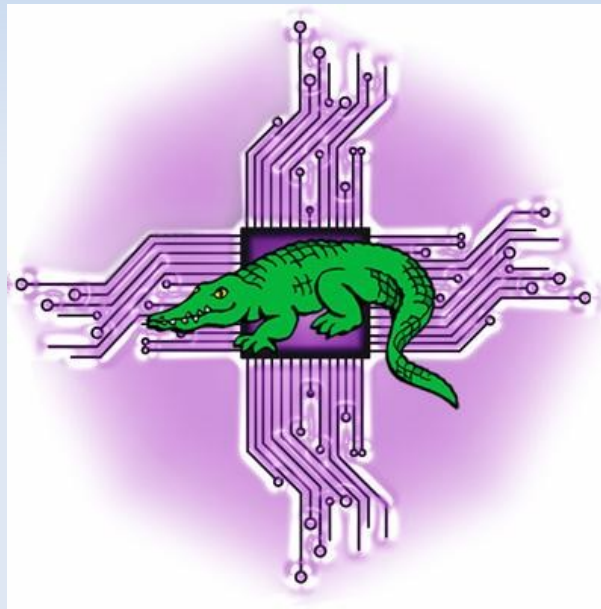


# HPC Certification Forum & Skill Tree: An Update

## Supercomputing Asia 2024



**International Convention Centre  
Sydney, February 21, 2024**

[lev.lafayette@unimelb.edu.au](mailto:lev.lafayette@unimelb.edu.au)

# Why HPC Certification?

***The HPC Certification Forum is one of those ideas so good and so right that you wonder why no one thought of it before. The Forum's Steering Board and members have done the technical community an enormous service by providing a concise training in what it takes to be HPC-literate. I wish we had had this thirty years ago.***

**- John Gustafson, Chief Technology Officer at Ceranovo, inventor of Gustafson's Law in parallel computing**



As data volume, quantity, and complexity expands more researchers look toward HPC and the most efficient and effective means of computing “large and complex” datasets – especially as personal computing devices become less capable, relative to data size and complexity.

Researchers have varying experience and knowledge of how to use HPC. Very inefficient use of resources from them and by HPC service providers.

HPC Certification provides an “at a glance” and tested level of competency.

# Who Is the HPC Certification Forum?

Initiated in 2018 at International Supercomputing Conference, Frankfurt.  
Developed from the Performance Conscious HPC (PeCoH) project in 2017 with the Hamburg HPC Competence Center (HHCC).

Independent international body. Elected steering board. Regular meetings.

General chair: Julian Kunkel (Georg-August Universität Göttingen/GWDG)

Skill-tree curator: Kai Himstedt (DKRZ, German Climate Computing Centre)

HPC Knowledge: Lev Lafayette (University of Melbourne)

Performance Engineering: Anja Gerbes (University of Dresden)

Software Development: Marc-Andre Hermanns (RWTH Aachen)

Administration: Sudeep Narayan Banerjee (Indian Institute of Technology Gandhinagar)

Publicity chair: Weronika Filingner (EPCC)

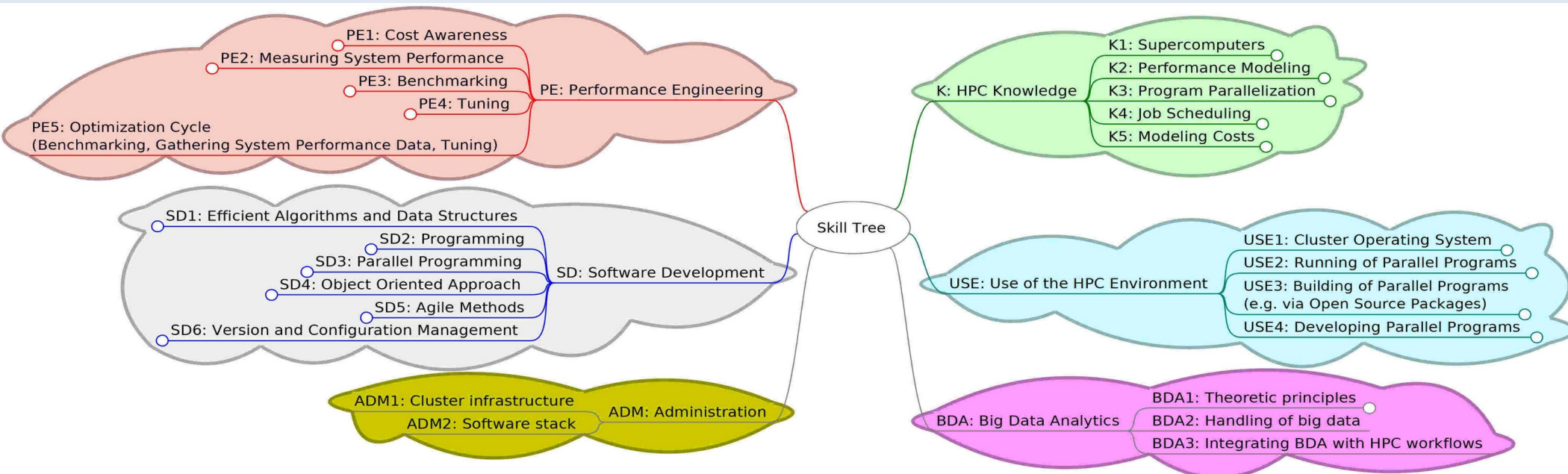
Webpage (<https://www.hpc-certification.org>), Monthly public meetings on our Slack channel. AGM at ISC

