



Supercharging Your HPC Applications

Free Expert Support through EPICURE and POP3

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This project has received funding from the European High Performance Computing Joint Undertaking under grant agreement No. 101139786. Views and opinions expressed are, however, those of the author(s) only and do not necessarily reflect those of the European Union or EuroHPC Joint Undertaking. Neither the European Union nor the granting authority can be held responsible for them.



From Code to Scale:

EPICURE's Services, Stories,
and Training for EuroHPC Users



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What is EPICURE?

4-year project (Feb 2024 – Jan 2028)

- Coordinated by CSC with 17 partners from European HPC sites
- Provides a distributed network of Application Support Teams (ASTs) for Level 2 and Level 3 support
- Covers: Porting & Optimisation · Advanced Training · Best Practice Guides
- Collaboration at European and global level for pre/exascale applications
- Works with Centres of Excellence and National Competence Centres

Mission: to establish a European HPC Application Support Service and develop an educated, HPC-capable research community.

17

Partner
Organisations

120+

Projects
Supported

70+

Application
Codes Optimised

FREE

For EuroHPC
Allocation Holders

Who Can Apply?

Supported — any project with EuroHPC resources:

Extreme Scale Access

Regular Access

Development Access

Benchmarking Access

Not Supported:

National projects using resources **not** coming from EuroHPC (e.g. resources from purely national allocations).



Tip:

If you do not yet have a qualifying EuroHPC project, consider submitting a Development Access proposal and requesting EPICURE application support directly in the form — it's the easiest route in.

Support Services Overview

Meet our Support Services

KNOW MORE

APPLY FOR EUROHPC ACCESS CALLS



Code enablement and scaling

Support for enabling and increase the scalability of user codes to EuroHPC supercomputers



Performance Analysis

Performance analysis for HPC codes



Benchmarking

Our service focuses on developing a benchmarking suite to evaluate the performance of EuroHPC machines.



Code refactoring

This service involves restructuring or rewriting parts of an application code to improve its maintainability but without changing its function.



Code optimization

Our service aims at improving the efficiency and performance of the software such that it consumes fewer resources

Level 2 vs Level 3 Support



2nd Level Support | Code Porting, Enabling and Scaling

Work limited to 1-2 months with focus in compilation improvements, vectorization and scalability analysis



3rd Level Support | Code Optimization

Handling large-scale workloads with durations of 2 to 6 months, focused on performance improvements that require code modifications, such as inter-node optimizations, GPU porting and scalability improvements

What EPICURE Does NOT Provide

EPICURE does not provide Level 1 Support — that is provided by your local computing centre or EuroHPC helpdesks.

✗ General information (e.g. how to generate SSH keys)

✗ Login and access to HPC systems

✗ Setting up your environment / modules

✗ Preparing workflow or job scripts (e.g. SBATCH templates)

✗ Standard software installation not related to your project's code

How to Apply for EPICURE Support

1

Submit EuroHPC Access Proposal

Apply via the EuroHPC JU open calls at pracecalls.eu. Select Development, Regular, Extreme Scale, Benchmarking or AI access.

2

Request Application Support in the Form

In the web submission form, check:

"Does your proposal require assistance from an AST on the selected partition(s)?" → Select Yes.

3

Project Accepted → Support Begins

Once awarded, you are matched with an Application Support Team expert. No extra application needed — support is automatic for approved projects.

4

Collaborate & Achieve

Work closely with the AST on profiling, optimisation and scaling. Outcomes are documented and shared on the HPC Application Support Portal.

EPICURE Impact — First 24 Months

Driving forward the development of the European HPC Application Support Service

120+

**Projects
Supported**

completed or ongoing

70+

**Application
Codes Optimised**

incl. GROMACS, QuantumEspresso, PyTorch

28

**AI / LLM
Projects**

model support & optimisation

18

**Profiling &
Benchmarking**

performance analysis cases

24

**Enabling &
Porting Projects**

compilation & optimisation

8

**Workflow &
Data / I/O Cases**

containerisation, HPC workflows

Success Stories

ENERGY

Methane→H₂ Catalytic Reactor Simulation

EHPC-EXT-2023E01-036 · CINECA on Leonardo

Python implementation updated and replaced with more efficient libraries.

Result: 20× performance improvement

ENVIRONMENT & CLIMATE

North West European Shelf Ecosystem

EHPC-REG-2023R02-047 · IZUM on Vega

Process memory pinning via quiet option applied to multi-node runs.

