

# CS & IT ENGINEERING



## Computer Network

### Introduction

**Lecture No. - 04**



**By - Abhishek Sir**



# Recap of Previous Lecture



Topic

Transport Layer

Topic

End-to-end Communication





# Topics to be Covered



Topic

Network Layer

Topic

Data Link Layer

Topic

Physical Layer

# ABOUT ME



Hello, I'm **Abhishek**

- GATE CS AIR - 96
- M.Tech (CS) - IIT Kharagpur
- 12 years of GATE CS teaching experience

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#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?

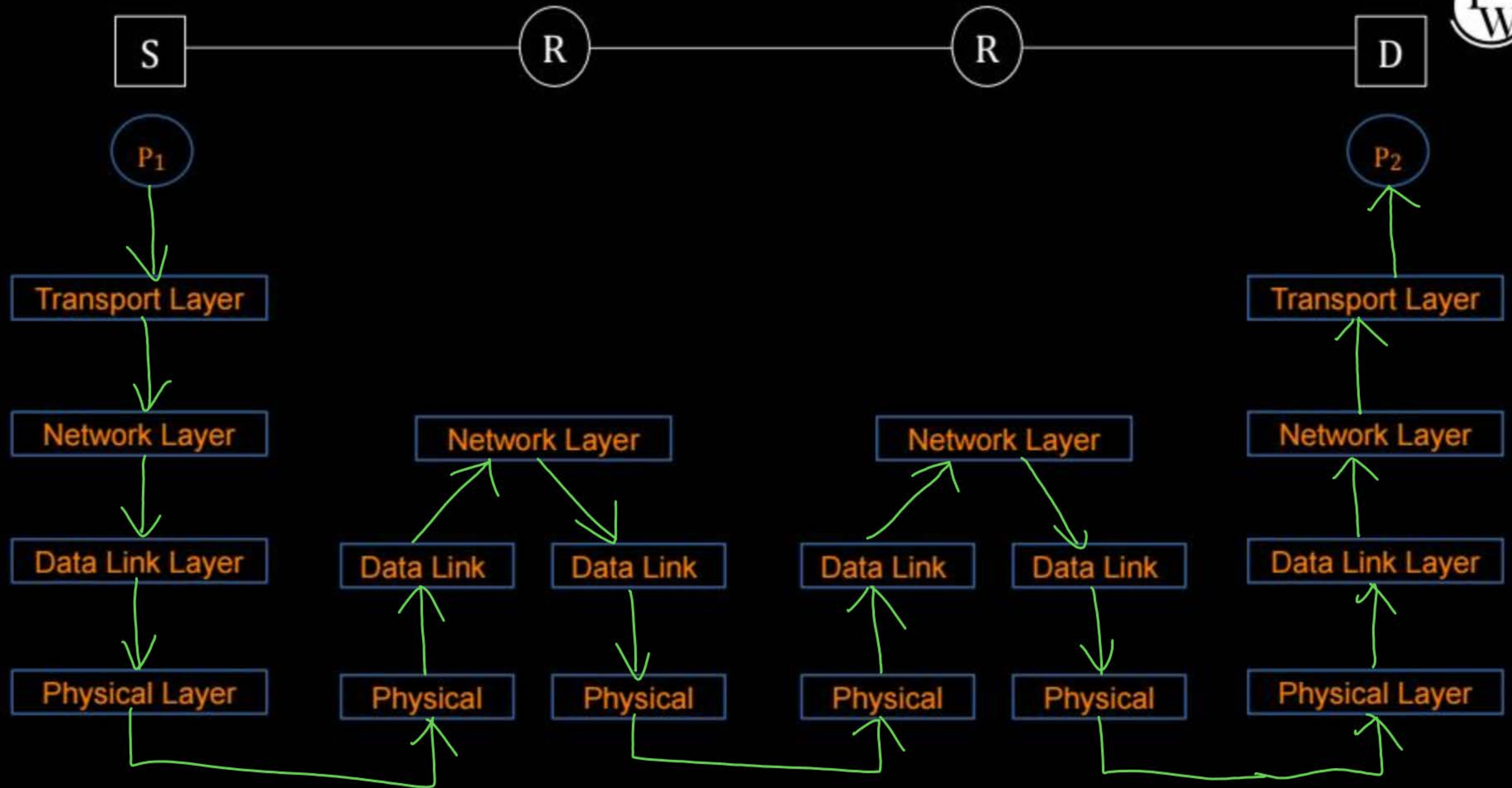
[GATE-2013, 1-Mark]



- ☒ (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







## Topic : SDU



- Service Data Unit (SDU)
- Upper layer 'Protocol Data Unit'
- Layer n PDU is SDU for Layer (n-1)



