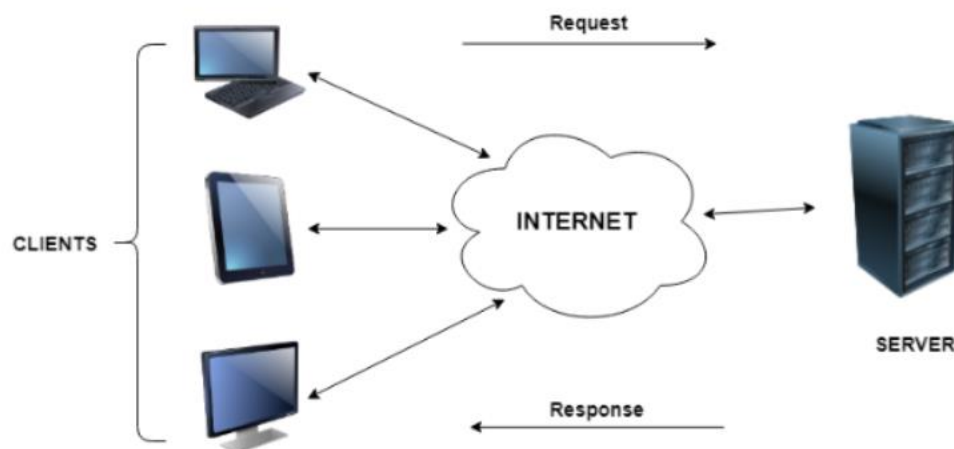


Unit-I

Client-Server Technology and its uses, historical development, client-server technology and heterogeneous computing, Distributed Computer, Computing platform, Microprocessor integration and client server computing, implementations and scalability

1.1 Client Server Computing

- In client server computing, the clients request a resource and the server provides that resource.
- A server may serve multiple clients at the same time while a client is in contact with only one server.
- Both the client and server usually communicate via a computer network but sometimes they may reside in the same system.



1.1.1 Characteristics of Client Server Computing

- The client server computing works with a system of request and response. The client sends a request to the server and the server responds with the desired information.
- The client and server should follow a common communication protocol so they can easily interact with each other. All the communication protocols are available at the application layer.
- Services:
The client-server is primarily a relationship between processes running on separate m/c. The server process is provider of services and client is consumer of services.
- Shared Resources:
A server can services many clients at a same time and regulate their access to shared resources.
- Mix-Match:
Client-server software is independent of hardware and operating system

- Scalability
 - Client –server can be scaled horizontally or vertically.
 - Horizontal Scaling means adding or removing client workstations with only a slight work performance impact.
 - Vertical Scaling means either migrating to a larger and faster server M/C or distributing the processing load across multiple server.
- Integrity:

Server code and data is centrally managed which guarding shard data integrity.

1.1.2 Advantages of Client Server Computing

- All the required data is concentrated in a single place i.e. the server. So it is easy to protect the data and provide authorization and authentication.
- The server need not be located physically close to the clients. Yet the data can be accessed efficiently.
- It is easy to replace, upgrade or relocate the nodes in the client server model because all the nodes are independent and request data only from the server.
- All the nodes i.e clients and server may not be build on similar platforms yet they can easily facilitate the transfer of data.

1.1.3 Disadvantages of Client Server Computing

- If all the clients simultaneously request data from the server, it may get overloaded. This may lead to congestion in the network.
- If the server fails for any reason, then none of the requests of the clients can be fulfilled. This leads of failure of the client server network.
- The cost of setting and maintaining a client server model are quite high.

1.2 Heterogeneous Computing

- Heterogeneous computing is the term used to describe diverse computing environment.
- For the operating system, heterogeneous computing means the ability to communicate with other dissimilar operating system and protocol.
- heterogeneous computing was popularized in late eighties and early nineties

1.2.1 Issues with heterogeneous computing

- There are many issues faced by both programmer and MIS (Management Information system) personnel.
- Issue regarding three components of system i.e. **Hardware, Operating System and Software program.**

- H/W platform must be able to support multiple OS, N/Ws and protocol.
- Operating System must deal with logical connections not only between their peer components, but with other operating system as well.
- Developer must make code work over diverse hardware, operating system, and network
- Many operating system work independently of hardware ie. UNIX, Microsoft Windows NT
- For OS, heterogeneous computing mean the ability to communicate with other dissimilar OS and protocol.
- Application developer must make code work over diverse H/W, N/Ws and OS

1.3 Distributed Computing

- It is technology architecture in which work is distributed among more than one machine.
- It is client server computing with one client and many server processing the request.

Benefits

- **User benefits**
 - Increase overall application throughput
 - Ability to multitask
- **Corporation benefits**
 - Integration of discrete n/w components

1.3.1 How Server work?

- They take distributed computing requests and divide their large processing task into single task that can run on single machine.
- They send application package and some client management software to the idle machine that request them.
- They monitor status of the job being run by client

1.3.2 Load Balancing

- Load balancing is the process of distributing the load among various nodes of distributed system to improve both job response time resource utilization.
- By knowing the current load of available node, request can be dispatched to specific nodes, such as those geographical nearest or idle.
- The processing nodes could return the result either dispatching station or original client.

