

Computers I

6.4 Three Level Database Architecture

Also known as Three Tier, or Three Schema approach.

Databases are organized in a three level architecture.

The purpose of the Three Schema architecture is so that:

- All users should be able to access same data
- A users view should be immune to changes made in other views
- Users should not need to know physical database storage details
- DBA should be able to change database storage structures without affecting the users view
- Internal structure of database should be unaffected by changes to physical aspects of storage

The **DBA** or database administrator handles the maintenance of the database.

The DBA is responsible for doing the following to a DBMS

- Installation
- Configuration
- Upgrade
- Administration
- Monitoring
- Maintenance
- Securing

When designing a database, or maintain a database as is the case of the DBA we want to keep all of the above architecture purposes in mind.

Physical Data Level

- Defines details of its physical storage structures.
- Deals with indices and RAM
- The internal schema uses a physical data model to describe the complete details of data storage and access paths for the database.

In other words, records, and blocks of data with links to each other are organized within the file for efficiency.

Conceptual Data Level

- Also known as Logical Level
- Hides details of the physical level
- Data is represented as a set of tables
- Describes the structure of the whole database for a community of user

External Data Level

- Specifies a view of the data in the application program
- Tailored to the needs of a particular user
- Portions of data should not be seen by some users
- Implements a level of security

Examples of External Data Level

- Students should not see faculty salaries
- Faculty should not see billing or payment data

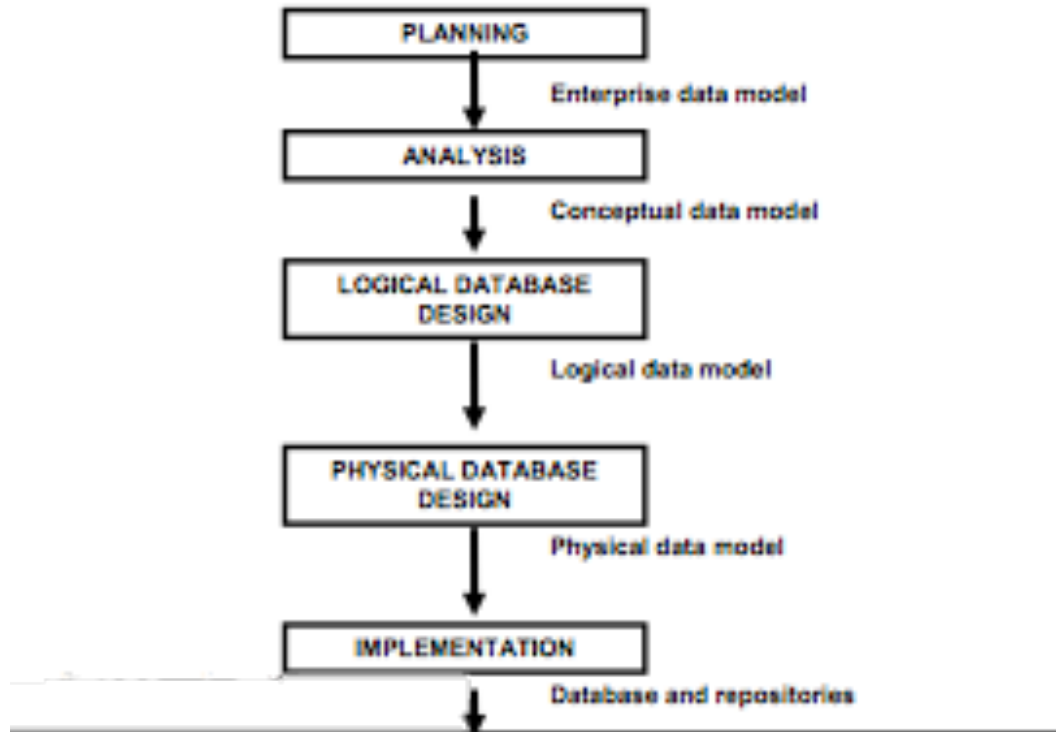
Sometimes it is possible, and efficient to not store a specific data, if the information can be easily derived from stored data.

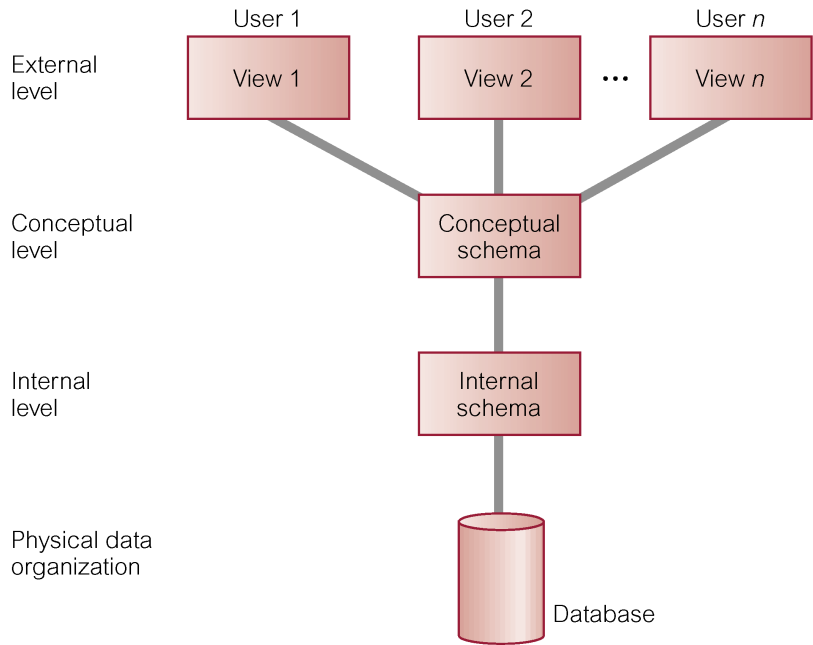
For example, GPA of a student can be displayed when the student searches for his or her GPA but it is not stored only calculated when needed.

