DATABASE MANAGEMENT SYSTEM

UNIT-1 : INTRODUCTION

**Ques. What is Data, Information, Database and DBMS.**

**Answer:-**

**DATA:-**

* Data is nothing but **facts** and statistics stored or free flowing over a network, generally it’s a **raw** and **unprocessed**.
* **For Example:-** When you visit any website, they might store your **IP address**, **that is data**, in return they might add a cookie in your browser, **marking you that you visited the website, that is data**, your name, it’s data, your age, it’s also data.

**INFORMATION:-**

* Data becomes **information** when it is **processed**, turning it into something **meaningful**. Like, based on the cookie data saved on user's browser, **if a website can analyse that generally men of age 20-25 visit us more, that is information**, derived from the data collected.

**DATABASE:-**

* A **Database** is a **collection of related data** organised in a way that data can be easily accessed, managed and updated.
* Database can be software based or hardware based, with one sole purpose, storing data.
* It is also used to organize the data in the form of a table, schema, views, and reports, etc.
* **For example:** The college Database organizes the data about the admin, staff, students and faculty etc.

Using the database, you can easily retrieve, insert, and delete the information.

* **Larry Ellison, the co-founder of Oracle was amongst the first few, who realised the need for a software based Database Management System.**

**DATABASE MANAGEMENT SYSTEM (DBMS):-**

* **Database management system** is a **software** which is **used to manage the database**.
* **For example:** MySQL, Oracle, DB2, SQL SERVER etc are a very popular commercial database which is used in different applications.
* DBMS provides an interface to perform various operations like database creation, storing data in it, updating data, creating a table in the database and a lot more.
* It provides protection and security to the database. In the case of multiple users, it also maintains data consistency.
* **DBMS allows users the following tasks:-**

1. **Data Definition:** It is used for creation, modification, and removal of definition that defines the organization of data in the database.
2. **Data Updation:** It is used for the insertion, modification, and deletion of the actual data in the database.
3. **Data Retrieval:** It is used to retrieve the data from the database which can be used by applications for various purposes.
4. **User Administration:** It is used for registering and monitoring users, maintain data integrity, enforcing data security, dealing with concurrency control, monitoring performance and recovering information corrupted by unexpected failure.

**Ques. Write down the characteristics, application, advantage and disadvantage of database management system.**

**Answer:-**

**A database management system has following characteristics:**

1. **Data stored into Tables:** Data is never directly stored into the database. Data is stored into tables, created inside the database. DBMS also allows to have relationships between tables which makes the data more meaningful and connected. You can easily understand what type of data is stored where by looking at all the tables created in a database.
2. **Reduced Redundancy:** In the modern world hard drives are very cheap, but earlier when hard drives were too expensive, unnecessary repetition of data in database was a big problem. But DBMS follows Normalisation which divides the data in such a way that repetition is minimum.
3. **Data Consistency:** On Live data, i.e. data that is being continuously updated and added, maintaining the consistency of data can become a challenge. But DBMS handles it all by itself.
4. **Support Multiple user and Concurrent Access:** DBMS allows multiple users to work on it(update, insert, delete data) at the same time and still manages to maintain the data consistency.
5. **Query Language:** DBMS provides users with a simple Query language, using which data can be easily fetched, inserted, deleted and updated in a database.
6. **Security:** The DBMS also takes care of the security of data, protecting the data from un-authorised access. In a typical DBMS, we can create user accounts with different access permissions, using which we can easily secure our data by restricting user access.
7. DBMS supports transactions, which allows us to better handle and manage data integrity in real world applications where multi-threading is extensively used.

**Users of DBMS**

Following are the various category of users of DBMS

|  |  |
| --- | --- |
| **Component Name** | **Task** |
| Application Programmers | The Application programmers write programs in various programming languages to interact with databases. |
| Database Administrators | Database Admin is responsible for managing the entire DBMS system. He/She is called Database admin or DBA. |
| End-Users | The end users are the people who interact with the database management system. They conduct various operations on database like retrieving, updating, deleting, etc. |

**Application of DBMS**

Below are the popular database system applications:

|  |  |
| --- | --- |
| **Sector** | **Use of DBMS** |
| Banking | For customer information, account activities, payments, deposits, loans, etc. |
| Airlines | For reservations and schedule information. |
| Universities | For student information, course registrations, colleges and grades. |
| Telecommunication | It helps to keep call records, monthly bills, maintaining balances, etc. |
| Finance | For storing information about stock, sales, and purchases of financial instruments like stocks and bonds. |
| Sales | Use for storing customer, product & sales information. |
| Manufacturing | It is used for the management of supply chain and for tracking production of items. Inventories status in warehouses. |
| HR Management | For information about employees, salaries, payroll, deduction, generation of paychecks, etc. |

**Advantages of DBMS**

* **Controls database redundancy:** It can control data redundancy because it stores all the data in one single database file and that recorded data is placed in the database.
* **Data sharing:** In DBMS, the authorized users of an organization can share the data among multiple users.
* **Easily Maintenance:** It can be easily maintainable due to the centralized nature of the database system.
* **Reduce time:** It reduces development time and maintenance need.
* **Backup:** It provides backup and recovery subsystems which create automatic backup of data from hardware and software failures and restores the data if required.
* **Multiple User Interface:** It provides different types of user interfaces like graphical user interfaces, application program interfaces

**Disadvantages of DBMS**

* **Cost of Hardware and Software:** It requires a high speed of data processor and large memory size to run DBMS software.
* **Size:** It occupies a large space of disks and large memory to run them efficiently.
* **Complexity:** Database system creates additional complexity and requirements.
* **Higher impact of failure:** Failure is highly impacted the database because in most of the organization, all the data stored in a single database and if the database is damaged due to electric failure or database corruption then the data may be lost forever.

**Ques. Explain the Database Development Life Cycle.**

**Answer:-**

**Planning**

**Analysis**

**Physical Design**

**Implementation**

***Maintenance***

**Logical Design**

1. **Planning:-** Purpose–preliminary understanding Deliverable–request for study
2. **Requirement Analysis:-**

* The most important step in implementing a database system is to find out what is needed i.e what type of a database is required for the business organization, daily volume of data, how much data needs to be stored in the master files etc.
* In order to collect all this information, a database analyst spends a lot of time within the business organization talking to people, end users and getting acquainted with the day-to-day process.

1. **Logical Design:-**

* In this phase the database designers will make a decision on the database model that perfectly suits the organization’s requirement. The database designers will study the documents prepared by the analysis in the requirement analysis stage and then start development of a system model that fulfils the needs.
* This design is translated into internal model which includes mapping of all objects i.e design of tables, indexes, views, transaction, access privileges etc.

1. **Physical Design:-**

* This phase selects and characterizes the data storage and data access of the database.
* The data storage depends on the type of devices supported by the hardware, the data access methods.
* Physical design is very vital because of bad design which results in poor performance.

1. **Implementation:-**

* Database implementation needs the formation of special storage related constructs.
* These constructs consist of storage groups, table spaces, data files, tables etc.
* Once the database has been created, the data must be loaded into the database.
* The data required to be converted, if the loaded date is in a different format.

1. **Maintenance:-**

* It is one of the ongoing phases in DDLC.
* The major tasks included are database backup and recovery, access management, hardware maintenance etc.