Design of Cloud Teaching Resource Sharing Platform Based on Hadoop

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Abstract. Efficient and rational use of teaching resources is the basis of teaching work in Colleges and universities. It is also the key factor to improve teaching quality. At present, there have been some achievements in the sharing of university teaching resources, but there are still many problems that need to be solved. Function design of platform of teaching resources sharing under the cloud computing environment, the construction of educational resources sharing platform of education, can share the low degree of the maximum resolution of resources and infrastructure construction is dispersed, the repeatability and excessive construction of resources, and the resource sharing platform of power, the integration of existing teaching resources, to improve the utilization of teaching resources, to maximize the value of the use of teaching resources.

1. Present Situation and Existing Problems of Teaching Resources Sharing in Colleges

At present, with the development of distance education and online education, the teaching resources of colleges and universities are shared, to a certain degree, through the Internet, but the sharing degree of teaching resources is still poor. Colleges post some content in their own Web site, such as the school's recruitment information, academic conferences, literature, teaching resources and some other content. Because the universities' digital resources have more entrances, the various information systems use heterogeneous platform, which caused the "resource island" phenomenon that some resource can not be used well. At the same time, most of colleges focus on the technology processing of the educational resources in detail, which makes the sharing of educational resources construction remain stagnant. The details are presented as follows:

(1) There is a lack of valid argument and reasonable planning in digital resource construction. Most of schools resources construction is fragmented, redundant construction, randomness, resulting in waste of resources, the lack of unified planning and management at the macro level.

(2) There is lack of unified resource construction standards and resource exchange platform. Most of colleges and universities establish the teaching resource base according to their own actual teaching needs, which makes the database interface standards between colleges and universities not to be unified, and it is difficult for each other to exchange data and interoperate with each other. As a result, the independent storage of teaching resources and the lack of exchange of educational information make it difficult to provide the guarantee for sharing resources.

(3) The recall ratio of teaching resource search engine is not high enough, the search efficiency is low, and it is difficult to search the practical teaching resources quickly and accurately.

2. Function Design of Shared Teaching Resource Database Based on Cloud Computing

The purpose of the construction of shared teaching resource database is to develop and integrate all kinds of high-quality teaching resources, avoid repeated construction and waste, and finally build a teaching resource sharing platform based on cloud computing. Therefore, the teaching resource sharing platform needs to break through the following points in functional design:

(1) There are already a number of teaching resource systems in the university, the teaching resource sharing platform is able to exchange resources and share resources with other resources;

(2) In the metadata processing of resources, we should strictly refer to the "Education Resource Construction Technical Specification", use XML to organize and describe the resources in a unified way, provide a unified interface technology, and provide basis for resource exchange, sharing, integration. In addition, each category of resources is indexed information, in order to query quickly, browse and access;

(3) Compared with the traditional teaching model, Shared teaching resource library platform can fully reflect a modern, innovative teaching means and methods, students can rely on the platform for independent learning, in order to meet the needs of personalized learning.

In view of this, the shared teaching resource library platform includes resource database module, resource management module, teaching application module and resource integration module.

2.1 Resource database module

Resource content is the cornerstone of shared teaching resource base construction. According to the granularity and composition of resource data, it can be divided into three levels: basic resource library, integrated library and courseware library. The basic resource library is the lowest level resource in the subject resources, including the basic materials used in the course teaching, such as text, graphic image, animation, audio, video and graphics. Integrated library is set of teaching resources and expressions that regard the subject knowledge as the the classification clues, and integrated library is also the basic element set of the courseware and organization teaching activities, including the micro teaching unit, the case database, the test question bank, the common question bank, the reference database, the shared software library and so on; courseware library is the main component of the teaching resource library, including courseware, teaching video, e-books, teaching CD-ROM, network courses and so on.

2.2 Resource management module

Resource management module is mainly on the repository data management and maintenance, mainly to achieve the following functions:

(1) Resource description function: describe the metadata of the teaching resources according to certain specifications, and generate the standard XML documents of the metadata so as to access the resources with each other.

(2) Resource maintenance function: to accomplish the operations, including the upload, download, modify, delete, audit of teaching resources and other basic operations.

(3) Resource registration function: through the audited state information of teaching resources, locating information registered to the resource information table, for user-friendly search.

(4) Resource search function: to find matching search conditions or related teaching resources in the resource database.

2.3 Teaching application module

Teaching application module collects a variety of teaching management and application and some other auxiliary systems, such as learning forums, teacher and student communication system, information release system, video teaching system, student comprehensive evaluation system, resource evaluation system, etc..

2.4 Resource integration module

When most of the colleges and universities build a shared teaching resource library, they have built a network course teaching platform, excellent course management platform. As these resource systems mostly use the independent solution, causing the data between the heterogeneous systems not to be shared and exchange, aggravating repeat constructions. The resource integration module will achieve seamless connectivity and interoperability between multiple heterogeneous resource systems, that is, users can share resources with other platforms on a repository system. Without having to know the physical location of the resource. The integration of resources is based on XML unified description and centralized management of metadata. Since XML is independent of specific software, hardware and application, the resources described by XML can easily realize the exchange and sharing of heterogeneous data. First, the resources that are distributed in each heterogeneous node resource library are transformed by XML, described as the unified normative resource representation in order to present a unified normative resource library, and then the resources and services that need to be shared

are registered into the central repository. When the user requests a resource from the node resource database, if the local resource is available, it will be directly given back to the user. Otherwise, the system will forward request to the central repository. The central repository will retrieve the metadata to the local node. Based on the obtained metadata, the service request is made to the node resource library as the resource provider by the local node, and finally the resource is returned to the user.

