the template layer is responsible for solving the logic of the data part. There are two ways to manage the data storage. For the data information elements that are necessary in various systems with small but complicated data amount, the compatible MySQL is used for storage management, which is convenient for developers to use, and also for background managers to carry out reasonable maintenance and management. In addition to storing the necessary data inside the system, we use the third-party cloud storage technology to store the massive data of videos, textbooks and courseware uploaded by teachers [3]. By renting Huawei cloud server, the data stored in GFS and database are used for cloud storage, which achieves the effects of optimizing the management of resource chain, saving storage space and relieving server pressure, and facilitates the rapid development of the system. Managers also need simple operations to

complete the deployment of links, which is of great help to improve the overall performance of the whole system [10].

4 FUNCTION REALIZATION

From the perspective of business roles, the system can be divided into three categories, namely, student users, teacher users and administrators. The overall functional requirement business scenario of the system includes the user end facing students and teachers, and the administrator end facing the system.

4.1 User end

The function settings of teacher user end and student user end in the login personal center module and online communication module are basically the same. After entering the login page, enter the account number and password in the input box according to the instructions, and the background will match and verify the data with MySQL database. They can only enter the system after completing the information verification. When teachers and students open the online communication module, they can browse the list of contact dialog boxes, and click one of the dialog boxes to view the historical chat records between the users and the teachers. Users all know the uploading teacher of each video, courseware, textbook and other teaching materials by clicking on the upper right corner of the material. Double-clicking on the avatar can jump to the private chat interface of the online communication module, generate a dialog box with the author, and communicate with the author about the doubtful points of the material they are reading at this time.

4.1.1 Student user end

The function modules of the student user end mainly include personal center module, online communication module, professional course learning module and exercise module. In addition to managing their own information, students can also manage their own operational information, including collecting all kinds of course videos and viewing all kinds of course records. The course learning part of cloud classroom platform is the core demand of students, that is, the platform provides one-stop service for students to find, watch and learn courses. Students can click on the course learning module to view the course list, the introduction and details of courses, browse or download relevant professional course videos online for learning, and express their opinions and comments in the comment area for academic exchange. Students can click on the exercise module to browse the exercises of after-school homework exercises under different course schedules, and click enter to start the exercise exercises. After the answers are answered, the built-in subsystem of judging right or wrong in the system will score them instantly. After the students submit exercises and the system scores the results, the system will automatically jump to the answer analysis page.

4.1.2 Teacher user end

Besides the personal center module and online communication module, the teacher user end also have teaching resource database module and resource uploading module. Teachers can click on the teaching resource library module, and they can read the classroom teaching resources such as PPT courseware, reference materials and literature texts uploaded by other teachers, in addition to the video classroom resources of various professional courses, for teachers to prepare lessons for reference. The resource uploading module is divided into two parts: sharing and uploading of teachers' teaching resources and uploading of students' teaching resources. In the uploading module of students' teaching resources, teachers will upload cloud classroom teaching videos provided for students' clients. In this module, teachers can also fill in the test questions and answers in the homework test bank of the system, and upload the answer analysis. Click on the teacher's teaching resource sharing and uploading module, and teachers will submit various teaching resource text files in the form of file uploading to the teaching resource database. The code for realizing the file uploading function is shown in Figure 5

```
@csrf_exempt
@login_required
def upload(request, user_id, ord_id, req_id):
        req_id = int(req_id)
        ord_id = int(ord_id)
        req = Requirement.objects.get(id = req_id)
        ord = Order.objects.get(id = ord_id)
        if (int(request.user.id) == int(user_id)) and (req.file.count() == 0):
            if request.method == 'GET':
                form = FileForm()
            return
TemplateResponse(request,"fileupload/file_form.html",{'active':'file','form':form,'warning':'u','user
_id':user_id,'ord_id':ord_id,'req_id':req_id})
            else:
                return TemplateResponse(request,"404.html")
```

