Research on Key Technologies of Personal Learning Service Based on Cloud Computing and Big Data Analysis

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Abstract: This paper firstly analyzes the sources and development of personalized learning, and studies the key technologies of personalized learning service based on cloud computing and big data analysis, and then analyzes the implementation technologies of cloud computing infrastructure layer and the implementation strategies of virtual machine real-time migration. According to the personalized customization tasks carried out by Portal and the analysis of personalized learning channel calculation methods, it provides certain reference value for cloud computing and big data analysis in the personalized teaching process.

1. Introduction

Cloud computing and big data are the most fashionable buzzwords nowadays. Their use is also increasingly extended to different areas of social life, as well as in the field of education. Teachers in the era of cloud computing and big data will be able to analyze the data of each student's specific learning in real time, so as to achieve the goal of “teaching students in accordance with their aptitude” more effectively. That is to say, it can make every student's learning process become digital, involving knowledge points in textbooks and specific learning process. Accordingly, the key technologies of personalized learning service based on cloud computing and big data analysis are studied as follows.

2. Sources and Development of Personalized Learning

2.1. Sources of Personalized Learning

Individualized teaching idea should be traced back to the period of Socrates in ancient Greece and Confucius in China at the earliest. Since the 15th century, Renaissance movement has been carried out in Europe, and many educators have paid attention to people and their personality in their educational concepts. In the 17th century, British educator Locke pointed out that slave discipline only cultivated children or feminized temperament. Rousseau, a French educator, highly esteemed the freedom and liberation of human personality. According to Marxist theory, human development refers to the all-round, full and free development of human beings, and full and free development is the development of human nature. It can be seen that the idea of personalized learning came from an earlier source and was valued by many ideological educators.

2.2. Development of Individualized Learning

Under the background of the rapid development of science and technology, the externalization of personalized learning in different stages is not enough. From the late 1980s to the early 1990s, many experts and scholars advocated developing the intelligence of teaching system, aiming at replacing teachers with intelligent teaching system to carry out individualized teaching objectives. However, follow-up studies confirm that such ideas have not achieved the goal of success.

In the late 1990s, the academia began to pay attention to the application of Hypermedia in the adaptive learning system, and the domestic and foreign academia paid attention to the application of part of the adaptive Internet teaching prototype system.

After entering the 21st century, Zhu Zhiting (2013), a domestic expert, put forward intelligent

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learning, which points out a new development path for personalized learning. Intelligent learning is mainly based on the characteristics of students and the differences between different individuals to provide corresponding personalized learning programs, and then mining the specific data of students' learning. According to this, a deep research is carried out to infer the problems that students may expose based on the data. After education introduced wearable technology and quantitative self-technology, a series of technologies such as cloud computing and big data came into being. Therefore, intelligent learning is promoted to a new perspective and provides the necessary conditions for the development of personalized learning.

3. Research on Key Technologies of Personalized Learning Service Based on Cloud Computing and Big Data Analysis

3.1. Implementation Technology of Cloud Computing Infrastructure Layer

The key types involved in the implementation of this technology include server virtualization, storage virtualization and software for cloud computing management. Among them, virtualization of servers is regarded as a prerequisite. After consolidating or distinguishing physical resources, more flexible resources are provided and allocated. The management software of cloud computing is regarded as the center of the cloud computing structure, mainly controlling the underlying resources. Storage virtualization is widely used in storage technology as a distributed storage system, which can not only allow cloud computing to obtain shared storage, but also store users' application-oriented data.

