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Effectiveness of Memory according to Buffer Size

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Abstract. This paper compared and analyzed efficiency of each storage medium, by changing the size of data buffer caching in a memory, after connecting DBMS with a storage medium. According to the result of the test, both performances of storage media increased, as the buffer size was greatly reduced. Seeing that D-SSD's performance and HDD's performance changed from above 1GB and 2GB, respectively, it is supposed that there is no need to cut down the buffer size infinitely, because performance doesn't change from a certain section, although it improves, as the buffer size highly decreases. It isn't necessary to expand the buffer size greatly under the small load, since there was no change of performance, even when the buffer size was greatly increased under the small load. While D-SSD also can maintain its performance without any big change, if it exceeds the scope of capacity that the buffer can process, HDD and NBD benchmark test, for small loads for reading, printing out, or searching posts, it is necessary to reduce the two storage media largely.

Keywords: NBD becchmark, QphH storage, Buffer Size, effectiveness

1 Introduction

Tuning DBMS requires a lot of expertise, Thus, it is actually difficult to tune DBMS if you are not am expertise. Currently most of DBMSs have a parameter that can adjust a size of the buffer allocated from the memory. This parameter is used to set the size of the data buffer where the database server is cashing in memory. If the buffer size is alloted a lot, the data page is cashed to the buffer. Thus, it has the advantage of being able to reduce the disk I/O. On the other hand, if this parameter value is excessively set, the system memory is excessively occupied. Accordingly, the phenomenon that the buffer pool is swapped by an operating system. It is generally recommended to set the parameter value to be within 2/3 of the system memory. But if the workload and the storage medium are different, the expediency can vary

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accordingly. In addition, if the capacity that the buffer can process is largely exceeded, the performance may be largely differ. In this study, the efficiency by storage medium according to changes in the buffer size was compared and analyzed focusing on parameters setting the size of the buffer that most of DBMSs have in common in relation to storage media.

2 TPC (Transaction Processing Performance Council)

In this study, TPC-H model is only used even though there are other models such as TPC-C, TPC-H, and TPC-E. TPC-H is a benchmark tool that is used to measure how fast it can process a complex SQL. It is defined as a data set of 22 SQL sentences, DB schema, and 1GB or so. It is a certified performance test using SQL (Structured Query Language) which is configured with the combination of task-oriented Ad-hoc Query(atypical search) and simultaneous data modification operation against massive data. It means a test environment in which users process query without prior knowledge rather than writing optimal SQL with specific knowledge of the DB data structure and layout. Like data warehouse environment, it is regarded as the most common and certified test environment to check the DBMS processing performance for general multiple users. Fig.1. represents the business environment of TPC-H. Extemporary Query and modified transactions are performed on the table from multiple users. It is modelling the situation that data are distributed into the database of decision making support system from the OLTP (On-Line Transaction Processing) and then input. The system performance of 22 complex Ad-hoc Query reflecting an actual business situation and 2 Refresh Functions is measured. The unit of performance measurement of TPC-H is QphH@Size (Query-per-Hour)[1,2,3,].
This value reflects various aspects of the ability that a certain system can process Ad-hoc Query. It is geometric mean of TPC-H Power and TPC-H Throughput. If the performance of a certain system is 3413QphH@100GB, for example, it means that it can perform atypical questions of 34.13 a year against 100GB of data and produce results. Figure. 2. represents the database schema of TPC-H.

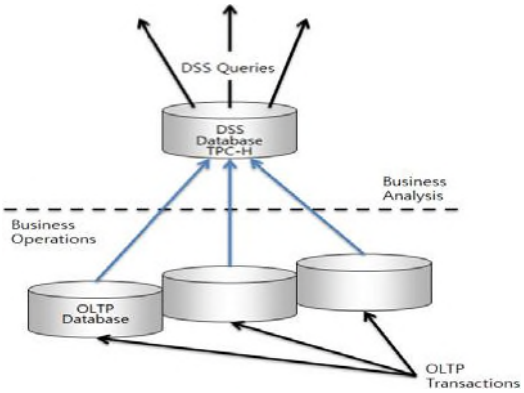

Fig. 1. TPC-H Business Environment

Query statement used in TPC-H is consisted of Ad-hoc Query statements necessary for an actual business situation. This is a lot more complex than ordinary OLTP transaction, includes a wide range of manipulations and constraints, and generates a concentrated load against the overall parts of the database including Memory and I/O as well as CPU.

