Chapter 5
A Broadcasting Scheme for Transaction Processing in a Wireless Environment

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ABSTRACT

In broadcasting, schemes are widely used in a wireless environment. In this chapter, a heuristic broadcasting scheme is proposed that directly affects the concurrency of database transactions. The proposed broadcasting scheme is suitable for real-time transactions. A heuristic scheme is developed in a mobile environment to enhance system performance. Further simulation results in the chapter show that the proposed broadcasting scheme is suitable to improve transaction processing in a wireless environment.

INTRODUCTION

In recent few years, the use of portable mobile devices has their key role in technological development. The wireless technology depends very much on these fast processing portable devices. In near future, it may be realistic that everybody will store and share their information using these wireless devices. The various daily life applications using these devices run transactions to complete their tasks on time. Admin at server end controls all the mobile devices connected using these wireless networks. Data consistency during transaction execution is the key issue in the database (Gray, 1978). Real time application like satellite launch, missile launch and fighter planes navigations need to complete their task within a time frame. Real time system should complete the transaction before elapse of the deadline (Ramamritham, 1993),(Shanker, Misra, & Sarje, 2008). A minor fault can degrade the whole system performance. In the recent few years, mobile distributed real time applications are getting a big attention for the database researchers. Stock trading, online shopping, e- ticketing, E-commerce are some example of real time applications. In a battlefield, a fast processing within a time frame is essential; otherwise, a big loss can occur. In these systems, the transactions should maintain not only the data correctness, but also timely execution. In other words, transaction execution in distributed real time database system depends on

various concurrency control schemes (Lindström, 2003),(Lam, Kuo, Tsang, & Law., 2000),(Lee, Lam, Son, & Chan, 2002),(Lee, Lam, & Kuo,2004),(Pandey, & Shanker, 2016,2017a,2017b,2018a,2018b,2018c),(Shanker, Misra, & Sarje, 2006,2008). It also depends on scheduling schemes used in the system. A number of locking and optimistic protocols has been developed to support these systems (Shanker, Misra, & Sarje, 2008). Meanwhile, various pessimistic protocols have also been developed. However, in recent years, researches are focused to develop optimistic concurrency control mechanism (Lindström, 2003). Pessimistic protocols basically support locking schemes. Some of these pessimistic approaches also include the concept of time stamping (Lee, Lam, Son, & Chan, 2002). Optimistic approaches run the transaction unhindered till validation; however, the commit operation is performed only after validation phase. Optimistic CC executes transaction operations in three different phases; first one is read phase, then validation phase and at last writing phase (Lee, Lam, & Kuo, 2004). Every transaction in optimistic CC passes through all these three phases for completion of its task. Here, the validation can follow two types of validation approach, i.e., one is forward and another one is backward validation policy. Both of these approaches have their own importance in the field of mobile database. In optimistic concurrency control backward policy, the transaction data validation is performed against the transactions which are already in committed phase. Further, in the second type of validation policy (forward validation policy), the validation is performed against the active (or read phase) transaction (Lee, Lam, Son, & Chan, 2002). Transaction which passes the validation phase can further proceed for execution. However, most of the researches in mobile environment prefer to perform forward validation in their optimistic approaches (Lee, Lam, & Kuo, 2004). Lee et al. has developed their optimistic approach using forward validation (Lee, Lam, Son, & Chan, 2002).

The Concurrency controls a single supportive part of successful commitment of transaction within a time frame. The other issues should also integrate with it to improve the system performance. Researchers have developed a number of transaction policies to enhance system performance in wireless medium. However, in mobile environment, a number of wireless medium obstacles lies which affect the performance of the system. The asymmetric channel bandwidth, power limitation, multi hop network problem, frequent disconnection etc. are some general intrinsic limitations which should be tackled by the developed policies (Barbará, 1999),(Padmanabhan, Gruenwald, Vallur, & Atiquzzaman, 2008),(Xing, & Gruenwald, 2007), (Madria, Mohania, Bhowmick, & Bhargava,2002),(Mok, Leong, & Si, 1999),(Imielinski, & Badrinath, 1994), (Gruenwald, Banik, & Lau, 2007), (Pitoura, & Samaras, 2012). Apart from these, maintaining the temporal consistency of data item is difficult in mobile environment. To maintain new version of data item timely is a fixed issue in mobile environment. It is a requirement to deal this hot issue in the field of mobile database. In mobile database, maintaining the valid data item timely and execute transaction within its deadline are challenging tasks.

Each real time data storage system needs to fulfil the real time requirements in mobile distributed real time database system (MDRTDBS) which needs to complete the tasks within a deadline (Lam, Kuo, Tsang, & Law., 2000). However, various applications in real life use these concepts. The navigation satellite, e–commerce, bus ticket booking frequently use these ideas. In recent research, the transaction execution is affected from the broadcasting policies. It affects mobile sites in MDRTDBS in a larger scale. Researchers in last three decades have developed a number of broadcasting policies to maintain data consistency (Acharya, Alonso, Franklin, & Zdonik, 1995),(Acharya, Franklin, & Zdonik, 1995),(Acharya,, Franklin, & Zdonik, 1997),(Hameed, & Vaidya, 1999),(Imielinski, Viswanathan, & Badrinath, 1997),(Kim, Lee, & Hwang., 2003),(Lee, Hwang, & Kitsuregawa, 2003),(Lo, & Chen, 2000),(Shigiltchoff, Chrysanthis, & Pitoura, 2004),(Su, Tassiulas, & Tsotras, 1999),(Vaidya, & and Hameed, 1999). In this work, broadcast-

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