

Performance analysis of polling systems with retrials and glue periods

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Abstract

We consider gated polling systems with two special features: (i) retrials, and (ii) glue or reservation periods. When a type- i customer arrives, or retries, during a glue period of station i , it will be served in the next visit period of the server to that station. Customers arriving at station i in any other period join the orbit of that station and retry after an exponentially distributed time. Such polling systems can be used to study the performance of certain switches in optical communication systems.

For the case of exponentially distributed glue periods, we present an algorithm to obtain the moments of the number of customers in each station. For generally distributed glue periods, we consider the distribution of the total workload in the system, using it to derive a pseudo conservation law which in its turn is used to obtain accurate approximations of the individual mean waiting times. We also consider the problem of choosing the lengths of the glue periods, under a constraint on the total glue period per cycle, so as to minimize a weighted sum of the mean waiting times.