1 Container packing

Containers arrive at a sea terminal and they must be transported to an inland terminal. There are two types of containers: 1 TEU and 2 TEU. Containers can be transported by barges with capacity 28 TEU or by trucks. Trucks can carry only one container at a time, independently of its size. The cost for transporting any container by truck is fixed. Barges have a fixed cost, which is equivalent to the cost of carrying 7 containers by 7 trucks. To comply with release dates (arrival times at the sea terminal) and due dates (desired arrival time at the inland terminal) each container must be picked up at the sea terminal within a given time window.

In a more simplified version of the problem we assume all containers to be located at the same quay. In a less simplified version of the problem we assume containers to be located on different quays at a given navigation time from one another.

Different versions of the problem also occur in how time restrictions are managed. In one version we assume that each container can be loaded on a barge within its time window; in another version containers can be loaded on a barge only when all of them have been released. In this case the barge loading operations must be done within the intersection of the time windows of all containers assigned to the barge.

Finally, we may assume the loading time to be negligible or not.

We use a notation XYZ, where all three options can be equal to A or B, indicating the first and the second option above, respectively. So we have 8 possible models, from AAA to BBB. Models AAA and ABA are not different, because loading is instantaneous and the point in time in which it occurs must be in the intersection of the time windows of the containers.

The objective is to minimize costs, i.e. to exploit the barge capacities at the maximum possible extent.

For this purpose a dynamic programming algorithm can be designed.