NETWORK PROTOCOLS & SECURITY
23EC2210 R/A/E

Topic:

INTRODUCTION TO COMPUTER NETWORKS

Session - 1

AIM OF THE SESSION

To familiarize students with the basic idea of Computer networks and its uses

INSTRUCTIONAL OBJECTIVES

This Session is designed to:

1. Demonstrate the need for computer networks in daily lives
2. Describe the components of computer networks
3. Describe the architectures of a computer network.

LEARNING OUTCOMES

At the end of this session, you should be able to:

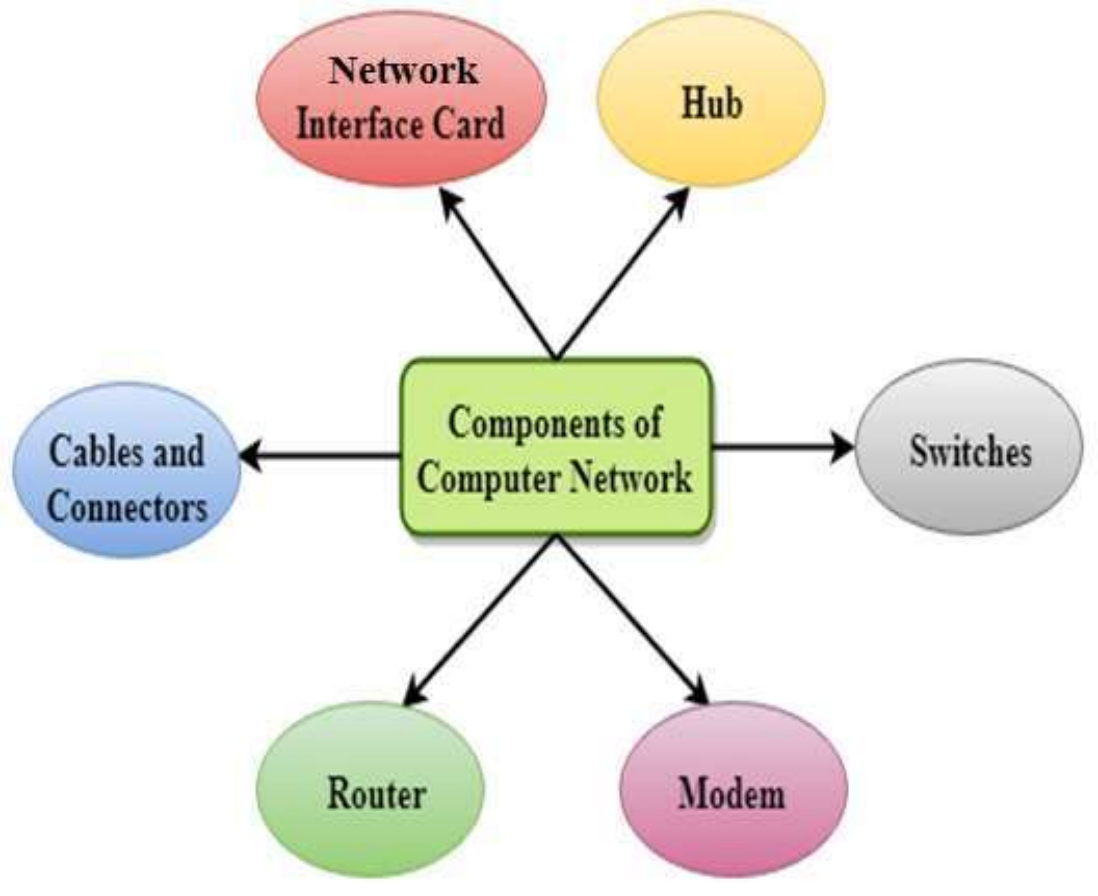
1. Define Computer network
2. Describe the components that are used in construction of computer networks
3. Summarize the uses of computer networks

SESSION INTRODUCTION

- **Computer Network:** A collection of autonomous computers interconnected by a single technology.
- Two computers are said to be interconnected if they are able to exchange information.
- The aim of the computer network is the sharing of resources among various devices.
- In the case of computer network technology, there are several types of networks that vary from simple to complex level.

