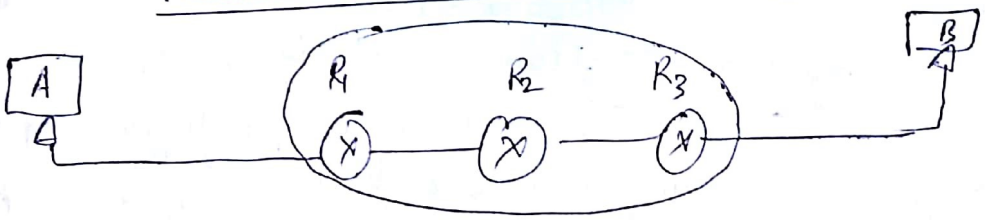
CHAPTER: TRANSPORT LAYER

- The main function of Transport layer is to transfer the Packet from source to destination ensuring that the Packets sent has not been modified / destroyed & lost

TRANSPORT LAYER TECHNICAL FUNCTIONS

1. FLOW CONTROL - TL makes sure that rate of transmission of data with which Sender is transmitting must be less than or equal to the rate of data receiver can support.
2. Error control - Ensures that Packets must be retransmitted or checked against data corruption using Checksum.
3. Segmentation & Reassembling - A message is divided into Segments, each segment contains sequence number which enables this layer in reassembling the message.

4. PROCESS-TO-PROCESS DELIVERY



- NODE to Node delivery : Data link layer
- Host to Host delivery : Network layer
- Process-to-Process delivery : Transport layer.
  - Suppose Processes running at host A are $P_1, P_2 \cdots P_n$ & Processes running at Host B are $P_1', P_2', \cdots P_n'$

So TL ensures process to process delivery of DATA

(5) PORT ADDRESSING

- At data link layer, we need a MAC Address to choose one node among several nodes if connection is not Point-to Point
- At n/w Layer, we need IP addressing
- At Transport Layer, we need transport layer address called Portno to choose among multiple processes, running on the destination host.
  - PORT NUMBERS are 16-BIT integer b/w 0 – 65535

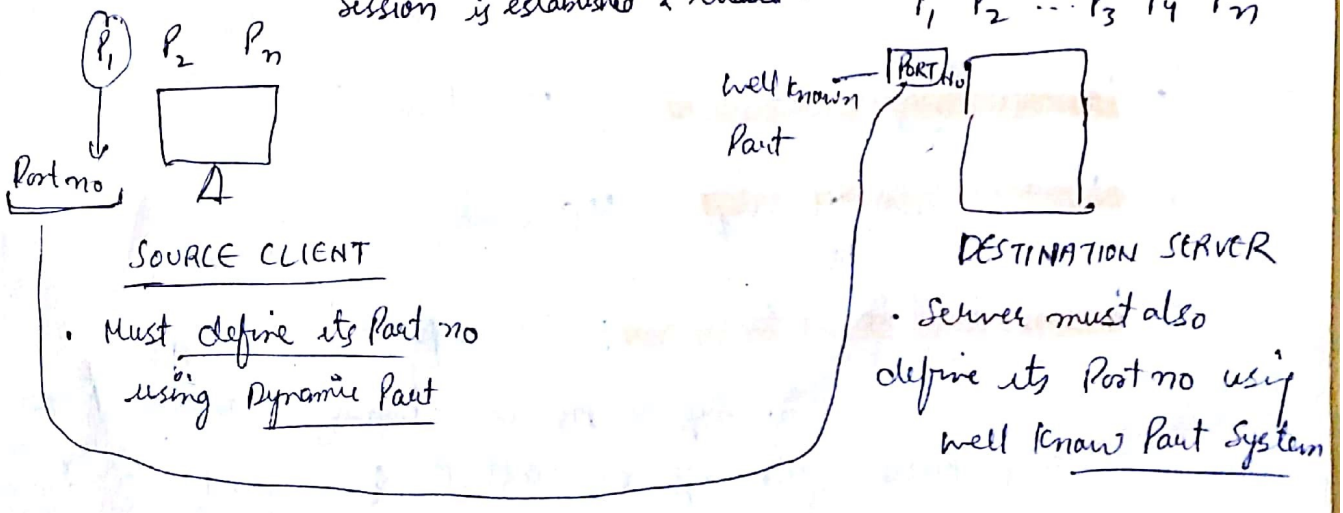
- IANA RANGES
  Internet Assigned Number Authority
  ↓ divides
  Port number into 3 ranges

