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A survey on RDBMS and NoSQL Databases

MySQL vs MongoDB

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ABSTRACT

The breakneck development in the Internet showcase and the rising of the new web innovations with another challenges, fresh concepts and modern applicationsfor example, NoSQL databases which is as of late turns out to be well known as an option in contrast to the social databases particularly in managing huge information which is one of the most widely recognized highlights of the web today. This provideshigh accessibility and adaptability to the circulated frameworks when compared to RDBMS. Commonly distributed system needsquick access time and can't endure any vacation during disappointments and has been utilized vigorously by enormous endeavors and web organizations. Every new technology faced many challenges like effective access such as responses with high speed. This paper compares the concepts of NoSQL and Relational databases then it's limitations. And address the advantages and types of NoSQL databases.

Keywords --- Relational DBMS(SQL), NoSQL, ACID Property, CAP Theorem, MySQL, MongoDB

I. INTRODUCTION

Today, the fast development of computers and the web causes an issue of proficient stockpiling and recovery of information. Very a lot of online exchanges and experimentation bring about gigantic measures of information that require efficient stockpiling arrangements. Databases assume a significant job so as to fulfill this requirement for putting away and recovering information in a sorted-out way. Two most ordinarily utilized database database types are SQL and NoSQL databases. The key idea of the SQL database is that the SQL database is the main Table based for example Social Database (Relational DBMS).

This paper covers ACID property which is followed by SQL and CAP theorem which is used by NoSQL in the first part. At the next we discus about the types of both the databases. The next part will focus on operations and basic terminologies of MySQL and MongoDB, it also covers comparisons and limitations. Next part will describe the query processing in both the databases.

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II. PROPERTIES AND THEOREMS

1. *ACID Property:*

For the dependability of exchanges, SQL databases bolster ACID (Atomicity, Consistency, Isolation, and Durability) properties. Every one of the ACID property is clarified with regards to databases as follows [1]: -

Atomicity: By this, we imply that either the whole exchange happens without a moment's delay or doesn't occur by any stretch of the imagination. There is no halfway for example exchanges don't happen somewhat. Every exchange is considered as one unit and either rushes to finishing or isn't executed in any way. It includes the accompanying two tasks. **Abort:** If an exchange prematurely ends, changes made to the database are not noticeable. **Commit:** If an exchange submits, changes made are obvious.

Consistency: This implies trustworthiness requirements must be kept up with the goal that the database is steady when the exchange. It alludes to the rightness of a database.

Isolation: This property guarantees that numerous exchanges can happen simultaneously without prompting the irregularity of the database state. Exchanges happen freely without impedance. Changes happening in a specific exchange won't be unmistakable to some other exchange until that specific change in that exchange is kept in touch with memory or has been submitted.

Durability: This property guarantees that once the exchange has finished execution, the updates and adjustments to the database are put away in and written to plate and theycontinue regardless of whether a framework disappointment happens.

2. *CAP Theorem:*

NoSQL underpins CAP Theorem it includes the accompanying three properties: Consistency, Availability, and Partition -tolerance[1].

Consistency: The information present on all machines must be the equivalent in all updations to be made on all machines much of the time, for example, predictable information.

Availability: Data ought to be accessible for all time and not incidentally for example it should be available all the time for example accessibility.

Partition-tolerance: If there should be an occurrence of machine disappointment or any shortcomings happened in the machine's database should work appropriately without taking any end for example segment resistance.

III. TYPES OF DATABASES

1. *SQL Databases:*

Relational database management system has standard query language SQL stands for Structured Query Language. A few models for RDBMS are MS Access, Oracle, MySQL, Informix, SQL Server, these are explained below. These databases use SQL as their standard database query language [1].

a. MySQL Community Edition

MySQL Database is a generally utilized mainstream open-source database. It is ordinarily been utilized with apache and PHP, in spite of the fact that it very well may be additionally utilized with

server-side java scripting strategy utilizing Node js.

b. MS-SQL Server Express Edition

This is a Microsoft item. MS_SQL having great unwavering quality, versatility, soundness highlights. It is an amazing and easy to use database.

c. Oracle 11g Express Edition

Prophet 11g express release is for improvement, sending, and to dissemination. It is having less difficult organization and is quick to download.

