

Unit-IV

Computer networking or Data communications (Datacom):- is the engineering discipline concerned with the communication between computer systems or devices. A computer network is any set of computers or devices connected to each other with the ability to exchange data.^[1] Computer networking is sometimes considered a sub-discipline of telecommunications, computer science, information technology and/or computer engineering since it relies heavily upon the theoretical and practical application of these scientific and engineering disciplines. The three types of networks are: the Internet, the intranet, and the extranet.

Network:- is a collection of computers connected to each other. The network allows computers to communicate with each other and share resources and information.

Benefits of network:-

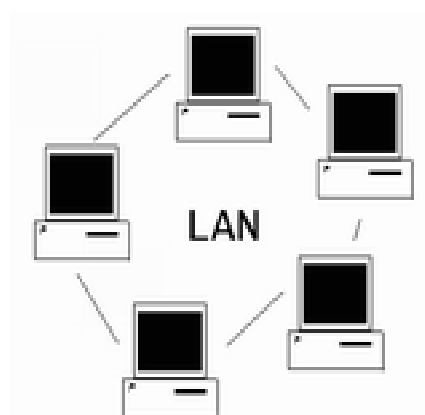
Shared Files: Share data & program files to all network users

Shared Printers: Share the cost of printer among all users gain access to different types of printers

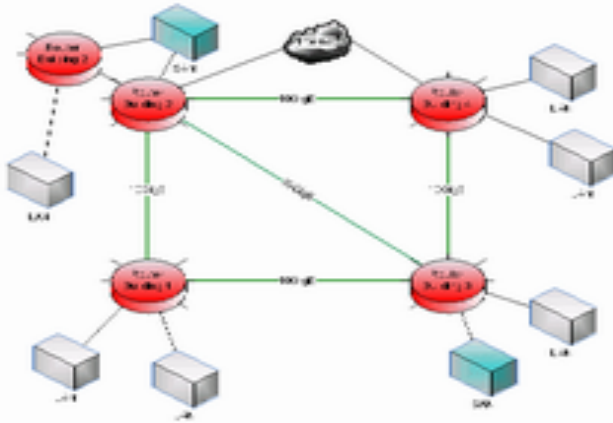
Shared Resources: Share peripheral devices access powerful information resources.

Types of network:-

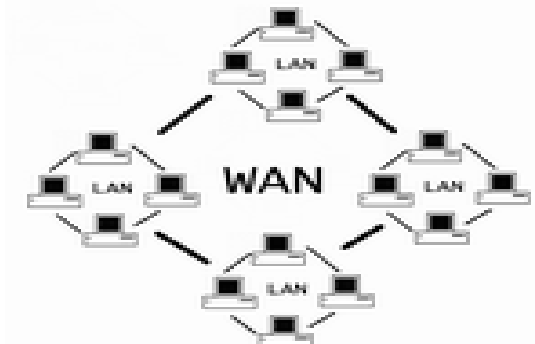
Local Area Network (LAN):- This is a network covering a small geographic area, like a home, office, or building. Current LANs are most likely to be based on Ethernet technology. A local area network (LAN) is a computer network that connects computers and devices in a limited geographical area such as home, school, computer laboratory or office building.^[1] The defining characteristics of LANs, in contrast to wide area networks (WANs), include their usually higher data-transfer rates, smaller geographic area, and lack of a need for leased telecommunication lines.



Metropolitan Area Network:- is a network that connects two or more Local Area Networks but does not extend beyond the boundaries of the immediate town/city. Routers, switches and hubs are connected to create a Metropolitan Area Network. A MAN is optimized for a larger geographical area than a LAN, ranging from several blocks of buildings to entire cities. MANs can also depend on communications channels of moderate-to-high data rates. A MAN might be owned and operated by a single organization, but it usually will be used by many individuals and organizations. MANs might also be owned and operated as public utilities. They will often provide means for internetworking of local networks.



