

**Lab # 02(a)****Network Topologies**

To Study about basics of Network Topology and its Types.

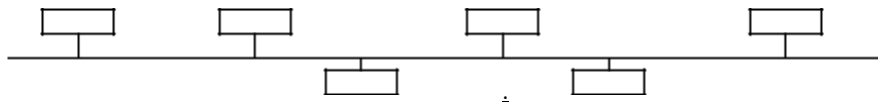
**THEORY:****Network Topology:**

A network topology is a pattern in which nodes(e.g. printer, computer, router or other devices) are connected to a Local Area Network(LAN) or other networks via a links(erg twisted pair, copper wire cable or optical fiber cable).

**Main Types of Network Topologies:**

The following sections discuss the physical topologies used in networks and other related topics.

- Linear Bus
- Star
- Ring
- Mesh

**Linear Bus:**

Bus topology is a network type in where every computer and network device is connected to single cable.

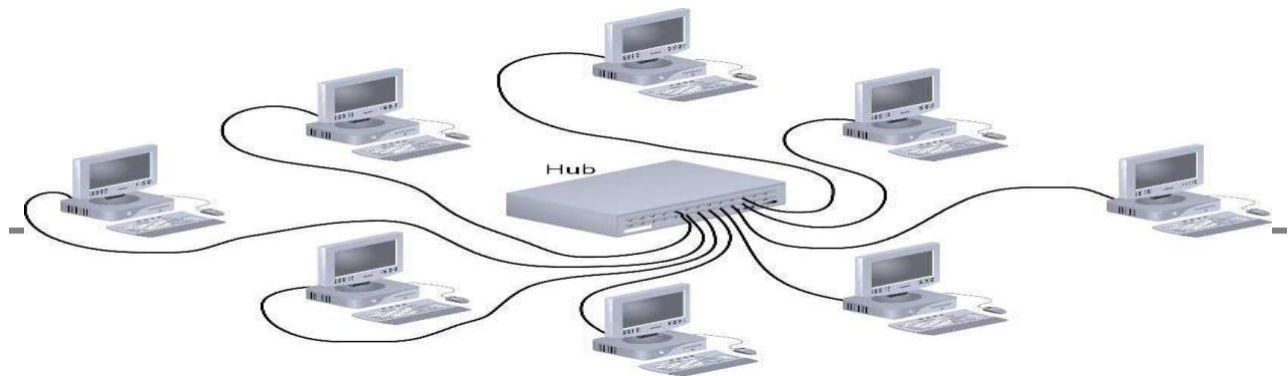
In the bus network topology, every work station is connected to a main cable called the bus. Therefore, in effect, each workstation is directly connected to every other workstation in the network.

**Advantages of Linear Bus Topology:**

- ☐ It is cost effective.
- ☐ Cable required is least compared to other network topology.
- ☐ Used in small networks.
- ☐ It is easy to understand.
- ☐ Easy to expand joining two cables together.

**Disadvantages of Linear Bus Topology:**

- ☐ Cables fails then whole network fails.
- ☐ If network traffic is heavy or nodes are more the performance of the network decreases.
- ☐ Cable has a limited length.
- ☐ It is slower than the ring topology.

**Star:**

In this type of topology all the computers are connected to a single hub through a cable. This hub is the central node and all others nodes are connected to the central node.

**Advantages of Star Topology:**

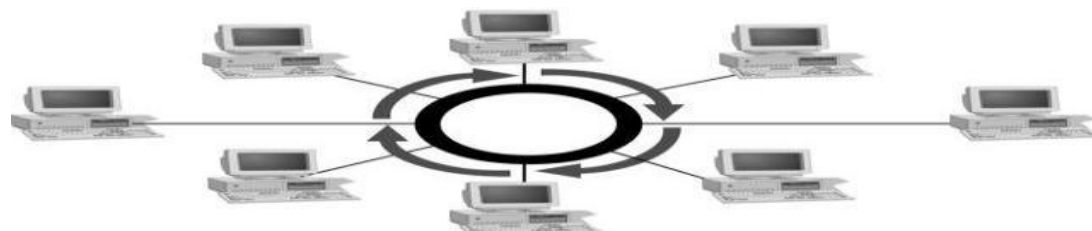
- Fast performance with few nodes and low network traffic.
- Hub can be upgraded easily.
- Easy to troubleshoot.
- Easy to setup and modify.
- Only that node is affected which has failed rest of the nodes can work smoothly.