A Computer Network consists of a collection of computers, printers and other equipment that is connected together so that they can communicate with each other

COMPONENTS OF COMPUTER NETWORKS



A computer network comprises the following components:

- A minimum of at least 2 computers.
- **Cables** that connect the computers to each other, although wireless communication is becoming more common.
- A network interface device on each computer (this is called a **network interface card or NIC**).
- A **switch** used to switch the data from one point to another. **Hubs** are outdated and are little used for new installations.
- A **router** that connects two or more networks or subnetworks.
- A **modem** that is used especially to transmit and receive information between computers via landlines

Components of computer networks…

NIC(National interface card)

NIC is a device that helps the computer to communicate with another device.

The network interface card contains the hardware addresses

The data-link layer protocol use this address to identify the system on the network so that it transfers the data to the correct destination.

Types of NIC

Wireless NIC:

All the modern laptops use the wireless NIC. In Wireless NIC, a connection is made using the antenna that employs the **radio wave technology**.

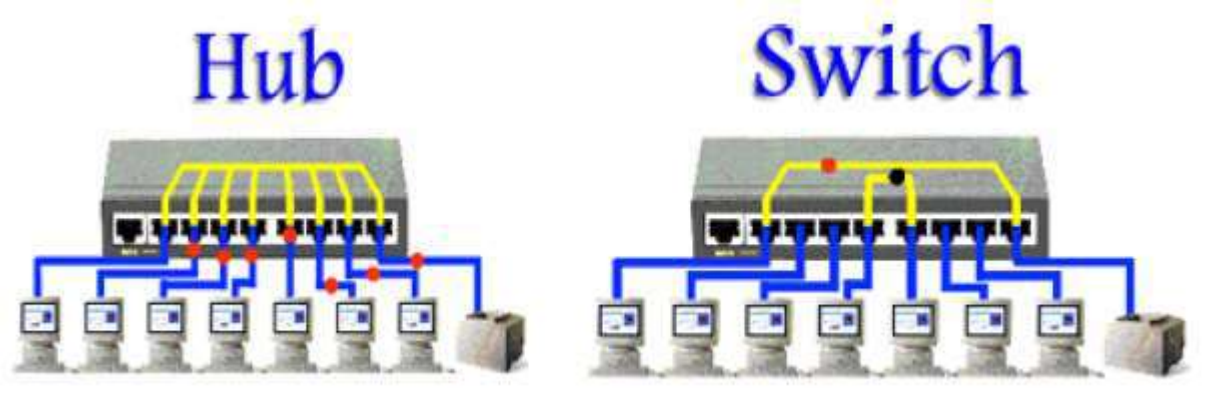
Wired NIC:

Cables use the **wired NIC** to transfer the data over the medium.

Components of computer networks…

Hub

- Hub is a central device that splits the network connection into multiple devices.
- When computer requests for information from another computer, it sends the request to the Hub.
- Hub distributes this request to all the interconnected computers.



Switch

- Switch is a networking device that groups all the devices over the network to transfer the data to another device.
- A switch is better than Hub as it does not broadcast the message over the network, i.e., it sends the message to the device for which it belongs to.
- Therefore, we can say that switch sends the message directly from source to the destination.

Components of computer networks…

Cables and connectors

Cable is a transmission media that transmits the communication signals.

Three types of Cables:

- **Twisted pair cable:** High-speed cable that transmits the data over 1Gbps or more.
- **Coaxial cable:** Resembles like a TV installation cable. Coaxial cable is more expensive than twisted pair cable, but it provides the high data transmission speed.
- **Fibre optic cable:** High-speed cable that transmits the data using light beams. It provides high data transmission speed as compared to other cables. It is more expensive as compared to other cables, so it is installed at the government level.

