703650 VO Parallel Systems WS2020/2021
Introduction & Administrative Stuff

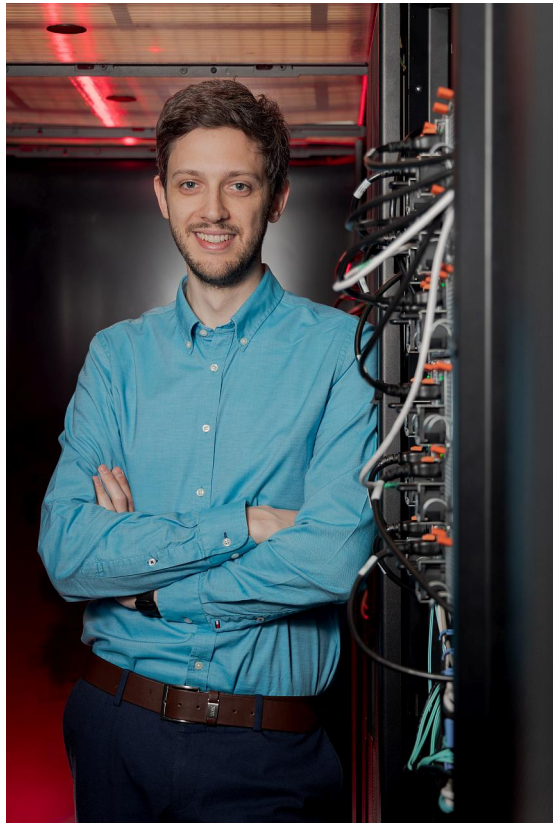
Philipp Gschwandtner

Where are the Slides?

https://github.com/philippgs/uibk_parsys_20

https://git.io/JUbVN

Where is the Instructor?



Organizational Stuff

- lecturer information
  - Philipp Gschwandtner PhD
  - philipp.gschwandtner@uibk.ac.at
  - room 2W05, ICT building
  - no fixed office hours
    (send an e-mail, I'm quite responsive)
- dates and location
  - see lfu:online for exact dates
  - generally:
    - lecture every Tuesday
      08:15-10:00 in ~~HS B 7~~ the Internet
    - proseminar every Monday
      12:15-15:00 in ~~RR 26~~ the Internet

More Organizational Stuff

- prerequisites
  - interest in parallel programing and high performance computing
  - lecture: very little beyond that
  - proseminar: programming in C/C++
  - **a working headset/microphone/etc.**
- language
  - English-ish?

- content
  - general concepts of parallel programming and its intricacies
    - concepts apply to almost all parallel programming models
    - as an example, we will mainly discuss MPI
    - there are countless others (OpenMP, OpenCL, CUDA, TBB, Cilk, Pthreads, C++ STL, Charm++, X10, PGAS, …)

Grading: Lecture

- no mandatory attendance
  - Note: not everything I say will be on the slides…
- single, written exam on February 2nd 2021
  - multiple exercises with multiple points
  - standard grading scheme, ≥ 50 % for positive grade
  - Covid-19-specific: could be online, could be on another day ¯_(ツ)_/¯

Grading: Proseminar

- weekly assignments, published on GitHub
  - https://github.com/philippgs/uibk_parsys_20
- teamwork is permitted and encouraged
  - 3 people max. per team
  - **every** team member must be able to present and discuss solution
- solutions have to be handed in before the PS starts!
  - solutions **must work** on the LCC2 cluster
  - copying solutions (e.g. off the Internet) is acceptable **if properly cited and understood**
  - grade is 50 % solutions, 50 % presentations/discussion – both must be ≥ 50 %!

Literature

- www.internet.com
  - MPI: A Message-Passing Interface Standard, Version 3.1 (hardcover book, PDF available via https://www.mpi-forum.org/)
  - Stackoverflow
  - Google
  - …
- old school: Printed books
  - Let me know and I will look up some references…

What do I do when I am not teaching?

- Senior Scientist at Research Center HPC (Forschungszentrum Hochleistungsrechnen)
  - www.uibk.ac.at/fz-hpc
  - aid researchers at UIBK in developing and optimizing parallel applications
  - formerly Distributed and Parallel Systems Group (DPS), https://dps.uibk.ac.at

- research interests in and around HPC
  - measurement/optimization/modeling of performance, energy, efficiency, …
  - APIs, programming models, runtime systems, compilers, ...
  - interested in master thesis topics?

What are we all doing here?

- discuss key concepts of parallel computing
  - hardware **and** software aspects
  - multiple non-functional aspects – there's more than just speed
  - portability, usability, maintainability, sustainability
- we still need to actually do some concrete work
  - (mostly) MPI for implementing and evaluating distributed-memory parallelism concepts
  - we'll use LCC2 for running experiments

What are we Going to Discuss?

- crash course on hardware and programming models
- introduction to MPI (and a bit of OpenMP)
- tons of generic concepts at the example of MPI (and OpenMP) programs
  - metrics: performance, efficiency, scalability
  - problem partitioning, scheduling and load balancing
  - parallel program classification and characteristics
  - programmer productivity, debugging, profiling
  - …

Hints (not only) for this Course

- choose a suitable source code editor / IDE and choose it wisely!
- get acquainted with your toolchain
  - debuggers, version control (git), etc.
- use common sense and sanity checks!

Questions?

Image Sources

- LCC2: https://www.uibk.ac.at/zid/systeme/hpc-systeme/lcc/hardware/
- Sandbox: http://www.googblogs.com/open-sourcing-sandboxed-api/