Database Management System (DBMS)

Lecture-2

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Advantage of DBMS over File system

There are several advantages of Database management system over file system. Few of them are as follows:

No redundant data: Redundancy removed by data normalization. No data duplication saves storage and improves access time.

Data Consistency and Integrity: As we discussed earlier the root cause of data inconsistency is data redundancy, since data normalization takes care of the data redundancy, data inconsistency also been taken care of as part of it.

Fundamentals of Database

Data Security: It is easier to apply access constraints in database systems so that only authorized user is able to access the data. Each user has a different set of access thus data is secured from the issues such as identity theft, data leaks and misuse of data.

Privacy: Limited access means privacy of data.

Easy access to data: Database systems manages data in such a way so that the data is easily accessible with fast response times.
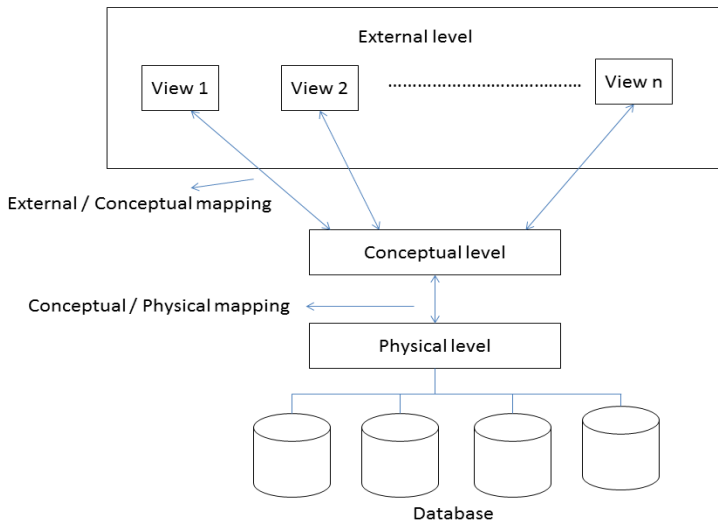
Easy recovery: Since database systems keeps the backup of data, it is easier to do a full recovery of data in case of a failure.

Flexible: Database systems are more flexible than file processing systems.

Fundamentals of Database

Disadvantages of DBMS

- DBMS implementation cost is high compared to the file system
- Complexity: Database systems are complex to understand
- Performance: Database systems are generic, making them suitable for various applications. However this feature affect their performance for some applications

Data abstraction model or Three level data abstraction architecture

External level

View 1   View 2   ....   View n

External / Conceptual mapping

Conceptual level

Conceptual / Physical mapping

Physical level

Database

Fundamentals of Database

Data abstraction means to hide the information. To hide the information from some users, three levels of abstraction is used. This architecture has three levels:

1. External level
2. Conceptual level
3. Physical level

1. External level

It is also called view level. The reason this level is called "view" is because several users can view their desired data from this level which is internally fetched from database with the help of conceptual and internal level mapping. The user doesn't need to know the database schema details such as data structure, table definition etc. User is only concerned about data which is what returned back to the view level after it has been fetched from database (present at the internal level). External level is the "top level" of the Three Level DBMS Architecture.

2. Conceptual level

It is also called logical level. The conceptual level describes the structure of the whole database. The conceptual schema hides the details of physical storage structures and concentrates on describing entities, data types, relationships, user operations, and constraints. Usually, a representational data model is used to describe the conceptual schema when a database system is implemented.

3. Physical level

This level is also known as internal level. This level describes how the data is actually stored in the storage devices. This level is also responsible for allocating space to the data. The internal level describes the physical storage structure of the database. The internal schema uses a physical data model and describes the complete details of data storage and access paths for the database. This is the lowest level of the architecture.

Schema

The overall design of the database is called the database schema. Schema is of three types: Physical schema, logical schema and view schema.

Physical schema: The design of a database at physical level is called physical schema, how the data stored in blocks of storage is described at this level.

Logical schema: Design of database at logical level is called logical schema, programmers and database administrators work at this level, at this level data can be described as certain types of data records gets stored in data structures, however the internal details such as implementation of data structure is hidden at this level (available at physical level).

View schema: Design of database at view level is called view schema. This generally describes end user interaction with database systems.

Instance

The collection of information stored in the database at a particular moment is called an instance of the database.

Fundamentals of Database