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Research on the system modeling and its application of cloud service of educational resources

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Abstract. Under the background that educational informalization gradually enters cloud computing era, the sustainable development of educational resource cloud service depends on the integration of each service system and the play of overall efficiency. However, the loosely distributed service system must be solved of heterogeneous problems of service system during the process of integration. Based on the management and application system of open and interoperable educational resource cloud service, this paper constructs the system framework of educational resource cloud service, provides the solutions for the integration and interoperation of educational resources cloud service, making better of the centralized management and dynamic integration capabilities of educational resources cloud service to meet the learners' individual needs of educational resources service.

Key words. Educational resources, cloud services, modeling, application.

1. Introduction

Educational resources cloud service can effectively reduce the construction cost of research infrastructure and greatly enhance the collaboration and innovation ability of researchers. For example, MoodleRooms provides online learning services for elementary education and higher education institutions in many countries. Shanghai distance education group is also building lifelong learning services cloud; Dalian Institute of Technology adopts VMware products to build IaaS private cloud in schools, saving the cost of reform and improving operation efficiency, flexibility and service level. Because the field of educational resources cloud services is too specialized, it is hard for most people to judge the specific functions and contents of services from the service names, seriously affecting the value playing of educational resources cloud service and the interaction of digital learning activities. The content description and

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organizational technology of educational resources cloud service are the basis for its high efficient management and application. Only the effective, reliable and uniform of description and organizational standard of educational resources cloud service are adopted, that is the information description and organizational level of educational resource cloud service are standardized processed, so as to achieve the sharing and communication of educational resources cloud services, and ultimately to achieve computer automation and intelligent processing.

The only way to solve the contradiction between the "thinness" of learning terminals and the demand for high-quality learning support services is enhancing the ordering, structuring and semantization of educational resources cloud services under the situation that "cloud + terminal" mobile learning and ubiquitous learning technology systems are becoming more prevalent, and then it can be freely integrated with learning activities to improve the efficiency and benefit of digital education. The establishment of a unified, standardized and semantic framework for the communication and sharing of educational resources cloud service makes it possible for educational resources cloud services to be integrated and operated into a higher degree and in a broader scope, and promote the value playing of educational resources cloud service, so as to provide learners with a better cloud service experience. Therefore, this paper proposes and discusses a suitable method for the modeling of educational resource cloud field, establishing a conceptual model of educational resource cloud, and solves the problems of effectiveness, completeness and consistency of educational resource cloud service description to construct the application ontology of educational resource cloud service, it has important practical significance.

2. Composing elements of educational resources cloud service system

2.1. Educational cloud

Educational cloud is the migration of related technology and services of cloud computing in the field of education, and is the infrastructure of education information for the future. The educational cloud includes all the hardware and software computing resources necessary for educational informalization. After these computing resources are virtualized that provides educational institutions, education practitioners and students with cloud services in the form of computing resources. Educational cloud is the basic platform and environment for future digital learning, which will bring a positive impact on the construction of learners' personal learning environment, the construction of school resources and the development of educational information system. On the one hand, learners can freely choose their learning content and learning style through the services provided by the educational cloud to make better use of information resources and services. On the other hand, educational management agencies and educational researchers can better manage teaching resources, carry out teaching design, and optimize the teaching process after getting rid of the complicated and heavy bottom technical details. A well-

designed educational cloud can realize these educational functions such as online learning, online teaching, educational management, interactive social networking, using open architecture, open resources, and through open standards, open interfaces to achieve interconnection. It also can provide learners, teachers, and managers with a variety of educational information and technical services.

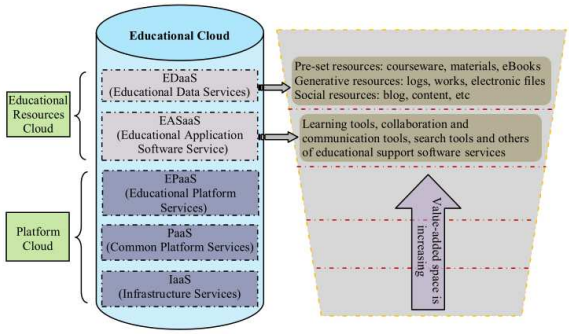

Fig. 1. the structure of educational cloud

2.2. Educational resource cloud

Educational resource cloud is a cloud platform or service system that provides educational resource services. It is a platform for the management and integration of educational resources. The service it provides to the outside world is also an educational resource cloud service. Educational resource cloud is an self-governing, self-maintaining and dynamically expanding information infrastructure the education resources cloud is built and operated in a cloud computing form. Aggregating and integrating massive, dynamic and heterogeneous high-quality educational resources, and then with the form of cloud services to provide a comprehensive range of users with overall educational resources services.

