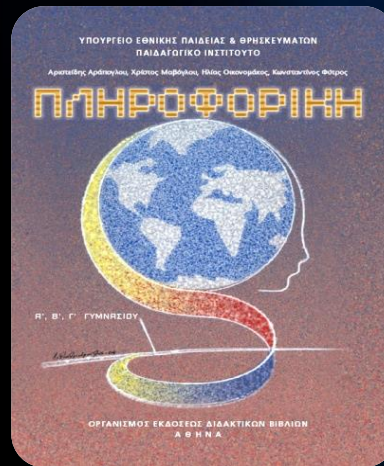


<http://www.zioulas.gr>



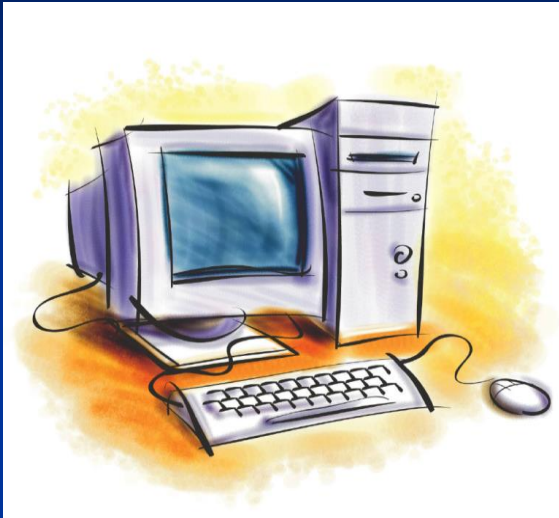
COMPUTER NETWORKS

CHAPTER 4



EVANGELOS C. ZIOULAS (IT TEACHER)

KEY WORDS



NETWORK

NETWORK CARD (NIC)

