

# Basics of Computer Network Fundamentals

Whether you are a newbie who is interested in learning some basic concepts related to computer networks or an experienced fellow looking for a quick refresher on computer network fundamentals, this article is for you. In this article, we will discuss some basic terminologies related to computer networks that will help you understand the fundamentals of computer networks.

## 1. Links & Nodes

A Computer network is nothing but a network of computers that are connected to each other either directly or indirectly. A computer can communicate with other computer only when it is connected to it. The connection could be simple or complex depending upon the type of network.

Computer network in its very basic form can be thought of a simple set-up in which two computers are connected through a physical medium like optical fibre or co-axial cables. In this particular set-up, the physical medium i.e. optical fibre or co-axial cables are known as link while the end points i.e. the computers are known as nodes. In real world, it is not only the computers that can act as nodes, there are various other hardware like routers, switches etc. that can also act as nodes.

A link can cater to two nodes or more than two i.e., multiple nodes. These type of links are known as point-to-point links and multiple access links respectively. For example - two computers connected directly through a link over a wide area network can be thought of as a point to point link while multiple computers connected to a wireless connection can be thought of as a multiple access link.

So, in computer networks, links are nothing but medium to connect two or more nodes together.

## 2. Point-to-Point & Multiple Access

As already discussed, a point to point access method consists of a dedicated link between two nodes. It is through this link the nodes communicate with each other. The link is said to be dedicated because the complete capacity of a point to point link is reserved for communication between these two nodes. A point to point link can be a physical medium such as a cable or can also be a satellite link. Point to point access forms the most basic platform of communication between two

computers. It is also not difficult to visualise and understand. A telephone connection can be visualized as an example of a point to point access.

On the other side, multiple access method consists of a link that is shared between multiple nodes. So, the capacity of link gets shared in this case. This sharing of link can either be spatial or time based. In spatial sharing, all the nodes share the link simultaneously while in time based sharing the nodes share link on turn by turn basis.

In real-world, both the number of nodes and the range of a network working on multiple access method is limited.

### 3. Circuit Switched and Packet Switched Network

What is the real reason for which a computer network is required? Yes, it's required in order to enable communication between various nodes. In more simpler terms, a computer network is required so that various nodes can exchange information. Now, a network may contain more than one path from source to destination. So, it is up to the network to decide which path to use while exchanging information between two nodes. Based on the method to decide the path of information flow, a network can be of two types - Circuit switched network and Packet switched network.

A circuit switched network is one in which the path is established prior to exchange of any information. This connection between source and destination is known as a circuit and hence the network is known as a circuit switched network. A circuit once selected remains active for the whole duration of a session of information exchange between source and destination. It can either be permanent or can be created as and when information exchange between two nodes is required. A common example of a circuit switched network is a telephone system where-in a circuit or communication path is established before the actual communication begins. This communication path remains active for complete duration of a telephone call.

A packet switched network is one where there is no specific path for communication. The information is sent in terms of small packets that contain sufficient information (for example- source, destination address etc.) to be received and logically assembled at the destination node. As the data is sent in form of packets, so the network is known as a packet switched network. The packets can be routed to different paths, they may get fragmented but are collected together to form the complete message at the destination. This type of network is a good option when a

particular path is vulnerable and can go down.

## 4. IP addresses and MAC addresses

Every node that is a part of an IP (Internet Protocol) computer network is assigned an IP address. An IP address is a 32 bit number that is represented in a dotted decimal form.

For example - 192.168.221.220

This is the representation of an IP address in IPv4 model of addressing. Being 32 bit, the maximum number of unique IP addresses can be 2 to the power 32. As this list is exhausting rapidly. A newer IPv6 model is being used today. You can read more IPv4 and IPv6 addresses on [Wikipedia](#).

Apart from IP addresses that does not have a permanent association with network device, a hardware or MAC address is also assigned to every network device. These addresses are unique and tightly associated with each device and are assigned to the devices at the time they are manufactured. A MAC address is represented by 6 groups of 2 hexadecimal numbers each.

For example - 89:67:45:23:01:00

## 5. Hubs, Switches and Routers

Earlier, when we discussed nodes, we discussed that in a computer network, except computer, there can be other hardware devices. In this section, we will discuss some of the popular hardware devices that help forming a computer network.

A hub can be thought of as a hardware device that can be used to connect different computers on a network. It is regarded as a dumb networking device because it transmits a received data packet or segment to all the ports except the one from where it is arrived. Hubs are now replaced with other intelligent network devices such as switches and routers. Hubs operate at layer-1 of the OSI model.

A switch is nothing but an intelligent big brother of a hub. The main intelligence lies in the fact that a switch slowly tends to learn the exact port at which the data is to be sent. For example, when a switch receives a data segment, it sends it to all the connected ports except the port from where it arrived. So, here it just acts like a hub

but over and above this, it also stores the information regarding the hardware address (MAC address) of the node from where the message arrived. So, now whenever a message arrives for this port, a switch knows which port to send the message instead of sending it to all the ports. This way, it keeps on building this table and at one stage, it knows exactly where to forward every message. The limitation of switch is that it cannot transfer the data packets across networks because it does not have any information about the IP addresses (from which networks are determined). Switches operate at layer-2 of OSI model.

A router is nothing but a switch capable of forwarding data across networks. This is because router operate at layer-3 of OSI model and have IP address information that lets them decide which network the data packet is destined. Just like switches, routers also maintain a table through which they intelligently decide the exact port to transfer data.

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