Usmanu Danfodiyo University, Sokoto

FACULTY OF PHYSICAL & COMPUTING SCIENCES

CMP 101: Introduction to Computer Science

PART 4: INTRODUCTION TO DATABASE SYSTEMS

INTRODUCTION TO DATABASE SYSTEMS

Data

- facts related to any object in consideration
- For example
  - name, age, height, weight, etc.
  - picture, image, file, pdf, etc.

Database

- Collection of related data
- Known facts that can be recorded and that have implicit meaning
- Mini-world or Universe of Discourse (UoD)
- Represents some aspect of the real world
- Logically coherent collection of data with inherent meaning
- Built for a specific purpose

Database System

- It is a computerized system, whose overall purpose is to
  - maintain the information and
  - to make sure that the information is available on demand

Advantages of Database System

- Redundancy can be reduced.
- Inconsistency can be avoided.
- Data can be shared.
- Standards can be enforced.
- Security restrictions can be applied.
- Integrity can be maintained.
- Data gathering can be possible.
- Requirements can be balanced.

Database Management System (DBMS)

- It is a collection of programs that enables users to create and maintain a database.
- it is general-purpose software that provides the users with the processes of
  - ➤ defining,
  - ➤constructing and
  - ➤manipulating
- the database for various applications.

Advantages of DBMS

- Data Independence.
- Efficient Data Access.
- Data Integrity and security.
- Data administration

DISADVANTAGE OF DBMS

- DBMS may offer plenty of advantages but, it has certain flaws:
  - ➤ The cost of Hardware and Software of a DBMS is quite high which increases the budget of your organization.
  - ➤Most database management systems are often complex systems, so training for users to use the DBMS is required.
  - ➤In some organizations, all data is integrated into a single database which can be damaged because of electric failure or database is corrupted on the storage media.
  - ➤Use of the same program at a time by many users sometimes leads to the loss of some data.
  - ➤DBMS can’t perform sophisticated calculations.

Applications Database Applications

- Banking: all transactions
- Airlines: reservations, schedules
- Universities: registration, grades
- Sales: customers, products, purchases Online retailers: order tracking, customized
- Manufacturing: production, inventory, orders, supply chain
- Human resources: employee records, salaries, tax deductions

Database Users

- Database Administrator (DBA)
  - ➤Database Administrator (DBA) is a person/team who defines the schema and also controls the 3 levels of the database.
  - ➤The DBA will then create a new account ID and password for the user if he/she needs to access the database.
  - ➤DBA is also responsible for providing security to the database and he allows only authorized users to access/modify the database.
    - ✔DBA also monitors the recovery and backup and provides technical support.
    - ✔The DBA has a DBA account in the DBMS which is called a system or super-user account.
    - ✔DBA repairs damage caused due to hardware and/or software failures.

Database Users

- Naive / Parametric End Users:
  - ➤Parametric End Users are the unsophisticated who don’t have any DBMS knowledge but they frequently use the database applications in their daily life to get the desired results.
  - ➤For example, Railway’s ticket booking users are naive users. Clerks in any bank is a naïve user because they don’t have any DBMS knowledge but they still use the database and perform their given task

Database Users

- System Analyst:
  - ➤System Analyst is a user who analyzes the requirements of parametric end users.
  - ➤They check whether all the requirements of end users are satisfied

Database Users

- Sophisticated Users:
  - ➤Sophisticated users can be engineers, scientists, and business analysts, who are familiar with the database.
  - ➤They can develop their database applications according to their requirement.
  - ➤They don’t write the program code but they interact with the database by writing SQL queries directly through the query processor.

Database Users

- Data Base Designers:
  - Data Base Designers are the users who design the structure of database which includes
    - tables,
    - indexes,
    - views,
    - constraints,
    - triggers,
    - stored procedures.
  - He/she controls what data must be stored and
  - How the data items are to be related

Database Users

- Application Program
  - ➤Application Programs are the back-end programmers who write the code for the application programs.
  - ➤They are the computer professionals.
  - ➤These programs could be written in Programming languages such as Visual Basic, C, FORTRAN, COBOL, etc.