Unshielded Twisted Pair (UTP) Cable

Coaxial Cable

Fiber Optic Cable

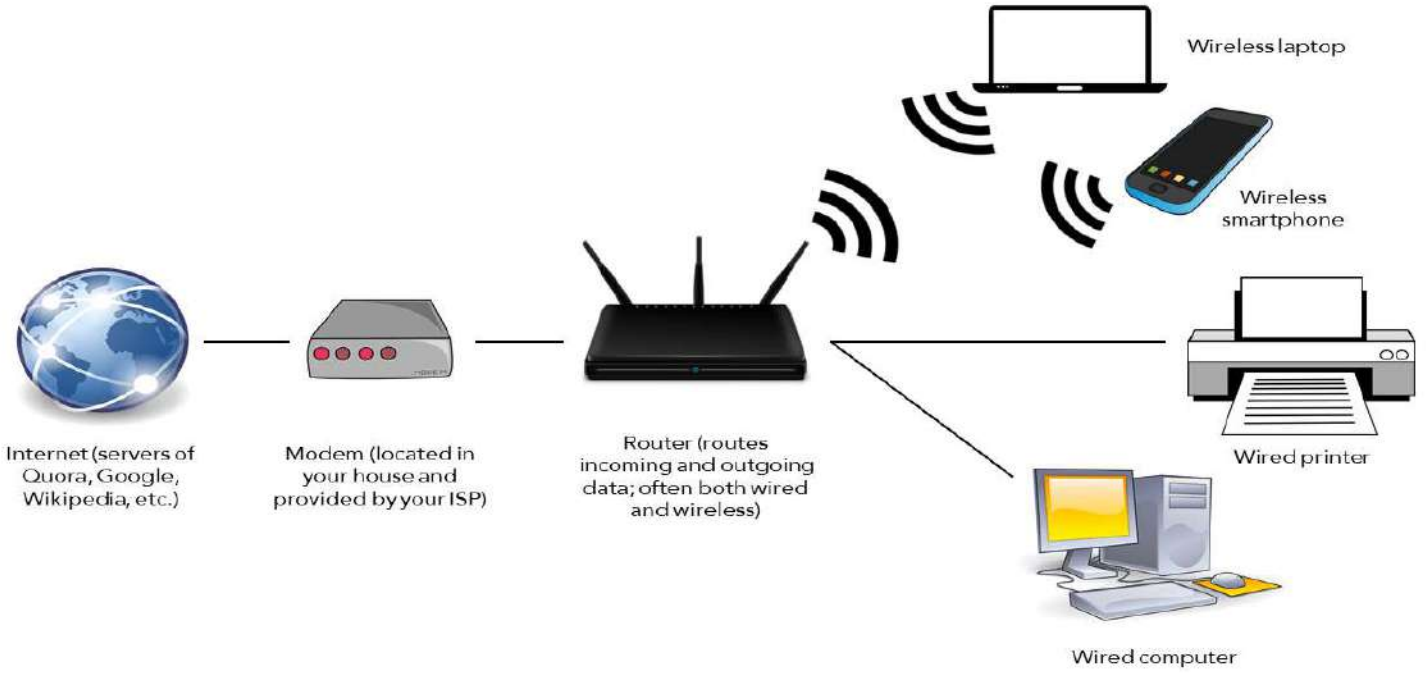
Components of computer networks…

Modem

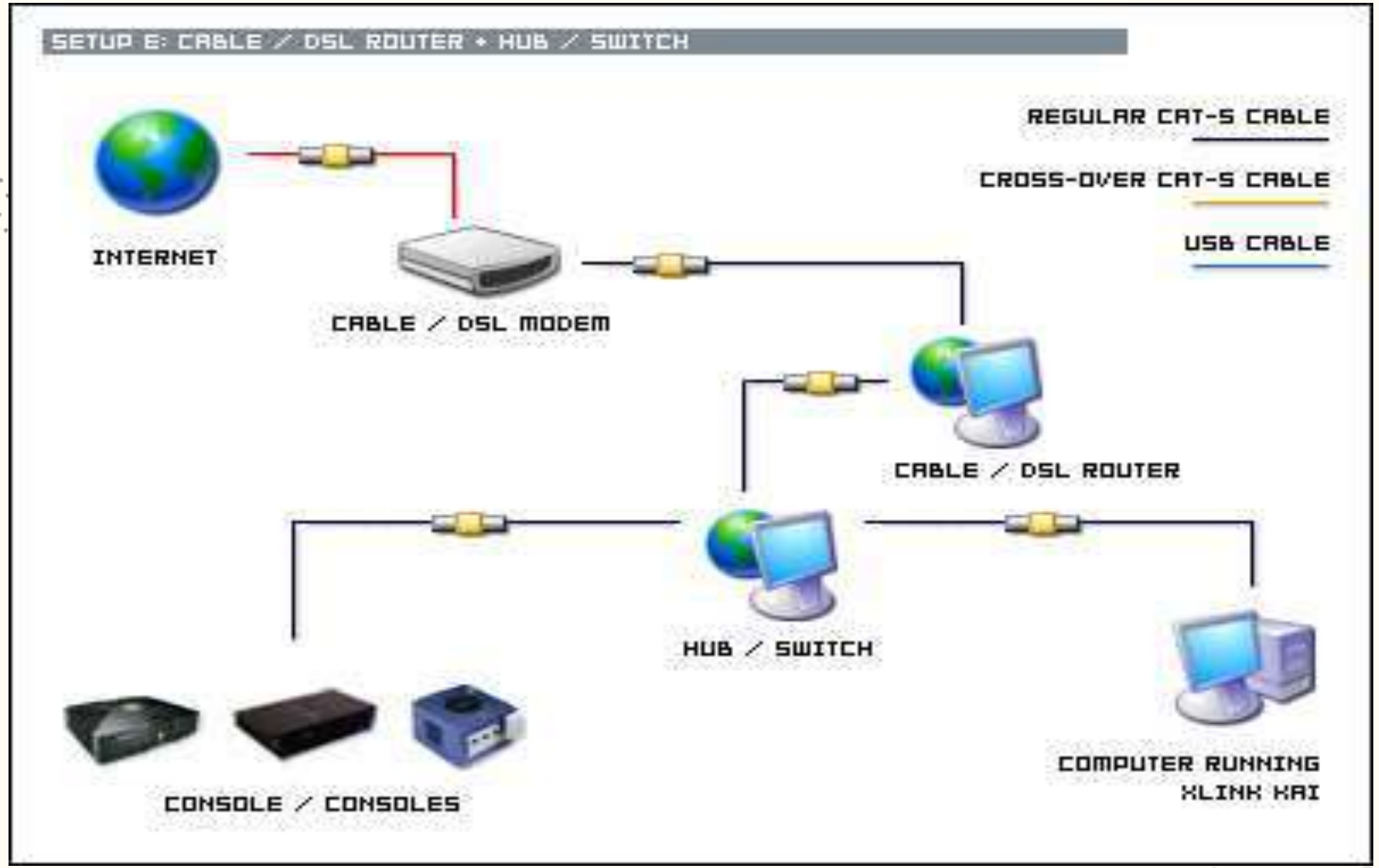
- Modem connects the computer to the internet over the existing telephone line.
- A modem is not integrated with the computer motherboard.
- A modem is a separate part on the PC slot found on the motherboard.

Router

- Router is a device that connects the LAN to the internet.
- The router is mainly used to connect the distinct networks or connect the internet to multiple computers.



