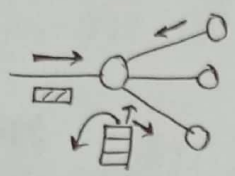
Congestion (network layer)

Final

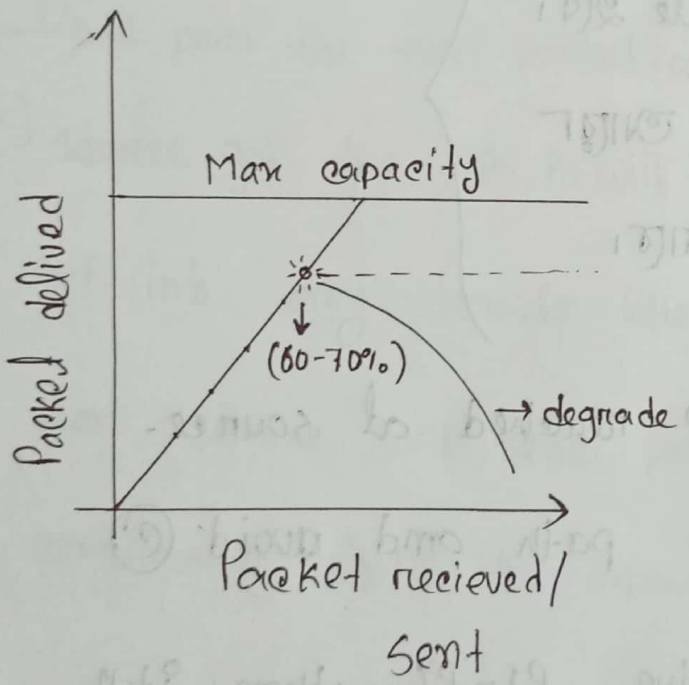


overflow

incoming packets > delivering capacity

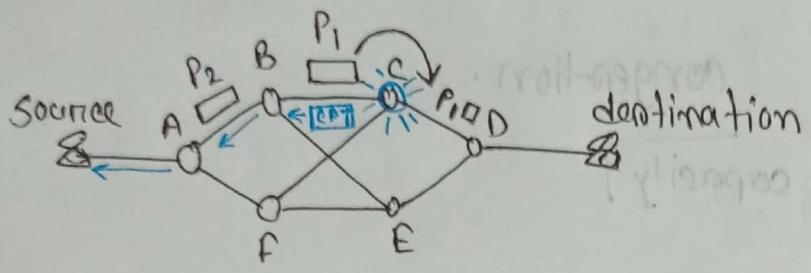
60-70% Buffer full হয়ে গেলে router degrade করা শুরু করে and this is congestion.

↳ congestion হলে we'll loose packets.



Congestion control algorithm:

① Choke packet technique.



* problem solve না হওয়া পর্যন্ত continuous CP generate হবে। CP source পর্যন্ত যেতে আরো packet generate হয়ে যাবে।

* C তার CPT তে নিজের identity দিয়ে source কে packet পাঠাবে। So, other will avoid ③.

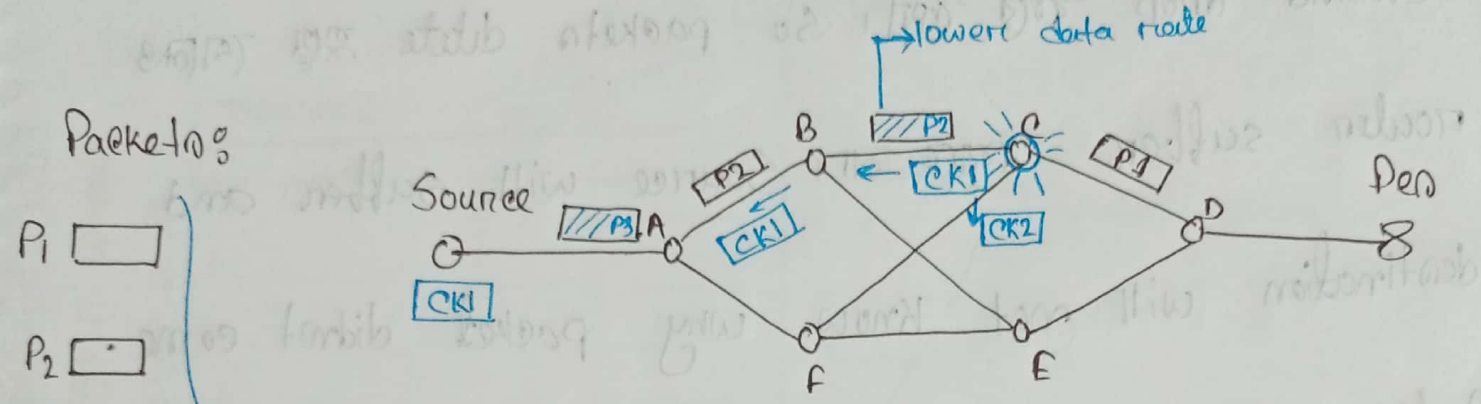
P1
P2
P3
P4
P5
P6
P7

↳ P7 generated after CP reached at source. So it'll take another path and avoid ③.