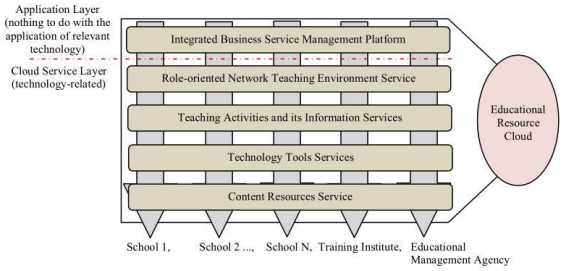

Fig. 2. the structure of educational resource cloud

2.3. Educational resource cloud services

Educational resources cloud service is the "process" for cloud service providers to meet the educational resource needs of their clients. The demand here involves the design, development, transmission, use, evaluation and other related services of educational resources, educational resource services can be obtained at any time, use on-demand, whenever to expand, paid according to the use. Educational resources cloud services organized experts in the field of educational resource services and experts in the field of information technology services to design and construct "transparent services", "cloud + terminal" and "one-stop" new model of educational resources services based on the technical concept of "cloud services", The new model has broken the traditional boundaries of educational informalization, and enabled more schools, teachers and students to have equal and available information services.

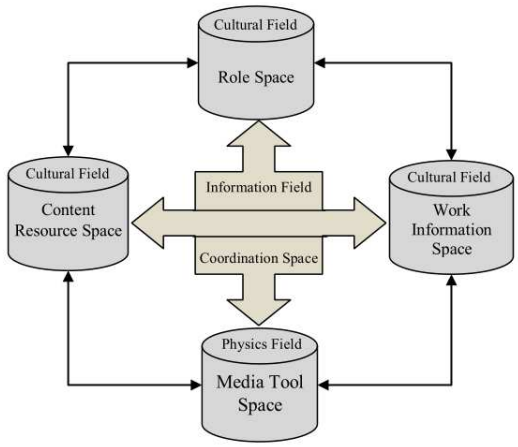

Fig. 3. The system operational mechanism of educational resources cloud service

In the learning environment of technical intermediary, the system structure of the educational resource cloud service consists of three fields: the physical field, information field and cultural field, as well as the five spaces of the role space, resource space, and media space, coordinating space and working space. Among them, the three fields reflect the three levels of learning carrier, the physical field is based on the Internet, and the information field is based on the information network formed by the World Wide Web. The core of the cultural field is the value concept. Role subspace defines the composed of members, structure, roles and responsibilities of network teaching activities; content resource subspace is the educational resource entity required for network teaching activities; job information subspace is a collection of network teaching activities, which including task scheduling, execution processes and learning outcomes. The media tool subspace is a collection of various media tools entities required for the cognitive process of online teaching activities. The coordination subspace is a collection of some control mechanisms and some rules of performance-oriented collaborative learning process.

3. Service system model construction of educational resources cloud

3.1. Educational resource service system structure

The structure of educational resources service system is divided into three layers: presentation layer, affair logic layer and resource management layer. The presentation layer is composed of user browsers, which is for end users, teachers and students. The users do the related operations by the connects to the server via a browser, including searching required resources from a resource repository and downloading to a local device, related resource uploads, and testing students online etc. affair logic layer: In fact, it is the system provides a variety of functions of dynamic business processes and services. The application server stores various application modules, including system management module, user registration module, user login module, resource navigation module, resource browsing module, resource searching module, resource evaluation module, resource upload module and resource download module. Through these application modules, teachers can choose various forms of teaching resources for flexible organization and compiling during lesson preparation according to the teaching needs to form a courseware with teaching individuality. so that teachers can fully reflect their teaching characteristics when teaching. Resource management layer is responsible for the day-to-day management of the underlying data center, including related management functions of resources storage, modification, deletion, and attribute setting, as well as classifying and auditing the uploaded resources.

