

Performance Conscious HPC (PeCoH) Kickoff

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Agenda ¹

14:00 Intro, concept and overview of WPs (*Julian Kunkel, SC*)

14:20 WP 2 – Perf. Engineering (*Mohamed Soliman, SWK*)

15:00 WP 3 – Perf. Awareness (*Julian Kunkel, SC*)

15:25 WP 4 – HPC certification (*Julian Kunkel, SC*)

15:50 *Coffee break*

16:10 WP 5 – Tuning (*Hinnerk Stüben, SVPP/RRZ*)

16:45 WP 6 – Dissemination (*Hinnerk Stüben, SVPP/RRZ*)

17:00 Plan for 2017 and discussion

18:00 *end*

¹Each Presentation is followed by a discussion.

Goals

- Raise awareness and knowledge of users for performance engineering
 - Assist in identification and quantification of potential efficiency improvements
- Establish novel services to foster performance engineering
 - But also utilize existing capabilities
- Improve coordination of performance engineering activities in Hamburg
 - Establish the Hamburg regional HPC competence center (HHCC)
 - Support all three Hamburger data centers

Partners



Universität Hamburg

DER FORSCHUNG | DER LEHRE | DER BILDUNG



DKRZ

TUHH

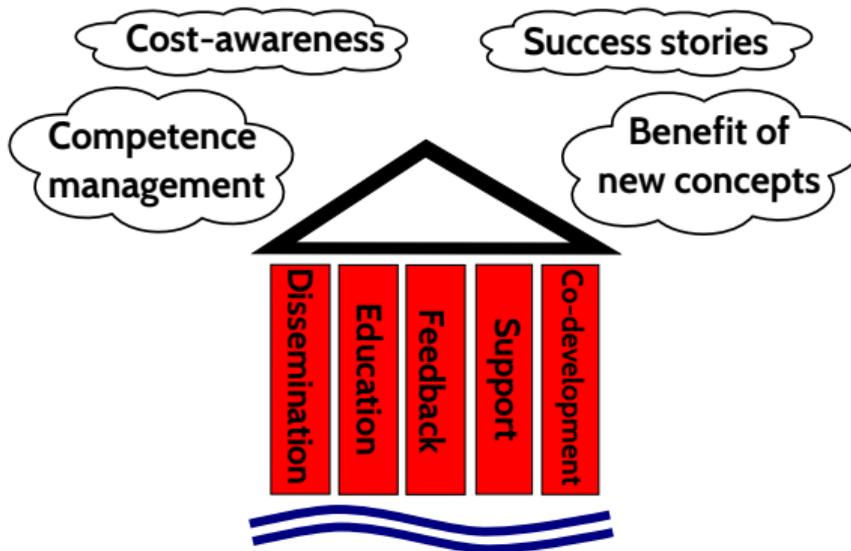
Technische Universität Hamburg-Harburg

Funding

- Each University of Hamburg partner is provided with
 - 12 PM PhD position
 - 12 PM Postdoc position
- Presumably hiring one PhD and Postdoc for 36 PM
- Employees will move between the involved data centers
- Collaboration in the University of Hamburg
 - Prof. Ludwig, **Scientific Computing (SC)** and **DKRZ**
 - Prof. Olbrich, **Scientific Visualization and Parallel Processing (SVPP)** and **Regionales Rechenzentrum (RRZ)**
 - Prof. Riebisch, **Software Construction Methods (SWK)**

