An Approach to Design a SOA Services Governance Architecture for an u-Healthcare System with Mobility

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ABSTRACT

Ubiquitous health (u-Health) system is focused on the concept of providing medical service and assistance to the patients “anywhere and anytime” regardless of their locations. Existing mobile u-Healthcare systems have problems in lacking one or the other S.C.A.L.E. (Scalability, Connectivity, Adaptability, Liability, and Ease-of-use) criterion that any ubiquitous system must support. They become expensive during setup, reconfiguration, and modification as no proper and efficient solution is available. Also, they lack security, privacy, and wireless accessibility features so all these problems can prevent the system from being expanded widely. The objective of this paper is to implement a u-Healthcare system based on wireless mobile technology using Service Oriented Architecture (SOA). Applying Service Governance of Service Oriented Architecture helps make all services more secure, reusable, interoperable, available, and imposes all the features a ubiquitous system should have. A prototype system uSG-Health was developed using the approach for demonstrating the functionality and ability of the proposed u-Healthcare system.

Keywords: Privacy, Security, Service Governance, Service Oriented Architecture (SOA), u-Healthcare, Wireless Mobile

INTRODUCTION

Rapidly expanding IT sector has spanned many areas affecting human lives such as communication, transportation, accounting, production, manufacturing automation, medical, healthcare, etc. Technology advent in ubiquitous or pervasive computing has also entered in the field of healthcare (Serrano, 2011; Elmisery, 2011; Foghlu, 2011; Donnelly, 2011; Storni, 2011; Fernstrom, 2011). For an u (ubiquitous)-Healthcare system to be a complete system, it should follow certain criteria called S.C.A.L.E.
which stands for Scalability, Connectivity, Adaptability, Liability, and Ease-of-use (Cha, 2005; Pallapa, 2007). Currently, there is no such system which provides reusability, interoperability, availability, and loose coupling. Moreover, there are security and privacy issues in using a mobile based u-Healthcare system.

U-Healthcare systems in the current market are implemented to different extents. For example, there was work in the area of smart emergency and multi-agents system (Bergenti, 2010; Poggi, 2010). One part of ubiquitous healthcare market proposes u-Healthcare system with possible issues like security and privacy, but does not solve them. They just use the ubiquitous computing technology in their systems without solving any problems. None of these systems provides reuse and availability (Song, 2006).

One part of market develops a better u-Healthcare system by providing some security and privacy framework. Such u-Healthcare systems provide security and privacy to the data that are transmitted between clients and servers. Security is implemented by encrypting the data being transmitted and stored. Also the systems provide access control to the data so that there is no unauthorized access (Varshney, 2007).

One part of market provides security and privacy solutions to their u-Healthcare systems. Systems like SHOES provide extra security using steganography to protect the data (Cotroneo, 2004). Some also apply Service Oriented Architecture (SOA) technology to the u-Healthcare systems which make the systems reusable, interoperable, and loosely coupled (Riz, 2004). In spite of the features provided by the systems, they are not completely ubiquitous. They lack some ubiquitous system features (Pallapa, 2007; Cotroneo, 2006).

In today’s world, it is highly desirable to make medical or health data available anywhere and anytime (Pereira, 2011; Caldeira, 2011; Rodrigues, 2011). Few systems are available to provide such access capabilities using mobile devices. “PoketDoktor” is a system which allows storing data on pocket devices as well as transferring the data wirelessly whenever required. “Code Blue” is a wireless network that helps to gather information for adding to patients’ records.

Many different existing solutions are available, but there is no solution in the market which can address and manage the desirable u-Healthcare services that are reusable, interoperable, scalable, and highly available. We propose a system design approach to design and implement a wireless mobile based u-Healthcare system called “uSG-Health,” which emphasizes Service Governance related system design concepts and technology over the SOA platform so that the systems would be capable to address and manage the issues and problems mentioned above. Service Governance provides rules and policies that define the use of services and avoid conflicts. It is desirable to consider and integrate some important ethical related issues in developing and implementing e-Healthcare systems (Hood, 2011; Bougourd, 2011) in the area of Service Governance. In this paper, we focus on the technological aspects of the system design and implementation processes and results.

Current Issues in E-Healthcare

Current e-healthcare systems are only web-based that are not available anywhere and anytime. They just provide Electronic Health Records (EHR) of patients online. One example of such system is e-Healthcare Systems, Inc. At most, they provide online consultation to the patient from the physician. Such systems do not send data automatically to the server. These systems are not ubiquitous, and do not have many issues as there are in ubiquitous systems. These systems do not involve emergency or require strong availability like u-Healthcare systems.

One model of such system is the SHOES (Secure u-Healthcare Oriented Environment System) model. This u-Healthcare system provides authorization, authentication, and confidentiality. This provides strong security and privacy to the information. It also provides access control where every user is restricted to particular access. This system does not guaran-
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