Multiplexing

Introduction

In telecommunications and computer networks, **multiplexing** is a method by which multiple analog message signals or digital data streams are combined into one signal over a shared medium. The aim is to share an expensive resource. For example, in telecommunications, several telephone calls may be carried using one wire. The multiplexed signal is transmitted over a communication channel, which may be a physical transmission medium. The multiplexing divides the capacity of the high-level communication channel into several low-level logical channels, one for each message signal or data stream to be transferred.

Multiplexing is of following three types:

1.Frequency-division Multiplexing (FDM) is an analog multiplexing technique that combines analog signals. FDM is applied when the bandwidth of a link (in hertz) is greater than the combined bandwidths of the signals to be transmitted. 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. Channels can be separated by strips of unused bandwidth i.e **guard bands,** to prevent signals from overlapping. In addition, carrier frequencies must not interfere with the original data frequencies.
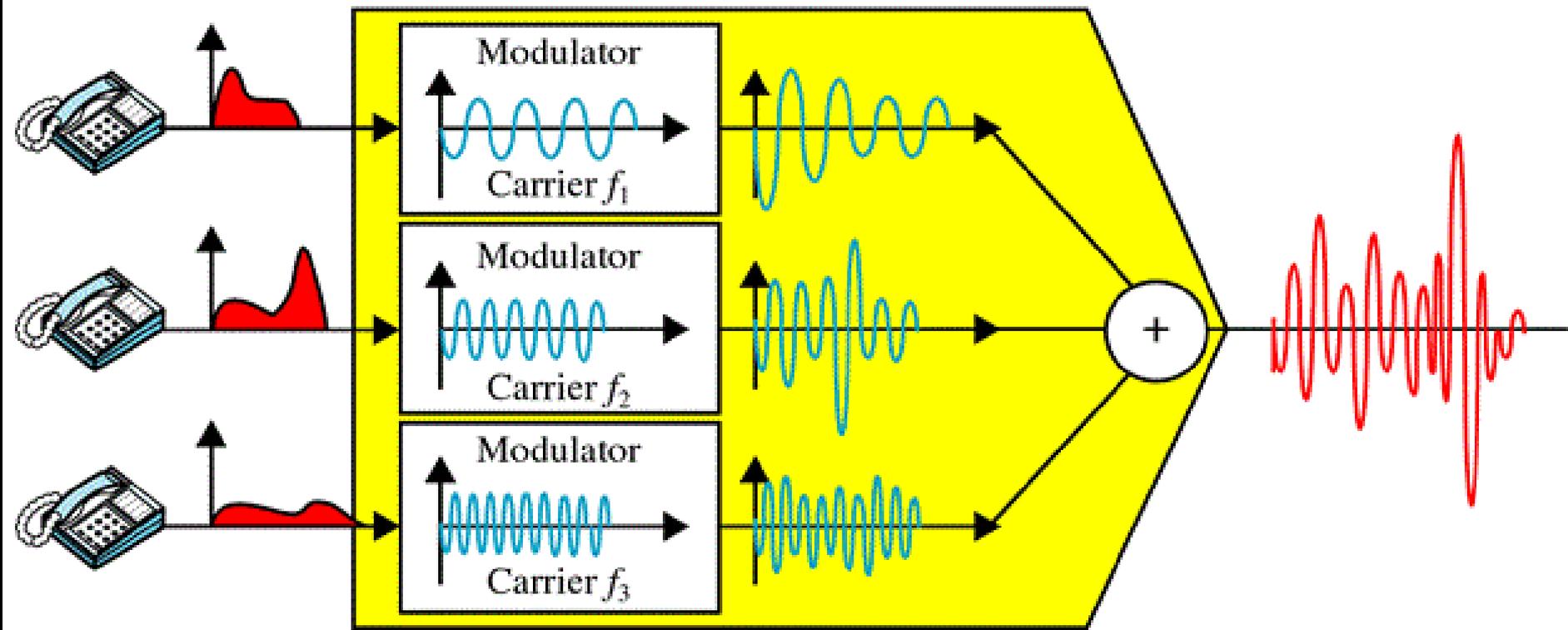
Frequency Divsion Multiplexing

2.Wavelength-division multiplexing (WDM) is an analog multiplexing technique to combine optical signals.WDM is designed to use the high data rate capability of fiber-optic cable. The optical fiber data rate is higher than the data rate of metallic transmission cable. Using a fiber-optic cable for one single line wastes the available bandwidth. Multiplexing allows us to combine several lines into one.

