# Introduction to HPC2N, Kebnekaise and HPC

Birgitte Brydsö,
Pedro Ojeda May, and others at HPC2N

HPC2N
Umeå University

8. September 2021



UMEÅ UNIVERSITY

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- A part of **Swedish National Infrastructure for Computing (SNIC)**

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  - Application Experts (AEs)
- International network for **research and development**

# HPC2N (partners)

HPC2N has five **partners**:

- Luleå University of Technology
- Mid Sweden University
- Swedish Institute of Space Physics
- Swedish University of Agricultural Sciences (SLU)
- Umeå University

# HPC2N (funding)

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- Involved in several **projects and collaborations**
  - EGI, PRACE, EISCAT, eSSENCE, NOSEG, SNIC Science Cloud, ...

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**System and support**

- Erik Andersson
- Birgitte Brydsö
- Niklas Edmundsson (Tape coord)
- Ingemar Fällman
- Magnus Jonsson
- Roger Oscarsson
- Åke Sandgren
- Mattias Wadenstein (NeIC, Tier1)
- Lars Viklund

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- Contact through regular support or dedicated support form[1]
  - If you have a specific problem/question and/or need consultation (up to 100 h)

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# HPC2N (users by discipline)

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  - Biosciences and medicine
  - Chemistry
  - Computing science
  - Engineering
  - Materials science
  - Mathematics and statistics
  - Physics including space physics
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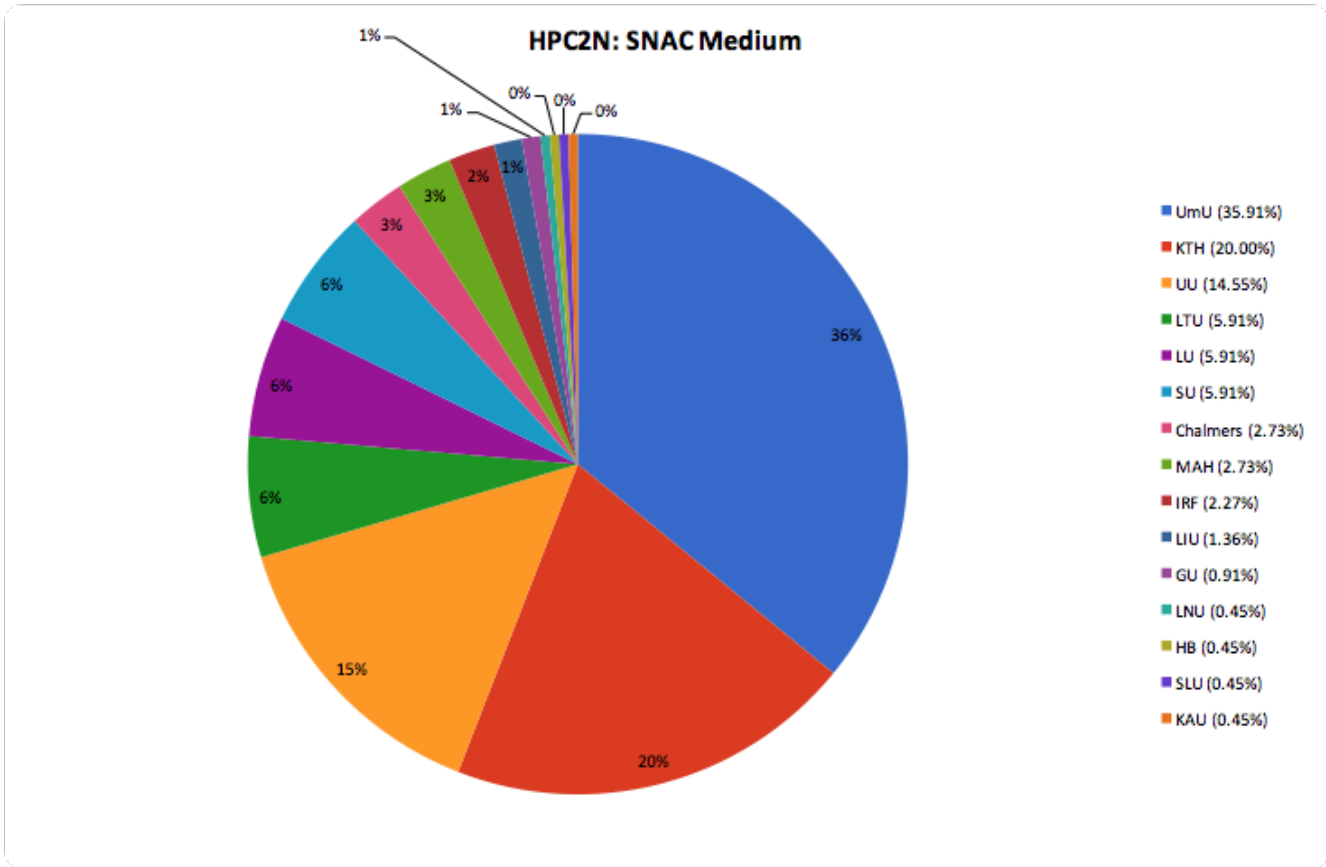


