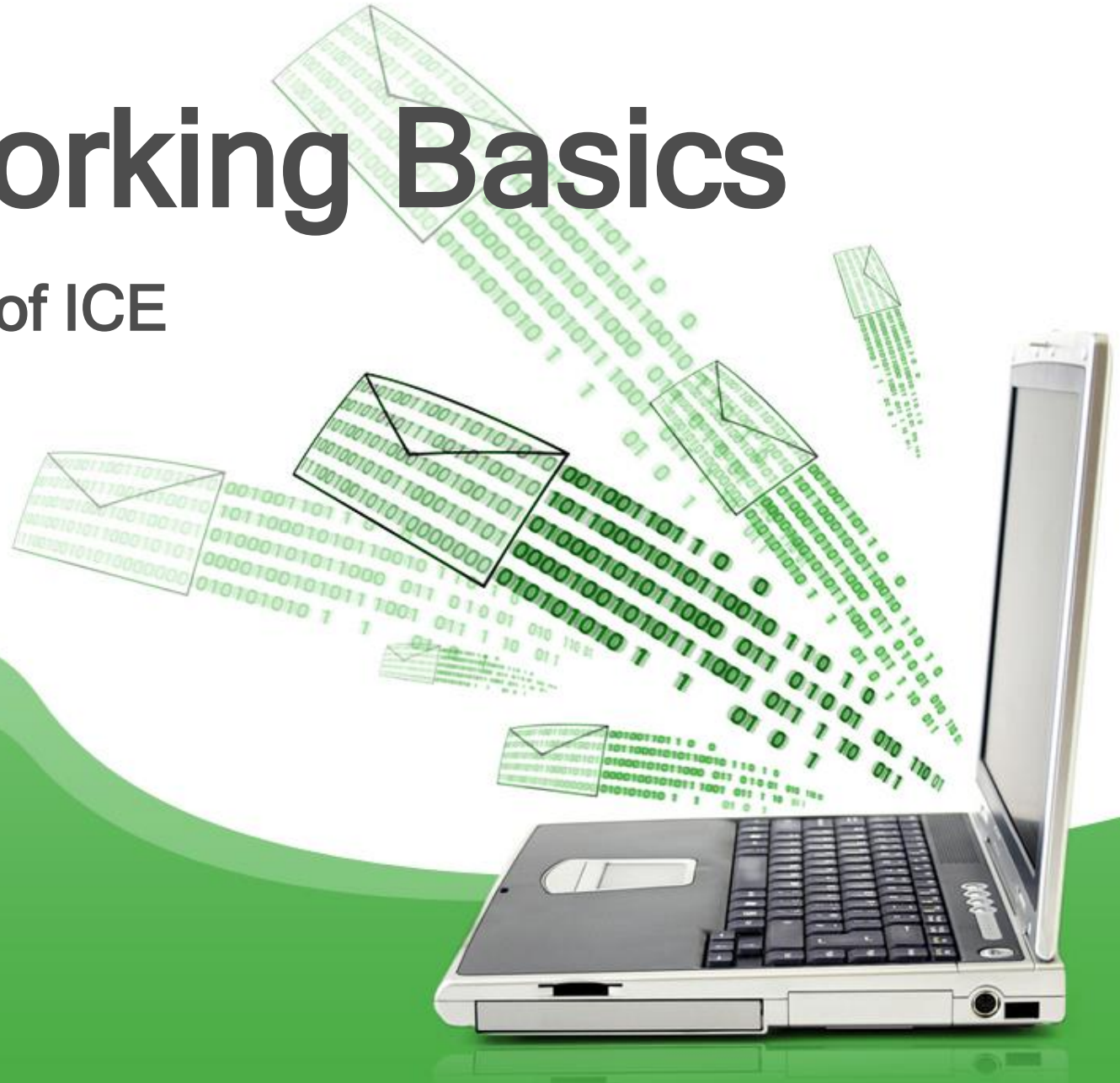


Networking Basics

Dept. of ICE



Contents:

- **Computer Networks: LAN, MAN, WAN, HAN**
- **Network topologies**
- **Client-server network**
- **Network Protocols**



Lecture-1

This Lesson Covers:

- What is computer networks?
- Evolution of computer networks
- Overview of networks:
LAN/MAN/WAN/Internet



