**Unit 5**

* **Introduction to Current Trends**

**# CENTRALIZED SERVER ARCHITECTURES**

These are those systems which run on a single computer system and do not interact with other computer systems. Thus, such [database](https://www.computernetworksite.in/2021/04/data-in-hindi-dbms-in-hindi.html?m=1) systems range from single user [database](https://www.computernetworksite.in/2021/04/data-in-hindi-dbms-in-hindi.html?m=1) systems running on  [personal computers to high performance](https://www.computernetworksite.in/2019/07/personal-computer.html?m=1)[database](https://www.computernetworksite.in/2021/04/data-in-hindi-dbms-in-hindi.html?m=1)  systems  running on High End Server Systems.  In a modern General Purpose Computer System, it is made up of one to several CPUs and many device controllers and these devices are connected to a common bus that provides access to shared memory. To speed up access to [data](https://www.computernetworksite.in/2021/04/data-in-hindi-dbms-in-hindi.html?m=1) , CPUs have cache memories that store local copies of sections of memory. Each device controller is in charge of a specific type of device, for example a disk drive, audio and video device, or video display. CPUs and device controllers can execute simultaneously, competing for memory access.

In this, competition for cache memory and memory access is reduced. Since it reduces the number and number of times the CPU needs to access shared memory, there are two ways of using a computer: single user systems and multiuser systems.

On the other hand, an ideal multiuser system has more disks and more memory and can have more than one CPU and has multiuser [operating systems](https://www.computernetworksite.in/2019/05/operating-system.html?m=1/) . [Database](https://www.computernetworksite.in/2021/04/data-in-hindi-dbms-in-hindi.html?m=1) systems designed for single-user use   generally   do not have many of the features provided by multiuser [databases](https://www.computernetworksite.in/2021/04/data-in-hindi-dbms-in-hindi.html?m=1) . In particular, they do not support concurrency control because it is not required when only one user is generating updates and in such systems, provisions for crash recovery are either nonexistent or very rudimentary.

**EXAMPLE**

import sqlite3

#connect to the database

conn = sqlite3.connect('example.db')

#create a cursor object

cursor = conn.cursor()

#create a table

cursor.execute('''CREATE TABLE employees (id INT PRIMARY KEY NOT NULL, name TEXT NOT NULL, salary REAL);''')

#commit the changes

conn.commit()

#close the connection

conn.close()

**# CLIENT SERVER ARCHITECTURE -**

* Client server architecture is a computing model in which a server hosts services and provides these services to clients.
* In other words, “Client server architecture is a model of computer network in which the client requests for services hosted by the server and the server accepts this request and provides service to the client.”
* This architecture is also known as “ networked computing model ” or “ client server network ”.
* In this architecture when the client sends a request for service to the server through the Internet, the server accepts that request and sends the service to the client.
* In this architecture the client is often located in a workstation and personal computer while the server is located on the network.
* In this, many clients can simultaneously access data from a server, and can also perform other tasks.
* Where the number of computers is large, client server architecture is used so that the work can be handled easily.
* For example, if we connect the printer to the server, we can print out files from any workstation.
* Examples of client server architecture are:- Email and world wide web (WWW).

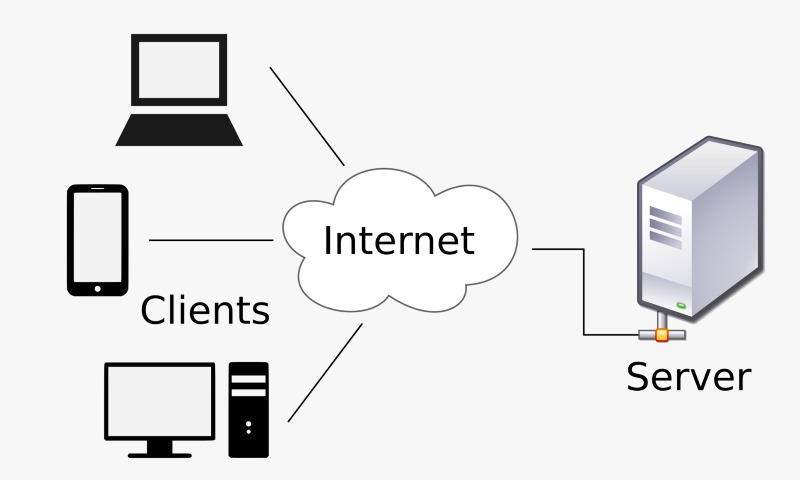


Diagram of client server architecture

* **Client Server Architecture components**

**1- Workstations**

Workstations are also called client computers. It manages files and databases.

