The Virtual Institute High-Productivity Supercomputing

Felix Wolf
f.wolf@fz-juelich.de

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The virtual institute in a…

- What exactly is a virtual institute?
- What does productivity here mean?
- Who is involved and what is their plan?
- Why together?

Helmholtz Virtual Institutes

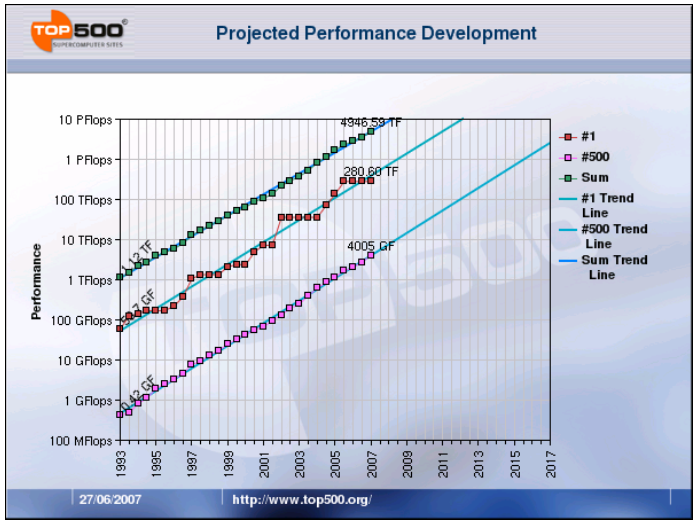
- Funding instrument of the President of the Helmholtz Association of German Research Centers
  - Supplemented with up to €300K per year for three years
- Main goal: expanding networks with universities
- Unite national and international competencies and resources
- Have their own management structure
- Qualify young researchers

