IIT KHARAGPUR

NPTEL ONLINE
CERTIFICATION COURSES

COMPUTER NETWORKS AND INTERNET PROTOCOLS

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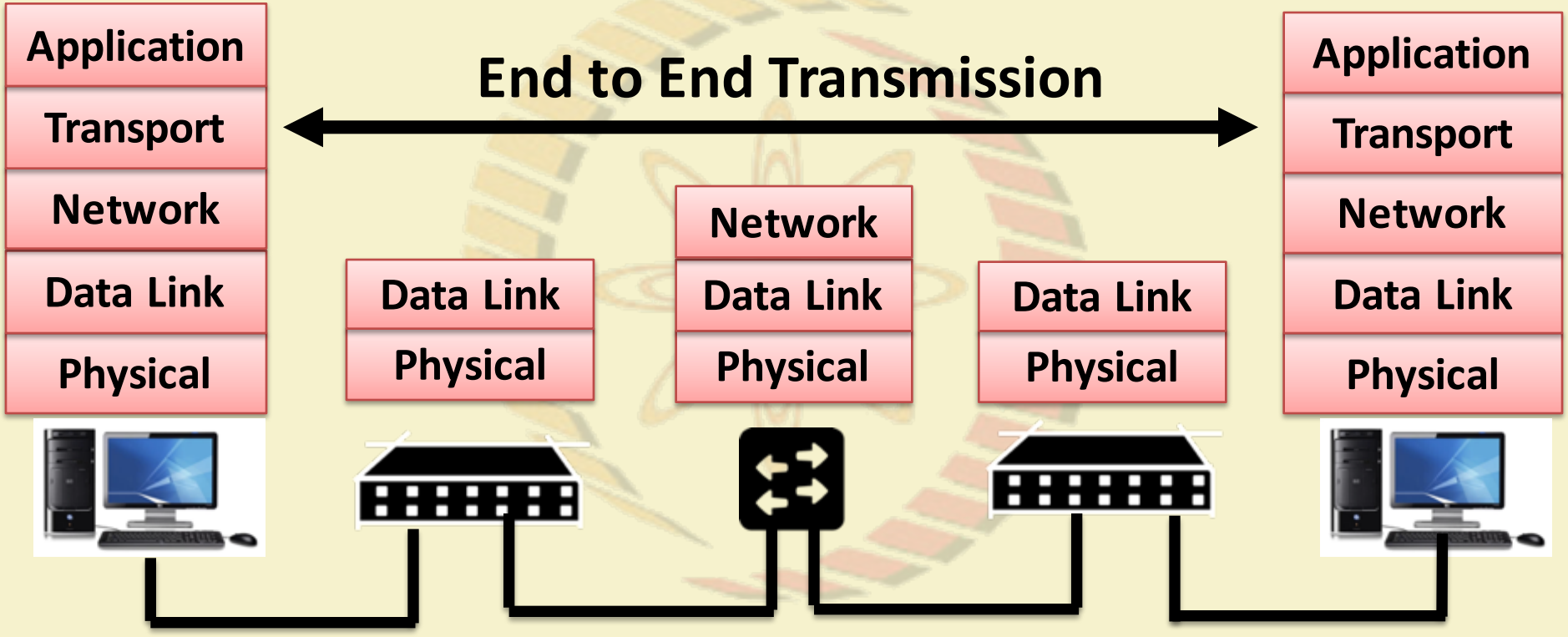
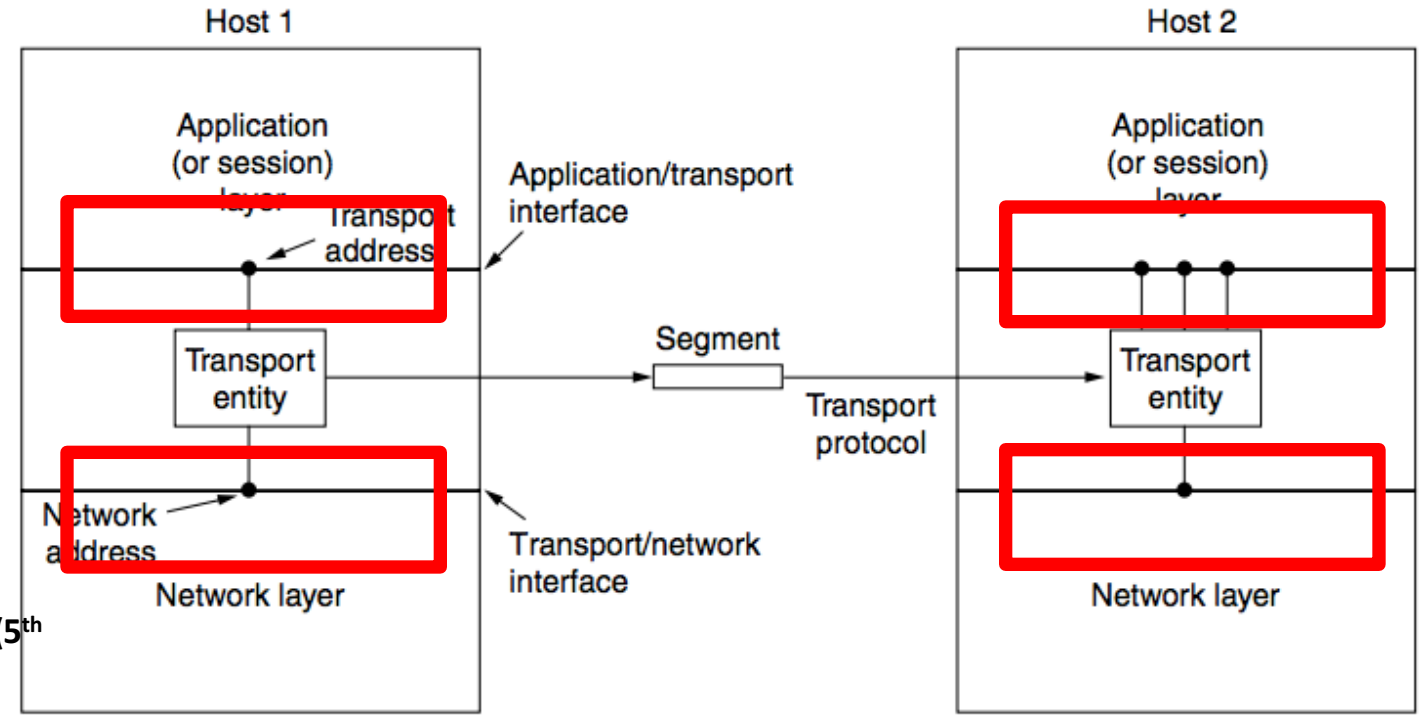
Transport Layer - VI (Primitives)



