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A blind policy for equalizing cumulative idleness

Rami Atar* Yair Y. Shaki† Adam Shwartz‡

Department of Electrical Engineering
Technion–Israel Institute of Technology
Haifa 32000, Israel

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Abstract

We consider a system with a single queue and multiple server pools of heterogenous exponential servers. The system operates under a policy that always routes a job to the pool with longest cumulative idleness among pools with available servers, in an attempt to achieve fairness toward servers. It is easy to find examples of a system with a fixed number of servers, for which fairness is not achieved by this policy in any reasonable sense. Our main result shows that in the many-server regime of Halfin and Whitt, the policy does attain equalization of cumulative idleness, and that the equalization time, defined within any given precision level, remains bounded in the limit. An important feature of this policy is that it acts 'blindly', in that it requires no information on the service or arrival rates.

Keywords: Blind control; Diffusion limits; Halfin-Whitt regime; Fairness; Many-server systems

1 Introduction

The performance and optimization of systems with a large number of servers has attracted much attention in recent years. This is due to their applicability—for example to call centers—as well as to their interesting structure. Since exact analysis proves impossible in most cases, large part of research has focused on asymptotics. Particularly, the many-server diffusion regime introduced by Halfin and Whitt [9] has been widely studied and is the subject of ongoing research. Under this regime, both the arrival rates and the number of servers are scaled up

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