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What is a Database?

A database is a collection of related data which represents some aspect of the real world. A database system is designed to be built and populated with data for a certain task.

What is DBMS?

Database Management System (DBMS) is a software for storing and retrieving users' data while considering appropriate security measures. It consists of a group of programs which manipulate the database. The DBMS accepts the request for data from an application and instructs the operating system to provide the specific data. In large systems, a DBMS helps users and other third-party software to store and retrieve data.

DBMS allows users to create their own databases as per their requirement. The term "DBMS" includes the user of the database and other application programs. It provides an interface between the data and the software application.

History of DBMS

Here, are the important landmarks from the history:

- 1960 - Charles Bachman designed first DBMS system
- 1970 - Codd introduced IBM'S Information Management System (IMS)
- 1976- Peter Chen coined and defined the Entity-relationship model also know as the ER model
- 1980 - Relational Model becomes a widely accepted database component
- 1985- Object-oriented DBMS develops.
- 1990s- Incorporation of object-orientation in relational DBMS.

- 1991- Microsoft ships MS access, a personal DBMS and that displaces all other personal DBMS products.
- 1995: First Internet database applications
- 1997: XML applied to database processing. Many vendors begin to integrate XML into DBMS products.

Characteristics of Database Management System

- Provides security and removes redundancy
- Self-describing nature of a database system
- Insulation between programs and data abstraction
- Support of multiple views of the data
- Sharing of data and multiuser transaction processing
- DBMS allows entities and relations among them to form tables.
- It follows the ACID concept (Atomicity, Consistency, Isolation, and Durability).
- DBMS supports multi-user environment that allows users to access and manipulate data in parallel.

Types of DBMS

Four Types of DBMS systems are:

- Hierarchical database
- Network database
- Relational database
- Object-Oriented database

Hierarchical DBMS

In a Hierarchical database, model data is organized in a tree-like structure. Data is Stored Hierarchically (top down or bottom up) format. Data is represented using a parent-child relationship. In Hierarchical DBMS parent may have many children, but children have only one parent.

Network Model

The network database model allows each child to have multiple parents. It helps you to address the need to model more complex relationships like as the orders/parts many-to-many relationship. In this model, entities are organized in a graph which can be accessed through several paths.

Relational model

Relational DBMS is the most widely used DBMS model because it is one of the easiest. This model is based on normalizing data in the rows and columns of the tables. Relational model stored in fixed structures and manipulated using SQL.

Object-Oriented Model

In Object-oriented Model data stored in the form of objects. The structure which is called classes which display data within it. It defines a database as a collection of objects which stores both data members values and operations.

Advantages of DBMS

- DBMS offers a variety of techniques to store & retrieve data
- DBMS serves as an efficient handler to balance the needs of multiple applications using the same data
- Uniform administration procedures for data
- Application programmers are never exposed to details of data representation and storage.
- A DBMS uses various powerful functions to store and retrieve data efficiently.
- Offers Data Integrity and Security
- The DBMS implies integrity constraints to get a high level of protection against prohibited access to data.
- A DBMS schedules concurrent access to the data in such a manner that only one user can access the same data at a time
- Reduced Application Development Time

Disadvantage of DBMS

- Cost of Hardware and Software of a DBMS is quite high which increases the budget of your organization.
- Most database management systems are often complex systems, so the training for users to use the DBMS is required.
- In some organizations, all data is integrated into a single database which can be damaged because of electric failure or database is corrupted on the storage media
- Use of the same program at a time by many users sometimes lead to the loss of some data.
- DBMS can't perform sophisticated calculations

MS ACCESS:

One of the main applications of DBMS is that it can also be used to manage an accounting system. And MS Access is one of the popular DBMS tools that is used for the same. As Microsoft's primary database program MS Access has many applications in the economic world.

In accounting it may be used for reviewing accounts, tracking down invoices, keeping a check on the creditors of the company, reviewing final accounts at year end etc. MS Access is a very effective tool for financial management and even tax management.

Components of MS Access

There are seven major components of Microsoft Access. When we create a component in Access it is an object, and several similar objects grouped together will constitute a class. Let us take a look at the components.

- Tables
- Relationships
- Queries
- Forms
- Reports
- Macros
- Modules

Important functions:

- **Automated tasks: Microsoft Access has a great advantage of automating its routine tasks, if the data needs to be exported automatically a macro is created that allows to perform the task.**
- **Realization of reports: It has the advantage of placing the information of the database in a format that can be formatted for impressions, custom adjustments can be made according to what the user requires.**
- **Query information: It has the ability to modify, add, delete and even be able to isolate the information in tables, this function can only be used for manipulation and selection of information.**
- **The access of simultaneous users: It has the facility of admitting a number of users at the same time depending on the volume of data and the tasks designated in their level of use and design of the application.**
- **Publication of data on websites: Forms and reports based on a web model can be published easily in any of the current web browsers without the need to use extensions.**
- **Now that the most important functions of Microsoft Access have been mentioned, we will talk about what are the advantages and disadvantages to understand in a more exact point the limitations.**

Advantages of MS Access

- Ease of integration: It works in a way with varied programs for software development based on Windows only, you can also use its tables in products such as SQL Server.
- Storage capacity: The Access database can support up to 2 GB of data which is considered a good quantity for a majority of data developments.
- Multi-user support: Previous versions such as 2016 allow a total of 255 users approximately.
- Easy development: It is an excellent combination that can be applied for users who wish to develop software using .NET since it is possible to link with access.

