



## **Chapter VIII**

# **Data Caching in a Mobile Database Environment**

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## **Abstract**

*In this chapter, we present an extensive study of the available types of data caching in a mobile database environment. We explore the different types of possible cache management strategy that can be adopted in a mobile environment. Generally, it is important to be able to cache frequent access data items because very often mobile users may require to downloading the same data over again. And by having the ability to cache the data, would helps avoid having to re-download the same data again. We include some discussions regarding the issues that arise from cache management strategy as well as include investigation on using cache management strategy involving location dependent data.*

## Introduction

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With the rapid development as well as recent advances in wireless network technologies have led to the development of the concept mobile computing. Mobile computing environment enables mobile users query databases from their mobile devices over the wireless communication channels (Cai & Tan, 1999). The potential market for mobile computing applications is projected to increase overtime by the currently increasingly mobile world which enables user to satisfy their need by having the ability to access information anywhere, anytime. However, the typical nature of a mobile environment would include low bandwidth and low reliability of wireless channels which causes frequent disconnection to the mobile users. Often, mobile devices are associated with low memory storage and low power computation and with a limited power supply (Imielinski & Badrinath, 1994). Thus, for mobile computing to be widely deployed, it is important to cope with the current limitation of power conservation and low bandwidth of the wireless channel. These two issues create a great challenge for fellow researchers in the area of mobile computing.

By introducing data caching into the mobile database environment, it is believe to be a very useful and effective method in conserving bandwidth and power consumptions. This is because when the data items are cached, the mobile user can avoid requesting for the same data if the data are valid. And this would lead to reduce transmission which implies better utilization of the nature of the wireless channel of limited bandwidth. The cached data are able to support disconnected or intermitted connected operations as well. In addition, this also leads to cost reduction if the billed is per KB data transfer (Papadopuli & Issarnyy, 2001). Caching has emerged as a fundamental technique especially in distributed systems as it not only helps reduce communication costs but also off loads shared database servers. Generally, caching in mobile environment is complicated by the fact that the caches need to be kept consistent at all time.

In this chapter, we would concentrate on several types of caching management particularly semantic and cooperative caching as well as cache invalidation strategy. Each of these different types of cache management will be further explored in the subsequent sections.

## Background and Preliminaries

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The effect of having the ability to cache data is of great importance especially in the mobile computing environment than in other computing environment. This is due to the reason that contacting the remote servers for data is expensive in the wireless environment and with the vulnerable to frequent disconnection can further increase the communication costs (Leong & Si, 1997). We would first introduce the mobile computing environment, followed by traditional mobile query processing, then overview of cache management and then discussions on the issues of caching.

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