



GFS and Chubby

Let's explore how BigTable interacts with GFS and Chubby.

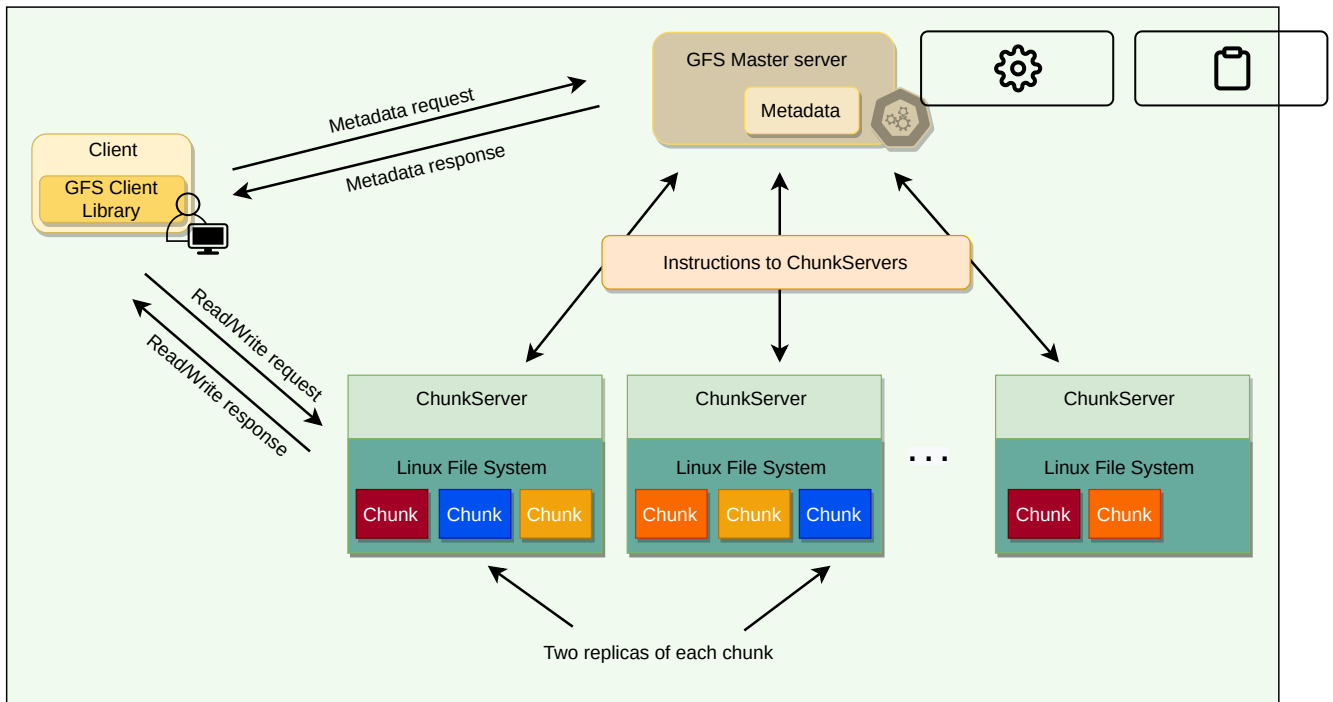
We'll cover the following ^

- GFS
- Chubby

GFS#

GFS is a scalable distributed file system developed by Google for its large data-intensive applications such as BigTable.

- GFS files are broken into fixed-size blocks, called Chunks.
- Chunks are stored on data servers called ChunkServers.
- GFS master manages the metadata.
- SSTables are divided into fixed-size, blocks and these blocks are stored on ChunkServers.
- Each chunk in GFS is replicated across multiple ChunkServers for reliability.
- Clients interact with the GFS master for metadata, but all data transfers happen directly between the client and ChunkServers.



