

**Modern Education Society's  
College of Engineering, Pune**

<b>NAME OF STUDENT:</b>	<b>CLASS:</b>
<b>SEMESTER/YEAR:</b>	<b>ROLL NO:</b>
<b>DATE OF PERFORMANCE:</b>	<b>DATE OF SUBMISSION:</b>
<b>EXAMINED BY:</b>	<b>EXPERIMENT NO:</b>

**Assignment No. A1**

**Title:** Setup a wired LAN using switch

**Objectives:** To establish a wired LAN for four computers.

**Problem Statement:**

Setup a wired LAN using Layer 2 Switch and then IP switch of minimum four computers. It includes preparation of cable, testing of cable using line tester, configuration machine using IP addresses, testing using PING utility and demonstrate the PING packets captured traces using Wireshark Packet Analyzer Tool.

**Outcomes:**

Develop and demonstrate a wired LAN for four computers.

**Tools Required:**

**Hardware:** Computer, LAN Cards, RJ-45 Connectors, Switch, CAT-5 Cable, Cable tester, Crimping tool, etc.

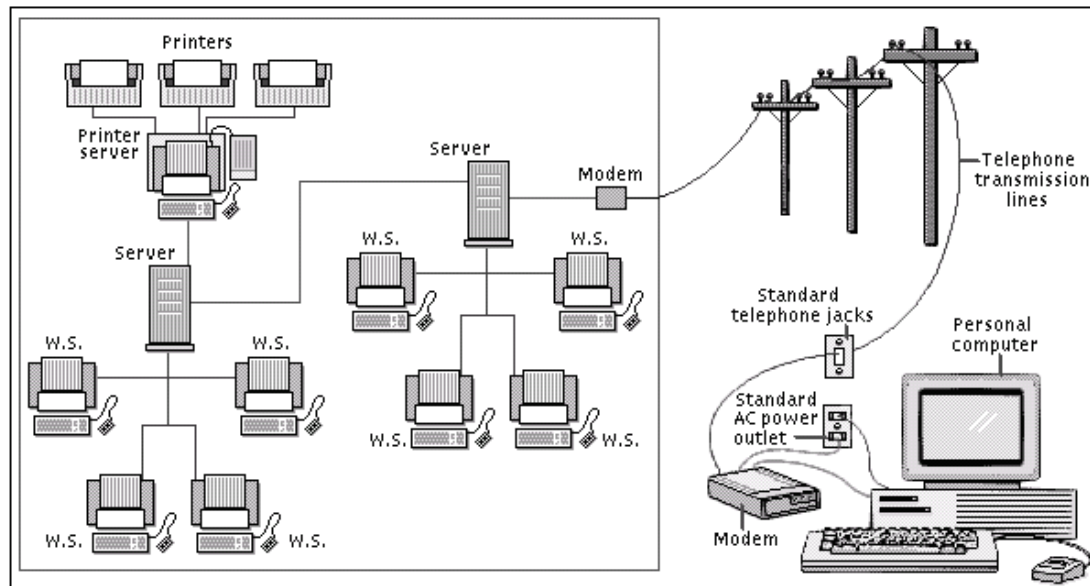
**Software:** Open source O.S. and Wireshark

**Theory:**

**Introduction:-**

**Computer Networks**, the widespread sharing of information among groups of computers and their users, a central part of the information age. The popular adoption of the personal computer (PC) and the local area network (LAN) during the 1980s has led to the capacity to access information on a distant database; download an application from overseas; send a message to a friend in a different country; and share files with a colleague—all from a personal computer.

The networks that allow all this to be done so easily are sophisticated and complex entities. They rely for their effectiveness on many cooperating components. The design and deployment of the worldwide computer network can be viewed as one of the great technological wonders of recent decades.



**Computer Network**

Networks are connections between groups of computers and associated devices that allow users to transfer information electronically. The local area network shown on the left is representative of the setup used in many offices and companies. Individual computers, called work stations (WS), communicate to each other via cable or telephone line linking to servers. Servers are computers exactly like the WS, except that they have an administrative function and are devoted entirely to monitoring and controlling WS access to part or all of the network and to any shared resources (such as printers). The red line represents the larger network connection between servers, called the backbone; the blue line shows local connections. A modem (modulator/demodulator) allows computers to transfer information across standard telephone lines. Modems convert digital signals into analogue signals and back again, making it possible for computers to communicate, or network, across thousands of miles.