If the router survive P1-P6, then it'll back to normal state after receiveing CP by source.

Hop by hop choke packet technique

↳ improvment of CPT.



C trouble free থাকে তখন it will genarate CP. which will go to source through B and A. But for immidate remedy, B will pass the next packet will lower data rate until the source got the CP. A will do the same so that B don't get into any trouble. When the CP will reache source then source will send packets avoiding C. C will send CP continuously until the trouble solved. When source will stop recieving CP then it will again send packet to C.

② Load - Shedding.

Demand drop করে দেয়া। So packets delete হয়ে যাচ্ছে router suffer করছে না। Source will suffer and destination will not know why packet didn't come. Router will delete the packets as it is a suffering.

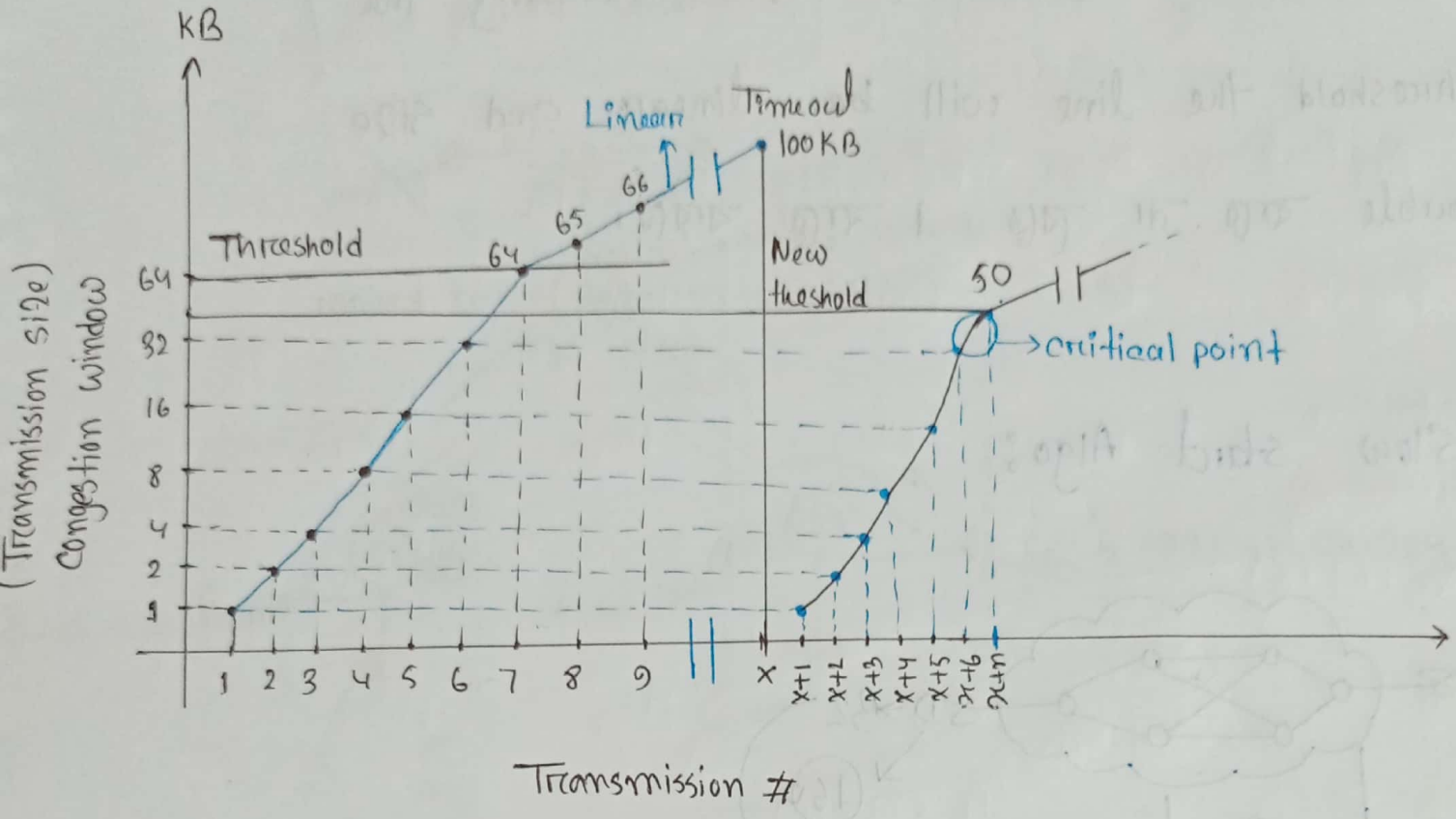
↳ delete technique:

- Milk technique (From is good)
- Wine ও (Old is good)

Queue তে ঢুকানো packet কে রাখা হবে and পরে transmission হবে and newly entered packets will be deleted.

