SONET

(Synchronous Optical Network)

GALGOTIAS UNIVERSITY

What is SONET?

- Synchronous Optical Networking (**SONET**) and Synchronous Digital Hierarchy (**SDH**) are standardized protocols that transfer multiple digital bit streams synchronously over optical fiber using lasers or highly coherent light from light- emitting diodes (LEDs).
- At low transmission rates data can also be transferred via an electrical interface.
- The method was developed to replace the Plesiochronous Digital Hierarchy (**PDH**) system for transporting large amounts of telephone calls and data traffic over the same fiber without synchronization problems.

Introduction

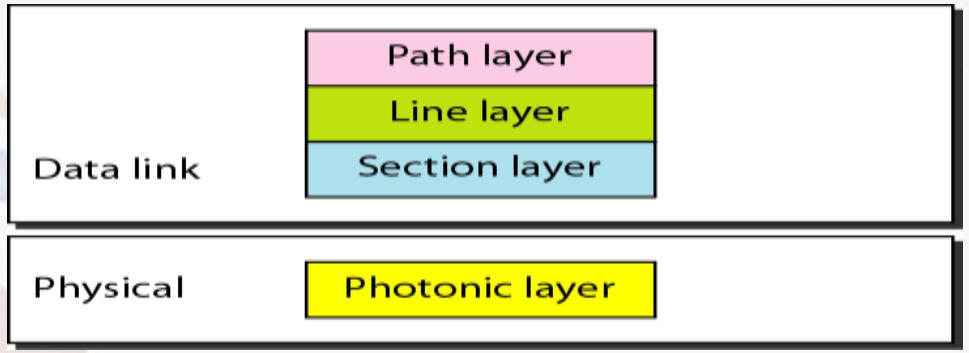
Independently developed in USA & Europe

SONET (Synchronous Optical Network)

SDH (Synchronous Digital Hierarchy)

- Synchronous network using synchronous TDM multiplexing All clocks in the system are locked to a master clock
- It contains the standards for fiber-optic equipments
- A bit-way implementation providing end-to-end transport of bit streams. Multiplexing done by *byte interleaving.*
- SONET commonly transmits data at speeds between 155 megabits per second (Mbps) and 2.5 gigabits per second (Gbps).
- One of SONET's most interesting characteristics is its support for a ring topology .