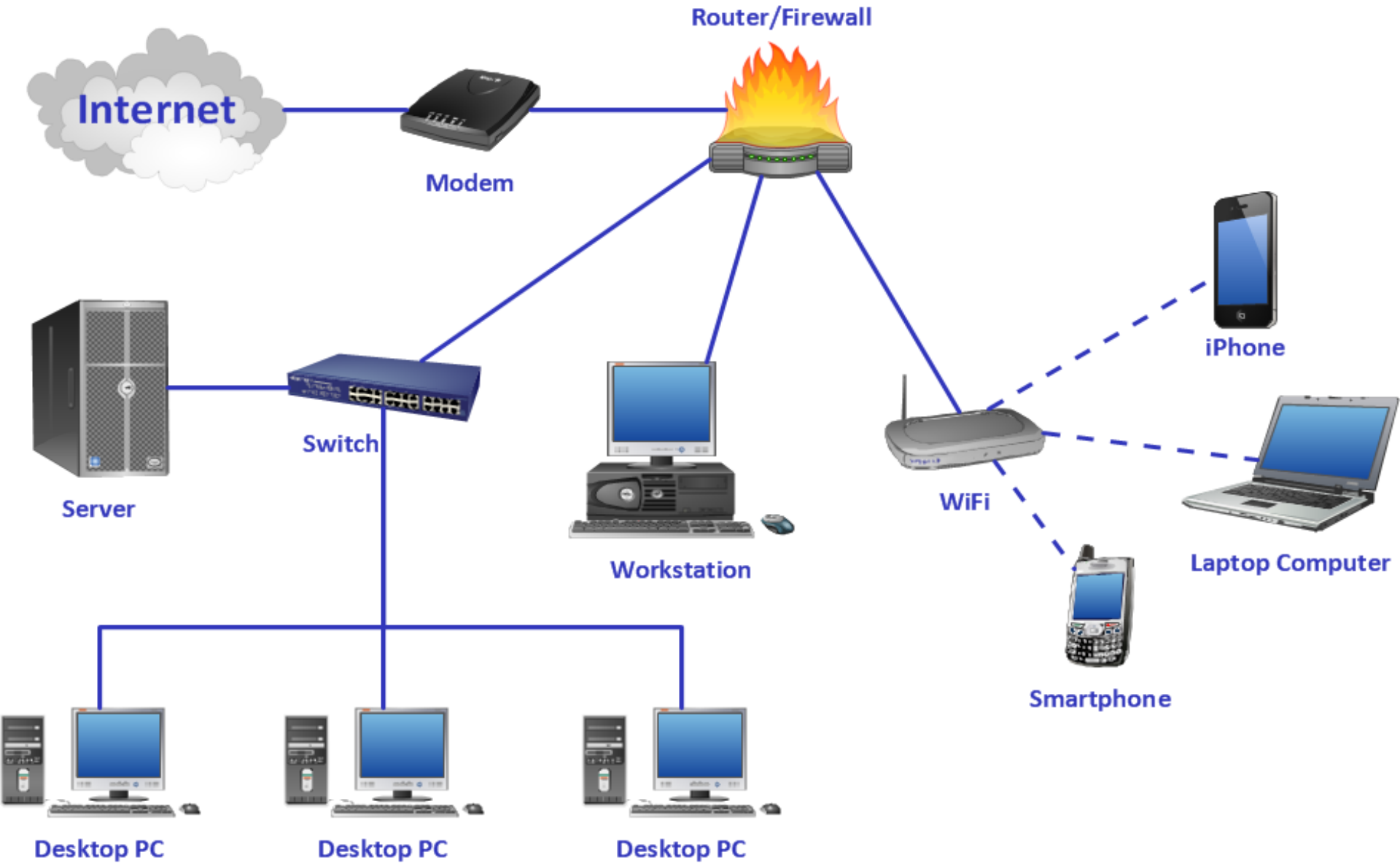
- **Network:** A connected system of objects or people
- **Computer network:** A collection of computers and other hardware devices connected together so users can share hardware, software, and data, and electronically communicate to each other.



- **Computer networks converging with telephone and other communications networks**
- **Networks range from small private networks to the Internet (largest network in the world)**



Computer Network:



- **The purpose of the network is to serve users, which can be humans or processes.**
- **Network links can be point-to-point or multipoint and implemented with several transmission media.**
- **Information exchanged can be represented in multiple media (audio, text, video, images, etc.), Services provided to users can vary widely.**



❑ Computer networks started as a mean for:

- **Distributed processing**
- **Communicating among people (electronic mail, conferencing)**
- **Increasing system reliability**



History of Computer Networks

- ❑ **1950s - 1960s: Terminal-Oriented Computer Networks**
- ❑ **1960s – 1970s: Computer-to-Computer Networks: the ARPANET – first Wide Area Network (WAN)**
- ❑ **1980s: Local Area Networks (LANs)**
- ❑ **1980s: The Internet (most superior telecommunication network)**



Types of Networks

Three types of networks:

- 1. Local Area Network (LAN)**
- 2. Metropolitan Area Network (MAN)**
- 3. Wide Area Network (WAN)**



Local Area Network (LAN)

- Covers a small region of space, typically a single building.
- LAN is the smallest network compared to other networks.
- The simplest form of LAN is to connect two computers together
- LAN is operated within a limited physical area such as at home, school, a single building or several buildings.



- **A network which consists of less than 500 interconnected devices across several buildings, is still recognized as a LAN.**
- **LAN is very high speed network (from previously 10Mbps) to 100Mbps, which is faster than MAN and WAN.**



LAN



Metropolitan Area Network (MAN)

