

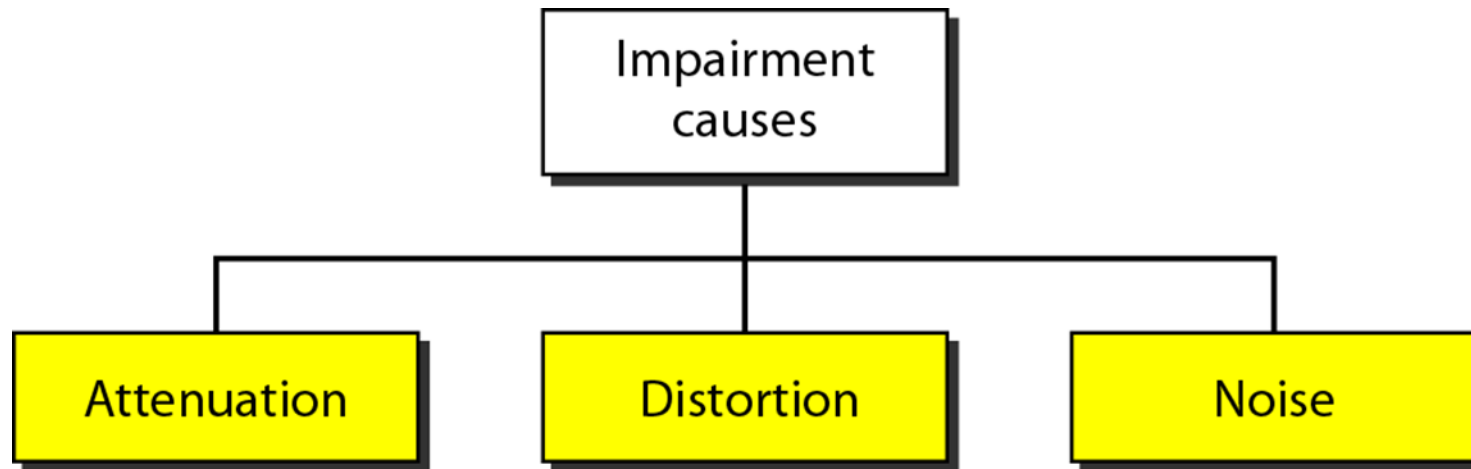
TRANSMISSION IMPAIRMENT

CSE320 – Data Communications

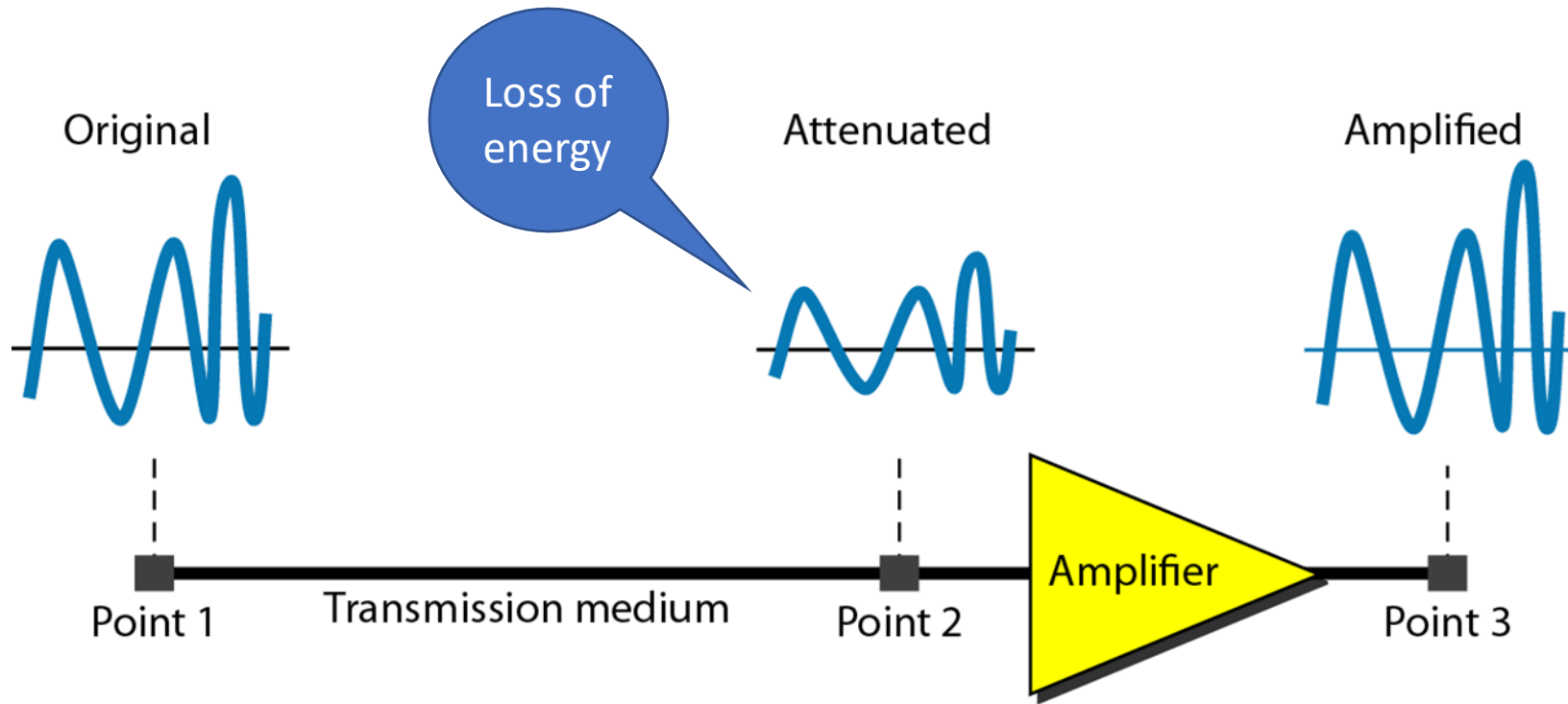
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TRANSMISSION IMPAIRMENT

