REPORT

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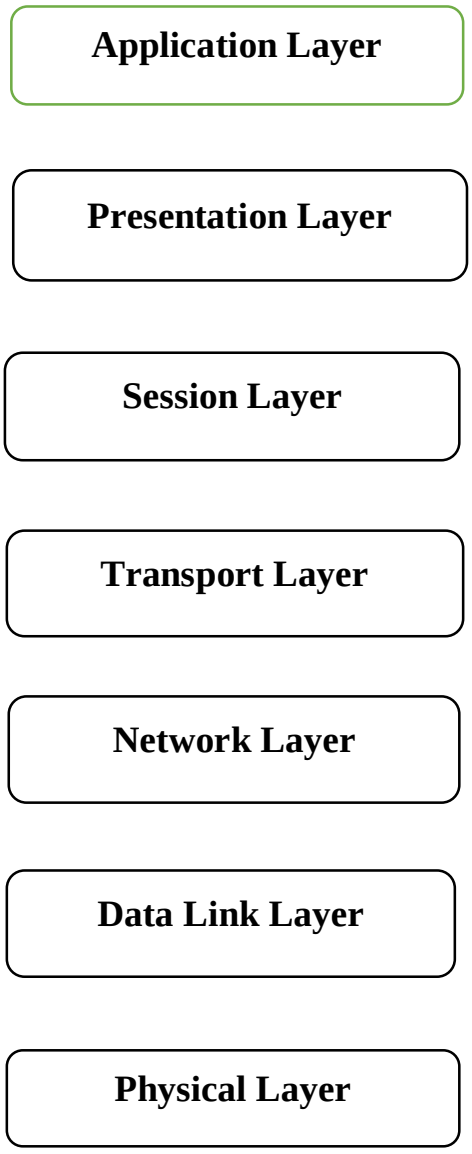
OSI Modal Of Layers:

OSI stands for **Open Systems Interconnection**. It has been developed by ISO – '**International Organization of Standardization**', in the year 1974. It is a 7 layer architecture with each layer having specific functionality to perform. All these 7 layers work collaboratively to transmit the data from one person to another.



1. Physical Layer

The lowest layer of the OSI reference model is the physical layer. It is responsible for the actual physical connection between the devices. The physical layer contains information in the form of **bits.** It is responsible for the actual physical connection between the devices. When receiving data, this layer will get the signal received and convert it into 0s and 1s and send them to the Data Link layer, which will put the frame back together.

2. Data Link Layer

The data link layer is responsible for the node to node delivery of the message. The main function of this layer is to make sure data transfer is error free from one node to another, over the physical layer. When a packet arrives in a network, it is the responsibility of DLL to transmit it to the Host using its MAC address.

3. Network Layer

Network layer works for the transmission of data from one host to the other located in different networks. It also takes care of **packet routing** i.e. selection of the shortest path to transmit the packet, from the number of routes available. The sender & receiver's IP address are placed in the header by network layer.

-Sending of IP datagrams from source network to destination network

4. Transport Layer

Transport layer provides services to application layer and takes services from network layer. The data in the transport layer is referred to as segments . It is responsible for the End to End delivery of the complete message. Transport layer also provides the acknowledgment of the successful data transmission and re-transmits the data if an error is found.

The services provided by transport layer :

1. **Connection Oriented Service(TCP):** It is a three-phase process which include
   – Connection Establishment
   – Data Transfer
   – Termination / disconnection
   In this type of transmission, the receiving device sends an acknowledgment, back to the source after a packet or group of packet is received. This type of transmission is reliable and secure.
2. **Connection less service(UDP):** It is a one phase process and includes Data Transfer. In this type of transmission, the receiver does not acknowledge receipt of a packet. This approach allows for much faster communication between devices. Connection oriented Service is more reliable than connection less Service.

5. Session Layer (Layer 5) :

This layer is responsible for establishment of connection, maintenance of sessions, authentication and also ensures security.

The functions of the session layer are:

1. **Session establishment, maintenance and termination:** The layer allows the two processes to establish, use and terminate a connection.
2. **Synchronization :** This layer allows a process to add checkpoints which are considered as synchronization points into the data. These synchronization point help to identify the error so that the data is re-synchronized properly, and ends of the messages are not cut prematurely and data loss is avoided.
3. **Dialog Controller :** The session layer allows two systems to start communication with each other in half-duplex or full-duplex.

