

Robust Workload Balance in Postal Delivery Services

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Abstract

Postal delivery services are an essential part of our lives. We use them whether to send Christmas cards or to receive everyday products directly to our doorstep. This service is assured by couriers who perform daily rounds in fixed geographic areas called districts. Districts are typically defined for a long period of time based on the expected demand. However, normal demand variation can negatively impact the couriers' workload, either by exceeding their shift duration, or by creating a largely unfair workload distribution among couriers on certain days. We address the problem of designing robust districts so that the workload of couriers remains balanced under stochastic demand and service times. The problem is modeled and solved as a two-stage stochastic program: the districting decisions are made in the first stage, and the robust workload balanced is estimated in the second stage. In order to include realistic distribution network features, the underlying problem is treated as a node, edge, and arc routing problem with stochastic customers and service times. This research is carried out in collaboration with bpost, the Belgian postal service company.