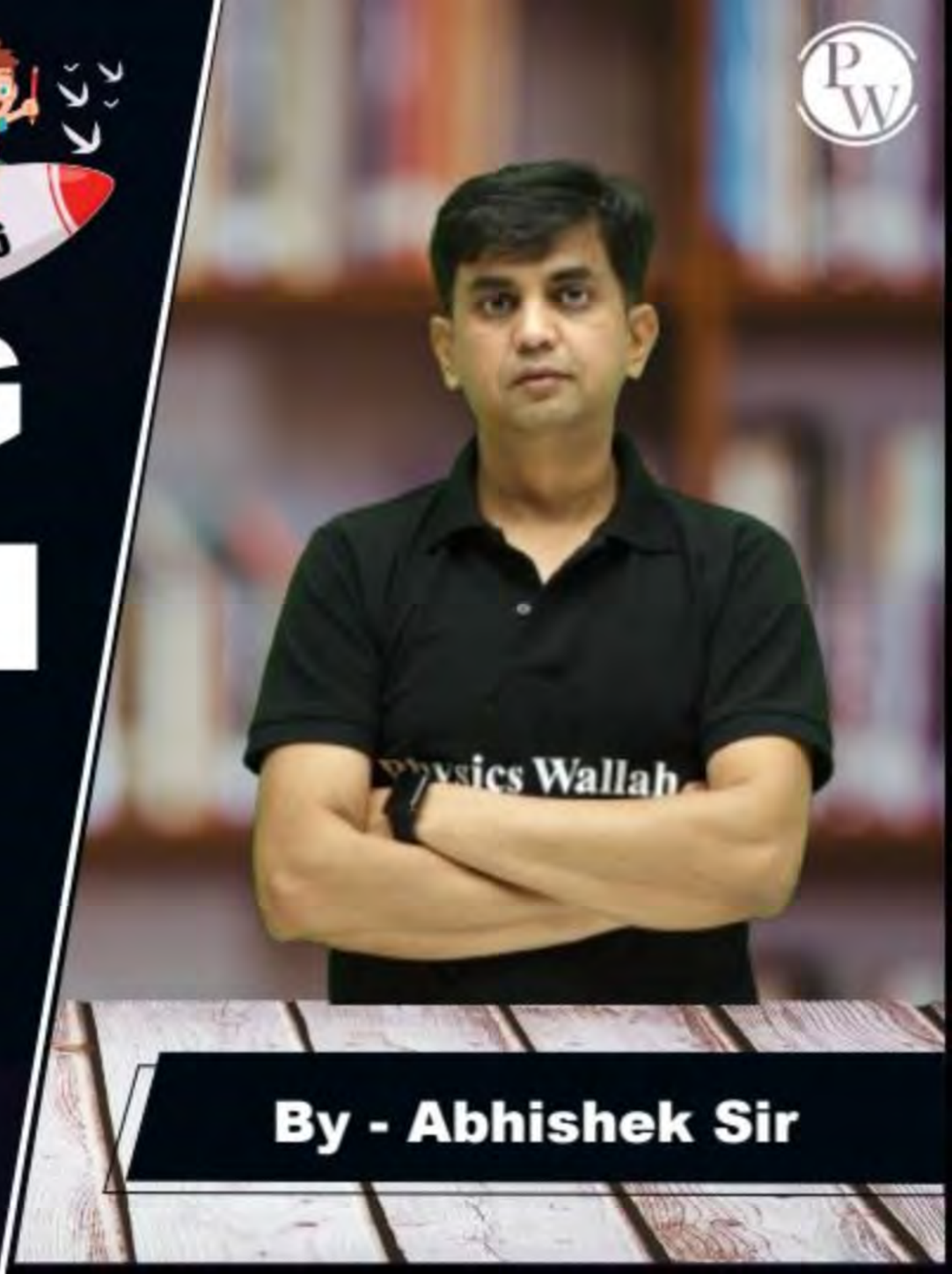
CS & IT ENGINEERING

Computer Network

Introduction

Lecture No. - 02



By - Abhishek Sir

Recap of Previous Lecture

Topic Concepts of Layering

Topic OSI & TCP/IP Model

Topic Application Layer

Topics to be Covered

- Topic: Transport Layer
- Topic: Network Layer
- Topic: Data Link Layer
- Topic: Physical Layer

#Q. Assume that source S and destination D are connected through two intermediate routers labeled R. Determine how many times each packet has to visit the network layer and the data link layer during a transmission from S to D ?