Ports
80 - http
21 - ftp
25 - smtp
23 - TELNET
22 - SSH
53 - DNS

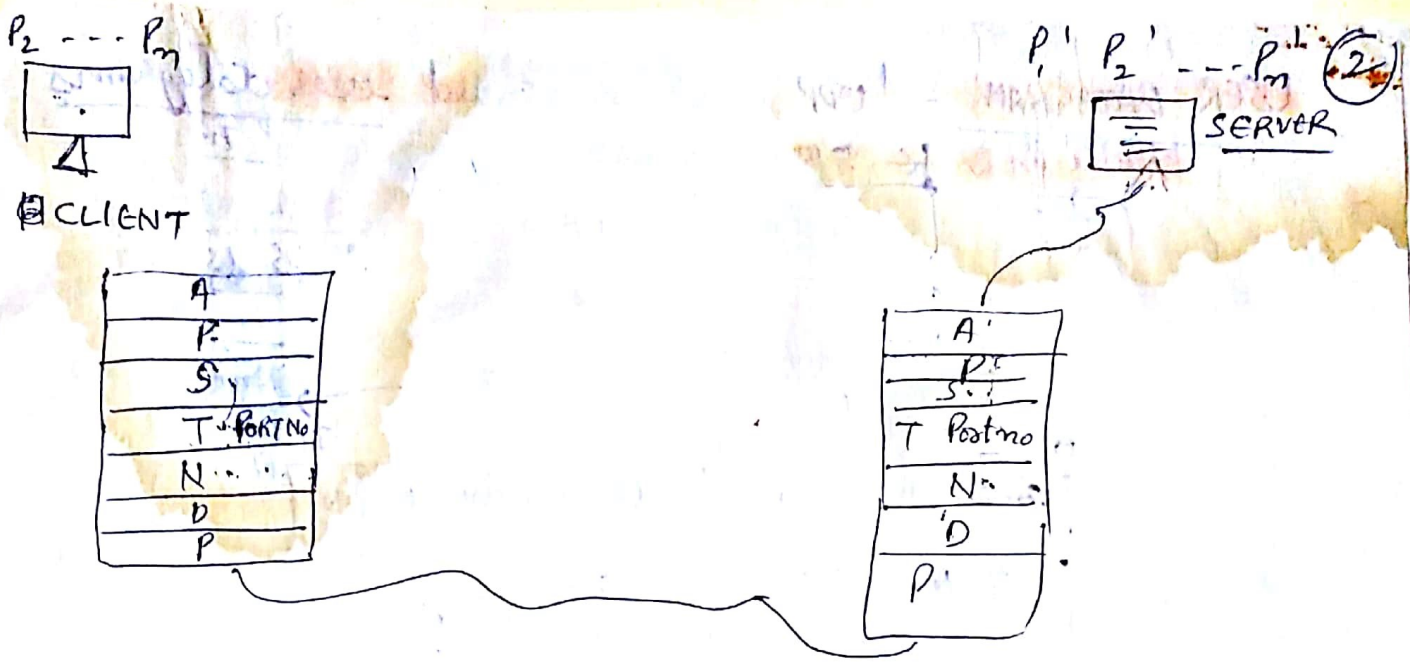
a) well known Port – Ports ranging from 0 to 1023 are assigned & controlled by IANA. Assigned to common protocols & services.

b) Registered Ports – range 1024 – 49,151. Not assigned or controlled by IANA. Only registered with IANA to prevent duplication.

c) Dynamic Ports – 49152 to 65535. Not controlled not registered. They can be used by any process. These are called Ephemeral Ports. Ports are assigned when a session is established & released when session ends.

