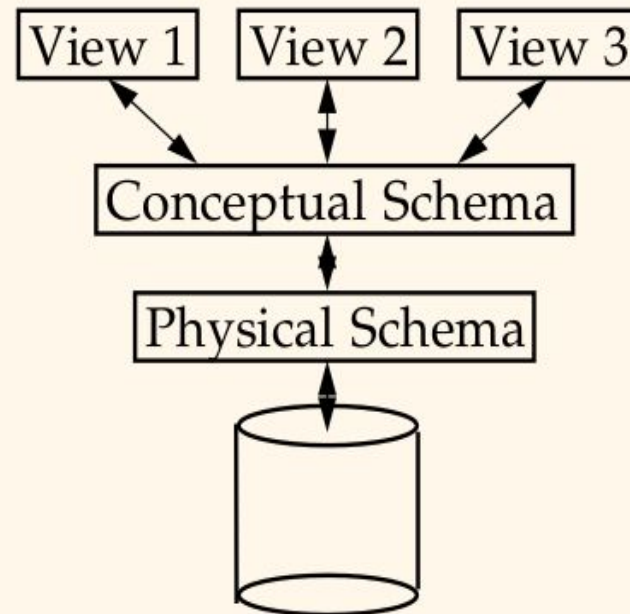


# DATABASE ARCHITECTURE

# Levels of Abstraction

- ❖ Many views, single conceptual (logical) schema and physical schema.
  - Views describe how users see the data.
  - Conceptual schema defines logical structure
  - Physical schema describes the files and indexes used.



• Schemas are defined using DDL; data is modified/queried using DML.

# Users of DBMS

Although database users can be of different types, they are mainly classified as the following:

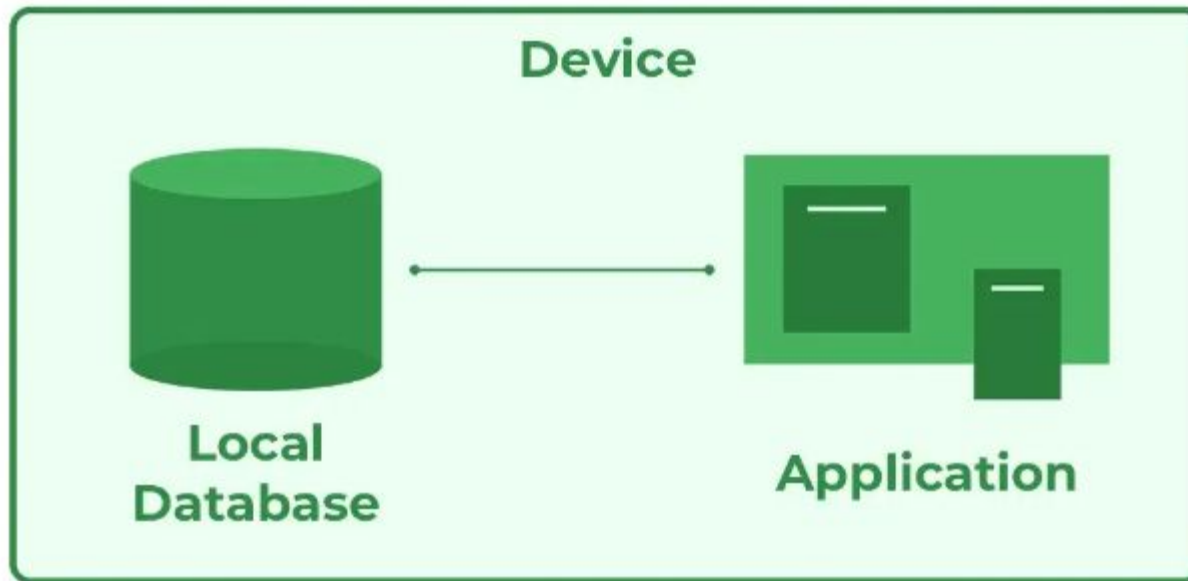
- **Database Administrators (DBA):** A database administrator, also called a DBA, is the person responsible for managing the entire database management system, including databases, user accounts, access control, backup or recovery, database security, etc.
- **Application Programmer or Software Developer:** An application programmer or software developer is a person who designs and develops parts of a DBMS using various programming languages (such as Java, C++, or Visual Basic) to allow other users to interact with the DBMS.
- **End-Users:** Any person who indirectly interacts with a DBMS and performs various database-related operations like inserting, modifying, retrieving, or deleting data, using database commands or applications.