## Topic : Transport Layer



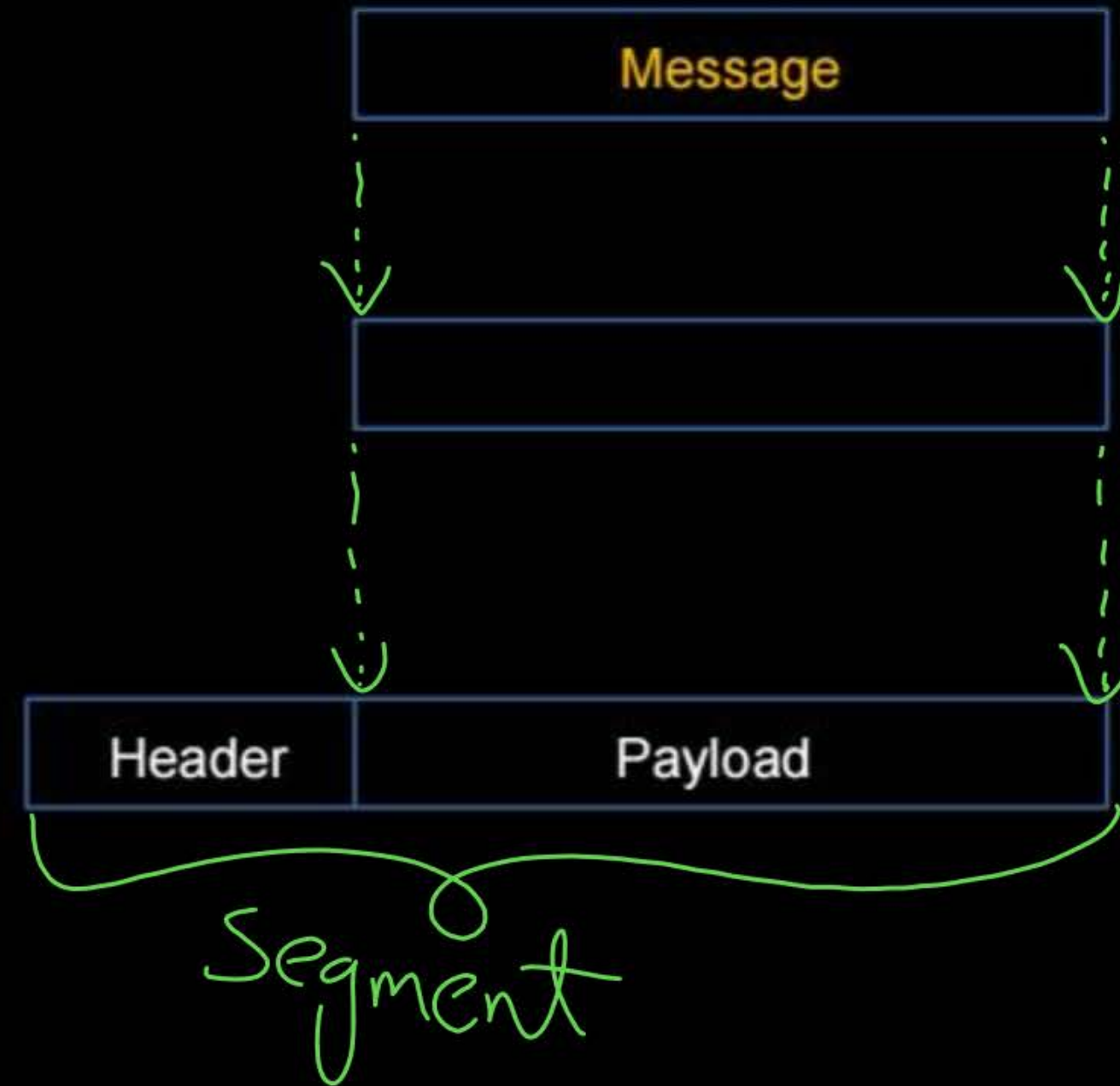
- Transport Layer PDU : "Segment"
- Sender : Divide application messages into segments,  
Segments passes to network layer
- Receiver : Resembles segments into messages,  
Messages passes to application layer



Application Layer PDU

Transport Layer SDU

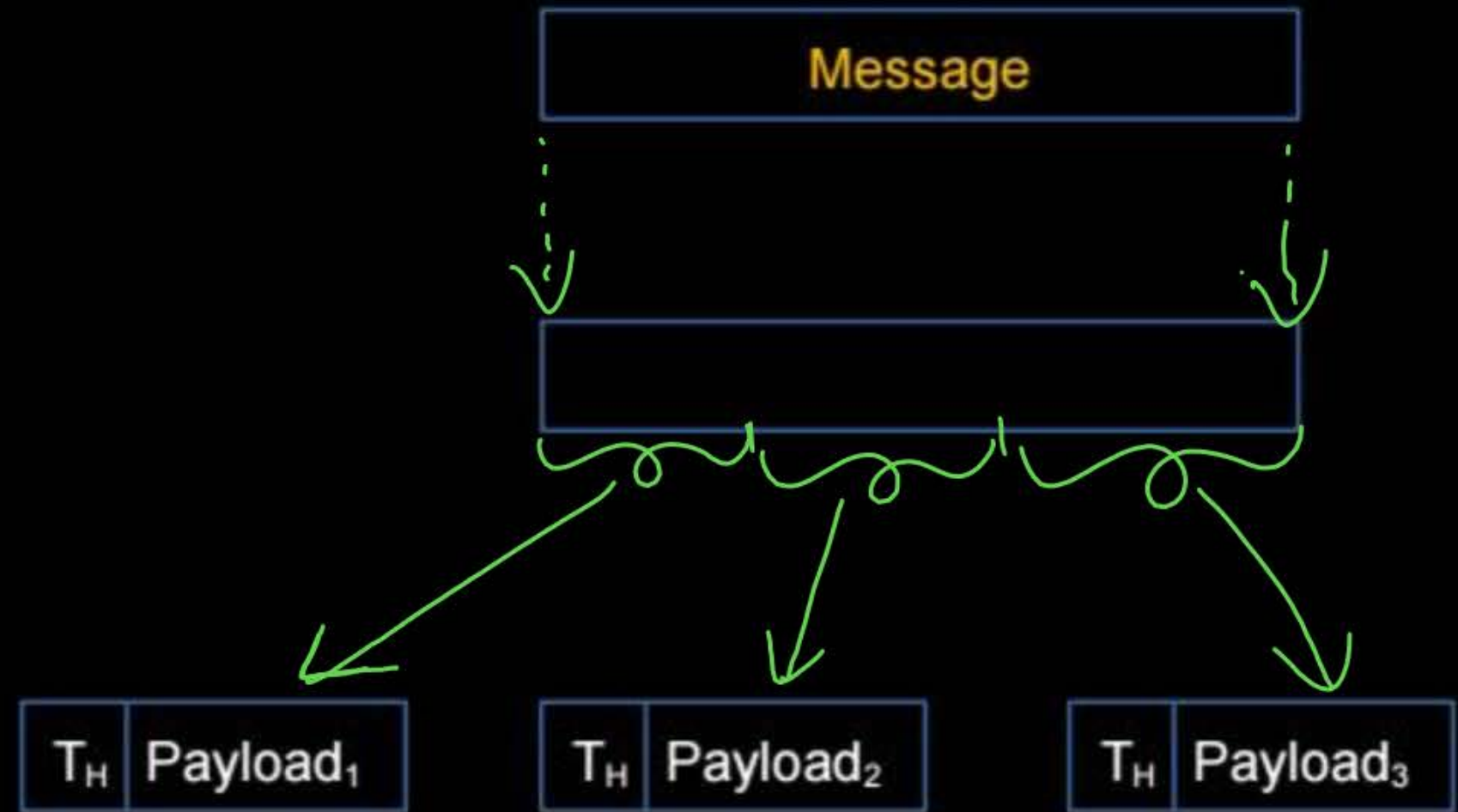
Transport Layer PDU  
"Segment"