Transport Layer – Interfacing with Application and Network

Port Number

IP Address



Source: Computer Networks (5th Edition) by Tanenbaum, Wetherell

Transport Layer – Interfacing with Application and Network

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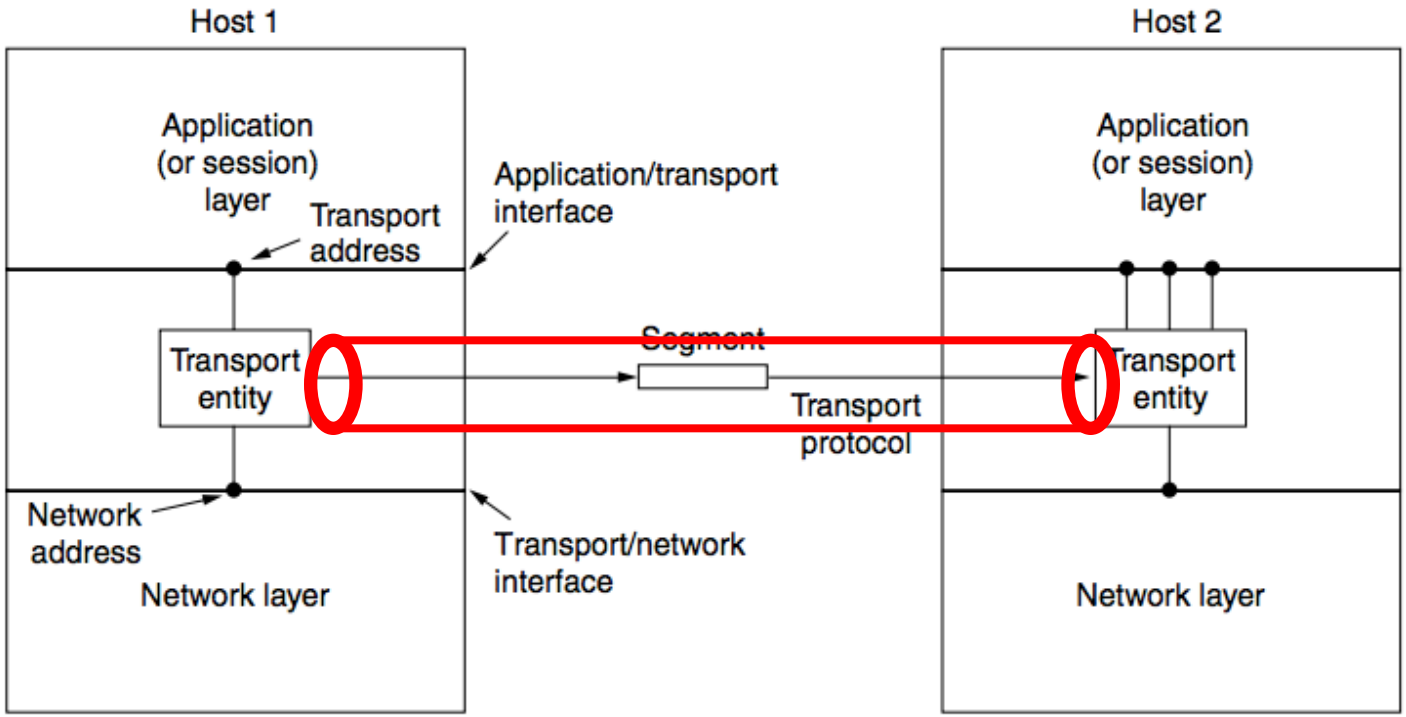
