



# Database Management System



Presented By:

Er. Parul Preet Singh

Assistant Professor, CSE Department

MAIT, Maharaja Agrasen University



# Topics Discussed in this Section

---

- Introduction to DBMS(Database Management System)
- Key Features of DBMS(Database Management System)
- Advantages of DBMS(Database Management System)
- Disadvantages of DBMS(Database Management System)
- Applications of DBMS(Database Management System)
- Difference between File System and DBMS
- Data Independence
- Physical Level Data Independence
- Logical Level Data Independence



# Introduction to DBMS(Database Management System)

---

**Data:** It is defined as representation of facts, concepts or instructions in a formalized manner suitable for Communication, Interpretation or processing by human or electronic machine.

Data is represented with the help of Characters (or processing by human or electronic machine) like alphabets(A-Z, a-z), digits(0-9) or special characters(+,-, >, <) etc.

Data is collection of raw facts. Data is required in the operation of any organization. We can derive meaningful conclusion from this data.



# Introduction to DBMS(Database Management System)

**Field or Data Item:** A set of characters which are used together to represent a specific data elements are called field.

e.g. In Below mentioned figure Rollno, Name, Marks are fields.

Rollno	Name	Marks
200	Priya	74
201	Rahul	82
202	Raj	87

field → (pointing to columns)

record 1 → (pointing to first row)

record 2 → (pointing to second row)

record 3 → (pointing to third row)

file (bracketed around the entire table)



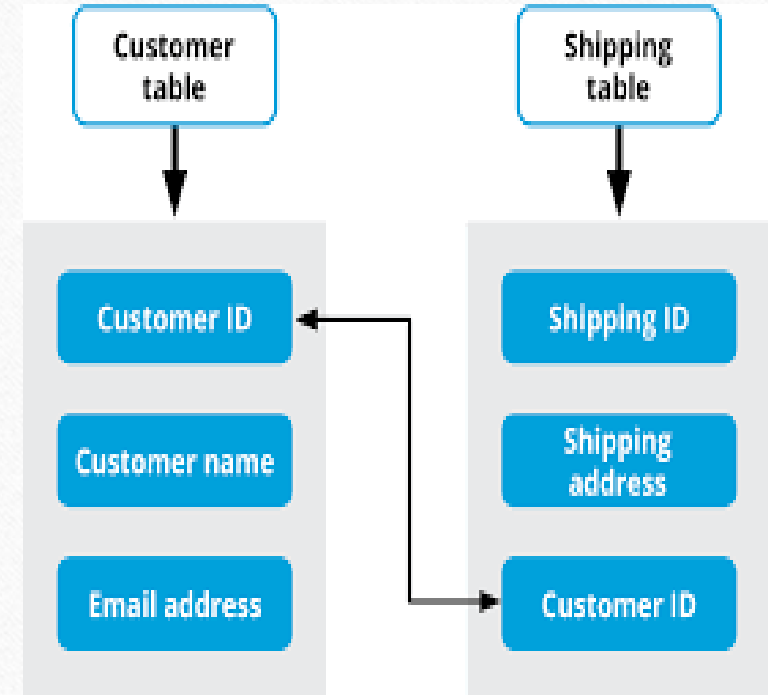
# Introduction to DBMS(Database Management System)

**Record:** Collection of fields is called as record. e.g class record for a student contains data fields as Rollno, name, marks etc.

**File:** Collection of records is called as file.

**Database:** A database is an organized collection of data stored in a computer system and usually controlled by a database management system (DBMS). The data in common databases is modeled in tables, making querying and processing efficient. Structured query language (SQL) is commonly used for data querying and writing.

The Database is an essential part of our life. We encounter several activities that involve our interaction with databases, for example in the bank, in the railway station, in school, in a grocery store, etc. These are the instances where we need to store a large amount of data in one place and fetch these data easily.





# Introduction to DBMS(Database Management System)

---

A database is a collection of data that is organized, which is also called structured data. It can be accessed or stored in a computer system. It can be managed through a Database Management System(DBMS), a software used to manage data. Database refers to related data in a structured form.

