703078 PS Parallel Programming SS2022
Introduction & Administrative Stuff

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Organizational Stuff

- Philipp Gschwandtner
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- Groups 2, 3
  - Tue, 09:15-10:00
  - Tue, 10:15-11:00
- Group 4
  - Tue, 11:15-12:00
- Groups 1, 5
  - Tue, 08:15-09:00
  - Tue, 12:15-13:00

Covid-specific information

- Discord server for weekly proseminar sessions and any discussion
  - please change your nickname to your full name (can be done per-server)
  - mute any channels you're not interested in (e.g. of other groups)
  - make sure you have a working audio setup and that you can share your screen for discussing any measurements, source code, etc.

More Organizational Stuff

- Prerequisites
  - Interest in parallel programing
  - Programming in C or C++
- Language
  - Groups 1, 2, 3, 5: German, unless there are non-German speakers?
  - Group 4: English
- Content
  - General concepts of parallel programming
    - Concepts apply to many parallel programming models
    - As an example, we will mainly discuss OpenMP

Grading: Proseminar

- Weekly assignments, published on OLAT
  - Link to GitHub
  - 3 points per week
- 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 until Mon 17:00!
  - Solutions of assignments on the LCC2 cluster **must work** on LCC2
  - Copying solutions (e.g. off the Internet) is acceptable **if cited properly and understood**
  - Grade is 50 % solutions, 50 % presentations/discussion – both must be ≥ 50 %!

Literature

- www.internet.com
  - https://www.openmp.org/resources/ (incl. video tutorials)
  - stackoverflow
  - Google
  - …
- Old school: Printed books
  - Let us know and we will look up some references…

What are we all doing here?

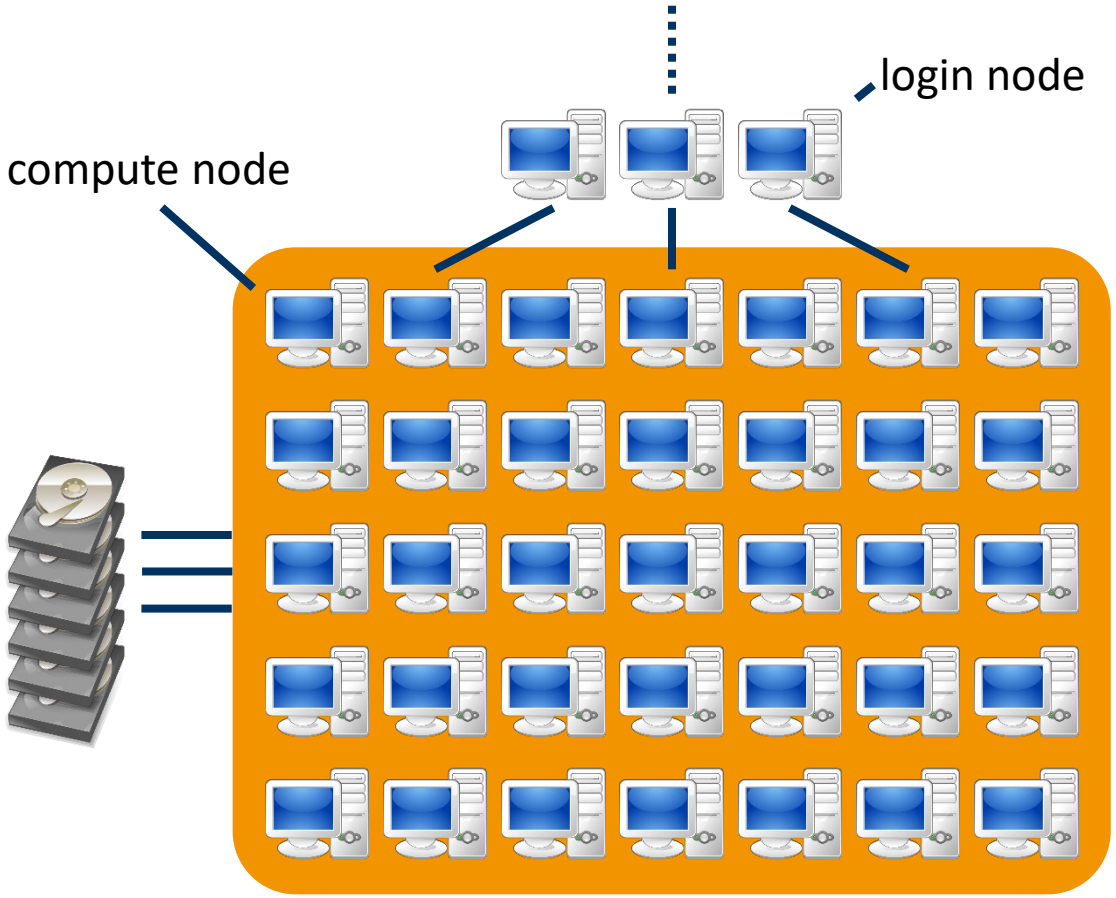
- Discuss key concepts of parallel computing
  - Hardware **and** software aspects
  - Multiple non-functional aspects – there's more than just speed
  - Portability, usability, maintainability, sustainability
- We still need to actually do some concrete work
  - (Mostly) OpenMP for implementing and evaluating distributed-memory parallelism concepts
  - We'll also use LCC2 for running experiments

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!

Clusters and Supercomputers

- Looks like:



Get User Credentials, Log in and Change Your Password!

- `ssh cbxxxxxx@lcc2.uibk.ac.at`
- Change password with `passwd`
- You are responsible for your account!
  - don’t use these credentials for anything other than this course
  - coin mining isn’t worth it anyways…

Submission Systems

- Responsible for resource management and job orchestration
  - used to submit or cancel “jobs”, query their status, get information about cluster, …
- Very popular: SLURM
  - modern, complex but very capable
  - de-facto standard on most systems these days

- ~~On LCC2: Sun Grid Engine (SGE)~~
  - ~~older and deprecated ☹~~
  - ~~switch to SLURM currently in progress~~

SLURM!!11!!

Jobs: Submission, Deletion, Status

- `sbatch name_of_script`
  - allocates resources
  - sets up environment
  - executes application
  - frees allocation
- `scancel job_id_list`
  - terminates application
  - frees up resources
- `squ (squeue -u $USER)`
  - queries for job status
  - `squeue` for all users

```
[cb761011@login.lcc2 ~]$ sbatch job.sh
Submitted batch job 184
[cb761011@login.lcc2 ~]$ scancel 184
[cb761011@login.lcc2 ~]$ sbatch job.sh
Submitted batch job 185
[cb761011@login.lcc2 ~]$ squ
JOBID PRIORITY PARTITION NAME USER     STATE   NODES CPUS TIME_LIMIT NODELIST(REASON)
185   504      lva       test cb761011 RUNNING 1     8    30:00      n002
```

Questions?

Image Sources

- LCC2: https://www.uibk.ac.at/zid/systeme/hpc-systeme/lcc/hardware/
- Sandbox: http://www.googblogs.com/open-sourcing-sandboxed-api/
- Cluster Photo: https://forschungsinfrastruktur.bmbwf.gv.at/de/fi/hpc-compute-cluster-leo3-leo3e_513
- SLURM: https://justjimsthoughts.blogspot.com/2017/07/trivia_24.html