SONET LAYERS

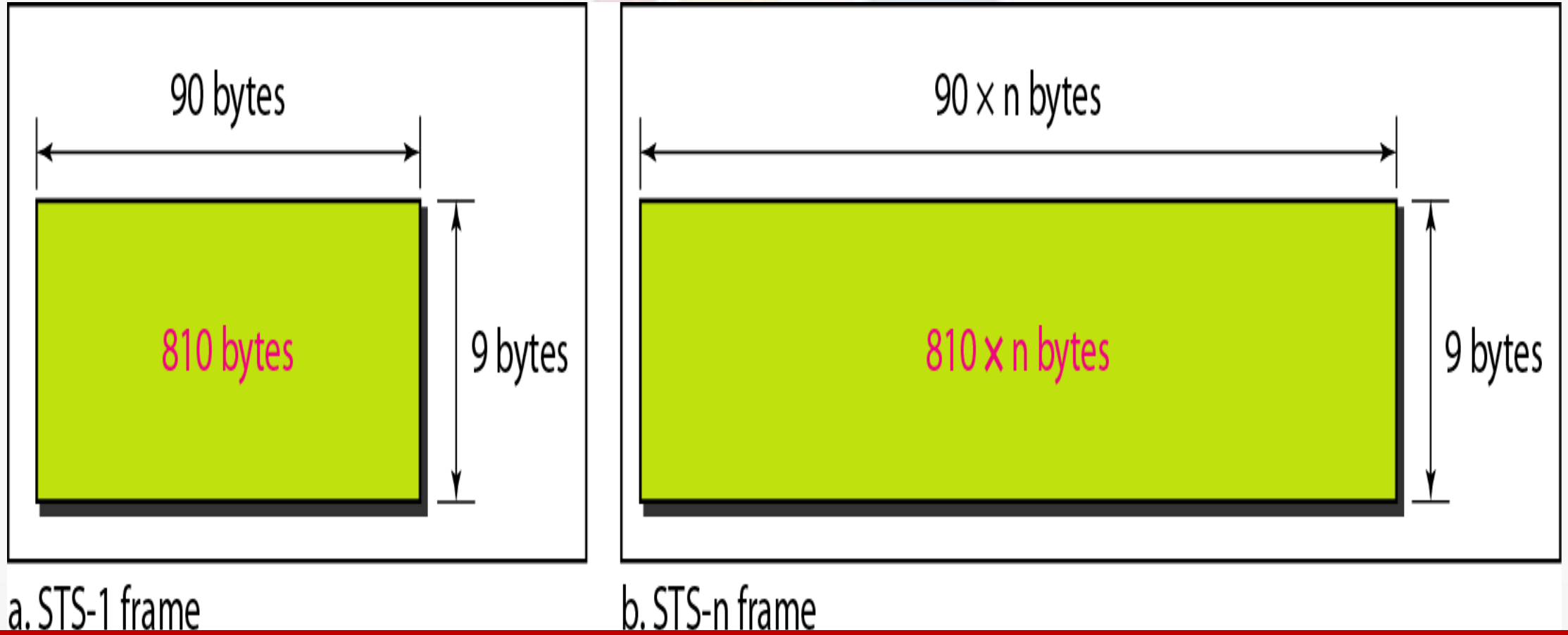


- SONET defines four layers: path, line, section, and photonic layer
- Path layer is responsible for the movement of a signal from its optical source to its optical destination
- Line layers is for the movement of a signal across a physical line
- Section layer is for the movement of a signal across a physical section, handling framing, scrambling, and error control
- Photonic layer corresponds to the physical layer of OSI model

SONET ARCHITECTURE

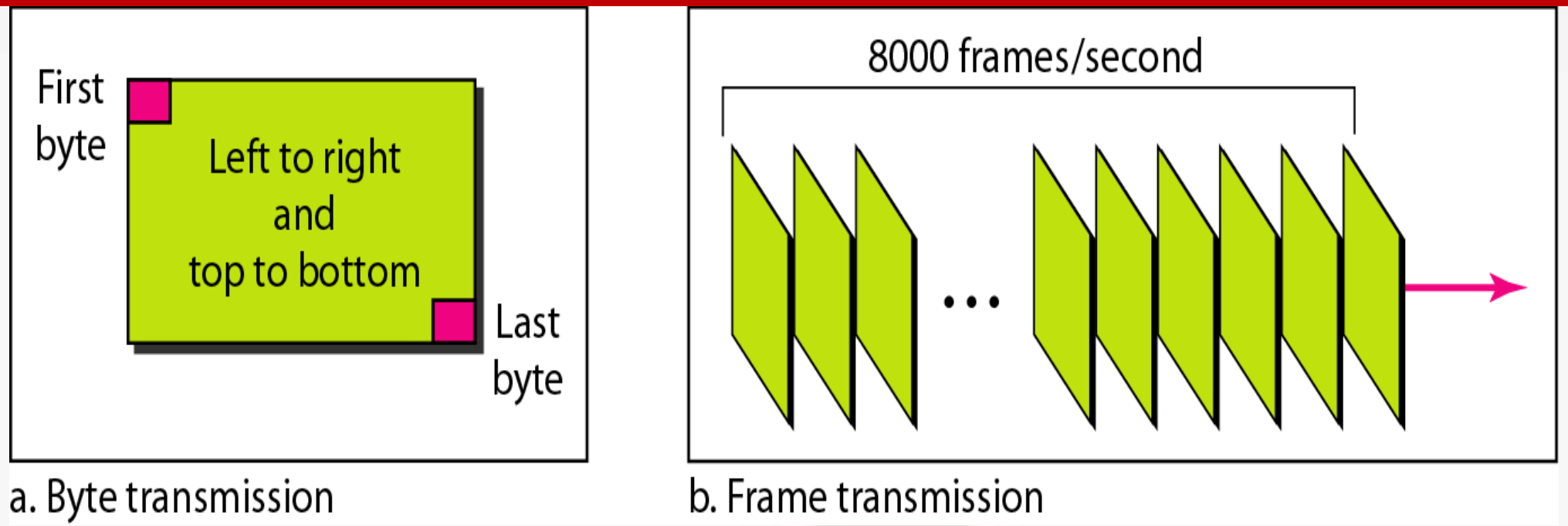
- Architecture of a SONET system: signals, devices, and connections
- Signals: SONET(SDH) defines a hierarchy of electrical signaling levels called STSs (Synchronous Transport Signals, (STMs)).
- Corresponding optical signals are called OCs (Optical Carriers)
- Devices: STS Multiplexer/ Demultiplexer, Regenerator, Add/Drop Multiplexer and Terminals
- Connections: SONET devices are connected using *sections*, *lines*, and *paths*

