ETH zürich

High-Performance Computing Lab for CSE **2020**

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Solution for Project 1

Due date: 09.03.2020 (midnight)

In this project you will practice memory access optimization, performance-oriented programming, and OpenMP parallelizaton on Euler.

1. Explaining Memory Hierarchies *(30 Points)*

1.1. Identifying Parameters

Using the commands given on the exercise sheet, I was able to find the following values for the memory hierarchy on the computer node of the Euler cluster:

Main memory	32 GB
L3 cache	6 MB
L2 cache	256 kB
L1 cache	32 kB

1.2. Running Membench

In this exercise we were supposed to run the membench program on our local machine and on the Euler cluster. The first plot (Fig. 1) represents the results on my local machine. I have a Intel Core i7 processor with 16 GB of Main Memory, 196 kB of L1 cache, 2 MB of L2 cache and 8 MB of L3 cache. The second plot (Fig. 2) represents the results using Euler. I have used the Xeon Gold 6150 CPU. When we look at the time axis, we can easily see that the performance of the Euler cluster is much better than on my local machine.

Figure 1: Plot for local machine

Figure 2: Plot for Euler

1.3. Memory Access Patterns

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1.4. Temporal Locality

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2. Optimize Square Matrix-Matrix Multiplication *(70 Points)*