Application Layer PDU

Transport Layer SDU

Transport Layer PDU  
"Segment"





# Topic : Protocol Data Unit





#Q. What is the maximum size of data that the application layer can pass on to the TCP layer below?

[GATE-2008]

- ☒ (A) Any Size
- (B)  $2^{16}$  bytes - size of TCP Header
- (C)  $2^{16}$  bytes
- (D) 1500 bytes

#Q. What is the maximum size of data that the application layer can pass on to the TCP layer below?

[GATE-2008]

- (A) Any Size
- (B)  $2^{16}$  bytes - size of TCP Header
- (C)  $2^{16}$  bytes
- (D) 1500 bytes

Ans : (A) Any Size

Application layer can send any size of data.  
No any limit defined by OSI Model.



## Topic : Network Layer



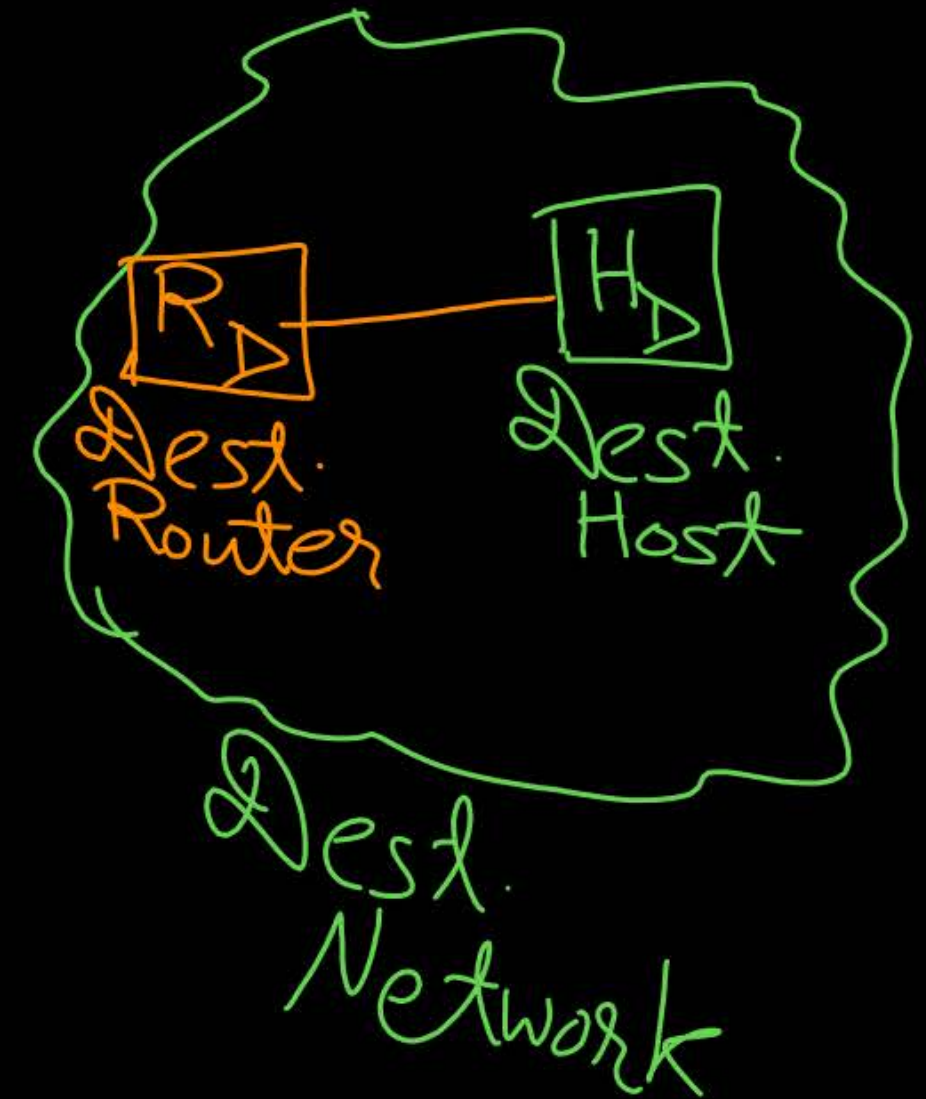
