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Comparative Performance Analysis of MySQL and SQL Server Relational Database Management Systems in Windows Environment

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Abstract: The enormous amount of data flow has made Relation Database Management System the most important and popular tools for persistence of data. While open-source RDBMS systems are not as widely used as proprietary systems like Oracle DB or SQL Server, but over the years, systems like MySQL have gained massive popularity. In a stereotypical view, SQL Server is considered to be an enterprise-level tool, MySQL has carved a niche as a backend for website development. This paper is an attempt to set a benchmark in comparing the performance of MySQL against SQL Server in Windows Environment. To test and evaluate the performance the Resort Management System named Repose is considered. The result shows that SQL Server is still a significantly better performer when compared to MySQL.

Keywords: MySQL, SQL Server, Performance Analysis,Repose.

I. INTRODUCTION

Repose is a Resort Management System designed for managing the records of a resort. It stores information of the users and the resort, which includes services available in the resort, room details, reservation details, et al. Repose RMS is designed in such a way that the staffs as well as the guests feel comfortable in using the software. Repose RMS enables a guest to register themselves online, as well as register through staff manually. The intention of this project is to develop a software which is more user friendly, and can be efficiently used by people in different roles.

We saw the development of this project as an opportunity for analysing the comparative performance of MySQL and SQL Server. The main focus of this paper is to analyse the performance of the system in two databases namely - SQL Server and MySQL and to discover which database is well suited to work with this system.

II. WHY MYSQL AND SQL SERVER?

MySQL and SQL Server are two of the most popular RDBMS systems. SQL Server is the most used database system in organizations, while MySQL is the third most popular [4]. In overall-use rankings however, MySQL is the second most popular database system after Oracle DB, while SQL Server is the third most popular [5]. The mismatch in these rankings is considered because SQL Server is seen more of an enterprise tool while MySQL is considered a tool that appeals most often to individuals interested in managing databases associated with their websites [6].

MySQL and SQL Server as the databases were selected based on the convenience of the developers, available resources and the fact that the project happens to use the relational model in the database.

A. MySQL

MySQL is the world's second most used Database management system [5], and the most popular of all open-source RDBMS systems. It provides many features, the most valuable of which is its platform independence. The various features of MySQL and SQL server are as follows-

Features of MySQL:

- It can work on multiple platforms.
- Uses Multi-layered server design with independent modules.
- Executes very fast.
- Supports many data types.
- Uses a very fast thread-based memory allocation system.
- Supports fixed-length and variable-length records.

B. SQL Server

SQL Server is Microsoft's relational database management system (RDBMS). It is a fully-featured database which is primarily designed to compete against the likes of Oracle Database (Oracle RDBMS) and MySQL.

Features of SQLServer:

- Enables memory optimization of selected tables and stored procedures.
- Provides Migration Assistant programs to migrate data from the most widely used DB systems.
- Clustering Services that allow to recover instantly from one system to another.
- Replication Services that keep data synchronized in between SQL Server and other DBMS systems.

III.RELATED WORKS

In [1], the performance comparison for data storage of health care with two databases namely Dbo4 and MySQL was done. The authors have made a detailed study about

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data storage in health care and have made an analysis of data storage in both the databases. The authors have considered both execution time and memory consumption as a parameter for performance analysis.

In [2], performance comparison between MySQL and Virtuoso Universal Server 6 triplestores was done. They have done comparison of these two system on the basis of average read and write times.

In [3], performance comparison for row-storage vs column-storage in databases, using SQL Server and Oracle DB as test database system was done. This paper had analysed the execution time where a sequence of five SELECT queries against database systems were executed, using MATLAB as a front-end.

