

ChEESE

WP3

Co-design with European HPC vendors and technologies

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Progress Update - Outlook

- Preparation of mini-apps → Done (D3.1)
- Test of mini-apps → Done by Eviden, feedback provided to developers, still some actions to finalize readiness for co-design with
 - OpenSequana prototypes (EUPEX)
 - RISC-V prototypes, the European Processor Initiative (EPI) and EUPILLOT
- Preparing the Solid Earth Community applications for EUPEX platform (T3.2)
 - Rhea CPU (HBM + SVE 2x256) → use of SDV (A64FX, SPR+HMB, Ampere Altra, Grace, etc.)
 - Software Stack and Tools → partially accessible via EUPEX Early Access Programme
 - GPU (To be define) → standby
 - BXI interconnect (Not yet available) → standby
- Studying CHEESE-2P mini-apps on SDVs or other RISC-V compute infrastructure (T3.3)
 - Mini-Fall3D: Vectorization on the RISC-V vector architecture of EPI / EUPILLOT
 - SeisSol-proxy: First vectorization study performed on EPI RISC-V vector architecture, workshop paper to be presented at PPAM24 (7-11 Sept, Ostrava)



Progress Update – Mini-apps

Code	Lead	Code type (CPU, GPU, etc.)	Mini-app	Test and validation status CPU	Test and validation status GPU	x86 profiling	HBM study	ARM porting	ARM profiling	SVE study	Optimisation status + comments
SeiSol	LMU	CPU & GPU (CUDA, HIP, SYCL)	SeisSol-proxy	SeiSol CPU testing feedback	SeiSol GPU testing feedback	Not started	Not started	Not started	Not started	Not started	Not started
FALL3D	CSIC	GPU (OpenACC)	Mini-Fall3D-GPU		Mini-Fall3D GPU testing feedback						
FALL3D	CSIC	CPU	Mini-Fall3D	Mini-Fall3D CPU testing feedback		Done	Done	Done	Not started	Not started	Not started
Specfem3D	CNRS	CPU, GPU (cuda, HIP)	specfem_mini_app	Mini-Specfem3D CPU testing feedback	Mini-Specfem3D GPU testing feedback	Done	WIP	Done	Not started	Not started	Improve vectorization on x86
Tandem	LMU	CPU & GPU (PETSc)	Mini-Tandem	Mini-Tandem CPU testing feedback	Mini-Tandem GPU testing feedback	Not started	Not started	Not started	Not started	Not started	Not started
HySEA	UMA	GPU (CUDA)	HySEA (open source version)	Mini-HySEA CPU testing feedback		Done	Not started	Not started	Not started	Not started	15 % dependency on memory bandwidth, HBM utilization doesnot seem useful; Profiling on x86 shows mostly scalar FP operation executed; Arm porting: find compiler able to compile SYCL on arm
HySEA	UMA	CPU & GPU (SYCL)	HySEA (open source version)		Mini-HySEA GPU testing feedback						
PTatin3D	SU	CPU & GPU (PETSc)	Mini-PTatin3D	Mini-PTatin3D CPU testing feedback	Mini-PTatin3D GPU testing feedback	Not started	Not started	Not started	Not started	Not started	Not started
Xshells	CNRS	CPU & GPU (CUDA, HIP)	Mini-xshells	Mini-XShells CPU testing feedback	Mini-XShells GPU testing feedback	Done	Done	Done	Done	Not started	Good vectorization (good for SVE),50 % memory bandwidth dependency (Good for HBM)

Legend
Not tested
Fetch the code
Compile code
Run test cases
Validate results

Legend
Not started
WIP
Done



What's next?

- Test GPU version of the Mini-xshells
- T3.2:
 - Finalize the verification procedures for SiesSol-proxy, specfem_mini_app and Mini-Tandem
 - Continue the profiling, studies and optimizations in collaboration with application developers with the current SDVs
 - Follow-up on the EAP
- T3.3:
 - Test the vectorized on mini-Fall3D codes on HPC state-of-the-art machines (first target MareNostrum5).
- Populate the one single entry point to disseminate all the work done and to be done
- Energy consumption measurement on EuroHPC systems

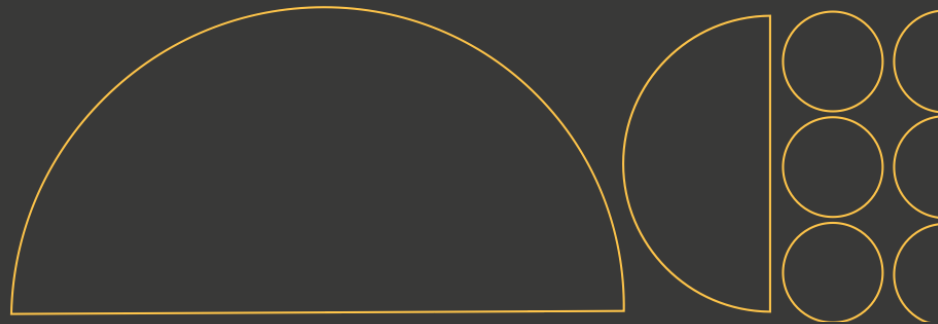


Key Discussion Items & Other comments

- We need you!
- Collaboration with application developers is key
 - To ensure numerical correctness of the mini-apps
 - To contribute to the co-design loop into WP3 and with WP2 to enhance application performance and scalability
- We are looking for technical information to measure energy consumption on the EuroHPC systems
- We need tight collaboration with WP2
 - Through application developers' involvement
- We would like to disseminate the work done in the project
 - At EU level to other CoE, EPI, EUPEX, EUPILLOT, etc.
 - EPI & EUPEX Forum in Oct. 2024
 - At Scientific and Technical level



Thank you!



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