

SPPEXA – Software for Exascale Computing (SPP1648)

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computational algorithms
system software
application software
data management
programming and exploration
software tools

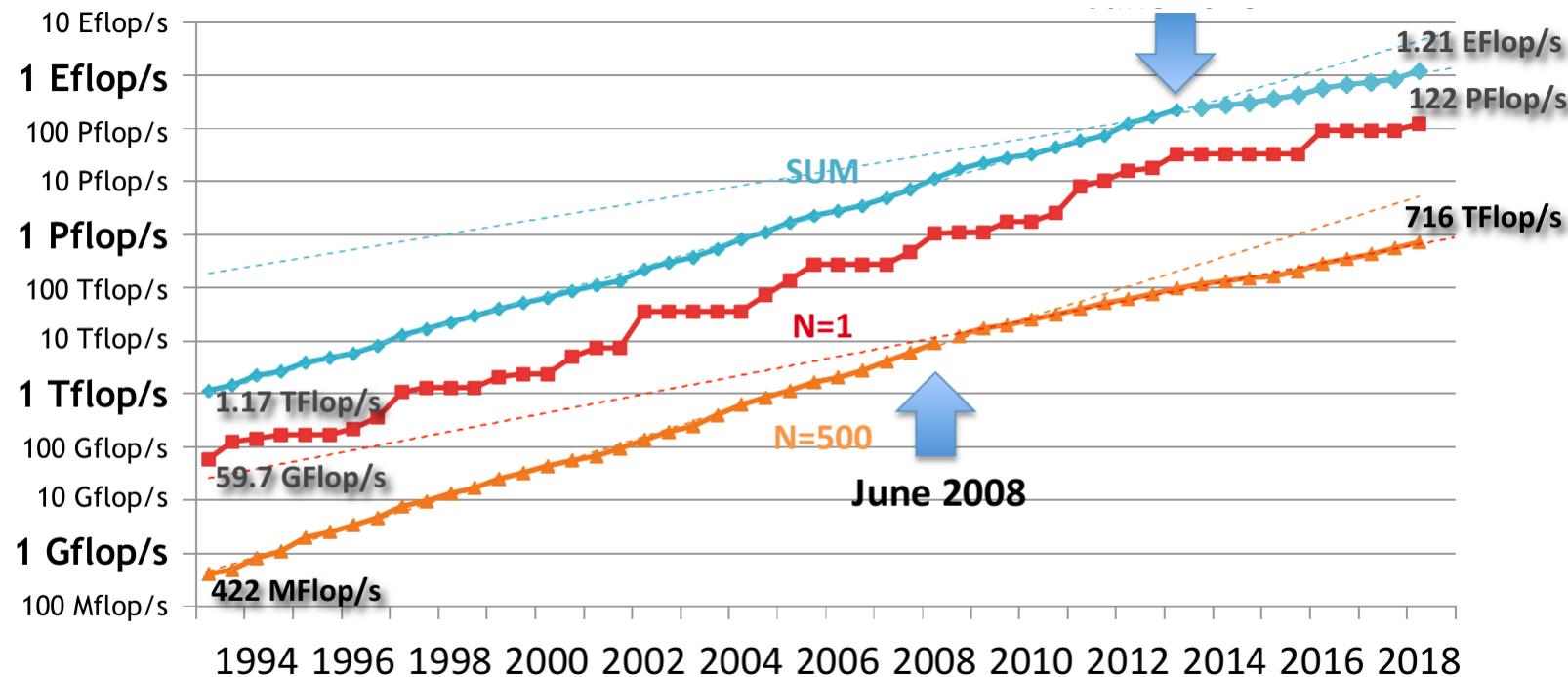
A strategic Priority Program by

DFG – German Research Foundation/Germany

ANR – Agence Nationale de la Recherche/France

JST – Japan Science and Technology Agency/Japan

Yes, We Will Get!

