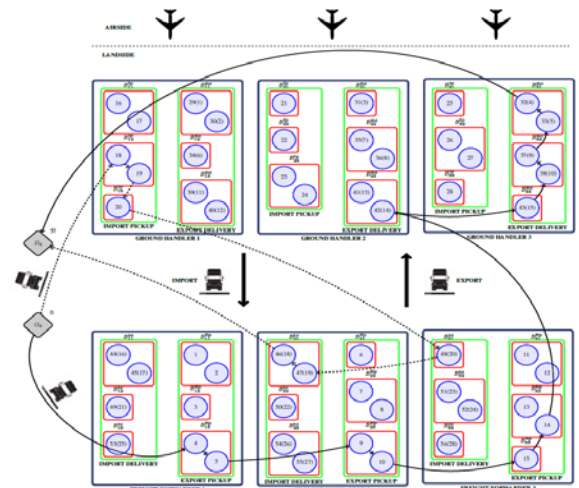## Development of an optimization framework to foster collaboration in the landside air cargo supply chain

Problem description

Horizontal and vertical collaboration inside the air cargo supply chain are important to achieve economies of scale in airline services and landside cargo services at airports. Vertical (horizontal) collaboration involves two or more companies that operate in different layers (in the same layer) of the supply chain. Most studies on the effects of collaboration focus on airside collaboration between airlines; studies on landside air cargo services are only of very recent times. As trucks that connect forwarders and airlines' ground handlers are generally underutilized and, often, congestion occurs due to uncoordinated operations, the potential of collaboration is becoming a research topic of high practical relevance. So far, quantitative studies to assess impacts of collaborative schemes have used methods such as discrete event simulation, system dynamics and multi criteria decision analysis. We argue that also mathematical optimization studies are needed to shed light on the potential effect of collaboration, as these can help design arrangements that create the highest benefits for all parties together. Optimizing complex, collaborative routing structures specifically addressing the air cargo supply chain around airports has, to our knowledge, not been the subject of research so far.

Assignment

- Literature review on Vehicle Routing Problem (VRP) and other related Mixed Integer Programming (MILP) formulations, with a focus on logistics and air cargo supply chain.
- Development of a MILP model that optimizes the cargo flow between freight forwarders and ground handlers around an airport, while fostering collaboration between stakeholders.
- Development of ad-hoc heuristics to obtain high-quality sub-optimal solutions for potential real-time applications.
- Preparation of a report and, possibly, of a scientific paper.

Information:

Transport & Planning department
Thesis supervisor: Prof. Lorant Tavasszy, KLM and Schiphol airport (potential supervisors)
Daily supervisors: Alessandro Bombelli
Contact: l.a.tavasszy@tudelft.nl, a.bombelli@tudelft.nl

TUDelft