## Study of Network Devices:-

### NIC (Network Interface Card):-

Each computer includes Network will have a card Expunction slot or will have on-Interface Card), which will among the workstation in the network through cables.



the File server or a plugged in the PCI board NIC (Network provide connectivity

### Type's of Card:-

1. Arc net card (2.5 mbits/sec)
2. Ethernet card (10/100 mbps)
3. Token Ring card (4-16 mbits/sec)

### Hub/Switch:-

These devices are used for Re-directing traffic, i.e. in a **Star** Topology the central device is used to ECHO/Re-Direct the packets coming from one workstation/node to the Destination workstation/node.



This is done by using the devices like Hub/Switch, during the present situation **Hub's are absolute due to their disadvantages of Echoing a packet from one node to all, which leads to increasing N/W traffic and packet Collision.**

## Type of Hub:-

### 1. Passive Hub:-

It is a device which do not require any type of power supply and does not boost incoming signal, it just echo the incoming signal to all nodes.

### 2. Active Hub :-

It is a device which requires power supply and boosts the incoming signal and echoes the signal to all nodes.

Hub where absolute due to use of an intelligent device called **Switch** which reads the destination adders and sends the incoming packet to it.

## paring Rules and Color Code:-

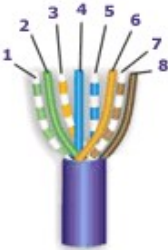
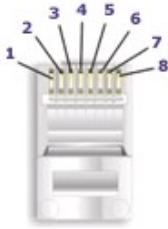
The CAT 5 Cable consist of 8 wires which comes pares of White/Blue, Blue, White/Orange, Orange, White/Green, Green, White/Brown, Brown and they are coded for **Straight** and **Cross** combinations respectively.

### Straight:-



Pair #	Wire	Pin #
1-White/Blue	White/Blue	5
	Blue	4
2-Wht./Orange	White/Orange	1
	Orange	2
3-White/Green	White/Green	3
	Green	6
4-White/Brown	White/Brown	7

**Cross:-**



Pair #	Wire	Pin #
1-White/Blue	White/Blue	5
	Blue	4
2-White/Green	White/Green	1
	Green	2
3-White/Orange	White/Orange	3
	Orange	6
4-White/Brown	White/Brown	7

**Connections among devices:-**

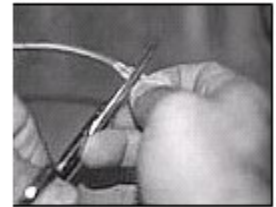
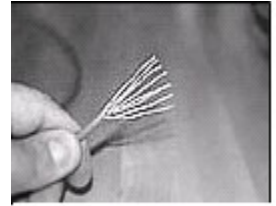
Node to Node - Straight – Cross,

Switch to Node - Straight – Straight,

Switch to Switch - Straight – Cross.

## How to Crimp a Cat 5 cable with RJ 45 Connector:-

1. Strip off the cable jacket approximately 1" or slightly more.
2. Un-twist each pair, and straighten each wire between the fingers.
3. Place the wires in the order of one of the two diagrams shown above . Bring all of the wires together, until they touch.
4. At this point, recheck the wiring sequence with the diagram.
5. Optional: Make a mark on the wires at 1/2" from the end of the cable jacket.
6. Hold the grouped (and sorted) wires together tightly, between the thumb, and the forefinger.
7. Cut all of the wires at a perfect 90 degree angle from the cable at 1/2" from the end of the cable jacket. This is a very critical step. If the wires are not cut straight, they may not all make contact. We suggest using a pair of scissors for this purpose.
8. Conductors should be at a straight 90 degree angle, and be 1/2" long, prior to insertion into the connector.
9. Insert the wires into the connector (pins facing up).
10. Push moderately hard to assure that all of the wires have reached the end of the connector. Be sure that the cable jacket goes into the back of the connector by about 3/16".
11. Place the connector into a crimp tool, and squeeze hard so that the handle reaches its full swing.
12. Repeat the process on the other end. For a straight through cable, use the same wiring.
13. Use a cable tester to test for proper continuity.



## Cable Testing Tool:-

It is a tool used for testing whether there is no cut in between two terminals and to identify the type of pair crimp with.

