

Information Technology Networks & Communication Systems

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What is a Network?

- As the demands on IT systems and computers have grown, the need to share resources to create an overall working system has emerged.
- Network is the concept of having more than one computer, hardware devices, software and communication devices working in tandem with each other for a common purpose.



Network Materials

- Network consists of the following materials:
 - Computers (Desktop, Server, Mainframe)
 - Printers and other devices connected for common use
 - Communications Media for connecting these devices (Hubs, Switches, Routers, Modems)
 - Software for allowing for the system to work together
 - Protocols for determining how the data is transmitted and how the applications are prioritized and how the rights are determined

Types of Computer Networks

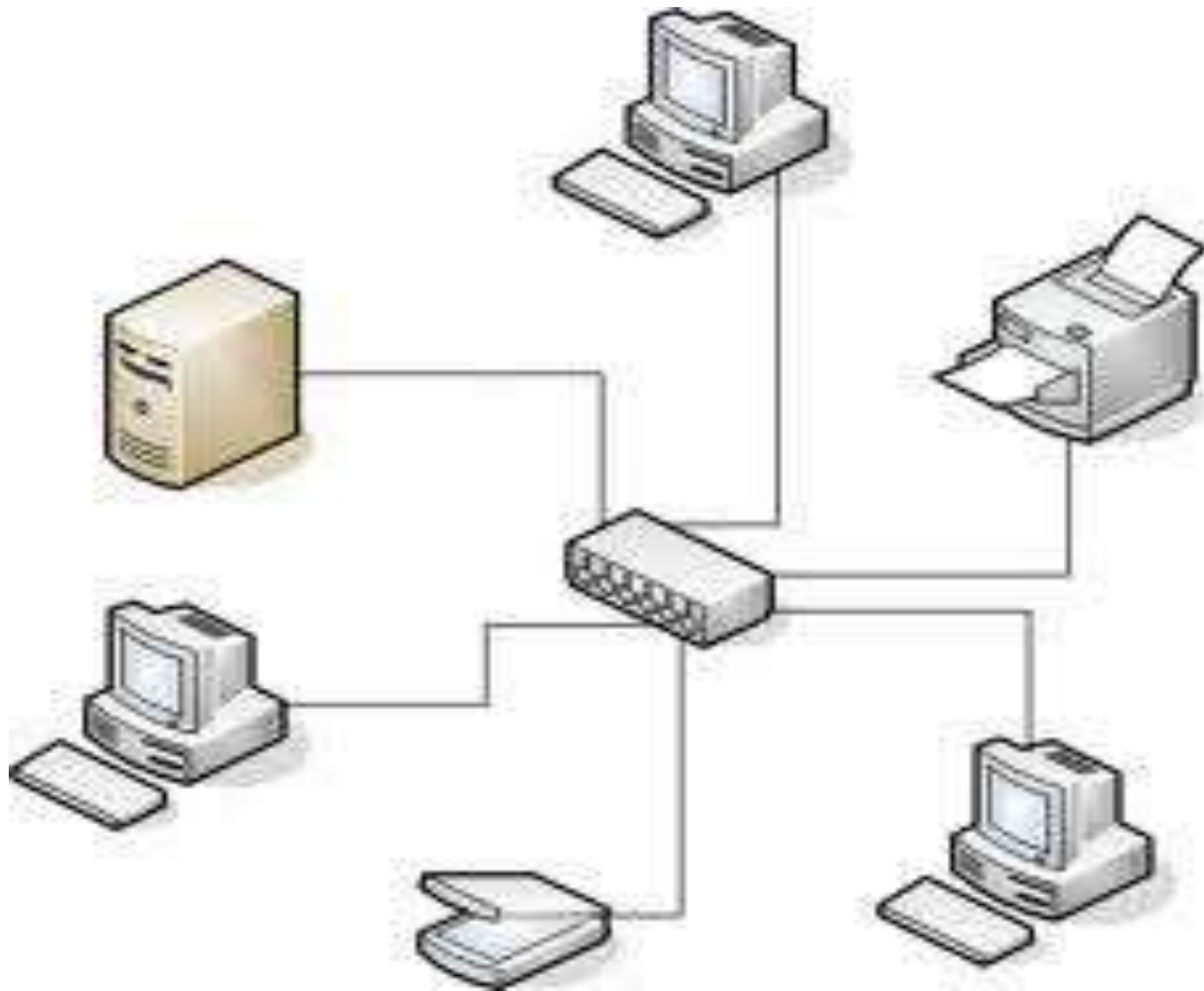
- There are mainly two types of computer network types for computer systems
 - Local Area Network
 - Wide Area Network