[GATE-2013, 1-Mark]

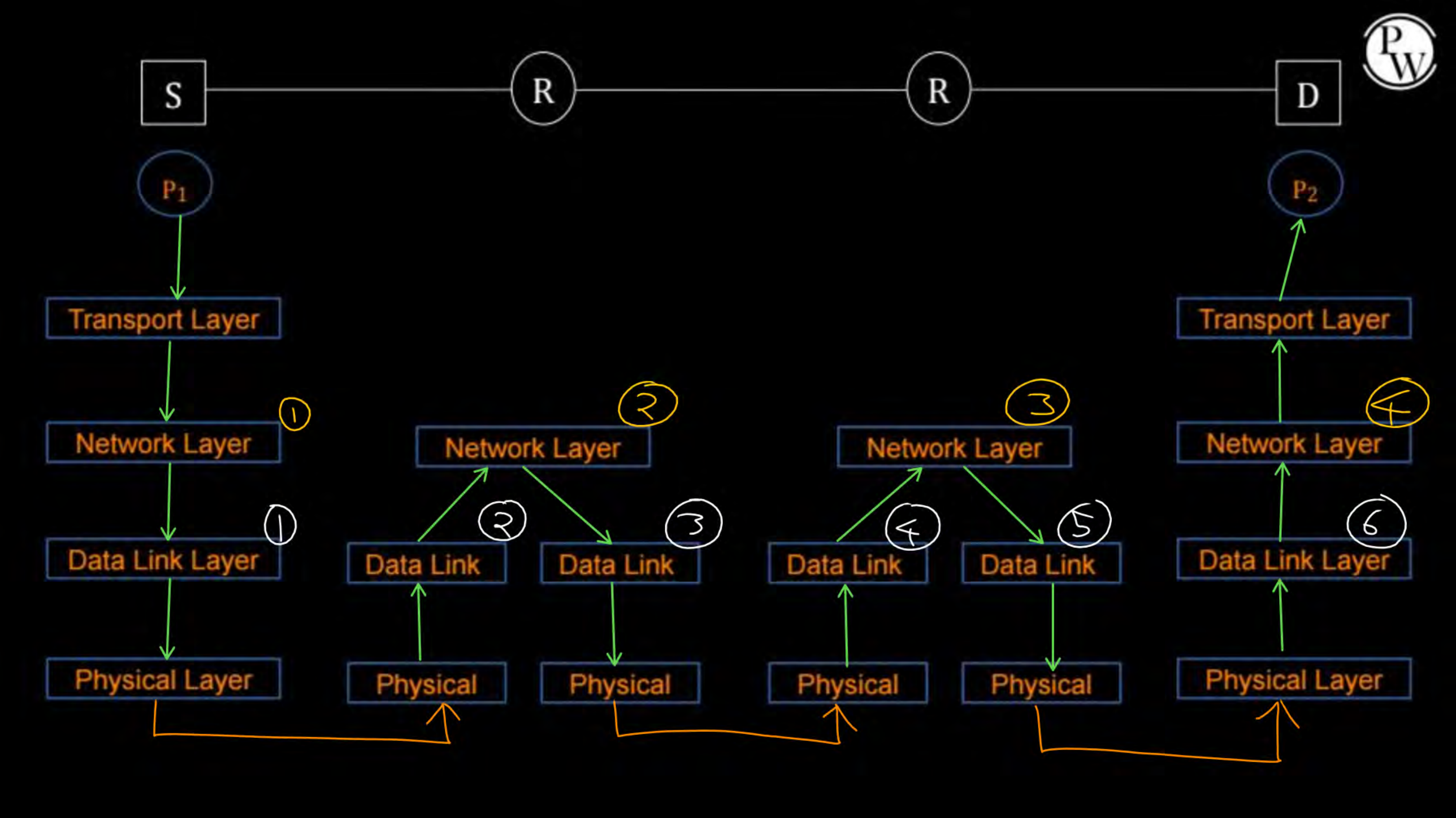
(A) Network layer – 4 times and Data link layer – 4 times

