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# GOOGLE BIGTABLE



# Motivação

- Necessidade de sistema escalável
- Armazenamento na ordem de PB ( $10^{15}$ )
- Servidores locais não suportam



# Solução

- Armazenamento distribuído
- Múltiplos servidores que se comunicam
- Escalabilidade
- Baixa latência



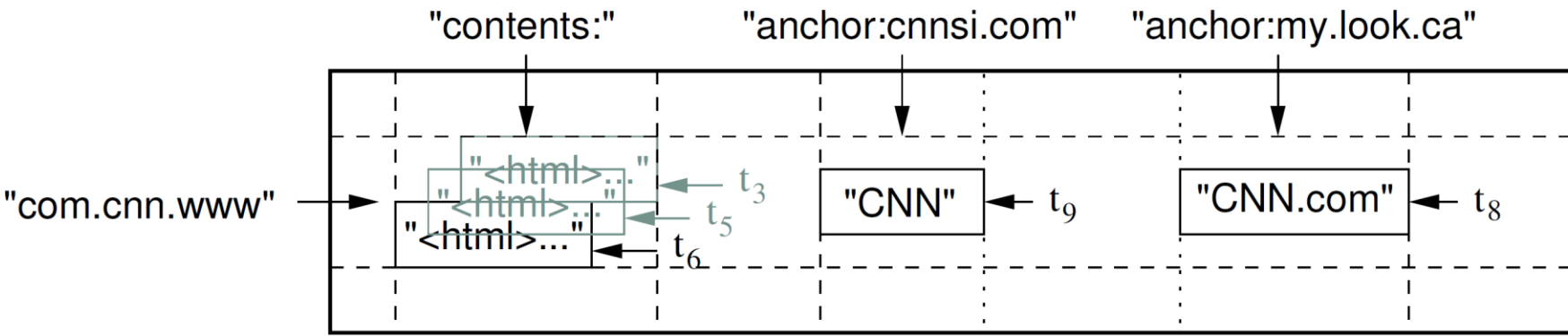
# Bigtable

- 2006
- NoSQL
- *A Bigtable is a sparse, distributed, persistent multi-dimensional sorted map. The map is indexed by a row key, column key, and a timestamp; each value in the map is an uninterpreted array of bytes.*



# Modelo

- Linhas
  - Ordem lexicográfica (“alfabética”)
  - Agrupamento dos dados
- Colunas
  - Famílias e Qualificadores
  - Compressão dos dados
  - Operações
- Timestamps
  - Versionamento
  - Garbage collection



# Componentes



- Chubby
  - Concorrência
  - *Locks*
  - Permissões de acesso
- Google File System
  - Armazenamento
  - Load balance



