

Dynamic Service Sharing with Heterogeneous Preferences

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Abstract

We consider a service system where individual users share a common resource, modeled as a processing-sharing queue. Arriving users observe the current load in the system, and should decide whether to join it or not. The motivation for this model is based, in part, on best-effort service classes in computer communication networks. This decision problem is modeled as a noncooperative dynamic game between the users, where each user will enter the system only if its expected service time (given the system description and policies of subsequent users) is not larger than its quality of service (QoS) requirement. The present work generalizes a previous one by Altman and Shimkin (1997), where all users were assumed identical in terms of their QoS requirements; here we allow heterogeneous requirements, hence different policies. The main result is the existence and uniqueness of the equilibrium point in this system, which specifies a unique threshold policy for each user type. Computation of the equilibrium threshold are briefly discussed, as well as dynamic learning schemes which motivate the Nash equilibrium solution for this system.