SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

MICROWAVE & OPTICAL ENGINEERING

IV YEAR/ VII SEMESTER

UNIT 5 – OPTICAL NETWORKS
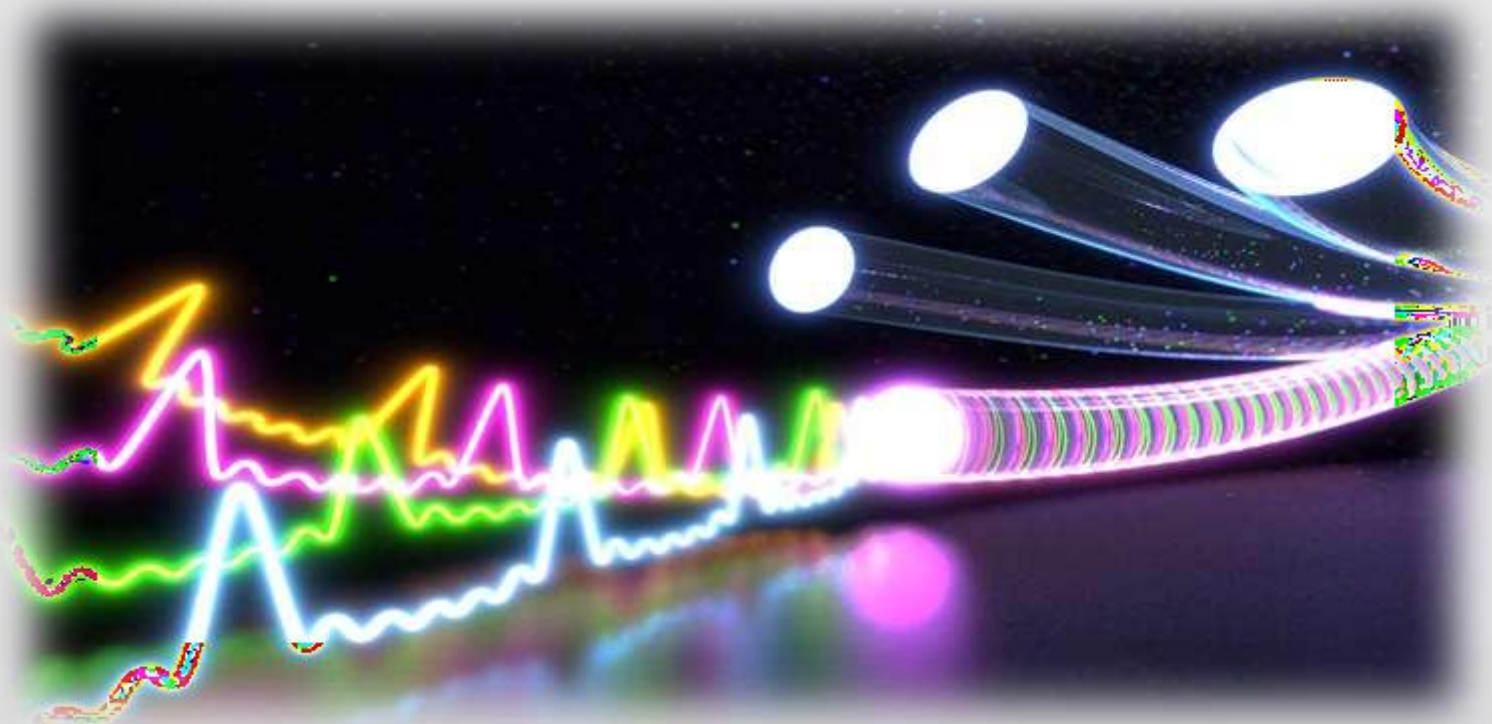
SONET/SDH

Contents

- Introduction
- SONET SYSTEM
- SONET FRAME
- SONET LAYERs
- SONET Network
- Advantage

SONET

- Synchronous optical network is a standard for optical telecommunication transport.

- We use it when we send data by optical fiber.

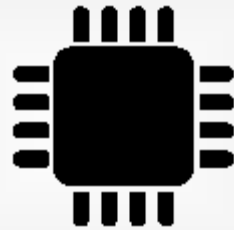# SONET

Independently developed in USA & Europe:

- SONET (Synchronous Optical Network) by ANSI.

- SDH (Synchronous Digital Hierarchy) by ITU-T.

SONET SYSTEM

Signals

Devices

Connections

SONET SYSTEM

Signals:

•Electrical signaling levels called synchronous transport signals (STSs).

•The corresponding optical signals are called optical carriers (OCs).

•SDH specifies a similar system called a synchronous transport module (STM).

SONET SYSTEM

Optical carrier (OC) signal	Electrical signal, or synchronous transport signal (STS)	International Telecommuni-cations Union (ITU) terminology	Bandwidth in Megabits per second (Mbps)
OC-1	STS-1		51.84
OC-3	STS-3	STM-1	155.52
OC-9	STS-9	STM-3	466.56
OC-12	STS-12	STM-4	622.08
OC-18	STS-18	STM-6	933.12
OC-24	STS-24	STM-8	1244.16
OC-36	STS-36	STM-12	1866.24
OC-48	STS-48	STM-16	2488.32

SONET SYSTEM

Devices:

- STS multiplexers
- STS DE multiplexers
- Regenerators
- add/drop multiplexers
- Terminals.

SONET SYSTEM
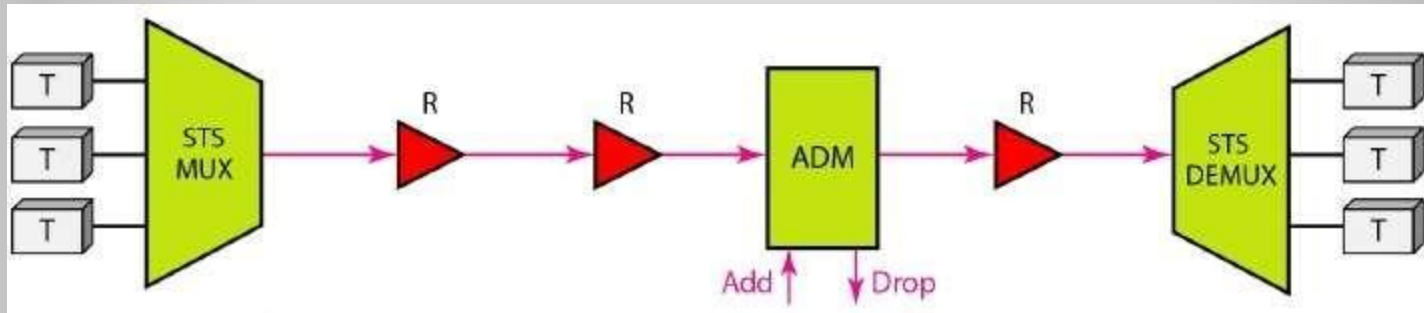
SONET SYSTEM

STS Multiplexer/ DE multiplexer:

•Provide the interface between an electrical tributary network and the optical network.