PROTOCOL

HUB

MODEM

LAN – WAN – MAN

TOPOLOGY

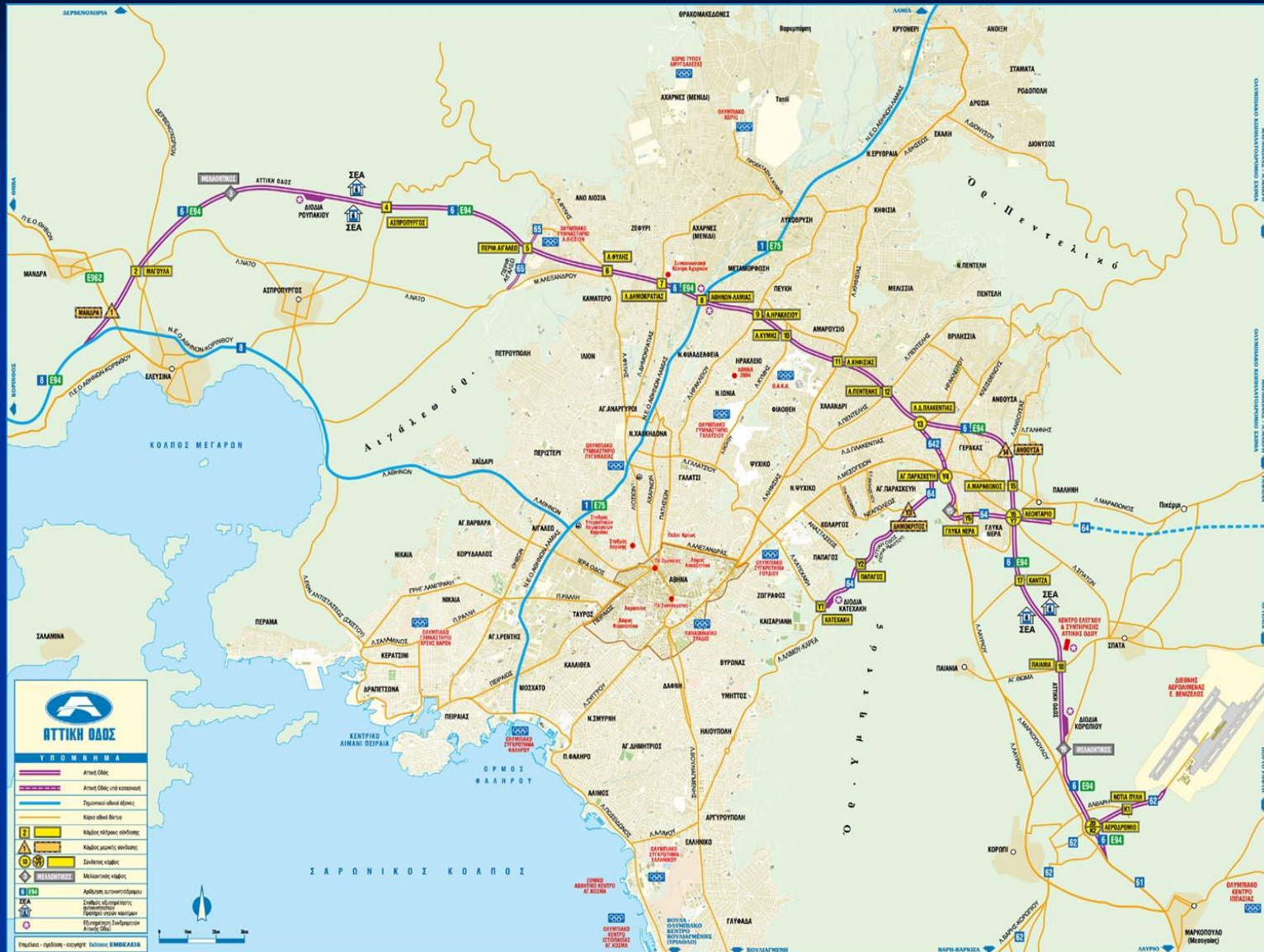
ISP

NETWORK

- 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

Part of National Road Network (Attiki odos)



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



CONNECTION TYPES

(LOCAL AREA)

■ Wired connection:

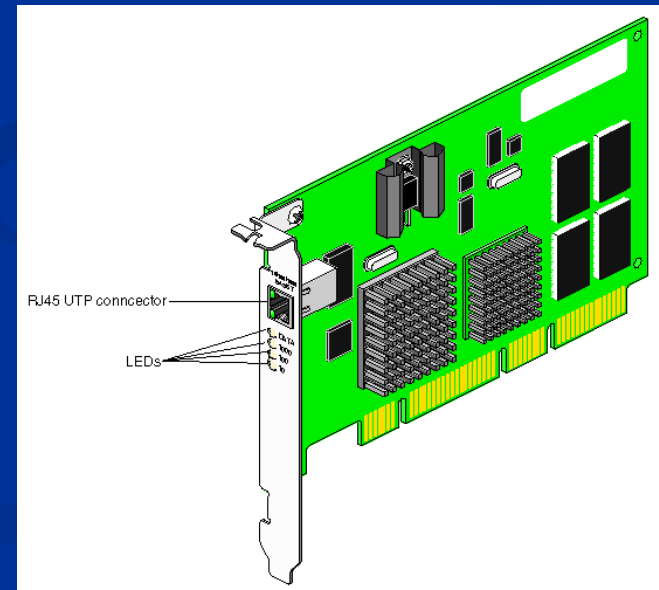
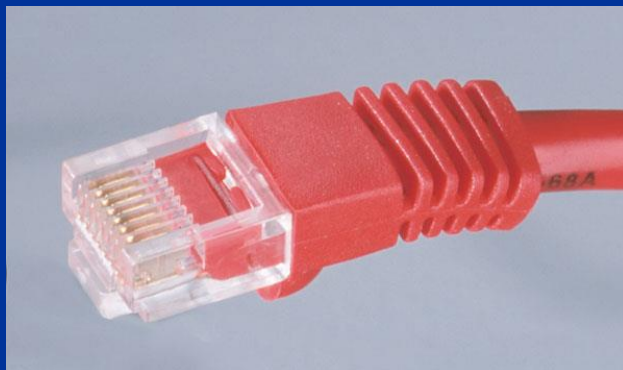
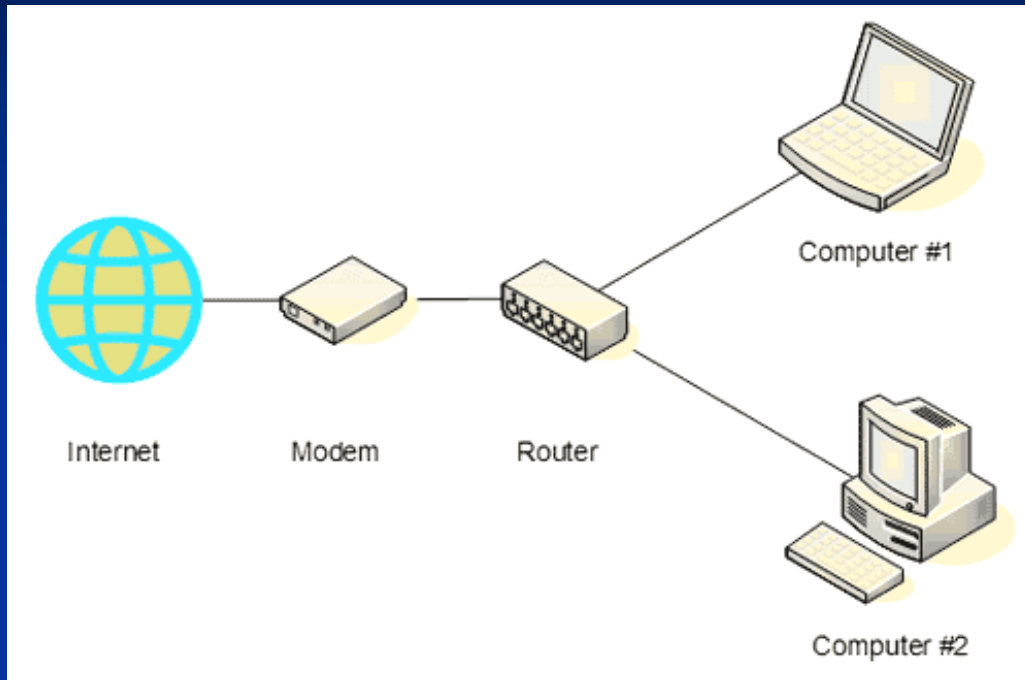
The interconnection of computers is based on **cables** (Ethernet, USB, Firewire) which are connected to **network card** (NIC) of each computer.

