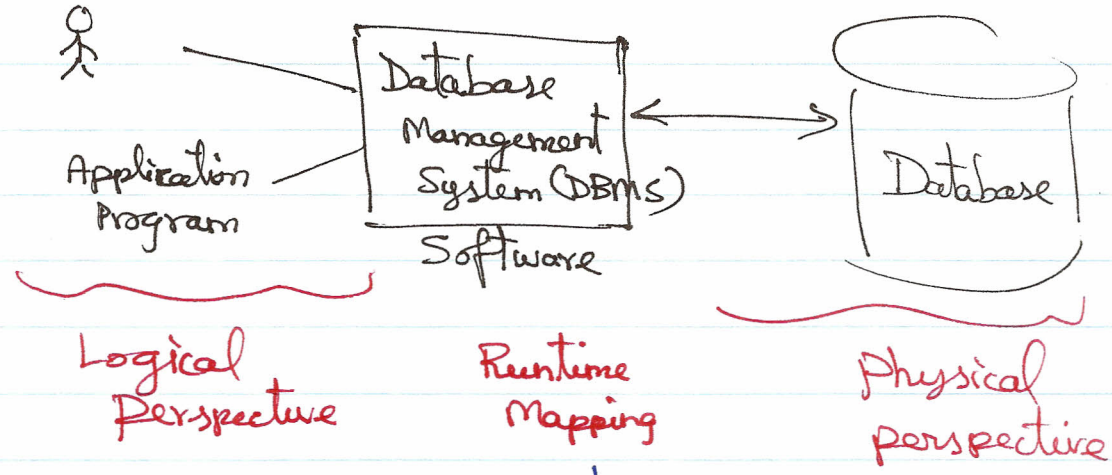


<https://moodle.cis.fiu.edu>

What is a database?

It is a collection of related data

Database System



High level of Data Abstraction

benefits

Program-data independence

Allows to change the physical representation of data w/o making any changes to application programs.

Program-operation independence

- functions/methods
- separation {
  - interface/signature
  - [name of the method & parameters]
  - implementation of the method
  - ↳ Code segment

Allows to modify implementation w/o making any changes to the interface.

# Database

Part I & II

Traditional

(Structured data)

(Relational Databases)

E.F. CODD - Bell Lab

A set of 2-D Flat Tables  
of text/numeric data

Based on Set Theory

Part III

Non-Traditional

(Unstructured)

Social media: facebook, twitter

Big data

NOSQL (not only SQL) systems

cloud storage

Limitations of DB Systems:

- High overhead in storage, processing, learning
- Single user access of data
- Stringent real-time application

## Data Model

A collection of concepts to store the structure of a database  
(meta-data)

Conceptual  
(High-level)

Physical  
(Low-level)

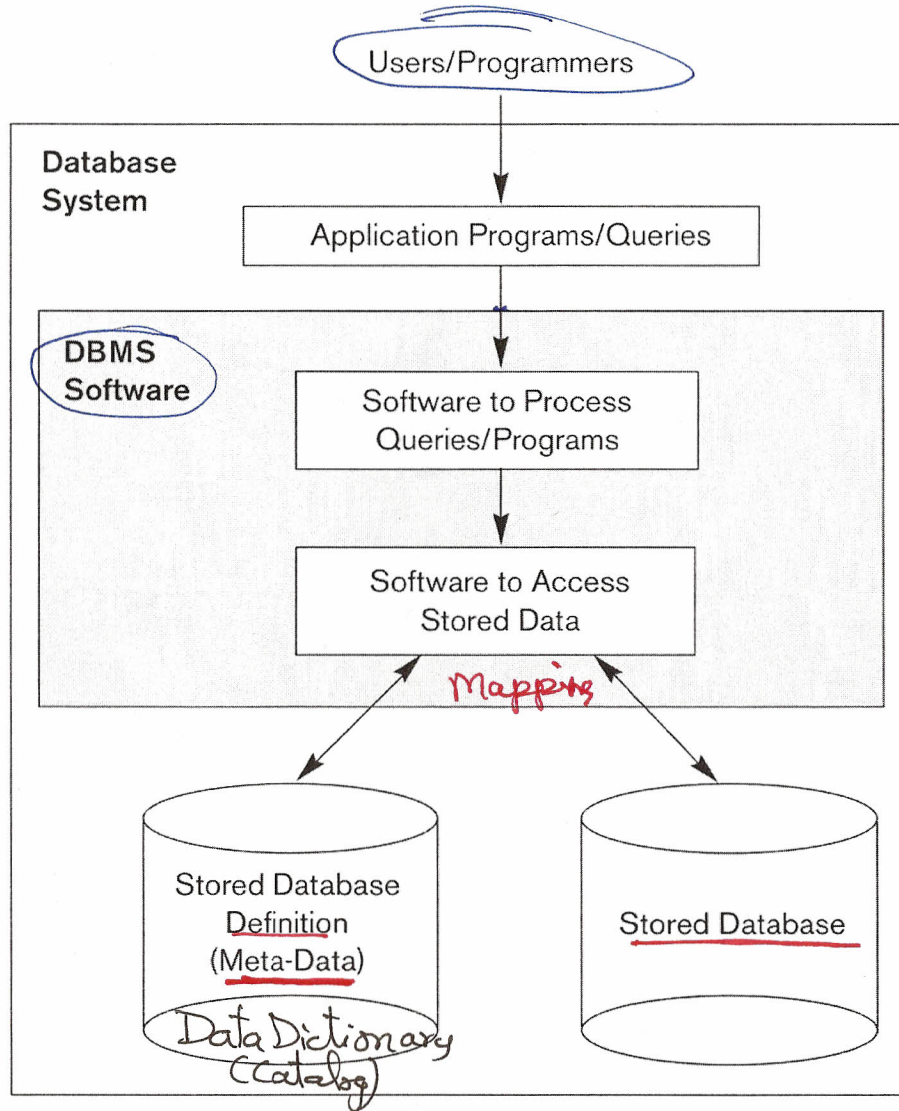
Relational Model (Data Model): Set Theory.