SONET FRAMES



a. STS-1 frame

b. STS-n frame



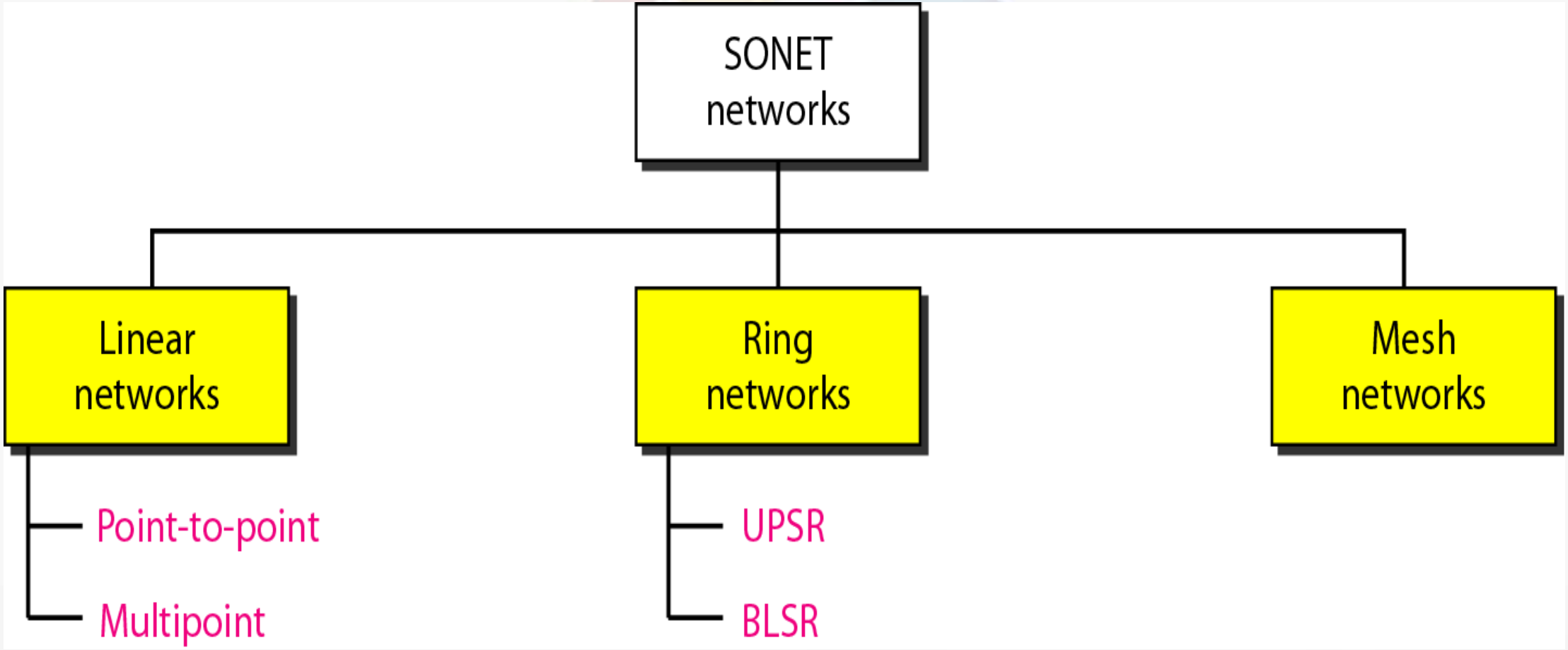
A SONET STS-n signal is transmitted at 8000 frames per second