2. NoSQL Databases:

The term NoSQL means "Not just SQL". This isn't really a swap for the customary SQL despite the fact that NoSQL databases are non- relational databases. In numerous applications, NoSQL databases are utilized related to social databases. Contingent upon their properties, NoSQL databases are partitioned into five classifications [2][3][4]:

a. Key-Value Databases

In key-value databases, a hash table is kept up that is recorded by a "key". The key focuses to the arrangement of information (values) that the database can store. In this sort of database data is normally put away as a mass of information except for the key. Amazon DynamoDB and Riak are examples.

b. Document Oriented Databases

A document-oriented database, or document store, is a PC program intended for putting away, recovering and overseeing archive arranged data, otherwise called semi-organized data. Document-arranged databases are one of the primary classifications of NoSQL databases.MongoDB and CouchDB areexamples of a document-oriented database[5].

c. Column-Family Databases

In column family NoSQL database, information is put away in cells assembled in column of information as opposed to as row of information. Sections are sensibly assembled into column families. Cassandra and HBase are examples of a column family database.

d. Graph Databases

One of the least-comprehended sorts of databases out there is the graph database. Intended for working with profoundly interconnected information, a chart database may be portrayed as increasingly "relational" than a relational database. Graph databases sparkle when the objective is to catch complex connections in huge trap of data. Example: Dgraph, OrientDB[6].

e. Object-Oriented Databases

An item object-oriented database is a database that buys in to a model with data spoke to by objects. Item situated databases are a specialty offering in the relational database management system (RDBMS) field and are not as effective or surely understood as standard database engines. Example Db40[1].

IV. RDBMS vs NoSQL

1. Comparison

Development History : NoSQL **-** In 2000 to help adaptability and replication. Likewise appropriate for unstructured information. SQL - In 1970 to work with the original of information storage and applications. [6]

Forms: "Not just SQL" is partitioned into five classifications: Key-value databases, Column-family databases,

Document based databases, Object-oriented databases, graph database. SQL Databases are Relational schema table-oriented databases.[6]

Schemas: NoSQL follows dynamic schemas. So the information or data can be added at the runtime.SQL follows static schema. Every row must be finished and fixed before information passage.[6]

Type of data to be stored: "Not just SQL" database is nearly better for the various leveled information storage as it follows the key-value pair method for putting away information content which is like JSON information. For the most part enormous informational set prefers NoSQL databases large data set means that big data. The example for big data NoSQL database is Hbase.SQL databases are not much good fit for hierarchical data storage.[8]

Scalability: NoSQL databases depend on the horizontal scalability. Horizontal scalability is the capacity to expand limit by associating numerous equipment or programming substances so they fill in as a solitary logical unit.RDBMS depends on vertical Scalability this is one of the greatest challenges in relational databases. When load increases then hardware power has to be increased to scale this could be expensive.[9]

Data warehouse: "Not just SQL" databases are not intended to serious information distribution center applications on the grounds that the originators concentrated on elite, adaptability, accessibility and putting away huge information which is possibly profited by data warehouse to explain the expanding size of put away information issue.Relational databases utilized for information warehousing which - as known - coming about of get-together information from numerous sources and after some time the size of put away information increments then this causes enormous information issue. This also leads to some other problems like execution corruption while doing an OLAP, information mining.[10]

Complexity: "Not only SQL" databases has the capacity to maintain and handle structured, semi-structured and unstructured information[9][10]. Complexity is high because relational database follows table structure, information has to be fit into table. Suppose the provided information not suitable for tables, then you need to restructure the entire table or the database this makes difficulty.[9]

Cloud: "Not just SQL" databases are the best answer for cloud databases since every one of the attributes that characterize the NoSQL databases are entirely alluring for cloud databases. The cloud databases are also deals with unstructured and semi-structured data.The relational databases are hard to scale beyond the limit and it does not support full content data search. So it is not well suited for cloud environments.[10]

