MARKOV MODULATED TWO NODE FLUID NETWORK: TAIL ASYMPTOTICS OF THE STATIONARY DISTRIBUTION

M. Miyazawa, Tokyo University of Science, Japan, miyazawa@is.noda.tus.ac.jp

We consider a Markov modulated two node fluid network with unlimited buffers. Exogenous fluid input and potential release rates at each node are modulated by a finite state Markov chain. A constant fraction of the output from one node is transferred to the other, and these fractions are assumed to be not modulated. Thus, this model is a network generalization of standard Markov modulated single and tandem fluid queues. We describe it by a continuous time Markov modulated two dimensional reflecting process on the quadrant. Similar to a semi-martingale reflecting Brownian motion, regulators play a key role to handle reflection here.

We are interested in tail asymptotic behaviors of the stationary distribution of this continuous time reflecting process, provided it is stable. For this, we derive the convergence domain of the moment generating function of the stationary distribution in terms of the modeling primitives. This gives an upper bound for the tail decay rate of the marginal distribution in an arbitrary direction. This bound is obtained as the solution of an optimization problem for a linear objective function with a finite number of linear and quadratic constrains. We conjecture it to be the decay rate. Some technical evidence is provided for this conjecture.