
The Google File System and A Comparison of Approaches to Large-Scale Data Analysis

Database Management
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What is the Google File System?

- It is a scalable distributed file system for large distributed data-intensive applications.
 - It provides fault tolerance while running on inexpensive commodity hardware.
 - It delivers high aggregate performance to a large number of clients.
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Ideas about Goolge File System

- The file system meet Google's storage needs.
 - The largest cluster to data provides hundreds of terabytes of storage across thousands of disks on over a thousand machines.
 - Handle and process multi-TB data
 - In favor high bandwidth over low latency
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Implementation

- Composed of single master and multiple chunkservers and is accessed by multiple clients.
 - Files are divided into fixed-size chunks. Each chunk is identified by an immutable and globally unique 64 bit chunk handle assigned by the master at the time of chunk creation.
 - The master maintains all file system metadata.
 - Utilizes lazy space allocation
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My analysis

- Having a single master vastly simplifies the design.
 - It enables the master to make sophisticated chunk placement and replication decisions using global knowledge.
 - Besides, it will allow consistency through its respective chunk servers.
 - One master might be risky, but google minimized its involvement in reads and writes, to that it does not become a bottleneck.
 - Also, Google does well to recover itself when the system goes down.
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Advantages

- Inexpensive commodity hardware
 - Large chunk size
 - Reduces clients' need to interact with the master
 - Reduces network overhead
 - Reduces the size of the metadata stored on the master
 - Provides higher fault tolerance
 - High Availability
 - Fast Recovery
 - Chunk Replication
 - Master Replication
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Disadvantages

- No optimized for small scale data to process workloads
 - Single master may be a potential bottleneck
 - Hot Spots, many clients accessing a 1-chunk file
 - Design the file system is only for Google, so it might not be adopted in other system
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A comparison of Approaches to Large-Scale Data Analysis

MapReduce

- Distributed file system
 - Uses a relational database model and allows data to be in any format
 - Easier and quicker for beginners to learn
 - More flexible in terms of data expressiveness
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Parallel DBMS

- Requires data to specifically fit into a relational paradigm of rows and columns
 - Uses parallel query optimizer to balance the amount of data being transmitted
 - Have better performance, which results in fewer errors
 - Data are partitioned over cluster nodes
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Advantages

- Simple and able to distribute relatively complex formats
 - Data formats are very flexible
 - Handles node failure well
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Disadvantages

- Data sharing between programmers can easily cause problems
 - Data transfer causes performance issues
 - Some data formats result in slower load and execution times
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Bibliography

- Sanjay Ghemawat, Howard Gobioff, and Shuntak Leung. “The Google File System.” *Labouseur*. Fri. 5 December. 2014.
 - Pavlo, Andrew and et al. “A Comparison of Approaches to Large Scale Data Analysis.” *Labouseur*. Fri. 5 December. 2014.
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