

A Multi-Orbit Retrial Queue with Orbital Search of Customers

Ambily P. Mathew, Varghese C. Joshua, Achyutha Krishnamoorthy, Janos Sztrik, Agassi Melikov

We consider a single server retrial queue with a finite sequence of M orbits. Of these M orbits, the first $M - 1$ are of finite capacities and the last one (marked M) is of infinite capacity. Retrial customers belong to any one of these orbits based on the number of retrials made by them. Primary arrivals who are unable to access the server upon arrival, go to an orbit of finite capacity. From this orbit customers retry; those who fail to access the server join a second orbit of size larger than the first one and retry to access the server. Finally, they join the M th orbit (after $M - 1$ repeated trials). Retrials from all the orbits are assumed to be linear. Retrials occur from the M th orbit and if those were unsuccessful, each customer will come back to the M th orbit itself with probability q whereas with probability $1 - q$, leaves the system. Also after each service completion epoch, the server goes in search of customers from the M th orbit with probability p . With probability $1 - p$ the server remains idle. Steady-state analysis has been done. Various measures of performance are calculated. An optimization problem is discussed. We analyze this retrial queuing model graphically as well as numerically. We also analyze the model for the optimum value of search probability p . Some probability distributions of interest related to the model, have been derived.