

## Database:

### \* Basic definition:

a collection of related data.

### \* Data:

known facts that can be recorded and have an implicit meaning.

### \* Mini-Worlds

Some part of the real world about ~~what~~ which data is stored in a database.

### \* Data base Management System:

software package/system to facilitate the creation and maintenance of a computerized data base.

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\* Database system:

DBMS + Data  
(application).

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# Database system environment

users/programmers

DB  
system

App Programs/Queries

DBMS

software to  
process queries  
programs

software to Access  
Stored Data

Stored DB  
Definition  
(Meta-Data)

Stored  
DB

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## Manipulating the databases

① Retrieval

Querying / generating reports.

② Modifications

Insertion & deletions / updates

③ Access the data through web application

DBMS (catalog)

stores the description of a particular database (data structures, types, constraints).

~~Data~~ → Description?

Meta-data

this allows DBMS software to work with different database applications.

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Insulation between programs and Data:

- ① program-data independence.
- ② can change data structures without changing DBMS access programs.

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## OLTP's on-line Transaction processing.

### \* Database Users

→ use and control database content.

→ design, develop, maintain data base applications  
(Actors on the Scene)

→ design and develop DBMS software and related tools

, computer systems operators.  
(workers Behind the Scene).

## + Actors on the Scene:

- ① Database administrator.
- ② Database designer

## \* Categories of End-users:

→ End-users.

① Casual

② Naive / Parameter.

③ Sophisticated.

④ Stand-alone

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when not to use a DBMS?

\* Main inhibitors (costs) of using DBMS:

- overhead for providing generality, security, concurrency,
- High initial investment.
- \* when DBMS be unnecessary:
- Simple.
- stringent real-time requirements.
- multiple users access<sup>to</sup> data not required.



## Data Model:

set of concepts to describe the structure of a data base

→ structure includes:

data types.

relationships.

constraints.

\* Data Model operations:

→ specifying retrievals

→ update on the data base.

→ user defined operations.

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## Categories of Data Models:

① Conceptual (high-level, semantic) data models:

entity-based / object-based

② Physical (low-level, internal) data models:

③ Implementation (representational) data models:

## \* Schemas versus Instances

### → Database Schema:

~ description of database.

includes descriptions:

→ database structure.

→ data types.

→ constraints on database.

### → Schema diagrams:

~ illustrative display of database schema.

### → Schema Construct:

~ component of the schema

~ object within the schema

## \* Database State:

The actual data stored in a database at a particular moment in time.

~ It includes the collection of all the data in the database.  
→ also called:

① set of database instances.

② occurrences in the database.

when we delete, change value we change the state of the database from one state to another

→ Initial database state:  
initially loaded into the system.

→ Valid State:

A state that satisfies the structure and constraints of the database.

→ Distinctions

- ~ DB schema changes very infrequently
- ~ DB state changes every time the database is updated.

\* Schema : intension.

\* State : extension.

### 3- Schema Architecture

#### ① Internal schema:

describe physical storage structure and access paths.

