Chapter 30
Mobile Information Systems in a Hospital Organization Setting

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ABSTRACT

The emerging of wireless computing motivates radical changes of how information is obtained. Our paper discusses a practical realisation of an application using push and pull based mechanism in a wireless ad-hoc environment. We use a hospital information system as a case study scenario for our proposed application. The pull mechanism is initiated from doctors as mobile client to retrieve and update patient records in the central database server. The push mechanism is initiated from the server without a specific request from the doctors. The application of push mechanism includes sending a message from central server to a specific doctor, and multicasting a global message to all doctors connected to the server application. The global message can be disabled by each doctor to perform selective recipients.

INTRODUCTION

Recent advances in wireless technology have led to mobile computing, a new dimension in data communication and processing. Many predict a new emerging, gigantic market with millions of mobile users carrying a small, battery-powered terminal equipped with wireless connection (Acharya, Alonso, Franklin, & Zdonik, 1995; Barbara, 1999; Imielinski & Viswanathan, 1994). The main properties of mobile computing include mobility, severe power and storage restriction,

frequency of disconnection is much greater than in a traditional network, bandwidth capacity, and asymmetric communications costs. Radio wireless transmission usually requires approximately 10 times more power as compared to the reception operation (Zaslavsky & Tari, 1998).

There are two ways of data delivery in wireless environment. One is called *pull* mechanism, and the other is *push* mechanism (Aksoy et al., 1999). In this paper, we apply these two mechanisms in a wireless ad-hoc environment. We use hospital information system as a case study scenario to show the effective uses of the mechanisms. The hospital information system relates to doctors as the principal clients to a server application. Pull mechanism refers to data delivery on a demand basis. In the hospital information system, we apply this mechanism for doctors to retrieve his/her patients. Once the patient has been diagnosed, doctors can update the record in the database. In push mechanism, the server initiates the delivery of data without a specific request from the client. We apply this mechanism to send a direct message to a specific doctor, and to distribute information to all or selective doctors such as news bulletin. The information or message is sent from central server.

Push mechanism can be categorized into 1-1 (unicast) and 1-N (multicast/broadcast) communication type. Unicast communication involves a server and a client, and the data is sent from the server to the client. 1-N communication can be either multicast or broadcast mode. In multicast mode, the recipients are known and the data are delivered only to those recipients, for example; the information is delivered to doctors and nurses that are registered in a specific domain. On the contrary, the broadcast mode simply sent the data without knowing the number of clients who might receive the data. This paper concerns with 1-N (multicast mode) communication type.

Push-based data dissemination approaches can be performed in aperiodic or periodic manner (Franklin & Zdonik, 1997). Aperiodic data dissemination is event-driven; whereas, periodic data dissemination adheres to a pre-defined schedule. An example of aperiodic push-based event is when the central administrator sends an urgent message to a specific doctor in the hospital. In contrast, periodic push-based transmission is managed by an automated server program transmitting data (or information) according to a pre-defined schedule such as, distribution of news bulletin to doctors in every hour or so.

The advantage of push mechanism over pull mechanism is that query performance is not overwhelmed by multiple client requests. Push mechanism avoid the possibility of congested channel bandwidth and server queue causes by increase of number of clients, request arrival rate, and overlap in user"s requests. The congested channel and server queue may severely affect the power consumption of mobile clients. Figure 1 illustrates the push and pull mechanism.

This application will demonstrate the usability of wireless networks, and improve the mobility of doctors through wireless data dissemination. The subsequent sections in this paper are organized as follows. The following section provides the infrastructure of push and pull wireless information system. The next section describes the client and server processes in the system. It is then followed by the development of push and pull wireless information system in a hospital environment. Finally, the last section concludes the paper.

PUSH AND PULL MOBILE INFORMATION SYSTEMS: INFRASTRUCTURE

In this section, we describe the infrastructure of a push and pull wireless information system. We use the hospital information system scenario for implementation purposes. This section includes design overview, technology aspect, database aspect, server, and client model. The model is designed to realize and to demonstrate pull-based