Signals travel through transmission media, which are not perfect. The imperfection causes signal impairment.



Attenuation



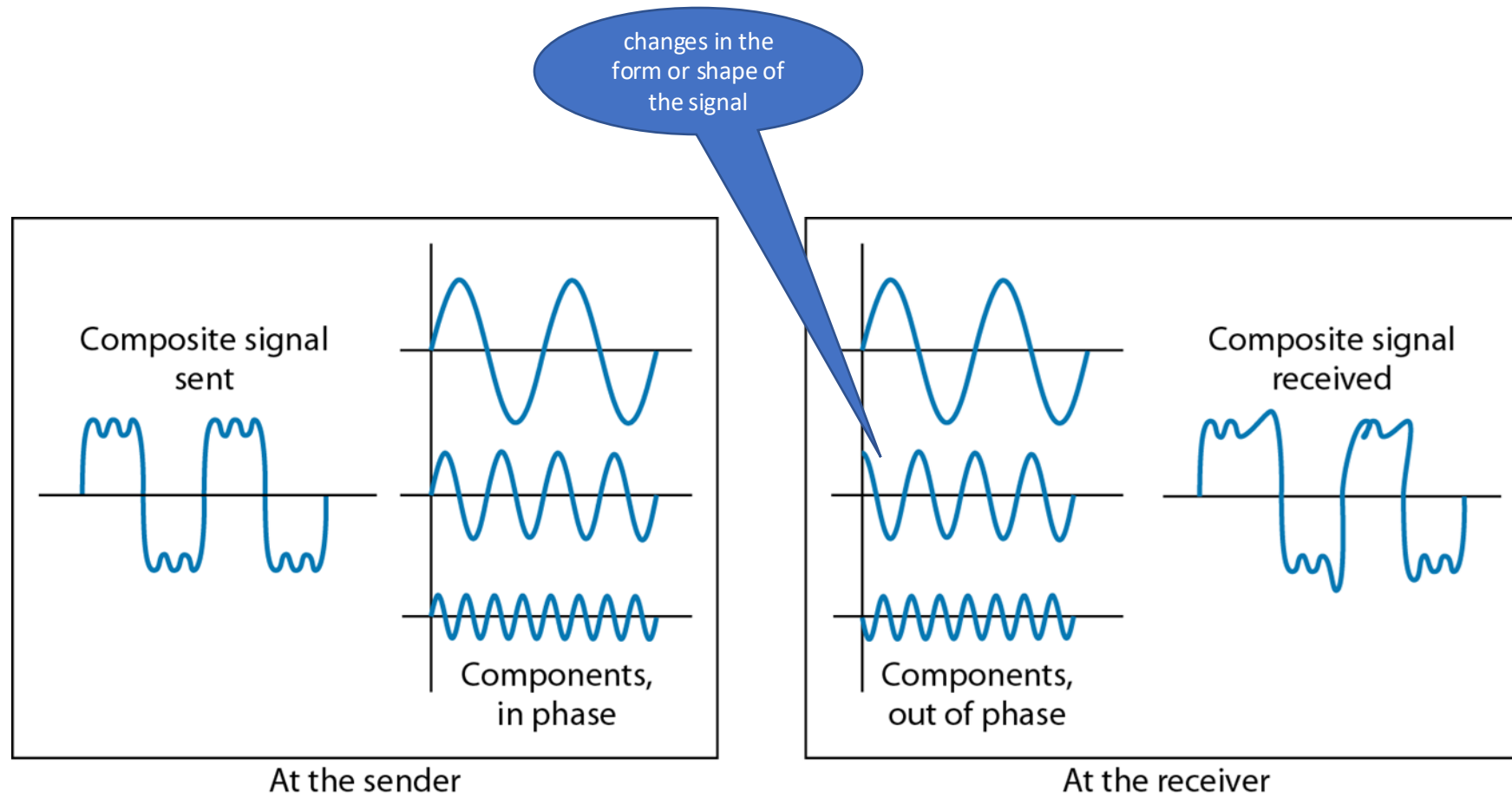
Example

- *Suppose a signal travels through a transmission medium and its power is reduced to one-half. This means that P_2 is $(1/2)P_1$. In this case, the attenuation (loss of power) can be calculated as*

