Chapter 61
Mobile Healthcare Computing in the Cloud

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ABSTRACT

Previous medical services for humans provided healthcare information using the static-based computing of space-constrained hospitals or healthcare centers. In contrast, current mobile health information management computing and services are being provided so that they utilize both the mobility of mobile computing and the scalability of cloud computing to monitor in real-time the health status of patients who are moving. In addition, data capacity has sharply increased with the expansion of the principal data generation cycle from the traditional static computing environment to the dynamic computing environment. This chapter presents mobile cloud healthcare computing systems that simultaneously leverage the portability and scalability of healthcare services. This chapter also presents the wearable computing system as an application of mobile healthcare.

INTRODUCTION

This chapter describes system structure, information flow and application or service scenario in order to build a cloud computing based on mobile healthcare system. In order to implement this system, one must satisfactorily accommodate the characteristics of mobile healthcare device, client, or the special advantages of information system on the mobile computing, ubiquitous computing, wearable computing and cloud computing, etc (Barry, 2006; Gunther, 2006; Monique, 2010).

First, mobile healthcare is rising as an important concept to implement real-time remote medical treatment service. The mobile healthcare is increasing usage of portable devices such as PDA or Smartphones/Smartpads while guaranteeing mobility of patients, for their free activity. It also identifies the condition of patients on a real-time basis, in other words in order to provide healthcare information service immediately without delay of time. HL7 establishes a standard of supporting messaging interwork and compatibility between existing information system and health & medical treatment information service based on the standard layer of OSI. This can support the scalability of mobile health care (Jim, 2007; Daniel, 1999; Vietanh, 2000; Deborah, 2001; Ian, 2002; Malik, 2003).

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Second, mobile computing implements multilateral healthcare services through gathering and analyzing various types of healthcare information without setting limitations on the specific medical treatment of mobile users. And it extends the static computing based on wire as a dynamic and flexible computing environment.

Third, ubiquitous computing supports a sensing network, which recognizes user status (place, time, weather and temperature, etc) without limitation of place and time. It also supports freedom of user connection and seamless connectivity.

Fourth, wearable computing is an item which is steadily being studied in various business fields because of its advantages such as clothing-based wearability, portability, and lightness. This is attracting people's interest as a next generation computing item with a composition that has combined the advantages of mobile computing and ubiquitous computing (Rehman, 2012; Polly, 2000; Sungmee, 2003; Peter, 2007; Franz, 2004; Shirley, 2009). Especially, it shows strength as a form of important critical mission applications from the emergence of the cases of applying wearable computing to the field of healthcare (Peter, 2007; Franz, 2004; Shirley, 2009).

Fifth, cloud computing has been proposed based on the distribution of the system in order to consolidate the economic efficiency of existing computing or system flexibility and scalability aspects (Bhaskar, 2009; Hoang, 2011; Sanjit, 2010). The implementation of healthcare-cloud information system based on such cloud system can effectively support large-scale healthcare client as a background computing system located in the back of mobile healthcare user.

Healthcare clients would want to identify their own health condition on a real-time basis at a free daily living environment and receive medical services instantly in case abnormal symptoms are discovered. In order to implement such real-time mobile client healthcare, the following requirements must be supported. First, the body information of mobile user must be gathered on a real-time basis. Second, a seamless wireless mobile network infrastructure must be supported for the satisfactory transmission of health information continuously.

In order to satisfy these requirements, wearable computing and clouding computing must be combined based on the mobile healthcare client, mobile computing and ubiquitous computing as it is described above. Through such various integrated configuration of computing, the mobile healthcare service for mobile client shown as Figure 1 should be implemented.

Mobile healthcare can provide a mobile healthcare solution that makes information available to users (Wikipedia, 2012). Recently, mobile healthcare has been an increasingly important topic because it employs bio-sensing and mobile user information to provide real-time monitoring of a customer's body. The flow of information in embedded bio-sensing systems from the standpoint of the user of mobile healthcare is a series of forwarding processes, which collect sensing data from bio-sensing nodes. First, the sensing node senses the state of the user's body, and collects analogue or digital bio-signal data. Next, it delivers the collected data over wired or wireless communication links. Finally, a backbone-computing node in the Internet receives the filtered data as a relay or a final node. When executed in reverse, a healthcare process may be executed that will control or monitor the bio-sensing nodes on the user's body.

Figure 1 depicts services that monitor the momentum, the electrocardiogram, and the respiration, which are mobile healthcare services. These services check the user's health as the user changes location. Furthermore, the remote healthcare service makes doctor-patient consultation possible, and the emergency healthcare service supports emergency calls and emergency medical services. In addition, the body posture service monitors the body shape in order to observe the acute syncope