IV. PROPOSED METHODOLOGY

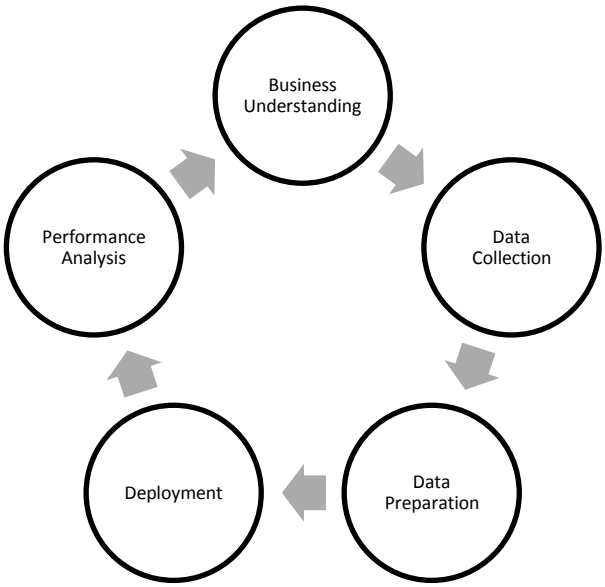

Fig 1: The test method

A. Business Understanding

As mentioned before, the purpose of this paper is to find out the database system that works best for the Repose RMS system. As of now the user base of the system is very small and hence the impact on the back-end is not very huge. However, knowing how the different database systems are going to perform beforehand is beneficial in choosing in between them.

B. Data Collection

Repose RMS acts as a tool for data collection in this performance study. The daily interaction of the users with the system fills up the database gradually with clean, formatted and actual data.

C. Data Preparation

Data cleaning is a process of detecting corrupted and inappropriate data from a dataset and correcting it. Data which are inconsistent are removed from the table and are not considered for the performance analysis. Data cleaning is minimal in this case since the forms take formatted inputs. Even then, some data in the tables are manually cleaned

D. Deployment

This system concentrates on the performance analysis of the backend with respect to the databases MySQL and SQL server. The different modules of the system are executed in both the databases and the execution time (time taken by the database to return the result of a query) is recorded in each case. This record is later utilized to find out which database is best suitable for this application with respect to the time it takes to execute the query.

E. Performance Analysis

The software is executed, using both the databases and performance is analysed based on the time it takes to complete its execution. The execution times are obtained and then tabulated Microsoft Excel for further processing. The performance analysis is done on both the databases and the database well suited for Repose RMS is found out.

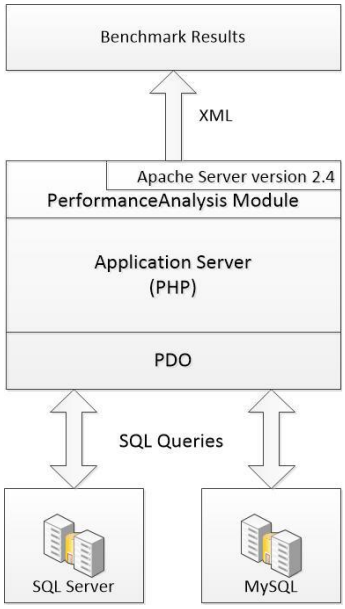

Fig 2: Design of the test system

The data access layer in the architecture of the RMS system is responsible for CRUD (Create, Read, Update, and Delete) operations as well as logging the time taken to execute the operations. The Data Access Layer uses the *PerformanceLog* class to log entries in an XML file. This logging operation is done only if Performance Analysis mode is set to on in the configuration file.

Sample log

```
<Entry TimeStamp="26-Feb-2015 Thursday, 03:51:56 PM IST">
<ConnectionString>odbc:Driver={MySQL ODBC 5.3 UNICODE Driver};Server=localhost;Database=resortdb;Uid=user;Pwd=password;</ConnectionString>
<Query Category="SELECT" RowCount="1500" HasJoin="FALSE" HasConditions="FALSE">SELECT * FROM users</Query>
<TimeTaken>0.0053150653839111</TimeTaken>
</Entry>
```

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These entries provide us with data for the performance comparison between MySQL and SQL Server.

V. COMPARISON

The comparison test was performed on a Windows 8 64-bit machine running on an Intel® Core™ i5-2430M CPU with a clock frequency of 2.4 GHz. and 4GB of RAM.

The SQL Server 2008 and MySQL 5.6.17 were the respective versions of SQL Server and MySQL to test the data. The data was first collected in MySQL, and then migrated to SQL Server using the Microsoft SQL Server Migration Assistant for MySQL program.

Different DML queries, namely SELECT, INSERT, UPDATE, and DELETE were executed on both and the execution time was recorded via the RMS system.

The test cases were as follows –

A. SELECT queries

Four SELECT queries were executed on both SQL Server and MySQL server –

- A non-conditional SELECT query
- A SELECT query with an ORDER clause on a non-indexed column
- A SELECT query with a JOIN
- A SELECT query with a JOIN and an ORDER clause on a non-indexed column

All four queries were executed five times with 3000 rows and five times with 5000 rows.

