CS 372 – Intro to Networks – Benjamin Brewster, adapted from Kurose & Ross

Problems 4 – Chapter 4 (Book Required)

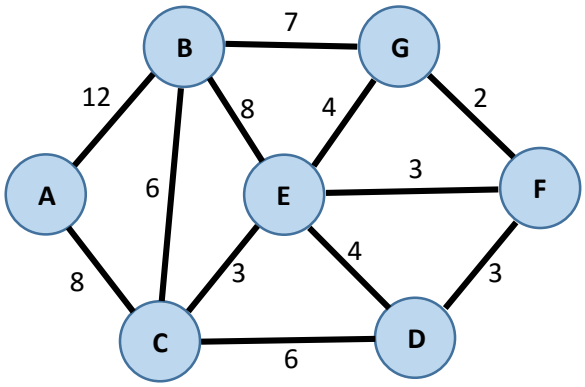
QUESTIONS

1. Open up www.arin.net/whois in a web browser.
   a. Use the page to determine the IP address blocks for three different universities, and list them.

   b. Can whois services be used to know where these universities are *exactly*, in terms of their geographical location, by using a specific IP address?

   c. Use www.iplocation.net to try to find the locations of the web servers of these universities, and list your results.

2. Examine the following network, with its routers named A-G and route costs as shown. Use Dijkstra's Algorithm to compute the shortest path from router C to all other routers, building up a table with the same format as table 4.3 in your book, on page 368.
   Hint for self-check: at Step 5, N' = CEFDBG:



Step	N'	D(G), p(G)	D(F), p(F)	D(E), p(E)	D(D), p(D)	D(B), p(B)	D(A),p(A)
0							
1							
2							
3							
4							
5	CEFDBG						
6							

3. Examine the network shown in Problem 2, above. Use the spanning tree algorithm given on pages 403 and 404 to draw a tree rooted at A (that is, router A is the *core*) that includes as "leafs" (end nodes) routers B, E, D, and F (assume G is not in the network). Note that the link between two nodes chosen is always the smallest one, and selection is NOT based on looking more than one node ahead.

4. Is it true that routers have IP addresses? Discuss the number of IP addresses a router might have. Ignore the multi-function "router" devices we use at home and work, and focus on the basic router functionality we've discussed in class.

5. Let's say we have a subnet with the prefix 128.119.40.128/26.
    a. Give an example of any one IP address that can be assigned to this network.

    b. Let's further say that an ISP owns a block of addresses of the form 128.119.40.64/26. This ISP wants to create four separate subnets from this block, with each block having the same number of IP addresses. What are the prefixes, using form A.B.C.D/X for the four subnets?

6. In your own words, describe the terms **subnet**, **prefix**, **and BGP route**.

7. Let's say that two packets arrive at two separate input ports of a router at the exact same time. Let's further assume that the router is otherwise clear of packets. Answer the following three questions:
    a. If the two packets are forwarded to two separate output ports by the router, is it possible to forward them through the switch fabric at the same time if the fabric is using a shared bus?

    b. If the two packets are forwarded to the same output port by the router, is it possible to forward them through the switch fabric at the same time if the fabric is using a crossbar?

    c. If the two packets are forwarded to two separate output ports by the router, is it possible to forward them through the switch fabric at the same time if the fabric is using a crossbar?

8. Can loops be detected in routing paths by BGP? Is possible, describe how. If not possible, describe why not.

9. Convert the IP address 223.1.3.27 to its 32-bit binary equivalent.

10. Let's say that datagrams are limited to only 1.5 kilobits, which includes the header. Assuming a 20-byte IP header, and a 20-byte TCP header, how many datagrams would be required to download a 5 million byte image file? Make sure you show your work.

11. We've discussed three different types of switching fabrics in section. In your own words, and describe each of these methods. Can any of these send multiple packets across the switching fabric at the same time (that is, in parallel)?

12. Imagine that you are trying to download the image file described in problem 10, and that your computer is behind a router that is using Network Address Translation (NAT) – i.e., packets sent from your computer will have their address translated to something else when they go through and out of your router to the internet. If the server you are trying to download the file from is *also* behind a NAT, can your computer establish a TCP connection to the server, assuming that your download application hasn't been specifically programmed to work with either or both NATs? Why or why not?

INSTRUCTIONS

Write up your answers in any way you see fit, including appropriate equations and descriptions. Submit the resulting work as a document upload to Canvas, either scanning your paper work, or producing the work initially on a computer. If you have multiple files, please enclose them in a zip file.

I recommend you work in groups. If you choose to do so, you must still write and turn in your own work.

Please post your questions onto the relevant Canvas Discussion board.

GRADING

Each problem is worth 10 points if correctly answered, and worked out with appropriate equations and descriptions. If an answer to a problem is only partially correct, or is grossly missing supporting work, the grader may instead assign 5 points. Completely wrong or unanswered problems are worth 0 points. The total available is 120 points for this assignment.