SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution

Coimbatore-35

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19ECB301-ANALOG AND DIGITAL COMMUNICATION

III YEAR/ V SEMESTER

UNIT 1 – ANALOG COMMUNICATION

TOPIC – FREQUENCY DIVISION MULTIPLEXING

MULTIPLEXING

- Multiplexing is a technique of simultaneous transmission of multiple signal over single data link.
- To combine multiple signals (*analog* or *digital*) for transmission over a single line or media is called Multiplexing.
- A common type of multiplexing combines several low-speed signals for transmission over a single high-speed connection.
- Multiplexing is the set of techniques that allows the simultaneous transmission of multiple signals across a single data link. As data and telecommunications use increases, so traffic also increases. We can either add a new channel for such increasing traffic or we can install higher-bandwidth links and use each to carry multiple signals.

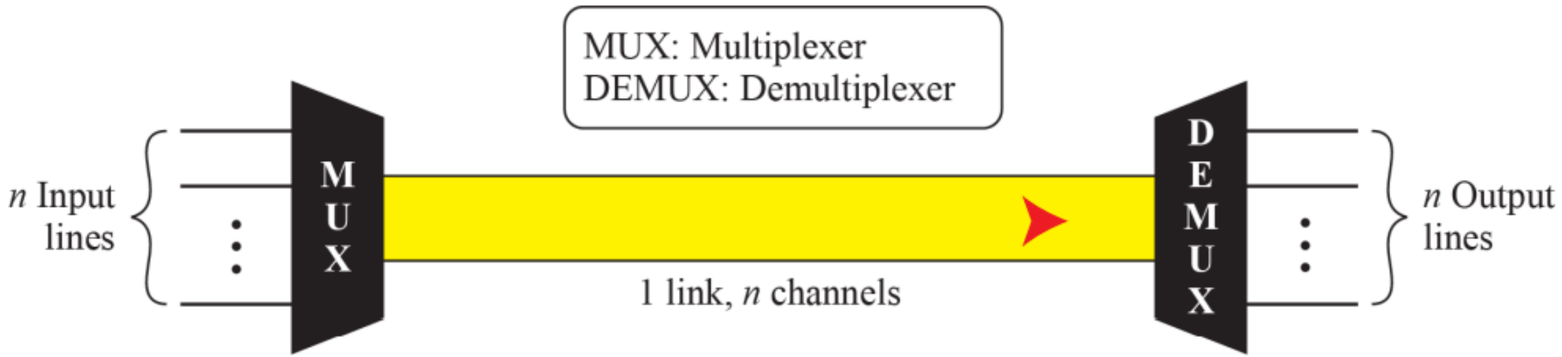
MULTIPLEXING

- Multiplexing is done by Multiplexer
- Demultiplexing is done by Demultiplexer
- Multiplexer receives large no of different input signals
- Multiplexer has only one link channel
- Multiplexer combines all input signal into one composite signal & then transfers it
- Sometimes this composite signal is modulated as well
- At the receiving end of communication demultiplexer sorts the composite signal into its original forms
- Multiplexing can increase amount of transmitting information

