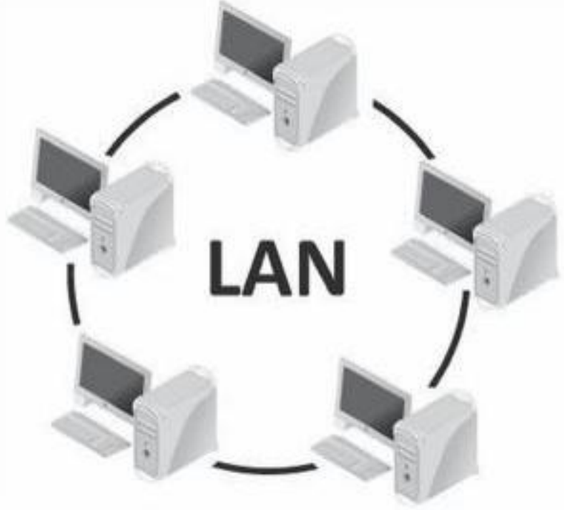
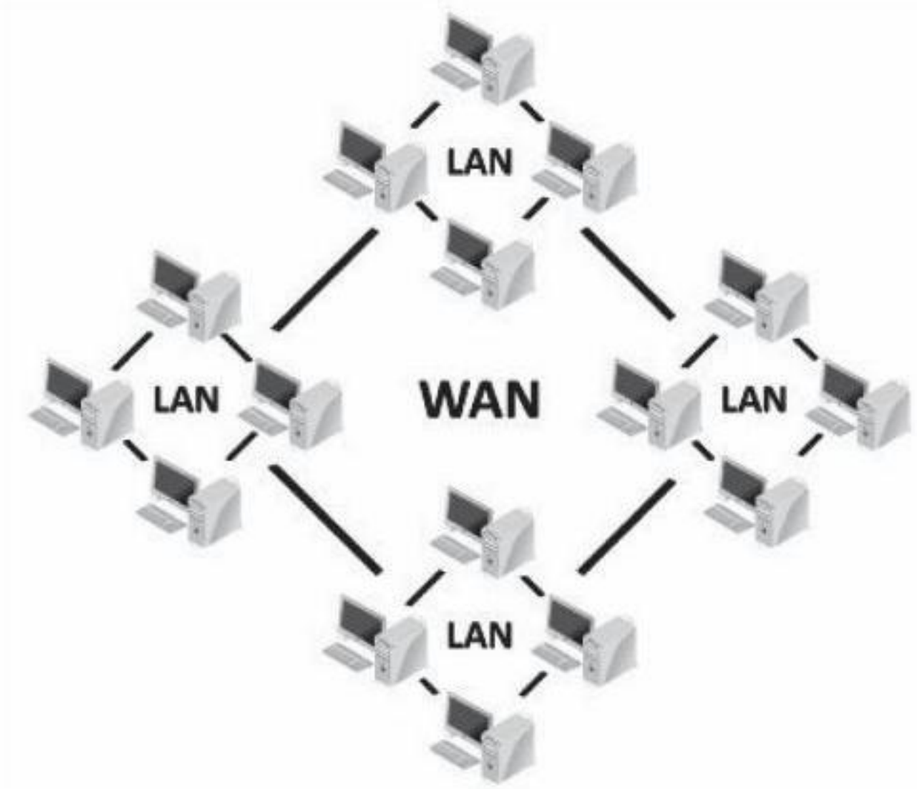
Computer Networks

STUDY NOTES

- **Introduction to Computer Network:** A computer network is a group of devices connected with each other through a transmission medium such as wires, cables, etc.
- These devices can be computers, printers, scanners, fax machines, etc.
- The purpose of having computer network is to send and receive data stored in other devices over the network.
- **Types of Network:** There are many types of computer networks, the common types of area networks including these three:
  - ❖ **LAN:** A Local Area Network (LAN) is a collection of devices connected together in one physical location, such as a building, office, or home.

