BC3.04a Advanced Programming for HPC

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Course Introduction

Goals

- Be familiar with the principles of parallel algorithms
- Write GPU accelerated programs
- Do the project
  - and (hopefully!), pass the exam

Content

- Review of distributed systems
- Introduction to CUDA programming
- GPU thread and memory model
- "Map-Reduction" pattern
- "Gather-Scatter" pattern

P.S. You're going to spend **a lot** of time programming.

Format

- 2.5 ECTS = 25 hours
- Lecture / Practical work : 10h / 15h
- Prerequisites: Python Programming
- Environment: Linux/Mac
  - Windows isn't supported
- Assessment:
  - Project / Final Exam

Policy

- Collaborations!
  - During exercises
  - Not in the project
  - Nor in the final exam
- **All** students finish, we move to the next exercise

Labwork

- Several Python Programs
  - Understand what you learnt
  - Show your ability to apply it to new problems
- Compilable on Linux/Mac
  - Windows is not supported (by me!)
- Don't copy paste. I have checker tools ☺
- Should be well organized and well written

> *Bad programmers worry about the code. Good programmers worry about data structures and their relationships.*
>
> - Linus Torvalds

Labwork

- Git : Version Control System
- Github
  - Initial repository and instruction
  - https://github.com/SonTG/advancedhpc2022

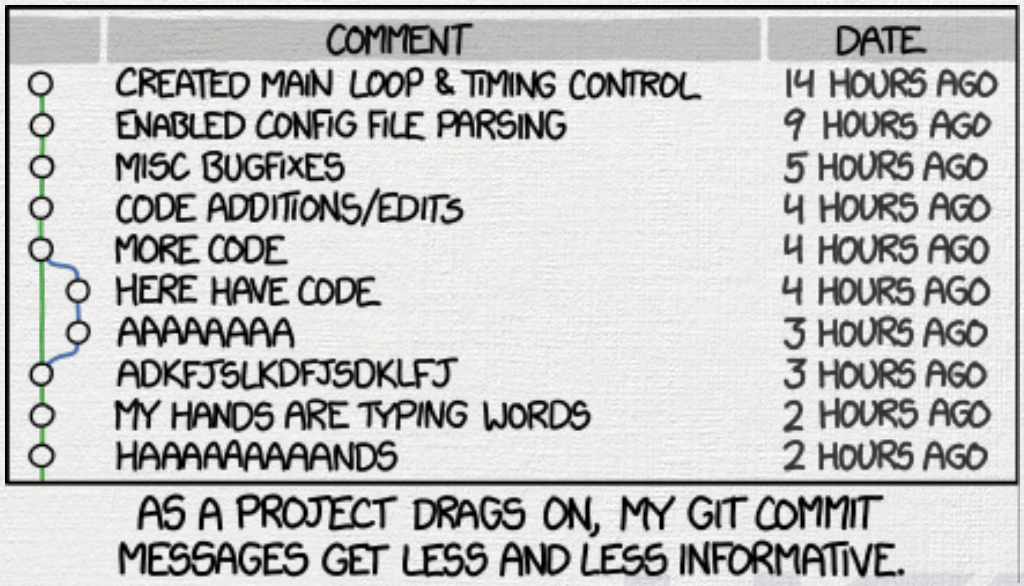

Figure 1: Don't be lazy with your commit messages

Exams

- 3 sheets of A4 documents are allowed
- No laptop / mobile phone / internet
- No discussion, of course

References

- Books
  - An Introduction to Parallel Algorithms, Joseph JáJá. Addison-Wesley Professional. 1992.
  - CUDA Programming: A Developer's Guide to Parallel Computing with GPUs, Shane Cook.
  - Numba Documentation