# Optimal Resource Allocation in Networks of General Single-server Finite Queues *

Gabriel L. Souza [1], Anderson R. Duarte [2],
Frederico R. B. Cruz [3], Gladston J. P. Moreira [1]

[1]*Computing Department*
*Universidade Federal de Ouro Preto*
*35400-000 - Ouro Preto - MG, Brazil*

[2]*Statistics Department*
*Universidade Federal de Ouro Preto*
*35400-000 - Ouro Preto - MG, Brazil*

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

gabriel.souza65@gmail.com, anderson.duarte@ufop.edu.br,
fcruz@est.ufmg.br, gladston@ufop.edu.br

**Abstract**

This study considers simultaneously minimizing the total buffer allocation and the overall service rates in the network while maximizing its throughput. Some algorithms have already been proposed in the literature, but the discussion of efficient alternatives is relevant. We develop a novel approach to multi-objective particle swarm optimization. To optimize throughput, we apply this approach to an acyclic, general single-server finite queueing network. This algorithm was specifically tailored to address the problem, which involves mixed-integer variables and constraints dependent on the current solution, as service rates cannot fall below arrival rates. The proposed approach simultaneously decreases the total buffer allocation and the overall service rate together. Consequently, our method yields a suboptimal Pareto set for these conflicting objectives. We performed a computational, experimental set to verify the effectiveness of the presented approach and compare it with previously proposed solutions. The insights gained can enhance the design of networks of queues.

**Keywords:** Multi-objective optimization; particle swarm optimization; buffer allocation; service rate allocation; queueing networks; conflicting objectives.

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