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SQL vs NoSQL

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***Abstract*—NoSQL databases (either no-SQL or Not Only SQL) are currently a hot topic in some parts of computing. In fact, one website lists over a hundred different NoSQL databases NoSQL databases are designed to meet the huge data storage requirements of cloud computing and big data processing. NoSQL databases have lots of advanced features in addition to the conventional RDBMS features. Hence, the "NoSQL" databases are popularly known as "Not only SQL" databases. A variety of NoSQL databases having different features to deal with exponentially growing data-intensive applications are available with open source and proprietary option.**

Keywords— NoSQL

INTRODUCTION

To date, the RDBMS exists to support data management of all types regardless the format. With the new concept of Big Data, it is deemed essential that a new data management method is created to support applications such as real time log files analysis, transactions in e-commerce, and data uploaded social media.

"NoSQL" is a breed of databases that are appearing in response to the limitations of existing relational databases (RDBMS). NoSQL databases are capable of handling large amounts of structured, unstructured, semi-structured and hybrid data with an amazing performance at reduced complexity and cost.

Table:1 Comparison of NoSQL database and RDBMS

SL	NoSQL Database	Traditional Relational Database Management System
1.	NoSQL is unstructured way of storing the data.	RDBMS database completely structured way storing of data.
2.	The amount of data stored does not depend on the Physical memory of the system. It can be scaled horizontally as per the requirement.	The amount of data stored mainly depends on the Physical memory of the system.
3.	It can effectively handle million and billions of records	It can Effectively handle few thousands of records
4.	It is never advised for transaction management	It is best suited for transaction management
5.	Processing time depends upon number of cluster machines	The processing time depends on the server machine's configuration
6.	Availability is preferred over consistency.	Consistency is preferred over availability
7.	It follows CAP theorem.	It follows ACID property of transaction
8.	It scales horizontally as well as vertically.	It scales better vertically
9.	There is no need of normalization.	Tables must be normalized.
10.	Most of the NoSQL Databases are schema less	Traditional databases use the strict schema of database design.

NoSQL FEATURES

The requirement of NoSQL database originates from the needs of online shopping, services offered via web and online social media communication. These applications require the provision of reports, warning, and data integrity for the improvement in the services. Such data is typically collected from different foundations and need to be handled in realtime.

NoSQL databases provide:

1- Scalability (can be scaled horizontally)

2- High availability

3- Optimized resource allocation and utilization

4- Virtually unlimited data store capacity

5- Multitenancy

Features of NoSQL are briefed below.

1. High Scalability: NoSQL does not support "Join" because joins makes databases unscalable. They are capable of handling large amounts of growing data. NoSQL databases use the concept of distributing database over multiple hosts for dealing with increasing load. Commodity hardware can be used cost effectively using NoSQL in the cloud or virtualized environment. NoSQL databases are designed to enlarge transparently for taking advantage of freshly added nodes using lower cost commodity hardware

2. Performance: A growing number of people are joining the cloud for storing their data on different remote disks. More and more commodity servers were added by every passing day to enhance the performance of NoSQL for linearly balancing the loads

at a minimal cost at the same time keeping performance higher to meet user's expectations.

3. Availability: NoSQL uses replication, i.e. storing multiple copies of data across the cluster and even at various data centers for ensuring high availability and disaster recovery.

NoSQL AND CLOUD COMPUTING

A model from which the computing infrastructure is viewed as "Cloud", is called Cloud Computing, means that from anywhere in the world the application can be accessed by the business or individuals depend upon their demand. Essential characteristics of Cloud Computing:

- On-Demand Service: A user can access cloud provider service without human interaction.
- Wide Network Access (Basically Internet): Heterogeneous thick and thin client applications can access the services.
- Atomic, rapid, and elastic provisioning of resources (illusion of unlimited scalability).

Some of the NoSQL database are Apache Cassandra, CouchDB, MongoDB, which can run on the cloud environment. NoSQL databases are built to service heavy read/write loads and are able to scale up and down easily.

Table 2. Features of cloud computing in different NoSQL databases

Deployment Model	Database Technology	Provider	Cloud-Specific Features
Native Cloud NoSQL Database	Amazon SimpleDB	Amazon Web Browser	• Managed service. • High availability. • Unlimited scale. • Data durability.
Virtual machine image	Cassandra	Apache Cassandra – machine image for Amazon - EC2	None
Database as a Service	Cassandra	Instracluster – available on Amazon EC2, Rackspace, Windows Azure, Joyent, Google Computer Engine	• Managed service. • Performance tuning. • Monitoring. • Automated backups.
Native Cloud NoSQL Database	Google App Engine Datastore	Google	• No planned downtime. • Atomic transaction. • High availability at reads and writes.
Virtual machine image	MongoDB	MongoDB – machine images at Amazon EC2 and Windows Azure	None
Database as a Service	MongoDB	MongoDB – available on Amazon, Google, Joynet, Rackspace & Windows Azure	• Managed service. • High availability. • Automatic failover.
Database as a Service	Redis/Memcached	Amazon Web Services – Elasticache	• Pre-configured clustering. • Managed service. • Automatic healing at failed nodes. • Resilient system to prevent overloaded DBAs. • Performance monitoring .
Virtual machine image	Redis	Redis – standard open source installation	None
Database as a Service	Redis	Redis To Go – available an Amazon EC2, Windows Azure, Cloud Foundry, AppHarbor	• Managed service. • Automatic scaling. • Unlimited redius nodes. • High availability. • Built in clustering.
Native Cloud NoSQL Database	SalesForce Database.com	SalesForce	• Unlimited scale. • Access to SalesForce metadata. • Social API. • Support for mobile clients. • Multi-tenancy

FUTURE RESEARCH DIRECTIONS

The future work will focus on benchmarking and performance evaluation of various NoSQL databases available with respect to the size of datasets as well as the different type of the data sets.

CONCLUSION

NoSQL database movement which appeared in the recent years to provide better performance compare to the predominant RDMS.

NoSQL databases have shown they are capable of handling both real time of business applications as well analytic and enterprise search system.

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