To Pool or Not to Pool:
Queueing Design for Large-Scale Service Systems

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Abstract:

There are two basic queue structures commonly adopted in service systems: the pooled structure where waiting customers are organized into a single queue served by a group of servers and the dedicated structure where each server has her own queue. Although the pooled structure, known to minimize the servers' idle times, is widely used in large-scale service systems, this study reveals that the dedicated structure, along with the join-the-shortest-queue routing policy, could be more advantageous for improving some service levels, such as the probability of a customer's waiting time being within a delay target. The servers' additional idleness resulted from the dedicated structure will be negligible when the system has many servers. Using a fluid model substantiated by asymptotic analysis, we provide a performance comparison between the two structures for a moderately overloaded queueing system with customer abandonment. We intend to help service system designers answer the following questions: To achieve a specified service level, which queue structure will be more cost-effective? How many servers can be saved by converting one structure into the other? Aside from structure design, our results are also of practical value for performance analysis and staffing deployment.

Biography:

Prof. Junfei Huang is an associate professor of the Department of Decision Sciences and Managerial Economics at The Chinese University of Hong Kong. His research interests are in asymptotic analysis and optimal control of queuing systems and their applications in services such as healthcare systems (e.g. emergency departments) and tele-services (e.g. telephone call centres). His work has been published in journals such as Operations Research and Mathematics of Operations Research. His research awards include the MSOM Service Management SIG Best Paper Award and the Uriel G. Rothblum Prize for Excellent Work in Operations Research by the Operations Research Society of Israel.

Your attendance is most welcome!

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