Projects with allocations at HPC2N: 2014-01-01 to 2016-05-30

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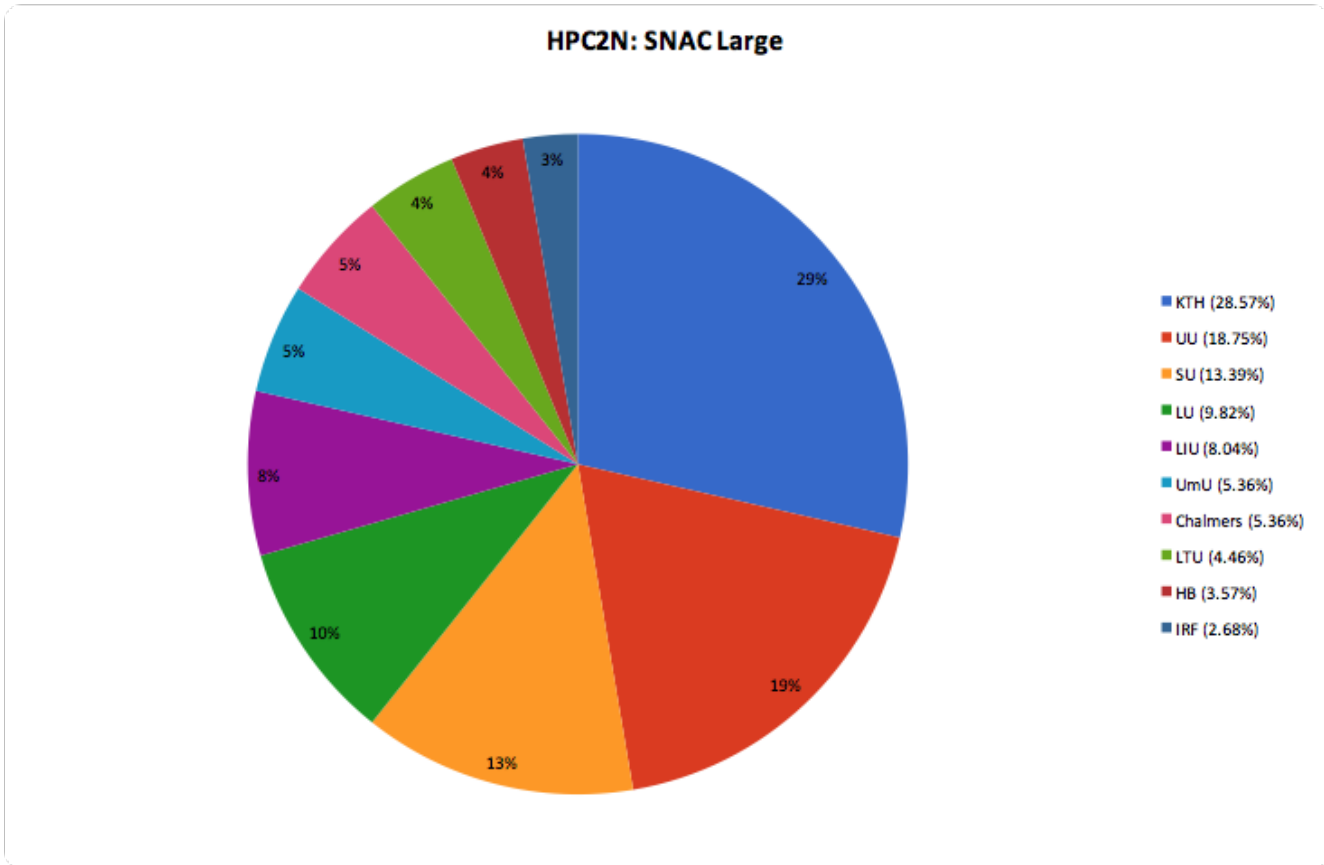


