Db & Appln Arch, Db users and admins

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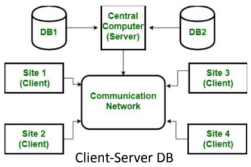
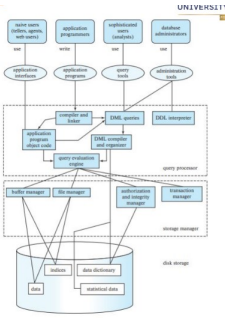
- **Centralized databases (Centralized architecture)**
  - Suitable for shared-memory server architectures with multiple CPUs accessing a common shared memory.
  - Limited scalability for larger data volumes and higher processing speeds.
  - One to a few cores, shared memory

- **Client-server**
  - One server machine executes work on behalf of multiple client machines.



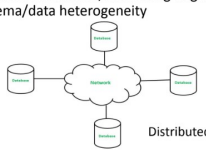
Client-Server DB



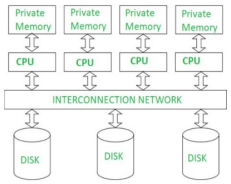
Centralized/Shared Memory DB

- **Parallel databases**
  - Designed to run on a cluster of multiple machines,
  - enables better scalability and higher processing capabilities.
  - Many cores shared memory
  - Shared disk

- **Distributed databases**
  - Allow data storage and query processing across geographically separated machines, facilitating large-scale data management.
  - Schema/data heterogeneity



Distributed DB



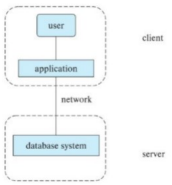
Parallel DB

Application Architectures

- We now consider the architecture of applications that use databases as their backend. Database applications can be partitioned into two or three parts.

Two Tier Architecture

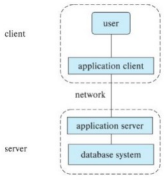
- Earlier-generation database applications used a two-tier architecture
- application resides at the client machine and invokes database system functionality at the server machine through query language statements.



Two Tier Architecture

Three Tier Architecture

- Modern database applications use a three-tier architecture
- Client machine acts as merely a front end and does not contain any direct database calls; web browsers and mobile applications are the most commonly used application clients today.
- The front end communicates with an application server.
- The application server, in turn, communicates with a database system to access data.
- The business logic of the application, which says what actions to carry out under what conditions, is embedded in the application server, instead of being distributed across multiple clients.
- Three-tier applications provide better security as well as better performance than two-tier applications.



Three Tier Architecture

Database Users

People who work with a database can be categorized as:

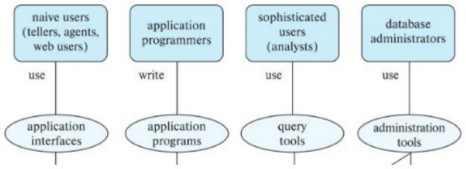
1. Database Users
2. Database Administrators.

Database Users

There are four different types of database-system users, differentiated by the way they

expect to interact with the system. Different types of user interfaces have been designed for different types of users.

1. Naïve Users
2. Application Programmers
3. Sophisticated Users
4. Database Administrators



Database Users

Naïve users :

- They are inexperienced users who interact with a system using predefined interfaces like web or mobile applications, often through filling out forms.
- For instance, a student registering for a class through a web application where they enter their desired information into a form.

Application programmers :

- They are skilled computer professionals who write application programs.
- They have various tools at their disposal to develop user interfaces.
- For example, a programmer creating a new mobile app with a custom interface for users to interact with.

Sophisticated users :

- These users interact with the system without writing code.
- They can use database query languages or data analysis software to form their requests and explore data in the database.
- An example would be an analyst querying a database to retrieve specific information for a report without needing to write any code.

Database Administrator

One of the main reasons for using DBMSs is to have central control of both the data and the programs that access those data.

A person who has such central control over the system is called a database administrator (DBA)

Functions of a Database Administrator (DBA):

1. **Schema definition:** DBA creates the original database schema using data definition statements (DDL).
2. **Storage structure and access-method definition:** DBA specifies parameters for data physical organization and index creation.
3. **Schema and physical-organization modification:** DBA makes changes to reflect organization's needs or enhance performance.
4. **Granting authorization for data access:** DBA regulates user access by granting different types of authorization.
5. **Routine maintenance:** DBA performs periodic backups, ensures disk space availability, and monitors database performance.