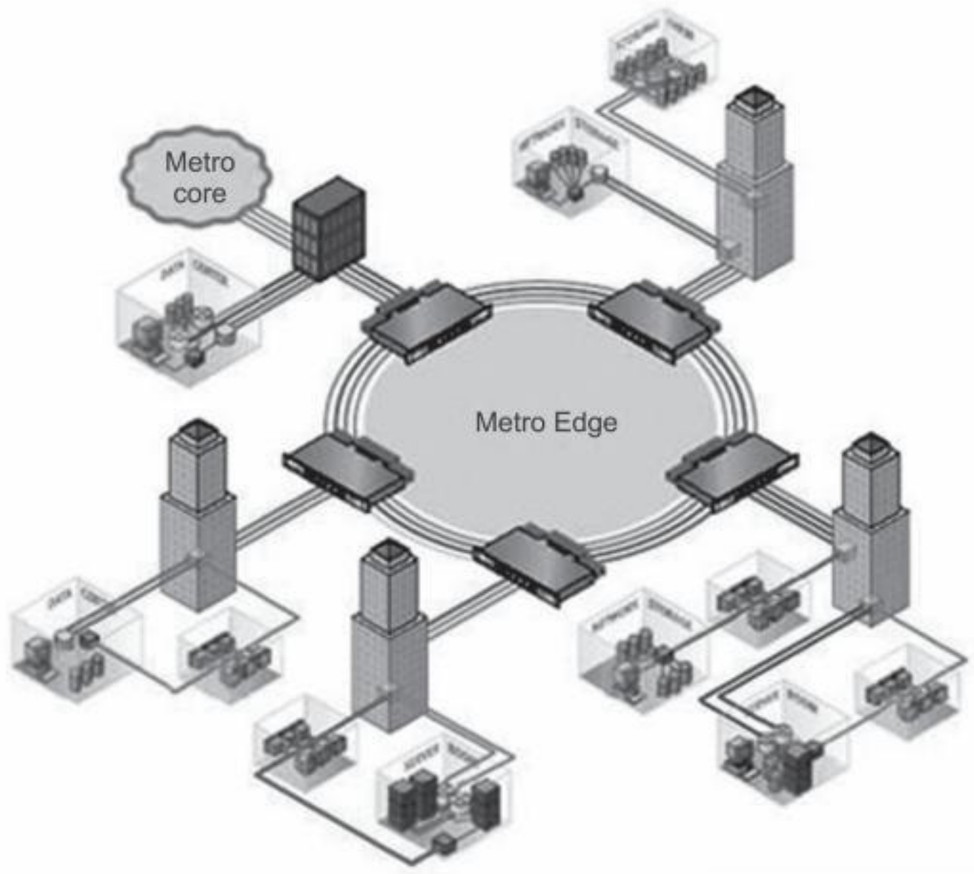


  - ❖ A LAN can be small or large, ranging from a home network with one user to an enterprise network with thousands of users and devices in an office or school.
  - ❖ **WAN:** A Wide Area Network (WAN) is a collection of local-area networks (LANs) or other networks that communicate with one another.



  - ❖ A WAN is essentially a network of networks, with the Internet the world's largest WAN.

❖ **MAN:** A metropolitan area network (MAN) is a computer network that connects computers within a metropolitan area, which could be a single large city, multiple cities and towns, or any given large area with multiple buildings.



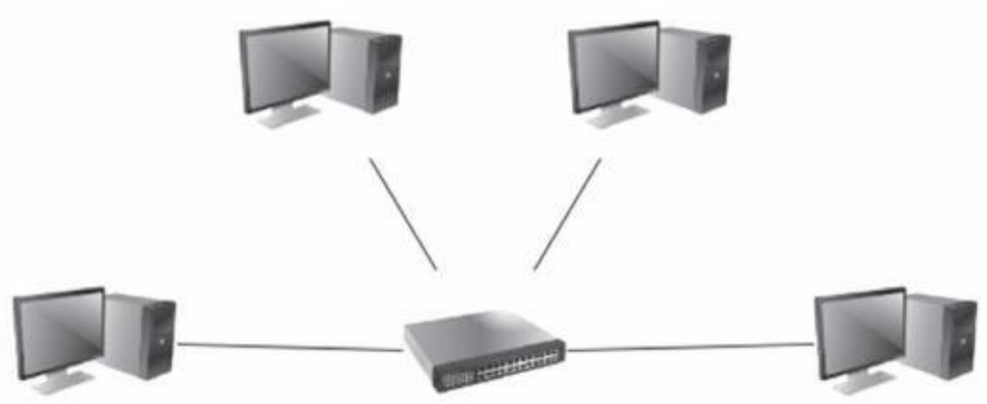
❖ A MAN is larger than a Local Area Network (LAN) but smaller than a Wide Area Network (WAN).

