**AIM OF THE EXPERIMENT:** TO STUDY ABOUT DIFFERENT HARDWARES, TOOLS USED FOR NETWORKING.

**THEORY:**

**NETWORKING**: A computer network connects various nodes (Computers, mobile phones and other devices) which allows them to communicate and share data and resources.

These connections/links can be established using cables/wires or optical fibres or via wireless medium like Wi-Fi.

Network computer devices that originate, route and terminate the data are called network nodes. Nodes are identified by network addresses, and can include hosts such as personal computers, phones, and servers, as well as networking hardware such as routers and switches.

**COMMUNICATION:** In computer networks, communication refers to transmission of this digital data between two or more computers and a computer network or data network is a telecommunications network that allows computers to exchange data. In computer networks, the data is passed in the form of packets.

**TYPES OF COMPUTER NETWORKS:**

Various types of networks are:

1. **Personal Area Network (PAN):** It is the most basic type of network, a PAN is made up of a wireless modem, a computer or two, phones, printers, tablets, etc., and revolves around one person in one building. These types of networks are typically found in small offices or residences, and are managed by one person or organization from a single device.

2. **Local Area Network (LAN**): It is usually a small network that is restricted to a small geographic area. A computer network available only to the residents within a building or between groups of two or three buildings in close proximity to each other can be called a LAN.

3. **Wide Area Network (WAN):** These networks cover a broad range of geographic area. WANs are used to connect LANs and other types of networks together so that users and computers can communicate with computers in other regions. An example of a WAN is internet.

4. **Metropolitan Area Network (MAN):** MAN is a network that connects the users with computer resources in a geographic area that is larger than LAN but not quite as large as WAN. An example would a connection over a large city.

**COMPONENTS OF A COMPUTER NETWORK:**

1. **Servers** - Servers are computers that hold shared files, programs, and the network operating system. There are many different kinds of servers like file servers, print servers, mail servers, communication servers, database servers, print servers, fax servers and web servers.

2. **Clients** - Clients are computers that access and use the network and shared network resources. Client computers are basically the customers (users) of the network, as they request and receive services from the servers.

3. **Transmission Media** - Transmission media are the facilities used to interconnect computers in a network, such as twisted-pair wire, coaxial cable, and optical fibre cable. Transmission media are sometimes called channels, links or lines.

4. **Shared data** - Shared data are data that file servers provide to clients such as data files, printer access programs and e-mail.

5. **Shared printers and other** **peripherals** - Shared printers and peripherals are hardware resources provided to the users of the network by servers. Resources provided include data files, printers, software, or any other items used by clients on the network.

6. **Network Interface Card** - Each computer in a network has a special expansion card called a network interface card (NIC). The NIC prepares (formats) and sends data, receives data, and controls data flow between the computer and the network

7. **Local Operating System** - A local operating system allows personal computers to access files, print to a local printer, and have and use one or more disk and CD drives that are located on the computer.

8. **Network Operating System** - The network operating system is a program that runs on computers and servers, and allows the computers to communicate over the network.

9. **Hub** - Hub is a device that splits a network connection into multiple computers. It is like a distribution centre. When a computer request information from a network or a specific computer, it sends the request to the hub through a cable. The hub will receive the request and transmit it to the entire network. Each computer in the network should then figure out whether the broadcast data is for them or not.

10. **Switch** - Switch is a telecommunication device grouped as one of computer network components. It uses physical device addresses in each incoming messages so that it can deliver the message to the right destination or port.

**TYPES OF A COMMUNICATION/TOPOLOGIES:**

**1. Point to Point communication:** A direct communication is established between the two communicating computers.

**2. Bus Topology:** There is a main cable to which all of the computers are connected. Here, the data flows in a single direction. It is cost effective and used in small networks. The whole network goes down if the main cable fails.

**3. Ring Topology:** The computers are connected in a ring structure. It is easy to install and reconfigure.

**4. Star Topology:** All the computer are connected to a central hub/switch. Here, the whole network goes down if the hub fails. It is less expensive and robust.

**5. Mesh Topology:** In this topology, all the computers are interconnected with each other. So, there are n\*(n-1)/2 bus needed. It is highly private and has secure connection. More no of cabling and I/O ports are required.

**6. Hybrid Topology:** Combination of two or more types of topology is called Hybrid Topology.

**PHYSICAL EQUIPMENTS:**

**1. NIC Card:** A network interface card is a hardware used to connect a node into network. It has an inbuilt unique MAC address of 48 bits in IPV4.

**2. Hub:** A hub 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. A Hub is used to communicate only within a local area but not outside their own network.

**3.** **Switch:** A switch is a high-speed device that receives incoming data packets and redirects them to their destination using their physical/MAC address on a local area network (LAN). It is smarter than a hub as it sends the packets only to the receiver node.

**4. Router:** Router is an interconnecting device which is based on ip and make the communication between different networks possible. Routers perform the traffic directing functions on the Internet. Routers have the additional ability to forward packets between different networks, whereas a switch is limited to node-to-node communication on the same network.

**5. Firewall:** A firewall is a network security system that monitors and controls incoming and outgoing network traffic based on predetermined security rules. A firewall typically establishes a barrier between a trusted internal network and untrusted external network, such as the Internet.

**6. Socket:** A network socket is an internal endpoint for sending or receiving data within a node on a computer network. Sockets allow communication between two different processes on the same or different machines. There are 2 sockets for a connection: Server socket and Client socket.

**7. Ports:** A port is an endpoint of communication. Physical as well as wireless connections are terminated at ports of hardware devices. Ports range from 0 to 65,534 where 0-1023 are well known ports and 1024- 49,151 are registered ports maintained by IANA. The dynamic or private ports are those from 49152 through 65,535. One common use for this range is for ephemeral/short-lived ports.