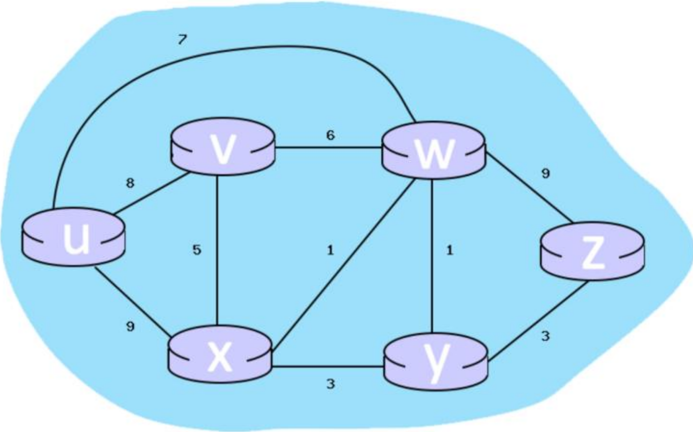
Chap 5.

Problems

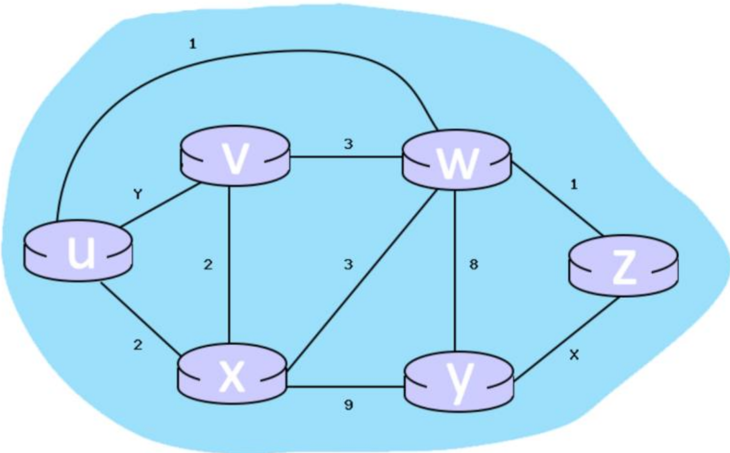
- P1. Consider the 6-node network shown below, with the given link costs.



Using Dijkstra's algorithm, find the least cost path from source node U to all other destinations and answer the following questions

a) What is the shortest distance to node v and what node is its predecessor? Write your answer as n,p
b) What is the shortest distance to node y and what node is its predecessor? Write your answer as n,p
c) What is the shortest distance to node x and what node is its predecessor? Write your answer as n,p

- P2. Consider the incomplete 6-node network shown below, with the given link costs.

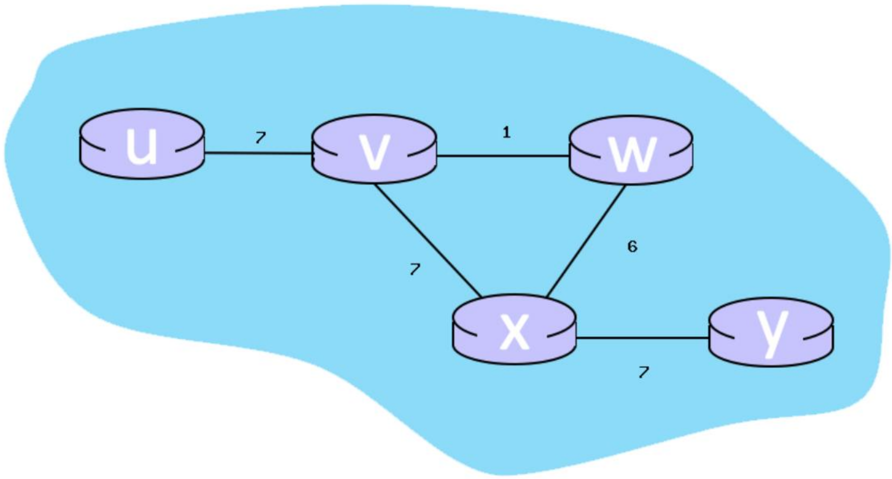


Consider the completed table below, which calculates the shortest distance to all nodes from X:

Node	Shortest distance from X	Previous Node
X	0	n/a
U	2	X
V	2	X
W	3	X
Z	4	W
Y	9	X

a) For link X, what is the cost associated with this link? If the answer can't be determined given the information, respond with 'n/a'
b) For link Y, what is the cost associated with this link? If the answer can't be determined given the information, respond with 'n/a'

■ P3. Consider the 6-node network shown below, with the given link costs:



a) When the algorithm converges, what are the distance vectors from router 'W' to all routers? Write your answer as u,v,w,x,y

b) What are the initial distance vectors for router 'V'? Write your answer as u,v,w,x,y and if a distance is ∞, write 'x'

c) The phrase 'Good news travels fast' is very applicable to distance vector routing when link costs decrease; what is the name of the problem that can occur when link costs increase?

Chap 6.

Problems

- P1. Suppose that a packet's payload consists of 10 eight-bit values (e.g., representing ten ASCII-encoded characters) shown below. (Here, we have arranged the ten eight-bit values as five sixteen-bit values):

Figure 1
10001100 01011101 01000001 01000111 10110000 11111101 10110100 10100100 01110011 01110100
Figure 2 Both the payload and parity bits are shown. One of these bits is flipped.
10001001 01111101 1 10110011 11000001 0 00101111 01011111 0 10010110 10000111 0 01101111 11010000 1 11100100 10110100 0
Figure 1 Both the payload and parity bits are shown; Either one or two of the bits have been flipped.
00000101 00111010 0 00111011 00010000 1 11011110 11110101 1 10111010 00110011 1 01111100 01101000 0 00100110 10000010 1

a) For figure 1, compute the two-dimensional parity bits for the 16 columns. Combine the bits into one string

b) For figure 1, compute the two-dimensional parity bits for the 5 rows (starting from the top). Combine the bits into one string

c) For figure 1, compute the parity bit for the parity bit row from question 1. Assume that the result should be even.

d) For figure 2, indicate the row and column with the flipped bit (format as: x,y), assuming the top-left bit is 0,0

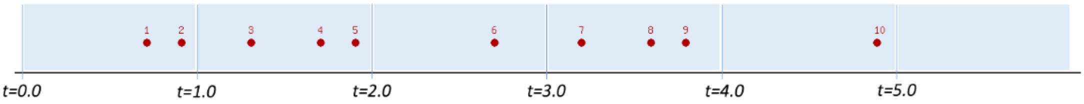
e) For figure 3, is it possible to detect and correct the bit flips? Yes or No

- P2. Consider the Cyclic Redundancy Check (CRC) algorithm discussed in Section 6.2.3 of the text. Suppose that the 4-bit generator (G) is 1001, that the data payload (D) is 10011001 and that r = 3.

a) What are the CRC bits (R) associated with the data payload D, given that r = 3?

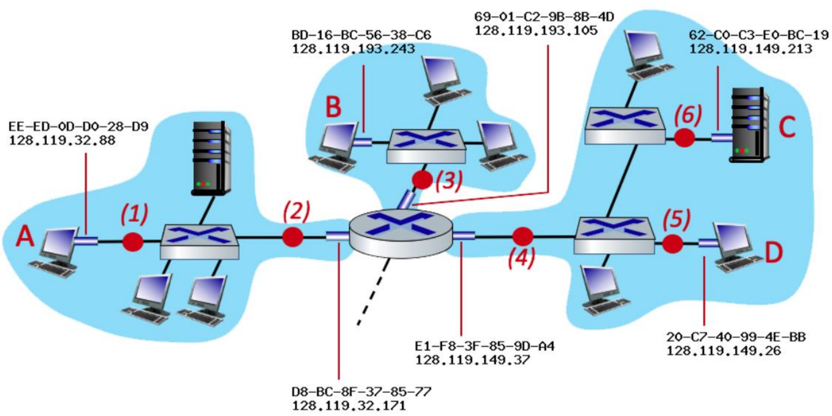
- P3. Assume that there are 2 active nodes, each of which has an infinite supply of frames they want to transmit, and these frames have a constant size of L bits. If two or more frames collide, then all nodes will detect the collision.
  There are two versions of the Aloha protocol: Slotted and Pure. In this problem we will be looking at the efficiency of these two variations. In the case of Slotted Aloha, frames will be sent only at the beginning of a time slot, frames take an entire time slot to send, and the clocks of all nodes are synchronized.
  Please round all answers to 2 decimal places.
  a) Given a probability of transmission p = 0.27, what is the maximum efficiency? (Aloha Protocol: Pure)
  b) Given a probability of transmission p = 0.74, what is the maximum efficiency? (Aloha Protocol: Pure)
  c) Given a probability of transmission p = 0.27, what is the maximum efficiency? (Aloha Protocol: Slotted)
  d) Given a probability of transmission p = 0.74, what is the maximum efficiency? (Aloha Protocol: Slotted)