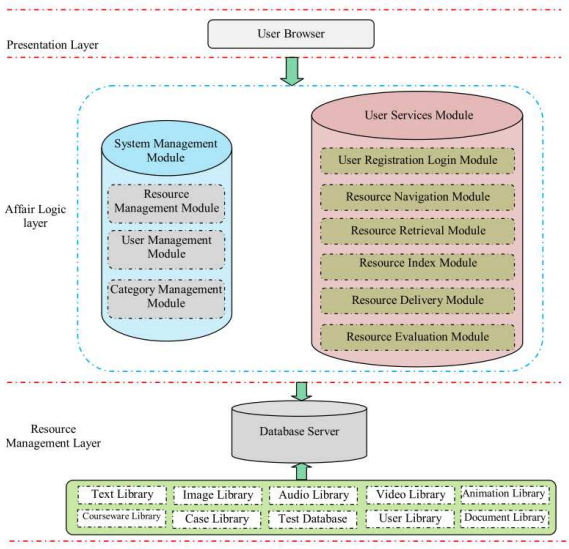

Fig. 4. The structure characteristics map of educational resource service system

3.2. The system construction of educational resources cloud services

The first layer is the presentation layer, the physical performance of it is the cloud device, mainly providing users with graphical user interface based browser, as well as mainly responding to the client's user request, and showing the service process interface and result information to the users.

The second layer is the service management and integration layer, which mainly establish resource service information to respond to resource service requests from the presentation layer, carrying out business logic operations for service request information, and integrating and managing educational resource cloud services, cloud platform administrators can add, modify, and delete cloud service information through the interface.

The third layer is a resource service layer that does an open and computer-readable description for educational resource information, which helps users to search, select, utilize and integrate educational resource services through intelligent agents. Resources include media tools, content material, classroom transcripts, literature material, FAQs, resource directory indexing, online courses, and special forums.

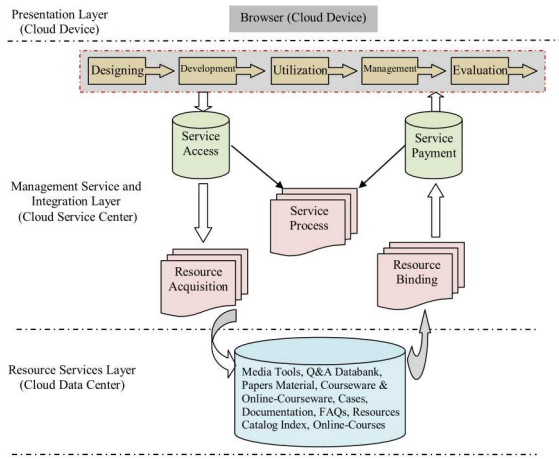

Fig. 5. the Level of educational resources cloud structure

3.3. The subject constitution of educational resources cloud services

In the educational resources cloud service framework, cloud users use educational resources cloud services, cloud platform operators provide and manage the cloud platform infrastructure, cloud service providers design, develop and publish the provided educational resources cloud services.

Cloud users: Cloud users do not have to know the underlying technical details of the used cloud services. The general users' interface is similar to that of traditional applications. Users do not need to know about cloud computing when in use; some

users require more personalized services, so their users' operational interface provides management features such as starting or stopping virtual machines or managing cloud storage etc.

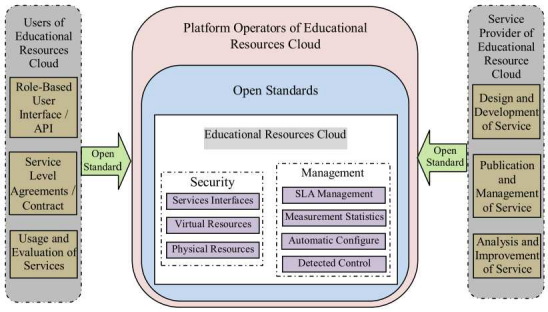

Fig. 6. the main body of educational resources cloud

Cloud platform operators: cloud platform operators provide services to cloud users and ensure service quality, and provide independent cloud service providers with infrastructure services of operational service. Cloud platform operators through the operational measurement and statistics services of cloud service to determine the service usage condition and the corresponding bills management of cloud users, through automatic configuration to confirm the resources allocated to the users, and by monitoring and tracking to find out cloud platform status and the usage condition of resource services.

Cloud service providers: Service providers can be learners, teachers and educational institutions that have cloud service development capabilities, or may be the professional IT service providers whose job is creating and publishing educational resource cloud services.

3.4. The conceptual model of educational resource cloud service

In order to better meet learners to conduct personalized autonomous learning by using resource services in the cloud, the educational resource cloud must accurately grasp the overall conceptual model of educational resource cloud. From perspective of the users, the educational resource cloud is shown to the cloud users that is a technological transparency, flat structure and seamlessly interconnected educational resource service pool. The conceptual model of educational resource cloud mainly consists of four layers: identity layer, role layer, service layer and IP layer.

