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CHAPTER 4

COMPUTER NETWORKS

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CHAPTER 4 : COMPUTER NETWORKS

In daily life the term "network" is very common e.g. road network, water supply network, electrical network, telephonic network etc.
Generally with the term **network** we mean a set of objects (telephones, computers, cables etc) that are interconnected in a complex way, and communicate to each other in order to serve a specific task.

COMPUTER NETWORK

It is a group of two or more computers which are interconnected in order to:

- **exchange** data
- **share** common peripheral devices
- **execute** specific programs all together

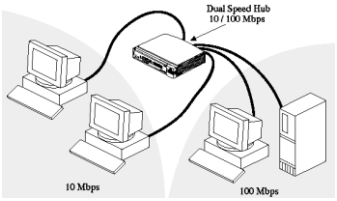
COMPUTER CONNECTION (close range)

There are two basic ways in order two or more computers to be connected in a local area:

A) Wired connection:
The interconnection of computers is based on **cables** (Ethernet, USB, Firewire) which are connected to **network card** (NIC) of each computer.

B) Wireless connection :
The interconnection of computers is based on **wireless network cards** (USB, PCMCIA) which are able to transmit or receive **electromagnetic waves** carrying the data.

- To simplify the network by using as less cables as we can, we use special network devices called **HUBS** which are able to **interconnect multiple devices together** and making them act as a single network segment. A HUB has multiple input/output ports in which a signal introduced at the input of any port appears at the output of any other port.



- Computers in order to communicate to each other need two more things:
  - **Convenient software** (e.g. a convenient operating system which allows them to exchange their data harmonically).
  - **Communication protocol** (which is a system of rules which must be respected from two computer systems when they need to communicate exchanging their data).

COMPUTER CONNECTION (distant range)

To communicate in a distant range we use a device called **modem** which permits us to connect to the internet through a telephone line. It is actually an analog to digital converter and vice versa.

It converts digital data (bits) of transmitter into analog, so they be able to transmit through the lines of analog telephone network (similar to sound transmission). Conversely, it converts the analog signal getting to receiver into digital form, so the receiver can open it and manage it.

The conversion in transmitter from digital to analog is called **modulation**, while that in receiver from analog to digital is called **demodulation**.

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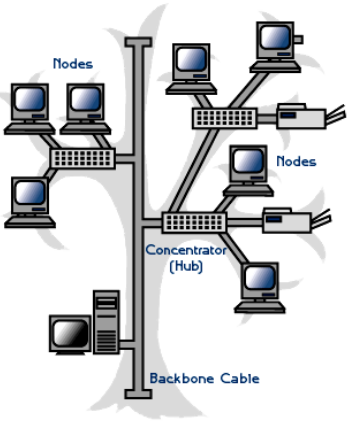
NETWORK APPLICATIONS

Networks are widely applicable to our daily activities, such us:

- Bank transactions
- Tickets reservations
- Hotels booking
- Public services dealings
- Automatic Teller Machines (ATM)

NETWORK ADVANTAGES

1. **Communication of computers for data interchange**
   For occupational, educational, recreational and other affairs.
2. **Sharing of the equipment, applications and data**
   Such as network printers, hard disks, scanners, cd-players etc.
3. **Money savings**
   Because of the hardware and software sharing.
4. **High level of reliability**
   If a computer is damaged, the rest of the network is still working unaffected.
5. **High level of upgradeability**
   It is notably easy to add new computers or peripherals to a network.



NETWORK DISADVANTAGES

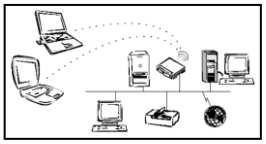
1. Data Security
computers are vulnerable in malicious actions conducted by unauthorized users.

2. Computer Viruses
An infected computer may also infect other computers with which it is connected inside a network. To encounter these threats there is a wide variety of **antivirus** and **internet security** software which is able to truck and cure malware from a system. Moreover a user can keep **back- up files** of his system to avoid loss of data due to malicious attacks.

