Network 20q HW8

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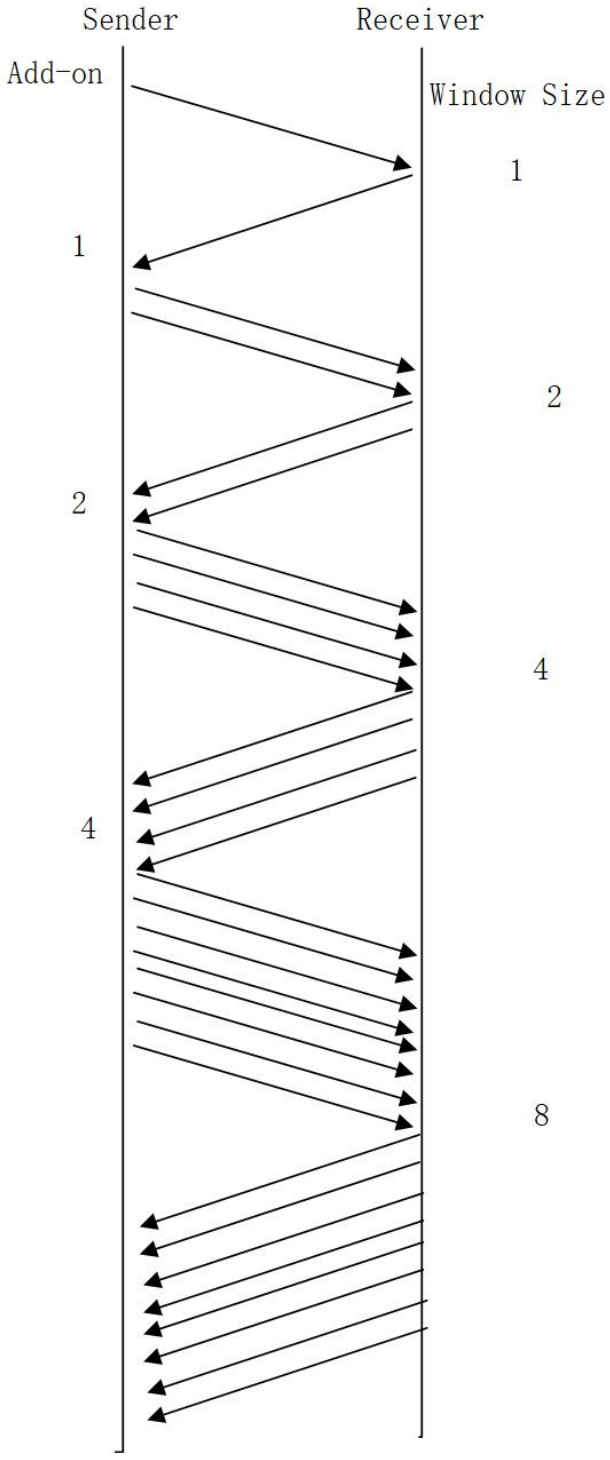
1 TCP slow start

In this question, while the windows size of a TCP session w would increase by 1 for each ACK received. So for a connection without lost, we would have the following transition.

Round	Add-on	Current Window Size
1	0	1
2	1	2
3	2	4
4	4	8
...	...	...
n	2^{n-2}	2^{n-1}

(1)

The Window Size would grow exponentially with the time slide.
So the time-space diagram for the first four RTT would be like:

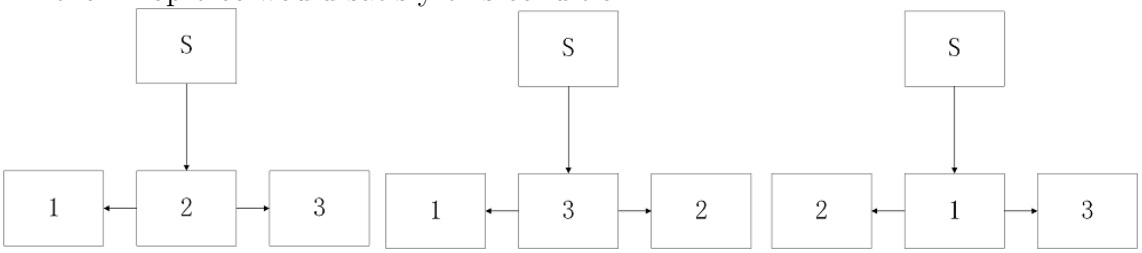

Sender
Receiver
Add-on
Window Size
1
1
2
2
4
4
8

2 Embedding Tree

2.1 a

$$r_{max} = min\{u_s, \frac{u_s + \sum u_i}{N}\} = min\{2, \frac{2+3+2+1}{3}\} = min\{2, \frac{8}{3}\} = 2 \quad (2)$$

All the 2-hop tree would satisfy this condition:



2.2 b

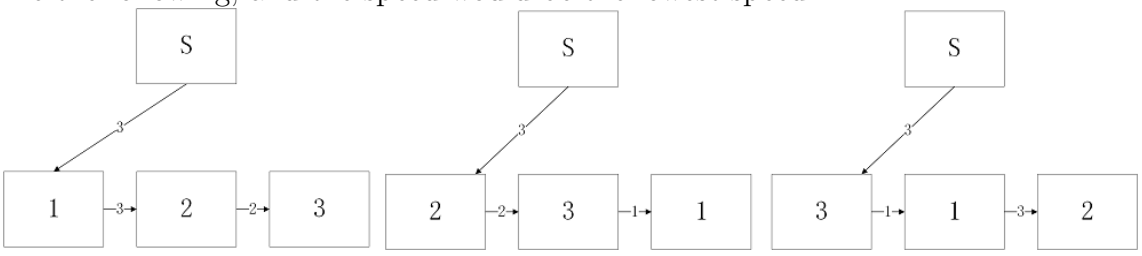
$$r_1 = \frac{2}{1+2+3} * 2 = \frac{2}{3} \quad (3)$$

$$r_1 = \frac{1}{1+2+3} * 2 = \frac{1}{3} \quad (4)$$

$$r_1 = \frac{3}{1+2+3} * 2 = 1 \quad (5)$$

2.3 c

Under this condition, the link could only pass one link, so the graph would be like the following, and the speed would be the lowest speed.



$$r_1 = 2 \quad (6)$$

$$r_2 = 1 \quad (7)$$

$$r_3 = 1 \quad (8)$$