Identity layer: It is mainly means the specific object that participate in services, including personnel and organizational representatives etc, such as student Lee of A school, teacher Wang of B school, representatives Zhao of C agency and so on. The identity layer is mainly based on the commercial service level agreement to give user account of a different identity to the users, and a user account has been given a role or multiple roles, if the cloud service providers achieve interconnection and interworking in the technology that you can combine data with user identities on

different cloud platforms to achieve cloud joint. Users can implement cloud joint operation across IDCs and trans-trust boundaries through web single sign-on.

Role layer: The role layer is mainly for the users classification management and the corresponding operational authority control, mainly including learners, teachers, field experts and managers, the roles of educational resource services field also include: resource authors, resource publishers, editors, resource reviewers, graphic designers, technology implementers, content providers, technical reviewers, teaching reviewers, scripter's, instructional designers, and more others. The permissions of resource services usually have browse, edit (modify), delete, update, download and so on.

Service layer: The service layer is based on the cloud service model to carry out overall and effective organization and management for educational resources,the implementation of the transparent services on technology, as well as the total lifecycle services of various educational resources to be provided in the content, so as to ensure that the overall orderly, structured, semantic of resource services to effectively meet the users' resource service needs of various digital learning and teaching activities.

IP layer: it includes cloud data center, computing, network, storage and other infrastructure services of educational resources, the IP layer is the material basis for the upper system. It can reach the rapid elasticity and customized service of resource service based on the virtualization technology. The physical resources can be fully utilized and shared, so as to exert the maximum benefit of resources.

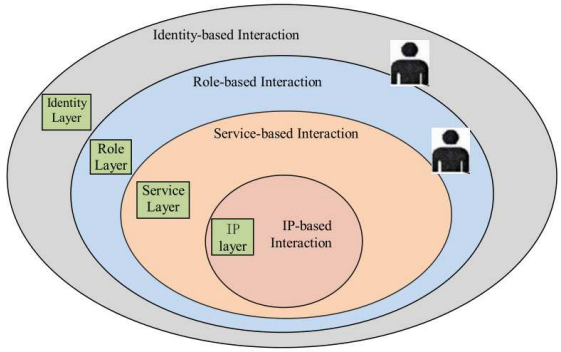

Fig. 7. the conceptual model of educational resource cloud service

4. The applications of educational resources cloud service system

Educational resource cloud is to improve the efficiency of teaching and the performance of educational information by creating; using and managing the appropriate educational resources cloud services (service processes and service resources).

Activity Area includes a series of activities, such as design activities, development activities, application activities, management activities, evaluation activities etc.

The method of activity creation can take into account of the personalized needs of a wide range of users, that is ensuring the universality and customization of cloud services, including aesthetic, scientific, engineering, psychological, procedural, and systematic, so as to create the necessary and effective environments for educational resources cloud services.

The purpose of Application Zone is to bring learners into the learning environment. The activity begins with the selection of a suitable educational resource cloud service, including design service, development service, utilization service, management service, and evaluation service of educational resource. Whether the choose from learners or teachers, a wise choice must be based on an evaluation of the cloud service, it is the way that judge whether the service processes and service resources of the existing cloud service are suitable for the learning objectives. And this is called integration when the teacher combines the cloud service with the lesson plan.

Management Zone is one of the responsibilities for workers in the field of educational technology; it can be transferred to cloud service operators in the cloud service era. These managements include: personnel and its authority management and resource information management etc. In the systematic approach, quality control measures are required to monitor the results, and quality assurance measures also to be adopted to keep the management process continuously optimized.

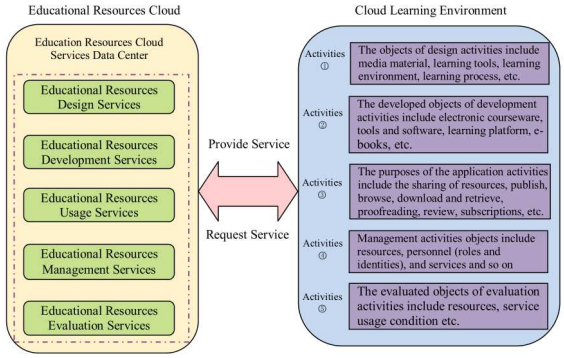

Fig. 8. The service system applications of educational resources cloud

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