**DBMS (Database Management System)**

**Database:**Database is a collection of inter-related data which helps in efficient retrieval, insertion and deletion of data from database and organizes the data in the form of tables, views, schemas, reports etc. For Example, university database organizes the data about students, faculty, and admin staff etc. which helps in efficient retrieval, insertion and deletion of data from it.

**Database Management System:**

**What is DBMS?**  
A Database Management System (DBMS) is a application software that allows users to efficiently define, create, maintain and share databases. Defining a database involves specifying the data types, structures and constraints of the data to be stored in the database. Creating a database involves storing the data on some storage medium that is controlled by DBMS. Maintaining a database involves updating the database whenever required to evolve and reflect changes in the miniworld and also generating reports for each change. Sharing a database involves allowing multiple users to access the database. DBMS also serves as an interface between the database and end users or application programs. It provides control access to the data and ensures that data is consistent and correct by defining rules on them.   
An application program accesses the database by sending queries or requests for data to the DBMS. A query causes some data to be retrieved from database.

DBMS allows users the following tasks:

**Data Definition:** It helps in creation, modification and removal of definitions that define the organization of data in database.

**Data Updation:** It helps in insertion, modification and deletion of the actual data in the database.

**Data Retrieval:** It helps in retrieval of data from the database which can be used by applications for various purposes.

**User Administration:** It helps in registering and monitoring users, enforcing data security, monitoring performance, maintaining data integrity, dealing with concurrency control and recovering information corrupted by unexpected failure.

**What is File System?**   
A File Management system is a DBMS that allows acces to single files or tables at a time. In a File System, data is directly stored in set of files. It contains flat files that have no relation to other files (when only one table is stored in single file, then this file is known as flat file).

**Paradigm Shift from File System to DBMS**

File System manages data using files in hard disk. Users are allowed to create, delete, and update the files according to their requirement. Let us consider the example of file based University Management System. Data of students is available to their respective Departments, Academics Section, Result Section, Accounts Section, Hostel Office etc. Some of the data is common for all sections like Roll No, Name, Father Name, Address and Phone number of students but some data is available to a particular section only like Hostel allotment number which is a part of hostel office. Let us discuss the issues with this system:

* **Redundancy of data:** Data is said to be redundant if same data is copied at many places. If a student wants to change Phone number, he has to get it updated at various sections. Similarly, old records must be deleted from all sections representing that student.
* **Inconsistency of Data:**Data is said to be inconsistent if multiple copies of same data does not match with each other. If Phone number is different in Accounts Section and Academics Section, it will be inconsistent. Inconsistency may be because of typing errors or not updating all copies of same data.
* **Difficult Data Access:** A user should know the exact location of file to access data, so the process is very cumbersome and tedious. If user wants to search student hostel allotment number of a student from 10000 unsorted students’ records, how difficult it can be.
* **Unauthorized Access:** File System may lead to unauthorized access to data. If a student gets access to file having his marks, he can change it in unauthorized way.
* **No Concurrent Access:**The access of same data by multiple users at same time is known as concurrency. File system does not allow concurrency as data can be accessed by only one user at a time.
* **No Backup and Recovery:** File system does not incorporate any backup and recovery of data if a file is lost or corrupted.

**Advantages of DBMS over File system :**

* **Data redundancy and inconsistency –**  
  Redundancy is the concept of repetition of data i.e. each data may have more than a single copy. The file system cannot control redundancy of data as each user defines and maintains the needed files for a specific application to run. There may be a possibility that two users are maintaining same files data for different applications. Hence changes made by one user does not reflect in files used by second users, which leads to inconsistency of data. Whereas DBMS controls redundancy by maintaining a single repository of data that is defined once and is accessed by many users. As there is no or less redundancy, data remains consistent.
* **Data sharing –**   
  File system does not allow sharing of data or sharing is too complex. Whereas in DBMS, data can be shared easily due to centralized system.
* **Data concurrency –**   
  Concurrent access to data means more than one user is accessing the same data at the same time. Anomalies occur when changes made by one user gets lost because of changes made by other user. File system does not provide any procedure to stop anomalies. Whereas DBMS provides a locking system to stop anomalies to occur.
* **Data searching –**  
  For every search operation performed on file system, a different application program has to be written. While DBMS provides inbuilt searching operations. User only have to write a small query to retrieve data from database.
* **Data integrity –**   
  There may be cases when some constraints need to be applied on the data before inserting it in database. The file system does not provide any procedure to check these constraints automatically. Whereas DBMS maintains data integrity by enforcing user defined constraints on data by itself.
* **System crashing –**   
  In some cases, systems might have crashes due to various reasons. It is a bane in case of file systems because once the system crashes, there will be no recovery of the data that’s been lost. A DBMS will have the recovery manager which retrieves the data making it another advantage over file systems.
* **Data security –**   
  A file system provides a password mechanism to protect the database but how longer can the password be protected? No one can guarantee that. This doesn’t happen in the case of DBMS. DBMS has specialized features that help provide shielding to its data.

