

Student/Bachelor/Master Project: CPLEX Performance Benchmarks

Description: While HPC is already well established in research and development fields such as engineering and science, there is still much room for solving optimization problems in business administration and economics [Schryen20]. Considering the application area of logistics, there are a multitude of diverse planning problems of high relevance notably with respect to economic efficiency and ecological sustainability (e.g., various kinds of scheduling and vehicle routing problems). Even simplified models of such problems from practice are often NP-hard. This project should investigate for the time-dependent traveling salesman problem (TD-TSP) [Fink03] how the available mixed-integer mathematical optimization solver CPLEX [CPLEX] is already able to exploit parallel computing power of the shelf (considering shared memory multi-core parallelization). Performance benchmarks based on [CPLEX2] should be conducted to improve the default CPLEX settings for the TD-TSP from [Fink03], see [Neumann22] for first results.

Prerequisites: Ideally experience in IBM ILOG CPLEX Optimization Studio, data evaluation, benchmarking performance, working on an HPC cluster.

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References:

[Fink03] A. Fink, S. Voß. Solving the continuous flow-shop scheduling problem by metaheuristics. European Journal of Operational Research 151(2), pp. 400-414, 2003

[Schryen20] G. Schryen, N. Kliewer, A. Fink. High Performance Business Computing. Business & Information Systems Engineering 62, pp. 1-3, 2020

[Neumann22] P. Neumann. hpc.bw: A Supercomputer with Competence Platform for the Universities of the Federal Armed Forces. dtec.bw Sammelband, pp. 305-310, 2022, <https://openhsu.ub.hsu-hh.de/handle/10.24405/14569>

[CPLEX] https://www.ibm.com/mysupport/s/topic/0TO50000000226IGAQ/ilog-cplex-optimization-studio?language=en_US

[CPLEX2] <https://www.ibm.com/support/pages/cplex-performance-tuning-mixed-integer-programs#Item2>