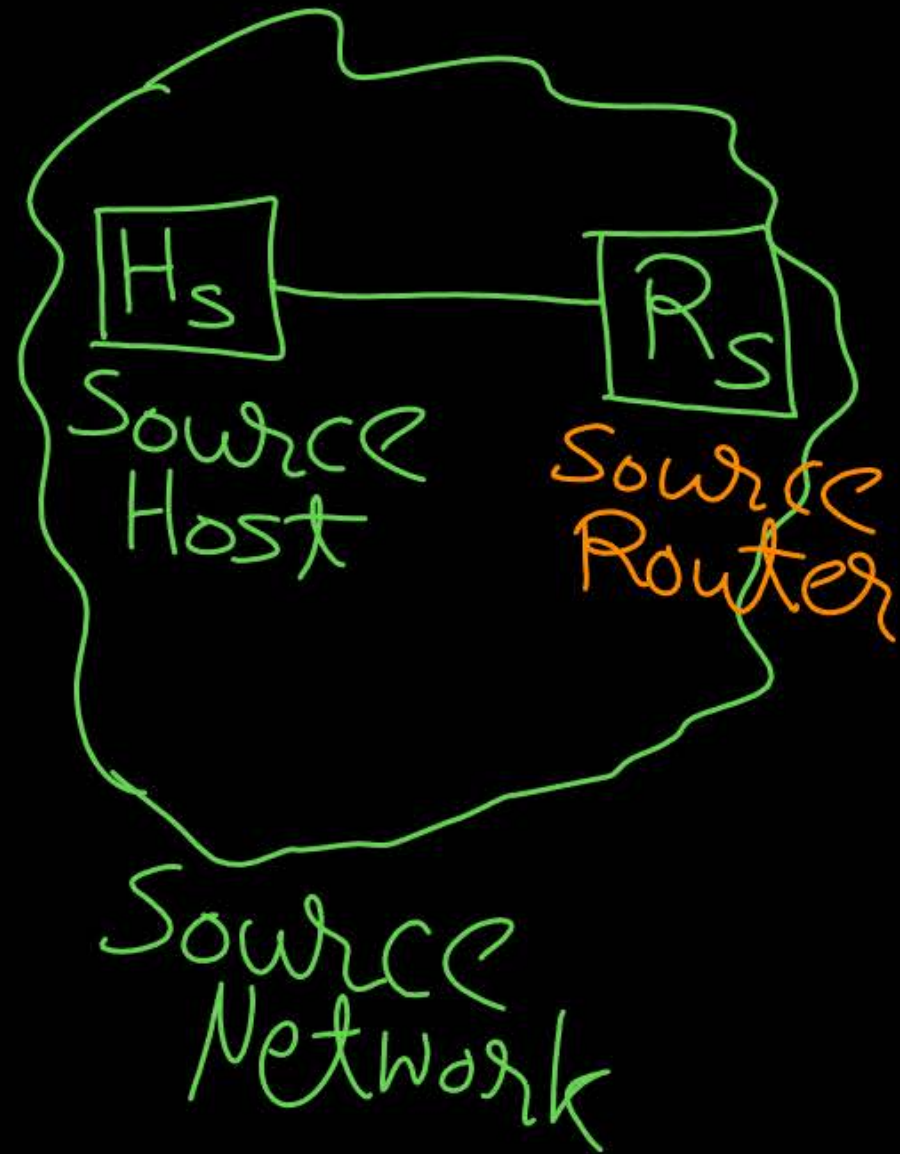
- Provide host-to-host communication services
- Forwarding and Routing
- Internet protocol (IP) : IPv4, IPv6
  - ① IP Header
  - ② IP Address





## Topic : Host-to-Host Communication

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





## Topic : Forwarding



### Data Plane :

- > Determine how datagram is forwarded  
[Forwarding table]
- > Move packet from a router's input link to appropriate router's output link



## Topic : Routing



### Control Plane :

- > Determine how datagram routed among routers  
[Routing table]
- > Determine route taken by packets from source to destination  
[Routing algorithms]





