BITS, PILANI – K. K. BIRLA GOA CAMPUS

Database Systems and Applications

(IS F243)

by

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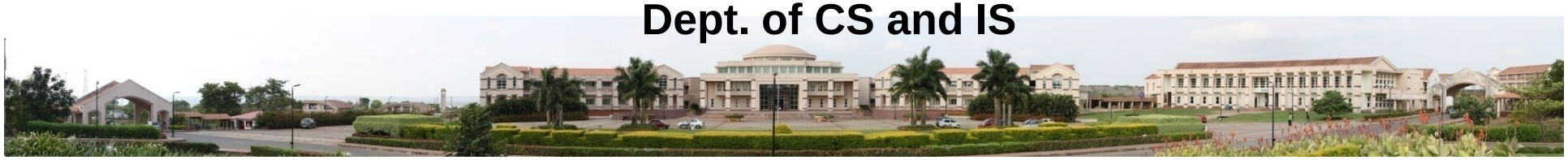


Last Class

- Database applications
- File system versus DBS
  - Data redundancy and inconsistency
  - Difficulty in accessing the data
  - Data isolation
  - Integrity constraints
  - Atomicity
  - Concurrency control
  - Security

Levels of Abstraction

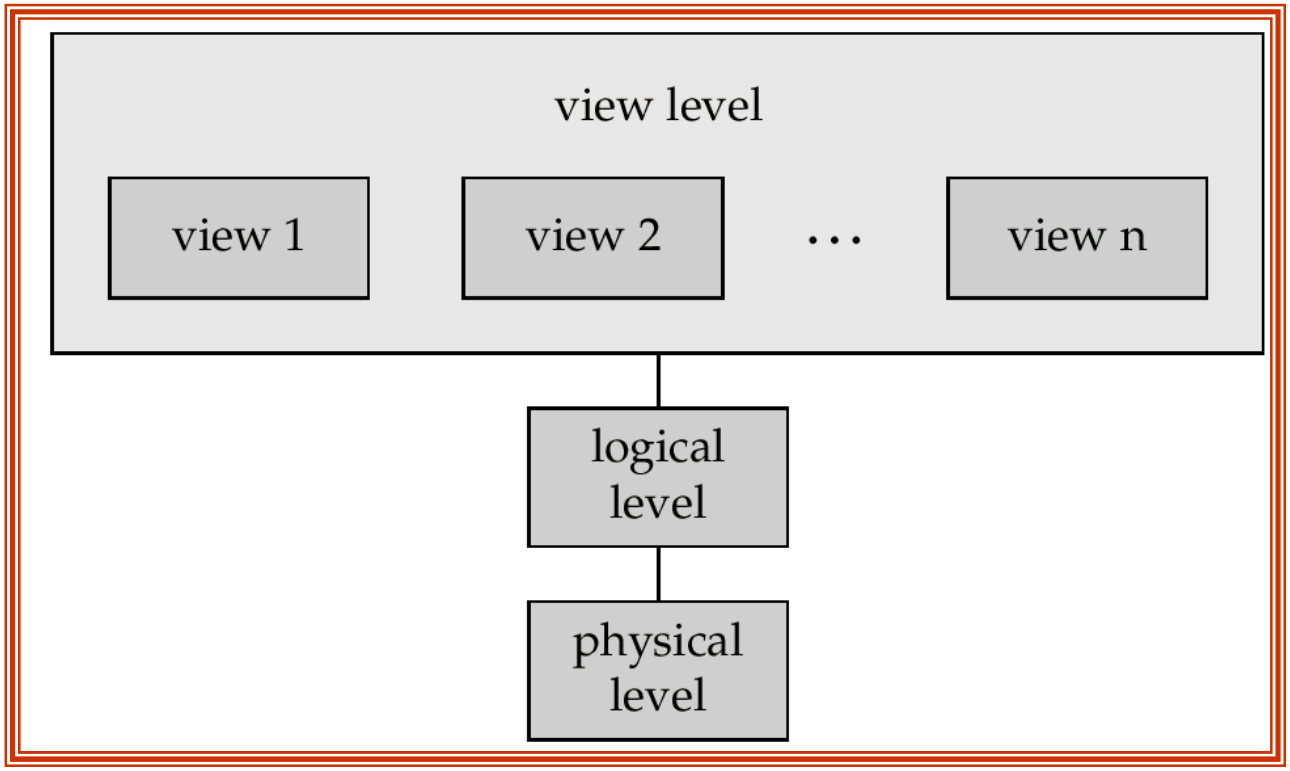
- Physical level describes how a record (e.g., customer) is stored.
- Logical level: describes data stored in database, and the relationships among the data.

```
type customer = record
                    name : string;
                    street : string;
                    city : integer;
                end;
```

- View level: application programs hide details of data types. Views can also hide information (e.g., salary) for security purposes.