Queue তে new added packets কে save রেখে old packets delete করে দেয়া হবে।

Congestion control (Transport layer)



Threshold: it's a baseline to monitore data collection.

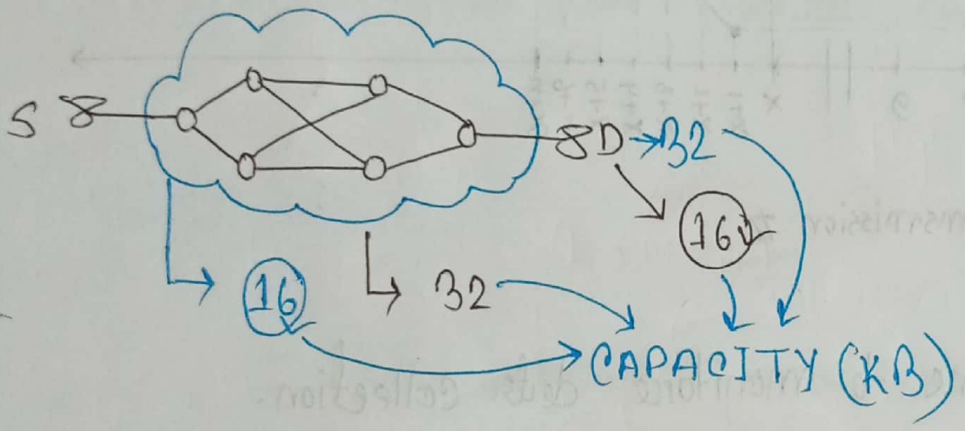
* New threshold = 1/2 x time out

= 1/2 x 100 = 50 → (NT)

It's not like threshold value কমাতে থাকবে, Network ভালো হলে timeout বাড়ও হতে পারে, অথবা late হতে পারে। যার কারণে new threshold value up-down হতে পারে। x position-এ যেই size এর data got timeout, তার (x+1) থেকে বা 1KB করে

transmission ও শুরু করবে। After crossing the threshold the line will be linear. and size double করে না বেড়ে 1 করে বাড়বে।

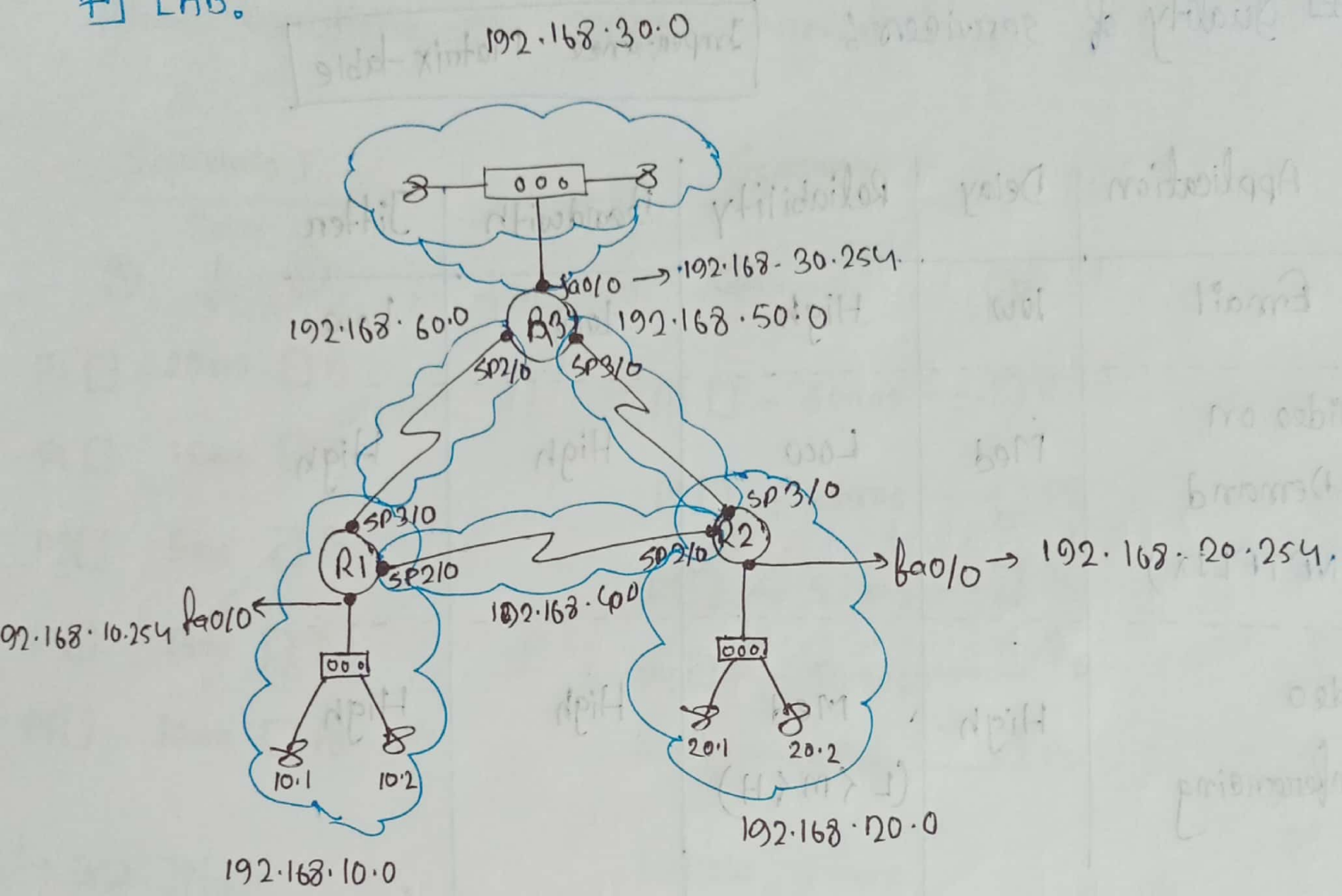
Slow start Algo:



Following this algorithm data/packets are being transmitted. Network/source এর capacity যতই হোক না কেন starting-এ 1KB করে data পাঠানো হবে। 1KB data এর জন্য Acknowledgment আসলে transmission size double হবে like 1, 2, 4, 8, 16, 32... Destination capacity 32 KB আর Network capacity 16 KB হলে 16 KB amount এর data-ই transmit হবে।

↳ vice-versa.

LAB:



* Link State routing algorithm: OSPF

→ Open Shortest path first.

255.255.255.255
(-) 255.255.255.0
0.0.0.255

router OSPF (1) → process id (1 - 65,535)

network 192.168.10.0 0.0.0.255 → wild card mask

area 1.

Quality of services:

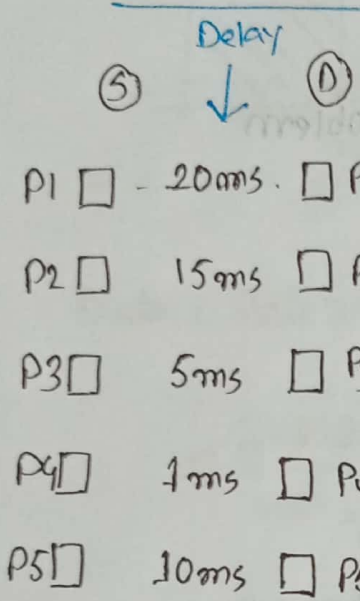
Importance Matrix table

Application	Delay	Reliability	Bandwith	Jitter
Email	low	High	Low	Low
Video on Demand (NETFLIX)	Med	Low	High	High
Video Conferencing	High	Med (L < M < H)	High	High

per application, importance can be diffrent. Base on the app we can set the importance to low or high.

Jitter: Variations in packets arrival time.

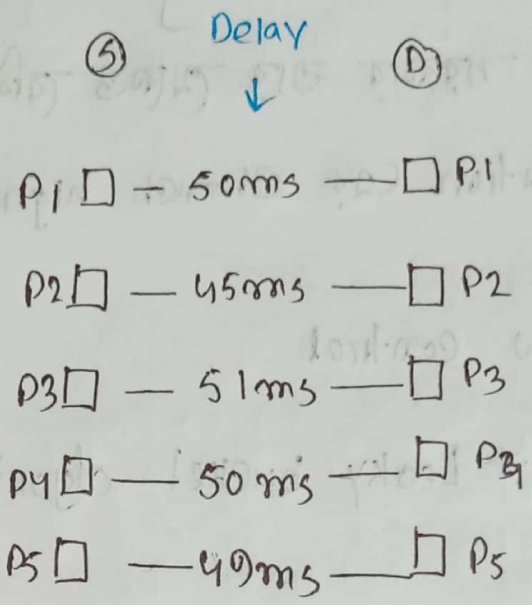
Scenario 1



↳ low Jitter

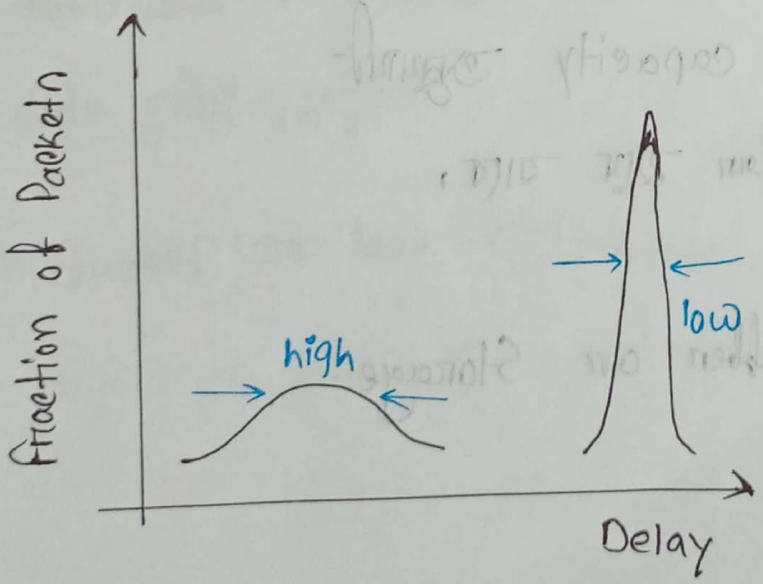
High ↑

Scenario 2



↳ low jitter

* multimedia communication - ⓐ jitter low থাকবে।



Techniques to improve QoS :

