

Introduction to VI-HPS

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Virtual Institute – High Productivity Supercomputing

- **Goal:** Improve the quality and accelerate the development process of complex simulation codes running on highly-parallel computer systems
- Start-up funding (2006–2011)
by Helmholtz Association of German Research Centres
- Activities
 - Development and integration of HPC programming tools
 - Correctness checking & performance analysis
 - Academic workshops
 - Training workshops
 - Service
 - Support email lists
 - Application engagement



<http://www.vi-hps.org>

VI-HPS partners (founders)



Forschungszentrum Jülich

- Jülich Supercomputing Centre



RWTH Aachen University

- Centre for Computing & Communication



Technische Universität Dresden

- Centre for Information Services & HPC



University of Tennessee (Knoxville)

- Innovative Computing Laboratory



VI-HPS partners (additional members)

2018



Barcelona Supercomputing Center

- Centro Nacional de Supercomputación



Lawrence Livermore National Lab.

- Center for Applied Scientific Computing



Technical University of Darmstadt

- Laboratory for Parallel Programming



Technical University of Munich

- Chair for Computer Architecture and Parallel Systems



University of Oregon

- Performance Research Laboratory



University of Stuttgart

- HPC Centre



University of Versailles St-Quentin

- LRC ITACA



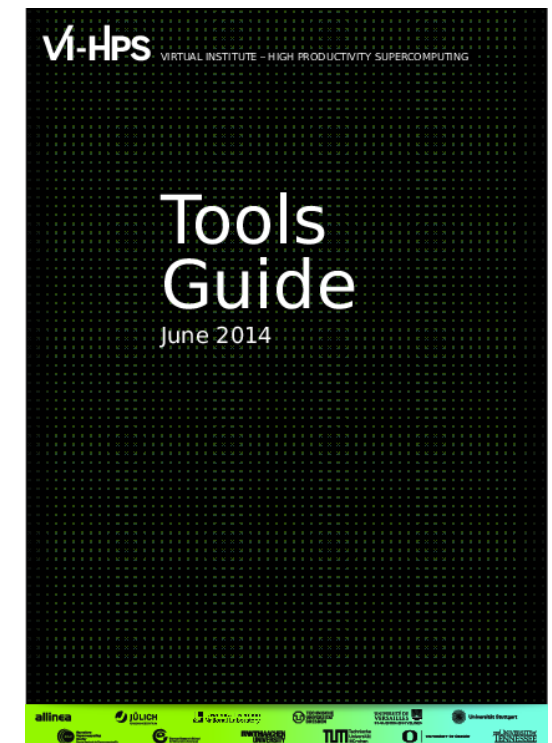
Allinea Software Ltd (Now part of ARM)



Productivity tools

- **MUST & ARCHER**
 - MPI usage correctness checking & OpenMP race detection
- **PAPI**
 - Interfacing to hardware performance counters
- **Periscope Tuning Framework**
 - Automatic analysis via an on-line distributed search
- **Scalasca**
 - Large-scale parallel performance analysis
- **TAU**
 - Integrated parallel performance system
- **Vampir**
 - Interactive graphical trace visualization & analysis
- **Score-P**
 - Community-developed instrumentation & measurement infrastructure

