The Google File System

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Ghemawat, Sanjay, Howard Gobioff, and Shun-Tal Leung. "The Google File System." 22 Oct. 2003. PDF file.

What is the Google File System?

- Google File System (GFS) is distributed system which simply means that a bunch of separate computers are connected together by a network.
- The GFS was created to handle all of Google's data processing concerns.
- The GFS's job is to organize and manage all of the files that Google has to deal with on a daily basis.
  - This includes editing, deleting, and creating new files.
- The GFS is unique to Google and its specific needs.

What is the GFS design?

- GFS's architecture is a cluster that can be broken down into three components:
  1. GFS Master
  2. GFS Chunkserver
  3. GFS Client
- The Master keeps track of metadata and the operations log.
  - If there is only one Master it can have global knowledge.
- The Chunkserver are tasked with keeping track of the chunks (files are separated into 64 MB chunks). They also create the chunk replicas which are for redundancy.
- Clients work with both the Master and Chunkservers. Clients look at the metadata from the Masters and the files in order to edit them via the Chunkservers.
- "Files are organized hierarchically in directories and identified by pathanames" (2).

What do I think of the GFS?

- I think the GFS is a smart system because
  1. It uses cost effective components.
  2. The Master is in charge of metadata that helps to keep the system efficient.
  3. “The master state is replicated for reliability” (8).
  4. The append function make it easy to edit a file.
  5. When it deletes a file, it just moves it to another table instead of deleting it completely.

GFS: Good or Bad?

ADVANTAGES

- Inexpensive components/hardware
- Ability to append files
- When a file is deleted it isn't deleted forever it is just hidden
- The Chunkservers and Master are able to recover quickly.
- Linux – free and open source

DISADVANTAGES

- Components fail often
- Multiple replicas of chunks can lead to not updating the information in every place
- At least one server is guaranteed to be down all the time.
- Linux – some problems with some functions

GFS in the Real World

- There is a Cluster A. It's purpose is research and development.
- There is a Cluster B. It's purpose is data processing.
- Both clusters have numerous Chunkservers at their disposal.
- Both clusters have 30 MB/s or less for their write rate.
- Both have a rate of operations between 200 – 500 operations per second.
- Cluster A writes more than it appends with a ratio of 8 to 1 operations.
- Cluster B also writes more than it appends but only with a ratio of 2.5 to 1.
- Cluster B has more delete requests than Cluster A because it constantly has to update data.