**Disadvantages of Star Topology:**

- Cost of installation is high.
- Expensive to use.

**Ring:**

It is called ring topology because it forms a ring as each computer is connected to another computer, with the last one connected to the first. Exactly two neighbors for each cable device.

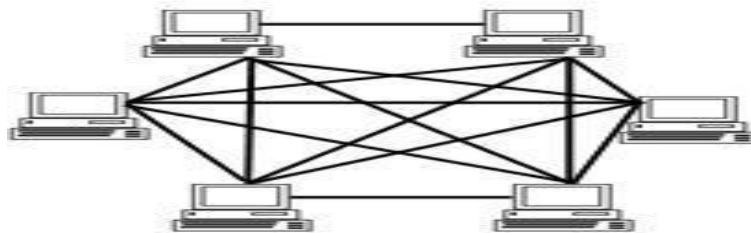


**Advantages of Ring Topology:**

- Transmitting network is not affected by high traffic or by adding more nodes, as only the nodes having tokens can transmit data.
- Cheap to install and expand.

**Disadvantages of Ring Topology:**

- ☐ Troubleshooting is difficult in ring topology.
- ☐ Adding or deleting the computers disturbs the network activity.
- ☐ Failure of one computer disturbs the whole network.

**Mesh:**

A network setup where each computer and network device is interconnected with one another.

There are two types of mesh topology network:

- Fully mesh network
- Partially mesh network

**Advantages of Mesh Topology:**

- each node is connected to several others; when a node fails its neighbors find other routes
- capacity can be added simply by adding nodes

**Disadvantages of Mesh Topology:**

- There are high chances of redundancy in many of the network connections.
- Expensive.
- Maintenance is difficult.

**Considerations when choosing a Topology:**

**Money:** A linear bus network may be the least expensive way to install a network; you do not have to purchase concentrators.

**Length of cable needed:** The linear bus network uses shorter lengths of cable.

**Future growth:** With a star topology, expanding a network is easily done by adding another concentrator.

**Cable type:** The most common cable in schools is unshielded twisted pair, which is most often used with star topologies.

**Exercise:**

(1) What is difference between partial and full mesh topology?

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(2) Design Bus and Star Topology environment using Packet Tracer?

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**Lab # 02(a)****Network Topologies**

To study about how networking devices communicate with each other.

**THEORY:****Switch:**

In networks, a device that filters and forwards packets between LAN segments. Switches operate at the data link layer (layer 2) and sometimes the network layer (layer 3) of the OSI Reference Model and therefore support any packet protocol. LANs that use switches to join segments are called switched LANs.

**Hub:**

A hub is a place of convergence where data arrives from one or more directions and is forwarded out in one or more other directions.

Basically there are two types of Hub:

- The Active Hub, which is used to extend the length of the cable.
- The Passive Hub is basically used to connect workstations in the star.

The distinction seems to be that the hub is the place where data comes together and the switch is what determines how and where data is forwarded from the place where data comes together.

**IP Address:**

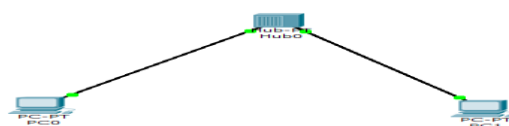
Internet Protocol Address (or IP Address) is a unique address that computing devices such as personal computers, tablets, and smartphones use to identify itself and communicate with other devices in the IP network. Any device connected to the IP network must have a unique IP address within the network. An IP address is analogous to a street address or telephone number in that it is used to uniquely identify an entity.

**Subnetting:**

Subnetting allows an organization to add sub-networks without the need to acquire a new network number via the Internet service provider (ISP). Subnetting helps to reduce the network traffic and conceals network complexity. Subnetting is essential when a single network number has to be allocated over numerous segments of a local area network (LAN).

