Assignment

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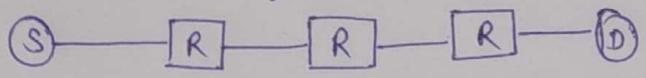
Subject :- Computer Networks.

Qu 1.) Assume that source S and destination D are connected through three intermediate routers labeled R. Determine and explain how many times each packet has to visit the network layer and the data link during a transmission from S to D.



Ans- Network layer 5 times and Datalink layer 8 times.

Here, network layer is considered only once and data link layer twice. Since, once the message comes to network layer, it tries to connect to R's network level. Network levels sends message via Data link layer.

The network layer at the source (S) :- Find R send message via Data link layer.

From this we can conclude Data link layer at S and D are used for only sending & receiving purpose respectively where data link layer at R's are used for both sending and receiving purpose.

Qu 2.) What is the total delay (latency) from a frame of size 5 million bits that is being sent on a link with 10 routers each having a queuing time of 2 μs & a process timing of 1 μs. The length of the link is 2000 km. The speed of light inside the link is 2×10^8 m/s. The link has a bandwidth of 5 Mbps. Which component of the total delay is dominent? Which one is negligible?

Ans- Given,

Frame of size = 5 million bits = 5×10^6 bits.

Queuing time = 2 μs = 2×10^{-6} sec.

Processing time = 1 μs = 2×10^{-6} sec.

length of link (d) = 200 km = 200×10^3 km.

Speed of light = 2×10^8 m/s

Bandwidth = 5×10^6 bps.

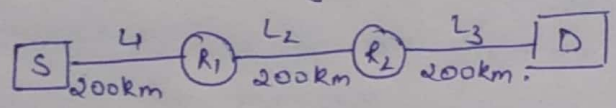
Propogation time (T_p) = $\frac{\text{Distance}}{\text{Speed}} = \frac{2 \times 10^6}{2 \times 10^8} = 0.01$ sec.

Transmission time (T_t) = $\frac{\text{Frame size}}{\text{Bandwidth}} = \frac{5 \times 10^6}{5 \times 10^6} = 1$ sec.

Delay = $T_p + T_t$ + queuing time + Processing time.

$= 2 \times 10^{-6} + 1 \times 10^{-6} + 0.01 + 1 = 1.01003$ sec.

Ques-3) A source node is transmitting a video of size 212 size bits to another node on a network with two intermediate routers (R_1 & R_2) & having three links (L_1, L_2 & L_3). L_1 connects first node to R_1. L_2 connects R_1 to R_2 & L_3 connects R_2 to final node to R_1. L_2 connects R_1 to R_2 and L_3 connects R_2 to final node. Assume each links' length is 200km. Assume signal speed over link is 10^8 m/sec. Given link bandwidth on each link is 2 μbps. Find the total latency for the transmission of file if video is chuncked into 2000 packets each of size of 2000 bits (Neg queuing & Processing time).

Ans 

Message size, = 212 bits

Bandwidth = 2 μbps = 2×10^6 bps.

signal speed = 10^8 m/s.

No. of packets (N) = 2000

Size of packets = 2000 bits

Distance b/w each node = 200km = 200×10^3 m.

Transmission delay (T_d) = size of Nodes / Bandwidth.

$S \rightarrow R_1$: $T_d = \frac{2000 \times 212}{2 \times 10^6} = 212 \times 10^{-3} = 212$ ms.

(i.e. S sends 2000 packets to R_1)

Similarly T_d from $R_1 \rightarrow R_2$ & $R_2 \rightarrow D$ will be same.

So, Total Transmission delay = (3×212) ms = 636 ms.

Propagation Delay (T_p) = Distance b/w nodes / signal speed.

$S \rightarrow R_1 : T_p = \frac{200 \times 10^3}{10^5} = 2\,ms$

Similarly T_p for $R_1 \rightarrow R_2$ and $R_2 \rightarrow D$ will be same.

So, Total Propagation speed = 6ms

Total latency (delay) for the transmission of file if video is chunked into 2000 packets = N x (Total T_d + Total T_p)

$= 2000 \times (636\,ms + 6\,ms)$

$= 2000 \times 642 \times 10^{-3}$

$= 1284\,sec.$

Qu. 4 An organization bought a following chunk of IP address. 203.248.128.0/20. The organization wants to give half of the chunk of address to Branch A and a quarter to Branch B, while keeping rest with it. What will be the valid allocation of address to A & B?

Ans. Give, n(prefix) = 20

No. of IP address = $2^{(32-20)} = 2^{12}$

Out of 2^{12} IP address 2^{11} address are given to organization A and 2^{10} IP address are given to organization B and remaining for themselves.

So, prefix for A is 21

prefix for B is 22.

Now by setting 21 bit to either 0 or 1 for organization A

203.248.10000000.0 ⟶ 203.248.128.0/21.

203.248.10010000 ⟶ 203.248.136.0/21

Similarly fixing 22nd bit for organization B.

203.248.10000000.0 ⟶ 203.248.128.0/22.

203.248.10000100.0 ⟶ 203.248.132.0/22

Que 8.) Explain the terms :-

1.) Internet :- It is a globally connected network system that uses TCP/IP to transmit data via various types of media. The internet is a network of globally exchanges including private, public, business wireless and fibre-optic technologies.

2.) Intranet :- It is a private computer network that uses internet protocol technologies to securely share any part of an organization information or operational systems within the organization.

3) Extranet :- It is a private network that uses Internet technology and the public telecommunication system to, securely share part of a business's information or operations with suppliers, vendors, partners, customers or other businesses.

4.) Virtual Private Network :- It is a technology that creates a safe & encrypted connection over a less secure network, such as the internet. VPN is a way to extend a private network using a public network such as internet.