

Practical Parallel Programming 0



Course Organization

Jan Lemeire
2021–2022

Overview of Courses

- ◆ My former course 'Parallel Systems' (6SP) has been split into 2 smaller courses (each 3SP).

Parallel Systems



Practical Parallel Programming

- Introductory course, for newbies in parallel computing
- The basics
- First semester

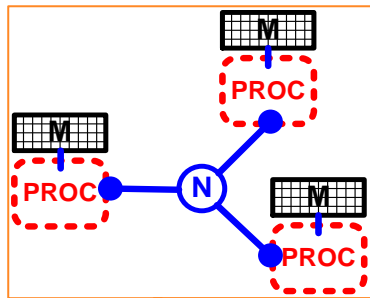


GPU computing

- Advanced course, completely focused on GPUs.
- Extensive programming experience is required
- Second semester

Parallel Systems

Distributed memory

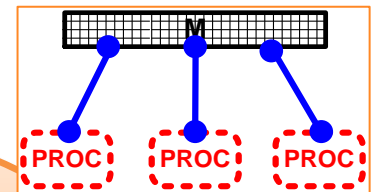


Message-
passing
MPI

*coarse-grain
parallelism*

Shared memory

*coarse-grain
parallelism*



Explicit
multi-
threading

OpenMP

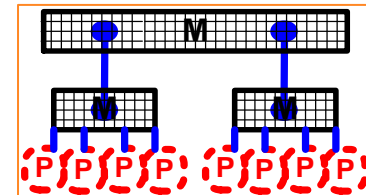
OpenCL/
CUDA

Vector
instructions

GPU

CPU

*fine-grain
parallelism*



Goals of course PPP

- ◆ Understand architecture of modern parallel systems
 - ✦ All important ones except for GPUs (see overview scheme)
- ◆ Employ software technologies for parallel programming.
- ◆ Understand their performance.

Evaluation of Practical Parallel Programming:

20% Mini-project on optimization
40% Oral exam on theoretical part
40% Project: parallelize an algorithm with the learned technologies

Organization

<http://parallel.vub.ac.be/education/ppp>

- ◆ Theory sessions: 5 chapters
 - ✦ Starts in week 4
 - ✦ Interleaved with the exercises
 - ✦ sessions were recorded and are available on website
- ◆ Practica: exercises to train you
 - ✦ Starts in week 5
 - ✦ Install Visual Studio (Community edition is for free)
 - ✦ explanation is recorded and made available
- ◆ Mini-project with 1-2 students
 - ✦ Starts by the end of October
- ◆ Project with 1-2 students
 - ✦ Starts in November

References

<http://parallel.vub.ac.be/education/ppp>

PPCP

- ◆ "Parallel Programming: Concepts and Practice" by Schmidt et al. (2019)

PPP

- ◆ "[Principles of Parallel Programming](#)" by Calvin Lin and Larry Snyder (2009)
 - ✦ Chapters 1-6, 7 (partly)

KUMAR

- ◆ "[Introduction to Parallel Computing](#)" by Grama, Gupta, Karypsis & Kumar (2003)
 - ✦ Chapters 1-7, 8.2, 9, 11

PPCP

Parallel Programming

Concepts and Practice



Bertil Schmidt | Jorge González-Domínguez
Christian Hundt | Moritz Schlarb

MK
MOSEMAN KAPPMANN

PPP

PRINCIPLES OF PARALLEL PROGRAMMING



CALVIN LIN
LAWRENCE SNYDER

KUMAR

Introduction to

Parallel Computing

Second Edition

Second
Edition

Introduction to Parallel Computing

GRAMA
GUPTA
KARYPIS
KUMAR

ANANTH GRAMA • ANSHUL GUPTA
GEORGE KARYPIS • VIKIN KUMAR

ADDISON-WESLEY

Jan Lemeire (jan.lemeire@vub.be)

- ◆ Civil Engineer - electronics, 1994, VUB
 - + additional masters in computer sciences (1995)
- ◆ Worked for 4 year in the private sector, in 2 IT-consultancy companies
- ◆ 2000-2007: did PhD at the VUB as assistant
 - ★ Topic: Performance analysis of MPI programs
 - ★ Assisting the practica of informatics
- ◆ Since 2008: professor at VUB
 - ★ Course 'Parallel systems' in the masters
 - ★ Since 2011: 'Informatics' first year bachelors engineer
- ◆ Since October 2013: teaching to engineers in industrial sciences
 - ★ Computer architecture, Electronics, Informatics
- ◆ Research topics:
 - ★ parallel processing, gpu computing
 - ★ data mining/machine learning/probabilistic models
 - ★ **Self-learning robots**