

Big Data Paper Summary

Cassandra - A Decentralized Central Storage System

Choosing A Cloud DBMS: Architectures and Tradeoffs

Michael Stonebraker on his 10-Year Most Influential Paper Award

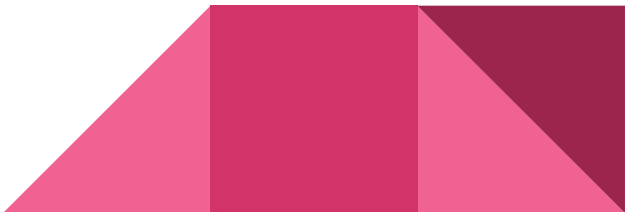
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Cassandra - Main Points

- Cassandra is a database designed for Facebook with reliability and scalability in mind.
- It is designed to run on an infrastructure of hundreds of nodes.
- Some of these nodes will expectedly fail.
- Cassandra does not support a full relational model, it has a simple data structure designed to run on cheap hardware.



Solutions Implemented by Cassandra

- Data in Cassandra is stored in a table which can be indexed by a key.
 - The table has a row key, a 16-36 byte string, and column families, which can be super column families if they contain more column families.
 - All deployments of Cassandra have only one table in their schema.
 - The Cassandra API consists of just insert, get, and delete.
 - Nodes in the system are consistently hashed in a ring structure, and lightly loaded nodes can move on the ring to balance the load and improve performance.
 - New nodes will take data from existing nodes to alleviate the load.
 - Nodes can locally determine if any other node in the system is up or down.
 - Zookeeper is used for large scale updates and coordination throughout the system.
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Facebook's Delivery

The implementation of a simple data structure in Cassandra is a great answer to Facebook's use case. Failures are detected in an average of 15 seconds. The system already stores more than 50 TB of data on a 150 node cluster. They have proven that their system works fast with their inbox search, and they've delivered on both reliability and scalability.



Choosing A Cloud DBMS - Main Points

- Cloud based applications, specifically cloud database management systems, are becoming increasingly popular.
- What are the pros and cons of existing cloud DBMSs?
- How can cloud DBMSs be improved?



What was found?

- Remote shared object storage like S3 is much cheaper than remote block stores like EBMS with comparable performance.
- Caching S3 data in memory is advantageous for warm speedup but disadvantageous for cold start cases.
- Cluster horizontal scaling improves systems, while vertical scaling is less beneficial.




Understanding Database Price and Performance

This paper contains a lot of important information and research conducted on cloud database management systems. Conclusions are made about cloud database performance that may have never been considered. This opens up new opportunities for the people creating cloud database management systems to improve performance or save money.



Research Conclusions and Cassandra

Cassandra is Facebook's own database created with simplicity and speed in mind. While Cassandra most likely is the best database for their use case, Facebook can use the research conducted on query restrictions, system initialization time, query performance, cost, data compatibility with other systems, and scalability. For example, Cassandra was designed to run on cheap hardware. Choosing the Right DBMS goes in depth with evaluating query costs and storage costs, which is another attempt at saving money.



Stonebraker Talk - Main Points

- From 1970 to 2000, database engineers were trying to make relational database management systems universal.
- In 2005, Stonebraker and his team published a paper discussing storing columns (C-Store) instead of rows. They concluded the RDBMS model does not fit all cases.
- Present day markets benefit from many different types of database models.



Conclusion - The Future of Big Data

Stonebraker mentions how for most of the 80s and 90s database research didn't evolve much due to the belief that the relational model was the only acceptable model. Modern database management systems vary immensely, as discussed in "Choosing A Cloud DBMS." Facebook's Cassandra database is a great example of a proprietary model that fits their use case much more than a relational database would. There is still a lot of work to be done to push DBMS research further, especially with more models to work with.