Concept

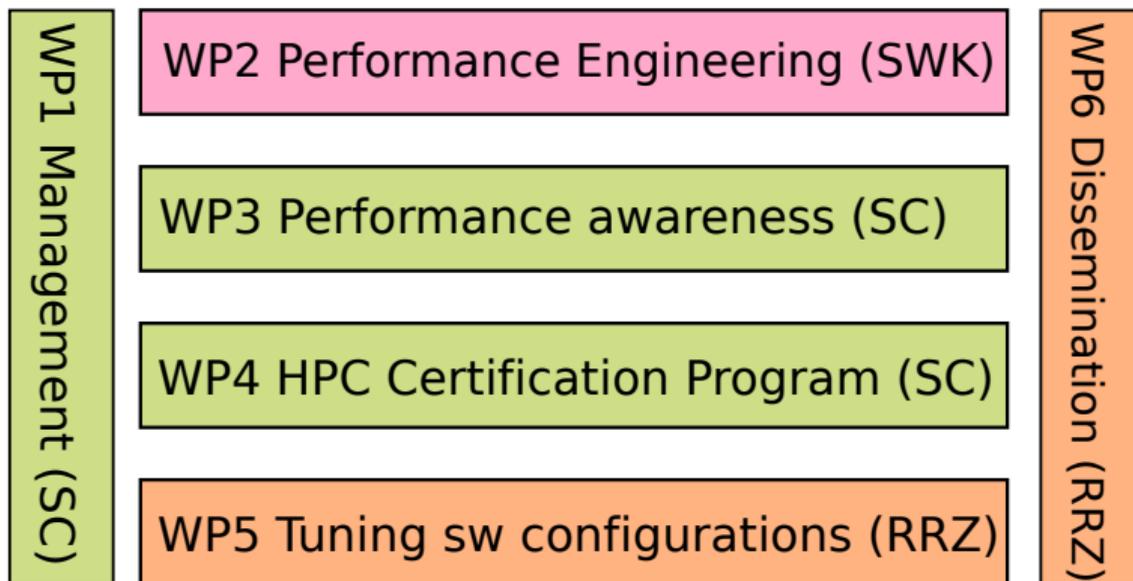
- We implement **services** provide basic support to users
- We research **methods** to raise user awareness for performance engineering



Data Handling (In the Proposal)

- Open access, self-archiving if possible
- Deliverables will become public
- Code-base will be open source
 - HHCC entity on GitHub

Work Packages & Responsibilities



Milestones

M1 Month 6: HHCC is established

- Web page and (distributed) help desk

M2 Month 12: First user workshop

- Promoting of results
- Dissemination of results
- Include users from HLRN and Gauß-Alliance

M3 Month 18: Success stories available

M4 Month 24: Second user workshop

WP1 Management

T1.1 Project management (Ludwig, L1²)

- Biannual face-to-face meetings
- Biannual risk discussions
- Short monthly status (phone) calls (can be canceled if nothing happens)
- We use the Redmine of SC for preparing deliverables

T1.2 Coordination between data-centers (Olbrich, O1)

- Monthly status update of performance engineering activities
- Participation of the Postdoc in relevant meetings at TUHH, DKRZ, RRZ?
- Ongoing activities are tracked by the Postdoc and (potentially) documented on the web page

²Responsible PI, person months per PI (here Ludwig only).

WP3 Performance Awareness

Goal Capturing performance metrics and quantify costs

T3.1 Modeling costs of running scientific applications (Ludwig, L3)

- Understand economics of performance engineering
 - Costs software development vs. costs for execution
- Costs metrics (deployment, configuring, optimization of hardware/software)

T3.2 Reporting costs of user jobs (Ludwig, L3)

- Embed cost metrics into SLURM to quantify job execution costs
- How can we provide this information on the web-presence; sites and HHCC

T3.3 Deploying feedback tools for user jobs (Ludwig, L2, O1)

- Deploy tools to collect performance info for jobs and quantify costs
- Additional tool for semi-automatically identify typical problems and costs/benefit for fixing them

T3.4 Analyzing data and giving feedback to users (Olbrich, O1)

- Monthly check of the feedback tools to understand bottlenecks
- Postdoc can decide to pro-actively contact users

Deliverables

D3.1 Month 6: Report: Costs for running applications

D3.2 Month 12: Code: Integration of cost-efficiency in SLURM

D3.3 Month 30: Report: Tools for semi-automatic user feedback

WP4 HPC Certification Program

Goal Establish a HPC certification program to support users

T4.1 Classification of competences (Riebisch, L1,R2)

- Identify relevant HPC competences (especially performance relevant)
- Alternative (domain-specific) views of competences are appreciated

T4.2 Development of the certification program (Riebisch, L1,O1,R1)

- Overall HPC certification framework
- Identify relevant levels of expertise for competences

T4.3 Workshop material (Olbrich, O4,R1)

- Assemble (own) material to achieve basic level for each competence

T4.4 Online tutorial (Olbrich, O1)

- The tutorial will build upon workshop material but also references external (advanced) material

T4.5 Online examinations (Ludwig, L3)

- Multiple-choice test to gain the HPC certificates
- Create a pool of questions for each topic
- Embed the multiple-choice test into SC developed tool

ICP: Platform Developed for Code (but also Supports Questions)

Teaching at Scientific Computing / University of Hamburg

Login / Sign Up ▾

Note: Your progress will be lost when you do not login.