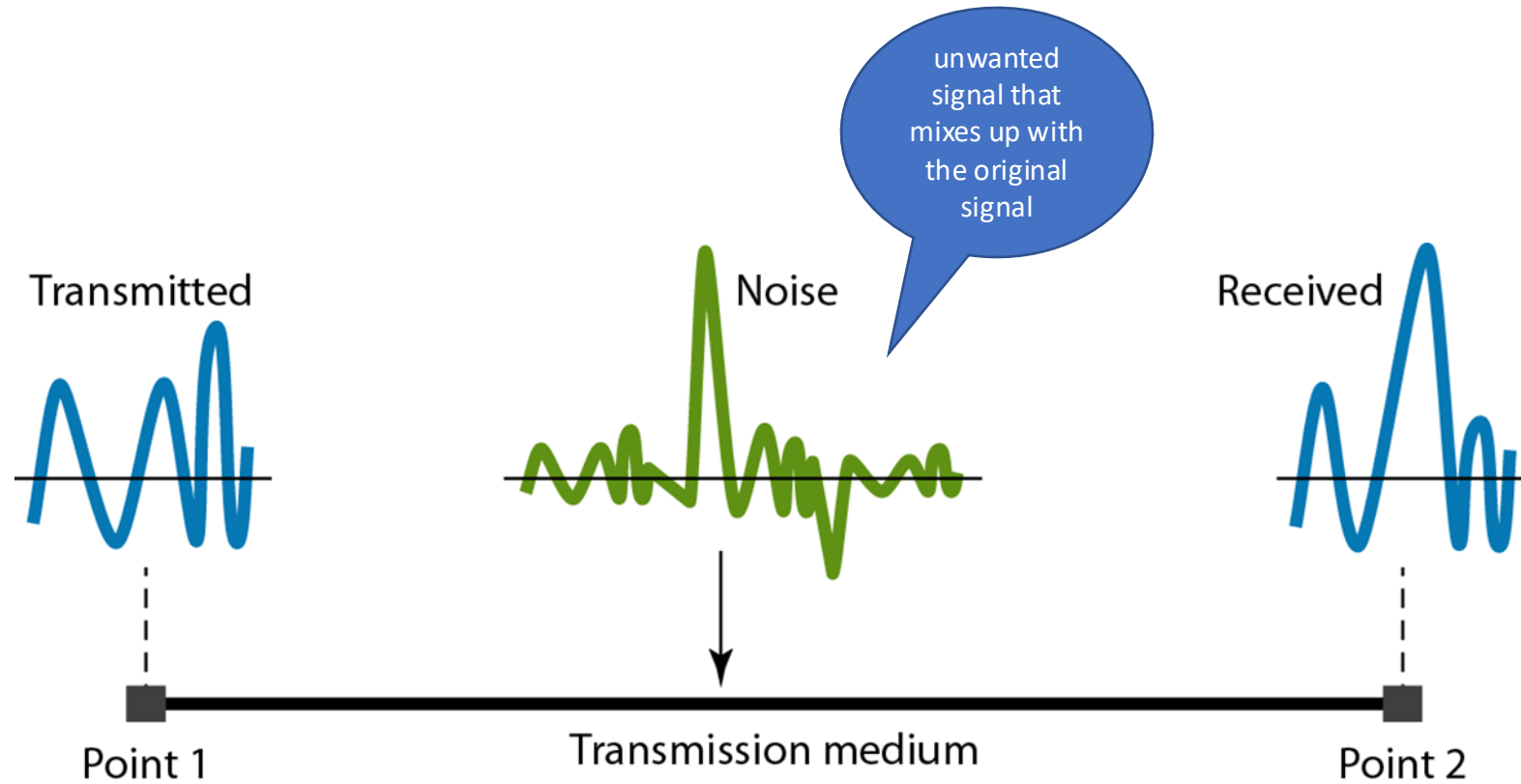
$$10 \log_{10} \frac{P_2}{P_1} = 10 \log_{10} \frac{0.5 P_1}{P_1} = 10 \log_{10} 0.5 = 10(-0.3) = -3 \text{ dB}$$

A loss of 3 dB (−3 dB) is equivalent to losing one-half the power.

Distortion



Noise



Signal to Noise Ratio (SNR)

$$SNR = \frac{P_{signal}}{P_{noise}}$$

Wanted component

Unwanted component

Example: The power of a signal is 10 mW and the power of the noise is 1 μ W; what are the values of SNR and SNR_{dB} ?

Solution

The values of SNR and SNR_{dB} can be calculated as follows:

$$SNR = \frac{10,000 \mu W}{1 \text{ mW}} = 10,000$$
$$SNR_{dB} = 10 \log_{10} 10,000 = 10 \log_{10} 10^4 = 40$$

$$1 \text{ W} = 10^3 \text{ mW}$$

$$1 \text{ mW} = 10^{-3} \text{ W}$$

$$10 \text{ mW} = 10^{-2} \text{ W}$$

$$1 \text{ W} = 10^6 \mu W$$