A new method for deriving waiting-time approximations in polling systems with renewal arrivals

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Abstract

We study the waiting-time distributions in cyclic polling models with renewal arrivals, general service and switch-over times, and exhaustive service at each of the queues. The assumption of renewal arrivals prohibits an exact analysis and reduces the available analytic results to heavy-traffic asymptotics, limiting results for large switch-over times and large numbers of queues, and some numerical algorithms. Motivated by this, the goal of this paper is to propose a new method for deriving simple closed-form approximations for the complete waiting-time distributions that work well for arbitrary load values. Extensive simulation results show that the approximations are highly accurate over a wide range of parameter settings.

Key words: Polling systems, renewal arrivals, waiting-time distribution, approximation