Government Girls' Polytechnic, Bilaspur

Name of the Lab: **Networking Lab**

Practical : **Computer Networking Lab**

Class: **3rd Semester (Information Technology)**

Teachers Assessment: 30 End Semester Examination: 70

EXPERIMENT NO: - 1

1. **OBJECTIVE: -** Demonstrate & explain type of architecture used.
2. **HARDWARE & SYSTEM SOFTWARE REQUIRED :-** Computers, Client server n/w,

3. **SOFTWARE REQUIRED :-**

4. **THEORY :-**Different type of network architecture used are :
   - Peer to Peer Network
   - Client server network

Peer-to-Peer networks-

In contrast to client server networks, there is no dedicated sever in peer to peer architecture. Thus each computer in such a network is part server and part client. This means that each computer on the network is free to share its own resources. A computer which is connected to a printer may even share the printer so that all other computers may access it over the network.

Advantages of peer to peer network-

- Lower cost (the costs involved in such a network are hardware, cabling and maintenance).
- Foolproof simplicity.

Disadvantages of peer to peer to network-

- The system is not centralized, making administration difficult.
- Lack of security.
- No computer in the network is reliable.

5. **FLOW CHART (IF REQUIRED) :-**

6. **PROGRAM INPUTS & OUTPUT :-**

7. **OBSERVATIONS: -** Therefore, peer to peer n/ws are only suitable for applications that do not require a high level of security (it is not advisable in a business network containing sensitive data).

EXPERIMENT NO:-2

1. **OBJECTIVE: -** Demonstrate the transmission media.

2. **HARDWARE & SYSTEM SOFTWARE REQUIRED: -** Coaxial cables, optical fibers etc.

3. **SOFTWARE REQUIRED :- Nil**

4. **THEORY: -** A transmission media (medium) is a material substance which can propagates energy waves. For example, the transmission medium for sound by the ears is usually air, but solids and liquids may also act as transmission media for sound.

The term transmission media can also be refer to the technical device which employs the material substance to transmit or guide the waves. Thus an optical fiber or a copper cable can be referred to as a transmission media.
A transmission medium can be classified as a :

- Linear Medium, if different waves at any particular point in the medium can be superposed.
- Bounded Medium, if it is finite in extent, otherwise unbounded medium,
- Uniform medium or homogeneous medium, if its physical properties are unchanged at different points.
- Isotropic medium, if it's physical are the same in different directions.

Coaxial cable is one example of a transmission medium.

5. **FLOW CHART (IF REQUIRED) :- Not required**

6. **PROGRAM INPUTS & OUTPUT :-**

7. **OBSERVATIONS: -** Electromagnetic radiation can be transmitted through an optical media, such as optical fiber, or though twisted pair wires, coaxial cables, or dielectric-slab waveguides.

EXPERIMENT NO. 3

1. **OBJECTIVE:-**Demonstrate & explain type of topologies used in computer networking.

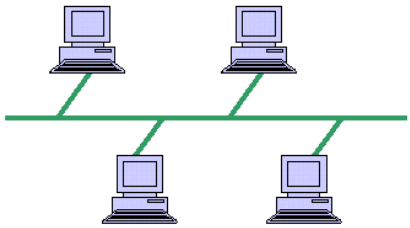
2. **EQUIPMENT / MATERIAL REQUIRED: -** Network interface cards, Computers, Networking cables & equipments.

THEORY: - Network topology is the layout pattern of interconnections of the various elements (links, nodes, etc.) of a computer network. Network topologies may be physical or logical. Physical topology means the physical design of a network including the devices, location and cable installation. Logical refers to how data is actually transferred in a network as opposed to its physical design.

Network topology recognizes five basic topologies:

- Bus (point-to-multipoint) topology
- Star topology
- Ring topology
- Tree topology
- Mesh topology

Bus Topology- In local area networks where bus topology is used, each node is connected to a single cable. Each computer or server is connected to the single bus cable through some kind of connector. A terminator is required at each end of the bus cable to prevent the signal from bouncing back and forth on the bus cable.



Ring Topology- A network topology that is set up in a circular fashion in which data travels around the ring in one direction and each device on the right acts as a repeater to keep the signal strong as it travels. Each device incorporates a receiver for the incoming signal and a transmitter to send the data on to the next device in the ring.

Mesh Topology

Mesh topologies involve the concept of routes. Unlike each of the previous topologies, messages sent on a mesh network can take any of several possible paths from source to destination. (Recall that even in a ring, although two cable paths exist, messages can only travel in one direction.) Some WANs, most notably the Internet, employ mesh routing.

