

UPDATE-ORDERING FOR DATABASE CONSISTENCY IN
DISTRIBUTED DATABASE ENVIRONMENTS


WAN NOR SHUHADAH BINTI WAN NIK

MASTER OF SCIENCE
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 Update-ordering for database consistency in distributed database environments / Wan Nor Shuhadah Wan Nik.

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**UPDATE-ORDERING FOR DATABASE CONSISTENCY IN
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WAN NOR SHUHADAH BINTI WAN NIK

To Father and Mother

**Thesis Submitted in Fulfillment of the Requirement for the
Degree of Master Science in the Faculty of Science and Technology
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June 2007

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Abstract of thesis presented to the Senate of Universiti Malaysia Terengganu
(UMT) in fulfillment of the requirement for the degree of Master of Science

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WAN NOR SHEHADAH BINTI WAN NOK

June 2007

Chairperson : Professor Md. Yazid Mohd Saion, Ph.D.
Member : Professor Mustafa Mat Deris, Ph.D.
Rahim Masril, MSc.
Faculty : Science and Technology

To Father and Mother

Database consistency is one of the major issues in replicated and distributed database environments. Data replication in distributed systems have been studied extensively for many years. It is quickly becoming a critical tool for providing high availability, reliability and high performance for replicated database. However, to provide useful replication one has to solve the non-trivial problem of maintaining data consistency between all replicas. The existing replication control mechanisms can be categorized into two spectrum: the logical design for the replicated nodes and its construction management mechanism. These two spectrum give a major impact to the performance and the consistency of replicated database.

This research proposes a new model, called "the reconciliation model", which extends the Neighbor Replication on Grid (NRG), where the data is replicated to

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Rabiei Mamat, MSc.
Faculty : Science and Technology

Database consistency is one of the major issues in replicated and distributed database environment. Data replications in distributed systems have been studied extensively for many years. It is quickly becoming a critical tool for providing high availability, survivability and high performance for replicated database. However, to provide useful replication one has to solve the non-trivial problem of maintaining data consistency between all replicas. The existing replication control mechanism can be categorized into two spectrums: the *logical design* for the replicated nodes and its *transaction management mechanism*. These two spectrums give a major impact to the performance and the consistency of replicated database.

This research proposes a new model, called “the reconciliation model”, which combines the Neighbor Replication on Grid (NRG), where the data is replicated to

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the neighbors of the grid with the Update Ordering approach. In order to represent this reconciliation model, the research has been conducted by simulation method. For a performance comparison purposes, two set of simulators has been developed. One set of simulator, called *NRG+UO-Simulator*, is developed to represent the reconciliation model while another set of simulator, called *BA-Simulator*, is developed to represent the existing model which has been proposed by Baruch Awerbuch and Ciprian Tutu, called “BA model”. Both simulators are written in C++ language and have been developed to simulate the transaction execution for both compared model.

In this research, the performance evaluation is based on the response time. The performance comparison shows that the proposed mechanism is greatly improve the performance of the replicated database in distributed database environment up to 91.34% improvement while preserving the data consistency.

Abstrak tesis yang dikemukakan kepada Senat Universiti Malaysia Terengganu sebagai memenuhi keperluan untuk ijazah Sarjana Sains.

“UPDATE-ORDERING” UNTUK KEKONSISTENAN PANGKALAN DATA DALAM PERSEKITARAN PANGKALAN DATA TERAGIH

WAN NOR SHUHADAH BINTI WAN NIK

Jun 2007

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Kekonsistenan pangkalan data merupakan salah satu isu yang besar dalam persekitaran pangkalan data teragih. Pereplikaan data dalam sistem teragih telah dikaji sejak sekian lama. Kini, ia menjadi salah satu kaedah yang kritikal dalam menyediakan satu pereplikaan pangkalan data yang tinggi ketersediaan, kewujudan dan prestasinya. Walaubagaimanapun, untuk menyediakan suatu pereplikaan yang berguna, suatu masalah yang rumit perlu diselesaikan dalam usaha mengekalkan kekonsistenan data antara semua replica. Mekanisma pereplikaan yang sedia ada boleh dikategorikan kepada dua spektrum: rekabentuk logical untuk nod-nod replika dan mekanisma pengurusan transaksi. Kedua-dua spektrum ini memberi kesan yang besar kepada prestasi dan kekonsistenan bagi pangkalan data yang di replika.