Local Area Network (LAN)

- Local Area Network connects two or more communicating devices within a building or within nearby buildings.
- Every user on LAN has the potential to communicate with every other device
- LAN allows large number of corporate users to share resources such as printers, programs, storage devices and data files
- LAN users can have a common access to corporate information which can allow for productivity

LAN



How to Connect LAN Devices?

- LAN consists of cabling or wireless technology linking individual devices, network interface cards (adapters that allow for network cables to be interfaced with computers) and software to control LAN activities
- Hub / Switch connects more than one device in a nearby area.
- Bridge connects two networks of the same type
- Router connects LAN to Wide Area Network.

Wireless Local Area Network (WLAN)

- WLAN technologies provide LAN connectivity, typically limited to less than 150 meters, usually within one building.
- Wi-fi is the usage of radio technology to create internet and network connectivity wirelessly
- Bluetooth is used for shorter range applications to connect computers, printers and palm pilots.

WLAN

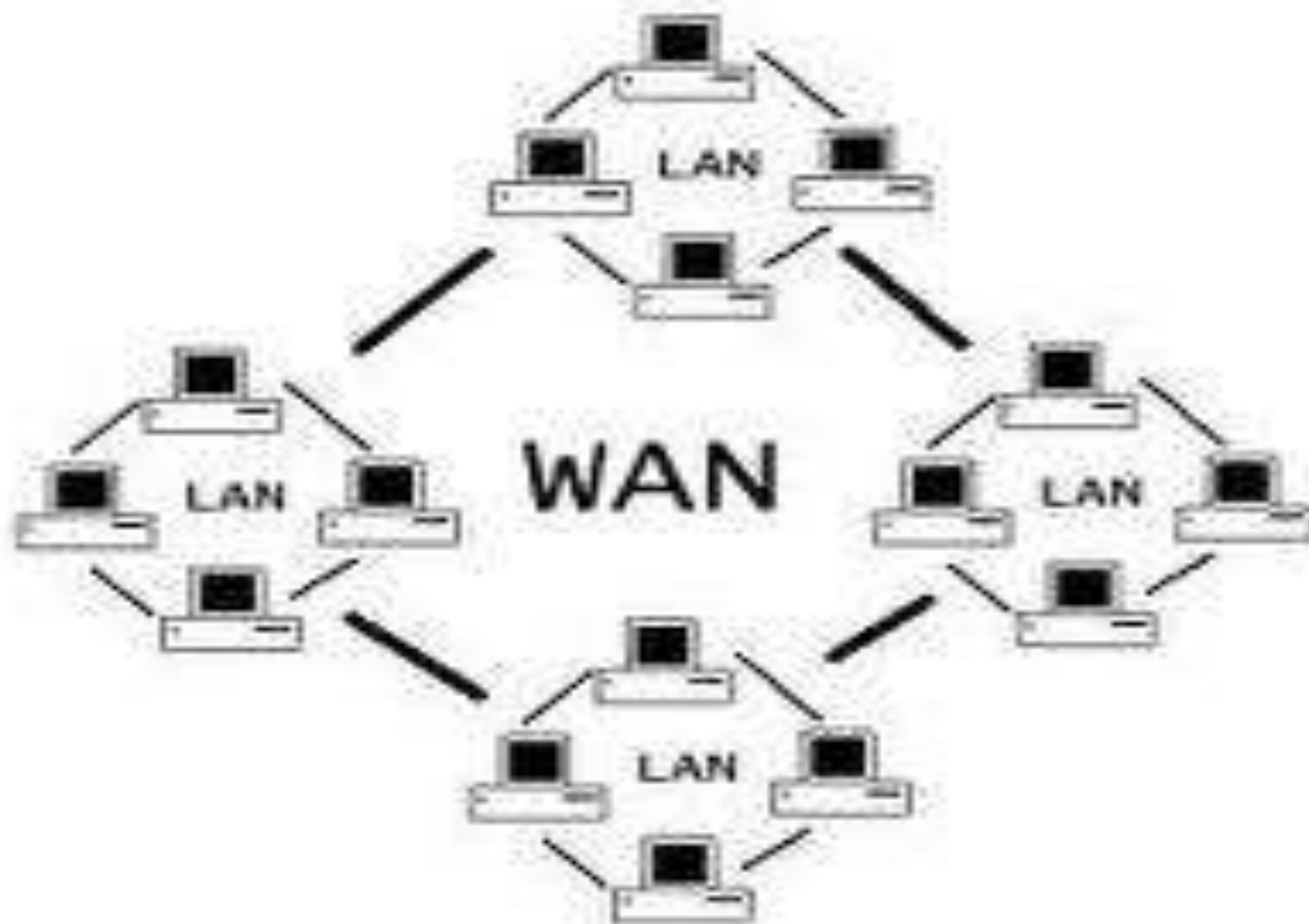


Access points wirelessly transmit data to and from network devices, connect wireless devices to the wired LAN, and the internet.

Wide Area Networks (WAN)

- Wide area networks are long haul, broadband networks covering wide geographic areas.
- Some WANs are commercial, while others are private created by large corporations
- An example of a widespread public WAN is the Internet.
- WANs may connect using cables as well as wireless technology.

WAN



Virtual Private Network (VPN)

- Virtual Private Network is a gateway between a corporate LAN and an Internet.
- VPN allows an access to corporate networks email, shared files etc. with an Internet connection
- VPN transmissions are encrypted allowing for the necessary security for companies.
- VPNs are used as extranets

VPN

How VPNs Work

Virtual private networks are two things to connect external hosts securely: **authentication** and **encryption**.



