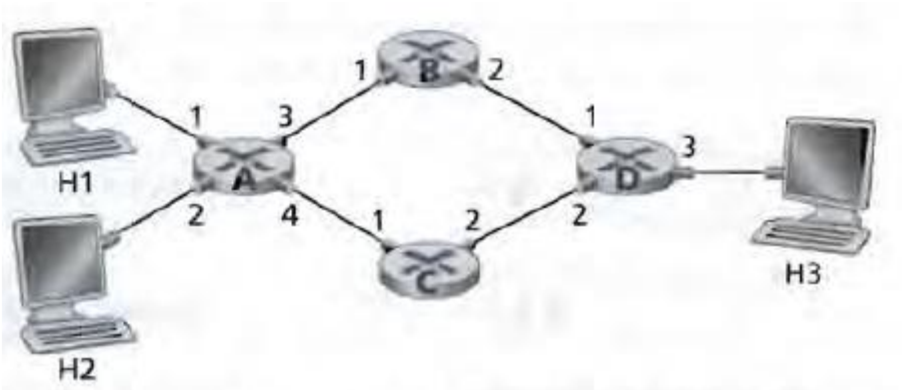
Chapter 4 Assignments

Note:

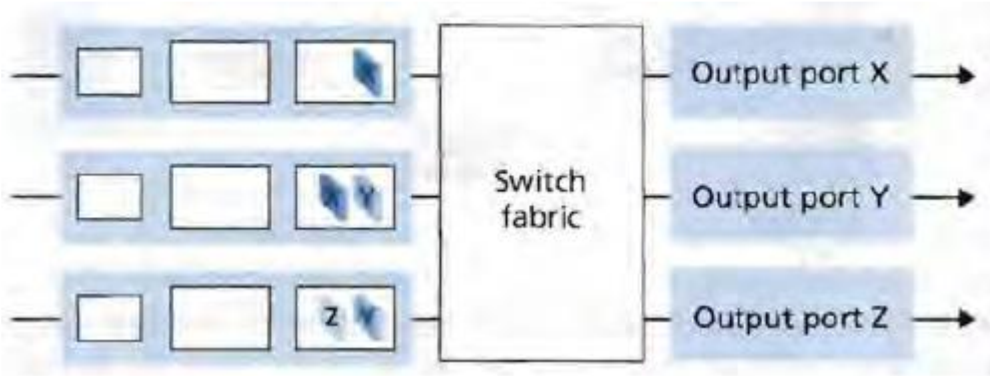
1. Due time: 25th May 2017

P4. Consider the network below.

a. Suppose that this network is a datagram network. Show the forwarding table in router A, such that all traffic destined to host H3 is forwarded through interface 3.
b. Suppose that this network is a datagram network. Can you write down a forwarding table in router A, such that all traffic from H1 destined to host H3 is forwarded through interface 3, while all traffic from H2 destined to host H3 is forwarded through interface 4? (Hint: this is a trick question.)
c. Now suppose that this network is a virtual circuit network and that there is one ongoing call between H1 and H3, and another ongoing call between H2 and H3. Write down a forwarding table in router A, such that all traffic from H1 destined to host H3 is forwarded through interface 3, while all traffic from H2 destined to host H3 is forwarded through interface 4.
d. Assuming the same scenario as (c), write down the forwarding tables in nodes B, C, and D.



P8. Consider the switch shown below. Suppose that all datagrams have the same fixed length, that the switch operates in a slotted, synchronous manner, and that in one time slot a datagram can be transferred from an input port to an output port. The switch fabric is a crossbar so that at most one datagram can be transferred to a given output port in a time slot, but different output ports can receive datagram from different input ports in a single time slot. What is the minimal number of time slots needed to transfer the packets shown from input ports to their output ports, assuming any input queue scheduling order you want (i .e. , it need not have HOL blocking)? What is the largest number of slots needed, assuming the worst-case scheduling order you can devise, assuming that a non-empty input queue is never idle?



P9. Consider a datagram network using 32-bit host addresses. Suppose a router has four links, numbered 0 through 3, and packets are to be forwarded to the link interfaces as follows:

Destination Address Range	Link Interface
11100000 00000000 00000000 00000000 through 11100000 00111111 11111111 11111111	0
11100000 01000000 00000000 00000000 through 11100000 01000000 11111111 11111111	1
11100000 01000001 00000000 00000000 through 11100001 01111111 11111111 11111111	2
otherwise	3

a. Provide a forwarding table that has four entries, uses longest prefix matching, and forwards packets to the correct link interfaces.
b. Describe how your forwarding table determines the appropriate link interface for datagrams with destination addresses:

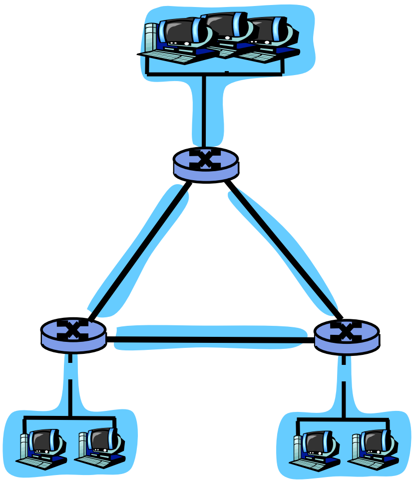
11001000 10010001 01010001 01010101
11100001 01000000 11000011 00111100
11100001 10000000 00010001 01110111

P14 In Problem P9 you are asked to provide a forwarding table (using longest prefix matching). Rewrite this forwarding table using the a.b.c.d/x notation instead of the binary string notation.