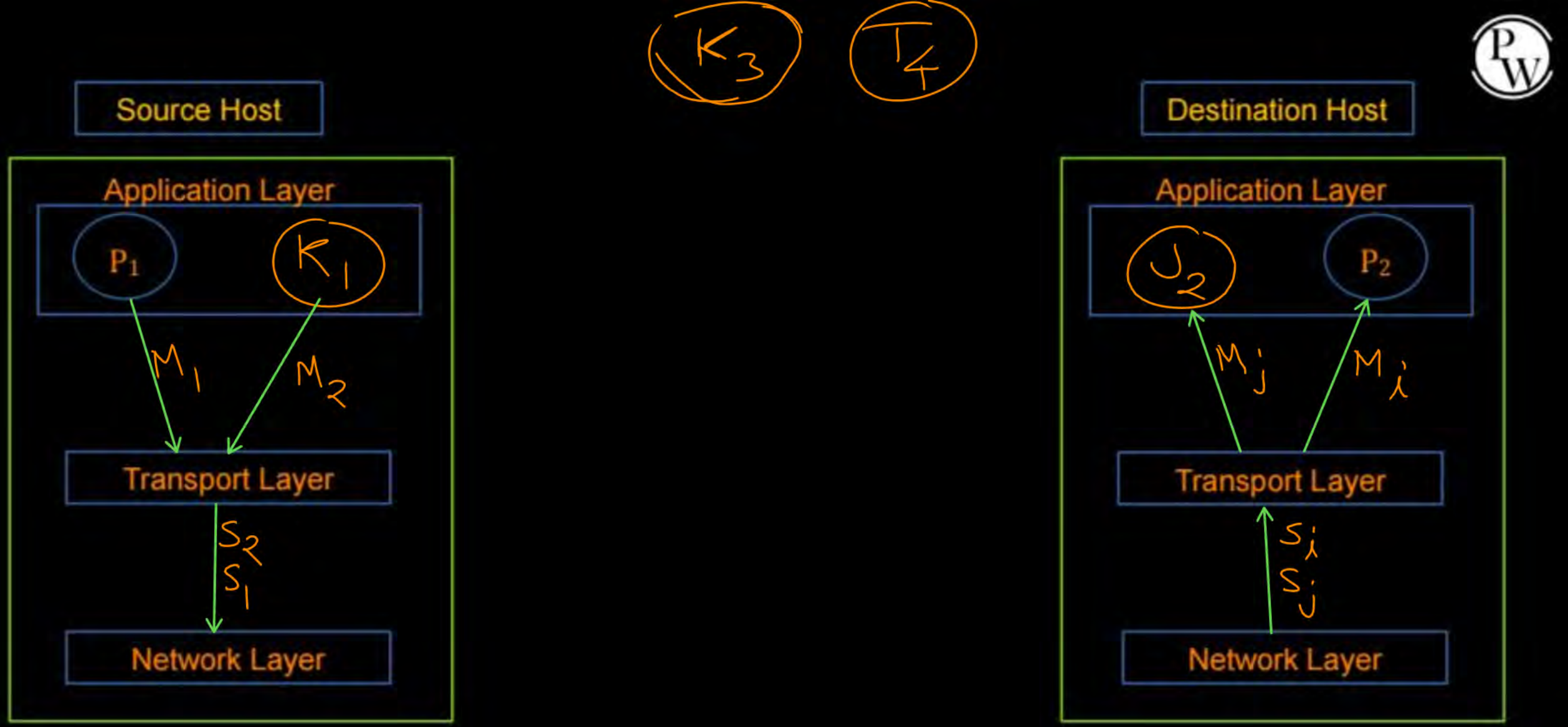
(B) Network layer – 4 times and Data link layer – 3 times

(C) Network layer – 4 times and Data link layer – 6 times

(D) Network layer – 2 times and Data link layer – 6 times

Ans: C


S
R
R
D
P1
P2
Transport Layer
Transport Layer
Network Layer
Network Layer
Network Layer
Network Layer
Data Link Layer
Data Link
Data Link
Data Link
Data Link
Data Link Layer
Physical Layer
Physical
Physical
Physical
Physical
Physical Layer
1
2
3
1
2
3
4
5
6


K3
T4
Source Host
Application Layer
P1
K1
M1
M2
Transport Layer
S2
S1
Network Layer
Destination Host
Application Layer
J2
P2
Mj
Mi
Transport Layer
Si
Sj
Network Layer

Topic : Transport Layer

-> Provide logical communication between application processes (Processes running on different machine)

-> Responsible for process-to-process (end-to-end) communication

Connectivity

#Q. Which of the following functionality must be implemented by a transport protocol over and above the network protocol ?

[GATE-2003]

IIT-M

(A) Recovery from packet losses

(B) Detection of duplicate packets

(C) Packet delivery in the correct order

} Optional

(D) End-to-end connectivity

Ans : D

Topic : Transport Layer

-> Multiplexing & Demultiplexing

[Demultiplexing on the basis of Destination Port Number]

Topic : Transport Layer

Two Transport Layer Protocols :

1. UDP : User Datagram Protocol
2. TCP : Transmission Control Protocol

[TCP = UDP + Extra Services]

*UDP is faster
*TCP is reliable

Topic : Transport Layer

Application Layer Protocol	Transport Layer Protocol
DNS	UDP (Default) TCP (Conditional)
HTTP/1 HTTP/2	TCP
HTTP/3	UDP
FTP	TCP
SMTP	TCP

#Q. Which one of the following uses UDP as the transport protocol?

