Database Systems and Web (15B11CI312)

Database Systems and Web

Lecture 2

Contents to be covered

- Database Terms
- Three-schema Architecture
- Data Independence
- Roles for people in DBMS
- Database Languages and Interface
- Data Models
- Classification of DBMSs

Database Terms

- **Schema :** A schema is a description of a particular collection of data, using the a given data model.
- Schema is the overall design of database.

In RDBMS context:

Schema – table names, attribute names with their data types for each table and constraints etc.

Name	Roll	Class	Subject

Database Terms

- **Database state : ** Data in a database at particular moment is called database state or snapshot.
- **Instances :** It is sometimes called the current state or instances in database.

  Example : Entry in student table.
- **Metadata :** DBMS stores description of schema construct and constraints known as Metadata.
- The Schema is sometimes called Intension and instance is called extension of schema.

Three-schema Architecture

Three-schema Architecture

Physical level:

- Describes details of how data is stored: files, indices, etc. on the random access disk system
- It also typically describes the record layout of files and type of files (hash, b-tree, flat).

Three-schema Architecture

Conceptual level(logical):

- Describes data stored in database, and the relationships among the data.
- Hides details of the physical level.
- In the relational model, the conceptual schema presents data as a set of tables

Three-schema Architecture

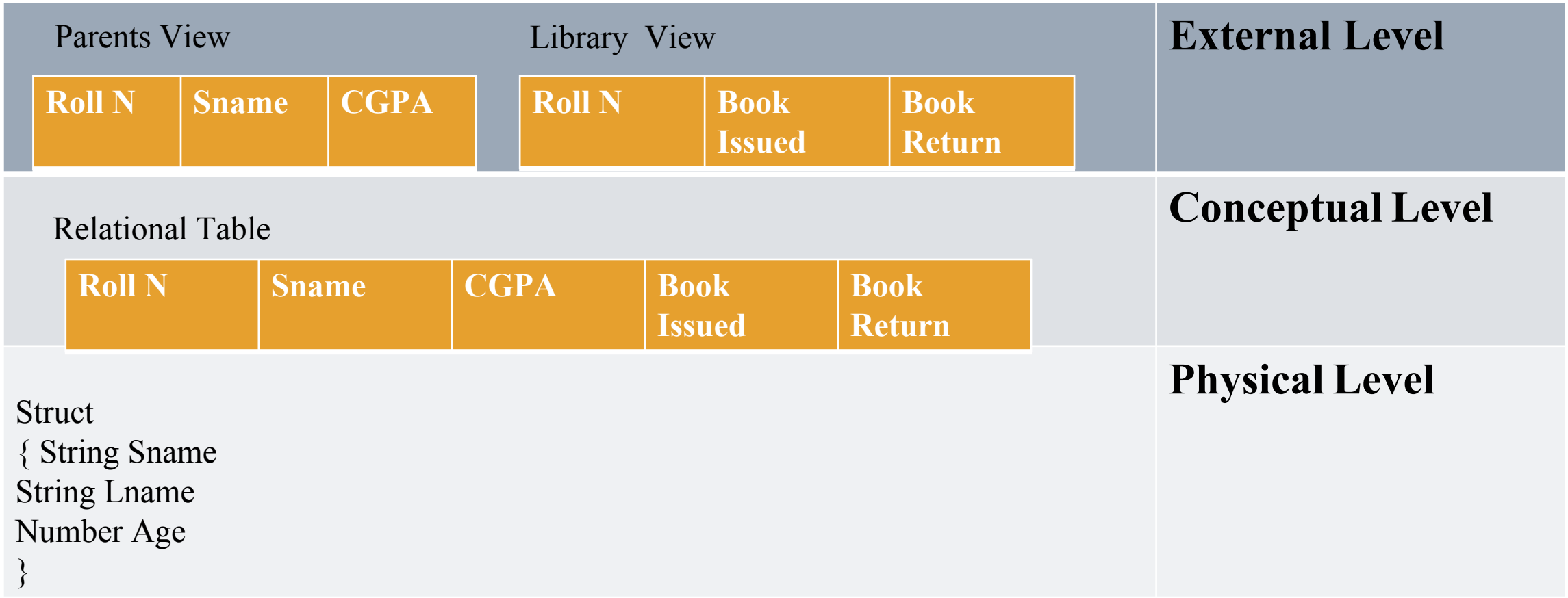
View level :

- Each view describes an aspect of the database relevant to a particular group of users.
- Portions of stored data should not be seen by some users and implement a level of security .