## Topic : Network Layer



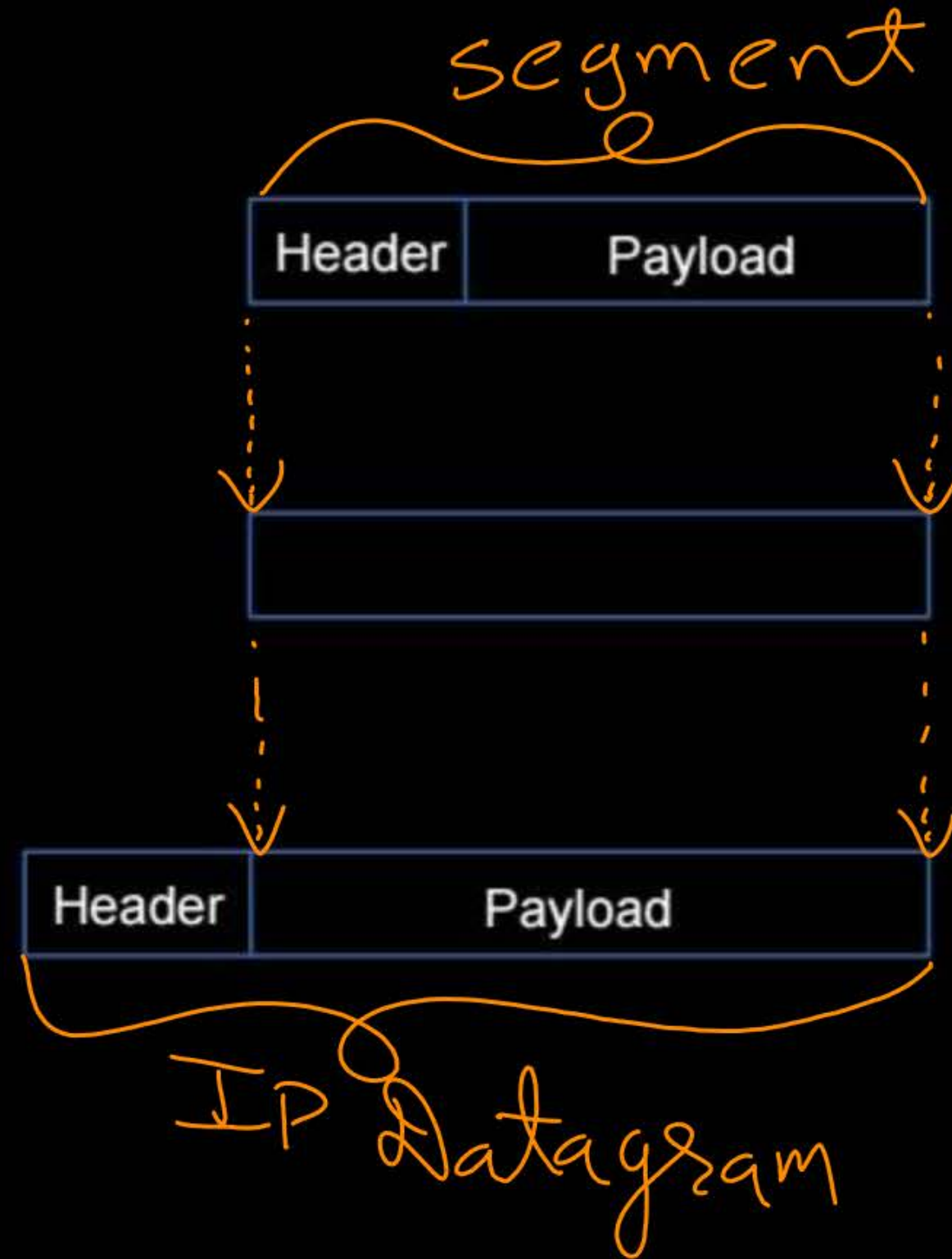
Network Layer PDU : “Datagram”

- Sender : Divide segments into datagrams ,  
Datagrams passes to data link layer
- Receiver : Resembles datagrams into segments,  
Segments passes to transport layer

Transport Layer PDU  
"Segment"

Network Layer SDU

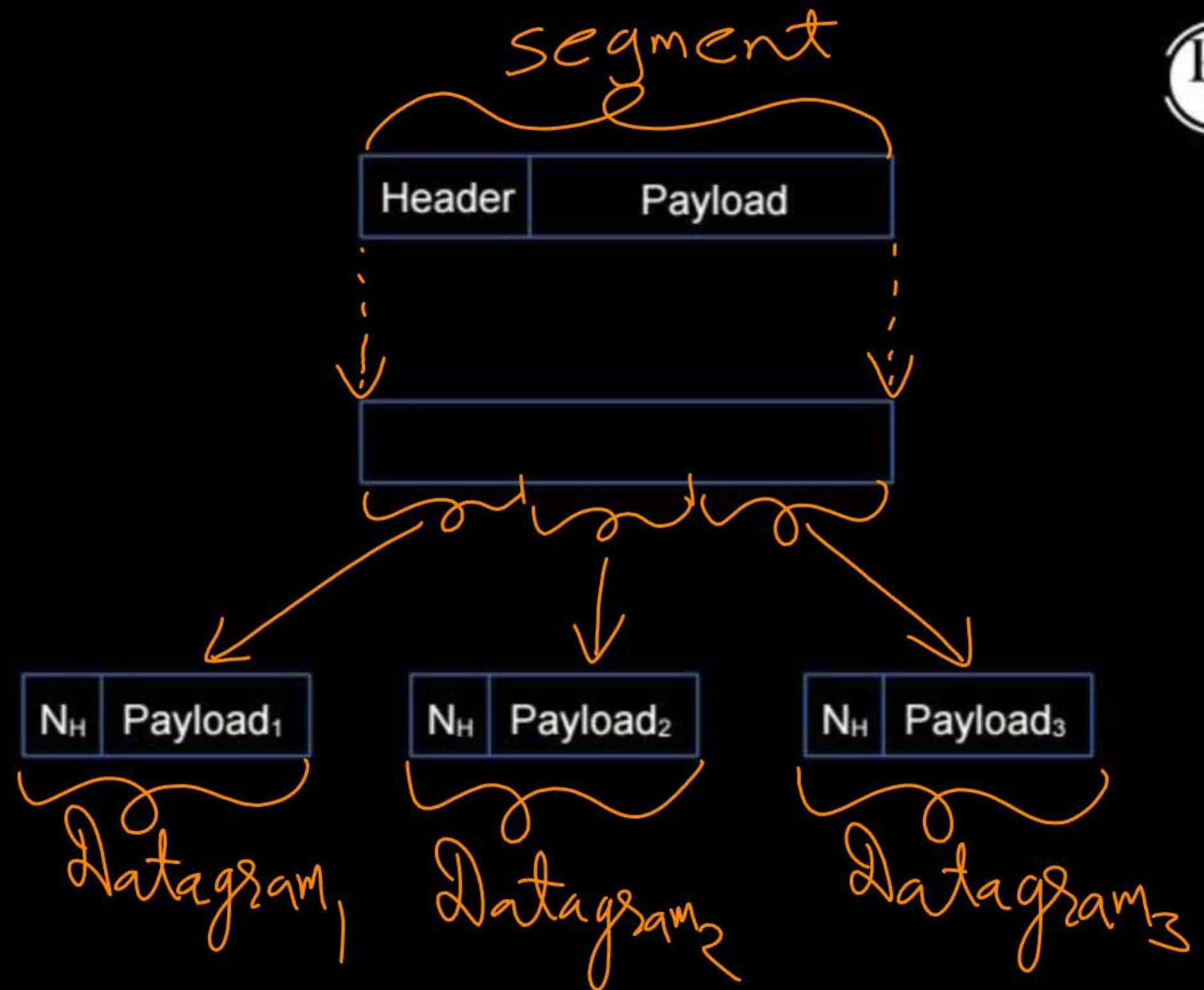
Network Layer PDU  
"Datagram"