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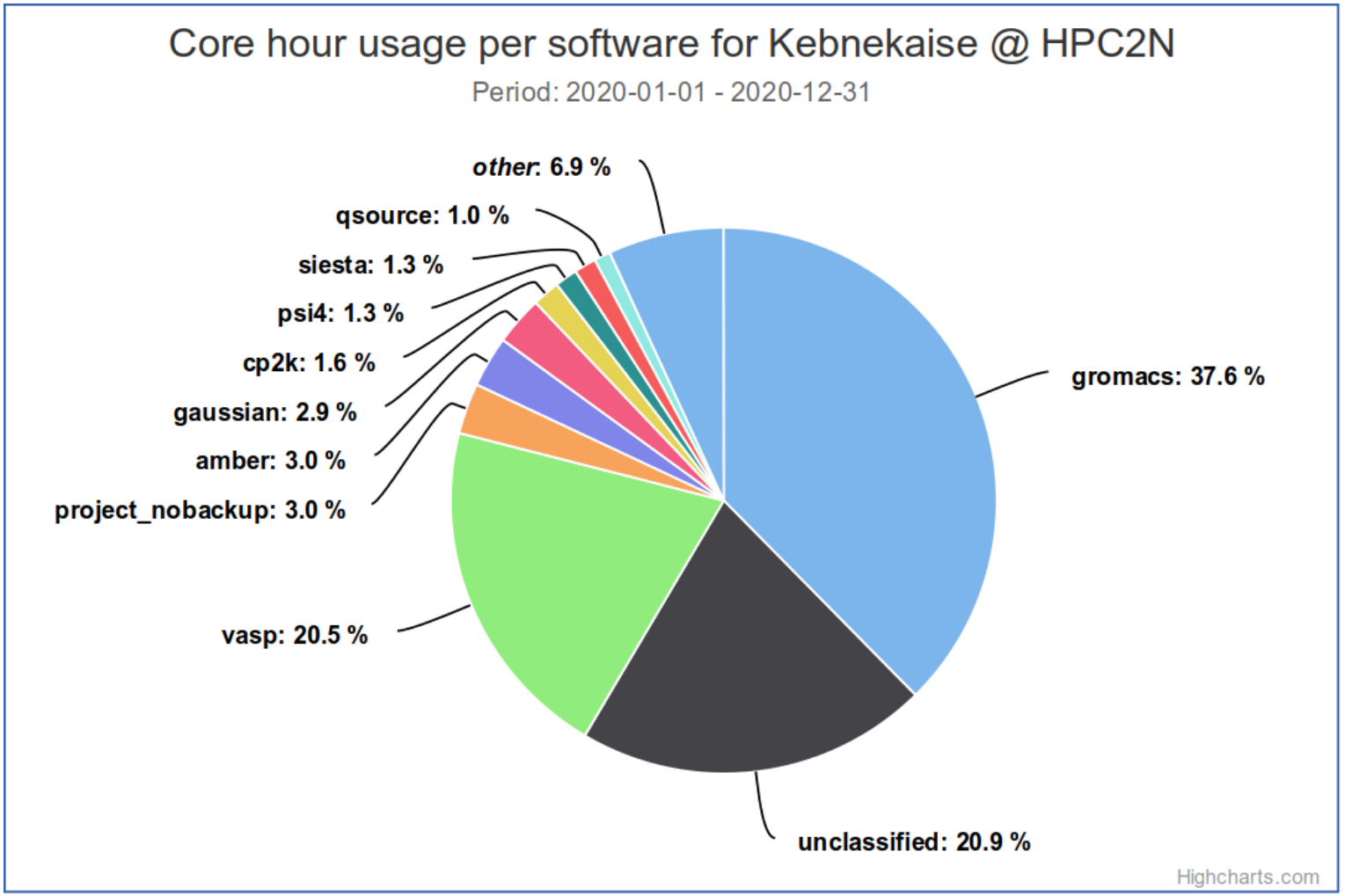

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- In 2018, Kebnekaise was **extended** with
  - 52 Intel Xeon Gold 6132 (Skylake) nodes, as well as
  - 10 NVidian V100 (Volta) GPU nodes

