DATABASE MANAGEMENT SYSTEM(DBMS)

-INTRODUCTION AND OVERVIEW OF DBMS

Readings

TEXTBOOK

- [1] Ramez Elmasri and Shamkant B. Navathe, **Fundamentals of Database Systems**, 5th Edition, 2007, Addison-Wesley, ISBN 0-321-36957-2.

- [2] **Database System Concepts** (Fourth Edition)

  Abraham Silberschatz,Henry F. Korth,S. Sudarshan

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- Introduction to Database
- Advantages of Data in Databse
- Types of Databases and Database Applications
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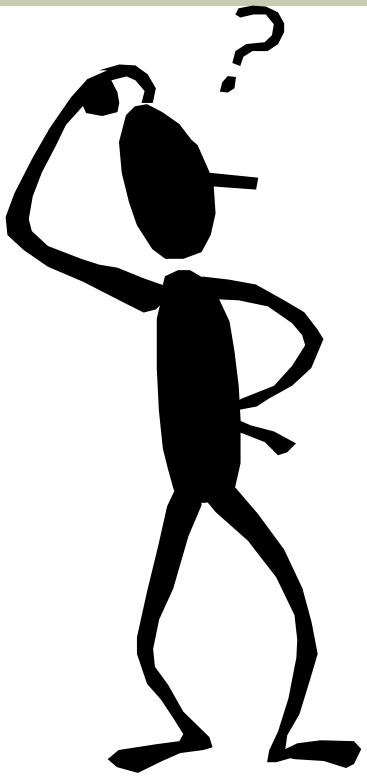
DATA

Introduction to DATA

- What is data?
  - Known facts that can be recorded and have an implicit meaning.
  - All the text, Graphics, Images, Sound, Video that have meaning in the user environment.
  - A Data represent information of the real world.



Data ⇒ → Data are raw facts.

→ Information is Data that is meaningful & useful in context.

→ for user, who uses it to make Decisions. (1)

→ Information efficient & effective.

→ Data is Building block of Info.

→ Accurate Information is the key of good Decision Making for it we require good Data.

→ Data generation should be proper & stored in a proper way

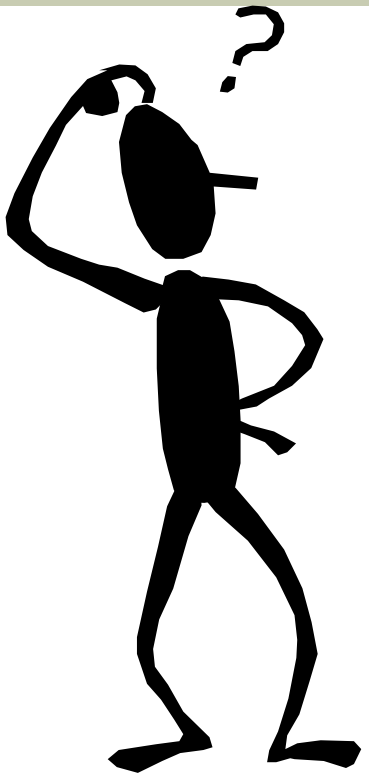
Data
↓
Information
↓
Knowledge
↓
Intelligence

→ Information is refined Data (or) processing Data.

DATABASE

Introduction to Database

- What is a database?
  - Collection of related data.
  - It is a collection of data that are related in a meaningful way, which can be accessed in many different logical order but are stored only once.
  - It describing the activities of one or more related organizations.
  - e.g. Banking database, University database.



→ Information

Database ⇒ why ⇒ Because it provides Centralized Control of its Data. ie → Organization.

→ Database resembles as an 'Electronic filing system'. DB are organized by fields, record & files.

↓ Single piece of information.

file → Telephone Book.

Records → Name, Add., No. } fields

→ Database represents some aspects of real world sometimes called Miniworld (or) Universe of Discourse (UoD).

→ Why organization have database
↳ for central control of its Data.

→ Database changes in a sense of user Data are stored, accessed & managed. To access info. we need DBMS.

Database Definition

- "A database has some source from which data are derived, some degree of interaction with events in the real world, and an audience that is actively interested in the contents of the database"

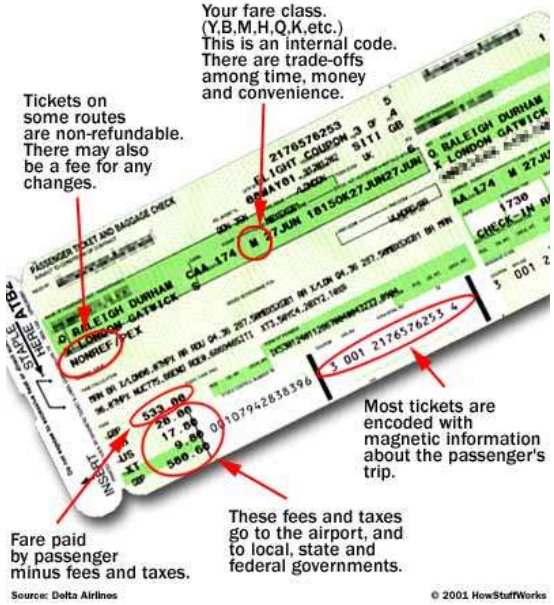
- Implicit Properties of a Database:
  - Represents some aspect of the real world (Mini-world).
  - A logically coherent collection of words with some inherent meaning.
  - Designed, built & populated with data for a specific purpose.