B. INSERT queries

On both MySQL and SQL Server, the average time to INSERT 100 rows was calculated.

C. UPDATE queries

Two UPDATE queries, the first one to update certain rows that fulfil certain conditions, and the second one to update all the rows, were executed.

The queries were executed five times each, first with 1500 rows and then with 2000 rows and their average was found out.

D. DELETE queries

In case of DELETE queries as well, two queries were executed.

The first one was to remove the last 500 of 1500 rows and the next one to remove all remaining 1000 rows.

Both queries were executed five times and the average found out.

VI. RESULTS

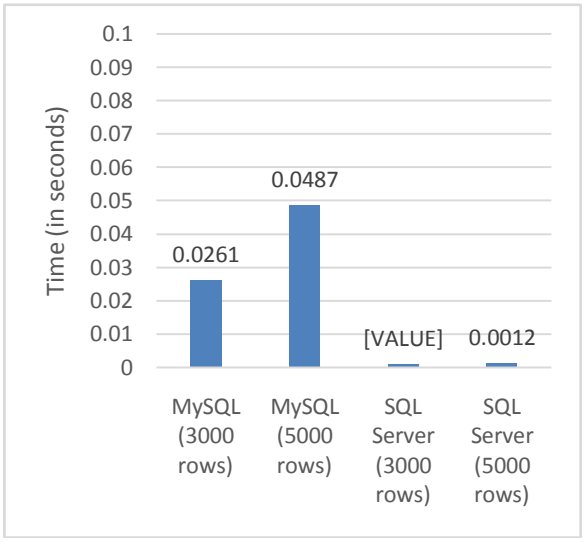

Fig. 3: Averages for a non-conditional SELECT query

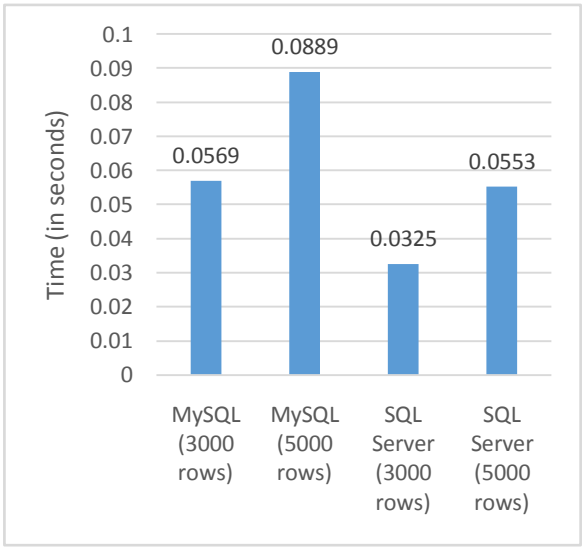

Fig. 4: Averages for SELECT query with an ORDER clause on a non-indexed column

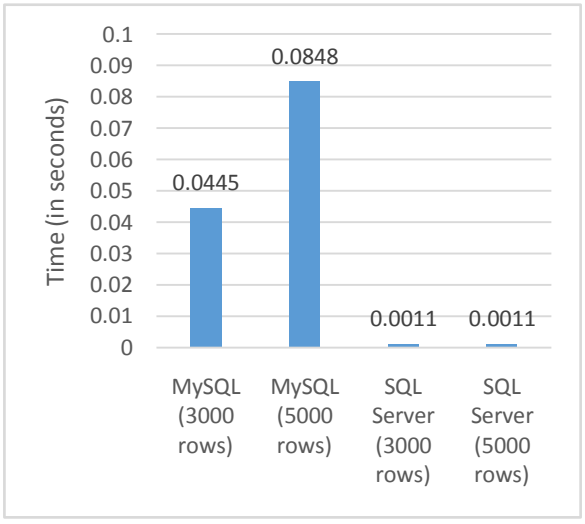

Fig. 5: Averages for SELECT query with a JOIN

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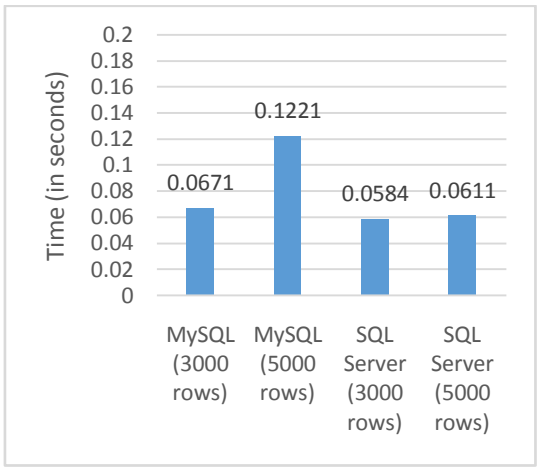