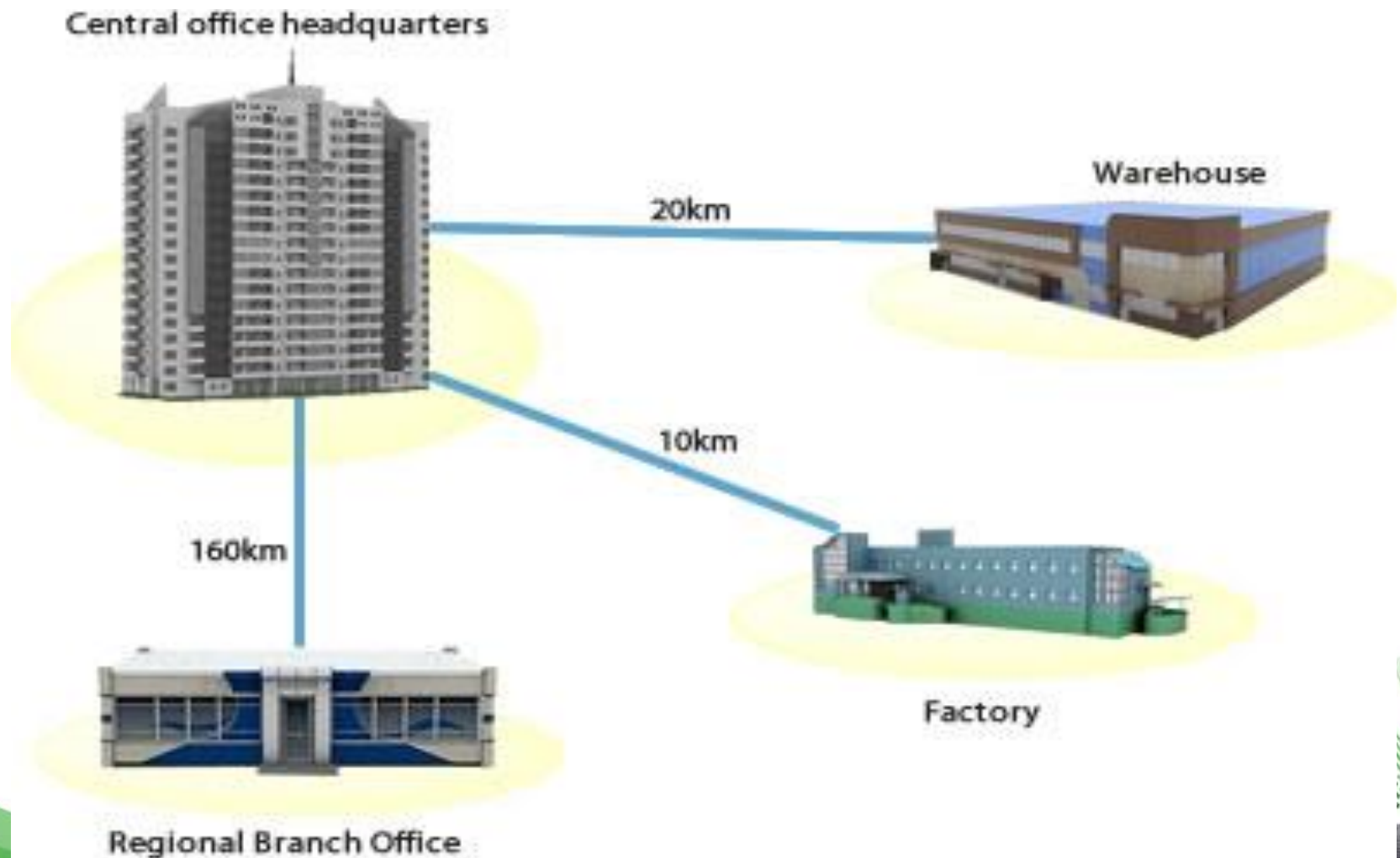
- Is collection of LANs with the same geographical area, for instance a city.
- MAN is a network of computers located at different sites within a large physical area, such as a city.
- MAN often acts as a high speed network(although not as fast as LAN) to allow sharing of regional resources.



- **MAN can defined as a group of computers and network devices connected together within a large physical area.**
- **For example: Companies that have several branches within the Dhaka city such as banks, might find a MAN useful to them.**



MAN



Wide Area Network (WAN)

- **WAN is the largest network of all network types.**
- **The internet is the largest WAN in the world.**
- **WAN generally covers large distances such as states, countries or continents.**



- **WAN is group of MANs or LANs or the mixture of both network.**
- **An example in the society using WAN is the banking organization.**



WAN



LAN/MAN/WAN Comparison

	<i>LAN</i>	<i>MAN</i>	<i>WAN</i>
Distance	Limited—typically up to 2,500 meters or 2 miles	Limited—typically up to 200 kilometers or 100 miles	Unlimited
Speed	High—typically in excess of 10 Mbps—10,100 and 1,000 are standard	High—typically 100 Mbps	Slower—usually 1.5 Mbps
Media	Locally owned—twisted-pair wires, fiber optic cable, wireless (not satellite)	Locally owned and common carrier—twisted-pair wires, fiber optic cable	Locally owned and common carrier—twisted-pair wires, coaxial cable, fiber optic cable, wireless to include satellite
Nodes	Can be any, but most are desktop computers	Can be any, but most are desktop computers and minicomputers	Can be any, but most are desktop computers

Home Area Network (HAN)

