

CMPT 371: Solutions to Homework 3

March 19, 2007

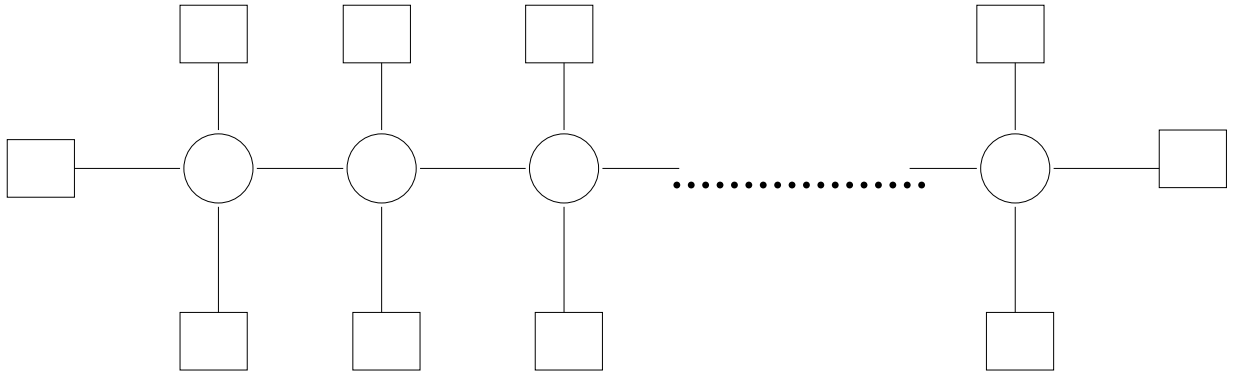
1. (a) In slow-start mode, the size of the window approximately doubles each time the sender finishes sending the current window. Therefore, the sender would send a window of size 1 MSS, then a window of size 2 MSS, etc. The file consists of 2^{10} MSS. Since $\sum_{i=0}^9 2^i = 2^{10} - 1$, the sender will finish sending the file on the 11th window. Let j be the smallest integer such that $2^j \cdot \text{MSS}/R \geq \text{MSS}/R + \text{RTT}$. Then the sender takes

$$j(\text{MSS}/R + \text{RTT}) + (2^{10} - 2^j + 1) \text{MSS}/R.$$

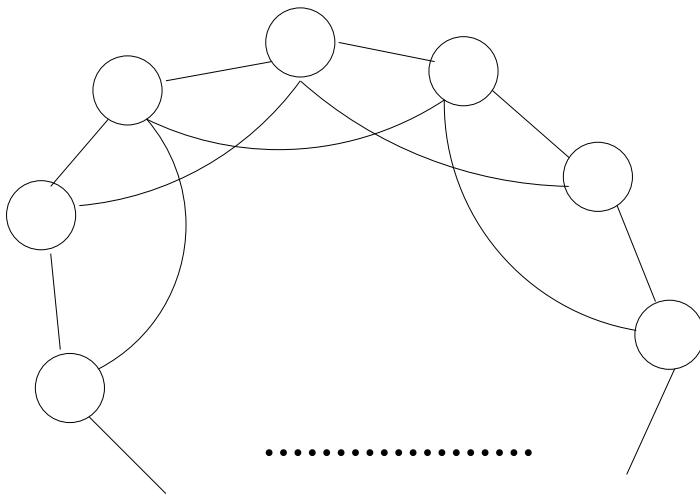
(b) The window has size 2^{10}MSS .

- (c) In AIMD mode, the window size increases by about 1 MSS whenever the sender finishes sending the current window. Since the window starts at 2^9 MSS, it only takes two windows to send the entire file. This takes about the minimum of $2(\text{MSS}/R + \text{RTT})$ and $2^{10}\text{MSS}/R$.

2. Many ($3N + 1$ subnets):



Few ($2N$ subnets):

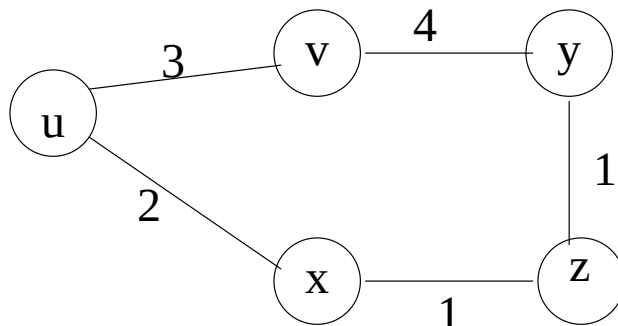


3. There are 32 5-bit addresses. We need at least $\lceil \frac{32}{7} \rceil = 5$ links, and this is certainly enough. Note that some of these links need to service the maximum number of addresses (7) because $5 \times 6 = 30 < 32$. A straightforward forwarding table would be:

Address range	link
00000-00110	0
00111-01101	1
01110-10100	2
10101-11011	3
11100-11111	4

In prefix form (sort of trying to minimize the number of entries):

Address prefix	link
0	0
00111	1
01	1
0111	2
1	2
10	3
110	3
111	4



4. (a)

	Step	N'	D(u),p(u)	D(v),p(v)	D(x),p(x)	D(y),p(y)	D(z),p(z)
	0	u	0,u	3,u	2,u	∞ ,Nil	∞ ,Nil
(b)	1	u,x		3,u	2,u	∞ ,Nil	3,x
	2	u,x,v		3,u	2,u	7,v	3,x
	3	u,x,v,z				4,z	3,x
	4	u,x,v,z,y				4,z	

	Round	Messages
(c)	1	v:((u,3),(y,4)), x:((u,2),(z,1))
	2	v:((u,3),(y,4),(x,5),(z,6)), x:((u,2),(z,1),(v,5),(y,2))