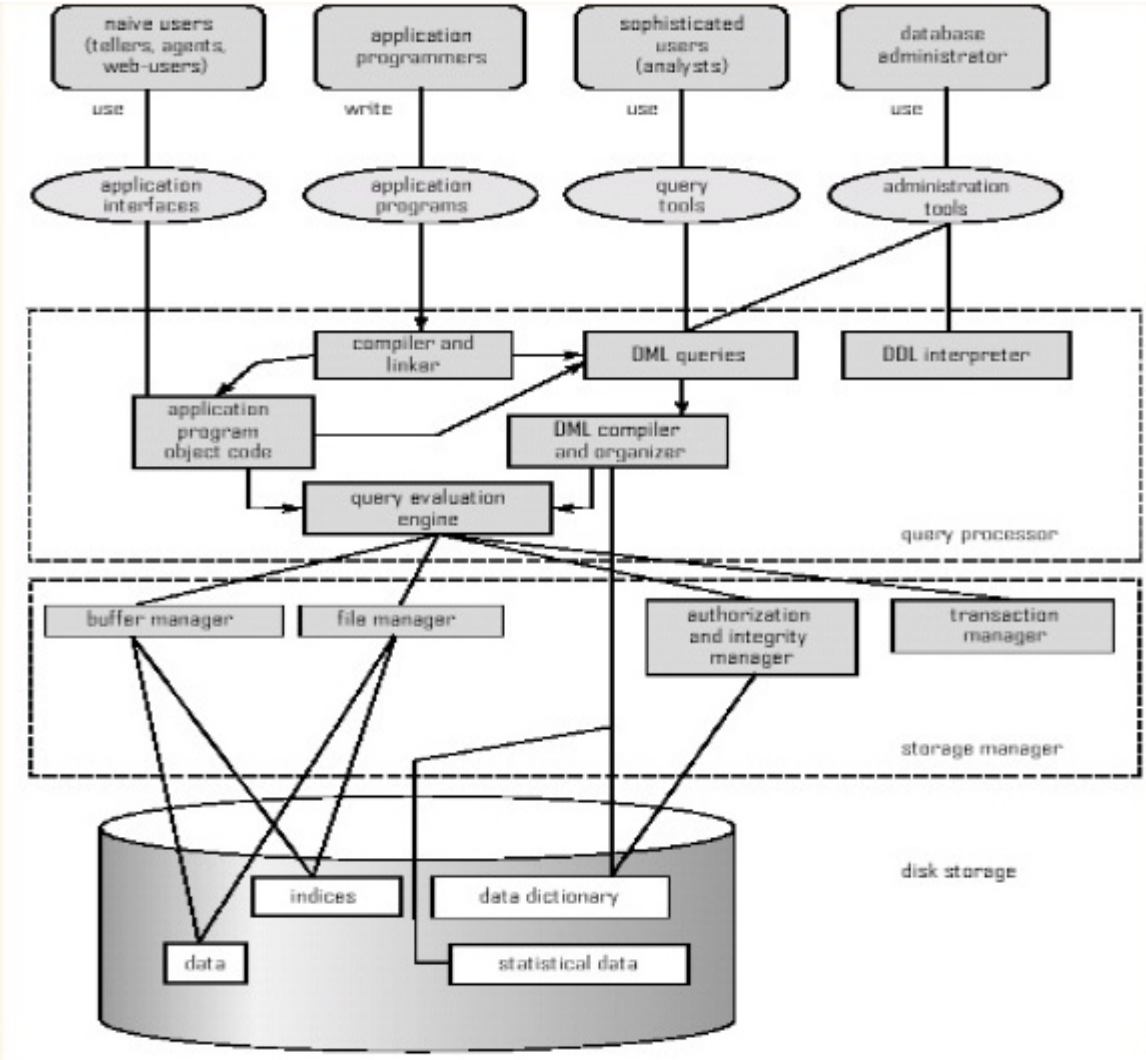
Database Architecture

Database Architecture

- Also included as Components of database management or database structure.
- A database system is partitioned into modules that deal with each of the responsibilities of the overall system.
- Functional components of a database system can be broadly divided into,
    - Storage Manager
    - Query Processor



Database Architecture / System Structure

1. Disk Storage

- All data or information stored in disk storage
- Various components of disk storage
    - **Data** → Data files which stores the database itself
    - **Data directory**
        - It contains meta data → data about data
        - Schema of table is an example of meta data
        - A database system consults the data directory before reading and modifying the actual data.
    - **Indices** → It provides fast access to data items that holds particular values.
    - **Statistical data** → Stores information/statistics of data stored.

2. Storage Manager

- Storage manager is a program module that provide interface between,
    - Low level data stored in database and
    - Application programs and
    - Queries submitted to system.
- Storage manager is responsible for the interaction with file manager.
- Storage manager translates DML statements into low-level file system commands.
- Storage manager is responsible for
    - Storing
    - Retrieving
    - Updating data in database

Components of Storage manager

a) **Authorization and integrity manager**
    - Checks **authority of users** accessing the data
    - It **tests integrity and constraints of data**

b) **Transaction manager**
    - It ensures that the database remains in a consistent state despite of failure.
    - **Concurrent execution in maintained without any conflict.**

c) **File manager**
    - It manages **allocation of space** on disk storage
    - Information stored on disk is represented using database.

d) **Buffer manager**
    - It is responsible for fetching data from disk storage into main memory.
    - It decides what data to cache the main memory

3. Query processor

- Query processor is an important part of the database system
- It helps the database system to simplify and facilitate access to data.

