

# Design and Implementation of Parameter Tuning on Oracle DBMS

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## Abstract

Retrieving data in the huge database resources needs a lot of time since hardware resources cannot be modified in some operating systems. This delay may lead to serious problems in large institutions such as airlines, banks, security or military institution; accordingly, the quality of services and the time of offering these services to their clients will be affected negatively. This delay will be very clear in some operating systems, databases and some reports especially intelligent reports that are retrieved from more than one table. This delay will cause many problems; the most important one is hanging of operating systems. In order to solve this problem, and with the same resources (Memory, CPU, etc...), and without changing hardware or any computer specifications, some parameters from Linux operating system with some Oracle parameter are modified (tuning Parameter) to reduce the delay time of data retrieved from database tables, and thus reducing the hang time on available hardware resources. This research aims to study the relationship between different Operating Systems and Database application, to increase the performance of the database using database parameter tuning with operating system parameters. As a concept, it can be applied on any Operating System with many differences. For instance, Windows Operating System is not as clear as Unix or Linux OSs because we cannot control the hardware resources of the computer to serve operating system requirements. In the contrast with windows, which is dependent on the registry editor construction, it is difficult to be applied in such operating system. So Linux operating system was chosen to implement this study.

**Keywords:** Oracle database, Windows, Linux, Tuning, and parameters.

## 1. Introduction

It is well known that Database Management System (DBMS) becomes popular, and increases dramatically in various fields. So, different studies are introduced to improve the performance of application systems that depend on database management system. Tuning Application becomes an important area to database administrators and application developers [1]. So, both of them provide a considerable amount of time to tune the various functions of the database. A poorly tuned business application can potentially affect not only the end-users but also the entire business operation. For these reasons, companies invest significant resources to ensure smooth running of vital tuning application for their businesses [2]. It has to be mentioned that performing tuning of any

software application is a complex job, since it requires an understanding of various components and subsystems of the software. Database tuning is the activity of making a database application run more quickly, or in other words, it may mean lower response time for time-critical applications. Therefore Database Tuning becomes more relevant than ever before. As a consequence of this trend, Database tuning becomes an important research problem. So, the aim of this research is to focus more particularly on Database tuning.

### 1.1 Introduction to Unix

Software was always customized to serve a specific purpose, and software for one given system didn't run on another system. Being able to work with one system did-

n't automatically mean that you could work with another. It was difficult, both for the users and the system administrators.

Computers were extremely expensive then, and sacrifices had to be made even after the original purchase just to get the users to understand how they worked. The total cost per unit of computing power was enormous [3].

Technologically the world was not quite that advanced, so they had to live with the size for another decade. In 1969, a team of developers in the Bell Labs laboratories started working on a solution for the software problem to address these compatibility issues. They developed a new operating system, which was:

1. Simple and elegant.
2. Written in the C programming language

Instead of assembly code.

3. Able to recycle code.

The Bell Labs developers named their project "UNIX." The code recycling features were very important. Until then, all commercially available computer systems were written in a code specifically developed for one system. UNIX on the other hand needed only a small piece of that special code, which is now commonly named the kernel. This kernel is the only piece of code that needs to be adapted for every specific system and forms the base of the UNIX system. The operating system and all other functions were built around this kernel and written in a higher programming language, C.

## 1.2 Introduction to Linux

This language was especially developed for creating the UNIX system. Using this new technique, it was much easier to develop an operating system that could run on many different types of hardware. The software vendors were quick to adapt, since they could sell ten times more software almost effortlessly.

Weird new situations came in existence: imagine for instance computers from different vendors communicating in the same network, or users working on different systems without the need for extra education to use another computer. UNIX did a great deal to help users become compatible with different systems [3].

Throughout the next couple of decades the development of UNIX continued. More things became possible to do and more hardware and software vendors added support for UNIX to their products. UNIX was initially found only in very large environments with mainframes and minicomputers (note that a PC is a "micro" computer). You had to work at a university, for the government or for large financial corporations in order to get your hands on a UNIX system [7]. But smaller computers were being developed, and by the end of the 80's, many people had home computers.

By that time, there were several versions of UNIX available for the PC architecture, but none of them was truly free and more important: they were all terribly slow, so most people ran MS DOS or Windows 3.1 on their home PCs.

