Q1. [10 points]

Find out the nodal delay for transferring 4 data packets (DATA[1], DATA[2], DATA[3] and DATA[4]) from host A to B in a datagram network. Consider the following data:

Ignore the first letter 'K' in your roll number. The packet size, L=([Last digit of your roll number] mod 10)+1 Mbits. The transmission rate of links are R1 (link between A and X)=[2nd Last digit of your roll number] mod 10)+1 Mbps, R2(link between X and y)=([3rd Last digit of your roll number] mod 10)+1 Mbps and R3 (link between Y and B)=([4th Last digit of your roll number] mod 10)+1 Mbps. The length of the links is d1=([First digit of your roll number] mod 10)+1 Km, d2=([2nd digit of your roll number] mod 10)+1 Km and d3=([3rd digit of your roll number] mod 10)+1 Km. The processing delay is same for all packets which is the ([Last digit of your roll number] mod 10)+1 µsec. The queueing delay of packet1, packet2, packet3 and packet4 are ([1st digit of your roll number] mod 10)+1 µsec , ([2nd digit of your roll number] mod 10)+1 µsec, ([3rd digit of your roll number] mod 10)+1 µsec and ([4th digit of your roll number] mod 10)+1 µsec respectively.

For example, if a student has roll numberK171234, he has the following data:

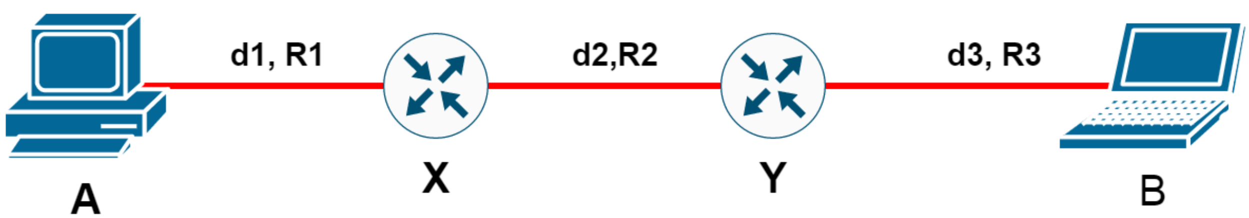
R1=(3 mod 10)+1=4Mbs, R2=(2 mod 10)+1=3Mbps and R3=(1 mod 10)+1=2Mbps

d1=(1 mod 10)+1=2Mbs, d2=(7 mod 10)+1=8Mbps and d3=(1 mod 10)+1=2Mbps

$T_{proc}= T_{proc1}= T_{proc2}= T_{proc3}= T_{proc4}$=(4 mod 10)+1=5µsec

T_{Q1}=(1 mod 10)+1=2 µsec, T_{Q2}=(2 mod 10)+1=3 µsec, T_{Q3}=(3 mod 10)+1=4 µsec and T_{Q4}=(4 mod 10)+1=5 µsec

L=(4 mod 10)+1=5Mbits



Solution

$Delay_{nodal}=T_{prop}^{A\text{-}X}+ T_{prop}^{X\text{-}Y}+ T_{prop}^{Y\text{-}B}+(T_{proc}^{1}+ T_{Q}^{1}+ T_{trans}^{pkt,1})+ (T_{proc}^{2}+ T_{Q}^{2}+ T_{trans}^{pkt,2})+ (T_{proc}^{3}+ T_{Q}^{3}+ T_{trans}^{pkt,3})+ (T_{proc}^{4}+ T_{Q}^{4}+ T_{trans}^{pkt,4})$

$Delay_{nodal}= T_{prop\text{-}e2e}+4\ T_{proc}+ (T_{trans\text{-}pkt1}+ T_{trans\text{-}pkt2}+ T_{trans\text{-}pkt3}+ T_{trans\text{-}pkt4})=T_{Q1}+ T_{Q2}+ T_{Q3}+ T_{Q4}$

17K-3894 - Aafia Rehman

Question 1 (3894)

$L = (4 \bmod 10) + 1 = 5$ M bits

$R_1 = (9 \bmod 10) + 1 = 10$ mbps

$R_2 = (8 \bmod 10) + 1 = 9$ Mbps

$R_3 = (3 \bmod 10) + 1 = 4$ Mbps

$T_{Q_1} = (3 \bmod 10) + 1 = 4$ μsec

$T_{Q_2} = (8 \bmod 10) + 1 = 9$ μsec

$T_{Q_3} = (9 \bmod 10) + 1 = 10$ μsec

$T_{Q_4} = (4 \bmod 10) + 1 = 5$ μsec

$d_1 = (3 \bmod 10) + 1 = 4$ km

$d_2 = (8 \bmod 10) + 1 = 9$ km

$d_3 = (9 \bmod 10) + 1 = 10$ km

Transmission delay:

$T_{T_1} = L/R_1 = 5$ M bits $/ 10$ M bps $= 0.5$ sec

$T_{T_2} = 5/9 = 0.556$ sec

$T_{T_3} = 5/4 = 1.25$ sec.