3. The Implementation Plan of Cloud Computing in the Teaching Resource Sharing Platform of Colleges and Universities

3.1 Resource sharing platform system architecture

Based on the cloud computing teaching resources platform, it is to build a service platform for teachers and students through virtualization technology with variety of decentralized teaching resources. Platform system structure is divided into four layers, namely: resource layer, platform layer, software service layer, user layer, as shown in Figure 1.

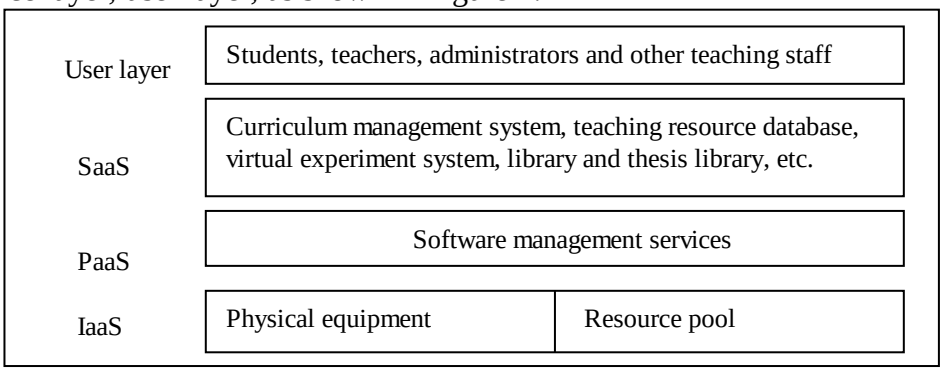

Fig. 1 Resource sharing platform system architecture

Resource layer (IaaS): This layer uses cloud computing virtualization technology to manage the platform hardware facilities, in order to build a virtual hardware resource pool, and provide storage, computing and network resources and other shared services, namely infrastructure services (Iaas).

Platform service layer (PaaS): Platform service layer refers to building the software development platform as a service on the virtual resource layer, the cloud service providers are responsible for hardware facilities, data storage and computing functions, and manage uniformly all kinds of services, teaching resources and accounts. On the sharing platform through the management API. And they will also assign each user to an authentication ID; only access to a unified ID, users can access the platform to share resources.

Software service layer (SaaS): the layer is to provide users with software services on the platform. The users rent all kinds of teaching-related software that the cloud service providers provide through the layer, including video teaching on demand system, teaching resources management software and online library etc., the users simply request services from the cloud on demand, without having to buy their own software, and do not need to maintain the infrastructure and software operating environment.

User layer: the top level of the shared platform, is the entrance to access platform for the users, the users use different kinds of terminal equipments, anytime, anywhere, to access the platform, browse multimedia teaching resources, download and share, so as to effectively improve the users' experience, promote the sharing of teaching resources.

3.2 Build a cloud computing environment based on Hadoop

On the platform being built, in order to enable the server to be efficient and stable operation, we choose to use the Linux system of the Centos version, and the version used is CentOS 6.2. We use Tomcat 7 as the Web container on the primary server, the relational database MySQL version is 5.6; the cluster runs using the JDK version of JAVA is 1.8; the Hadoop version 2.2 is used. A cluster is made up of 4 virtual systems. Each virtual machine is configured with a CPU, a 100M full duplex network card, and the memory settings of the virtual machine are 2G.

3.3 Eliminate HDFS performance bottlenecks

In the process of designing education resource sharing platform, do not respond to all of the data's equally, need to distinguish according to the actual needs, for example, more valuable data's should be paid more attention to, and the more storage resources should be allocated, namely the more copies are established to deal with high concurrency, reduce access latency, at the same time, the safety and the stability of data's will be improved. As a result, improvements can be made on the basis of HDFS, adding a system controller over the name node.

4. Conclusion

The application of cloud technology platform of teaching resources construction in Colleges and universities must be based on data sharing, security of the resource data sharing, application sharing and service sharing, integration of excellent teaching resources, standardization, coordination of dispatching and unified management of teaching resources. The construction of shared teaching resources of the Library under the environment of cloud computing, will inject new vitality into the major construction, curriculum construction and information construction, provides a wider space for the teaching reform and innovation, so as to promote the quality of teaching resources sharing among colleges and universities, colleges and universities to improve the information construction level and teaching quality.

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References

[1] Jian Wang, Using cloud computing to realize the sharing of university teaching resources, Academic Forum. 11 (2011) 198-199.

[2] Hai long Liu, Yan Wang, Application of cloud computing in university teaching resource sharing platform, Lesson Garden. 01(2014) 247-247.

[3] Wei Wang, Ran Tao, Construction and application of Hadoop cluster based on Virtualization Technology, Software Guide. 11 (2016) 50-54.

[4] Linhai Tan, Design of teaching resource sharing model based on Cloud Computing, Power information.12(2015) 591-591.