•STS multiplexer multiplexes an electrical signal into corresponding Optical signal.

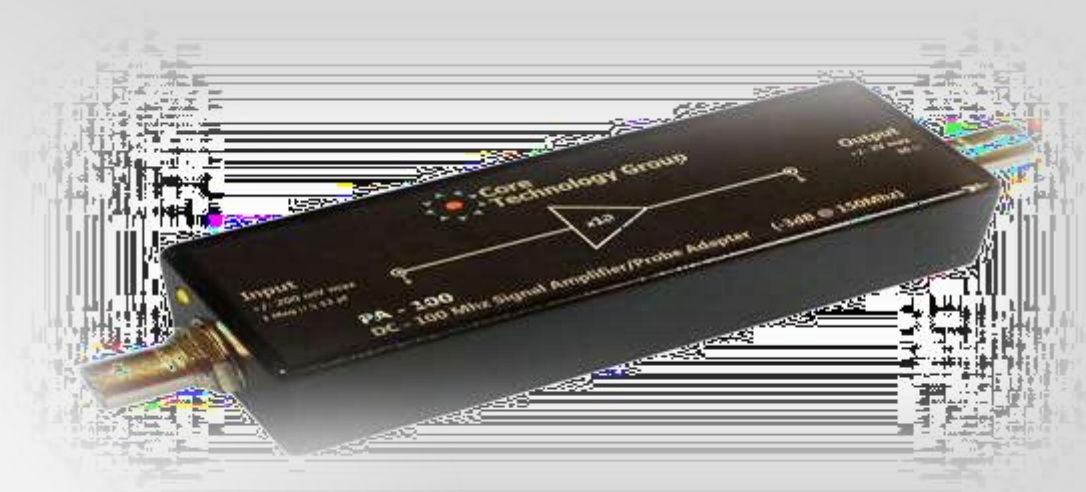•   STS DE multiplexer DE multiplexes an optical OC signal into corresponding electric signals.

