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A stochastic analysis of milkrun systems

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Milk-run systems are advanced batch picking systems in which the batches are made in real time. During the picking cycle, the picker is continuously updated on requested items, which they then pick. To do this, the picker walks a fixed route along all aisles and locations, picking any requested item they encounter. After each cycle, the picked items are disposed of at the depot, which are then sorted. This system allows for a fast response time to orders and saves up worker travel time, especially in warehouses with high arrival rates.

In this talk, we relate milk-run systems to polling models; a queueing system in which a server switches between queues and serves customers in these queues. In the many-queue case, this can be accurately approximated by a continuous polling system, where customers no longer queue at given queues, but obtain locations on a circle. The server moves at a fixed speed over this circle, serving any customers they encounter. Using a mean-value analysis we propose an intricate analysis of the mean delivery times in such a system.