Create a logical pipe between the sender and the receiver and monitor the data transmission through this pipe



Transport Service Primitives

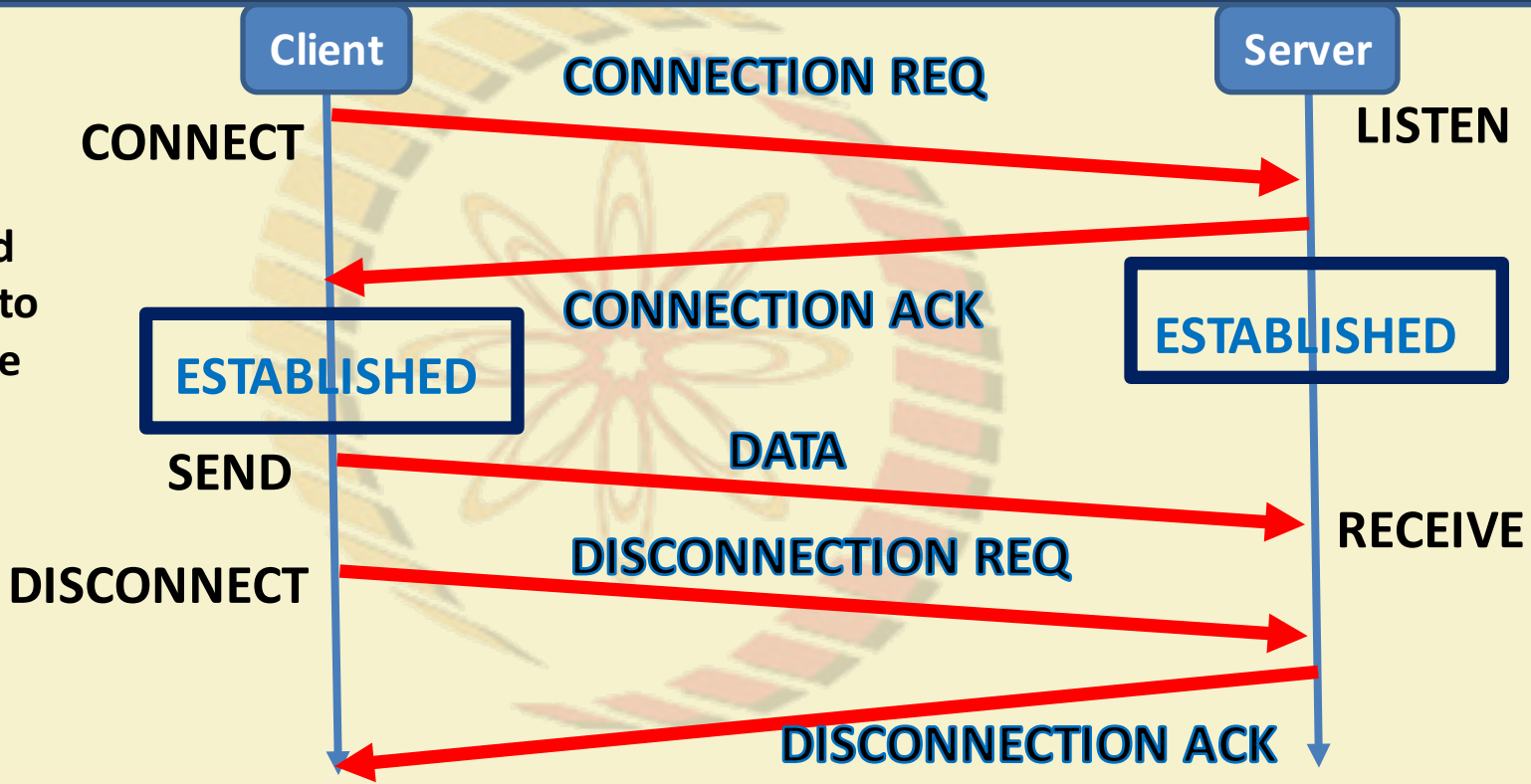
- To allow users to access transport service, the transport layer must provide some operations to the application programs.