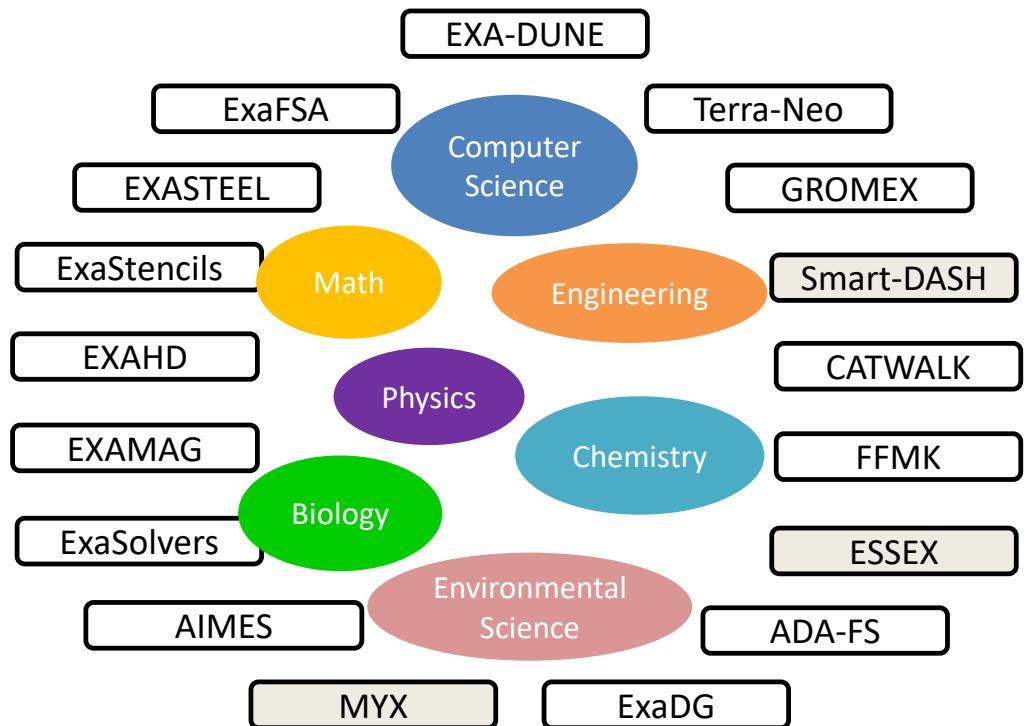


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SPPEXA: A Really Interdisciplinary Endeavor

- **17 research consortia funded**
 - Interdisciplinary, international research consortia
 - Involving 2-5 groups each
 - Addressing at least 2 out of the 6 SPPEXA topics
 - About 60 PIs and 60 PhD students/Postdocs per first/second phase
 - Overall budget of 3.8m € per year
- **Two three-year funding phases**
- **Launch of first phase in January 2013**
- **Second phase: Launch in January 2016**
 - Strong internationalization component: joint call with France and Japan
 - More than 8 international project consortia
- **Highly interdisciplinary projects and project consortia**
 - Requires close collaboration within and among SPPEXA consortia
 - The central coordination fosters synergistic effects within SPPEXA



SPPEXA 6 Research Directions

- 1. Computational algorithms**
- 2. System software and runtime libraries**
- 3. Software tools**
- 4. Application software**
- 5. Programming**
- 6. Data Management**

A Priority Program in DFG's set of funding formats

SPPEXA research is ...

- ... driven by domain sciences / CSE applications
- ... powered by scientific computing & informatics / CSE methodology
- ... in parts smooth/**evolutionary**, in parts radical/**revolutionary**



SPPEXA: A Really International Endeavor: Partner Institutions from...

- **Germany:**
 - **(Tech) Universities** Heidelberg, Würzburg, Münster, Stuttgart, Kaiserslautern, Clausthal, Dortmund, München, Stuttgart, Aachen, Frankfurt, Erlangen-Nürnberg, Greifswald, Wuppertal, Köln, Kassel, Siegen, Darmstadt, Hamburg, Bonn, Essen, Dresden, ...
 - **Institutes** Max Planck Garching & Göttingen, Zuse Institute Berlin, DLR Köln, ...
 - **Compute Centers** HLRS Stuttgart, JSC Jülich, etc.
- **Japan:**
 - RIKEN
 - Tokyo Tech
 - University of Tsukuba
 - University of Tokyo
 - Tohoku University
 - Tokyo University of Science
 - Tokyo University
- **France:**
 - Université de Versailles
 - Université de Strasbourg
 - Maison de la Simulation, Saclay
- **other Countries:**
 - TU Delft, Netherlands
 - USI Lugano, ETH Zurich, Switzerland
 - Royal Institute of Technology, Sweden
 - UCLA, USA
 - ANU, Australia
 - Hebrew University Jerusalem, Israel



HPC Beyond SPPEXA – A German View *

* ... from an individual perspective!

- USA
 - Exascale Initiative: FastForward, DesignForward
 - XSEDE (supported by NSF)
 - Exascale Co-Design Centers (ExMatEx, CESAR, ExaCT)
 - DOE SciDAC/ASCR
 - ASCR Call “Exploratory Research for Extreme-Scale Science”
- Europe
 - EU: EXA2CT, CRESTA, DEEP(-ER), MONT BLANC (2), EPIGRAM, NUMEXAS, EESI
 - France: ExaSE, C2S@Exa, ...
 - **Germany: SPPEXA,...**
 - Possibility of D-J or D-F-J consortia
 - Joint call after intense preparations: DFG & ANR & JST
 - Continuation strategies?
- Japan
 - CREST Post-Peta Scale
 - ...



