

# IBM ILOG CPLEX Optimization Studio



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## Highlights

- Provides high performance and scalability
  - Develops and deploys new optimization-based models
  - Makes a difference with real-world applications
  - Available for testing via the free Community Edition
  - Enables flexible deployment of optimization models on premises and on cloud
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## Overview

Decision optimization is a mathematical technique used to help make complex business decisions that have the potential for business disruption and involve many large data sources, multiple trade-off possibilities and complex constraints. This advanced analytics technique is often used for planning, scheduling and pricing, as well as other business applications. Organizations across the world have seen business value and high ROI from optimization, as demonstrated through successful projects in a wide range of industries.

IBM Decision Optimization products enable business decision-making processes such as operational, tactical and strategic planning and scheduling. They can be used in a range of industries, including manufacturing, energy and utilities, finance and logistics. The Decision Optimization portfolio includes modeling tools, solvers and deployment capabilities to make decision optimization capabilities available for planning, scheduling and resource allocation scenarios. It supports operations research experts with modeling activities in the mathematical, constraint programming and constraint-based scheduling model domain, and also facilitates collaboration between operations research experts and IT developers in their deployment needs. Business users can benefit from a tailored graphical user interface and access other advanced features like predictive analytics and machine learning, or business functions like control and execution systems, without having to worry about the underlying optimization technology.



## IBM ILOG CPLEX Optimization Studio

IBM® ILOG® CPLEX® Optimization Studio provides powerful modeling tools to convert a business problem to a mathematical model and then solve it. Solving a mathematical model would provide an optimal solution for achieving a business goal, replacing intuition and heuristic thinking with fact-based, measurable decisions. With exact mathematical algorithms, proving optimality (that no better solution, decision or action exists) is also possible. This enables the user to understand what is possible and how much it would cost to do it, thereby providing great business advantage over competitors who base their decisions on heuristics or rules.

This analytical decision support toolkit supports rapid model development and solving by combining the Integrated Development Environment (IDE), the Optimization Programming Language (OPL) for modelling, and two solvers: IBM ILOG CPLEX Optimizer for mathematical programming models, and IBM ILOG CPLEX CP Optimizer for constraint programming and constraint-based scheduling models.

The core technologies of IBM ILOG CPLEX Optimization Studio provide:

- Solutions for all sizes of optimization models, with no limit on the number of constraints and variables (although the size of the hardware limits the size of the model).
- Solutions in real time to support operational process requirements by providing unmatched performance of best-in-class algorithms.
- Multiple solver algorithms for different type of models to help choose the best algorithm for any specific situation. The mathematical programming solver provides LP, MIP and MIQCP algorithms, while the constraint solver provides solutions for models involving any type of constraints (including non-linear) over integer variables, as well as scheduling models over cumul functions (AKA resources) and interval variables (AKA activities).
- Optimal solutions and consistently short solution times across numerous problem instances. If the user wants to end the solve before optimality is proven, bounds and gaps are given, showing how close the potential optimum solution is (both for math and constraint programming).
- Ability to design interactive optimization models to adapt to real-world situations where data and business conditions change frequently.

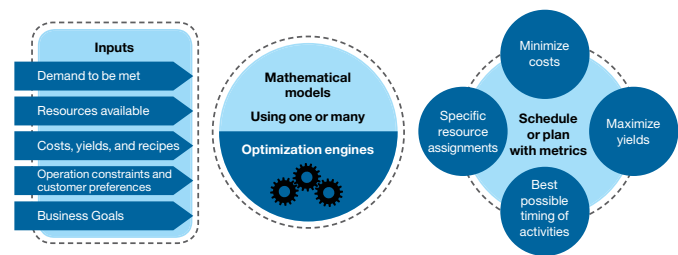


Figure 1. The core technologies of IBM ILOG CPLEX Optimization Studio.

## IBM ILOG CPLEX Optimization Studio Community Edition

There is no better way to test the power of IBM ILOG CPLEX Optimization Studio than through a hands-on approach of solving pertinent optimization problems. While traditional software trials give users the ability to test the software, they generally have a strict time limit. In recognition of that, IBM now offers a free Community Edition, which gives users the freedom to fully test the software and run models with up to 1,000 variables and 1,000 constraints.

