

Open Edge and HPC Initiative

ISC'2022 Status Report



<http://www.openedgehpcinitiative.org/>



Open Edge and HPC Initiative



Our Mission

- Foster the development of an open and feature-rich **ecosystem for Arm- and RISC-V-based technologies**
- Make the Arm and RISC-V based technology well suited for different IT segments assuming a future **computing continuum ranging from HPC to Edge**
- support the evolving **needs of the various industries undergoing digitization** and of all their respective stakeholders

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Our Goals

- Facilitate **shorter time to market**
- Create an environment where members can **integrate solutions** coming from different suppliers
- Create an open environment for **sharing information**
- Raise awareness for **capabilities** of Arm[®]- and RISC-V-based solutions

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Computing continuum paradigm

Observe emergence of a continuum of computing, here represented by two extremes:

- High-performance computing = on-premise
- Edge computing = distributed

Needs for realising a computing continuum arise in the context of digital twins or smart cities

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Target stakeholders

- Scientists from all domains
- Engineers
- Code developers
- Educators
- Students
- ISVs

Provisioning of hardware infrastructure

- **HAICGU cluster** at Goethe University of Frankfurt
 - Target 64 nodes, each with 2x Kunpeng 920 CPUs
 - 8192 Arm-based CPU cores
 - IB network
 - Atlas deep learning accelerators
- **Armida cluster** at E4
 - ThunderX2 servers
- Upcoming: **RISC-V Cluster** at E4
 - Servers with SiFive Freedom U740 SoCs



Why Arm or RISC-V for HPC?



Speed of integration of innovations like

- Arm's Scalable Vector Extension (SVE)
 - Extension of Arm-v8 that includes NEON SIMD instructions
 - Unique feature of SVE: Vector Length Agnostic (VLA)
- Integration of high-bandwidth memory technologies like HBM
 - Promising to overcome the “memory wall”
 - Arm-based A64FX first standard CPU using HBM

Ongoing Activities



Software ecosystem for Arm

- **EasyBuild**

- Software stack for HAICGU cluster similar to JSC's production environment
- Consistent support of multiple development environments
 - Different versions of Compilers: GCC, Clang, Arm Compilers and Performance Libraries for HPC
- See talk by S. Nassyr at AHUG workshop on Friday

- **BeeGFS**

- White paper “Performance Evaluation of the BeeGFS File System on the Arm AArch64 Architecture”

https://thinkparq.com/wp-content/uploads/2019/08/White_Paper_BeeGFS_File_System-on_the_Arm-AArch64-Architecture.pdf

Ongoing Activities



Software ecosystem for Arm: System software status

- **Operating system**
 - Several enterprise-class Linux distributions are supported
- **Cluster management solutions**
 - Tested solutions available, few supported solutions
- **Resource managers**
 - Tested solutions available (e.g. Slurm), limited support
- **Parallel file systems**
 - Tested solutions available (e.g. Lustre, BeeGFS), limited support

Application porting and development

- Example: preparing for Arm's Scalable Vector Extension
- Evaluation of different vectorisation strategies
 - ARM C Language Extensions (ACLE) for SVE
 - Auto-vectorisation
- Evaluation of auto-vectorisation using synthetic benchmarks like PolyBench/C and ETSVC
 - Good results observed for both GCC and Arm Compilers

Ongoing Activities



Training

- Organisation of several hackathons for Arm
 - Focus on porting of applications to Arm-based platforms
- Upcoming: DeepHack
 - <https://www.open-edge-hpc-initiative.org/2022/03/ai-high-performance-computing-deephack/>
 - Organised jointly with EIT Digital
 - Focus on deep learning using Atlas 500 Edge station with Arm-based processors

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To engage contact us at

- <https://www.open-edge-hpc-initiative.org/contact/>



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