Different types of operating systems are used in workstations, out of which Windows operating system is mostly used.

Workstations are used by engineers, architects and graphic designers.

**2- Server**

Server is also called fast processing device. It is a computer that stores services and data.

It contains a type of memory that manages the requests coming from the workstation. The server can handle many clients at a time.

**3- Networking devices**

A networking device is a device that connects workstations and servers. This device is used to perform different tasks throughout the network. There are many types of networking devices like [hub, switch, router and modem](https://ehindistudy.com/2017/11/01/networking-device-router-hindi/) etc.

* **Types of Client Server Architecture**

There are four types of it which are given below:-

1. One Tier Architecture
2. Two Tier Architecture Unit 1
3. Three Tier Architecture
4. N- Tier Architecture
5. **N-Tier Architecture**

N-tier architecture is also called multi-tier architecture. This is a shorter form of all three architectures which includes tasks like presentation, application processing, and management.

* **Advantages of Client Server Architecture**

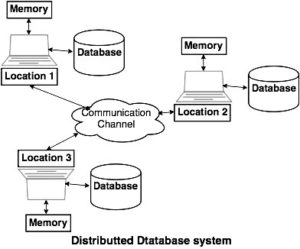
1. In client server architecture, every client does not need to login to the processor.
2. In this the server has better control and resources.
3. In this, processes and activities can be controlled with the help of a central network.
4. In this architecture, the user can access the files present in the central storage at any time.
5. It provides a better user interface for arranging files.
6. Sharing files is easy in this architecture.
7. Security is very good in this.
   * **Disadvantages of Client Server architecture**
8. In this, if the primary server goes down, the entire architecture is affected.
9. This architecture contains tools like hardware and software which are quite expensive. This architecture costs more to operate.
10. It requires a special type of operating system for networking.
11. Different types of technologies are required to maintain the network.
12. It is difficult to handle traffic.

* **Difference between client server architecture and peer-to-peer network**

|  |  |
| --- | --- |
| **CLIENT SERVER ARCHITECTURE** | **PEER-TO-PEER NETWORK** |
| It has centralized data management. | It has its own data and applications. |
| Its main function is to share information. | Its main function is to maintain the connection. |
| It is used for small and large networks. | It is used for small networks. |
| It is more stable. | These are less stable. |
| It is expensive compared to peer-to-peer networks. | It is cheaper than client server architecture. |

**# DISTRIBUTED DATABASE**

1. Distributed database is a type of database which is not limited to a single system, it is spread across many sites or [computers in the network.](https://ehindistudy.com/2017/03/02/types-computer-hindi/)
2. In other words, “distributed database is a collection of many interconnected databases which are spread over different locations and they communicate with each other through computer networks.”
3. In this, parts of the database are stored in many physical locations and its processing is distributed among many database nodes.
4. This database is controlled by distributed database management system (DDBMS).
5. The picture given below is a distributed database system in which communication channels have been used to communicate between different locations. And each system has its own database and memory.



* **Features of distributed database**

1. The databases in the group are logically interrelated to each other.
2. In this, data is physically stored in many computers or sites.
3. It is not a loosely connected file system.
4. In this, all the sites remain connected through a communication network.
5. The data of each site is controlled by DBMS.
6. The DBMS of each site has its own right to handle local applications independently.
7. Every DBMS of a distributed system has at least one global application.

