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DATABASE MANAGEMENTS SYSTEMS

A database is a collection of data or records. Database management systems are designed to manage databases. A database management system (DBMS) is a software system that uses a standard method to store and organize data. The data can be added, updated, deleted, or traversed using various standard algorithms and queries.

Types of Database Management Systems

There are several types of database management systems. Here is a list of seven common database management systems:

1. Hierarchical databases
2. Network databases
3. Relational databases
4. Object-oriented databases
5. Graph databases
6. ER model databases
7. Document databases
8. NoSQL databases

Hierarchical Databases

In a hierarchical database management system (hierarchical DBMSs) model, data is stored in a parent-children relationship node. In a hierarchical database, besides actual data, records also contain information about their groups of parent/child relationships.

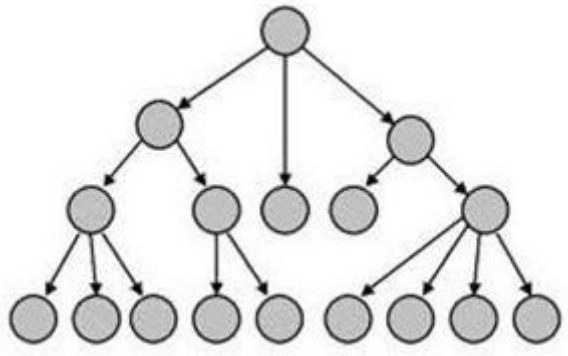
In a hierarchical database model, data is organized into a tree-like structure. The data is stored in the form of a collection of fields where each field contains only one value. The records are linked to each other via links into a parent-children relationship. In a hierarchical database model, each child record has only one parent. A parent can have multiple children.

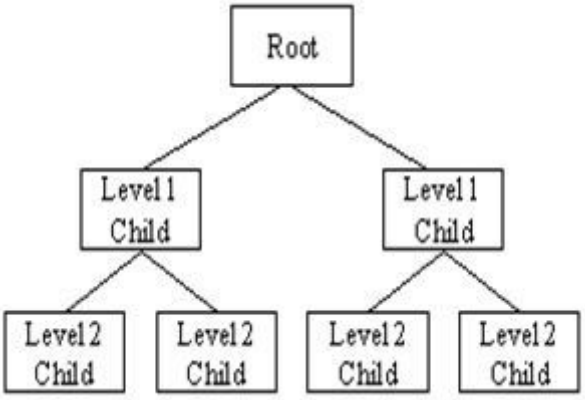
To retrieve a field’s data, we need to traverse through each tree until the record is found.

The hierarchical database system structure was developed by IBM in the early 1960s. While the hierarchical structure is simple, it is inflexible due to the parent-child one-to-many relationship.

Hierarchical databases are widely used to build high performance and availability applications usually in the banking and telecommunications industries.

The **IBM Information Management System (IMS)** and **Windows Registry** are two popular examples of hierarchical databases.





Advantages of Hierarchical Database:

- Have many different structures and forms.
- Structures data in an upside-down tree. (Simplifies data overview)
- Manages large amounts of data.
- Express the relationships between information.
- Many children per parent.
- Distribute data in terms of relationships.
- Improve data sharing.

Disadvantages of Hierarchical Database:

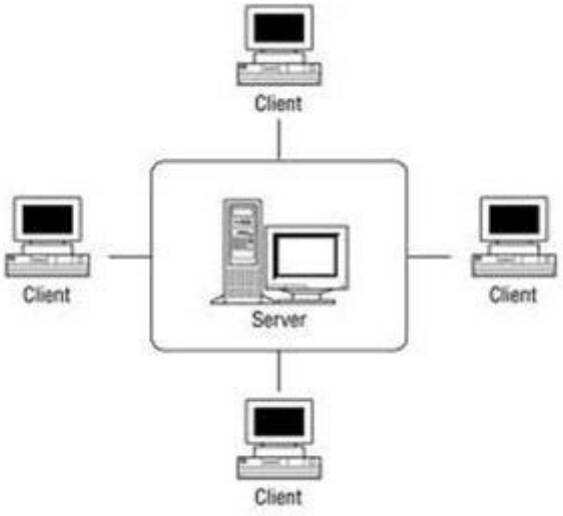
- One parent per child.
- Complex (users require physical representation of database)
- Navigation system is complex.
- Data must be organized in a hierarchical way without compromising the information.

- Lack structural independence.
- Many too many relationships not supported.
- Data independence.

Relational Databases

In a relational database management system (RDBMS), the relationship between data is relational and data is stored in tabular form of columns and rows. Each column of a table represents an attribute and each row in a table represents a record. Each field in a table represents a data value.

Structured Query Language (SQL) is the language used to query RDBMS, including inserting, updating, deleting, and searching records. Relational databases work on each table that has a key field that uniquely indicates each row. These key fields can be used to connect one table of data to another.



Relational databases are the most popular and widely used databases. Some of the popular DDBMS are **Oracle, SQL Server, MySQL, SQLite, and IBM DB2.**

Properties of Relational Tables

In a relational database, we have to follow the properties given below:

- Values are Atomic
- Each Row is alone.
- Column Values are the same thing.

- Columns are undistinguished.
- Sequence of Rows is Insignificant.
- Each Column has a common name.

Advantages of RDBMS

- It is easy to use.
- It is secured in nature.
- The data manipulation can be done.
- It limits redundancy and replication of the data.
- It offers better data integrity.
- It provides better physical data independence.
- It offers logical database independence i.e. data can be viewed in different ways by the different users.
- It provides better backup and recovery procedures.
- It provides multiple interfaces.
- Multiple users can access the database which is not possible in DBMS.