Each byte in a SONET frame can carry a digitized voice channel

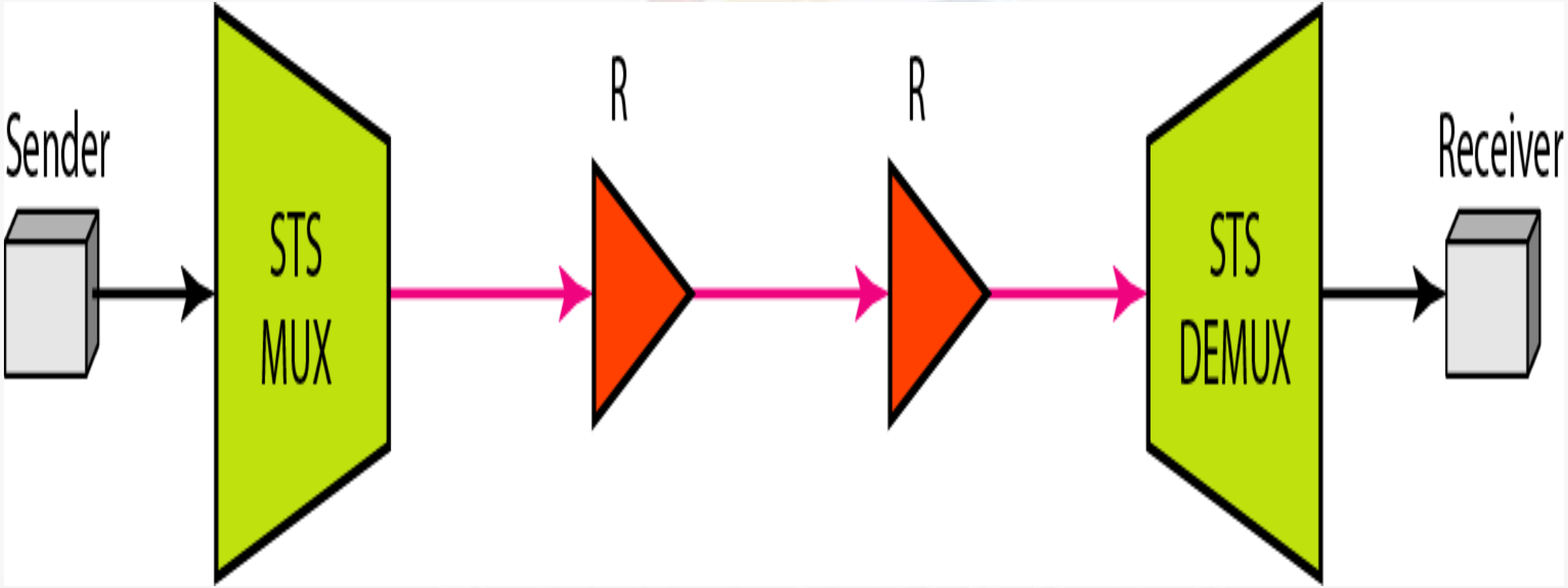
In SONET, the data rate of an STS-n signal is *n* times the data rate of an STS-1 signal