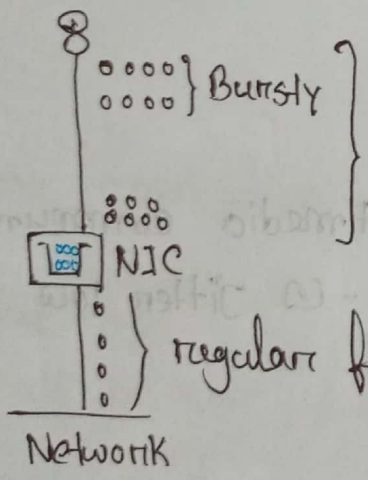
→ over provisioning

যা দরকার তার থেকেও বেশি দেয়া so problem solution এর chance high bcd costly.

→ Flow control

└→ ★ Leaky bucket algorithm

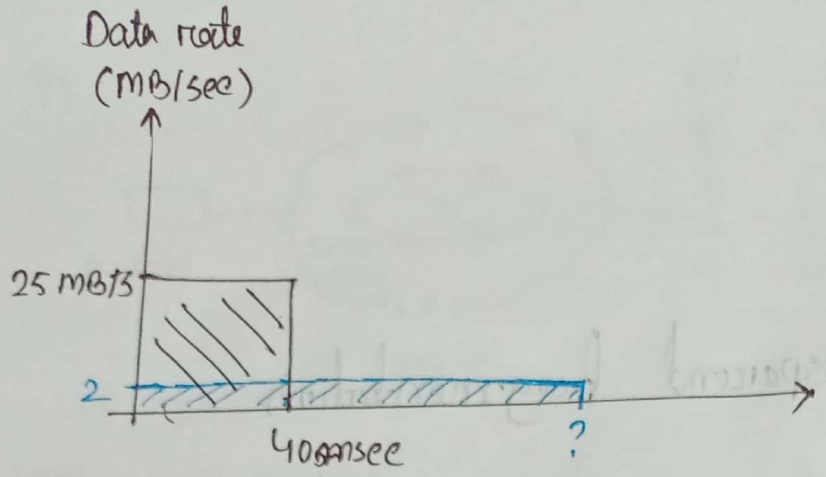
Buffer



Irregular flow → Data আসে বা একটু পর নাও আসতে পারে। □ ---- □□ --- □

→ network capacity অনুযায়ী- flow regular হয়ে যাবে।

* Bucket is nothing but a buffer on Storage.



* Flow controlling according to its capacity.

Data = Rate x time

$= \frac{25\ MB}{sec} \times 40\ msec$

$= \frac{25\ MB}{1000\ msec} \times 40\ msec$
$\quad 25$

= 1MB → bucket এ জমা হবে.

total data. কি পরিমান data পাঠানো হলো.

