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Interfacing COIN-OR solvers by GAMS

https://projects.coin-or.org/GAMSlinks

COIN-OR (www.coin-or.org)

- an initiative to spur the development of open-source software for the operations research community
- **Goal**: create for mathematical software what the open literature is for mathematical theory
- a repository of (currently) approx. **30** open source projects (solvers, interfaces, tools, ...)
- an active community (mailing lists, wikis, ...)

COIN-OR / GAMSlinks project

- development of interfaces between GAMS and open source solvers
- easy access to COIN-OR solvers as part of the GAMS distribution
- support solver developers to hook up their solvers to GAMS
- access to quality assurance and benchmarking tools

GAMS interfaces to open-source solvers

- COIN-OR Linear Programming (**CLP**) and Branch and Cut (**CBC**): state of the art LP and MIP solver from J. Forrest
- Gnu Linear Programming Kit (**GLPK**): LP and MIP solver from A. Makhorin
- Interior Point Optimizer (**IPOPT**): large scale NLP solver from A. Wächter
- Basic Open-source Nonlinear Mixed Integer programming (**BONMIN**): Branch and Cut based MINLP solver from P. Bonami et.al.
- Lagrangian Global Optimizer (**LaGO**): Convexification and Branch and Cut based MINLP solver from I. Nowak and S. Vigerske

Hooking up your solver to GAMS

GamsModel class:

- COIN-OR/OSI compatible representation of a MIP
- access to SOS, semicon. variables, branching prior.
- options reader, solution file writer, message handler

SMAG library:

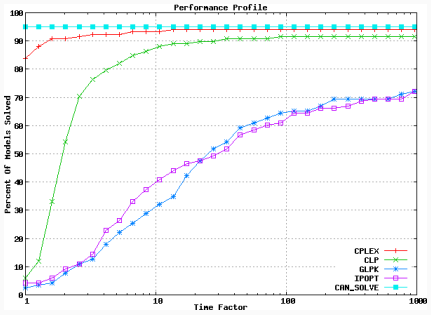
- C routines to interface nonlinear GAMS models
- functions and derivatives evaluation
- solution file writer, output handling

Quality Assurance and Benchmarking

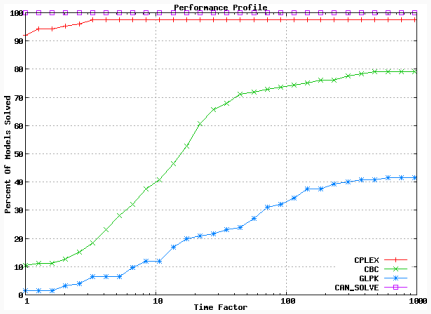
With a GAMS interface you can

- use the GAMS test library for testing
- use models from the GAMS World (www.gamsworld.org)
- use GAMS performance tools for benchmarking (batched solver runs, performance profiles, ...)

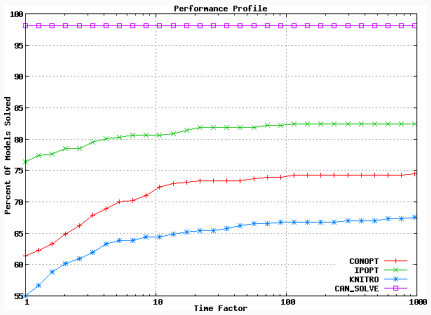
Performance Profiles



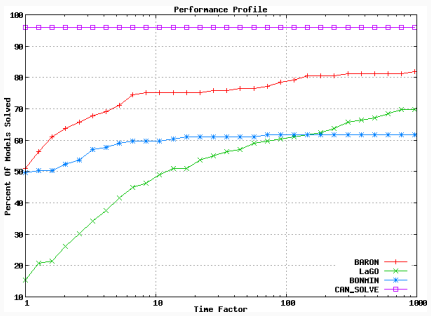
- 118 models: **LP**s from LINLib with $\geq$ 50000 nonzeros
- timelimit: 1 hour
- CPLEX 10.20
- CLP (Aug. '07)
- GLPK 4.20
- IPOPT 3.3 (w. HSL)



- 125 models: **MIP**s from LINLib
- timelimit: 1 hour
- gap tol.: 0.01%
- CPLEX 10.20
- CBC (Aug. '07)
- GLPK 4.20



- 379 models: GlobalLib **NLP**s
- timelimit: 1 hour
- CONOPT 3.14r
- KNITRO 5.1
- IPOPT 3.3 (w. HSL)



- 149 models (selected): MINLPLib **MINLP**s with $\leq$ 1000 var.
- timelimit: 1 hour
- gap tol.: 1%
- BARON 7.8.1
- LaGO (Aug. '07)
- BONMIN (Aug. '07)