Admission Control for Tandem Loss Systems

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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 present several conjectures, such as that the optimal policy is not monotone in the congestion level of the system and yet monotone in the probability that a potentially accepted customer will be lost at station 2. We present analytical and experimental results to substantiate these conjectures and discuss relevant implications, including those for more general loss systems. (A paper on this work can be found at http://www2.isye.gatech.edu/~bzhang34/ZA0710.pdf.)