Database Management Systems (CS 2004)

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4 Credit

Lecture Note 03

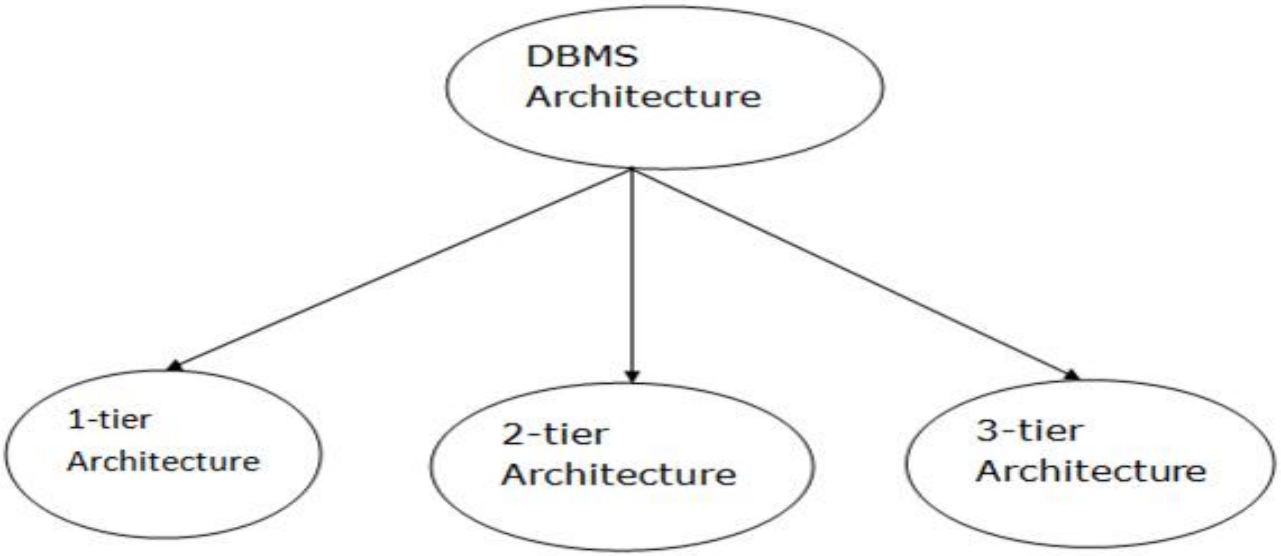
Chapter Contents

- 3-Level Abstraction of Database
- Mapping and Data Independence
- Database Users

DBMS Architecture

- The DBMS design depends upon its architecture. The basic client/server architecture is used to deal with a large number of PCs, web servers, database servers and other components that are connected with networks.
- The client/server architecture consists of many PCs and a workstation which are connected via the network.
- DBMS architecture depends upon how users are connected to the database to get their request done.