3 Experimental environment and Experimental condition

In this paper, first the TPC-H model was applied to the server and the test was executed. Table 1. shows the system specifications for tests.

Table 1. System specifications for tests.

	System
CPU	Intel Xeon(R) CPU X5550 @ 2.67GHz
Memory	8GB
OS	Linux CentOS 5.3
DBMS	MYSQL 5.0.90, CUBRID 2008 R4.1
Storage media	SAS HDD(300GB), D-SSD(120GB)
Tool	TPC-H(DBGEN), NBD benchmark

Figure 2. shows the logical structure of the server to view the performance by storage media.

If the capacity of range excessively reaches the level that the buffer cannot process, it comes directly to access the disk. Then, it is needed to set a parameter that is set to be directly accessed to the disk, not to go via the cash. In MYSQL, it is possible to set using Innodb_flush_method. Tests were executed in case of going via the cash by setting this parameter or by directly accessing the disc.

4 Efficiency by Storage Media according to Changes in the Buffer Size of MYSQL

In MYSQL, MYISAM engine types are not suitable for sites where financial transactions such as banks and shopping malls are done. Thus, these sites are required to apply an INNODB engine type or an engine with transaction capability. In this paper, for tests on engines with transaction functions, the efficiency according to the size of the buffer efficiency was compared and analyzed by setting a parameter to set whether to use the buffer size or not.

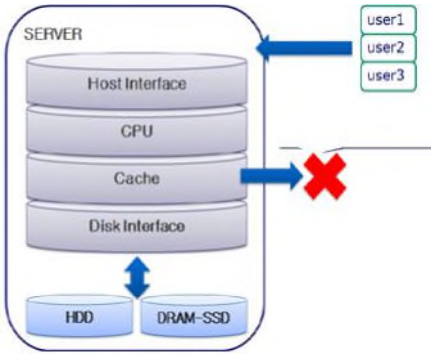

Fig. 3. Logical Structure of the Server According to Whether or not the Buffer Is Used(MYSQL)

5 Testing and Analysis according to Single Load by NBD benchmark

Fig. 4. shows the graph of TPS of each storage medium.. There is no difference in TPS between the two storage media all even though the buffer size is given largely, unlike the results derived by the applying the previous results. In other words, even if the default is given 512M, the small load in Level 2 does neither exceed the buffer capacity nor process the data. Thus, for small loads for reading, printing out, or searching posts, it is necessary to reduce the two storage media largely.

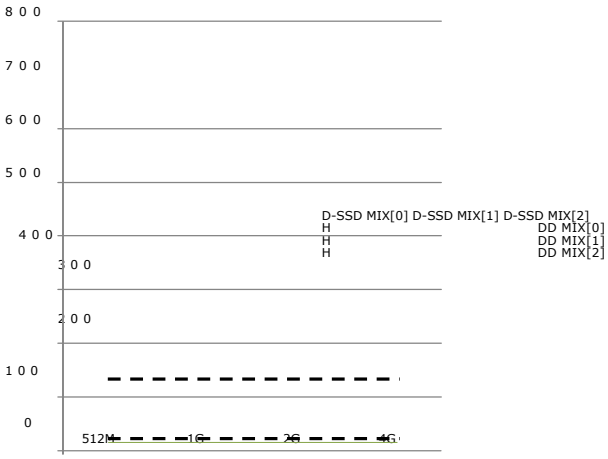

Fig. 4. TPS by Storage Medium according to Changes in the Buffer Size

6 Conclusion

In this paper, comparative analysis was made through multiple tests to review the efficiency by storage medium according to changes in the buffer size in DBMS environments.

if the capacity of range excessively reaches the level that the buffer cannot process, D-SSD can maintain the performance without a big change. But since HDD significantly degrades in performance, for D-SSD there is no need to do tuning works on the buffer size separatedly, unlike HDD. .and NBD benchmark test, for small loads for reading, printing out, or searching posts, it is necessary to reduce the two storage media largely.

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