DATABASE MANAGEMENT SYSTEM

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WHAT IS DATABASE MANAGEMENT SYSTEM?

A Database Management System (DBMS), or simply a Database System (DBS) consist of :

- A collection of interrelated and persistent data (usually referred to as the database (DB)).
- A set of application programs used to access, update and manage that data (which form the data management system (MS)).

BRIEF HISTORY

- Early 1960s: first general purpose database by Charles Bachman from GE. Used the network data model.
- Late 1960s: IBM developed Information Management System (IMS). Used the hierarchical data model. Led to SABRE, the airline reservation system developed by AA and IBM. Still in use today.
- 1970: Edgar Code of IBM developed the relational data model. Led to several DBMS based on relational model, as well as important theoretical results. Code wins Turing award.
- 1980s: relational model dominant. SQL standard.
- Late 1980s, 1990s: DBMS vendors extend systems, allowing more complex data types (images, text).

WHY USE A DBMS?

- Data independence and efficient access.
- Reduced application development time.
- Data integrity and security.
- Uniform data administration.
- Concurrent access, recovery from crashes.

PURPOSE OF DBMS

1. Data redundancy and inconsistency

- Same information may be duplicated in several places.
- All copies may not be updated properly.

2. Difficulty in new program to carry out each new task

3. Data isolation —

- Data in different formats.
- Difficult to write new application programs.

⑩ files and formats

PURPOSE OF DBMS …

Security problems

Every user of the system should be able to access only the data they are permitted to see.

- E.g. payroll people only handle employee records, and cannot see customer accounts; tellers only access account data and cannot see payroll data.
- Difficult to enforce this with application programs.

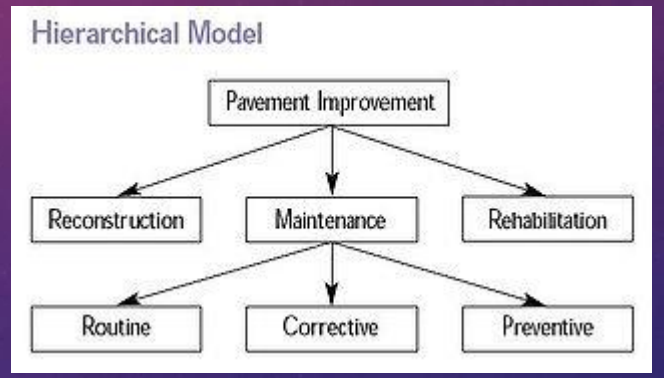
Integrity problems

- Data may be required to satisfy constraints.
- E.g. no account balance below $25.00.
- Again, difficult to enforce or to change constraints with the file-processing approach.

DATA MODELS

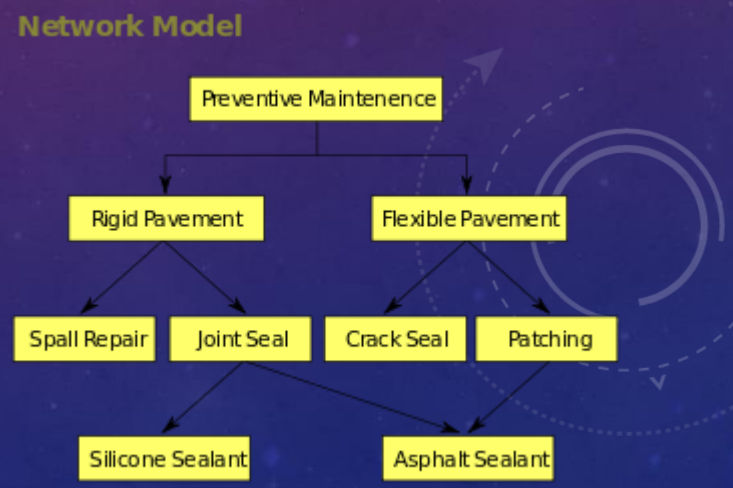
Hierarchical Model

- The hierarchical data model organizes data in a tree structure. There is a hierarchy of parent and child data segments. This structure implies that a record can have repeating information, generally in the child data segments.
- Hierarchical DBMSs were popular from the late 1960s, with the introduction of IBM's Information Management System (IMS) DBMS, through the 1970s.



NETWORK MODEL

- The popularity of the network data model coincided with the popularity of the hierarchical data model. Some data were more naturally modeled with more than one parent per child.
- So, the network model permitted the modeling of many-to-many relationships in data. In 1971, the Conference on Data Systems Languages (CODASYL) formally defined the network model.



RELATIONAL MODEL

- (RDBMS - relational database management system) A database based on the relational model developed by E.F. Code.
- A relational database allows the definition of data structures, storage and retrieval operations and integrity constraints.
- In such a database the data and relations between them are organized in tables. A table is a collection of records and each record in a table contains the same fields.

PROPERTIES OF RELATIONAL TABLES

- Values Are Atomic
- Each Row is Unique
- Column Values Are of the Same Kind
- The Sequence of Columns is Insignificant
- The Sequence of Rows is Insignificant
- Each Column Has a Unique Name

OBJECT-ORIENTED MODEL

- Object DBMSs add database functionality to object programming languages. They bring much more than persistent storage of programming language objects.
- A major benefit of this approach is the unification of the application and database development into a seamless data model and language environment.