In the IBM Marketplace, users can download the free Community Edition by visiting [ibm.biz/BdZ7Wx](http://ibm.biz/BdZ7Wx). IBM also provides a subscription option where users can buy the full version of IBM ILOG CPLEX Optimization Studio development edition on a **month-to-month** basis in a self-served manner.

### Enabling flexible solves

The IBM ILOG CPLEX Optimization Studio IDE provides an ideal environment to develop OPL models. In addition, it now allows users to seamlessly connect to IBM cloud resources through IBM Decision Optimization on Cloud, which fuses the power of the on-premises Decision Optimization offering with the scalability of deployment on the IBM Cloud™ infrastructure.

This flexibility gives users of the on-premises IDE the ability to solve their optimization problems with any of the two solvers on the cloud from their desktop. Though modeling in OPL is the best way to convert business problems to optimization models, users who want to directly model in APIs can use C, C++, Java, C# or Python APIs as well.

## Providing high performance and scalability

The solver engines solve a wide range of optimization models while also delivering superior performance. In addition, users get total flexibility for modeling with a compact and expressive OPL, and an IDE with diverse model development services.

## Developing and deploying new optimization models

Users can realize significant competitive gains through the ability to rapidly implement and integrate new optimization models to support emerging business needs.

IBM ILOG CPLEX Optimization Studio supports comprehensive model development and deployment through its intuitive modeling language (OPL), IDE, development services such as debugging, profiling, tuning, conflict detection and refinement, and solvers for mathematical programming and constraint programming and scheduling.

Enterprises can take advantage of the optimization models that IBM ILOG CPLEX Optimization Studio helps create in the following ways:

- The optimization models can be deployed through embedding APIs. (OPL has API embedding, and the API modeling contains embedding parts.)
- The models can be deployed through CPLEX Enterprise Server, based on IBM WebSphere® Application Server.
- The models can be deployed in an application created using IBM Decision Optimization Center (client or server).
- The models can be deployed on the IBM cloud (IBM Decision Optimization for Cloud) through a REST API.
- IBM SPSS® Modeler delivers the OPL node, as well as the Python model extension (optimization models written in Python API) so all SPSS Modeler deployment facilities can be used for optimization model deployment.

## Making a difference with real-world applications

Organizations in a range of industries use IBM ILOG CPLEX Optimization Studio to achieve better outcomes:

- A major transportation company reduced operating costs by USD 26 million annually through better allocation of rolling stock.
- A central securities depository saved USD 240 million for financial institutions in 18 months by clearing securities transactions faster.
- A power system operator reduced daily costs to consumers by USD 66,000 through better dispatch of generators.
- A major hotel chain increased annual revenue by USD 226 million by offering the right product to the right customer at the right price.

## Why IBM Decision Optimization?

IBM Decision Optimization brings more than 25 years of experience in the field and is a proven optimization technology. In the domain of decision optimization, the prestigious Edelman Prize is given each year to the best practitioner project in operations research. Over the past decade, four times as many Edelman finalists have used IBM ILOG CPLEX Optimizer than any other optimization technology to build innovative solutions to difficult challenges.

In addition, IBM has one of the largest groups of OR, IT cloud and industry solutions experts from product teams, IBM Research, and IBM Global Business Services. This combined expertise helps to ensure leading-edge product development and support for customer needs. From integrating with the IBM SPSS Modeler predictive analytics engine to running optimization algorithms on cloud to allowing for user collaboration and powerful visualizations in an intuitive user interface, IBM Decision Optimization solutions provide a comprehensive end-to-end solution for even the most complex challenges.

## For more information

To learn more about IBM ILOG CPLEX Optimization Studio, please contact your IBM representative or IBM Business Partner, or visit [ibm.co/2j5RvHi](http://ibm.co/2j5RvHi).

To register for the IBM ILOG CPLEX Optimization Studio free trial, visit [ibm.biz/BdZ7Wx](http://ibm.biz/BdZ7Wx).

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