



Lecture (01) Introduction



By:

Dr. Ahmed ElShafee

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Agenda

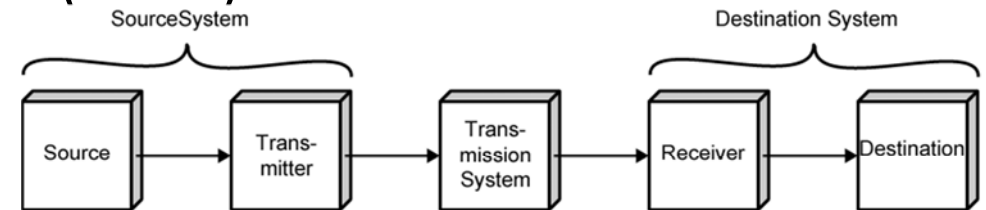
- Network & data communication.
- Perspectives on Networking
- Network building blocks
- Network objectives
- Machine types: Clients & servers
- Types of Networks : Local area network
- Types of Networks : Wide area network
- Types of Networks : Metropolitan area network

Network & Data Communication

Data communication

- Deals with data or information transfer between a source and a receiver.
- Data Communication is interested in the transfer of data, the method of transfer and the preservation of the data during the transfer process.
- Data communication focuses on the following topics:
 - data encoding and decoding
 - Modulation
 - Error correcting codes
 - Data Encryption and decryption

Network & Data Communication (cont..)



(a) General block diagram



(b) Example

Network & Data Communication (cont,..)

Networking

- Is interested in "connectivity", connecting computers together to share resources.
- Even though the computers can have different disk operating systems, languages, cabling and locations, they still can communicate to one another and share resources.
- provide the rules and regulations that allow computers with different disk operating systems, languages, cabling and locations to share resources.
- The rules and regulations are called protocols and standards in network

Perspectives on Networking

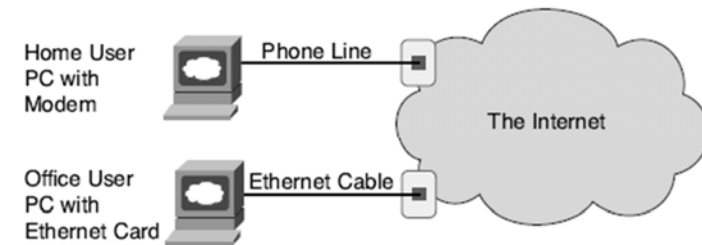
End-User Perspective on Networks

The user plugs in the phone line from the wall into a modem in a PC.

The user plugs PC network card to ADSL modem.

Uses his laptop to connect ADSL modem through wireless LAN.

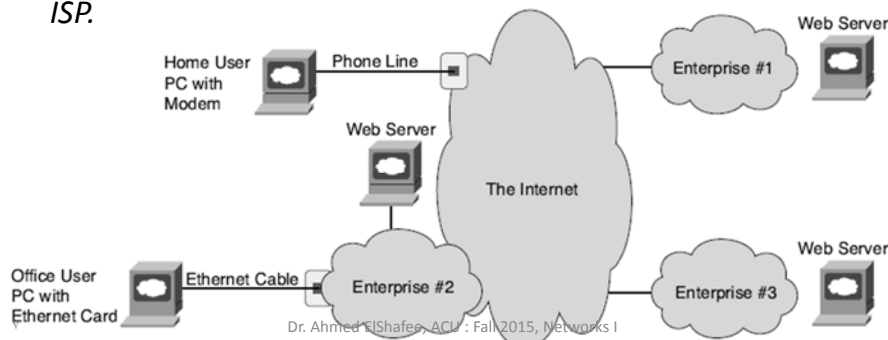
So user is directly connected the internet.