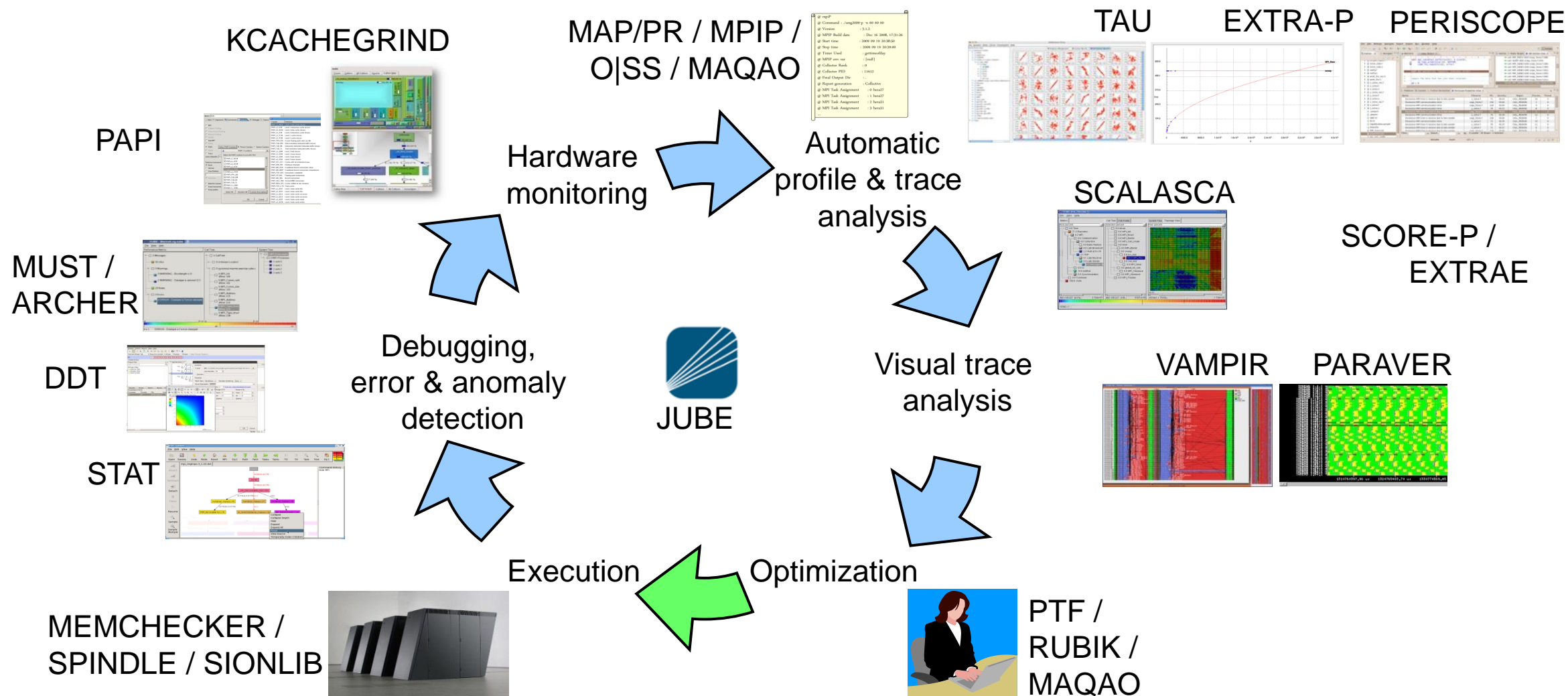
For a brief overview of tools consult the VI-HPS Tools Guide:



Productivity tools (cont.)

- **DDT/MAP/PR**: Parallel debugging, profiling & performance reports
- **Extra-P**: Automated performance modelling
- **JuBE**: Benchmark set creation, execution & evaluation framework
- **Kcachegrind**: Callgraph-based cache analysis [x86 only]
- **MAQAO**: Assembly instrumentation & optimization [x86-64 only]
- **mpiP**: MPI profiling tool and analysis viewer
- **Open MPI Memchecker**: Integrated memory checking
- **Open|SpeedShop**: Integrated parallel performance analysis environment
- **Paraver/Dimemas/Extrae**: Event tracing and graphical trace visualization & analysis
- **Rubik**: Process mapping generation & optimization [BG only]
- **SIONlib/Spindle**: Optimized native parallel file I/O & shared library loading
- **STAT**: Stack trace analysis tools

Technologies and their integration



Disclaimer

Tools will ***not*** automatically make you, your applications or computer systems more productive.

However, they can help you understand ***how*** your parallel code executes and ***when / where*** it's necessary to work on correctness and performance issues.

