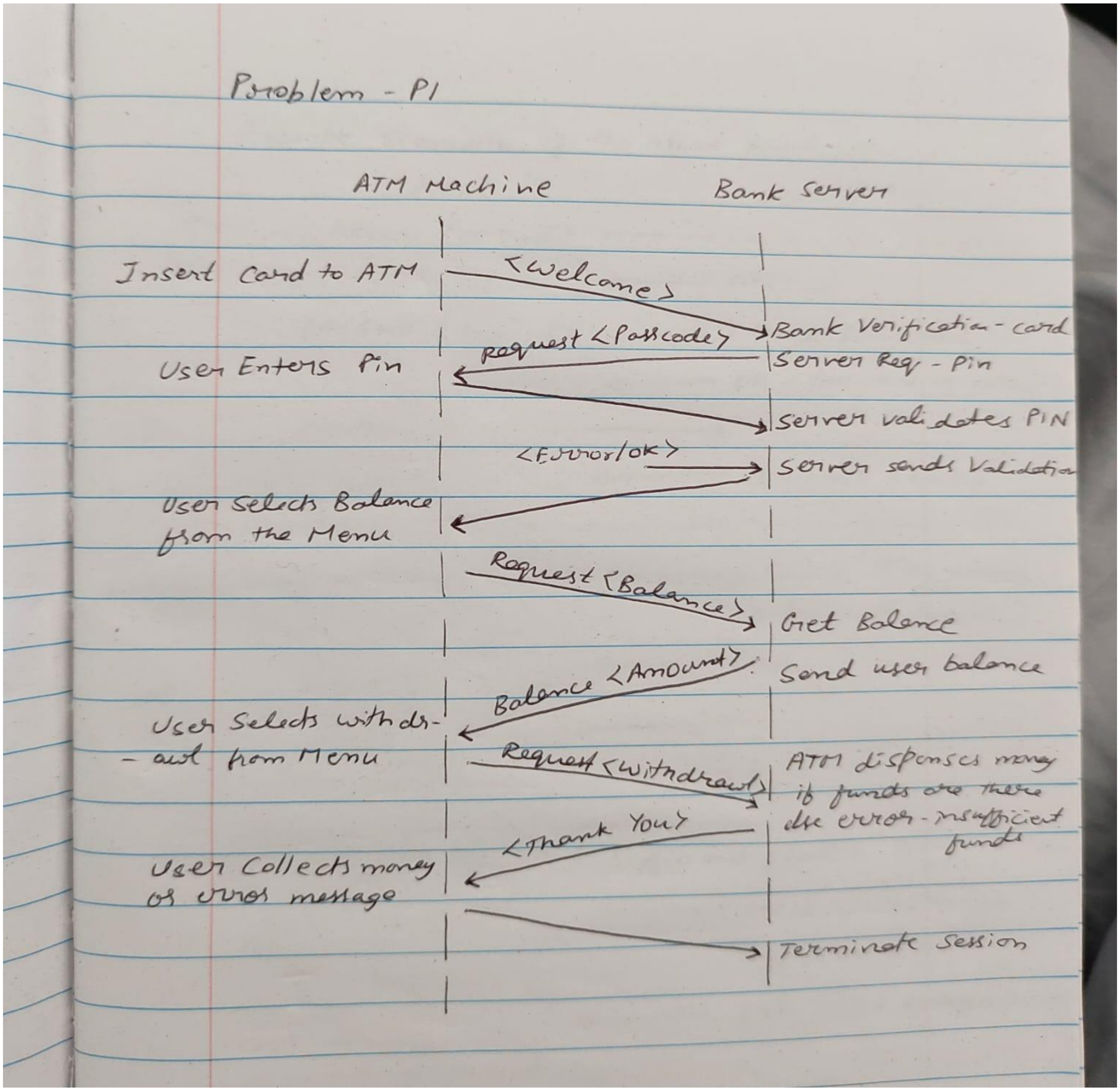
Computer Communication & Networks

Chapter 1 Problems



Example Scenario of the above protocol:

	Client		Server
1	HELLO (userid)	⟶	Check user validity
		⟵	PASSWD
	PASSWD <passwd>	⟶	(Check password)
		⟵	OK (Password is correct)
	BALANCE	⟶	
		⟵	AMOUNT <amt>

	Client		Server
2	WITHDRAWL <amt>	⟶	Check if there are sufficient funds
		⟵	OK
	ATM Disperses amount		
	BYE	⟶	
		⟵	BYE

Continued from 1 → Insufficient funds scenario

Client		Server
WITHDRAWL<amt>	⟶	check if there are sufficient funds
	⟵	ERR (Not enough funds)
Error Message No Money dispersed		
BYE	⟶	
	⟵	BYE

All this is stateless.

P3)

transmits data at a steady rate
sender generates N-bit unit every k time units

(a) A circuit-switched network is more appropriate because the applications which described above involves relatively long period of time i.e., long sessions which require smooth bandwidths. as they are predictable.

Since transmission rate is known, ~~bandwi~~ bandwidth can be used for each application session in a reserved mode without any waste.

(b) Given that, if it is used packet-switch network. & the traffic comes from the applications discussed above, it says that there is no need of congestion control mechanism. As each link offers sufficient Bandwidth to handle whole applications data transmission rates, there is no need of any congestion control since no congestion occurs.

Problem 5

(a) Given

The Distance = 175 km

the propagation speed = 100 km/hr

each ~~tollbo~~ tollbooth service one car in 12 seconds.

$\boxed{\text{transmission delay}}$

The time taken by tollbooth to push entire carvan out of 1 tollbooth.

Time to service 10 cars in 1 tollbooth

$= 10 \times 12 = 120$ seconds $= 2$ min.