Perspectives on Networking (2)

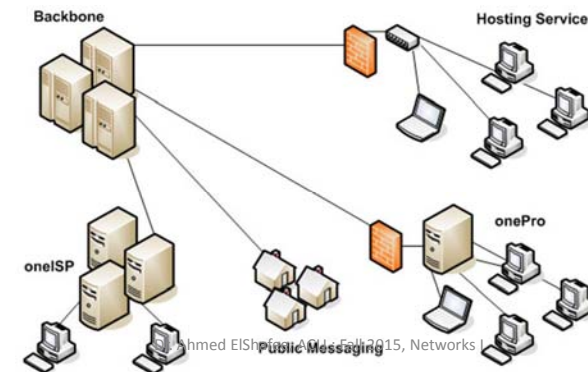
Enterprises Perspective on Networks and the Internet

When you go to your collage or your job and connect to "the network," you are most likely connecting to the private network, or enterprise network, for that school or company. That network, in turn, is connected to the Internet through an ISP.



Perspectives on Networking (3)

The Internet itself is really a collection of ISPs that, in turn, connect to each other. By having the various enterprise networks / users connect to the Internet, most computer users around the world can use applications to communicate with each other—worldwide.



Perspectives on Networking (4)

Network engineer Perspective on Networks

1.

A network engineer, who works for an enterprise, is responsible of the following:

- operating and maintaining enterprise network (servers and workstations) and its internet connectivity in appropriate way and with acceptable quality.
- Network operation, includes providing support of applications (DBs, web applications, mail exchanges) and OS (windows server, workstations) that run on enterprise servers and workstations.

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Perspectives on Networking (5)

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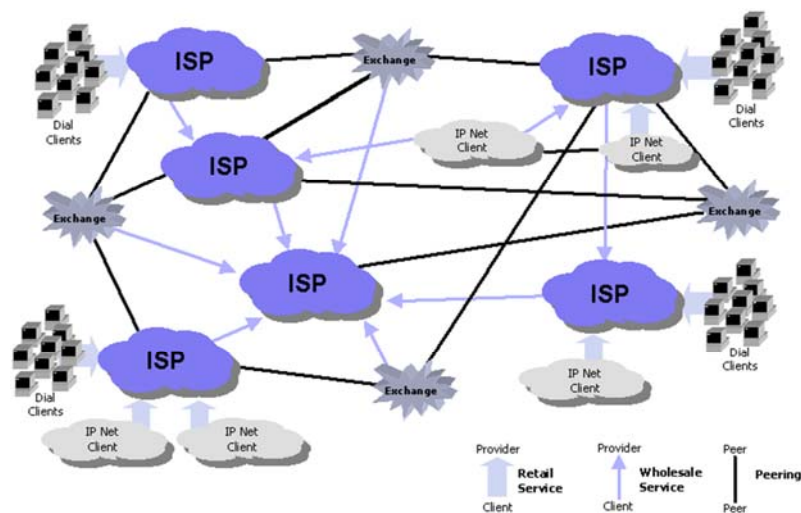
A network engineer, who works for network service providers, is responsible of one of the following

- Establishing, configuring and high level maintenance of clients network (enterprises or individuals users).
- Providing connectivity between enterprises premises (leased lines or VPNs), or connectivity of enterprises to internet (ISP).

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- ISP network engineer *Perspective*



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Perspectives on Networking (6)

A much larger number of people work on enterprise networks than ISP networks.

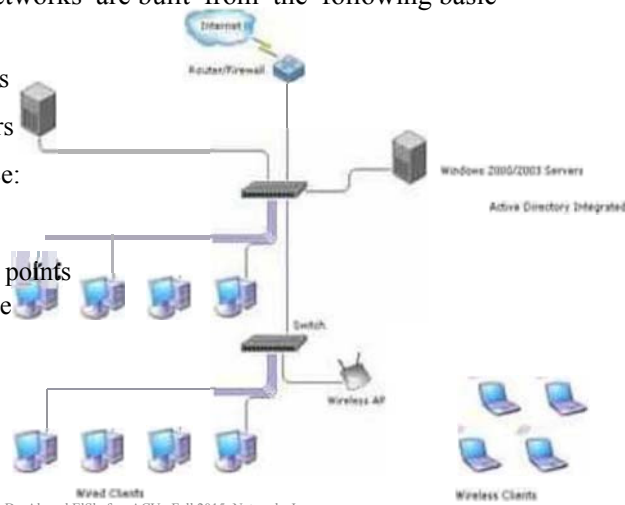
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Network building blocks