Transport Layer PDU  
"Segment"

Network Layer SDU

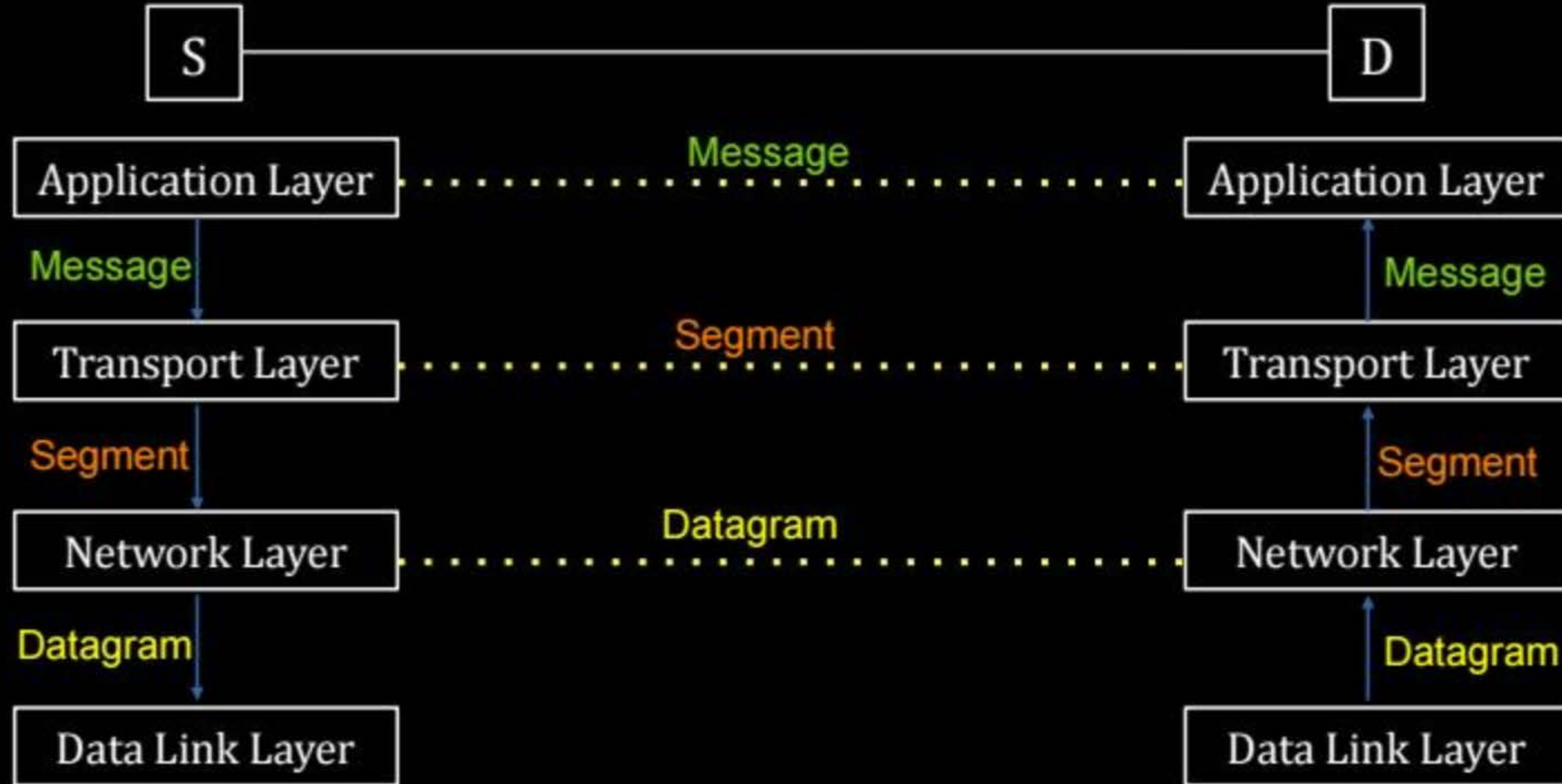
Network Layer PDU  
"Datagram"







