Research School for Operations
Management and Logistics

(Online) Learning (and Scheduling) Algorithms for Optimal Task Replication and Server Selection

Youri Raaijmakers – TU/e

In my PhD, I will study the class of queueing systems that exploit redundant jobs to improve system behavior. This may represent the behavior of server farms. Consider a system with N servers where tasks arrive as a Poisson process of rate λ. The jobs have independent and identically distributed service requirements governed by some distribution function B(·). The service speeds (R1, R2,…,RN) for a particular job at the various servers have a joint distribution F(r1, r2,…,rN). For a particular job with a given service requirement b, Ti = b/Ri may be interpreted as the service time when executed by server i. If the distribution F(·) is discrete, and has mass p1,p2,…,pM in M points, then jobs can equivalently be thought of as belonging to one of M classes, with corresponding arrival rates λ pi.
We are interested in a scenario where the distribution F(·) is known, and even the arrival rate λ and service requirement distribution B(·) may be known, but the values of the service speeds for individual jobs cannot be directly observed. Or equivalently, in case the distribution F(·) is discrete, the class memberships of jobs cannot be explicitly identified.
We allow for jobs to be interrupted and/or replicated to be processed by multiple servers simultaneously. A job is completed as soon as it receives its full service requirement from one of the servers. We intend to study various dispatching rules, assignment rules of jobs to servers, with the aim of optimizing system behavior under certain constraints.