

# **LINDO API 8.0 - Release Notes**

Changes from version 7.0

## **1. Multithreading support**

LINDO API 8.0 includes multi-cpu extensions to take advantage of computers with multicore processors. The extensions are of two types: concurrent solvers and parallel solvers. A concurrent solver runs two or more different algorithms simultaneously on the same problem. As soon as one solver finishes, all solvers are stopped. Concurrent solvers tend to give higher utilization of multiple cores but may not give reproducible results, e.g., if there are alternate optima. A parallel solver (repeatedly) splits the task of solving a problem into two or more subtasks and then allocates these subtasks over multiple cores. A parallel solver will generally give reproducible results but may not achieve 100% utilization of all available cores.

## **2. Stochastic Solver Improvements:**

- Nested Benders Decomposition implementation has been improved significantly, achieving speed factors up to 6X compared to the previous version.
- The Chance-programming solver adds a Genetic Algorithm to find high-quality feasible solutions to large-scale instances. Models in this class can now also be solved using the Simple Benders Decomposition method.
- Multithreading with Nested Benders Decomposition (NBD) solver leads to speed improvements from 2.5 to 3.5 when using 4 threads.

## **3. MIP Solver Improvements:**

- New Parallel Branch and Price solver for problems with block structures.
- The heuristics are improved significantly. Simple rounding and feasibility pump now use bound propagation to improve the current path to a new feasible MIP solution.
- New polishing heuristic to improve the best MIP solution using a pool of previous obtained MIP solutions and the current relaxation. This leads to better MIP solutions faster on many problems.
- New MIP parameters to enable/disable time-driven events to improve run reproducibility.
- Multithreading can lead to speed improvements from 1.5 to 3.0 times on difficult problems using 4 threads rather than 1. For easy MIP problems, e.g., < 600 seconds, multi-threading may give not much speedup.

## **4. Multistart Solver Improvements:**

- Multistart solver has been improved significantly, achieving speed factors up to 2X compared to the previous version. The likelihood of getting the global optimum has also improved by 10-15% over a wide range of nonconvex models.
- Multithreading often leads to speed improvements from 2.0 to 3.0 times when using 4 threads. Speed improvements tend to improve as the model size and the number of multistarts increase.

## **5. Other Solvers, Math Library and Utilities**

Global solver adds a parallel algorithm for exploiting multicore machines.

Improved detection of decomposition/block structured models.

More new probability distributions in the sampling API, e.g., the Beta Binomial.