Wide Area Network (WAN):- is a data communications network that covers a relatively broad geographic area (i.e. one city to another and one country to another country) and that often uses transmission facilities provided by common carriers, such as telephone companies. WAN technologies generally function at the lower three layers of the OSI reference model: the physical layer, the data link layer, and the network layer. The term Wide Area Network (WAN) usually refers to a network which covers a large geographical area, and use communications circuits to connect the intermediate nodes. A major factor impacting WAN design and performance is a requirement that they lease communications circuits from telephone companies or other communications carriers. Numerous WANs have been constructed, including public packet networks, large corporate networks, military networks, banking networks, stock brokerage networks, and airline reservation networks. Some WANs are very extensive, spanning the globe, but most do not provide true global coverage. Organisations supporting WANs using the Internet Protocol are known as Network Service Providers (NSPs). These form the core of the Internet



Types of LANs

A Local Area Network, as the name suggests, connects machines in close geographical proximity, although exactly what "proximity" means can be stretched. The term "Wide Area Network" (WAN) is used for networks that expand beyond the campus or office; the Internet is the best known example of a WAN. (The Internet is also an "internet", a collection of networks acting as one.) Usually a WAN will have one or more slow links, perhaps over telephone lines between cities, whereas all the links in a LAN will be fast. This difference in speed is important for optimizing the overall network performance.

The usual use of the term "LAN," however, implies more services than simply making connections between local machines. On a LAN, we expect to share files, programs, or printers, all without being particularly aware of where the physical resources we're using are actually located. LANs providing these types of services are typically set up either as "peer-to-peer" or "client-server" LANs, or perhaps as a combination of the two.

Peer-to-peer LANs

All the machines on a peer-to-peer LAN are equal. Provided that the file's owners give permission, a file on machine A can be accessed from machine B, and vice versa. Peer-to-peer LANs do not require any one machine to be a dedicated, high-performance server; service by a peer-to-peer LAN is often cheaper for this reason. Peer-to-peer LANs work well when only a small number of machines are connected to it. But as the size of the LAN grows, peer-to-peer services can become quite disorganized, and because each machine on the LAN must be powerful enough to serve all of its peers, the cost increases. For larger LANs, the dedicated client-server LAN architecture becomes more cost effective.

Client-server LANs

A client-server LAN consists of one or more server machines on which shared files and programs reside and many client machines where people do their work. The LAN server machines are usually big and fast because they must serve many users, while the client machines need only be fast enough for one person to use at a time. Shared printers are either attached directly to a server, or to a print server (a specialized computer attached to the network), or to a personal computer on network that acts as a print server.

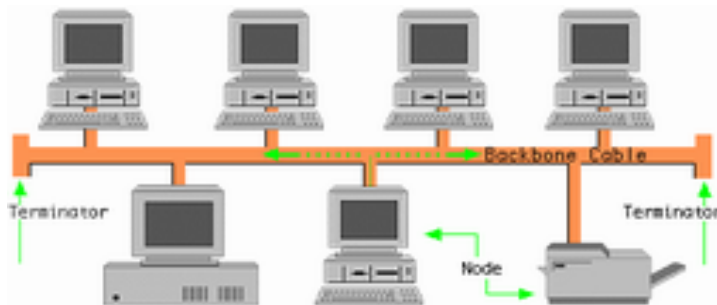
Components of LAN'S:-

1. **Cabling System:** LANs may use a wired or wireless connection system. Wired connections may be twisted pair wiring, coaxial cable or fiber optic cable. Wireless connections may be infrared, radio waves and Bluetooth.
2. **Router:** Router is a special device that directs communicating messages when several networks are connected together. It will route the traffic of the network.

3. **Bridge:** It is an interface used to connect same type of networks. LAN to LAN, MAN to MAN.
4. **Gateway:** It is an interface used to connect different types of networks
5. **NIC(N/w interface Card):** A NIC enables the computer to send and receive messages over a cable network.

Topologies of LAN:- A network topology describes the arrangement of systems on a computer network. It defines how the computers, or nodes, within the network are arranged and connected to each other. Some common network topologies include star, ring, line, bus, and tree configurations. These topologies are defined below:.

