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SECTION: BSE-5B
COURSE: COMPUTER NETWORKS

Q.1 The delay will be caused by transmission

R1: Transmission rate between sending host and switch.

R2: Transmission rate between rate between switch and receiving host.

Total : ~~$R_1 R_2$~~ $\frac{L}{R_1} + \frac{L}{R_2}$

Q.2

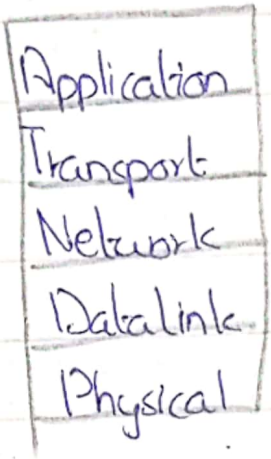
Router:

Network layer
Link layer
Physical layer

Link-layer:
- Link layer
- Physical layer

Host:
- Application layer
- Presentation layer
- Session layer
- Transport layer
- Network layer
- Link layer
- Physical layer.

Q.3 Internet protocols helps in understanding the network by layering as it provides flexibility; different layers can be swapped in and out to accomodate different network architecture.



Q.4 Packet delivery time varies between source and destination because of queuing delay as all other factors such as transmission and processing rates are same for both source and destination.

Q: 5(a) Solution

Propagation delay: $\frac{\text{Distance}}{\text{Speed}}$

$= \frac{3.6 \times 10^7}{2.4 \times 10^8}$

$\Rightarrow 0.15$ sec

(b) Solution

Transmission rate(R) = 10Mbps = $10 \times 10^6 = 10^7$ bits
Propagation_delay = 0.15 sec

Bandwidth-delay-product:

$10^7 \times 0.15$ bits

$= 1500,000$ bits

(C) Solution

Transmission rate: 10^7 bits
Frequency of transmitting the digital photo by satellite = 60 seconds.

$x = 10^7 \times 60 = 600,000,000$ bits.

Q.6(a) Solution

Transmission_rate = 5Mbps = 5×10^6 bps

Propagation_delay: $\frac{\text{Distance}}{\text{Speed}} : \frac{2 \times 10^7 \text{ meters}}{2.5 \times 10^8 \text{ m/s}}$

$\Rightarrow 0.08$ sec

R_drop = $0.08 \times 5 \times 10^6 = 400{,}000$ bits

(b) Solution

File_size = 8×10^5 bits.

Transmission_rate: 5Mbps = 5×10^6

R_drop = 400,000 bits

Maximum number of bits at any given time:
400,000 bits

(c) The product of band-width delay is equal to the maximum number of bits on the transmission line.

(d) Transmission_rate: 5 Mbps
Propagation_rate = 2.5×10^8 m/s
Length of 1 bit on the transmission line = $\frac{\text{Speed (s)}}{\text{Transmission\_rate (R)}}$

$\Rightarrow \frac{2.5 \times 10^8}{2 \times 10^6} = 125$ m/bit

$\Rightarrow$ Hence, it is longer than a football field.

(e) width = $\frac{\text{Transmission\_Rate (R)} * \text{Speed (s)}}{\text{Length of the link (m)}}$

Q.7 HTTP, FTP, SMTP, and POP3 run on TCP because of its reliability as being a connection-oriented network it assures delivery of packets. UDP, being a connectionless transport protocol, doesn't guarantee reliable data transmission.

Q.8(a) Solution

Length = 64kBytes = $64 \times 10^3 \times 8$

Distance = 3500km = 3500×10^3 m

Propagation_speed = 2.8×10^8 m/s

Transmission_rate = 22.5Mbps = 22.5×10^6

Transmission delay = $\frac{64 \times 8 \times 10^3}{22.5 \times 10^6}$

$\Rightarrow 0.0228$ sec $\approx$ 22.8msec

Propagation delay = $\frac{3500 \times 10^3}{2.8 \times 10^8}$

$= 0.0125$ sec / 12.5msec

Total = 22.8 + 12.5 = 35.3 msec $\approx$ 35msec

Distance: 800m:

Propagation delay: $\frac{800}{2.8 \times 10^8}$

$= 2.8$ usec

Total = 22756 usec + 2.8 usec

$= 22758.8 \times 10^{-6}$ sec

(b) Solution

Throughput = min{ 1800kbps, 4.6 Mbps, 1.8 Mbps }
= 1800 kbps

Time taken to transfer: $\frac{8 \times 10^6}{1800 \times 10^3}$ $\frac{8 \times 10^6 \times 8}{1800 \times 10^3}$

$= 4.4$ $= 35.5 \approx 36$ sec

Q.4(a) Processing delay
Queuing delay
Propagation delay.

(b) The delay is just a function of link and its physical characteristics, so it is not affected.

Q.5 In push protocols, client opens a connection to the server and keeps it constantly active. The server will send(push) all events to the client using that single always-on connection. Whereas in pull protocols, the client periodically connects to the server, checks for and gets(pulls) recent events and

then closes the connection and disconnects from the server.

Push = SMTP
Pull = HTTP

Q.11(a) Here, circuit switching is preferable since each of the users will get a dedicated allocation of 100kbps

(b) Here, packet switching is preferable. We cannot allocate 1Mbps per user in circuit-switching mode. Packet switching will work well since the aggregate average traffic rate is 0.5 Mbps and the link is a 1Mbps link.

Q.12 Solution

F = 10Gbits = 10240 Mbits

server = 20 Mbps (up)

di = 1 Mbps

Minimum distribution:

$$\Rightarrow \text{Max}\left\{\frac{NF}{u}, \frac{F}{d_{min}}\right\}$$

$$\text{Max}\left\{\frac{10 \times 10240}{20}, \frac{10240}{1}\right\}$$

$$\text{Max}\{5120, 10240\}$$

$$= 10240 \text{ seconds.}$$

Therefore, the minimum distribution time for each of the combinations of N and u for both client-sever distribution and P2P distribution = 10240 seconds

Q.13 Churning in P2P works in a way that peers may come and go; once peer has entire file, it may (selfishly) leave or (altruistically) remain in torrent. In peer is leaves abruptly, it won't be able to forward data (chunk of files) to other peers.

Q.14 Connectionless packet switching uses UDP which is faster and is used for long distance transmissions. Therefore connectionless packet switching is prefered.

Q.15(a) Solution

Propagation: $\frac{3100 \times 10^3}{2.5 \times 10^8}$

$= 0.0124$ seconds

Transmission $= \frac{1500 \times 8}{3 \times 10^6}$

$= 4 \times 10^{-3}$ seconds

Total $= 0.0124 + 0.004$

$= 0.0128$ sec

(b) $R = \frac{d}{s}$

(c) No

Yes, it is affected by both length L and transmission rate, R.