The Google File System by Google

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The Main Idea

- Observations of application workloads and it’s technological environment, has pushed Google's File System to challenge some of the traditional designs of other file systems, to provide reliability, accessibility, scalability, and performance.

Implementation

- GFS is built using inexpensive hardware. Component failures are treated as norm, rather than an exception. Constant monitoring and analysis of the hardware is necessary.
- The GFS is made up of one master server, and several chunk servers comprised of 64MB.
- Instead of overwriting the existing data in a file, any new data is appended.
- Co-designing applications and the file system to increase flexibility.

Idea and Implementation Analysis

- While the idea of GFS is simple to understand, the implementation of it is anything but simple.
- In summary, a GFS cluster works by having a single master server and several chunk servers. These servers are then accessed by a single, or multiple clients. Files are stored as chunks, and are replicated to provide reliability.
- When client mutates a file(chunk), the master gets the location of the replicas and pushes the mutated data to them.

Comparison

- All three models share the same goal of providing reliability, performance, scalability, and accessibility.
- GFS, MapReduce, and Parallel DBMS all use some form of clustered computing to increase performance.
- All three uses replication to mitigate data loss caused by failures.

Advantages/Disadvantages

- The architecture of the GFS allows sharing of files, unlike with MR. MR is flexible due to the fact that the data can be structured in anyway the programmer wants. Hoewever, if that data is shared, then the data needs to be in a agreed upon structure, reducing flexibility.
- GFS creates snapshots and record appended operations, so that in the event of a failure, no data is lost. With parallel DBMS, saving intermediate results to a disk is avoid often, which means that if something were to fail suddenly, the query would need to be restarted.