* **Types of distributed database –**

**Homogeneous distributed database system**

1. In homogeneous, all sites use the same DBMS and [operating system](https://ehindistudy.com/2018/09/19/operating-system-hindi-2/) . In this the sites use similar type of software.
2. In this, each site keeps information about all other sites and fulfills the user's request by cooperating with each other.
3. In this, data is accessed and modified simultaneously.
4. It is of two types:-  
   1:- autonomous and 2:- non-autonomous
   * 1. **Heterogeneous distributed database system**
5. In heterogeneous, each site has a different DBMS, data models and operating system.
6. In this, each site has different schemas and software.
7. There are many types of DBMS in this system such as relational, network, hierarchical or object-oriented.
8. Query processing is very difficult in this because it has different schemas.
9. Transaction processing is very difficult in this because it involves different software.
10. In this, one site does not have information about other sites. Due to which they are able to cooperate very little with each other.
11. It is of two types:- federated and un-federated.

* **Advantage of distributed database**

1. 1:- It increases reliability, availability and performance.
2. 2:- In this, data can be accessed quickly.
3. 3:- Data processing is faster in this.
4. 4:- It reduces operating costs.
5. 5:- Its interface is user-friendly.
6. 6:- Even if one site is modified or updated, it has no effect on other sites.
7. 7:- There is transparency in it.
8. 8:- It can be updated easily.

* **Disadvantage of distributed database**

1. 1:- Its complexity is very high because extra work has to be done by DBA.
2. 2:- It is very difficult to maintain integrity in this.
3. 3:- Increasing complexity means that its cost will also increase,
4. 4:- There is not much security in this.
5. 5:- It requires additional software.

* **Goals of distributed database system**

**1:- Reliability-** In distributed database system, if ever one system fails or stops working, the other system completes its task.

**2:- Availability-** In this, if one server stops then the other server fulfills the request of the client.

**3:- Performance –** In this, databases are in different locations due to which database is available for each location which is easy to maintain and their performance improves.

**# OBJECT-ORIENTED DATABASE MODEL** (Definition in 1st unit)

Relational Database Technology has failed to handle the requirements of complex information systems. The major problem with Relational Database Systems is that they force application developers to model information in tables where relationships between entities are defined by values.

Object classes used by programming languages ​​are those classes used by object-oriented database management systems (OODBMS). Since models are consistent; Therefore, there is no need to transform the object model of the program into a unique object for the database manager.

A Data Model is a collection of mathematically well-defined concepts that help you understand and express the static and dynamic properties of a data intensive application.

A [data](https://c3school.in/what-is-data-in-hindi/) model is made up of the following -

1. **Static Properties ;** Like-Objects, Attributes and Relationships.
2. Integrity rules applied to objects  and operations .
3. **Dynamic Properties** ; Such as operations, or rules that define the new database state based on applied state changes.

Object Oriented Databases can model these three components in the database itself. Databases before Object-Oriented Databases directly supported Static Properties and Integrity Rules.

But we relied on Applications to define the dynamic properties of the model.

Object Oriented Databases provide a Unifying Paradigm that allows you to integrate three aspects of data modeling and apply them consistently to all users of the database. Object-Oriented Model represents an entity as a class. A class represents both the attributes and behavior of a particular entity.

Object-oriented databases manage objects, which are abstract data types. Object-Oriented Database Management System (OODBMS) is suitable for managing multimedia applications and data containing such complex relationships.

**# DATA MINING I**

Data mining is also called data or knowledge discovery. Data mining is the process of searching for small data from a large set of data. Traditional statistics, [artificial intelligence](https://ehindistudy.com/2022/03/26/artificial-intelligence-hindi/) and [computer graphics](https://ehindistudy.com/2017/11/22/computer-graphics-hindi/) are used in this process.

In other words, “Data mining is a useful technique using which companies extract important information from large sets of data.”

In data mining, data mining tools are used to analyze data. These tools are very powerful.

Data mining has the following goals:-

**1:- Explanatory –** In this the observed incident or situation is explained.

**2:- Confirmatory –** In this, hypotheses free from possibilities are confirmed.

**3:- Analyzatry –** In this, new data is analyzed so that positive feedback can be given.

By using data mining, hidden patterns and useful data are discovered and then decision making is done on the basis of these patterns and data and by using the process of data mining, organizations solve the problems arising in business.

* **Advantage of Data Mining**

Its benefits are as follows:-

1. Through the technique of data mining, the company obtains information based on knowledge.
2. Through this, organizations improve their production and operation.
3. Data mining is cost effective compared to other statistical data applications, that is, it saves cost.
4. Through this, decisions can be taken easily.
5. It is very easy to implement it in new systems.
6. Its speed is very fast due to which big data can be analyzed in less time.
7. It finds profitable customers easily, which makes it easier to sell the product and also improves the relationship with the customer.

