

The background of the slide features a low-angle, black and white photograph of a modern building's interior. The image is dominated by a series of thick, curved concrete beams that create a sense of depth and architectural complexity. The lighting is dramatic, with strong highlights on the edges of the concrete and deep shadows in the recessed areas, emphasizing the geometric forms.

# DBMS Architecture

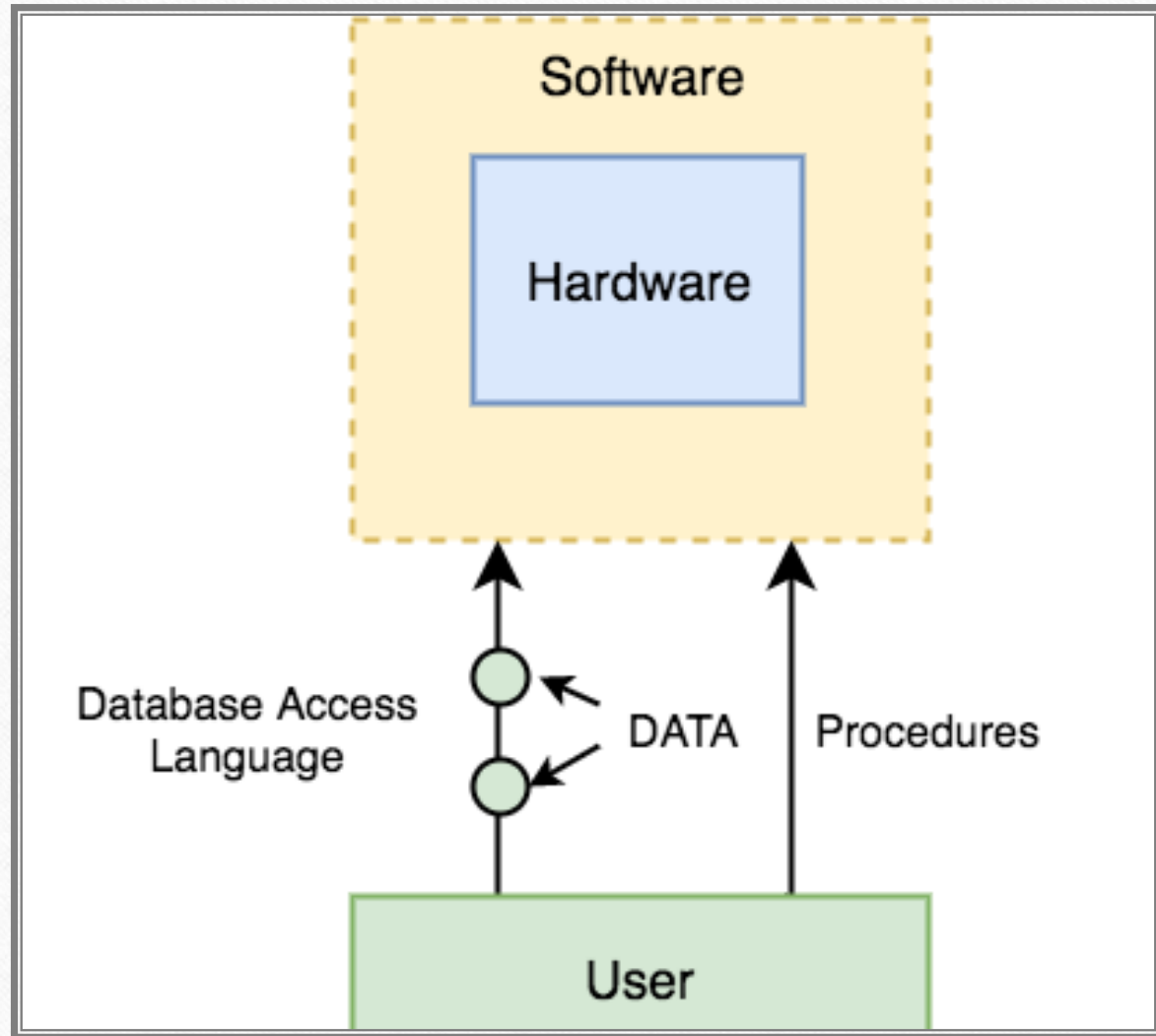
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## DBMS components