C Basics

Introduction

The very basics.

Variables

Representing information.

Pointers

The basics of using pointers and possible pitfalls.

Strings

Char arrays and how to use them.

Scopes

Where can you use the same variable

Structs & Enums

Datastructures to simplify programs.

Type Casting

Converting from one type to another

Preprocessor

Preprocessing on your source code.

Dynamic Memory

Allocate memory on the heap.

INTRODUCTION HELLO WORLD! **A SIMPLE ADDER** LOOPS RECURSION

A simple adder

Functions are helpful to organize code into easier to reuse snippets of code. Change the following program to return the sum of **a** and **b**. The section that requires to be changed is marked with "TODO".

```
1 #include <stdio.h>
2 #include <stdlib.h>
3
4 int add(int a, int b) {
5     //TODO: change so that the sum of a and b is returned
6     return 0;
7 }
8
9
10 int main(int argc, const char *argv[])
11 {
12     int a, b, result;
13
14     a = atoi(argv[1]);
15     b = atoi(argv[2]);
16     result = add(a, b);
17
18     printf("The sum of a=%d and b=%d is %d\n", a, b, result);
19     return 0;
20 }
```

EXECUTE

SUBMIT SOLUTION

CONTINUE ▾

Deliverables

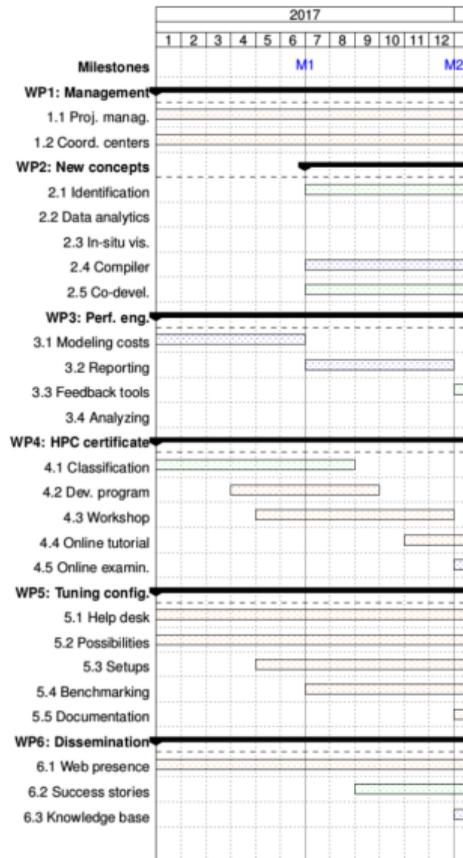
D4.1 Month 12: HPC competences and certification program

D4.2 Month 12: Workshop material

D4.3 Month 18: Online tutorial

D4.4 Month 18: Code: Online examination

Planning of 2017 (Proposal: Ludwig 11 PM, O 7 PM, R 6 PM)



■ Responsibilities of the PhD, and PMs for the PIs

- 3.1 Modeling costs (Ludwig 3)
- 3.2 SLURM extensions (Ludwig 3)
- 2.1 Identification of concepts (Riebisch 2)
- 2.4 Compiler (Ludwig 3)
- 4.1 Classification of competences (Riebisch 1)
- 2.5 Co-development (Riebisch 0)
- 6.2 Success stories (Riebisch 0)

■ Responsibilities of the Postdoc

- 4.1 Classification of competences (R 1, L 1)
- 4.2 Dev. certification program (L 1, R 1)
- 4.3 Workshop material (Olbrich 4, Riebisch 1)
- 4.4 Online tutorial (Olbrich 1)
- 6.1 web presence (Olbrich 1)
- 5.X Tuning of configurations (Olbrich 1)
- 2.1 New concepts, co-devel (Riebisch 0)
- 2.5 Co-development (Riebisch 0)