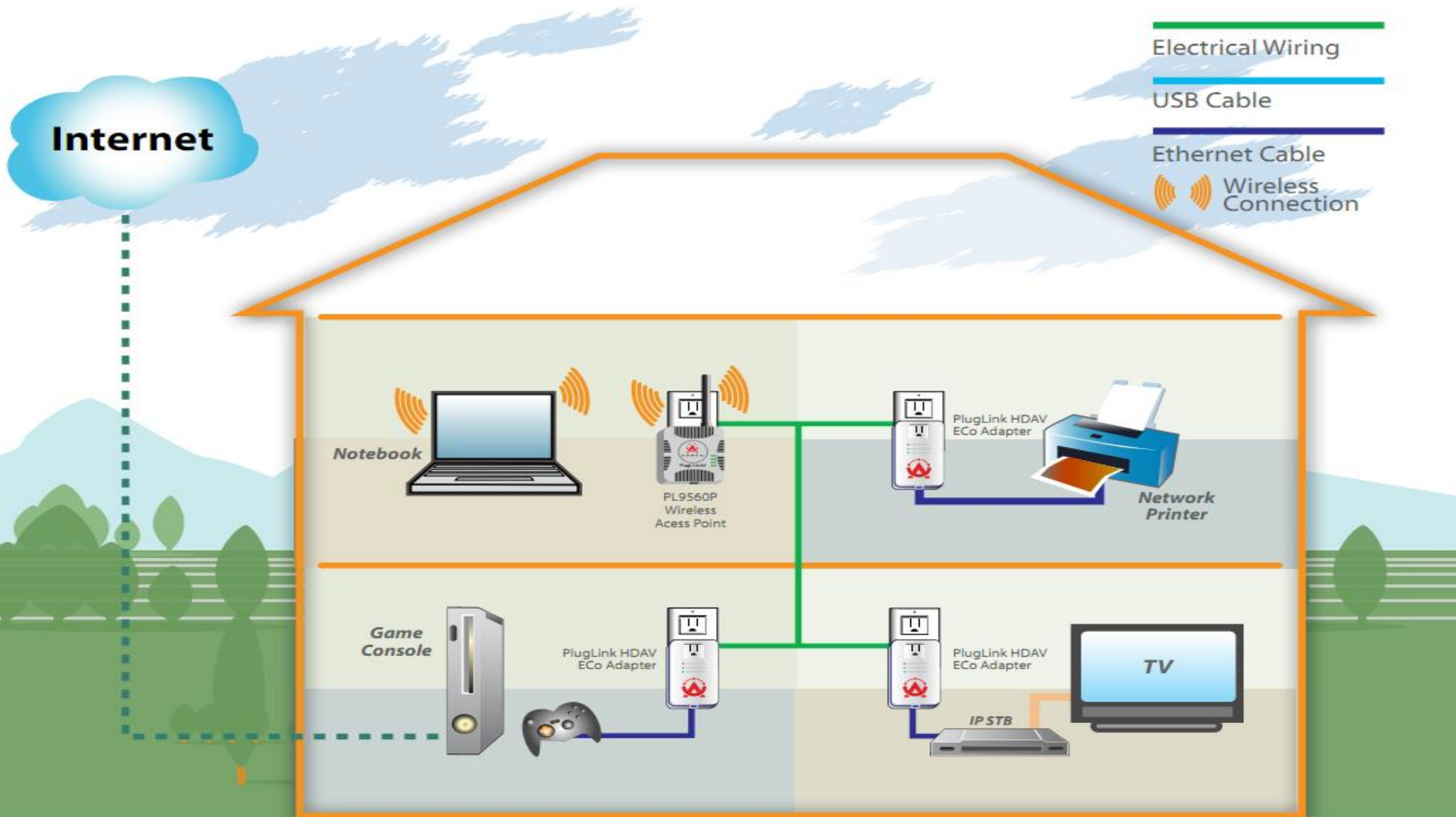
- A home network or home area network (HAN) is a type of local area network with the purpose to facilitate communication among digital devices present inside or within the close vicinity of a home. Devices capable of participating in this network, for example, smart devices such as network printers and handheld mobile computers, often gain enhanced emergent capabilities through their ability to interact.



- These additional capabilities can be used to increase the quality of life inside the home in a variety of ways, such as automation of repetitious tasks, increased personal productivity, enhanced home security, and easier access to entertainment.



HAN



Thank You

Lecture-2

This Lesson Covers: Network Topologies

- What is Topology
- Different Topologies
- Advantages and Disadvantages of different Topologies



What is Topology?

The pattern of interconnection of nodes in a network is called the Topology.

The factors while selecting a Topology

- **Cost**
- **Flexibility**
- **Reliability**



Different Topologies

There are five common types of network Topologies.