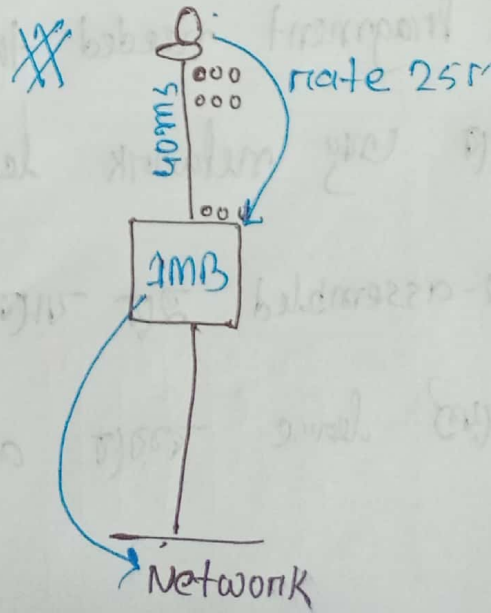
* Bucket এর leak → 2MB/sec

Time = Data/Rate

= 1MB/2MB sec

= 0.5 sec = 500 msec

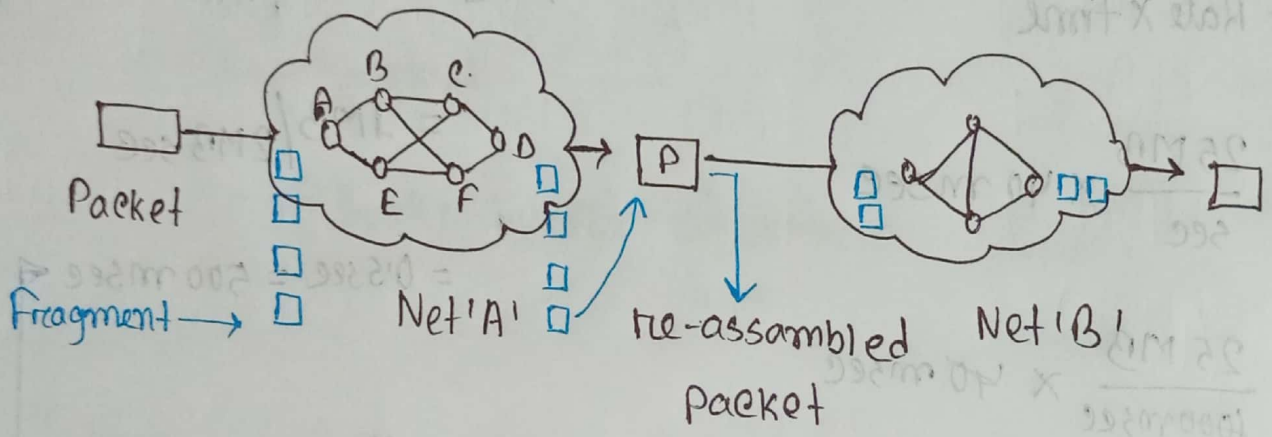
Buffer → Network যেতে time লাগবে.



Fragmentation:

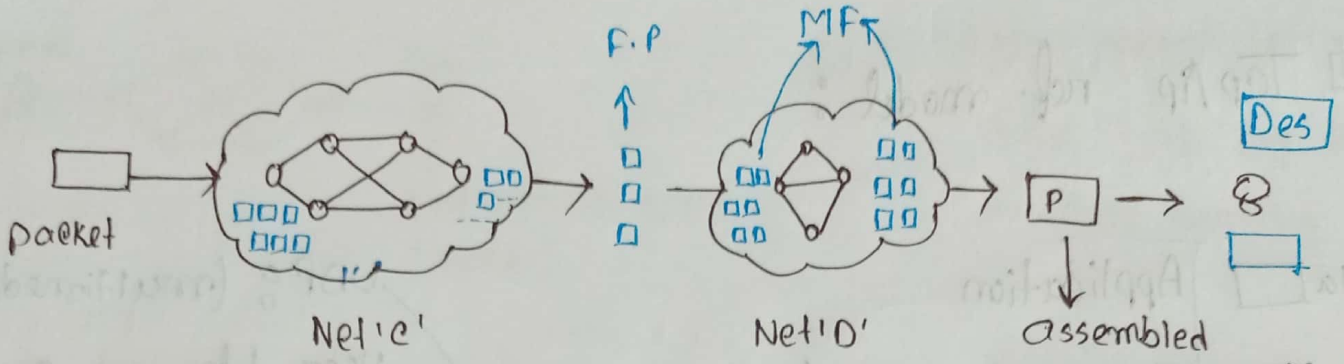
↳ ① Transparent fragmentation

② Non-transparent ,,

① 

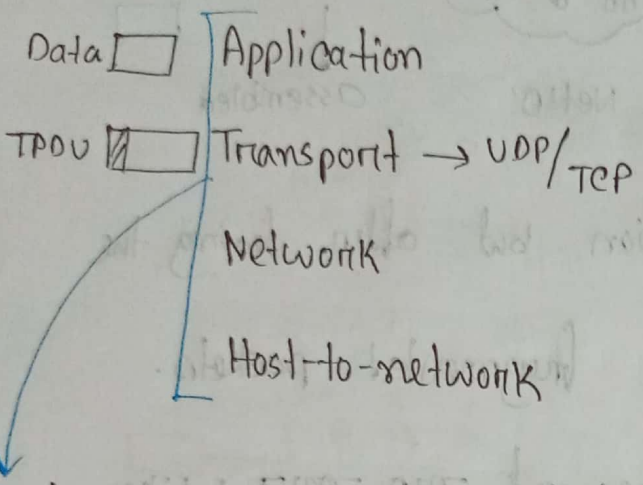
Packet go through one to many network while generating from source to destination. So. কোন network-এ enter করে তার if fragment needed then network এর capacity অনুযায়ী fragment হয়ে যায় network leave করার পর fragmented packets গুলো re-assembled হয়ে যায়। অবার কোন network-এ গিয়ে assembled হয়ে leave করবে and destination এ reach করবে।

(2)



packets will go through fragmentation but after leaving the network will not re-assembled the fragmented packets. Fragmented packets গুলো আবারো fragment হতে পারে। Like 3 to 6 or more. For this it have to make sure যে প্রত্যেক fragmented packet এ header থাকবে। Destination এ packet reach করার পরই fragmented packet গুলো assembeled হবে। Till then fragment অবস্থায় থাকবে।