■ Wireless connection :

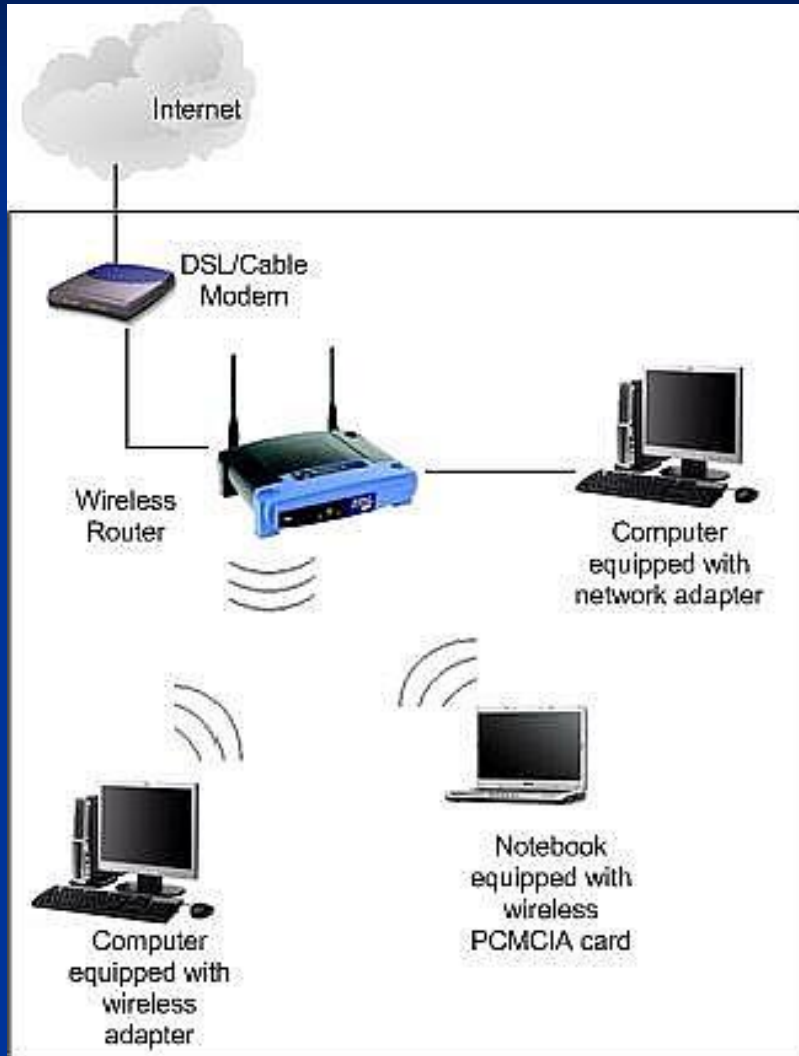
The interconnection of computers is based on **wireless network cards** (USB, PCMCIA) which are able to transmit or receive **electromagnetic waves** carrying the data.



WIRED CONNECTION



WIRELESS CONNECTION



WIRELESS COMMUNICATION



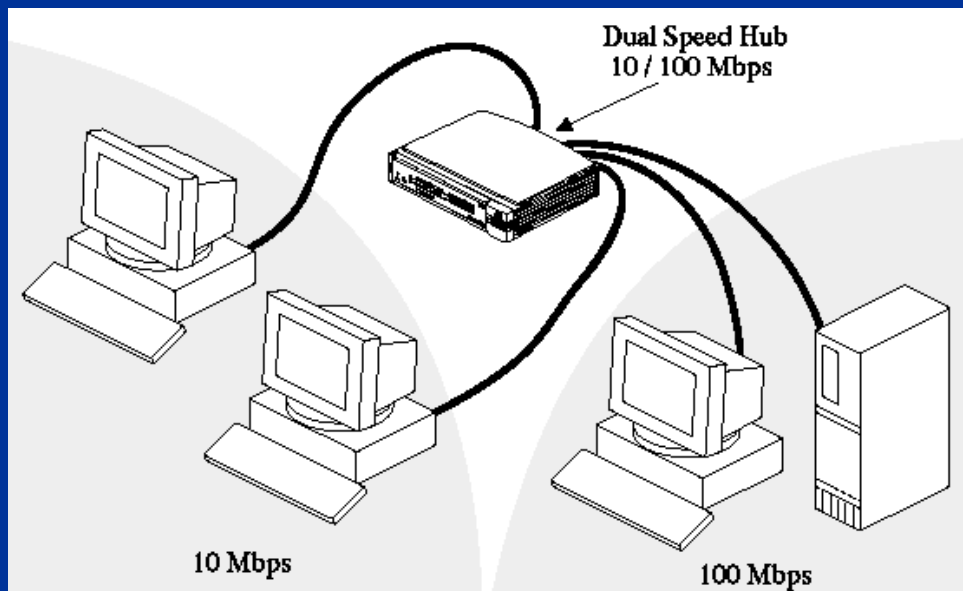
ADDITIONAL FEATURES

- 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).

