DBMS-Module I

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April 26, 2021

INTRODUCTION

What is Database?

1. Database is the collection of interrelated data
2. By **Data** we mean the known facts that can be recorded and that have implicit meaning. for *eg:StudentAdmission Number, Name*

Properties of Database

- Universe of discourse(UoD) or Miniworld.Database represent some aspects of real world. Changes to miniworld affects database
- A database is a logically coherent collection of data with some inherent meaning
- A database is designed, built and populated with data for specific purpose
- A database can be of any size and complexity eg:amazon , Facebook

DBMS

Definition I

DBMS is a Computerized system that enables users to create and maintain a database.

Definition II

The DBMS is a **general purpose software system** that facilitates the process of **defining , constructing , manipulating and sharing** among various users and application programmers

DBMS

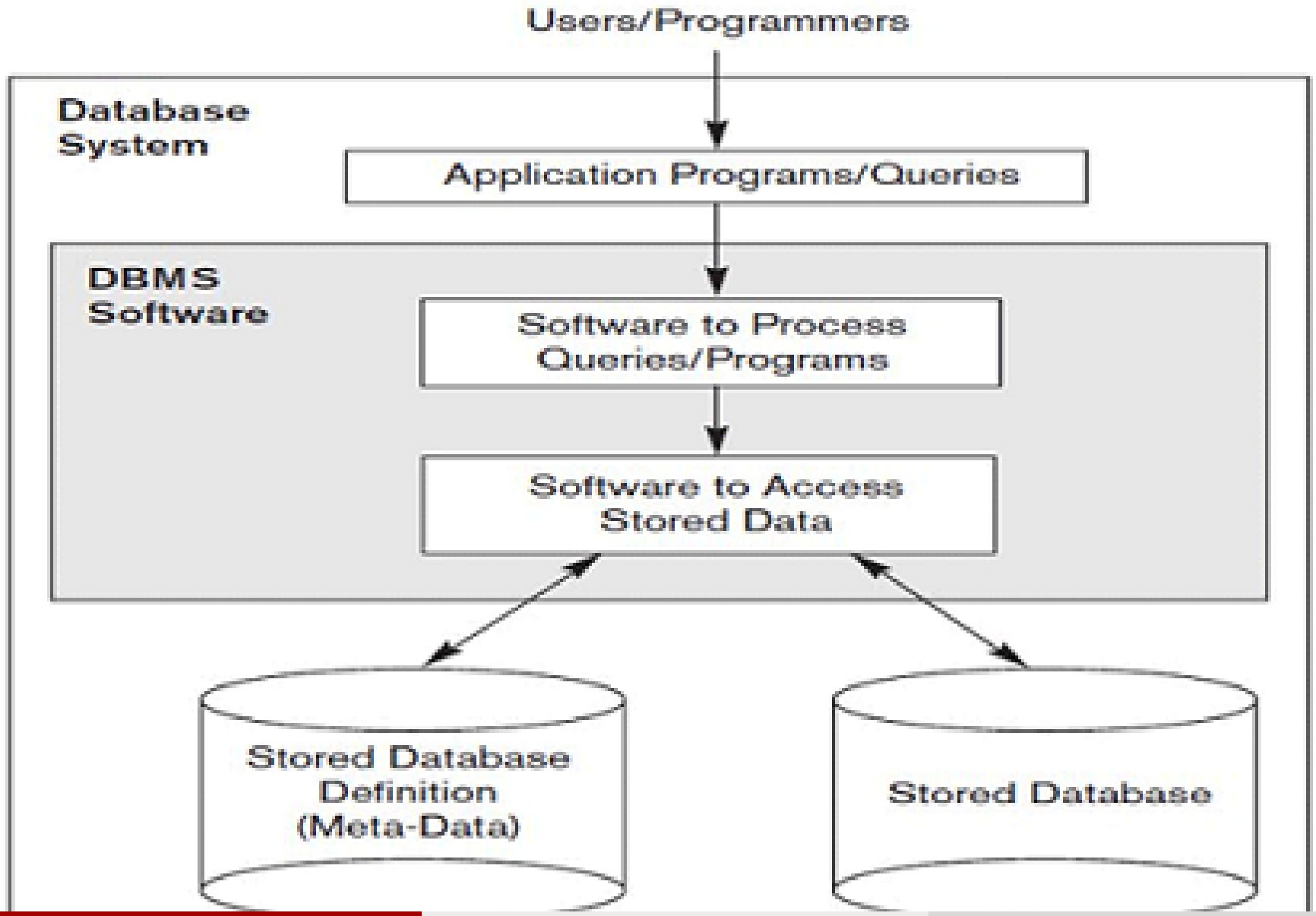
Defining means defining data, its datatype and constraints.
Constructing means storing the data in some storage medium that is controlled by DBMS
Manipulating the database includes functions such as **querying** the databaseto retrieve specific data and **updating** the database to reflect the miniworld

