- ❖ A Network is a group of connected devices.
- ❖ Bandwidth: The maximum data transmission capacity over a network, measured by bits per second
- ❖ Local Area Network (LAN) is a network that spans a small area like an office building, a school, or a home.
- ❖ Wide Area Network (WAN) is a network that spans a large geographic area like city, state, or country.
- ❖ **Common network devices:**
    - o Hub: broadcasts information to every device on the network
    - o Switch: makes connections between specific devices on a network by sending and receiving data between them.
    - o Router: connects multiple networks together.
    - o Modem: connects your router to the internet and brings internet access to the LAN
- ❖ Virtualization Tools are pieces of software that perform network operations.
- ❖ Cloud computing is the practice of using remote servers, applications, and network services that are hosted on the internet instead of on local physical devices.
- ❖ A Cloud Network is a collection of servers or computers that stores resources and data in a remote data center that can be accessed via the internet
- ❖ Cloud Service Provider (CSP) is a company that offers cloud computing services.

❖ **CSPs provide three main categories of services:**

  o Software as a service (SaaS) refers to software suites operated by the CSP that a company can use remotely without hosting the software.

  o Infrastructure as a service (Iaas) refers to the use of virtual computer components offered by the CSP. These include virtual containers and storage that are configured remotely through the CSP's API or web console.

  o Platform as a service (PaaS) refers to tools that application developers can use to design custom applications for their company. Custom applications are designed and accessed in the cloud and used for a company's specific business needs.

❖ When organizations use a CSP's services in addition to their on-premise computers, networks, and storage, it is referred to as a hybrid cloud environment.

❖ Data packet: A basic unit of information that travels from one device to another within a network

❖ Segmentation is the process of dividing up a large data transmission into smaller pieces that can be processed by the receiving system.

❖ Packet sniffing: The practice of capturing and inspecting data packets across a network

- ❖ **Internet Protocol (IP):** A set of standards used for routing and addressing data packets as they travel between devices on a network
- ❖ **Media Access Control (MAC) address:** A unique alphanumeric identifier that is assigned to each physical device on a network
- ❖ **Address Resolution Protocol (ARP)** assists IP with directing data packets on the same physical network by mapping IP addresses to MAC addresses on the same physical network.
- ❖ **Internet Control Message Protocol (ICMP):** shares error information and status updates of data packets which is useful for detecting and troubleshooting network errors.
- ❖ **Transmission Control Protocol (TCP):** ensures that data is reliably transmitted to the destination service and contains the port number of the intended destination service, which resides in the TCP header of a TCP/IP packet.
- ❖ **User Datagram Protocol (UDP)** used by applications that are not concerned with the reliability of the transmission. Data sent over UDP is not tracked as extensively as data sent using TCP. Because UDP does not establish network connections, it is used mostly for performance sensitive applications that operate in real time, such as video streaming

❖ **The TCP/IP model has four layers:**

o **Network Access Layer:**

- Organizes sending and receiving data frames within a single network
- Corresponds to the physical hardware involved in network transmission (Hubs, Modems, cables, etc.)
- The Address Resolution Protocol (ARP) is part of the network access layer.

o **Internet Layer:**

- Determines which protocol is responsible for delivering the data packets
- IP and ICMP are used protocols in this layer.

o **Transport Layer:**

- Responsible for reliably delivering data between two systems or networks
- TCP and UDP are used protocols in this layer.
- Protocols that occur at this layer

o **application layer:**

- Similar to the application, presentation, and session layers of the OSI model
- Responsible for making network requests or responding to requests
- Defines which internet services and applications any user can access

❖ **The OSI Model has 7 Layers:**

- o **Physical Layer:**
  - Corresponds to the physical hardware involved in network transmission (Hubs, Modems, cables, etc.)

- o **Data Link Layer:**
  - Organizes sending and receiving data packets within a single network

- o **Network Layer:**
  - Oversees receiving the frames from the data link layer and delivers them to the intended destination

- o **Transport Layer:**
  - Responsible for delivering data between devices
  - Handles the speed of data transfer, flow of the transfer, and breaking data down into smaller segments to make them easier to transport.

- o **Session Layer:**
  - Keeps the session open while data is being transferred and terminate the session once the transmission is complete.
  - Responsible for activities such as authentication, setting checkpoints, reconnection, and during a data transfer.

- o **Presentation Layer:**
  - Involve data translation and encryption for the network
  - Adds to and replaces data with formats that can be understood by applications (layer 7) on both sending and receiving systems.

- o **Application Layer:**
  - Includes processes that directly involve the everyday user
  - Includes all of the networking protocols that software applications use to connect a user to the internet