Lecture 16

Fundamentals of Computer Networks

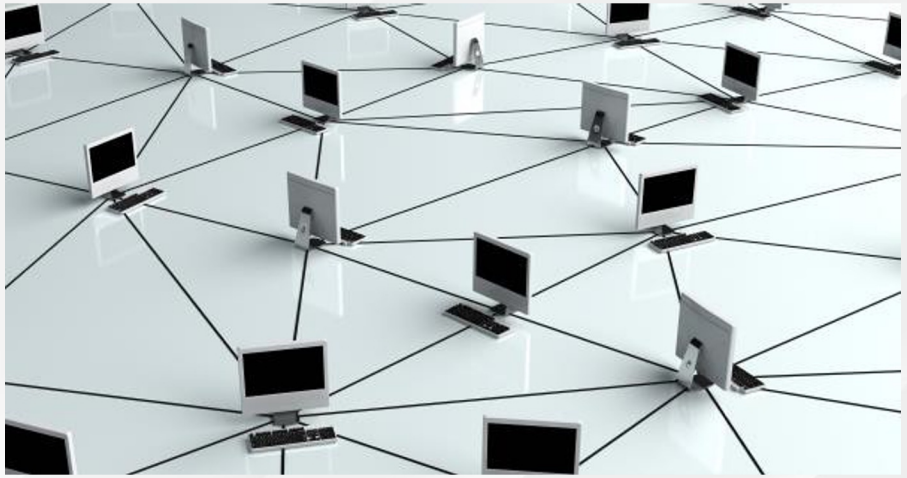
CT4005NI - Computer Hardware and Software Architectures

16.Introduction

This chapter provides an overview of network principles, standards, and purposes.

Objectives

- Principles of networking.
- Types of networks.
- Basic networking concepts and technologies.
- Physical components of a network.
- LAN topologies and architectures.



16.1 Principles of Networking

10.1.1 Computer Networks

- A computer data network is a *collection* of *hosts* **connected** by networking *devices*.
- A **host** is any device that sends and receives information on the network.
- Peripherals are devices that are connected to hosts. **Example: Printer**
- Computer networks are used globally in businesses, homes, schools, and government agencies.
- Different Types of devices can connect to the network. **Example**, Computer, Printer, Smart phones and so forth.

16.1 Principles of Networking

16.1.1 Computer Networks

Resources shared in a Network

- Services, such as printing or scanning and Applications, such as databases.
- Storage space on removable devices, such as hard drives or optical drives

Connections used to Link Network Devices

- **Copper cabling** – Uses electrical signals to transmit data between devices
- **Fiber-optic cabling** – Uses glass or plastic wire, also called fiber, to carry information as light pulses
- **Wireless connection** – Uses radio signals, infrared technology, or satellite transmissions