Various components of Query processor

a) **DDL Interpreter**
   - It interprets DDL statements into low level.
   - Records the definition in the data directory.

b) **DML Compiler**
   - It translates DML query statement in query language into low-level instruction.
   - Query evaluation engine understands only low level instruction.
   - Query can be translated into many number of evaluation plans which produces same result.
   - Query optimization is picking up the lowest cost evaluation plan among many alternatives. It is performed by DML compiler.

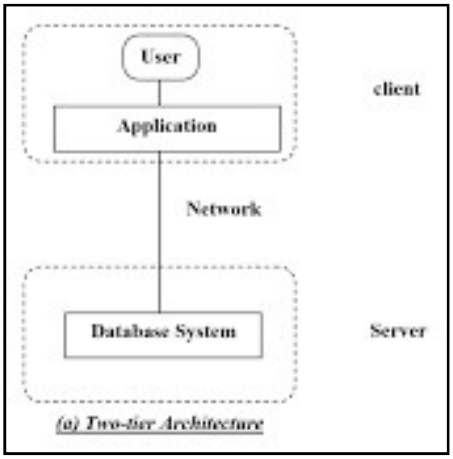
c) Query evaluation engine
   - Executes low level instruction generated by DML compiler.

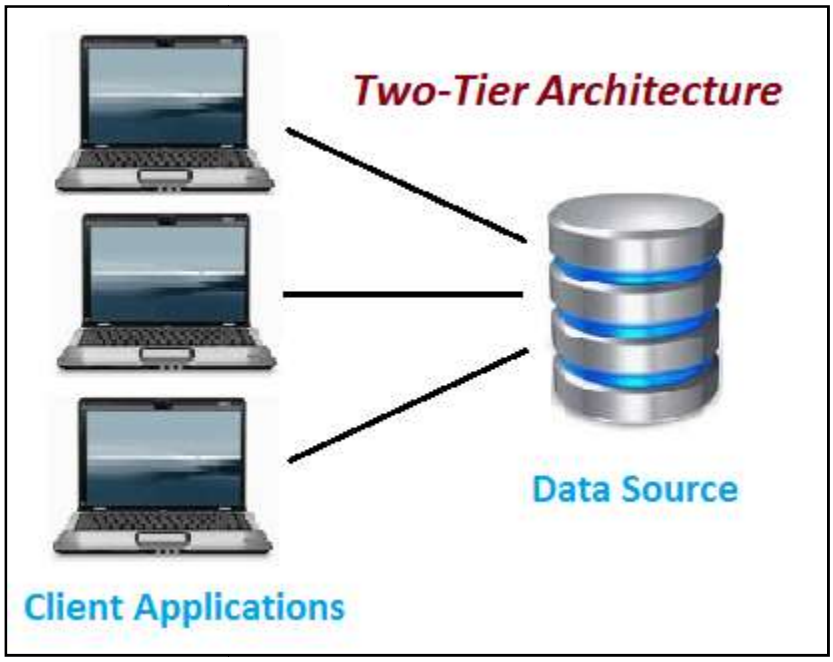
Database architecture can be of two types,

- Two Tier Architecture
- Three Tier Architecture

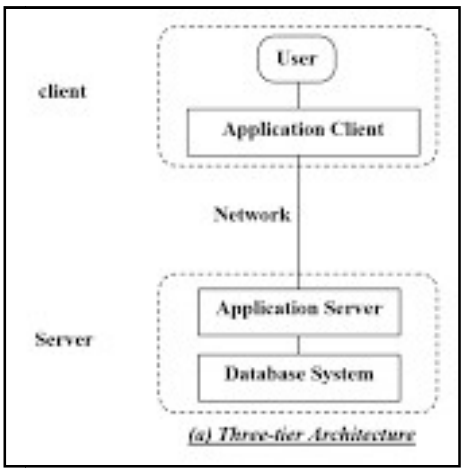
Two Tier Architecture

- Usually database application is partitioned into two parts.
- The two-tier is based on Client Server architecture.
- The two-tier architecture is like client server application.
- The direct communication takes place between client and server.
- There is no intermediate between client and server.





Three Tier Architecture



- In Three tier architecture, client machine acts as front end and does not contain any direct database calls.
- Instead client end communicate with an application server
- Application server in turn communicates with a database system to access data.

Three-tier architecture typically comprises a presentation tier, a business or data access tier, and a data tier. Three layers in the three tier architecture are as follows:

1) Client layer, 2) Business layer, 3) Data layer

1) Client layer:

- It is also called as Presentation layer which contains UI part of our application.
- This layer is used for the design purpose where data is presented to the user or input is taken from the user.
- For example designing registration form which contains text box, label, button etc.

2) Business layer:

- In this layer all business logic written like validation of data, calculations, data insertion etc.
- This acts as an interface between Client layer and Data Access Layer.
- This layer is also called the intermediary layer helps to make communication faster between client and data layer.

3) Data layer:

- In this layer actual database is comes in the picture.
- Data Access Layer contains methods to connect with database and to perform insert, update, delete, get data from database based on our input data.