HUBS

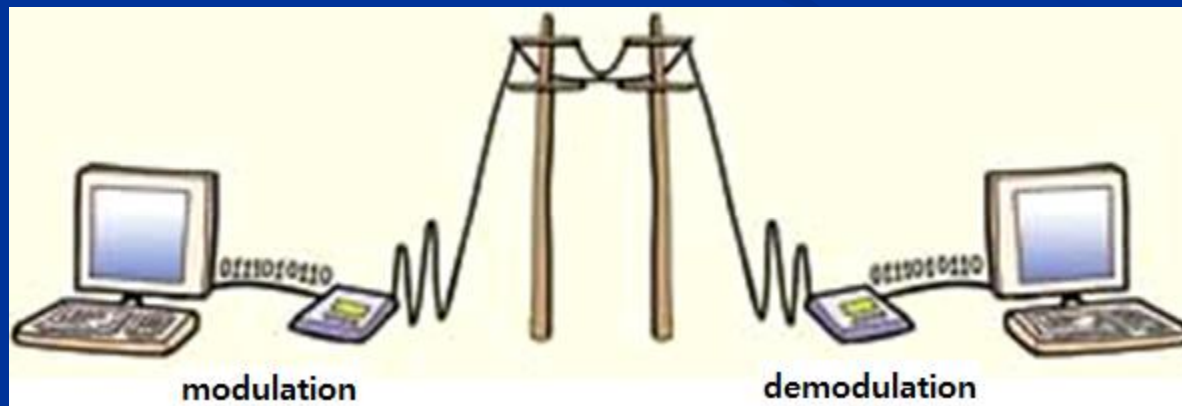
HUBS are important network equipment that **interconnect multiple devices together** and making them act as a single network segment.

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.