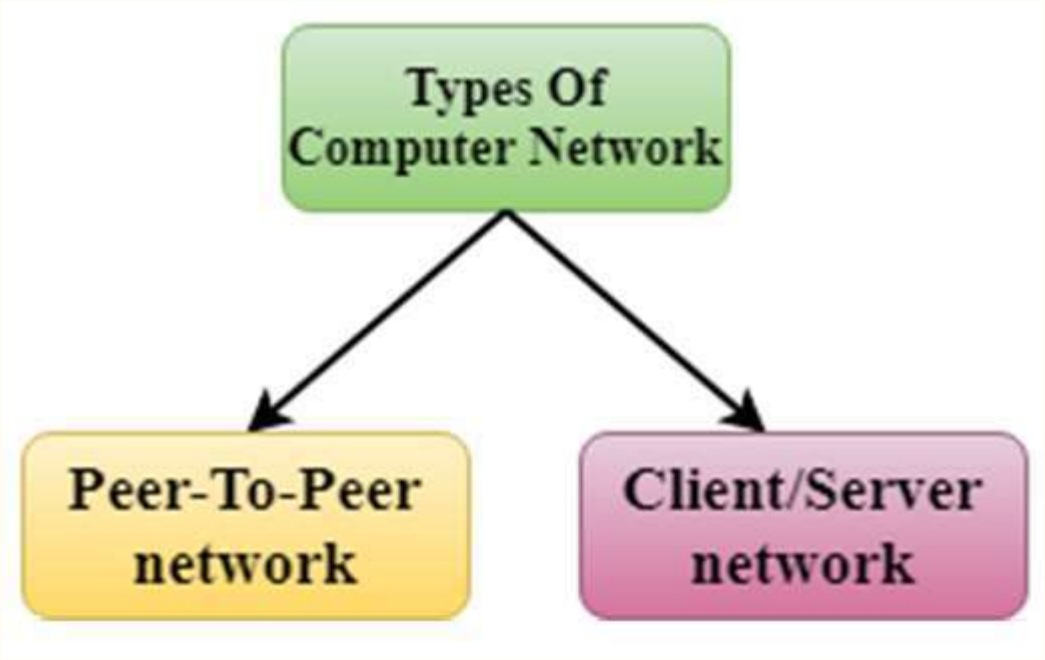
Sample Network



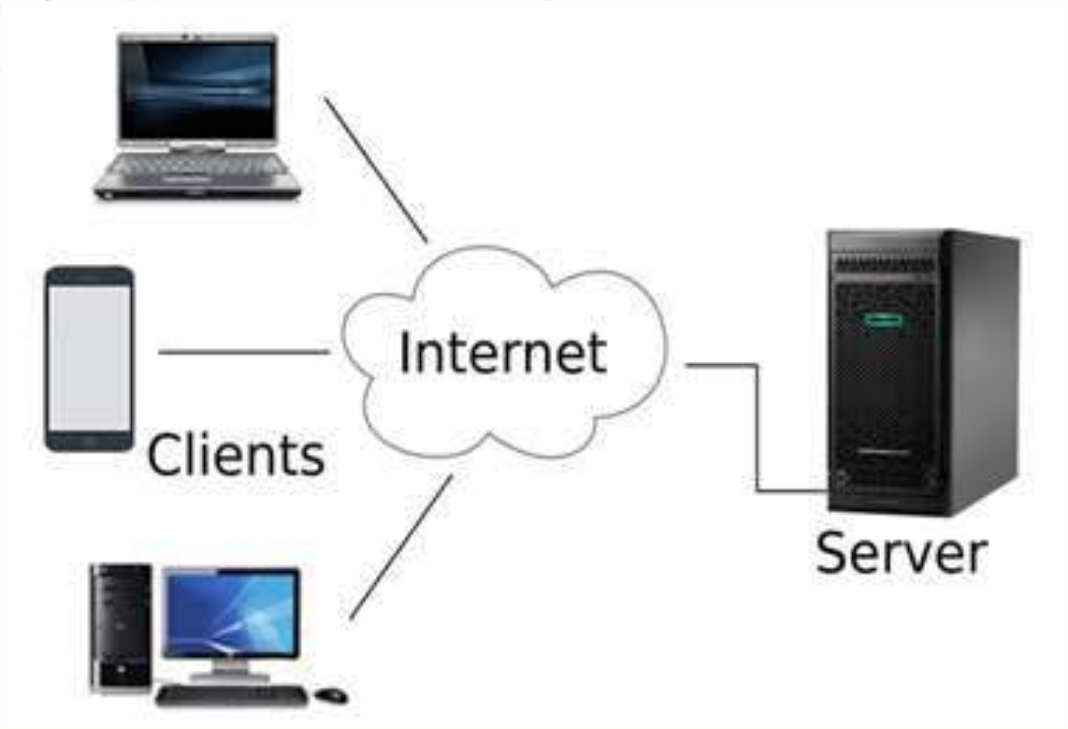
COMPUTER NETWORK ARCHITECTURE

- **Computer Network Architecture** is defined as the physical and logical design of the software, hardware, protocols, and media of the transmission of data.

- Simply we can say that how computers are organized and how tasks are allocated to the computer.



