The monitoring and managing application of cloud computing based on Internet of Things

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ABSTRACT

Cloud computing and the Internet of Things are the two hot points in the Internet application field. The application of the two new technologies is in hot discussion and research, but quite less on the field of medical monitoring and managing application. Thus, in this paper, we study and analyze the application of cloud computing and the Internet of Things on the medical field. And we manage to make a combination of the two techniques in the medical monitoring and managing field. The model architecture for remote monitoring cloud platform of healthcare information (RMCPHI) was established firstly. Then the RMCPHI architecture was analyzed. Finally an efficient PSOSAA algorithm was proposed for the medical monitoring and managing application of cloud computing. Simulation results showed that our proposed scheme can improve the efficiency about 50%.

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1. Introduction

With the rapid information technology development, the data volume is increasing at a surprising speed as well [1]. Recently, cloud computing and Internet of Things are the hottest topic in the information technology industry [2]. Cloud computing has its advantages in excellent scalability, large scale and low price, while the main technique of Internet of Things, such as sensor and RFID have already been applied in a large scale [3]. Many famous IT enterprises like Microsoft, Amazon, IBM and Google have already built their own cloud successfully and offer cloud service in information management, data storage, information searching, etc. [4]. However, people's acquaintance toward cloud computing and Internet of Things are not enough in modern medical application [5].

Internet of Things is the generation of information technology. It is an information field of significant development and the transformation opportunity [6]. European Union Committee believed that, Internet of Things development application will solve series of modern society problem in the future and bring the very big contribution [7]. The modern logistics uses the modernized information technology under modern management instruction logistics behavior. The three basic requests are: the service is better; the expense is lower; the speed is quicker. The medical information technology has the widespread function in the modern applications [8].

Medical information technology and healthcare service are closely related to the national welfare and the people's livelihood [9]. The integration of cloud computing and Internet of Things would be a great breakthrough in modern medical application [10]. Because cloud computing has its advantages

in large scale, high reliability, virtualization, high efficiency and expansibility, the construction of public cloud in hospitals and patients can promote resources sharing, cost saving and construct medical monitoring and managing systems with high efficiency [11]. The Internet of Things, as an important support for realizing safe, high-efficiency and high-quality medical monitoring and management, its main techniques such as RFID and photo acoustic electromagnetic sensors, can make great breakthroughs on medical information transmission, intelligent medical monitoring and precise location [12]. The Internet of Things also brings great conveniences to hospital, especially in the patient monitoring and tracking management [13]. With the rapid development of Internet and the integration of cloud computing and the Internet of Things, the medical monitoring and managing platform is providing new opportunity for hospital and even all areas in the society [14].

This article summarized the medical information technology in the domain of the cloud computing and Internet of Things, especially in the application domain of the medical monitoring and management at present research condition. In this paper, we propose and analyze the model architecture for remote monitoring and managing cloud platform of healthcare information (RMCPHI). Then an efficient PSOSAA algorithm is proposed for the medical monitoring and managing application of cloud computing.

The rest of this paper is organized as follows. In Section 2, the medical application of cloud computing is introduced. Analysis of RMCPHI architecture is presented in Section 3. The monitoring and scheduling management algorithm in cloud computing is presented in Section 4. And the simulation result of proposed scheme compared with existing methods is presented in Section 5. In Section 6, we give some conclusions.

2. Medical application of cloud computing

2.1. Medical information service

Cloud information services has advantages such as maximal efficiency, low upfront costs and service availability. By combining international advanced Cloud computing architecture and web-based Internet service mode, we can build a high speed medical information system between the patient and the hospital. Secondly, we could build a cloud service platform for the information service in hospital which can enable data sharing, remote data storage, interaction with doctors, medical experts' consultation, etc. As cloud computing has already offered users, their demand can be obtained from the cloud service supplier through the network, which reduces their difficulty in building service portals. Cloud computing is a good way to deal with resources using and management. Cloud computing can be roughly divided into private cloud and public cloud. However, neither of these two clouds can suit patients' control. Thus an idea of effective cloud computing in medical control was put forward.

The data center that is in the effective cloud provides service mostly for patient control. The cloud computing provider provides an effective cloud computing solution. In effective cloud, one of its key features is effective operation. It integrates free scattered resources in the cloud and endows

users with great operating power. This effective cloud combined network, server and various kinds of new technologies into effective cloud computing platform by virtualizing them seamlessly. To obtain advice and suggestions by analyzing the stored data, analysis engines such as data miners are operated on this large amount of data in the cloud. In cloud computing, the maintenance work for many users can be done simply by amending and adding to the software on the information system in the cloud center instead of a doctor having to do all this work.

The cloud computation center is very important in RMCPHI architecture. There some key technologies in the computation center. The main enabling technology for cloud computing is virtualization. Virtualization software separates a physical computing device into one or more "virtual" devices, each of which can be easily used and managed to perform computing tasks. Virtualization essentially creates a scalable system of multiple independent computing devices. Idle computing resources can be allocated and used more efficiently. Virtualization provides the agility required to speed up IT operations, and reduces cost by increasing infrastructure utilization. Autonomic computing automates the process through which the users can provide resources on-demand. By minimizing user's involvement, automation can speed up the process, reduce labor costs and reduce the possibility of human errors.

2.2. Healthcare application based on Internet of Things

Hypertension is one of the most common cardiovascular diseases. It is reported that there are about 160 million people who suffer from it. The incidence of hypertension and heart disease is trending to ascend [15]. With the accelerated pace of life, people's sub-health state is becoming more and more serious. Treatment and early detection of diseases have effect on the health level of the whole population. Remote monitoring cloud platform of healthcare information (RMCPHI) can provide services of monitoring and management of these diseases. RMCPHI can collect human body medical information by the body medical sensors; extract useful information by data encryption, analysis and processing. When the body appearance is abnormal, users are informed to take treatment. It ensures the early detection. When users are in emergency or hazardous state, it can inform the emergent agencies. So it improves the medical treatment. Furthermore, it is ease to establish national health records in order to provide the decision-making basis for the regional disease by comparing and analyzing the healthcare information. Abilities of disease prevention and disease treatment are improved largely in this way. This platform is able to manage and monitor the medical health information and behavioral state information of patients. The users of RMCPHI include patients with hypertension and other diseases such as stroke, heart disease, kidney disease, chronic lung disease, heart palpitations, chest tightness, disorders of consciousness, etc.

2.3. Remote monitoring cloud platform of healthcare information

Remote monitoring cloud platform of healthcare information includes body sensors, sensor network, communication