Research on Database Application Performance Optimization Method

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Keywords: Database, Application, Performance Optimization, Method

Abstract. Optimization of database systems for the normal operation of the whole system plays a vital role, but it is a very complex task. The final decides the database performance database availability. A database can be up and running, but if you want to take a long time to return results, then their use will be limited. From the user's point of view, if the actual throughput for a given period of time in the database is high, the actual performance of the database is higher. On the other hand, the poor performance of the database to run a large complex query seems to stop at some point, like a database does not exist, so was anxious to let the user. Therefore it emphasizes optimization is very important.

Introduction

Database application system currently used by the main database platform Oracle, Sybase, SQL, Server, DB2 other large relational database, Oracle for its openness, efficiency, reliability and confidentiality has become the first choice of many developers. However, due to the huge Oracle architecture, and the management is very complex, so a lot of database application system after Oracle as the database backend development for some time, there have been some problems in the use of performance, such as running slower reaction time becomes longer and the like. Usually developers often done at the application layer optimization process, such as the optimization of SQL statements, but sometimes the effect is not obvious, this is because many performance optimization must be adjusted to the DB server to complete.

Database is a database management system is more widely used, but the response time with the information age and the rapid expansion of the continuous generation of data, database applications have increased. How to network traffic, disk I / O and CPU time is minimized, so that the shortest response time of each query and maximize the throughput of the entire database server, to optimize the performance of database applications, it is particularly important. When the database optimization requires a thorough analysis of the requirements of the application, understand the logical and physical structure of the data, co-ordination from the viewpoint of the operating system, application design, indexes, stored procedures, transactions, etc., form the overall scheme of the system this paper made some research on this.

Consideration of performance issues should be run through the whole process of the development phase. The life cycle of a database system can be divided into: the design, development, and finished three stages. In the design and development phase of database performance optimization into wood a minimum, the largest gains.

Database Design

Logic Design. Logical database design, including relationships between tables, which is the core relational database optimization. A good logical database design can lay a good foundation for the optimization of databases and applications. Comply with the rules of database design usually comprises a large number, there is the relationship between the narrow tables instead of wide data table with many columns, columns and more tables to produce less, thus reducing data redundancy, thus reducing the page for storing data, to improve the efficiency and reduce the possibility of the application due to data inconsistencies caused the error. However, table relationships may need to merge through a complex process that will reduce system performance. Some degree of

standardization of the non-performance of the system can be improved, non-standardized procedure can be carried out using a variety of different ways depending on performance considerations, the preferred strategy is standardized design as a starting point, and for specific reasons selective some tables.

Physical Design. To achieve physical design optimization, we must understand and make good use of database access format and operating characteristics of hardware resources, especially memory and disk subsystem I / O. Associated with each table column's data type should reflect the minimum required data storage space, especially for indexed columns even more so. For example, be able to use type do not use integer type, so the index fields can be read faster, and more data can be placed in rows on a data page, therefore reducing the I / O operations.

Steps of Performance Optimization

Many people believe that optimize database application system is in operation of the system when there is a problem, which is when this view is wrong. Optimization work during the system planning and design phase has already begun, and has been throughout the operating cycle of the system. In the process of tuning the database requires application designers, application developers, database administrators and system administrators together. The following order of priority given step optimization:

Optimize the Business Logic. For best performance, the database design process to use business logic. This is related to the overall system level analysis and design. Like whether the system-wide adoption of such threaded server configuration issue is the need to consider the issue at this stage. Such designers with the performance requirements of specific business requirements directly linked;

Adjust the Data Structure Design. In the data design phase, the designer must decide what data is required for the application, but also consider the relationship between what is important and what are their properties, but also to determine which attributes can be used as the primary key (Primary Key) or foreign key (Foreign Key). Finally, to construct a good information to better meet performance goals. This phase requires a careful analysis of the data, to avoid data redundancy, taking into account a reasonable distribution of data in order to prevent congestion data access, such as whether to use the database partitioning feature, and for frequently accessed database tables need to establish whether local or global indexes;

Adjust the Application Structure. This step needs to consider the application uses what architecture is the use of the traditional Client / Serve: two-tier architecture, or use the three-tier architecture Browser / Web / Database of. Database resources of different application architecture requirements are different;

Optimize the Logical Structure of the Database This stage is through increase, decrease or adjust the logical structure, such as consideration other than indexing on the primary and foreign keys to add other indexes to improve system performance;
Operation

Database Optimization. This phase before optimize the database server, first make sure that the application has been fully utilized in order to improve the performance and design of SQL and some special features. As Oracle database array processing, Oracle optimizer, row-level locking management and PL / SQL and so on. Execution of the application will ultimately boil down to the database SQL statement is executed, and therefore the efficiency of SQL statements the final decision of the properties of the database performance analysis and optimization of database application system. Whether it is writing a new adjustment or had some performance issues with SQL statements should use less CPU or disk UO and other resources as the main objective;