View of Data

An architecture for a database system



Instances and Schemas

- Similar to types and variables in programming languages

- **Schema** – the logical structure of the database
  - e.g., the database consists of information about a set of customers and accounts and the relationship between them)
  - Analogous to type information of a variable in a program
  - **Physical schema**: database design at the physical level
  - **Logical schema (Conceptual schema)** : database design at the logical level

- **Instance** – the actual content of the database at a particular point in time
  - Analogous to the value of a variable

Data independence

- **Physical Data Independence** – the ability to modify the physical schema without changing the logical schema
  - Applications depend on the logical schema
  - In general, the interfaces between the various levels and components should be well defined so that changes in some parts do not seriously influence others.

- **Logical Data Independence** – the ability to modify the conceptual schema without changing the external schema or application program.

Database Users

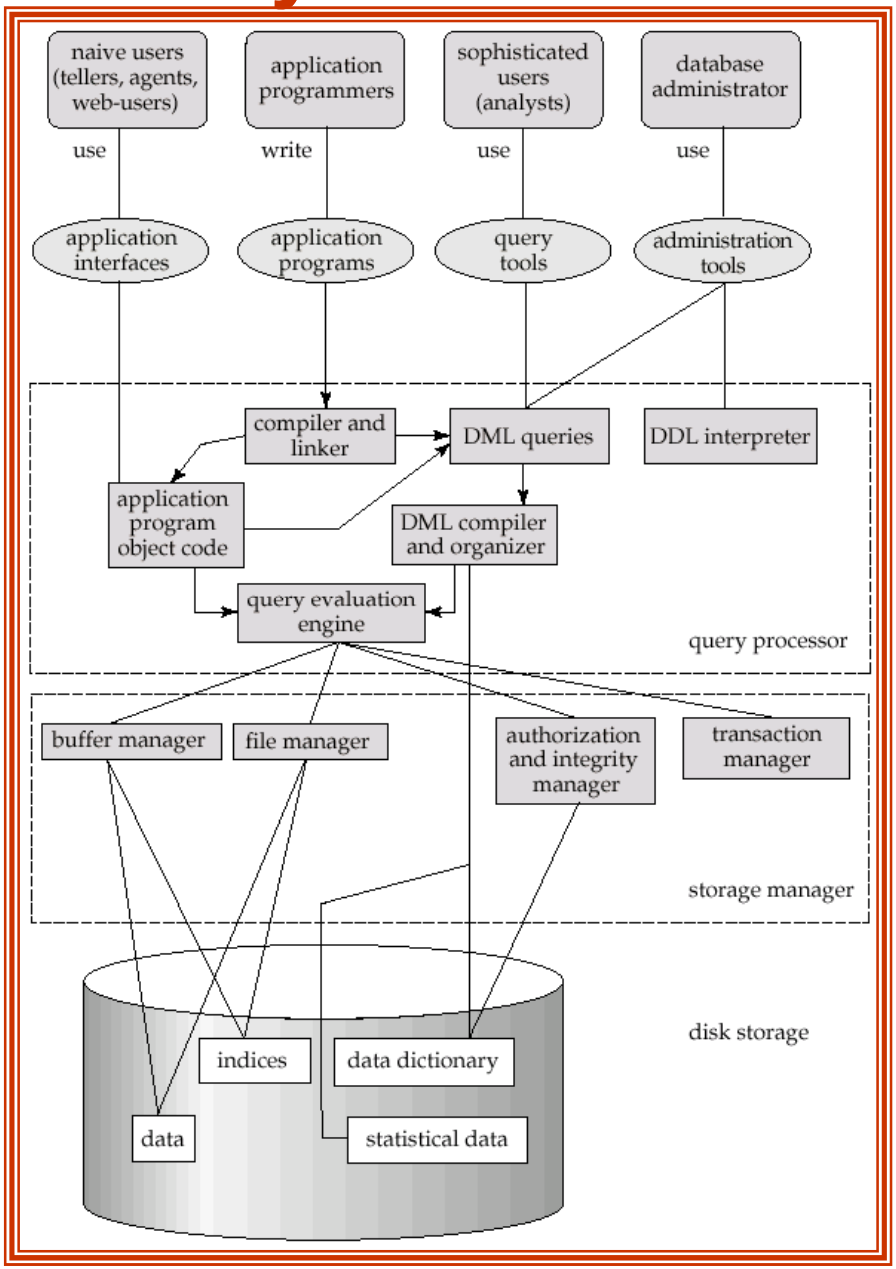
- Users are differentiated by the way they expect to interact with the system
- Application programmers – interact with system through DML calls
- Sophisticated users – form requests in a database query language
- Specialized users – write specialized database applications that do not fit into the traditional data processing framework
- Naïve users – invoke one of the permanent application programs that have been written previously
  - E.g. people accessing database over the web, bank tellers, clerical staff