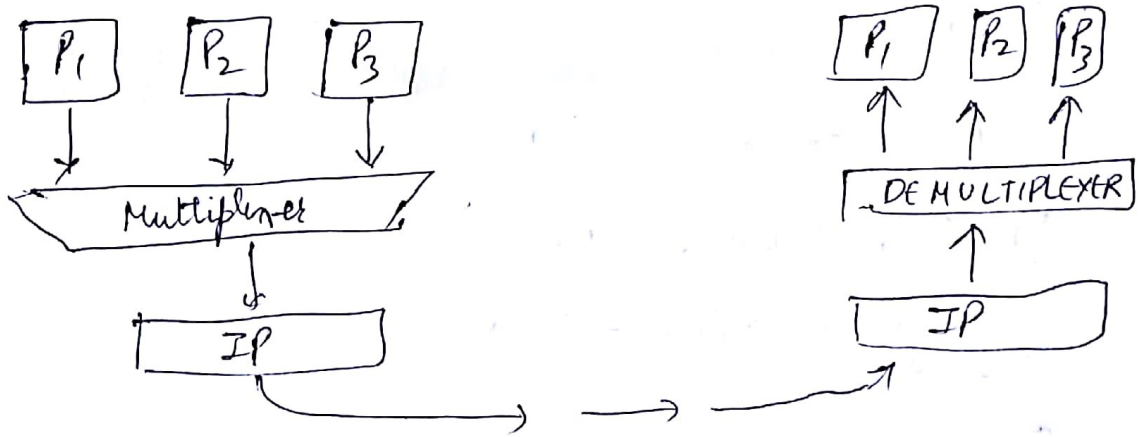


- Must define its Port no using Dynamic Port
- Server must also define its Port no using well known Port System



- Transport layer assigns Portno to each process to ensure Process to Process delivery.

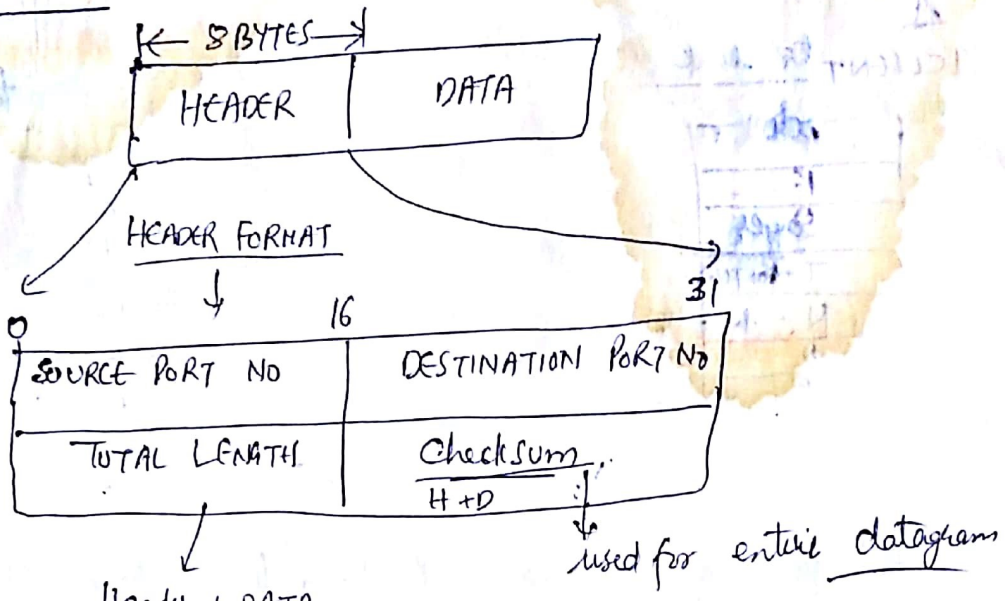
Multiplexing & Demultiplexing



CONNECTION LESS & CONNECTION ORIENTED SERVICE

UDP – user datagram protocal It is the simplest protocal that involves minimum amount of communication mechanism. It is connectionless, unreliable TP.

USER DATAGRAM - UDP Packet is called user datagrams



FEATURES -

① Process-to-Process communication
↳ using Port nos.