SONET SYSTEM

Regenerator

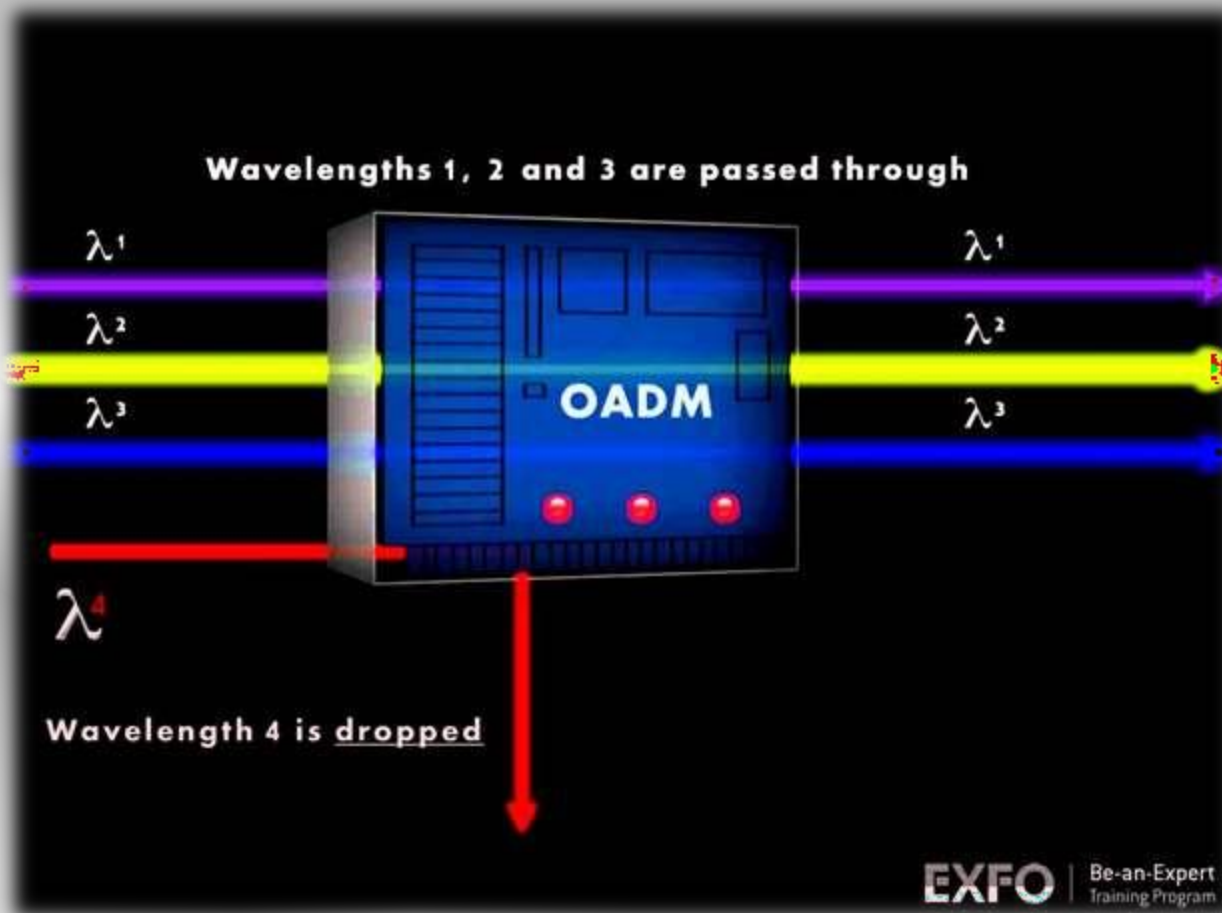- Regenerator is a repeater

- Extend the length of the links

Add/drop Multiplexer

•Add/drop multiplexers allow insertion and extraction of signals.
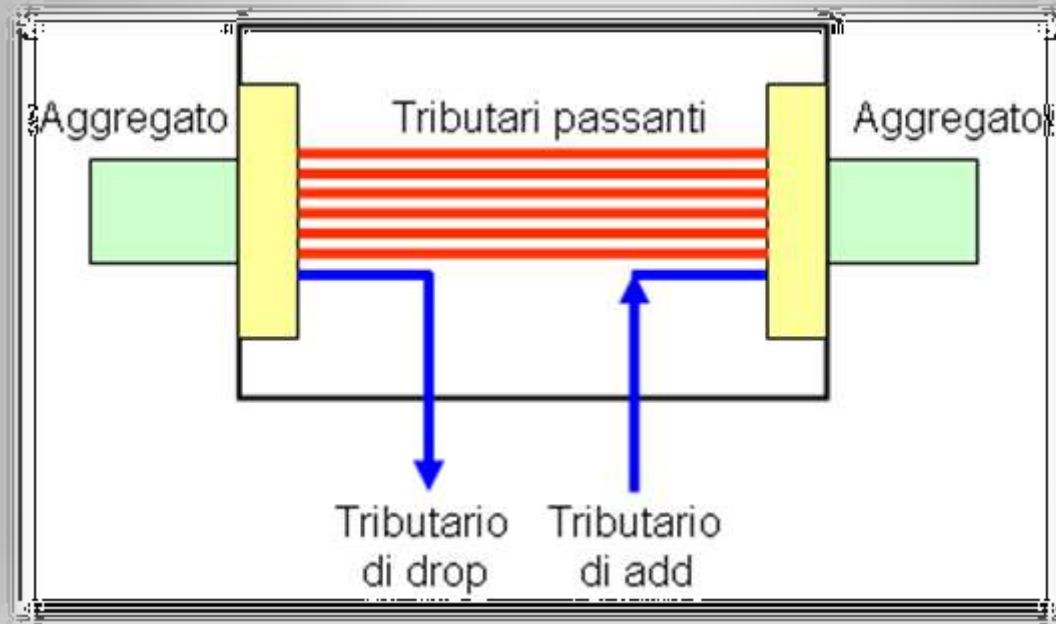
SONET SYSTEM

SONET SYSTEM

Terminals

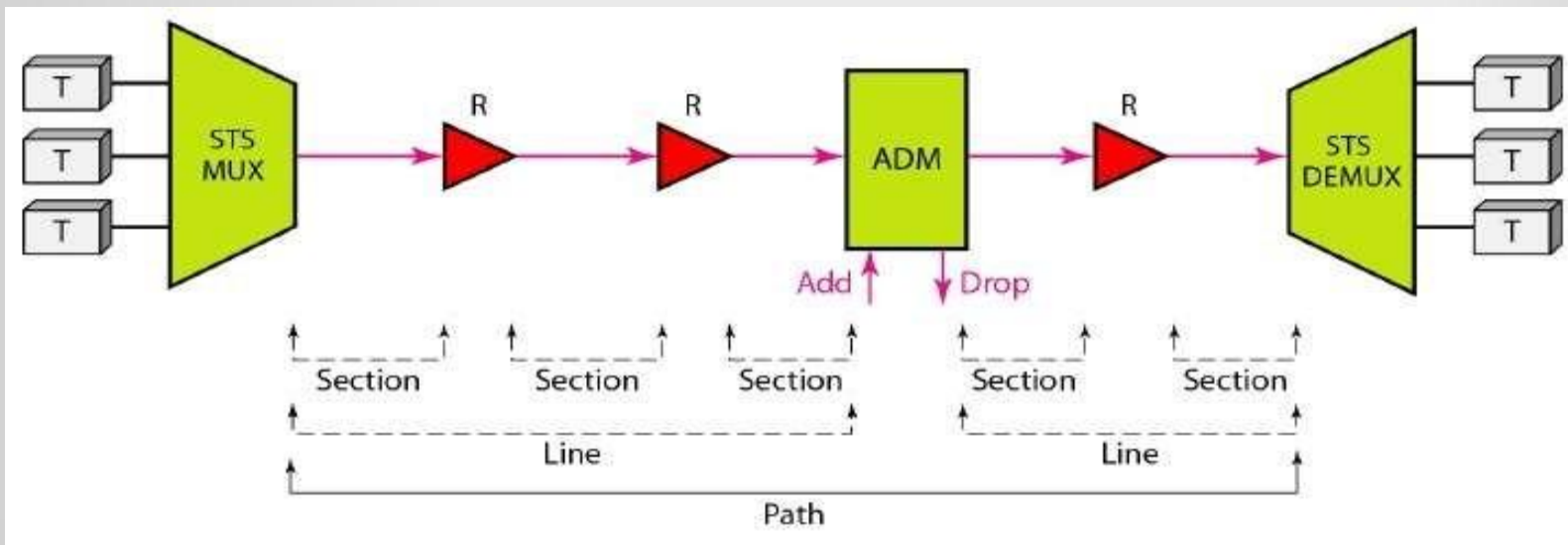• Device that uses the services of a SONET network.

SONET SYSTEM

Connections:

- Sections(connecting two neighboring devices).
- Lines(two multiplexers).
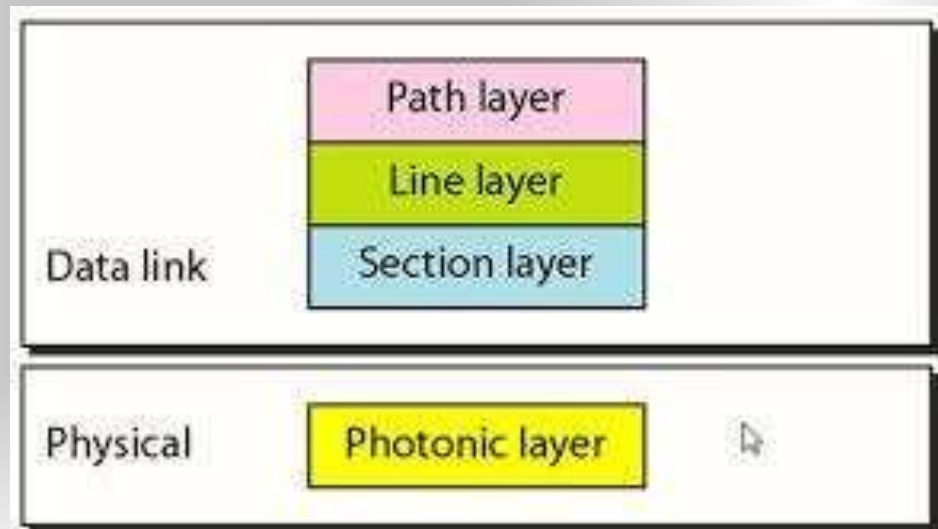- Paths(end-to-end portion).

SONET LAYERs

The SONET standard includes four functional layers:

- Path

- Line

- Section

- Photonic.

SONET LAYERs

Path:

•The path layer is responsible for the movement of a signal from its optical source to its optical destination.

Line:

•The line layer is responsible for the movement of a signal across a physical line

•STS multiplexers and add/drop multiplexers provide line layer functions.

SONET LAYERs

Section Layer:

• Section layer overhead is added to the frame at this layer and control errors.

Photonic Layer:

• It includes physical specifications for the optical fiber channel.

