

Optimal Threshold Control in a Stochastic Network with Concurrent Resources

by

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Abstract Concurrent resource occupancy pervades most service and engineering systems. For example, a multi-leg plane trip requires seat reservation on several connecting flights; a shipping network design considers the availability of vessel space, empty container and lift capacity at terminal; a configure-to-order product demands the simultaneous processing of all its components; a file transfer on the Internet needs bandwidth on all the links along its route from source to destination. The object of our study is a network with stochastic concurrent occupancy of resources. The job demand (e.g., passenger) arrivals are stochastic and their processing requires the concurrent occupancy of resources (e.g., seats on connecting flights). Our goal is to do revenue optimization in the network through resource control: to regulate the distribution of resources among the job classes, in particular, when to accept/reject a job and from which class. Specifically, we highlight a new fixed-point approximation for a network operating under a set of thresholds that control the access of jobs from each class. With this fixed-point approximation, the resource control problem takes the form of setting the optimal thresholds, which can be formulated and solved as a linear program. We establish the asymptotic optimality of this control policy under fluid and diffusion scaling.

Biography

Hengqing Ye received the PhD degree in Industrial Engineering from the Hong Kong University of Science and Technology in 2000. He has been an assistant professor with the School of Business, National University of Singapore since 2000, and the Faculty of Business, Hong Kong Polytechnic University since January 2007. His research interests include the modeling and analysis of stochastic network models and logistics systems. He has published research papers in academic journals such as Operations Research, IEEE Transactions in Automatic Control and Queueing Systems.

❖ *All interested are welcome!* ❖