UNIT 1

Lecture 3

Database Users

- Users are differentiated by the way they expect to interact with the system. They fall into the following categories :
  a) Application Programmers
  b) Sophisticated User
  c) Specialized User
  d) Naïve User

Application Programmer

- They are computer professionals interacting with the system through DML calls embedded in a program written in a host language (e.g. C, PL/1, Pascal).
  - These programs are called application programs.
  - The DML pre-compiler converts DML calls (prefaced by a special character like $, #, etc.) to normal procedure calls in a host language.
  - The host language compiler then generates the object code.
  - Some special types of programming languages combine Pascal-like control structures with control structures for the manipulation of a database.
  - These are sometimes called fourth-generation languages.
  - They often include features to help generate forms and display data.

Sophisticated Users

- They interact with the system without writing programs.
- They form requests by writing queries in a database query language.
- These are submitted to a query processor that breaks a DML statement down into instructions for the database manager module.

Specialized Users

- They are sophisticated users writing special database application programs. These may be CAD systems, knowledge-based and expert systems, complex data systems (audio/video), etc.

Naive Users

- They are unsophisticated users who interact with the system by using permanent application programs (e.g. automated teller machine).

Database Administrator

- The database administrator is a person having central control over data and programs accessing that data.
- He coordinates all the activities of the database system;
- The database administrator has a good understanding of the enterprise's information resources and needs.

Functions of a DBA

a) **Schema definition :** the creation of the original database schema. This involves writing a set of definitions in a DDL (data storage and definition language), compiled by the DDL compiler into a set of tables stored in the data dictionary.
b) **Storage structure and access method definition :** writing a set of definitions translated by the data storage and definition language compiler.
c) **Schema and physical organization modification:** writing a set of definitions used by the DDL compiler to generate modifications to appropriate internal system tables (e.g. data dictionary). This is done rarely, but sometimes the database schema or physical organization must be modified.

Functions of a DBA

d) **Granting user authority to access the database :** granting different types of authorization for data access to various users.

e) **Specifying integrity constraints :** generating integrity constraints. These are consulted by the database manager module whenever updates occur.

f) **Routine Maintenance :** It includes the following:

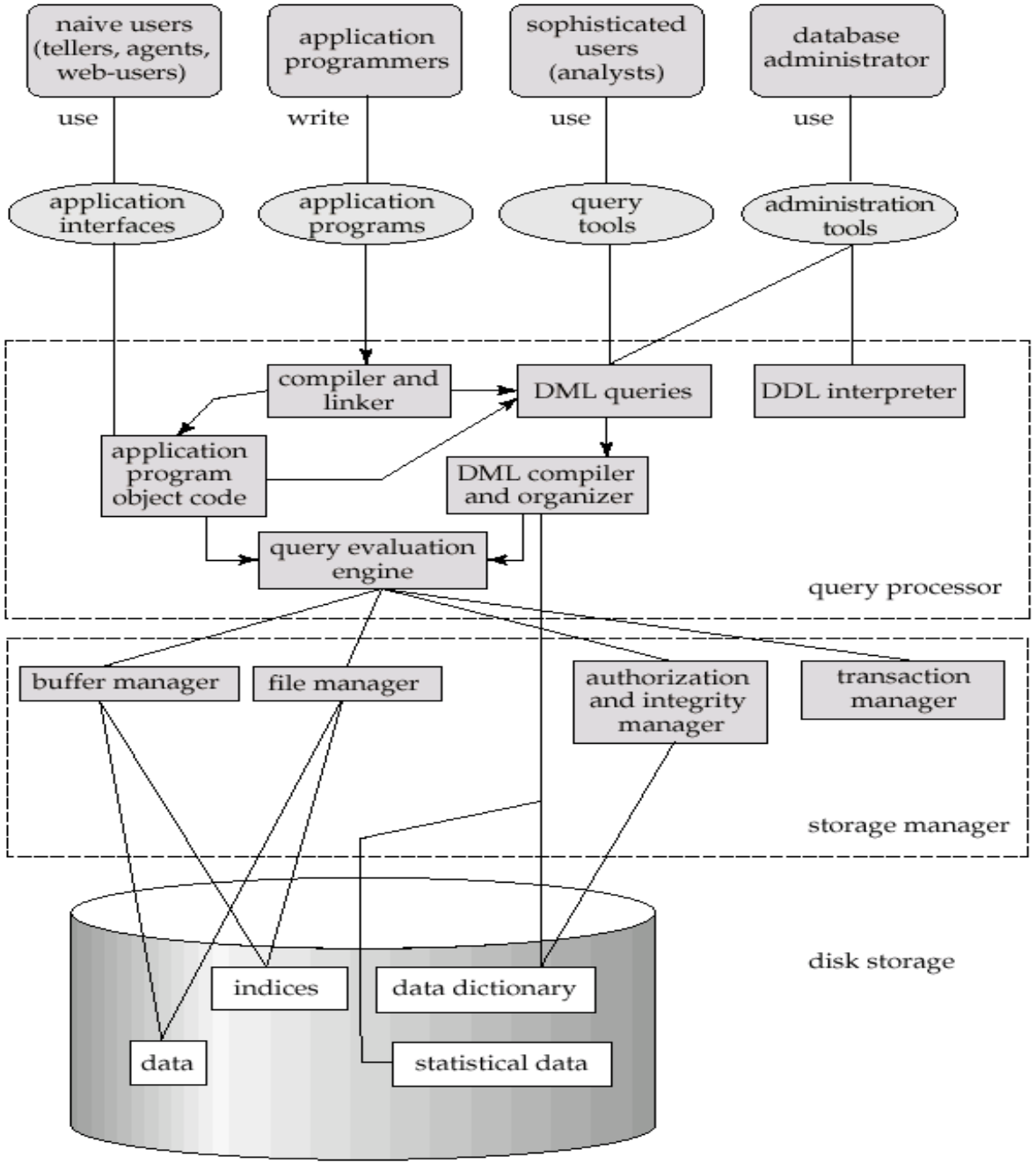
   d) Acting as liaison with users.