HELMHOLTZ | ASSOCIATION

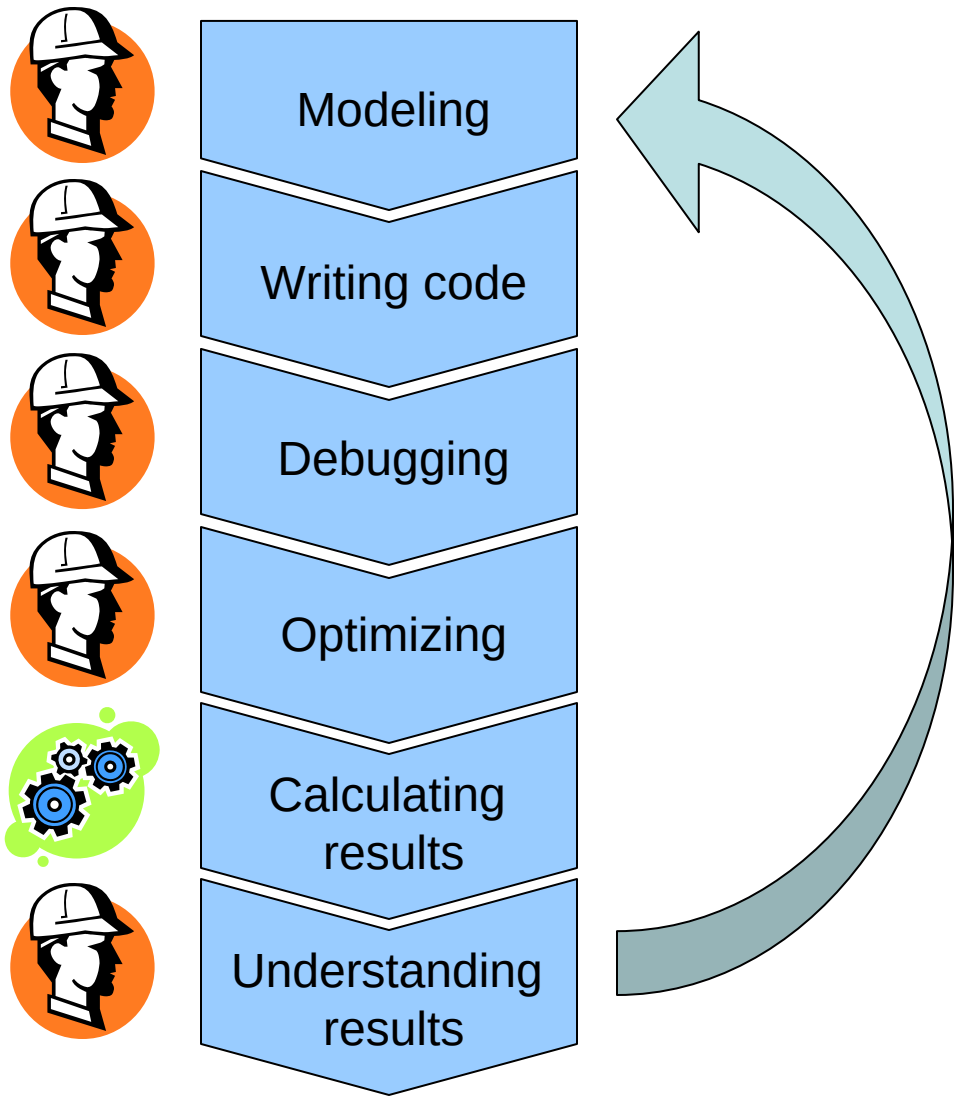
Productivity of supercomputing

Today's supercomputers offer unprecedented levels of hardware performance, but using them in a **productive** manner remains a major challenge.

- Writing correct and efficient code requires to be
  - A domain scientist
  - A (super)computer expert