**Database Management System:** A Database Management System (DBMS) is a software system that is designed to manage and organize data in a structured manner. It allows users to create, modify, and query a database, as well as manage the security and access controls for that database.



# Key Features of DBMS(Database Management System)

---

- **Data modeling:** A DBMS provides tools for creating and modifying data models, which define the structure and relationships of the data in a database.
- **Data storage and retrieval:** A DBMS is responsible for storing and retrieving data from the database, and can provide various methods for searching and querying the data.
- **Concurrency control:** A DBMS provides mechanisms for controlling concurrent access to the database, to ensure that multiple users can access the data without conflicting with each other.
- **Data integrity and security:** A DBMS provides tools for enforcing data integrity and security constraints, such as constraints on the values of data and access controls that restrict who can access the data.



# Key Features of DBMS(Database Management System)

---

- **Backup and recovery:** A DBMS provides mechanisms for backing up and recovering the data in the event of a system failure.
- **DBMS can be classified into two types:** Relational Database Management System (RDBMS) and Non-Relational Database Management System (NoSQL or Non-SQL)
- **RDBMS:** Data is organized in the form of tables and each table has a set of rows and columns. The data are related to each other through primary and foreign keys.
- **NoSQL:** Data is organized in the form of key-value pairs, documents, graphs, or column-based. These are designed to handle large-scale, high-performance scenarios.





# Advantages of DBMS(Database Management System)

---

- **Data organization:** A DBMS allows for the organization and storage of data in a structured manner, making it easy to retrieve and query the data as needed.
- **Data integrity:** A DBMS provides mechanisms for enforcing data integrity constraints, such as constraints on the values of data and access controls that restrict who can access the data.
- **Concurrent access:** A DBMS provides mechanisms for controlling concurrent access to the database, to ensure that multiple users can access the data without conflicting with each other.



# Advantages of DBMS(Database Management System)

---

- **Data security:** A DBMS provides tools for managing the security of the data, such as controlling access to the data and encrypting sensitive data.
- **Backup and recovery:** A DBMS provides mechanisms for backing up and recovering the data in the event of a system failure.
- **Data sharing:** A DBMS allows multiple users to access and share the same data, which can be useful in a collaborative work environment.



# Disadvantages of DBMS(Database Management System)

---

- **Complexity:** DBMS can be complex to set up and maintain, requiring specialized knowledge and skills.
- **Performance overhead:** The use of a DBMS can add overhead to the performance of an application, especially in cases where high levels of concurrency are required.
- **Scalability:** The use of a DBMS can limit the scalability of an application, since it requires the use of locking and other synchronization mechanisms to ensure data consistency.
- **Cost:** The cost of purchasing, maintaining and upgrading a DBMS can be high, especially for large or complex systems.
- **Limited Use Cases:** Not all use cases are suitable for a DBMS, some solutions don't need high reliability, consistency or security and may be better served by other types of data storage.