16.1 Principles of Networking

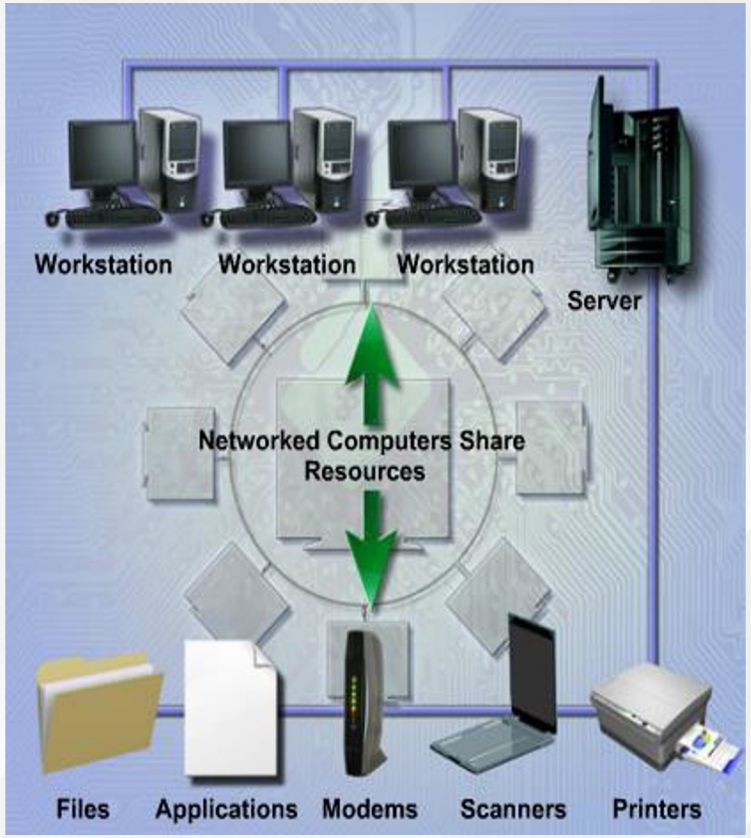
16.1.2 Benefit of Networking

Fewer Peripherals Needed

- Various devices like Printer, Scanner or Backup devices can be shared and managed in a network.

Increased Communication Capabilities

- Several collaboration tools like Email, Forums, Instant Messaging can be used to communicate between network users.



16.1 Principles of Networking

Avoid File Duplication and Corruption

- A server manages network resources, share and store data, classify confidential data, and prevents from corrupting the integrity of files using Document Tracking Software.

Lower Cost Licensing

- One can reduce license cost for individual computer by using Site License for entire organization for a single fee.

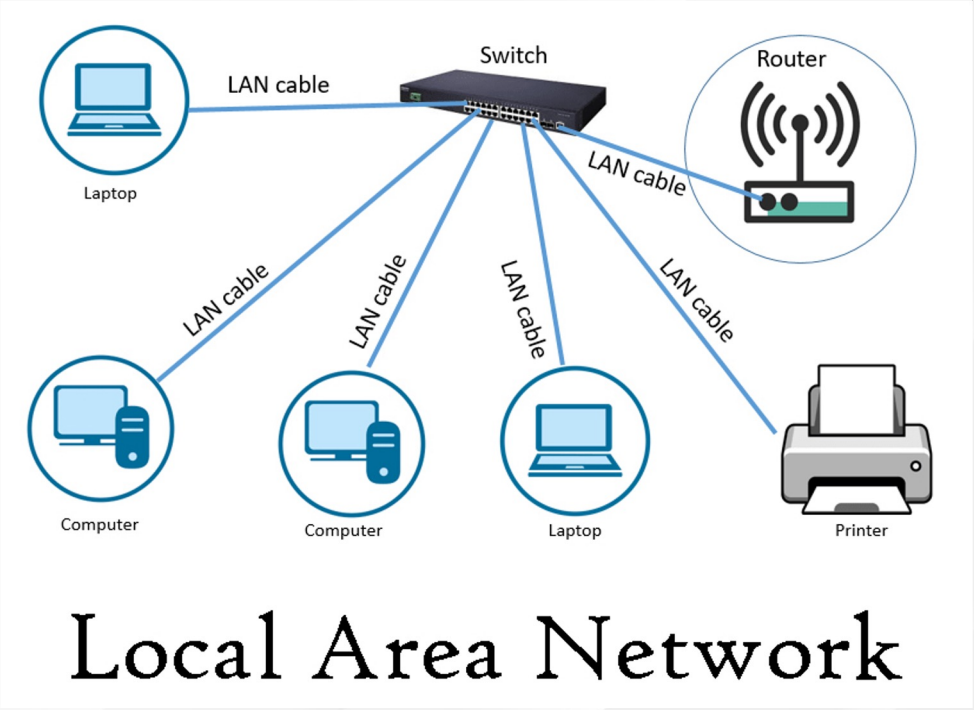
Centralized Administration

- Centralized administration reduces the number of people needed to manage the devices and data on the network, reducing time and cost to the company.

