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Hierarchical Scheduling Mechanisms for Multilingual Information Resources in Cloud Computing

Yaojun Han[a], Xuemei Luo[b]*

[a]College of International Business, Shanghai International Studies University, Shanghai 200083, China
[b]College of International Finance and Trade, Shanghai International Studies University, Shanghai 200083, China

Abstract

Cloud computing provides information resources for users in "Cloud" through the Internet. These information resources with a variety of different languages are distributed in Web pages and the databases. The scheduling of multilingual information resources becomes complex, as multilingual information resources are heterogeneous and uneven in cloud computing. The need arises in scheduling of multilingual information resources in cloud computing for new mechanisms. This paper presents a four-tier architecture for multilingual information resources scheduling in cloud computing. It includes user accessing tier, technology supporting tier, resource scheduling tier and resources tier. We propose a three-layer scheduling model for multilingual information resources in cloud computing. The model includes some home managers, some local scheduling agents and a global scheduling agent. The model not only shows the autonomy of private cloud resources and is convenient for user to submit and supervise tasks, but also lightens the pressure of the global scheduling agent. The example shows that the proposed scheduling model could improve the performance of the scheduling of multilingual information resources in cloud computing.

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* Corresponding author. Tel.: +86-21-67702059
E-mail address: yjhan@shisu.edu.cn.

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1. Introduction

With the development of the Internet and Web technology and frequent cross-cultural communication, it is necessary for people to be able to access and manage information in many different languages. These information resources with a variety of different languages are distributed in Web pages and the databases. Cloud computing[1] provides information resources for users in "Cloud" through the Internet. Cloud computing utilizes large-scale virtualized data centers to manage such large volume of resources.

Resources scheduling is the core of resources management. There are some recent and related works that address the problem of resources scheduling in cloud computing. An algorithm for solving the problemby applying Gröbner bases theory and stochastic integer programming technique was given in [2]. Yun Fei Cui et al.[3] give a improved genetic algorithm for cloud computing resource scheduling. Hao Li and Guo Tang[4] propose a cloud banking model based on multi-dimensional Pareto optimal theory for resource scheduling. Haihua Chang and Xinhuai Tang[5] present a resource scheduling algorithm based on dynamic load balance in cloud computing. Xin Lu and Zilong Gu [6] present a load-adaptive cloud resource scheduling model based on ant colony algorithm. Chen Ming et al.[7] present a scheduling model for cloud computing resource based on buffer-pool agent. Dr. M. Dakshayini and Dr. H. S. Guruprasad[8] propose a priority and admission control based service scheduling policy that aims at serving the user requests satisfying the QoS. However, above researches do not involve the scheduling of multilingual information resources. So it is not suitable to the multilingual resources scheduling in computing.

Now, multilingual information retrieval and management issues are increasingly attracting research attention[9,10]. But, the scheduling of multilingual information resource in cloud computing has not given more attention. The scheduling of multilingual information resource in cloud computing becomes complex, as resources with a variety of different languages distributed in different Web pages and the databases are heterogeneous and uneven. In this paper, we present a four-tier architecture and a two-layer model for multilingual information resources scheduling in cloud computing.

The rest of this paper is organized as follows. In section 2, we give a four-tier architecture for multilingual information resources scheduling in cloud computing. A three-layer model for multilingual information resources scheduling in cloud computing is presented in section 3. In section 4, we give an example, which proves the effectiveness of the scheduling model given in this paper. The conclusions of the paper are given in section 5.

2. Author Artwork Scheduling Architecture for Multilingual Information Resource in Cloud Computing

Effective information resource scheduling architecture is important to optimize the use of resource. In this section, we give a four-tier architecture (shown in Fig. 1) for multilingual information resources scheduling in cloud computing based on hierarchical method. The architecture includes user accessing tier, technology supporting tier, resource scheduling tier and resources tier.

2.1. User accessing tier

User accessing tier is a front-end component, which is responsible for providing a way for users to access information. The users can retrieve the information from cloud datacenter in "Cloud" through the Internet. The ways for users accessing the Internet are PC terminal via wired network as well as mobile terminal such as mobile phone and PDA via wireless network.

2.2. Technology supporting tier

Technology supporting tier is responsible for providing necessary technologies for pre-processing tasks proposed by users. The technologies include identity authentication for users legally accessing system, ontology, modeling and analysis for processing and optimizing tasks, natural language processing and translation for multilingual information, and virtualization and distributed processing for processing information resources in cloud computing.

2.3. Resource scheduling tier

Resource scheduling tier is responsible for providing scheduling models, scheduling algorithms, matching strategies and information integration technologies, which mapping user requirement into some resources, match requirement with information resources stored in index database, assign user requirement to relevant cloud entity according to the matching result, and pre-processing information according to user requirements.

