Cyclic Railway Timetabling

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This sample demonstrates the use of 'warm start' in CPLEX® problems. A warm start can help CPLEX to find a solution more quickly. This is useful if you have multiple similar problems to solve, or if a previous solve was interrupted because a time limit was reached. The problem addressed by this sample concerns a cyclic railway timetable. According to such a timetable, a train for a given destination leaves a particular station at the same time during every cycle, such as every half hour, every hour, or every two hours. Cyclic timetables provide clear and transparent scheduling to railway users, who only need to remember the minutes of the hour at which a regular train departs.

Model

The model specifies a railway network, consisting of a graph representing its stations and routes. Each route is operated every T time units, and the goal is to identify periodic departure times within the basic interval $[0,T)$ at every stop on the line. Constraints in the model come from a variety of sources, including running and stopping times and specific conditions on single tracks.

A complete definition of the model is available in *Information on the MIPLIB's timetab-instances* by C. Liebchen and R.H. Möhring, referenced on the MIPLIB website: http://miplib.zib.de/biblio.html#LiebchenMoehring2003

Warm starting MIP optimization

Two files are packaged in the **timtab1** sample:
* The `timtab1.mps` file contains the mathematical programming formulation of the problem instance.
* The `timtab1.sol` file is the outcome of an interrupted solve, that is a solve that has been stopped before completion because the stopping time configured in the user preferences has been reached. This solution file contains all the information required for a MIP start.

If you drop the `timtab1.sol` MIP start file along with the `timtab1.mps` problem in DropSolve, you automatically invoke the warm start feature of CPLEX. The MIP start file provides a starting point for MIP optimization that CPLEX uses to find a solution to the problem without restarting from scratch.

You can easily check the improvement in performance by comparing the solving time for `timtab1.mps` by itself compared with the solving time for `timtab1.mps` accompanied by `timtab1.sol`. Solving time is about half as long when the solution file is present.

MIPLIB

MIPLIB is a set of models used to compare the performance of mixed integer optimizers, such as IBM® ILOG® CPLEX. The set of models, assembled and made publicly available by a number of distinguished researchers, stimulates research and promotes better, faster solution of real-world problems.