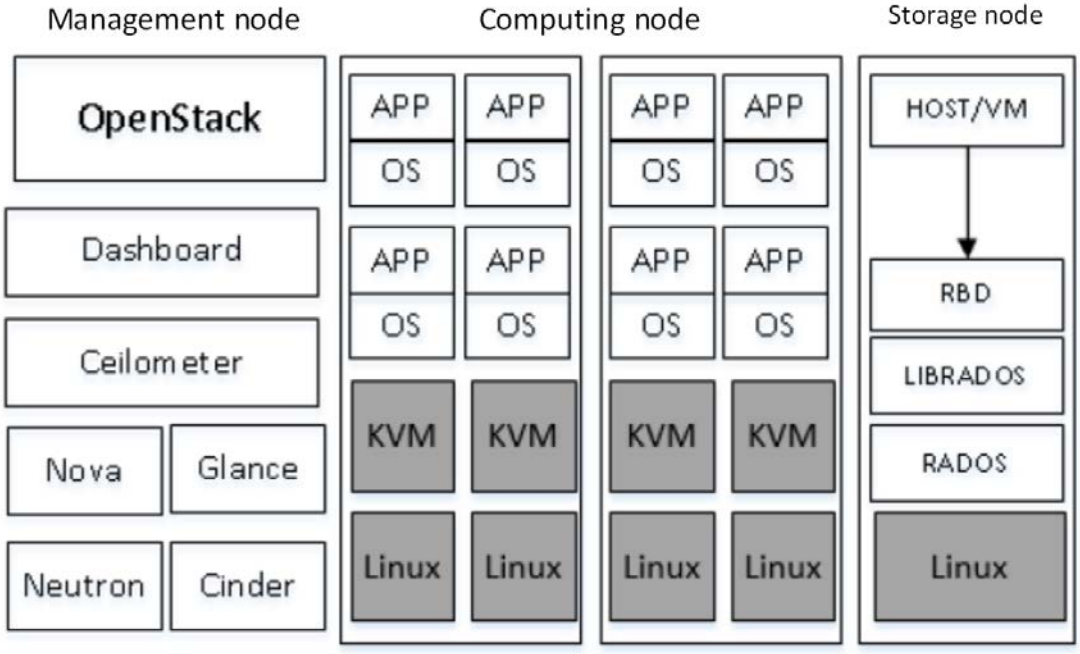

Fig. 1 Basic device layer structure diagram of cloud computing

According to the open source virtual technology KVM, distributed storage software Ceph and cloud management related software OpenStack, this paper designs the structure of the basic equipment layer of cloud computing, which can be shown in Fig. 1 above. This structure mainly includes the following three modules: (1) managed nodes, laying out various devices related to OpenStack, including Nova, Neutron and Cinder. (2) Calculate nodes and provide services of virtual hosts according to Linux and KVM. (3) Storage nodes, layout of Ceph devices, and provision of shared storage services for cloud computing.

3.2. Implementation strategy of virtual machine real-time migration

The virtual machine real-time migration technology is at the core of optimizing the resource and usage process and being able to use the system. It can transfer the virtual machine between different

physical machines, so that the implementation of the previous layer is not implemented. hero. When using this technology, this paper designs and implements a class of virtual machine real-time migration system based on load speculation. Its logical architecture can be seen in Fig. 2 below:

