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On Building a Data Broadcast System in a Wireless Environment

Agustinus Borgy Waluyo, Monash University, Australia

Gabriel Goh, Monash University, Australia

David Taniar, Monash University, Australia

Bala Srinivasan, Monash University, Australia

ABSTRACT

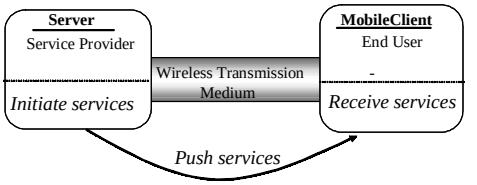
Data broadcasting is a scalable mechanism to disseminate information to a large number of mobile clients in a wireless environment. This paper concerns the development of a data broadcast system in a wireless environment. The broadcast data is retrieved from a central database server. We apply three different data broadcast schemes in the following order: first, we implement a filtering technique for a mobile device to select and display the desired data from incoming broadcast data items; second, the index broadcasting scheme is designed to predict the arrival of the desired data to appropriately execute the power conserving mode; third, we incorporate multiple channel environments to allow a mobile device to tune into multiple broadcast channels in order to receive the desired data. The proposed model uses a shared indices price context to demonstrate the effective use of these data broadcast schemes in order to provide efficient data retrieval. In order to develop this model, a wireless ad-hoc network infrastructure is used.

Keywords: *data broadcast system; mobile broadcast system; wireless data broadcasting; wireless data dissemination*

INTRODUCTION

Advances in wireless technology over recent years have led to mobile computing, a new dimension in data communication and processing. People are now able to access information anytime, anywhere, via wireless communications. An analysis predicts that by 2006, there will be more than 760 million mobile users connected to the Internet and more than 1.7 billion users by 2007 (Drews et al., 2003). With the limited bandwidth and power supply in mobile devices, data broadcasting has become the method of choice for disseminating information to a large user population (Su et al., 1999). This is due to communication asymmetry and scalability. From a power consumption viewpoint, communication asymmetry indicates

Figure 1. The broadcast mechanism



that it is far more costly to send than to receive data; scalability demonstrates that it is independent of the number of users for whom it is providing service.

Broadcast mechanism refers to pushing or disseminating information or data instances to a number of clients through one or more broadcast channels and allows a mobile client to capture and select data items for whatever data in which it is interested (Franklin & Zdonik, 1998). Access to data is sequential, as clients need to wait for the desired data to arrive on the broadcast channel. The behavior of the broadcast channel is unidirectional, which means that the server disseminates a set of data periodically to a multiple number of users. With this mechanism, the request is not known a priori. Figure 1 illustrates broadcast mechanism.

Broadcast mechanisms can be categorized into 1-1 (unicast) and 1-N communication type (Aksoy et al., 1999). 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. On the contrary, the broadcast mode simply sends the data to an undetermined number of clients who might receive the data. With this mechanism, a mobile client is able to retrieve information without wasting power to transmit a request to the server. Other characteristics include scalability as it supports a large number of queries; query performance is not affected by the number of users in a cell as well as the request rate; it is effective to a high degree of overlap in a user's request.

The main challenge in periodic broadcast is to minimize query response time and tuning time of retrieving database items (Waluyo et al., 2005). In some cases, the response time is equal to the tuning time. As the data size increases over time, the required number of data items to be broadcast also increases accordingly. This situation may cause some mobile clients to wait for a substantial amount of time before receiving a desired data item (Jayaputera & Taniar, 2005). Consequently, the advantages of periodic broadcast strategy will be diminished. A multi-channeling method can be used to maintain a low query response time, while an indexing method is used to minimize clients' tuning times so that energy efficiency can be preserved.

In this paper, we present a broadcast-based information system in a mobile ad-hoc environment. We apply indexing and multi-channeling schemes to assist users in performing query operation efficiently. The broadcast data is retrieved from a central database server. In order to demonstrate the effective uses of the periodic broadcast mechanism, we use share price indices context. This work is an extension of our previous work, which focused on multicasting (Waluyo et al., 2004). In our earlier work, we built a multicasting application for use in wireless hospital (e-health) environment. The application improves the mobility of doctors through wireless data dissemination. However, the multicasting application requires the client to establish communication with the server, which is not applicable in a broadcast environment. Furthermore, it is not concerned with efficient data items queries.

DATA BROADCAST SYSTEM: ARCHITECTURE

Our proposed model consists of a server application and client application (see Figure 2). Server application is designed to deliver database-based service. Client application will be able receive these services using data filtering or data filtering with index. The service provided by the server application can be delivered by involving three different features, including a data broadcasting scheme, index broadcasting, and broadcast channel environ-

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