Fig. 6: Averages for SELECT query with a JOIN and an ORDER clause on a non-indexed column

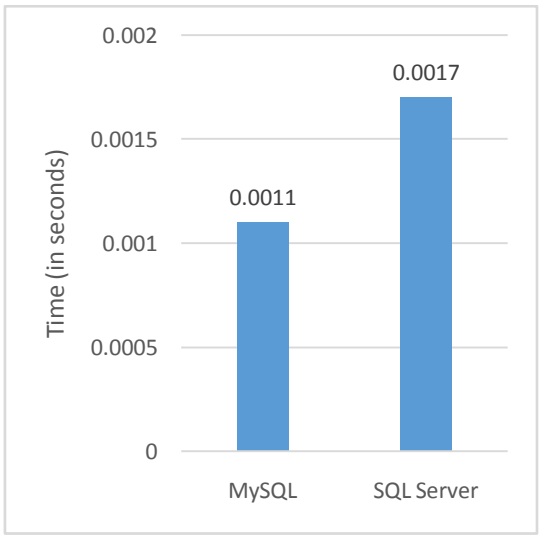

Fig. 7: Averages for 100 INSERT queries

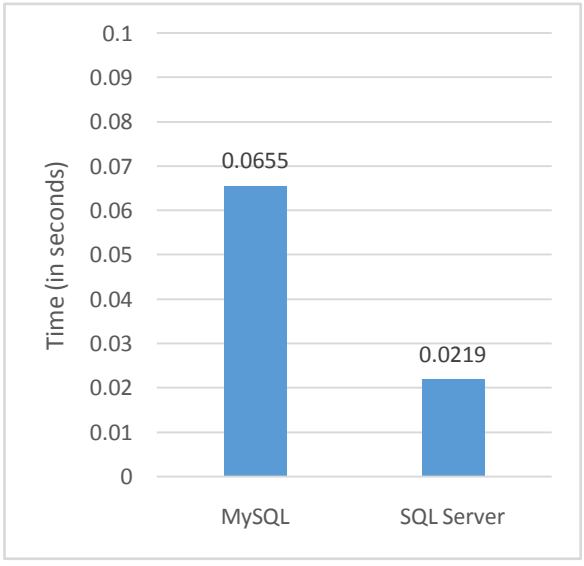

Fig. 8: Averages for conditional DELETE query

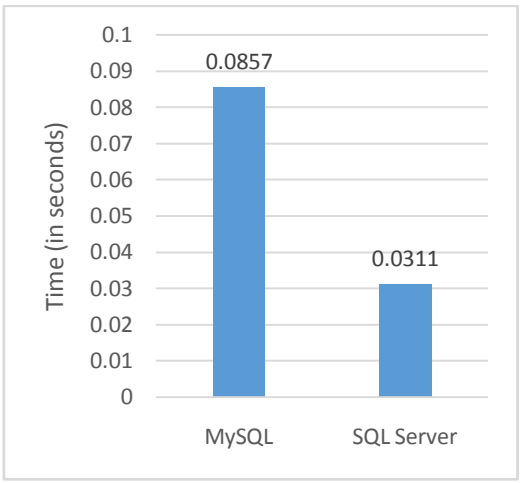

Fig. 9: Averages for non-conditional DELETE query

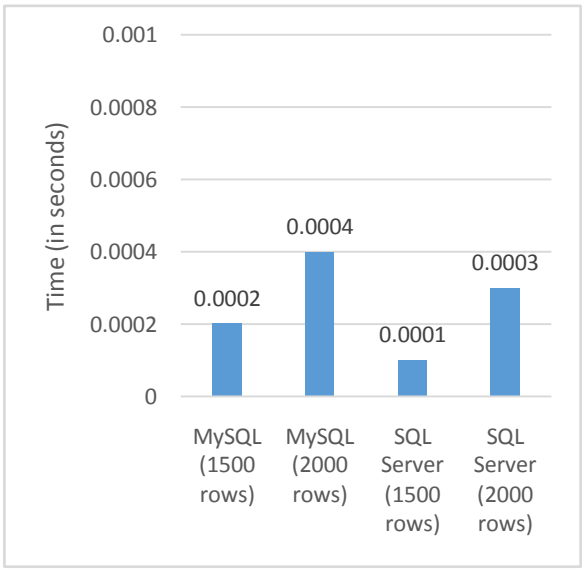

Fig. 10: Averages for conditional UPDATE query

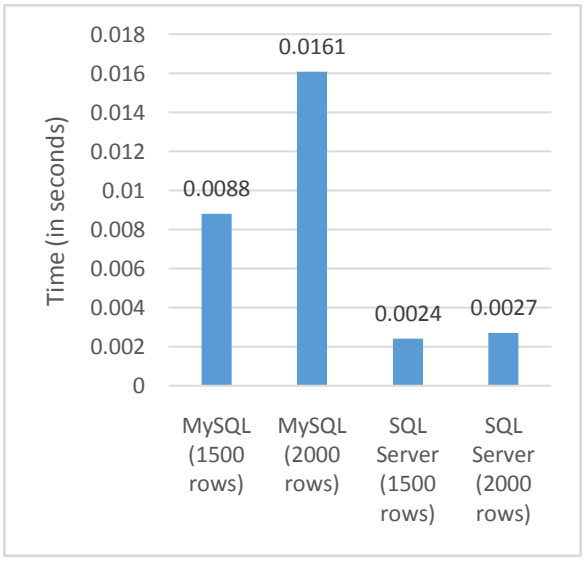

Fig. 11: Averages for non-conditional UPDATE query

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VII. CONCLUSION

The purpose of this paper is to analyse the performance of two popular relational database management systems, MySQL and SQL Server, in terms of time taken to respond to requests.

The results show that SQL Server offers more performance than MySQL in terms of response time. In all the test cases, except INSERT queries, SQL Server consistently took lesser time when compared to MySQL.

MySQL also performed poorly in terms of scaling up. MySQL shows a two-fold increase in time taken when the number of rows go up. SQL Server also showed similar results, but the increase in time taken wasn't as great as MySQL.

The most striking difference in performance was in SELECT statements. In Fig 3, we can see that the time taken by MySQL is two orders of magnitude more than SQL Server when dealing with 3000 rows.

While it may seem that SQL Server is the obvious choice as a backend, its cost is an obstacle for implementation, for a small business. On the other hand, the open-source nature of MySQL means that implementation costs will be minimal. MySQL is capable enough to be used as a backend for a website, and other small-scale applications.