Big data handling: "Not just SQL" databases intended to deal with the large information so they actualized strategies to improve the exhibition of putting away and recovering information.Managing big data in RDBMS is a very big issue. Because the complexity is high due to the table structure.[10]

Output performance: Caching in NOSQL has been done in system memory. So it expands information yield execution. Caching in relational database system is finished utilizing the different framework.[9]

2. Operations and Basic terminology[11][2]

TABLE I. BASIC TERMINOLOGIES

S. No	*Basic terminology in MongoDB vs MySQL*	
	MySQL	**MongoDB**
1	Tables	Collection
2	Rows	Document or Bson document
3	Columns	Field
4	Join	Embedded documents and linking
5	Primary key Constraint	Object ID

TABLE II. BASIC OPERATIONS

	Operations in MySQL vs MongoDB	
	MySQL	**MongoDB**
1	Create Database	Use DBNAME
2	Create Table	Db.createCollection
3	Insert into	Db.collection.insert
4	Update table	Db.collection.update
5	Select	Db.collection.find()

3. Limitations

a. Limitations and Disadvantages of MySQL

1. Relational database scaling has to be done on incredible servers that are costly and hard to deal with.
2. Since relational database follows table structure, information has to be fit into table. Suppose the provided information not suitable for tables, then you need to restructure the entire table or the database if needed again it leads to difficulty.
3. RDBMS must be dispersed on to numerous servers, so that it can be scalled. Taking care of tables crosswise over various servers is a big trouble.[9]

b. Limitations and Disadvantages of NoSQL

1. The greatest strength of NoSQL databases is Open Source and yet its most prominent shortcoming in light of the fact that there are very few characterized norms for NoSQL databases, so no two NoSQL databases are equivalent .
2. A NoSQL database MongoDB does not maintain any stored procedures.
3. Relational databases uses some graphical interface tools to communicate with the databases. But for NoSQL, there is no availability in market.
4. very hard for discovering NoSQL specialists since it is the most recent innovation and NoSQL designer are in learning mode.[9]

V. PROCESSING QUERY

1. Query Processing in MySQL

Even though MySQL uses the modern technique called multiple threads to boost the performance, it is based on quite an old database concept. So it contains some issues to treat with. Multiple threads are

used when multiple queries need to be processed at the same time that is queries are processed in parallel. So if the query processor has high load by containing a huge number of queries, then MySQL processes those queries simultaneously. To avoid the crash while parallel processing, especially on writing queries in parallel, MySQL uses locks technique. This locking technique depends on the storage engines. Locking technique blocks the write access and secures against alternating write access to the same row (entry) this is called row-locking. With the help of row-locking, if a pushing data to a row will be protected by blocking another query which is trying to push data on the same row. This query will be blocked until the first write query has been finished. Meanwhile, other rows of the same table can be modified by simultaneous processing of other update or write queries [7].

2. Query Processing in MongoDB

The query processing mechanism of MongoDB is totally different from MySQL. Like MySQL, simultaneous query processing has not appeared in MongoDB. Instead, all the write queries are queued once it received by the MongoDB server. The queries are processed one by one by the server. This concept is known as instance-wide-locking which is processing only one write query at a time. But it is able to use multiple databases parallelly. Since MongoDB uses database-wide-locking itallows DB to process only one write query per database at a time. So MongoDB is processed queries much faster than MySQL[7].

VI. CONCLUSION

The primary focus of this survey is to compare the relational databases and NoSQL Database. This covers the properties, types, differences, limitations and query processing. Also specifically we represent MySQL for relational databases and MongoDB for NoSQL databases. Both, MySQL and MongoDB have their advantages and limitations. By these comparisons, we can conclude that the relational database might be a great choice if you have structured data and need a traditional relational database. If you have unstructured and/or structured data with the potential for rapid growth then NoSQL will be the better choice.However, if you need an increasingly adaptable, mapping free arrangement that can work with unstructured information, MongoDB merits considering.

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