

connectionless,  
media independent

Q IP/Network Layer provides best effort service.

properties of best effort service

- ① IP will not guarantee the delivery of packet.
- ② It doesn't know other device has received the packet or not
- ③ IP doesn't expect acknowledgement
- ④ IP has reduced overhead cause it doesn't need to resend packet if not received.

NT :- Transport Layer UDP also support best effort delivery service

## TCP-3way Handshake

It is a initial handshake process by TCP to establish a reliable connection between two device client server.

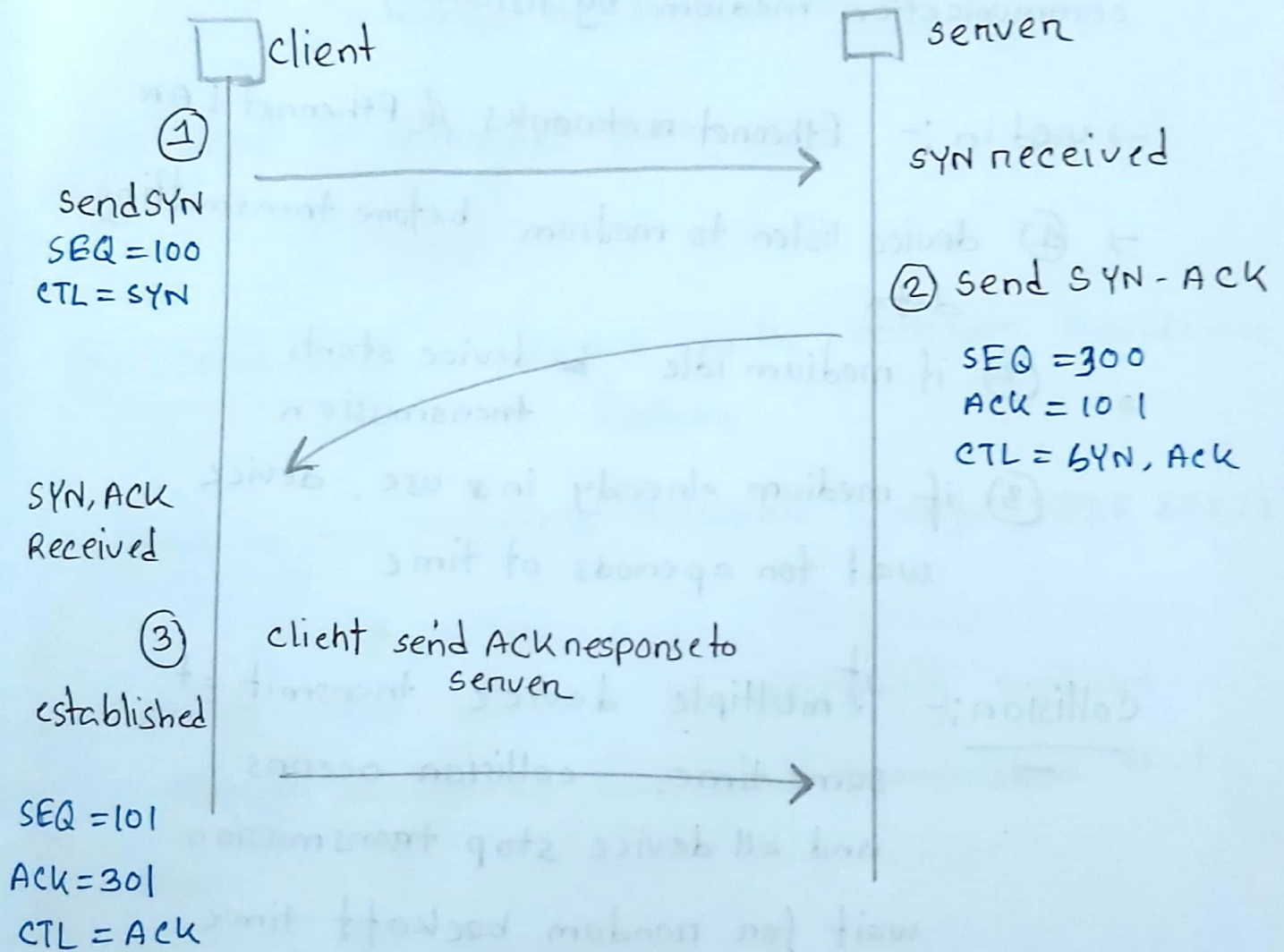
control flags:-      SYN → synchronize  
                                    ACK → Acknowledgement