1.4 Downsizing: Mainframe Application to Smaller Computing Platforms

- Downsizing can be defined as the migration of mainframe application to smaller , less expensive computing platform such as UNIX, Windows NT
- Benefits of Downsizing:

- The dollar per MIPS cost is low as compared to mainframe
- These are more flexible and scalable.

1.4.1 Challenges for smaller computing platform

Following are advantages of mainframe based systems and challenges for small computing environments

- It has provided the mechanism to ensure safe and continuous operation of component that large organization need.
- It provide high degree of availability, reliability and serviceability.
- It provide robust enough to provide secure operating environment with increasing numbers of users.

1.4.2 Providing Availability, Reliability and Serviceability by smaller Computing Platform

- Mainframe based systems are providing all the features: availability, reliability and serviceability.
- For the large-scale downsizing, the distributed computing platforms need to provide similar reassurance, safety and comfort for information system and their corporations.
- The reliability and manageability has recently become viable in distributed, client-server platforms.
- UNIX has been the most popular choice for downsizing because it is very scalable hardware system across.

1.4.3 Need for Robust Secure OS

OS must be able to provide service in secure manner to requesting client machine.

- Windows NT: Microsoft's Windows NT is unproven as a downsizing platform. It has been architected and developed, however, to support stringent operating system and h/w protection feature.
- OS/2: IBM'S OS/2 gaining acceptance as downsizing platform. It provide well protected environment for application and services.
- NetWare: It has been criticized for unprotected environment.
- UnixWare: UnixWare has provides an excellent downsizing platform. Protection feature available to provide reliable operating System.

1.5. Microprocessor Integration and Client Server Computing

- Microprocessor integration affects client-server computing in two ways.
 1. Able to process information not only at central computer, but a client nodes as well.
 2. The cost has decreased while speed, performance and capacity of the microprocessor increased. So microcomputer has become excellent h/w platform for server application

1.5.2 PC's as clients are affected by microprocessor

- PC's have become faster, more capable and cheaper with evolution of microprocessor.
- PC's became nodes of n/w.
- It is capable of processing information efficiently.
- Work is thus completed faster when client and server components are involved.

1.5.3 The need for High-performance Server machine.

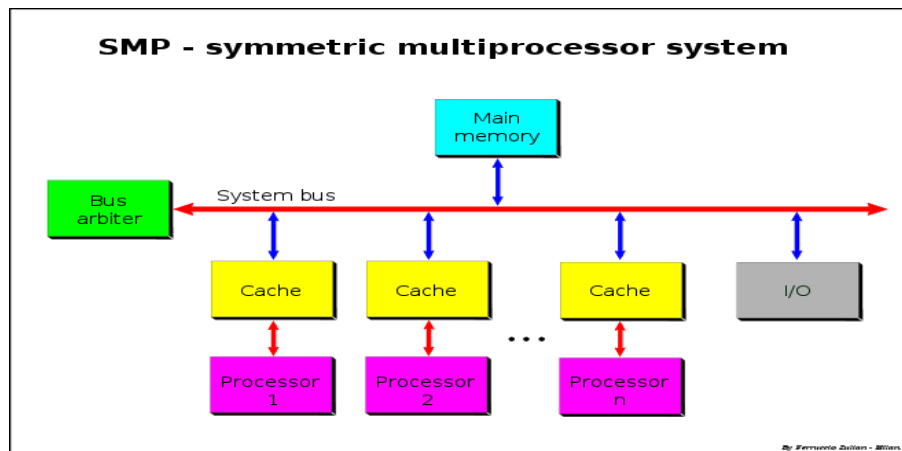
- For large scale implementation high performance dedicated server m/c is required.
- With advance microprocessor high performing servers has been created.
- Servers process data for clients in real time and it has to be quick with no error.
- With the advancement in microprocessor day by day, the coming era would be high performance client server computing

1.6 Scalability

- Scalability is measure of how well computer, service, or application can grow to meet increasing performance demand.
- For server cluster, it is the ability to incrementally add one or more system in existing cluster when overall load of the cluster exceeds its capabilities.
- Scalability affects all aspects of client server computing, including computer hardware, operating system and application programs.

1.6.1 Hardware Scalability

- Microprocessor must be able to provide support for extremely high performance, high capacity computing by certain servers.
- Scalability of microprocessor-based server solution is multiprocessor (MP) support.
 - It is the use of two or more CPU with in single computer system
- System that use this technology have at their disposal not just a single CPU, but potentially many CPUs and hence performance increase.
- Multiprocessing system are generally either designed as Symmetric (SMP) or Asymmetric (AMP) in operation.
- **Symmetric multiprocessing (SMP)** involves two or more identical processors are connected to a single, shared main memory, have full access to all input and output devices, and are controlled by a single operating system instance that treats all processors equally,



- **Asymmetric multiprocessing**
 - An **asymmetric multiprocessing (AMP or ASMP)** system is a multiprocessor computer system where not all of the multiple interconnected central processing units (CPUs) are treated equally. For example, a system might allow (either at the hardware or operating system level) only one CPU to execute operating system code or might allow only one CPU to perform I/O operations.

1.6.2 Need for OS Scalability

- They must be hosted on many different microprocessor.
- They must support MP and RAID.
- They must provide full-featured APIs for developers.
- OS must be scalable and reliable to support today's client-server technology.