Combining load plan design and vehicle routing

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Abstract

Freight transportation has received a growing attention in the last decades from the operations research community. In particular, more and more efficient models and algorithms are developed to optimize the design of freight transportation networks and the flow of goods in these networks. The distribution of goods in large structured networks is generally organized in two layers: (i) a long haul network, made of logistics hubs and terminals, and (ii) a local distribution network between a terminal and its associated customers. The routing of goods in long haul networks is studied in the field of service network design and, more precisely, load plan design. Local distribution deals with solving vehicle routing problems. Due to practical aspects and scales considerations, these two types of optimization problems are generally solved separately.

The company 4S Network acts as a 5PL provider for suppliers of the retail industry in France. It offers a service that facilitates the pooling of shipments at logistic hubs, called Collaborative Routing Centers (CRC). Pooled distribution routes are then subcontracted to local carriers. The synchronization of routes at CRCs is a key element to reduce costs and satisfy delivery deadlines. The resulting optimization problems integrate aspects from load plan design and vehicle routing.

Our goal is to propose an algorithm to solve integrated load plan design and vehicle routing problems. It is based on recent advances involving continuous time management in service network design problems.

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