- P4. Consider the figure below, which shows the arrival of 10 messages for transmission at different multiple access wireless nodes at times
  t = <0.7, 0.9, 1.3, 1.7, 1.9, 2.7, 3.2, 3.6, 3.8, 4.9> and each transmission requires exactly one time unit.
  (**Assume Aloha Protocol**.)



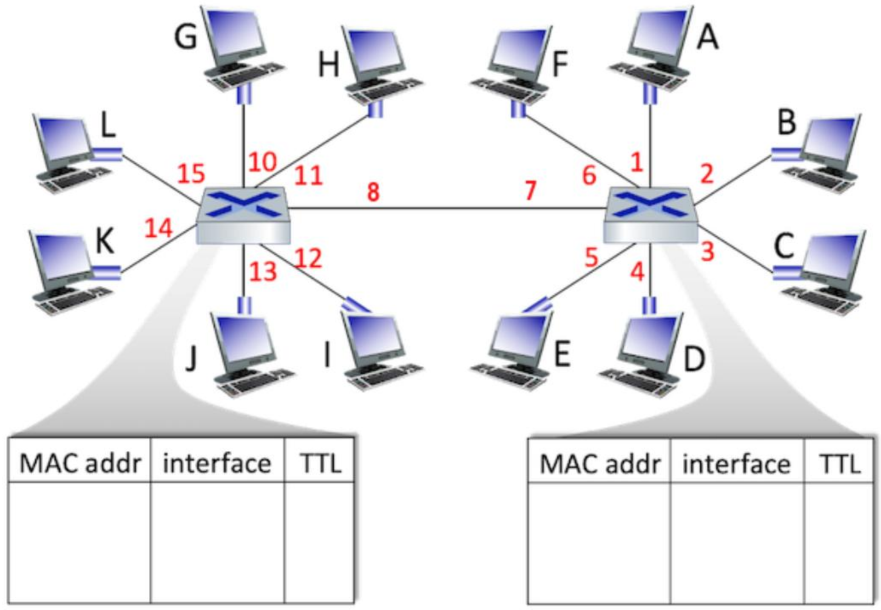
  a) Suppose all nodes are implementing the Aloha protocol. For each message, indicate the time at which each transmission begins. Separate each value with a comma and no spaces.
  b) Which messages transmit successfully? Write your answer as a comma seperated list with no spaces using the messages' numbers

- P5. Consider the figure below. The IP and MAC addresses are shown for nodes A, B, C and D, as well as for the router's interfaces.



  Consider an IP datagram being sent from node D to node B.
  a) What is the source mac address at point 5?
  b) What is the destination mac address at point 5?
  c) What is the source IP address at point 5?
  d) What is the destination IP address at point 5?
  e) Do the source and destinaton mac addresses change at point 4? Answer with yes or no.
  f) Do the source and destinaton mac addresses change at point 3? Answer with yes or no.
  g) What is the source mac address at point 3?
  h) What is the destination mac address at point 3?