Hence,

$T_{T_1} = 500000\ \mu s$, $T_{T_2} = 556000\ \mu s$, $T_{T_3} = 1250000\ \mu s$

17k-3894
Aafia Rehman

②

Quest 1 conti:

Hence,

$T_{T_1} = 500000\,\mu s$

$T_{T_2} = 556000\,\mu s$

$T_{T_3} = 1250000\,\mu s$

For Propogation delay,

$T_{prop1} = d_1/s = \frac{4000\ m}{3\times10^8\ m/s} = 13.33\,\mu sec$

$T_{prop2} = d_2/s = \frac{9000}{3\times10^8} = 30\,\mu sec$

$T_{prop3} = d_3/s = \frac{10.000}{3\times10^8} = 33.33\,\mu sec$

New:

Total $T_{prop} = 13.33 + 30 + 33.33 = 76.66\,\mu sec$

" $T_{tran} = 500000 + 556000 + 1250000 = 2306000$ sec

" $T_q = 4 + 9 + 10 + 5 = 28\,\mu sec.$

" $T_{proc} = 9 \times 4 = 36\,\mu sec.$

17k-3394
Aafia Rehman 3

1 conti)

Total Delay:

$76.66 + 2306000 + 28 + 36$

$= 2306140.66$ μsec.

Q No. 2 [10 points]

A) Mr. Amitabh Bachchan is using Internet Explorer as his client application to brow his website named www.bachchan.com. He wants to send a picture on a page of his website. Suppose, mistakenly he sends a wrong image (image1.jpg), now he wants to remove that image and send the right image(image2.jpg).

Keeping the above scenario in the mind please answer the following:

(i) What type of application level protocol Mr. Bachchan's client application should use?
(ii) What type of message format the Mr. Bachchan client application should use to send the data to the server?
(iii) Keeping all three actions of the above scenario in your mind; what method the message should use {keep in mind the type of message you answered in A(ii) } for each case?
(iv) Write down example messages of your proposed protocol for all three cases (showing message method for each case as well).
(v) Finally, what version of your proposed protocol is best suited for above scenarios and why?

Answer: 2A

(i) The web browser of Mr. Amitabh Bachchan should use HTTP protocol.
(ii) It should use HTTP request message to send the data to the web server.
(iii) For uploading picture both times; it should use PUT method. For deleting an image, it should use DELETE method.

(iv)

PUT /somedir/image1.jpg HTTP/1.1
Host: www.bachchan.com
Connection: Keep-Alive
User-agent: Mozilla/5.0*
Accept-language: en

DELETE /somedir/image1.jpg HTTP/1.1
Host: www.bachchan.com
Connection: Keep-Alive
User-agent: Mozilla/5.0*
Accept-language: en

PUT /somedir/image2.jpg HTTP/1.1
Host: www.bachchan.com
Connection: Keep-Alive
User-agent: Mozilla/5.0*
Accept-language: en

*Mozilla/5.0 is the general token that says the browser is Mozilla-compatible. For historical reasons, almost every browser today sends it. (this is optional, if a student put IE or Internet Explorer as User-agent in his/her answer it will be accepted as well).

(v) It should use HTTP/1.1 as the method type PUT is not available in HTTP/1.0.

B) Suppose you are running a chat application in your computer; this application requires to connect with its server on cloud to get verification of account.

(i) Explain how these applications communicate with each other.
(ii) Is it a P2P model or some other model?
(iii) What is the name of that interface which provides communication between to applications?
(iv) Many applications on computer are communicating with some other devices, how does your computer identify that, which message is received for what application and from what computer/ mobile? Define required identifications.

Answer: 2B

(i) A basic understanding of how the programs, running in multiple end systems, communicate with each other. In the jargon of operating systems, it is not actually programs but processes that communicate. A process can be thought of as a program that is running within an end system. Processes on two different end systems communicate with each other by exchanging messages across the computer network. A sending process creates and sends messages into the network; a receiving process receives these messages and possibly responds by sending messages back.

(ii) It is client-server model. In a client-server architecture, there is an always-on host, called the server, which services requests from many other hosts, called clients.

(iii) As noted above, most applications consist of pairs of communicating processes, with the two processes in each pair sending messages to each other. Any message sent from one process to another must go through the underlying network. A process sends messages into, and receives messages from, the network through a software interface called a **socket**.

(iv) In the Internet, the host is identified by its IP address. an IP address is a 32-bit quantity that we can think of as uniquely identifying the host. In addition to knowing the address of the host to which a message is destined, the sending process must also identify the receiving process (more specifically, the receiving socket) running in the host. This information is needed because in general a host could be running many network applications. A destination port number serves this purpose. Popular applications have been assigned specific port numbers. For example, a Web server is identified by port number 80.