High-level architecture of GFS

For a detailed discussion, please see GFS

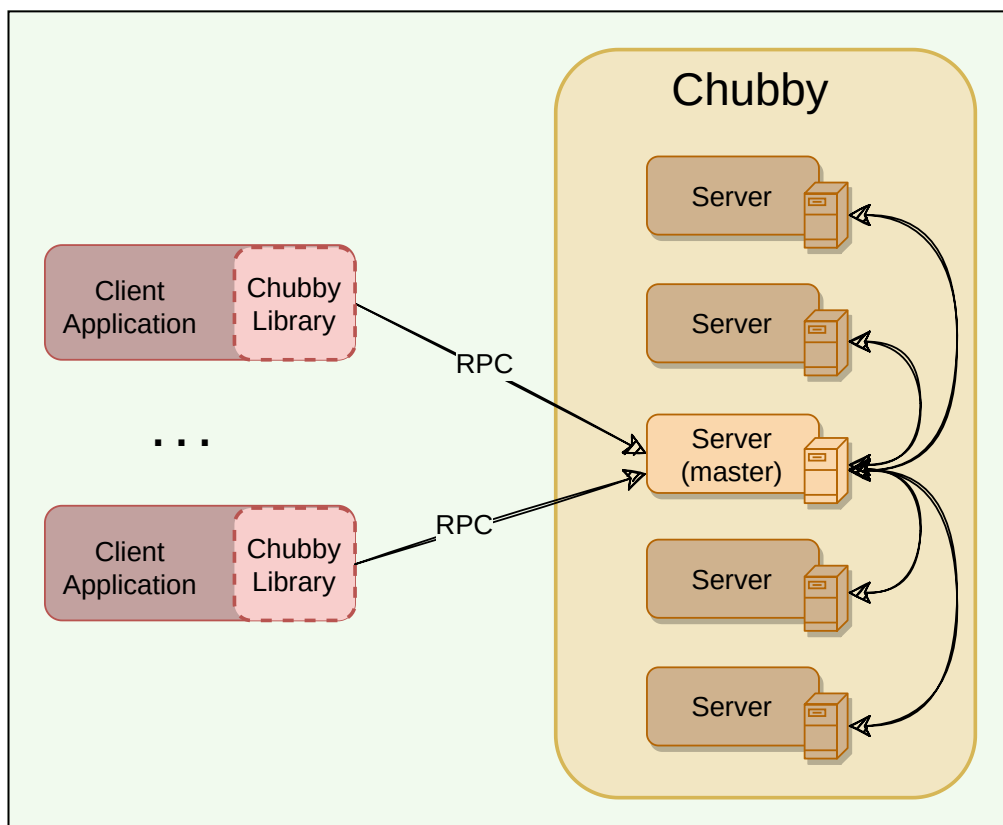
(<https://www.educative.io/collection/page/5668639101419520/5559029852536832/6383131278442496>).

Chubby#

Chubby is a highly available and persistent distributed locking service that allows a multi-thousand node Bigtable cluster to stay coordinated.

- Chubby usually runs with five active replicas, one of which is elected as the master to serve requests. To remain alive, a majority of Chubby replicas must be running.
- BigTable depends on Chubby so much that if Chubby is unavailable for an extended period of time, BigTable will also become unavailable.
- Chubby uses the Paxos algorithm to keep its replicas consistent in the face of failure.
- Chubby provides a namespace consisting of files and directories. Each file or directory can be used as a lock.

- Read and write access to a Chubby file is atomic.
- Each Chubby client maintains a session with a Chubby service. A client's session expires if it is unable to renew its session lease within the lease expiration time. When a client's session expires, it loses any locks and open handles. Chubby clients can also register callbacks on Chubby files and directories for notification of changes or session expiration.
- In BigTable, Chubby is used to:
 - Ensure there is only one active master. The master maintains a session lease with Chubby and periodically renews it to retain the status of the master.
 - Store the bootstrap location of BigTable data (discussed later)
 - Discover new Tablet servers as well as the failure of existing ones
 - Store BigTable schema information (the column family information for each table)
 - Store Access Control Lists (ACLs)



High-level architecture of Chubby

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SSTable



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Bigtable Components

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