- P6. Consider the LAN below consisting of 10 computers connected by two self-learning Ethernet switches. (You may want to re-read section 6.4.3 in the 8th edition textbook). At t=0 the switch table entries for both switches are empty. At t = 1, 2, 3, and 4, a source node sends to a destination node as shown below, and the destination replies immediately (well before the next time step).



Assume that the following transmissions occur (the transmissions in reply occur but are not shown in the list below):

t=1: I -> D

t=2: E -> J

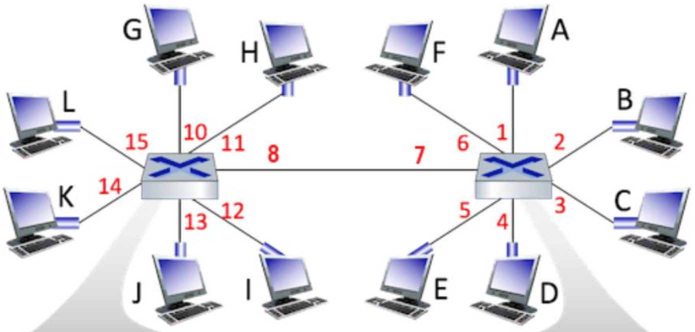
t=3: F -> C

t=4: B -> J

Fill out the two switch tables and answer the questions below.

a) At t=1, what is the source entry for switch 1? Format your answer as letter,number or 'n/a'
b) At t=1, what is the destination entry for switch 1? Format your answer as letter,number or 'n/a'
c) At t=1, what is the source entry for switch 2? Format your answer as letter,number or 'n/a'
d) At t=1, what is the destination entry for switch 2? Format your answer as letter,number or 'n/a'
e) At t=2, what is the source entry for switch 1? Format your answer as letter,number or 'n/a'
f) At t=2, what is the destination entry for switch 1? Format your answer as letter,number or 'n/a'
g) At t=2, what is the source entry for switch 2? Format your answer as letter,number or 'n/a'
h) At t=2, what is the destination entry for switch 2? Format your answer as letter,number or 'n/a'
i) At t=3, what is the source entry for switch 1? Format your answer as letter,number or 'n/a'
j) At t=3, what is the destination entry for switch 1? Format your answer as letter,number or 'n/a'
k) At t=3, what is the source entry for switch 2? Format your answer as letter,number or 'n/a'
l) At t=3, what is the destination entry for switch 2? Format your answer as letter,number or 'n/a'
m) At t=4, what is the source entry for switch 1? Format your answer as letter,number or 'n/a'
n) At t=4, what is the destination entry for switch 1? Format your answer as letter,number or 'n/a'
o) At t=4, what is the source entry for switch 2? Format your answer as letter,number or 'n/a'
p) At t=4, what is the destination entry for switch 2? Format your answer as letter,number or 'n/a'

- P7. Consider the LAN below consisting of 10 computers connected by two self-learning Ethernet switches. (You may want to re-read section 6.4.3 in the text). At t=0 the switch table entries for both switches are empty. At t = 1, 2, 3, 4, 5, 6, 7, 8, and 9, a source sends to a destination as shown below, and the destination replies immediately (well before the next time step).



MAC addr	interface	TTL
A	8	1
J	13	2
I	12	9
K	14	4
E	8	5
G	10	9
L	15	6
B	8	8
H	11	7

MAC addr	interface	TTL
A	1	3
E	5	5
J	7	2
K	7	4
G	7	5
I	7	8
B	2	8
H	7	7

a) At t=8, what two nodes communicated? Write your answer in alphabetical order as x,y (If there is only enough information for 1 node, write that, and if there's no information, write 'n/a')

b) At t=6, what two nodes communicated? Write your answer in alphabetical order as x,y (If there is only enough information for 1 node, write that, and if there's no information, write 'n/a')

c) At t=9, what two nodes communicated? Write your answer in alphabetical order as x,y (If there is only enough information for 1 node, write that, and if there's no information, write 'n/a')

d) At t=3, what two nodes communicated? Write your answer in alphabetical order as x,y (If there is only enough information for 1 node, write that, and if there's no information, write 'n/a')