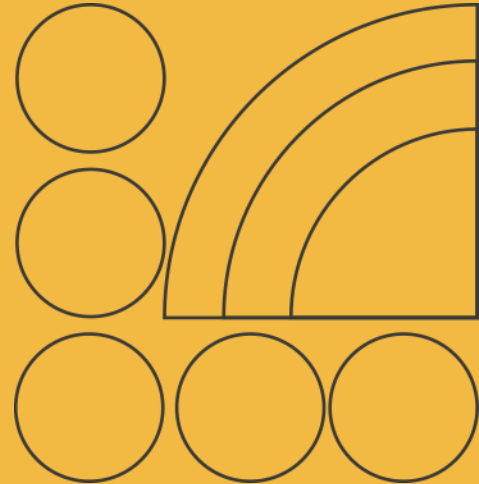




ChEESE

Exascale ambition towards D2.4: status

Team EARTH
CINECA



WP2 Tasks



WP2 tasks				
Task	Name	Lead partner	Start month	End month
2.1	Code audits	HLRS	3(27)	15(36)
2.2	Increasing the performance portability of flagship codes for different accelerators	CIN	1	48
2.3	Optimisation for Exascale	CIN	6	48
2.4	Continuous Performance Efficiency Monitoring	BSC	18	48



WP2 Deliverables



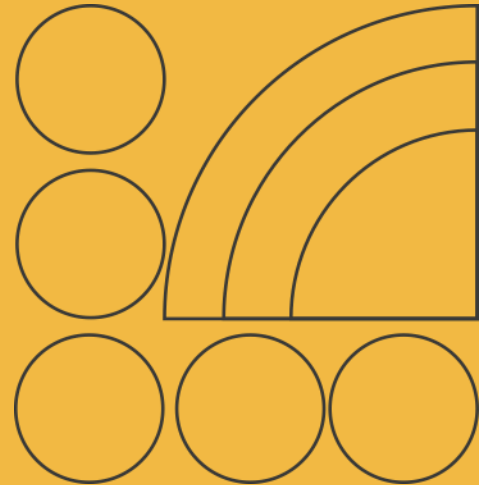
D	Deliverable name	Short description	Lead	Type	Level	M
2.1	First code audit report	First code audit round results and the recommendations arising from the analysis	HLRS	R	PU	12
2.2	First report on improving code performance at exascale	Report on porting, optimization and tuning for the selected applications on the available hardware	CIN	R	PU	24
2.3	Second code audit report	Update of D2.1 and further recommendations arising from the analysis	HLRS	R	PU	30
2.4	Final report on improving code performance at exascale and Best Practice Guide	Technical report describing the achieved scalability level and related performances obtained for the selected applications on the available hardware including a final Best Practice guide	CIN	R	PU	48





ChEESE

Cross-cutting and Vertical Tasks (reminder)



Cross-cutting Tasks

These tasks are derived from
common technical needs

Primary focus is on providing
concrete support to B1 codes

Extension to B2 codes will be
considered based on **impact vs effort**

Task	Codes	WP2 task	Priority	Partners
Performance monitoring at scale	SeisSol, xSHELLS, HySEA, FALL3D, ELMER/ICE	T2.4	High	BSC, CINECA
Deepening PETSc GPU performance	Tandem, LaMEM, pTatin3D	T2.3	High	CINECA



Cross-cutting Tasks

- Main objectives:
 - Investigation on the TALP side
 - Scalability testing (production versions) and resolution of any issues (porting). It will require EuroHPC budget.
- A reasonable goal: to extract lessons learned for D2.4 and metrics for new code releases
- BSC should coordinate this part together with HLRS and CINECA (as WP2 lead)

Task	Codes	WP2 task	Priority	Partners
Performance monitoring at scale	SeisSol, xSHELLS, HySEA, FALL3D, ELMER/ICE	T2.4	High	BSC, CINECA
Deepening PETSc GPU performance	Tandem, LaMEM, pTatin3D	T2.3	High	CINECA



Cross-cutting Tasks

Main objectives:

investigation on the PETSc side
potential engagement of
expertise on the library
(particularly regarding GPU
support)

Benchmarking campaign (use of
demonstrators)

Minimum goal to extract lessons
learned for D2.4

CINECA proposes to coordinate this
task

Task	Codes	WP2 task	Priority	Partners
Performance monitoring at scale	SeisSol, xSHELLS, HySEA, FALL3D, ELMER/ICE	T2.4	High	BSC, CINECA
Deepening PETSc GPU performance	Tandem, LaMEM, pTatin3D	T2.3	High	CINECA



Vertical Tasks

Vertical tasks address **code-specific needs** that cannot be generalized across multiple applications.