NETWORK CATEGORIES

Networks can be divided into different categories based on three basic criteria:

A) **transmission channel** (wired or wireless networks)
B) **data service provider** (public or private networks)
C) **geographical coverage** (local or wide area networks)



Local Area Network (LAN)	Wide Area Network (WAN)	Metropolitan Area Network (MAN)
It covers a local geographical area with cables or wirelessly e.g. home, school, office etc.	It covers a wide area through telephone lines or satellites e.g. country, continent, whole world. It consists of smaller individual networks.	It is smaller than WAN and bigger than LAN used to cover intermediary areas e.g. town or city.

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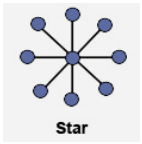
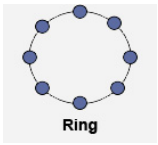
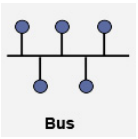
NETWORK TOPOLOGY

It is the **arrangement of various computers** inside a local area network (LAN). There are three different topology types which affect the way computer nodes communicate with each other:

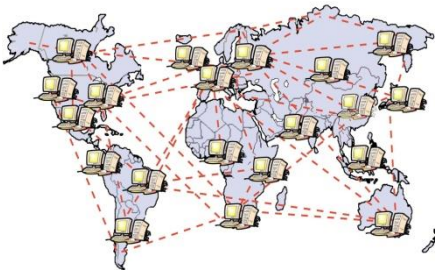
Star Topology	**Ring** Topology	**Bus** Topology
There is acentral node (server) which manages data transmissions of others, by permitting or forbidding the communication between them.	Every node in a ring receives data from the previous node and carries them forward to the next node until they get their final destination.	All network computers are connected to the same cable (bus) receiving all data transmitted from others but each of them opens only the data addressed to it



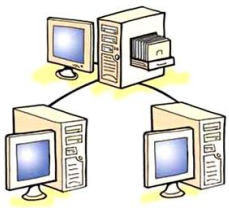




INTERNET (International Network)



- Internet is the largest WAN that consists of many smaller interconnected individual networks which can operate and communicate through existent telephone network.
- When we send a message through the Internet, its contents are divided into very small pieces called **packets**. Each packet having a specific number in order to be identified, is sent separately from other packets through the net following its own routing.

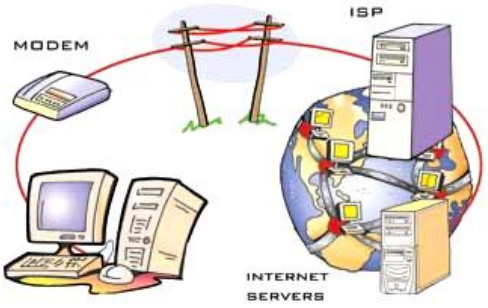


- Transmitter is responsible for breaking a message into packets and sending each of them through a different route, whereas receiver collects and reassembles them to build the initial message.
- The communication between computers on the Net is based in **Client – Server** architecture.
- When we ask to open a webpage, our computer acting as a **client** connects to a remote computer of the Internet sending it a request. The remote computer acting as a **server** satisfies the request of the client by sending back the data of the webpage, which have been saved to its storage.

WAYS OF INTERNET CONNECTION

A computer or an individual network can easily connect to the Internet by using the elements below:

- **telephone line** (PSTN, ISDN, ADSL)
- **connection device** (modem, or modem-router)
- **ISP connection** (forthnet, hol, otenet)



INTERNET SERVICE PROVIDER (ISP)

- It is an organization (private or public) that provides access to the Internet using telephone lines. Users are needed to pay a price to ISP for having that service. The service is provided in two ways:
  - **Subscription** (limitless, annual or half-year)
  - **Prepaid card** (internet access for prepaid time intervals)

forthnet OTENET hol hellas online

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