Modeling and Optimization of Buffers and Servers in Finite Queueing Networks[*]

Helgem S. Martins[1], Frederico R. B. Cruz[2],
Anderson R. Duarte[1], Fernando L. P. Oliveira[1]

[1]*Departamento de Estatística*
Universidade Federal de Ouro Preto
35400-000 - Ouro Preto - MG, Brazil

[2]*Departamento de Estatística*
Universidade Federal de Minas Gerais
31270-901 - Belo Horizonte - MG, Brazil

helgem@ufop.edu.br, fcruz@est.ufmg.br
anderson.duarte@ufop.edu.br, fernandoluiz@ufop.edu.br

March 23, 2019

Abstract

The joint buffer and server optimization problem (BCAP) is a non-linear optimization problem with integer decision variables that optimizes the numbers of buffers and servers such that the resulting throughput is greater than a pre-defined threshold throughput. This work presents a detailed review of the current literature that addresses allocation problems, particularly the BCAP, and a quite effective methodology for solving this problem, which consists of a combination of approximate methods and the Powell algorithm, a derivative-free optimization algorithm. The methodology was applied to networks of queues in the basic topologies series, split, and merge, producing very encouraging results that pointed at robust and homogeneous solutions.

Keywords: Buffer and server allocation, finite queues, queueing networks, generalized expansion method.