Database Administrator

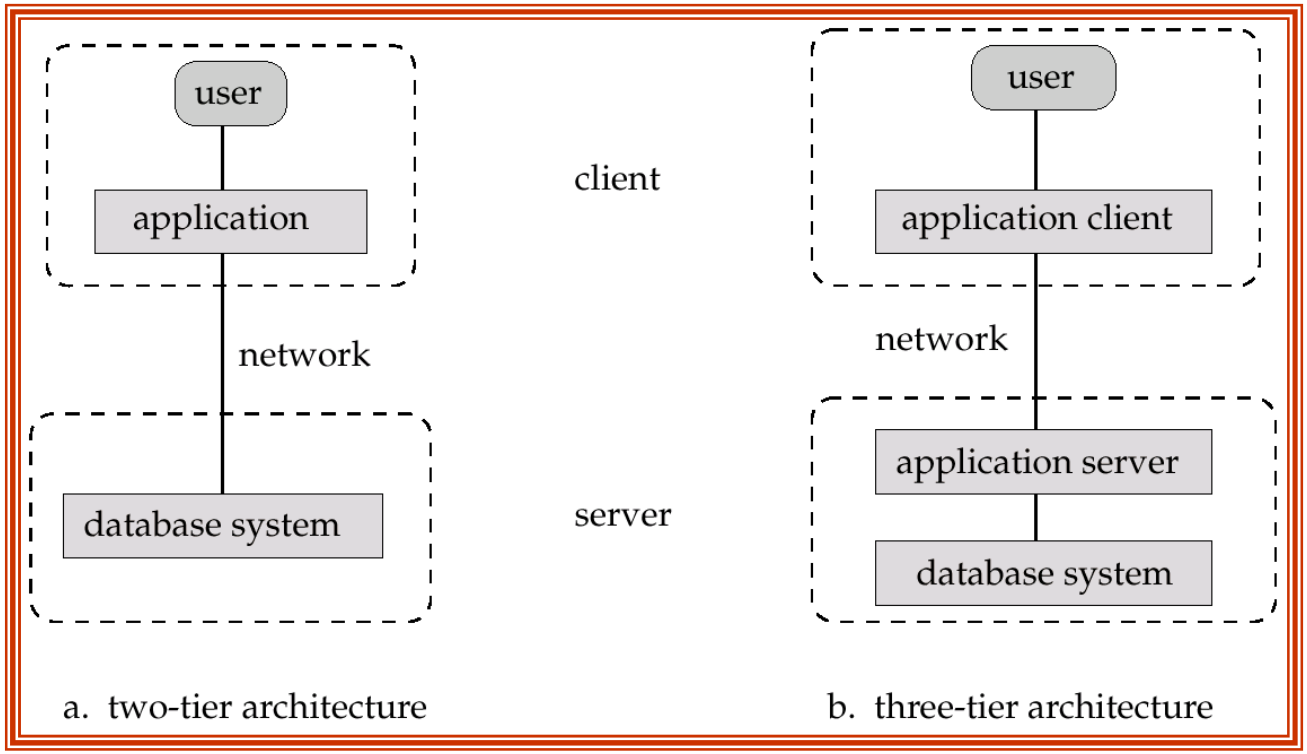
- Coordinates all the activities of the database system; the database administrator has a good understanding of the enterprise's information resources and needs.

- Database administrator's duties include:
  - Schema definition
  - Storage structure and access method definition
  - Schema and physical organization modification
  - Granting user authority to access the database
  - Specifying integrity constraints
  - Monitoring performance and responding to changes in requirements
  - Periodic backup
  - Recovery of database in case of crash

Overall System Structure



Application Architectures



- **Two-tier architecture**: E.g. client programs using ODBC/JDBC to communicate with a database
- **Three-tier architecture**: E.g. web-based applications, and applications built using “middleware”