It is important to know that external and conceptual are only descriptions of data and that the only real data exists at the physical level.

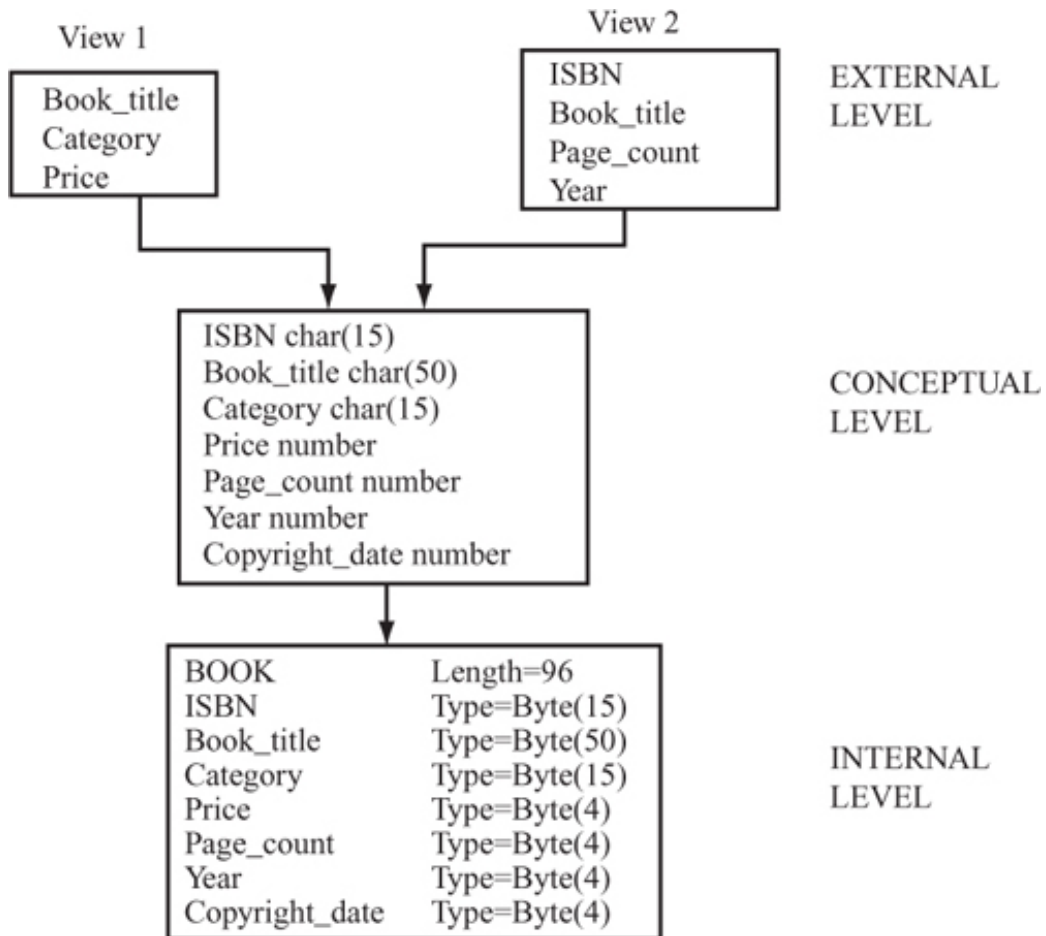
Changing the schema at one level without having to change the next level is called **data independence**.

Database Development Process





Three levels for an Online Book database



6.5 Query Optimization

When working with SQL it is essential that every query be as efficient as possible or in other words, optimized.

Some DBMS such as the Oracle Database contains an Optimizer component.

The Optimizer determines the most efficient execution plan for each SQL statement based on the structure of the query.

SQL has some general rules when writing queries so that it performs efficiently,

This includes

- Use single case for all SQL verbs
- Begin all SQL verbs on a new line
- Separate all words with a single space

Also, The SQL query becomes faster if you use the actual columns names in SELECT statement instead of than '*'.
SELECT

For example:

I want to retrieve the name and salary of the employees of the IT department.

Original:

```
Select * From Employees
```

Optimized:

```
Select Name, Salary From Employees Where Dept = IT
```

The data that travels on the network will be much smaller than if we had asked for everything, and therefore the performances will improve and the query will be faster.