A DB is a set of tables.

Each table has a set of rows.

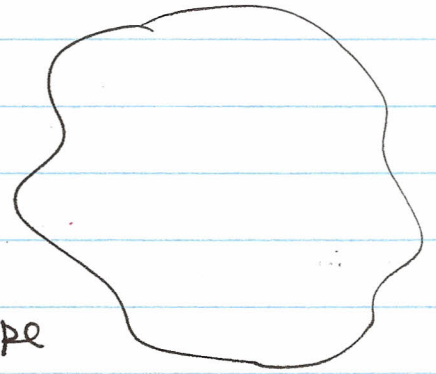
Each row has a set of columns.

**Figure 1.1** A simplified database system environment.



## Properties of a set

- Any ~~of~~ number of elements
  - no element
  - one element
  - three elements
  - infinite elements
- All elements must be of the same type
- Each element must be unique  
(The set cannot have duplicate elements)
- No order among elements



## Data Model: Conceptual

Represent

- Entities and attributes of entities
- Relationships among entity types
- Constraints (Rules that must be obeyed by the DB)

Only One

→ Conceptual Schema: Conceptual data model  
(Logical Schema) Diagram of the DB.

## Data model: Physical

Tables, Columns, datatype, size

only one

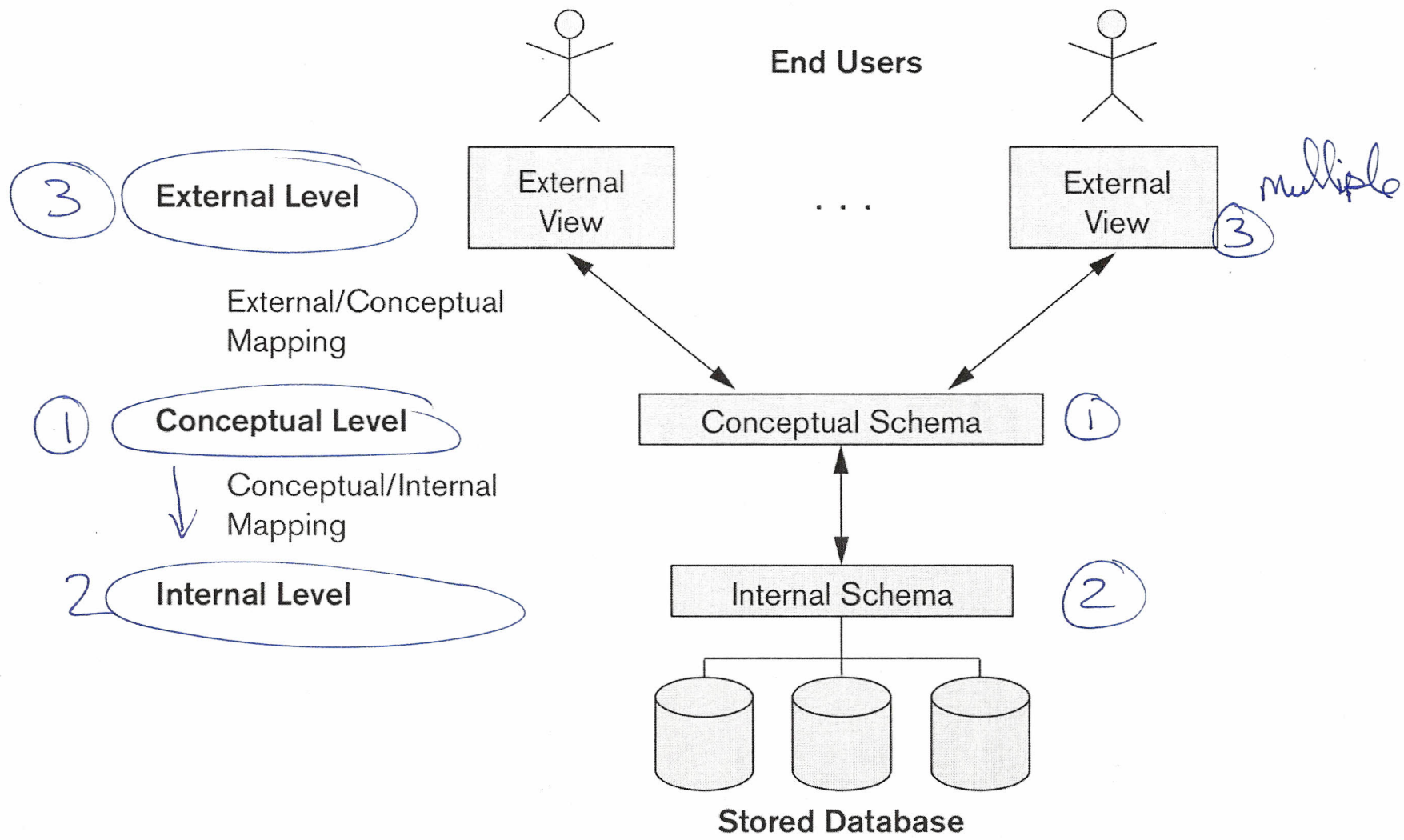
→ Internal Schema (Physical Schema) Data Definition Lang (DDL)  
Storage and Access paths...

Several

→ External View: Subset of the conceptual schema for a specific <sup>user</sup> group

For each user group, a separate view is created.

Figure 2.2 The three-schema architecture.



**Figure 2.3** Component modules of a DBMS and their interactions.