• NRZ encoding, with the presence of light representing 1 and the absence of light representing O.
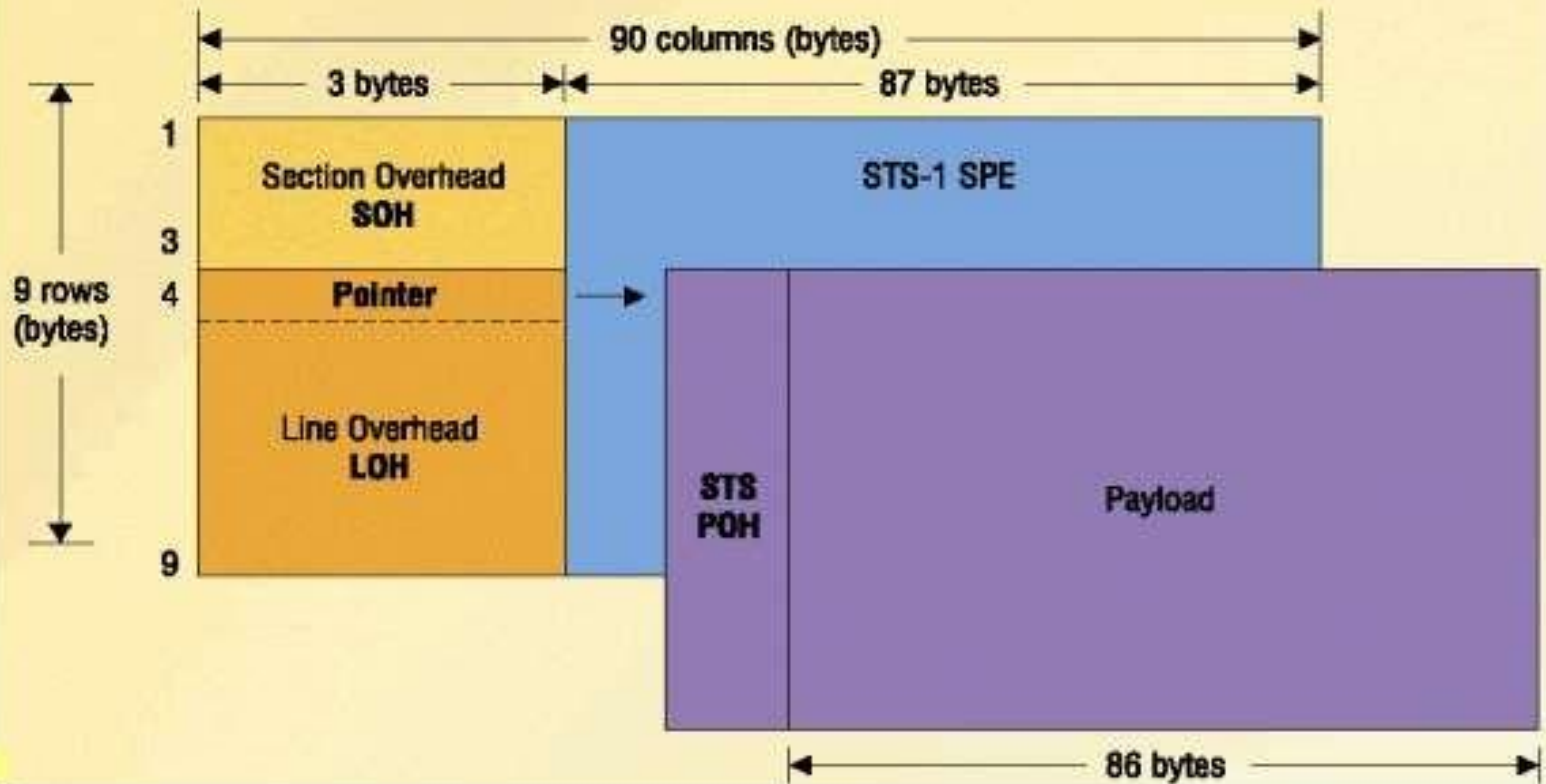
SONET FRAME

