Linergrid
Optimizing Liner Networks

A LINERGRID WHITEPAPER

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Transpacific Network Optimization

Using advanced mathematical modelling, the existing G6 network is shown to have a cost reduction potential of 6% - equivalent to an estimated 200 million USD annually.

A LinerGrid Whitepaper

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Executive Summary

The development of networks for liner shipping companies has become increasingly complex over the past 20 years. In the “old days” a container carrier would have a single service connecting one region of the world with another. At that point it was of paramount importance to design an efficient schedule for that one service.

However, since then a confluence of developments has changed the equation substantially. Sharply increasing vessels size drove the growth in transshipment operations. The emergence of efficient transshipment hubs led to the development of more complex networks and gave rise to truly global carriers. The desire for a broader product portfolio in combination with escalating vessel sizes has led to increasing sizes of key alliances.

As an example, 20 years ago the Asia-Europe trade was serviced by 23 main carriers. 2 of these operated independently, the remainder collaborated in 7 different alliances or similar structured vessel sharing agreements.

10 years ago this had been condensed into 20 carriers of which 9 operated independently and the remainder collaborated in 3 different alliances.

5 years ago, the market had further condensed into 17 carriers split on 4 alliances and 5 independent carriers.

Presently there are 15 carriers split on 4 alliances with no-one being independent, and from next year this further gets condensed into 3 alliances covering 12 main carriers.

The task of designing a competitive network in an environment where multiple carriers need to agree on the complexities related to a network is anything but simple. Consequently, the use of powerful mathematical tools can facilitate the optimization necessary to design a network.

LinerGrid has developed a proprietary mathematical model specifically for the optimization of complex liner shipping networks.

In order to test the model, a study has been undertaken a simple review of the G6 network on the Transpacific trade.

The result of the study is that the G6 network can be optimized in such a way as to reduce operational costs by more than 200 million USD annually – equal to a cost saving in excess of 6%.

If the G6 Transpacific network is representative for the G6 network globally, as well as also representative for the Ocean-3 and CKYHE alliances, this indicates a global savings potential in excess of 1 billion USD annually from further optimizing the network design compared to the present status.

The Analysis

The G6 network will of course soon be obsolete, as the existing G6 alliance will be dissolved in spring 2017 with the members shifting to the Ocean Alliance and THE Alliance – pending regulatory approval.

However, the G6 network is a good place for which to perform an optimization study. The G6 alliance has been in existence since 2012, and is effectively the combination of the Grand Alliance and the New World Alliance which both have existing for almost 20 years, albeit with slight changes in the membership of the Grand Alliance.

As such, the current network designed by the G6 alliance partners is the result of many years of redesigning and tweaking the network in order to adapt it to the market conditions as well as the individual members' preferences.

The aim with our analysis was to test LinerGrid's mathematical tool versus the network as it was in July/August 2016 to ascertain the degree to which it could be further optimized.

G6 services included	
String name	Vessel class (TEU)
NP1	9,200
NP2	9,200
NP3	9,200
CC1	6,600
CC2	9,200
CC4	6,600
SC1	9,200
SC2	9,200
SE2	9,200
SE3	6,600
PA1	4,800
PA2	6,600
AZX	6,600
SVS	9,200
CEC	9,200

The analysis has been performed purely on the basis of publicly available information in August 2016 regarding the network offered by G6, combined with LinerGrid's internal assessments of a range of operational parameters and cost levels.

The starting point for our analysis is the 15 Transpacific services offered by the G6 carriers, and for each service we have assigned a standardized vessel size. This is a simplification introduced for the purpose of time charter and bunker consumption estimation, and more detailed modelling would be able to cater for varying vessels sizes on each string.

The analysis is done on the basis of the proforma schedules, and does not take ad-hoc blank sailings into account. A total of 114 standardized vessels are used for the baseline network.

For every proforma service, the round-trip schedule is mapped inclusive of sailing distances and sailing speeds on each leg of the voyage. Additionally, this is augmented by LinerGrid's standardized assessment of vessel costs and fuel consumption patterns, providing a baseline operational cost for the vessels in the network.

Additionally, LinerGrid has developed an assessment of the main deep-sea cargo flows for the G6 alliance carriers at a main port to main port level. This provides a constraint for the optimization, as ideally the proposed solution should be able to cater for the same demand flows as the existing network.

Finally, the model takes into consideration estimates of port and handling costs at the main ports used for handling the cargo in the model.