Database Systems: Then

Databases Everywhere

amazon.com

ebay



Advantages of Data in Database ⇒

(3) ① Redundancy Can be reduced → By Centralized DB.

② Inconsistency avoided → same Data is Duplicated. & change in one

⑤ Data Can be shared → Existing Applications Can share Data from DB

④ Security Restrictions Can be applied → DBA provide proper Channel & authority.

⑤ Integrity Can be Maintained → Integrity means Data is accurate.

DBMS ⇒ Management of Data in a Database.

What the DBMS is managing Answer is → The Database.

Types of Databases and Database Applications

- Traditional Applications:
  - Numeric and Textual Databases
- More Recent Applications:
  - Multimedia Databases
  - Geographic Information Systems (GIS)
  - Data Warehouses
  - Real-time and Active Databases
  - Many other applications

Database Implementation

- Defining a database
  - Data types
  - Structures
  - Constraints
- Constructing a database
  - Storing the data itself on a storage medium
- Manipulating a database
  - Querying
  - Updating
  - Generating reports

DATABASE MANAGEMENT SYSTEM(DBMS)

DBMS → It is a collection of program that enables a user to create & maintain a Database. It is a general purpose s/w system.

→ It is a s/w designed to assist in maintaining & utilizing large collection of Data.

→ The alternative to using a DBMS is to store the Data in files & write application specific code to manage it.

History → → firstly proposed by Charles Bachman in 1960. It formed the basis for "N/w Data model" he got Turing Award in 1973.

→ In late 1960, IBM Developed IMS DBMS. It formed basis for "hierarchical Data model".

→ 1970, Edgar Codd proposed "Relational Data Model". SQL is an example of Relational Data model developed by IBM

→ ERP & MRP (Enterprise & management Resource planning) add a substantial layer of Application oriented features on top of the DBMS.

Historical Development of Database Technology

- Early Database Applications:
  - The Hierarchical and Network Models were introduced in mid 1960s and dominated during the seventies.
  - A bulk of the worldwide database processing still occurs using these models, particularly, the hierarchical model.
- Relational Model based Systems:
  - Relational model was originally introduced in 1970, was heavily researched and experimented within IBM Research and several universities.
  - Relational DBMS Products emerged in the early 1980s.

Historical Development of Database Technology (continued)

- Object-oriented and emerging applications:
  - Object-Oriented Database Management Systems (OODBMSs) were introduced in late 1980s and early 1990s to cater to the need of complex data processing in CAD and other applications.
    - Their use has not taken off much.
  - Many relational DBMSs have incorporated object database concepts, leading to a new category called *object-relationa*l DBMSs (ORDBMSs)
  - *Extended relational* systems add further capabilities (e.g. for multimedia data, XML, and other data types)

Historical Development of Database Technology (continued)

- Data on the Web and E-commerce Applications:
  - Web contains data in HTML (Hypertext markup language) with links among pages.
  - This has given rise to a new set of applications and E-commerce is using new standards like XML (eXtended Markup Language). (see Ch. 27).
  - Script programming languages such as PHP and JavaScript allow generation of dynamic Web pages that are partially generated from a database (see Ch. 26).
    - Also allow database updates through Web pages

Database Management System (DBMS)

- ***General-purpose*** software system that facilitates the processes of defining, constructing and manipulating databases.

- Can also write your own set of programs to create and maintain the database, i.e. your own ***Special-purpose*** DBMS software.

Database + Software == Database System

What the DBMS is managing Answer is → The Database.

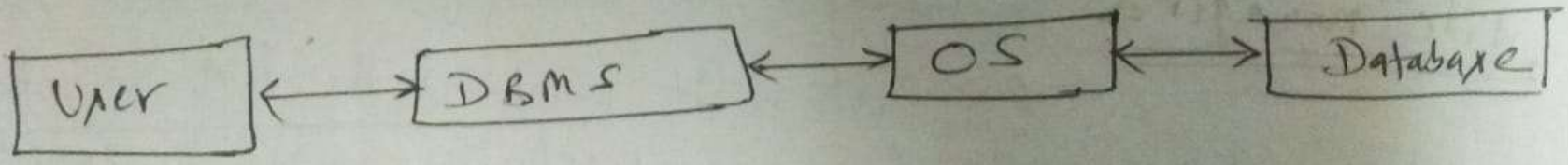
DBMS ⇒ Management of Data in a Database System is done by DBMS called general purpose software Package.