- **Network Devices:**
  - ❖ **Hub:** A hub is the most basic networking device that connects multiple computers or other network devices together.

    Unlike a network switch, a network hub has no routing tables or intelligence on where to send information and broadcasts all network data across each connection.

  - ❖ **Switch:** A network switch connects devices within a network (often a Local Area Network, or LAN).

    Unlike a router, a switch only sends data to the single device it is intended for (which may be another switch, a router, or a user's computer), not to networks of multiple devices.

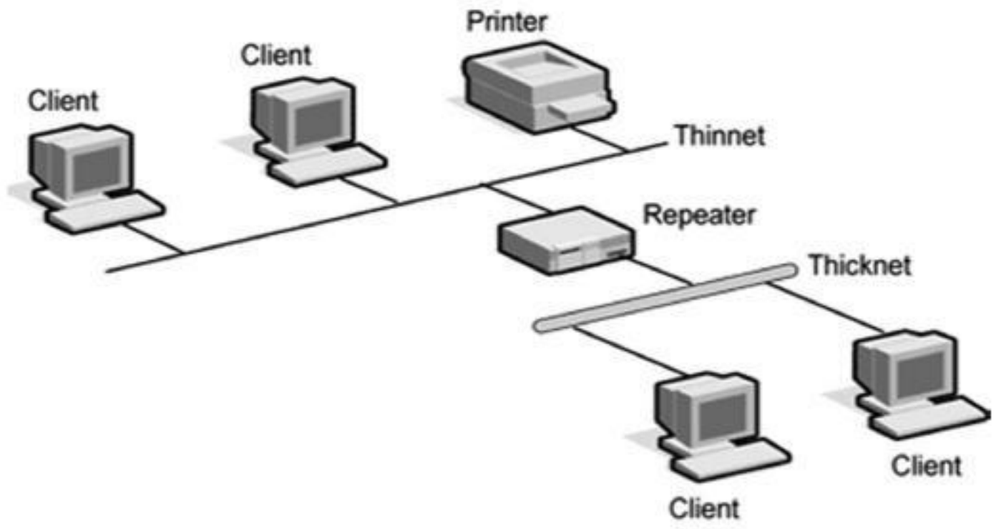


❖ **Router:** Routers select paths for data packets to cross networks and reach their destinations.

Routers do this by connecting with different networks and forwarding data from network to network - including LANs, wide area networks (WANs), or autonomous systems, which are the large networks that make up the Internet.

Now, we can say routers are necessary for an Internet connection, while switches are only used for interconnecting devices. Homes and small offices need routers for Internet access.

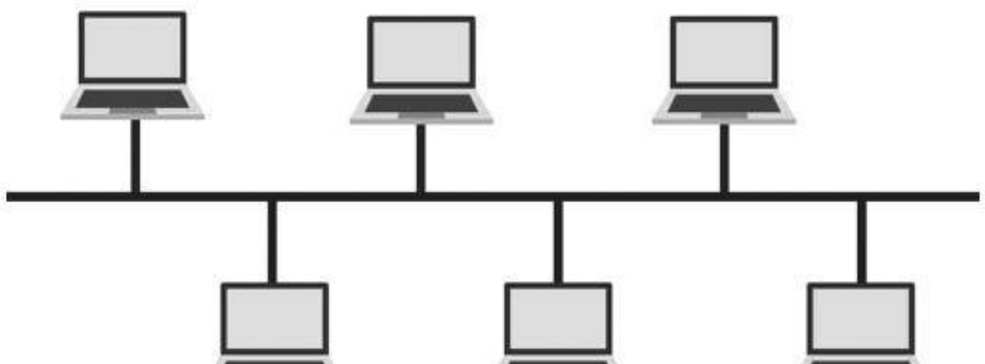
❖ **Repeater:** A repeater is an electronic device that receives a signal and retransmits it.
Repeaters are used to extend transmissions so that the signal can cover longer distances.



