

A Diffusion Approximation for a Markovian Queue with Reneging

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Consider a single-server queue with a Poisson arrival process and exponential processing times in which each customer independently reneges after an exponentially distributed amount of time. We establish that this system can be approximated by either a reflected Ornstein–Uhlenbeck process or a reflected affine diffusion when the arrival rate exceeds or is close to the processing rate and the reneging rate is close to 0. We further compare the quality of the steady-state distribution approximations suggested by each diffusion.