

What is a Communication System?

The process of transmission and reception of information is called communication. The communication system is a system which describes the information exchange between two points.

Types Of Communication Systems

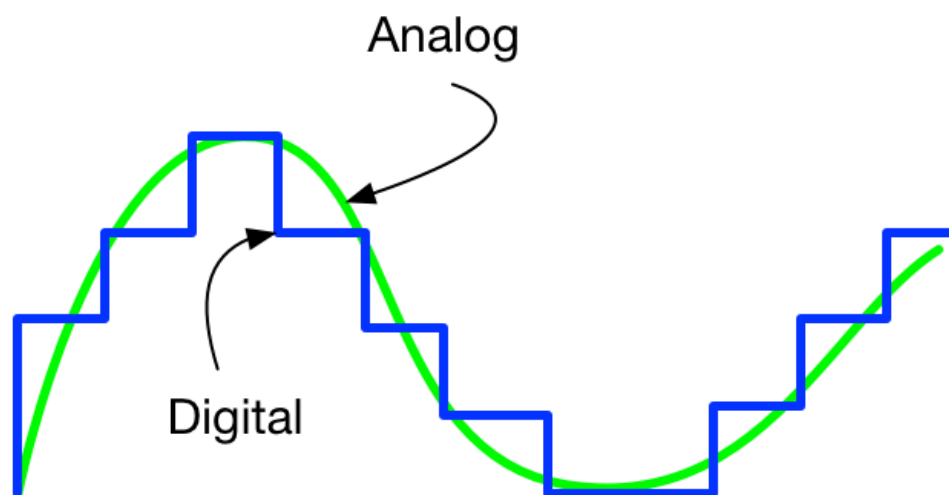
Depending on Signal specification or technology, the communication system is classified as follows:

(1) Analog

Analog technology communicates data as electronic signals of varying frequency or amplitude. Broadcast and telephone transmission are common examples of Analog technology.

(2) Digital

In digital technology, the data are generated and processed in two states: High (represented as 1) and Low (represented as 0). Digital technology stores and transmits data in the form of 1s and 0s.



Depending on the communication channel, the communication system is categorized as follows:

1. **Wired** (Line communication)

- Parallel wire communication
- Twisted wire communication
- Coaxial cable communication
- Optical fibre communication

2. **Wireless** (Space communication)

- Ground wave communication
- Skywave communication
- Space wave communication

- Satellite communication

Examples Of Communication Systems

The following are a few examples of communication systems:

1. Internet
2. Public Switched Telephone network
3. Intranet and Extranet
4. Television

Elements Of Communication Systems

The definitions of the terms used in the communication system are discussed below.

Information

Message or information is the entity that is to be transmitted. It can be in the form of audio, video, temperature, picture, pressure, etc.

Signal

The single-valued function of time that carries the information. The information is converted into an electrical form for transmission.

Transducer

A device or an arrangement that converts one form of energy to the other. An electrical transducer converts physical variables such as pressure, force, temperature into corresponding electrical signal variations. Example: Microphone – converts audio signals into electrical signals. Photodetector – converts light signals into electrical signals.

Amplifier

The electronic circuit or device that increases the amplitude or the strength of the transmitted signal is called an amplifier. When the signal strength becomes less than the required value, amplification can be done anywhere in between transmitter and receiver. A DC power source will provide for the amplification.

Modulator

As the original message signal cannot be transmitted over a large distance because of their low frequency and amplitude, they are superimposed with high frequency and amplitude wave called carrier wave. This phenomenon of superimposing of message signal with a carrier wave is called modulation. And the resultant wave is a modulated wave which is to be transmitted.

Again there are different types of Modulation.

i. Amplitude Modulation (AM)

The process of changing the amplitude of the signal wave by impressing or superimposing it on a high-frequency carrier wave, keeping its frequency constant is called amplitude modulation.

ii. Frequency Modulation (FM)

Frequency modulation is a technique in which the frequency of the message signal is varied by modulating with a carrier wave. It is better than deficient than amplitude modulation because it eliminates noise from various sources.

iii. Phase Modulation (PM)

The phase of the carrier wave changes the phase of the signal wave. The phase shift after modulation is dependent on the frequency of the carrier wave as well. Phase modulated waves are immune to noise to a greater extent.

Transmitter

It is the arrangement that processes the message signal into a suitable form for transmission and subsequently reception.

Antenna

An Antenna is a structure or a device that is radiate and receive electromagnetic waves. So, they are used in both transmitters and receivers. An antenna is basically a metallic object, often a collection of wires. The electromagnetic waves are polarised according to the position of the antenna.

Channel

A channel refers to a physical medium such as wire, cables, space through which the signal is passed from transmitter to the receiver. There are many channel impairments that affect the channel performance to a pronounced level. Noise, Attenuation and distortion to mention the major impairments.

Noise

Noise is one of the channel imperfection or impairment in the received signal at the destination. There are external and internal sources that cause noise. External sources include interference, i.e. interference from nearby transmitted signals (cross talk), interference generated by natural source such as lightning, solar or cosmic radiation, from automobile generated radiation, etc. The external noise can be minimised and eliminated by appropriate design of the channel, shielding of cables. Also by digital transmission external noise can be much minimised.

