The project implements traditional services across the virtual competence center and research methods to improve the current state of the art in performance engineering. More details about selected activities are provided in the boxes on the right.

**Goals**

The objectives of PeCoH are to:
1. raise awareness and knowledge for performance engineering and to coordinate performance engineering within Hamburg’s institutions. To reach these goals, we will establish the Hamburg Regional HPC Competence Center.

**CONCEPTS**

The PeCoH project started on March 1, 2017 and has a duration of three years (one PhD candidate and a postdoctoral full time position). For processing the work packages three main topics can be emphasized for scientific work and for the target domain.

- **Establishing Software Engineering for HPC**
  - Our observations show that parallel programs are often developed in the same way as decades ago. One obvious reason is that in the scientific computing community the focus lies on publishing scientific results and not on the software that was used to obtain these results. In the past the software engineering community did not work effectively enough in the field of HPC. Therefore in the PeCoH project we want to measure the positive impact of using software engineering on scientific productivity.
- **Cost-awareness**
  - This will be used to quantify the cost-benefit ratio of novel approaches. Thus we raise the awareness and knowledge of users for performance engineering, i.e., assist in identifying and quantification of potential efficiency improvements in scientific parallel codes and parallel code usage.
- **Competence management**
  - Transfer of HPC Know-how and Providing Tuning Principles
  - According to our experience problems of the scientists are often dominated at the level of getting things to work, i.e. the user focuses on getting a parallel job to run, rather than being aware of how to use the expensive HPC resources appropriately. Hamburg HPC Competence Center (HHCC), as a virtual institution, takes this into account and provides basic and advanced HPC knowledge to improve the situation via online content e.g. for the target domain.
  - Part of general performance engineering support
  - Development of a Cost Model
  - Our cost model will be based mainly on:
    - resource usage of the batch jobs
    - time spent in different tasks to rewrite existing code on pilot studies applying performance engineering concepts.
  - With the subsequent cost analysis we can estimate the cost-benefit ratio of novel approaches. Thus we raise the awareness and knowledge of users for performance engineering, i.e., assist in identifying and quantification of potential efficiency improvements in scientific parallel codes and parallel code usage.

**STATUS AND FUTURE WORK**

The PeCoH project started on March 1, 2017 and has a duration of three years (one PhD candidate and a postdoctoral full time position). For processing the work packages three main topics can be emphasized for scientific work and for the target domain.

1. **Establishing Software Engineering for HPC**
   - Our observations show that parallel programs are often developed in the same way as decades ago. One obvious reason is that in the scientific computing community the focus lies on publishing scientific results and not on the software that was used to obtain these results. In the past the software engineering community did not work effectively enough in the field of HPC. Therefore in the PeCoH project we want to measure the positive impact of using software engineering on scientific productivity.

2. **Cost-awareness**
   - This will be used to quantify the cost-benefit ratio of novel approaches. Thus we raise the awareness and knowledge of users for performance engineering, i.e., assist in identifying and quantification of potential efficiency improvements in scientific parallel codes and parallel code usage.

3. **Competence management**
   - Transfer of HPC Know-how and Providing Tuning Principles
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       - Basic Competences: Linux command line, shell scripts, robust job scripts, job chaining
       - System Building: compilers, optimization flags, linker, libraries, debugger, code optimization
       - Hardware Architectures: shared memory systems, distributed systems, hybrid systems
       - 1/0 Operations: storage systems, choice of file sizes vs. number of files, compression
       - Detecting Performance Issues: measuring speedups (compared to best known sequential algorithm) and efficiencies, monitoring resource utilization on the application level

**WORK PACKAGES**

- **WP2 Performance Engineering**
- **WP3 Performance awareness**
- **WP4 HPC Certification Program**
- **WP5 Tuning sw configurations**

**Hamburg HPC Competence Center (HHCC)**

**Performance Conscious HPC (PeCoH)**

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