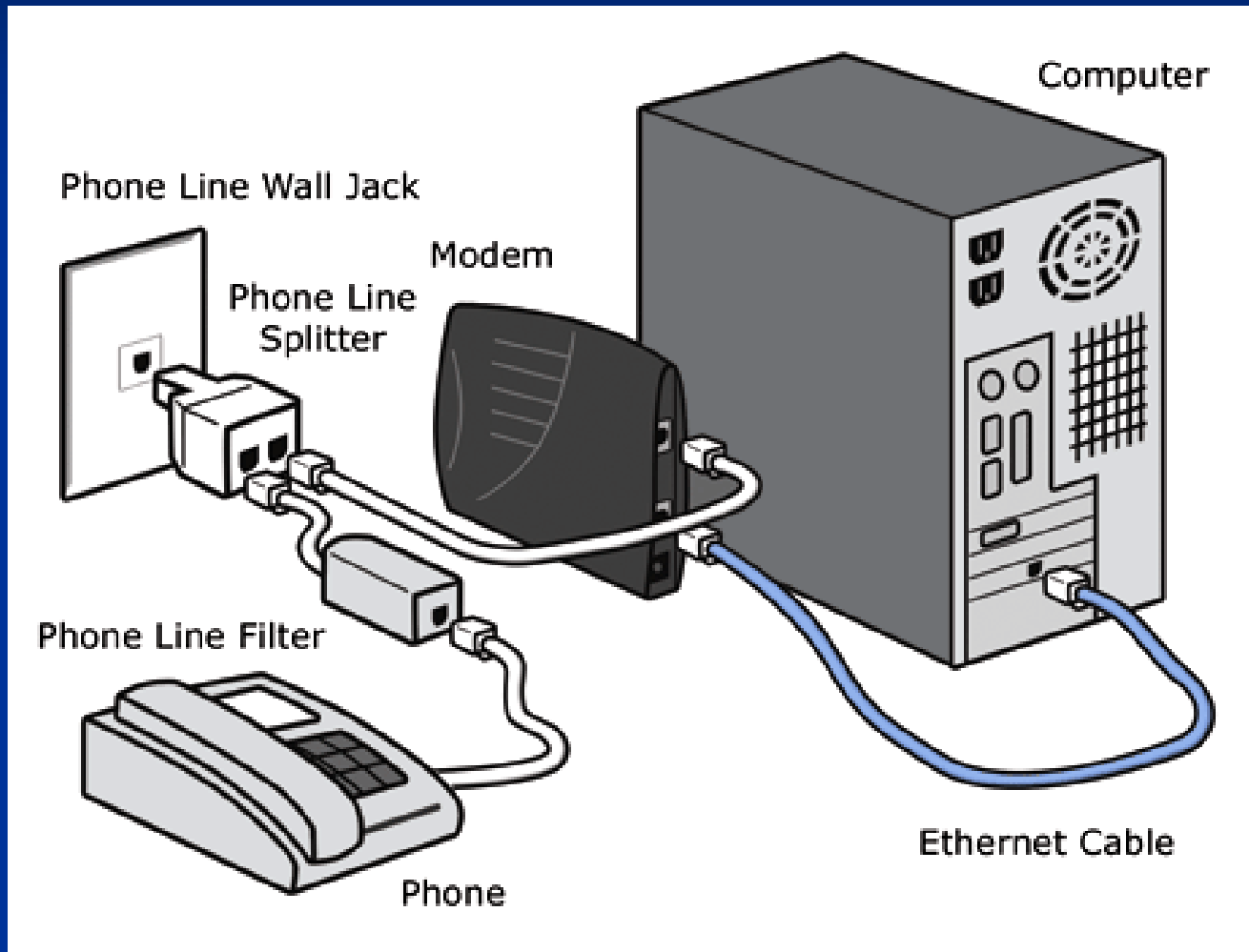


MODEM

- It **converts digital** data (bits) **to analog**, so they can be transmitted through the telephone lines (analog network). Conversely, it **converts the analog** signal coming from the telephone network **to digital**, so computer 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**.



DSL MODEM CONNECTION



NETWORK APPLICATIONS

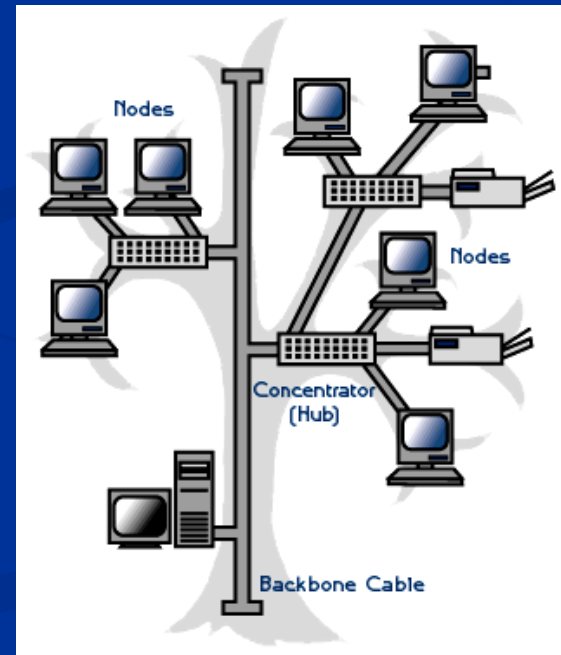
- Networks are widely applicable to our daily activities, such us:
- Bank transactions
- Tickets reservations
- Hotels booking
- Public services dealings
- ATM of banks



Inside an ATM there is a hidden computer system which is connected with the bank network to manage any transaction

NETWORK ADVANTAGES

- **Communication** of computers for data interchange
- **Sharing** of the equipment, applications and data
- Money **savings**
- High level of **reliability**
- High level of **upgradeability**



NETWORK DISADVANTAGES

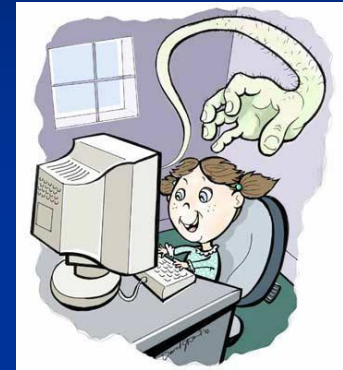
■ Data Security

computers are vulnerable in malicious actions conducted by unauthorized users.

■ Computer Viruses

An infected computer may also infect other computers with which it is connected inside a network.

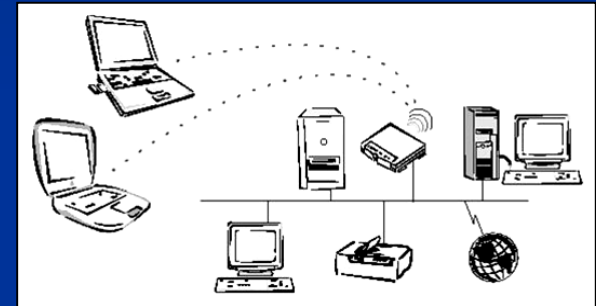
To encounter these threats there is a wide variety of **antivirus** and **internet security** software able to track and cure malware..