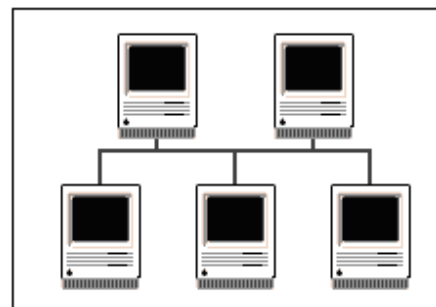
## Study of Topologies:-

### What is a Topology?

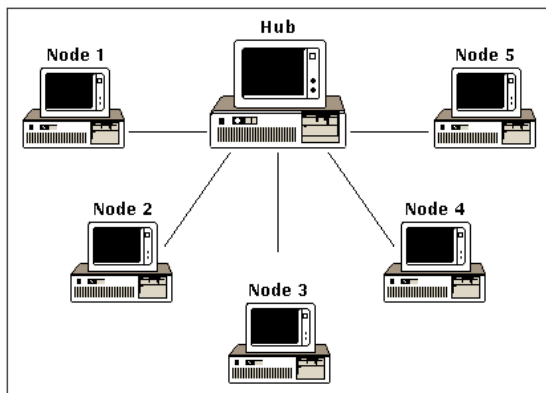
The physical topology of a network refers to the configuration of cables, computers, and other peripherals. Physical topology should not be confused with logical topology which is the method used to pass information between workstations.

### 1. Bus Topologies:-

In a bus network configuration, each node is connected to one main communications line. With this arrangement, even if one of the nodes goes down, the rest of the network can continue to function normally.



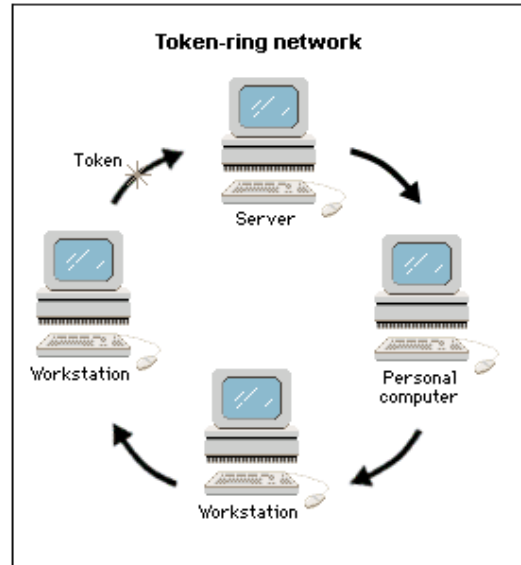
### 2. Star Topologies:-



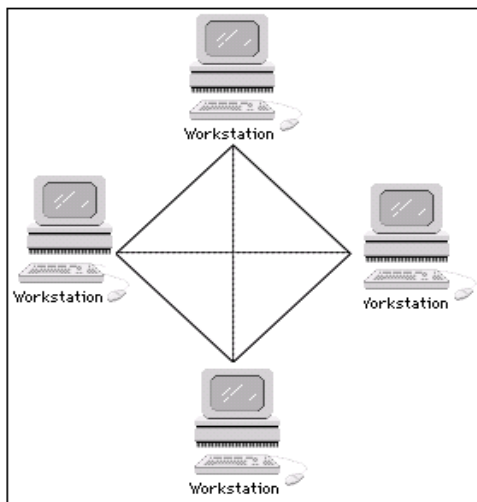
A star network consists of several nodes connected to a central hub/switch in a star-shaped configuration. Messages from individual nodes pass directly to the hub/switch, which determines any further routing.

### 3. Ring Topology:-

Token Ring Network, in computer science, a LAN formed in a ring (closed loop) topology that uses token passing as a means of regulating traffic. On a token ring network, a token governing the right to transmit is passed from one station to the next in a physical circle. If a station has information to transmit, it "seizes" the token, marks it as being in use, and inserts the information. The "busy" token, plus message, is then passed



the



around the circle, copied when it arrives at its destination, and eventually returned to the sender. The sender removes the attached message and then passes the freed token to next station in line. Token ring networks are defined in the IEEE 802.5 standards.

### 4. Mesh Topology:-

The type of network topology in which each of the nodes of the network is connected to each of the other nodes in the network with a point-to-point link – this makes it possible for data to be simultaneously transmitted from any single node to all of the other nodes.