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- Five major components:

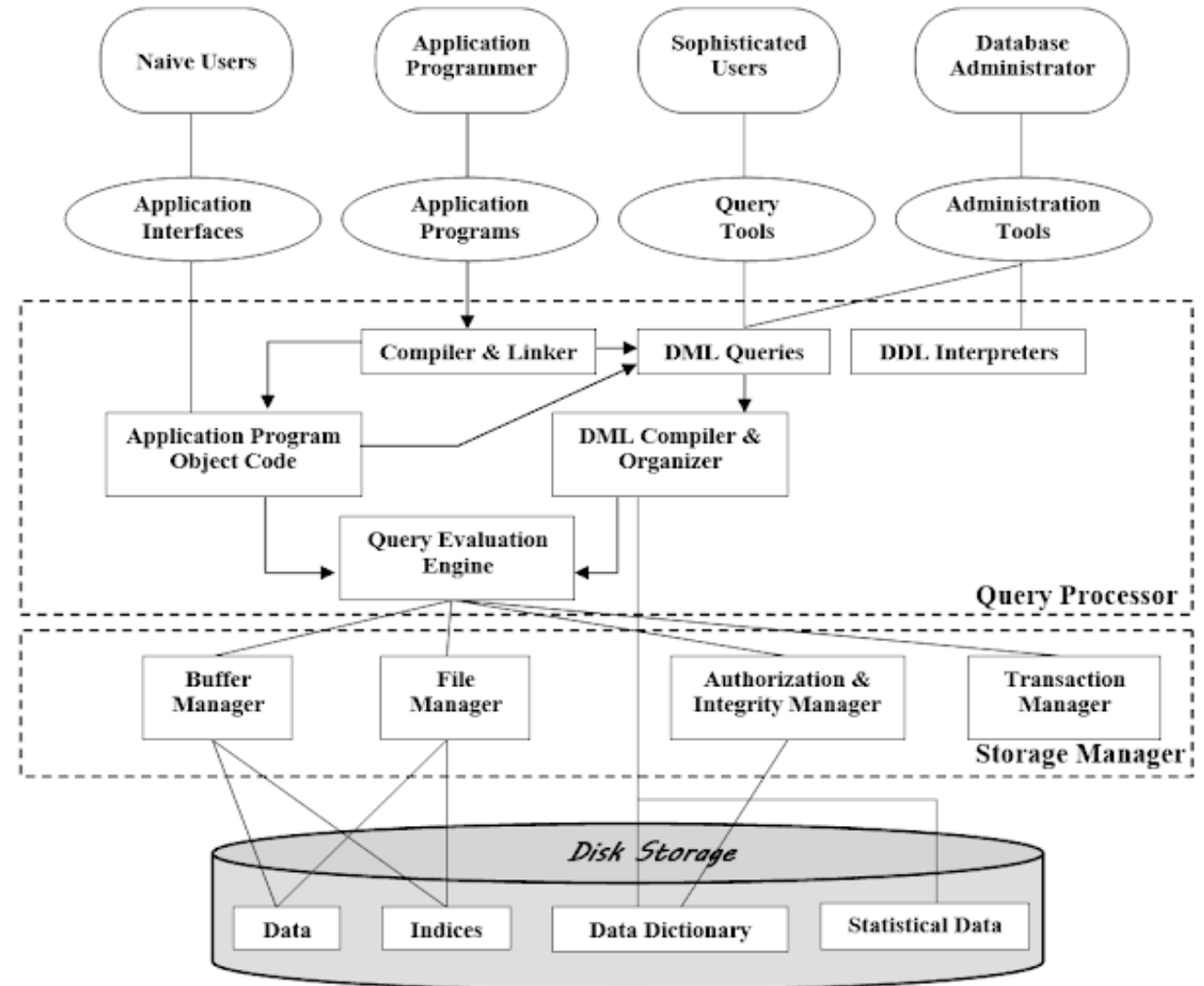
- Hardware
- Software
- Data
- Procedures
- Users



# Physical Architecture of DBMS

## Components:

- Users
- DBA
- Query processors
- Storage manager
- Disk storage



*Figure: System Architecture*



# Logical and Physical Database Components

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## Logical

- Data Definition Language (DDL)
- Data Manipulation Language (DML)
- Host Language Interface

## Physical

- Query Processor-Compiler & Optimizer
- Management
  - Transaction Manager
  - File Manager
  - Buffer Manager
  - Authorization and Integrity Manager

# Database administrator (DBA)

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**DBA** has central control of both the data and the programs that access those data.

