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# A large neighborhood based matheuristic for the vehicle routing problem with cross-docking and dock resource constraints

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## Abstract

The Vehicle Routing Problem with Cross-Docking (VRPCD) is a variant of the Pickup and Delivery Problem with Transfers with one compulsory transfer point: vehicles start by collecting items, then return to the cross-dock where they unload/reload some items and eventually visit delivery locations. The VRPCD has been proposed to model the routing part of the cross-docking distribution strategy, which has been largely used since 1980s and is known to help reducing delivery costs compared to traditional distribution systems. In the VRPCD, it is assumed that a truck undergoes consolidation operations as soon as it arrives at the cross-dock. However, in real life the processing capacity of the cross-dock is a limiting factor, and as such several recent articles have outlined the need for a model that would take it into account in the routing problem. To that end, we introduce an extension of the VRPCD in which the number of vehicles that can simultaneously be processed at the cross-dock is limited. We call it the Vehicle Routing Problem with Cross-Docking and Dock Resource Constraints (VRPCD-DR). To solve it, we adapt a recently proposed method for VRPCD that relies on large neighborhood search and periodic calls to a set partitioning based problem. In particular we focus on feasibility tests in the reinsertion part of the LNS, as the capacity constraints at the cross-dock makes the scheduling subproblem NP-Hard. Our method has been tested on instances adapted from the VRPCD.

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