# Optimizing Domestic Road Freight Operations of a 3PL Carrier in Turkey

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**Abstract**

This study is inspired by a complex real-world problem faced by a third-party logistics (3PL) provider in Turkey. The aim of the study is to develop a methodology to optimize the planning of daily domestic road transport operations of the company. Three types of facilities exist: pick-up locations, delivery locations and cross-dock centers. Both Full-truckload (FTL) and less-than-truckload (LTL) operations are considered within the problem context. Currently, these operations are planned separately and manually by on-site planners located at different facilities. The algorithms developed in this study will help the 3PL company shift towards centralized and automated planning.

The company owns a heterogeneous vehicle fleet and also utilizes long-term contracted and on-the-spot hired vehicles to fulfill transportation orders. Different types of vehicles have different cost structures and load capacities. The problem is represented on a time-space network and time windows are imposed on both pick-ups and deliveries, while synchronization requirements arise at cross-docks. Certain rules and regulations such as working hours of drivers, maximum number of facilities visited and distances between the stops are taken into account when defining feasible routes. These rules depend on the type of the vehicle assigned to the route.

We propose a construction algorithm that generates routes considering all predefined rules. The resulting set of routes is then inserted into a comprehensive mixed-integer linear programming model to find the least-cost assignment of orders to routes and vehicles satisfying all problem constraints. We test and validate our model using real-life data of the 3PL company.

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