Center for
Advanced
Decision
Support for
Water and
Environmental
Systems

Linear Programming: Alternatives to CPLEX

Tim Magee

RiverWare Optimization

Supported by: Tennessee Valley Authority

Requirements for Alternatives

- Callable library
  - C or C++ primal or dual simplex code.
  - Similar interface for the features we use.
- Robust on small problems.
- Well supported & good future prospects.
- Free or low cost.
- Windows XP and Solaris (and pref. LINUX).
- Not necessarily fast.

3 Leaders in Open Source LP

- CLP – part of the COIN-OR project
  - Initially sponsored by IBM.
  - Version 1.02
  - Common Public License
  - C++ used as C
- lp_solve
  - Version 5.5
  - Lesser GNU Public License
  - C
- GLPK – GNU Linear Programming Kit.
  - GNU Public License
  - Less Robust than CLP on Benchmark tests*
  - C

*Source: Hans Mittelmann, 2/6/06
http://plato.asu.edu/ftp/free.html

Computational INfrastructure for Operations Research

- Open Source for Operations Research
  - Linear Programming
  - Integer Programming
  - Nonlinear Optimization
  - Stochastic Optimization
  - Metaheuristics: Tabu Search
- Corporate Sponsors: IBM and Informs
- Workshop on COIN-OR July 17-20, 2006 at Rutgers University, NJ
- Active Mailing List

COIN Linear Program

- C++ Callable Library
  - Appears to be C++ used as C
  - Compared to CPLEX interfaces
    - Closer to the C callable library than the C++ API, "Concert Technology"
- Modified version of OSL
  - OSL was an IBM product competing with CPLEX
  - IBM has discontinued marketing of OSL in January, 2004
  - IBM donated code to CPL
  - CPL version is slightly slower than OSL
  - CPL is easier to read than OSL

COIN Linear Program

- Tested with up to 1.5 million constraints
- Apparently as reliable as OSL
- Compiled under
  - Linux using g++ version 3.1.1 (or later)
  - Windows using Microsoft Visual C++ 6
  - Windows using cygwin
  - AIX using xlC

Open Source

- Licensed under the terms of the Common Public License (CPL)
  - http://opensource.org/licenses/cpl.php
- CPL is approved by the Open Source Initiative
- IBM is the "Initial Contributor" of CLP
- IBM's understanding of the CPL: FAQs
  - http://www-128.ibm.com/developerworks/library/os-cplfaq.html

Leaning towards CLP

- More in depth look at lp_solve
- Consult with users of CLP and lp_solve
- Read the Fine Print in the Licenses
- Compile selected software on Solaris and Windows
  - Verify that there are no problems