- Access to parallelism offered via low-level interfaces
  - Hard to learn and use
  - Performance behavior hard to understand and predict

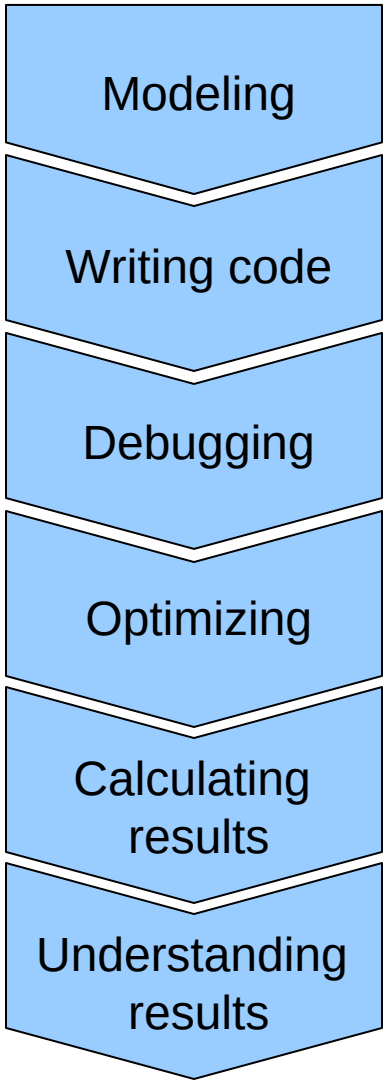


Productivity of supercomputing (2)

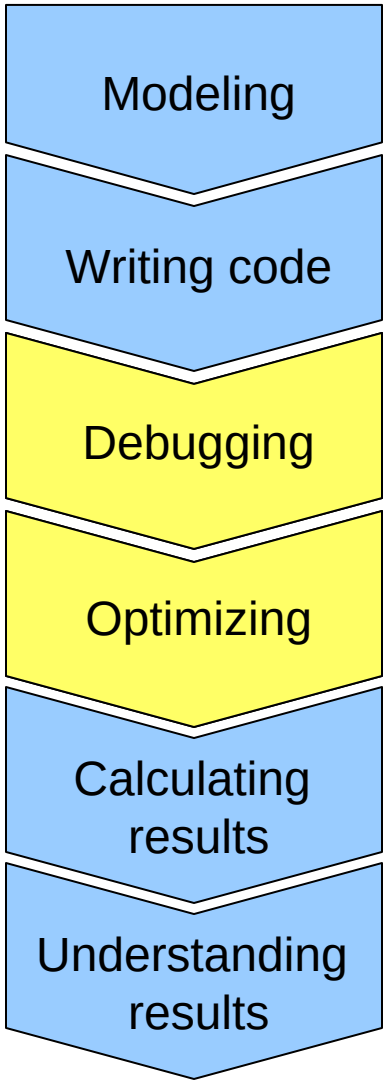


- Metric for productivity
  - Time to solution
- Beyond hardware
  - People
  - Software tools

