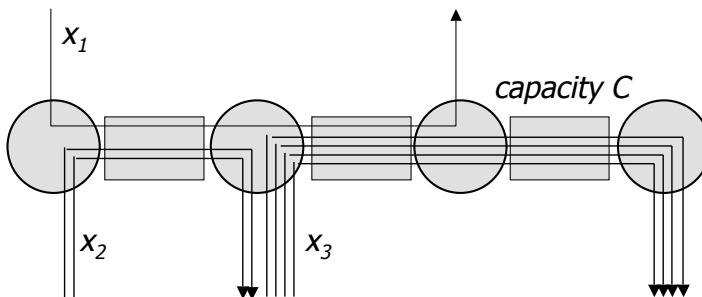


1 Congestion control

Consider the network presented in Figure 1. We have seven sources: one source with rate x_1 , two sources with rate x_2 , and four sources with rate x_3 . Each of the links has the same capacity C .

1. Compute x_i assuming that the rates are distributed according to the max-min fairness.
2. Compute x_i assuming that the rates are distributed according to the proportional fairness.

Figure 1: Example network with flows



Solution.

1. max-min fairness:

$$x_1 = C/5, 2x_2 = C - C/5 = 4C/5, x_2 = 2C/5, x_3 = C/5$$

2. proportional fairness:

$x_1 + 2x_2 = C, x_1 + 4x_3 = C$, so we can maximize the function:

$$f(x_1) = \ln(x_1) + 2\ln((C - x_1)/2) + 4\ln((C - x_1)/4)$$

and we obtain:

$$x_1 = C/7, x_2 = 3C/7, x_3 = 3C/14$$