# What Does the HPC Certification Forum do?

Development of skill trees, competency standards, and examinable content. Developing a learning ecosystem based on the competencies. Challenge on granularity and organisation of skills and leaf nodes.

Everything is available on GitHub (<https://github.com/HPC-certification-forum>) - except exam questions!

A skill is defined as a background, objectives, and learning outcomes. The skill tree organises the competencies into a hierarchy with dependencies. Certificates are developed that include several skills into a testable unit.



# High-Level Skill Example

Name: Command Line Interface

Id: USE1.1-B

Background: HPC systems are usually accessed via a Linux-based Command Line Interface (CLI) that is provided by a shell. At its core, a shell is ...

Aim: (i) describe the key principles of a shell (ii) execute basic programs to query system information and manipulate...

Learning outcomes (these must be examinable)

Utilize the bash shell to execute individual programs with arguments

Describe the meaning of the exit code of a program

Run multiple programs after another depending on the exit code `;`, `&&`, `||`

List the set of basic programs and their tasks:

`pwd`

... See <https://www.hpc-certification.org/wiki/skill-tree/use/1/1/b>

# Development Status

Development version of Competency Standard is online; 250 skills, git-managed markdown files. Accessible via Wiki and REST API.

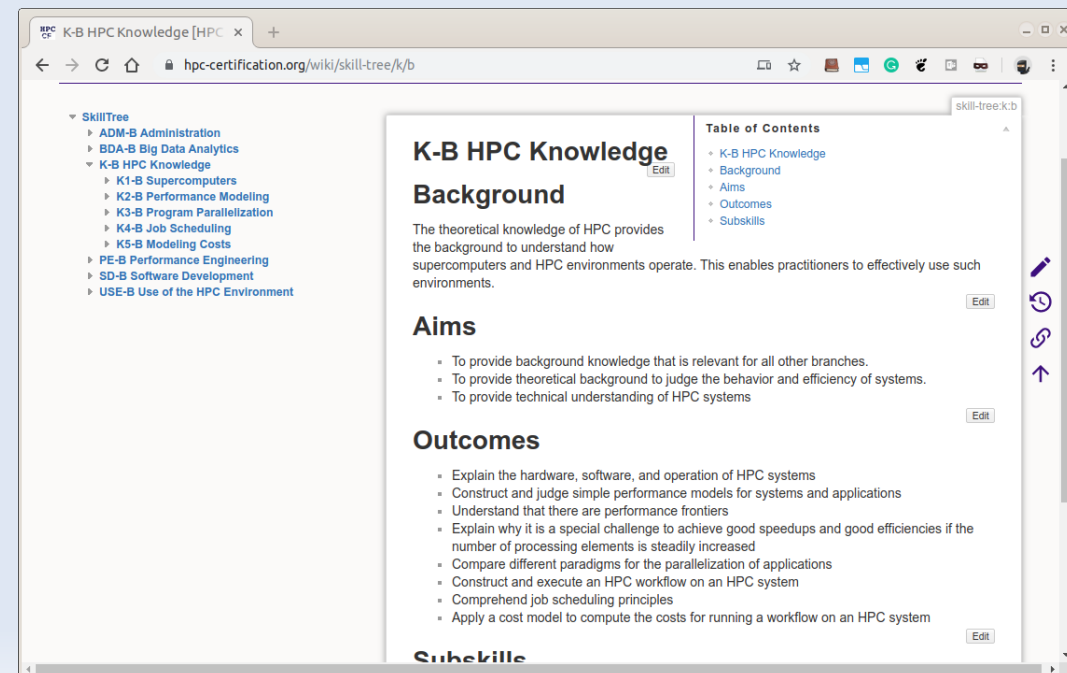
First (limited, prototype) exams are available. Adoptions via BoF at SC and ISC, and various tier-2 (DE) centres (ZIH Dresden, GWDG, Mainz, etc). International collaboration with SIG-HPC EDU. e.g.,  
<https://tu-dresden.de/zih/hochleistungsrechnen/nhr-training/performance-engineering/pika>  
<https://hpc-en.uni-mainz.de/kurse-und-workshops/>

Working on more centres to adopt.

