بسم الله الرحمن الرحيم

((يا أَيُّهَا الَّذِينَ آمَنُوْا إِذَا قِيلَ لَكُمْ تَفَسَّحُوْا فِي الْمَجَالِسِ فَافْسَحُوْا يَفْسَحِ اللَّهُ لَكُمْ وَإِذَا قِيلَ انشُزُوْا فَانشُزُوْا يَرْفَعِ اللَّهُ الَّذِينَ آمَنُوْا مِنكُمْ وَالَّذِينَ أُوتُوْا الْعِلْمَ دَرَجَاتٍ وَاللَّهُ بِمَا تَعْمَلُونَ خَبِيرٌ)) .

صدق الله العظيم ،،

المجادلة -الآية(11).

Dedication

❖ *To my family:*

My parents,

Who taught me how

To find my way in the life

,,,

My aunt, brother, and sister

❖ *To all those who I love and respect them very much*

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ABSTRACT

In Multidatabase Systems (MDBS), pre-existing autonomous local database systems that manage by heterogonous Database Management System (DBMS) in distributed environment are integrated together. Consequently, in such surroundings, global query optimization should be considered to achieve the overall system performance. Concurrently, security consideration is enlarged greater than before. Therefore, autonomous nature of such MDBS causes additional challenges in optimizing query process as well as offering adequate security features. Although, the majority of algorithms that have been suggested and used for optimizing query in such context are lacking of security aspects. Thus, this study proposes a security enhancement to query optimization algorithms.

The proposed security enhancement considered access control mechanisms, which maintain the database confidentiality and integrity, as a crucial security aspect that ought to associate with query optimization process. Moreover, an appraisal experiment is conducted using ORACLE-9i in order to confirm the feasibility and robustness of such enhancement. The experimental results shown that the enchantment approach is entirely adequate and promising, particularly in term of estimating local cost parameters. Furthermore, statistical measures confirm that the derived cost formula is significant

المستخلص

نظم قواعد البيانات المتعددة (Multi Database Systems) هى عبارة عن مجموعة أنظمة قواعد بيانات تتميز بالاستقلالية (Autonomous) عن بعضها البعض حيث تدار هذه الأنظمة بواسطة نظم إدارة قواعد بيانات غير متجانسة (Heterogeneous)، يتم تجميع تلك الأنظمة مع بعضها البعض فى البيئات الموزعة على هيئة تجعلها متكاملة معاً . وعليه لابد من اعتبار أمثلية الاستفسارات فى مثل ذلك النوع من الانظمة وذلك لتحقيق الاستفادة القصوى منها فيما يتعلق بالأداء العام لها ، وفى ذات الوقت اعتبار بعض الجوانب الأمنية والتى من الممكن أن تتعلق بعملية تحسين الاستفسار، لكن الطبيعة المستقلة لمثل تلك الأنظمة تتسبب فى خلق وإيجاد العديد من الصعوبات والتحديات والتى من المحتمل أن تجعل الوصول إلى مثل ذلك الهدف من الصعوبة بمكان وذلك على الرغم من وجود العديد من الخوارزميات المقترحة والمستخدمة فى عملية تحسين الاستفسارات، لكننا نجد أن غالبية هذه الخوارزميات لم تأخذ فى اعتبارها محاولة توفير بعض الجوانب الأمنية ذات الصلة بتلك العملية.

ولهذا كان السبب الأساسى لهذه الدراسة محاولة تلافى ذلك بعمل التعزيز المطلوب والذى يتعلق باعتبار بعض تلك الجوانب الأمنية المشار إليها ، مثل آلية التحكم بالوصول كأحد جوانب السرية والتي تعمل على الحفاظ على صحة وأمن البيانات. من ناحية أخرى، تم تقييم هذه الدراسة باستخدام أحد نظم إدارة قواعد البيانات وهو (Oracle9i) للتأكد من جدوى وفعالية الجزء المضاف. وقد أظهرت نتائج تلك التجارب أهمية هذا التحسين خاصة فيما يتعلق بعملية تقدير التكلفة المحلية للمعاملات ،كذلك أكدت النتائج الإحصائية أهمية صيغ التكلفة المشتقة للاستفسارات.

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LIST OF ABBREVIATIONS

MDBS	MultiDataBase System
DB	Data Base
R_i	A table in Data Base
G	Set of all component (unary and join) query
$R_i.a_n$	Denote a column of R_i
C	A constant in the domain of column $R_{i.an}$
$G_{1\,1}$	Unary queries whose qualifications have at least one conjunct $R_i.a_n = C$ where $R_i.a_n$ is clustered- indexed
$G_{1\,2}$	Unary queries whose qualifications have at least one conjunct $R_i.a_n = C$ where $R_i.a_n$ is indexed
$G_{1\,3}$	Unary queries whose qualifications have at least one conjunct $R_i.a_n \theta C$ where $R_i.a_n$ is clustered – indexed
$G_{1\,4}$	Unary queries whose qualifications have at least one conjunct $R_i.a_n \theta C$ where $R_i.a_n$ is indexed
G_{15}	Unary queries whose qualifications have at least one conjunct $R_i.a_n \theta C$ where $R_i.a_n$ is indexed
$G_{2\,1}$	Join queries whose qualifications have at least one conjunct $R_i.a_n = Rj.am$ where either $R_i.a_n$ or $R_j.a_m$ is clustered-indexed
$G_{2\,2}$	Join queries whose qualifications have at least one conjunct $R_i.a_n = Rj.am$ where either $R_i.a_n$ or $R_j.a_m$ is indexed
$G_{2\,3}$	Join queries whose qualifications have at least one index-usable for al least one operand table
DAC	Dictionary Access Control
MAC	Mandatory Access Control
LBAC	Label Base Access Control
BLP	Bell-Lapadula model
TS	Top-Secret
S	Secret

C	Confidential
U	Unclassified
V_{UB}	Basic Explanatory Variables
V_{JB}	Secondary Explanatory Variables
Ru	The operand table for a unary query;
R_{j1}	The first operand table for a join query
R_{j2}	The second operand table for a join query
N_u	Cardinality of unary operand table
N_{J1}	Cardinality of the first join operand table
N_{J2}	Cardinality of the second join operand table
L_u	The tuple length of R_u
L_{J1}	The tuple length of R_{j1}
L_{J2}	The tuple length of R_{j2}
RL_u	The tuple length of the result table for a unary query
RL_J	The tuple length of the result table for a join query
TN_U	The cardinality of the intermediate table for a unary query
RN_U	The cardinality of the result table for the unary query
RN_J	The cardinality of the result table for a join query
TN_{J1}	The size of the intermediate table obtained by performing the conjunction of all separable conjunctive terms on R_{J1}
TN_{J2}	The size of the intermediate table obtained by performing the conjunction of all separable conjunctive terms on R_{J2}
TN_{J12}	The size of the cartesian product of the intermediate table
Z_U	Real physical size of the operand table of a unary table.
RZ_U	Real physical size of the result table of a unary query
Z_{J1}	The physical size of the first operand table of join query
Z_{J2}	The physical size of the second operand of join query
R_{ZJ}	The physical size of the result table of join query
Y	Query cost