Time to service 10 cars in 3 tollbooths

$= 120$ seconds $\times 3 = 360$ seconds

$= 6$ minutes.

$\boxed{\text{Transmission delay} = 6 \text{ minutes.}}$

Propagation delay : Time taken by a car to travel from exit of one tollbooth to next.

$$\text{Propagation delay} = \frac{\text{distance}}{\text{Propagation Speed}}$$

$$= \frac{175}{100\,km/hr} = 1.75\ hrs$$

$$= 105\ minutes$$

end to end delay = transmission delay + propagation delay

= 6min + 105 min

$\boxed{\text{end to end delay} = 111\ \text{minutes}}$

(b.) Each tollbooth service 1 car in 12sec

Transmission delay.

time to service 8 cars in 1 tollbooth

$= 12 \times 8 = 96$ seconds = 1minute 36 seconds

time to ~~travel~~ service 8 cars in 3 tollbooths

$= 96\ sec \times 3 = 288$ seconds

= 4min 48 seconds

Propagation delay

$$\text{Propagation delay} = \frac{\text{distance}}{\text{Propagation Speed}} = \frac{175}{100}$$

= 105minutes

End to end delay = transmission delay

+ propagation delay

= 4min 48sec + 105min

= 109min 48sec

$\boxed{\therefore \text{End to End delay} = 109 \text{ min } 48 \text{sec}}$

P 6) The given data is:

Two hosts A and B which are connected by single link at rate 'R' bps. The two hosts are seperated by 'm' meters, and the propagation speed along the link is 's' meters/sec.

Host A is sending a packet to Host B which is of size 'L' bits.

(a) propagation delay, d_{prop} in terms of 'm' and 's'.

The distance between two hosts is 'A' and 'B' is m. and speed along the link is meter/sec.

The speed propagation delay, d_{prop} is:

$$d_{prop} = m/s \text{ seconds.}$$

$$\left(\because \text{Speed} = \frac{\text{Distance}}{\text{Time}}\right)$$

(b) The transmission time of the Packet, d_{trans}, in terms of L and R.

The transmission rate is 'R' bps of link.
Size of the packet is 'L' bits.

Transmission time, as d_{trans}

$\therefore d_{trans} = L/R$ seconds

(C) Ignoring processing and queuing delays, obtain an expression for end to end delay.

We knew that, end-to-end delay is

$$d_{ete} = d_{proc} + d_{queue} + d_{trans} + d_{prop}.$$

$\therefore$ Hence, d_{proc}, d_{queue} are ignoring, the equation is altered to,

$$d_{ete} = d_{trans} + d_{prop}$$

$$d_{ete} = L/R + M/S \text{ seconds.}$$

(d) Host A begins to transmit the packet at time $t=0$, at time $t = d_{trans}$, where is the last bit of packet?

As the $t = d_{trans}$, the transmission started which is equal to transmission delay. The transmission delay is the time taken by host to eject the packet.

From that, we can say that at time $t = d_{trans}$, the last bit of the packet has been pushed out or transmitted.

(e) Suppose $d_{prop} > d_{trans}$. At time $t = d_{trans}$, where is first bit of packet?

If $d_{prop} > d_{trans}$,

The last bit has been transmitted from host A; but as the propagation delay is greater than transmission delay, the first bit has been not reached to B.

(f) Suppose $d_{prop} < d_{trans}$. At time $t = d_{trans}$, where is first bit of packet.

If $d_{prop} < d_{trans}$, ~~as,~~

As the propagation delay is less than the transmission delay, the first bit of the packet has reached the destination host 'B'.

(g). Suppose, $s = 2.5 \times 10^8$, $L = 1500$ bytes, $R = 10$ Mbps, Find distance 'm', so that $d_{prop} = d_{trans}$.

$d_{prop} = d_{trans}$

$\Rightarrow \frac{m}{s} = \frac{L}{R}$ $\quad$ ($\because d_{prop} = \frac{m}{s}$ sec)

$\Rightarrow m = s \times \frac{L}{R}$ $\quad$ ($\because d_{tran} = \frac{L}{R}$ sec)

$\Rightarrow \frac{2.5 \times 10^8 \times 1500 \times 8}{10 \times 10^6}$ $\quad$ ($\because 1$ Mbps $= 10^6$ bps)

($\because 1$ byte $= 8$ bits).

$\Rightarrow$ 300 km.

Distance $= m = \underline{300 \text{ km}}$

problem 12 :

Given :

link bandwidth (bps) : R

packet length (bits) : L

$$\boxed{\text{Queuing delay} = La/R}$$

where 'a' is average packet arrival rate

The queuing delay for packet 1 = 0

The queuing delay for packet 2 = L/R.

The queuing delay for next 3rd packet = $2L/R$

The queuing delay for packet 4 = $3L/R$

then, for packet N, the queuing delay = $(N-1)L/R$.

Average queuing delay for packet N

$$= \frac{0 + L/R + 2L/R + 3L/R + \cdots + (N-1)L/R}{N}$$

$$\Rightarrow \left(\frac{L}{NR}\right)(1+2+3+\cdots+(N-1))$$

$$\Rightarrow \left(\frac{L}{\cancel{N}R}\right)\frac{\cancel{N}(N-1)}{2}$$

$$\Rightarrow \frac{L(N-1)}{2R}$$

Now, the queuing delay for 4 packets be

$$= \frac{(4-1)\ (1500 \times 8)\ \text{bits}}{2 \times (2.5 \times 1024 \times 8)\ \text{bits/sec}}$$

$$\Rightarrow \frac{3 \times \cancel{12000}^{600}}{\cancel{2} \times 20{,}48\cancel{0}}\ \text{sec}$$

$$\Rightarrow \frac{1800}{2048} \Rightarrow 0.879\ \text{sec}$$

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Thank you