#### ② Conceptual schema:

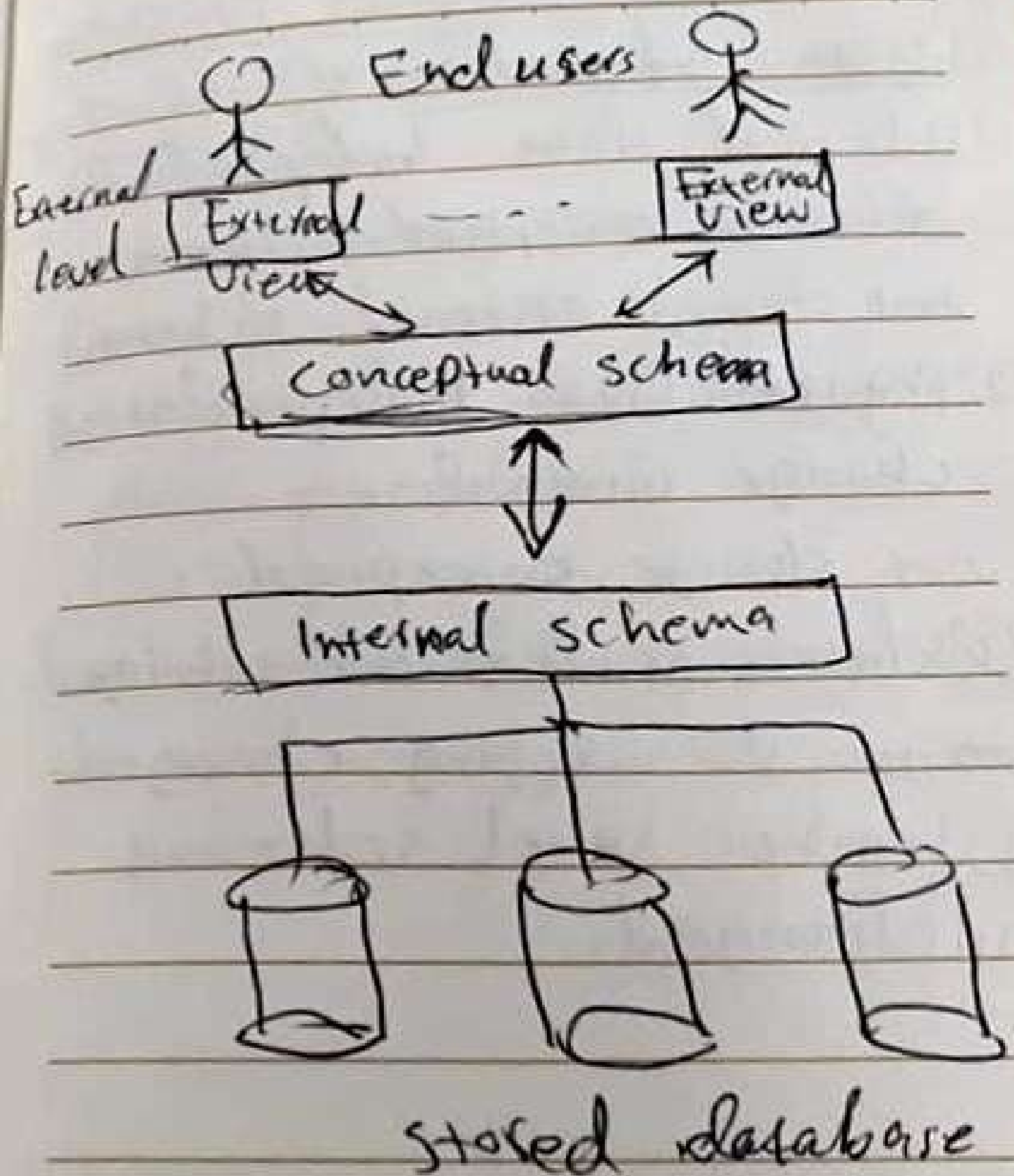
describe structure and <sup>conceptual</sup> <sup>implementation</sup> and constraints.

#### ③ External schema:

describe the various user views.

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## \* Data Independence:

① logical data Independence:  
change conceptual schema  
not change external schema

② physical Data Independence:  
change internal  
not change conceptual

③ schemas at lower-level  $\rightarrow$  changed.

$\Rightarrow$  just the mapping changed.

④ higher level schemas unchanged.



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\*DBMS languages:

→ Data Definition language  
(DDL)

→ Data Manipulation Language  
(DML)

↳ High-level language

Non-procedural language,  
(SQL)

↳ low-level language

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## Classification of DBMS:

→ Based on data model used:

- ① Flat files.
- ② Traditional: Network / Hierarchical
- ③ Relational.
- ④ Emerging: object-oriented