COMMUNICATIONS SYSTEMS

- Computer network: a set of devices connected to each other through physical media that send or receive data. Data is sent with the help of electrical impulses, electromagnetic waves, etc.

    - Heterogeneous network: networks with different components from different manufacturers.

    - Homogeneous network: networks with components and devices from the same manufacturer.

NOTE: a network card is used to connect devices to each other.

- System: set of processes and ordered elements interrelated for a purpose.

NOTE: order does not always matter in a system.

- Communication: transfer of information from one point to another (sender, recipient, transmitter to receiver, etc).

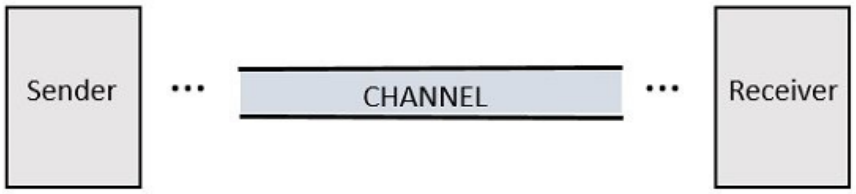
    - The channel can be bidirectional (first one speaks and then releases the channel and the other speaks) or dual (both can talk at the same time).

    - A *telecommunication* is when there is a machine involved in the communication. This machine can amplify the communication range unlike traditional communication.

    - A piece of *data* is an element that by itself says nothing, but information is a set of data with a context and linked in a coherent way.

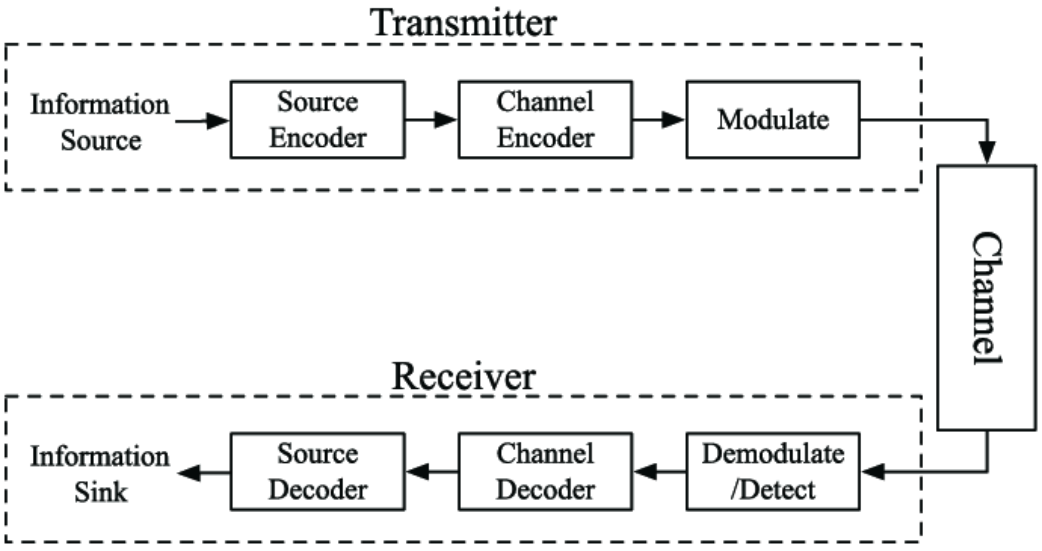
- Information: (data set with some meaning). Information is a physical pattern to which a commonly agreed upon meaning is assigned. The pattern must be unique to avoid interpretation, capable of being sent by the transmitter and capable of being detected and understood by the receiver. Information is usually transmitted in various forms: sound, waves, light, patterns, voltage, which can be detected by appropriate devices.

Elements of a communications system



NOTE: If one element of the communication is faster than the other, it becomes saturated and data is lost (in the case of the transmitter). There must be a balance.

- Transmitter: is responsible for sending the message (data) through the channel to reach the receiver.
- Channel: is the link between transmitter and receiver. This medium can be a pair of wires, coaxial cable, fiber optics and even air.
- Receiver: is responsible for extracting the message from the channel; In many cases the signal (carries the message) is very weak, and therefore it must be amplified using some extra techniques.



- Noise: Any unwanted signal that is mixed with the useful signal that we want to transmit is called noise. Noise is due to multiple causes: electronic components (amplifiers), thermal noise from resistors, interference from external signals, etc.

    - Shot noise: is an uncorrelated electromagnetic noise, also called transistor noise, produced by the random arrival of carrier components (hole electrons) at the output element of a device, such as a diode, a transistor (field-effect or bipolar), or a vacuum tube.

Historical events related to networks

➔ 1752: Discovery of electricity (B. Franklin).

➔ 1845: Kirchhoff's Laws.

➔ 1876: Birth of telephony (Bell).

➔ 1915: Experiments are done with AM radio.

➔ 1918: First FM station established (Pittsburg).

➔ 1923-1938: TV technology develops.

➔ 1945: Proposal for communication between satellites.

➔ 1955: Fiberglass is discovered to transmit light.

➔ 1969: ARPANET is developed.

➔ 1981: Cellular telephony is born.

➔ 1985: Mexico launches its first satellite.

➔ 1991-1994: Dissemination of the Internet as a means of public communication.

- A telecommunications system consists of a physical infrastructure through which data is transported from source to destination and based on said infrastructure, services are offered to users. It is also called a "telecommunication network."

- NSFNET: English acronym for National Science Foundation's Network.

Data communication

- To receive telecommunications equipment, a user uses terminal equipment through which he or she gains entry to the network through an access channel.

- *Principles for a reliable shipping system (security triad):*
    - Integrity
    - Availability
    - Confidentiality