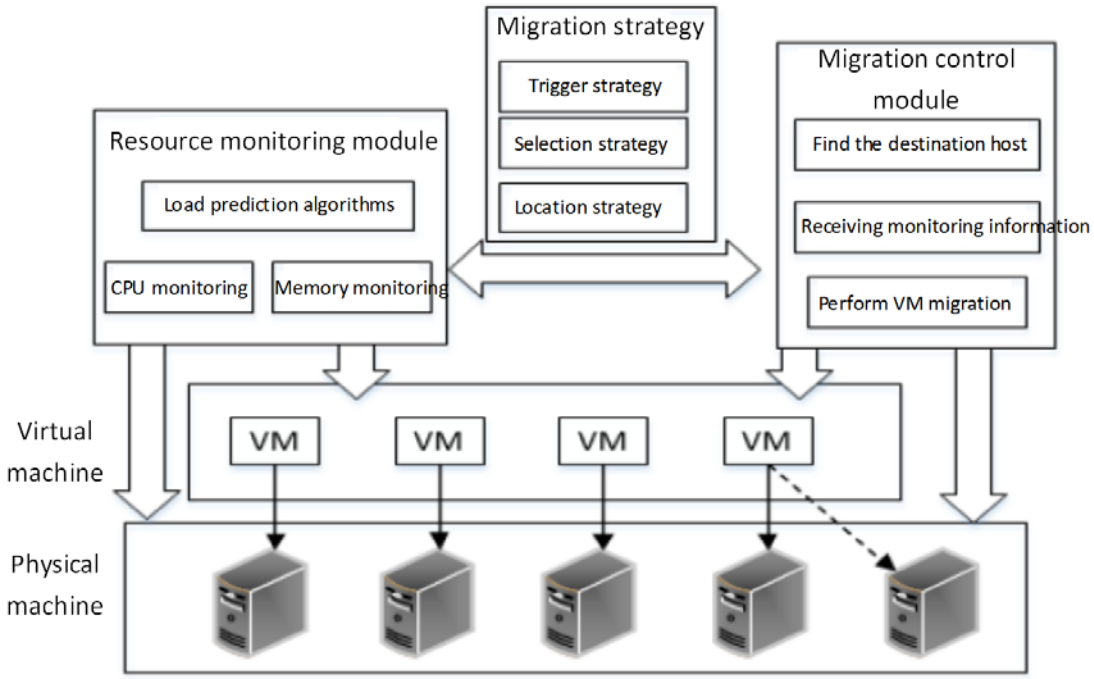

Fig. 2 Schematic diagram of the internal structure of the virtual machine real-time migration system logic based on load speculation

As can be seen from the above Fig. 2, the resource supervision and control module uses Ganglia and Nagios software to supervise and control the resource utilization of CPU and memory in virtual machines and physical machines, and to speculate on the future load condition. Therefore, this paper uses exponential smooth time series to speculate on the model. The function of the migration control module is to accept the supervision and control data transmitted by the resource monitoring module, retrieve the target object of the physical machine based on the migration strategy, and finally implement the real-time migration process of the virtual machine.

3.3. Personalized customized tasks based on Portal

Personalized customization tasks mainly focus on the user's axis, providing users with personalized services and information aggregation technologies. Users can customize the interface, application and service content with personalized color based on self-preference. The space for Internet learning requires a diverse range of applications and services for interested parties such as teachers, students, and administrators, all of which are based on past Web structures. Although they are all classified into the large platform system of cloud computing, different applications are still separate islands of information data. It is necessary to conFig. Effective integrated information methods to integrate various application projects. Building a space for Internet learning with Portal-related technologies is not only consistent with a personalized spatial concept, but also effectively integrates many applications and services.

The core components involved in customizing the personalized Internet learning space include: Portlet devices, Portal servers, and Portal containers. Each of these has a personalized interface that includes a single or several portlet-type windows. The implementation process can be seen in Fig. 3 below:

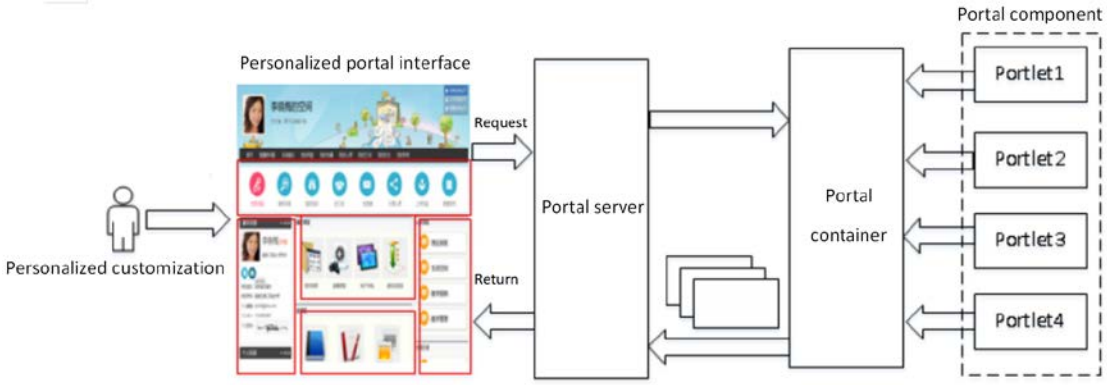

Fig. 3 Implementation of personalized space customization

3.4. Analysis of Personalized Learning Channel Calculation Methods

3.4.1 Objective of Personalized Learning Channel Recommendation

In the recommendation process of the learning path, the teaching system should control the learning path and find the optimal learning path.

The specific tasks of the problem can be described as follows:

(a) A learning path that traverses the knowledge points on the effective learning path once and has a high recommendation probability is recommended to the learner.

(b) The learning path that needs to be recommended is influenced by the historical learner's evaluation information, and the knowledge structure rules are followed.

(c) The expression characteristics and difficulty coefficients of the knowledge points on the path should be adapted to the learner.

