4 - Design and Analysis of a Proposed Nested Genetic Algorithm to Solve a Vehicle Routing Problem with Cross Docking
Mahdi Bashiri, Ali Baniamirian

Implementation of an appropriate distribution strategy in order to manage the physical flow of materials is one of the most important factors in the success of the companies. Cross docking is an efficient distribution strategy which today is practically used by many companies to improve their services in the lower cost with the high level of customer satisfaction. In this paper, because of the possibility of forming the problem a nested Genetic algorithm is designed to solve a vehicle routing problem with cross docking and time windows. Review on the literature of cross docking shows that at most one part solution re- presentations algorithms were proposed to the problem. The length of one part solution representations in the larger instances leads to high computational time to search which is an important issue in the evolutionary algorithms. In the proposed algorithm we introduce a two part solution representation and an efficient approach to search the solution space called nested approach. A good feasible solution of delivery part is obtained in the first phase and the best pickup part solution is created according to the obtained delivery part in the second phase. The consolidation operations are then added to the complete solution. In order to evaluate the performance of the proposed algorithm of this paper, different examples of a real data set from small to large sizes are solved and analyzed.

2 - Solving Integrated Vehicle Routing and Resource Assignment Problems from Practice
Sameh Haneyah, Leendert Kok

We address a problem from practice on vehicle routing and resource assignment. Our solution approach decomposes the problem into two phases. The first phase constructs trailer routes by solving a capacitated vehicle routing problem with time windows, driving legislation, and congestion. The second phase then generates resource shifts, i.e., truck and driver combinations, by solving a scheduling problem. To provide greater flexibility and better utilization of resources, we may divide trailer routes into segments and assign the segments to resource shifts. The latter case increases the complexity due to dependency issues when segments of the same trailer route are assigned to different resource shifts. Currently, we have a software product that uses column generation, where complete trailer routes are assigned to resource shifts (columns), but this approach is not fully applicable with segments, because then the columns are no longer independent. In literature, we see few papers on this problem where limitations are introduced on the segments resulting from the first phase, to make them independent in the second phase. However, we need a solution method that handles the dependencies, because circumventing them diminishes the benefits of planning with segments. Moreover, we need a method that works well in practice. In this talk, we discuss the different solution methods we developed and propose the suitable method to use for a difficult case from practice.

3 - Practical Ways to Solve Real-life Extensions to Routing Problems
Bryan Kuiper

Vehicle routing problems in practice appear with many restrictions such as capacities, time windows, calendar openings, forbidden or required capabilities, drivers’ working and driving regulations, etc. At ORTEC we have a generic software product that employs state-of-the-art algorithms to solve different variants of such problems. However, we are often encountered with new requirements from special business cases that the generic framework cannot immediately handle. In some cases, it is sensible to extend the framework to cover the new requirements, but in other cases it makes more sense not to extend the algorithms and increase their complexity considerably only to cover a fraction of customer cases. For the latter cases, we develop some procedures that can complement the main algorithmic framework in order to solve certain sub-problems or complicated business restrictions. In this talk, we first describe the existing algorithmic framework in general, and second present new customer cases with requirements not fully covered by the generic framework. Finally, we present procedures and tricks implemented to handle the additional requirements. A main example comes from a customer case where combinations of pallets and large doors need to be transported in trailers with flexible floors. The construction of flexible floors increases the assignment of doors and pallets to be transported, and this changes for every optimization call.