Quantitative Modeling In Parallel Systems

The $M/G/1$ queue with negative customers

Peter G. Harrison Edwige Pitel
Department of Computing, Imperial College
180 Queen's Gate, London SW7 2BZ

D W2.T1.6-3.v1

23 July 1993

Distribution Level: Public

Approved by: P. Harrison

Abstract We derive expressions for the generating function of the equilibrium queue length probability distribution in a single server queue with general service times and independent Poisson arrival streams of both ordinary, positive customers and negative customers which eliminate a positive customer if present. For the case of first come first served queueing discipline for the positive customers, we compare the killing strategies in which either the last customer in the queue or the one in service is removed by a negative customer. We then consider preemptive-restart last come first served queueing discipline for the positive customers, combined with the elimination of the customer in service by a negative customer – the case of elimination of the last customer yields an analysis similar to first come first served discipline for positive customers. The results show different generating functions in contrast to the case where service times are exponentially distributed. This is also reflected in the stability conditions.

The QMIPS Project: The QMIPS project is a collaborative research project supported by the CEC as ESPRIT-BRA project no 7269. It is being carried out by the following organisations: CWI (Amsterdam), EHEI (University of Paris V), Imperial College (London), INRIA (Sophia-Antipolis), University of Erlangen, University of Newcastle, University of Torino and University of Zaragoza.