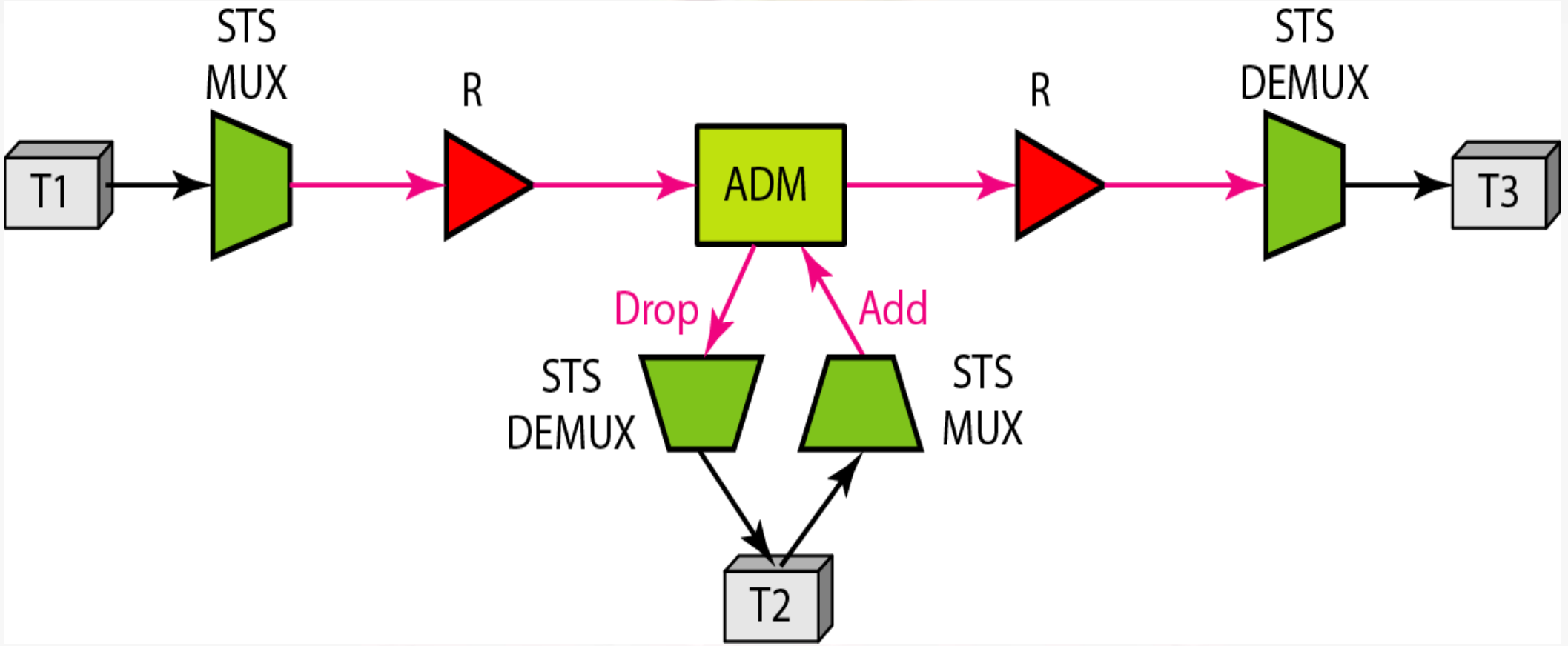
In SONET, the duration of any frame is 125 μs