Internal sources include noise due to random motion and collision of electrons in the conductors, thermal noise due to diffusion and recombination of charge carriers in other electronic devices. Internal noise can be minimised by cooling and using digital technology for transmission.

Attenuation

Attenuation is a problem caused by the medium. When the signal is propagating for a longer distance through a medium, depending on the length of the medium the initial power decreases. The loss in initial power is directly proportional to the length of the medium. Using amplifiers, the signal power is strengthened or amplified so as to reduce attenuation. Also, digital signals are comparatively less prone to attenuation than analogue signals.

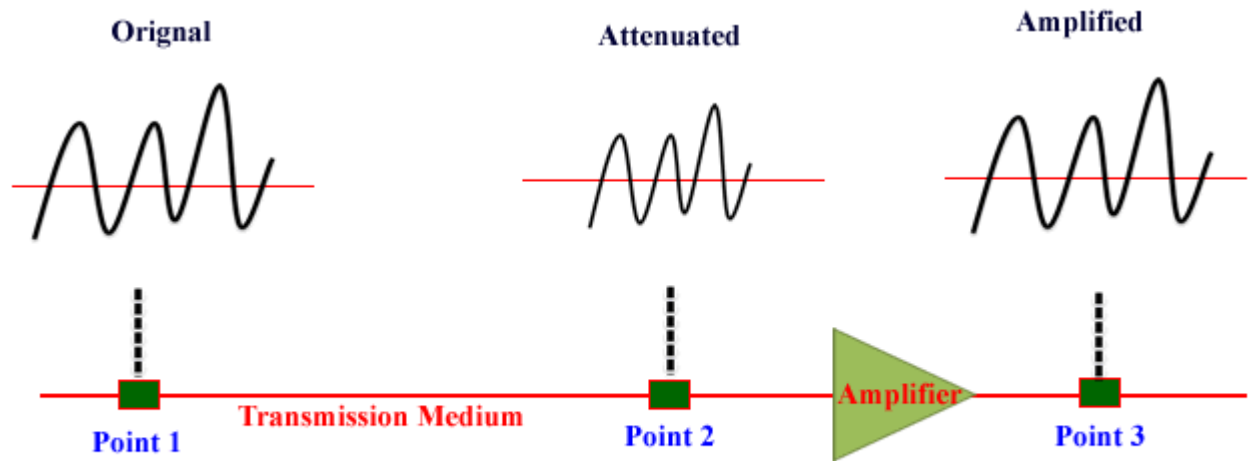


Fig: Effect of Attenuation

Distortion

It is also another type of channel problem. When the signal is distorted, the distorted signal may have frequency and bandwidth different from the transmitted signal. The variation in the signal frequency can be linear or non-linear.

Receiver

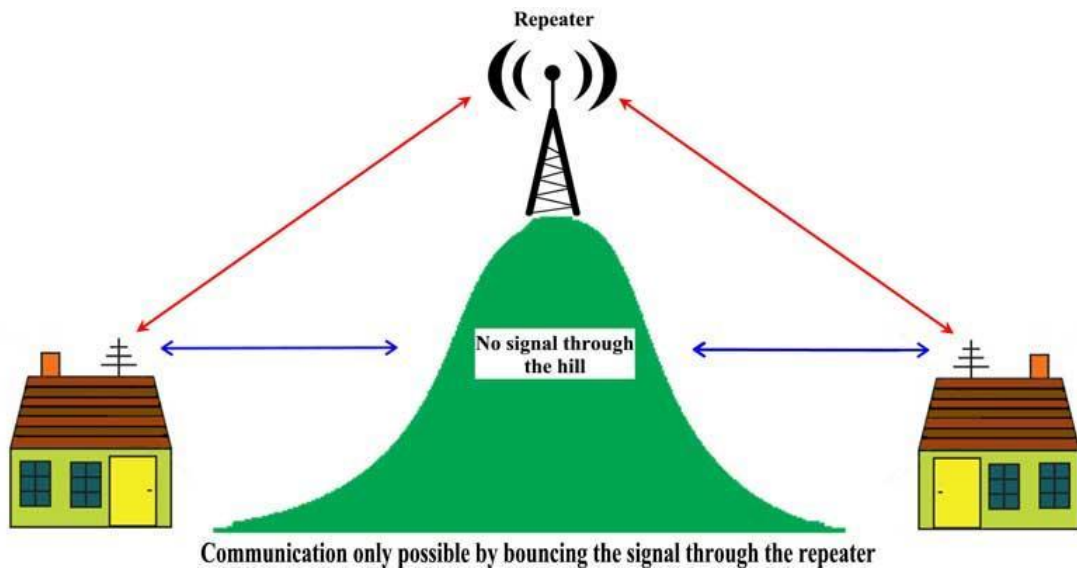
An arrangement that extracts the message or information from the transmitted signal at the output end of the channel and reproduces it in a suitable form as the original message signal is a receiver.

Demodulator

It is the inverse phenomenon of modulation. The process of separation of message signal from the carrier wave takes place in the demodulator. The information is retrieved from the modulated wave.

Repeaters

Repeaters are placed at different locations in between the transmitter and receiver. A repeater receives the transmitted signal, amplifies it and send it to the next repeater without distorting the original signal.



Block Diagram of Communication Systems

The block diagram given below represents the flow of the signal from the source to the destination. The role of every device and arrangement discussed above is better understood.