**Disadvantages of DBMS**

With the vast list of advantages, there are some following disadvantages or limitations of the database management system.

**1. High Cost**

The high cost of software and hardware is the main disadvantage of the database management system.

Database users require a high-speed processor and huge memory size to use the database on the DBMS. Sometimes, users require costly machines for maintaining databases.

Organizations need a trained and highly paid technical database administrator for using and maintaining the large database systems.

**2. Huge Size**

The size of the database is not big at the initial state, but when the user stores a large amount of data, then it creates many problems. Due to the huge data, database systems do not provide good results and do not run efficiently. That’s why the size is another limitation of the database systems.

**3. Database Failure**

In the database systems, all the data or information of an organization is stored in one centralized database. If the database of that organization fails, then the data is lost, and the organization will collapse. So, database failure is a big problem with the database management system.

**4. Complexity**

Database management system (DBMS) is so complex for non-technical users. So, it isn’t easy to manage and maintain database systems. Therefore, training for the designers, users, and administrators is necessary to efficiently run the database systems.

**5. Increased Staff Cost**

DBMS requires an educated and skilled staff for managing and maintaining the databases. So, we need to spend a lot of money to get this level of trained and experienced staff.

**6. Requirement of Technical Staff**

A non-technical people can’t understand the complexity of the database. So, the technical staff is required for maintaining and handling the database management system.

**Application of DBMS**

There are different fields where a database management system is utilized. Following are a few applications which utilize the information base administration framework –

1. **Railway Reservation System –**  
   In the rail route reservation framework, the information base is needed to store the record or information of ticket appointments, status about train’s appearance, and flight. Additionally, if trains get late, individuals become acquainted with it through the information base update.
2. **Library Management System –**  
   There are loads of books in the library so; it is difficult to store the record of the relative multitude of books in a register or duplicate. Along these lines, the data set administration framework (DBMS) is utilized to keep up all the data identified with the name of the book, issue date, accessibility of the book, and its writer.
3. **Banking –**  
   Database the executive’s framework is utilized to store the exchange data of the client in the information base.
4. **Education Sector –**  
   Presently, assessments are led online by numerous schools and colleges. They deal with all assessment information through the data set administration framework (DBMS). In spite of that understudy’s enlistments subtleties, grades, courses, expense, participation, results, and so forth all the data is put away in the information base.
5. **Credit card exchanges –**  
   The database Management framework is utilized for buying on charge cards and age of month to month proclamations.
6. **Social Media Sites –**  
   We all utilization of online media sites to associate with companions and to impart our perspectives to the world. Every day, many people group pursue these online media accounts like Pinterest, Facebook, Twitter, and Google in addition to. By the utilization of the data set administration framework, all the data of clients are put away in the information base and, we become ready to interface with others.
7. **Broadcast communications –**  
   Without DBMS any media transmission organization can’t think. The Database the executive’s framework is fundamental for these organizations to store the call subtleties and month to month postpaid bills in the information base.
8. **Account –**  
   The information base administration framework is utilized for putting away data about deals, holding and acquisition of monetary instruments, for example, stocks and bonds in a data set.
9. **Online Shopping –**   
   These days, web-based shopping has become a major pattern. Nobody needs to visit the shop and burn through their time. Everybody needs to shop through web based shopping sites, (for example, Amazon, Flipkart, Snapdeal) from home. So all the items are sold and added uniquely with the assistance of the information base administration framework (DBMS). Receipt charges, installments, buy data these are finished with the assistance of DBMS.