- Small or large, all networks are built from the following basic building blocks:

- Client computers
- Server computers
- Network interface:
- Cable
- Switches/Access points
- Network software



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Client computers:

- The computers that end users use to access the resources of the network.
- They usually run a desktop version of Windows such as Windows 8, 7, Vista, or XP.
- In addition, the client computers usually run some type of application software such as Microsoft Office.
- Client computers are sometimes referred to as **workstations**.

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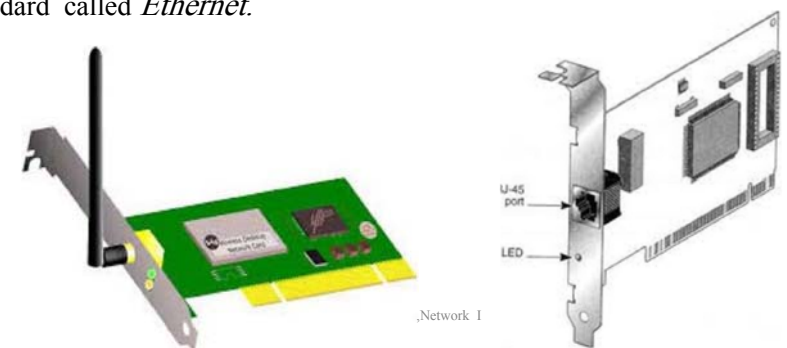
Server computers:

- Computers that provide
 - shared resources, such as disk storage and printers,
 - network services, such as e-mail and Internet access.
- Server computers run a specialized network operating system such as Windows Server 2008 or 2003, NetWare, or Linux, along with special software to provide network services.
- For example,
 - a server may run Microsoft Exchange to provide e-mail services for the network, or
 - it may run Apache Web Server so that the computer can serve Web

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Network interface:

- An interface -sometimes called a *network port*- that's installed in a computer to enable the computer to communicate over a network.
- Almost all network interfaces implement a networking standard called *Ethernet*.



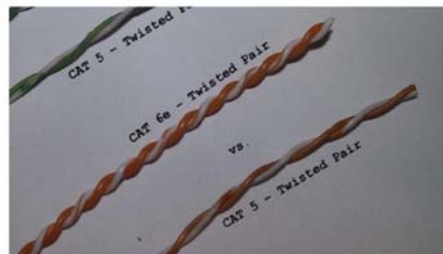
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- A network interface is sometimes called a NIC, which stands for *network interface card*.
- in the early days NIC was a separate card need to be installed on PC motherboard,now it become an integrated part of desktop PC.

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Cable:

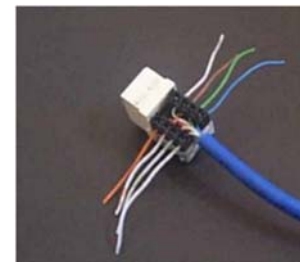
- Computers in a network are usually physically connected to each other using cable.
- Most networks today use a type of cable called *twisted pair*; also known by its official designation *10BaseT*.
- Twisted-pair cable is referred to as *Cat-5 or Cat-6 cable*.
- These terms refer to the standards that determine the maximum speed with which the cable can carry data, Cat-6 being rated for more speed than Cat-5.
- *Fiber-optic cable which is used for the highest-speed network connections.*
- Fiber-optic cable uses strands of glass to transmit light signals a very large speed.



