Winter 2019- CSI 2470 Home Assignment 1

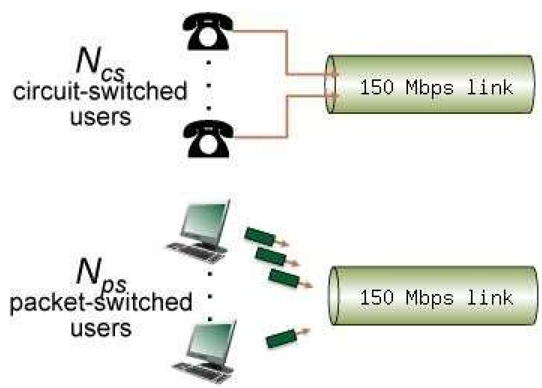
Deadline: January 23, 2019
Total points: 50

Note: Your solution (answers of all questions) should be in one PDF file. Submit your file to Moodle before January 23 11:55pm. Follow naming convention given in syllabus file. No late submission will be accepted. For question 7 & 8, screen shots should be submitted as evidence to support your answer, i.e., you should provide your explanation based on the screen shot.
Question 1 has no credit, as answer are provided. For Question 1, ensure you understood the answer

Question 1

Consider the two scenarios below and refer the answer given.

- A circuit-switching scenario in which N_{CS} users, each requiring a bandwidth of 25 Mbps, must share a link of capacity 150 Mbps.
- A packet-switching scenario with N_{PS} users sharing a 150 Mbps link, where each user again requires 25 Mbps when transmitting, but only needs to transmit 20 percent of the time.



Answer the following questions and match your answers with one given below:

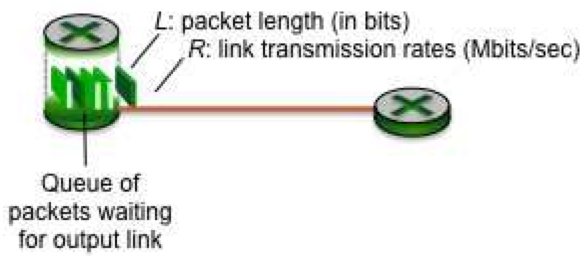
a. When circuit switching is used, what is the maximum number of circuit-switched users that can be supported? Explain your answer.
b. suppose packet switching is used. Suppose there are 11 packet-switching users (i.e., N_{PS} = 11). Can these many users be supported under circuit-switching? Explain.

Answer:
a. When circuit switching is used, at most 6 circuit-switched users that can be supported. This is because each circuit-switched user must be allocated its 25 Mbps bandwidth, and there is 150 Mbps of link capacity that can be allocated.
b. No. Under circuit switching, the 11 users would each need to be allocated 25 Mbps, for an aggregate of 275 Mbps - more than the 150 Mbps of link capacity available.

Winter 2019- CSI 2470 Home Assignment 1

Question 2 (2+6 =8 points)

- A- Consider the figure below, in which a single router is transmitting packets, each of length *L* bits, over a single link with transmission rate *R* Mbps to another router at the other end of the link.



Suppose that the packet length is *L*= 12000 bits, and that the link transmission rate along the link to router on the right is *R* = 1000 Mbps.

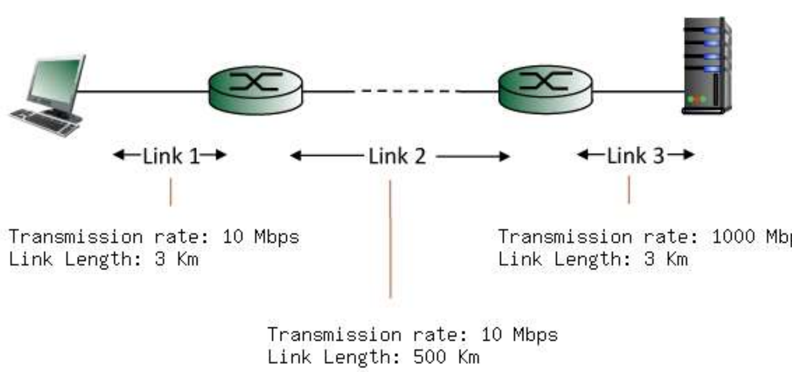
(i) What is the transmission delay (the time needed to transmit all of a packet's bits into the link)? (ii) what is the maximum number of packets per second that can be transmitted by the link? (**1+1 points**)

Answer:

(i) 1200 bits / 10000000 bs = 0.000012 seconds. The transmit delay to send all the data is 0.00012 seconds.

(ii) 1000Mbs / 1200 bits = 8333.33 packets in one second

- B- Consider the figure below, with three links, each with the specified transmission rate and link length (**6 points**).