- Two-dimensional matrix of bytes
- 9 rows by 90 x n columns
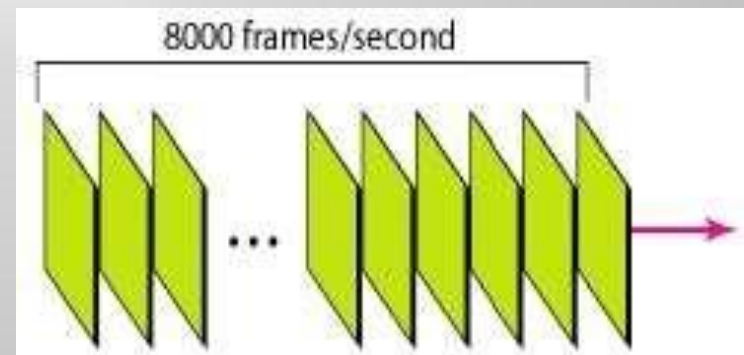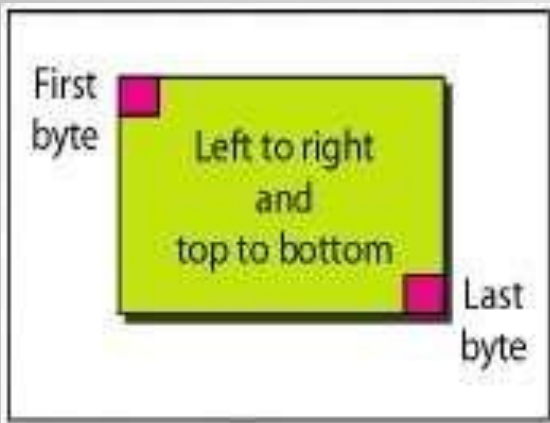- Each byte in a SONET frame can carry a digitized voice channel.
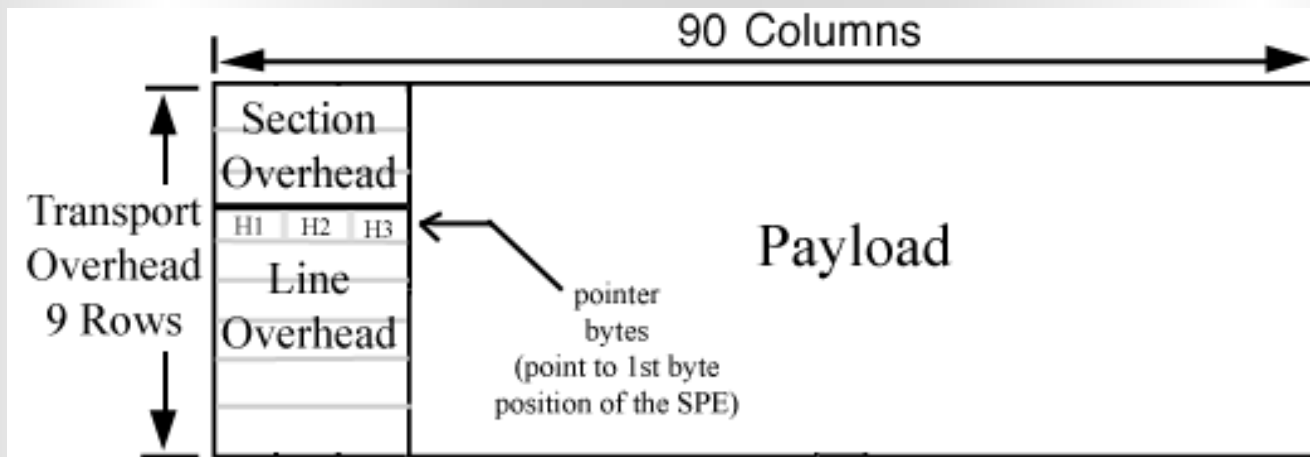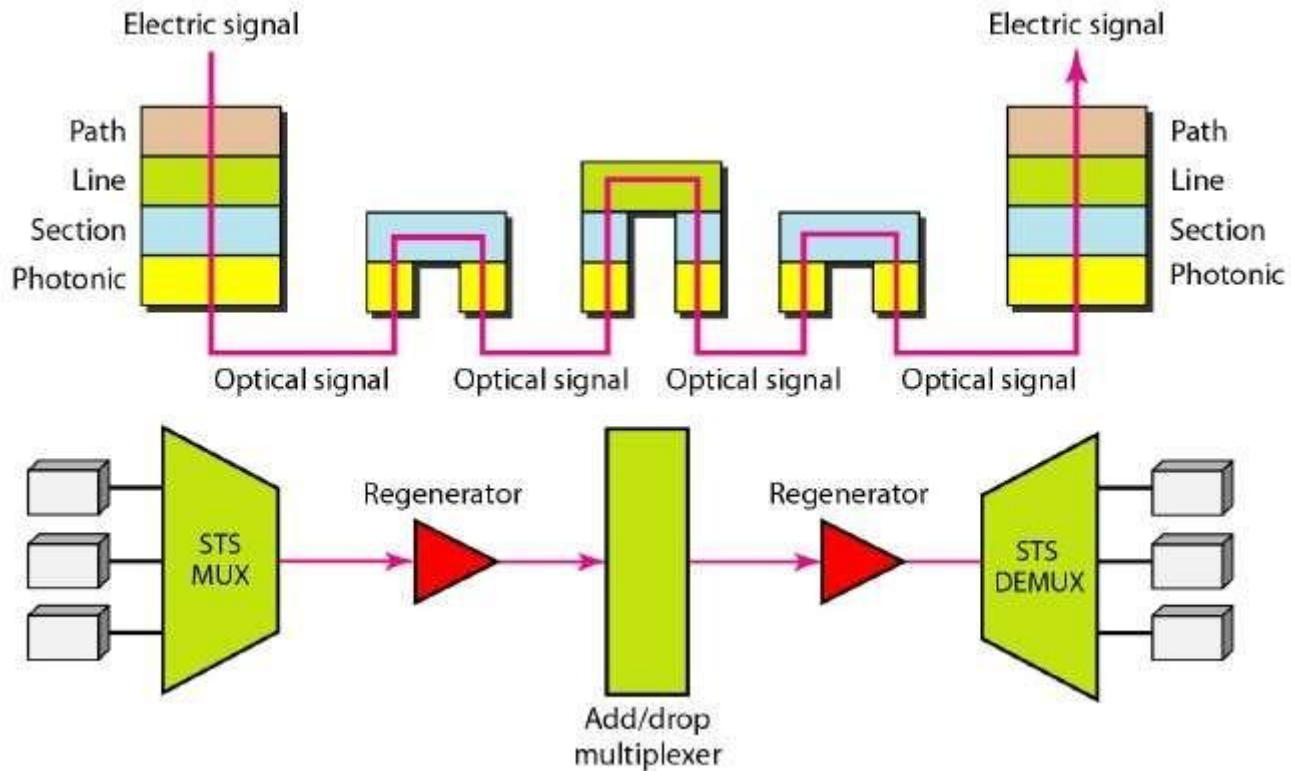
SONET FRAME

SONET FRAME

- Bytes are transmitted from the left to the right and top to the bottom.

- STS-n signal is transmitted at a fixed rate of 8000 frames per second.
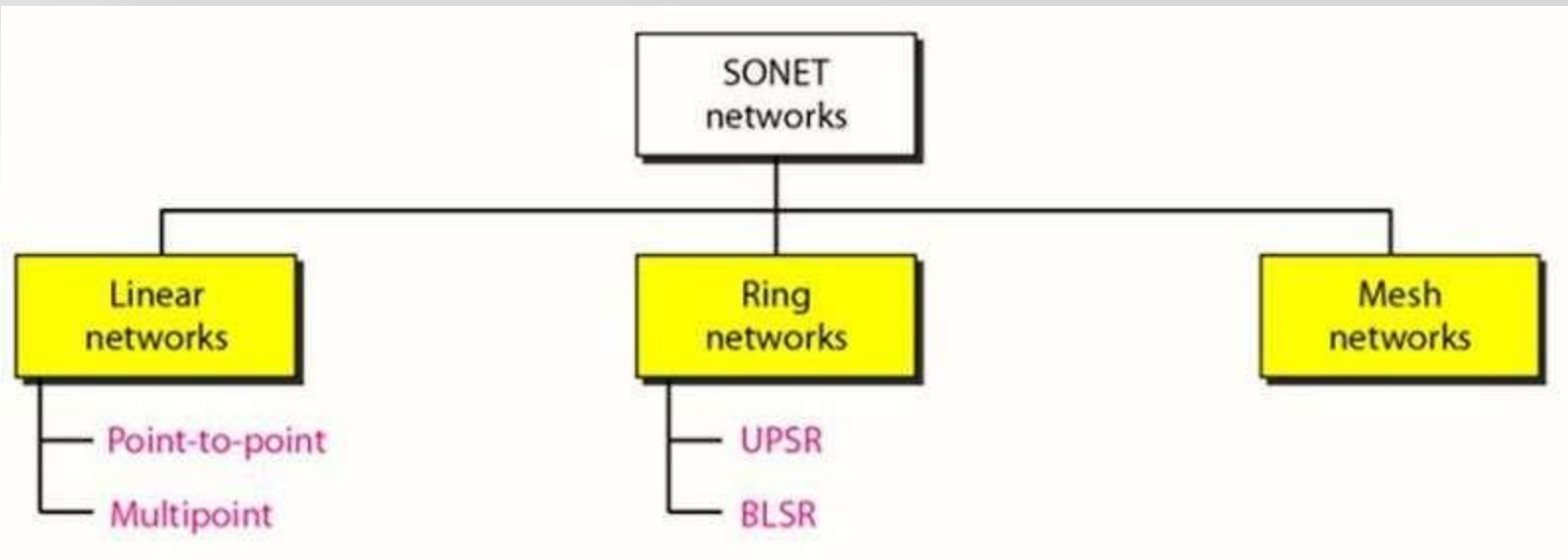
SONET LAYERs