TCP/IP ref. model:



* type wise header structure change হয়।

UDP: (multimedia)
User datagram protocol
(8 Byte header)

TCP:
Transmission control protocol
(20 Byte header)

TCP header:

Header

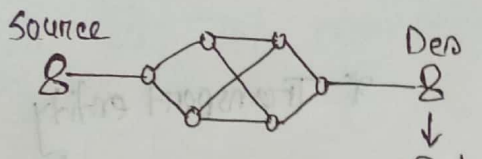
Source port	Destination port
UDP length	Checksome (CRC)

16 Bits

16 Bits

Source Port	Destination port
Sequence #	
Acknowledgement #	
header leng-th / URG / ACK / PSH / RST / SYN / FIN	Window size
Checksome	Urgent pointer

20 Byte



End point : IP + port.
(socket)

* Reply packet ও যদি Aek # নিয়ে যায় then → piggy backing.

URG: Urgent

ACK: Acknowledgement

PSH: Push. Queue থেকে আস্তে পাঠানো

RST: Reset. Connection disconnect হয়ে গেলে reset করা

SYN: Synchronization. Use for new connection.

FIN: Finish. Disconnect করা।

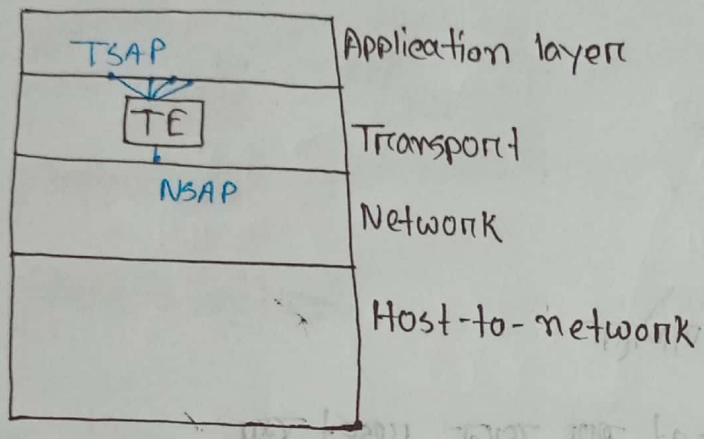
* Size of the beffer is window size

* URG যদি 1 হয় তাহলে urgent pointer-ও দিতে হবে যে what kind of urgency is here.

* Socket create হয় at End point.

TCP/IP Ref Model

CNN Web Server



* Transport entity does the job of transport layer.

Network service access point. (IP)

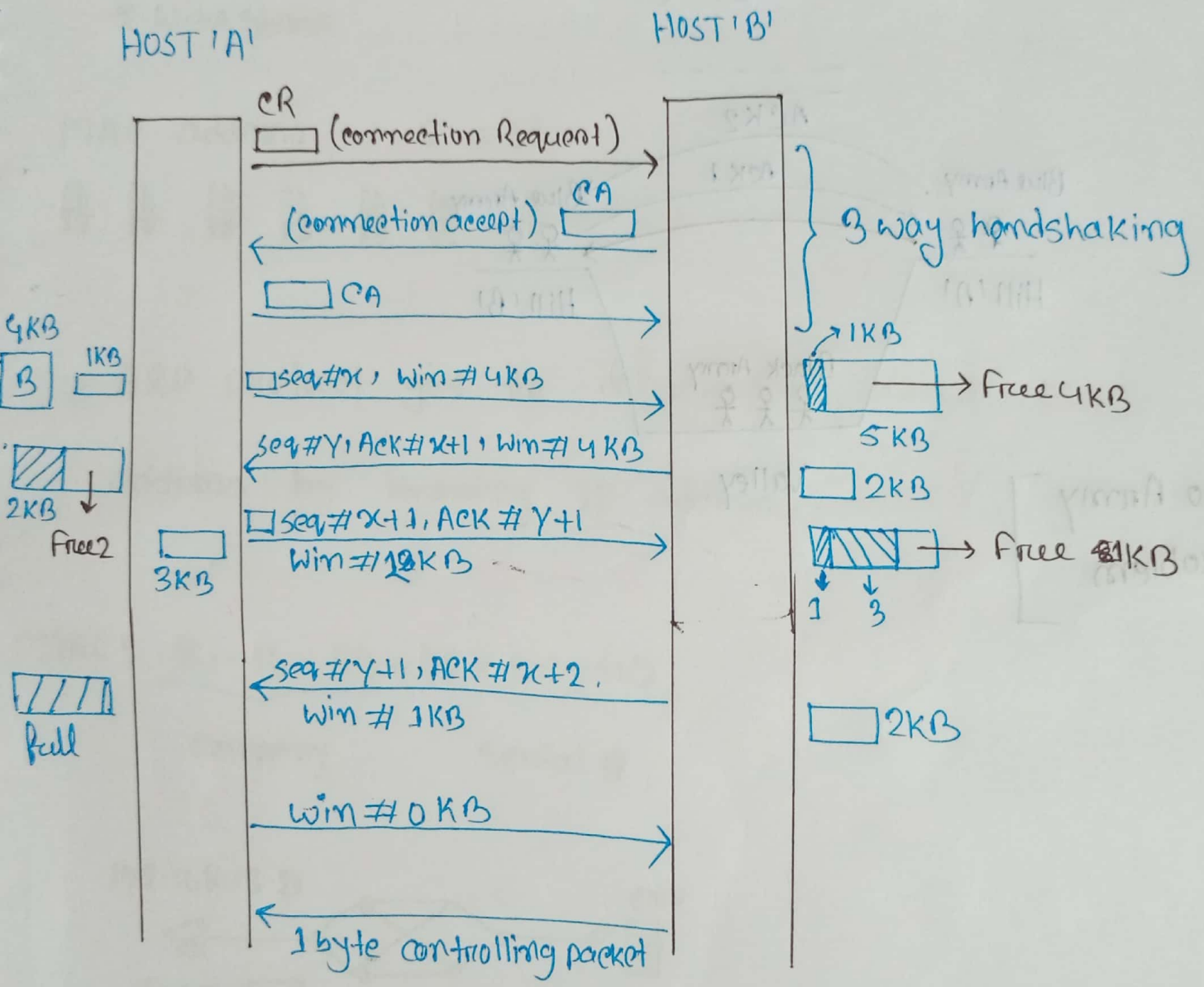
Transport " " (Port)