Database Users

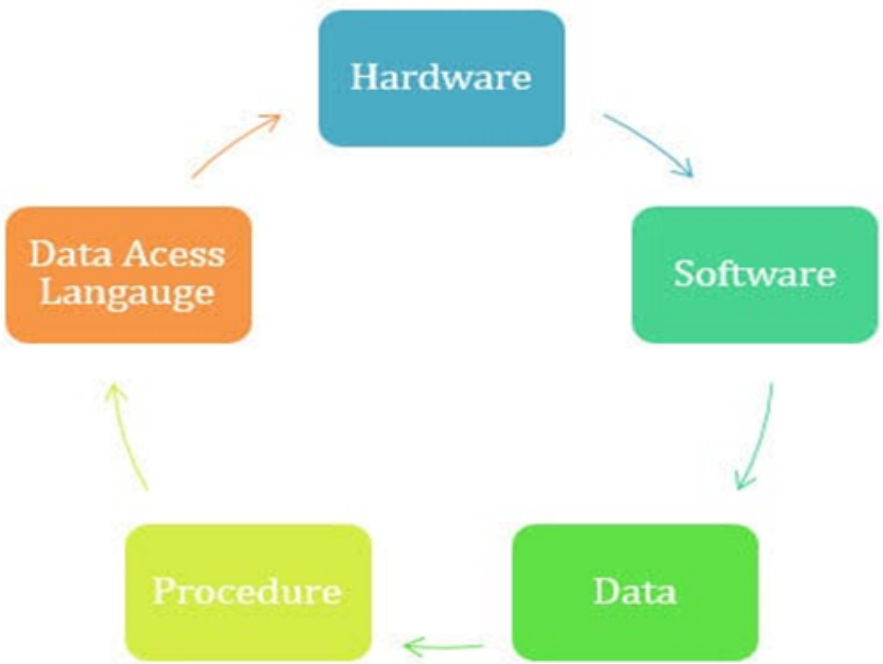
- Casual Users / Temporary Users:
  - Casual Users are the users who occasionally use/access the database but each time when they access the database they require new information.
  - For example:
    - Middle or higher level manager.

TYPES OF DATABASES

- **Distributed databases**
  - A distributed database is a type of database that has contributions from the common database and information captured by local computers. In this type of database system, the data is not in one place and is distributed at various organizations.
- **Relational databases**
  - This type of database def nes database relationships in the form of tables. It is also called Relational DBMS, which is the most popular DBMS type in the market. Database examples of the RDBMS system include MySQL, Oracle, and Microsoft SQL Server database.
- **Object-oriented databases**
  - This type of computer database supports the storage of all data types. The data is stored in the form of objects. The objects to be held in the database have attributes and methods that define what to do with the data. PostgreSQL is an example of an object-oriented relational DBMS.
- **Centralized database**
  - It is a centralized location, and users from different backgrounds can access this data. This type of computer database store application procedures that help users access the data even from a remote location.
- **Open-source databases**
  - This kind of database stores information related to operations. It is mainly used in the fields of marketing, employee relations, customer service, of databases.
- **Cloud databases**
  - A cloud database is a database that is optimized or built for such a virtualized environment. There are so many advantages of a cloud database, some of which can pay for storage capacity and bandwidth. It also offers scalability on-demand, along with high availability.

DATABASE COMPONENTS

- There are five (5) main components of a database as shown in figure below:



DATABASE COMPONENTS

Hardware

The hardware consists of physical, electronic devices like computers, I/O devices, storage devices, etc. This offers the interface between computers and real-world systems.

Software

This is a set of programs used to manage and control the overall database. This includes the database software itself, the Operating System, the network software used to share the data among users, and the application programs for accessing data in the database.

Data

Data is a raw and unorganized fact that is required to be processed to make it meaningful. Data can be simple at the same time unorganized unless it is organized. Generally, data comprises facts, observations, perceptions, numbers, characters, symbols, images, etc.

Procedure

Procedures are a set of instructions and rules that help you to use the DBMS. It is designing and running the database using documented methods, which allows you to guide the users who operate and manage it.

DATABASE ACCESS LANGUAGE

Database Access language is used to access the data to and from the database, enter new data, update already existing data, or retrieve required data from DBMS. The user writes some specific commands in a database access language and submits these to the database.

Database software

- is used to create, edit, and maintain database files and records, enabling easier file and record creation, data entry, data editing, updating, and reporting.
- The software also handles data storage, backup and reporting, multi-access control, and security.
- Strong database security is especially important today, as data theft becomes more frequent.
- Database software is sometimes also referred to as a “database management system” (DBMS)
- Database software makes data management simpler by enabling users to store data in a structured form and then access it.
- It typically has a graphical interface to help create and manage the data and, in some cases, users can construct their databases by using database software.
- The most common types of database software are Microsoft Access, Oracle, MySQL, PostgreSQL, dBASE and FoxPro etc.

Thank you!!