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Comparison of Performance Tuning Methodologies Adopted by different Databases

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Abstract: The comparison of different database which are booming out there in the market nowadays out of which Oracle, My SQL and SQL Server are being compared based on different database performance parameters. Performance usually degrades with the time phase as with the advancement of technology day to day several methodologies are being adopted to resolve this issue as for user using these database is only concerned about the query fetched and response quickly irrespective of any internal resource allocation or overload of the system which plays important role in degradation of performance of any database.

Keywords: *Tuning, Bottleneck, Scalability, Automatic workload repository (AWR), Buffer pool extensions.*

I. Introduction

Database is collection of data in a meaningful way. There are various database out there in market such as Microsoft SQL Server, Oracle, MySQL. Largest vendor out in market are No. 1 Oracle and No. 2, IBM. 3. Microsoft Performance from user point is response time i.e. how quickly the system response to user query and from System point it is capacity to handle the given workload. Due to over use of system resources with more and more workload than the system capacity the performance problem arises. As the performance is usually degrades with the time hence fixing the performance problem is what known as tuning. The main goal is to use effectively the system resource.

In general, the cost of database management is increasingly associated with database administrators [1]. So autonomic computing systems and autonomic DBMSs are proposed [3][4]. It is very complex database tuning considerations affect the performance of random parameters such as Security, Cost, Performance, Scalability, Ease of maintenance and administration, Reliability, Ganek and Corbi [7] introduced the need to autonomic computing and presented four fundamental features of future autonomic computing such as self-configuring, self-healing, Self-optimizing, and self-protecting.

II. Performance area

There are prime four areas where problem can occurs-[14]

- 1-OS and hardware,
- 2-Design,
- 3-Database,
- 4-Application

III. Types of problems

Types of problems that you might see Performance problems tend to fall into two broad categories: [15]

Those that affect the entire system and those that only affects a part of it, such as a particular application or SQL statement. During the course of investigation, a problem of one type might turn into the other, and vice versa. For example, the root cause of an overall system slow-down might be a single statement, or a system-wide problem might first be seen only in a particular area.

There are four common types of bottlenecks, each of which is discussed in detail below:

- 1-Disk,
- 2-CPU,
- 3-Memory,
- 4- 'Lazy system'

IV. Performance Tuning

As the performance of system decreases along with that most systems will respond to increased load. Ability of system to accept higher load is called scalability and synonymous to performance tuning is to handle a higher load. [2]

Systematic tuning steps are follows:

- 1- Inspect the problem and calculate the numeric values that categorize acceptable behavior.
- 2- Before modification, measure the performance of the system.

- 3- Identify the part of the system which is critical for improving the system performance. This is known as bottleneck.
- 4- Modify that part of the system in order to remove the bottleneck

V. System Performance Designing and Developing

These are follows [13]:

1. Excellent system performance begins with design and it continues throughout the life of system.
2. During the initial design phase carefully consider performance issues so that one can tune the system more easily during production.
3. Any performance increases is achieved by adding hardware which need to be considered a short-term relief to an immediate problem. Due to the demand and load rates on the application continue to grow there is a probability that same problem is likely occurring soon.
4. In fact additional hardware does not improve the system's performance at all. No matter how much extra hardware is allocated poorly designed systems perform poorly.
5. For long-term, it is more valuable to increase the efficiency of application in terms of the number of physical resources used for each transaction.

VI. Performance features

The following is the features used for upgrading the performance present in latest version of Oracle 12c, My SQL 5.7, SQL server 2014 at present 2015.

Sno	Oracle	My Sql	SQL server
1	Automatic workload repository (AWR)	Performance dashboard	Buffer pool extensions
2	Automatic database diagnostic monitor (ADDM)	Top performance reports	Resource governor
3	SQL tuning advisor	Query results view	Lock priorities
4	SQL access advisor	Visual explain	Clustered column store indexes
5	End to end application tracing		In-memory OLTP
6	Server-generated alerts		Delayed transactions
7	Database performance page		Cardinality estimation

VII. MANUAL TUNING OR AUTOMATIC TUNING

Performance Tuning is the process of improving the system performance i.e. proper allocation of the system resources. The purpose for tuning is to decrease resource usage or to min the completion time for an operation to complete [12]. Either way, the main aim is to improve the effective use of a particular resource. The Figure1 depicts the entire working schedule of the SQL Tuning Advisor [9].