# Applications of DBMS(Database Management System)

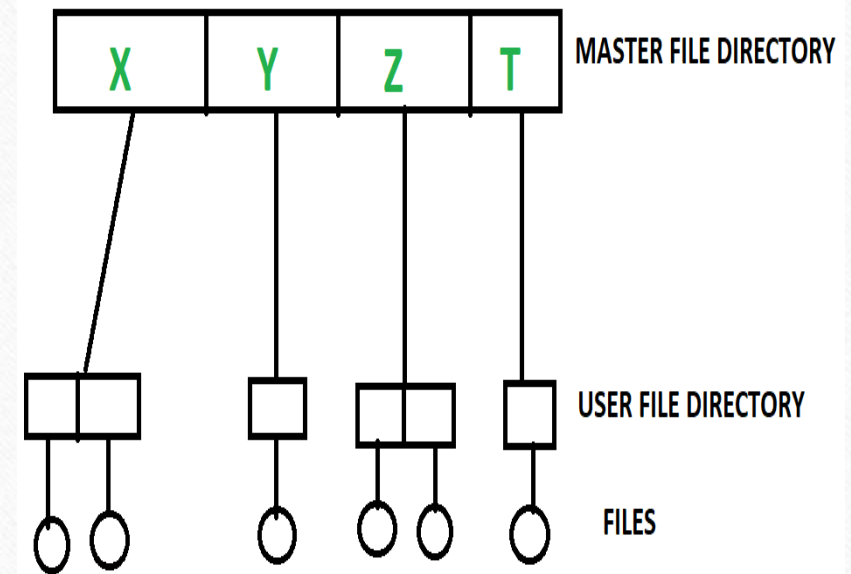
---

- **Enterprise Information:** Sales, accounting, human resources, Manufacturing, online retailers.
- **Banking and Finance Sector:** Banks maintaining the customer details, accounts, loans, banking transactions, credit card transactions. Finance: Storing the information about sales and holdings, purchasing of financial stocks and bonds.
- **University:** Maintaining the information about student course enrolled information, student grades, staff roles.
- **Airlines:** Reservations and schedules.
- **Telecommunications:** Prepaid, postpaid bills maintenance.



# Differentiate Between File System and DBMS

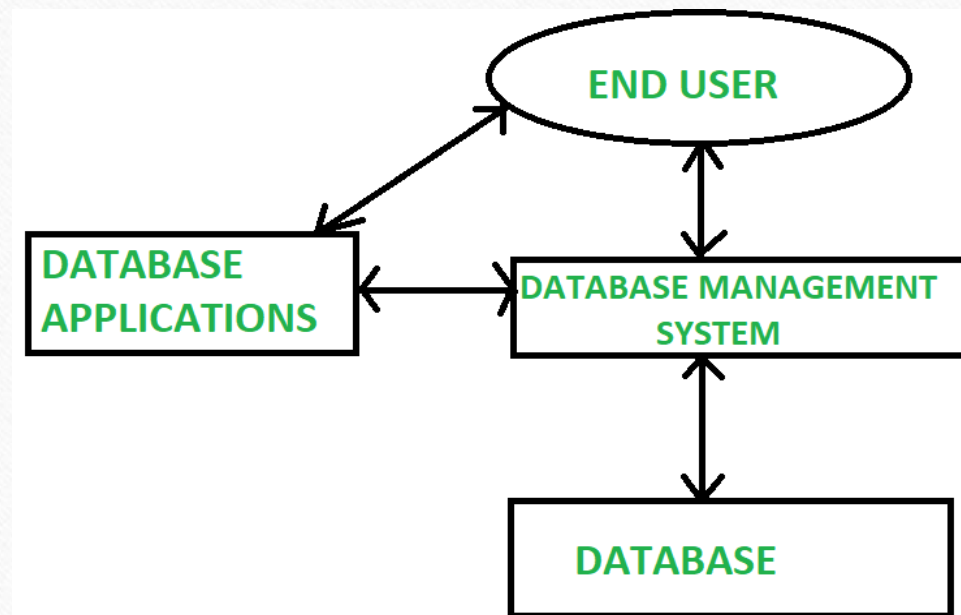
- The **file system** is basically a way of arranging the files in a storage medium like a hard disk. The file system organizes the files and helps in the retrieval of files when they are required. File systems consist of different files which are grouped into directories. The directories further contain other folders and files. The file system performs basic operations like management, file naming, giving access rules, etc.
- **Example:** NTFS(New Technology File System), EXT(Extended File System).





# Differentiate Between File System and DBMS

- **DBMS(Database Management System)**
- Database Management System is basically software that manages the collection of related data. It is used for storing data and retrieving the data effectively when it is needed. It also provides proper security measures for protecting the data from unauthorized access. In Database Management System the data can be fetched by SQL queries and relational algebra. It also provides mechanisms for data recovery and data backup.
- Example: Oracle, MySQL, MS SQL Server





# Differentiate Between File System and DBMS

Basics	File System	DBMS
<b>Structure</b>	The file system is a way of arranging the files in a storage medium within a computer.	DBMS is software for managing the database.
<b>Data Redundancy</b>	Redundant data can be present in a file system.	In DBMS there is no redundant data.
<b>Backup and Recovery</b>	It doesn't provide Inbuilt mechanism for backup and recovery of data if it is lost.	It provides in house tools for backup and recovery of data even if it is lost.