6. Presentation Layer (Layer 6) :

Presentation layer is also called the **Translation layer**.The data from the application layer is extracted here and manipulated as per the required format to transmit over the network. The functions of the presentation layer are :

1. **Translation :** For example, ASCII to EBCDIC.
2. **Encryption/ Decryption :** Data encryption translates the data into another form or code. The encrypted data is known as the cipher text and the decrypted data is known as plain text. A key value is used for encrypting as well as decrypting data.
3. **Compression:** Reduces the number of bits that need to be transmitted on the network.

7. Application Layer (Layer 7) :

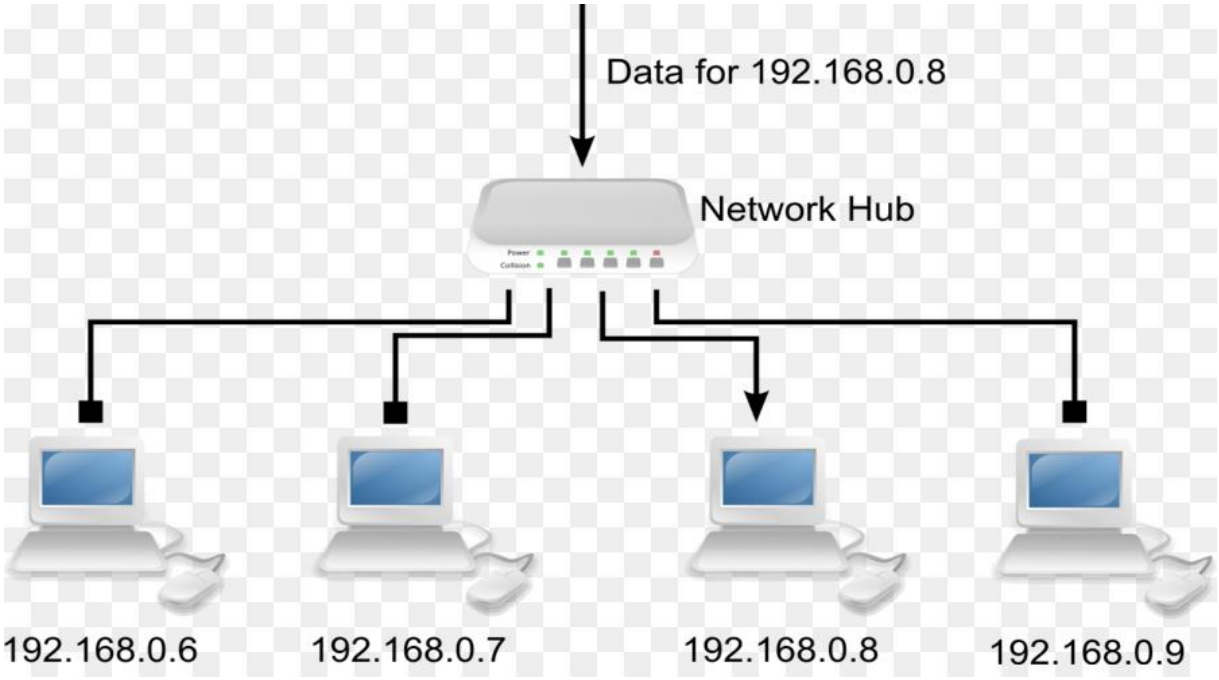
At the very top of the OSI Reference Model stack of layers, we find Application layer which is implemented by the network applications. These applications produce the data, which has to be transferred over the network. This layer also serves as a window for the application services to access the network and for displaying the received information to the user.

The functions of the Application layer are :

1. Network Virtual Terminal
2. FTAM-File transfer access and management
3. Mail Services
4. Directory Services

Hub:

A hub, in the context of networking, is a hardware device that relays communication data. A hub sends data packets (frames) to all devices on a network, regardless of any MAC addresses contained in the data packet. Common types of hubs used in networking are network hubs, passive hubs, intelligent and switching hubs.