[GATE-2007]

(A) HTTP 1 & 2 → TCP

(B) Telnet → TCP

(C) DNS → UDP

(D) SMTP → TCP

Ans: C

#Q. Which of the following transport layer protocols is used to support electronic mail?

[GATE-2012, 1-Mark]

(A) SMTP → App. Layer

(B) IP → Network Protocol

(C) TCP

(D) UDP

Ans: C

#Q. Which of the following transport layer protocols is used to support electronic mail?

[GATE-2012, , 1-Mark]

(A) SMTP

(B) IP

(C) TCP

(D) UDP

Ans : (C) TCP

E-mail uses SMTP as application layer protocol.

SMTP uses TCP as transport layer protocol.

Topic : Transport Layer PDU

-> In 'Internet Protocol Suite' (TCP/IP Model)

1. For TCP : "Segment"
2. For UDP : "Datagram"

-> In 'OSI Model'

Transport Layer PDU : "Segment"
[For both TCP and UDP]

Topic : Transport Layer

-> Transport Layer PDU : "Segment"

-> Sender : Divide application messages into segments,
(Segments passes to network layer) } Segmentation

-> Receiver : Reassemble segments into messages,
(Messages passes to application layer) } Reassembly

Topic : Protocol Data Unit

Topic : SDU [Not Imp.]

→ Service Data Unit (SDU)

→ Upper layer 'Protocol Data Unit'

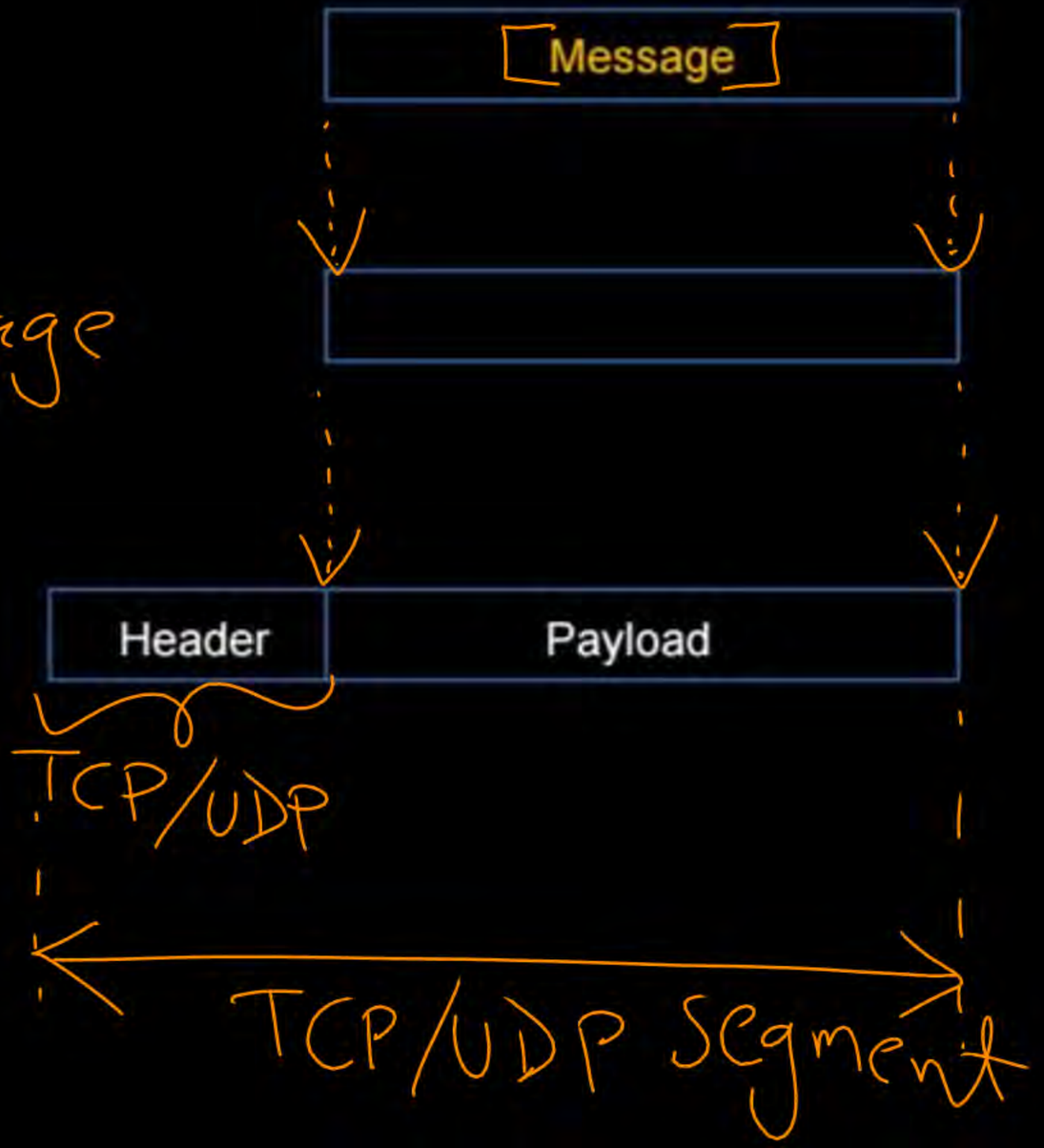
→ Layer n PDU is SDU for Layer (n–1)

