DATABASE SYSTEMS

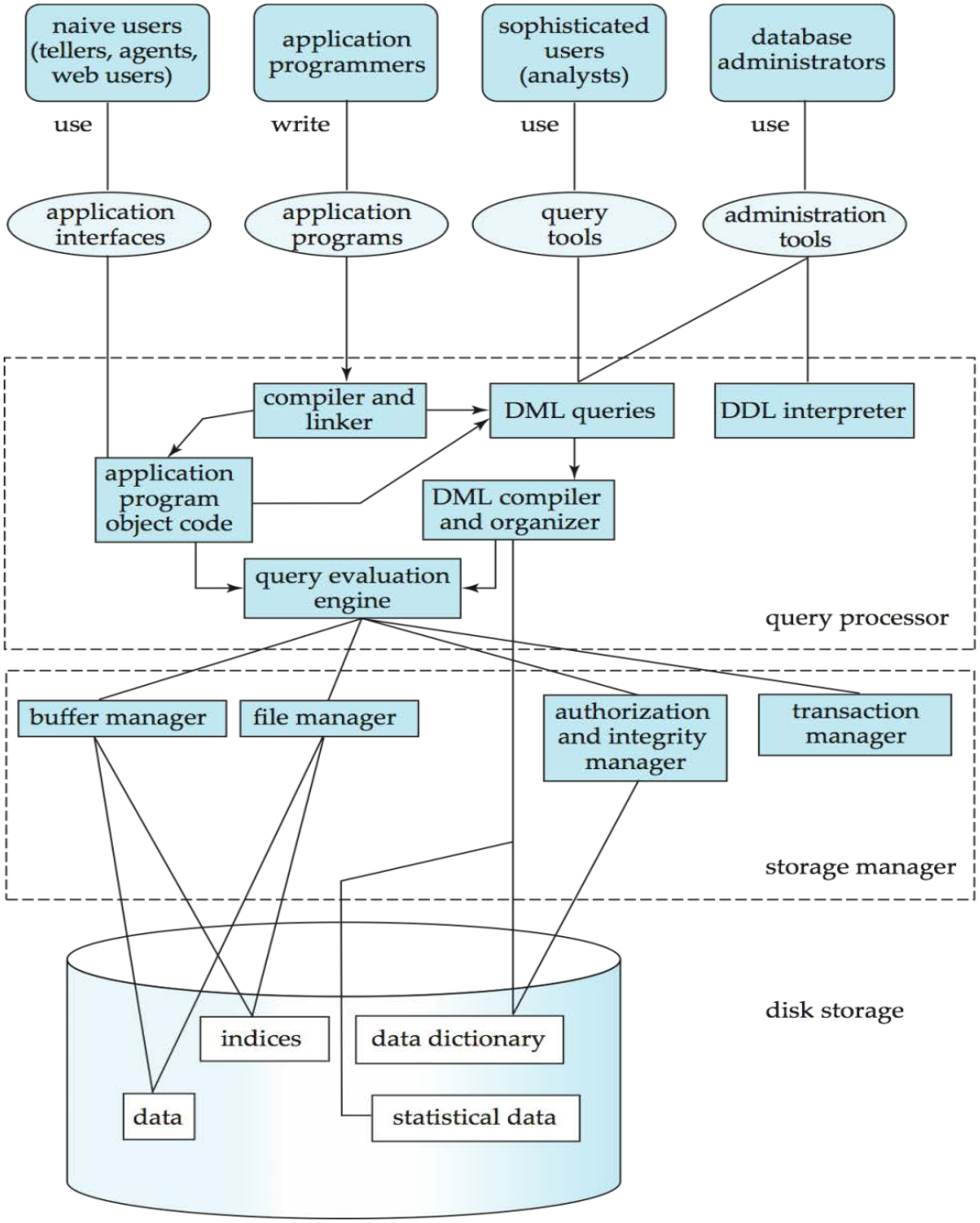
Components

Presentation by

Dr. Jenila Livingston L.M.

VIT Chennai

Components of Database Systems / Overall System Structure



1. DATABASE USERS

- **Naive Users** - **interact with the system** by invoking one of the **application programs** that have been written previously
- **Application Programmers** - computer professionals who **write application programs**
- **Sophisticated Users** – analysts - interact with the system with queries
- **Specialized Users** - write specialized database applications that do not fit into the traditional data-processing framework

DATABASE ADMINISTRATOR

Database Administrator

- Schema definition
- Storage structure and access-method definition
- Schema and physical-organization modification
- Granting of authorization for data access
- Specifying integrity constraints
- Routine maintenance
- Monitoring performance and responding to changes in requirements

2. Query Processor

- DDL interpreter
- DML compiler
- Compiler
- Query Optimization
- Query evaluation engine

Data Definition Language (DDL)

- Specification notation for defining the database schema
- DDL compiler generates a set of tables stored in a data dictionary
- Data dictionary contains ***metadata*** (data about data)
- Data storage and definition language – special type of DDL in which the storage structure and access methods used by the database system are specified

Data Manipulation Language (DML)

- Language for accessing and manipulating the data organized by the appropriate data model
- Two classes of languages
  - Procedural – user specifies what data is required and how to get those data

    Eg: PL SQL
  - Nonprocedural – user specifies what data is required without specifying how to get those data

    Eg: SQL (Structured Query Language),

    QBE (Query By Example)

Compiler & Query Evaluation Engine

- Compiler – verifies whether a program or query is written in accordance with DDL and DML rules
- Query Optimizer – Finds the most effective way to access the required data and supply it in a user requested form. Monitors the query execution and modifies a query evaluation plan if necessary.

3. Storage Manager

- A storage manager is a program module that provides the interface between the low-level data stored in the database and the application programs and queries submitted to the system.
- The storage manager is responsible for the following tasks:
  - Interaction with the file manager
  - Efficient storing, retrieving, and updating of data

Storage Manager

- Authorization and Integrity manager
- Transaction manager
- File manager
- Buffer manager

Implements **disk storage**

- Data Files
- Data Dictionary
- Indices
- Statistical data

Authorization and Integrity Manager

- This manager is responsible for **granting an access** to database or portions thereof only to authorized users and preventing the access to unauthorized users

- Integrity manager must **assure data integrity** during normal database operations as well as during the database failures

Transaction Manager

- A transaction is a collection of operations that performs a single logical function in a database application
- ACID Properties (**Atomicity, Consistency, Isolation, Durability**)
- Transaction-management component
- concurrency-control manager

File Manager

- File Manager is responsible for mapping logical database units (objects, relations, etc.) into a set of low level files.

- It is responsible for **maintenance of files and indexes on them**.

- It should be able to **create and destroy index** and collect unused storage space to eliminate an unneeded gaps on disks.

Buffer Manager

- Buffer Manager is responsible for the allocation and maintenance **buffer space** in a memory to facilitate processing database data by several concurrent applications.

- Buffer Manager decides when **to load data from a buffer to a database or discard the data** and under what conditions a new data should be put into a buffer

Thank You