A matheuristic for the liner shipping network design problem

We present a matheuristic, an integer programming based heuristic, for the liner shipping network design problem. This problem consists of finding a set of container shipping routes defining a capacitated network for cargo transport. The objective is to maximize the revenue of cargo transport, while minimizing the cost of operating the network. Liner shipping companies publish a set of routes with a time schedule, and it is an industry standard to have a weekly departure at each port call on a route. A weekly frequency is achieved by deploying several vessels to a single route, respecting the available fleet of container vessels. The cargo transports make extensive use of transshipments between routes and the number of transshipments of the cargo flow is decisive for network profitability. Computational results are reported for the benchmark suite LINER-LIB 2012 following the industry standard of weekly departures on every schedule. The heuristic shows overall good performance and is able to find high quality solutions within competitive execution times. The matheuristic can also be applied as a decision support tool to improve an existing network by optimizing on a designated subset of the routes. A case study is presented for this approach with very promising results.

General information
State: Published
Organisations: Department of Management Engineering, Management Science
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Keywords: (Liner shipping, network design, matheuristic)
Number of pages: 24
Publication date: 2014

Publication information
Publisher: GERAD, Montreal, Canada
Original language: English

Series: Cahiers du GERAD
Number: G–2014–30
ISSN (print): 0711-2440
Main Research Area: Technical/natural sciences
Source: PublicationPreSubmission
Source-ID: 98135959
Publication: Research - peer-review › Report – Annual report year: 2014