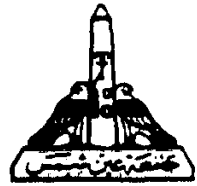

AIN SHAMS UNIVERISTY
Faculty Of Engineering
Computers And Systems Engineering Department

IMPLEMENTATION OF DISTRIBUTED DATABASE ENHANCEMENT FUNCTIONS

BY

HESHAM EL-SAID MOHAMED
(B.Sc. Computer Eng. - Military Technical college)

A Thesis Submitted in Partial Fulfillment of
the Requirement for the Degree of
MASTER OF SCIENCE
IN COMPUTER ENGINEERING

Supervised by

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CAIRO, EGYPT
1997

بسم الله الرحمن الرحيم

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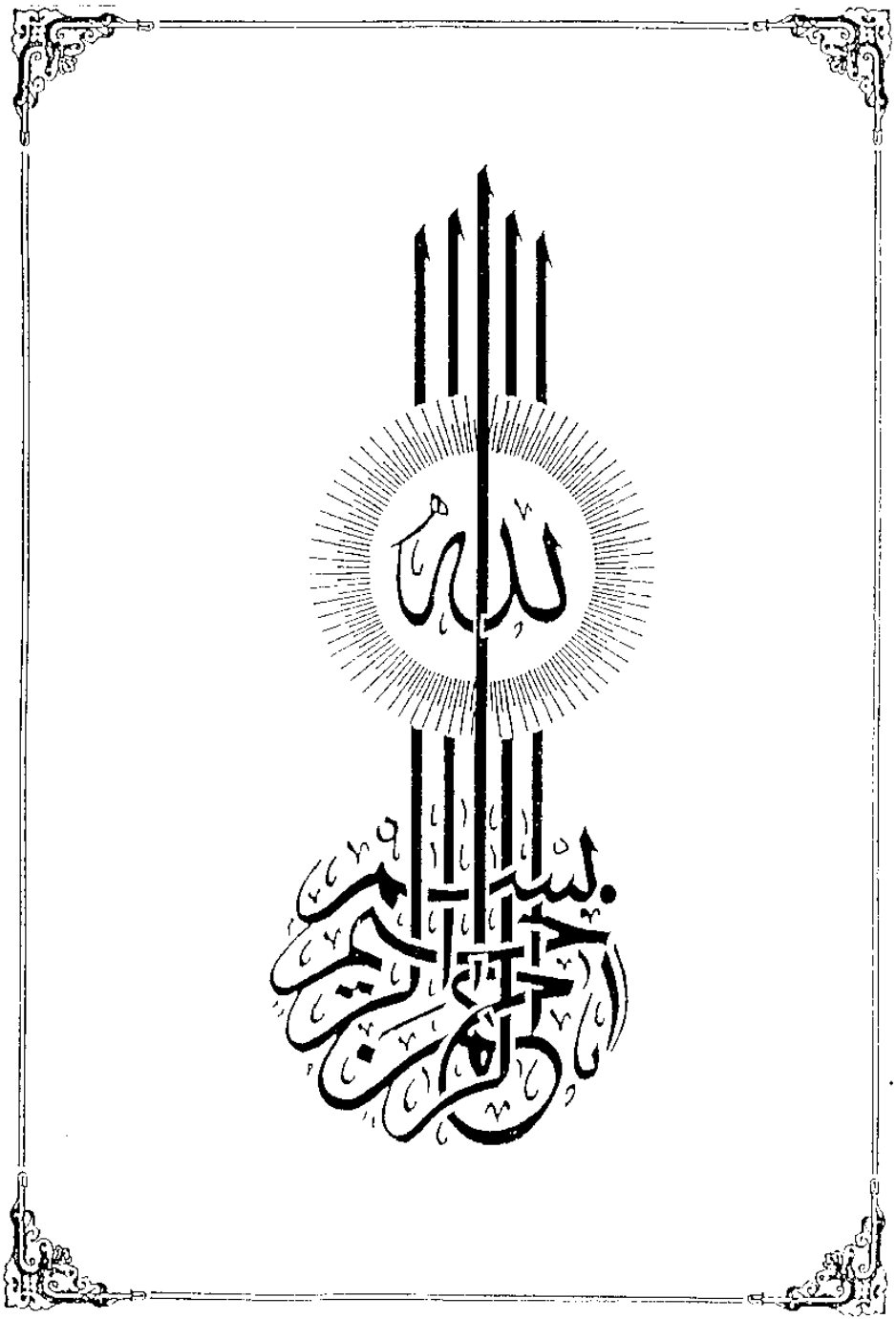