# Types of Database Architecture

- 1-Tier Architecture
- 2-Tier Architecture
- 3-Tier Architecture

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# 1- Tier Architecture



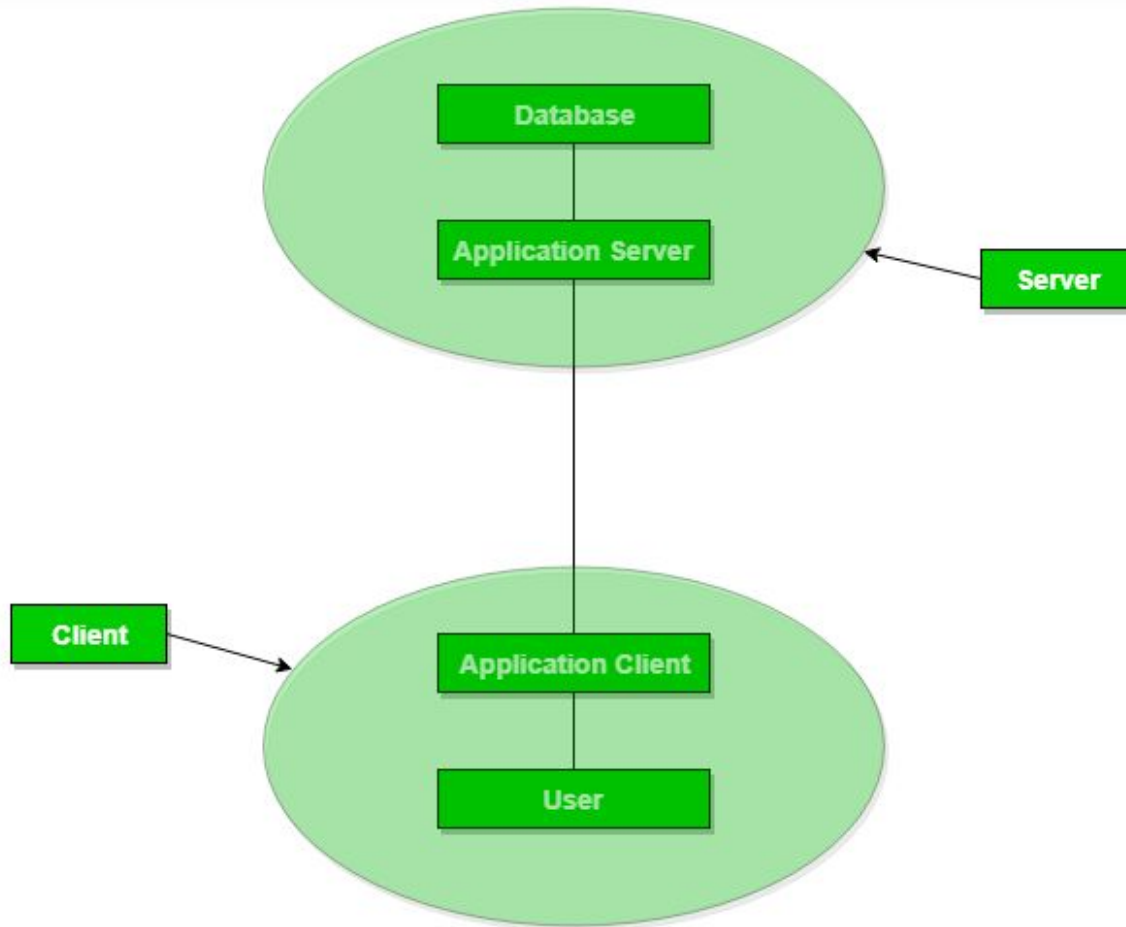
*DBMS 1-Tier Architecture*

## 2 - Tier Architecture



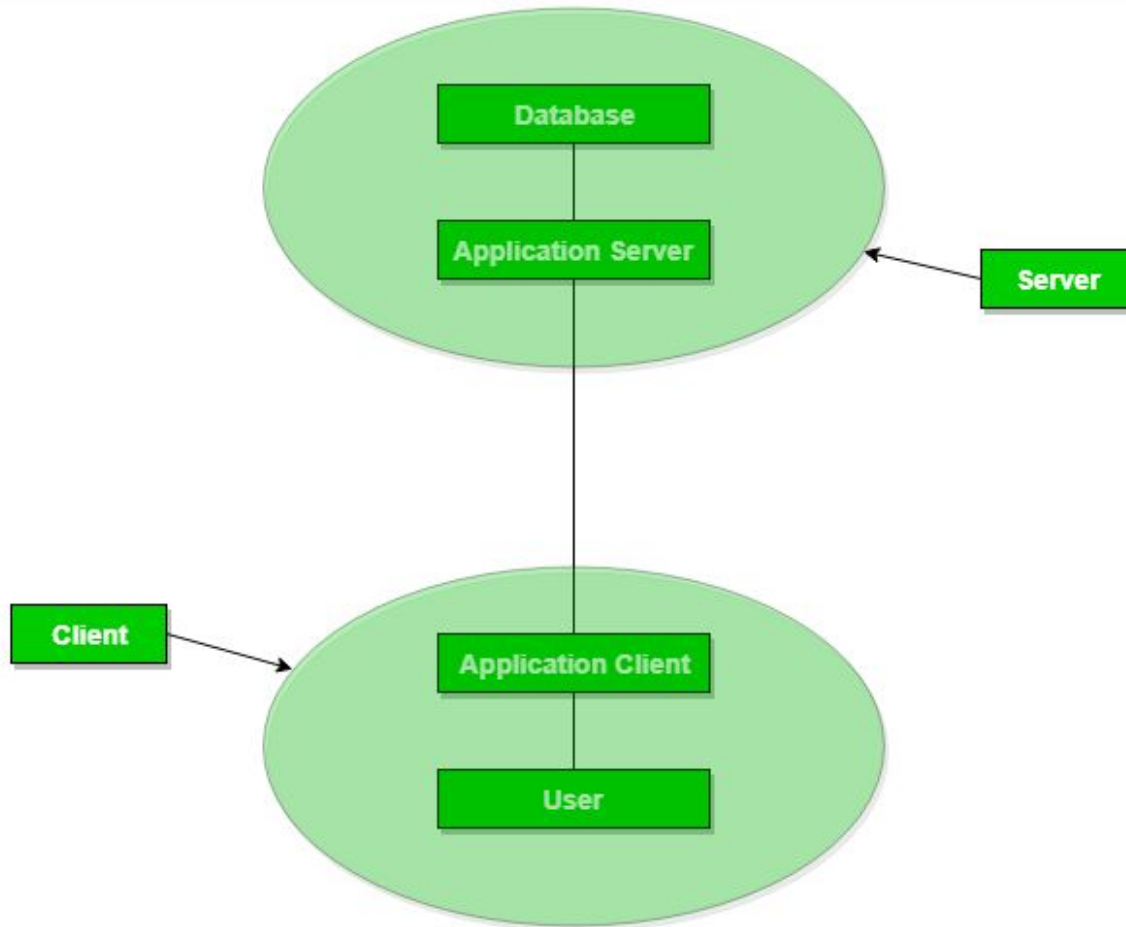
*DBMS 2-Tier Architecture*

- 3 - Tier Architecture



*DBMS 3-Tier Architecture*

- 3 - Tier Architecture



*DBMS 3-Tier Architecture*

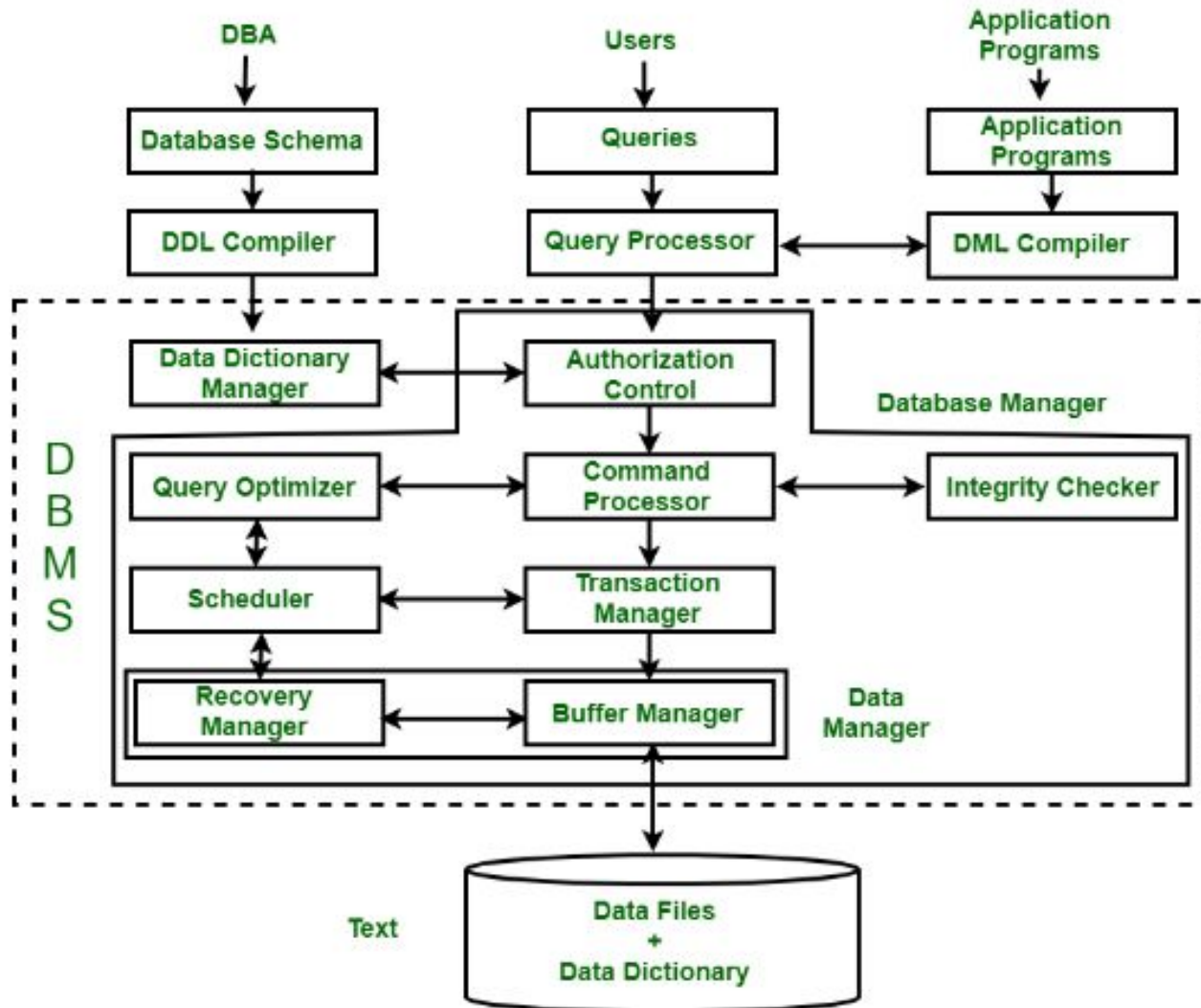


# Components

The database system is divided into three components:

- Query Processor,
- Storage Manager, and
- Disk Storage.

# ○ Structure of a DBMS



Architecture of DBMS

# Database Languages

- ◆ **DDL** – Data Definition Language
- ◆ **DCL** – Data Control Language
- ◆ **DML** – Data Manipulation Language

(For data manipulations like insertion, deletion, update, retrieval, etc.)

# Query Processor

1. Query Processor: It interprets the requests (queries) received from end user via an application program into instructions. It also executes the user request which is received from the DML compiler.

Query Processor contains the following components –