② Connection less Service

③ UN-RELIABLE

④ Flow control → No

⑤ Error Control → No

⑥ Conjection Control → No

⑦

TRANSMISSION CONTROL PROTOCOL

- Most widely used for data transmission in CN such as Internet. Provides Process-to-Process Comm using Port nos

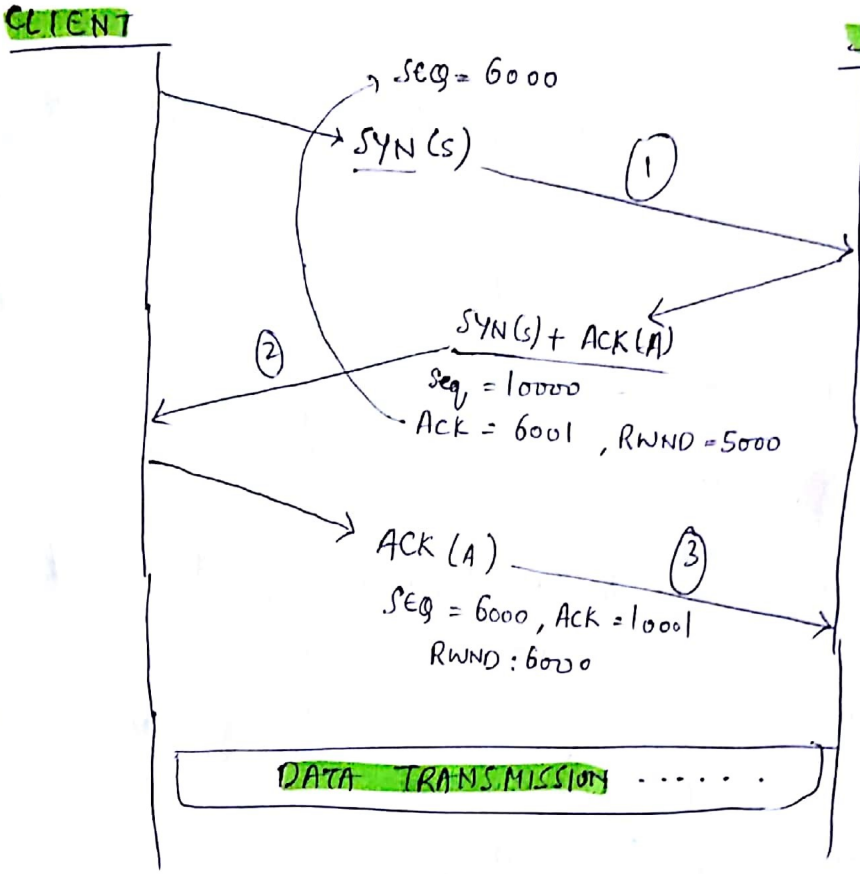
Feature

- Process-to-Process Comm → Port nos
- Uses numbering system in TCP, to keep track of Segments transmitted / Received.

THREE-WAY HANDSHAKING PROCESS / TCP HANDSHAKE (SYN-SYN-ACK)

3

- It is connection establishment in TCP.
- Will Establish a secure & reliable connection before sending data
- WORKS with Full duplex mode (becoz of client & server architect)



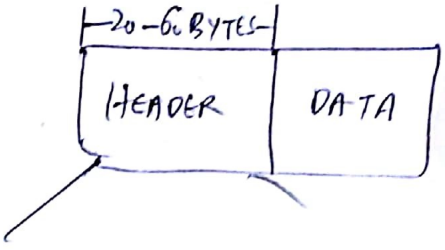
① **SYN**
- It is for synchronization of sequence numbers
- It consumes 1 sequence no
- Carries no real data