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| GPU-volta | 10 | Intel Xeon Gold 6132, 2 x 14 cores,<br>192 GB, EDR Infiniband,<br>**2 x NVidia V100**,<br>2 x 5120 CUDA cores, 2 x 16 GB VRAM,<br>**2 x 640 Tensor cores** |

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  - 86% of Peak performance

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  - Tape Storage
    - Backup
    - **Long term storage**

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- I will cover more details in the next section, where we go more in to detail about HPC2N and Kebnekaise

# High Performance Computing (definition)

"High Performance Computing most generally refers to the practice of **aggregating computing power** in a way that delivers much **higher performance** than one could get out of a typical desktop computer or workstation in order to **solve large problems** in science, engineering, or business."[2]

[2] https://insidehpc.com/hpc-basic-training/what-is-hpc/

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- **Solve large problems**
  - When does a problem become large enough for HPC?
  - Are there other reasons for using HPC resources? (Memory, software, support, etc.)

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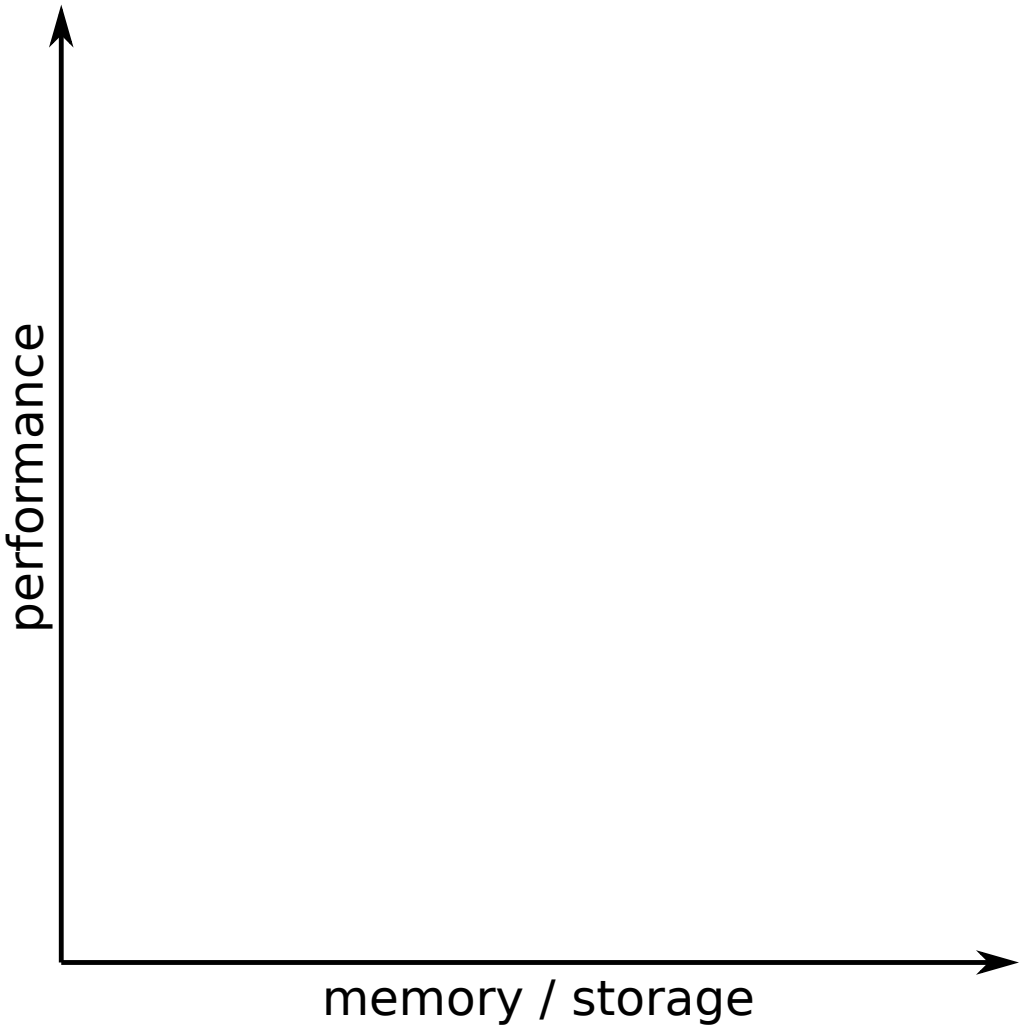
- The latter by **adding more memory / storage**
  - More memory per node (including large memory nodes), more nodes, ...
  - Large storage solutions, ...

