NoSQL

In computing, **NoSQL** (sometimes expanded to "not only SQL") is a broad class of database management systems that differ from classic relational database management systems (RDBMSes) in some significant ways. These data stores may not require fixed table schemas, usually avoid join operations, and typically scale horizontally. Academia typically refers to these databases as **structured storage**,[1] [2] [3] [4] a term that would include classic relational databases as a subset.

History

Carlo Strozzi used the term *NoSQL* in 1998 to name his lightweight, open-source relational database that did not expose an SQL interface.[5] (Strozzi suggests that, as the current NoSQL movement "departs from the relational model altogether; it should therefore have been called more appropriately 'NoREL', or something to that effect."[6])

Eric Evans, a Rackspace employee, reintroduced the term *NoSQL* in early 2009 when Johan Oskarsson of Last.fm wanted to organize an event to discuss open-source distributed databases.[7] The name attempted to label the emergence of a growing number of non-relational, distributed data stores that often did not attempt to provide ACID (atomicity, consistency, isolation, durability) guarantees, which are the key attributes of classic relational database systems such as IBM DB2, MySQL, Microsoft SQL Server, PostgreSQL, Oracle RDBMS, Informix, Oracle Rdb, etc.

In 2011, work began on UnQL (Unstructured Query Language), a specification for a query language for NoSQL databases.[8] It is built to query collections (versus tables) of documents (versus rows) with loosely defined fields (versus columns). So it is a superset of SQL where SQL is a very constrained type of UnQL where the queries will always return the same fields (same number, names and types). However, UnQL does not cover the DDL SQL statements like CREATE TABLE or CREATE INDEX[9] .

Architecture

Typical modern relational databases have shown poor performance on certain data-intensive applications, including indexing a large number of documents, serving pages on high-traffic websites, and delivering streaming media.[10] Typical RDBMS implementations are tuned either for small but frequent read/write transactions or for large batch transactions with rare write accesses. NoSQL, on the other hand, can service heavy read/write workloads.[10] Real-world NoSQL deployments include Digg's 3 TB for green badges (markers that indicate stories upvoted by others in a social network)[11] and Facebook's 50 TB for inbox search.[12]

NoSQL architectures often provide weak consistency guarantees, such as eventual consistency, or transactions restricted to single data items. Some systems, however, provide full ACID guarantees in some instances by adding a supplementary middleware layer (e.g., AppScale and CloudTPS).[13] [14] Two systems have been developed that provide snapshot isolation for column stores: Google's Percolator system based on BigTable,[15] and a transactional system for HBase developed at the University of Waterloo.[16] These systems, developed independently, use similar concepts to achieve multi-row distributed ACID transactions with snapshot isolation guarantee for the underlying column store, without the extra overhead of data management, middleware system deployment, or maintenance introduced by the middleware layer.

Several NoSQL systems employ a distributed architecture, with the data held in a redundant manner on several servers, often using a distributed hash table. In this way, the system can readily scale out by adding more servers, and failure of a server can be tolerated.[17]

Some NoSQL advocates promote very simple interfaces such as associative arrays or key-value pairs. Other systems, such as native XML databases, promote support of the XQuery standard. Newer systems such as CloudTPS also support join queries.[18]

Taxonomy

NoSQL implementations can be categorized by their manner of implementation:

Document store

Name	Language	Notes
BaseX	Java, XQuery	XML database
Apache CouchDB	Erlang	
eXist	XQuery	XML database
Jackrabbit	Java	
Lotus Notes	LotusScript, Java, others	MultiValue
MarkLogic Server	XQuery	XML database
MongoDB	C++	BSON (Binary format JSON)
OrientDB	Java	
SimpleDB	Erlang	
Terrastore	Java	

Graph

Name	Language	Notes
AllegroGraph	SPARQL	RDF GraphStore
DEX	Java	High-performance Graph Database
InfiniteGraph	Java	High-performance, scalable, distributed Graph Database
Neo4j	Java	
OrientDB	Java	
FlockDB	Scala	
Sones GraphDB	C#	Graph database with query language called *GraphQL*
Pregel		

Key-value store

Key-value stores allow the application to store its data in a schema-less way. The data could be stored in a datatype of a programming language or an object. Because of this, there is no need for a fixed data model.[19] The following types exist:

Eventually€consistent key€value store

- € Apache Cassandra
- € Dynamo
- € Hibari
- € Project Voldemort
- € Riak [20]

Hierarchical key-value store

- GT.M

Hosted services

- Freebase

Key-value cache in RAM

- Citrusleaf database
- memcached
- Oracle Coherence
- Redis
- Tuple space
- Velocity

Key-value stores on disk

- BigTable
- CDB
- Citrusleaf database
- Keyspace
- LevelDB
- membase
- Memcachedb
- Redis
- Tokyo Cabinet
- TreapDB
- Tuple space
- MongoDB

Ordered key-value stores

- Berkeley DB
- IBM Informix C-ISAM
- Memcachedb
- NDBM

Multivalue databases

- Extensible Storage Engine (ESE/NT)
- OpenQM
- Revelation Software's OpenInsight
- Rocket U2
- D3 Pick database
- InterSystems Cach•

Object database

- € db4o
- € GemStone/S
- € InterSystems Cach•
- € JADE
- € ObjectDB
- € Objectivity/DB
- € ObjectStore
- € Versant Object Database
- € ZODB

Tabular

- € BigTable
- € Apache Hadoop
- € Apache Hbase
- € Hypertable
- € Mnesia

Tuple store

- € Apache River

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External links

- € (http://www.odbms.org/downloads.aspx#nosql) on [ODBMS.ORG: NoSQL Data Stores Section]
- € NoSQLforums.ORG: NoSQL Knowledgebase - Live Message Board (http://www.nosqlforums.org/)
- € NoSQL User Group (http://www.linkedin.com/groups?gid=2085042) on LinkedIn
- € nosql-discussion (http://groups.google.com/group/nosql-discussion) on Google Groups
- € nosqldatabases.com (http://nosqldatabases.com/)
- € myNoSQL: news, articles and links about NoSQL (http://nosql.mypopescu.com/)
- € nosql-databases.org (http://nosql-databases.org/)
- € computerworld.com : No to SQL? Anti-database movement gains steam (http://www.computerworld.com/s/article/9135086/No_to_SQL_Anti_database_movement_gains_steam_)
- € Is Microsoft Feeling the "NoSQL" Heat? (http://reddevnews.com/blogs/data-driver/2009/12/nosql-heat_0.aspx)
- € *Information Week* "The NoSQL Alternative" (http://www.informationweek.com/news/development/architecture-design/showArticle.jhtml?articleID=224900559)
- € How RDF Databases Differ from Other NoSQL Solutions (http://blog.datagraph.org/2010/04/rdf-nosql-diff)
- € CouchOne (http://www.couchone.com)
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