

Achieving Transportation Network Efficiency through Consolidation

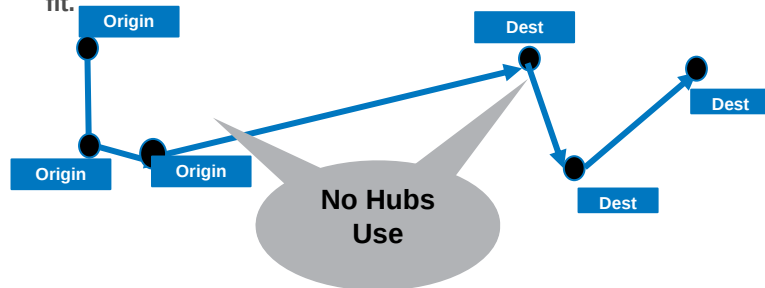
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Sponsor: GlobalTranz

Motivation / Background

LTL trucking in North America is a \$58B market and 33% of the total freight trucking industry. Unlike the fragmented TL market, 25 carriers handle 90% of the LTL volume.

Each shipper has distinct speed, reliability and cost expectations, and would benefit from a delivery network optimized to their needs.

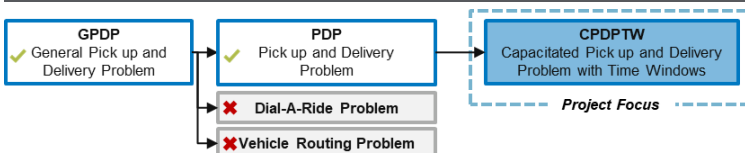
GlobalTranz wants to use technology to better partner with shippers, offering a multi-stop truckload option if it is a good fit.



Key Question

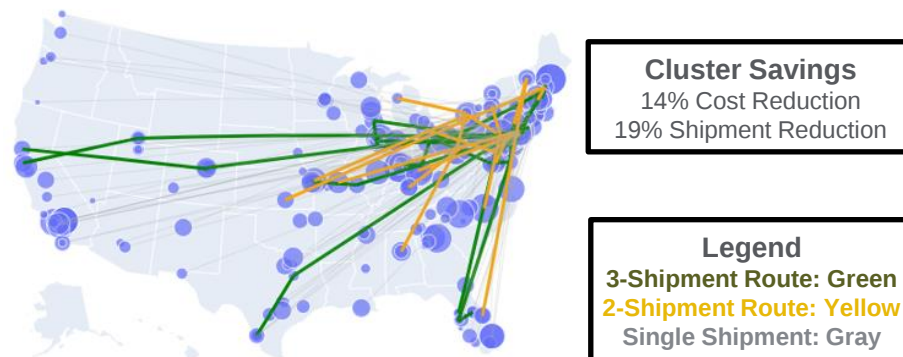
How can technology be used to identify multi-stop truckload consolidation opportunities that reduce network delivery cost?

Relevant Literature



Savelsbergh, M. W. P., and M. Sol. "The General Pickup and Delivery Problem." (Feb 1995)
Silver, Jeffrey. "Optimization Tools for the Freight Brokerage Industry," (2003)

After Consolidation and Optimization



Sample set of 166 NE shipments to all other Regions

The Problem

Today, the average US full truckload utilization is only 66%, and most small shipments move through a separate hub-and spoke network. Sometimes, pairing these large and small shipments can improve delivery times, reduce carbon emissions, and decrease cost. We aim to identify beneficial pairing opportunities to create 'multi-stop truckloads' (MSTL).

Methodology

Our model is solving the Capacitated Pickup and Delivery Problem with Time Windows (CPDPTW) and static demand.

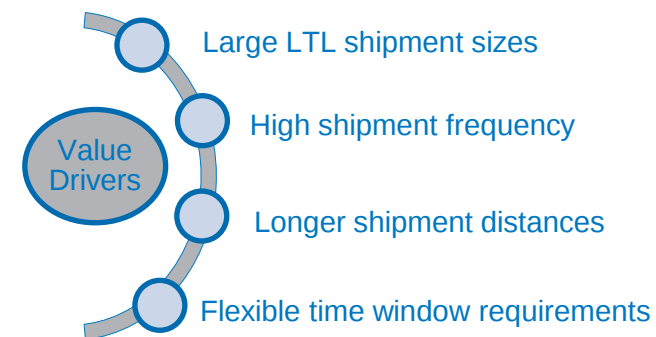
1. Identify all possible routes using column generation
2. Calculate cost of each route as well as the distance
3. Identify all permitted real-world routes by applying hard constraints
 - Vehicle capacities (e.g. volume, # of pallets, weight)
 - Pick up and delivery time windows
 - Demand
4. Select a subset of permitted routes which minimizes network cost using Mixed Integer Linear Programming (MILP) model

Results

Our initial results are based on a set of 18,000 customer shipments across the United State, which were placed into 6 geographic clusters. Our initial results show:

- 11.1% reduction in total network cost
- 4.5% reduction of number of shipments to deliver

Results indicate value will be driven by lane (market to market) characteristics identified below.



Expected Contribution

1. On average, a 3PL is expected to reduce transportation cost by 11% through MSTL consolidation.
2. MSTL consolidation has significant network effects; more shipments in the network drives greater cost savings.
3. Freight brokers need analytical know-how and strong relationships with shippers and carriers to achieve MSTL savings

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