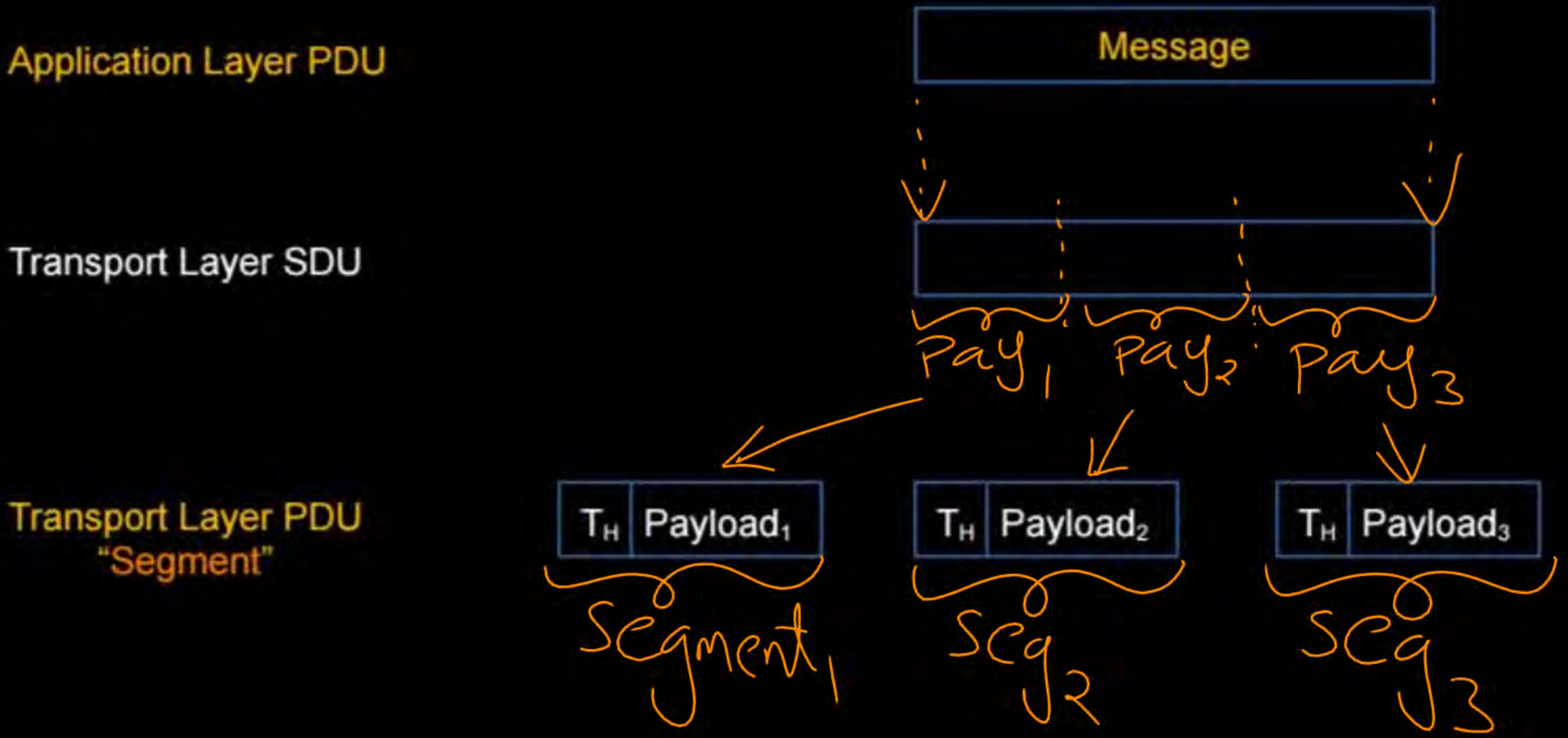
PDU → Imp

Application Layer PDU

(Transport Layer SDU) = Message

Transport Layer PDU
"Segment"




Application Layer PDU
Message
Transport Layer SDU
Pay1
Pay2
Pay3
Transport Layer PDU
"Segment"
TH
Payload1
TH
Payload2
TH
Payload3
Segment1
Seg2
Seg3

Topic : Network Layer

-> Provide host-to-host connectivity

-> Forwarding and Routing

-> Internet protocol (IP)

H.W.