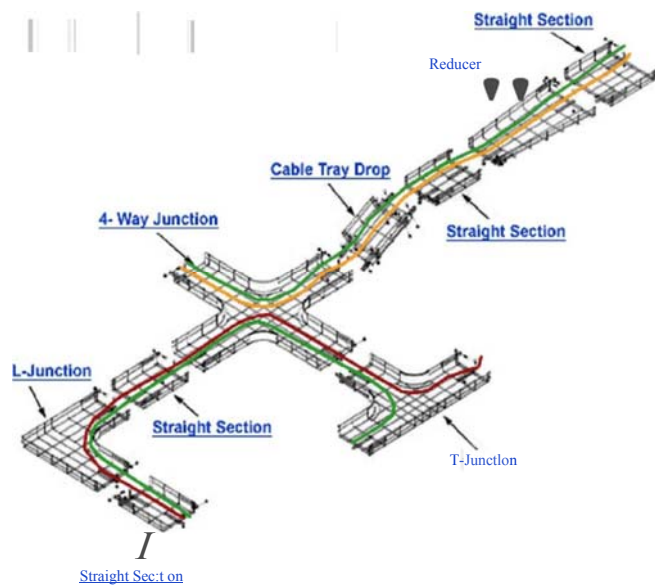
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- the cables run through the walls and converge on a central room called a *wiring closet*.
- *But for smaller networks/ the cables are often just strung along the floor, hidden behind desks and other furniture whenever possible.*



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Switches:

- Network cable doesn't connect computers directly to each other, each computer is connected by cable to a device known as a *switch*.
- *The switch/ in turn/ connects to the rest of the network.*
- Switch contains 5, or 8 or 16 or 24/ or 48 ports.
- Switches can be connected to each other to build larger networks.
- Older networks may use *hub instead of a switch*.
- *A hub provides the same function as a switch, but it isn't as efficient.*

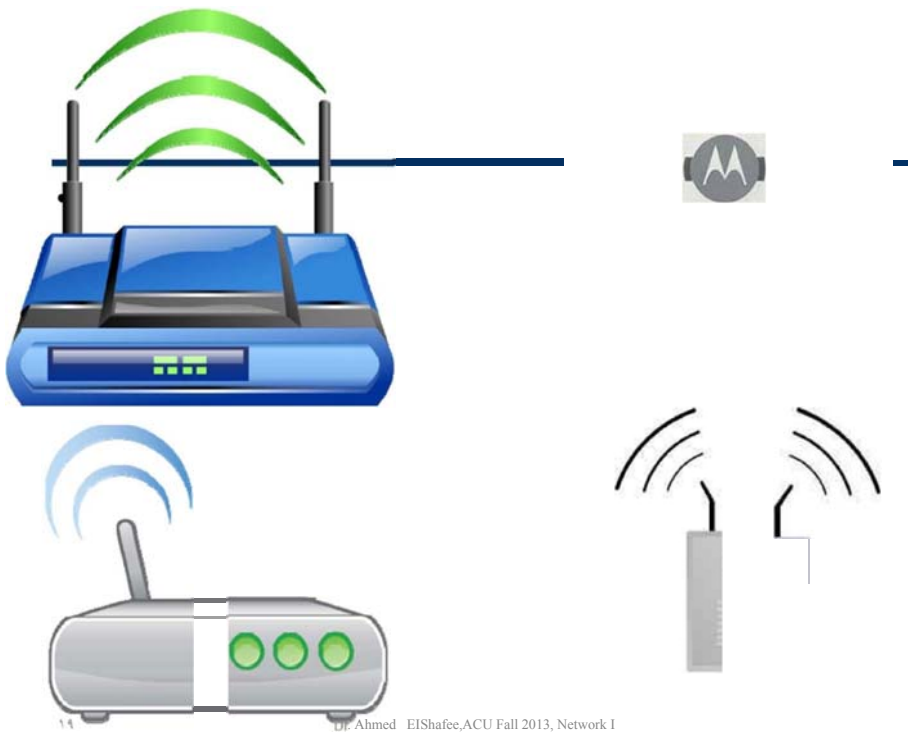
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Access Points for Wireless networks:

- In a wireless network, radio transmitters and receivers take the place of cables.
- The main advantage of wireless networking is its flexibility. With a wireless network, you don't have to run cables through walls or ceilings, and your client computers can be located anywhere within range of the network broadcast.
- The main disadvantage of wireless networking is that it's less secure and less efficient than a cabled network.

