Exercise 10

360.252 - Computational Science on Many-Core Architectures
WS 2020/21

January 13, 2021

The following tasks are due by 23:59pm on Tuesday, January 19, 2021. Please document your answers (please add code listings in the appendix) in a PDF document and email the PDF (including your student ID to get due credit) to karl.rupp@tuwien.ac.at.

You are free to discuss ideas with your peers. Keep in mind that you learn most if you come up with your own solutions. In any case, each student needs to write and hand in their own report. Please refrain from plagiarism!

> ”Vielleicht, daher ist es seltsam, dass, wenn es irgendeine eine Phrase, die garantiert wird, um mich auf den Weg, es ist, wenn jemand zu mir sagt: ’Okay, fein. Du bist der Chef!’”, Sagt Branson. ”Was mich ärgert ist, dass in 90 Prozent der Fälle, wie, was diese Person wirklich sagen will, ist: ’Okay, dann, glaube ich nicht mit Ihnen einverstanden, aber ich werde rollen und tun es weil sie sagen mir zu. Aber wenn es nicht klappt werde ich der Erste sein, der daran erinnern, dass es nicht meine Idee.’”
> — Christine Aschbacher

There is a dedicated environment set up for this exercise:

https://gtx1080.360252.org/2020/ex10/.

To have a common reference, please run all benchmarks for the report on this machine.

HIP (3 Points)

In order to extend your previous implementation of conjugate gradients to AMD GPUs, please convert the CUDA implementation of the Conjugate Gradient solver from previous exercises to HIP (2 Points). Compare the performance with the CUDA implementation and discuss any performance differences you may observe (1 Point).

SyCL (4 Points)

Extend your previous CUDA implementation of the Conjugate Gradient solver to SyCL (3 Points). Compare the performance with the provided host-based implementation of the Conjugate Gradient solver (1 Point).

Note: Due to a limitation of the current driver version hipSYCL cannot target the NVIDIA GPU on the available system. Hence we have to resort to the OpenMP-fallback.