

Facility Location Optimization in Parcel and Letter Mail Networks with Hubs

Hans-Jürgen Sebastian

RWTH Aachen University

Sebastian@or.rwth-aachen.de

Abstract:

The paper focuses on distribution networks for parcel and letter mail, which form the basis of the core business of postal organizations and of express logistics service providers. Optimization of such distribution networks is necessary owing to increasing competition in this market and to increasing customer expectations with respect to the quality, the reliability and the price of the services offered by postal and express shipment companies. This situation forces postal service providers to reengineer their networks by focusing on the three planning phases: strategic, tactical and operational network planning. The problems, models and applications in postal logistics which will be discussed in detail are the following:

- Selection of optimal hub-locations within a hub&spoke network. In this model transportation costs are not directly incurred by flows but by vehicles trips which realize the flows between all nodes of the network. The application deals with the optimal number and locations of the sorting centers for mail which are used as hub of the long-haul transportation network for letter mail.
- Facility location optimization in parcel mail and in integrated parcel-letter mail networks taking into account transportation duration and service quality constraints. Applications deal with re-planning of delivery-bases and -stations and with migration of networks.

For all models mentioned above we developed tabu-search metaheuristics, which work very well for large instances from Deutsche Post DHL. The important trends related to the problems, models and algorithms mentioned above are:

- Making allocated areas (e. g. allocated regions of sorting centers, delivery districts of the last mile) more flexible, more dynamic.
- Adding service quality constraints explicitly to the models for facility location problems.
- Dealing with dynamic facility location problems either by migration of status quo networks into optimized target networks or by dynamic facility location models.
- Improving the approximation of transportation costs within facility location models by location routing approaches.