

Work Assignment

Phase 3 - Final

Learning outcomes

This assignment phase aims to understand how to design and implement an **efficient** parallel version of the case study, eventually using accelerators (e.g., GPUs), keeping the main goal of reducing the execution time.

Description

In this final assignment student have the freedom **to select one** of three alternative paths to improve the execution of the work submitted in previous phases: i) Correct/improve the OpenMP implementation (this option is limited to a max grade of 13 values); ii) design and implement a new version for accelerators (GPU with CUDA); iii) design and implement a new version for distributed memory (C with MPI).

Note: in the final assignment projects with data races or with the inadequate use of parallelism (e.g., inadequate usage of parallelism directives) will have a strong penalty.

One new request for this final assignment **is the selection and implementation a set of tests** for a solid performance assessment of the developed implementation. This may include the selection of different input sizes, different set of machines and an adequate scalability analysis.

The final assignment (report and presentation) should include a **discussion the key performance aspects** of the case study parallel implementation in order to justify the design decisions and their impact.

Evaluation

The final evaluation will consider:

- (i) **design and implementation** of the sequential and parallel versions of case study (20%);
- (ii) proposed **set of tests** for a scalability analysis (20%);
- (iii) **understand and explain the performance results**, including metrics and models to justify the results (20%);
- (iv) the **report quality** (20%);
- (v) quality of the **oral presentation** (20%)

Groups, submission format and dates

The work assignment should be performed by the same student's groups from previous phases.

Submission rules are similar to previous assignments with minor changes (**in bold**):

- **the final submission must run on the search cluster with a default number of atoms set to 5000;**
- the work must be submitted through the e-learning platform, compressed into a zip file that, when unzipped, should generate a base directory whose name is the groups elements, e.g., a43000_pg54000. It should include:
 - a **6-page PDF final report** with the all relevant information concerning all assignments, using the same IEEE template (in <https://www.ieee.org/conferences/publishing/templates.html>); longer reports are penalized; annexes can be added beyond these 6 pages;
 - a subdirectory with all source code (please, do not submit executables, or other files);
 - a `Makefile` is requested in the base directory, that generates and runs the executable: i) `make` `Makefile` should generate all required executables; ii) **`make run` should run the program by submitting execution to the cluster with `sbatch`, requesting the appropriate resources.**

Submission deadline: 23:59, 7-Jan-24.

The defence of this assignment will be performed during the oral presentation from **8 to 12 of Jan** (the schedule of defences will be provided before the submission deadline). The **oral presentation is mandatory**. Students should prepare a slide presentation of 7 min, which will be followed by a 10 min discussion.