Home assignment set 5: Fairness

Problem 1

Consider the network given on the Fairness lecture slide 9. Find the max-min fair allocation, when two of the flows have limited bandwidth requirements as follows: $r_{1,\max} = 1/2$ and $r_{2,\max} = 1/5$.

Problem 2

Consider a modified parking lot scenario. The network has two links of capacity 1. Flow 1 goes through both links, while flows 2 and 3 use only link 1. Calculate the max-min fair rate allocation, the proportional fair allocation and the allocation that minimizes the potential delay. Define also the set of possible allocations that maximizes the sum of the rates. Can you conclude something based on the results?

Problem 3

Consider a network where congestion is controlled by fixed size window control, and nodes implement fair queuing (a packet based version of GPS). What kind of fairness does this network achieve? What is the effect of the window sizes and the round trip times? (You need to read the Massoulie-Roberts paper.)