

Independent Study Research

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Stable Storage

When reading and writing from a database, checksums are most certainly helpful in detecting when errors have been made, but they are not helpful when it comes to correcting the error. Stable storage is the best fix for this problem. Stable storage is a policy that can be enacted on one or on several disks, with the general idea being that there are multiple paired sectors with each pair representing one sector-contents. Essentially a right and left copy. It is assumed that the copies are written with a sufficient number of parity bits so we can discount the possibility of a bad sector looking good when parity checks are considered. The writing policy of stable storage consists of the following steps:

1. Write the data into the left copy. Check that the parity bits are correct in this written copy. If not, repeat the write. If after a set number of write attempts the data contents have not been written to the left copy, we can assume there has been a failure.
2. Repeat step one for the right copy.

The stable storage reading policy involves alternating between reading the left copy and the right copy until the proper value is returned. Stable storage is capable of dealing with a large number of issues, including media and write failure.

Tuples

A tuple in terms of databases is simply a row contained in a table in the tablespace. A tuple is a single entry in that table and is also called a row or a record. They usually represent a set of related data or an ordered list of elements. Relational data models arrange into at least one table

of rows and columns using a unique key. The columns are called attributes while the rows are called tuples or records. Additionally, each of said rows contained in the table has its own unique key. Rows in a different table can be connected by including a column for the key of the linked row.

Index Structures

Indexing is a data structure technique which allows for the speedy retrieval of records from a database. An index is a smaller table possessing only two columns, with the first column consisting of a copy of the primary or candidate key of a table. The second table contains a set of pointers for holding the address of a disk block where a specific key value is stored. An index takes a search key as input and returns a collection of matching records. There are two main types of indexing, primary and secondary. A primary index is an ordered file which is of fixed length and has two fields. A secondary index is generated by a field which has a unique value for each record, and should have a candidate key. This kind of index is also referred to as a non-clustering index.

Query Optimization

Query optimization as a whole is based on the fact that SQL servers have always been a cost-based optimizer. Such cost-based optimization involves the creation of multiple execution plans and selecting the lowest cost plan to execute the query. An optimal plan is found by finding the balance between what plan it wants to select and the maximizing the effectiveness of that the particular plan before the actual execution takes place. It is a give-and-take between creating the best plan and completing the task in a certain amount of time. The estimated execution plan is generated based on statistics and various parameters, though it may not be the plan actually generated by the SQL server.

