NIELIT GORAKHPUR

Course Name: O Level (2nd Sem) **Subject:** Introduction to ICT Resources
Topic: Computer Network – Network Architecture **Date:** 22-06-2020

Computer Network

Network Architecture

Network architecture is the design of a computer network. It is a framework for the specification of a network's physical components and their functional organization and configuration, its operational principles and procedures, as well as communication protocols used.

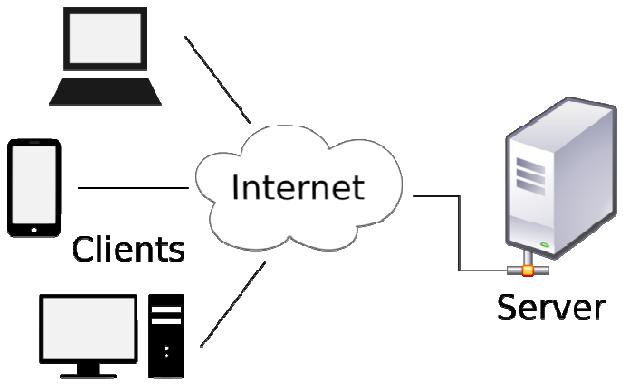
The two types of network architecture are used:

- Client/Server network
- Peer-To-Peer network

Client/Server Architecture

A network architecture in which each computer or process on the network is either a client or a server. Each client or server connected to a network can also be referred to as a node. The most basic type of client-server architecture employs only two types of nodes, clients and servers. This type of architecture is sometimes referred to as two-tier. It also allows devices to share files and resources.

Client/Server application consists of a server portion (back end), where most of the processing and storage is performed, and a client portion (front end) that provides a user interface.
Each instance of the client software can send data requests to one or more connected servers. In turn, the servers can accept these requests, process them, and return the requested information to the client. Although this concept can be applied for a variety of reasons to many different kinds of applications, the architecture remains fundamentally the same. For example of a client / server application is a web application that is designed for Internet Information Services (IIS) using a combination of server side, Active Server Pages (ASF) programming and client side scripting. ASP scripts run on the web server, while client-side scripts run on the client web browser.



Characteristics of a Client

The characteristics of a client computer are as follows:

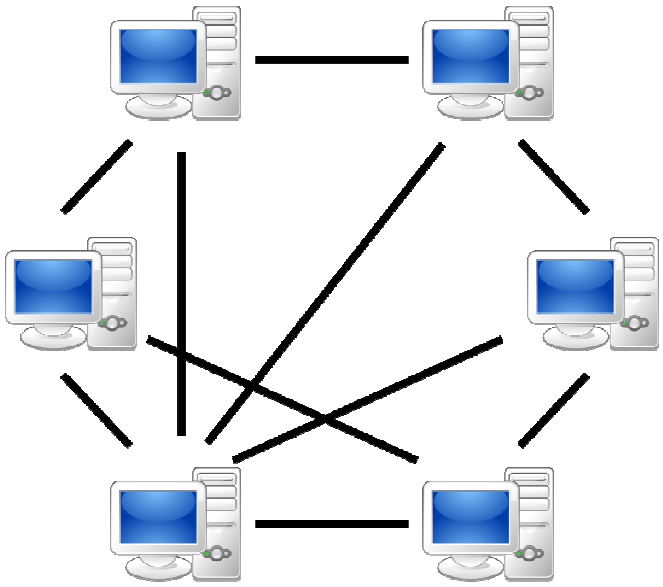
1. Activates the master computer.
2. Initiates requests.
3. Waits for and receives replies.
4. Connects to one or more number of servers at one time.
5. Typically interacts directly with end-users using a graphical user interface (GUI).

Characteristics of a Server

Characteristics of a server computer are as follows:

1. It waits for requests from clients.
2. Upon receipt of requests, it processes them and then offers replies.
3. Usually accepts connections from a larger number of clients.
4. It does not interact directly with end-users.

Peer to Peer Architectures



Peer to peer computer network is a network in which the computers are managed independently of one network and have equal rights for initiating communication with each other, sharing resources, and validating users. These networks are typically used for connecting nodes and are very useful. Sharing content files containing audio, video, data or anything in digital format is very common. Real-time data, such as telephony traffic, if also passed using peer to peer network. ***Peer to peer architecture is a type of network in which each workstation has equivalent capabilities and responsibilities.*** This network differs from client/server architectures, in which some computers are dedicated to serving the others. It is generally simpler, but may not offer the same performance under heavy loads.

How Peer to Peer Network Works?

A peer to peer network has no special server for authenticating users. Each computer manages its own security, so a separate user account might need to be created for each computer that a user needs to access. A user usually stores files on own computers and is responsible for ensuring that the files are appropriately backed up.

In a peer to peer network, each computer typically runs both client and Server software and can be used to make resources available to other users or to access shared resources on the network. Once you have downloaded and installed a peer to peer client, if you are connected to the Internet, you can launch the utility and log/onto a central indexing server. This central server indexes all users who are currently online and connected to the server. This server does not host any files for downloading. The peer to peer client will contain an area where you can search for a specific file. The utility queries the index server to find other connected users with the file, that you are looking for. When a match is found, the central server tells you where to find the requested file. You can then choose a result from the search query and your utility will then attempt to establish a connection with the computer hosting the file you have requested. If a successful connection is made, you can start begin downloading the file. Once the file download is complete, the connection will be broken. Another type of peer-to-peer client works in the same way but without a central indexing, server.

Peer to peer networks are simple to set up and are often ideal for small businesses that have fewer than 10 computers and that cannot afford a server-based solutions. They need cost-

effective solution for sharing files with co-workers and clients. The disadvantages of peer to peer networks are poor security and lack of centralized file storage and backup facilities.

Comparison of Client/Server Architecture with Peer to Peer Architecture

1. Client-server architecture enables the roles and responsibilities of a computing system to be distributed among several independent computers that are known -to each other only through a network. This creates an additional advantage to this architecture, i.e., greater ease of maintenance. For example, it is possible to replace, repair, upgrade, or even relocate a server while its clients remain both unaware and unaffected by that change.
2. All the data are stored on the servers, which generally have far greater security controls than most clients. Servers can better control access and resources, to guarantee that only those clients with appropriate permissions can access and change data.
3. Since data storage is centralized, updates to data are far easier to administer than would be possible under a peer to peer system. Under a peer to peer architecture, data updates may need to be distributed and applied to each "peer" in the network, which is both time-consuming and error-prone, as there can be thousands or even millions of peers.
4. Traffic congestion on the network has been an issue since the inception of the client-server system. As the number, of simultaneous client requests to a given server increases, the server can become severely overloaded. Contrast that to a peer to peer network, where its bandwidth actually increases as more nodes are added. The peer to peer network's overall bandwidth can be roughly computed as the sum of the bandwidths of every node in that network.
5. The client-server network lacks the robustness of a good peer to peer network. Under client- server, should a critical server fail, client- requests cannot be fulfilled. In peer to peer networks, resources are usually distributed among many nodes. Even if one or more nodes depart and abandon a downloading file, the remaining nodes should still have the data needed to complete the download.
6. An important goal in such networks is that all clients provide resources, including bandwidth storage space and computing power. Thus, nodes arrive and demand on the system increases, the total capacity of the system also increases. This is not true of client-server architecture with a fixed set of servers, in which adding more clients could mean slower data transfer for all users.

Exercise:

1: What is Network Architecture?
2: What is Client/Server?
3: What is Peer-To-Peer?
4: Write Comparison between Client/Server and Peer-To-Peer?