Queues and Lévy processes

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Abstract

In this talk we consider various extensions of classical $M/G/1$-type queueing models. After a brief introduction to Lévy processes, two models will be discussed:
1. A queueing model with vacations. Classical vacation models are generalized in two directions: (i) The length of a vacation depends on the length of the previous active period, and (ii) the workload process behaves according to (reflected) Lévy processes during the active and vacation periods, thus generalizing the compound Poisson process with(out) negative drift from the $M/G/1$ queue.
2. We consider a Lévy process without negative jumps, reflected at the origin. Feedback information about the level of the Lévy process ("workload level") may lead to adaptation of the Lévy exponent. Examples of such models are queueing models in which the service speed or customer arrival rate changes depending on the workload level, and dam models in which the release rate depends on the buffer content. We assume that information about the workload level is continuously available. In particular, we study dam processes with a two-step release rule and M/G/1 queues in which the arrival rate, service speed, and/or jump size distribution may be adapted depending on whether the workload is above or below some level K. The steady-state workload distribution is determined.
The first model has been analyzed jointly with Offer Kella and Michel Mandjes, and the second model jointly with Rene Bekker and Jacques Resing.