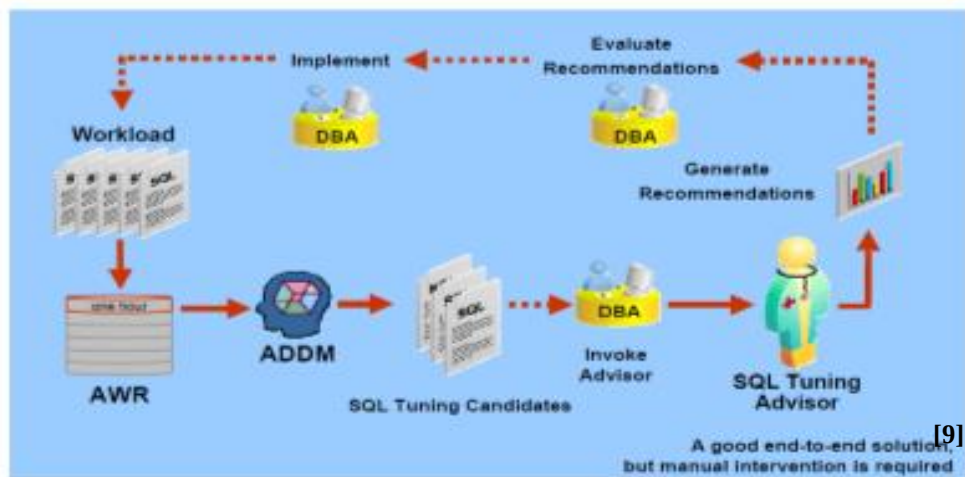


Figure 1: SQL Tuning in Oracle Database 10g

In 10g: The Figure 1[9] depicts the Automatic workload Repository (AWR) which is capable of collecting, processing and maintaining performance statistics for the database. The Automatic Database Diagnostic Monitor (ADDM) is capable of analyzing the AWR data on day to day basis then identifies the root causes of performance problems, gives recommendations for correcting any problems and identifies non-problem areas of the system. It is important to realize that tuning is an repeated process and fixing one problem can cause the bottleneck to transfer to another part of the system.

In Oracle contains an automatic mechanism for performance tuning. This is depicted in the Figure 2[10] as follows:

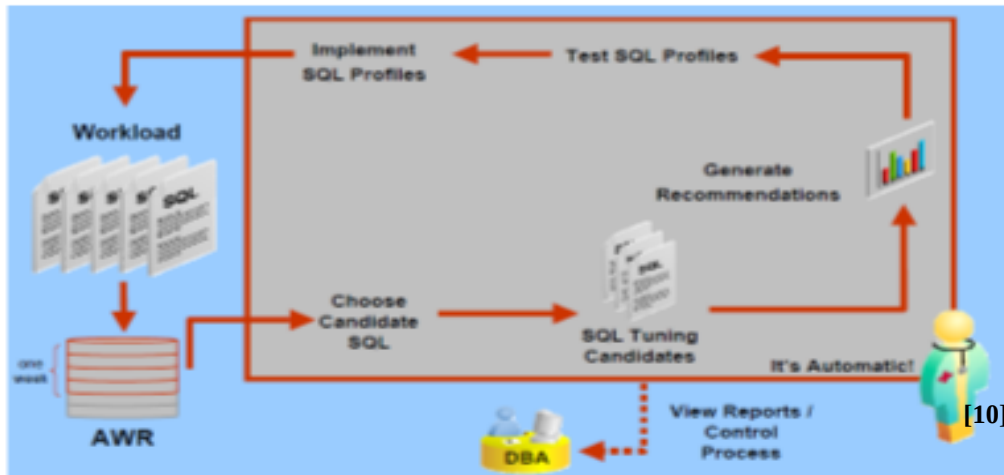


Figure 2: Automatic SQL Tuning in Oracle 11g

In order to resolves the problem that is encountered by the earlier versions of Oracle. Tuning is divided into two main types [11]:

1. **Proactive Monitoring:** Proactive monitoring usually encounter on a day to day scheduled interval where several performance statistics are examined to figure out whether the system behavior and resource usage has changed. Monitoring does not consider as result of configuration changes to the system unless the monitoring encounter a serious problem that is generating.
2. **Bottleneck Elimination-** Tuning usually indicates fixing a performance problem. It should consider as part of the life cycle of an application i.e. analysis, design, coding, production, and maintenance stages. Until the database is in production the tuning phase is left. At that time, tuning converts into a reactive process where the most important bottleneck is identified and fixed.

VIII. Analysis

The analysis is considered on the basis of different databases and based on this parameters, the analysis table is depicted below:

Factors	Oracle	My SQL	SQL server
Security	Less	Less	More
Cost	More	Less	Less
Performance	More	Less	Less
Scalability	More	Less	Less
Ease of maintenance and administration	Less	Less	More
Reliability	More	Less	Less

XI. Recommendations

A performance problem may be recognized when systems is working slow. This occurs due to high system loading i.e. the system resources are used more that its usage causing some part of the system to reach a limit in

its ability to respond. This limit within the system is known as a bottleneck. A number of techniques are used to improve performance of the system.

Automation database helps any enterprise better manage their database operations by reducing response time as well as the overall time taken in database management. Automation works well with any SQL database from the leading vendors like Oracle, MS SQL, and Sequel server. Unlike other automation solutions no as such significant training is required. It is very simple to operate, easy to use yet powerful and it can automate any task. [9]

When the performance of the system degrades due to over consumption of resources in that case buying the additional hardware is just temporary solution. Important is to find the root cause and eliminate the bottleneck i.e. the database design should be optimal, there should be proper allocation of system resources and there should be proper memory allocation.

XII. Conclusion

All these three database are effective and efficient in one or the other way as analyzed, out of them which database need to be implement depends upon on personal choice i.e. for small organization My SQL is suitable where as for big Organization Oracle and SQL server.

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