

## An Integer Nonlinear Program Proposal for Intermodal Transportation Service Network Design

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**Abstract :** The Service Network Design Problem (SNDP) is a tactical issue in freight transportation firms. The existing formulations of the problem for intermodal rail-road transportation were not always adapted to the intermodality in terms of full asset utilization and modal shift reinforcement. The objective of the article is to propose a model having a more compliant formulation with intermodality, including constraints highlighting the imperatives of asset management, reinforcing modal shift from road to rail and reducing, by the way, road mode CO2 emissions. The model is a fixed charged, path based integer nonlinear program. Its objective is to minimize services total cost while ensuring full assets utilization to satisfy freight demand forecast. The model's main feature is that it gives as output both the train sizes and the services frequencies for a planning period. We solved the program using a commercial solver and discussed the numerical results.

**Keywords :** intermodal transport network, service network design, model, nonlinear integer program, path-based, service frequencies, modal shift

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