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Data Communication CS601 Lecture No 10

Lecture Prepared By

Muhammad Abid Ali

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CS601 Lecture No 10 Topic 43 to 48

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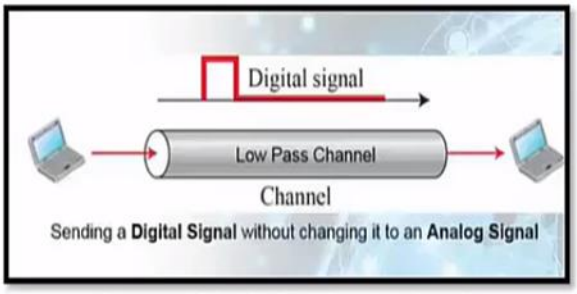
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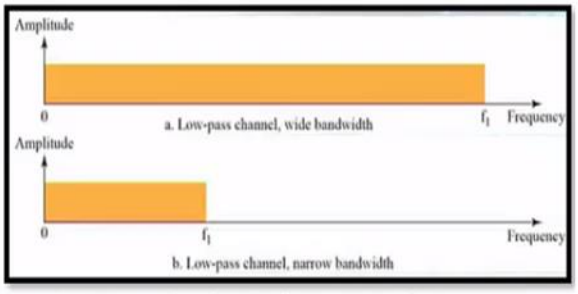
Transmission of Digital Signals

We have already study that when the digital signal seen as composite signal it has infinite bandwidth and it has frequency from ZERO to ONE. To Transmit such signals we need two methods.

- **Baseband Transmission** **Digital Signal to Digital Signals**

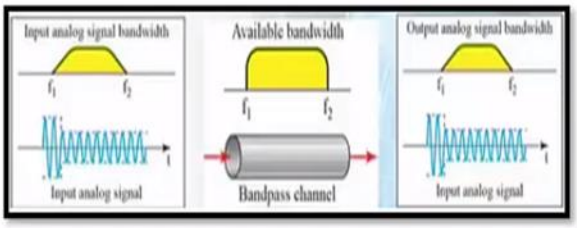


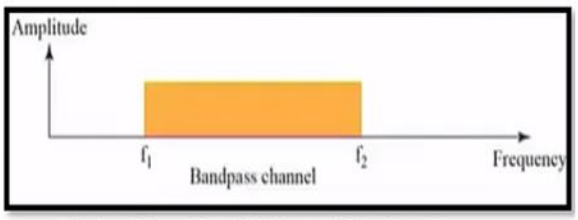
The output of the digital signal is NOT changed.



The low Pass Chanel started from Zero to Infinite Frequency
For this Transmission we need dedicated link (**Bus Topology**)