NETWORK CATEGORIES

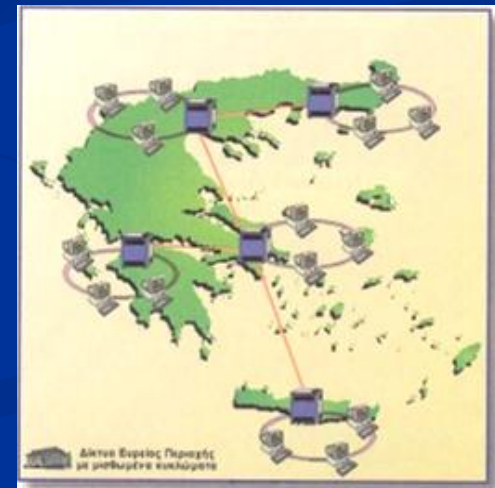
- Networks can be divided into different categories based on three basic criteria:

- **transmission channel**
(wired or wireless networks)



- **data service provider**
(public or private networks)

- **geographical coverage**
(local or wide area networks)

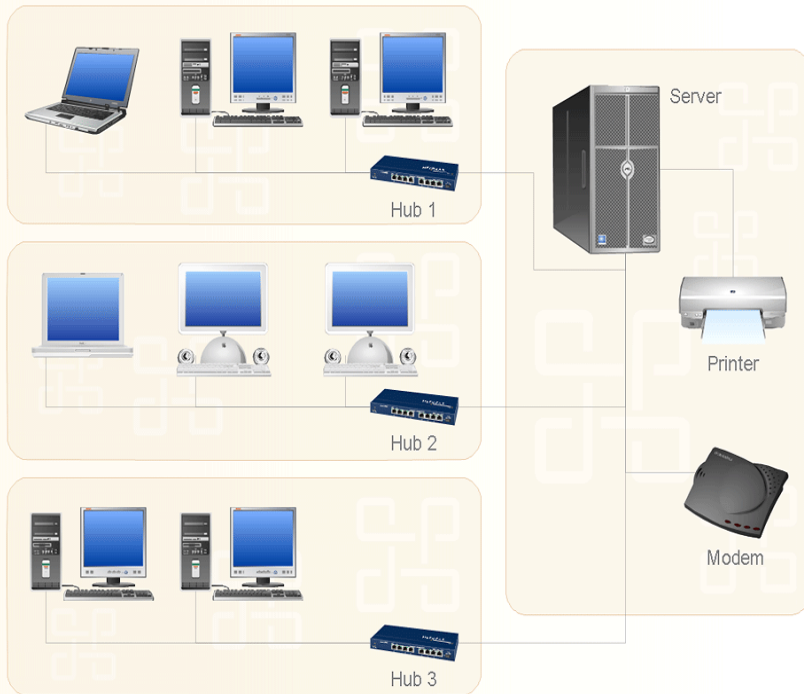


Local Area Network (LAN)

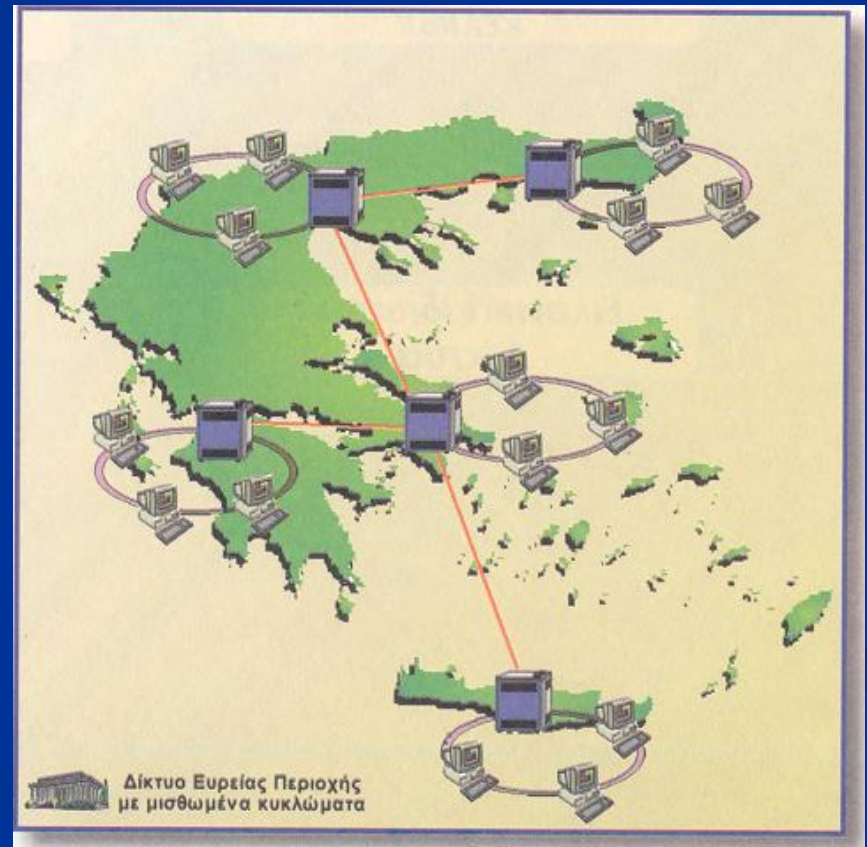
It covers a local geographical area with cables or wirelessly e.g. home, school, office etc.

Wide Area Network (WAN)

It covers a wide area through telephone lines or satellites e.g. country, continent, whole world. It consists of smaller individual networks.