Taking the 15 identified services, the estimated demand flows through the network as well as the associated costs, an annual baseline cost can be calculated.

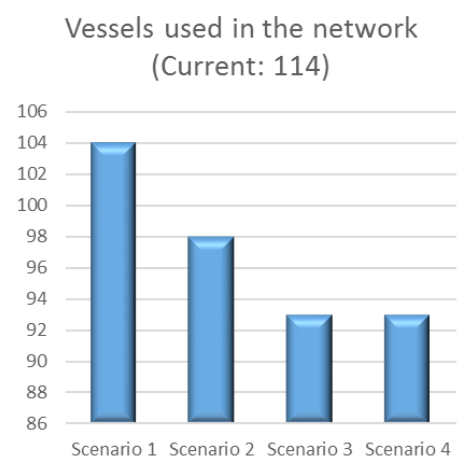
The next step is to identify a range of differing scenarios. These involve scenarios with service closures, service alterations, as well changes in the number and types of vessels deployed per service.

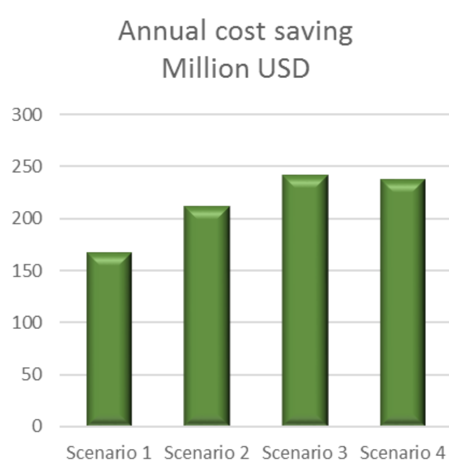
The mathematical model then performs a detailed optimization routine for a range of scenarios, and calculates both the costs associated with each optimized scenario. In each calculation, the optimization will attempt to seek different ways of flowing the demand between ports, seeking the most optimal solution. This gives rise to varying transshipment costs across the scenarios, with the optimizer ensuring the identification of the best solution.

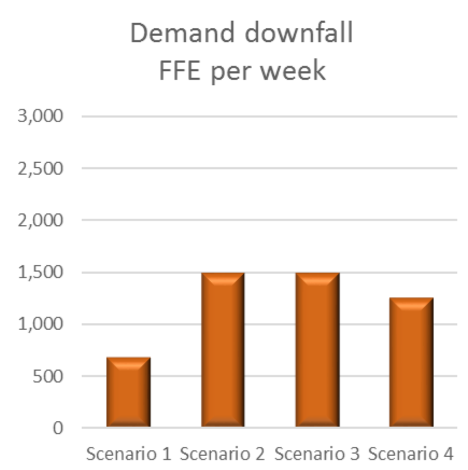
From the range of scenarios explored, 4 scenarios give rise to an annual cost reduction of 4% or more, equal to an annual saving in the range of 168-235 Million USD. One scenario uses 104 vessels, one scenario uses 98 vessels and two scenarios use 93 vessels.

For each scenario, a detailed flow calculation is made to see whether all existing demand flows can be catered for in the new optimized scenario. As an optimization, amongst other parameters, aims to increase vessel utilization, each of the scenarios results in minor existing cargo flows which cannot be catered for in the new proposed solutions.

From a carrier perspective, this downfall can be viewed from two different perspectives. It can be seen as a loss of revenue, and the associated loss should be offset against the operational savings. It can also be seen as a means to more actively pursue a yield management strategy – as the new proposed networks utilize the assets much more efficiently, the carrier obtains a position from which it can select and deselect cargo, and hence pursue higher yielding cargo to a greater degree than what is possible in the existing network which has much more unused capacity.







Conclusion: Significant savings potential

The analysis of the G6 network is based on a range of simplifications as outlined in the analysis. However, this also means that the analysis performed only provides for high-level optimization to take place.

In a more detailed and realistic optimization based on the specific details from within each carrier, the optimization would also be able to cater for market seasonality, cargo imbalances, empty repositioning and a calculated impact value of, as an example, the use of blank sailings. Thereby the tool could be used to optimize the network given the uncertainties in demand flows using a structured and standardized process.

From this analysis it is without doubt that the G6 Transpacific network can be optimized significantly. Of course, this will not happen in reality as the G6 will cease to exist shortly, however the important part to note is that carriers and alliances seeking to extract material savings from their network operations should look to integrate detailed statistical modelling into their network design efforts.