Admission Control for Tandem Loss Networks

Motivated by communication networks, we study an admission control problem for a loss system consisting of two finite capacity service stations in series. Customers arrive to station 1 according to a Poisson process and a gatekeeper who has complete knowledge of the number of customers at both stations decides to accept or reject each arriving customer. If a customer is rejected, a cost $c_1$ is incurred. If an admitted customer finds that station 2 is full at the time of his service completion at station 1, he leaves the system and a cost $c_2$ is incurred. We obtain structural results on the optimal admission control policy for minimizing the long-run average loss cost per unit time. Specifically, we prove that if the capacity of either station is one, the optimal policy is either to accept a customer whenever there is space at station 1, or to admit an arrival only if the customer will not be lost at station 2 (hence, there is no middle ground). For the general model, we first present sufficient conditions under which these two policies are still optimal and then provide the structure of the optimal policy for systems with small buffer sizes. Using these insights, we design heuristic admission control policies. Our numerical results indicate that in general the heuristics yield near optimal long run average cost performance.

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