Definition III DBMS is a collection of interrelated data and a set of programs to access those data.
The primary goal of a DBMS is to provide a way to store and retrieve database information that is both convenient and efficient

DBMS

1. Database systems are designed to manage large bodies of information.
2. Management of data involves both storage of information and mechanisms for manipulation of information.
3. The database system must ensure the safety of the information stored
4. If data are to be shared among several users, the system must avoid possible anomalous results.

Simplified Database System Environment



Characteristics of the Database Approach

1. Self describing nature of a database system
2. Insulation between programs and data, and data abstraction
3. Support of multiple views of the data
4. Sharing of Data and multiuser transaction processing

Relations

Relation Name	No of Columns
Student	4
Course	4
Section	5
Grade_report	3
Prerequisite	2

Columns

Relation Name	No of Columns
Student	4
Course	4
Section	5
Grade_report	3
Prerequisite	2

catalog

Column Name	Data type	Belongs to relation
Name	Character(30)	Student
Student Number	Character(04)	Student
class	Cinteger(1)	Student
Major	Major Type	Student
Course Name	Character(10)	course
.....	.....	.....
.....	.....	.....
.....	.....	.....
prerequisite no	XXXX	Prerequisite.

Self-Describing Nature of a Database System

1. Database system contains not only the database itself but also a complete definition or description of the database structure and constraints.
2. This definition is stored in the **DBMS catalog or Data Dictionary**
3. Information stored in the catalog is called **metadata** and it describes the structure of the primary database

Insulation between Programs and Data, and Data Abstraction

1. The structure of data files is stored in the DBMS catalog separately from the access programs.
2. This property is called **program-data independence**
3. An operation (also called a function or method) is specified in two parts.
   Interface The interface (or signature) of an operation includes the operation name and the data types of its arguments (or parameters).
   hspace5mm
   Implementation The implementation (or method) of the operation is specified separately and can be changed without affecting the interface.

- Application programs can operate on data by invoking these operations through their names and arguements, regardless of how the operation are implemented.This may be termed **program operation independence**
- The characteristic that allows program-data independence and program operation independence is called **data abstraction**.

Support of Multiple Views of the Data

- A database has many users, each user may require a different perspective or view of the database.
- A view may be a subset of the database or it may contain virtual data that is derived from the database files but is not explicitly stored

Sharing of Data and Multiuser Transaction Processing

- DBMS must include concurrency control software to ensure that several users trying to update the same data do so in a controlled manner so that the result of the updates is correct
- DBMS must enforce several transaction properties

ACID

ACID

1. Atomicity
2. Consistency
3. Isolation
4. Durability

Atomicity

Atomicity ensures that either all the database operations in a transaction are executed or none

Time	T_x	T_y
t_1	READ (A)	—
t_2	A = A - 50	
t_3	—	READ (A)
t_4	—	A = A + 100
t_5	—	—
t_6	WRITE (A)	—
t_7		WRITE (A)

LOST UPDATE PROBLEM

Consistency

Consistency ensures that each transaction should procede from one consistent state to another consistent state.

For example an amount of Rs 50 has to be transferred from Account A to Account B.

Let the amount has been debited from account A but have not been credited to Account B and in the meantime, some failure occurred.So, it will lead to an inconsistent state

Isolation

Isolation ensures that each transaction appears to execute in isolation from other transactions even though hundreds of transactions may be executing concurrently.

Durability

Database shpuld persist even if any natural calamities occurs

Security Problems

All the user of database should not be able to access all the data

For example a payroll Personnel needs to access only that part of data which has information about various employees & are not needed to access information about customer accounts