SONET NETWORKS

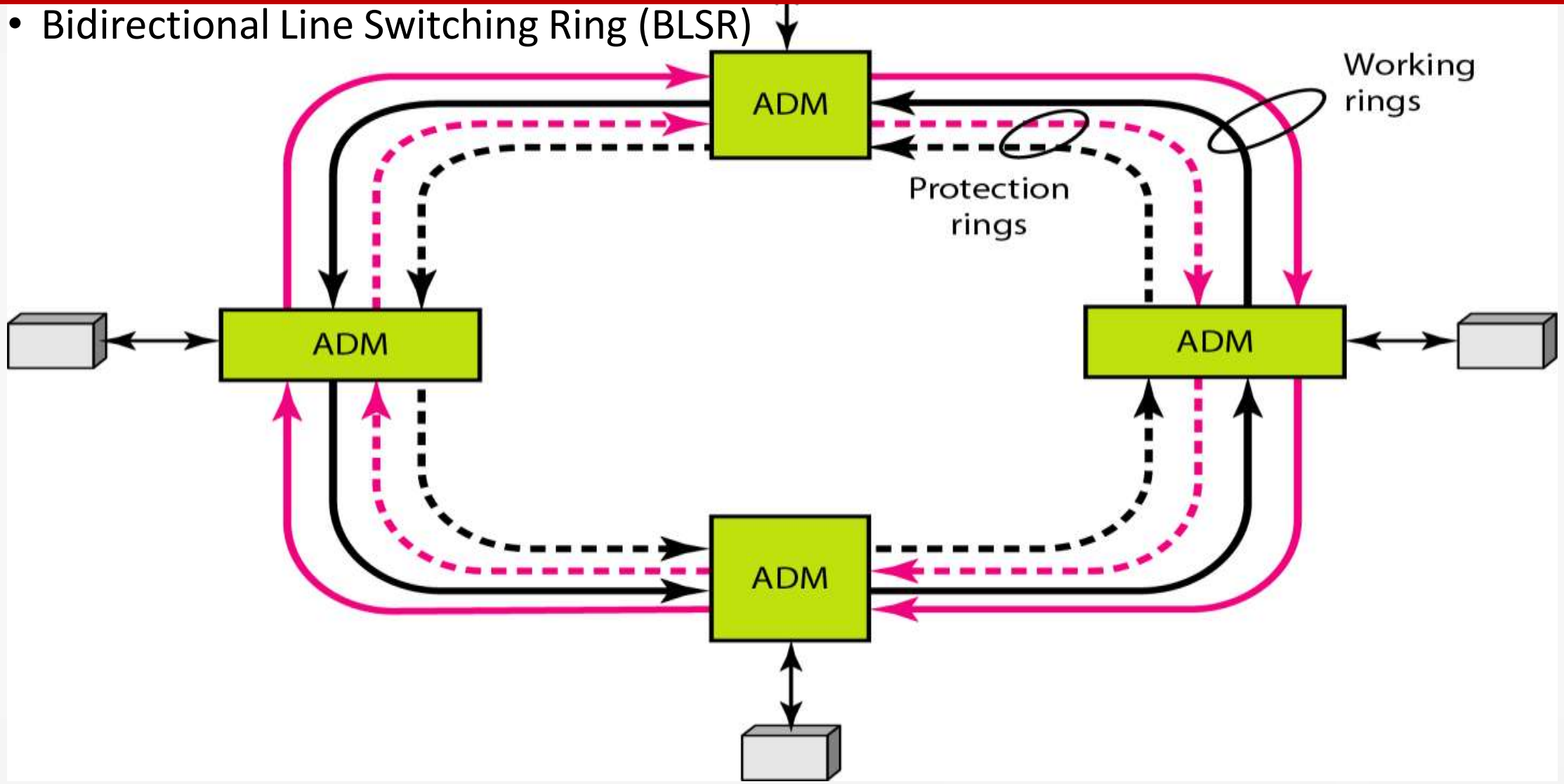


1. Point-to-point network :



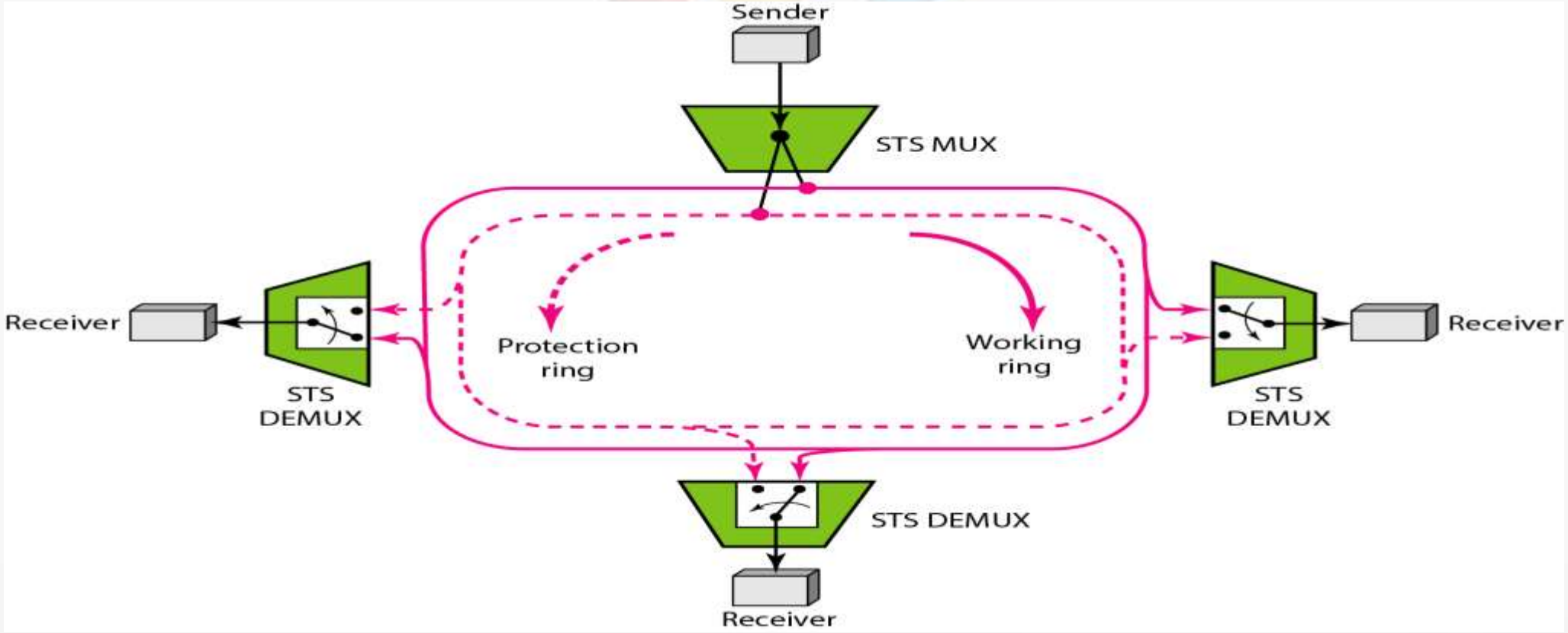

STS
MUX
R
R
STS
DEMUX
T1
ADM
T3
Drop
Add
STS
DEMUX
STS
MUX
T2

- Bidirectional Line Switching Ring (BLSR)