Functions of a DBA include:

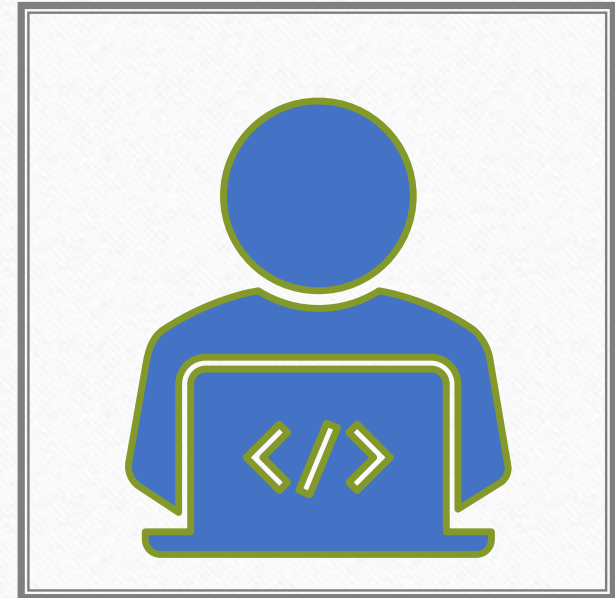
- **Schema definition** by executing a set of data definition statements in the DDL.
- **Storage structure and access-method definition**
- **Schema and physical-organization modification** to reflect the changing needs of the organization and to improve performance.
- **Granting of authorization for data**
- **Routine maintenance**



# Users

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- **Application Programmer or Software Developer:** Develop and design the parts of DBMS.
- **Sophisticated users:** Form requests in a DB query language.
- **Naïve users:** Invoke one of the permanent application programs that have been written previously.





# Query processors

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**DML Pre-compiler :** It translates DML statements in a query language into low level and it also transform user's request into an equivalent but more efficient form.

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**Embedded DML Pre-compiler :** It converts DML statements embedded in an application program to normal procedure calls in the host language.

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**DDL Interpreter :** It interprets the DDL statements and records them in a set of tables containing meta data or data dictionary.

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**Query Evaluation Engine :** It executes low-level instructions generated by the DML compiler.

# Storage Manager

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They provide the interface between the low-level data stored in the database and application programs and queries submitted to the system.

- **Authorization and Integrity Manager :** It tests for the satisfaction of integrity constraints checks the authority of users to access data.
- **Transaction Manager :** It ensures that the database remains in a consistent state despite the system failures and that concurrent transaction execution proceeds without conflicting.
- **File Manager :** It manages the allocation of space on disk storage and the data structures used to represent information stored on disk.
- **Buffer Manager :** It is responsible for fetching data from disk storage into main memory and deciding what data to cache in memory.