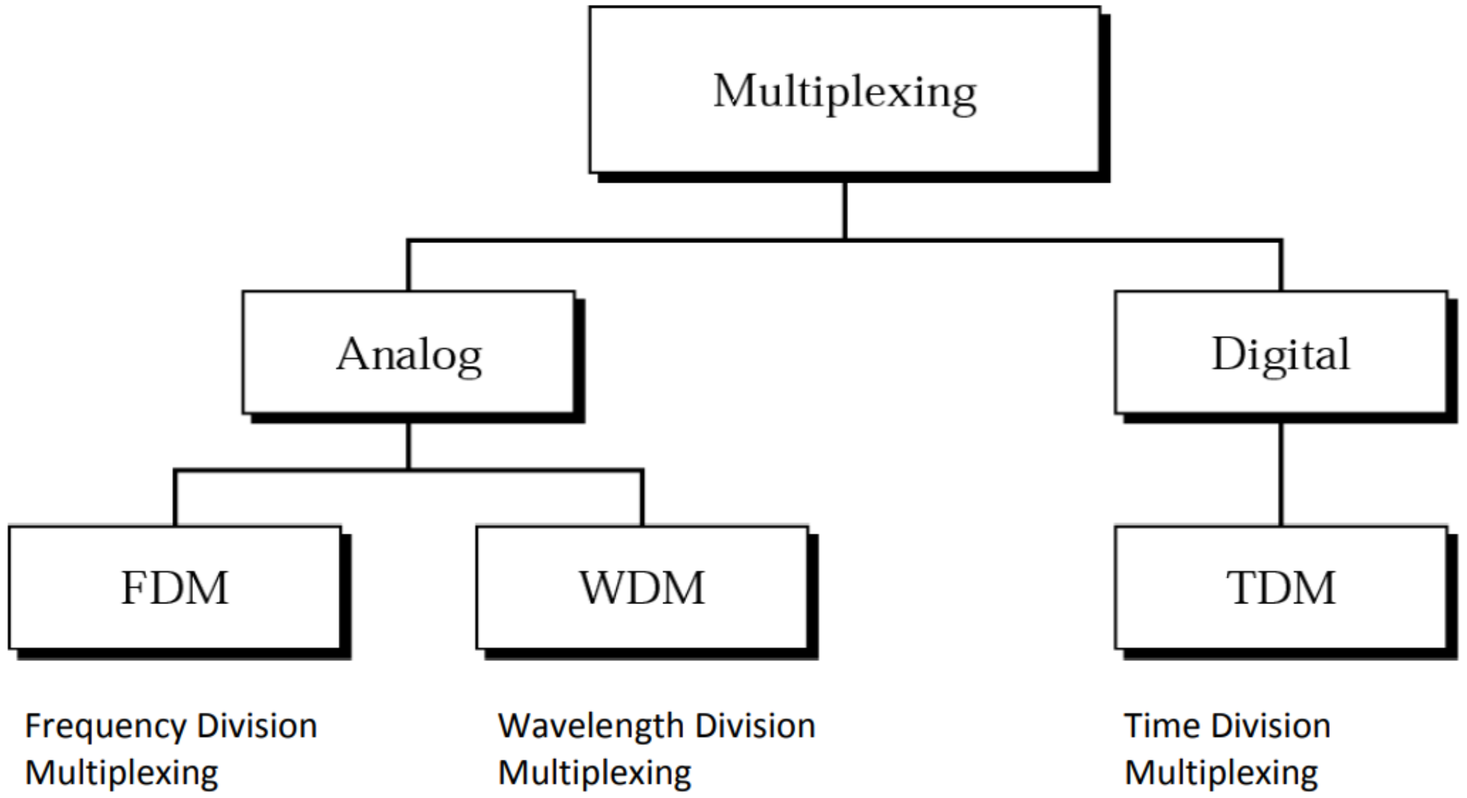
MULTIPLEXING

- Bandwidth of the medium has to be greater than the linking devices
- Efficiency of utilizing bandwidth can be achieved through multiplexing
- e.g. telephony, telemetry & FM Radio transmission

MULTIPLEXING



TYPES OF MULTIPLEXING



FREQUENCY DIVISION MULTIPLEXING(FDM)

- **F**requency **D**ivision **M**ultiplexing(FDM) is a multiplexing technique that uses different frequencies to combine multiple streams of data for transmission over a communications medium.
- FDM assigns a discrete carrier frequency to each data stream and then combines many modulated carrier frequencies for transmission.
- In FDM, signals generated by each sending device modulate different carrier frequencies.
- These modulated signals are then combined into a single composite signal that can be transported by the link.
- Carrier frequencies are separated by sufficient bandwidth to accommodate the modulated signal. These bandwidth ranges are the channels through which the various signals travel.