# High Performance Computing (what counts as HPC)



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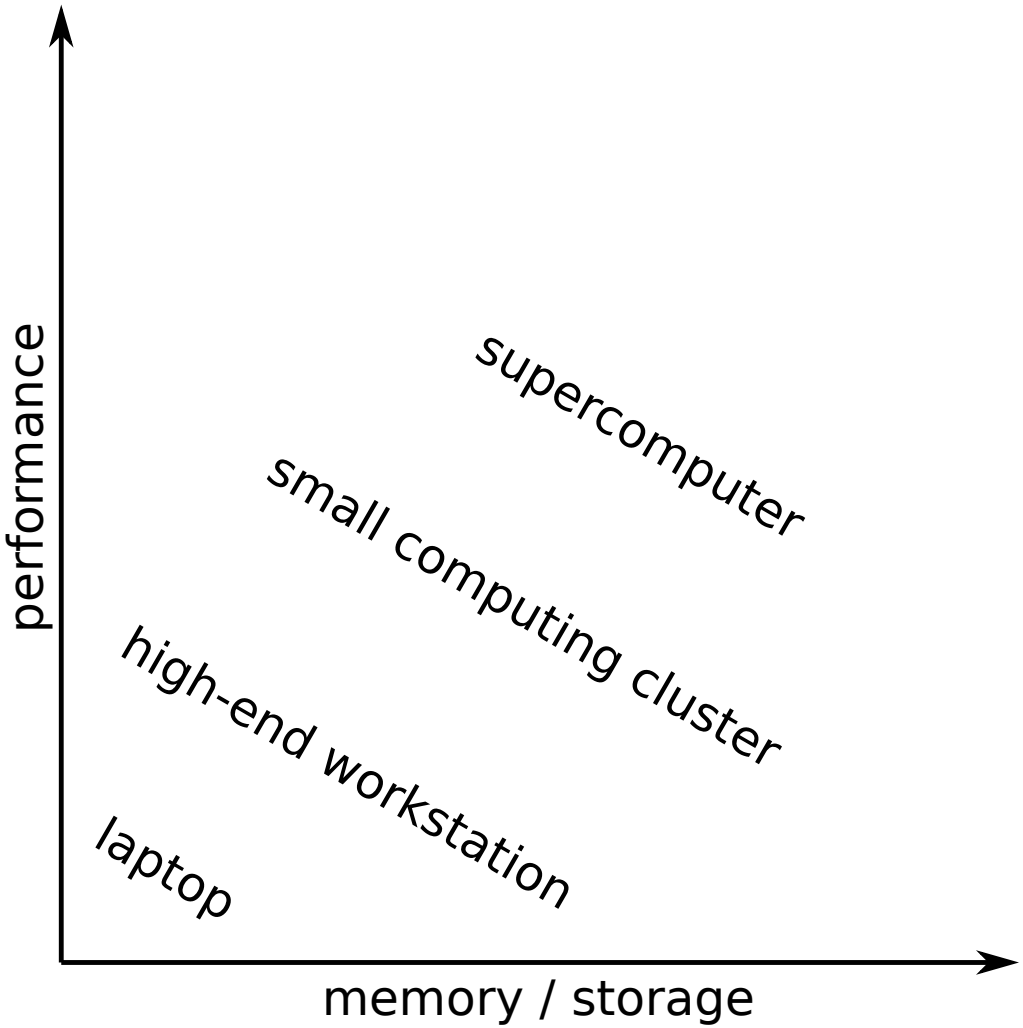