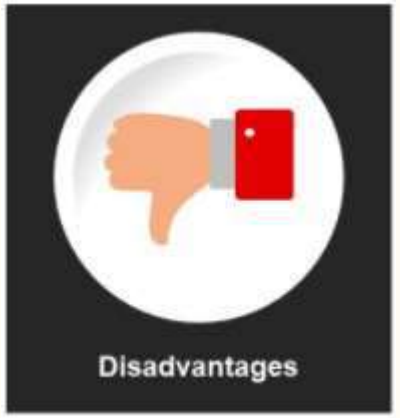
Client/server network



- Is a network model designed for the end users called clients, to access the resources such as data, songs, video, etc. from a central computer known as Server.
- The central controller is known as a **server** while all other computers in the network are called **clients**.
- A server performs all the major operations such as security and network management.
- A server is responsible for managing all the resources such as files, directories, printer, etc.
- All the clients communicate with each other through a server. For example, if client1 wants to send some data to client 2, then it first sends the request to the server for the permission. The server sends the response to the client 1 to initiate its communication with the client 2.

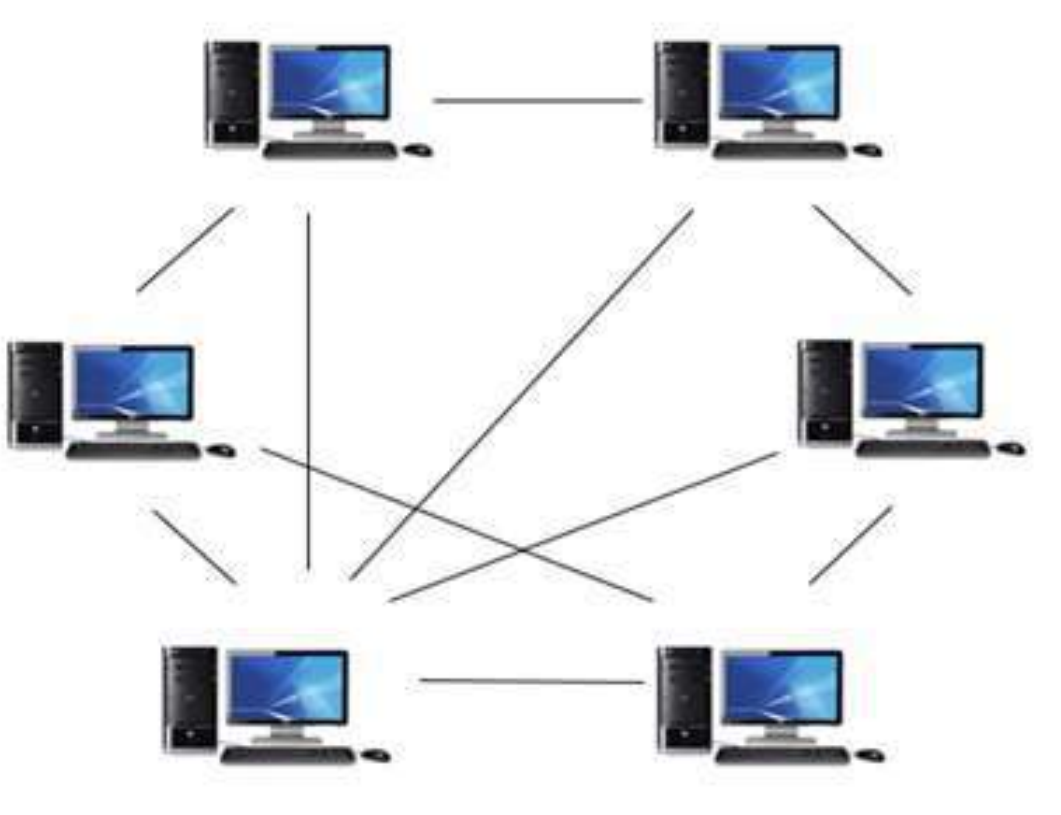
Client/server network

- Contains the centralized system. Therefore, we can back up the data easily.
- Has a dedicated server that improves the overall performance of the whole system.
- Security is better as a single server administers the shared resources.
- It also increases the speed of the sharing resources.



- Client/Server network is expensive as it requires the server with large memory.
- A server has a Network Operating System(NOS) to provide the resources to the clients, but the cost of NOS is very high.
- It requires a dedicated network administrator to manage all the resources.