3 steps:-

- ① client initiates the connection with server by sending TCP packets with SYN flag.
- ② Server receives SYN packet. and responds to client by sending a TCP packet with control flag SYN & ACK
- ③ Client receives SYN-ACK packets and acknowledge the server by sending packet with ACK flag.

(4) Server receives the ACK packet

∴ TCP connection is established.





① CSMA (Carrier sense Multiple Access)

→ is a method (network access control) which allows multiple device to share the same communication medium by listening to medium.

→ used in :- Ethernet networks & Ethernet LAN

→ ① device listen to medium before transmitting data

② if medium idle, device starts transmission

③ if medium already in use, device wait for a periods of time

Collision:- if multiple device transmit at same time, collision occurs and all device stop transmission. wait for random backoff time for retrying / retransmission

① CSMA / CD CSMA with collision detection feature

→ detect collision as soon as they occur and minimize the time taken by collisions

→ used in :- Ethernet LAN

② CSMA / CA CSMA with collision Avoidance feature

used in :- wireless Network , wifi IEEE 802.11

minimize the collisions by reserving medium through handshake and avoid transmission that time.

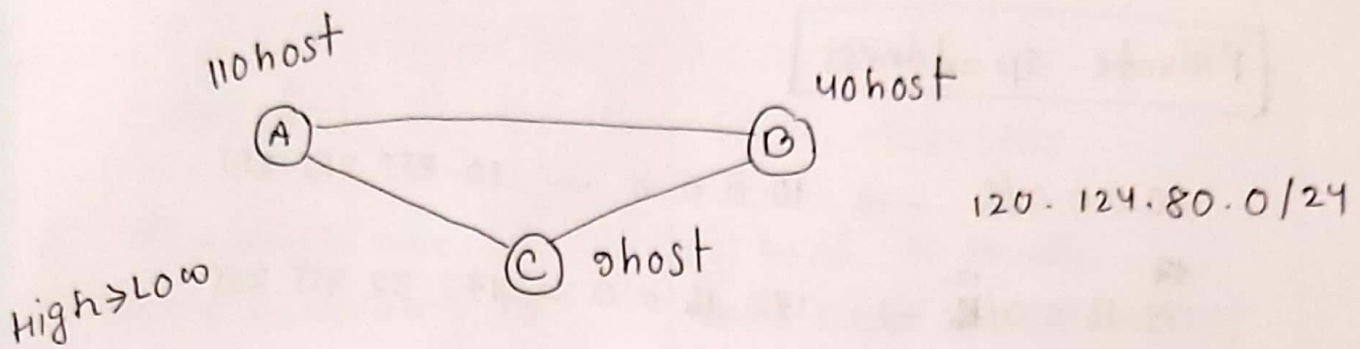
<u>Layer</u>	<u>POUs</u> <u>Protocol Data unit</u>
Application Layer	→ Data
Session Layer	→ Data
presentation	→ Data
Transport	→ Segment
Network	→ Packet
Data Link	→ Frame
physical	→ bit

What is subnetting

is a method of dividing a single physical network into logical subnetworks or subnets.