Approval sheet

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SUMMARY

The aim of this research is to study the effect of distributed processing systems (client/server architecture) on the deployment of database management software on different processors. In this thesis we start by studying the distributed database approach, which is a collection of data that belongs logically to the same system but is physically spread over the sites of a network. The architecture of a distributed database system consists of multiple computers, network, data processor software for local data management, application processor software for distributed functions and communication software. Distributed database systems (DDBSs) have a lot of advantages, they improve performance, reliability, availability, shareability, and expandability. DDBSs also give a local autonomy and they are more economical from the communication cost point of view. DDBSs, have also some disadvantages, complexity, lack of experience, cost of communication and additional software to manage the distribution and difficulty of change between already existing centralized databases to distributed databases. There is two approaches for developing distributed databases, bottom-up integration and top-down distribution. There is a lot of data distribution strategies, basic distribution relation, data fragmentation (horizontal, vertical and mixed fragmentation), and replicated relations (full replication, no replication and partial replication). We show the transition of DDBSs to the client/server approach and how client/server features favor its use. We show the problems associated with distributed database systems, from administration point of view (catalog management, object naming, authorization, protection and archival check points), from transaction management point of view (two phase commit and three phase commit), from concurrency control point of view (locking and dead lock), from query optimization point of view (join sequencing, fragment access optimization and replica access optimization), and from integrity maintaining point of view (fragment integrity constraints and distributed integrity constraints). We analyze the different modes of distributed processing, host/terminal mode, network/file-server mode and client/server mode. We consider hardware components, systems services and application architecture of each mode in this analysis. We show the components, characteristics and communication aspects of the client/server environment. We

analyze the different types of database server configurations for user connections (single-task server, dedicated server and multithreaded server). We show that single-task server mode is used for nonnetworking (host based database server systems), dedicated server mode is used for administration tasks, and multithreaded server mode is widely used for client/server database environment. We show the distribution of the client/server database system processes between the clients and the server, and how they are interacting among the network. We develop a case study to establish client/server database environment including configuring conversational middleware for a database in client/server environment, starting middleware network listener process to accept and route remote client connections to the database server and configuring the database server as a multithreaded server. We show how to establish client/server database application, including (the role of the administrator on behalf of the application, schema design aspects and creating application schema aspects). We develop a case study for establishing and creating client/server database schema. Finally we study the query execution strategies (data shipping and query shipping) in client/server database environment, including the execution plan for each strategy. We show recommended guide lines to improve query execution performance for client/server database environment. The study concluded by studying query processing strategies and applying tuning guide lines.

ABSTRACT

HESHAM EL SAID MOHAMED
IMPLEMENTATION OF DISTRIBUTED DATABASE ENHANCEMENT FUNCTIONS
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Client/server environment is now the most used environment of the distributed processing Most of the distributed database management systems (DDBMS) is directed to this environment. There are a new view of establishing and tuning the distributed database (DDB) according to this environment. A middleware can be used to make the connection between client's applications and the database servers transparent. Overall system performance can be enhanced through controlling database management system (DBMS) use of space. There are two query execution strategies, query shipping (used with relational database) and data shipping (used with object oriented database). The query performance can be enhanced by tuning the server cache memory, reducing disk contention, tuning the query structure query language (SQL) statements and centralizing application logic at the server.

KEYWORDS

Buffer cache, Client/server, Data shipping, Dictionary cache, Distributed database, Library cache, Message passing, Query execution, Query execution performance, Query shipping, Remote procedure call, Stored procedure, Triggers, Storage parameters, Tuning cache memory.

STATEMENT

This thesis is submitted to Ain Shams University for the degree of Master of Science in Civil Engineering.

The work included in this thesis was carried out by the author in the Department of Computer and Systems Engineering, AIN Shams University, from May, 1995 to June, 1997.

No part of this thesis has been submitted for a degree or a qualification at any other University or institution.

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ACKNOWLEDGMENT

I would like to express my thanks and obligation to whom helped me, that without their help the completion of this work was impossible.

I wish to express my deep gratitude to Prof. Dr. M. Adeeb R. Ghonaimy, who supervised this study and guided its progress. I wish to thank him for his kind supervision, useful suggestions, and constructive criticism.

I am deeply thank Dr. Medhat Fakhery, who supervised this study and guided it progress. I wish to thank him for his kind supervision, useful suggestions, and constructive criticism.

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