For Example, in the context of a library database

- Books details section
- Issue/Returns management section

Three-schema Architecture



Data Independence

Capacity to change schema at one level of database system without having to change schema at next higher level.

- **Physical data independence:** The ability to modify physical level schema without affecting the logical or view level schema.
- **Logical data independence:** The ability to change the logical level scheme without affecting the view level schemes or application programs.

Database Languages

- Data Definition Language (DDL),
- Data Manipulation Language (DML)
- Data Control Language (DCL)
- Transaction Control Language (TCL)

Database Interfaces

- Web-based user interfaces.
- Forms-Based Interfaces.
- Graphical User Interfaces.
- Natural Language Interfaces.
- Interfaces for the DBA.

Roles for people in DBMS

- **Application programmers** – interact with system through DML calls
- **Sophisticated users** – form requests in a database query language
- **Specialized users** – write specialized database applications that do not fit into the traditional data processing framework
- **Naive users** – invoke one of the permanent application programs that have been written previously
  - E.g. people accessing database over the web, bank tellers, clerical staff

DBA (Database Administrator)

- Designing the logical schema and Creating the structure of the entire database
- Monitor usage and create necessary index structures to speedup query execution
- Grant / Revoke data access permissions to other users etc

Data Models

- A **data model** is a collection of concepts for describing data.
- Data Models define underlying structure of DBMS.
- Use to achieve data abstraction for creation of good database
- Define and organize data according to users
- Contains Description of data, data relationship ,data semantics , data integrity constraints.

Data Models

Type of data model

- Object Based Logical data model
  - ER Model
  - OO Model
- Record Based Logical Data Model
  - Relational Data Model
  - Hierarchical Data Model
  - Network Based

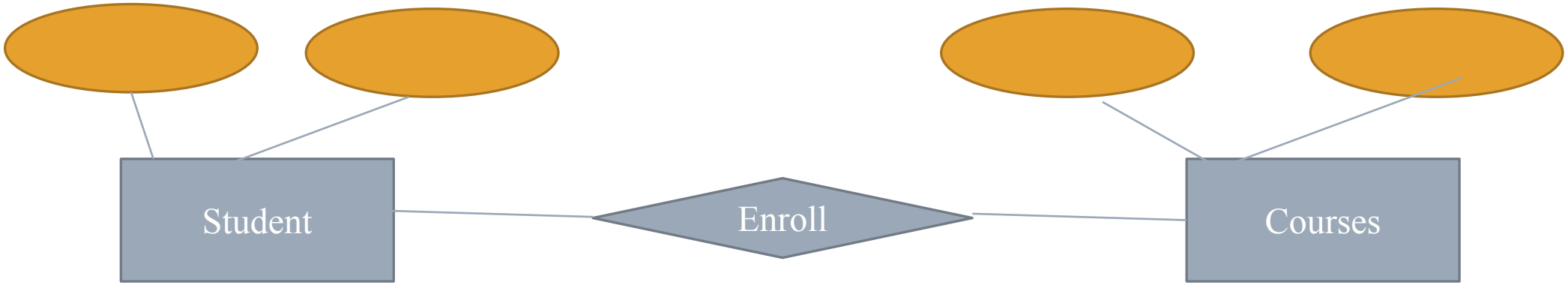
Data Models

The **Relational model and ER Model** of data is the most widely used model today.

- **ER Model:** Describes the structure of a database with the help of a notations
- **Relational Model :** Represent the database in form of a table with rows and columns.

Data Models

Example of database schema in the **Entity-Relationship** model



We will discuss ER in coming Lectures

Data Models (cont…..)

Example of tabular data in the relational model

Student-id	*Student-name*	*CGPA*
10001	Johnson	9.5
10002	Smith	5.9

Attributes

- Database design in E-R model usually converted to design in the relational model (coming up next) which is used for storage and processing

Classification of DBMSs

- General or special-purpose
- Data model
  - •Relational
  - •Object
  - •Object-relational
  - •Hierarchical and network
- Number of users
  - •Single-user and Multiuse
- Number of sites
  - •Centralized
  - •Distributed
- Licensing
  - •Open source
  - •commercial