VSB TECHNICAL UNIVERSITY OF OSTRAVA | IT4INNOVATIONS NATIONAL SUPERCOMPUTING CENTER

HIGH LEVEL SUPPORT TEAM

Keep your momentum
Leave the bottlenecks to us.

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EUROPEAN UNION
European Structural and Investment Funds
Operational Programme Research,
Development and Education

MINISTRY OF EDUCATION, YOUTH AND SPORTS

MISSION STATEMENT

Keep your momentum—leave the bottlenecks to us.

We help researchers move from idea to insight faster by resolving complex issues, tuning performance, and stabilizing scale.

Keep your momentum—leave the bottlenecks to us.

it4i HLST

WHO WE SERVE

Academia: researchers, PIs, students, research software engineers.

Industry: startups, SMEs, large R&D teams.

Public labs and national centers collaborating across sites.

Cross-disciplinary communities needing scalable HPC expertise.

LIST OF SERVICES

Level 2 — Enable & Scale

- **Activation/porting to target system** (builds, modules, containers).
- **Environment setup** (compilers, MPI, math libs, licenses).
- **Job sizing & scaling guidance** (node counts, memory, GPUs).
- **Baseline performance & quick profiling** (spot obvious bottlenecks).
- **Workflow orchestration** (Slurm arrays, pipelines, checkpoints).
- **I/O & storage hygiene** (scratch usage, striping, small-file mitigation).
- **Runtime debugging** (failed jobs, environment conflicts).
- **Allocation efficiency** (queue strategy, cost-of-run awareness).
- **Documentation & handover** so teams can run independently.

Level 3 — Optimize Deeply

- **Algorithm & code optimization** (MPI/OpenMP, hybrid, tasking).
- **Accelerator enablement/migration** (CUDA, HIP, SYCL; kernel tuning).
- **Memory/communication tuning** (NUMA, cache, vectorization, collectives).
- **Advanced profiling & tracing** (roofline, comm/computation overlap).
- **I/O redesign** (parallel I/O, formats, throughput at scale).
- **Scalability studies** (weak/strong scaling, co-design with system).
- **Resilience engineering** (checkpoint/restart, fault handling).
- **Math libs & mixed precision** (BLAS/FFT/Sparse tuning, accuracy checks).
- **Performance portability strategy** (Kokkos, RAJA, SYCL backends).
- **CI for HPC** (reproducibility, perf guards), **patches/MRs upstream**.

EPICURE

Unlocking European-level HPC Support

SUPPORTING USERS RESEARCH

academia & industry

EuroHPC JU Supercompting Ecosystem

Consortium

CSC

Barcelona Supercomputing Center
Centro Nacional de Supercomputación

CINECA

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KTH VETENSKAP OCH KONST

IZUM
Institute of Information Science, Maribor, Slovenia

LUX PROVIDE
NEXT-LEVEL INSIGHTS WITH SUPERCOMPUTING

INESC TEC

CYFRONET

DTU Technical University of Denmark

Jožef Stefan Institute
Ljubljana, Slovenia

Universiteit Antwerpen

SOFIA TECH

INES

GENCI
HPC at the service of knowledge

JÜLICH
Forschungszentrum

How EPICURE support flows

Apply: to EuroHPC Access Call BEN/DEV/REG/EXT/AI4Science

→

Start: project enters via a simple support form / single entry point.

→

Triage: route to the right level (L2/L3) and partner site.

↓

Assign: designate a lead expert and assemble a cross-site team.

