Delay in a Tandem Queueing Model with Mobile Queues: An Analytical Approximation

Ahmad Al Hanbali\textsuperscript{a}, Roland de Haan\textsuperscript{b}, Richard J. Boucherie\textsuperscript{b}, and Jan-Kees van Ommeren\textsuperscript{b}

\textsuperscript{a} EURANDOM, QPA group, The Netherlands.  
\textsuperscript{b} Dep. of Applied Mathematics, SOR group, University of Twente, The Netherlands.

alhanbali@eurandom.tue.nl  
haanr.r.j.boucherie,J.C.W.vanOmmeren@ewi.utwente.nl

September 7, 2009

Abstract

In this paper, we analyze the end-to-end delay performance of a tandem queueing system with mobile queues. Due to state-space explosion there is no hope for a numerical exact analysis for the joint-queue length distribution. For this reason, we present an analytical approximation that is based on queue length analysis. Through extensive numerical validation, we find that the queue length approximation exhibits excellent performance for light and moderate traffic load.

Keywords: Tandem queueing model; Mobile queues; Autonomous server; Performance analysis; Delay analysis; Stability; Ad hoc networks.

AMS Classification: 60K25; 68M20.

\textsuperscript{*}The major part of this work was carried out when Ahmad Al Hanbali was at the SOR group at the University of Twente.