16.2 Types of Networks

16.2.1 LAN

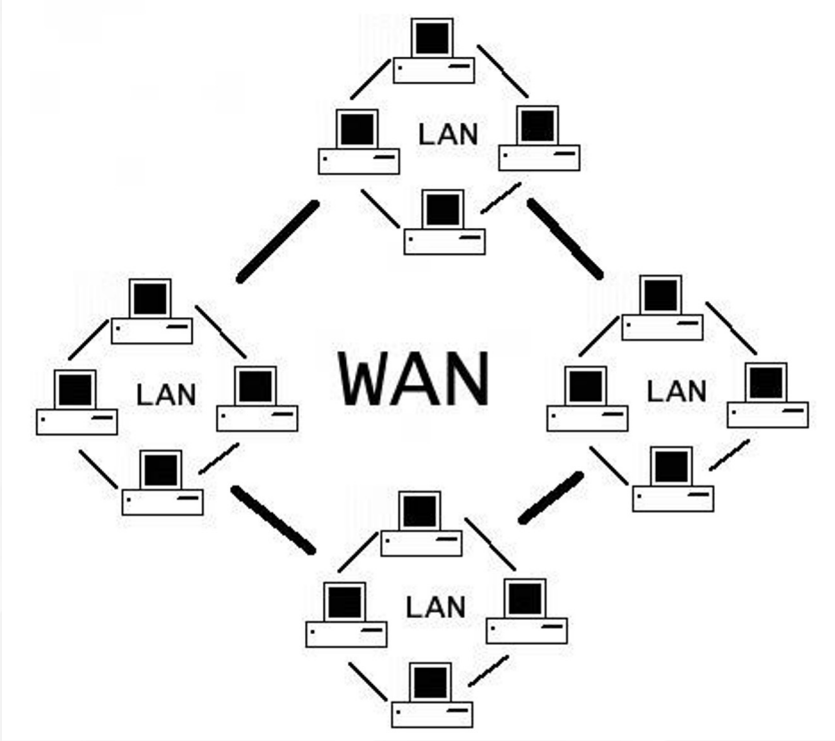
- A LAN is a group of interconnected devices that is under the same administrative control.
- Traditionally, LANs were considered to be small networks that existed in a single physical location.
- However, it has evolved to include interconnected local networks consisting many hundreds of devices, located in multiple buildings and location, but within same administrative control.



16.2 Types of Networks

16.2.2 WAN

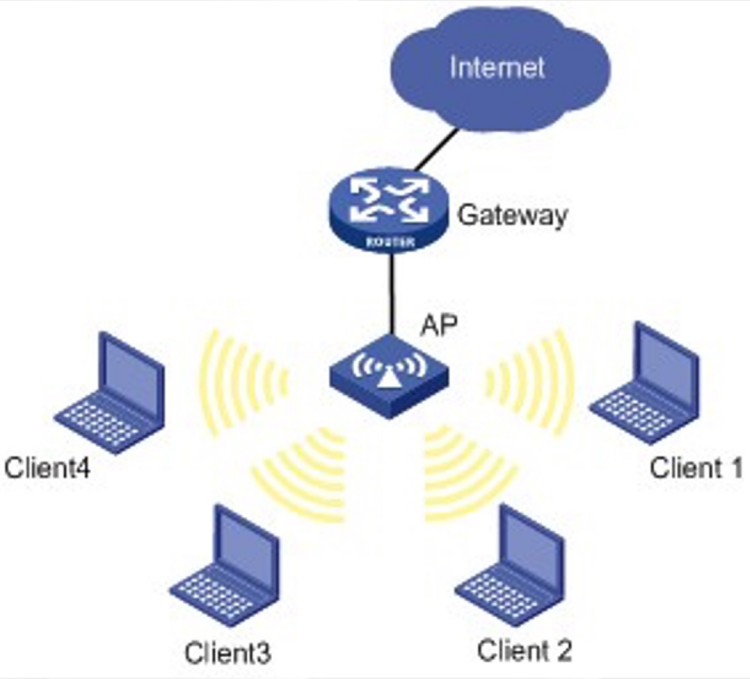
- A WAN is a network that connects LANs in geographically separated locations.
- The most common example of a WAN is the Internet.
- The Internet is a large WAN that is composed of millions of interconnected LANs, interconnected by Telecommunication service providers.



