[4]. Corbett JC, Dean J, Epstein M, Fikes A, Frost C, Furman JJ, Ghemawat S, Gubarev A, Heiser C, Hochschild P, Hsieh W. Spanner: Google's globally distributed database. ACM Transactions on Computer Systems (TOCS). 2013 Aug 1;31(3):1-22.

The problem being addressed?

Google products are some of the most popular and widely used applications worldwide, generating vast amounts of data that need to be stored and processed using highly fault-tolerant systems without compromising performance. As a result, this need has led to multiple innovations in the field of data management, including tools such as Google File System (a highly fault-tolerant distributed file system), MapReduce (a highly efficient programming model that performs aggregation computing on large datasets), Bigtable (a distributed storage system for structured data), and Megastore (a scalable and highly available storage for interactive services). All the above products provide exceptional data management capabilities at a regional level, but they lack at providing a unified consistent data a global level. Therefore, the authors Corbett et al. studied the problem and utilized all the above mentioned services and built a novel product to address the problem of providing a globally distributed, highly available, and consistent database system for Google's applications and services.

Limitations of Existing work?

According to the authors, traditional database systems have limitations in terms of scalability, availability, and latency, particularly in a globally distributed environment. Therefore, existing systems such as MySQL, Oracle, Megastore, and DynamoDB have issues with replication as they are pre-built solutions and are unable to globally distribute data due to their architecture. Additionally, these solutions require manual effort that results in high operational costs and potential anomalies.

Summary of Proposed Strategy?

The authors proposed Spanner, a globally distributed database system developed by Google that provides both strong consistency and high availability. It combines several techniques, including a distributed versioned storage system, a distributed consensus protocol, a TrueTime API for clock synchronization across data centers, and uses the concept of a global clock to achieve external consistency. Spanner is designed to scale horizontally and handle large amounts of data, and it provides an SQL-based interface for querying and updating data. Spanner also supports distributed transactions across multiple data centers, making it a powerful tool for building globally distributed applications.

Summary of Methodology and Result of Evaluation?

The authors present several experiments that evaluate the performance and scalability of Spanner. The experiments demonstrate that Spanner can scale to hundreds of nodes and can handle millions of transactions per second with low latency. The experiments also show that Spanner can provide strong external consistency and high availability even in the presence of network partitions and other failures. Overall, the results demonstrate that Spanner is a highly scalable and reliable database system.

Any Research Directions Provided?

The authors conclude by discussing future research directions for Spanner, including improving its performance and scalability, supporting new data types and query languages, and integrating it with other Google services. The authors also suggest that the techniques used in Spanner could be applied to other distributed systems beyond databases, such as distributed file systems and key-value stores. Overall, the paper highlights the importance of developing new techniques for managing data at scale in a globally distributed environment.