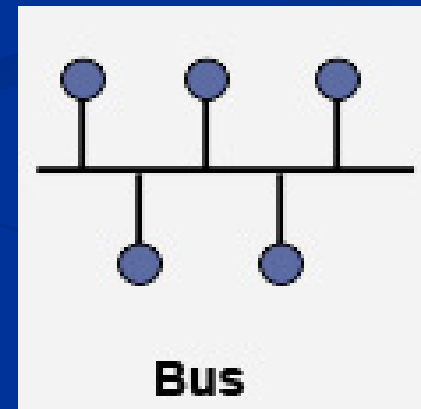
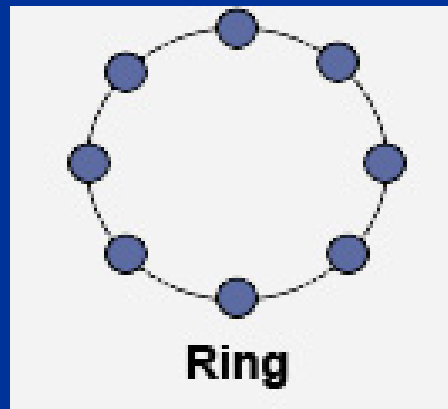
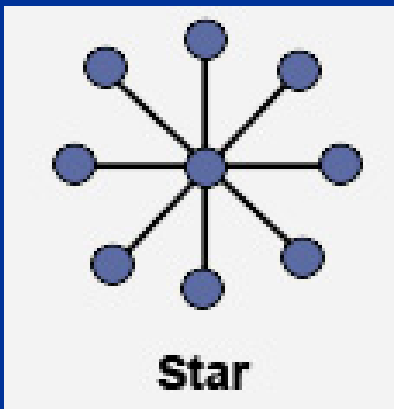


Simple LAN

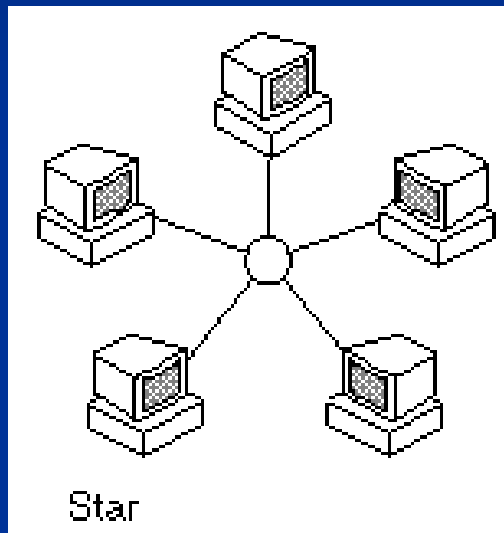


NETWORK TOPOLOGY

- 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:

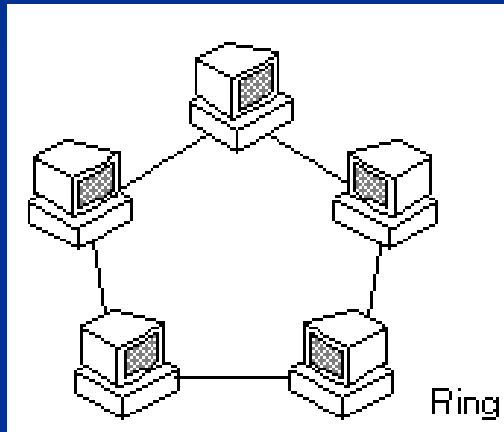


STAR TOPOLOGY



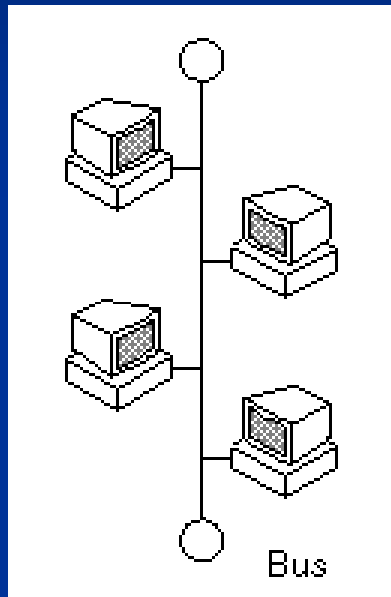
There is a central node (server) which manages data transmissions of others, by permitting or forbidding the communication between them.

RING TOPOLOGY



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.