Figure 5: File upload function implementation code

4.2 Administrator end

This system adopts Xadmin background management subsystem of Django. The background management module is divided into five modules: authority management, student and teacher information management, course management and log recording. Student information management includes students' basic information, students' course collection, system information and students' learning courses. Course information includes course categories, subject chapters, course videos, downloaded materials, course reviews and other information. The background management subsystem mainly imports the relevant data of three basic information: student information, professional course information and teacher information, and makes timely management of adding, deleting and checking according to the needs of the school. The administrator can control and manage the permissions of teachers and students in the permission control module. Click the logging function module, and the administrator can see the detailed operation logging rules between teachers and students. Administrators can better record system operation information and analyze possible errors of this cloud classroom platform through logging function. The operation and management of background data is essentially the process that the administrator reflects on the front page through the interaction between the Web back end and the database. The structure diagram of the background management module is shown in Figure 5 [6].
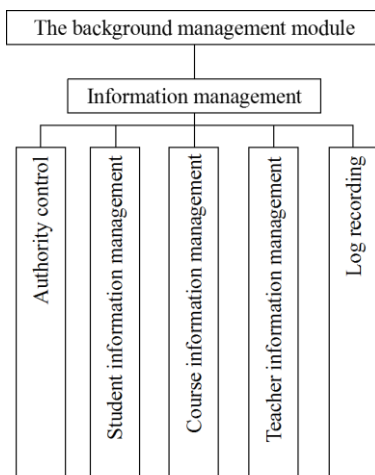
Figure 6: Structure diagram of the background management module

5 CONCLUSIONS

To sum up, in the construction of digital campus network in colleges and universities, the cloud classroom education platform established by applying cloud technology can not only further improve the applicability of campus network, but also optimize its teaching management, which plays a very positive role in the effectiveness of campus network. The vision of this paper is to provide a pure learning environment for college students, precipitate the content, build a cloud classroom platform that outputs high-quality standardized educational resources, and guide students to carry out personalized learning, autonomous learning and collaborative learning. This educational platform can

basically meet a series of demands of our school on the collection, input, processing, storage and management of educational and teaching information resources, ensure the effective management of teaching information resources in various disciplines, realize the sharing of teaching information resources, and enable every teacher and student in the school to browse teaching resources in time, accurately and quickly. This paper comes from an actual project, so in the future work, we still need to constantly improve the functions of the system and optimize it after the system goes online. The functions of some videos are relatively basic, and the personalized functions during video playback will continue to be added in the future. By making good use of the user operation data in the platform operation, we can mine the data, learn the user behavior characteristics, and provide more intelligent services for users.

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REFERENCES

[1] Bai Xiangchen. (2019) Design and Implementation of Web Online Education Platform Based on Django Framework. Beijing Jiaotong University.06.

[2] Feng Lin. (2017) Analysis on the Influencing Factors of College Students' Using Behavior of Cloud Classroom Learning Platform. Central China Normal University.5.

[3] Liang Jian. (2020) Research and Analysis of Online Teaching of "Cloud Classroom" in Colleges and Universities under the Background of Epidemic Situation. China Journal of Multimedia & Network Teaching..05.

[4] Li Qian. (2022) Application of Cloud Technology in Digital Campus Network of Colleges and Universities. Network Security Technology & Application.02.

[5] Liu Yuanming. (2018) Design and Implementation of Cloud Classroom Platform for Primary and Secondary Schools Based on Python. Beijing Jiaotong University.05.

[6] Qi Junfeng. (2013) Analysis and Development of Campus Management System Based on Django. Lanzhou University.10.

[7] Shi Yali, Mu Hui. (2021) Research on Information Education Teaching Mode Based on Cloud Technology. Wireless Internet Technology.03.

[8] Tong Le. (2020) Online Education System Based on Django Development Framework. Central China Normal University.05.

[9] Yang Zongkai.(2022) The Comprehensive Digital Transformation of Education has Become an Inevitable Trend. China Youth Daily.04.

[10] Zheng Wenyu. (2020)Research on Information Education Teaching Mode Based on Cloud Technology. Digital Communication World.08.