2.4. Resources tier

Resources tier is a bottom component, which is responsible for providing resources for overall system operation. The resources include physical resources such as computing resources, store resources, network resources, etc. and information resources such as corpus, knowledge base, original information base, etc.

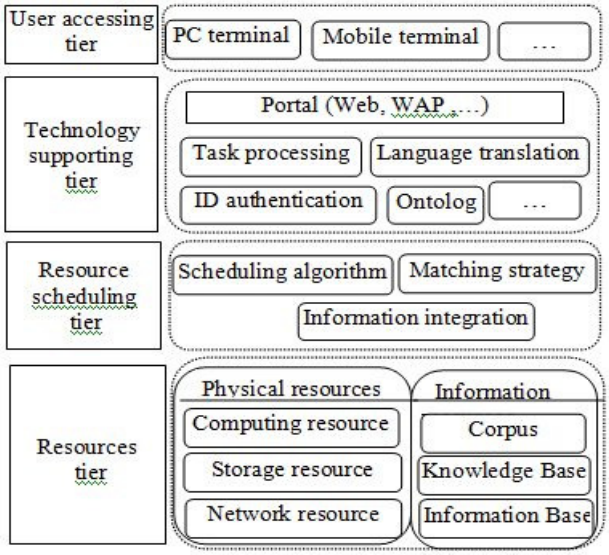

Fig. 1. Scheduling architecture for multilingual information resources in cloud computing

3. Scheduling Model for Multilingual Information Resource in Cloud Computing

In this section, we give a three-layer model (shown in Fig. 2) for multilingual information resources scheduling in cloud computing. The model includes some home managers, some local scheduling agents and a global scheduling agent.

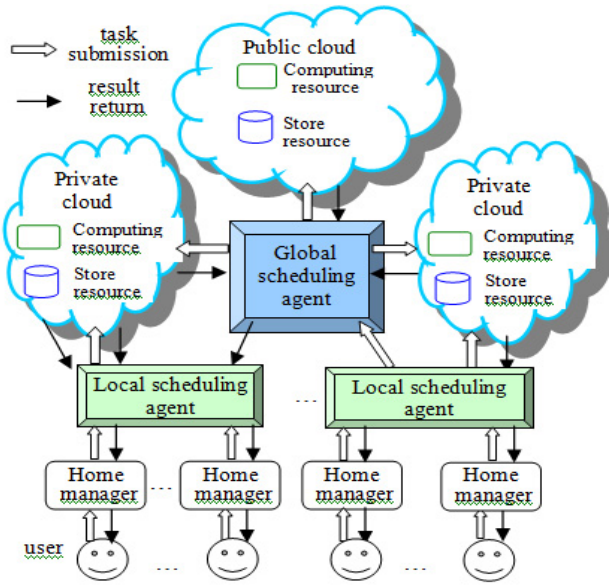

Fig. 2. Scheduling model for multilingual information resources in cloud computing

3.1. Home manager

There is a home manager at each site. The functions of the home manager are as follows:

- Receives multilingual information requirement shown in single language
- Translates the single language requirement to multilingual requirements
- Sends multilingual requirements to the local scheduling agent
- Receives and integrates multilingual information from local sites and remote sites

3.2. Local scheduling agent

There is a local scheduling agent at each private cloud, which functions are as follows:

- Receives requirements submitted by home managers or tasks assigned by global scheduling agent
- If the requirement can be matched with information resource in private cloud datacenter, the requirement is executed in the private cloud. Otherwise, the requirement is submitted to global scheduling agent

3.3. global scheduling agent

There is only one global scheduling agent at public cloud, which functions are as follows:

- Receives requirements submitted by local scheduling agent
- Matches the requirement with information resources stored in public cloud datacenter and assigns the requirement to the local scheduling agent of the matched server

4. Example

In this section, we verify the effectiveness of the scheduling model given in this paper by following example.

Suppose that there is a digital library cloud computing system. The system is consists of a private cloud and a public cloud. There is one datacenter named as DL1 belonging to a university in the private cloud. There are two datacenters named as DL2 and DL3 in the public cloud. The DL1 stores information of language L1 such as Chinese and language L2 such as English. The DL2 stores information of languages L1, L2 and L3 such as Frence. The node DL3 stores information of languages L3 and L4 such as Spanish. The transmission times of the requirement are 2s and 4s from the home manager of submission node to the local scheduling agent and global scheduling agent respectively. The transmission times of the requirement are 3s from the local scheduling agent to the global scheduling agent. The download times of different languages information at different datacenters are listed in table 1.

Suppose that a student submits a requirement in language L1 and requires to retrieve the information of languages L2, L3 and L4 at the node in the private cloud.