A mesh network in which every device connects to every other is called a full mesh. As shown in the illustration below, partial mesh networks also exist in which some devices connect only indirectly to others.

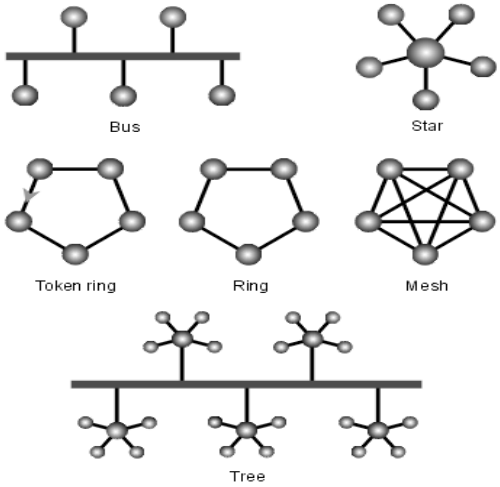
Star Topology

Many home networks use the star topology. A star network features a central connection point called a "hub" that may be a hub, switch or router. Devices typically connect to the hub with Unshielded Twisted Pair (UTP) Ethernet.
Compared to the bus topology, a star network generally requires more cable, but a failure in any star network cable will only take down one computer's network access and not the entire LAN. (If the hub fails, however, the entire network also fails.)

Tree Topology

Tree topologies integrate multiple star topologies together onto a bus. In its simplest form, only hub devices connect directly to the tree bus, and each hub functions as the "root" of a tree of devices. This bus/star hybrid approach supports future expandability of the network much better than a bus (limited in the number of devices due to the broadcast traffic it generates) or a star (limited by the number of hub connection points) alone.

3. **CIRCRIT / BIOCK /CONNECTION DIAGRAM (IF REQUIRED):-**



4. **OBSERVATIONS / TRUTH TABLE (IF REQUIRED) :- Not required.**

5. **RESULT: -** Topologies remain an important part of network design theory. You can probably build a home or small business computer network without understanding the difference between a bus design and a star design, but becoming familiar with the standard topologies gives you a better understanding of important networking concepts like hubs, broadcasts, and routes.

EXPERIMENT NO: - 4

1. **OBJECTIVE: -** Study of different network connectivity devices used to establish computer network**.**

2. **HARDWARE & SYSTEM SOFTWARE REQUIRED :-** NIC, Hub,Switch,Bridge,Router Gateway

3. **SOFTWARE REQUIRED :-**

4. **THEORY :-** The different network connectivity devices are :
    1. NIC(Network interface Card)
    2. The Hub
    3. The Switch
    4. The Router
    5. The Gateway

NIC (Network interface Card)- A network interface controller (also known as a network interface card, network adapter, LAN adapter and by similar terms) is a computer hardware component that connects a computer to a computer network. A NIC provides the hardware interface between a computer and a network. A NIC technically is network adapter hardware in the form factor of an add-in card such as a PCI or PCMCIA card. Some NIC cards work with wired connections while others are wireless. Most NICs support either wired Ethernet or WiFi wireless standards.

The Hub- An Ethernet hub, active hub, network hub, repeater hub or hub is a device for connecting multiple twisted pair or fiber optic Ethernet devices together and making them act as a single network segment. Hubs work at the physical layer (layer 1) of the OSI model. The device is a form of multi-port repeater. Repeater hubs also participate in collision detection, forwarding a jam signal to all ports if it detects a collision.

Transceivers: Transceivers are commonly used with co-axial media using 10Base2 or 10Base5 networking standards. It allows a Network Interface Card to connect to a coax, providing necessary translation of signals.

The Switch - A network switch is a small hardware device that joins multiple computers together within one local area network (LAN). Technically, network switches operate at layer two (Data Link Layer) of the OSI model.

Network switches appear nearly identical to network hubs, but a switch generally contains more intelligence (and a slightly higher price tag) than a hub. Unlike hubs, network switches are capable of inspecting data packets as they are received, determining the source and destination device of each packet, and forwarding them appropriately.

N/W Switch 

The Router - A router is a device that forwards data packets across computer networks. Routers perform the data "traffic directing" functions on the Internet. A router is a microprocessor-controlled device that is connected to two or more data lines from different networks. When a data packet comes in on one of the lines, the router reads the address information in the packet to determine its ultimate destination. Then, using information in its routing table, it directs the packet to the next network on its journey. A data packet is typically passed from router to router through the networks of the Internet until it gets to its destination computer. Routers also perform other tasks such as translating the data transmission protocol of the packet to the appropriate protocol of the next network, and preventing unauthorized access to a network by the use of a firewall

Router: 

The Gateway - A network gateway is an *internetworking* system capable of joining together two networks that use different base protocols. A network gateway can be implemented completely in software, completely in hardware, or as a combination of both. Depending on the types of protocols they support, network gateways can operate at any level of the OSI model. Gateways are the most complex devices with respect to the functionality. They typically work at the upper most layers of OSI model

5. **FLOW CHART (IF REQUIRED) :-** Not Required

6. **PROGRAM INPUTS & OUTPUT :-**

7. **OBSERVATIONS: -** There are different- different network connectivity devices are available for different type of usage. User can choose any of the devices according to their work.