16.2 Types of Networks

16.2.3 Wireless LAN

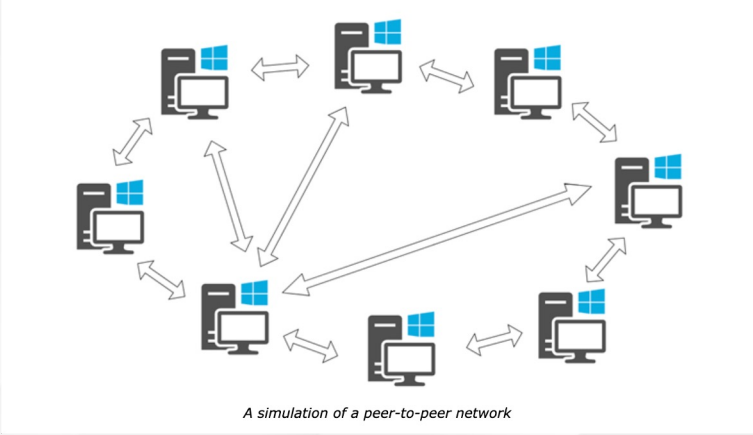
- In some environments, installing copper cabling might not be practical, desirable, or even possible.
- Hence, radio waves can be used to transmit and receive data.
- These networks are called wireless LANs, or WLANs.
- As with LANs, on a WLAN you can share resources, such as files and printers, and access the Internet.



16.2 Types of Networks

16.2.4 Peer-to-Peer Networks

- There are no dedicated servers or hierarchy among the computers, meaning each device has equivalent capabilities and responsibilities.
- Peer-to-peer networks work best in environments with ten or fewer computers.



A simulation of a peer-to-peer network

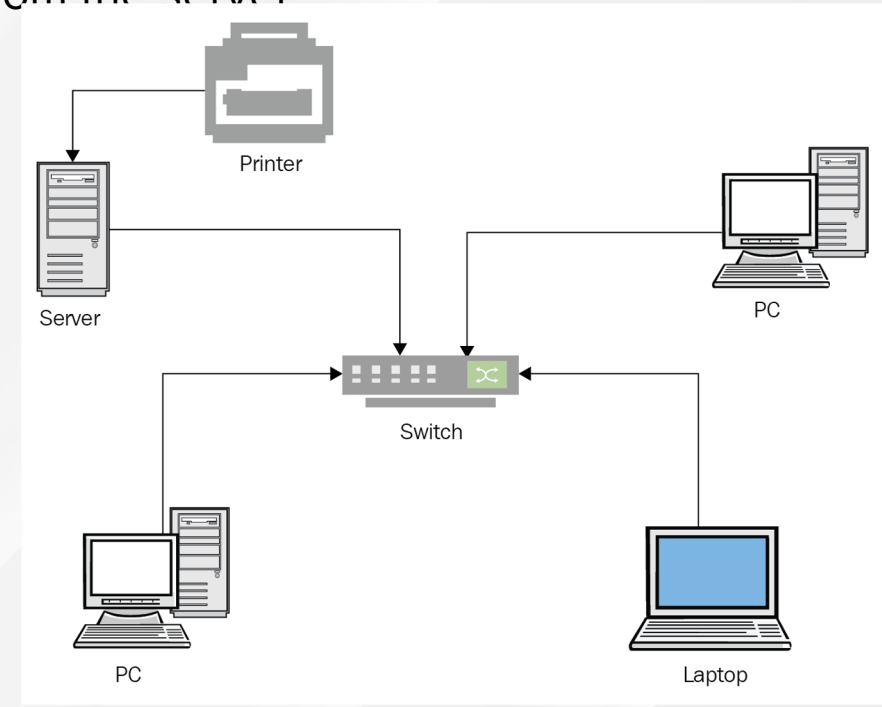
Disadvantages

- There is no centralized network administration.
- There is no centralized security.
- The network becomes more difficult to manage increasing number of computers.
- There might be no centralized data storage.