→ It is a collection of interrelated Data & a set of programs to access that Data.

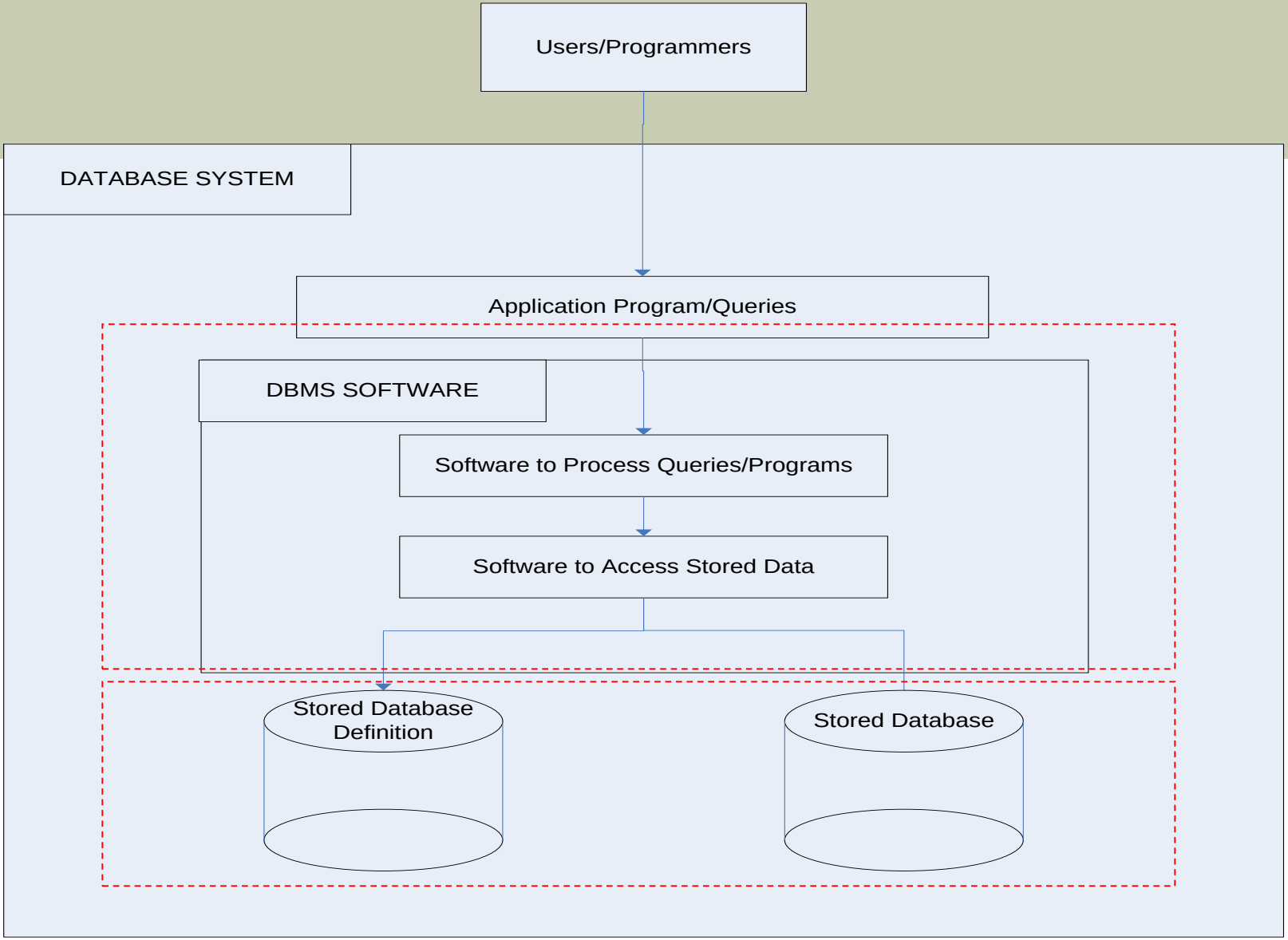
→ Primary goal of DBMS is to provide a way to store & retrieve information that convenient & efficient.

