Research on Design and Development of Computer Network Platform for College Students' Personal Knowledge Management

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ABSTRACT. *In this paper, the author discussed the design and development of computer network platform for college students' personal knowledge management. By analyzing the existing PKMS, find out their advantages and disadvantages. The paper also built the model of E-learners' PKM. Based on the existing model of PKM, by analyzing the characteristics of E-learners and the elements of their knowledge, build the model of E-learners' PKM. Software design of the system Using the object-oriented software design method, from the perspective of software engineering, design the software of the system. After the completion of the system design, verify and optimize the system. The experiment result shows the proposed method can improve the overall performance.*

KEYWORDS: *Design and development, Computer network platform, College students' personal knowledge management*

1. Introduction

The combination of E-learning and knowledge management is an important way to develop the information literacy and knowledge innovation capability of the E-learners; it is an important means for learners to obtain competitive advantage. However, at present, about personal knowledge management (PKM) in the application of E-learning, more emphasis on the acquisition, storage, application and expression of explicit knowledge, the attention of the innovation and the recessive knowledge management is not enough. In addition, because E-learning has the characteristics of interactive, timeliness, sharing and global, etc., and there are differences between E-learners and traditional students on group characteristics, autonomy, self-control abilities, etc., so it is difficult to find a personal knowledge management system (PKMS) that fit for the E-learners from existing knowledge

management tool. Therefore, the research of PKMS for E-learners, especially the design method, has important theoretical significance and application value.

2. Overview

At present, the network speed is not ideal in our country. The network and server can't bear the centralized access. The schools that launch the network security management system usually build many learning center diversion servers, mostly adopting B / S mode. The overall structure is shown in Fig. (1). It builds the central learning center server in headquarter of school and the other learning centers also build their own teaching resource servers. All the system backstage servers store the learning resource, including document resources and video resources, for the user to use freely. Currently, from the effect of system application, this operation mode has two obvious shortages: (1) In personal knowledge management system, there are a lot of learning resources and it has a huge volume. But, the network speed in our country is not ideal for the large amounts of resources transmission. So, due to the network transmission, some resources in the servers of platform do not synchronize with the resources in other servers, which result in a number of learning resources on the servers are incomplete or not the latest information. This makes the learners cannot learn the latest knowledge timely.

(2) In this combined mode, students need to register several times, because the account is not shared between servers. In other words, an account registered on a server cannot use to learn and download resources on another server. The students must register again when they want to learn in another server. This is very trouble. The new education platform proposed in this paper makes full use of the advantages of multimedia database cloud computing and stores the resources of each central server it the "multimedia database cloud". Distance education platform provides the function of automatic search and choosing the best path to transmit data. The servers can spare for each other and switch with each other, if a server fails, the platform system can switch to another nearest server automatically and the user can not feel this process. This design makes the students no longer to make several registrations when using different servers. The users can use all the resources in the servers of a platform with one registration, which achieve the greatest sharing of learning resource. At the same time, it improves the reliability of the whole platform system [1-3]. The system adopts the modularized design concept and the logical structure is clear. Due to the integration of multimedia database cloud computing, the service ability of the system has significant improvement and can adjust the using method and interface according to the actual situation of the students. So, it has strong flexibility and practicality [4-5].

The overall structure of distance education platform de-signed by the project is made up of the basic layer, service layer and application layer. It is divided into 5 modules, including the module of data processing, monitoring, treatment process, decision-making and the basic module. Among them, the resource library of the base layer platform system requests to ensure the reliability and stability of the basic resource library through the hardware, software, virtual and other technology. The

base layer provides the basic support for the server and application layer, such as providing computing processing ability and storage function. We can say that the base layer is like an energy depot of platform system. Because the business processing module of the system lays in the application layer, so the core of the platform system is the application layer. The business processing module is divided into the following sub-modules: comprehensive supervision, authority distribution, business processes, system automatic sign, document processing, information collection and searching. The application layer mainly provides interactive interface for students or other programs. The service layer includes the various service functions in platform system, such as file transfer service and data query service. The next section of the paper will introduce the design of the core module of the system.