# Chubby

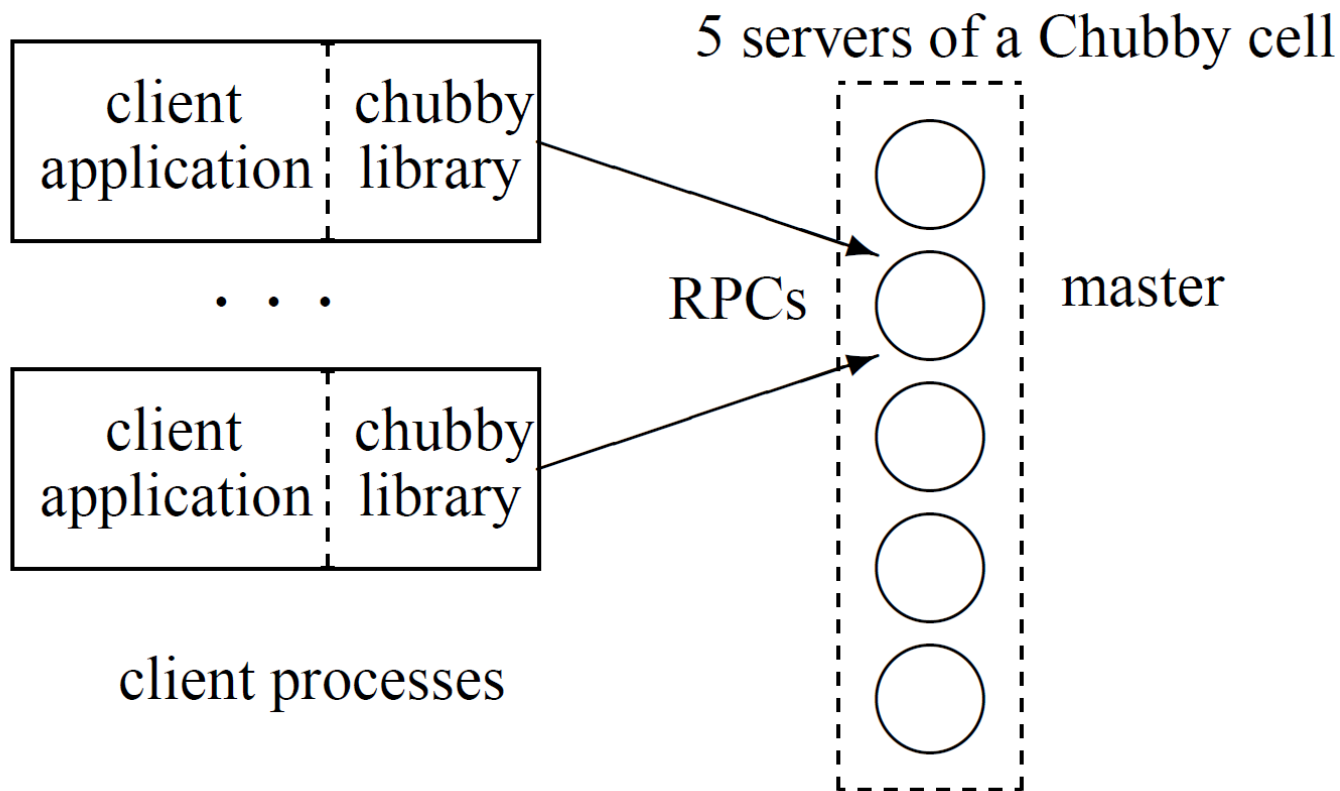
- *Locks* para Sistema distribuído
- Sincronismo
- Sistema de arquivos
- Mutualmente exclusive