Disadvantages of MS Access:

- Limit of capacity: The database is intended for small and medium enterprises, but more than anything, exceeding 2 GB of information will be the cause of a limitation.
- Indiscriminate use of multiple operating systems: The use of different Windows operating systems on different computers can corrupt or generate a certain breakdown of the information when sharing the database with this mixture can originate this consequence.
- Actual limit of users: Technically the limit of users of the database of access is approximately 255 users at the same time but nevertheless the actual limit covers from 10 to 80 users.

mongoDB:

MongoDB is one popular NoSQL database that stores data in BSON. BSON is binary encoding JSON which stores data in key-value pairs.

Working with MongoDB NoSQL database is much easier than working with any relational database. There are no tables in MongoDB. All the data is stored in JSON format,i.e. key-value pairs. In JSON, we define a unique key with a value associated with it. These key-value pairs are stored in a document, which in turn is stored in a collection. A collection in MongoDB can have any number of documents and such documents can have any number of key-value pairs. As I mentioned earlier, data in the MongoDB database is stored in BSON. BSON is nothing but extended JSON. It supports more data types than JSON. We store anything like, string, integer, boolean, double, binary data, object, array, javascript code and many more.
These documents are grouped inside a collection. A collection can be equivalent to a table in a relational SQL database. A collection always exists in a database and there is no predefined structure of a collection. In SQL, the database contains tables and in MongoDB, the database contains collections.

Important Terms in MongoDB

There are many different terms used in MongoDB NoSQL database. The following are some of the important terms used in the MongoDB database.

- Document
- Collection
- Database
- Key-value pairs
- JSON
- BSON
- _id

ADVANTAGES OF MongoDB:

- schema-less. If you have a flexible schema, this is ideal for a document store like MongoDB. This is difficult to implement in a performant manner in RDBMS
- ease of scale-out. Scale reads by using replica sets. Scale writes by using sharding (auto balancing). Just fire up another machine and away you go. Adding more machines = adding more RAM over which to distribute your working set.
- cost. Depends on which RDBMS of course, but MongoDB is free and can run on Linux, ideal for running on cheaper commodity kit.
- you can choose what level of consistency you want depending on the value of the data (e.g. faster performance = fire and forget inserts to MongoDB, slower performance = wait til insert has been replicated to multiple nodes before returning)

DISADVANTAGES OF MongoDB:

- Data size in MongoDB is typically higher due to e.g. each document has field names stored it
- less flexibity with querying (e.g. no JOINs)
- no support for transactions - certain atomic operations are supported, at a single document level

- at the moment Map/Reduce (e.g. to do aggregations/data analysis) is OK, but not blisteringly fast. So if that's required, something like Hadoop may need to be added into the mix
- less up to date information available/fast evolving product

IBM DB2 :

Overview

DB2 is a database product from IBM. It is a Relational Database Management System (RDBMS). DB2 is designed to store, analyze and retrieve the data efficiently. DB2 product is extended with the support of Object-Oriented features and non-relational structures with XML.

DB2 was originally designed by IBM in the 80's for their specific platform. However, in the 1990's the company decided to make it compatible with other operating systems; Linux, Unix, and Windows. DB2 is suitable for large organizations which have diverse and high volume of data.

History

Initially, IBM had developed DB2 product for their specific platform. Since year 1990, it decided to develop a Universal Database (UDB) DB2 Server, which can run on any authoritative operating systems such as Linux, UNIX, and Windows.

FEATURES:

- IBM® BLU Acceleration
- IBM pureScale
- Advanced storage optimization
- Hybrid Flex
- Storage optimization
- SQL compatibility
- Disaster recovery

ADVANTAGES OF DB2:

- DB2 is a versatile relational database; as it can be hosted from a traditional physical server in a data warehouse, cloud or both.
- DB2 has a task scheduler which makes it capable of running and prioritizing multiple jobs simultaneously.
- IBM BLU acceleration is a cutting-edge tech integrated into DB2. It provides actionable insights even for enormous data sources.

DISADVANTAGES OF DB2:

- Since the release of version 10.5, IBM has limited the database size to 15TB — applicable to versions below the Enterprise Server Edition.
- Third-party tools need to be employed to make clusters or secondary nodes.

- Considering the intuitive and user-friendly GUI most RDBMSs offer, DB2 has a rudimentary black screen interface.