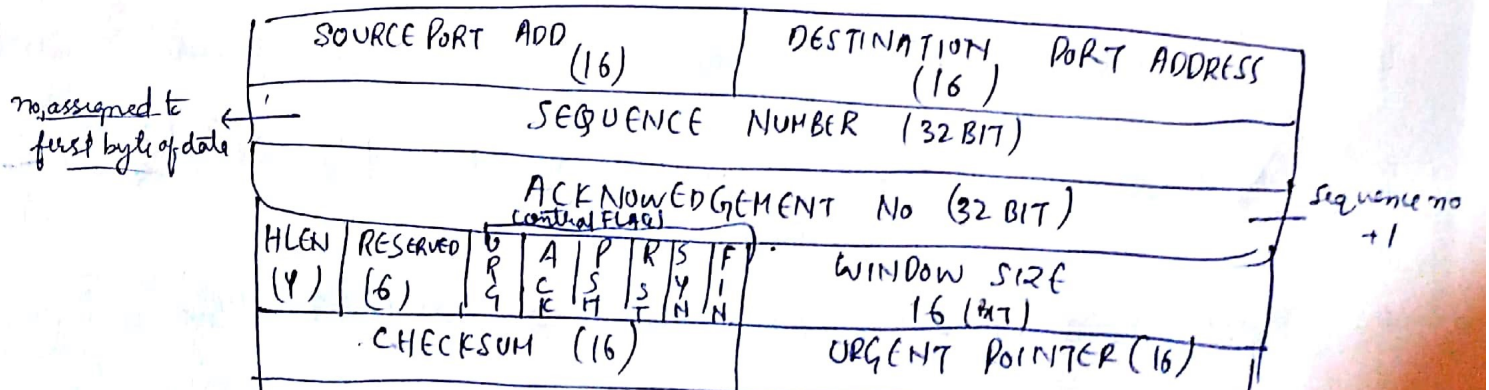
② **SYN + ACK**
- SYN segment for comm in other direction & ACK for the received SYN
- It consumes 1 sequence no

③ **ACK**
- Just an ACK segment
- Does not consume any sequence no.

TCP SEGMENT

- A Packet in TCP is called a Segment





TRANSMISSION CONTROL PROTOCOL

[TCP] . CONNECTION ORIENTED PROTOCOL

- TCP is most widely used for data transmission in communication n/w. such as Internet.
- TCP Provides Process-to-Process communication using Port numbers.

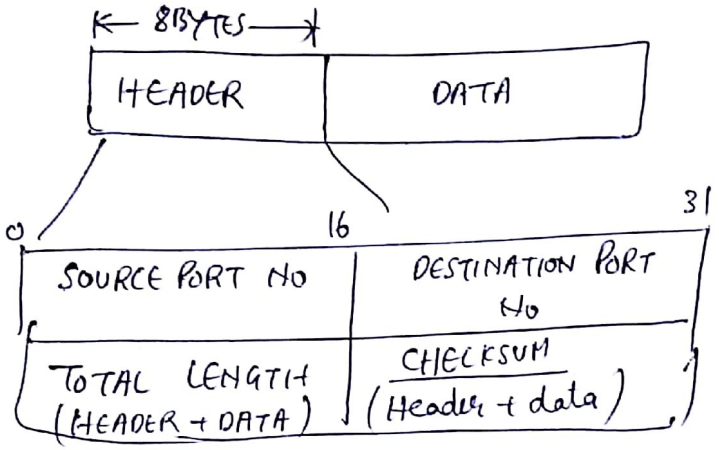
FEATURES OF TCP

1) PROCESS - TO - PROCESS COMMUNICATION
2) PORT NUMBERS ARE USED
3) NUMBERING SYSTEM - used to keep track of Segments that are transmitted or received.
   - ↳ BYTE NUMBER - all bytes of data that are transferred with the help of TCP are numbered.
     · Numbering is arbitrary
   - ↳ SEQUENCE NUMBER - It is number assigned to each segment that is transmitted. And the sequence number of each segment is the no of bytes carried in that segment..
     · Sequence no is given to segments
   - ↳ ACKNOWLEDGEMENT NUMBER - Numbering given to the acknowledged received from receiver. (becz of full duplex nature of TCP)
4. FLOW CONTROL - maintains easy flow of data from sender to receiver
5. ERROR CONTROL - due to this nature of TCP, it is called Reliable Protocol.
6. Congestion Control - (BROAD DISCUSSION IN NEXT TOPIC)

UDP (USER DATAGRAM PROTOCOL)

- It is the simplest Protocal that inralves minimum amount of communication mechanism. It is connectionless, unreliable TP

USER DATAGRAM - UDP Packet is called user datagrams.



FEATURES

(1) Process - to - Process Communication
↓
done with the help of Port nos

(2) Connectionless Service

(3) Unreliable

(4) Flow Control — No

(5) ERROR CONTROL - No (uses checksum for entire datagram)

(6) Congestion control - No

(7)