1.The Star Topology

2.The Bus Topology

3.The Ring Topology

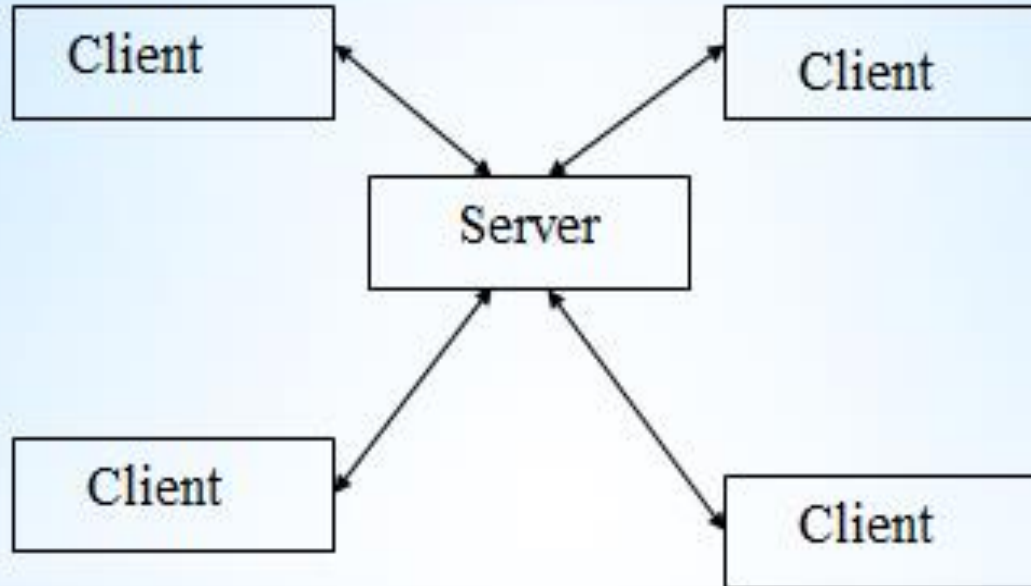
4.The Tree Topology

5.Mesh Topology

Another type is Graph Topology



The Star Topology



❑ All nodes are connected to a central node by a single path

❑ This is used for data processing and voice communication networks

❑ Advantages

✓ Ease of service

✓ One device per connection

✓ Centralized control/Problem diagnosis

✓ Simple access protocols

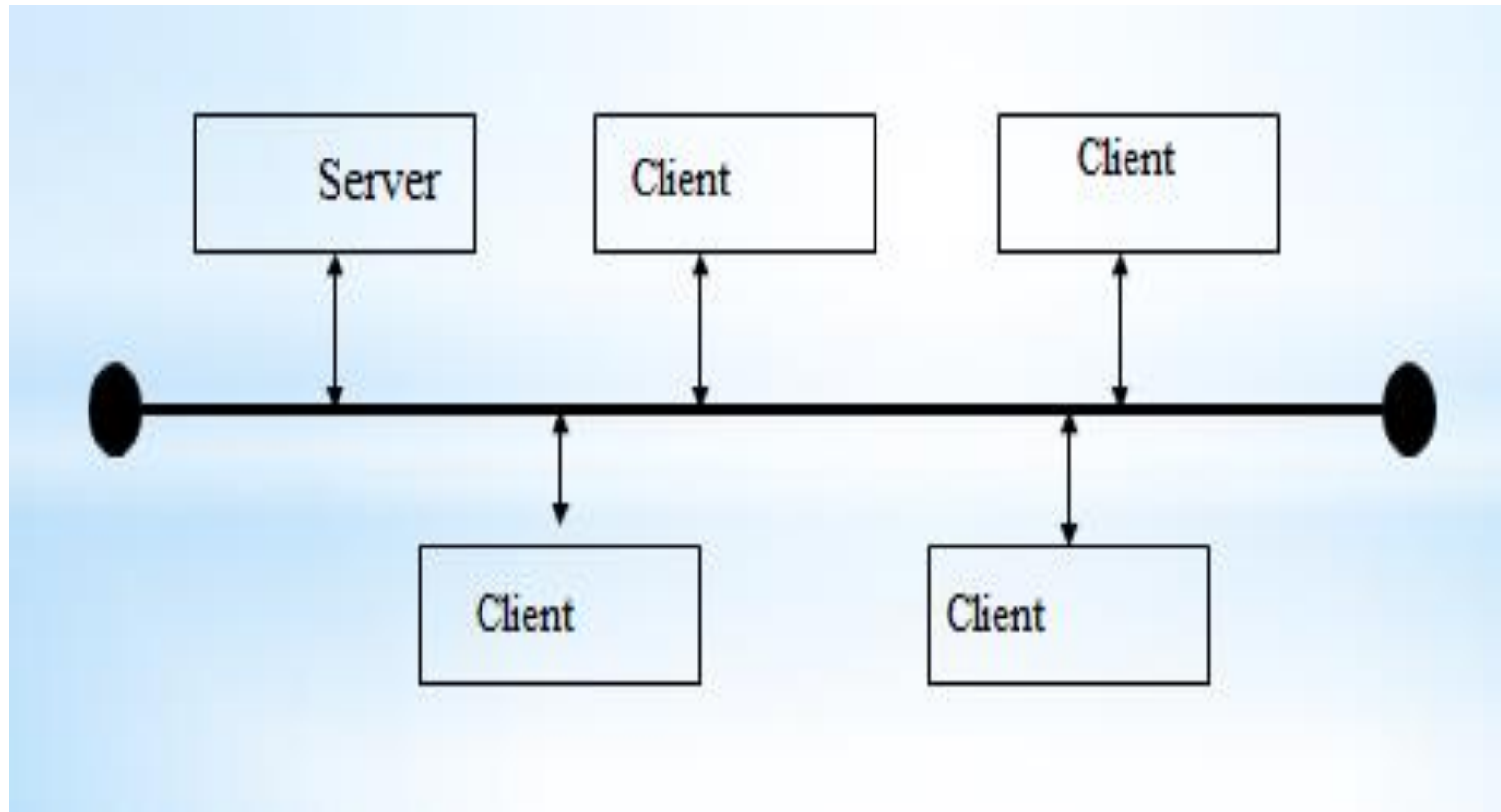


❑ Disadvantages

- ✓ Long cable length
- ✓ Difficult to expand
- ✓ Central node dependency



The Bus Topology



- ☐ Popular topology for data network
- ☐ Single transmission medium onto which various nodes are attached
- ☐ Normally coaxial cable is used
- ☐ Terminators at both end of BUS absorb signal, removing it from BUS