Primitive	Packet sent	Meaning
LISTEN	(none)	Block until some process tries to connect
CONNECT	CONNECTION REQ.	Actively attempt to establish a connection
SEND	DATA	Send information
RECEIVE	(none)	Block until a DATA packet arrives
DISCONNECT	DISCONNECTION REQ.	Request a release of the connection

The transport layer needs to remember the state of the pipe, so that appropriate actions can be taken. We need a stateful protocol for transport layer.

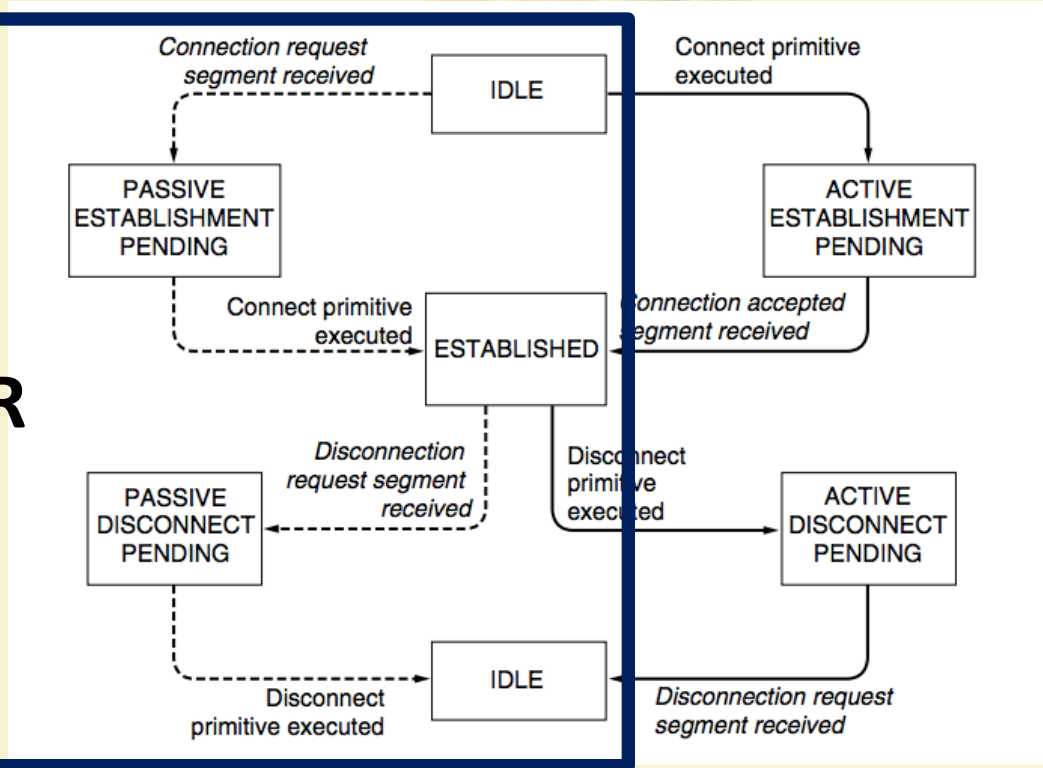
Transport Service Primitive – Connection Establishment