- **Broadband Transmission (Modulation)** **Digital Signal to Analog Signals**



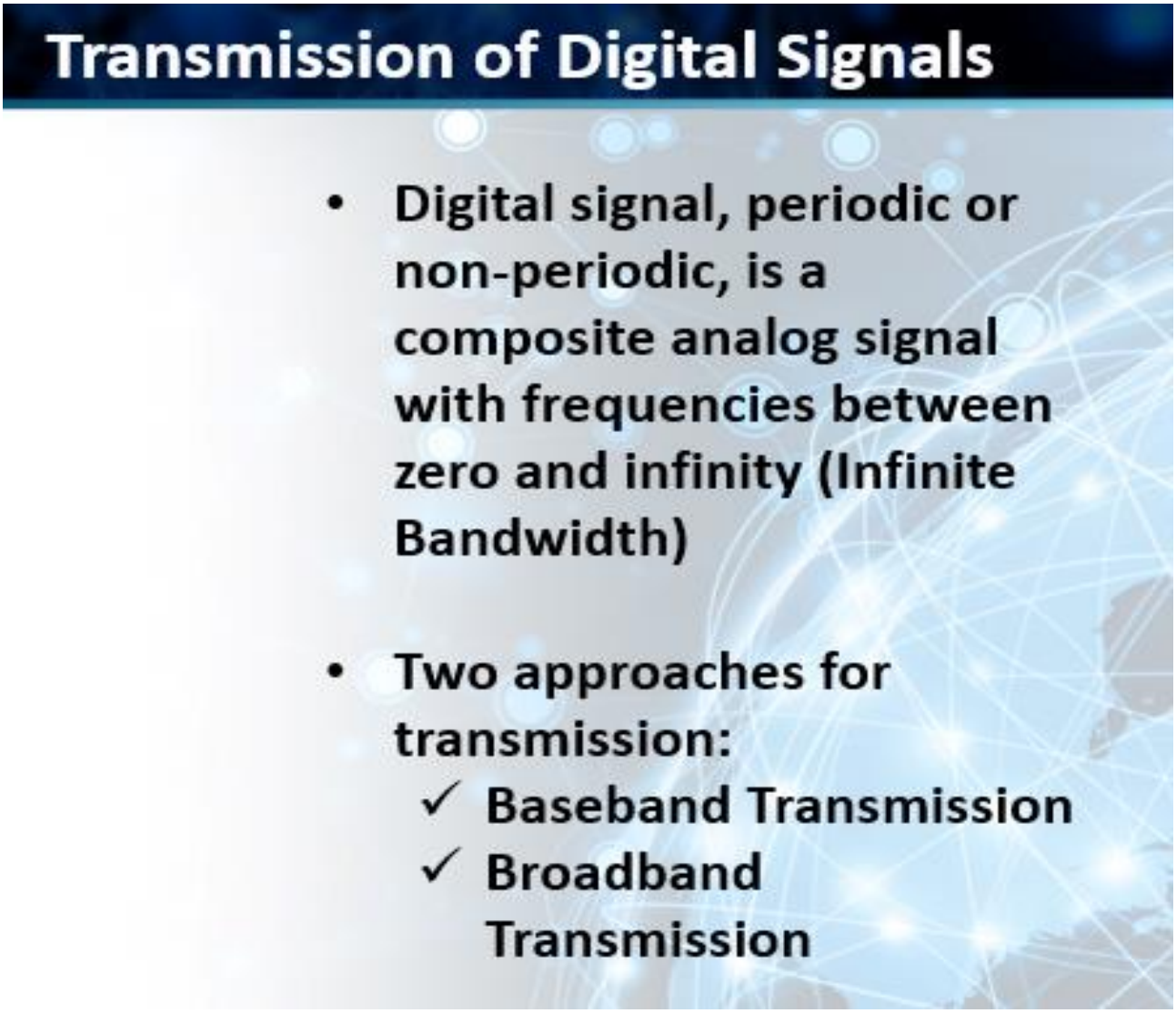


The band Pass Chanel NOT started from Zero Frequency

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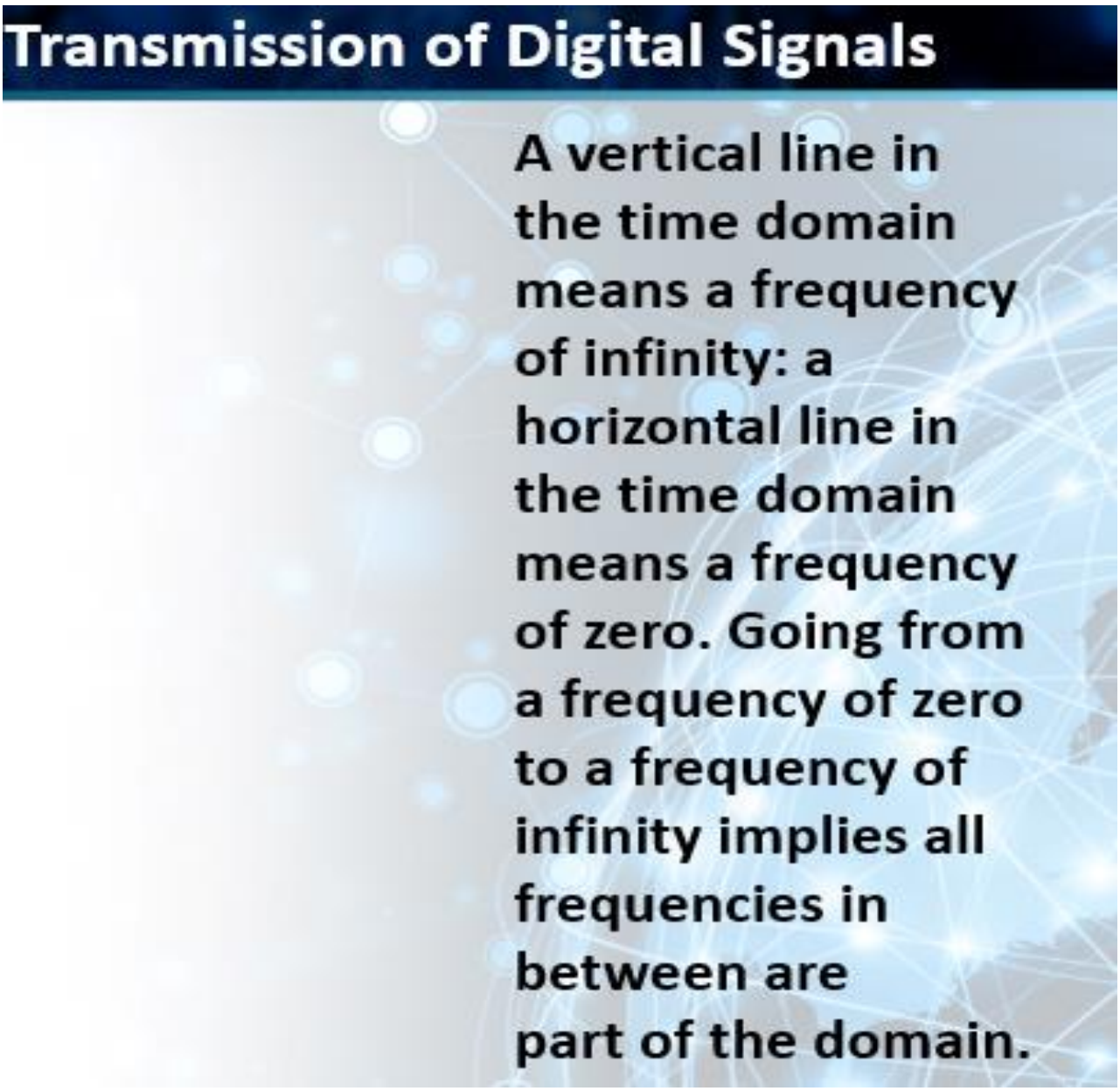
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Transmission Impairments