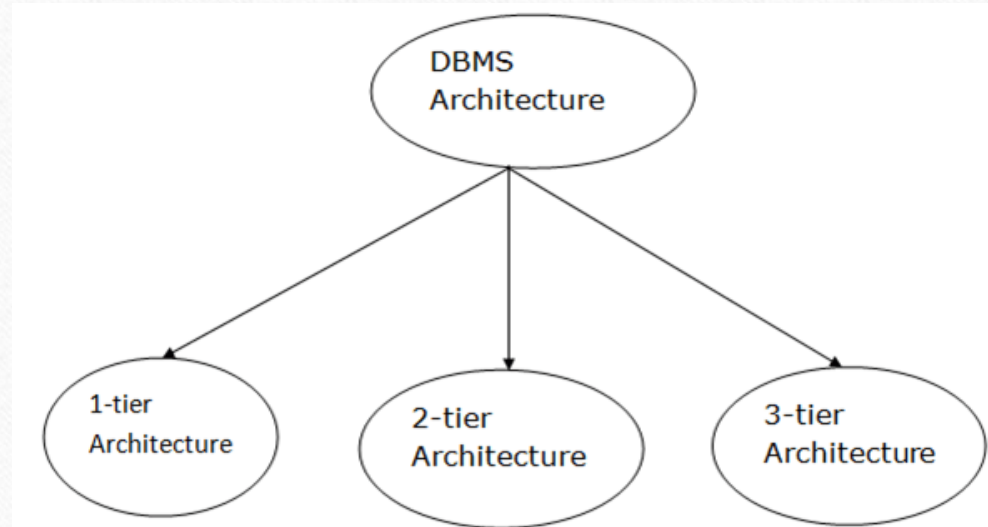
# Disk storage

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- **Data Files** : It stores the database.
- **Data Dictionary** : It stores meta data (data about data) about the structure of the database.
- **Indices** : Provide fast access to data items that hold values.
- **Statistical Data** : It stores statistical information about the data in the database. This information is used by query processor to select efficient ways to execute query.

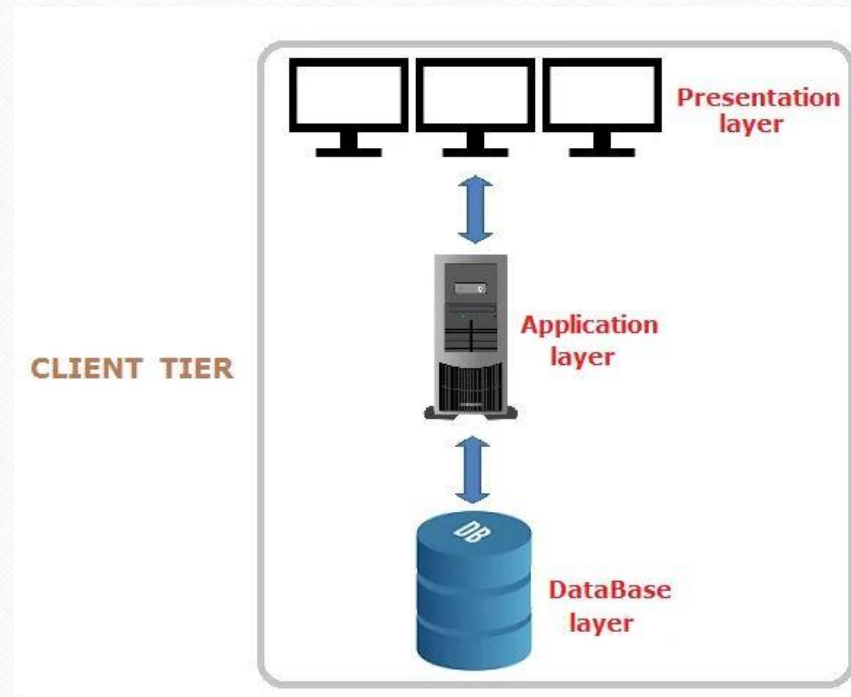
# Application Architecture

- DBMS is not always directly available for users and applications to access and store data in it.
- It can be **centralized**, **decentralized** or **hierarchical**, depending upon its architecture.
- DBMS architecture depends upon how users are connected to the database to get their request done.



# 1-Tier Architecture

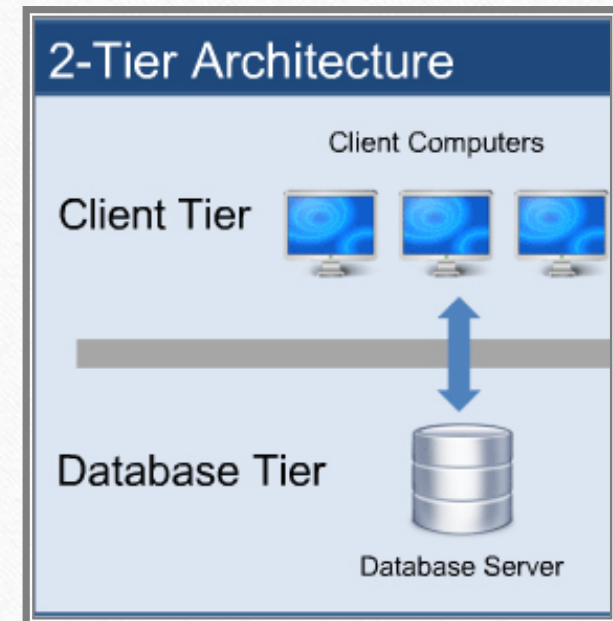
- In this architecture, the database is directly available to the user. It means the user can directly sit on the DBMS and uses it.
- Any changes done here will directly be done on the database itself. It doesn't provide a handy tool for end user
- It is used for development of the local application,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