❖ **Gateway:** A gateway is a hardware device that goes about as a "gate" between two networks.
It is very well might be a server, firewall, router, or another device that empowers traffic to stream all through the network.

❖ **Modem:** The modem converts data between analog and digital formats in real time for two-way network communication. In the case of the high-speed digital modems popular today, the signal is much simpler and doesn't require the analog-to-digital conversion.

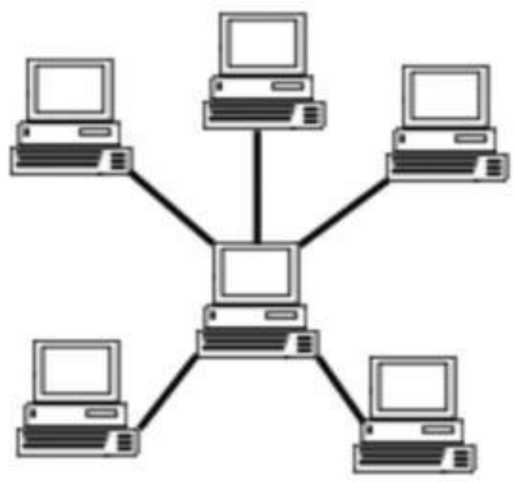
- **Topologies:**
  - ❖ **Bus Topology:** Bus topology, also known as line topology, is a type of network topology in which all devices in the network are connected by one central network cable or coaxial cable.
    The single cable, where all data is transmitted between devices, is referred to as the bus, backbone, or trunk.



Advantages of 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 Bus Topology: Cable 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.

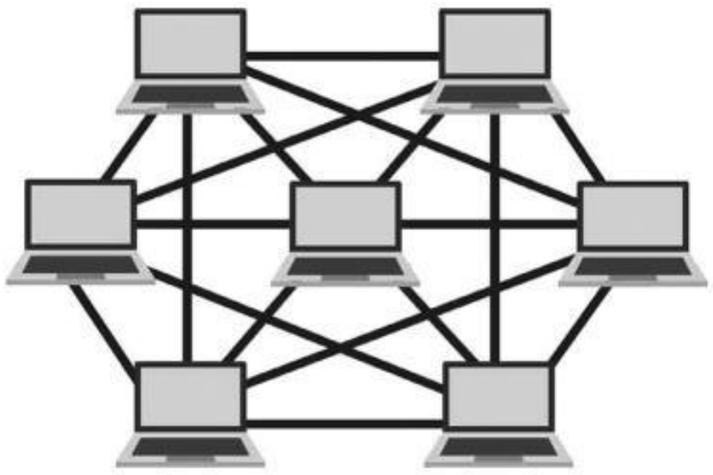
❖ **Star Topology:** A star topology, is a network topology in which each device is connected to a central hub.

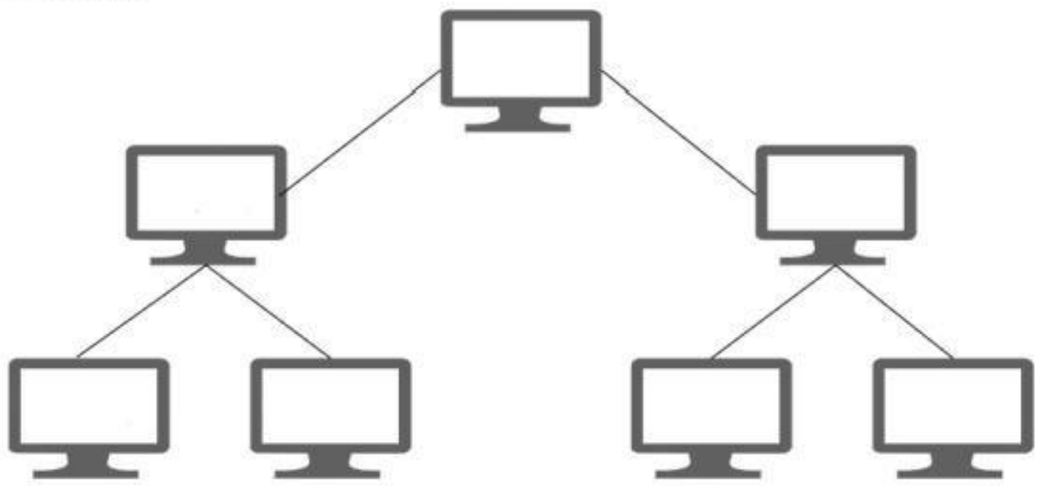


Advantages: If one node or its connection breaks, it does not affect the other computers nor their connections. Devices can be added or removed without disturbing the network, works well under heavy load. Appropriate for a large network.