WDM is conceptually the same as FDM, except that the multiplexing and demultiplexing involve optical signals transmitted through fiber-optic channels. The idea is the same: We are combining different signals of different frequencies. The difference is that the frequencies are very high.
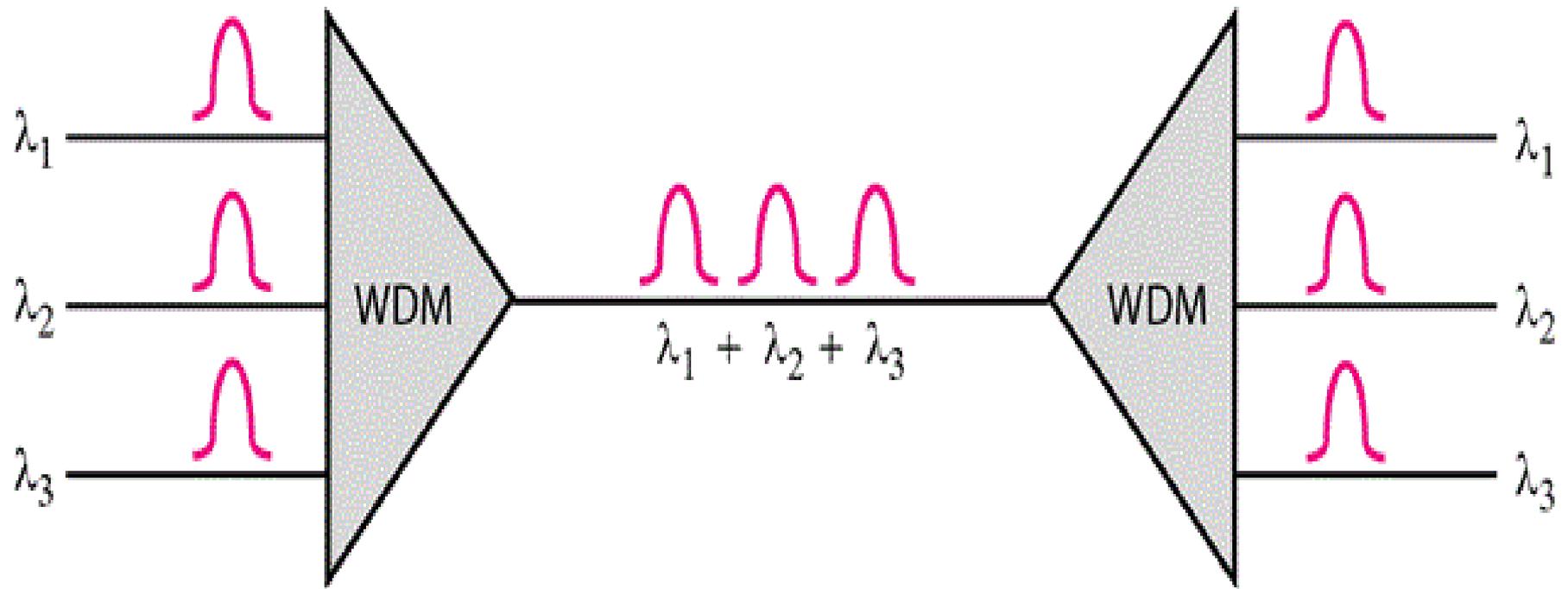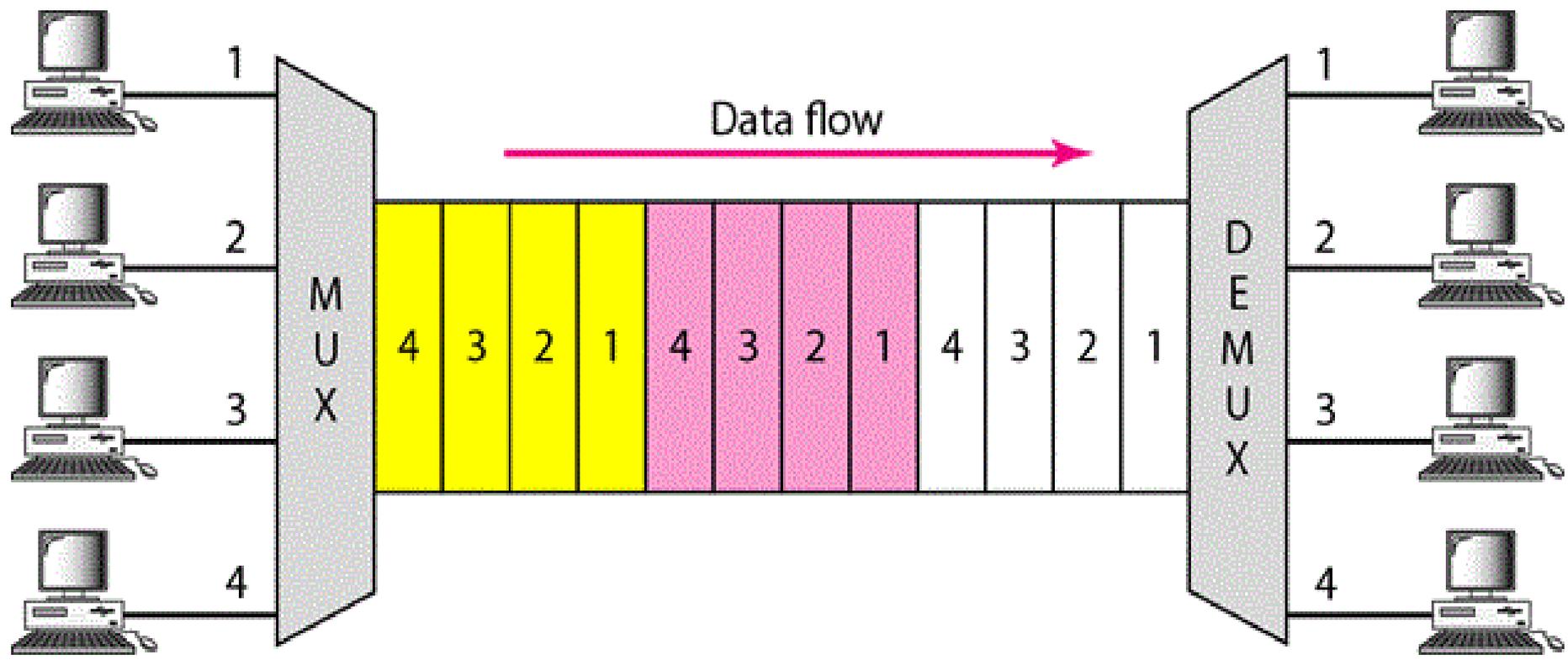
WavelengthDivision Multiplexing