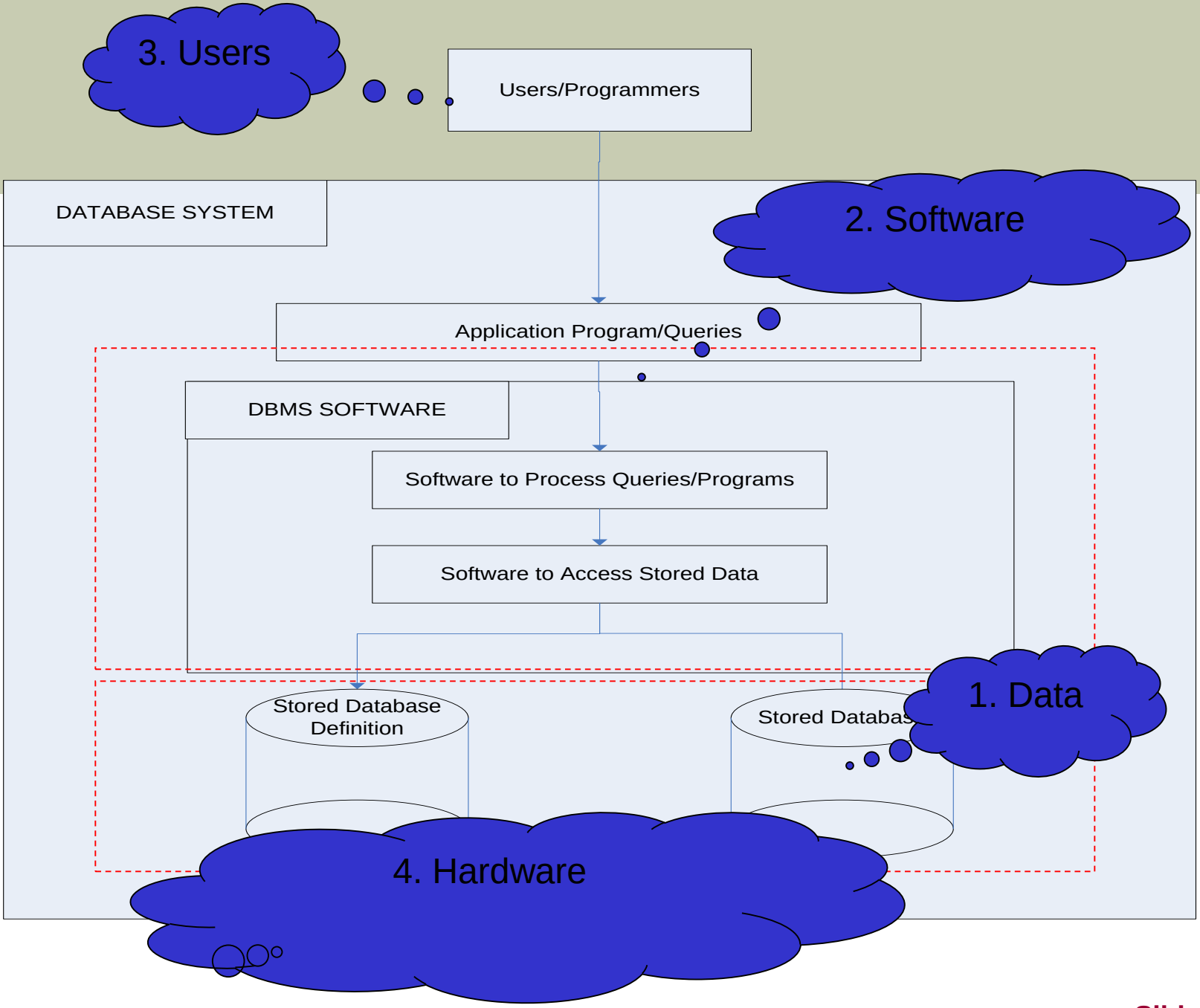
→ Ex:- of DBMS are INGRES, ORACLE & SYBASE.

→ It is a Combination of H/w & S/w that can be used to set up & monitor a Database.



DBMS is an interface between Database & Users.


Users/Programmers
DATABASE SYSTEM
Application Program/Queries
DBMS SOFTWARE
Software to Process Queries/Programs
Software to Access Stored Data
Stored Database Definition
Stored Database


3. Users
Users/Programmers
DATABASE SYSTEM
2. Software
Application Program/Queries
DBMS SOFTWARE
Software to Process Queries/Programs
Software to Access Stored Data
Stored Database Definition
Stored Databas
1. Data
4. Hardware

Advantages of DBMS ⇒

(1) **Data Independence** ⇒ Applications should not get into the Details of Data representation & storage.
→ changes in one level does not affect another level.

(2) **Efficient Data Access** ⇒ DBMS provide many variety of Techniques to store & retrieve Data efficiently.

(3) **Reduction of Redundancy** ⇒ Centralized Control of Data by DBA.

(4) **Shared Data** ⇒ According to Applications or users.

(5) **Data Integrity** ⇒ Data Both Consistent & accurate.
ie ⇒ Age of employee between 25 to 75 Not greater & Lesser.

(6) **Security** ⇒ Data should be visible to Different classes of User it should be specified by a categorial manner.