



INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Research on Search Optimization Based on Oracle Database

¹ Mr Shani R Patel, ² Dr. Viral Parekh

¹ Assistant Professor, ² Associate Professor

¹ C P Patel & F H Shah Commerce College (Autonomous) Anand, ² Hasmukh Goswami College Of Eng. & Technology, Vahelal

Abstract: With the continuous progress of human civilization, the whole society has accelerated the process of informatization. With the continuous enrichment of social life, a large number of information data are produced every day. In order to meet the information needs of financial, administrative and other fields, Oracle database technology is applied, and its efficient and accurate data query features give powerful help to all walks of life. However, with the increasing amount of information, the structure of Oracle database system becomes more complex and chaotic, and even has a serious impact on the stability of the database. In order to improve the stability of Oracle database and further improve the performance of data search, this paper studies the optimization of search based on Oracle database. This paper mainly studies the optimization scheme of the physical layer and software layer of Oracle system, and optimizes the SQL statement after adjusting the hardware structure of the system. Through the simulation, it is found that the stability of database and the response time and accuracy of search query can be improved by improving the structure of database server and optimizing SQL statements.

Keywords: Oracle Database, Data Query, Search Optimization, SQL Statement

1. Introduction

Oracle database query system has become the most widely used database system because of its excellent multi-platform compatible operation and good portability [1]. In addition to the support of numerous platforms, strong versatility, Oracle database also has a strong and comprehensive data management capability [2]. Based on these advantages, Oracle database is playing an important role in many fields. Especially in today's rapid development of information technology, the value of data is constantly being mined, and more and more attention is paid [3].

A few years ago, the Internet has not yet been popularized, and the wave of data has not swept the world. However, with the rapid development of data communication technologies such as the Internet of things in recent years [4-5]. With the deepening of social data, the total amount of database management data is also growing exponentially. The explosive growth of data makes the performance of database gradually lag behind the production demand [6]. The larger the amount of data in database management, the longer the response time is required to extract the required information. At this time, how to reasonably optimize the database search mechanism has become a key point to improve the performance of the database [7].

The progress of science and technology always promotes each other with social progress. In the early stage of the development of database technology, it is mainly aimed at the data management which the total amount of information is not too large [8]. With the development of various industries, the storage of data

is more and more large, and the structure of database system is also constantly expanding, improving and becoming more complex. For data, the stability of storage is very important, but with the complexity of hardware structure, the stability is greatly affected, and the design of software system is more and more complex and difficult [9]. By improving the performance of the hardware structure, the physical constraints of database performance are improved. However, the full play of performance depends on the cooperation of software. The execution efficiency of different algorithmic statements is greatly different. Therefore, in order to further improve the performance of Oracle database system, it is necessary to optimize and improve the hardware structure and SQL statement algorithm from the physical layer and software layer at the same time [10].

2. Response Time, Throughput and Hit Ratio

2.1 System Response Time

In order to obtain the required information through database query technology, users need to send a request to the database server, that is, SQL statements with request instructions and target information. The timing starts from the client submitting the request to the server. The database receives the request information, searches and sorts out the target information, and returns the result from the server to the client. When the client receives the returned result, the timing ends. This period of time is defined as the system response time, that is, the time taken by the database server system to return the results of user requests. The order of magnitude is usually millisecond or second.

Therefore, the system response time can be divided into the consumption time of data transmission process and the consumption time of database server processing the request to find the target data, that is, the former is the user waiting time, and the latter is the system service time. The relationship formula is as follows:

$$SRT = IST - PET \quad (1)$$

System response time (SRT); instruction submission time (IST); processing end time (PET)

2.2 System Throughput

In order to reflect the processing speed of SQL instructions, the concept of system throughput is defined: the ratio of the total number of instructions analyzed by the database in a period of time to the time consumed in the analysis process. From its definition, we can see that the throughput reflects the strength of the server processing capacity. For the same number of tasks, the response time of the database server with large throughput is less than that of the server with small throughput. The expression is as follows:

$$TPS = \frac{IPN}{TC}$$

(2)

System throughput (TPS), number of instruction processing (IPN), consumption time (TC)

2.3 System Hit Rate

In the process of searching relevant information according to the client's request instructions, the database server needs to find the relevant results in the massive database. The process of finding relevant results are also called buffering process. In the process of buffering, the server needs to analyze and check a large number of data, and separate the data that meets the requirements of the request instructions. The system hit rate is defined as the ratio of the effective amount of information separated by the server and the total amount

of information processed. It can be seen from the definition that the system hit rate itself reflects the processing efficiency of the server, and the expression is as follows:

$$SHR = \frac{ED}{TAD}$$

(3)

System hit rate (SHR); effective data (ED); total analysis data (TAD)

3. Server and SQL Optimization Effect

3.1 Test Background

The data search function of Oracle database is mainly realized by query system. The following Table 1 shows several common query systems.