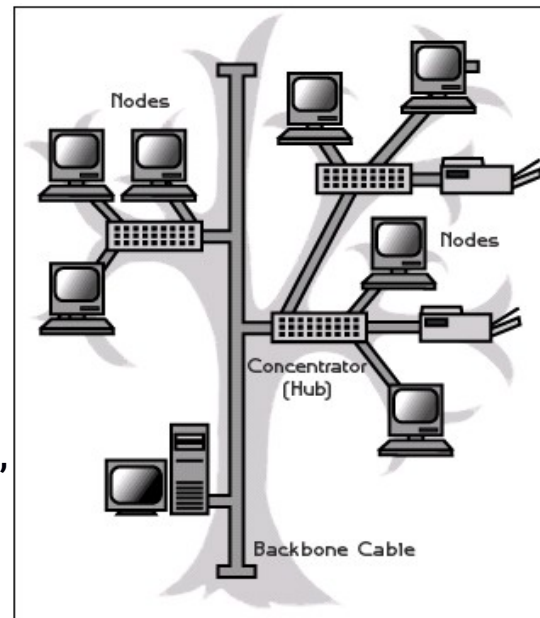
**Note:** The physical fully connected mesh topology is generally too costly and complex for practical networks, although the topology is used when there are only a small number of nodes to be interconnected



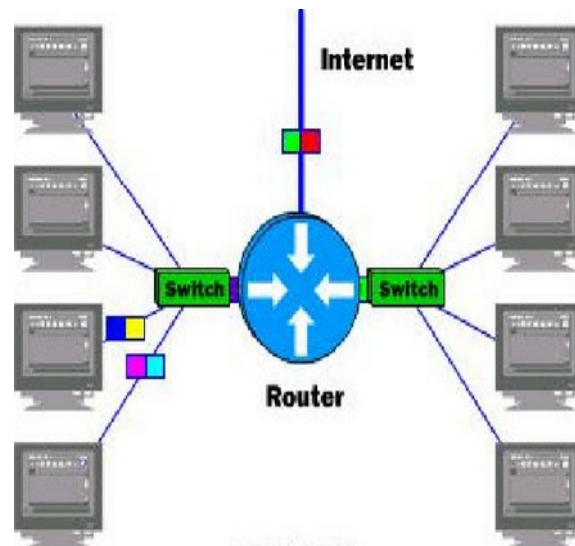
## 5. Hybrid/Tree Topology:-

A tree topology combines characteristics of linear bus and star topologies. It consists of groups of star-configured workstations connected to a linear bus backbone cable.

These topologies can also be mixed. For example, a bus-star network consists of a high-bandwidth bus, called the **backbone**, which connects a collection of slower-bandwidth star segments.



## How Routers Work



Routers are the traffic cops of intranets. They make sure that all data gets sent to where it's supposed to go and that it gets sent via the most efficient route. Routers are also useful tools to make the most efficient use of the intranet. Routers are used to segment traffic and provide redundancy of routes. Routers use encapsulation to permit different protocols to be sent across otherwise incompatible networks.

Just as routers direct traffic on the Internet, sending information to its proper destination, routers on an intranet perform the same function. Routers-equipment that is a combination of hardware and software-can send the data to a computer on the same subnetwork inside the intranet, to another network on the intranet, or outside to the Internet. They do this by examining header information in IP packets, and then sending the data on its way. Typically, a router will send the packet to the next router closest to the final destination, which in turn sends it to an even closer router, and so on, until the data reaches its intended recipient.

A router has input ports for receiving IP packets, and output ports for sending those packets toward their destination. When a packet comes to the input port, the router examines the packet header, and checks the destination in it against a routing table-a database that tells the router how to send packets to various destinations.

Based on the information in the routing table, the packet is sent to a particular output port, which sends the packet to the next closest router to the packet's destination.

If packets come to the input port more quickly than the router can process them, they are sent to a holding area called an input queue. The router then processes packets from the queue in the order they were received. If the number of packets received exceeds the capacity of the queue (called the length of the queue), packets may be lost.

In a simple intranet that is a single, completely self-contained network, and in which there are no connections to any other network or the Internet, only minimal routing need be done, and so the routing table in the router is exceedingly simple with very few entries, and is constructed automatically by a program called `ifconfig`

**Conclusion:** Hence ,we have demonstrate a wired LAN for four computers.

### Questions

- 1) Explain the Specification & functionality of hardware components used- RJ-45 Connectors, Switch, CAT-5 Cable, Cable tester, Crimping tool.
- 2) What is topology? Explain different types og topologies used for designing Network.
- 3) Explain funcionality of Switch, bridge, Hub, Router, Brouter.
- 4)Write down command to install wireshark Tool. Explain importance of wireshark Tool.