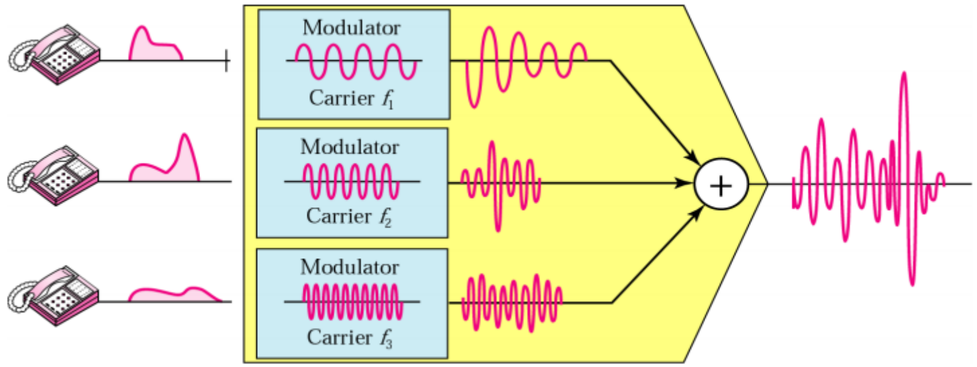
FREQUENCY DIVISION MULTIPLEXING(FDM)

- Channels can be separated by strips of unused bandwidth – **guard bands** – to prevent signals from overlapping. In addition, carrier frequencies must not interfere with the original data frequencies.
- Figure gives a conceptual view of FDM. In this illustration, the transmission path is divided into three parts, each representing a channel that carries one transmission.
- FDM uses AM, FM or PM Modulations
- For example, television transmitters use FDM to broadcast several channels at once.
- FM Radio, which combines many frequencies into one channel

FREQUENCY DIVISION MULTIPLEXING(FDM)

MULTIPLEXING PROCESS

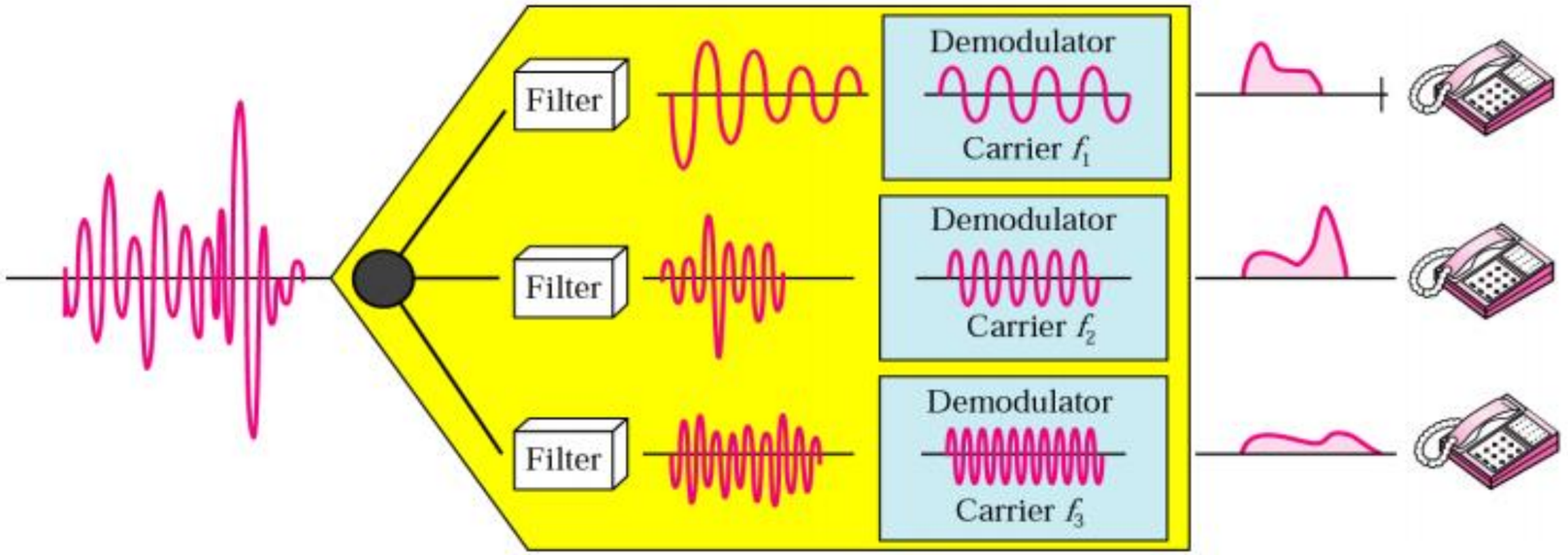
- The given figure is a conceptual illustration of the multiplexing process.
- Each source generates a signal of a similar frequency range.
- Inside the multiplexer, these similar signals modulate different carrier frequencies (f_1, f_2 and f_3).
- The resulting modulated signals are then combined into a single composite signal that is sent out over a media link that has enough bandwidth to accommodate it.



