## A STUDY ON DIFFERENT DATA BASE MANAGEMENT SYSTEM

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.

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

1. Centralized Database
2. NoSQL Database
3. Distributed Database
4. Relational Database
5. Cloud Database
6. Personal Database
7. Object-oriented Databases
8. Hierarchical Databases
9. Network Databases
10. Graph Databases
11. Enterprise Database
12. **Centralized Database**

Database that stores data at a centralized database system. It comforts the users to access the stored data from different locations through several applications. These applications contain the authentication process to let users access data securely.

Eg: Central Library that carries a central database of each library in a college/university.

### **Advantages of Centralized Database**

* It has decreased the risk of data management, i.e., manipulation of data will not affect the core data.
* Data consistency is maintained as it manages data in a central repository.
* It provides better data quality, which enables organizations to establish data standards.
* It is less costly because fewer vendors are required to handle the data sets.

### **Disadvantages of Centralized Database**

* The size of the centralized database is large, which increases the response time for fetching the data.
* It is not easy to update such an extensive database system.
* If any server failure occurs, entire data will be lost, which could be a huge loss.

## 2) NoSQL Database

Non-SQL/Not Only SQL is a type of database that is used for storing a wide range of data sets. It is not a relational database as it stores data not only in tabular form but in several different ways. It came into existence when the demand for building modern applications increased. Thus, NoSQL presented a wide variety of database technologies in response to the demands. Four types are there:

1. **Key-value storage:** It is the simplest type of database storage where it stores every single item as a key (or attribute name) holding its value, together.
2. **Document-oriented Database:** A type of database used to store data as JSON-like document. It helps developers in storing data by using the same document-model format as used in the application code.
3. **Graph Databases:** It is used for storing vast amounts of data in a graph-like structure. Most commonly, social networking websites use the graph database.
4. **Wide-column stores:** It is similar to the data represented in relational databases. Here, data is stored in large columns together, instead of storing in rows.

### **Advantages of NoSQL Database:**

* It enables good productivity in the application development as it is not required to store data in a structured format.
* It is a better option for managing and handling large data sets.
* It provides high scalability.
* Users can quickly access data from the database through key-value.

## 3) Distributed Database

Data is distributed among different database systems of an organization. These database systems are connected via communication links. Such links help the end-users to access the data easily.

**Examples** of the Distributed database are Apache Cassandra, HBase, Ignite, etc.

We can further divide a distributed database system into:

* **Homogeneous DDB:** Those database systems which execute on the same operating system and use the same application process and carry the same hardware devices.
* **Heterogeneous DDB:** Those database systems which execute on different operating systems under different application procedures, and carries different hardware devices.

### **Advantages of Distributed Database**

* Modular development is possible in a distributed database, i.e., the system can be expanded by including new computers and connecting them to the distributed system.

One server failure will not affect the entire data set.

## 4) Relational Database

This database is based on the relational data model, which stores data in the form of rows(tuple) and columns(attributes), and together forms a table(relation). A relational database uses SQL for storing, manipulating, as well as maintaining the data. E.F. Codd invented the database in 1970. Each table in the database carries a key that makes the data unique from others.

**Examples** of Relational databases are MySQL, Microsoft SQL Server, Oracle, etc.

### **Properties of Relational Database**

There are following four commonly known properties of a relational model known as ACID properties, where:

**A means Atomicity:** This ensures the data operation will complete either with success or with failure. It follows the 'all or nothing' strategy. For example, a transaction will either be committed or will abort.

**C means Consistency:** If we perform any operation over the data, its value before and after the operation should be preserved. For example, the account balance before and after the transaction should be correct, i.e., it should remain conserved.

**I means Isolation:** There can be concurrent users for accessing data at the same time from the database. Thus, isolation between the data should remain isolated. For example, when multiple transactions occur at the same time, one transaction effects should not be visible to the other transactions in the database.

**D means Durability:** It ensures that once it completes the operation and commits the data, data changes should remain permanent.

## 5) Cloud Database

A type of database where data is stored in a virtual environment and executes over the cloud computing platform. It provides users with various cloud computing services (SaaS, PaaS, IaaS, etc.) for accessing the database. There are numerous cloud platforms, but the best options are:

* Amazon Web Services(AWS)
* Microsoft Azure
* Kamatera
* PhonixNAP
* ScienceSoft
* Google Cloud SQL, etc.