## 1.3 Tunable Kernel Parameters

Tunable (or configurable) kernel parameters are kernel variables that allow the operating system to be configured to fit specific system needs such as (semmsl,semms,semopm,semgni, shmall, shmmax, shmmni, file-max, etc...), resulting in better performance and/or more efficient allocation of resources. The ideal value for each parameter is often determined by the system's particular hardware configuration, the specific mix of applications the system runs, and the trustworthiness of system users; factors that vary widely from system to system.

HP attempts to provide reasonable default parameter settings, but it may be necessary or beneficial to modify these settings to better suit the needs of your particular system's users.

## 2. Statement of the problem

In recent years, the database size and user interaction with database are increased because of the increased use of different applications by different institutions [4][5]. These applications become slow because the response time is increased and throughput rates are decreased due to the large size of database from which the data are retrieved. Since there is constraints on resources of different institutions because of the high costs of modifying the hardware devices from time and then, so why don't we try to find a way to reduce the cost of regular modification of hardware devices by making use of the available resources of the hardware with smart management of Oracle database and Linux operating system. By such management, the retrieval of data will become faster in

addition to that; the cost of modifying hardware is minimized [6].

The goal is not troubleshooting for the database performance problems because of its high cost. This research will encourage the system analyst and database designer to do well from the start and so prevent possible troubleshooting and bottlenecks for the system design. This will offer more time to enhance the system instead of solving high-aged problems. So the goal in this research is to provide a way to optimize Oracle-based systems, not only just tuning a database but by offering common proven tools to support system performance and tuning Oracle under different Operating Systems.

### 3. Suggested solution

The suggestion is using Oracle with Linux or Unix operating system because all hardware Parameters can be modified. Also applying such approach will be beneficial in systems using windows operating system with large database records to minimize the Execution Time for SQL statements. This approach can be applied in institution dealing with huge database such as Banks, Airlines Companies and Universities to provide good responsiveness and economical issues and good utilization for all parameters related.

### 4. Experimental Work

In this paper Linux and Oracle parameters are configured to prove the research hypothesis which says that if Linux and Oracle parameters are configured in a certain values, then the results of the performance are found in a more effective way than windows and Oracle parameters when it used, so a program is developed to measure the time needed to execute SQL statements on each operating system with showing the actual time needed to execute these statements.

#### 4.1 Phases of experimental work

The program used to describe Of-timer and SP-Timer packages (procedures and functions), each one of them consists of package specification and package body, and this is standard way to write in oracle language, the package is called from oracle form to execute it and show the results.

This research mainly concentrates on the configuration of different Oracle and database parameter, because controlling these parameters will lead to the dramatic reduction on time required for data retrieval more than any other steps that SQL statements pass through.

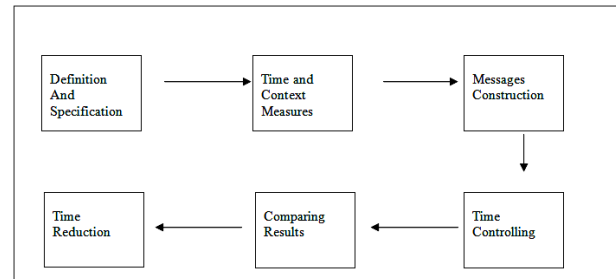


Figure 1 phases of experimental work

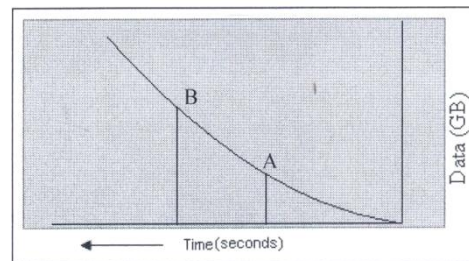


Figure 2 Efficiency after setting parameters

#### 4.2 Computer specification (test Environment)

##### 4.2.1 First Environment Specification

Processor : 798 MHz

Memory : 256 MB

Operating system : Windows XP Professional (Service Pack 2) Red Hat Enterprise Linux ES (2.6.9-55 EL)

The following table contains SQL statements that are chosen randomly and executed by using the previous program on two different operating systems (Linux, Windows), the results are shown below and also figure for clarification.