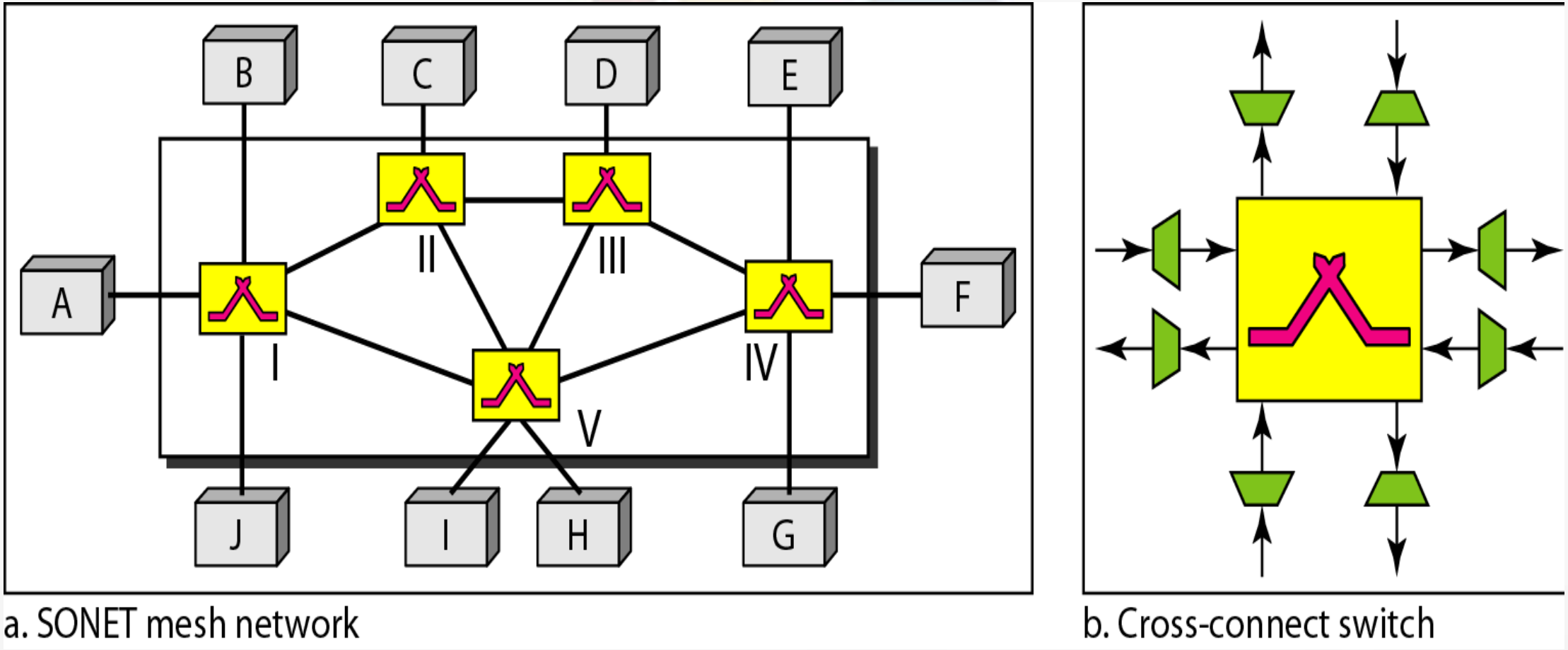


Ring Network:

Unidirectional Path Switching Ring (UPSR)



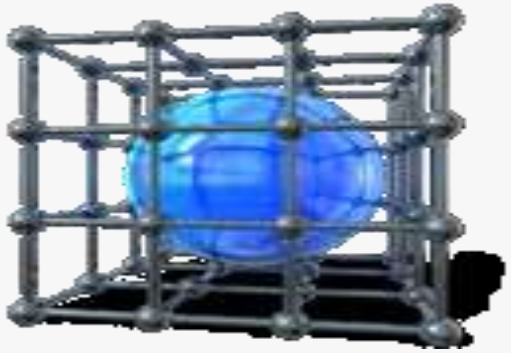
Mesh Network



a. SONET mesh network

b. Cross-connect switch

ADVANTAGES



Reduced network complexity

Efficient management of bandwidth

Protection Bandwidth

Flexible Topologies

DISADVANTAGES

- Strict synchronization schemes required
- Complex and costly equipment as compared to cheaper Ethernet

GALGOTIAS UNIVERSITY

THANK YOU

GALGOTIAS UNIVERSITY