TECHNISCHE UNIVERSITÄT
CHEMNITZ

Department of Computer Science
Chair for Practical Computer Science
Prof. Dr. G. Rünger
Dr. Jens Lang
Thomas Jakobs, M.Sc.

1st Task Sheet

The tasks 1 and 2 are solved together during the tutorials on 28th October. Task 3 is supposed to be solved until the 3rd November. Please upload your solution in OPAL.

Task 1

A parallel programme has a speedup of $S_p(n) = s$ on p cores. The problem size is n.

    a) Give a formula for the maximum attainable speedup for $p \to \infty$.

    b) Give the maximum attainable speedup for $p \to \infty$ if $S_{10}(n) = s = 5$ and $p = 10$.

Amdahl's Law shall hold true.

Task 2

There are two programmes Π_1 and Π_2. The parallel execution time T_p is given depending on the problem size $n > 0$ and the number of cores p:

Π_1: $T_p^1(n, p) = n + n/p$,

Π_2: $T_p^2(n, p) = n + n^2/p$.

The sequential execution time equals the parallel execution time for $p = 1$. Decide for each of the programmes whether it is scalable or not.

Task 3

A parallel programme shall be executed in a computer center. The computer center charges a fee G (in Euros) for executing a parallel programme with costs C_p on p processors according to the following formula:

$$G = 0.15\,\frac{€}{s} \cdot C_p + 2.50\,\frac{€}{s} \cdot T_p \quad .$$

Your programme has a sequential part of f and a sequential runtime of T^*. The parallel runtime of the programme follows Amdahl's Law.

Give the number of processors to be used in order to minimise the fee G for executing parallel programmes with the following properties:

a) $f = 0.25$ and $T^* = 45$ s,

b) $f = 0.25$ and $T^* = 250$ s,

c) $f = 0.5$ and $T^* = 45$ s,

d) $f = 0.1$ and $T^* = 45$ s.