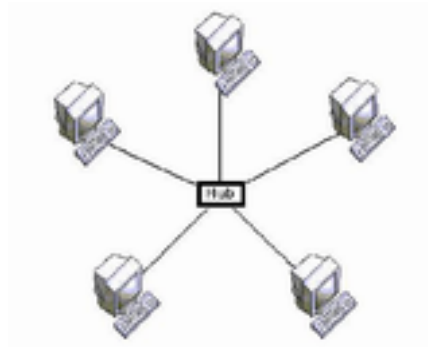
1. **Bus topology** is a network architecture in which a set of clients are connected via a shared communications line, called a bus. Bus network topology uses a broadcast channel which means that all attached stations can hear every transmission and all stations have equal priority in using the network to transmit data. Each node is connected to a central bus that runs along the entire network. All information transmitted across the bus can be received by any system in the network.



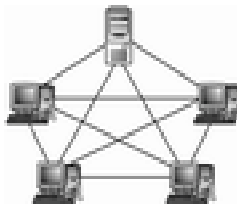
2. **Ring topology:** is a network topology in which each node connects to exactly two other nodes, forming a circular pathway for signals – a ring. Data travels from node to node, with each node handling every packet. Each node is connected to exactly two other nodes, forming a ring. Can be visualized as a circular configuration. Requires at least three nodes.



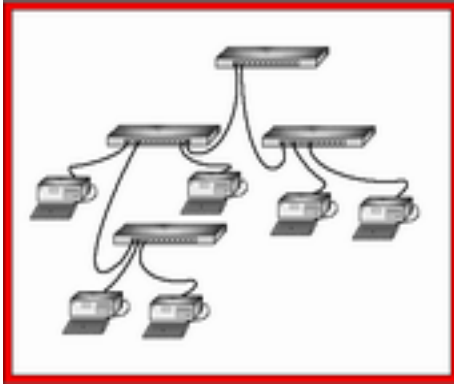
3. **Star topology** is one of the most common computer network topologies. In its simplest form, a star network consists of one central switch, hub or computer, which acts as a conduit to transmit messages. Thus, the hub and leaf nodes, and the transmission lines between them, form a graph with the topology of a star. One central node is connected to each of the other nodes on a network. Similar to a hub connected to the spokes in a wheel.



4. **Mesh topology** whose nodes are all connected to each other is a fully connected network. Mesh Network is a network where all the nodes are connected to each other and is a complete network. In a Mesh Network every node is connected to other nodes on the network through hops. Some are connected through single hops and some may be connected with more than one hop.

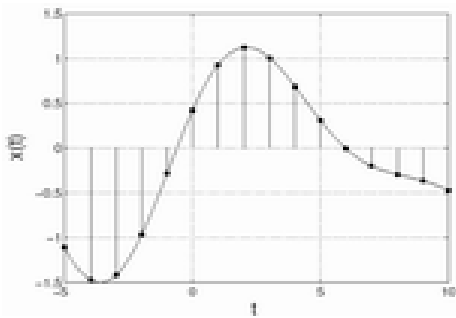


5. **Tree** Also known as a **hierarchical network**. One "root" node connects to other nodes, which in turn connect to other nodes, forming a tree structure. Information from the root node may have to pass through other nodes to reach the end nodes. The type of network topology in which a central 'root' node (the top level of the hierarchy) is connected to one or more other nodes that are one level lower in the hierarchy



Analog to Digital: -

Analog signal: An **analog** or **analogue signal** is any continuous signal for which the time varying feature (variable) of the signal is a representation of some other time varying quantity, i.e., analogous to another time varying signal. It differs from a digital signal in terms of small fluctuations in the signal which are meaningful. Analog is usually thought of in an electrical context; however, mechanical, hydraulic, and other systems may also convey analog signals.