# Chubby



Implementação = Mágica



# Chubby

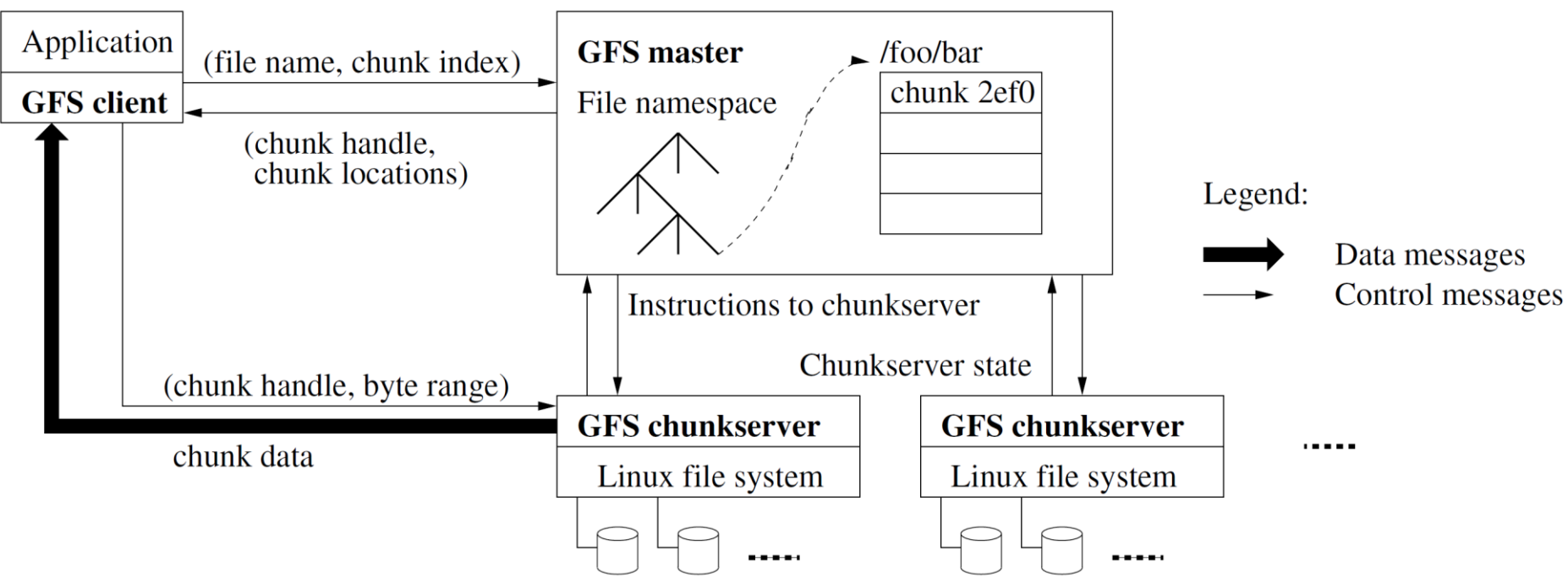


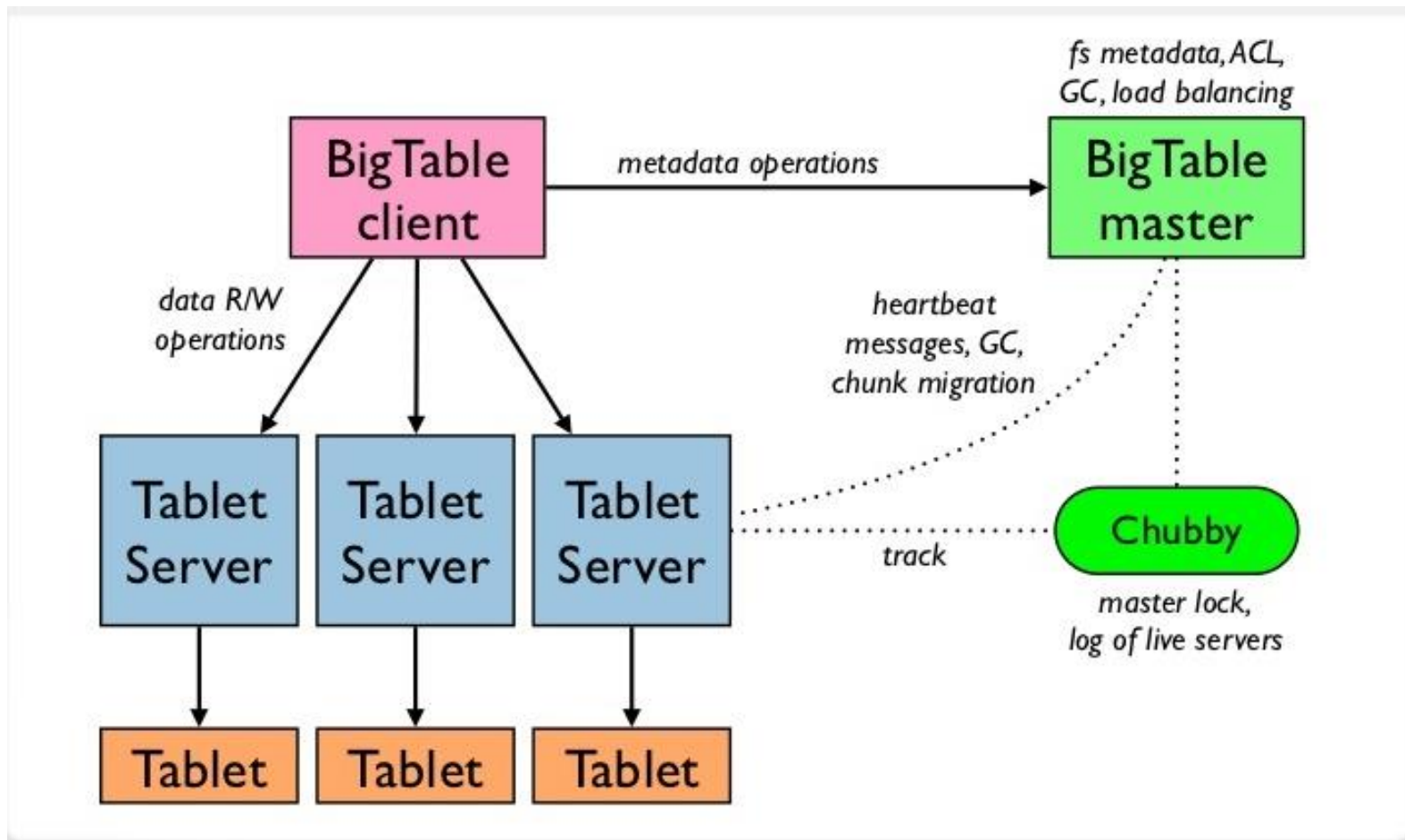
- Abstração:
  - Sistema de arquivos
  - Cada arquivo = *lock*