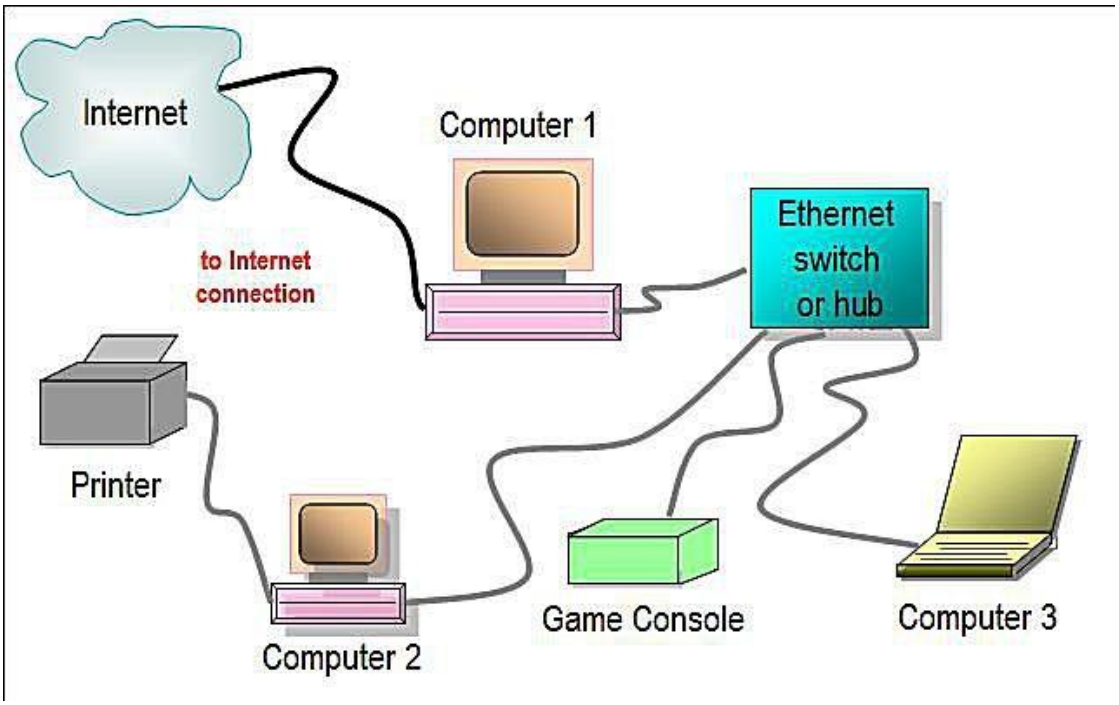


- **Network Hubs:** These are common connection points for network devices, which connect segments of a LAN (local area network) and may contain multiple ports – an interface for connecting network devices such as printers, storage devices, workstations and servers. A data packet arriving at one hub's port may be copied to other ports allowing all segments of the network to have access to the data packet.
- **Passive Hubs:** These only serve as paths or conduits for data passing from one device, or network segment, to another.
- **Intelligent Hubs:** Also known as manageable hubs, these hubs allow system administrators to monitor data passing through and to configure each port, meaning to determine which devices or network segments are plugged into the port. Some ports may even be left open with no connection.
- **Switching Hubs:** These hubs actually read the attributes of each unit of data. The data is then forwarded to the correct or intended port.

Switch:

A switch, in the context of networking is a high-speed device that receives incoming data packets and redirects them to their destination on a local area network (LAN). A LAN switch operates at the data link layer (Layer 2) or the network layer of the OSI Model and, as such it can support all types of packet protocols.

A switch in an Ethernet-based LAN reads incoming TCP/IP data packets/frames containing destination information as they pass into one or more input ports. The destination information in the packets is used to determine which output ports will be used to send the data on to its intended destination.



Switches are similar to hubs, only smarter. A hub simply connects all the nodes on the network -- communication is essentially in a haphazard manner with any device trying to communicate at any time, resulting in many collisions. A switch, on the other hand, creates an electronic tunnel between source and destination ports for a split second that no other traffic can enter. This results in communication without collisions.

Switches are similar to routers as well, but a router has the additional ability to forward packets between different networks, whereas a switch is limited to node-to-node communication on the same network.

Router:

A router is a device that analyzes the contents of data packets transmitted within a network or to another network. Routers determine whether the source and destination are on the same network or whether data must be transferred from one network type to another, which requires encapsulating the data packet with routing protocol header information for the new network type.

Based on designs developed in the 1960s, the Advanced Research Projects Agency Network (ARPANET) was created in 1969 by the U.S. Department of Defense. This early network design was based on circuit switching. The first device to function as a router was the Interface Message Processors that made up ARPANET to form the first data packet network.

The initial idea for a router, which was then called a gateway, came from a group of computer networking researchers who formed an organization called the International Network Working Group, which became a subcommittee of the International Federation for Information Processing in 1972.