As mentioned in the previous section, the core module of distance education was divided into the following sub-modules: comprehensive supervision, authority distribution, business processes, system automatic sign, document processing, information collection and searching. System module is shown in Fig. (2). Each module has the one to one relationship with the corresponding renter and each module is started by the corresponding tenant identifier. The identifier arrives each module by using Meta data channel and each module accesses the needed resources combined with the Meta data function area. The main function of comprehensive monitoring is the installed platform system of SaaS service. It configures the related parameters of system for users and distributes user rights. Authority control module has three kinds of methods to identify tenants [6]. The people related to SaaS service and application, based on their identity identifier, use the corresponding rights assigned by the system to access the specified files. In order to prove a good, efficient and convenient service for different users, SaaS should satisfy a variety of workflow requirements. The configuration tool of workflow module only supports the workflow in the department or the inside of platform system and it does not support the others. The system automatic sign module is realized by the means of signature technology and watermark identification. The main function of file processing module is to add, reduce or transfer the documents in servers. These documents are stored in a form in the database and they are independent of each other between different tenants. Also, they can manage some specific electronic files automatically, such as cleaning up the expiration or temporary files and activating the relevant documents. The main function of the searching module is to extract the relevant information in the files by collecting, allowing users to enjoy better query service. Using this function, students can search for the relevant information they need freely in the database of network security management system.

3. Computer Network Platform Model and Algorithm

As already mentioned, according to the service characteristics offered by multimedia database cloud computing, it can be divided into three layers. The lowest layer offers the most basic hardware support, such as central processing unit (CPU),

memory and hard disk. They are collectively called "the hardware infrastructure services." [7]

The system designed in this study is based on B / S model. SaaS is provided by a Web browser. SaaS platform be composed of four layers, namely: external interaction layer, comprehensive processing layer, business layer and information storage layer. Renters register system using the external interaction layer through the browser. The comprehensive processing layer can handle a variety of user's requests, making the system more flexibility. The main functions of the business layer are business security service, friendly interface, configuration information service. Usually, the in-formation storage layer is designed by the form of shared database and data separation to improve the security of the database. In order to make the interface and function of the system can be configured, and the personal knowledges can be the allocated efficiently and flexibly, the platform designs scheduling mechanism for the requests. The renter's requests can be roughly divided into 3 categories: One category is the interface appearance request. There are corresponding appearance modules to answer this request and such request needs SaaS to show the specified information without changing the service state. The other type is the system configuration request [8]. This request requires SaaS to modify the corresponding configuration. Because the design the configuration module is extracted from the business module, so the processing request of configuration module is similar to the service module and it does not change the status of the service. The last is the request of personal knowledges and this kind of request needs to change the service state. For example, if a user submits a request to study the video, this operation will start a workflow management module and the platform will allocate system resources to maintain the lifecycle of the video. Taking advantage of workflow engine and rules engine, SaaS can deal with a variety of requests smoothly, and can better arrange application services to support them to dispatch the resources [9-10].

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$$\overline{x_i} = \frac{x_i - b_i}{a_i - b_i} \quad (1)$$

Where X_i and X_j respectively, the i-th index and the actual value Standard value; a_i, b_i are the maximum, minimum, the i-th index. Known evaluation indexes m, n

hidden layer nodes depending Problems and experimental data to determine, you can also experience the value of the formula (2) the decision.

$$n = \log_2 m \quad (2)$$

Ant colony optimization algorithm is essentially a multi-agent, through the interaction between single agents to complete the complex behaviour of the ant colony. The basic principles of ACO are illustrated through the traveling salesman problem, such as [8] described. Hidden node output is calculated as follows:

$$h_j = f\left(\sum_{i=1}^{m} w_{ij} x_i - \theta_j\right) \quad (3)$$

There are disadvantages of falling into local optimum and the slow convergence in ACO. Inspired by feeding, clustering and rear-end behaviours of Artificial fish-swarm algorithms [9], on the basic of the ant colony algorithm, applied the rear-end behaviour of the Artificial fish-swarm algorithm to modify the solution of a feasible region was searched by ant colony. The cores of the ant colony algorithm are paths selecting strategy and the pheromone update mechanism. Thus, to select the next customer j for the kth ant at the ith node, the ant uses the following probabilistic formula. Where θ_j is defined as the threshold value for hidden node.