VI-HPS training & Tuning Workshops

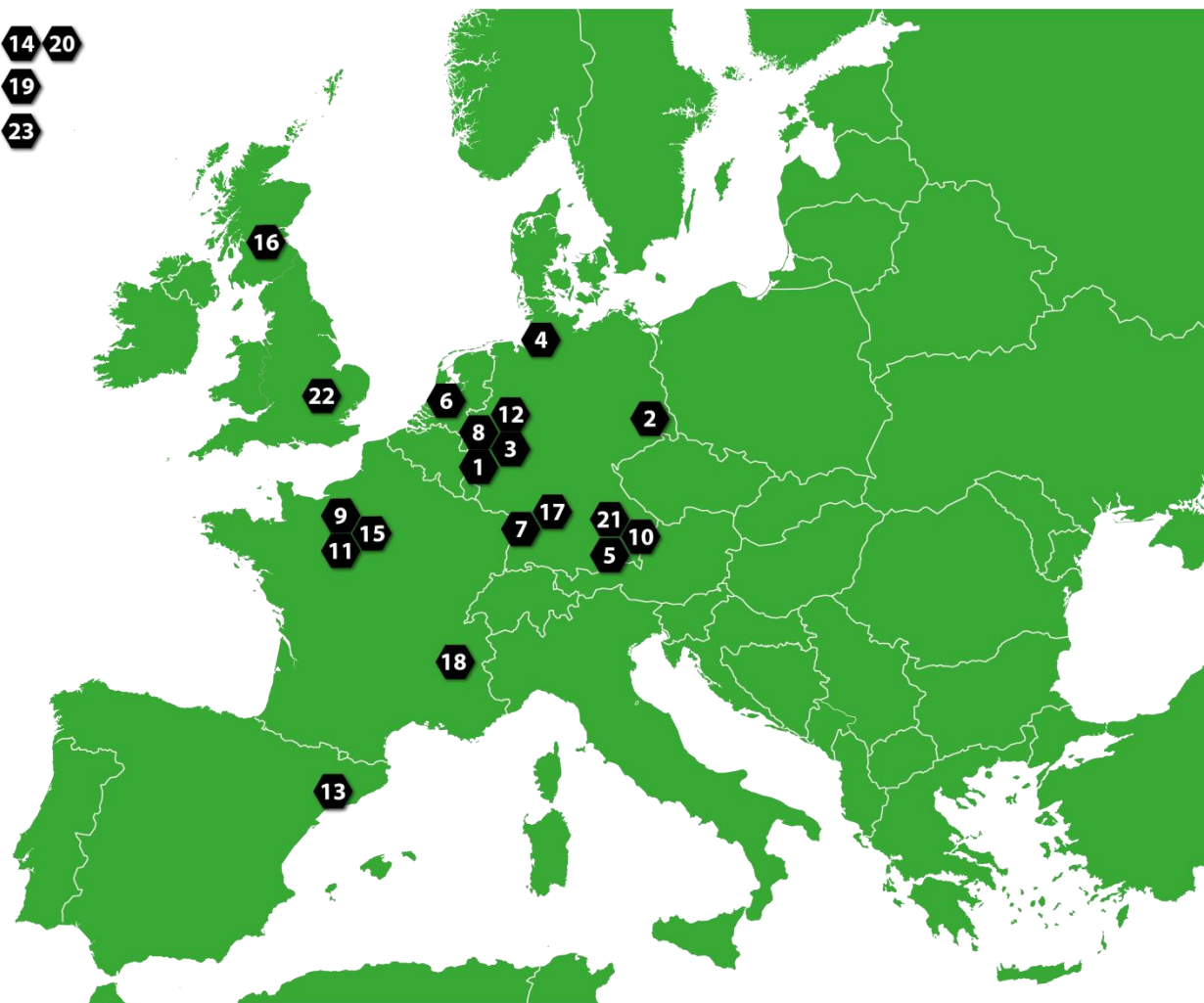
- Goals
 - Give an overview of the programming tools suite
 - Explain the functionality of individual tools
 - Teach how to use the tools effectively
 - Offer hands-on experience and expert assistance using tools
 - Receive feedback from users to guide future development
- For best results, bring & analyze/tune your own code(s)!
- VI-HPS Hands-on Tutorial series
 - **SC'08-11/13/14/15/16/17**, ICCS'09, Cluster'10, EuroMPI'12/14, XSEDE'13, **ISC-HPC'15/16/17**
- VI-HPS Tuning Workshop series
 - 2008 (x2), 2009 (x2), 2010 (x2), 2011 (x2), 2012 (x2), 2013 (x2), 2014 ([Barcelona/Spain](#), [Kobe/Japan](#), [Saclay/France](#), [Edinburgh/UK](#)), 2015 ([Stuttgart/Germany](#), [Grenoble/France](#), [Santiago/Chile](#)), 2016 ([Kobe/Japan](#), [Garching/Germany](#), [Cambridge/UK](#), [Livermore/USA](#)), 2017 ([Southampton/UK](#), [Aachen/Germany](#), [Bruyères-le-Châtel/France](#))





