Chapter 18

MOBILE DISTRIBUTED REAL-TIME DATABASE SYSTEMS

Kam-Yiu Lam
Department of Computer Science
City University of Hong Kong, Kowloon, Hong Kong
cskylam@cityu.edu.hk

Tei-Wei Kuo
Department of Computer Science and Information Engineering
National Taiwan University
ktw@csie.ntu.edu.tw

1. INTRODUCTION

Recent advances in mobile communication technology have made mobile computing a reality [5, 6, 12]. Various novel mobile computing applications, such as tele-medicine systems, real-time traffic information and navigation systems, and mobile Internet stock trading systems, are emerging as mobile users require instant access to information using their palmtops, personal digital assistant (PDA) and notebook computers not matter where they are. The realization of "instant" information access over a mobile network relies on real-time processing of transactions. As a result, the research on concurrency control and transaction scheduling for mobile distributed real-time database systems (MDRTDBS) is receiving growing attention in recent years [2, 8, 15, 17].

Although many researchers, e.g., [1, 3, 13, 16], have done excellent research in concurrency control and transaction scheduling for single-site and distributed RTDBS, not much work has been done for MDRTDBS. Owing to the intrinsic limitations of mobile computing systems, such as limited bandwidth and frequent disconnection, the efficient techniques for distributed real-time database systems (DRTDBS) which are supported by wired networks, may not be suitable and useful to MDRTDBS. Compared to wired networks, mobile networks are much slower, unreliable, and unpredictable. The mobility of clients affects
the distribution of workload in the system. Disconnection between the mobile clients and the base stations is common [5]. These unique features of the systems can seriously affect the probability of data conflicts and deadline missing probability. Furthermore, overheads in resolving data conflicts will also be much higher. [15].

In this chapter, we discuss the issues of concurrency control and transaction scheduling for MDRTDBS which is supporting soft or firm real-time transactions. An important consideration in the design of the strategies for transaction processing and concurrency control is how to reduce the impact of the unreliable network on the performance of the system.

2. SYSTEM AND TRANSACTION MODEL

2.1 SYSTEM ARCHITECTURE

Basically, a MDRTDBS consists of four main components: mobile clients (MCs), base stations, mobile network, and main terminal switching office (MTSO) [9], as shown in Figure 18.1. The mobile network is assumed to be a low bandwidth cellular network such as the GSM network. The entire service area is divided into a number of connected cell sites. Within each cell site, there is a base station, which is augmented with a wireless interface to communicate with the MCs within its cell site.

![Figure 18.1 System Architecture of a MDRTDBS](image-url)