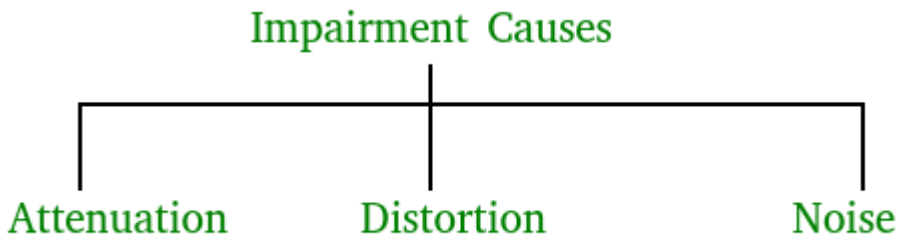
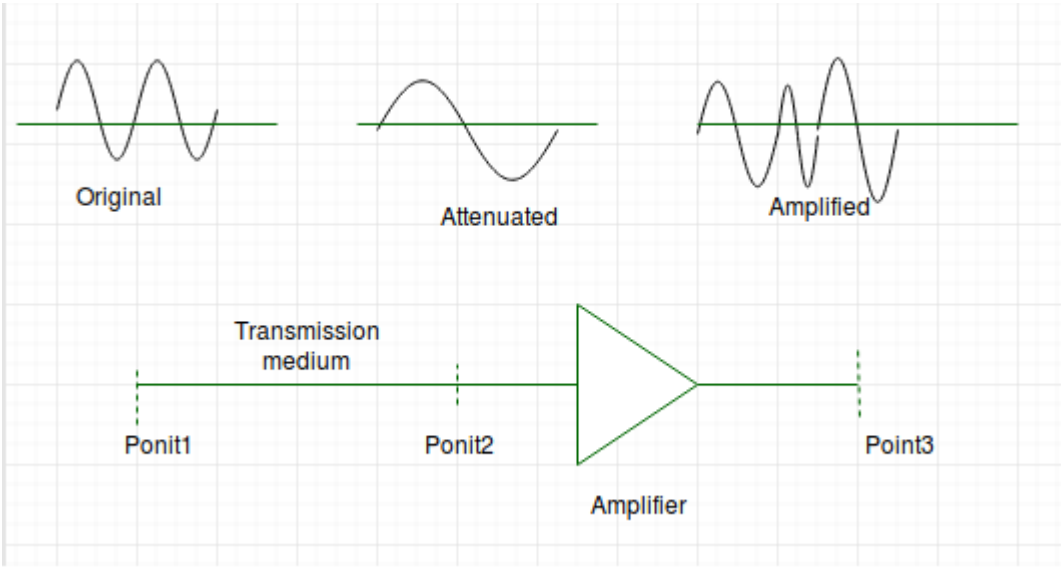
Transmission Impairment in Data Communication

In communication system, analog signals travel through transmission media, which tends to deteriorate the quality of analog signal, which means that the signal at the beginning of the medium is not the same as the signal at the end of the medium. The imperfection causes signal impairment. Below are the causes of the impairment.

Causes of impairment –



- **Attenuation –** It means loss of energy. The strength of signal decreases with increasing distance which causes loss of energy in overcoming resistance of medium. This is also known as attenuated signal. Amplifiers are used to amplify the attenuated signal which gives the original signal back and compensate for this loss.



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Attenuation is measured in **decibels(dB)**. It measures the relative strengths of two signals or one signal at two different point.

Attenuation(dB) = 10log10(P2/P1)

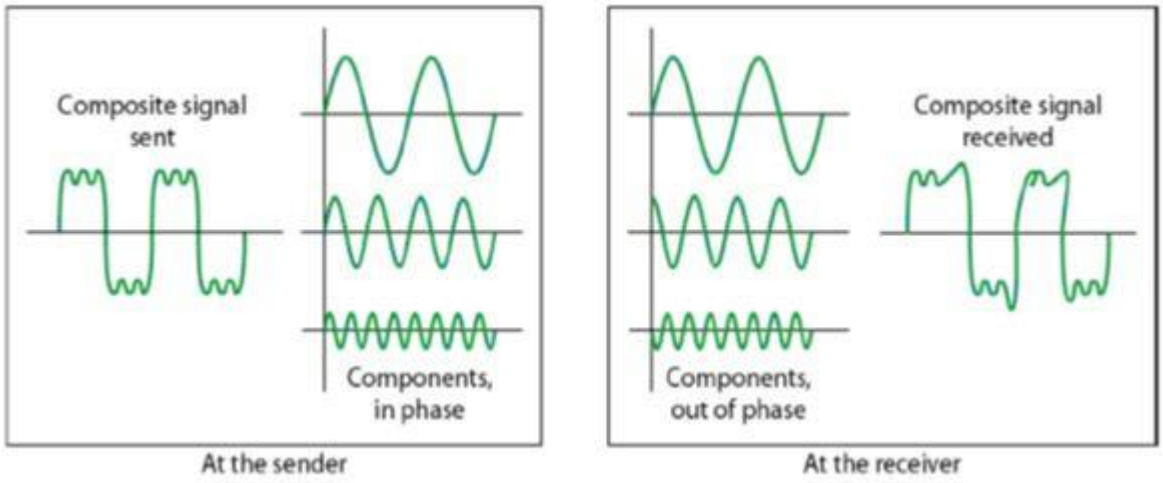
P1 is the power at sending end and P2 is the power at receiving end.

Some where the decibel is also define in terms of voltage instead of power.In this case because power is proportional to the square of the voltage the formula is

Attenuation(dB) = 20log10(V2/V1)

V1 is the voltage at sending end and V2 is the voltage at receiving end.

- **Distortion –** It means changes in the form or shape of the signal. This is generally seen in composite signals made up with different frequencies. Each frequency component has its own propagation speed travelling through a medium. And thats why it delay in arriving at the final destination Every component arrive at different time which leads to distortion. Therefore, they have different phases at receiver end from what they had at senders end.



Capacity of a channel in Computer Network

By capacity of a channel, it means the capacity of the **transmission medium (wire or link)**. Capacity is the number of bits the transmission medium can hold. So basically there are 2 types of channels – Full duplex and half duplex.

1. **Half duplex –** the transmission can happen in one direction at a time.
2. **Full duplex –** the transmission can happen in both the direction simultaneously.

For example, the transmission medium is operating in its maximum capacity then at that time the number of bits it is holding is called capacity of the transmission medium. **But how can we find the capacity mathematically?**

- If the length of the transmission medium is longer than its capacity will be higher.
- It also depends on the area of cross section of the medium.
- If the bandwidth is 1 bps, then every second it can take 1 bit. After every second it will move forward so that next bit could occupy the space. Therefore the final time in which it will occupy all the bits will be its propagation delay.

The capacity of the channel depends on two things:

1. Bandwidth
2. Propagation delay

Capacity = bandwidth * propagation delay

(in case of half duplex)

Capacity =2* bandwidth * propagation delay

(in case of full duplex)