3.Time-division Multiplexing (TDM) is a digital mutiplexing technique for combining several low rate channels into one high-rate one.TDM is a digital process that allows several connections to share the high bandwidth of a link Instead of sharing a portion of the bandwidth as in FDM, time is shared. Each connection occupies a portion of time in the link.Digital data from different sources are combined into one timeshared link. However, this does not mean that the sources cannot produce analog data; analog data can be sampled, changed to digital data, and then multiplexed by using TDM.
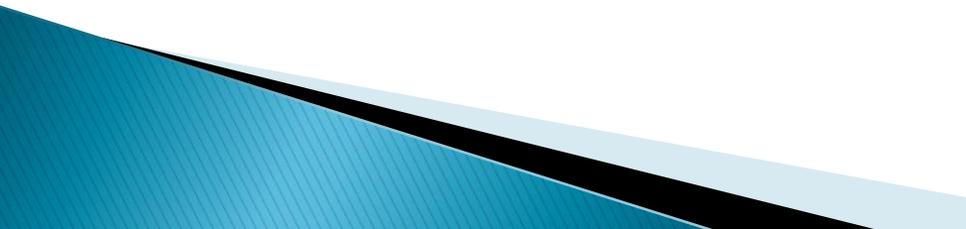
Time Division Multiplexing

Issues and Objectives of Multiplexing:

Mutiplexing is designed to reduce the number of electrical connections or leads in the display matrix. Besides reducing the number of individually independent interconnections, multiplexing also simplifies the drive electronics, reduces the cost and provides direct interface with the microprocessors. . There are limitations in multiplexing due to complex electro-optical response of the liquid crystal cell. However, fairly reasonable level of multiplexing can be achieved by properly choosing the multiplexing scheme, liquid crystal mixture and cell designing. By introducing voice stream multiplexing , bandwidth efficiency can be improved by reducing header overhead. The Congestion in IP Network can be avoided due to telephony traffic by reducing number of voice packets.

Bandwidth Utilization: Bandwidth utilization is the wise use of available bandwidth to achieve specific goals. Efficiency can be achieved by multiplexing; i.e., sharing of the bandwidth between multiple users.

FUTURE SCOPE

Multiplexing is a technique used to improve the bandwidth efficiency and reducing the number of electrical connections. There are limitations in multiplexing due to complex electro-optical response of the liquid crystal cell. However, fairly reasonable level of multiplexing can be achieved by properly choosing the multiplexing scheme, liquid crystal mixture and cell designing.