Developing more “expert” level skills.

More events, workshops, and contributors.

Sponsorship would be good!



The screenshot displays a web browser window with the URL `hpc-certification.org/wiki/skill-tree/k/b`. The page content is as follows:

- SkillTree**
  - ▶ ADM-B Administration
  - ▶ BDA-B Big Data Analytics
  - ▼ K-B HPC Knowledge
    - ▶ K1-B Supercomputers
    - ▶ K2-B Performance Modeling
    - ▶ K3-B Program Parallelization
    - ▶ K4-B Job Scheduling
    - ▶ K5-B Modeling Costs
  - ▶ PE-B Performance Engineering
  - ▶ SD-B Software Development
  - ▶ USE-B Use of the HPC Environment

**K-B HPC Knowledge** Edit

**Background**

The theoretical knowledge of HPC provides the background to understand how supercomputers and HPC environments operate. This enables practitioners to effectively use such environments. Edit

**Aims**

- To provide background knowledge that is relevant for all other branches.
- To provide theoretical background to judge the behavior and efficiency of systems.
- To provide technical understanding of HPC systems

Edit

**Outcomes**

- Explain the hardware, software, and operation of HPC systems
- Construct and judge simple performance models for systems and applications
- Understand that there are performance frontiers
- Explain why it is a special challenge to achieve good speedups and good efficiencies if the number of processing elements is steadily increased
- Compare different paradigms for the parallelization of applications
- Construct and execute an HPC workflow on an HPC system
- Comprehend job scheduling principles
- Apply a cost model to compute the costs for running a workflow on an HPC system

Edit

**Subskills**

# Exam Process

Register online, receive email, take online test (scenario-based; SSH login to a container and multiple choice, questions selected from a pool).

Automatic creation of certificate. Award of skill has a PDF and text version with GPG signature and verifiable link to [hpc-certification.org](https://hpc-certification.org)

Provides privacy, statistics, and some protection against brute-force cheating.

-----BEGIN PGP SIGNED MESSAGE-----

Hash: SHA512

HPC Certification Forum Certificate

This text confirms that "Jane Doe" has successfully obtained the certificate

"HPC driving license" (id: 1) at 02/2019.

Verification URL: [https://hpc-certification.org/\[...\]](https://hpc-certification.org/[...])

-----BEGIN PGP SIGNATURE-----

[...]

-----END PGP SIGNATURE-----

## Examination for "Linux basics: USE1.1-B Command Line Interface"

This exam allows to obtain the certificate "Linux basics: USE1.1-B Command Line Interface" with the ID 1.

Deadline: 2022-10-18 17:11:42

Note that more than one answer may be correct for a question.

You must submit the test to the server via the button on the last page, otherwise the results are not saved!

Time remaining: 2994s

### Question 1

Which command is used to close the vi editor?

Mark individual answers as correct or wrong.

unknown  q

unknown  :q & wq & x

unknown  <esc>ZZ

unknown  quit

### Question 2

Which command is used to close the vi editor without saving any changes?

Mark individual answers as correct or wrong.

unknown  :q!

unknown  q

unknown  quit

unknown  :q & wq

### Question 3

Assume you try to run the program "pwd" and if that doesn't work, you want to run "whoami". How can this be executed in one command line on the bash?

Mark individual answers as correct or wrong.

unknown  pwd ELSE whoami

unknown  pwd || whoami

unknown  echo -n ; pwd || whoami

unknown  pwd ; whoami

# Future of the Forum

Need to get more people involved; definitely need funding for one FTU for creating and curating skills.

Development of ecosystem among HPC centres for contributing to skill competencies, questions, and for receiving teachable material.

Examinable content can equate with training curriculum with structured content and scaffolding! Approved centres for training.

Anyone can join! Pull requests, reviews, comments etc for skill trees in github,

join our discussion in Slack, become a member of the Board!

Skill Tree

<https://github.com/HPC-certification-forum/skill-tree>

Processes

<https://www.hpc-certification.org/processes/>

Youtube

[https://www.youtube.com/playlist?list=PL4b682pSp7MQbdhhvwisrPo7PjYya26\\_g](https://www.youtube.com/playlist?list=PL4b682pSp7MQbdhhvwisrPo7PjYya26_g)





**THANKS FOR WATCHING**



**& LISTENING PATIENTLY**