Uni.lu HPC School 2019

PS14: Distributed Mixed-Integer Programming (MIP) optimization with Cplex and Gurobi

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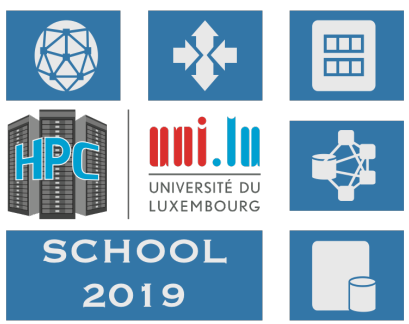
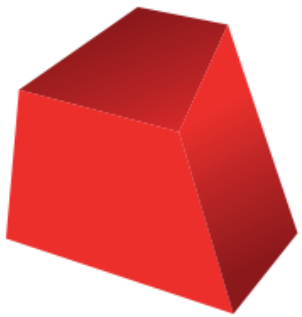
Latest versions available on Github:

UL HPC tutorials: https://github.com/ULHPC/tutorials

UL HPC School: http://hpc.uni.lu/hpc-school/

PS14 tutorial sources: ulhpc-tutorials.rtfd.io/en/latest/maths/Cplex-Gurobi





GUROBI
OPTIMIZATION

Main Objectives

- Usage of Cplex and Gurobi on the UL HPC Platform
  - ↪ sequentialy
  - ↪ multithreaded
  - ↪ multithreaded/distributed (hybrid)

CPLEX

- Optimization software for mathematical programming.
- Cplex optimizer can solve:
  - ↪ Mixed-Integer programming problems (MIP)
  - ↪ Very large linear programming problems (LP)
  - ↪ Non-convex quadratic programming problems (QP)
  - ↪ Convex quadratically constrained problems (QCP)

GUROBI

- Powerful optimization software, alternative to Cplex for solving.
- Additionnal features:
  - ↪ Mixed-Integer Quadratic Programming (MIQP)
  - ↪ Mixed-Integer Quadratic Constrained Programming (MIQCP)

On the UL HPC platform

- Both softwares can be loaded using the module command
- Both softwares can solve very large problems
- EXCEPT MIP => NP-hard => implicit tree search algorithms (Branch and Bound family)
- Branch and bound algorithms can be solved in parallel to speed up the optimisation:
  - ↪ For exact optimisation => limited instance size
  - ↪ For approximation wit guarantee can be really interesting (tuning the gap to optimality).

Tutorial

- Please go to https://ulhpc-tutorials.readthedocs.io/en/latest/maths/Cplex-Gurobi/

Questions?

http://hpc.uni.lu

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