Network Transmission

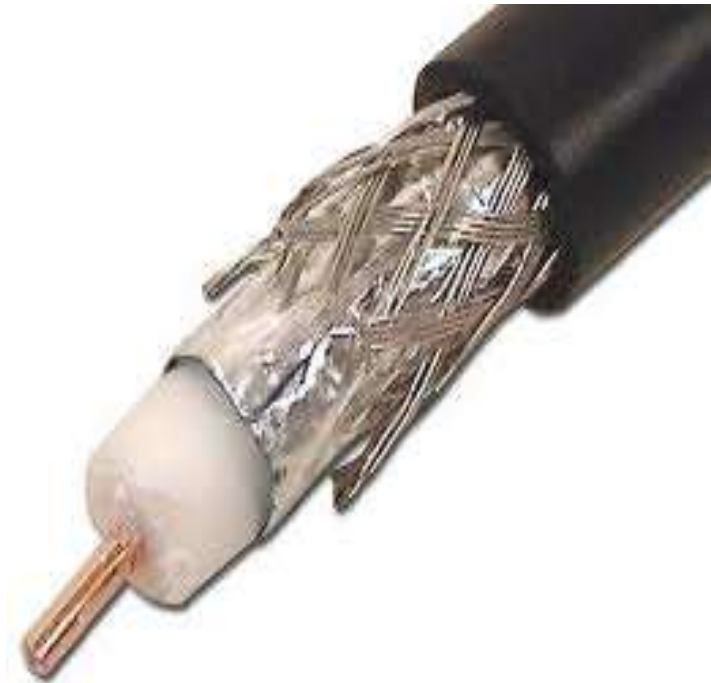
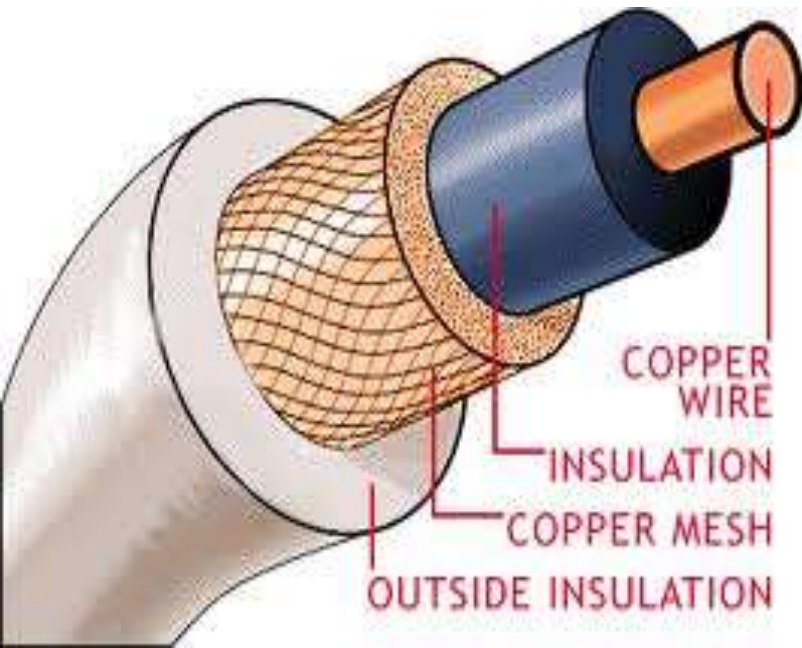
- In order to create a network, you need a medium to transmit the signal from one computer or device to another.
- The types of transmission technology are:
 - 1) Cable Media
 - 2) Broadcast Media

Cable Media

- Cable Media use physical wires or cables to transmit data and information. The three types of cable that are available are:
 - Coaxial Cable
 - Twisted Pair
 - Fiber optic cables

Coaxial Cable

- Coaxial Cable: These cables are like black TV cables and they can transmit huge amounts of information (like audio – visual signals), but they are expensive



Twisted Pair Cable

- Twisted Pair: These cables are very widespread and majority of networks are used with these since they use RJ-45 connectors.
- These connectors are similar to telephone connectors and they make connection very easy
- Twisted pair cables consist of 8 cables twisted around each other.



Fiber Optic Cables

- Fiber optic cables: They transmit laser signals through glass fibers.
- They are very expensive due to high cabling costs
- A single glass fiber can carry more than 50,000 simultaneous telephone cables compared to only 5,500 calls.
- Fiber cable can carry 25 terabits of data per second.



Network Broadcast Media

- Microwave Signals
- Radio Signals
- Cellular Transmission
- Infrared
- Satellite

Broadcast Media Properties

- On the available broadcast media, satellites have a high bandwidth and large coverage area, but they are the most expensive. Mostly preferred for ATM's and similar remote outposts.
- Radio transmissions are cheap and signals can pass through walls. However, the security is an issue, but all computers and notebooks use radio technology for wireless networking.
- Microwave, infrared are susceptible to interference

Network Management Software

- Network Operating system is a software that controls the hardware devices, software and communications media across the network.
- Some common network operating systems are:
 - Microsoft NT / Microsoft Server 2003-2008
 - Novell Netware

Network Protocols

- The set of rules and procedures that govern transmission across a network is called protocol.
- The principal functions of protocols in a network are line access and collision avoidance.
- Line access is the regulation of how the sending device gains access to the network
- Collision avoidance refers to managing message transmission so that two messages do not collide over the network

TCP / IP

- Transmission Control Protocol / Internet Protocol (TCP / IP) refers to a transfer protocol that can send files of information across networks with the assurance that the data will arrive in an uncorrupted form.