VI-HPS Tuning Workshop series

JP 14 20
CL 19
US 23



1. 2008/03/05+3: RWTH, Aachen, Germany
2. 2008/10/08+3: ZIH, Dresden, Germany
3. 2009/02/16+5: JSC, Jülich, Germany
4. 2009/09/09+3: HLRN, Bremen, Germany
5. 2010/03/08+3: TUM, Garching, Germany
6. 2010/05/26+3: SARA, Amsterdam, Netherlands
7. 2011/03/28+3: HLRS, Stuttgart, Germany
8. 2011/09/05+5: GRS, Aachen, Germany
9. 2012/04/23+5: UVSQ, St-Quentin, France
10. 2012/10/16+4: LRZ, Garching, Germany
11. 2013/04/22+4: MdS, Saclay, France
12. 2013/10/07+5: JSC, Jülich, Germany
13. 2014/02/10+5: BSC, Barcelona, Spain
14. 2014/03/25+3: RIKEN AICS, Kobe, Japan
15. 2014/04/07+4: MdS, Saclay, France
16. 2014/04/29+3: EPCC, Edinburgh, Scotland
17. 2015/02/23+5: HLRS, Stuttgart, Germany
18. 2015/05/18+5: UGA, Grenoble, France
19. 2015/10/27+3: NLHPC, Santiago, Chile
20. 2016/02/24+3: RIKEN AICS, Kobe, Japan
21. 2016/04/18+5: LRZ, Garching, Germany
22. 2016/07/06+3: Univ. of Cambridge, England
23. 2016/07/27+3: LLNL, Livermore, California, USA
24. 2017/02/08+3: Uni. Southampton, England
25. 2017/03/27+5: RWTH, Aachen, Germany
26. 2017/10/16+5: Lab. ECR, Ter@tec, France

Upcoming events

- Full-day tutorial at ISC-HPC18 (Frankfurt-am-Main, Germany, 24 June 2018)
 - Hands-on practical hybrid parallel application performance engineering using Stampede2
 - Score-P and associated tools Scalasca, TAU & Vampir
- VI-HPS Tuning Workshop (Paris region, France, October 2018)
 - To be confirmed
- Further events to be determined
 - (one-day) tutorials: with guided exercises sometimes using a Live-ISO/OVA
 - (multi-day) training workshops: with your own applications on actual HPC systems
- Check www.vi-hps.org/training for announced events
- Contact us if you might be interested in hosting a training event



VI-HPS Linux Live ISO/OVA

- Bootable Linux installation on DVD (or USB memory stick)
- Includes everything needed to try out our parallel tools on an 64-bit x86-architecture notebook computer
 - VI-HPS tools: Score-P, Periscope, Scalasca, TAU, Vampir*
 - Also: Eclipse/PTP, DDT*, MUST, PAPI, TotalView*
 - * evaluation licences provided for commercial products (limited time/capability)
- GCC (w/ OpenMP), OpenMPI
- Manuals/User Guides
- Tutorial exercises & examples
- Produced by U. Oregon PRL
 - Sameer Shende

<http://www.vi-hps.org/training/live-iso/>