16.2 Types of Networks

16.2.5 Client/Server Networks

- In a client/server network, the client requests information or services from the server.
- Servers commonly perform some of the processing work for client machines.



Example:

- Sorting database before delivering records to the client.
- Company's email server to send, receive, and store email.
- Network administrators maintain the servers for data backups and security measures.
- For data protection, an administrator performs a routine backup of all the files on the servers.

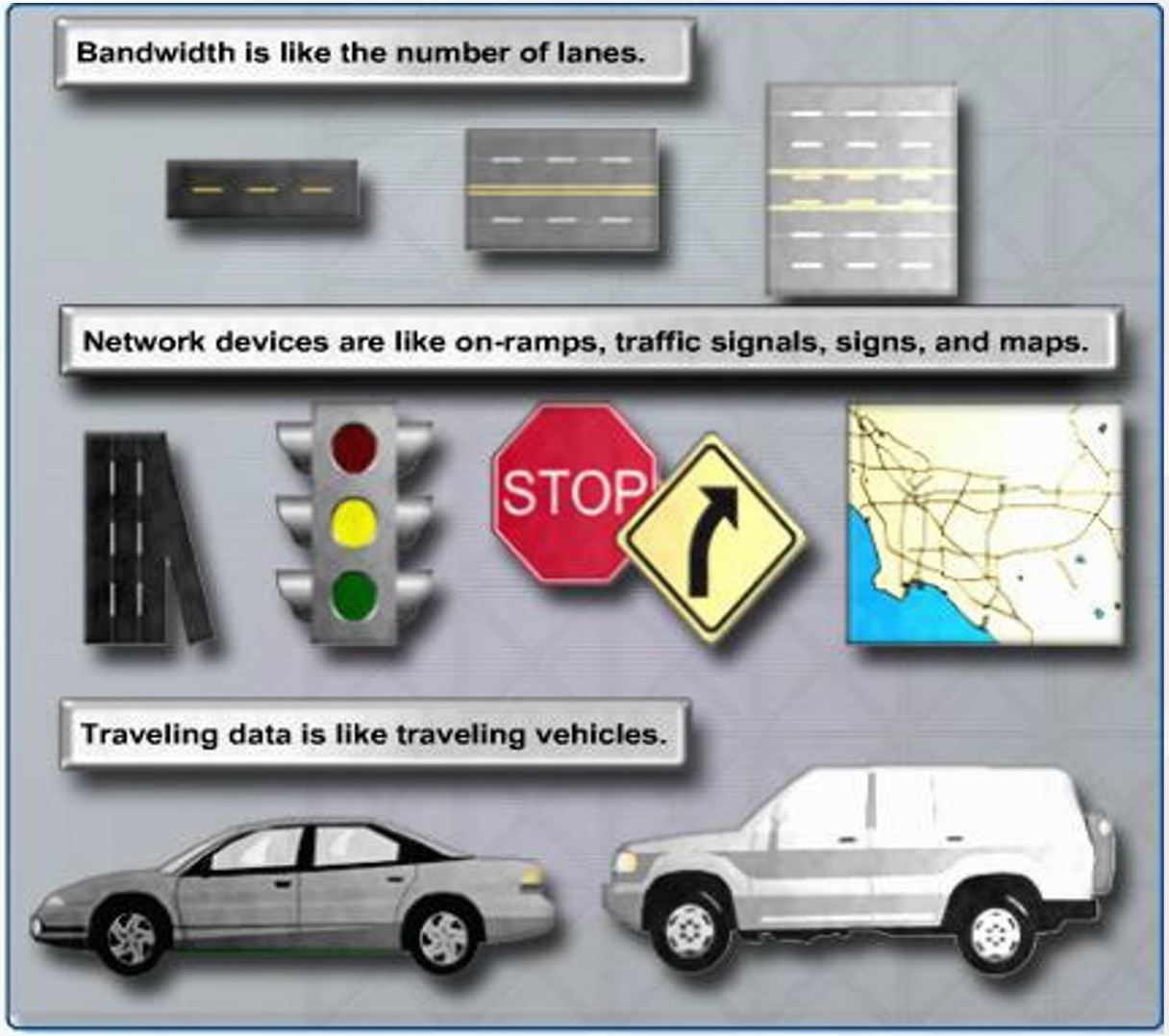
16.2 Types of Networks

16.2.5 Client/Server Networks

- A **workgroup** is a collection of workstations and servers on a LAN that are designed to communicate and exchange data with one another.
- A **domain** is a group of computers and electronic devices with a common set of rules and procedures administered as a unit.
- Does not refer to a single location or specific type of network configuration.