   e) Monitoring performance and responding to changes in requirements.

   f) Periodically backing up the database.

DBMS System Structure and its Components

- Database systems are partitioned into modules for different functions. Some functions (e.g. file systems) may be provided by the operating system.
- Broadly the functional components of a database system are :
  - **Query Processor**
  - **Storage Manger (Database Manager)**


naive users (tellers, agents, web-users)
application programmers
sophisticated users (analysts)
database administrator
use
write
use
use
application interfaces
application programs
query tools
administration tools
compiler and linker
DML queries
DDL interpreter
application program object code
DML compiler and organizer
query evaluation engine
query processor
buffer manager
file manager
authorization and integrity manager
transaction manager
storage manager
disk storage
indices
data dictionary
data
statistical data

Query Processor

- It is one of the functional components of DBMS. It translates statements in a query language into low-level instructions the database manager understands. It may also attempt to find an equivalent but more efficient form.
- It contains following components:
  - **DML compiler** - It translates DML statements in a query language into an evaluation plan consisting of low-level instructions that the query evaluation engine understands. A query can usually be translated into any of a number of alternative evaluation plans that all give the same result. The DML compiler also performs query optimization, that is, it picks the lowest cost evaluation plan from among the alternatives.
  - **DDL interpreter** – It interprets DDL statements and records definitions into data dictionary.
  - **Query evaluation engine** – It executes low-level instructions generated by DML compiler.
- They mainly deal with solving all problems related to queries and query processing. It helps database system simplify and facilitate access to data.

Storage Manager (Database Manager)

- 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 to the following tasks:
  - interaction with the file manager
  - efficient storing, retrieving and updating of data

Storage Manager (Database Manager)

- The important components include:
  a) **Authorization and integrity manager,** which tests for the satisfaction of integrity constraints and checks the authority of users to access data.
  b) **Transaction manager,** which ensures that the database remains in a consistent (correct) state despite system failures, and that concurrent transaction executions proceed without conflicts.

Storage Manager (Database Manager)

- The important components include:
  c) **File manager,** which manages the allocation of space on disk storage and the data structures used to represent information stored on disk.
  d) **Buffer manager,** which is responsible for fetching data from disk storage into main memory, and deciding what data to cache in main memory. The buffer manager is a critical part of the database system, since it enables the database to handle data sizes that are much larger than the size of main memory.

DBMS System Structure and its Components

- In addition, several data structures are required for physical system implementation:
  a) **Data files :** They store the database itself.
  b) **Data dictionary :** It stores information about the structure of the database. It is used heavily. Great emphasis should be placed on developing a good design and efficient implementation of the dictionary. In short, it stores *metadata.*
  c) **Indices :** They provide fast access to data items holding particular values.

University Questions

- What are the different types of Database Users that will access the data in the database?
- What are the duties of DBA?
- Explain the complete architecture of DBMS.
- Explain DBMS System Structure and its Components.
- What is data dictionary?
- What is meta data?

University Questions

- Which type of user (database user) would perform the following function for a billing system in a large company :
  a) Write a program to generate monthly bills.
  b) Develop schema for new kind of billing system?

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https://www.youtube.com/channel/UCRWGtE76JlTp1iim6aOTRuw?sub_confirmation=1