



PROGRAMME
DE RECHERCHE
NUMÉRIQUE
POUR L'EXASCALE

Accelerators working group

Exa-MA 2025 General Meeting

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Table of contents

Working group

GPU days

Projects call

Working group

Accelerators working group

- Most large-scale machines are hybrid and leverage accelerators (CPUs, GPUs, TPUs, FPGAs)
- Exploiting them is a challenge for applications
 - Sometimes libraries already exist (e.g. cuBLAS, Chameleon)
 - Or a framework allow to express application
 - Or have to write the kernels (low-level or high-level approaches)
- The objectives of the Numpex projects cannot be achieved without accelerators used optimally.
- Mailing list `numpex_gt_accelerateurs@groupe.renater.fr`
 - At least 1 member per PC
 - Samuel.Thibault@u-bordeaux.fr, Marc.Perache@cea.fr, Francois.Bodin@irisa.fr, Joshua-Charles.Bowden@inria.fr, Julien.Bigot@cea.fr, Julien.Diaz@inria.fr, Laurent.Morin@irisa.fr, Philippe.Helluy@unistra.fr, Pierre.Jolivet@lip6.fr

Accelerators working group

- Call for projects to complement NumPEX contributions
- Tutorials on the different approaches (with NumPEX training WG and CExA): e.g. Kokkos training, June 17-19, 2024
- Workshops with manufacturers to check proposals, solutions, roadmaps: e.g. participation to ORAP forum, October 14-15, 2024
- Organize workshops on compilation-based optimization approaches
- Organize workshops on the programming approaches
- Provide application port examples, as mini-apps, to demonstrate effective methodologies.
- Publish analysis papers, to describe the current situation and provide rationales for application porting

GPU days

- Introduction to GPUs (in CUDA)
- Presentation of approaches
 - CUDA/HIP/OpenCL ("heroic" programming)
 - Frameworks for special applications (Arcane, Chameleon, ...)
 - Libraries (cuBLAS, cuSPARSE, cuFFT, ...)
 - Languages (OpenMP, Kokkos, ...)
 - Tasks (StarPU, ...)
- Retex
 - Tasks, OpenACC, Kokkos, Rust/OpenCL

Slides and videos are available at

<https://numpex.org/>

[the-first-workshop-of-the-numpex-accelerator-working-group/](https://numpex.org/the-first-workshop-of-the-numpex-accelerator-working-group/)

Projects call

Projects call, 3 axes

- Computation kernel programming
 - Taxonomy of application cases and experience
 - Modern C++ approaches (Kokkos)
 - Auto-tuning
 - Memory safety
 - Integration of compiler techniques
 - Debuggers/profilers/etc.
- Other programming models
 - Tensor computation
 - Non-GPU accelerators (e.g., TPU, FPGA)
- Code transition
 - Progressive transition
 - Adapting data structures

Projet call, requirements

- Co-conception with NumPEX demonstrators
- Synergy with NumPEX work
- Integration with production code
- Sustainability of solutions
- Integrating existing offer

1-2 projects, 36 months, 1.8M€