The output of the output node is calculated as follows:

$$f\left(\sum_{i=1}^{m} w_{ij} x_i - \theta_j\right) = f\left(f\left(\theta_j\right)\right) \quad (4)$$

Where in θ is an output node threshold.

Equation (3) and Equation (4) in the transfer function is generally expressed as (0,1) interval of S-type function:

$$f\left(\sum_{i=1}^{m} w_{ij} x_i - \theta_j\right) = f\left(f\left(\theta_j\right)\right) \quad (5)$$

Each index can score from reviewer's subjective scoring method after obtaining. The data to be using equation (1) is normalized.

$$\overline{x_i} = \frac{x_i - b_i}{a_i - b_i} \quad (6)$$

h_j is gaussian basis function, the basic equation of RBF nueral network function is shown below :

$$h_j = \exp\left(-\frac{\|X - C_j\|}{2b_j^2}\right), \quad j = 1, 2, ..., m \quad (7)$$

The output of the network is given as:

$$y_m(k) = wh = w_1 h_1 + w_2 h_2 + ... + w_m h_m \quad (8)$$

Assuming the ideal output is y (k), the performance index function is:

$$E(k) = \frac{1}{2}\left(y(k) - y_m(k)\right)^2 \quad (9)$$

Based on the gradient descent method, node centre and base width parameter are:

$$w_j(k) = w_j(k-1) + \eta\left(y(k) - y_m(k)\right)h_j$$
$$+ \alpha\left(w_j(k-1) - w_j(k-2)\right) \quad (10)$$

$$\Delta b_j = \left(y(k) - y_m(k)\right)w_j h_j \left(\frac{\left\|X - C_j\right\|^2}{b_j^3}\right) \quad (11)$$

When a search completed, the information contained on walking path is an extracting feasible solution. Length of the path is the value of the objective function. State solution is expressed by the state vector X. Xk is the solution searched by the kth ant. So far, the optimal solution is Xbest. Comparison of their fitness, if the current solution Xk is better than the optimal solution Xbest, the value of Xbest is replaced by the value of Xk, Otherwise the value of Xk is changed as the following:

$$b_j(k) = b_j(k-1) + \eta \Delta b_j$$
$$+ \alpha\left(b_j(k-1) - b_j(k-2)\right) \quad (12)$$

$$\Delta c_{j,i} = \left(y(k) - y_m(k)\right)w_j \frac{x_j - c_{j,i}}{b_j^2} \quad (13)$$

$$c_{ij}(k) = c_{ij}(k-1) + \eta \Delta c_{ij}$$
$$+ \alpha\left(c_{ij}(k-1) - c_{ij}(k-2)\right) \quad (14)$$

Jacobian matrix algorithm is shown as follows:

$$\frac{\partial y(k)}{\partial u(k)} \approx \frac{\partial y_m(k)}{\partial u(k)} = \sum_{j=1}^{m} w_j h_j \frac{c_{1j} - x_1}{b_j^2} \quad (15)$$

Through researching the main business processes of education platform, using the modularized design systematically, the paper divides the network management system based on multimedia database cloud computing into several logical modules, as shown in Fig. (3). By using several event handlers and a continuously running event- loop the event-based servers manage to avoid concurrency issues such as locking and synchronization problems. An event-based system is commonly

configured to be active for only as short durations as is required for processing incoming requests. When there are no requests to serve, the system becomes idle, waiting for new requests to invoke handlers. A situation where an event-based system may run into problems is when it is dealing with event handlers needing a lot of time to process a request. This may cause the system to become less responsive if there are several requests queuing up for the time consuming handler. Another problematic situation for event-based systems occurs if there is a need of maintaining states across multiple request-processing events. Because of the principle of treating each incoming request as a unique session, there is no session id or linking indicator, which can be used to distinguish multiple related requests.

Therefore, it is not possible to share any information in-between two separate request-processing events. Over the years, the use of the RTP/RTCP/RSTP suite has become less common in larger streaming applications. One of the reasons for this is related to the cost of system scaling. HTTP uses a large well-established infrastructure of network servers and caches throughout the Internet making it possible to serve HTTP requests very quickly and efficiently. The infrastructure supporting HTTP has been developed for serving large amounts of traffic where it efficiently manages to balance the traffic load among its many servers. In comparison to the servers, which have previously been used for streaming video content the servers of the infrastructure, supporting HTTP are relatively cheap. This makes the infrastructure relatively cost-efficient to scale. The features of the infrastructure, supporting HTTP presented above, have in the last few years not only been found suitable for transferring structured text, but also video date. The adoption of HTTP for streaming video data has led to increased transmission reliability.