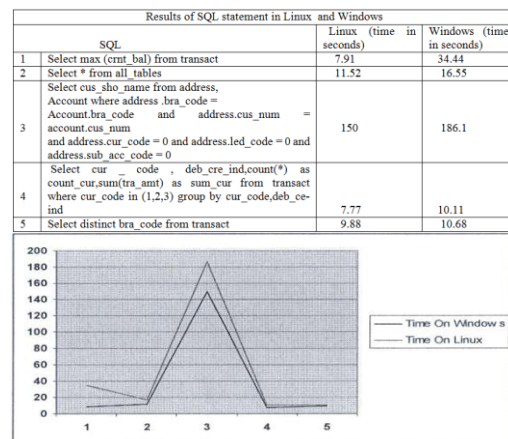
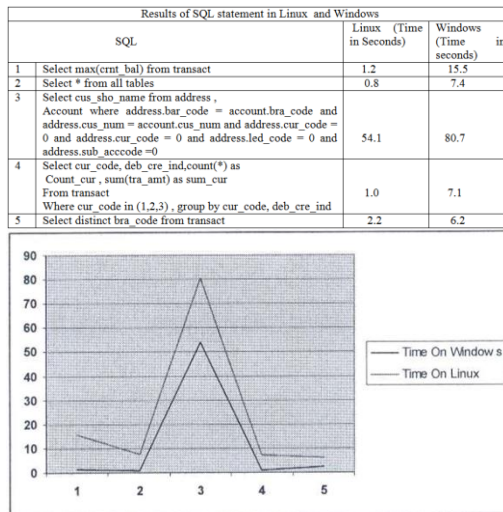


Figure 3 Comparison SQL statements in different operating Systems-256 RAM

### 4.2.2. Second Environment Specification

Processor : 1500 MHz  
 Memory : 512 MB  
 Operating Systems: Windows XP Professional (Service Pack 2)  
 Red Hat Enterprise Linux ES (2.6.9-55 EL)

The following table contains SQL statements that are chosen randomly and executed by using the previous program on two different operating systems (Linux, Windows), the results are shown below also the figure for clarification.



**Figure 4 Comparison SQL statements in different operating systems -512 RAM**

After executing SQL statements on different operating systems, results show that using 512 RAM memory is more efficient than using 256 RAM memory , since SGA components consumes more memory, so the setting of parameters is done on 512 RAM memory.

The above figures show the executing time in Linux operating system is better than windows operating system because the red line could reach hanging point.

### 5. Conclusions

- In this research we provide an overview of kernel parameters that are related to Linux operating system and the way of configuration them. On the other hand, we illustrate Oracle Architectures, parameters and configuration.
- Desire to reduce the execution and retrieval time in the same resources without additional time in the same resources without additional cost.

We connect the parameters from operating systems with Oracle parameters. We find that if we only tune the operating system parameters, time will be reduced in a certain amount, also if we only tune Oracle parameters, time will also be reduced in another certain amount, so we combine all parameters to get the least possible execution time. That means the SQL statements when applied on Linux operating system are executed successfully, in contrast with windows operating system which hanged when applied the same SQL statements, although the memory space is the same.

### REFERENCES

- [1] A. Abounaga , “Building Histograms Without Looking at Data.” , Computer Science Department , university of Wisconsin, 1999 .
- [2] B. Darmawan, G. Groenewald, A Irving, S. Henriques Soares Monteiro, K. M. Snedeker , "Database Performance Tuning on AIX" ,January 2003.
- [3] D. Shasha & P. Bonnet , M. Kaufmann Publishers; "Database Tuning Principles, Experiments, and Troubleshooting" , <http://www.mkp.com/dbtune> Techniques , 2002.
- [4] Oracle Company , “Oracle Database 10g –Administration workshop 1 , Volume 1 ,D17090GC30 , November 2005
- [5] Oracle Company , “Oracle Database 10g –Administration workshop 1 , Volume 2 ,D17090GC30 , November 2005
- [6] Oracle Company , “Oracle Database 10g – Performance Tuning” , Volume 2 ,D19165GC10 , February 2006.
- [7] Michael Kifer, Scott A. Smolka , Introduction to Operating System Design and Implementation, 2007