Types of DBMS Architecture



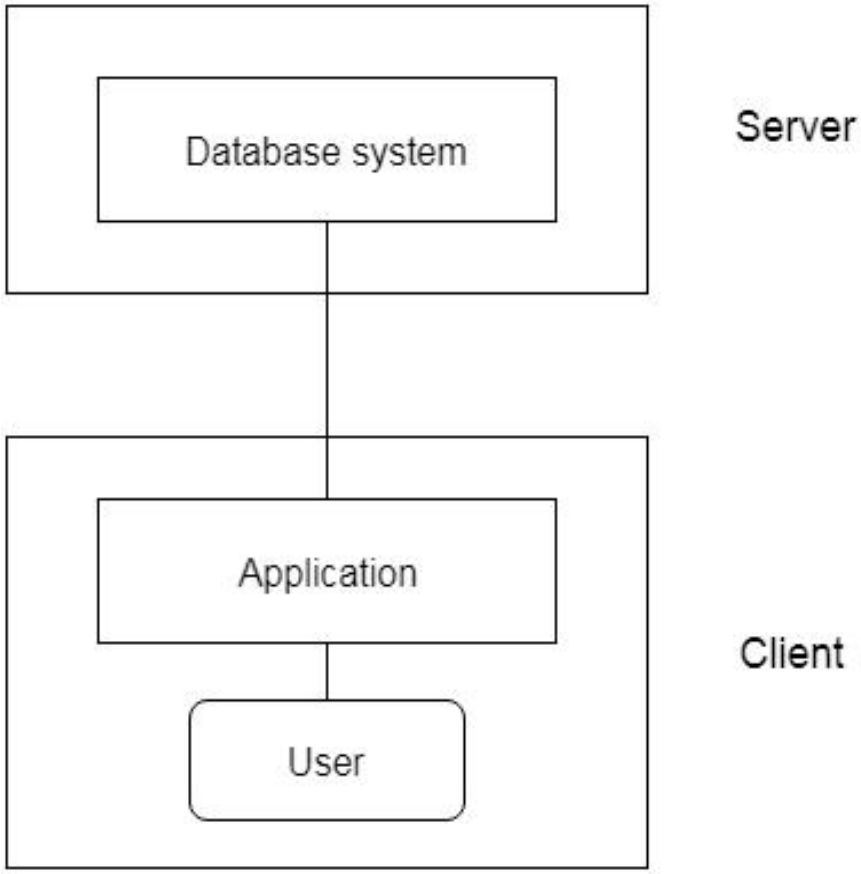
1-Tier Architecture

- ✓ In this architecture, the database is directly available to the user. It means the user can directly sit on the DBMS and uses it.
- ✓ Any changes done here will directly be done on the database itself. It doesn't provide a handy tool for end users.
- ✓ The 1-Tier architecture is used for development of the local application, where programmers can directly communicate with the database for the quick response.

2-Tier Architecture

- ✓ The 2-Tier architecture is same as basic client-server. In the two-tier architecture, applications on the client end can directly communicate with the database at the server side. For this interaction, API's like: ODBC, JDBC are used.
- ✓ The user interfaces and application programs are run on the client-side.
- ✓ The server side is responsible to provide the functionalities like: query processing and transaction management.
- ✓ To communicate with the DBMS, client-side application establishes a connection with the server side.