4. Experiment and Data Analysis

The distance education platform based on multimedia database cloud computing makes the data automatic management by using the backstage server and database management system. The school no longer carries on artificial management. The maintenance and upgrading of the whole system is completed by professional service provider, also the school no longer carries on maintenance and management. The use of multimedia database cloud computing cannot do without the Internet. All the requests sent by students and data transmission are realized by using the Internet, so it is very difficult to guarantee the safety of the data in the transmission process. Compared with the commercial system, especially the financial system, the security requirements of distance education platform are not very high, but the data which needs to be kept secret, such as the teachers and students' personal information, questions, especially the sensitive answers to questions, teaching document is not allowed to open to the public freely. So, when designing the new distance education platform, it is necessary to guarantee the safety and reliability of the sensitive data.

Usually there are three isolation methods. The first is a database isolation that is to keep the independence of the database between users. An account corresponds to a data-base. This isolation method is the most thorough isolation with the highest data security; however, the only drawback of this method is that it needs to invest

too much money. The second is the data pattern isolation and database sharing. The entire education platform just uses one database and each account has a separate mode, which provides abstract logical data isolation for each user, not the actual physical isolation. Also, a database can support several users, which effectively reduces the cost of system. Because the logical relationship of abstract isolation is complex relatively, so it is difficult to manage. The third is the data model and database shared. The entire education platform only has one database and a data mode. It can pluses the identifier (user ID) on the business table which has isolated demand to achieve the purpose of isolating the data. This makes the sharing degree of database achieve the highest and the cost of system achieves the lowest, but the isolation is not thorough enough. The drawbacks of this method are that it would increase the burden of the system' developer and the amount of code in the aspect of developer' safety and reliability would increase a lot. The data on the platform is also easy to lose. Considering the cost and safety of system, this paper adopts the second isolation method when carrying on data isolation. It's relatively low cost and safety meets our requirements to the distance education.

