

Chapter 3.10

A Preliminary Study Toward Wireless Integration of Patient Information System

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ABSTRACT

This paper presents the results of a study toward generating a wireless environment to provide real-time mobile accessibility to patient information system. A trial system is set up where database, Internet, and wireless personal digital assistants (PDAs) are integrated in such a way that the medical professionals like physicians, nurses, and lab assistants can create, access, and update medical records using wireless PDAs from any location in the hospital, which is covered by wireless LAN. The same services, which can be carried out via fixed terminals with Internet connectivity, can be carried out using wireless PDAs. The implementation has used and integrated many technologies like active server pages

(ASP), Visual Basic®, structured query language (SQL) server, ActiveSync®, IEEE802.11 wireless local area network (WLAN) technology and wireless security concepts. The paper details the architectural aspects of technology integration and the methodology used for setting up the end-to-end system. The proposed architecture, its performance data, and the common implementation barriers are reported.

INTRODUCTION

Medical professionals have already recognized the importance of keeping patient information (medical records) in an electronic format rather than paper-based format because of the sheer size

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of records generated daily. Due to the extensive size and costly storage requirements, keeping paper-based records became more expensive than keeping records electronically. A study conducted in a 500-bed hospital indicated that a 7-inch stack of paper-based laboratory reports must be filed daily. The informal survey was conducted with medical professionals among the American University of Sharjah medical center staff and a neighboring local hospital in which receptionists, laboratory, and X-ray technicians, nurses, and physicians participated. Most of them liked the idea of using electronic patient record (EPR) technology. Some of them expressed some concerns about the screen size and the resolution limitation of the personal digital assistants (PDAs) used in the trial. Others worried that if such ubiquitous systems are deployed, then medical staff will have to be available all the time even during vacations days. They stated that if such technology is available, they will be liable if they do not answer even during their breaks. "It is a matter of life and death" one of the nurses stated, "I should answer calls anywhere, anytime."

The cost of maintaining paper-based records and filing them in an ordered fashion to keep them accessible is over US\$10 per record (Safran & Goldberg, 2000). Keeping records electronically also presented the opportunity of being able to access records over the Internet from anywhere, anytime. Together with the powerful PDAs and wireless connectivity tools, it became feasible to access EPR remotely without being tied to workstations. There are several records in the literature, which mention successful implementations of Web-based access to patient databases (Liu, Long, Li, Tsai, & Kuo, 2001; Garcia et. al., 2002). Others have reported wireless healthcare using wireless local area networks (WLAN) and discussed the electronics home healthcare concepts and challenges (Wang & Hongwei, 2005; Wickramasighe & Misra, 2004). A trial study conducted recently among medical professionals in real hospital settings indicated that medical

professionals regard mobile access to the following data highly useful (Ammenwerth, Buchauer, Bludau, & Haux, 2000):

- Medical knowledge like drug data.
- Medical coding references like ICD-10 codes (International Classification of Diseases) and literature databases.
- Patient database and administrative patient data.
- General information like telephone numbers and medical databases.

After using the system for a week, the respondents indicated that mobile communication and mobile information processing power offered by PDAs are very valuable. However, the respondents also reported that they were not satisfied with the 9600-baud rate communication speed offered by the early versions of PDAs and the mobile phones based on the Global System for Mobile (GSM) standard used in the study. During the study, it also became apparent that the messaging ability offered by PDAs was much superior to personal accessibility provided by pagers and mobile phones (Ammenwerth et al., 2000). Since then, the rapid change in the technology provided better connection methods, more durable and faster handheld mobile computing devices. The wireless accessibility provided by nowadays existing WLAN standards such as IEEE802.11g can support 54 Mbits/s data rate and the soon to come IEEE802.11n standard will support 540 Mbits/s data rate. This will clearly satisfy the need to higher access bandwidth required by healthcare providers. Along with the other contemporary software and database tools, this new connectivity method promised better EPR system and motivated many researchers in the healthcare industry to develop integrated wireless applications for use on pocket PC, smart-phone PDAs and other portable device platforms (Lu, Xiao, Sears, & Jacko, 2005).

In this study, we will design a prototype electronic medical database system and evaluate its

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