Database System 2021

Database Architecture
Lec-4

Database Architecture

- It is very important to understand the architecture of database very well because
  - What are those different level where we see the data in a database
  - In order to make proper use of data and to design the database properly.

- The schema in the architecture refers to permanent structure of the database or **intention of database**.

History of Database Architecture

- In the beginning data processing with the file processing environment was developed.
- **Drawback:** realized when Applo Moon Landing Project generate the huge amount of data and no proper recourse was available to handle or process that data.
- **Solution:** 1st database system was implemented name **IMS.**

History of Database Architecture

IMS

- 1st database system.
- IMS was based on **hierarchical data model.** Hierarchical data model support one to many relationship between entities.
- **Drawback:** IMS is tree like structure database, so people start finding it hard to implement different applications in different situation.
- **Solution:** IDS database system was implemented

History of Database Architecture

IDS

- IDS database system was based on **Network data model.**
- IDS support many to many relationship.
- After that the efforts was made to standardized the architecture of database.

History of Database Architecture

CODASYL

- Conference of Data System and Language committee appointed **DBTG** to make effort to standardized the database architecture.

- In 1971, DBTG proposed **Two Level Architecture.**

History of Database Architecture

Two Level Architecture

- System View: Schema
  - It represent the view of whole organization database structure.
- User View: Subschema
  - It represent the view of different user group.
- **DDL** is used to define the schema and subschema.

History of Database Architecture

ANSI

- American National Standards Institute reject the recommendation of DBTG.
- ANSI organized committee **SPARC** (Standard Planning and Requirement Committee) to suggest the architecture.
- SPARC proposed **Three Level Architecture**