Table 1. Oracle Database Query Technology

Oracle Database Query Technology	Data Partition Query Technology
	Data Index Technology
	SQL Statement Query

Index technology is usually used, and the realization of index technology is based on data list to establish index directory. Through a certain data characteristic of the data arrangement and comparison, to complete the query function. An index is an auxiliary object built on a table column, in which a pointer to a row in a table is stored to uniquely determine the ROWID of a specific row in a database. Index query technology can effectively reduce disk I / O operations, improve query response time, and improve system performance and processing capacity.

3.2 Optimize Content

Adjust the SQL statement and improve the execution efficiency. Optimize and adjust the memory and buffer of database server to improve the efficiency.

3.3 Test Content

Taking the data of a leasing management platform with a total data size of 1t as the test data, the optimization effect of Oracle database is tested. The search affects parameters before and after optimization was collected and compared.

4. Search Optimization of Oracle Database

4.1 Analysis of Optimization Results

As shown in Figure 1 below, it is the test result of optimization scheme constructed with 1t data as experimental carrier in an Oracle database query system.

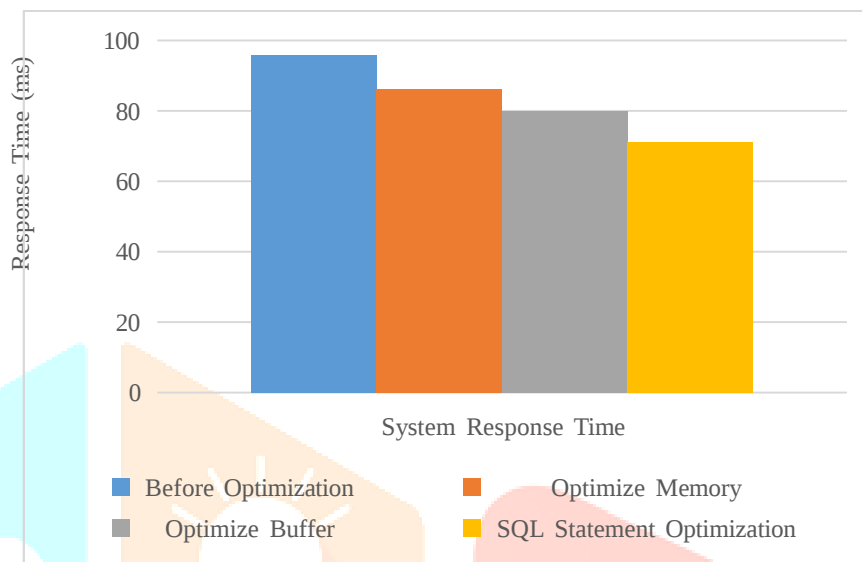


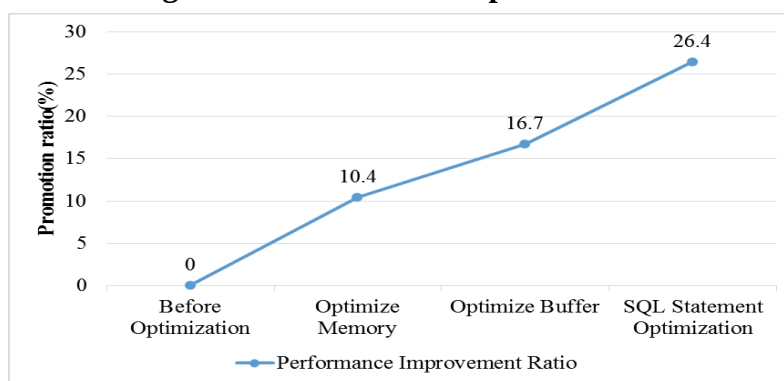
Figure 1. Database optimization results

According to Figure 1, it can be seen that different optimization objects achieve different effects in the whole process from the database receiving the data query request to the client receiving the query result returned by the server. Memory is the data storage unit of database. All kinds of functions of database are inseparable from the support of memory. Therefore, the performance of memory, including stability, read-write rate and so on, plays an important role in the performance of the whole database system. A cache is a high-speed memory used to store the operation to be performed or the storage address of common objects.