Q) internet vs Internet

Topic : Host-to-Host Connectivity

inter-networks : Source & Destination hosts belongs to different networks

Topic : Host-to-Host Connectivity

→ Routing of IP packets from source host to destination host.

1. Source host to source router
2. Source router to destination router *
3. Destination router to destination host

Topic : Forwarding

Data Plane :

-> Determine how IP packets are forwarded

[Using Router's Forwarding/Routing table]

-> Move packet from a router's input link to appropriate router's output link

Topic : Routing

Control Plane :

-> Determine how IP packets routed among routers

[Determine route taken by IP packets from source to destination]

-> Construction of Router's Forwarding/Routing table

[Using Routing algorithms/protocols]

Topic : Network Layer PDU

-> In 'Internet Protocol Suite' (TCP/IP Model)

Network Layer PDU : "Packet"

* Packet switch network

-> In 'OSI Model'

Network Layer PDU : "Datagram" or "Packet"

IP Datagram
or
IP packet
or IP fragment

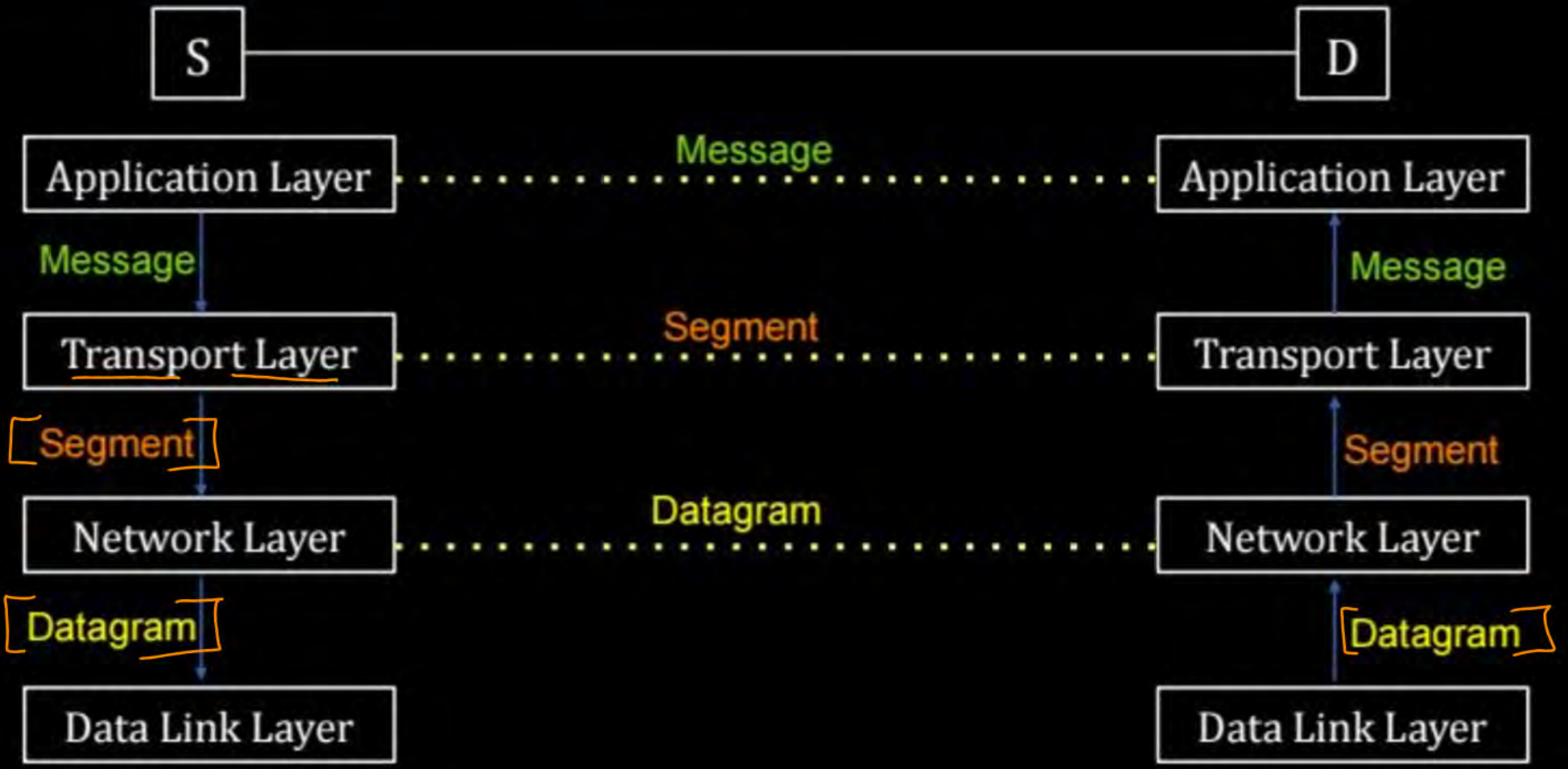
Topic : Network Layer

Network Layer PDU : "Datagram"

-> Sender : Divide segments into datagrams,
Datagrams passes to data link layer } Fragmentation

-> Receiver : Reassemble datagrams into segments,
Segments passes to transport layer } Reassmbly

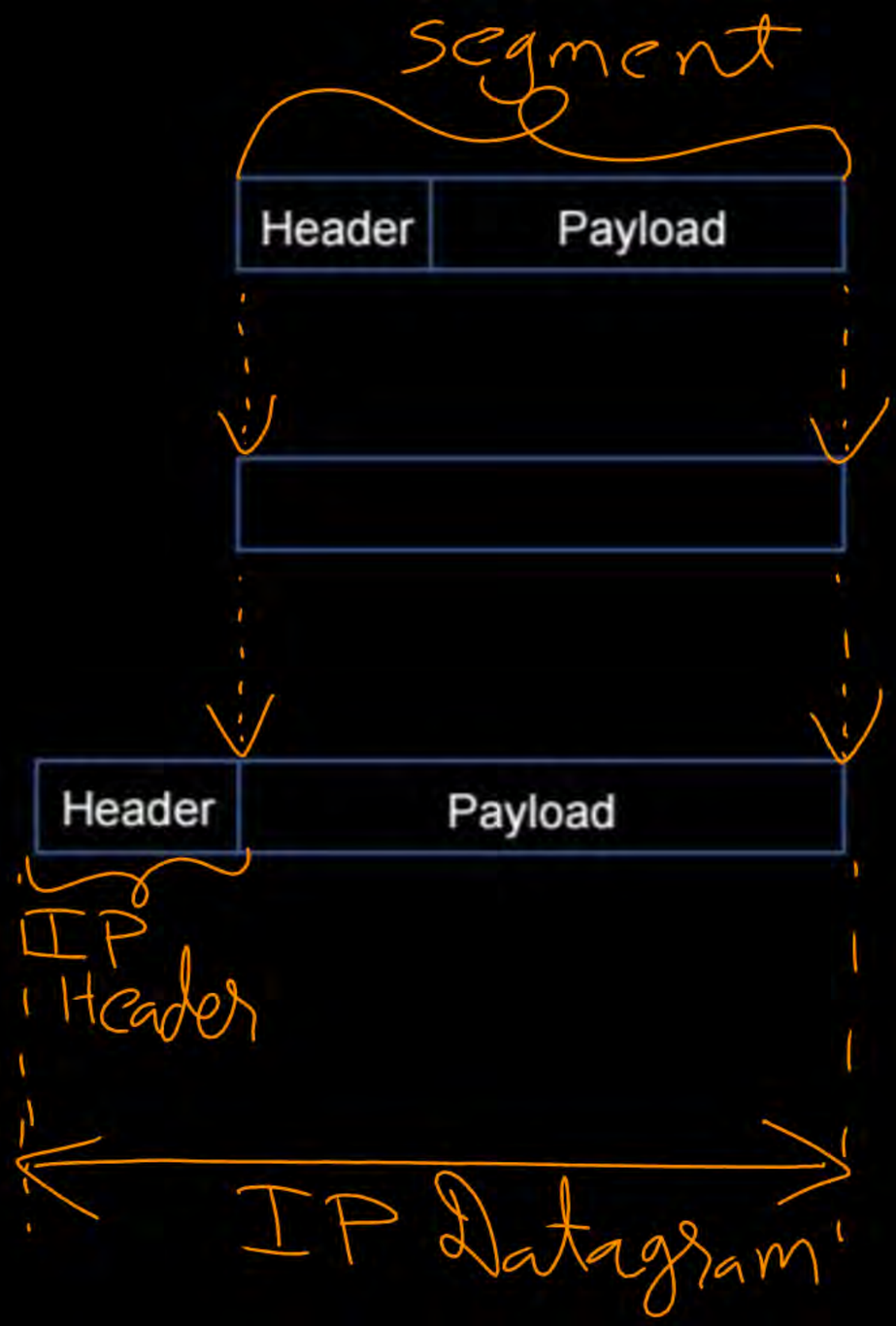
Topic : Protocol Data Unit



Transport Layer PDU
"Segment"