The Access Path Optimization. In order to ensure efficient data access path, consider using cluster (clusters), B * tree, bitmap index, and optimizer hints. Taking into account the table and histogram analysis to analyze each column, in order to help the optimizer determine the best query plan;

Optimize Memory Allocation. Memory allocation is optimized configuration information in the

system is running. In Oracle, for example, a database administrator can be adjusted according to the database Health System Global Area (SGA area) data buffer, the log buffer size and shared pool; you can also adjust the program global area (PGA area) in size. Note that, SGA zone is not the bigger the better, SGA region over the General Assembly takes up memory the operating system caused the virtual memory page swapping, so it will reduce the system. A reasonable allocation of memory resources can improve cache performance, reduce SQL statement parsing time, and reduce paging and paging;

Optimize the Physical Structure of the Database and FO. Database data is ultimately stored in the physical disk, access the data is read and write to these physical disk, so the physical storage of these optimization is an important part of system optimization. Although the physical storage optimization is not possible to reduce the number of physical storage read and write, but it can make them read and write as much as possible in parallel, to reduce disk reading and writing competition, thereby enhancing the efficiency of physical storage can also be precisely calculated to reduce unnecessary expand the physical storage structure, to improve system performance;

Adjust the Underlying Platform. Based on the underlying operating system, it adjusts to make the database more efficient operation. For example: UNIX operating system running on an Oracle database, you can adjust the size of the UNIX data buffer pool, each process can use the memory size and other parameters;

Adjust Network Performance. Large databases running inseparable is from the network, so the network configuration is good or bad has a direct impact on the efficiency of the database application systems. For example, the same application is executed on a client faster, and in another client but slow running, this indicates a problem on the network, the network needs to be adjusted. In fact, the linkages between the database optimization step, influence each other. Sometimes with several steps were sometimes done in the back of the adjustments need to return to the previous step and then adjust, and so forth constantly, until achieve the desired result.

Optimization of Database Application System

Optimize the Database Server. Fully understand the size of the computer's memory and main memory database usage and understanding of the working principle of the main memory will help tune the database. Here's to the Oracle database to illustrate the optimization of the performance of the memory. In Oracle, tuning memory usually refers to the adjustment of the Shared Global Area (SGA). This includes monitoring and adjusting the shared pool (library cache and data dictionary) and database cache. Adjust and adjust the application memory and input / output closely linked, since a major objective of a reduction or elimination of adjustment contention in all aspects of the adjustment process involves.

Optimize SQL Statements. And application design, as adjusted for the SQL statement seems to have nothing to do with the responsibility of database management. However, database administrators should check the SQL involved in a part of the application is written. A well-designed application, SQL structure is not ideal if you are using will still experience performance issues. In a properly designed database application design and SQL performance issues cause most of the problems. In a relational database, application design, not as good as the physical location of data is important to its logical position. However, the database must find the data, so that it can return the user to perform the query. Therefore, the key is to make adjustments SQL database to find the most simplified data path.

The optimization process is an internal mechanism used by Oracle, it can calculate the most efficient access paths to obtain the data required to satisfy SQL statements. Oracle provides two internal optimizers: rule-based optimizer and cost-based optimizer.

Optimize Operating System Platforms. The database server is heavily dependent on the operating system to run the server, if the operating system cannot provide the best performance, then the adjustment in any case, the database server cannot play its proper performance. Here mainly to the Windows NT platform, for example, instructions to run on the NT platform like Oracle to deal with large database operating system to do what changes.

Optimize Network Performance. Running large databases inseparable from the network, the network performance will directly affect the performance of the database. The main adjustment is to minimize network Internet data traffic on the network in order to reduce resource contention. Here's to oracle database as an example, explain how to adjust network performance. The Oracle SQL * Net is a network protocol or Nets, it is located in the session layer Open Systems Interconnection seven layer structure, which provides transparent connectivity to Oracle servers and clients. The so-called transparent connectivity means that SQL * Net / Net8 received from the Oracle application SQL statements via the interface layer and these statements packaged and sent to the database in a standard format. Oracle client application using SQL * Net / Net8 to communicate with the Oracle server, and SQL * Net / Net8 is responsible for establishing and maintaining (final safety shut-off) to open the client (or server) session between the server and the network connection.

Conclusion

Database optimization is a complex, involving very broad question, there is no fixed pattern to solve the need to analyze specific issues. Given above is only a general principle of optimization, in front of the main article in the Oracle database, for example, from the database server, SQL statements, running the operating system and network performance and other aspects of the Oracle database application system may encounter various performance issues provides a general solution under different circumstances, we hope to provide a database application system the general idea of optimization methods.

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