SONET NETWORK

Using SONET equipment, we can create a SONET network that can be used as a high-speed backbone carrying loads from other networks.
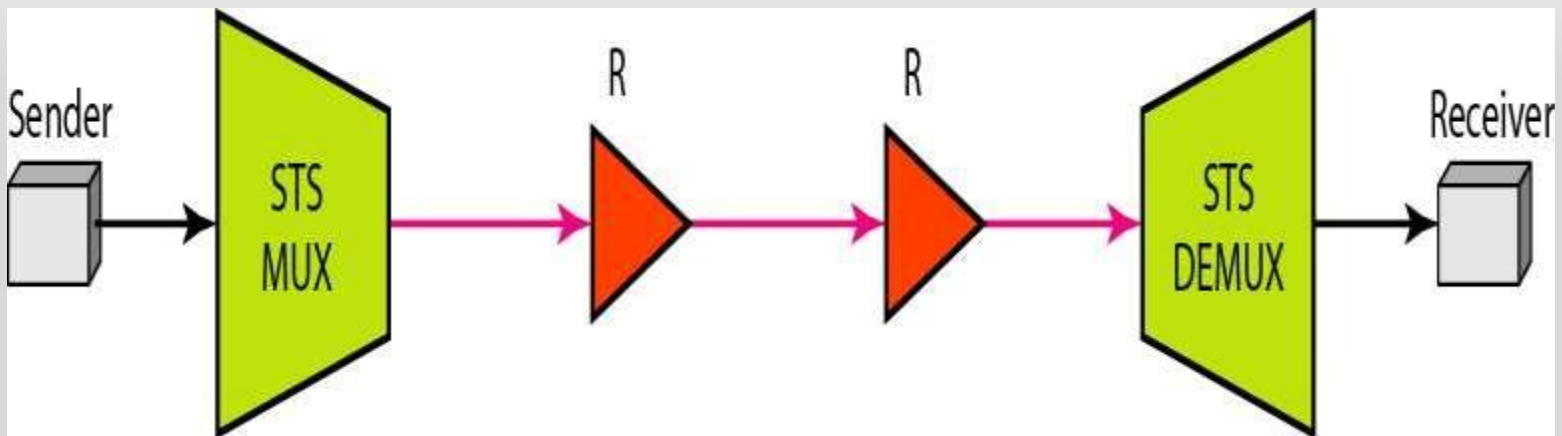
SONET NETWORK

Linear Network

Point-to-Point:

A point-to-point network is normally made of an STS multiplexer, an STS DE multiplexer, and zero or more regenerators with no add/drop
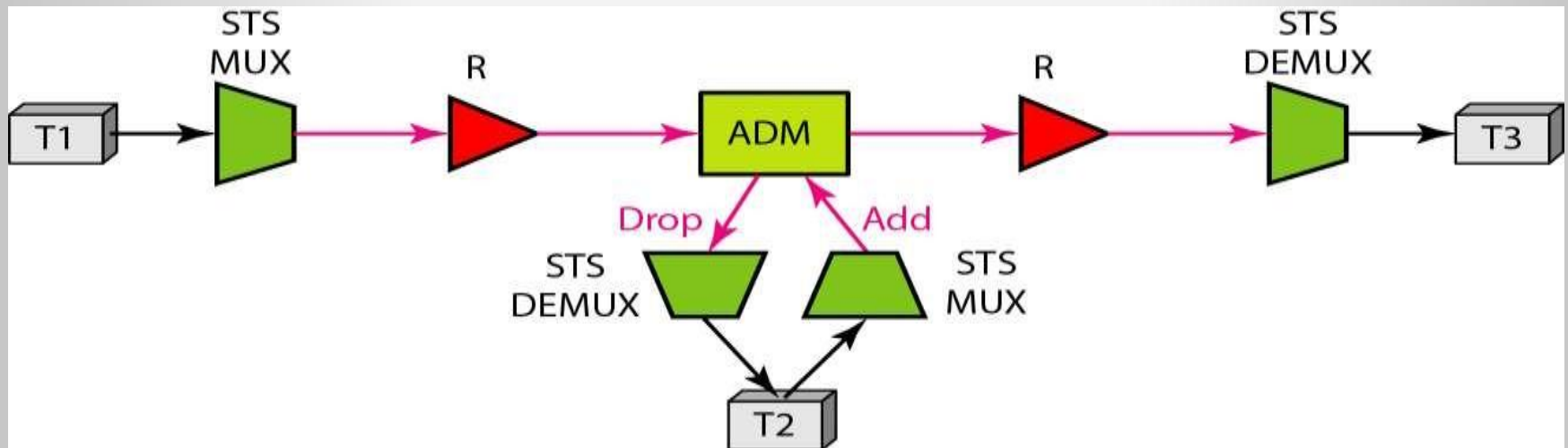
SONET NETWORK

Multipoint:

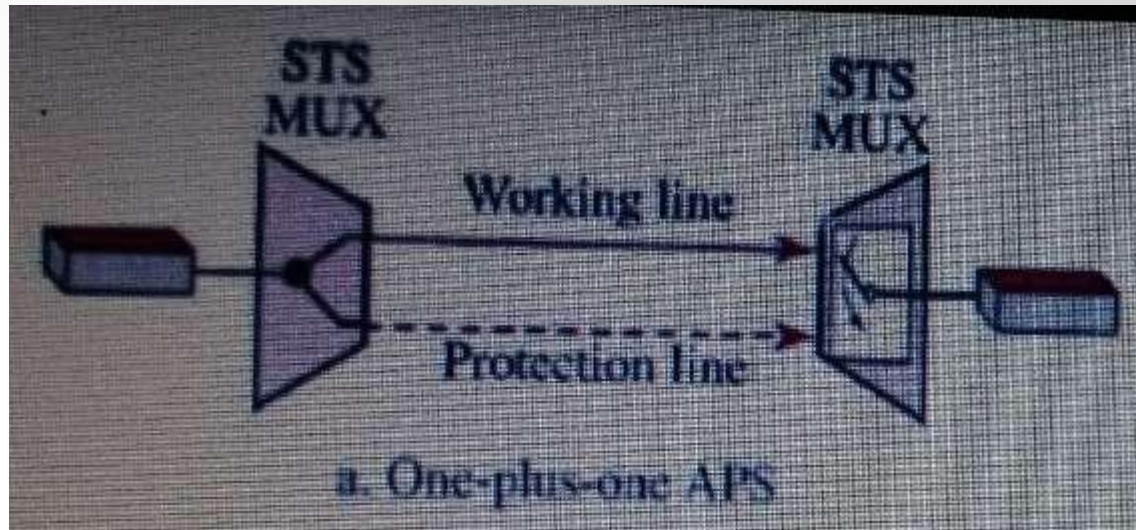A multipoint network uses ADMs to allow communications between several terminals.