Network Layer SDU = Segment

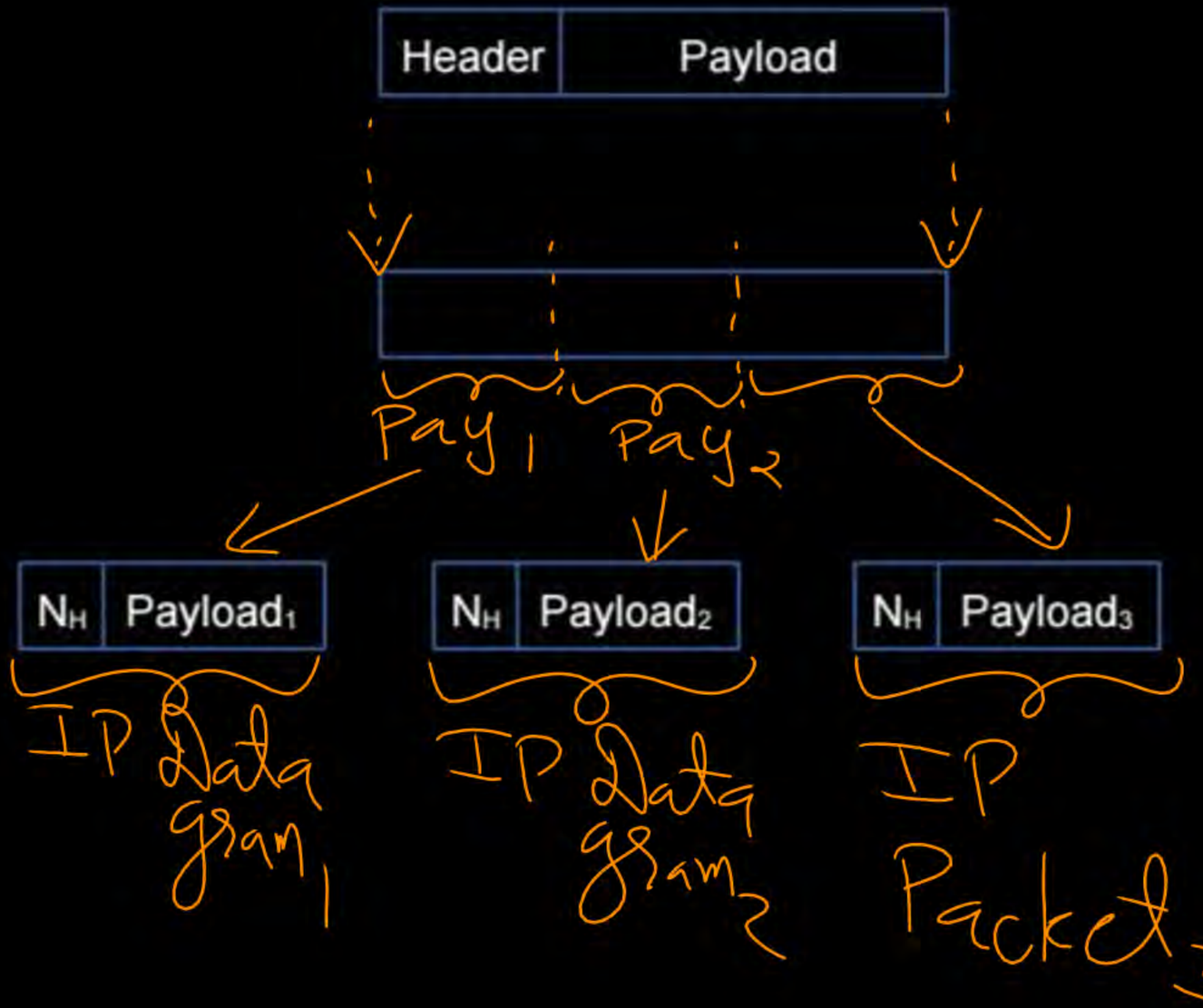
Network Layer PDU
"Datagram"



Transport Layer PDU
"Segment"

Network Layer SDU

Network Layer PDU
"Datagram"



Topic : Network Layer

-> Network Layer Networking Device : "Router" *

-> Store and Forward device
[Store, Process and Forward]

-> Forwarding based on IP Address *

2 mins Summary

Topic Transport Layer

Topic Network Layer

Topic ~~Data Link Layer~~

Topic ~~Physical Layer~~

THANK - YOU