SEMI STRUCTURED MODEL

- In semi structured data model, the information that is normally associated with a schema is contained within the data, which is sometimes called ``self-describing".
- In such database there is no clear separation between the data and the schema, and the degree to which it is structured depends on the application.

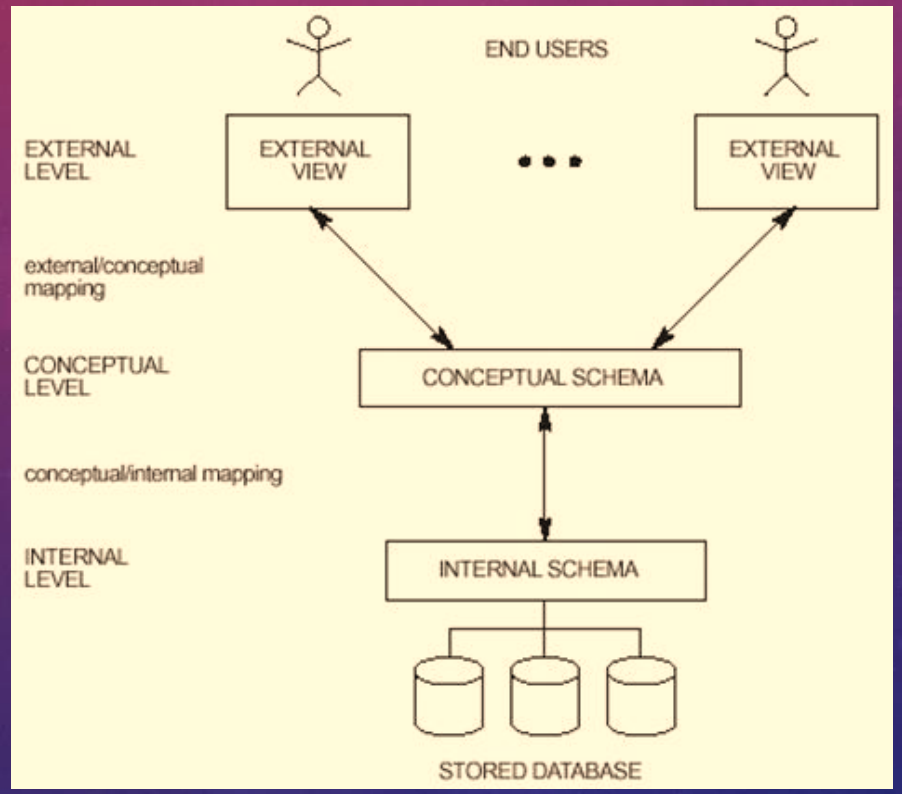
ARCHITECTURE OF DBMS

- An early proposal for a standard terminology and general architecture database a system was produced in 1971 by the DBTG (Data Base Task Group) appointed by the Conference on data Systems and Languages.
- The DBTG recognized the need for a two level approach with a system view called the schema and user view called subschema. The American National Standard Institute terminology and architecture in 1975.ANSI-SPARC recognized the need for a three level approach with a system catalog.

There are following three levels or layers of DBMS architecture:

- 1. External Level
- 2. Conceptual Level
- 3. Internal Level

ARCHITECTURE OF DBMS



LEVELS OR LAYERS OF DBMS ARCHITECTURE

- **External Level: -** External Level is described by a schema i.e. it consists of definition of logical records and relationship in the external view.
- **Conceptual Level: -** Conceptual Level represents the entire database. Conceptual schema describes the records and relationship included in the Conceptual view. .
- **Internal Level: -** Internal level indicates hoe the data will be stored and described the data structures and access method to be used by the database.

COMPONENTS OF DBMS

1. Hardware: Can range from a PC to a network of computers.
2. Software: DBMS, operating system, network software (if necessary) and also the application programs.
3. Data: Used by the organization and a description of this data called the schema.
4. People: Includes database designers, DBAs, application programmers, and end-users.
5. Procedure: Instructions and rules that should be applied to the design and use of the database and DBMS.

ADVANTAGE OF DBMS

- Controlling Redundancy
- Sharing of Data
- Data Consistency
- Integration of Data
- Report WriIntegration Constraints
- Data Security
- ters
- Control Over Concurrency
- Backup and Recovery Procedures
- Data Independence

DISADVANTAGE OF DBMS

- Cost of Hardware and Software
- Cost of Data Conversion
- Cost of Staff Training
- Appointing Technical Staff
- Database Damage

DBMS LANGUAGES

Data Definition Language-DDL

- Data Definition Language (DDL) statements are used to define the database structure or schema.

Some examples:

- CREATE - to create objects in the database
- ALTER - alters the structure of the database
- DROP - delete objects from the database
- TRUNCATE - remove all records from a table, including all spaces allocated for the records are removed
- COMMENT - add comments to the data dictionary
- RENAME - rename an object

DATA MANIPULATION LANGUAGE (DML)

Data Manipulation Language (DML) statements are used for managing data within schema objects.
Some examples:

- SELECT - Retrieve data from the a database
- INSERT - Insert data into a table
- UPDATE - Updates existing data within a table
- DELETE - deletes all records from a table, the space for the records remain
- MERGE - UPSERT operation (insert or update)
- CALL - Call a PL/SQL or Java subprogram
- EXPLAIN PLAN - explain access path to data
- LOCK TABLE - control concurrency

THANKYOU