A differential equation method with applications to routing models I

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We present some new concentration of measure inequalities for discrete time Markov chains, and illustrate their application by analysing a well-studied routing model in greater depth than had previously been possible. In the model, calls arrive for each pair of endpoints in a fully-connected network as a Poisson process, and calls have exponential durations. Each call is routed either along the link connecting its endpoints, or, if the direct route is unavailable, along a two-link path between them, via an intermediate node.

We study the distributions of the number of calls on links around each node, both in a time-dependent setting and in equilibrium. In equilibrium, we show that, under suitable conditions, the proportions of links of each load j is strongly concentrated around the jth coordinate of the fixed point of a certain differential equation.

(Joint work with Malwina Luczak)