The computing speed of the core CPU of the database server is much faster than that of other hardware. If the capacity of the cache is large enough, it can store more addresses of the content frequently accessed by the CPU, so as to provide faster analysis and execution for the access and operation of these contents by the CPU, simplify the unnecessary addressing process, reduce the waiting time of the CPU, improve the CPU execution efficiency, and greatly reduce the system response time. Among the optimization results of memory, cache and SQL statement, the optimization of SQL statement has the best improvement effect, and the query system has the fastest response speed. In Oracle database system, SQL statements account for a large proportion.

However, the timeliness of different algorithms is very different. By adjusting the algorithm structure of unreasonable SQL statement, the response time of query system can be greatly improved.

Figure 2. Performance Improvement Ratio



According to the improvement ratio of Oracle database performance by different optimization schemes shown in Figure 2, the performance optimization effect of data storage unit is good, and the new performance is improved by 10.4%, but it is still lower than the optimization scheme for other structures.

However, the improvement of hardware performance of storage unit raises the physical limit of the system and creates more room for improving the effect of software optimization. The core of instruction analysis and data collation is CPU. By increasing the capacity and performance of cache, the CPU efficiency can be better developed and the performance waste can be reduced.

The software design determines the specific operation mode of the database system function, and the improvement of memory and buffer improves the potential of software optimization. Through the line chart, we can see that the optimization of the software system, that is, the SQL algorithm statement, can improve the performance of the system, up to 26.4%, which is consistent with the previous analysis.

4.2 SQL Statement Optimization

SQL is the best language for data management, so SQL language is often used to write software system in Oracle database system. Table 2 shows the functions and main features of SQL language.

Table 2. Functions and main features of SQL language

Function s and main features of SQL language	Main Functions	Main Features
	Data query	Comprehensive and unified
	Data manipulation	Highly non procedural
	Data definition	Set oriented operation mode
	Data control	Provide two ways of using the same grammatical structure

From Table 2, we can deeply understand why SQL is a data-oriented language. SQL language integrates the four functions of query, manipulation, definition and control in the process of data processing, and fully covers all aspects of data management.

These data management friendly features are formally based on SQL language. SQL statement has become the most commonly used preferred language in data analysis and its application. In Oracle database, most of the data are managed by SQL language.

This is the reason why for Oracle database software optimization, the preferred target is focused on SQL statement optimization. SQL itself is a very flexible language. When implementing a functional requirement, the speed and efficiency of SQL programs with different algorithm structures are also different. Therefore, reasonable optimization of SQL program structure can greatly improve the database performance.

Through the optimization of SQL statements, the improvement of system performance is mainly reflected in two aspects: first, the excellent data search algorithm can greatly reduce the time and resource consumption of system analysis data, such as half search and sequential search; secondly, efficient program design itself can omit many unnecessary links when executed by CPU, and give full play to CPU performance and improve efficiency. The optimization of SQL program has been deeply studied, and now there are special SQL optimizer and optimization rules.

The combination of Oracle optimizer and SQL optimization rules can not only ensure the correctness of query results, but also improve the quality of the system and reduce the burden of the system. In this way, not only the database performance is improved, but also the operation efficiency of the system is improved. Here are some suggestions for optimizing SQL language:

In order to solve the problem of high system resource utilization, the best way is to reduce the number of queries that the CPU wants to store during the execution of SQL language. During the execution of SQL language, the system will set up a syntax tree for the frequently executed sentence structure and store it in the shared pool to facilitate the next execution speed. Therefore, writing similar SQL statements to make full use of the convenient function of syntax tree can effectively improve the efficiency.

Select more where statements to replace having statements. Oracle database needs to use more having statements, but the execution level of having statement in select statement is lower, which greatly inhibits the running efficiency of Oracle database. If the usage times of having statement can be maximally limited and the retrieval of Oracle database can be reduced before executing having statement, useless data can be filtered out before SQL statement grouping. This makes the subsequent grouping operation less expensive.

