

## Contributing HPC Skills to the HPC Certification Forum



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<https://hpc-certification.org>

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# Outline



## 1 The Program

## 2 Contributing

# The HPC Certification Program



## Goals

- Fine-grained standardizing HPC knowledge representation
  - ▶ What competences exist, how are they defined?
  - ▶ Puzzle of competences for everyone (practitioners, students)
  - ▶ Supporting navigation and role-specific knowledge maps
- Establishing international certificates attesting knowledge

## Important!

- We do not compete with content providers
- We do not intent to create a curriculum

This talk is about contributing to the knowledge representation

# The HPC Certification Forum



The HPC-CF is the central authority for the development of the program

## Organization Details

- An independent international body
- Organized into
  - ▶ Steering board
  - ▶ Full members with voting rights
  - ▶ Associate members
  - ▶ Collaboration with e.g., SIGHPC Education Chapter

## Responsibilities

- Curating and maintaining the skill tree and certificates
- Providing tools and ecosystem around the competences

## Example High-Level Skill



- Name: SLURM Workload manager
- Id: USE4.2.2-B
- Background: SLURM is a widely used open-source workload manager providing various advanced features.
- Aim:
  - ▶ comprehend and describe the basic architecture of SLURM and its tools
  - ▶ use relevant tools to run and monitor (parallel) applications

### Learning outcomes

- run interactive jobs with salloc, a batch job with sbatch
- explain the architecture of SLURM, i.e., the role of slurmd, srun
- explain the function of the tools: sacct, sbatch, salloc, ...
- explain time limits and the benefit of a backfill scheduler
- see <https://www.hpc-certification.org/wiki/>

# Content of the Certification Program



- A **skill** defines background, objectives, learning outcomes
- The **skill tree** organizes the competences as hierarchical skills
- Certificates bundle several skills into attestable unit

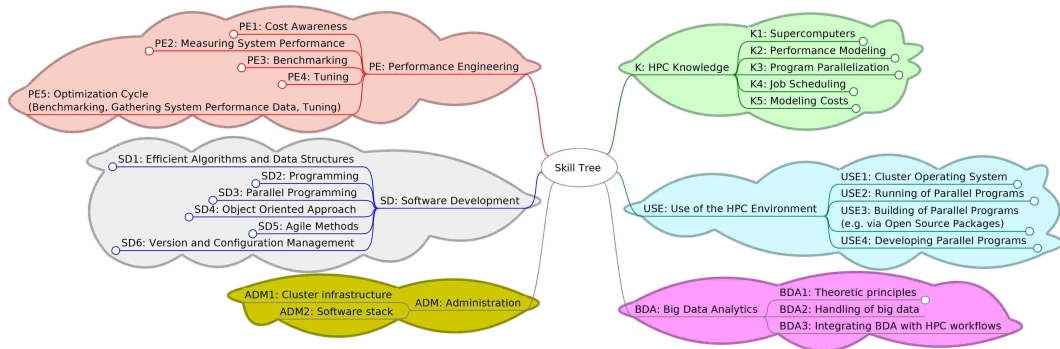


Figure: Top-levels of the skill tree (We are working on ADM and BDA branches)

# High-Level Editing



- Webpage with Markdown version controlled in Git
  - ▶ <https://www.hpc-certification.org/wiki/skill-tree/b>
  - ▶ GitHub: <https://github.com/HPC-certification-forum/skill-tree>
- Editing a MindMap, the structure of Skills
  - ▶ Synchronized with the skill tree in Git
  - ▶ Uses the OpenSource tool Freemind
- Discussion on our [Slack](#)
- We welcome any contribution via either channel
  - ▶ Pull requests are also welcome

# Webpage



The screenshot shows a web browser window with the address bar displaying `hpc-certification.org/wiki/skill-tree/k/b`. The page title is "K-B HPC Knowledge [HPC x]". The left sidebar contains a "SkillTree" menu with the following items: ADM-B Administration, BDA-B Big Data Analytics, K-B HPC Knowledge (selected), 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, and USE-B Use of the HPC Environment. The main content area is titled "K-B HPC Knowledge" with an "Edit" button. Below it is the "Background" section, which states: "The theoretical knowledge of HPC provides the background to understand how supercomputers and HPC environments operate. This enables practitioners to effectively use such environments." To the right of the main content is a "Table of Contents" with links to "K-B HPC Knowledge", "Background", "Aims", "Outcomes", and "Subskills". Below the "Background" section is the "Aims" section, which lists three bullet points: "To provide background knowledge that is relevant for all other branches.", "To provide theoretical background to judge the behavior and efficiency of systems.", and "To provide technical understanding of HPC systems". Below the "Aims" section is the "Outcomes" section, which lists seven bullet points: "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", and "Comprehend job scheduling principles". The "Subskills" section is partially visible at the bottom. The browser's address bar and various icons are visible at the top of the window.

K-B HPC Knowledge [HPC x]

hpc-certification.org/wiki/skill-tree/k/b

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