Taking into account the database management system has its own set of data security access mechanism, most of the traditional systems only encrypt the identification of the system users and do not encrypt the data information of system internals. Because of the database management rights of distance personal knowledge management system are in the hands of the operator, so it is necessary to encrypt some private data to prevent illegal disclosure and steal. This project researches a new multimedia database cloud storage and SaaS applications to protect the security of the data. In the process of system development, user data is isolated from the system. After running in the system platform, if the user's data and data storage location can keep update synchronization, which means a new data is stored in the new position, it can protect the private data. While creating and running a database, generally the system will encrypt the database according to the conventional encryption method. Sometimes, it will make a few changes to the function of original system to update the storage location of data in system running time. As shown in Fig. (4), the data on the old server of system operator can be transmitted to the new server through the network, which is equivalent to download the resources of original server to their mobile hard disk. The users have right to transfer all the files in the database to any database they want. After the transmitting of the data, the original database server will lost the access right to private data [6-10].
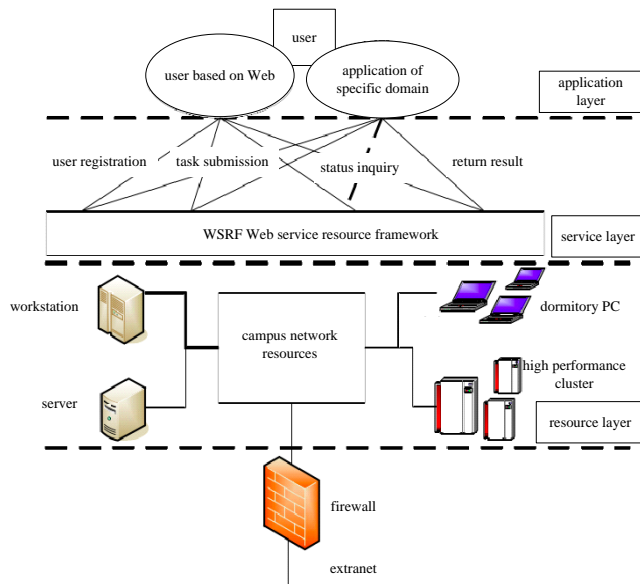
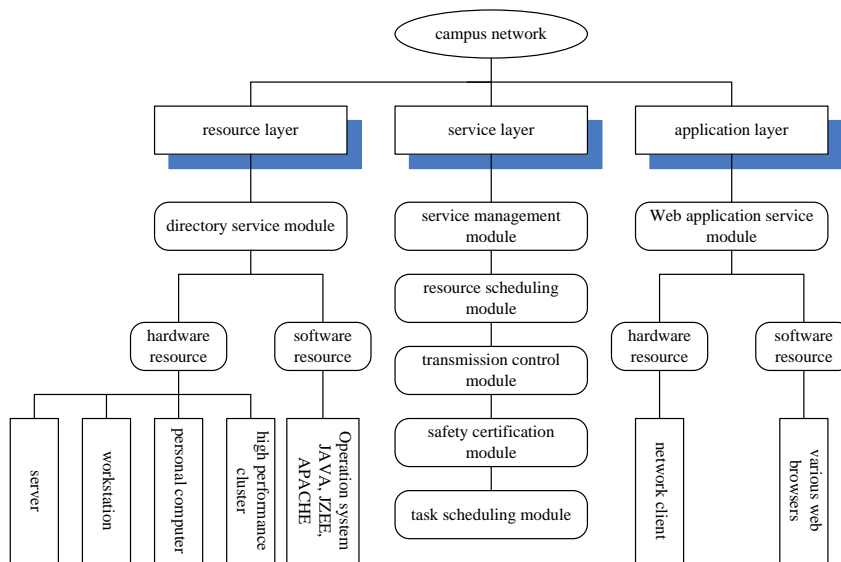*Fig.1 The Overall Architecture Diagram of System*
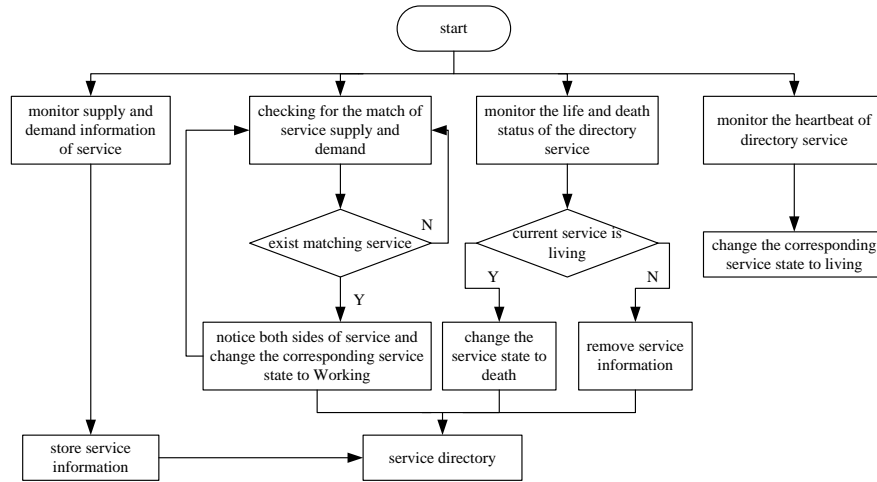