# Topic : Protocol Data Unit





## Topic : Network Layer



- > Network Layer Networking Device : “Router”
- > Store and Forward device  
[Store, Process and Forward]
- > Forwarding based on IP Address



## Topic : Data Link Layer



-> Responsible for node-to-node communication





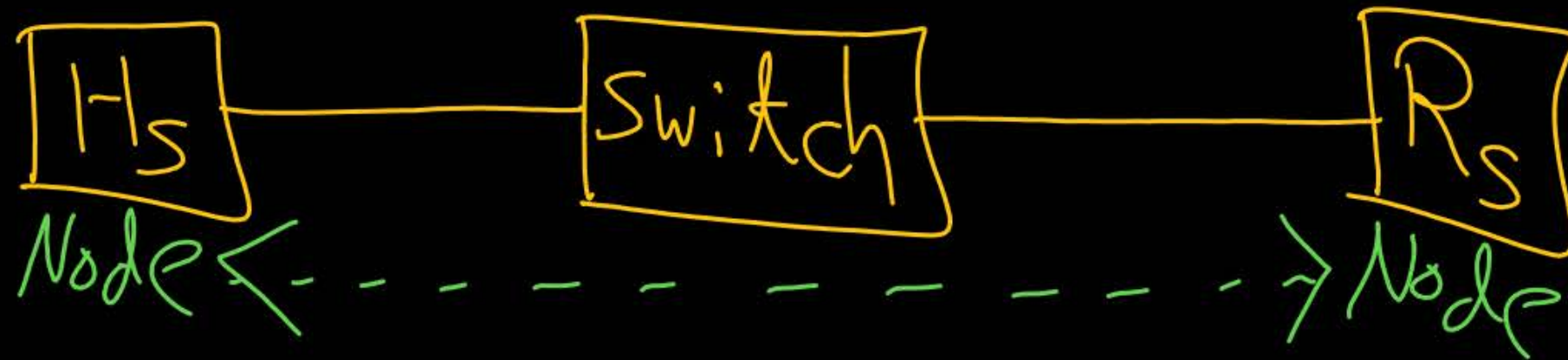


## Topic : Node to Node Communication

Intra-network : Source & Destination hosts belongs to same network  
(within a network)

Node : Host or Router or Gateway

[Layer-3 device or above]





## Topic : Data Link Layer



Data Link layer services :-

1. Framing
2. Error Control (CRC)
3. Flow Control
4. Access Control (CSMA/CD)



## Topic : Data Link Layer



Data Link Layer PDU : “Frame”

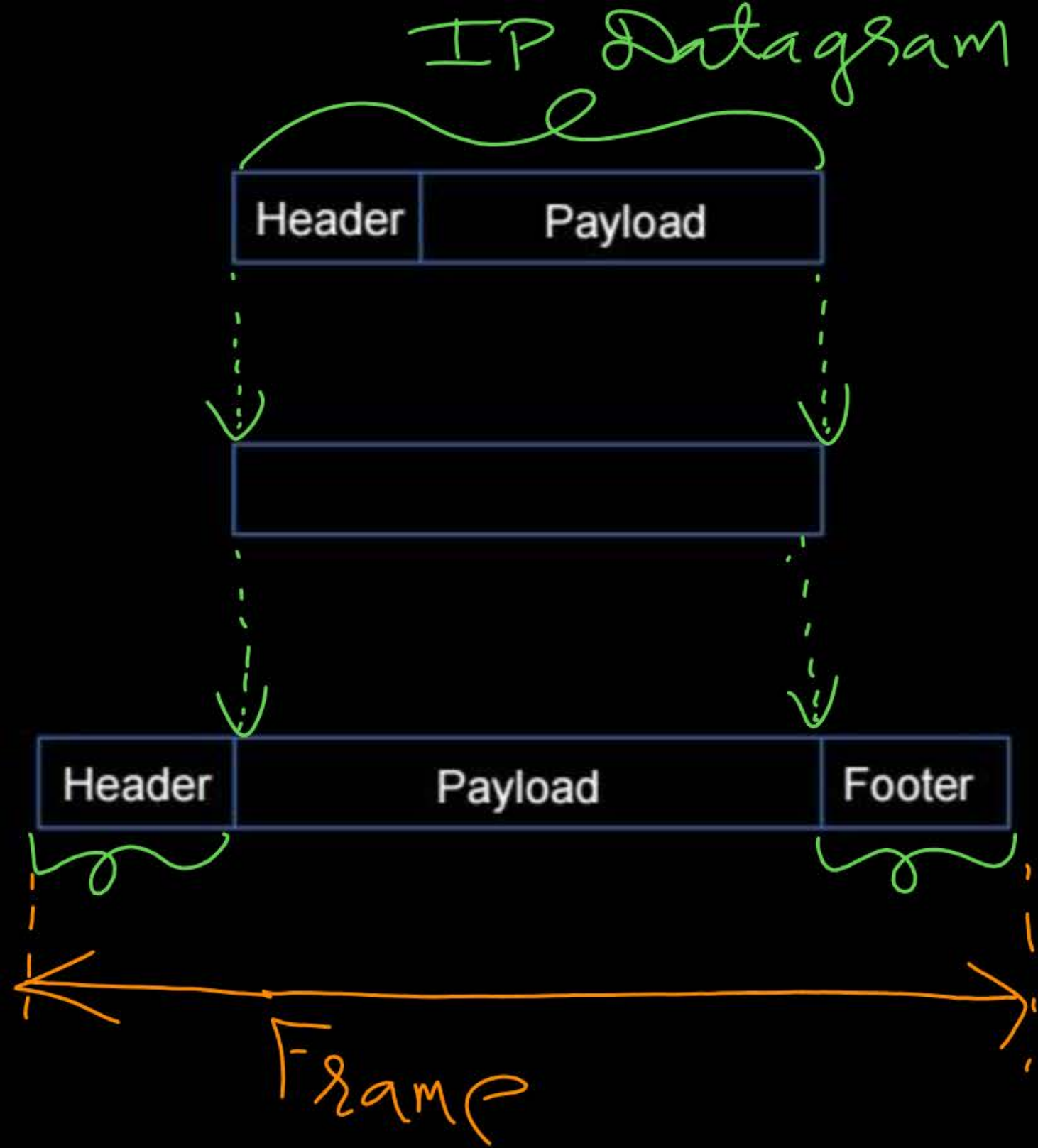
- Sender : Encapsulate datagram into frame,  
Frames passes to physical layer for transmission
- Receiver : Extract datagram from frame,  
Datagrams passes to network layer