The optimization rules for SQL language are the experience accumulated and summarized by people in the long-term practical research. It can be used as a reference. How to realize the optimal writing of SQL program requires not only abiding by the rules, but also some innovative ideas and a large number of practical tests.

4.3 Cache Optimization

In the basic structure of Oracle database, different buffers are designed for different functions. The system global area is a buffer collection area designed to realize fast access to data in database management system. Its sub buffers are dictionary cache, data buffer cache and library cache. Among several sub buffers, dictionary cache and library cache constitute a new level of structure, which is called shared pool.

The cache process of Oracle database is mainly to adjust the structure and size of each buffer in the global area of the system. As mentioned above, in order to achieve high-speed data access in the global area of the system, when the performance of the global area of the system cannot meet the requirements, structural optimization must be carried out. The cache adjustment mainly refers to adjusting the structure and capacity of the memory that constitutes the global area of the system to improve the system performance.

4.4 Memory Optimization

The main component of Oracle database is storage, which is related to the performance of the whole database. The storage of Oracle database is the embodiment of the whole database information and data input. Therefore, when optimizing and adjusting the storage of Oracle database, it will be affected by the distribution space and distribution form of memory.

Facing this situation, in order to ensure the rationality of Oracle database storage optimization and the effectiveness of adjustment, based on the engine, the information and data in Oracle database storage are adjusted and optimized, and the data and information of Oracle database are simplified to ensure the use effect of Oracle database engine and the accuracy of Oracle Database engine.

5. Conclusions

As science and technology plays a more and more important role in production and life. Various fields have begun to combine with digital journey. The continuous promotion of cloud computing and the Internet of things has detonated the information production of human society. The reserves of information and data are constantly growing in the situation of exponential explosion. The performance of the original Oracle database management system has been unable to meet the needs of people. Therefore, this paper studies the optimization scheme of physical layer and software layer of Oracle system, and finds that the performance of Oracle database management system can be greatly improved by optimizing the hardware structure of database system and combining with the algorithm of SQL statement (software design).

References

- [1] Li H , Liu H , Liu Y , et al. AN OBJECT-RELATIONAL IFC STORAGE MODEL BASED ON ORACLE DATABASE[J]. *International Archives of the Photogrammetry Remote Sensing & S*,2016, XLI-B2:625-631.
- [2] Schaeffer C , Booton L , Halleck J , et al. Data management /[J]. *Health Care Manager*, 2017, 36(1):87-95.
- [3] Joseph S R , Hlomani H , Letsholo K . Data Mining Algorithms: An Overview[J]. *Neuroence*, 2016, 12(3):719-43.
- [4] Bosch R M V D , Espin C A , Chung S , et al. Data-Based Decision-Making: Teachers' Comprehension of Curriculum-Based Measurement Progress-Monitoring Graphs: VAN DEN BOSCH ET AL.: COMPREHENSION OF CBM GRAPHS[J]. *Learning Disabilities Research & Practice*, 2017, 32(1):46-60.
- [5] Li S , Xu L D , Zhao S . 5G Internet of Things: A survey[J]. *Journal of Industrial Information Integration*, 2018, 10:1-9.
- [6] Ozkan T . Criminology in the age of data explosion: New directions[J]. *The Social Science Journal*, 2019, 56(2):208-219.
- [7] Brynjolfsson E , Geva T , Reichman S . Crowd-Squared: Amplifying the Predictive Power of Search Trend Data[J]. *MIS Quarterly*, 2016, 40(4):941-961.
- [8] Adam H , Pau A , Cesare C , et al. BIGNASim: a NoSQL database structure and analysis portal for nucleic acids simulation data[J]. *Nuclc Acids Research*, 2016(D1):D272-D278.
- [9] Pirk H , Moll O , Zaharia M , et al. Voodoo - a vector algebra for portable database performance on modern hardware[J]. *Proceedings of the VLDB Endowment*, 2016, 9(14):1707-1718.
- [10] Ender Sevinç, Ahmet Coşar. An Evolutionary Genetic Algorithm for Optimization of Distributed Database Queries[J]. *Computer Journal*, 2018, 54(5):717-725.