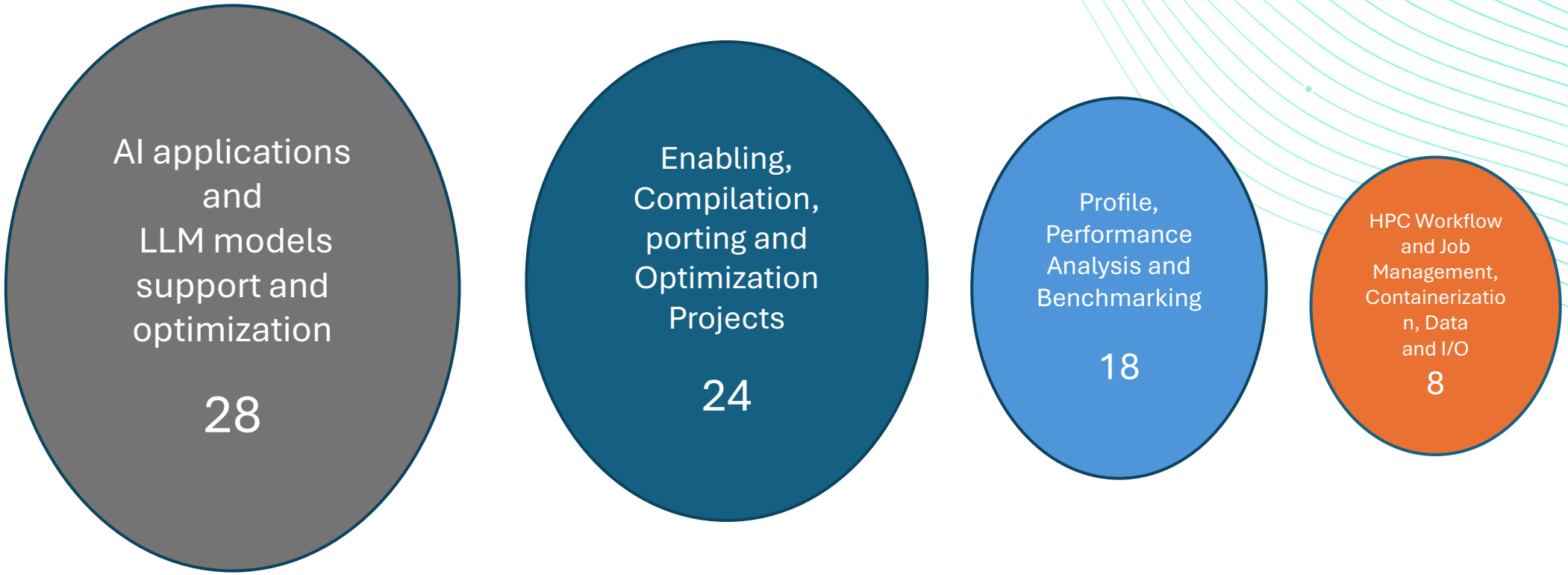
→

Execute: iterate with regular check-ins; track progress centrally.

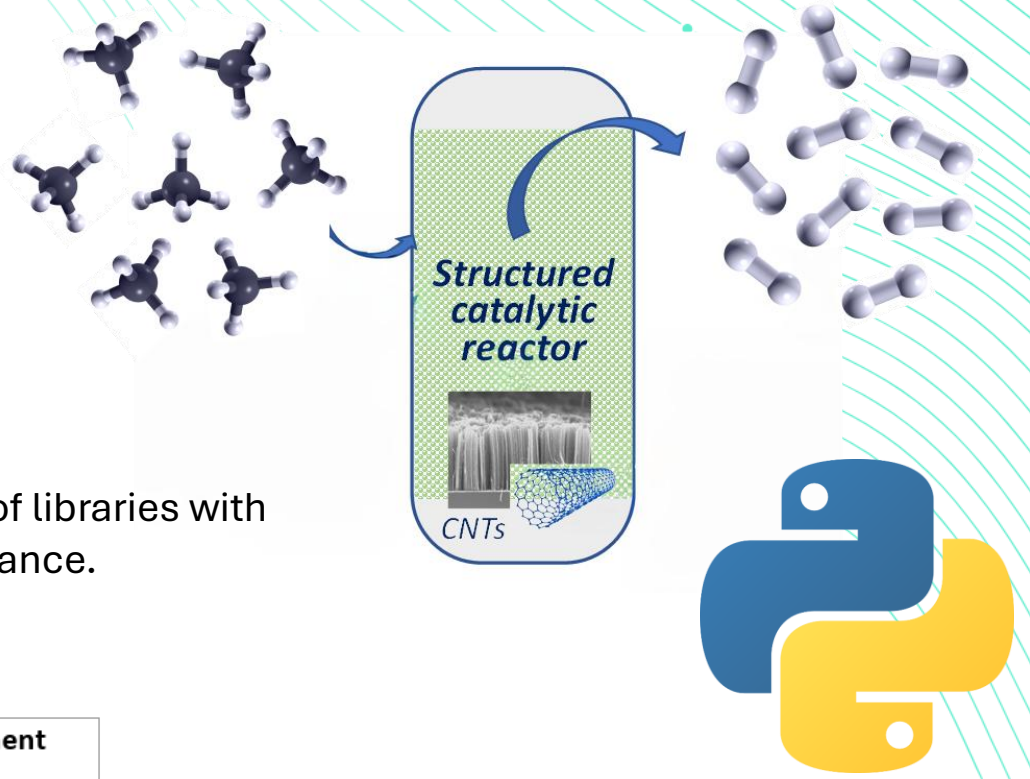
→

Share: document outcomes, lessons, and reusable assets.