* **Disadvantage of Data Mining**

Its disadvantages are given below:-

1. Its major disadvantage is that there is no security and privacy of data in it. In this, all the data is collected such as social media messages, photos etc. This destroys people's privacy.
2. The data collected through data mining is mostly incomplete.
3. In this, irrelevant (useless) data is also collected.

* **Characteristics of Data Mining**

Its features are as follows:-

1. It makes future predictions. This means that it predicts future events.
2. It focuses on large datasets and databases.
3. In this, the prediction of patterns is automatic and it is based on behavior analysis.
4. It creates useful information.

* **Types of Data Mining**

There are two types of data mining analysis, which are as follows:-

1. Predictive Data Mining Analysis
2. Descriptive Data Mining Analysis
   * + 1. **Predictive Data Mining Analysis**

It predicts future events. It is of four types.

* [Classification Analysis](https://ehindistudy.com/2016/06/05/data-mining-classification-in-hindi/)
* Regression Analysis
* Time Serious Analysis
* Prediction Analysis
  + - 1. **Descriptive Data Mining Analysis**

It is used to convert data into useful information. There are also four types of this:-

* [Clustering Analysis](https://ehindistudy.com/2016/04/18/cluster-analysis-in-hindi/)
* Summarization Analysis
* [Association Rules Analysis](https://ehindistudy.com/2017/05/16/association-sequential-patterns-hindi-data-mining/)
* Sequence Discovery Analysis
* **Applications of Data Mining**

It is used in many places. Its applications are as follows:-

1. **In the field of healthcare   –** it is used to find out about the patient's disease. It gives information about such hospitals where the patient can be treated at less money and in less time.
2. **In the field of marketing –** customer behavior is detected through data mining. In this it is seen that if the customer has purchased something similar then what other item will he buy along with it.
3. **In the field of education –** student's result is predicted using data mining. It also tells how to teach a student and what to teach.
4. **In detecting fraud –** A lot of frauds are happening nowadays. Due to which lakhs of people's money gets wasted. Data mining helps in avoiding this.

**# DATA VISUALIZATION**

You must be aware that when we see a picture etc., we can understand it very fast and learn about it. And then we remember everything about the picture for a long time. This is the reason why when we see any graph, picture etc., it is very easy for us to understand it.

We will tell you that data visualization is done on a very large scale. As difficult and strange as the word data visualization may sound, it is used more in our daily lives.

Data visualization is used every time and everywhere, such as, business main data visualization is used for reporting and marketing. Nonprofitable organizations use data visualization to tell stories and more. Reporters use visualization to show news and events to others. Data visualization makes any work more professional or easier to understand.

* **Principles of data visualization**
* The three main principles of data visualization are-

1. **Visualization** - Displays data in visual form.
2. **Insights -** Arranging data in the right way so that there is no wrong output of data for the user.
3. **Sharing -** The data can be easily understood by the user and the user can easily share that data with any other person.

* **Types of data visualization**

There are many different types of data visualization because people have come up with different ways of representing data as per their convenience. So that they can become much easier to understand, data visualization is divided into the following categories.

Infographics

Chart

Diagram

Map

1.

**2. Chart -** A data chart is a type of [diagram](https://en.wikipedia.org/wiki/Diagram) or [graph](https://en.wikipedia.org/wiki/Graph_of_a_function), that organizes and represents a set of numerical or qualitative data. [Maps](https://en.wikipedia.org/wiki/Map) that are adorned with extra information ([map surround](https://en.wikipedia.org/wiki/Map_surround)) for a specific purpose are often known as charts, such as a [nautical chart](https://en.wikipedia.org/wiki/Nautical_chart) or [aeronautical chart](https://en.wikipedia.org/wiki/Aeronautical_chart), typically spread over several [map sheets](https://en.wikipedia.org/wiki/Map_sheet). Line bars, dots, slices and items are used to represent data within a chart.

By looking at all these charts, you must have understood one thing that any different data is shown by different charts. Some genral types pf chart are –