□ Advantages

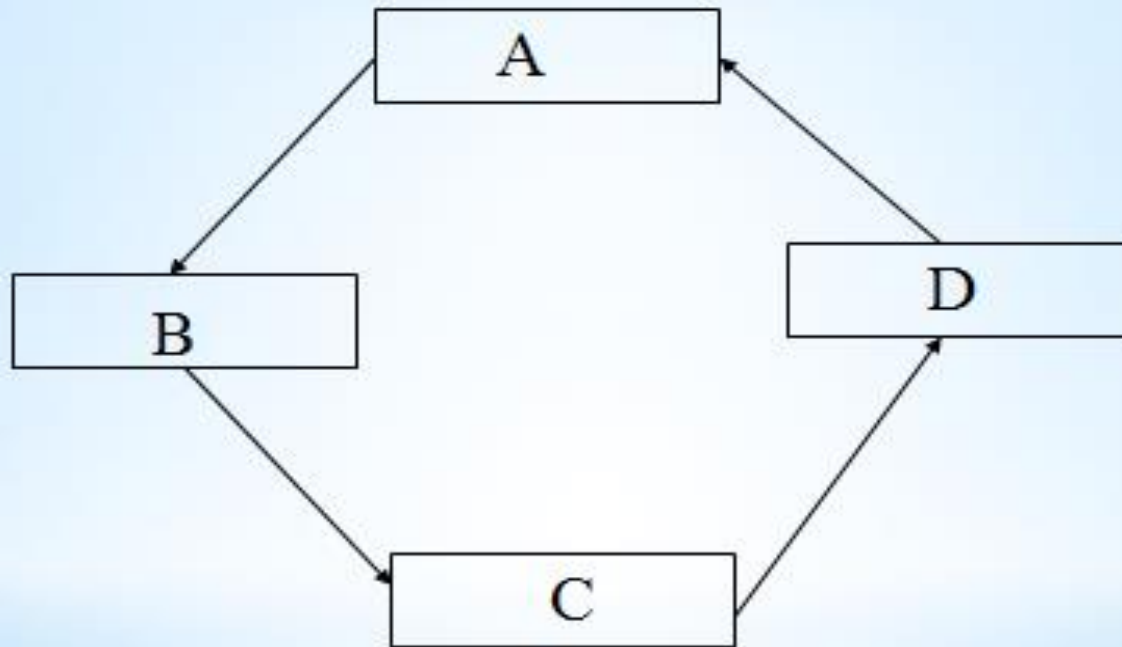
- ✓ Short cable length and simple wiring layout
- ✓ Resilient Architecture
- ✓ Easy to extend

□ Disadvantages

- ✓ Fault diagnosis is difficult
- ✓ Fault isolation is difficult
- ✓ Repeater configuration
- ✓ Nodes must be intelligent



The Ring Topology



- ☐ Each node is connected to two and only two neighboring nodes
- ☐ Data is accepted from one neighboring node transmitted to other
- ☐ Data travels in one direction
- ☐ After passing through each node, it returns to sending node, which removes it



□ Advantages

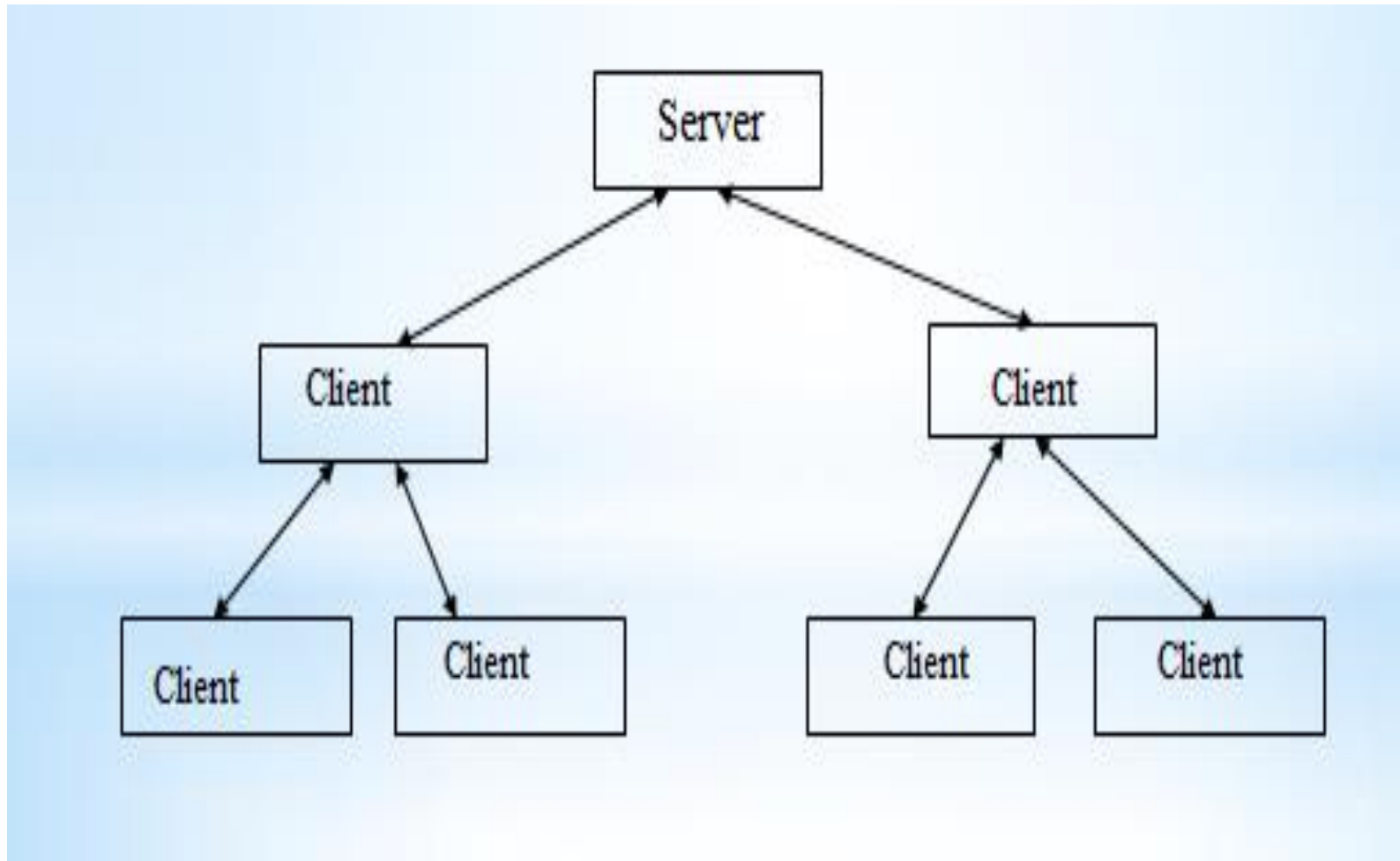
- ✓ Short cable length
- ✓ No wiring closet space required
- ✓ Suitable for optical fibers