P16. Consider the topology shown below. Denote the three subnets with hosts (starting clockwise at 12:00) as Networks A, B, and C. Denote the subnets without hosts as Networks D, E, and F.

a. Assign network addresses to each of these six subnets, with the following constraints: All addresses must be allocated from 214.97.254/23; Subnet A should have enough addresses to support 250 interfaces; Subnet
B should have enough addresses to support 120 interfaces; and Subnet C should have enough addresses to support 120 interfaces. Of course, subnets D, E and F should each be able to support two interfaces. For each subnet, the assignment should take the form a.b .c.d/x or a. b. c .d/x – e. f. g. h/y.

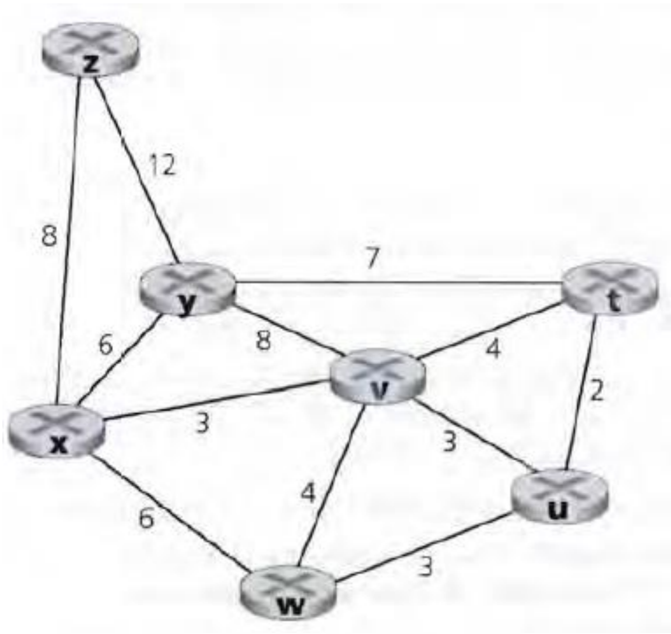
b. Using your answer to part (a), provide the forwarding tables (using longest prefix matching) for each of the three routers.



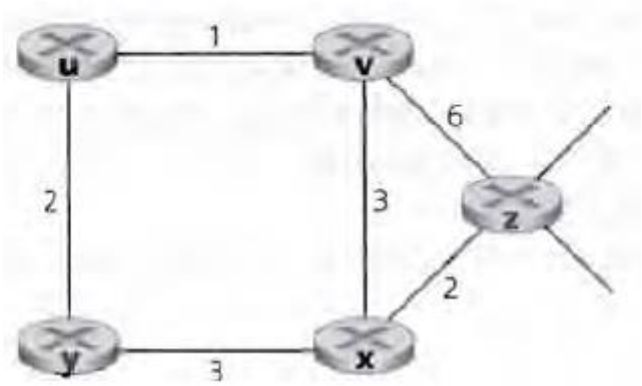
P24. Consider the following network. With the indicated link costs, use Dijkstra's shortest-path algorithm to compute the shortest path from *x* to all network nodes. Show how the algorithm works by computing a table similar to Table 4.3.

step	N'	D(v),p(v)	D(w),p(w)	D(x),p(x)	D(y),p(y)	D(z),p(z)
0	u	2,u	5,u	1,u	∞	∞
1	ux	2,u	4,x		2,x	∞
2	uxy	2,u	3,y			4,y
3	uxyv		3,y			4,y
4	uxyvw					4,y
5	uxyvwz					

Table 4.3 • Running the link-state algorithm on the network in Figure 4.27



P26. Consider the network shown below, and assume that each node initially knows the costs to each of its neighbors. Consider the distance-vector algorithm and show the distance table entries at node *z*.



Additional : Use WireShark to capture IP packets. Examine carefully of all the fields in an IP header, and answer the following questions:

1. Is the packet IPv4 or IPv6?
2. What is the type of the data in the IP packet, e.g. TCP or UDP or other protocols?
3. What is the length of the data in the IP packet?
4. What is the sequence No. and acknowledge No.? What should be the sequence No. and acknowledge No. of the response packet?
5. Examine the IP header of the response packet to check whether your answer to problem 4 is correct or not.
6. How many more hops it can go at maximum before it reaches the destination?

D2 (don't submit) Use the whois service at the American Registry for Internet Numbers (http://www.arin.net/whois) to determine the IP address blocks for MIT, and use the whois service at the Asia Pacific NIC (http://www.apnic.net/apnic-info/whois_search) to determine the IP address blocks of SJTU-CN and TSINGHUA-CN . Can the whois services be used to determine with certainty the geographical location of a specific IP address? Use http://bgp.he.net/report/world whois service to determine how many ASNs in China and the BGP peers to AS4538(CERNET)