# Differentiate Between File System and DBMS

Basics	File System	DBMS
<b>Query processing</b>	There is no efficient query processing in the file system.	Efficient query processing is there in DBMS.
<b>Consistency</b>	There is less data consistency in the file system.	There is more data consistency because of the process of normalization.
<b>Complexity</b>	It is less complex as compared to DBMS.	It has more complexity in handling as compared to the file system.





# Differentiate Between File System and DBMS

Basics	File System	DBMS
<b>Query processing</b>	There is no efficient query processing in the file system.	Efficient query processing is there in DBMS.
<b>Consistency</b>	There is less data consistency in the file system.	There is more data consistency because of the process of normalization.
<b>Complexity</b>	It is less complex as compared to DBMS.	It has more complexity in handling as compared to the file system.



# Differentiate Between File System and DBMS

Basics	File System	DBMS
<b>Security Constraints</b>	File systems provide less security in comparison to DBMS.	DBMS has more security mechanisms as compared to file systems.
<b>Cost</b>	It is less expensive than DBMS.	It has a comparatively higher cost than a file system.
<b>Data Independence</b>	There is no data independence.	In DBMS data independence exists, mainly of two types: 1) Logical Data Independence. 2) Physical Data Independence.



# Differentiate Between File System and DBMS

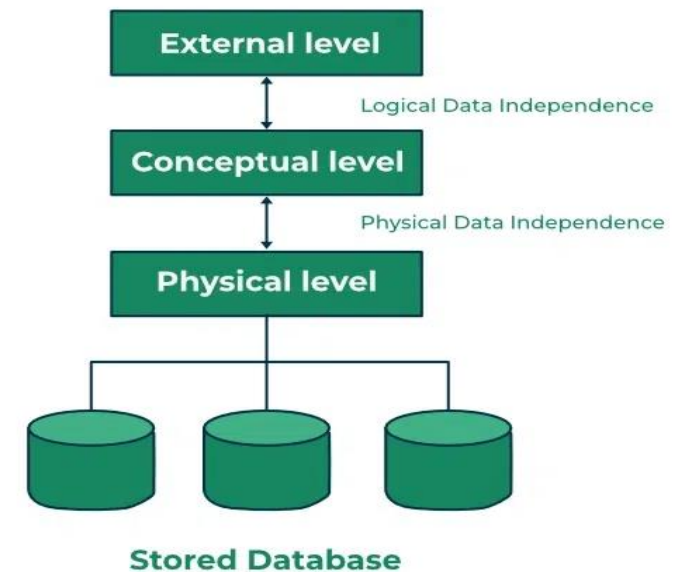
Basics	File System	DBMS
<b>User Access</b>	Only one user can access data at a time.	Multiple users can access data at a time.
<b>Meaning</b>	The users are not required to write procedures.	The user has to write procedures for managing databases
<b>Sharing</b>	Data is distributed in many files. So, it is not easy to share data.	Due to centralized nature data sharing is easy



# Data Independence

- **Data Independence** is mainly defined as a property of DBMS that helps you to change the database schema at one level of a system without requiring to change the schema at the next level. It helps to keep the data separated from all programs that make use of it. We have namely two levels of data independence arising from these levels of abstraction:
  - Physical level data independence
  - Logical level data independence

## Data Independence in DBMS





# Physical Level Data Independence

- It refers to the characteristic of being able to modify the physical schema without any alterations to the conceptual or logical schema, done for optimization purposes, e.g., the Conceptual structure of the database would not be affected by any change in storage size of the database system server. Changing from sequential to random access files is one such example. These alterations or modifications to the physical structure may include:
- Utilizing new storage devices.
- Modifying data structures used for storage.
- Altering indexes or using alternative file organization techniques etc.



# Logical Level Data Independence

---

- It refers characteristic of being able to modify the logical schema without affecting the external schema or application program. The user view of the data would not be affected by any changes to the conceptual view of the data. These changes may include insertion or deletion of attributes, altering table structures entities or relationships to the logical schema, etc.



---

Thank you