The client and server needs to remember the state



Transport Layer Protocol – State Diagram

SERVER



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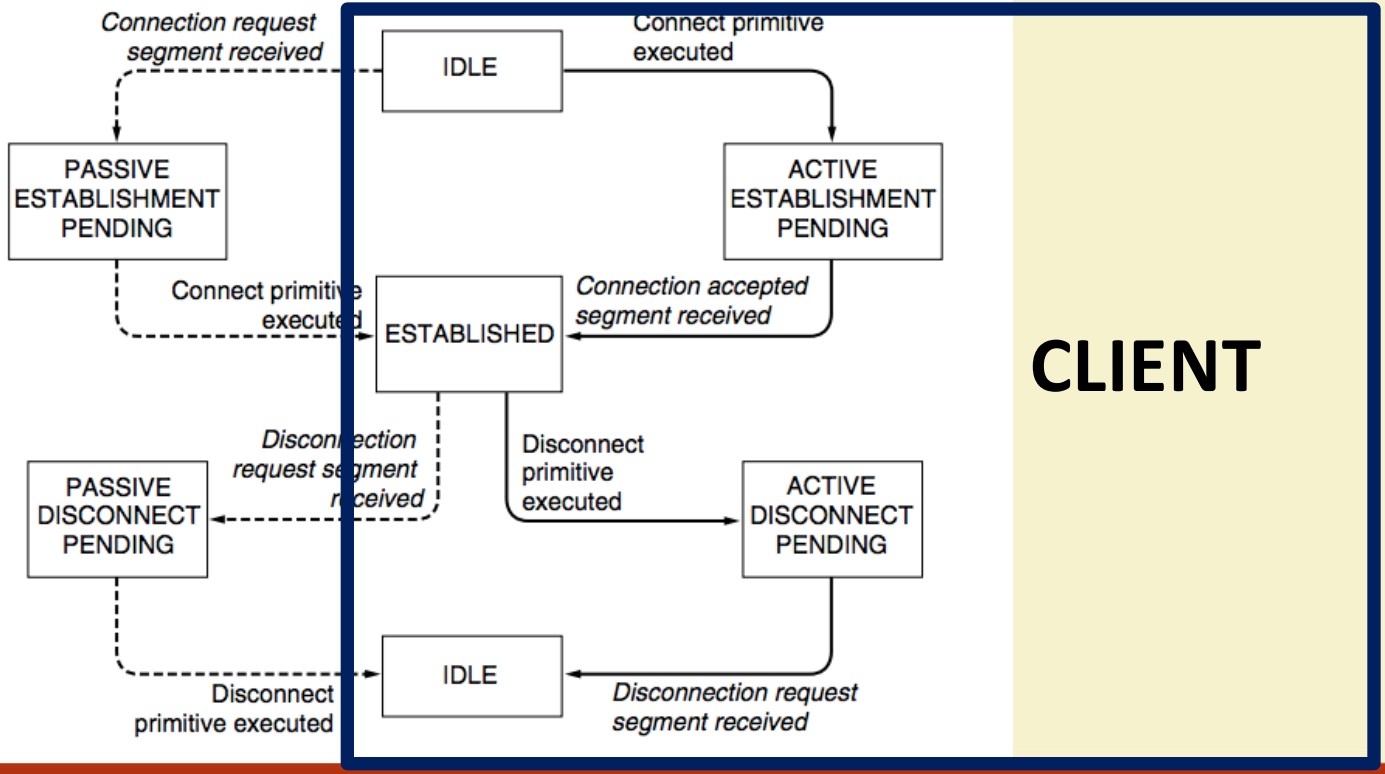
Transport Layer Protocol – State Diagram