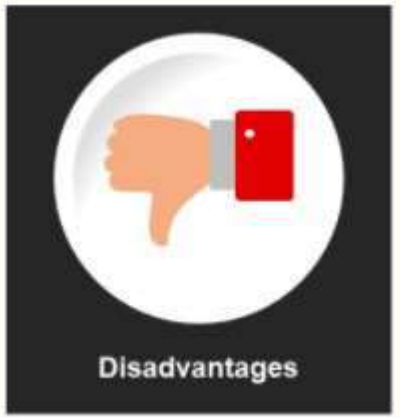
Peer-To-Peer network



- Is a network in which all the computers are linked together with equal privilege and responsibilities for processing the data.
- Useful for small environments, usually up to 10 computers.
- Has no dedicated server.
- Special permissions are assigned to each computer for sharing the resources, but this can lead to a problem if the computer with the resource is down.

Peer-To-Peer network

- It is less costly as it does not contain any dedicated server.
- If one computer stops working, other computers will not stop working.
- It is easy to set up and maintain as each computer manages itself.



- In the case of Peer-To-Peer network, it does not contain the centralized system. Therefore, it cannot back up the data as the data is different in different locations.
- It has a security issue as the device is managed itself.

USES OF COMPUTER NETWORKS

Business Applications

Home Applications

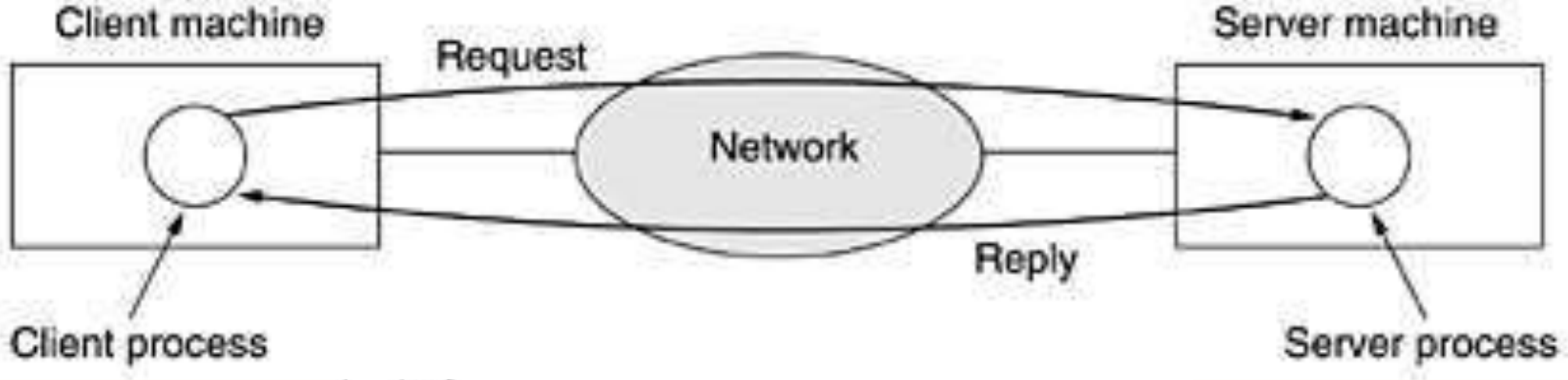
Mobile Users

Social Issues

Business Applications

1. **Resources and data sharing** (Client/Server Model)