SONET NETWORK

One-Plus-One APS

•To create protection against failure in linear networks, SONET defines automatic protection switching (APS).

•In this scheme, there are normally two lines: one working line and one protection line. Both lines are active all the time.
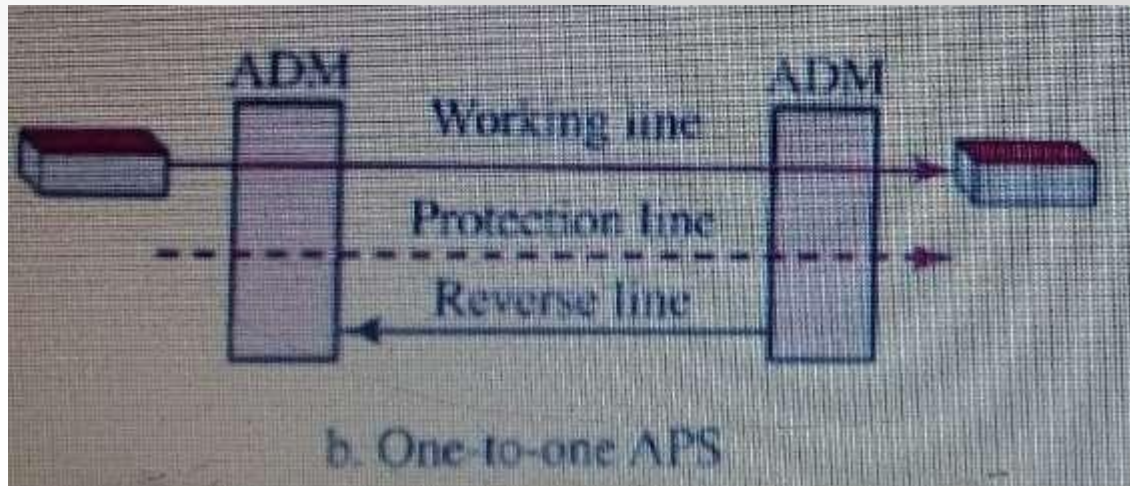

a. One-plus-one APS

SONET NETWORK

One-to-One APS

•The data are normally sent on the working line until it fails.

b. One-to-one APS
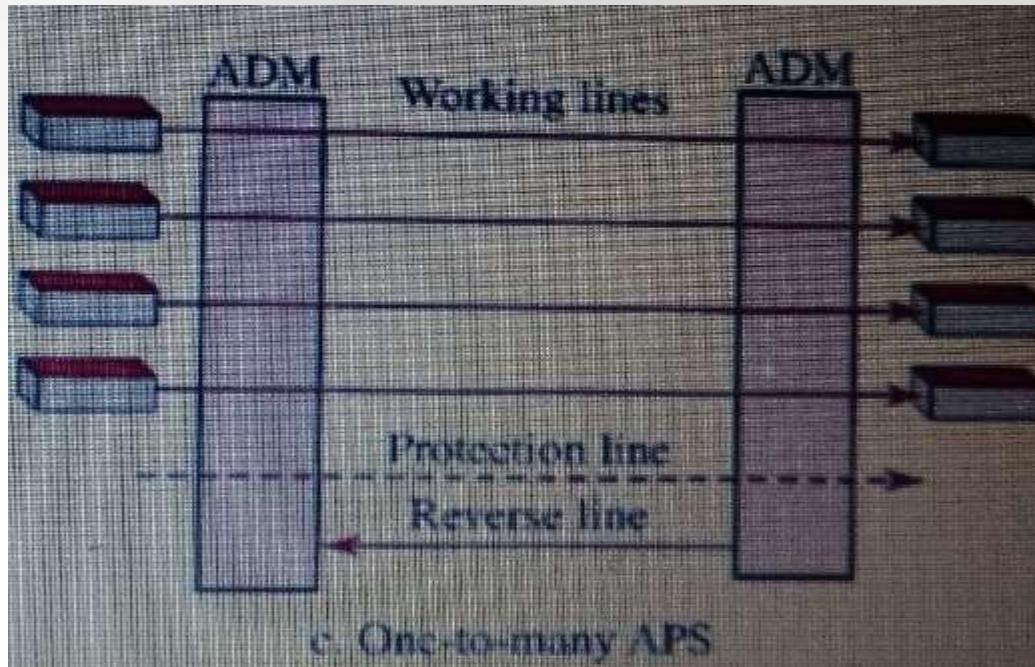
One-to-Many APS

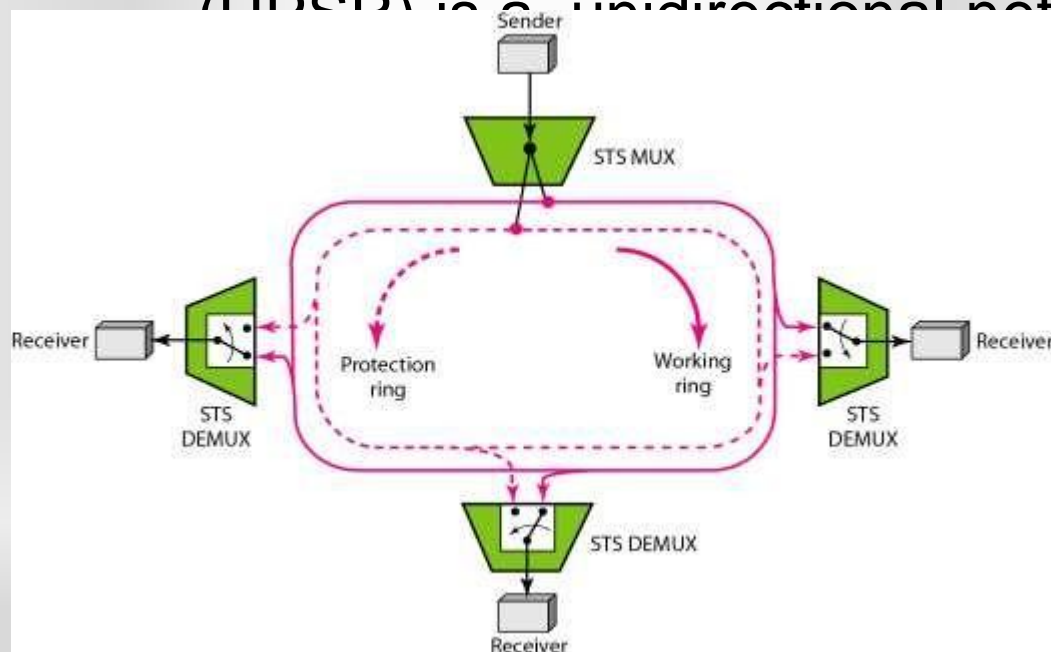•   This scheme is similar to the one-to-one scheme except that there is only one protection line for many working lines.