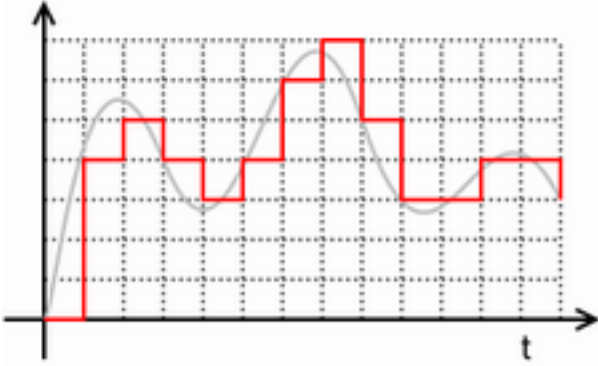


An analog signal uses some property of the medium to convey the signal's information. For example, an aneroid barometer uses rotary position as the signal to convey pressure information. Electrically, the property most commonly used is voltage followed closely by frequency, current, and charge.

Frequency: No. of cycles per second.

Amplitude: Height of the signal.

Digital Signal: - The term **digital signal** is used, to refer to more than one concept. It can refer to discrete-time signals that have a discrete number of levels, for example a sampled and quantified analog signal, or to the continuous-time waveform signals in a digital system, representing a bit-stream. In the first case, a signal that is generated by means of a digital modulation method which is considered as converted to an analogue signal, while it is considered as a digital signal in the second case.



To convert analog signal to digital and vice versa we use modem. Modem is short form “Modulator/ Demodulator”.

Internet Concepts:- In 1957 US established the ARPA (Advanced Research Project Agency) to investigate ways of increasing the military use of digital communication.

1969- With four nodes network was established

1973 – with 15 nodes

1984- JANET(Joint Academic N/w)

1989 – WWW(World wide web)

How the web works:- Web document can be linked together because they are created in a hypertext format.

Hypertext: Text, Pictures, sounds, movies etc.

To support hypertext document web uses a special protocol called HTTP(Hyper text transfer Protocol)

A hypertext document is a specially encoded files that uses the HTML. This language allow user to attach links. Hypertext document or links are called web pages.

A collection of related web pages is called a web site.

URL (Uniform Resource Locator) The HTTP uses internet address in a special format called URL's .

<http://www.loc.gov>

Hyperlink: Inside a webpage you can open them by clicking on the particular link.

File Transfer Protocol (FTP) is a network protocol used to transfer data from one computer to another through a network such as the Internet.

FTP is a file transfer protocol for exchanging and manipulating files over a computer

network. An FTP client may connect to an FTP server to manipulate files on that server.

Telnet (Telecommunication network) is a network protocol used on the Internet or local area network (LAN) connections. Typically, telnet provides access to a command-line interface on a remote machine.

Electronic mail, often abbreviated to **e-mail**, **email** or **eMail**, is a method of creating, transmitting, or storing primarily text-based communications with digital communications systems. Originally, e-mail consisted only of text messages composed in the ASCII character set, virtually any media format can be sent today, including attachments of audio and video clips.

Electronic commerce, commonly known as **e-commerce** or **eCommerce**, consists of the buying and selling of products or services over electronic systems such as the Internet and other computer networks.

Electronic commerce, commonly known as **e-commerce** or **eCommerce**, or **e-business** consists of the buying and selling of products or services over electronic systems such as the Internet and other computer networks. The amount of trade conducted electronically has grown extraordinarily with widespread Internet usage. The use of commerce is conducted in this way, spurring and drawing on innovations in electronic funds transfer, supply chain management, Internet marketing, online transaction processing, electronic data interchange (EDI), inventory management systems, and automated data collection systems. Modern electronic commerce typically uses the World Wide Web at least at some point in the transaction's lifecycle, although it can encompass a wider range of technologies such as e-mail as well.

- Internet banking
- Online Shopping

The World Wide Web (commonly shortened to **the Web**) is a system of interlinked hypertext documents accessed via the Internet. With a Web browser, one can view Web pages that may contain text, images, videos, and other multimedia and navigate between them using hyperlinks.

A **Web search engine** is a tool designed to search for information on the World Wide Web. Information may consist of web pages, images, information and other types of files. Some search engines also mine data available in news books, databases, or open directories. Unlike Web directories, which are maintained by human editors, search engines operate algorithmically or are a mixture of algorithmic and human input.