

DATABASE MANAGEMENT SYSTEM

- A database management system (DBMS) is a collection of interrelated data and a set of programs to access those data.
- The collection of data, usually referred to as the **database, contains information relevant to an enterprise.**
- The **primary goal** of a DBMS is to provide a way to **store and retrieve database information in a most efficient and convenient manner.**

DATABASE MANAGEMENT SYSTEM

- Database Management involves both defining structures for storage of information and providing mechanisms for manipulation of information.
- Above all, the database system must ensure the safety of information stored, despite system crashes, or attempts at unauthorized access.

DBMS APPLICATIONS

- Databases are everywhere.
 - **Enterprise Information**
 - Sales.
 - Accounting.
 - Human Resources
 - Manufacturing.
 - Online Retailers.
 - **Banking and Finance**
 - Banking.
 - Credit card transactions.
 - Finance.

DBMS APPLICATIONS

- **Universities**
 - For student information, course registrations and grades.
- **Airlines**
 - For reservations and scheduled information. Airlines were among the first to use databases in a geographically distributed manner.
- **Telecommunication**
 - For keeping records of calls made, generating bills, maintaining balances on your cell phones.

FILE PROCESSING SYSTEM

- File processing systems was an early attempt to computerize the manual filing system. A file system is a method for storing and organizing computer files and the data they contain to make it easy to find and access them.
- The system stores permanent records in various files and it needs different application programs to extract records from and add records to the appropriate files.
- File processing systems are directly under the control of operating system.

FILE PROCESSING SYSTEM

DRAWBACKS

- Keeping organisational information in file-processing system, results in a number of major drawbacks:
 - Data Redundancy and Inconsistency
 - Different application programs store information in different structures
 - Result are **duplication** and **redundancy**.
 - Difficulty in accessing data
 - We need to handpick the data in file processing system.
 - Even if we develop some program, it will only work for a particular request, and not for all.

FILE PROCESSING SYSTEM

DRAWBACKS

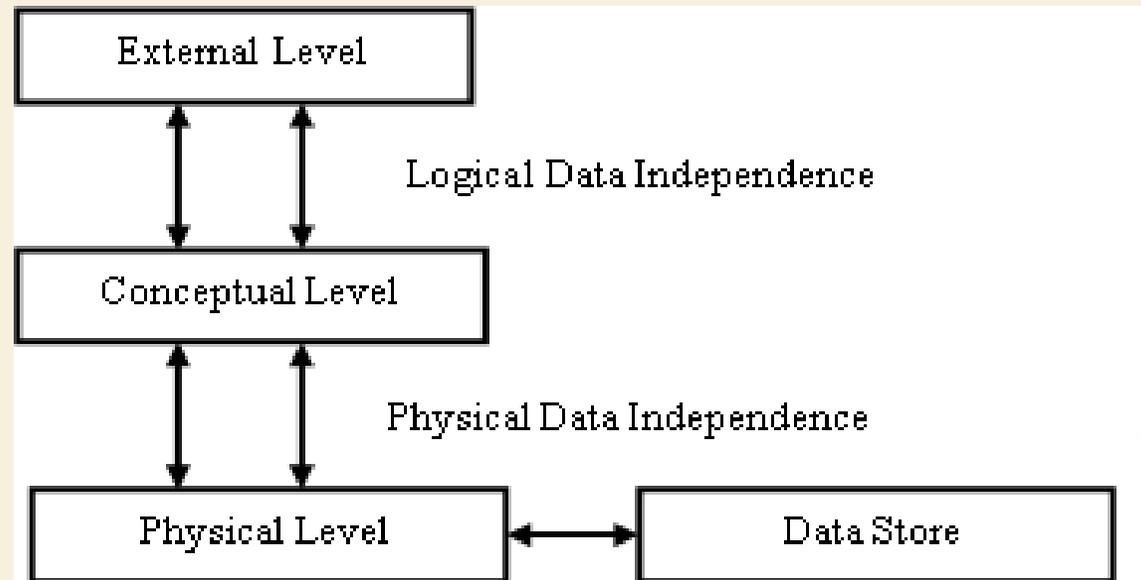
- Data Isolation
 - Data are scattered in various files and files may be in different formats, writing new application programs to retrieve the appropriate data is difficult.
- Integrity Problem
 - In a database data values that are stored satisfy certain types of consistency constraints
 - Data stored in file processing system store data in various files and in various files and in different formats.
 - It is very difficult to implement all types of constraints across various data items from different files.
- Atomicity Problem
- Security Problem

DATA ABSTRACTION

- The major task of a database system is to provide users with an **abstract view** of data.
- By **abstract view** of data, we mean, the system hides certain details of how the data are stored and maintained.
- **WHY DO WE NEED DATA ABSTRACTION?**
 - For our systems to be usable all the times they must retrieve data efficiently. This criteria of Efficiency has led to use of complex data structures to represent data in database. Since most of database users are not highly trained and skilled, developers hide the complexity from users through several levels of abstraction to simplify users interactions with the system

DBMS 3-TIER ARCHITECTURE

- DBMS 3-tier architecture divides the complete system into three inter-related but independent modules.