Objectives


Modeling
Writing code
Debugging
Optimizing
Calculating results
Understanding results

Objectives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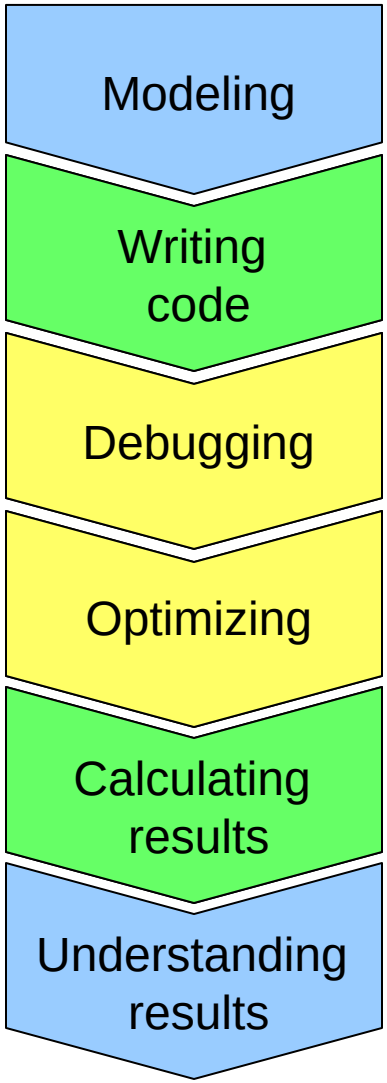
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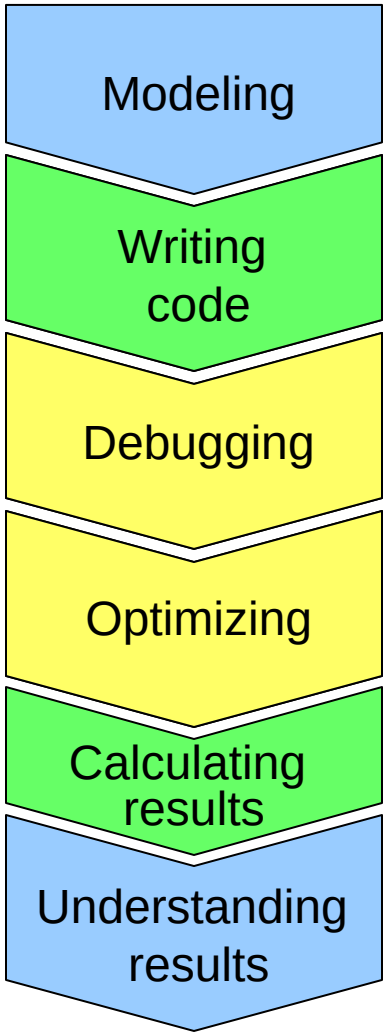
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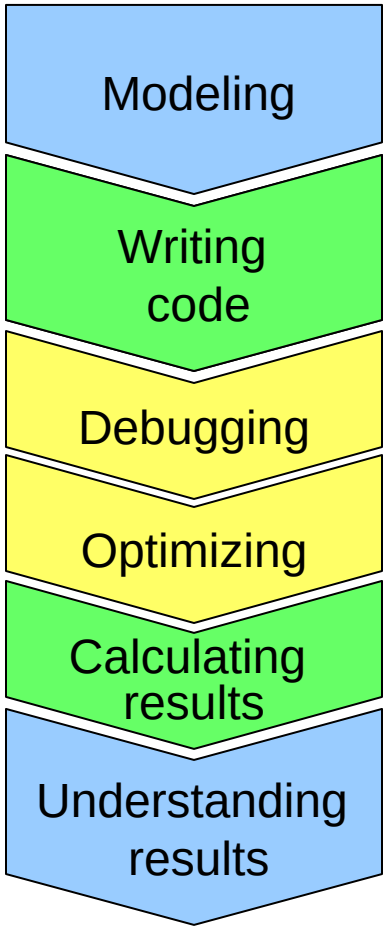
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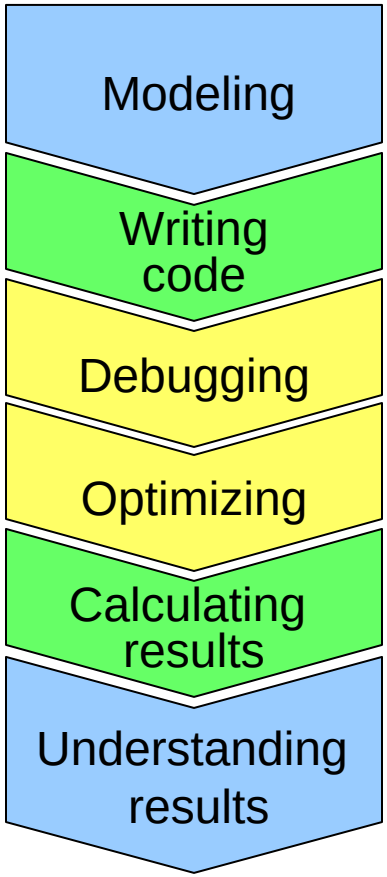