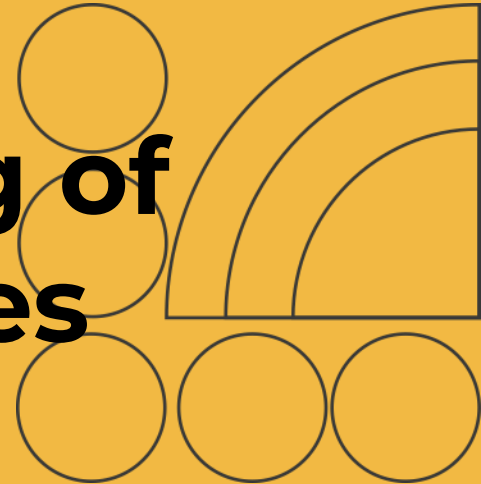
Task	Codes	WP2 task	Priority	Partners
Performance portability campaign using SPECfem-Waves	SPECfem3D	T2.2	Medium	CINECA
Avoiding GPU-CPU memory transfers in full-app by changing memory layout to SoA	ExaHyPE	T2.3	High	
Overlapping of communication and computation	ExaHyPE	T2.3	High	
Performance portability studies with different GPU backends on new hardware	ExaHyPE	T2.2	Medium	CINECA
Tuning I/O performances	ELMER/ICE	T2.3	Medium	
Clang/clang version tailored to AMD hardware	ELMER/ICE	T2.3	Medium	
Performance portability campaign using new hw	ELMER/ICE	T2.2	Medium	CINECA





ChEESE

Exascale ambition towards D2.4: planning of cross-cutting activities (CINECA)



Work Plan – Performance monitoring at scale

Main Objectives:

- Scalability testing on production versions of selected flagship codes+ issue resolution (porting) using TALP
- Extraction of lessons learned for D2.4 and updated metrics for new releases
- Coordination led by BSC and CINECA



Phase 1 – Setup & Coordination (CINECA)

Activities:

- Define target use cases and codes
- Define HPC environments (EuroHPC systems) and scaling parameters
- Plan EuroHPC resource/budget usage

Outcome:

- List of target codes and configurations (including scaling parameters), target EuroHPCs and budget



Phase 2 – TALP status (BSC)

Activities:

- Analysis of TALP status in relation to:
- Support of selected flagship codes selected on Phase
- Availability in EuroHPC systems selected in Phase 1

Outcome:

- Provide TALP installations and usage guidelines



Phase 3 – Scalability Testing (CINECA)

Activities:

- Strong and weak scaling tests
- Multi-node / multi-GPU experiments
- Comparison across different production versions
- Porting and issue resolution

Outcomes:

- Scalability and Porting report
- Comparative performance tables



Phase 4 – Metrics & Lessons Learned (BSC)

Activities:

- Aggregate and analyze results
- Identify best practices

Outcomes:

- Draft input for Deliverable D2.4



Work Plan – Deepening PETSc (GPU) Performance

Main Objectives:

- Listing the performance bottlenecks related to PETSc in Tandem, LaMEM and pTatin3D and identifying transversal issues.
- Collaborate with code owners and PETSc developers to define, benchmark and evaluate potential solutions
- Depending on the required level of effort, implement minor improvements directly in the codes and report more substantial ones in the deliverable for future work and projects.
- Coordination led by CINECA



Phase 1 – PETSc Performance bottlenecks (CINECA)

Activities:

- Reviewing code audits and POP reports of Tandem, LaMEM and pTatin3D
- Contacting code owners and developers for a better understanding of the issues

Outcome:

- List of individual and cross-cutting PETSc performance issues at (CPU and) GPU levels for each code



Phase 2 – PETSc solutions and benchmarking via demonstrators (CINECA/code owners)

Activities:

- Contacting PETSc developers and defining solutions
- Designing and implementing demonstrators to benchmark proposed solutions
- Evaluating solutions considering efforts vs potential performance improvements based on benchmarking results

Outcomes:

- List of solutions for each code
- Performance comparison results from demonstrators supporting solution selection



Phase 3 – Implementation and reporting (CINECA/code owners)

Activities:

- Implement minor changes to codes
- Report major changes as future developments in D2.4

Outcome:

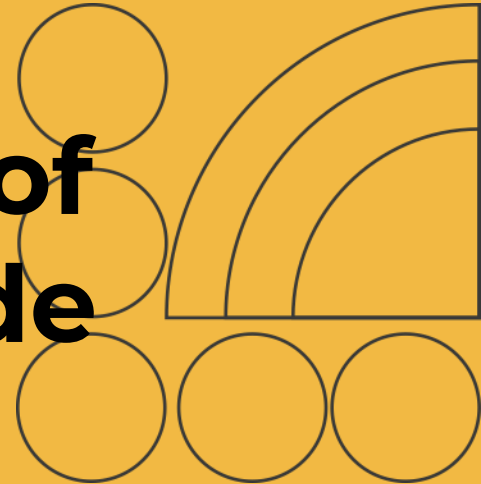
- Deliverable report





ChEESE

**Exascale ambition
towards D2.4: status of
vertical activities (code
owners)**



Next steps

- Monitoring overall advancement (**CINECA**)
- Start drafting D2.4 (**CINECA/task leaders**)
- ...





ChEESE

Questions/Comments?