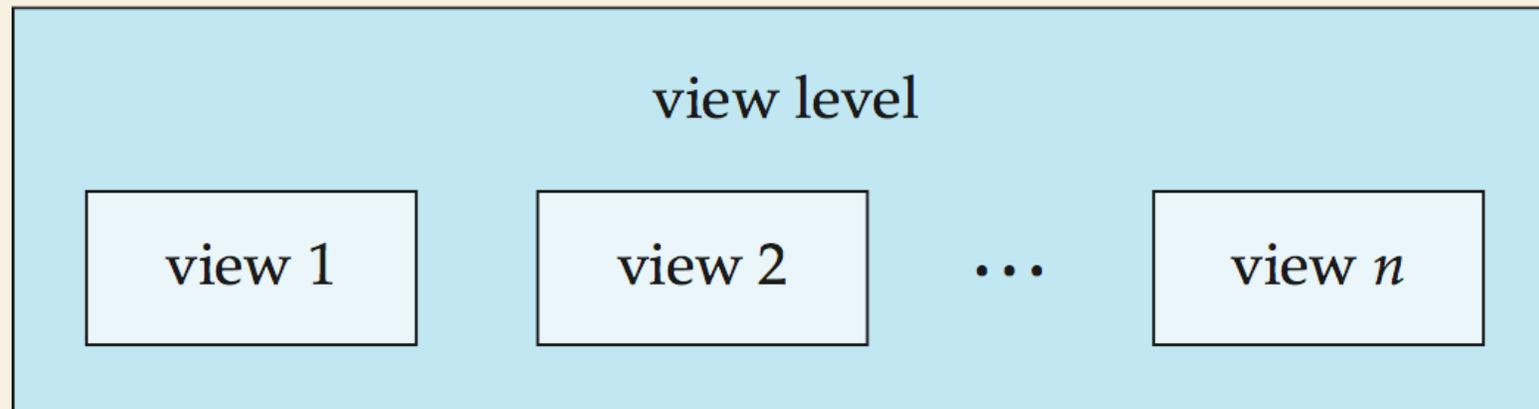
DBMS 3-TIER ARCHITECTURE

- **Physical Level:** At physical level, the information about location of database objects in data store is kept. Various users in DBMs are unaware about the locations of these objects.
- **Conceptual Level:**
 - This level describes what data are stored in the database and what relationships exist between them. Logical level describes the entire database in terms of small structures known as database tables. For Example, STUDENT database may contain STUDENT and COURSE tables which will be visible to users but users are unaware about their storage.

DBMS 3-TIER ARCHITECTURE

- **External Level or View Level :**

- An external level specifies a view of the data in terms of conceptual level tables. Each external level view is used to cater the needs of a particular category of users. FACULTY of a university is interested in looking course details of students, STUDENTS are interested in looking all details related to academics, accounts, courses and hostel details as well.
- This level exists only so that user interaction with the system is simplified.
- The System provides many views for the same database,



INSTANCE AND SCHEMA

- **Instance**

- The collection of information stored in the database at a particular moment is called an **instance**.
 - Analogous to the value of a variable

- **Schema**

- The overall design or overall structure of a database is called the database schema.
- We have
 - *Physical Schema: the overall Physical structure of the database.*
 - *Logical Schema: the overall logical structure of the database.*

- **Sub-Schema**

- **The database may have several schemas at view level, known as sub-schemas that describes different views of the database.**

DATA INDEPENDENCE

- Data independence means change of data at one level should not affect another level.
- **Physical Data Independence:**
 - Any change in physical location should not affect conceptual level or external view of data.
- **Conceptual Data Independence:**
 - The data at conceptual level schema and external level schema must be independent. This means, change in conceptual schema should not affect external schema. e.g.; Adding or deleting attributes of a table should not affect the user's view of table. But this type of independence is difficult to achieve as compared to physical data independence because the changes in conceptual schema are reflected in user's view.

DATABASE USERS AND ADMINISTRATORS

- A primary goal of a database system is to retrieve information from and store new information into the database. People who work with a database can be categorised as database users or database administrators.
- Based on the fact how users interact with a database, we have following categories of database users:-
 - Naïve Users
 - Application Programmers
 - Sophisticated Users.
 - Specialized Users.

DATABASE USERS

- **Naïve Users**

- Naïve Users are unsophisticated users who interact with the system by invoking one of the application programs that have been written previously.
- A typical user interface for naïve users is a forms interface, where the user can fill in appropriate fields of the form. Also such users may be interested in just simply reading reports generated from the database.
- Clerk in office and Student class registration are examples.

DATABASE USERS

- **Application Programmers**

- Application Programmers are computer professionals who write application programs.
- Application Programmers can choose from many tools to develop user interfaces. Rapid application development (RAD) tools enable application programmers to construct forms and reports with minimal programming effort.

- **Sophisticated Users**

- Sophisticated Users interact with the system without writing programs. Instead they form their queries either using a database query language or by using tools – database analysis software.

DATABASE USERS

- **Specialized Users**

- Specialized Users are the sophisticated users who write specialized database applications that don't fit into the traditional data-processing framework

- **Examples**

- Computer Aided design systems.
- Knowledge base and Expert Systems.
- Systems storing data with complex data types – graphics data, audio and video data.

DATABASE ADMINISTRATORS

- A database administrator is a person who has a central control of both the data and the programs that access that data. Various other functions of DBA include:
 - Schema Definition.
 - The DBA creates the original database schema.
 - Storage Structure and access-method definition
 - Schema and Physical Organization Modification
 - The DBA carries out changes to the schema and physical organization to reflect changing needs of organization or alter the physical organization to improve performance

DATABASE ADMINISTRATORS

– Granting of authorization for data access

- DBA creates a special structure which stores the authorization information about users. This helps in regulating access to various database parts.

– Routine Maintenance

- Periodically backing up the database, either onto Tapes or onto remote servers to prevent loss of data in case of disasters – Floods.
- Ensuring enough free disk space is available for normal operations, and upgrading disk space as required.
- Monitoring various activities running on the database and ensuring that performance isn't degraded by very expensive tasks submitted by some of the users.