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Network software:

- Although network hardware is essential, what really makes a network work is software.
- Server computers typically use a special *network operating system* (also known as a *NOS*)
- Client computers need to have their network settings configured properly in order to access the network.



Network objectives

- Sharing information:
- Sharing resources
- Sharing applications

Sharing information:

- Networks allow users to share information in several different ways
 - share individual files, two or more persons can work on the same file saved on cloud of file server
 - Exchanging messages, like Microsoft Outlook, or web mails.
 - online meetings, and chatting applications.
 - VOIP
 - Video conferences

Sharing resources

- Printers: It's cheaper to buy a single high-speed printer with advanced features such as collating, stapling, and duplex printing that can be shared by an entire workgroup
- Hard drives: computer whose main purpose in life is to host shared hard drives is called a *file server*. individual folders on a networked hard drive are shared. The network administrator can allow different network users to have access to different shared folders.
- a network can be used to share an Internet connection

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Sharing applications:

- In any businesses users can work together on a single business application.
- For example, an accounting department may have accounting software that can be used from several computers at the same time.
- Or a sales-processing department may have an order-entry application that runs on several computers to handle a large volume of orders.

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Machine types: Clients & servers

- Usually, the most powerful and expensive computers in a network are the servers. because every user on the network shares the server's resources.
- The cheaper and less powerful computers in a network are the clients.

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Client server network

- This server computer is dedicated solely to the task of providing shared resources, such as hard drives and printers, to be accessed by the network client computers.
- A network that relies on dedicated servers is sometimes called a *client/server network*.
- If you're going to dedicate a computer to the task of being a full-time server, you should use a full-fledged network operating system, such as Windows Server 2012.

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Peer to peer network

- Other networks take an alternative approach, enabling any computer on the network to function as both a client and a server.
- any computer can share its printers and hard drives with other computers on the network.
- This type of network is called a *peer-to-peer network*
- Peer-to-peer networking has been built in to all versions of Windows since Windows 95.
- Thus, you don't have to buy any additional software to turn your computer into a server. All you have to do is enable the Windows server features.

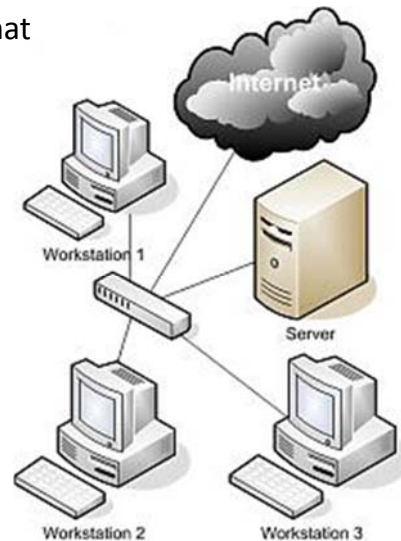
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- The network server features that are built in to desktop versions of Windows (including Windows 8, 7, Vista, and XP) aren't very efficient because these versions of Windows were not designed primarily to be network servers.

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Types of Networks: Local Area Networks (LAN)

- LAN is a communications network that interconnects a variety of device, providing means for information exchange among these devices.



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LAN (2)

- Characteristics
 1. Small scope, building, or cluster.
 2. Owned by organization which need communication facility.
 3. Data rate very high.

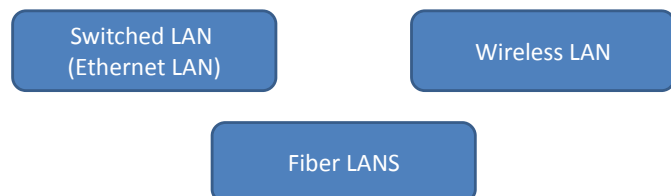


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LAN (3)

- Configuration, and types:

