An Object-Oriented Database Management System (OODBMS) with Simple Mobile Objects (SMO) Services

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Abstract - At present, the needs for the wireless mobile computing have tremendously increased. In view of the importance of wireless mobile computing for data mobility, and the limitations imposed by the wireless mobile devices, researchers develop an OODBMS to cater the needs of mobile computing are relatively important. We proposed an alternate solution that allows object management functionalities on the wireless mobile devices through messages synchronization with an OODBMS server. The proposed OODBMS is designed to serve as a database server which is capable to facilitate objects processing for a set of proposed Simple Mobile Objects (SMO) Services. These objects processing are designed as an interface for the SMO Services on wireless mobile device to carry out the actual object management activities.

Keywords: Object-Oriented Database Management System, Simple Mobile Objects Services, object management, messages synchronization.

1 Introduction

The fast changing of new technologies and advances in wireless communication networks have led to the emergence of mobile computing. Mobile devices that exist today are equipped with wireless communications capability. Consequently, the importance for wireless database accesses has tremendously increased in a number of areas such as warehouse inventory, logistic management, order taking and bill payment.

An Object-Oriented Database (OODB) is an implementation of real-world OO data model, which integrates data and methods of an object as a single unit. OODB can sufficiently support applications that are required to create and manipulates objects with intricately rich semantics, such as CAD, CAM and CASE. Also, OODB supports some essential OO characteristics such as inheritance, association, composition, collection and encapsulation. In view of the features supported by the OODB together with the integration of data and methods in an object makes it suitable to be deployed in a mobile computing environment. Furthermore, the limitations of the wireless mobile device such as small screen size, low bandwidth, frequent network disconnection, limited storage space and processing capacity has contributed as the fundamentals challenges for the design of OODB for wireless mobile devices. Frequent disconnections and highly variable in performance gives rise to the importance of reliability, and thus forces consideration of alternative and suitable transaction management capability.

In order to cope with the challenges and limitations imposed by mobile computing and wireless mobile devices, the consistency and integrity of objects in a multi-transactional environments are essential. Hence, the design of storage and transaction management systems is important for an OODBMS with wireless mobile object services. The design of the proposed Object-Oriented Database Management System (OODBMS) with Simple Mobile Objects (SMO) Services therefore needs to cope with the unreliable and low-performance bandwidth, as well as providing wireless transaction support in order to improve data consistency.

This paper proposed an adaptable OODBMS with SMO Services in order to fulfill the needs described above. The remainder of this paper are organized as follow. Section 2 presents the overview of the architecture of the proposed OODBMS with SMO Services. Section 3 discusses the Persistent Object Management (POM) and Cache Management (CM) Systems designed into the OODBMS that provides object management functionalities. The design of the POM and CM Systems have utilized storage management techniques such as instance access methods, caching, clustering and indexing. Section 4 examines the design of the Transaction Management (TM) System in the proposed OODBMS for concurrency and recovery control purposes by utilizing locking and logging mechanisms. The Persistent Object Storage Management (POM) System, designed for the storage of persistent objects within the Persistent Stores, in addition to Indexing Management (IM) System designed for the indexing of objects are discussed in Section 5. Section 6 will present the design of the SMO Services that are responsible to initiate the wireless simple mobile object services. The actual SMO Services will be carried out by the OODBMS through messages synchronization between OODBMS and SMO Services. Section 7 evaluates the achievements of the implementation for design proposed. Section 8 concludes