BIG DATA PAPERS SUMMARY

"The Google File System"

"A Comparison of Approaches to Large-Scale Data Analysis"

"One Size Fits All – An Idea Whose Time Has Come and Gone"

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THE GOOGLE FILE SYSTEM

- **"… a scalable distributed file system for large distributed data-intensive applications."**
- Key characteristics:
  - High performance
  - Redundancy
  - Fault tolerance
  - Large data sets
  - Large number of clients

GFS – IMPLEMENTATION

- **Master, chunk servers, and clients**
  - Master – keeps chunk locations in memory, gives clients chunk locations to clients upon request; stores metadata, not the data itself
  - Chunk servers – store chunks of data as Linux files, gives clients requested data
  - Clients
    - Make request to master server, receive back locations of chunk servers with needed data
    - Request data from chunk server and keep open TCP connection with server if more data is needed

GFS – ANALYSIS

- The Google File System seems to be an optimal system for storing large amounts of data in a way that may even be ACID-compliant. The main flaw – as the paper mentions – is that some of the optimizations and benefits of GFS are specific to Google's processes and workflows.

COMPARISON PAPER

- Compared large-scale data analysis with MapReduce (MR) and parallel database management systems (DBMSs) in terms of performance, "development complexity," and ease of use
- Developed a benchmark to test performance of these systems
- **"Although the process to load data into and tune the execution of parallel DBMSs took much longer than the MR system, the observed performance of these DBMSs was strikingly better."**

- "Grep Task" – searching for a three-character pattern in lots of 100-byte records
- With Hadoop MapReduce, structure had to be created, code later had to be altered several times
- With DBMSs, configuration was sometimes nontrivial
- DBMSs require rigid data structure, but code was easier with SQL than writing it for MR systems

COMPARISON PAPER – IMPLEMENTATION

COMPARISON PAPER – ANALYSIS

- Easier to get started with MapReduce systems than DBMSs
- Better performance optimizations in DBMS query execution
- DBMSs win because of the structure of database schema and SQL, and the abstraction of underlying filesystem to the user
- Could have had more/better results if tests had gone up to 1,000 nodes in size

COMPARISON OF THE TWO PAPERS

- Both papers related to big data processing…
- However, the Google File System is lower-level than data analysis as seen in the second paper, and the Hadoop framework contains an implementation of GFS that can be used instead of the Hadoop Distributed File System (HDFS)
- GFS paper related mainly to Google and its workflows, comparison paper dealt with a broader scope

STONEBRAKER TALK – MAIN IDEAS

- Relational DMBSs are not the answer to everything, increasingly not the perfect solution for anything
- Column stores faster than row stores by two orders of magnitude
- RDBMS and row stores are not the best answer for streaming, transactions, analytics, graphs, etc.
- Interesting to see what unfolds in the future of database management systems
- It's a great time to be a DBMS researcher!

GFS ADVANTAGES AND DISADVANTAGES

- Advantages of Google File System:
  - It is a distributed file system, which we will still need in the future, as we will still have large server farms and data warehouses that need to reliably store large amounts of data and allow multiple-user access
  - Performance-optimized, has operation logs for atomicity, system can tolerate hardware and other failures

- Disadvantages of Google File System:
  - May be too specific to Google, needs more tweaking to work with any company's workflow
  - Not optimized for small files