Application Layer

The application layer in the OSI model is the closest layer to the end user which means that the application layer and end user can interact directly with the software application. The application layer programs are based on client and servers.

The Application layer includes the following functions:

* **Identifying communication partners:** The application layer identifies the availability of communication partners for an application with data to transmit.
* **Determining resource availability:** The application layer determines whether sufficient network resources are available for the requested communication.
* **Synchronizing communication:** All the communications occur between the applications requires cooperation which is managed by an application layer.

Services of Application Layers

* **Network Virtual terminal:** An application layer allows a user to log on to a remote host. To do so, the application creates a software emulation of a terminal at the remote host. The user's computer talks to the software terminal, which in turn, talks to the host. The remote host thinks that it is communicating with one of its own terminals, so it allows the user to log on.
* **File Transfer, Access, and Management (FTAM):** An application allows a user to access files in a remote computer, to retrieve files from a computer and to manage files in a remote computer. FTAM defines a hierarchical virtual file in terms of file structure, file attributes and the kind of operations performed on the files and their attributes.
* **Addressing:** To obtain communication between client and server, there is a need for addressing. When a client made a request to the server, the request contains the server address and its own address. The server response to the client request, the request contains the destination address, i.e., client address. To achieve this kind of addressing, DNS is used.
* **Mail Services:** An application layer provides Email forwarding and storage.
* **Directory Services:** An application contains a distributed database that provides access for global information about various objects and services.

Authentication: It authenticates the sender or receiver's message or both.

Network Application Architecture

Application architecture is different from the network architecture. The network architecture is fixed and provides a set of services to applications. The application architecture, on the other hand, is designed by the application developer and defines how the application should be structured over the various end systems.

**Application architecture is of two types:**

* **Client-server architecture:** An application program running on the local machine sends a request to another application program is known as a client, and a program that serves a request is known as a server. For example, when a web server receives a request from the client host, it responds to the request to the client host.

**Characteristics Of Client-server architecture:**

* In Client-server architecture, clients do not directly communicate with each other. For example, in a web application, two browsers do not directly communicate with each other.
* A server is fixed, well-known address known as IP address because the server is always on while the client can always contact the server by sending a packet to the sender's IP address.

**Disadvantage Of Client-server architecture:**

It is a single-server based architecture which is incapable of holding all the requests from the clients. For example, a social networking site can become overwhelmed when there is only one server exists.

* **P2P (peer-to-peer) architecture:** It has no dedicated server in a data center. The peers are the computers which are not owned by the service provider. Most of the peers reside in the homes, offices, schools, and universities. The peers communicate with each other without passing the information through a dedicated server, this architecture is known as peer-to-peer architecture. The applications based on P2P architecture includes file sharing and internet telephony.

Features of P2P architecture

* **Self scalability:** In a file sharing system, although each peer generates a workload by requesting the files, each peer also adds a service capacity by distributing the files to the peer.
* **Cost-effective:** It is cost-effective as it does not require significant server infrastructure and server bandwidth.

Client and Server processes

* A network application consists of a pair of processes that send the messages to each other over a network.
* In P2P file-sharing system, a file is transferred from a process in one peer to a process in another peer. We label one of the two processes as the client and another process as the server.
* With P2P file sharing, the peer which is downloading the file is known as a client, and the peer which is uploading the file is known as a server. However, we have observed in some applications such as P2P file sharing; a process can be both as a client and server. Therefore, we can say that a process can both download and upload the files.