- DML Compiler: It processes the DML statements into low level instruction (machine language), so that they can be executed.
- DDL Interpreter: It processes the DDL statements into a set of table containing meta data (data about data).
- Embedded DML Pre-compiler: It processes DML statements embedded in an application program into procedural calls.
- Query Optimizer: It executes the instruction generated by DML Compiler.

# Storage Manager

provides an interface between the data stored in the database and the queries received. It is responsible for updating, storing, deleting, and retrieving data in the database. It contains the following components –

- **Authorization Manager:** It ensures role-based access control, i.e., checks whether the particular person is privileged to perform the requested operation or not.
- **Integrity Manager:** It checks the integrity constraints when the database is modified.
- **Transaction Manager:** It controls concurrent access by performing the operations in a scheduled way that it receives the transaction. Thus, it ensures that the database remains in the consistent state before and after the execution of a transaction.
- **File Manager:** It manages the file space and the data structure used to represent information in the database.
- **Buffer Manager:** It is responsible for cache memory and the transfer of data between the secondary storage and main memory.

# Disk Storage

**Disk Storage: It contains the following components –**

- **Data Files: It stores the data.**
- **Data Dictionary: It contains the information about the structure of any database object. It is the repository of information that governs the metadata.**
- **Indices: It provides faster retrieval of data item.**

# DBA - Responsibilities

1. Definition of the schema.
2. Modification of the defined schema as and when required.
3. Definition of the storage structure
4. Creating new user-id, password etc, and also creating the access permissions that each user can or cannot enjoy. DBA is responsible to create user roles, which are collection of the permissions (like read, write etc.) granted and restricted for a class of users. S/he can also grant additional permissions to and/or revoke existing permissions from a user if need be.
5. Defining the integrity constraints for the database .
6. Creating a security mechanism to prevent unauthorized access, accidental or intentional handling of data that can cause security threat.