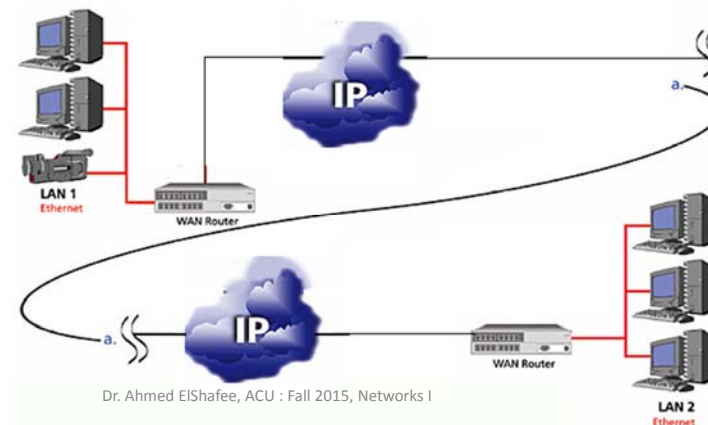


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Types of Networks: Wide Area Networks (WAN)

Consists of number of interconnected switching nodes, providing data exchange between different LANs or terminals over huge geographical area



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WAN (2)

- Transmission is being routed through these nodes to the destination device.
- Nodes are not concerned with contents of the data, their purpose is to provide a switching facility that will move the data from node to node.

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WAN (3)

Switching Technology:

1. Circuit Switching

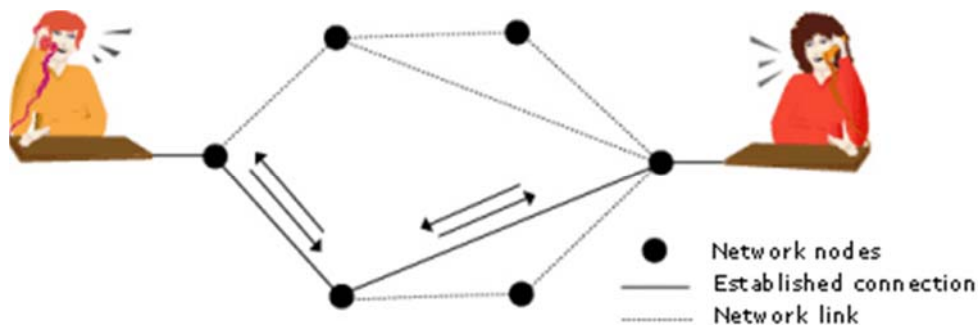
- A dedicated communication path (physical path between nodes) is established between the two stations through nodes of the network.
- Data transmitted as rapid as possible.
- Immediate routing and switching without delay.

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WAN (4)

- Common example is telephone network.



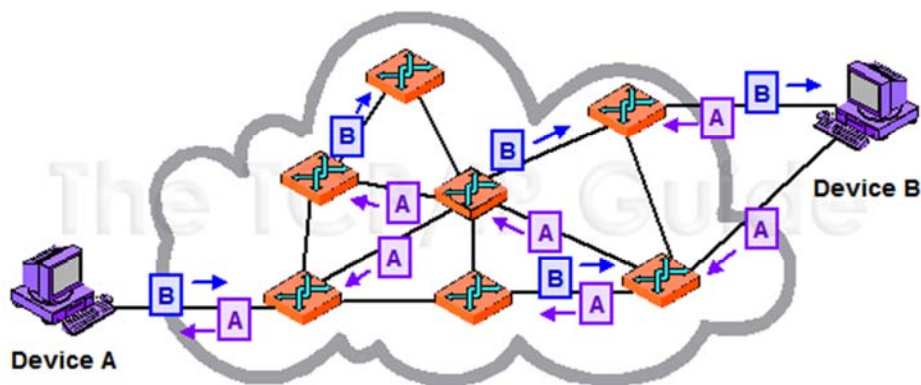
WAN (5)

2. Packet switching

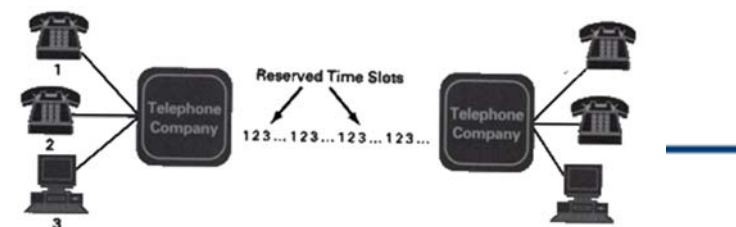
- Data is sent in small chunks called packets, each is passed through the network from node to node till reaching the destination.
- At each node, packet is stored then transmitted to the next node.
- Each packet carries destination address.
- Physical channel capacity is shared between different communication processes.

