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

HELMHOLTZ ASSOCIATION

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 (cont.)





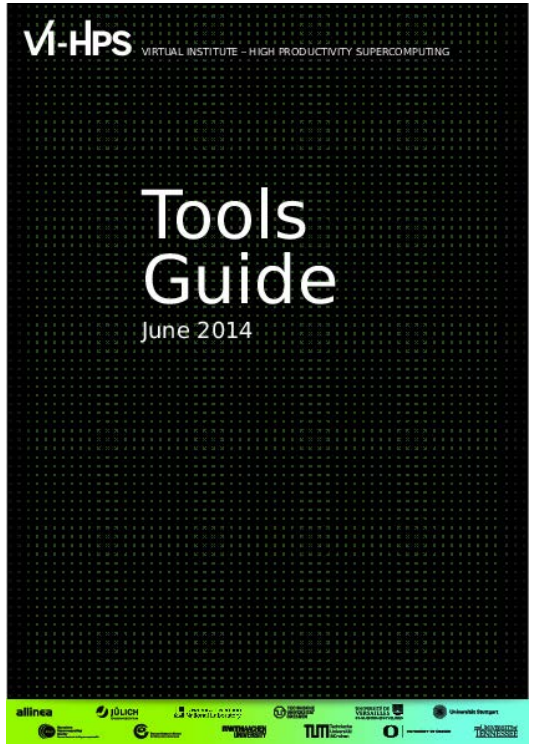



- Barcelona Supercomputing Center
  - Centro Nacional de Supercomputación
- German Research School
  - Laboratory of Parallel Programming
- Lawrence Livermore National Lab.
  - Centre for Applied Scientific Computing
- Technical University of Munich
  - Chair for Computer Architecture
- University of Oregon
  - Performance Research Laboratory
- University of Stuttgart
  - HPC Centre
- University of Versailles St-Quentin
  - LRC ITACA
- Allinea Software Ltd

Productivity tools

- MUST
  - MPI usage correctness checking
- PAPI
  - Interfacing to hardware performance counters
- Periscope
  - 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

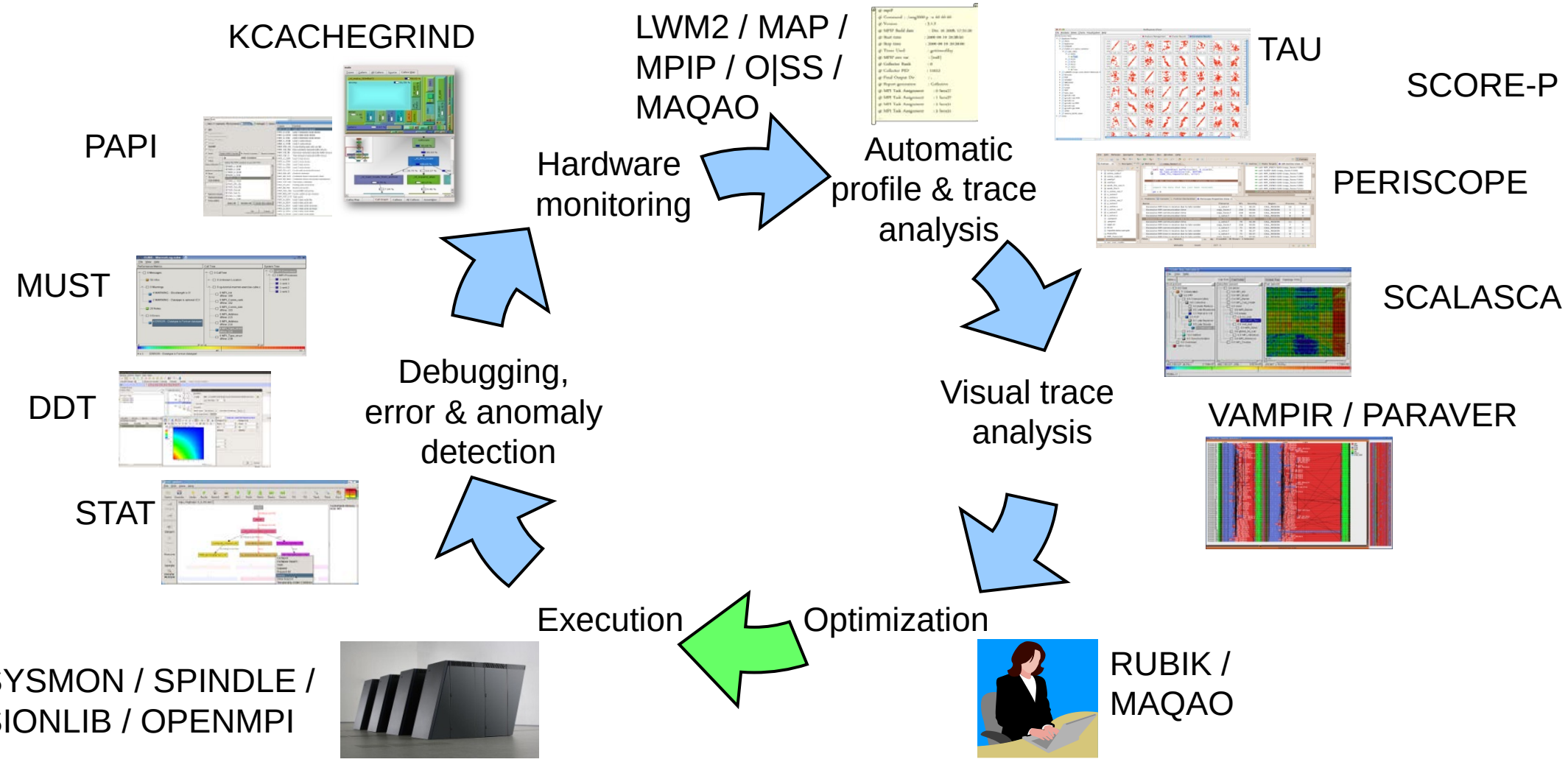
For a brief overview of tools consult the VI-HPS Tools Guide:



Productivity tools (cont.)

- DDT/MAP/PR: Parallel debugging, profiling & performance reports
- Kcachegrind: Callgraph-based cache analysis [x86 only]
- MAQAO: Assembly instrumentation & optimization [x86-64 only]
- mpiP/mpiPview: MPI profiling tool and analysis viewer
- Open MPI: 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
- SysMon: Batch system monitor plugin for Eclipse PTP

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'08/09/10/11/13/14/15, ICCS'09, Cluster'10, EuroMPI'12/14, XSEDE'13, ISC-HPC'15
- VI-HPS Tuning Workshop series
  - 2008 (Aachen & Dresden), 2009 (Jülich & Bremen), 2010 (Garching & Amsterdam/NL), 2011 (Stuttgart & Aachen), 2012 (St-Quentin/F & Garching), 2013 (Saclay/F & Jülich) 2014 (Barcelona/Spain, Kobe/Japan, Saclay/France, Edinburgh/UK) , 2015 (Stuttgart & Grenoble)

Recent events

- DiRAC/PATC MPI Tools workshop (Durham/England, 25-26 June 2015)
  - Using DiRAC *Hamilton/COSMA* IBM iDataPlex & EPCC *Archer* Cray XC30
  - Score-P, Scalasca & MUST
- ISC-HPC'15 tutorial 06 (Frankfurt, 12th July 2015)
  - Hands-on Practical Hybrid Parallel Application Performance Engineering
  - Using TACC *Stampede* Dell Xeon Linux Cluster
  - Score-P, Scalasca, Vampir, TAU and Periscope

- Further events to be determined
  - (one-day) tutorials: with guided exercises usually using a Live-ISO
  - (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 an 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

VI-HPS Linux Live ISO/OVA

- ISO image approximately 5GB, OVA approximately 12GB
  - download latest version from website
  - **http://www.vi-hps.org/training/live-iso/**
  - optionally create bootable DVD or USB drive
- Boot directly from disk
  - enables hardware counter access and offers best performance, but no save/resume
- Boot within virtual machine (e.g., VirtualBox)
  - faster boot time and can save/resume state, but may not allow hardware counter access
- Boots into Linux environment for HPC
  - supports building and running provided MPI and/or OpenMP parallel application codes
  - and experimentation with VI-HPS (and third-party) tools