* Client-1

http:// www.CNN.com → endpoint পাওয়া যাবে.

Protocol (80) — host name

Tcp connection esh-tablishment + Data transmission

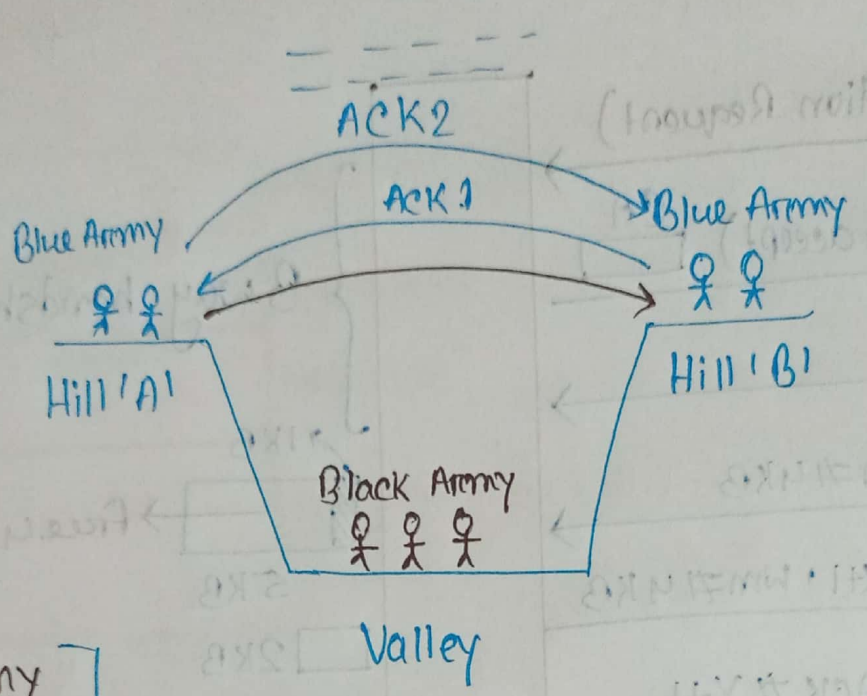


↓

Buffer full হলে 1byte এর controlling packet পাঠাবে to let know → clear the buffer.

Otherwise data পাঠানো যাবে না.

TCP connection realease



↳ Two Army Problem

LAB:

* Wireshark.

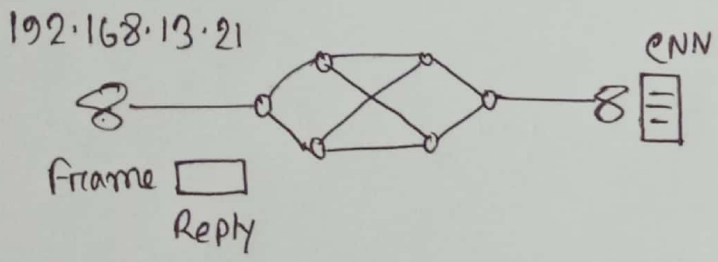
MAC address → 6 octet

ff ff ff ff ff ff (48 bit)

* ARP protocol give the information about MAC address by knowing IP address.

MAC: 84-16-F9-05-0C-40

company Serial #



Dest mac: 84 - - - - - 40

Source mac: CNN → ⊗ last router ⊡ address ⊡⊡⊡⊡.