Homework #4	CS 372	Rhea Mae Edwards

Review Questions

R3) The Difference Between Routing and Forwarding:

- Routing determines the route taken by packets from a source to a destination
- Forwarding is the movement of packets from router's input to the appropriate router output.

- Overall, the difference between routing and forwarding is like the overall picture/trip of a traveling packet is the routing process, and forwarding just represents the movement through a single hop/part of the trip.

R8.) Three Types of Switching Fabrics:

1) Memory: Usually used in traditional computers with switching under direct control of the CPU, where packets are copied to the system's memory, and that the speed is limited by the memory's bandwidth of 2 bus crossings per datagram

2) Bus: A datagram travels from an input port memory to an output port memory by a "shared bus". There's also a bus contention where the switching speed is limited by the bus bandwidth.

3) Crossbar: Developed to overcome bus bandwidth limitations that is also made to connect processors in a multiprocessor, by fragmenting a datagram in fixed length cells, that are then switch cells through the fabric with more advanced networks

Switching via an interconnected network (crossbar) can send multiple packets across the fabric in parallel, where more sophisticated interconnection networks use multiple stages of switching elements to allow packets from different input ports to proceed towards the same output port at the same time through the switching fabric.

R12) Yes, routers have IP addresses, and they have an address for each interface that the router has, so as many interfaces that the router has, is the number of IP addresses it has.

R17) There's a field within the data section of an IP datagram which has 8-bits that contains information for the network layer in Host B to read to let it know whether it should pass the segment (payload of the datagram) to TCP rather than to UDP or to something else

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Problems

P11)

Prefix Match	Interface
00	0
010	1
011	2
10	2
11	3

- For each of the four interfaces, associated range of destination host addresses and number of addresses in the range
- 8-bit Host Addreses

Interface	Range of Destination Host Addresses
0	00000000 through 00111111
1	01000000 through 01011111
2	01111111 through 10111111
3	11000000 through 11111111

Number of Addresses for Each Range = $2^8 / 4$ = 64 addresses

P13) Subnet 1, Subnet 2, Subnet 3

Prefix: 223.1.17/24

60 interfaces (s1)
90 interfaces (s2)
12 interfaces (s3)
} required

router interconnects

Three Network Addresses (a.b.c.d/x) that satisfy constraints:

2^8	2^7	2^6	2^5	2^4	2^3	2^2	2^1
256	128	64	32	16	8	4	2
	↑→		↑→		↑→		
	Subnet 2		Subnet 1		Subnet 3		

Subnet 2 Network Address

223.1.17.0000000/25 → 223.1.17.0 to 223.1.17.127

(128)

223.1.17.0

Subnet 1 Network Address

223.1.17.10000000/26 → 223.1.17.128 to 223.1.17.191

(64)

223.1.17.128

Subnet 3 Network Address

223.1.17.1100 0000/28 → 223.1.17.192 to 223.1.17.207

(16)

223.1.17.192

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P32) Count-to-Infinity in Distance Vector Routing

No, the count-to-infinity problem will not occur if we decrease the cost of a link, because the decreasing link won't cause a loop. When we connect two nodes that don't have a link, we also won't have the count-to-infinity problem occur, because it's similar to decreasing a link from some infinite weight to some finite weight.

Additional Questions

A1) Dijkstra's Shortest Path Algorithm
- From u to all network nodes

Step	N'	D(s),p(s)	D(t),p(t)	D(v),p(v)	D(w),p(w)	D(x),p(x)	D(y),p(y)	D(z),p(z)
0	u	4,u	2,u	(1,u)	3,u	∞	∞	∞
1	uv	4,u	(2,u)		2,v	4,x	2,v	∞
2	uvt	3,t			(2,v)	4,x	2,v	4,t
3	uvtw	3,t				3,w	(2,v)	4,t
4	uvtwy	(3,t)				3,w		4,t
5	uvtwys					(3,w)		4,t
6	uvtwysx							(4,t)
7	uvtwysxz							

A2) Distance-Vector Algorithm
- Node z's distance table for each iteration

	cost to u	v	x	y	z
from z	4	5	2	3	0

General Format used: $D_x(y) \leftarrow \min_v \{c(x,v) + D_v(y)\}$ for each node $y \in N$

$D_z(u) = \min\{c(z,x) + D_z(u)\} = \min\{2+2\} = (4)$

$D_z(v) = \min\{c(z,v) + D_z(v)\} = \min\{5+0\} = (5)$

$D_z(x) = \min\{c(z,x) + D_z(x)\} = \min\{2+0\} = (2)$

$D_z(y) = \min\{c(z,x) + D_x(y)\} = \min\{2+1\} = (3)$

$D_z(z) = \min\{c(z,z) + D_z(z)\} = \min\{0+0\} = (0)$

These formulas don't include the other possible paths represented within the graph, only the calculations of the shortest one presented.