EXPERIMENT NO:- 5

8. **OBJECTIVE :-** Study about TCP/IP Protocol suite
9. **HARDWARE & SYSTEM SOFTWARE REQUIRED :-**

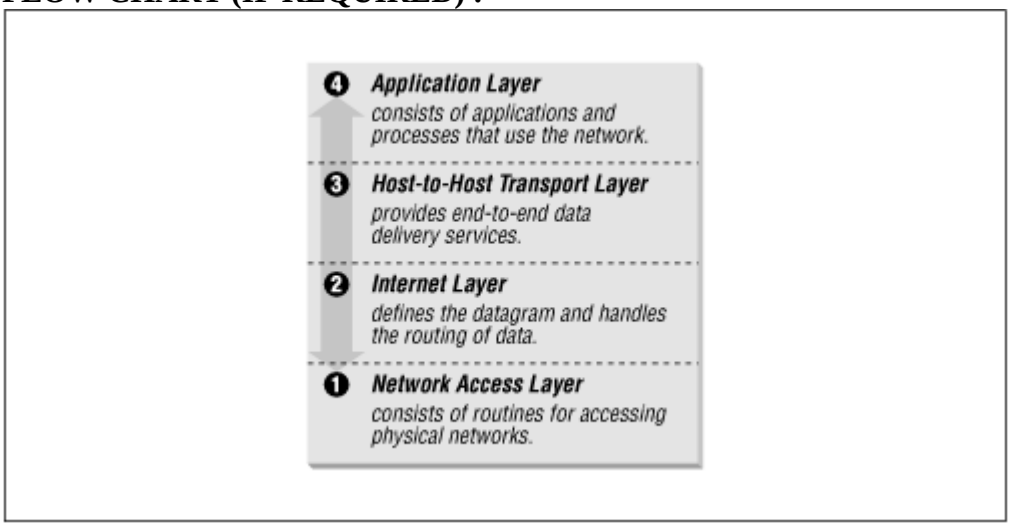
10. **SOFTWARE REQUIRED :-**

11. **THEORY :-** The TCP/IP model, or Internet Protocol Suite, describes a set of general design guidelines and implementations of specific networking protocols to enable computers to communicate over a network. TCP/IP provides end-to-end connectivity specifying how data should be formatted, addressed, transmitted, routed and received at the destination. Protocols exist for a variety of different types of communication services between computers.

The TCP/IP Protocol Suite organizes the functional groups of protocols and methods into four layers, the Application Layer, the Transport Layer, the Internet Layer, and the Link Layer.

- **Application Layer** (process-to-process): This is the scope within which applications create user data and communicate this data to other processes or applications on another or the same host. The communications partners are often called *peers*. This is where the "higher level" protocols such as SMTP, FTP, SSH, HTTP, etc. operate.
- **Transport Layer** (host-to-host): The Transport Layer constitutes the networking regime between two network hosts, either on the local network or on remote networks separated by routers. The Transport Layer provides a uniform networking interface that hides the actual topology (layout) of the underlying network connections. This is where flow-control, error-correction, and connection protocols exist, such as TCP. This layer deals with opening and maintaining connections between Internet hosts.
- **Internet Layer** (internetworking): The Internet Layer has the task of exchanging datagrams across network boundaries. It is therefore also referred to as the layer that establishes internetworking, indeed, it defines and establishes the Internet. This layer defines the addressing and routing structures used for the TCP/IP protocol suite. The primary protocol in this scope is the Internet Protocol, which defines IP addresses. Its function in routing is to transport datagrams to the next IP router that has the connectivity to a network closer to the final data destination.
- **Link Layer**: This layer defines the networking methods within the scope of the local network link on which hosts communicate without intervening routers. This layer describes the protocols used to describe the local network topology and the interfaces needed to affect transmission of Internet Layer datagrams to next-neighbor hosts. (cf. the OSI Data Link Layer).

12. FLOW CHART (IF REQUIRED) :-



13. PROGRAM INPUTS & OUTPUT -:

14. OBSERVATIONS :-