Find the end-to-end delay (including the transmission delays and propagation delays on each of the three links but ignoring queueing delays and processing delays) from when the left host begins transmitting the first bit of a packet to the time when the last bit of that packet is received at the server at the right. The speed of light propagation delay on each link is 3x10**8 m/sec. Note that the transmission rates are in Mbps and the link distances are in Km. Assume a packet length of **16000** bits. Give your answer in milliseconds.

Answer:

Winter 2019- CSI 2470 Home Assignment 1

Link 1:

16000 bits / 10 Mbps = 0.0016

3000 / 3x10**8 m/sec = .000001

Link 2:

16000 bits / 10 Mbps = 0.0016

500000 / 3x10**8 m/sec = 0.001666

Link 3:

1600 / 1000Mbps = 0.000016

3000 / 3x10**8 m/sec = .000001

In total

0.004884 Seconds

4.884 microseconds

Question 3 (2+2=4 points)

(a) Visit the site www.traceroute.org and perform traceroutes from two different cities in France to the same destination host in the United States (Note: you may choose other countries or cities, however, ensure that source and destination countries are in different continents). Answer following: How many links are the same in the two traceroutes? Is the transatlantic link the same?

(b) Pick a city in the United States, and perform traceroutes to two hosts, each in a different city in China. How many links are common in the two traceroutes? Do the two traceroutes diverge before reaching China?

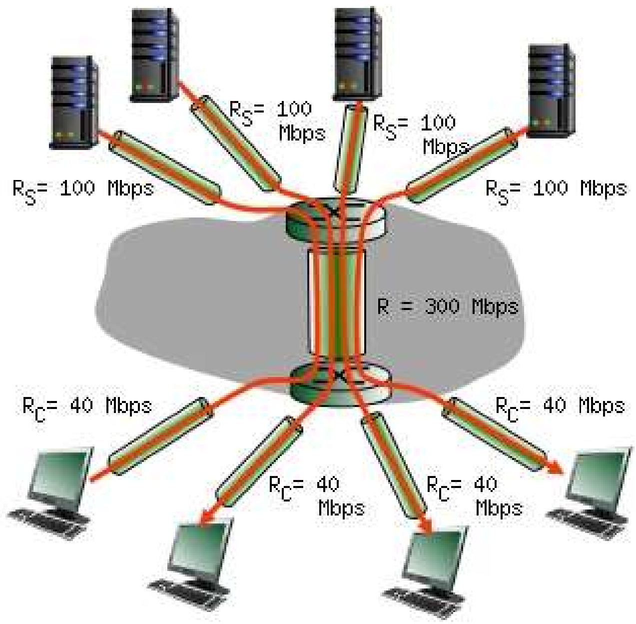
Answer:

a. 7 ips matched, yes the transatlantic links are the same
b. 11 links matched, the trac routes do not diverge before reaching china

Question 4 (1+1+1= 3 points)

Consider the scenario shown below, with four different servers connected to four different clients over four three-hop paths. The four pairs share a common middle hop with a transmission capacity of R = 300 Mbps. The four links from the servers to the shared link have a transmission capacity of R_S = 100 Mbps. Each of the four links from the shared middle link to a client has a transmission capacity of R_C = 40 Mbps per second. You might want to review Figure 1.20 in the text before answering the following questions:

Winter 2019- CSI 2470 Home Assignment 1



1. What is the maximum achievable end-end throughput (in Mbps) for each of four client-to-server pairs, assuming that the middle link is fair-shared (i.e., divides its transmission rate equally among the four pairs)?
2. Which link is the bottleneck link for each session?
3. Assuming that the senders are sending at the maximum rate possible, what are the link utilizations for the sender links (R_S), client links (R_C), and the middle link (R)?

Answer:

1. 40Mbs
2. Link Rc
3. 40/440 = 9% usage

Question 5 (2points*5 = 10 points)

In modern packet-switched networks, including the Internet, the source host segments long, application layer messages (for example, an image or a music file) into smaller packets and sends the packets into the network. The receiver then reassembles the packets back into the original message. We refer to this process as *message segmentation*. Figure below illustrates the end-to-end transport of a message with and without message segmentation. Consider a message that is $8 \cdot 10^6$ bits long that is to be sent from source to destination.

Suppose each link is 2 Mbps. Ignore propagation, queuing, and processing delays.

a. Consider sending the message from source to destination *without* message segmentation. How long does it take to move the message from the source host to the first packet switch? Keeping in mind that each switch uses store-and-forward packet switching, what is the total time to move the message from source host to destination host?

b. Now suppose that the message is segmented into 800 packets, with each packet being 10,000 bits long. How long does it take to move the first packet from source host to the first switch? When the first packet is being sent from the first switch to the second switch, the second packet is being sent from the source host to the first switch. At what time will the second packet be fully received at the first switch?

c. How long does it take to move the file from source host to destination host when message segmentation is used? Compare this result with your answer in part (a) and comment.