In our future work, the increase in the scope of the analysis in terms of parameters, database systems, DBMS models, and execution environment will be considered. Also, the comparison of the execution time and memory consumption of RDBMS and NoSQL systems on both Windows platform and UNIX platform can be considered for further enhancement.

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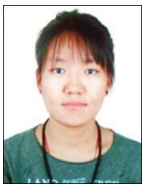
BIOGRAPHIES

Sherin Joy is a PG scholar in the Department of Computer Science, in Christ University. She secured the first rank in her BSc degree. She was also awarded first class in International Chinthana Mathematics 2004-05. She lists Embedded Systems and Database Systems as her academic interests.



Dhondup Dolma was born in Tibet. She earned her Bachelor's degree in Science (Physics, Mathematics and Computer Science), and is currently pursuing her Master's degree in Computer Science from Christ University. She lists Java and Network Security among her academic interests as well as travelling and exploration as her passion.

Amlanjyoti Saikia is from Assam, where he did his Bachelor's degree in Information through distance education. He is currently pursuing his Master's degree in Computer Science from Christ University. He lists AI and robotics among his academic and research interests as well as photography, riding and travelling as his passion.

Prof. Roseline Mary. R currently serves as an Assistant Professor in the Department of Computer Science, Christ University. She obtained her BSc (Mathematics),MCA from Bharathidasan University, MPhil from Alagappa University and MTech from Karnataka State Open University. Her research interests include Database Systems, Big Data, Data Mining and Cloud Computing.