- Develop advanced programming tools for complex simulation codes to
  - Improve the quality
    - Remove errors
    - Increase performance
  - Accelerate the development process
    - Make error detection and performance optimization not only better but also faster
    - Tools must be easy to use
- Offer training & support

Partners

Forschungszentrum Jülich
- Central Institute for Applied Mathematics

RWTH Aachen University
- Center for Computing and Communication

Technische Universität Dresden
- Center for Information Services and High Performance Computing

University of Tennessee
- Innovative Computing Laboratory

VI-HPS Steering Board

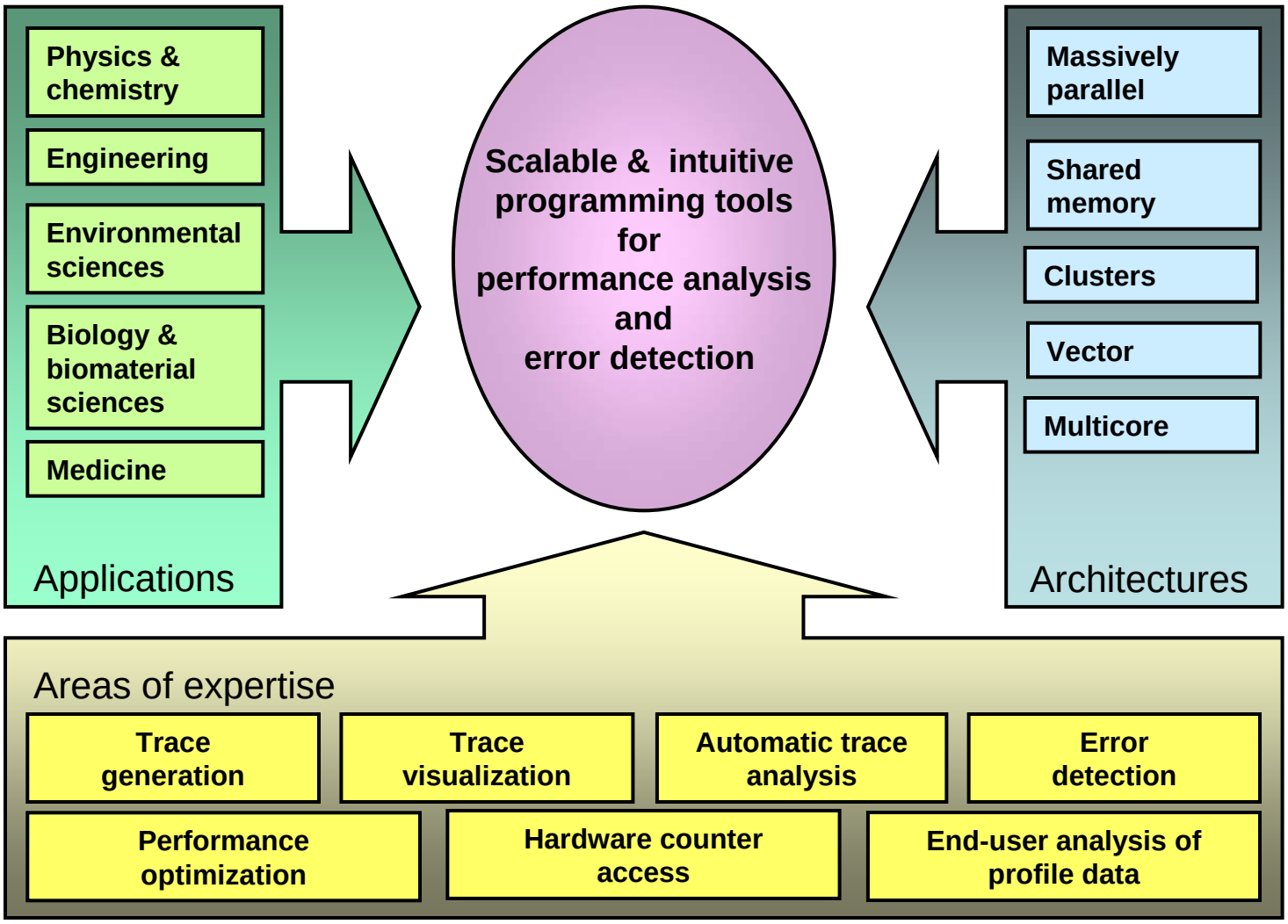
Felix Wolf (spokesman)
Thomas Lippert

Christian Bischof (deputy spokesman)

