

# On customer contact centers with a call-back option: Customer decisions, routing rules, and system design

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## Abstract

Organizations worldwide use contact centers as an important channel of communication and transaction with their customers. This paper describes a contact center with two channels, one for real-time telephone service, and another for a postponed call-back service offered with a guarantee on the maximum delay until a reply is received. Customers are sensitive to both real-time and call-back delay and their behavior is captured through a probabilistic choice model. The dynamics of the system are modelled as an  $M/M/N$  multi-class system.

We rigorously justify that as the number of agents increases, the system's load approaches its maximum processing capacity. Based on this observation, we perform an asymptotic analysis in the many-server, heavy traffic regime to find an asymptotically optimal routing rule, characterize the unique equilibrium regime of the system, approximate the system performance, and finally, propose a staffing rule that picks the minimum number of agents that satisfies a set of operational constraints on the performance of the system.