- A specialized server called a domain controller manages all security-related aspects of users and network resources, centralizing security and administration.

16.3 Basic Networking Concepts and Technologies

16.3.1 Bandwidth and Data Transmission



16.3 Basic Networking Concepts and Technologies

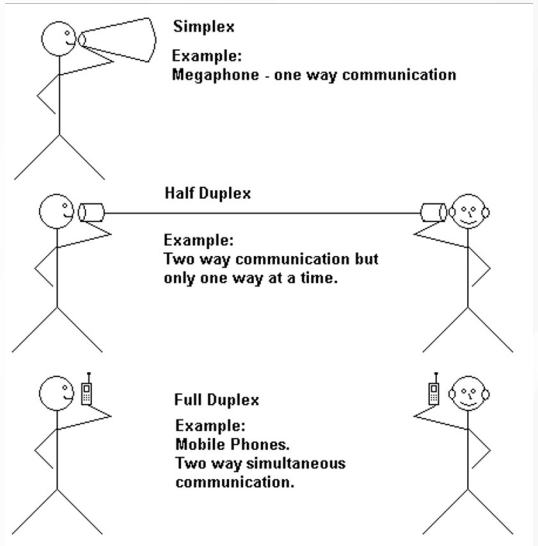
16.3.1 Bandwidth and Data Transmission

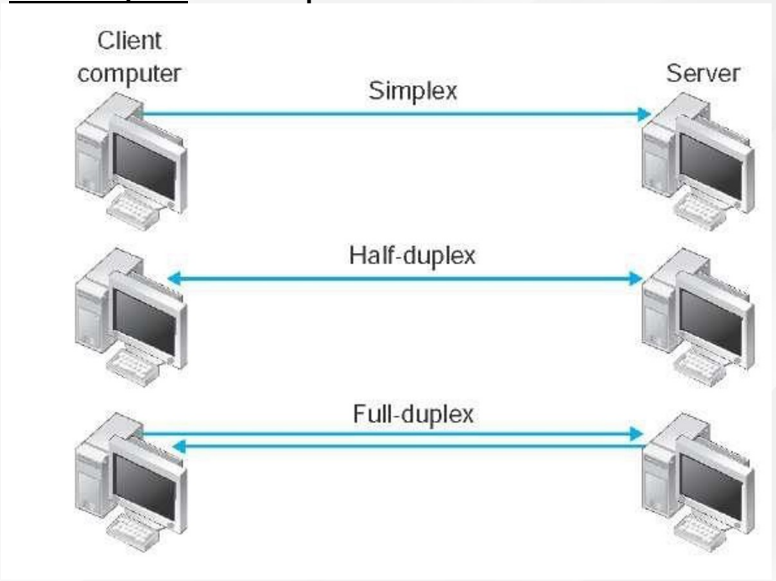
- Bandwidth is the amount of data that can be transmitted within a fixed time period.
- Bandwidth is measured in bits per second.
    - bps – bits per second
    - kbps – kilobits per second
    - mbps – megabits per second
- 1 byte (B) = 8 bits (b). Therefore, 1 MBps = 8 Mbps

16.3 Basic Networking Concepts and Technologies

Data Transmission Types:

- **Simplex:** One-way transmission of data. Example: Television Signal.
- **Half-Duplex:** One direction at a time. Example: Walkie-Talkie.
- **Full-Duplex:** Both Direction at the same time. Example: Telephone Conversation.





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