Introduction

The database is now an integral part of our day-to-day life. A database is a shared collection of logically related data and a description of this data, designed to meet the information needs of an organization. The database is now an integral part of our day-to-day life.

A Database Management System (DBMS) is a software system that enables users to define, create, and maintain the database and provides controlled access to this database. A database is a shared collection of logically related data and a description of this data, designed to meet the information needs of an organization. A Database Management System (DBMS) is a software system that enables users to define, create, and maintain the database and provides controlled access to this database.
ADBMS consist of:

- A collection of interrelated data
- The data describing one particular enterprise
- A set of programs to access those data

All DBMS have the capability:

- To access and update large amounts of data efficiently
- To share data and manage persistent data

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Other capabilities of DBMS:

- Support for high-level languages that allow the user to define the structure of data, access data, and manipulate data.

- Provision of correct, concurrent access to the database by many users at once (transaction management).

- Support for mathematical abstraction through which the user can view the data (data model).
Ability to limit access to data by unauthorized users.

Ability to recover from system failures without loss.

(Resiliency).

(Access control).

Validity of data.

Limit Validity of data by unauthorized users.
Examples

- Airlines use a DBMS to keep track of flight info, reservation, seat availability, and reservations.
- Retail stores use a DBMS to record sales, price, and maintain inventory.
- Universities use a DBMS to keep student records, including transcripts, tuition fees, etc.
A library DBMS records information about books, borrowers, and provides various types of classifications.

The collection of records kept for a common purpose at a particular moment is an instance of the database. The collection of information stored in the database is called a database.

The collection of information about books, borrowers, and provides various types of classifications.
A Simplified DBMS Environment

- Users/Programmers
- Application Programs/Queries
- Software to Process Queries/Programs
- Software to Access Stored Data
- Stored Database
- Stored Database Definition (Meta-Data)
DBMS Architecture

view level

external view 1 external view 2 ...... external view n

external/conceptual mapping

logical level

conceptual schema

conceptual/internal mapping

physical level

internal schema

stored database
Phases of Database Design

- Miniworld
- Requirements Collection and Analysis
  - Functional Requirements
    - Functional Analysis
  - Database Requirements
    - Conceptual Design
      - Conceptual Schema
        - Data Model Mapping
          - Conceptual Schema
            - Physical Design
              - Internal Schema
              - Transaction Implementation
            - Application Program Design
              - Transaction Specification
                - Commercial DBMS Independent
                  - Commercial DBMS Dependent
The structuring of information is determined by the data model. A data model is a mathematical formalism with two parts: 1. a notation for describing data and data relationships, and 2. a set of operations used to manipulate that data.
Groups of existing data models:

- Object-Based Logical Models
- Record-Based Logical Models
- The hierarchical model
- The network model
- The relational model
- The semantic data model
- The object-oriented model
- The entity-relationship model

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A DBMS provides the following facilities:

- A data-definition language (DDL) to specify the database schema
- A data-manipulation language (DML) to express database queries and updates
Data manipulation means:

- The retrieval of information.
- The insertion of new information into the database.
- The deletion of information from the database.
- The modification of information stored in the database.
- The retrieval of information stored in the database.

A query is a statement written in DML requesting the retrieval of information.

A data dictionary is a file that contains metadata.