Yukun Ma
Week #5: OLTP and OLAP
Page #1

Problem Statement

In general, the application of the database can be divided into two types: OLTP[1] and OLAP[2]. The basic concepts of OLTP and OLAP will be described in this paper. In addition, the differences between OLTP and OLAP will also be evaluated.

References

[1] datawarehouse4u. Oltp vs. olap. `http://datawarehouse4u.info/OLTP-vs-OLAP.html`. Accessed March 28, 2018.

[2] Wikipedia. Data warehouse - wikipedia. `https://en.wikipedia.org/wiki/Data_warehouse`. Accessed March 28, 2018.

Overview of OLTP and OLAP

In general, as said in the beginning, the application of the database can be divided into two types: OLTP and OLAP.

OLTP is the main application of traditional relational database, which is mainly for basic and daily transaction processing, such as bank transactions. The effectiveness of an OLTP database is measured by number of transactinos per second.[1]

OLAP is the main application of data warehouse system, supports complex analysis operations, focuses on decision support, and provides intuitive query results. It is widely used by Data Mining techniques.[2]

Critical Thinking

Table 1: The Differences Between OLTP and OLAP

	OLTP	OLAP
What is?	traditional relational database	data warehouse system
Source of data	operational data	consolidation data[3]
Purpose of data	daily transaction processing	mining useful information
Inserts and updates	short and piecemeal	time-consuming and acting on lots of data
Queries	simple and uniform	complex and ad-lib
Measure of efficiency	number of transactions per second	response time
Example of applications	an bank transaction system	a data mining system

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[1]OnLine Transaction Processing
[2]Online Analytical Processing
[3]data in OLAP systems is from OLTP systems

Question

When I looked up for the information of OLTP and OLAP, I saw some implementation details of OLAP. OLAP is implemented in a variety of ways, such as MOLAP, ROLAP, and HOLAP. So what are MOLAP, ROLAP, and HOLAP? What is the difference between them? Which implementation method to use?

Method

Describe how you are going to answer your own question stated above.

Analysis and Discussion

MOLAP is Multidimensional OLAP. In MOLAP, data is indexed directly into a multidimensional database. So what is a multidimensional database? A multidimensional database is a database in which all data is stored in an array for the user. In this way, users can obtain a high-dimensional cube in this multidimensional data by adding multidimensional constraints. For example, the user queries cities where annual precipitation is between 500 and 700, latitude is between 30 degrees and 50 degrees north latitude, and longitude is between 90 degrees and 110 degrees east longitude. Due to the use of fast indexing, MOLAP's time efficiency is very high. However, because the data in high-dimensional cubes may be sparse, the space efficiency is relatively poor.

The full spelling of ROLAP is Relational Online Analytical Processing. As you can guess from the name, ROLAP is an OLAP built on a relational database. When using ROLAP, the system converts the query to a SQL statement and executes it on a relational database. For the problem of city selection just now, ROLAP adds a few "WHERE". Because it is built on a relational database, ROLAP is very space efficient, but time efficiency is not as high as MOLAP.

HOLAP is Hybrid OLAP, which is a strategy that combines the previously mentioned MOLAP and ROLAP. For a rough query (for example, the number of cities that meet the requirements), HOLAP uses MOLAP to query high-dimensional cubes. However, when you need to query more detailed information (such as the name of each city), you need to use the underlying relational database to query.