## 6) Personal Database

Collecting and storing data on the user's system defines a Personal Database. This database is basically designed for a single user. Data is collected and stored on personal computers which are small and easily manageable. The data is generally used by the same department of an organization and is accessed by a small group of people.

### **Advantage of Personal Database**

* It is simple and easy to handle.
* It occupies less storage space as it is small in size.

**7) Object-oriented Databases**

The type of database that uses the object-based data model approach for storing data in the database system. The data is represented and stored as objects which are similar to the objects used in the object-oriented programming language. It provides full-featured database programming capabilities while containing native language compatibility. It adds the database functionality to object programming languages. This approach is analogical of the application and database development into a constant data model and language environment. Applications require less code, use more natural data modeling, and code bases are easier to maintain. Object developers can write complete database applications with a decent amount of additional effort.

The object-oriented database derivation is the integrity of object-oriented programming language systems and consistent systems. The power of object-oriented databases comes from the cyclical treatment of both consistent data, as found in databases, and transient data, as found in executing programs.

Object-oriented databases use small, recyclable separated from software called objects. The objects themselves are stored in the object-oriented database.

Each object contains two elements:

1. A piece of data (e.g., sound, video, text, or graphics).
2. Instructions, or software programs called methods, for what to do with the data.

**Disadvantages of Object-oriented databases**

1. Object-oriented databases are more expensive to develop.
2. Most organizations are unwilling to abandon and convert from those databases.

**Benefits of Object-oriented databases**

The benefits of object-oriented databases are compelling. The ability to mix and match reusable objects provides the incredible multimedia capability.

**8) 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.



**Advantage**

A hierarchical database can be accessed and updated rapidly. As shown in the figure above, its model structure is like a tree and the relationships between records are defined in advance. This feature is a double-edged sword.

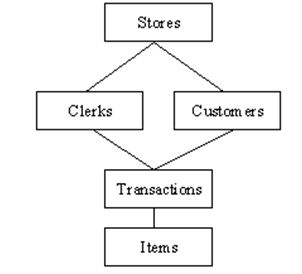
**Disadvantage**

This type of database structure is that each child in the tree may have only one parent. Relationships or linkages between children are not permitted, even if they make sense from a logical standpoint. Hierarchical databases are like this in their design. Adding a new field or record requires that the entire database be redefined.

## 9) Network Databases

Network database management systems (Network DBMSs) use a network structure to create a relationship between entities. Network databases are mainly used on large digital computers. Network databases are hierarchical databases, but unlike hierarchical databases where one node can have a single parent only, a network node can have a relationship with multiple entities. A network database looks more like a cobweb or interconnected network of records.

In network databases, children are called members and parents are called occupiers. The difference between each child or member is that it can have more than one parent. The approval of the network data model is similar to a hierarchical data model. Data in a network database is organized in many-to-many relationships.



The network database structure was invented by Charles Bachman. Some of the popular network databases are the Integrated Data Store (IDS), IDMS (Integrated Database Management System), Raima Database Manager, TurboIMAGE, and Univac DMS-1100

## 10) Graph Databases

Graph Databases are NoSQL databases and use a graph structure for semantic queries. The data is stored in the form of nodes, edges, and properties. In a graph database, a Node represents an entity or instance such as a customer, person, or car. A node is equivalent to a record in a relational database system. An Edge in a graph database represents a relationship that connects nodes. Properties are additional information added to the nodes.

The Neo4j, Azure Cosmos DB, SAP HANA, Sparksee, Oracle Spatial and Graph, OrientDB, ArrangoDB, and MarkLogic are some of the popular graph databases. Graph database structure is also supported by some RDBMS including Oracle and SQL Server 2017 and later versions.

## 11) Enterprise Database

Large organizations or enterprises use this database for managing a massive amount of data. It helps organizations to increase and improve their efficiency. Such a database allows simultaneous access to users.

Enterprise databases are widely used by enterprises in order to strategize, plan and standardize practices. They are primarily employed to boost efficiency in the company. By reducing costs, they help in promoting the effectiveness within an organization.

An enterprise database must allow simultaneous access of a large number of users. Some of the features such databases include:

* Parallel query
* Multiprocess support
* Clustering features

An ideal enterprise database is loaded with an array of features, all of which are focused to improve productivity and efficiency of the organization.

### **Advantages of Enterprise Database:**

* Multi processes are supportable over the Enterprise database.
* It allows executing parallel queries on the system.