- ① reduce overall traffic,  
improve network speed and performance
- ② subnet mask ensures the traffic remains in designated ~~traffic~~ subnet
- ③ boost network security
- ④ limit the IP address usage to within few devices





For (A)

$$\text{host} = 110 = (1101110) \text{ 7 bit}$$

128

$$\text{11111111. 11111111. 11111111. 1 } \frac{0000010}{7 \text{ Host bit}}$$

$$\therefore \text{subnet mask} = 255.255.255.128$$

$$\text{network} = 120.124.80.0/25$$

For (B)

$$\text{Host} = 40 = 101000 (6 \text{ bit})$$

$$\text{11111111. 11111111. 11111111. 11 } \frac{000000}{6}$$

$$\therefore \text{subnet mask} : 255.255.255.192$$

$$\text{network} :- 120.124.80.128 / 26$$

For (C)

$$\text{Host} = 9 = 1001 (4 \text{ bit})$$

64

$$\text{11111111. 11111111. 11111111. 1111 } \frac{0000}{4}$$

$$\therefore \text{subnet mask} = 255.255.255.240$$

$$\therefore \text{network} = 120.124.80.192 / 28$$

## Private Ip address

$10.0.0.0/8 \rightarrow 10.0.0.0 - 10.255.255.255$

$172.16.0.0/12 \rightarrow 172.16.0.0 - 172.32.255.255$

$192.168.0.0/16 \rightarrow 192.168.0.0 - 192.168.255.255$

## Loopback address

$127.0.0.1$

$127.0.0.0 - 127.255.255.255$

IPv6 :-  $::1$

## Link Local address

$169.254.0.0/16$



classful	classless
① IP address are allocated according to classes (A-E class)	① used to handle <del>not</del> rapid exhaustion of IP address.
② Network and Host depends on class	② No restriction
③ do <sup>not</sup> support VLSM	③ support <del>is</del> VLSM variable Length subnetting mask
④ requires more bandwidth	④ require less bandwidth
⑤ don't support CIDR	⑤ support CIDR classless Inter Domain Routing
⑥ easy troubleshoot	⑥ Hard to troubleshoot

## TCP (Transmission Control Protocol)

### Features:-

- ① TCP is connection-oriented and stateful protocol
- ② Provides Reliability (guarantee delivery, acknowledgement, retransmission if data fails).
- ③ provide flow control
- ④ Acknowledgment of Data Received
- ⑤ Divide data stream into segments and track each segment transmitted to specific host from specific Application
- ⑥ Sequence the data (Ordering)
- ⑦ Error detection
- ⑧ send data at efficient rate acceptable by user
- ⑨ Use case:- system all data must arrive with a proper sequence maintained.



## Transmission Control Protocol

- (1) connection - oriented
- (2) provide reliability of delivery
- (3) Acknowledgement of delivery
- (4) support ordering
- (5) support error control / detection
- (6) stream-oriented message
- (7) support congestion control mechanism
- (8) usecase :- used in web browsing, FTP, SSH email,
- (9) higher latency

## User Datagram Protocol

- (1) connection-less
- (2) Does not provide reliability (support best effort)
- (3) No acknowledgement
- (4) X don't support
- (5) X " "
- (6) message-oriented
- (7) X
- (8) usecase low-latency & Realtime communication  
VoIP, video streaming, online gaming
- (9) lower latency  
higher throughput



## Internet Message Access

### # IMAP protocol

→ is an email retrieval protocol that allows client to access and manage emails stored on mail server

function:-

- ① Email Retrieval
- ② Synchronization
- ③ Message status tracking

— o —

### ARP address resolution protocol

It is a protocol used in computer network to map an IP address to a physical or MAC address.

Two functions

- ① Resolve IP address to MAC address
- ② Maintaining an ARP Table of mapping IP to MAC address

same network → ARP table for destination IP address  
different " → ARP Table for default gateway  
③ No ARP table found, device send an ARP request

Purpose:- dynamically mapping the IP to MAC  
facilitating communication between  
device

disadvantage:-

- ① Lack of - Authentication
- ② " - vulnerability of  
ARP spoofing
- ③ " of scalability
- ④ Limited network scope

## switching

store-forward switching	cut-through switching
<p>① switch receive entire data frame before forwarding</p> <p>② Higher Latency</p> <p>③ has Error checking feature</p> <p>④ No frame size limitation</p>	<p>① switch starts forwarding frame as soon as it is received in destination MAC.</p> <p>② minimal Latency</p> <p>③ No error checking</p> <p>④ has frame size limitation</p>



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