□ Disadvantages

- ✓ Node failure causes network failure
- ✓ Difficult to diagnose faults
- ✓ Network reconfiguration is difficult



The Tree Topology



- ❑ **Variation of BUS topology**
- ❑ **Tree structure with central root branching and**
- ❑ **sub branching to the extremities of network**
- ❑ **Transmission is same as BUS**
- ❑ **Also known as Hybrid Topology**



□ Advantages of Tree Topology

- ✓ It is an extension of Star and bus Topologies, so in networks where these topologies can't be implemented individually for reasons related to scalability, tree topology is the best alternative.
- ✓ Expansion of Network is possible and easy.



- ✓ Here, we divide the whole network into segments (star networks), which can be easily managed and maintained.
- ✓ Error detection and correction is easy.
- ✓ Each segment is provided with dedicated point-to-point wiring to the central hub.
- ✓ If one segment is damaged, other segments are not affected.

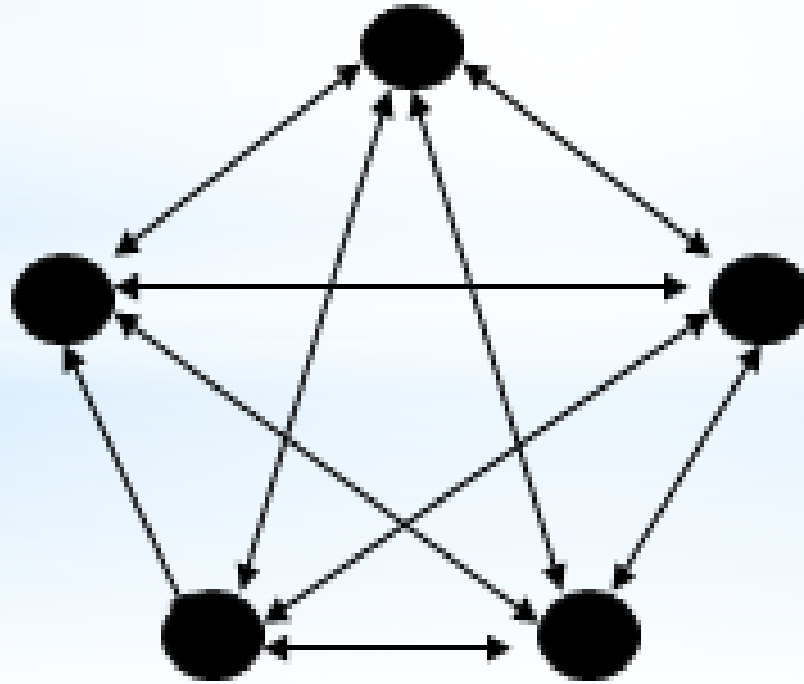


❑ Disadvantages of Tree Topology

- ✓ Because of its basic structure, tree topology, relies heavily on the main bus cable, if it breaks whole network is crippled.
- ✓ As more and more nodes and segments are added, the maintenance becomes difficult.
- ✓ Scalability of the network depends on the type of cable used.



Mesh Topology



- ☐ Each node is connected to more than one node
- ☐ This provide an alternate route mechanism
- ☐ Excellent for long distance networking
- ☐ Supports back-up and rerouting
- ☐ Used in large internetworking environments with stars, rings and buses as nodes



□ Advantages

- ✓ The arrangement of the network nodes is such that it is possible to transmit data from one node to many other nodes at the same time.
- ✓ The failure of a single node does not cause the entire network to fail as there are alternate paths for data transmission.