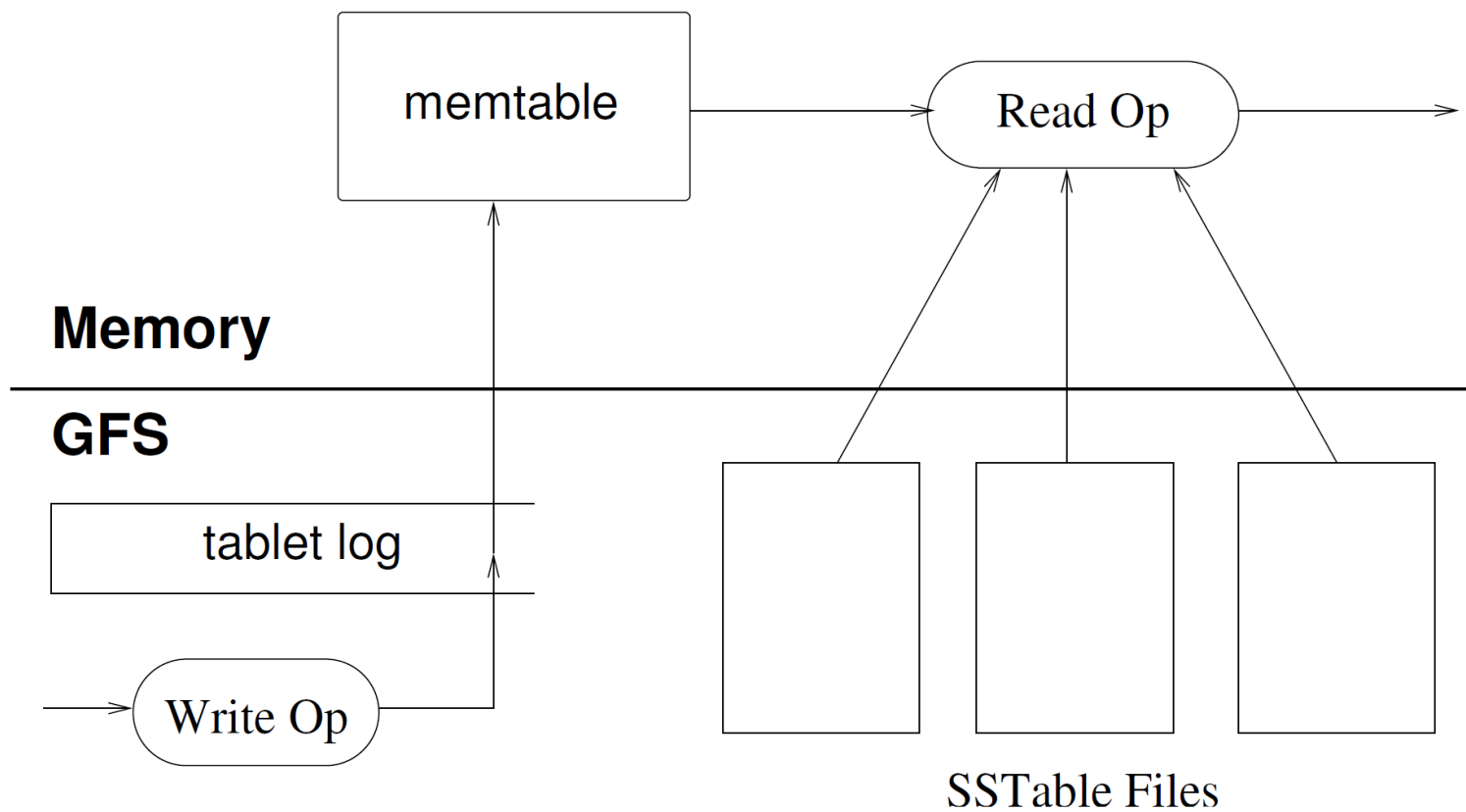
# Google File System

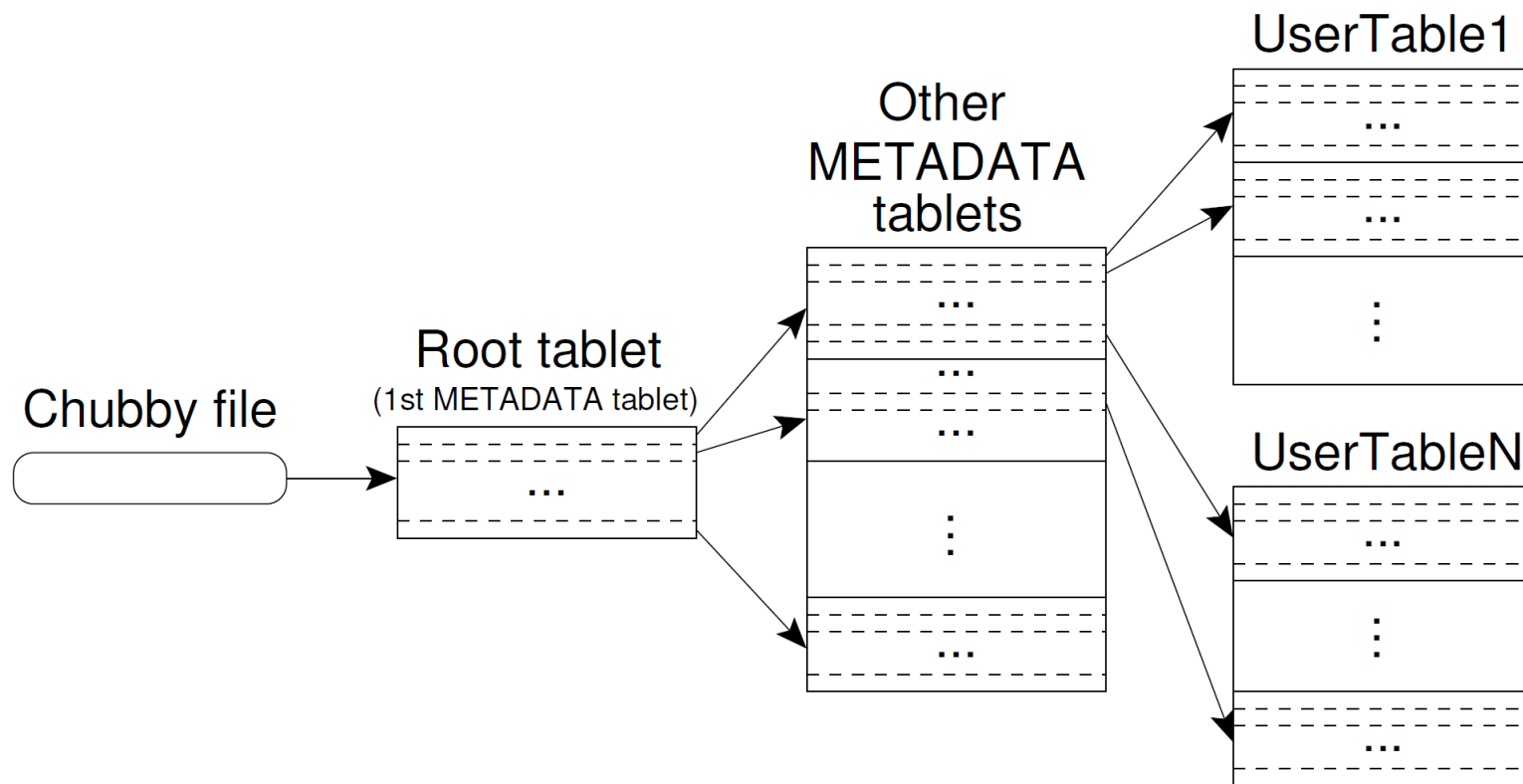


- 2003
- Armazenamento distribuído
- Único master
- Múltiplos servidores











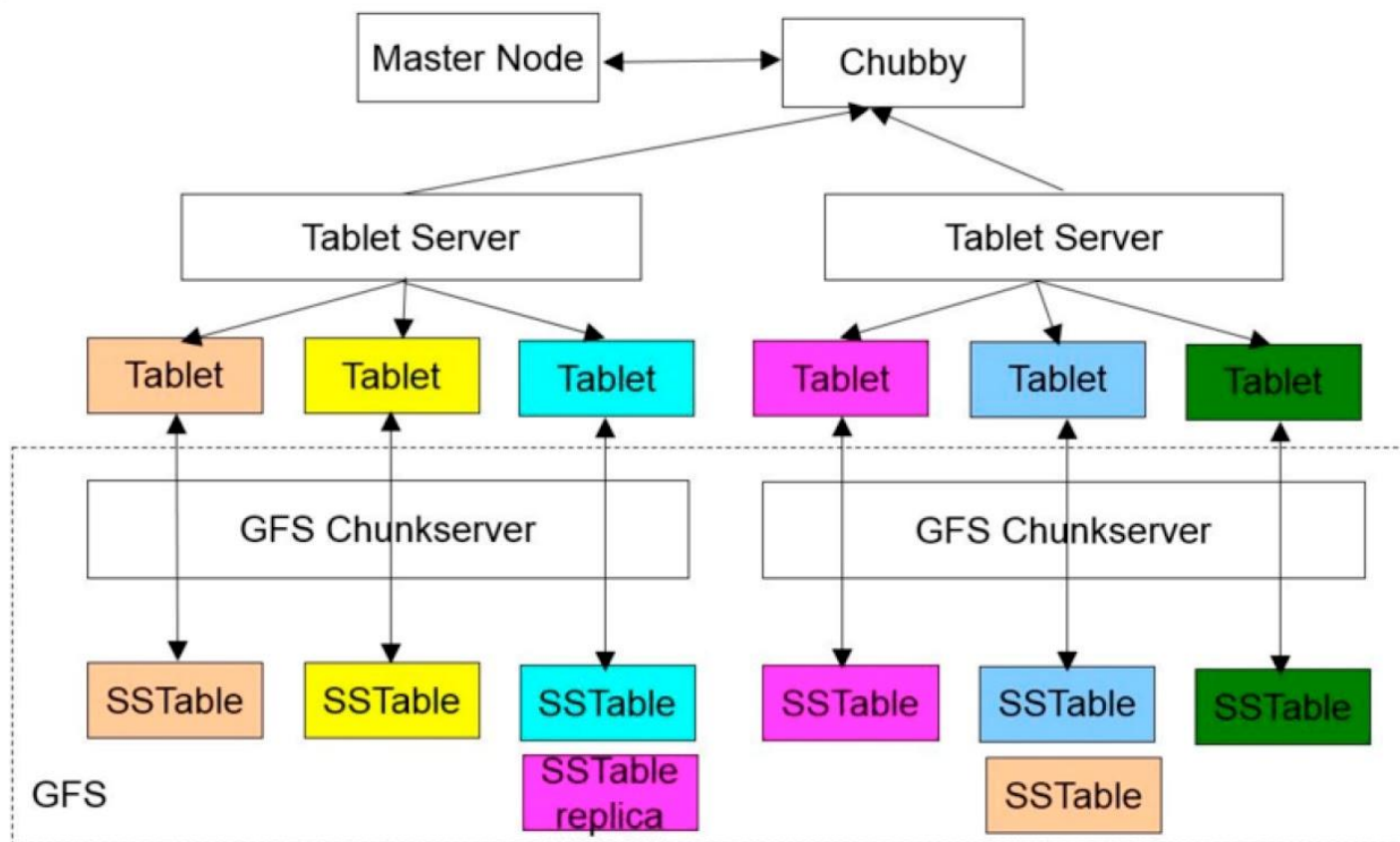


# Metatables

- 128 MB
- $2^{34}$  Tablets
- 2.34 ExaBytes (1000 PetaBytes)



# BigTable Architecture



# Atualmente



- Aprimoramentos
- Google Cloud Services



## CLOUD BIGTABLE

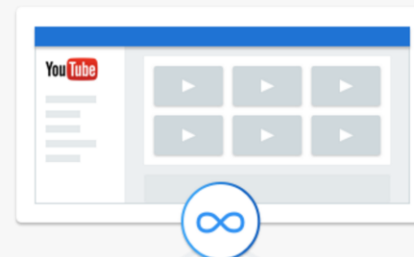
A high performance NoSQL database service for large analytical and operational workloads

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## Massively Scalable NoSQL

Cloud Bigtable is Google's NoSQL Big Data database service. It's the same database that powers many core Google services, including Search, Analytics, Maps, and Gmail.

Bigtable is designed to handle massive workloads at **consistent low latency and**





# Referências

- <https://en.wikipedia.org/wiki/NoSQL>
- <https://cloud.google.com/bigtable/>
- <https://research.google.com/archive/chubby.html>
- <https://research.google.com/archive/gfs.html>
- <https://research.google.com/archive/bigtable.html>



# Perguntas?