

The Google File System

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Main Idea of The Google File System

- The Google File System, or GFS, was implemented to meet the rapidly growing demands of Google's data processing needs.
- These include performance, scalability, reliability, and availability.
- The GFS is widely deployed within Google as the storage platform for the generation and is also used for the processing of data by Google's services as well as research and development efforts that require large data sets.

Implementation of the GFS

- The file system consists of hundreds or even thousands of storage machines built from inexpensive commodity parts and is accessed by thousands of client machines.
- Multiple GFS clusters are being deployed.
- The largest of these clusters have over 100 storage nodes, over 300 TB of disk storage, and are heavily accessed by hundreds of clients on a continuous basis.
- GFS provides a familiar file system interface similar to POSIX.
- Files are organized hierarchically in directories and are identified by path names.

My Analysis of The Google File System

- Because of The Google File System, Google can cater to all of its data and storage needs.
- This allows Google processes, such as the Google Search Engine, to run smoothly and provide accurate results.
- Without The Google File System, the over billion Google Searches run every day would not be able to be processed, analyzed, and stored correctly.
- As long as there are continuing checks to make sure that the inexpensive parts used to make the file system are replaced when needed, then I see no problem with the current system.

Advantages of The Google File System

- The GFS uses a large chunk size of 65 MB. Because of this, the clients' need to interact with the master is reduced, and the network overhead is reduced.
- The GFS uses the garbage collection approach to storage reclamation. This approach provides a uniform and dependable way to clean up any replicas not known to be useful, and the delay in reclaiming storage during garbage collection provides a safety net against accidental, irreversible deletion.

Disadvantages of The Google File System

- A large chunk size can cause chunkservers to become hot spots if many clients are accessing the same file.
- Because the file system is built from inexpensive commodity parts, component failures are the norm.
- The system is also open to application bugs, operating system bugs, human errors, and the failures of disks, memory, connectors, networking, and power supplies.

Real-World Use Cases of The Google File System

- One GFS cluster in use within Google, which we will call Cluster A, is used regularly for research and development by over a hundred engineers.
- A task is initiated by a human user and runs up to several hours, reading through a few MBs to a few TBs of data.
- It then analyzes the data, and writes the results back to the cluster.
- Another example of a GFS cluster in use within Google, which we will call Cluster B, is primarily used for production data processing.
- These tasks last much longer and continuously generate and process multi-TB data sets.
- Human intervention is only occasionally needed.

Characteristics of the two GFS Clusters

Cluster	A	B
Chunkservers	342	227
Available disk space	72 TB	180 TB
Used disk space	55 TB	155 TB
Number of Files	735 k	737 k
Number of Dead files	22 k	232 k
Number of Chunks	992 k	1550 k
Metadata at chunkservers	13 GB	21 GB
Metadata at master	48 MB	60 MB