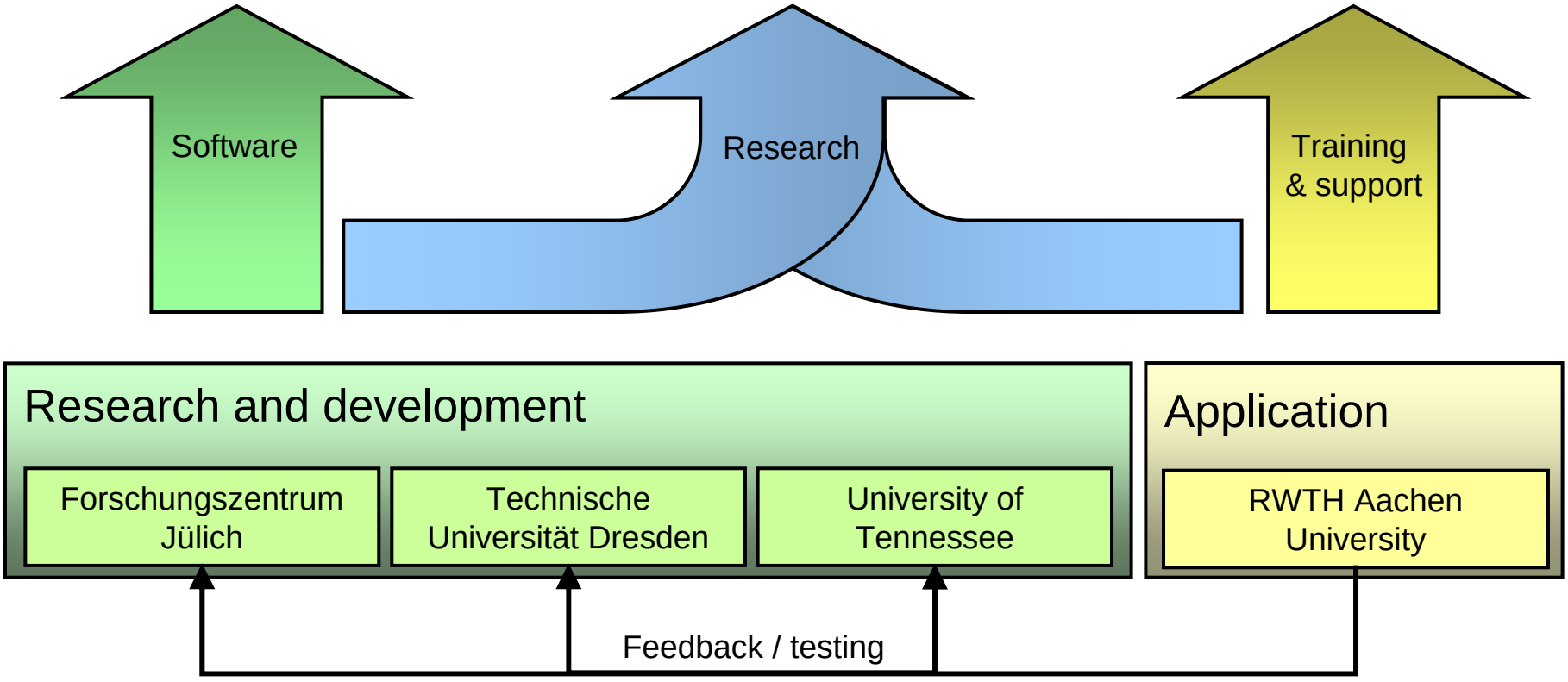
Wolfgang Nagel

Jack Dongarra

Resources & competencies

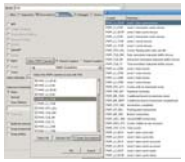


Work sharing

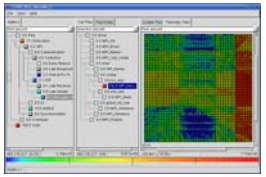


Technologies and their integration

PAPI



KOJAK / SCALASCA

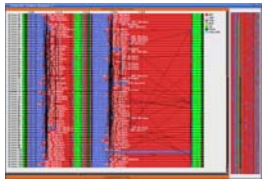


Hardware monitoring

Automatic trace analysis

Visual trace analysis

VAMPIR



Optimization

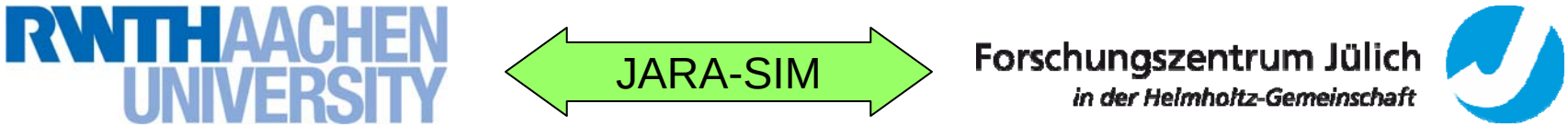
Execution

Error correction

MARMOT

Partnership between Aachen and Jülich

- Helmholtz Young Investigators Group
  - Research group on performance analysis of parallel programs
  - Junior Professorship in Computer Science at RWTH Aachen
- Aachen Institute for Advanced Study in Computational Engineering Science (AICES)
  - New “excellence” graduate school at RWTH Aachen University
  - Young Research Group Leader from FZJ
- German Research School for Simulation Sciences (GRS)
  - Joint graduate program (Master & Ph.D.) between Forschungszentrum Jülich and RWTH Aachen University



Jülich Aachen Research Alliance

Parallel computing goes main stream

"The coming years will fundamentally reshape software and transform the way people use and interact with computers. In order for consumers to enjoy performance improvements in the future, mass-market technology providers will have to embrace parallel computing to differentiate and compete."

Burton Smith
Microsoft Technical Fellow

More information…

www.vi-hps.org