Application Enablement



Example: From methane and iron nanoparticles - catalytic process inside a reactor



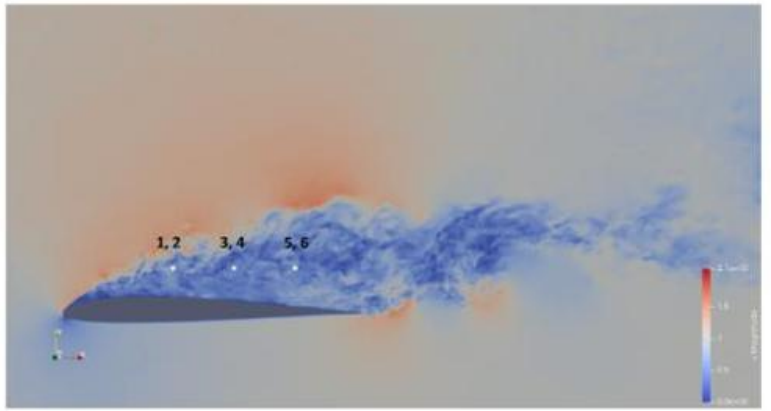
- Bottlenecks in the workflow's pre- and post-processing functions
- Update of the Python environment to later version
- Implementation/extension of the unit tests

Simply the update of the python implementation and the replacement of libraries with more efficient ones produced a huge (20x) improvement of the performance.

Interface	Old Rbf/old environment	old Rbf/new environment	new Rbf/new environment
Ag(111)/Cu(111)	54s	12s	11s
Al(111)/Cu(111)	1h18m	3m38s	2m12s
Ti(001)/Mg(001)	> 17h	43m49s	28m27s

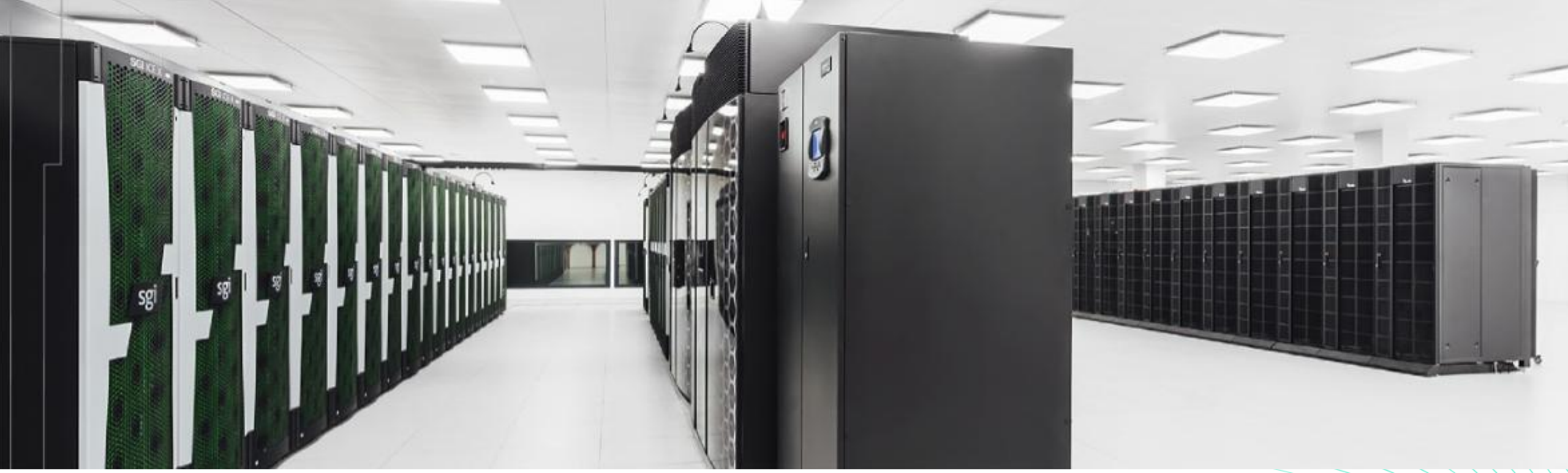
Interface	serial	parallel
Ti(001)/V(110)	2m12s	23s
Ti(001)/Fe(110)	38m45s	5m33s
Ti(001)/Cr(110)	1h0m1s	9m4s

Example: DEAREL: Large-scale Deep rEinforcement leARning for activE fLow control in wings



- Performed in-depth tracing analysis (Nsight) to identify bottlenecks and synchronization issues
- Optimization targeted several kernels (OpenACC Fortran)
  - Memory access patterns (stride, indirect access)
  - Cache utilization
  - Reduction of atomic operations
  - Improved register utilization
  - Loop optimization
- Significant improvement for parallel construct in save_hdf5_restartfile resulting in 1400x speedup

Kernel Name	Time Before	Time After	Speedup
visc_dissipationRate	140.08 ms	72.75 ms	× 1.93
save_hdf5_restartfile	542.27 ms	370.53µs	× 1463
eval_laplacian_diag	30.51 ms	3.41 ms	× 8.95
full_diffuision_ijk_incomp	1.21 ms	1.18 ms	× 1.03
smart_visc_spectral_incomp	2.63 ms	785.41 µs	× 3.35
eval_gradient	701.12 µs	486.08 µs	× 1.44
full_convec_ijk_incomp	2.53 ms	1.40 ms	× 1.81



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