Lecture 3b

Data Models and Database Schemas: The Three Schema Architecture

Week 2

Overview

- The 'three schema' architecture
- The process of database design
- Logical and physical data independence

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The three schema architecture

- A database can be described using three schema levels (not to be confused with data model levels)
- E.g. using the relational data model we can create
  - external schemas (schemata)
  - conceptual schema
  - internal schema

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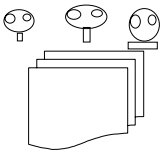

External schemas
for each group of users
(they provide a limited view of the database)

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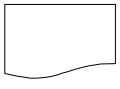

Conceptual schema
(describes the database schema as a whole)

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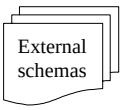

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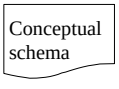

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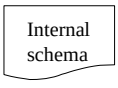

Internal schema
(describes the database's physical storage properties)

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Database design process

- Use conceptual level data model to capture user requirements
- Use conceptual level data model to integrate user requirements into one database schema

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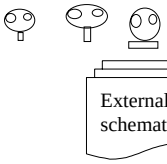

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1. Capture user requirements as external schemas written in a conceptual level data model

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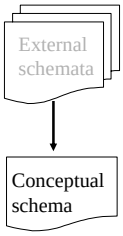

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2. Integrate external schemata using conceptual level data model into one conceptual level conceptual schema

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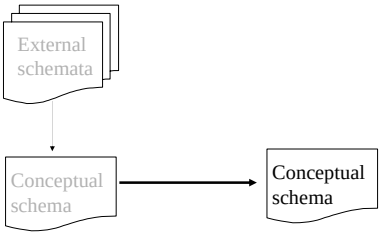

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3. Map the conceptual schema to an equivalent conceptual schema expressed in a logical level data model

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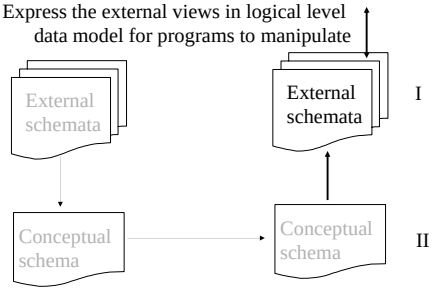
4. Express the external views in logical level data model for programs to manipulate



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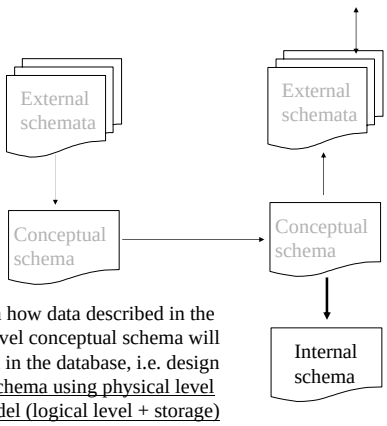

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5. Design how data described in the logical level conceptual schema will be stored in the database, i.e. design internal schema using physical level data model (logical level + storage)

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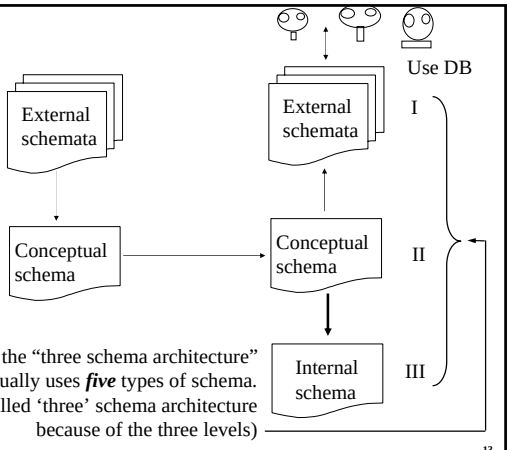

This is how the "three schema architecture" actually uses ***five*** types of schema. (called 'three' schema architecture because of the three levels)

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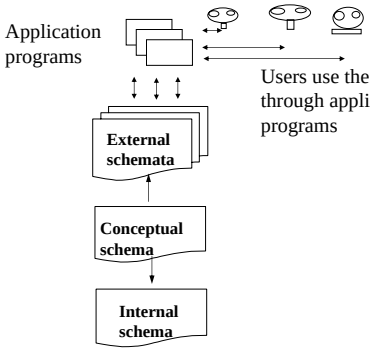

Users use the database through application programs

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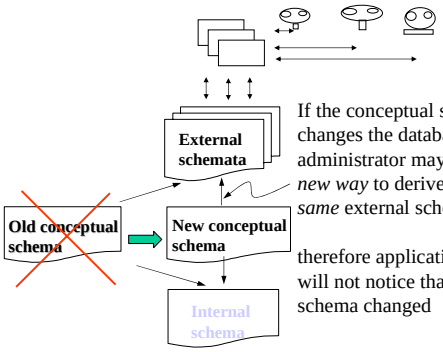
Logical data independence



If the conceptual schema changes the database administrator may define a *new way* to derive the *same* external schemata

therefore application programs will not notice that the conceptual schema changed

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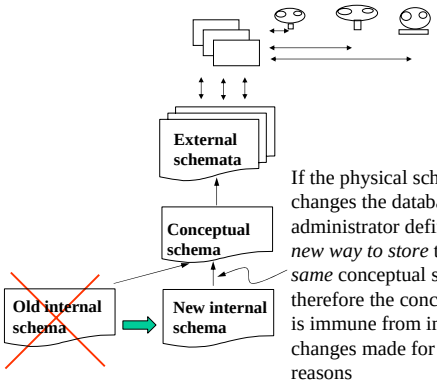
Physical data independence



If the physical schema changes the database administrator defines a *new way to store* the *same* conceptual schema therefore the conceptual schema is immune from implementation changes made for efficiency reasons

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The end

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