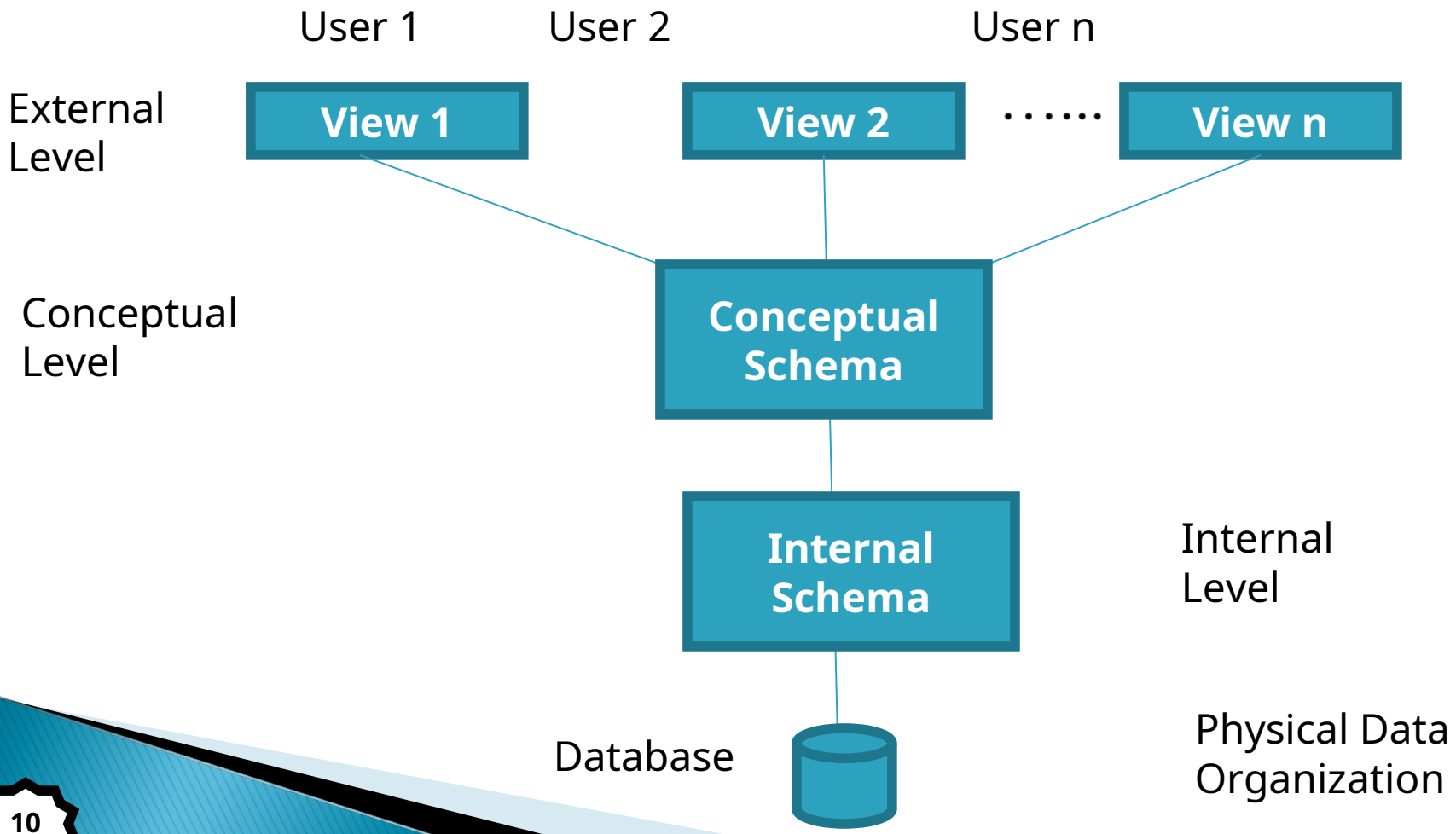
History of Database Architecture

Three Level Architecture

- This architecture proposed in 1975
- Data item can be described at three distinct level
  - External Level
  - Conceptual Level
  - Internal Level

Three Level Architecture

Three Schema Component



Three Level Architecture

Objective

- Separate users view from the physical representation.
- **Why???**
- Same data is view by different users differently.
- **Example**
  - Date of Birth of student is store in one format. One user group view the DOB in dd-mm-yyyy format, another user view month dd, yyyy and an other view in yyyy-mm-dd format.
  - **Different use of the same data**

Three Level Architecture

Objective

- Three level architecture give you the environment or facilities that you can store a consolidated view of all different views.
- Change the format of the data
  - Practically store
  - Seen by the user groups.
- By splitting it into different level it become much more easier.

Three Level Architecture

Three Schema Component

- **External View**
  - The **user view** of the database.
  - The way each **user group** use the data
  - In external level, different external views of database.
  - User may have different view of same data. E.g. date, time, etc.
  - External view are represented independently in the three level schema architectures.

Three Level Architecture

Three Schema Component

- **External View**
  - External view contain **virtual calculated data.**
  - The data that is not actually stored in the database but is created when needed. E.g. age. So derived or calculate data can be shown to users.

Three Level Architecture

Three Schema Component

- **User View**
  - Logical description of some portion of database that is require by the users to perform some task.
  - Database is access by the different **user group** and every user group access the data according to its requirements.
  - Users concern only the required data and have no relation with other data.