2-Tier Architecture

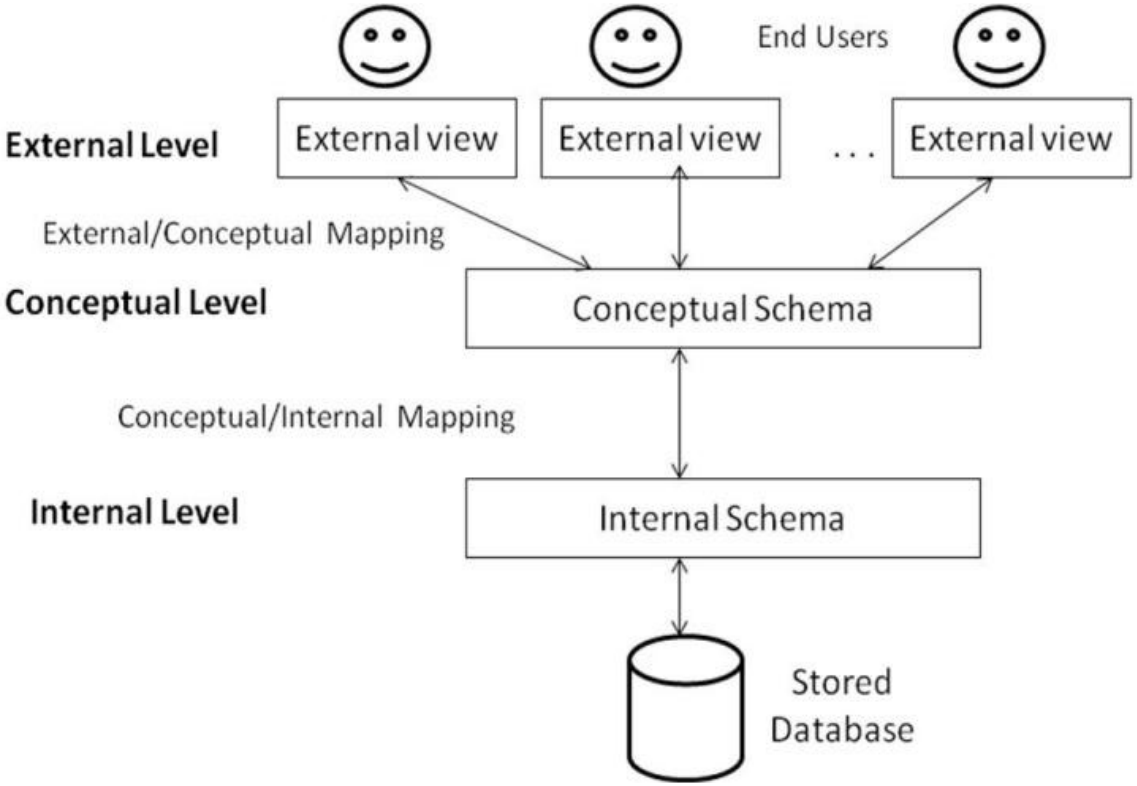


3-Tier Architecture

- ✓ The 3-Tier architecture contains another layer between the client and server. In this architecture, client can't directly communicate with the server.
- ✓ The application on the client-end interacts with an application server which further communicates with the database system.
- ✓ End user has no idea about the existence of the database beyond the application server. The database also has no idea about any other user beyond the application.
- ✓ The 3-Tier architecture is used in case of large web application.

3-Level Abstraction of Database

- The goal of the ANSI/SPARC 3-level abstraction is to separate the user applications and the physical database. It deals with the data, the relationship between them and the different access methods implemented on the database. The logical design of a database is called a **schema.**



3-Level Abstraction of Database...

- ✓ **External/View Level:** The external level includes a number of external schemas or user views. Each external schema or user view describes the part of the database that a particular user group is interested in and hides the details of the database from that user group.
- ✓ **Conceptual Level:** The conceptual level has a conceptual schema, which describes the structure of the whole database for a community of users. The conceptual schema hides the details of physical storage structures and concentrates on describing entities, data types, relationships and constraints. It represents global view of the entire database. Thus; for a database, there is only one conceptual schema available.
- ✓ **Internal Level:** The internal level has an internal schema, which describes the physical storage structure of the database system. Like conceptual schema, there is only one internal schema available for a database. It is the one which is closest to physical storage. The internal schema not only defines the various stored record types, but also specifies what indices exist, how stored fields are represented.

Mapping and Data Independence

- In a database system based on the 3-level architecture, each user group refers only to its own external schema. The process of transforming requests and results between different levels are called **mapping**.
- ✓ **Conceptual/Internal Mapping:** It defines the correspondence between the conceptual view and the stored database. **Physical Data Independence** indicates that the internal schema can be changed without any change to the conceptual schema.
- ✓ **External/Conceptual Mapping:** It defines the correspondence between a particular external view and the conceptual view. **Logical Data Independence** indicates that the conceptual schema can be changed without affecting the existing external schemas.

Database Users

- Different database users are:

✓ **Naive Users:** They are the normal or unsophisticated users who interact with the system by invoking application programs that have been written previously. The typical user interface for naive users is a form interface, where the user can fill in appropriate fields of the form.

✓ **Application Programmers:** They are computer professionals who write application programs to access data from the database. Application programmers can use different tools to develop user interfaces.

✓ **Sophisticated Users:** They interact with the system without creating any application program. Rather, they form their requests in a database query language and submit each such query to a query processor. Analysts who submit queries to explore data in the database fall in this category.

✓ **Specialized Users:** They are sophisticated users who write specialized database applications that don't fit into the traditional data processing framework.

✓ **Database Administrator (DBA):** The person who has central control of the whole database system is called DBA. The DBA coordinates all the activities of the database system.

Role of Data Base Administrator

- Role of DBA are:
  - ✓ DBA creates the original database schema by executing a set of DDL statements.
  - ✓ DBA defines and controls the access methods for the different users.
  - ✓ DBA carries out changes to the schema and physical organization to reflect the changing needs of the organization, or to alter the physical organization to improve performance.
  - ✓ By granting different types of authorization, DBA can regulate which parts of the database various users can access.
  - ✓ DBA specifies the different types of constraints to different tables or objects.
  - ✓ DBA is responsible for the periodically backing up the database.
  - ✓ DBA ensures that enough free disk space is available for normal operations and upgrading disk space as required.
  - ✓ DBA monitors the jobs running on the database and ensures that the performance is not degraded by very expensive tasks submitted by some users.


THANK
YOU!