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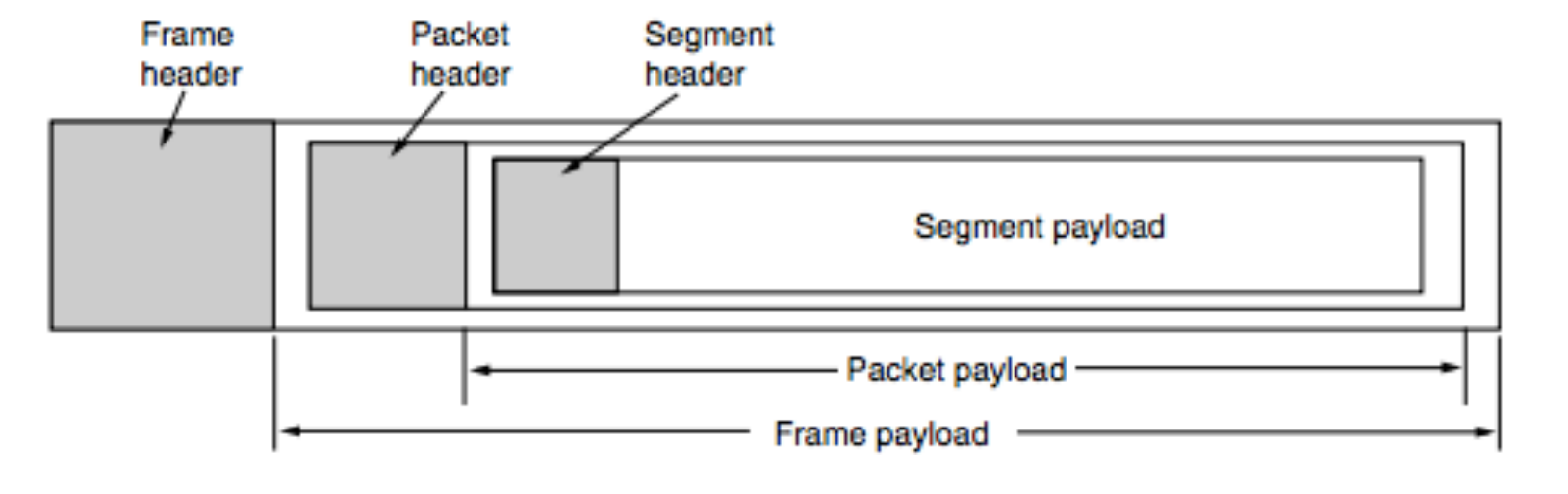
Segment, Packet (or Datagram) and Frame



Source: Computer Networks (5th Edition) by Tanenbaum, Wetherell

Transport Layer Process Flow

- **Connection Establishment** - Initiate a connection by selecting the initial sequence numbers, ensuring that the initial sequence numbers do not fall within the forbidden region of the previous connection between the same <source IP, source port, destination IP, destination port>
  - Sequence number becomes a part of a transport layer connection
  - <source IP, source port, source initial sequence number, destination IP, destination port, destination initial sequence number> - uniquely identifies a connection

Transport Layer Process Flow

- **Flow Control and Reliability** - Use ARQ protocols for ensuring flow control and reliability
  - Sender will not send data at a rate higher than the receiver rate
  - Sequence numbers are used to uniquely identify each byte/each packet
  - Loss in the communication path is handled through retransmission
- **Congestion Control** - reduce transmission rate once congestion is detected

Transport Layer Process Flow

- **Congestion Control -** reduce transmission rate once congestion is detected
  - Improves performance for end-to-end data delivery

- **Connection Closure** - close the connection when data transmission is complete
  - Synchronous closure with timeout


thank you!