BUS TOPOLOGY

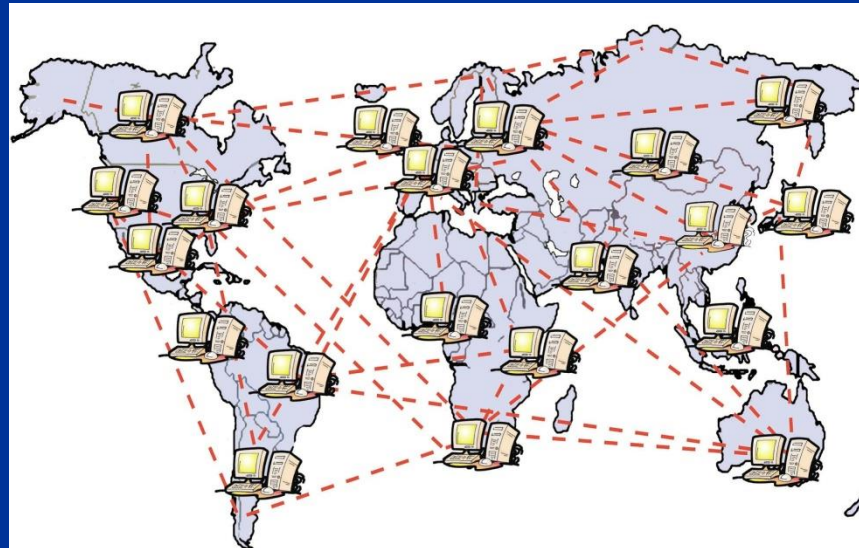


All network computers are connected to the same cable (bus) receiving all data transmitted from others but each one of them opens only the data addressed to it.

INTERNET

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.

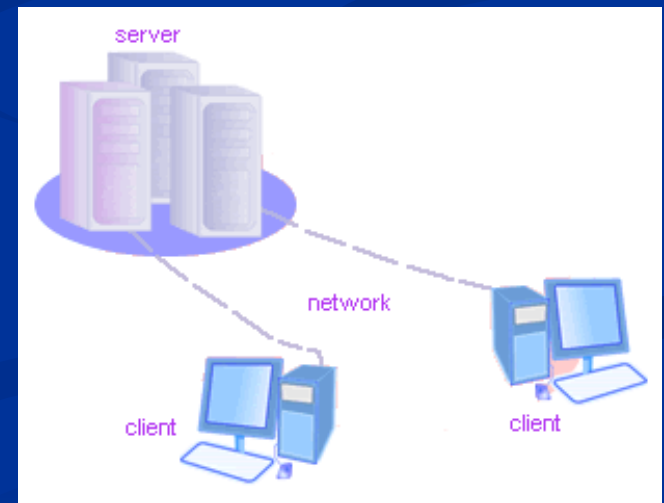
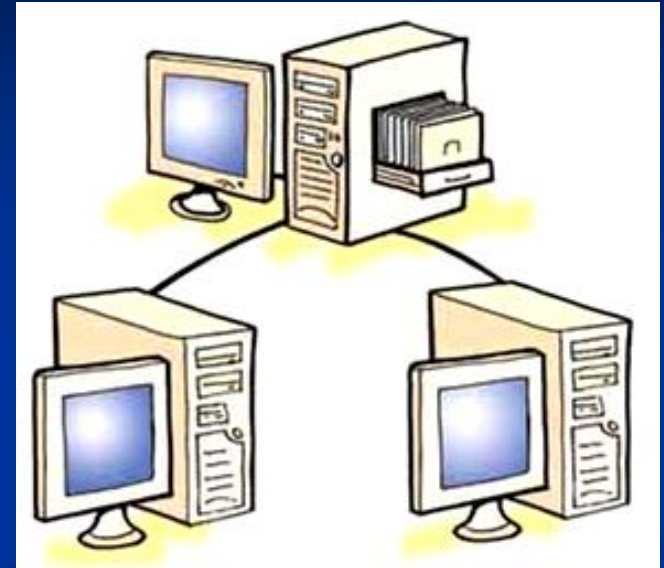


CLIENT – SERVER

- The communication between computers on the Net is based in **Client – Server** architecture.

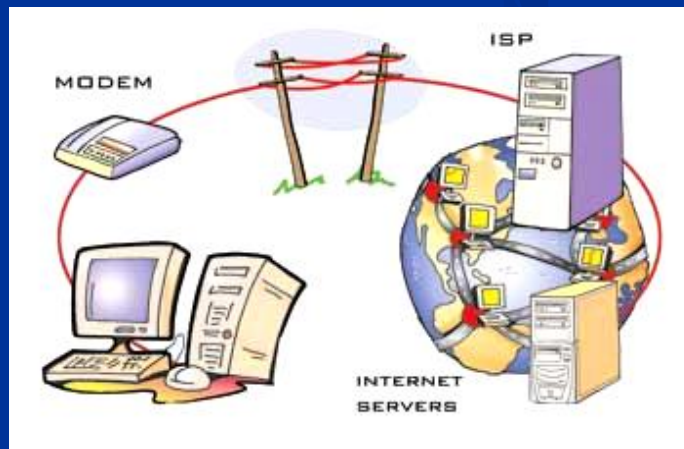


When we ask to open a webpage, our computer acting as a **client** connects to a remote computer of the Internet sending it a request. The remote computer acting as a **server** satisfies the request of the client by sending back the data of the webpage, which have been saved to its storage.



INTERNET CONNECTION PREREQUICITES

- 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)

