# Computer Network

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a network is a group of two or more computer systems linked together to exchange data and share resources, including expensive peripherals such as high-performance laser printers. Through the use of networked computers, people and businesses are able to communicate and collaborate in ways that were not possible before.

*Network Advantages:*

- *Reduced hardware costs*
  Networks reduce costs because users can share expensive equipment.

- *Application sharing.*
  Networks enable users to share software. Network versions of applications installed on a file server can be used by more than one user at a time.

- *Sharing information resources.*
  Organizations can use networks to create common pools of data that employees can access.

- *Centralized data management.*
  Data stored on a network can be accessed by multiple users. Organizations can ensure the security and integrity of the data on the network with security software and password protection.

- *Connecting people.*
  Networks create powerful new ways for people to work

# Network Disadvantages:

- *Loss of autonomy.*
When you become a part of a network, you become a part of a community of users. Sometimes this means that you have to give up personal freedoms for the good of the group.

- *Lack of privacy.*
Network membership can threaten your privacy. Network administrators can access your files and may monitor your network and Internet activities.

- *Security threats.*
Because some personal and corporate information is inevitably stored on network servers, it is possible that others may gain unauthorized access to files, user names, and even passwords.

- *Loss of productivity.*
As powerful as networks are, they can still fail. Access to resources is sometimes restricted or unavailable because of viruses, hacking, sabotage, or a simple breakdown

# Differences Between Networks

- **(LAN)**
uses cables, radio waves, or infrared signals typically owned and managed by a single person or organization

- **(WAN)**
uses long-distance transmission media to link computers separated by a few miles or even thousands of miles. owned by a single organization

- **(MAN)**
is a network designed for a city or town. It is usually larger than a LAN but smaller than a WAN. Typically, a MAN is owned by a single government or organization.

- *(CAN)*
includes several LANs that are housed in various locations on a college or business campus. Usually smaller than a WAN, CANs use devices such as switches, hubs, and routers to interconnect

- *(PAN)*
This is a network created among an individual's own personal devices, usually within a range of 32 feet.

- *(HAN)*
is a personal and specific use of network technology that provides connectivity between users and devices located in or near one residence.

- *Peer-to-Peer Networks*

  In a peer-to-peer (P2P) network, all of the computers on the network are equals, or peers that's where the term *peer-to peer* comes from. So, on a P2P network there's no file server, but each computer user decides which, if any files will be accessible to other users on the network. P2P networks are easy to set up; people who aren't networking experts do it all the time

- *Client/Server Networks*

  The typical corporate or university LAN is a client/server network, which includes one or more servers as well as clients Some common servers on a client/server network include those that provide e-mail, file storage, and database storage, and facilitate communication with other networks, The client/server model works with any size or physical layout of LAN and doesn't tend to slow down with heavy use.

- *Virtual Private Network (VPN)*

  **A VPN operates as a private network over a public network, usually the Internet, making data accessible to authorized users in remote locations through the use of secure, encrypted connections and special software**

# LAN Topologies

A topology isn't just the arrangement of computers in a particular space
a topology provides a solution to the problem of contention,
which occurs when two computers try to access the LAN at the same time.

• *Bus Topology*
 every node, whether it is a computer or peripheral device,
 is attached to a common cable or pathway referred to as the bus
 With a bus topology, only one node can transmit at a time. If more than one
 node tries to send data at the same time, each node waits a small random
 amount of time and then attempts to retransmit the data.
 bus networks are simple, reliable, and easy to expand. The bus topology
 is practical in a relatively small environment such as a home or small office.

- *Star Topology*
solves the expansion problems of the bus topology with a central wiring device, which can be a hub, switch, or computer The star topology is ideal for office buildings, computer labs, and WANs. The down side of a star topology is that the loss of the hub, switch, or central computer, caused by a power outage or virus invasion, can bring down the entire network.

- *Ring Topology*
all of the nodes are attached in a circular wiring arrangement. This topology, not in common use today, A special unit of data called a token travels around the ring. A node can transmit only when it possesses the token. The ring topology is well suited for use within a division of a company or on one floor of a multi-floor office building.

# WAN Components

• *Point of Presence (POP)*
is a wired or wireless WAN network connection point that enables users to access the WAN. To provide availability to it users,
However, POPs may still not be available in many rural areas


• *Backbones*
The LANs and WANs that make up the Internet are connected to the Internet backbone. Backbones are the high-capacity transmission lines that carry WAN traffic. A variety of physical media are used for backbone services, including microwave relays, satellites, and dedicated telephone lines.
Some backbones are regional, connecting towns and cities in a region

# LAN Components

- **HUB:**
Hubs are commonly used to connect segments of a LAN.
A hub contains multiple ports. When a packet arrives atone port,
it is copied to the other ports so that all segments of the LAN can
see all-packets.
- **Switch:**
A switch is like a hub in that it is a central point for connecting network
cables; however, a switch is able to receive a packet and
transmit it to only the destination computer.
- **Router:**
Routers make the connection to the Internet for LANs.
They use a configuration table to decide where packets should go.

# Packet & Circuit Switching

The Internet uses packet switching whereas the public switched telephone network (PSTN) uses circuit switching.
With circuit switching, the method used in the public switched telephone system, there is a direct connection between the communicating devices.
packet switching, the method used for computer communication,
No effort is made to create a single direct connection between the two communicating devices.
In circuit switching data is sent over a physical end-to-end circuit
Between the sending and receiving computers
In packet switching the sending computer's outgoing message is divided into packets each packet is numbered and addressed to the destination computer.

# *Their weaknesses and Strengths*

- *Packet Switching*

Is more efficient and less expensive than circuit switching.  What's more, packet-switching networks are more reliable. A packet switching network can function even if portions of the  network aren't working. However, packet switching does have some drawbacks. When a router examines a packet, it delays  the packet's progress by a tiny fraction of a second. In a huge packet-switching network such as the Internet a given packet may be examined by many routers, which introduces a noticeable delay called latency.

## Circuit Switching

It enables any Internet connected computer to connect almost Instantly and effortlessly with any other Internet-connected computer anywhere in the world.

# Network Protocol

They are fixed formalized exchanges that specify how two dissimilar network components can establish a communication.
All of the communications devices in a network conform to different protocols.
Take modems, for example. To establish communications, modems must conform to standards called modulation protocols, which ensure that your modem can communicate with another modem even if the second modem was made by a different manufacturer.
Several modulation protocols are in common use. Each protocol specifies all of the necessary details of communication, including the data transfer rate, or the rate at which two modems can exchange data.

# *Wired Protocols*

Today wired home networks are not as popular due to the hassle of physically pulling wire to each device on the network

*Versions:*

- *Cat-5:* wire transfers data at speeds of up to 100 Mbps
- *Cat-6:* transfers data at speeds of up to 1,000 Mbps (1 Gbps).

# *Wireless Protocols*

Wireless networks are gaining in popularity because of their ease of setup and convenience. There are no unsightly wires to run through the home, and users are no longer limited to working in just one location.

*Versions:*

- *The 802.11g:* operates in the 2.4 GHz radio band and is capable of data transfer rates of up to 54 Mbps.
- *The 802.11n:* can operate in both the 2.4 GHz and 5 GHz radio band, and the average data transfer rate is about 300 Mbps.

**Reference:**
http://portal.limu.edu.ly/pluginfile.php/22664/mod_resource/content/1/Computers%20Are%20Your%20Future

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