Table 1. Information download time (second)

Information	Datacenter		
	DL1	DL2	DL3
L1	10	20	N
L2	15	22	N
L3	N	16	20
L4	N	N	22

N means that the datacenter does not store this language information in table 1.

Analysis: We now analyze the time performance of the multilingual information scheduling system.

If the scheduling model is only one layer that is only one global scheduling agent, the requirement is submitted to the global scheduling agent. The sum of the transmission time of the requirement information of L2, L3 and L4 are 12s(4+4+4) from the submission node to the global scheduling agent. Then, the requirement information of L2 is assigned to DL2, L3 to DL2 and L4 to DL3 by the global scheduling agent. The sum of the transmission time is 9s(3+3+3). The information download time is 22s, 16s and 22s from DL2, DL2 and DL3 respectively. The sum of the download time is the maximum of download time from DL2 and DL3. Because the information download from DL2 and DL3 is parallel, The sum of the download time is 38s(max{22+16, 22}). The total scheduling time is 59s (12+9+38).

For the three-layer scheduling model proposed by this paper, the requirement is submitted to the local scheduling agent. The sum of the transmission time of the requirement information of L2, L3 and L4 are 6s from the submission node to the local scheduling agent. Then, the requirement of L2 is assigned to DL1, and the requirement of L3 and L4 is submitted to the global scheduling agent by the local scheduling agent. The sum of the transmission time is 8s(2+3+3). The requirement information of L3 is assigned to DL2 and L4 to DL3. The sum of the transmission time is 6s(3+3). The download time of information L2, L3 and L4 is 15s, 16s and 22s from DL1, DL2 and DL3 respectively. The sum of the download time is the maximum of download time from DL1, DL2 and DL3. Because the information download from DL1, DL2 and DL3 is parallel, The sum of the download time is 22s(max{15, 16, 22}). The total scheduling time is 42s (6+8+6+22). Therefore, our model is effective.

5. Conclusion

In this paper, we propose a four-tier architecture for multilingual information resources scheduling in cloud computing. Comparing with other resources scheduling architectures in cloud computing, our four-tier architecture include the technologies of ontology, natural language processing and language translation in

technology supporting tier, information integration in resource scheduling tier, and corpus, knowledge base in resource tier. We give a three-layer scheduling model for multilingual information resources in cloud computing. The model including home manager, local scheduling agent and a global scheduling agent, which not only shows the autonomy of private cloud resources, convenience for user to submit and supervise tasks, but also lightens the pressure of the global scheduling agent. The example shows that the proposed scheduling model could improve the performance of the scheduling of multilingual information resources in cloud computing. The effective scheduling algorithm for multilingual information resources in cloud computing is our further research.

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Corresponding Author:

Author Name:Yaojun Han Email: yjhan@shisu.edu.cn Mobile Telephone: +86-18016411657

References

[1] A. Weiss. Computing in the Cloud. ACM Networker, 2007;11:18-25.
[2] Qiang Li. An Optimal Algorithm for Resource Scheduling in Cloud Computing. Advances in Intelligent and Soft Computing, 2012;129:293-299.
[3]Yun Fei Cui, Xin Ming Li, Ke Wei Dong, Ji Lu Zhu. Cloud Computing Resource Scheduling Method Research Based on Improved Genetic Algorithm. Advanced Materials Research, 2011; 271-273:552-557.
[4]Hao Li, Guo Tang. Pareto-Based Optimal Scheduling on Cloud Resource. Communications in Computer and Information Science, 2011;163:335-341.
[5]Haihua Chang. A load-balance based resource-scheduling algorithm under cloud computing environment. Proceedings of the 2010 international conference on New horizons in web-based learning, 2011:85-90.
[6]Xin Lu, Zilong Gu. A load-adaptive cloud resource scheduling model based on ant colony algorithm. 2011 IEEE International Conference on Cloud Computing and Intelligence Systems, 2011:296-300.
[7]Chen Ming, Li Mengkun, Cai Fuqin. A Model of Scheduling Optimizing for Cloud Computing Resource Services Based on Buffer-pool Agent. 2010 IEEE Int. Conference on Granular Computing, 2010:107-110.
[8]Dr. M. Dakshayini, Dr. H. S. Guruprasad. An Optimal Model for Priority based Service Scheduling Policy for Cloud Computing Environment. International Journal of Computer Applications, 2011;32 (9):23-29.
[9]Pothula Sujatha. Performance Evaluation of Cross and Multilingual Information Retrieval Using Recall Metric Variants. International Journal of Computers & Distributed System, 2012;1(3):39-49.
[10]Chen, J. Multilingual Information Access for Digital Libraries and the Machine Translation of Metadata Records. Public Library Journal, 2012;36(3):51-58.