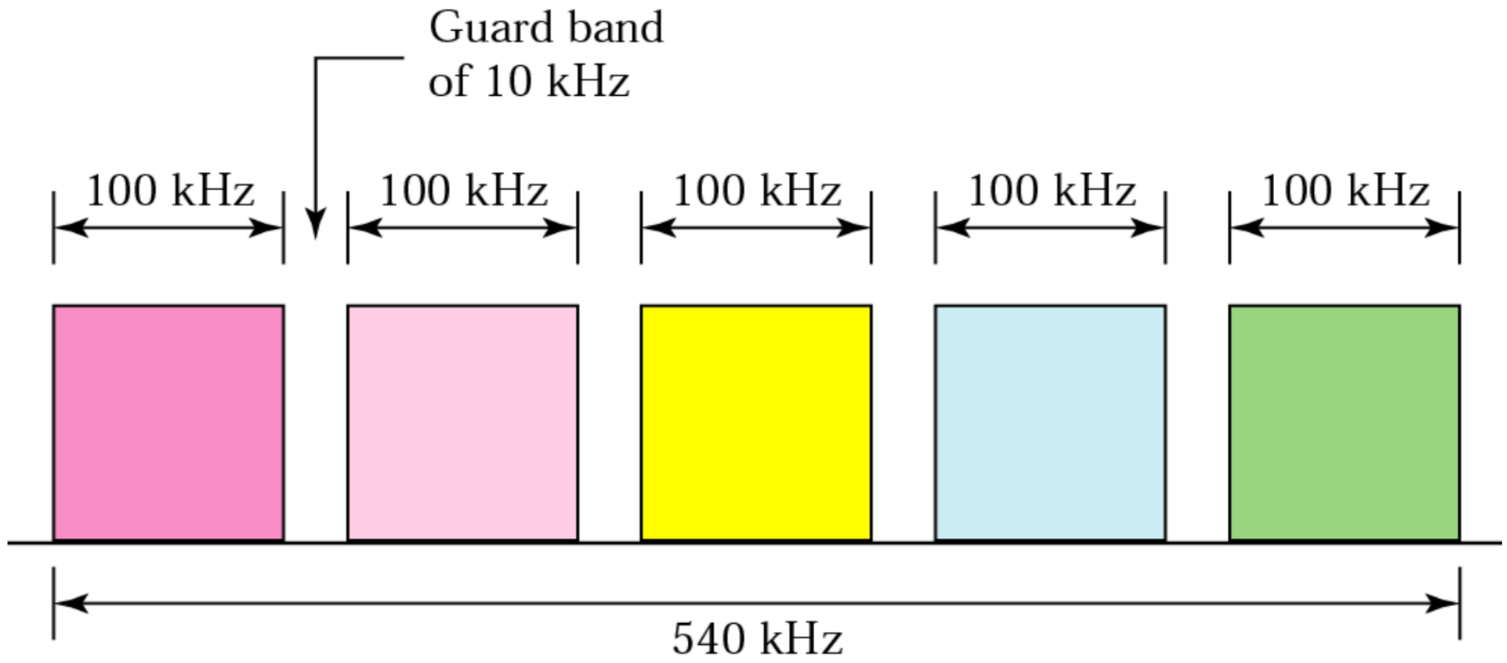
DEMULTIPLEXING PROCESS

The demultiplexer uses a series of filters to separate the multiplexed signal into its constituent component signals. The individual signals are then passed to a demodulator that separates them from their carriers and passes them to the output lines. Figure is a conceptual illustration of demultiplexing process.

DEMULTIPLEXING PROCESS



FDM


Guard band
of 10 kHz
100 kHz
100 kHz
100 kHz
100 kHz
100 kHz
540 kHz

THANK YOU