
Solution for Project 1

Due date: 12.10.2022 (midnight)

HPC 2022 — Submission Instructions
(Please, notice that following instructions are mandatory:
submissions that don't comply with, won't be considered)

- Assignments must be submitted to iCorsi (i.e. in electronic format).
- Provide both executable package and sources (e.g. C/C++ files, Matlab). If you are using libraries, please add them in the file. Sources must be organized in directories called:
Project_number_lastname_firstname
and the file must be called:
project_number_lastname_firstname.zip
project_number_lastname_firstname.pdf
- The TAs will grade your project by reviewing your project write-up, and looking at the implementation you attempted, and benchmarking your code's performance.
- You are allowed to discuss all questions with anyone you like; however: (i) your submission must list anyone you discussed problems with and (ii) you must write up your submission independently.

In this project you will practice memory access optimization, performance-oriented programming, and OpenMP parallelization on the ICS Cluster .

1. Explaining Memory Hierarchies

(25 Points)

By identifying the memory hierarchy parameters through `likwid-topology` for the cache topology and `free -g` for the amount of primary memory I find the following values:

Main memory	62 GB
L3 cache	25 MB per socket
L2 cache	256 kB per core
L1 cache	32 kB per core

All values are reported using base 2 IEC byte units. The cluster has 2 sockets and a total of 20 cores (10 per socket). The cache topology diagram reported by `likwid-topology -g` is the following:

Socket 0:

0	1	2	3	4	5	6	7	8	9
32 kB	32 kB	32 kB	32 kB	32 kB	32 kB	32 kB	32 kB	32 kB	32 kB
256 kB	256 kB	256 kB	256 kB	256 kB	256 kB	256 kB	256 kB	256 kB	256 kB
25 MB									

Socket 1:

10	11	12	13	14	15	16	17	18	19
32 kB	32 kB	32 kB	32 kB	32 kB	32 kB	32 kB	32 kB	32 kB	32 kB
256 kB	256 kB	256 kB	256 kB	256 kB	256 kB	256 kB	256 kB	256 kB	256 kB
25 MB									

2. Optimize Square Matrix-Matrix Multiplication

(60 Points)

3. Quality of the Report

(15 Points)