

Queueing models for autoscaling algorithms: Exact and asymptotic solutions

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In many modern computer systems such as data centers or 5G systems, computing resources are scaled in/out to adapt with varying demands and to save energy consumption. However, scaling in/out the resources may incur some setup delay, which potentially increases the response time and energy consumption. In this study, we present the queueing analysis of such a system to quantify the tradeoff between delay performance and energy consumption, in which we derive efficient algorithms for the stationary distribution of the underlying multi-dimensional queueing processes. We then present the analysis of the response time distribution, which is further utilized for a game-theoretical analysis of such models with strategic customers. We also extend to some models with abandonments or retries for which scaling limits are also considered.

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