

**GPU Computing**  
**Term 2016/2017 (Winter)**

## Exercise 11

- Return electronically until Thursday, 02.02.2016 14:00
- Include name on the top sheet. Hand in only one PDF.
- A maximum of three students is allowed to work jointly on the exercises.
- Hand in source code if the exercise required programming.

### 11.1 Reading

- Jianbin Fang, Ana Lucia Varbanescu, and Henk Sips. 2011. A Comprehensive Performance Comparison of CUDA and OpenCL. In *Proceedings of the 2011 International Conference on Parallel Processing (ICPP '11)*. IEEE Computer Society, Washington, DC, USA, 216-225.
- Stone JE, Hardy DJ, Ufimtsev IS, Schulten K., GPU-accelerated molecular modeling coming of age. *J Mol Graph Model*. 2010 Sep; 29(2):116-25.

(25 points)

### n-Body Problem

This is a continuation of the n-Body exercise. In this exercise, we will optimize it for multiple GPUs within one host. N-Body is a problem that should (almost) perfectly scale with the number of GPUs, as it is severely compute-bound. For this exercise, use the one of the creek nodes. They come with two GPUs, which should be simultaneously utilized in this exercise.

### 11.2 n-Body - Multi-GPU

- Modify your code to utilize both GPUs.
- Test your program extensively and verify correctness by comparing the result to a previous version.

(35 points)

### 11.3 n-Body - Performance Comparison

- Vary problem sizes and report performance numbers. Compare the performance results with the previous versions. Interpret your results!

(15 points)

This is the final exercise! Good luck preparing for the exam!

**Total: 75 points**