HPC Beyond SPPEXA*

* ... from an individual perspective!

- Next Tri-Lateral workshop at French embassy in Tokyo
 - Save the date: **Nov 6th- 8th 2019**
 - Organizers: Mitsuhsia Sato (J), Nahid Emad (F), Michel Dayde (F), Hans-Joachim Bungartz (D), Wolfgang Nagel (D)
 - Chairman: Serge Petiton
- Reception at the French embassy on first day
- One purpose/message of this workshop:
 - HPC is multi-national – there are lots of collaborations
 - Multi-national funding/projects offer a huge potential



Thank You for Your Attention!

German Priority Programme 1648
Software for Exascale Computing



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EXAMAG - Exascale Simulations of the Magnetic Universe
U Heidelberg +++ U Würzburg +++ U Tokyo +++
U Strasbourg

Smart-DASH - Smart Data Structures and Algorithms with Support for Hierarchical Locality
LMU München +++ U Stuttgart +++ HLRS Stuttgart +++
TU Dresden +++ KIT Karlsruhe

EXASteel - From Micro to Macro Properties
U Köln +++ TU Bergakademie Freiberg +++ U Essen +++
TU Dresden +++ U Lugano +++ FAU Erlangen-Nürnberg

Terra-Neo - Integrated Co-Design of an Exascale Earth Mantle Modeling Framework
LMU München +++ FAU Erlangen-Nürnberg
TU München

AIMES - Advanced Computation and I/O Methods for Earth-System Simulations **new!**
U Hamburg +++ U Versailles +++ RIKEN +++ Tokyo Tech

ExaStencils - Advanced Stencil-Code Engineering
U Passau +++ FAU Erlangen-Nürnberg +++ U Kassel +++
U Tokyo

EXAHHD - An Exa-Scalable Two-Level Sparse Grid Approach for Higher-Dimensional Problems in Plasma Physics
U Stuttgart +++ TU München +++ U Bonn +++
ANU Canberra +++ MPG Garching +++ UC Los Angeles

GROMEX - Unified Long-Range Electrostatics and Dynamic Protonation for Realistic Biomolecular Simulations on the Exascale
MPI BPC Göttingen +++ JSC Jülich +++ Stockholm U

About SPPEXA The Priority Programme Software for Exascale Computing (SPPEXA) of the German Research Foundation (DFG) addresses fundamental research on the various aspects of HPC software. SPPEXA runs 2013-2019, and it is implemented in two three-year phases, consisting of 13 (phase 1) and 16 (phase 2) project consortia and more than 50 institutions involved. With SPPEXA's second-phase projects funded by DFG as well as the French National Research Agency (ANR) and the Japan Science and Technology Agency (JST), SPPEXA strives for bi- and tri-national research to pave the road towards exascale computing.

EXA-DUNE - Flexible PDE Solvers, Numerical Methods, and Applications
U Heidelberg +++ U Münster +++ U Stuttgart +++
TU Kaiserslautern +++ TU Clausthal +++ TU Dortmund

CATWALK - A Quick Development Path for Performance Models
ETH Zürich +++ RWTH Aachen +++ JSC Jülich +++
TU Darmstadt +++ FU Frankfurt

ESSEX - Equipping Sparse Solvers for Exascale
FAU Erlangen-Nürnberg +++ DLR Köln +++ U Greifswald +++
U Wuppertal +++ U Tsukuba +++ U Tokyo

ExaSolvers - Extreme Scale Solvers for Coupled Problems
RWTH Aachen +++ Tokyo U of Science +++ U Lugano +++
HLRS Stuttgart +++ U Trier +++ GU Frankfurt +++ Toyo U

ADA-FS - Advanced Data Placement via Ad-hoc File Systems at Extreme Scales **new!**
TU Dresden +++ JGU Mainz +++ KIT

ExaFSA - Exascale Simulation of Fluid-Structure-Acoustics Interactions
U Stuttgart +++ TU Delft +++ U Siegen +++
TU Darmstadt +++ Tohoku U

ExaDG - High-Order Discontinuous Galerkin for the Exa-Scale **new!**
U Heidelberg +++ TU München

FFMK - A Fast and Fault Tolerant Microkernel-Based System for Exascale Computing
TU Dresden +++ ZIB Berlin +++ Hebrew U Jerusalem

MYX - MUST Correctness Checking for YML and XMP Programs **new!**
RWTH Aachen +++ MDLS Saclay +++ U Tsukuba +++ RIKEN

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or visit www.sppexa.de!