3.4.2 Probability of Determining Learning Objectives

When recommending channels, the teaching system defines new knowledge points to be recommended by current students according to the information content of learning channels. With the help of the Table allowedk, students' new knowledge points to be selected are recorded. this Table follows the organizational and structural connection of the knowledge system, and the collection will be adjusted and controlled in real time due to the learning process. When searching, the system summarizes the new knowledge points to be recommended based on the corresponding pheromone on each channel and the transition probability of the enlightening information operation state. Using $p^{k}{}_{ij}(t)$ to represent the T-time system, based on the current situation of students' mastery of I knowledge points and taking J as the transition probability of the new recommended knowledge point state, the following formula can be deduced:

$$P_{ij}^{k}(t)=\begin{cases}\dfrac{[\tau_{ij}(t)]^{\alpha}\cdot[sim_{e}(i,j)]^{\beta_1}\cdot[sim_{l}(i,j)]^{\beta_2}}{\sum_{s\subset allowed_k}[\tau_{is}(t)]^{\alpha}\cdot[sim_{e}(i,s)]^{\beta_1}\cdot[sim_{l}(i,s)]^{\beta_2}}, & \text{if } j\in allowed_k\\ 0, & \text{Otherwise}\end{cases} \tag{1}$$

In Formula (2), α represents the degree to which the evaluation information on the channel plays a role in introducing knowledge points to the system. β_1 and β_2 represent the expectation of the transition from knowledge point I to knowledge point J. They represent in turn the characteristics of knowledge points and the relative key degree of difficulty in channel recommendation. The final probability of learning channel recommendation is the product of the probability of knowledge points being promoted in this channel.

3.4.3 Design of Test and Analysis of Results

This paper uses the data of S City Lifelong Learning Network as experimental data. MAE research was conducted by extracting 8,070 learning records of 1,000 users from this web database, and two types of experiments were carried out. Among them, Experiment 1 uses the channel recommendation algorithm pointed out in this article, and Experiment 2 refers to the information after users have learned the same knowledge point and browsed it. Please refer to Fig. 4 below for details.

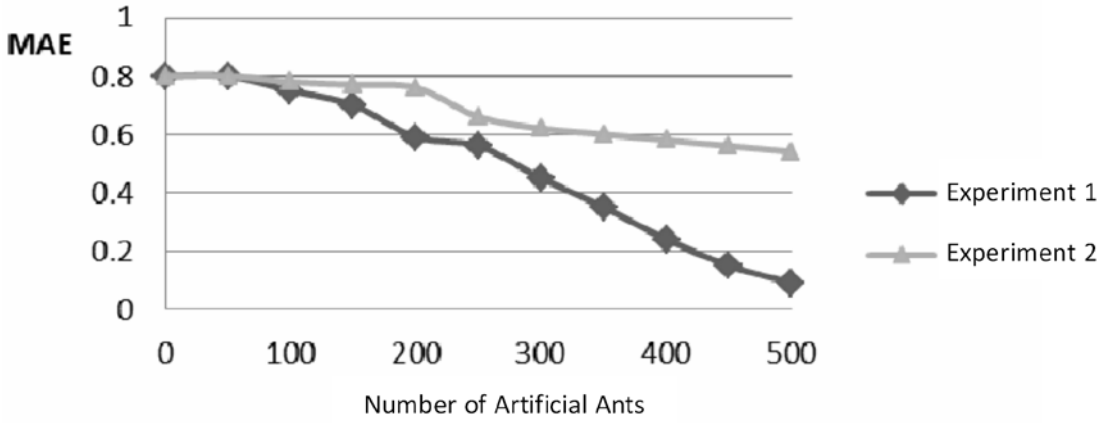

Fig. 4 Comparison of experimental results

It can be seen that when there are 200 artificial ants, experiment 1 increases rapidly and rapidly, and when there are 300 artificial ants, the recommendation accuracy is relatively high.

4. Conclusion

To sum up, personalized learning based on cloud computing and big data analysis can be said to be the development trend of education in the future. This method can reasonably use students' big data, conduct visual research, and then infer a learning plan that matches students' personality. On the basis of analysis, new data are continuously formed to track the student's dynamics in real time and feed back to the educators in time, and then feed back to the students for personalized learning. In this way, a virtuous circle can be formed, problems can be found in time and gaps can be filled, thus optimizing the learning effect and ensuring that the informatization of education has the characteristics of intelligent education.

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