Fig.2 System Module Diagram
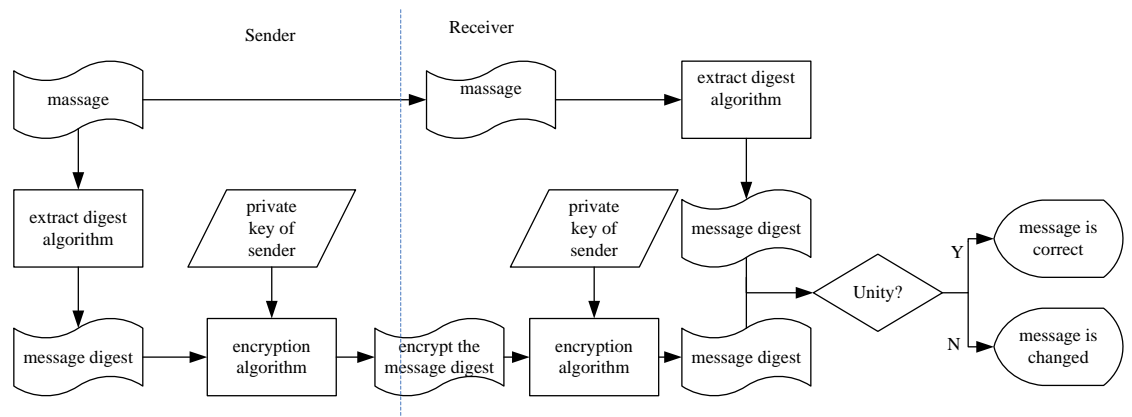
Fig.3 The Program Process Diagram

Fig.4 Identity Authentication

In order to prove the rationality of the system designed in this research, the system development platform uses VC + +6.0 and database development uses SQL2008. The followings are the design and realization situation of each function module in platform system. The interface of application client is composed of 5 parts: login interface, "community" management, and multimedia database cloud

storage, multimedia database cloud computing, management and control platform. Users of the system upload their own information in the login interface through the registration method. After landing the system, you can use learning resources on the platform. According to the needs of the users, the platform gets the resources from the corresponding server and offers them to the users. Traditional digital media storage and storage medium did not match the new era of digital media technology, digital media resources is important for college students of knowledge assets, and institutions of higher learning and digital media resources to storage medium and the way to preserve the requirements are very high, institutes of higher management personnel and information keeper in thinking about how to properly keep the digital media resources.

Aiming at these problems, this paper studies the storage mode of colleges and universities digital media storage resources and on this basis, design and architecture of digital media resources management by streaming resources. The essence of education information is using modern education idea, theory and modern information technology to build teaching environment of university to a place where information permeated also pedagogue and learner can get information conveniently. The expression of information is the collectivity of image, text, audio frequency and video frequency at present, all of the media resource is existed as digital. With the rapid development of multimedia technology, there are massive media resources, which represent information, meanwhile, the media resources increase with a very rapid speed. As the case stands, how to manage availably and utilize effectually media resource is taking an earthshaking significance for information and knowledge, and it is the base for pushing education information innovation effectively.

After users filling out and submitting the information, the "community" will manage this submitted information. And the "community" has all the resources on the platform. In essence, "community" is a kind of classification of user needs. It abstracts the same class users or the users who have similar demands into the households of a "community" and distribute a manager to them. The user needs to comply with the community management system in the "community" and use community resources (learning resources of platform) according to certain process. Because the powerful computing capability of multimedia database cloud computing can easily meet the access needs of a large number of users, so in the services module of multimedia database cloud computing , all teaching resources are stored in the multimedia database cloud server. Multimedia database cloud service model can reduce a lot of investment in bandwidth, firewall and load balancing equipment for users. Also, it will help the users to solve network security problems, complex computing problems, data integrity problems and other important problems.

The system has the function of interaction between teachers and students, and teachers can directly solve problems for students in education platform. The management module of system can control all resources in the platform, including the control to every module of the system itself and the supervision to the behavior of teachers and students on the platform. All the resources and operation on platform are transparent to the module.

The students must register again when they want to learn in another server. This is very trouble. The new education platform proposed in this paper makes full use of the advantages of multimedia database cloud computing and stores the resources of each central server it the "multimedia database cloud". Distance education platform provides the function of automatic search and choosing the best path to transmit data. The servers can spare for each other and switch with each other, if a server fails, the platform system can switch to another nearest server automatically and the user can not feel this process. This design makes the students no longer to make several registrations when using different servers.

5. Conclusions

This paper analyses the theoretical basis of the application of multimedia database cloud computing technology to the personal knowledge management system in detail and evaluates the technical difficulty of the system implementation. Through in-depth research, this subject designs a new implementation scheme, which fully inherits the traditional advantages of the system and makes further innovation. It achieves a set of management system in line with the latest modern network security requirements. Compared with the traditional personal knowledge management system, we find that this system has great improvement in service capability, sharing learning resources, flexibility and other aspects, consisting with the needs of modern network security management in our country.

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