Queues and Networks with Losses, Overflows or Blocking

[11 Tavor 10:00-11:30]

Chair: Yoni Nazarathy, The University of Queensland

1. Peter G. Taylor, The University of Melbourne, Blocking Probabilities in Queues with advance reservations

Queues where on “arrival” customers make a reservation for service at some time in the future are endemic in practice and under analyzed in theory. Simulations illustrate some interesting implications of the facility to make such reservations. For example introducing independent and identically distributed reservation periods into an Erlang loss system increases the blocking probability above that given by the Erlang B formula, thus degrading system throughput (despite the fact that the process of ‘reserved arrivals’ is still Poisson).In this talk I shall discuss some analysis that approximates the blocking probability of a finite system by the probability that there is not enough room to fit a new customer into the “bookings diary” for the infinite server system. Joint work withR.J. Maillardet

2. Ivo Adan, Eindhoven University of Technology, Performance analysis of zone-picking systems

In this talk we consider zone picking systems, where order totes travel between zones and visit only those zones where items need to be collected. However, if an order tote tries to enter a zone and this zone is fully occupied, then the tote is blocked and recirculated in the network, trying to enter in the next cycle. This system is approximated by a closed multi-class queueing network with jump-over blocking, which has a product-form solution. We develop an iterative algorithm based on mean value analysis to evaluate blocking probabilities and performance characteristics such as utilization and throughput.

3. Erjen Lefeber, Eindhoven University of Technology, Finite Buffer Fluid Networks with Overflows

Consider a network where each node has a finite buffer of capacity Ki and a single processor. Material is modeled as a continuous flow and arrives to the nodes exogenously. When material arrives to node i and finds less than Ki in the buffer then it either enters the buffer or is immediately processed if the buffer is empty. Material which is processed at node ican either leave the system or move to other nodes. This follows the proportions pi,j (the proportion of material leaving i which goes to j)with sum j pi,j <= 1; in case the inequality is strict, the remaining material leaves the system. When material arrives to find a full buffer it is diverted (overflows) according to propositions qi,j similarly to the pi,j. The case of random discrete memory less flows and Ki = 8 is the well-known Jackson network and has a product form solution in the stable case. As opposed to that, finite Ki typically implies intractability of the Markov Chain. In this case it is first fruitful to analyze the behavior of the system with deterministic continuous flows. In this respect we formulate traffic equations and show that they can be represented as a linear complementarity problem solved in polynomial time. The solution of the traffic equations is used to approximate the sojourn time distribution of customers through the network which can be represented as a discrete phase-type distribution. Joint work with Stijn Fleuren and Yoni Nazarathy.