- ✓ **It can handle heavy traffic, as there are dedicated paths between any two network nodes.**
- ✓ **Point-to-point contact between every pair of nodes, makes it easy to identify faults.**



❑ Disadvantages

- ✓ **The arrangement wherein every network node is connected to every other node of the network, many connections serve no major purpose. This leads to redundancy of many network connections.**



- ✓ **A lot of cabling is required. Thus, the costs incurred in setup and maintenance are high.**
- ✓ **Owing to its complexity, the administration of a mesh network is difficult.**



Lecture-3

This Lesson Covers:

- **What is Client-server network**
- **What is computer server ?**
- **Components of Client Server Network**
- **Introduction to Network Protocols**
- **The Need for a Protocol Architecture**
- **key features of a protocol**



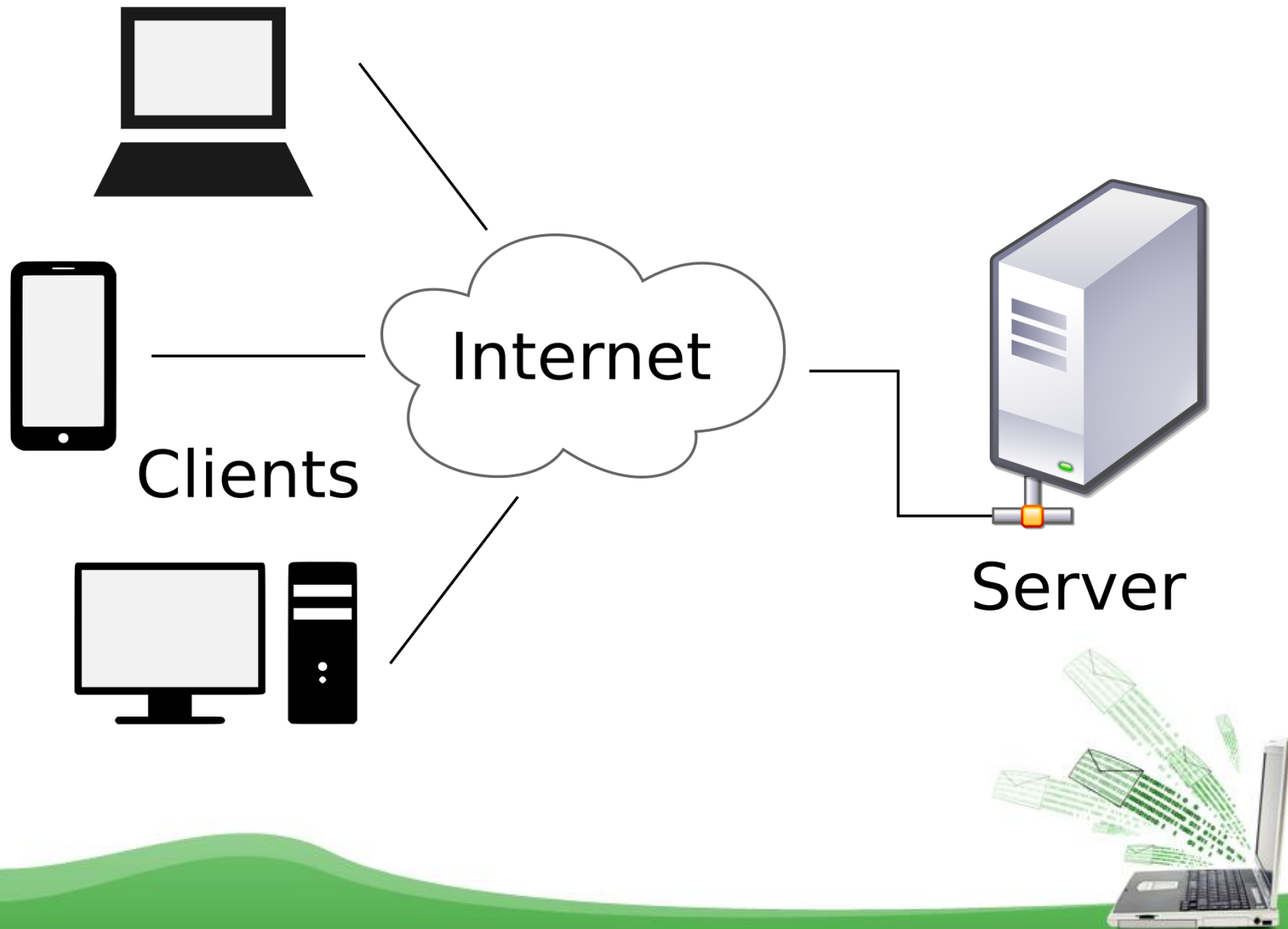
Definition of Client-Server Network

- ❑ The term 'Client-Server' refers to the Network Architecture ,where one or more computers are connected to a server . That one or more computer (*the Client*) sends a service request to another computer (*the Server*).



- ❑ A client-server network is essentially a connected set of computers like a peer-to-peer network but it has a 'master' computer called the server, which uses software called a network operating system' to control what happens on the network.
- ❑ The computers that you use on the network are called 'clients' because they are 'served' by the server, for example, the client may ask to load a piece of software.





What is computer server?

- ❑ A computer server is the powerful computer, or the set of computers connected to each other, which provide services to other systems. They usually have database integrated in them, and are very powerful machines with very advanced configuration. They process the requests of client machines. Their role is to make management of network easy and uniform.



Features of Servers

- 1) They have large storage capacity.
- 2) They are able to provide information to many computers simultaneously, therefore have large RAM.
- 3) Its processor speed is high, as it may have to execute multi-tasking too.



Components of Client Server Network

- 1) Clients or Workstations.
- 2) Servers.
- 3) Network Devices :- They connect the clients and servers, and at the same time ensure proper collision free routing of information.
- 4) Other components like scanner, printer, etc. can also be connected to network architecture.



Definition of network protocol

- ❑ A network protocol defines rules and conventions for communication between network devices. Protocols for computer_networking all generally use packet switching techniques to send and receive messages in the form of *packets*.



