



**BITS Pilani**  
Pilani Campus

# Database Systems (CS F212)- Lecture 4

# Recapitulation of Lecture 3

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- Data Models

# Database Languages

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## 1. Data Definition language (DDL)

- Defining the schema and constructs of a database
- Data dictionary: File containing *metadata*
- Also used for defining constraints

## 2. Data manipulation language (DML):

- Retrieve, Insert, Delete and Update
- *Procedural* and *Non-Procedural*

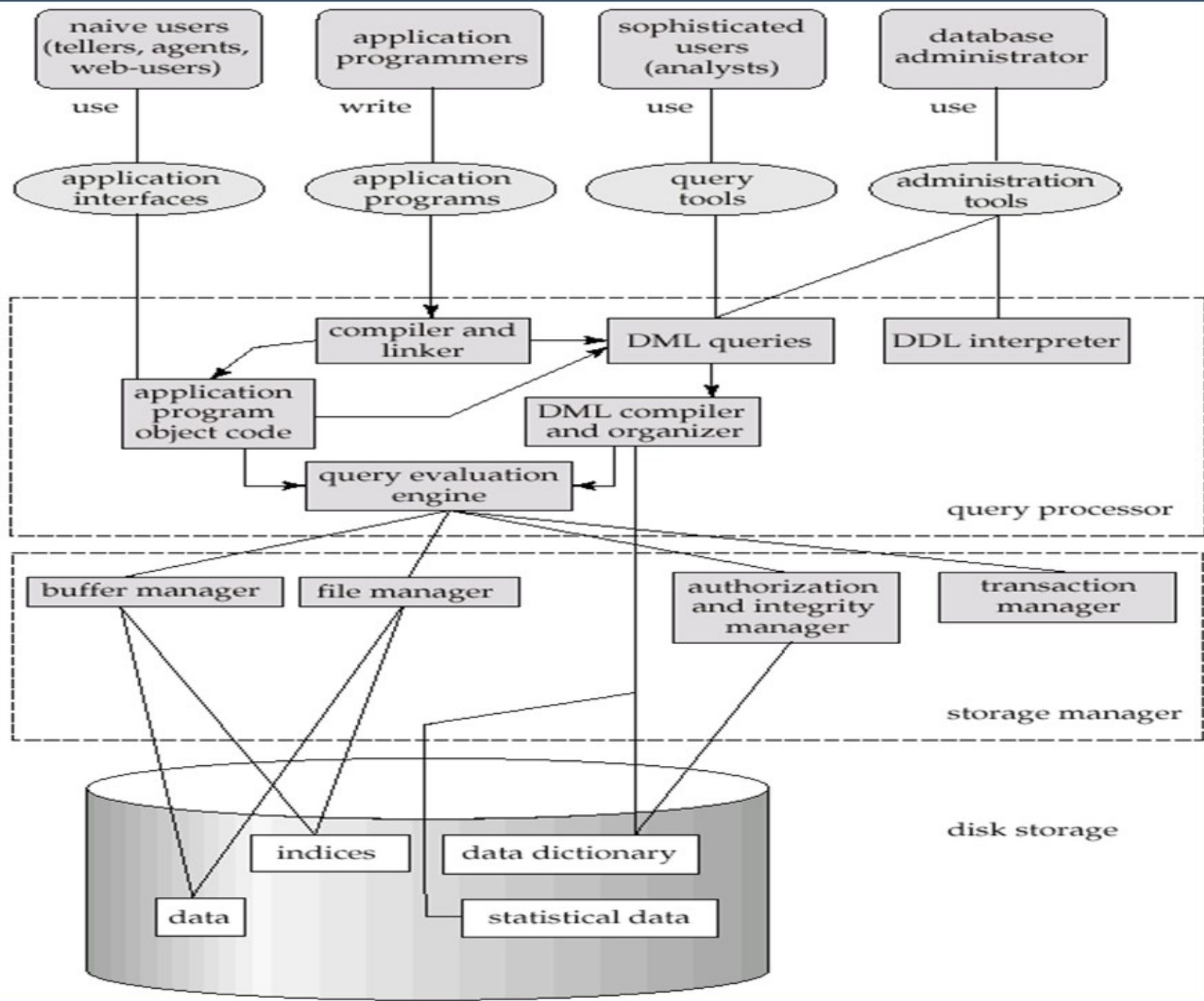
# Database Manager

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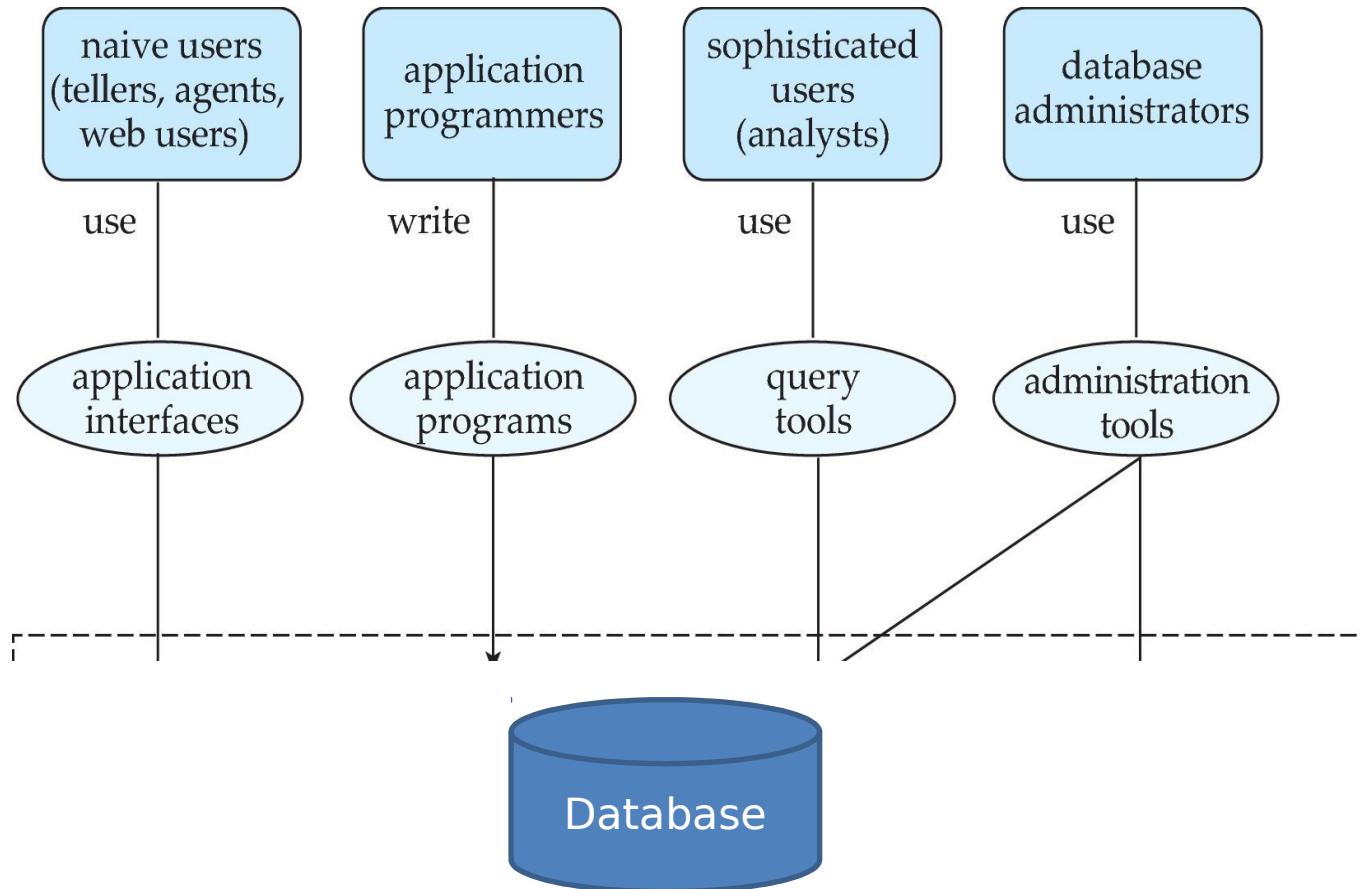
Interface between low-level data stored in the database and the application programs and the query submitted to the system

- Interaction with the file manager
- Integrity enforcement
- Security enforcement
- Backup and recovery
- Concurrency control

# Database System Architecture



# Database Users



# Database Structural Components

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## Query Processor

- Translates statements in a query language into low-level instructions that the database manager understands

## Components of Query Processor:

### 1. DML Compiler

- Translates DML statements in a query language into an evaluation plan consisting of low-level instructions that the query evaluation engine understands
- Performs query optimization

# Database Structural Components

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## 2. DDL Interpreter

- **Interprets DDL statements and records in the data dictionary**

## 3. Query Evaluation Engine

- **Executes low level instructions generated by the DML compiler**

## 4. Application program object code: **Code generated after compiling application program**

## 5. DML Queries: **Queries written in DML**

## 6. Compiler and linker: **Compiles the application program and links it with other libraries**





# Database Structural Components

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## Storage Manager/Database Manager

- Responsible for storing, retrieving, and updating data in the database

## Components are:

1. Buffer Manager: **In-out of various files between memory and disk storage**
2. File Manager: **Storage allocation of data and indices files.**
3. Authorization and Integrity Manager: **Checks integrity constraints and also checks for authorization to access data**
4. Transaction Manager: **Consistency of transactions**

# Database Structural Components

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## Disk Storage

- The actual storage space that stores data in form of data files, indices files, data dictionary and statistical files
- Data-files – Stores the actual data
- Indices file – Stores index information
- Data dictionary- Stores data about the database
- Statistical files – Stores statistical information related to a database