Disadvantages of RDBMS:

- Software is expensive.
- Complex software refers to expensive hardware and hence increases overall cost to avail the RDBMS service.
- It requires skilled human resources to implement.
- Certain applications are slow in processing.
- It is difficult to recover the lost data.

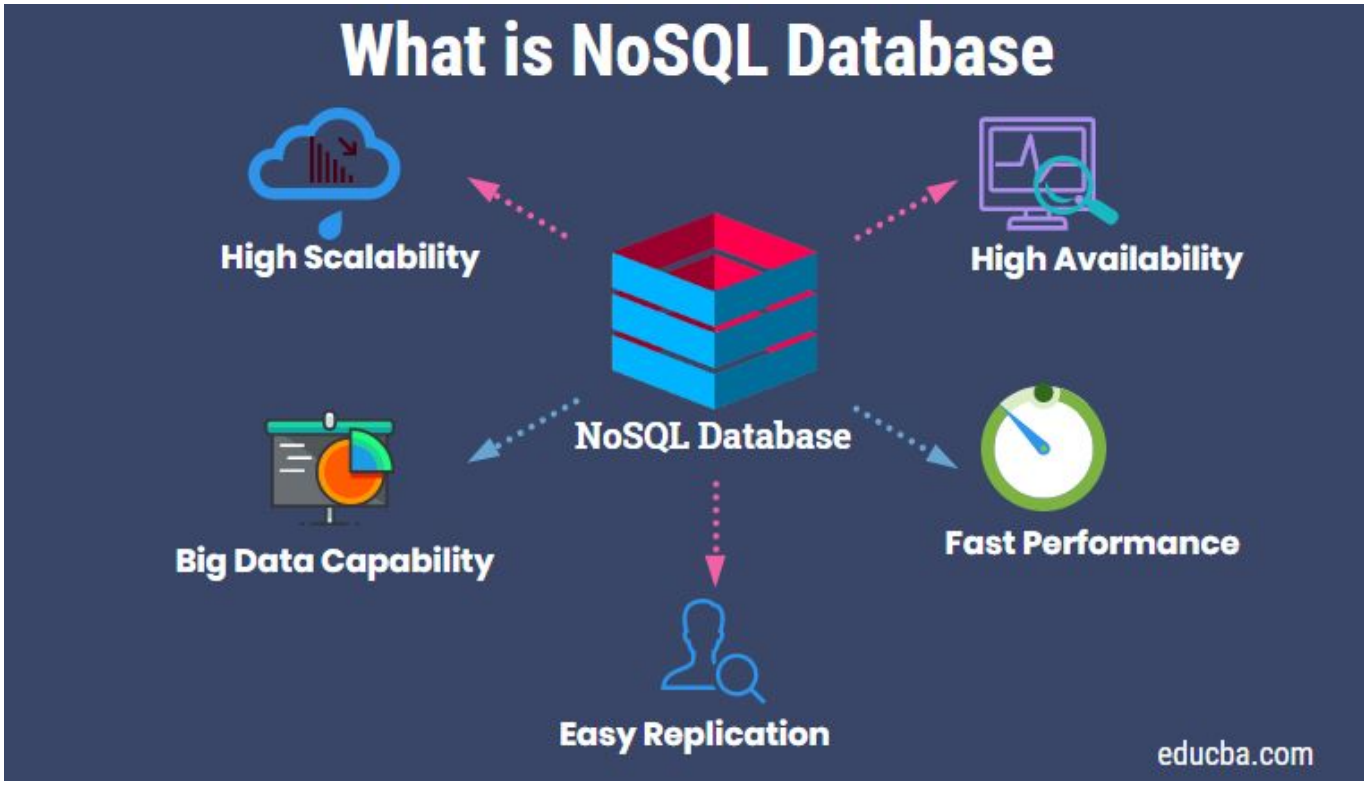
NoSQL Databases

NoSQL databases are the databases that do not use SQL as their primary data access language. Graph database, network database, object database, and document databases are common NoSQL databases. This article answers the question, what is a NoSQL database.

NoSQL database does not have predefined schemas, which makes NoSQL databases a perfect candidate for rapidly changing development environments.

NoSQL allows developers to make changes on the fly without affecting applications.

NoSQL databases can be categorized in the following five major categories, Column, Document, Graph, Key-value, and Object databases.



Here is a list of 10 popular NoSQL databases:

1. Cosmos DB
2. ArangoDB
3. Couchbase Server
4. CouchDB
5. Amazon DocumentDB
6. MongoDB, CouchBase
7. Elasticsearch
8. Informix
9. SAP HANA
10. Neo4j

Advantages of NoSQL:

- Loading test data can be done with drag-and-drop tools before ER modeling is complete.
- Modular architecture allows components to be exchanged.
- Linear scaling takes place as new processing nodes are added to the cluster.
- Lower operational costs are obtained by autosharding.

- Integrated search functions provide high-quality ranked search results
- There’s no need for an object-relational mapping layer.
- It’s easy to store high-variability data

Disadvantages of NoSQL:

- ACID transactions can be done only within a document at the database level. Other transactions must be done at the application level.
- Document stores don’t provide fine-grained security at the element level.
- NoSQL systems are new to many staff members and additional training may be required.
- The document store has its own proprietary nonstandard query language, which prohibits portability.
- The document store won’t work with existing reporting and OLAP tools.

CONCLUSION:

Thus, we have here a case study database management system. We have performed an in-depth study on Hierarchical Databases, Relational Databases and NoSQL Databases.