# GAMS

# Modeling for the Real World

## High-Level Modeling

The General Algebraic Modeling System (GAMS) is a **high-level modeling system** for mathematical programming problems. GAMS is tailored for complex, large-scale modeling applications, and allows you to build large maintainable models that can be adapted quickly to new situations. Models are **fully portable** from one computer platform to another.

## Multiple Model Types

GAMS allows the formulation of models in **many different problem classes**, including

- Linear (LP) and Mixed Integer Linear (MIP)
- Nonlinear (NLP) and Mixed Integer Nonlinear (MINLP)
- Quadratically Constrained (QCP) and Mixed Integer QCP (MIQCP)
- Mixed Complementary (MCP)
- Programs with Equilibrium Constraints (MPEC)
- Stochastic Linear Programming (SP)



GAMS Integrated Developer Environment for editing, debugging, solving models, and viewing data.

## State-of-the-Art Solvers

GAMS incorporates all major commercial and academic **state-of-the-art solution technologies** for a broad range of problem types, including a range of global and quadratic programming solvers.

## Branch-and-Cut With Heuristics

MIP problems can significantly benefit from user supplied routines that generate cutting planes and good integer feasible solutions.

The GAMS **Branch-and-Cut & Heuristic (BCH) facility** automates all major steps necessary to define, execute, and control the use of user defined routines within the framework of general purpose MIP codes. This allows GAMS users to **apply complex solution strategies** without having to have intimate knowledge about the inner workings of a specific MIP system.
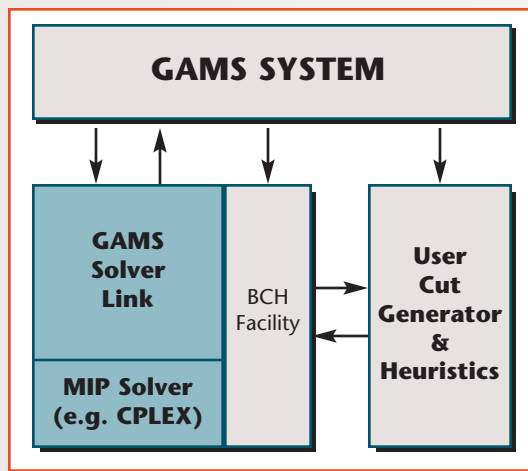


Branch-and-Cut facility in the GAMS framework which allows customized solution approaches.

## BCH Unique Features

The main features of the **BCH facilities** are that the cut generator and heuristic

- are represented in terms of the original GAMS problem formulation
- are independent of the specific MIP solver
- can use any other modeltype and solver available in GAMS (e.g. non-linear global optimization)
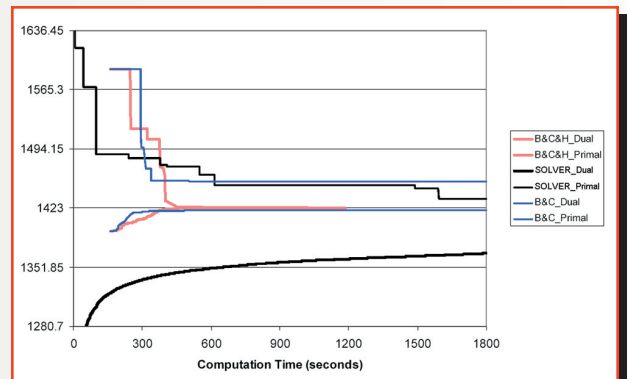


Comparison of solvers with and without BCH heuristics: solution convergence of the oil pipeline design problem.

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