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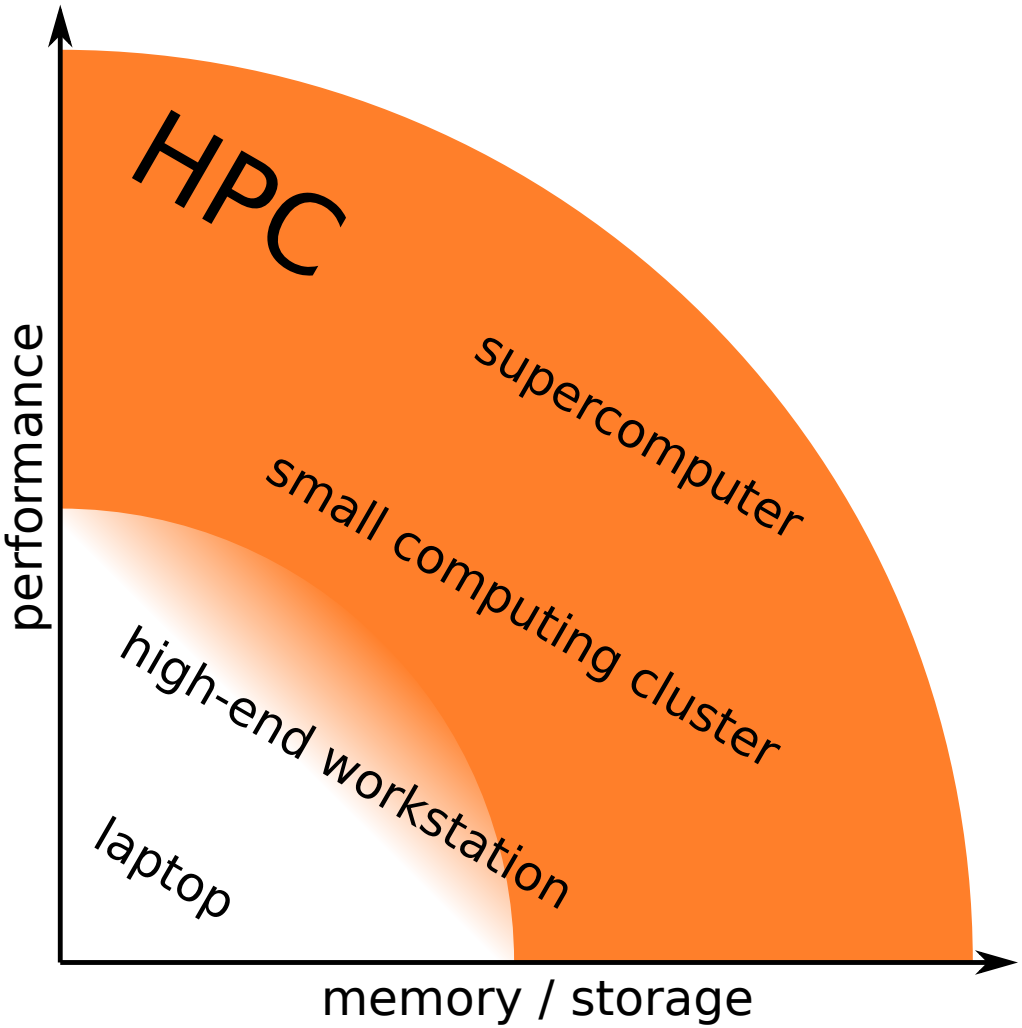

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- **Support and documentation**

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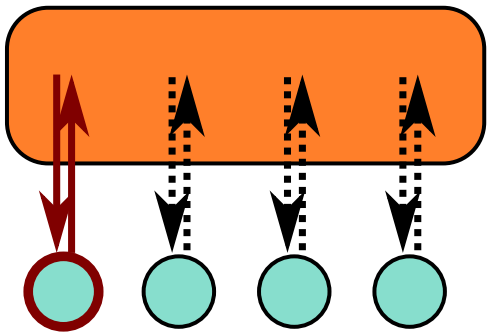