Network Layer PDU  
"Datagram"

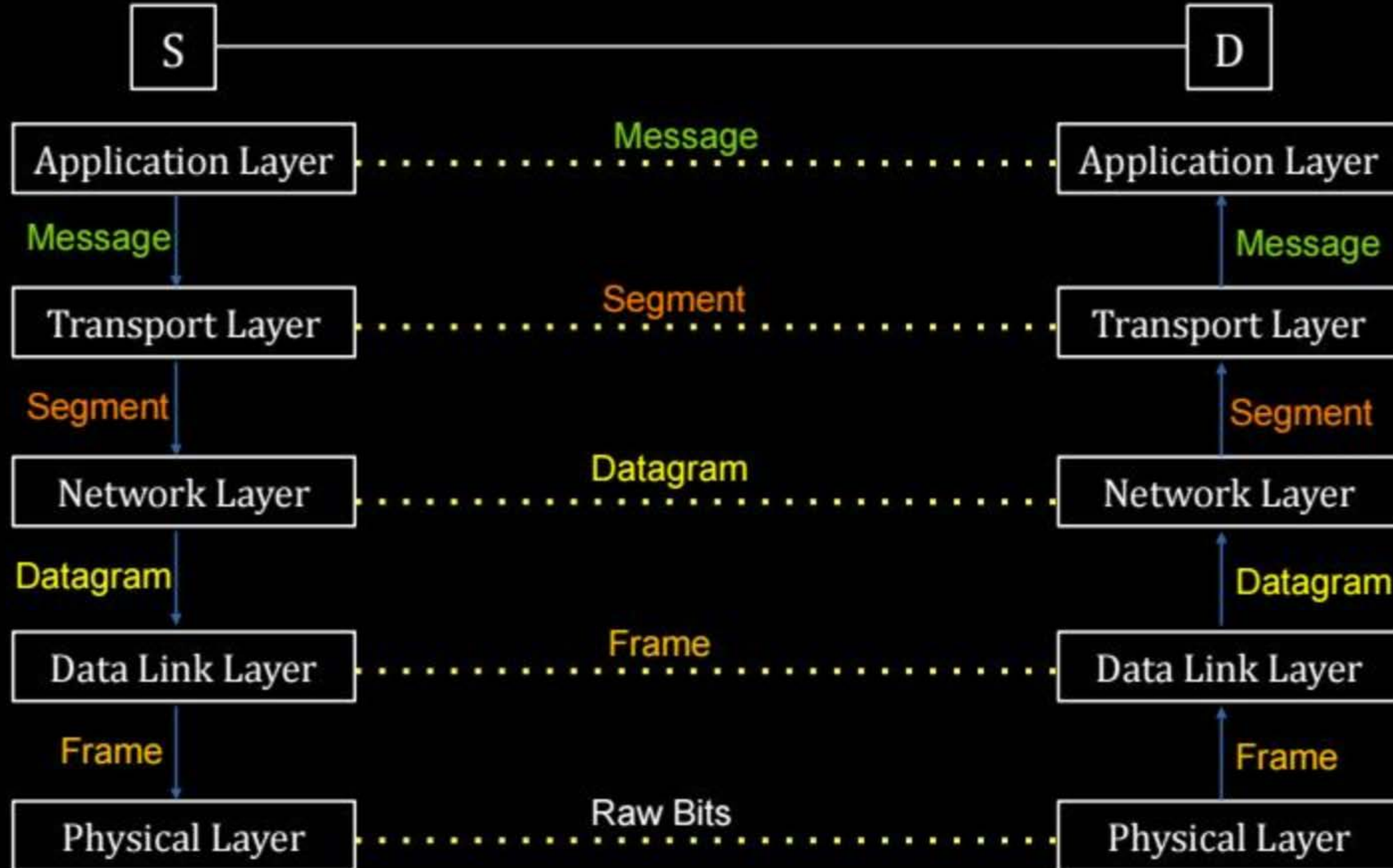
Data Link Layer SDU

Data Link Layer PDU  
"Frame"





# Topic : Protocol Data Unit





## Topic : Data Link Layer



-> Data Link Layer Networking Device : "Switch"

[Layer - 2 device, Old name : "Bridge"]

-> Store and Forward device

[Store, Process and Forward]

-> Forwarding based on MAC Address





## 2 mins Summary



Topic

Network Layer

Topic

Data Link Layer

Topic

~~Physical Layer~~



**THANK - YOU**