WAN (6)

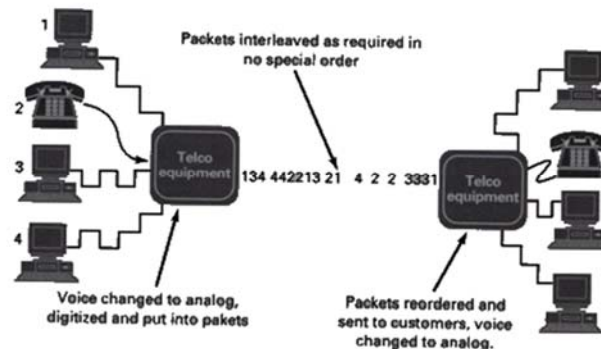
- Used for terminal/computer, and computer/computer communication.



WAN



Circuit Switching



Packet Switching

Types of Networks: Metropolitan Area Networks (MAN)

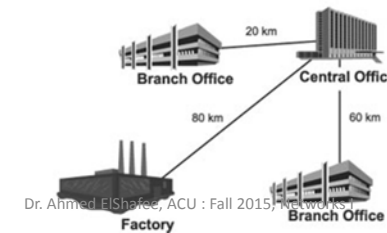
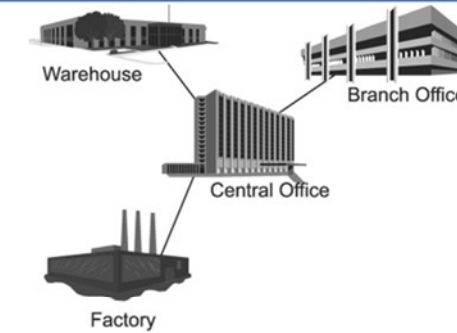
- middle ground between LAN and WAN
- private or public network
- large area

- It has two forms
 - Leased line
 - Terrestrial links

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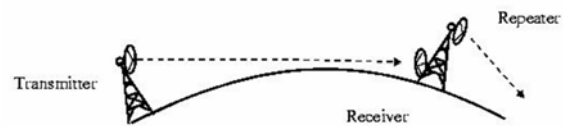
MAN (2)



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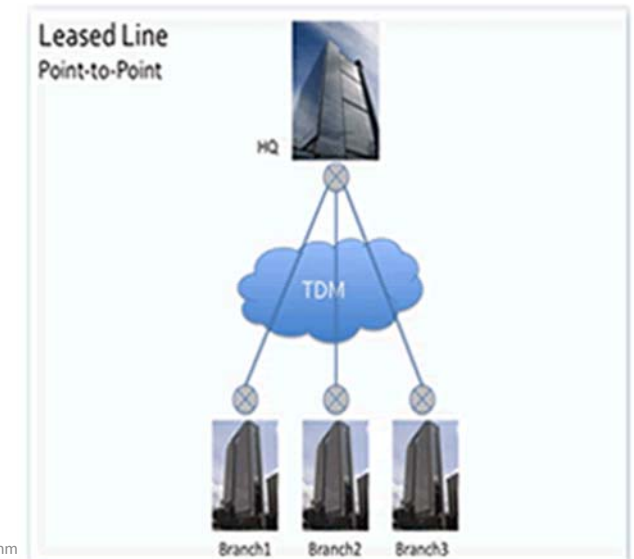
MAN (3)



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MAN (4)



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Dr. Ahm



**Thanks,..
See you next week (ISA),...**

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