  - **Everyone can access the same data**
  - Straightforward to use

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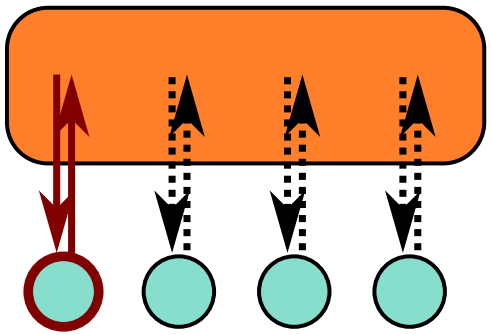
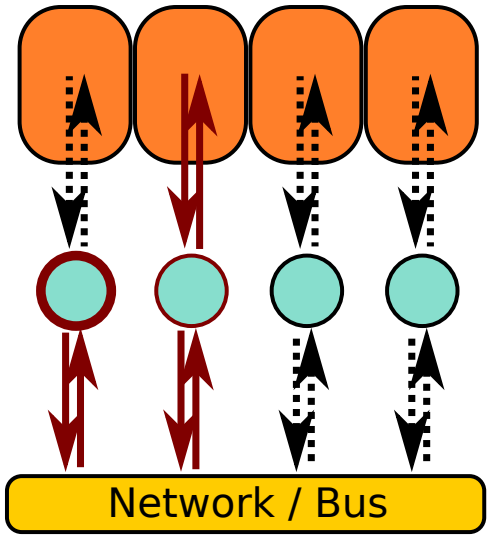
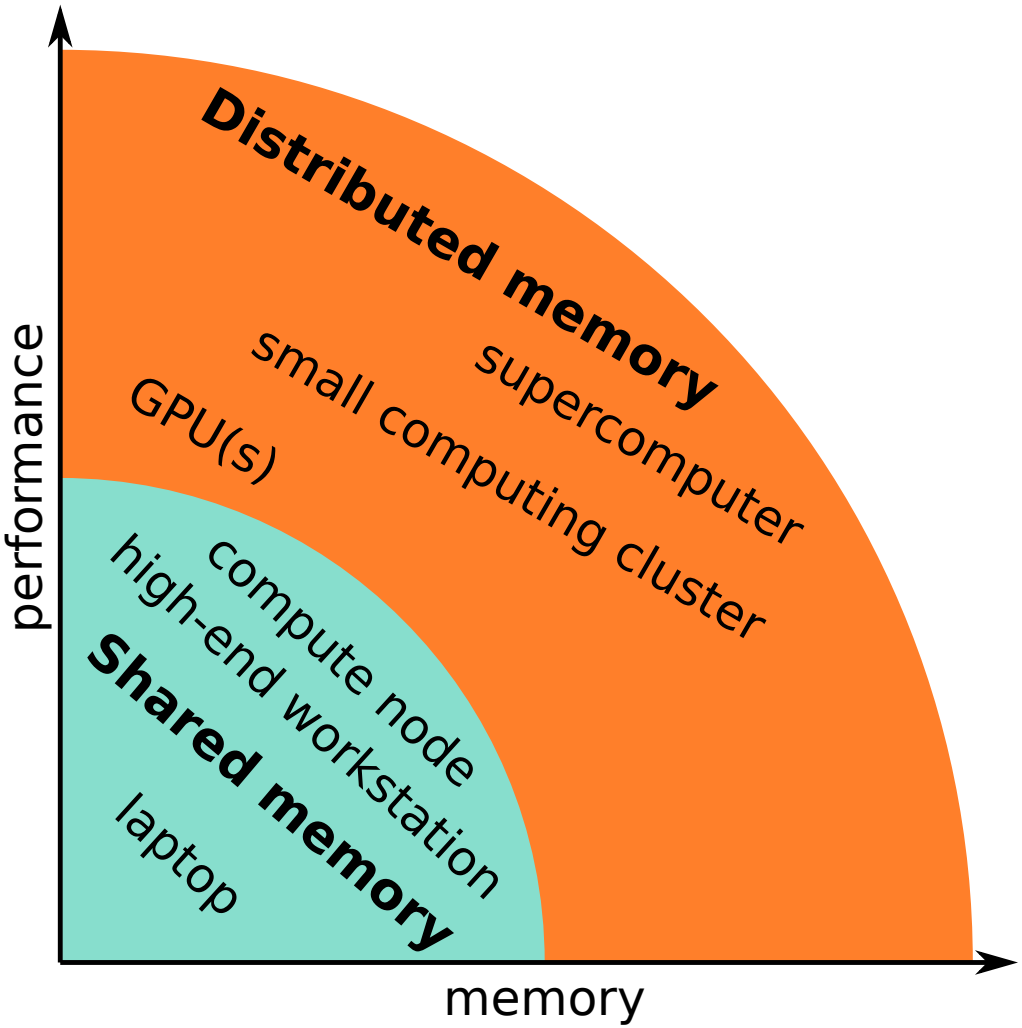


  - **Everyone can access the same data**
  - Straightforward to use
  - Distributed memory: Multiple **distinct** memory spaces.




  - Everyone has direct access **only to the local data**
  - Requires **communication**

# High Performance Computing (memory models)



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  - **Data distribution across memory spaces and movement**

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- GPUs: MAGMA, TensorFlow, ...
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  - Allocate correct number of **cores and GPUs**, configure software to use correct number of **cores and GPUs**, ...

# End (questions?)

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