Three Level Architecture

- **External View**

Employee Data
First Name: Atif Last Name: Khan Date of Birth: 28 Sept, 2006

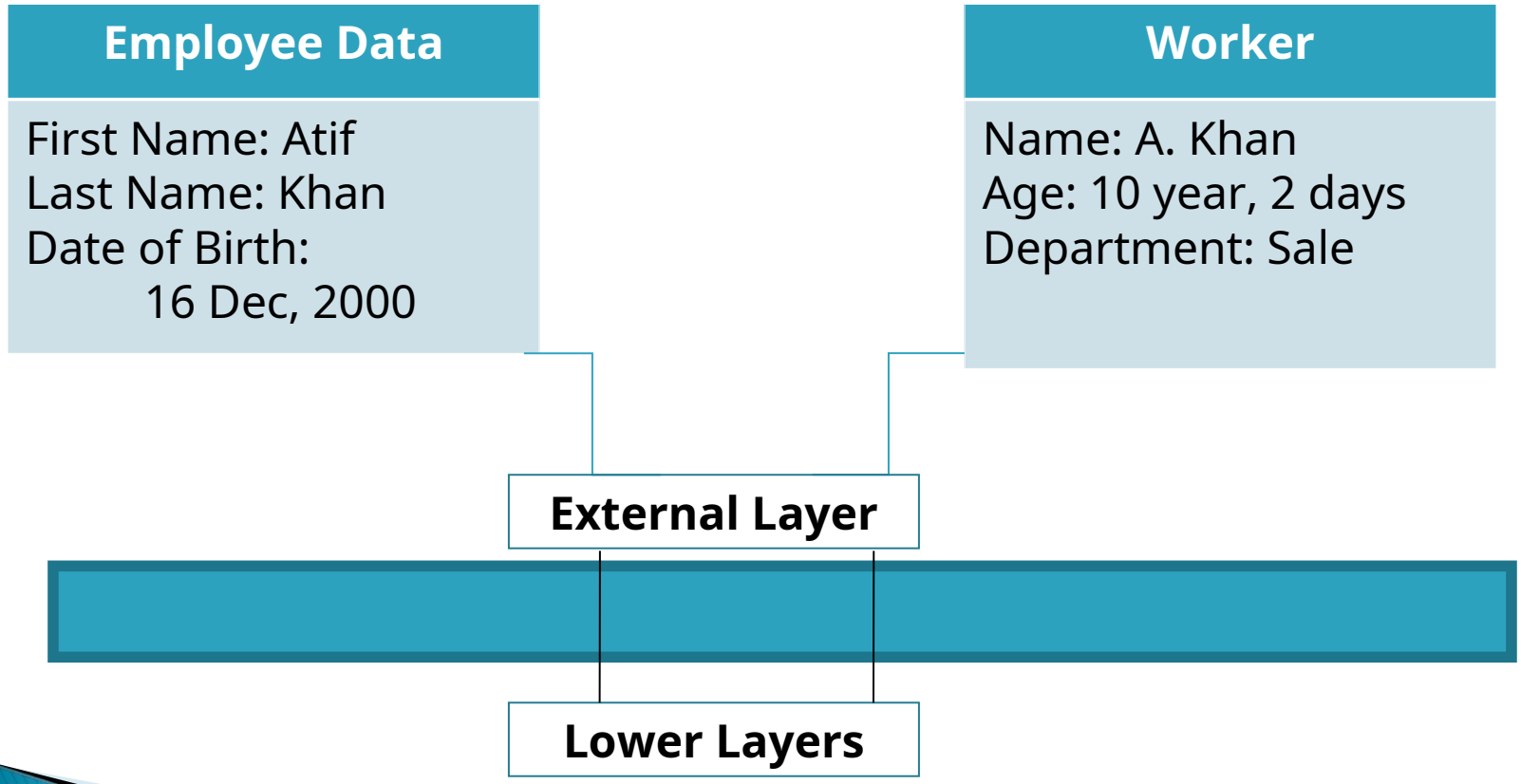
First User View

Worker
Name: A. Khan Age: 10 year, 2 days Department: Sale

Second User View

Three Level Architecture

- **External View**



Three Level Architecture

Three Schema Component

- **Conceptual Layer**
  - It contain Logical structure of the database
  - Describe whole database
  - Conceptual schema developed on the bases of all the external views.
  - Only DBA can access and understand conceptual schema
  - In Conceptual schema all **entities**, **attributes** and their **relationship** are represented .

Three Level Architecture

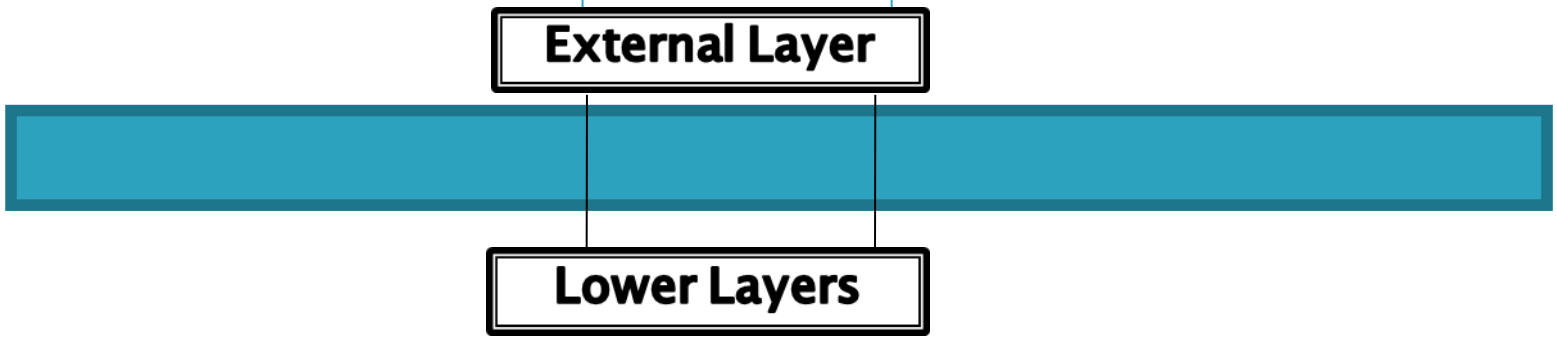
Three Schema Component

- **Conceptual Layer**
  - To maintain the **integrity of data**, few checks are used on the data.
  - Conceptual schema represent **semantic information** about data
  - It is relatively constant and design according to the present as well as future needs of an organization. But very few chance to make changes.
  - Have no **storage consideration**

Three Level Architecture

Employee Data
First Name: Atif Last Name: Khan Date of Birth: 16 Dec, 2000

Worker
Name: A. Khan Age: 10 year, 2 days Department: Sale



Name	Father Name	DOB	Dept ID
Atif Khan	Munsif	16-12-2000	D001
Baber Khan	Amjad	20-01-1998	D002

Three Level Architecture

Three Schema Component

- **Internal View**
  - How the data is **actually represented**?
  - In Internal schema DBMS concerned with the
    - storage space for data and indexes.
    - Record description
    - Data compression and data encryption techniques
  - Data define by the conceptual schema is store and **some data added by DBMS** by internal schema.

Three Level Architecture

Three Schema Component

- **Internal View**
- In internal view, formatting of data, arrangement of data is the responsibility of DBMS.
- In Internal view, DBMS interact with the operating system.
- Below the internal view there is a **physical level** which is not included in three level architecture.

Three Level Architecture

Three Schema Component

- **Internal View**
- In internal view, records are prepare by DBMS according to the need of organization and then it is handed over to OS with the appropriate guidelines or directions.

- OS prepare the physical layer and then store that data in binary form.

Have a Nice Day