A Fixed-Point Approximation for a Routing Model in Equilibrium

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Abstract

The following dynamic route-allocation model was studied fairly extensively in the 1990s. There are a number of nodes, and calls arrive between each pair as a Poisson process. Where possible, a call is allocated to the direct link between the two nodes. However, the link between each pair of nodes has a fixed capacity: when the direct link is at capacity, some number of two-link paths is inspected, and one of them is used for the incoming call if possible. The duration of each call is an exponential random variable with fixed mean. It is natural to expect that, in equilibrium, around each node, the number of links of each load will be an approximation to the fixed point of a certain differential equation, provided there is just one fixed point. We show that this is indeed true provided the arrival rate is sufficiently small. We also survey what is known about this model.

(joint work with Malwina Luczak, QMUL)