When we are sending signals from one point to another point the signals has lost some thing. These Losses can be heat, external factors etc. These in perfect signals are known as Transmission Impartments.

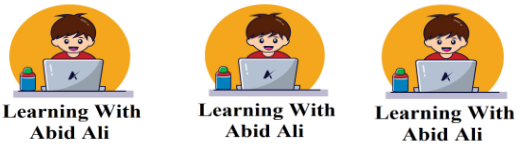
Causes of Transmission Impairments

Following factors affect on Transmission Impairments.

1. Attenuation
2. Distortion
3. Noise

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Attenuation | Distortion | Noise

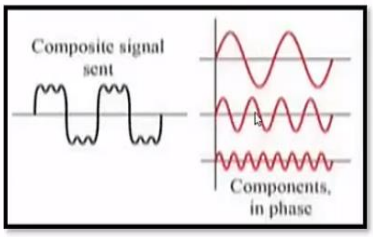
1. Attenuation – Loss of Energy. It cannot be recovered. (Heat)

The signals Strength can measured in terms of **Decible (dB).** We can measure it at two Pints (Point 1 and Point 2).

Formula: 10 Log_{10} P2 / P1

If Decible is Negative its mean Signals has Attenuated and Lost Strength.

2. Distortion – is change in the form or shape of signal. (Delay)



Attenuation Example

Suppose a signal travels through a transmission medium and its power is reduced to one half. Calculate the attenuation?

Formula: 10 Log_{10} P2 / P1

= 10 Log_{10} P2 / P1

= 10 Log_{10} (0.5 P1) / P1

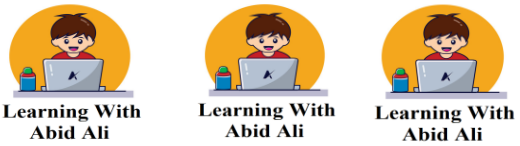
= 10 Log_{10} (0.5)

= -3 dB

= Signal has lost one half of the Power.

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Noise Example

The signal power is 10 mW (Milli Wats) and noise power is 1 uW (Micro Wats). What is SNR?

Formula = Avg. Signal Power / Avg. Noise Power

SNR = 10 mW / 1 uW

= 10,000 Milli Wats

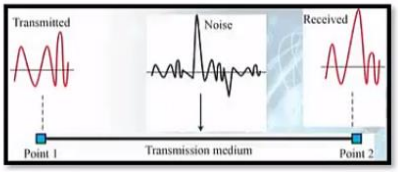
SNR_{dB} = 10 Log_{10} 10,000

= 40_{dB}

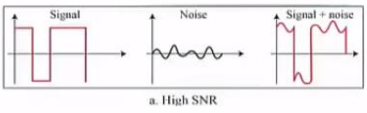
Attenuation | Distortion | Noise

3. Noise – Noise Corrupt Signal

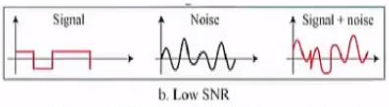
1. Thermal Noise 2. Induced Noise 3. Crosstalk Noise



Signal to Noise Ratio (SNR)



1. High SNR mean Low Corrupt Signal



2. Low SNR mean High Corrupt Signal