Networks of Queues with Feedback Information

This project is about queueing networks with *feedback information*, i.e., we consider networks of queues in which the behavior of some queue(s) depends on the current state of one or more of the other queues. The resulting mathematical models are intrinsically difficult to study, since one cannot consider any queue in isolation anymore; even knowing the local arrival process at this queue does not give sufficient information to determine the performance measures of interest.

We will especially focus on feedforward networks, where customers move from one queue to the next without returning to previously visited queues. However, the novelty is that information *is* allowed to flow in the opposite direction. Hence, the evolution of some queue depends on the 'upstream' queue(s) through the jobs leaving these queues, but also on the 'downstream' queue(s). We intend to study both traditional queues (with or without random environment) and fluid queues, while the particular form of the feedback information will vary.

Our primary goal is to characterize the steady-state behavior of the stochastic network under consideration. In more complex systems, we will resort to asymptotics. Furthermore we are interested in finding fast simulation methods and stability conditions for these models. The techniques to be used are Markov chain analysis (particularly with Quasi Birth-Death structure), Large deviations theory and Importance sampling.

For this challenging project we are looking for a student with strong mathematical skills, preferably having a background in stochastic processes. Please contact Dr. Werner Scheinhardt (w.r.w.scheinhardt@math.utwente.nl) and Prof.Dr. Richard Boucherie (r.j.boucherie@math.utwente.nl) for further information.