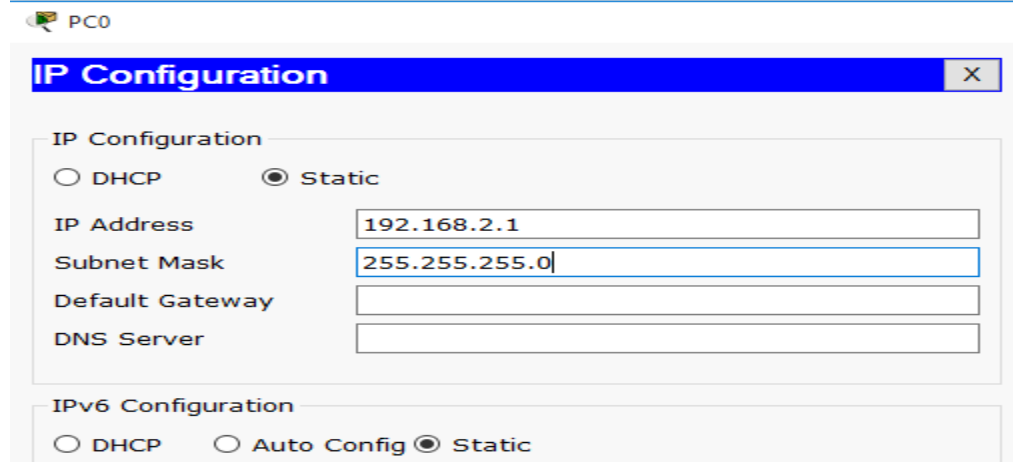
**Step#1**

Design network using a hub and two pc and connect them via straight through cable.

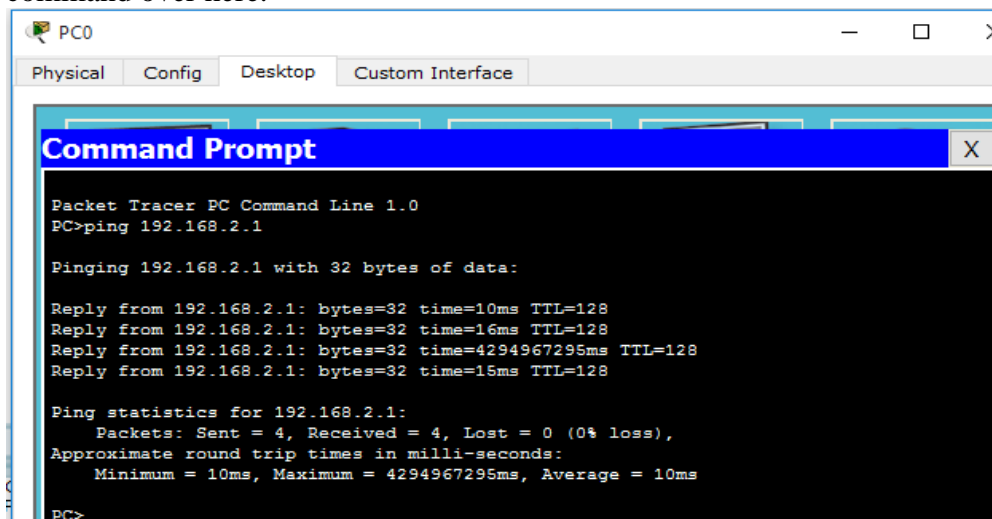


**Step # 2**

- Now assign IP to both pc using IP of same class.
- Click on pc select desktop then select IP configuration and assign IP.

**Step # 3**

Now you can check your network works properly by passing messages and using ping command. For ping command, click on pc and select desktop then select command prompt and write ping command over here.



**Task: Now repeat the same step for switch.**

**EXERCISES:**

Q1. If two computer belongs to the same network so either we should assign same class IP or different class IP? If we assign same IP address than why ?

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Q2. What happens if two computers want to communicate through switch and we forget to assign IP on one computer?

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Q3. What are the two ways of checking a networking connection either successful or failed?

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Q.4) Difference between hub and switch?

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