

# CPLEX - A Solver for Integer Programming

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*Linear programming* is arguably one of the most restrictive modeling paradigms for optimization problems. Namely, it demands that the objective function and all constraints are linear in the input variables. On the other hand, this limitation allows for very powerful solving algorithms. In theory, linear programs can be solved in polynomial time. And also in practice, current state-of-the-art simplex and barrier codes as implemented in IBM ILOG CPLEX Optimization Studio [1] routinely solve linear programs with hundred thousands or even millions of variables and constraints.

*Integer programming* is an extension to linear programming that allows to restrict some or all variables to take integer values only. In theory, this seemingly small modification moves the task into the space of  $\mathcal{NP}$ -hard problems. In practice, the option to restrict variables to integer values, in particular to use binary variables for yes-no decisions, makes integer programming one of the most widely used modeling and optimization frameworks for practical planning problems as they arise in a variety of business applications. Even though only exponential algorithms for integer programming are known, CPLEX allows for solving large and challenging problems and often helps to provide solutions that save millions of dollars when implemented in practice.

This talk provides an overview of integer programming modeling and solving techniques and highlights a few of the many successful applications in practice.

## References

[1] [www.cplex.com](http://www.cplex.com).