2. A computer network can provide a **powerful communication medium among em**

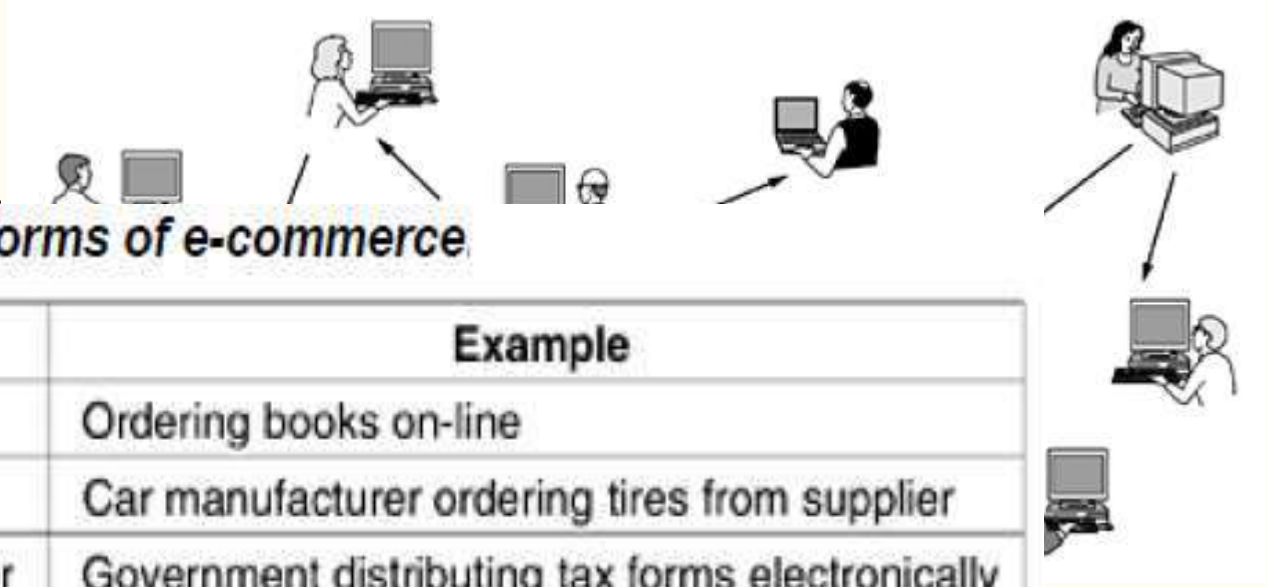


3. Doi
cus
etc
Usi
needed.

4. Doing business with consumers over the Internet. **E-commerce:** Many companies provide catalogs of their goods and services online and take orders on-line.

Home Applications

1. **Access to remote information**
   - ➢Surfing the World Wide Web for i
   - ➢Infor… histo…



Some forms of e-commerce

Tag	Full name	Example
B2C	Business-to-consumer	Ordering books on-line
B2B	Business-to-business	Car manufacturer ordering tires from supplier
G2C	Government-to-consumer	Government distributing tax forms electronically
C2C	Consumer-to-consumer	Auctioning second-hand products on line
P2P	Peer-to-peer	File sharing

2. **Person…**
   - ➢Peer…

3. **Interac…**
   - ➢Mov…

4. **Electronic business**
   - ➢Home shopping, Online banking, Online payments, etc

Mobile users

- Combination of wireless networks and mobile computing.

Wireless	Mobile	Applications
No	No	Desktop computers in offices
No	Yes	A notebook computer used in a hotel room
Yes	No	Networks in older, unwired buildings
Yes	Yes	Portable office; PDA for store inventory

Social issues

- Topics that people actually care about, like
  - Politics
  - Religion
  - Societal issues, etc.

SELF-ASSESSMENT QUESTIONS

1. Which among the following represents the characteristics of a computer network?

(a) Information Sharing
(b) Resource Sharing
(c) Both
(d) d. Neither a or b

2. Broadcasting is done through which computer network device?

(a) Hub
(b) Switch
(c) Both a & b
(d) Neither a nor b

3. The device that processes request is called _____?

(a) Client
(b) Server
(c) Process
(d) None

SELF-ASSESSMENT QUESTIONS: Answers

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(d) None

SUMMARY

- Definition of Computer Network
- Components of Computer Network
- Computer Network Architecture
- Uses of Computer Networks

TERMINAL QUESTIONS

1. Describe the term Computer network.

2. List out the components of computer networks.

3. Analyze Client-server and Peer-to-peer network architectures.

4. Summarize the uses of computer networks in our daily lives.

REFERENCES FOR FURTHER LEARNING OF THE SESSION

Reference Books:

1. A.S. Tanenbaum, David J. Wetheral “Computer Networks” Pearson, 5th Edition.
2. Kurose, J and Ross, K Computer Networking: A Top-Down Approach Addison-Wesley- 6th edition.

Sites and Web links:

1. https://www.javatpoint.com/computer-network-components
2. https://www.javatpoint.com/computer-network-architecture

THANK YOU

Team – Network Protocols & Security