Disadvantages: Expensive due to the number and length of cables needed to wire each host to the central hub. The central hub is a single point of failure for the network.

- ❖ **Mesh Topology:** A mesh topology is a network setup where each computer and network device is interconnected with one another, the connections between devices take place randomly.
- ❖ **Tree Topology:** A tree topology is a special type of structure where many connected elements are arranged like the branches of a tree. In a tree topology, there can be only one connection between any two connected nodes. Because any two nodes can have only one mutual connection, tree topologies create a natural parent and child hierarchy.





- **Introduction to Internet:**
  - ❖ It is a global network connecting millions of computers.
  - ❖ The internet is decentralized.
  - ❖ Each internet computer is independent.
  - ❖ There are a variety of ways to access the internet.
- **The Web:**
  - ❖ It is a system of internet servers that support specially formatted documents.
  - ❖ Documents are formatted in a markup language that supports links to other documents.
  - ❖ You can jump from one document to another simply by clicking on hot spots (hyperlinks).
  - ❖ Applications called web browsers that make it easy to access the World Wide Web.
- **URL:**
  - ❖ A URL (Uniform Resource Locator) is the complete address of a document on the web.
  - ❖ URL is used to access websites.
  - ❖ **For example:** the web address http://www.example.net/index.html is a URL.
- **Difference between Internet and web:** The Internet is a global network of networks while the Web, also referred formally as World Wide Web (www) is a collection of information that is accessed via the Internet.
- **Chat and Email:**
  - ❖ Chat refers to any type of online communication that offers a real-time transmission of text messages from sender to receiver.
  - ❖ An email is not a real-time transmission but a method of sending electronic mail from one person to another.
- **VoIP:**
  - ❖ Voice-over-Internet protocol (VoIP) is a technology that lets users make calls using a broadband Internet connection instead of a standard phone line.
  - ❖ VoIP technology converts the voice signal used in traditional phone calls into a digital signal that travels via the Internet rather than analog phone lines.
- **Web Browser:**
  - ❖ A web browser is a software application for accessing information on the World Wide Web.
  - ❖ When a user requests a web page from a particular website, the web browser retrieves the necessary content from a web server and then displays the page on the user's device.
  - ❖ **Popular web browsers:** Google Chrome, Mozilla Firefox, Internet Explorer, etc.

- **Web Browsers settings, add-ons and plugins:**
  - ❖ Every Internet browser has settings you can change, including privacy options, security settings, search engine preferences, autofill and autocomplete behavior, and more.
  - ❖ Web browser plugins and add-ons are programs integrated into your web browser and extending its capabilities.
- **Web Server:**
  - ❖ A web server is a computer that runs websites.
  - ❖ The basic objective of the web server is to store, process and deliver web pages to the users.
  - ❖ This intercommunication is done using Hypertext Transfer Protocol (HTTP).
- **Website:** A website is simply a collection of web pages of codes – codes that describes the layout, format and content on a page.
- **Web hosting:** Web hosting is the process of uploading/saving the web content on a web server to make it available on www.

Distinguish between website and web page

Web page	Website
A web page can be considered as a single entity.	Website is a combination of web pages.
A webpage is a content that is to be displayed on the website.	Website is a location used to display the content.
A web page URL has an extension like html, htm, php, etc.	Website URL doesn't have any extension, like that of web pages but of .com, .net, edu, mil, etc.
Requires less time to develop as it is a part of a website.	Usually, take more time as compared to a web page.

- **Distinguish between static and dynamic web page.**
  - ❖ **Static:** The contents of static page are usually unchanged over long period of time and written down manually inside HTML documents directly.
  - ❖ The content is static and will show same content to almost every visitor.
  - ❖ **Dynamic:** Dynamic webpages can show the different content, information. It is designed by server side scripting language like PHP, ASP, JSP with HTML, CSS.
  - ❖ The content is dynamic and will change according to the situation.