c. One-to-many APS

SONET NETWORK

- Ring Network

- UPSR:

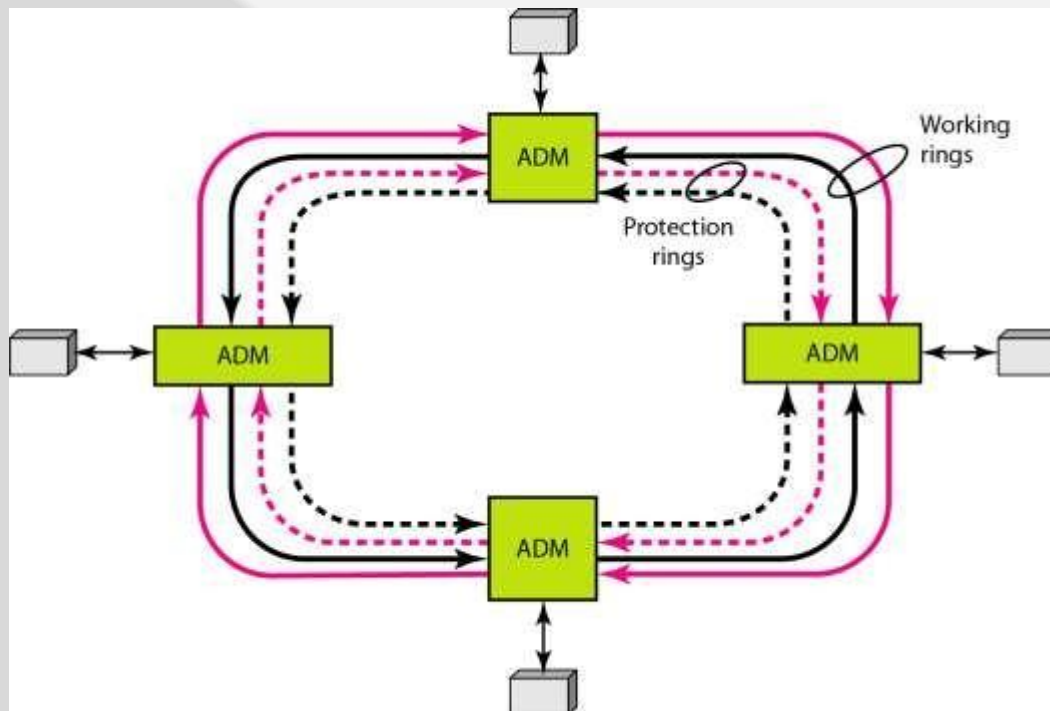- A unidirectional path switching ring (UPSR) is a unidirectional network with

SONET NETWORK

BLSR:

Another alternative in a SONET ring network is a bidirectional line switching ring (BLSR).
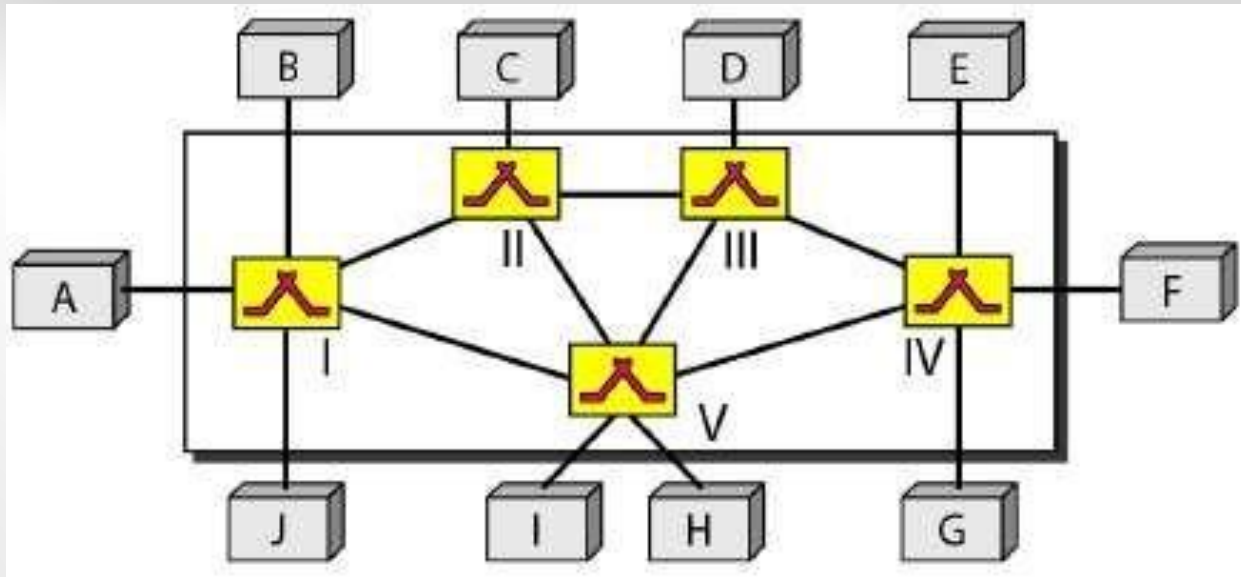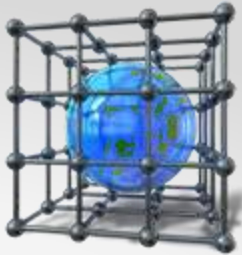
Mesh Network:

When the traffic in a ring increases, we need to upgrade.

ADVANTAGE
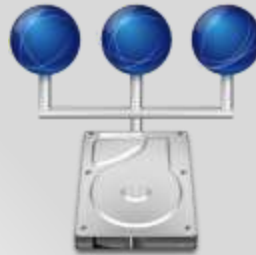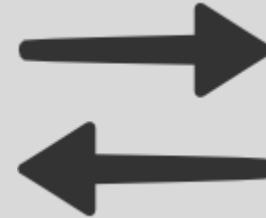
Reduced network complexity

Flexible Topologies

High data rate.

Efficient management of bandwidth

Protection Bandwidth

SUMMARY

- Introduction

- Requirement for SONET

- In which layer SONET work

- FRAME of SONET

- SONT Network

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Questions