Winter 2019- CSI 2470 Home Assignment 1

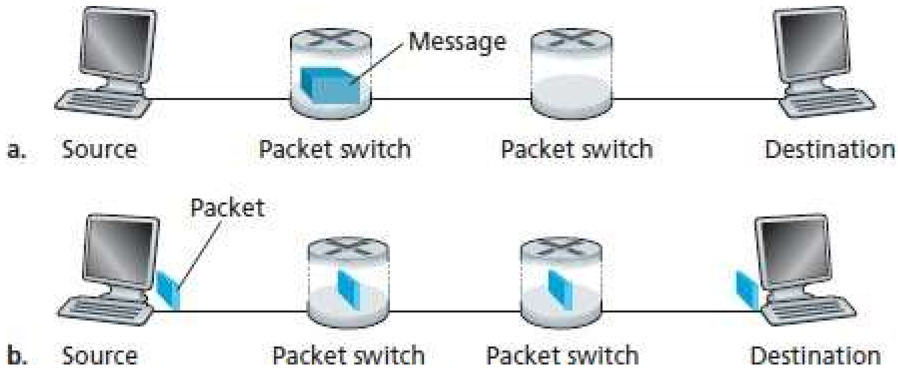


Figure: End-to-end message transport: (a) without message segmentation; (b) with message segmentation

d. In addition to reducing delay, what are reasons to use message segmentation?
e. Discuss the drawbacks of message segmentation.

Answer:

a. 8*10^6 / 2*10^6 = 4 seconds
b. 10^4 / 2*10^6 = 0.005 seconds
c. 10^4 / 2*10^6 = 0.005 seconds
d. If a packet needs to be resent, it is much faster to do this.
e. Some drawbacks include dropping packets. If one packet is lost, the whole message is lost

Question 6 (5 points)

Visit the Queuing and Loss applet at following URL
https://media.pearsoncmg.com/aw/ecs_kurose_compnetwork_7/cw/content/interactiveanimations/queuing-loss-applet/index.html
What is the maximum emission rate and the minimum transmission rate? With those rates, what is the traffic intensity? Run the applet with these rates and determine how long it takes for packet loss to occur. Then repeat the experiment a second time and determine again how long it takes for packet loss to occur. Are the values different? Why or why not?

Find the combination that is giving you answer in 5-10 mins. Max. No need to run the applet forever.

Answer:

a. 100-350 packets/S
b. 500-350 packets/S
c. Best combo is Emission rate = 500 P/S, and Transmission rate = 350 P/S
    a. Trial 1: 9.7 Seconds
    b. Trial 2: 9.1 Seconds
    c. Yes, the values are different because of random packet arrival times

Winter 2019- CSI 2470 Home Assignment 1

Question 7 (10 points)

Download the cisco packet tracer lab 01 from Cisco Packet tracer labs section of the Moodle. Place answers of question 1.1 to 1.4 of lab below.

Answer:

Q1.1: What is cisco packet tracer tool? What significance does this has for network engineer? (3 points)
IT is a tool that allows us to design and simulate a network. This tool would be useful for an engineer creating a large-scale network
Q1.2: What is purpose of Ping Command? Explain the output of Ping command in step 11. (2 points)
The ping command allows us to see if the address is reachable from that terminal. The output displays the size of the packet sent through the network, as well as the time it took.
Q 1.3: Why did we use the crossover cable in above scenario? (1 points)
Because we are connecting a pc to a pc, you need to use a crossover cable when connect the similar hardware together.

Q1.3 How many IP addresses did we assign to router? (2 points)
2 addresses
Q1.4 What is global configuration mode of cisco router? (2 points)
It allows you to configure everything about the router.

Question 8 (2+3+3+2 =10 points)

Refer Wireshark Lab 1 File uploaded on Moodle and answer following questions

4. List 3 different protocols that appear in the protocol column in the unfiltered packet-listing window in step 7 in lab 1 (Wireshark Activity).
5. How long did it take from when the HTTP GET message was sent until the HTTP OK reply was received? (By default, the value of the Time column in the packet-listing window is the amount of time, in seconds, since Wireshark tracing began. To display the Time field in time-of-day format, select the Wireshark View pull down menu, then select Time Display Format, then select Time-of-day.)
6. What is the Internet address of the gaia.cs.umass.edu (also known as www-net.cs.umass.edu)? What is the Internet address of your computer?
7. Print the two HTTP messages (GET and OK) referred to in question 2 above. To do so, select Print from the Wireshark File command menu, and select the "Selected Packet Only" and "Print as displayed" radial buttons, and then click OK.

Answer:

1. TCP, SNMP, HTTP
2. 0.024598 seconds
3. Address of gaia.cs.umass.edu: 128.119.245.12 and My computer: 35.50.12.250
4.