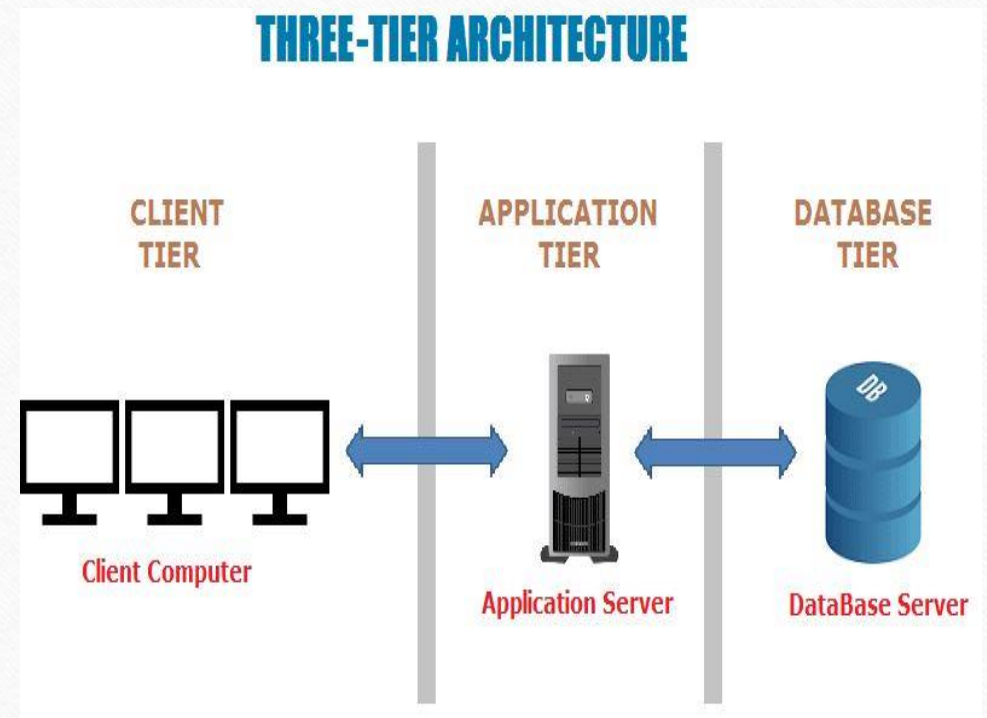
# 2-Tier Architecture

- It is same as basic client-server.
- Applications on the client end can directly communicate with the database at the server side with the help of API's like **ODBC, JDBC**.
- 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.



# 3-Tier architecture

- **Database (Data) Tier** – At this tier, the database resides along with its query processing languages. The relations with data and their constraints are defined at this level.
- **Application (Middle) Tier** –
  - It contains application server and the program
  - It presents an abstracted view of the database.
  - It acts as a mediator between the end-user and the database.
- **Client (Presentation) Tier** – Multiple views of the database can be provided by the application that reside in the application tier.



# MCQs

- In the three-tier architecture, the intermediate layer between database and client servers is classified as
  - Functional server
  - Transaction server
  - Application server
  - Disk server



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  - B. Transaction server
  - C. **Application server**
  - D. Disk server

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  - A. Multiple schema architecture
  - B. Single schema architecture
  - C. Two schema architecture
  - D. Three schema architecture

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- B. Client side
- C. Server side
- D. Host side



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# References

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- <https://www.studytonight.com/dbms/components-of-dbms.php>
- <http://dbmsnotesdownload.blogspot.com/2017/02/explain-dbms-architecture.html>
- <https://www.javatpoint.com/dbms-three-schema-architecture>
- <https://www.tutorialspoint.com/Three-Level-Architecture-of-Database>
- <http://linaxia.blogspot.com/2009/04/posting-3-dbms-architectures.html>