BIGTABLE: A DISTRIBUTED STORAGE SYSTEM FOR STRUCTURED DATA

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A COMPARISON OF APPROACHES TO LARGE-SCALE DATA ANALYSYS

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BIGTABLE

- ✓ It is a storage system for structured data of very large sizes across multiple servers
- ✓ Many Google applications use this storage system as a high-performance solution for their demands
- ✓ It provides dynamic control over the data
- ✓ Is a multidimensional sorted map with indexes by row key, column key, and timestamp
- ✓ It is very similar to databases
- ✓ It depends on a cluster management system for scheduling jobs, managing resources, dealing with machine failure and monitoring their status

IMPLEMENTATION

- ✓ Three major components: library linked into every client, one master server, and may tablet servers
- ✓ The master server has to manage , detect any changes, balance the server, and garbage collection for the tablet servers. It also deals with schema changes (table and column family creations)
- ✓ Tablet servers each mange a set of tables and splits tables that have become too large
- ✓ Clients communicate directly with tablet servers for reads and writes (most of the times clients do not communicate with the masters)
- ✓ As tables grow, they are split into many tablets

ANALYSIS

- ✓ Since it is so similar to a database, it is user-friendly and relatively easy to maintain and/or upgrade
- ✓ The amount of data that it can manage is so large it is almost unbelievable
- ✓ Since Google implements it for many of its applications, it demonstrates that it is an effective system to store data and be able to move and change it
- ✓ It is flexible, so it can be redesigned to satisfy a customer/user's specific needs

LARGE-SCALE DATA ANALYSIS

- ✓ Databases required data to be be under a well-defined schema while Map permits the data to be in any format.
- ✓ MapReduce is revolution of “cluster computer”
- ✓ Map reduce is a cheaper and more flexible system. It consists of two functions
- ✓ Both systems divide ant data set to be utilized into partitions
- ✓ Each system provides different indexing and compression optimization , programming models, the way in which data is distributed and query execution strategies
- ✓ Both systems have their strengths and weakness – not perfect

IMPLEMENTING MAP REDUCE & DATABASES

- ✓ MapReduce is implemented on a large number of low-end servers while databases are implemented in a small number of high-end servers
- ✓ Databases, the data is stored on multiple machines while in MapReduce data sets are stored in a collection of partitions divided in a file system on each node
- ✓ MapReduce has two phases. Phase 1 (function Map) : produces output file from a set of records. Phase 2 (function Reduce) : combines or processes the records, and writes them to an output file
- ✓ Databases have three phases to be executed: tables are partitioned over the nodes, SLQ commands are translated into query plans, based on the size of the date, algorithms are employed

ANALYSIS

- ✓ MapReduce is a cheaper and more flexible system
- ✓ Either a MapReduce or Database Management System can be valid solutions to storing large amounts of data
- ✓ It is hard to tell if one option has more advantages/benefits than the other since both have defined disadvantages and benefits
- ✓ Databases have been around for a while with plenty of testing and information, which could make them more reliable

BOTH PAPERS

- ✓ Both papers mentioned Google either implementing(BigTable) or testing (MapReduce) both systems, which confirms the idea that neither system is better than the other . Google could benefit from using either system.
- ✓ Both papers show how the systems are far from being perfect and can be updated. Strengths and weaknesses for both systems are mentioned in the papers
- ✓ To choose between the systems, it is a choice of money, user interface and trade offs between flexibility and failure tolerance/recovery
- ✓ Very important factor for all systems is the user interface since the product is develop for customers and they should be able to use/implemented relatively easy

STONEBRAKER

- ✓ “One size fits none”
- ✓ Relational Database Model System is dead
- ✓ Perfect time to be a a database management because all of the new opportunities that have been discovered and continue to be discovered
- ✓ Data Storage Market has many new models that are better than the Relational Model
- ✓ Expectation is to see many engines underneath a common parser
- ✓ Main competitors : SAP vs. Oracle

COMBINATION OF ANALYSYS

Advantages

- ✓ BigTable does not follow the traditional data model
- ✓ User friendly
- ✓ Flexible enough that there can be modifications/upgrades

Disadvantages

- ✓ Requires high-end servers
- ✓ Similar to Database Management Systems