Result: Up to 7% speedup on real-life workloads

HEALTH & MEDICINE

Heart Language Foundation Model

EHPC-DEV-2025D04-139 · Luxprovide on MeluXina

Distributed training pipeline optimised for multi-node multi-GPU environments: improved communication, memory usage and throughput.

Result: Significantly reduced training time

HPC Application Support Portal

A growing, open knowledge base for the entire European HPC community

How-to Guides

Step-by-step instructions for compiling, running, and tuning codes on all EuroHPC systems.

Best Practice Documents

Recommended workflows, compiler flags, MPI settings, and GPU configurations for major HPC applications.

Code Snippets

Reusable scripts for profiling, benchmarking, job submission, and common HPC patterns.

On-Demand Training Materials

Recorded lectures, hackathon content, workshop slides and exercises — available 24/7.

Interaction with POP3 Centre of Excellence

Start your analysis in POP3 — bring the performance bottlenecks identified to EPICURE for expert porting & optimisation support

1

Request a POP3 Performance Assessment

POP3 evaluates code performance & scaling, quantifies inefficiencies, and delivers expert recommendations — free of charge for all EuroHPC users.

2

Identify Problems: Scaling, Architecture Gaps & Optimisation Needs

POP3 reports pinpoint bottlenecks: parallelisation inefficiencies, memory issues, energy use, and readiness gaps for EuroHPC pre/exascale systems.

3

Bring Identified Problems to EPICURE for Level 2 / Level 3 Support

Apply for EPICURE support to address the issues — porting to new architectures, deep code optimisation, scalability work, and best-practice documentation.

Tip: POP3 and EPICURE are complementary services. POP3 diagnoses the problem — EPICURE implements the fix. Reference your POP3 report in your EPICURE support request.



EPICURE
Unlocking European-level HPC Support

Thank you!



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EuroHPC
Joint Undertaking

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POP3: Performance Optimisation and Productivity Center of Excellence

Radim Vavřík, IT4Innovations

HORIZON-EUROHPC-JU-2023-COE



EuroHPC
Joint Undertaking

1 January 2024– 31 December 2026

Grant Agreement No 101143931

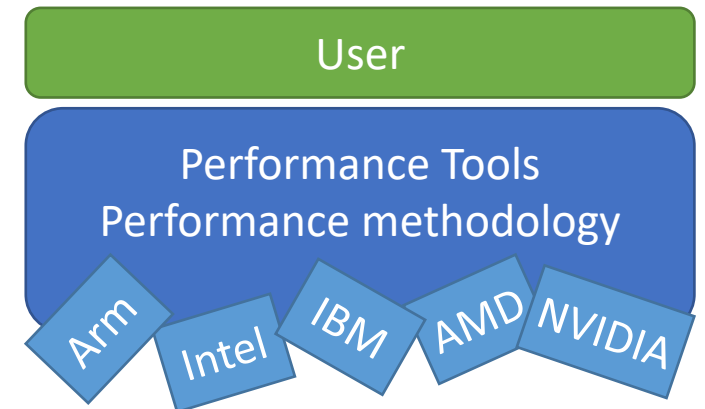


- A **Centre of Excellence**
 - On **Performance Optimisation and Productivity**
 - Promoting **best practices in parallel programming**
- Providing **FREE Services**
 - Precise understanding of application and system behaviour
 - Suggestion/support on how to refactor code in the most productive way
- **Horizontal**
 - Transversal across application areas, platforms, scales
- **For (EuroHPC) academic AND industrial codes and users !**

Context and history



- **POP-CoE** starts in 2015
- Objectives:
 - To offer performance analysis services to European HPC users.
 - To develop a common methodology for performance analysis
- **POP1** runs from October 2015 to March 2018
- **POP2** runs from December 2018 to June 2022
- **POP3** runs from January 2024 to December 2026
- **POP4** will run from January 2027
to December 2029 if accepted



Partners



• Who?

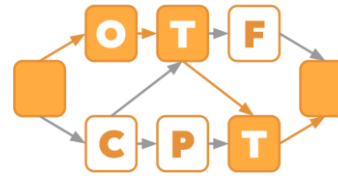
- BSC, ES (coordinator)
- HLRS, DE
- INESC-ID, PT
- IT4I, CZ
- JSC, DE
- RWTH Aachen, IT Center, DE
- TERATEC, FR
- UVSQ, FR



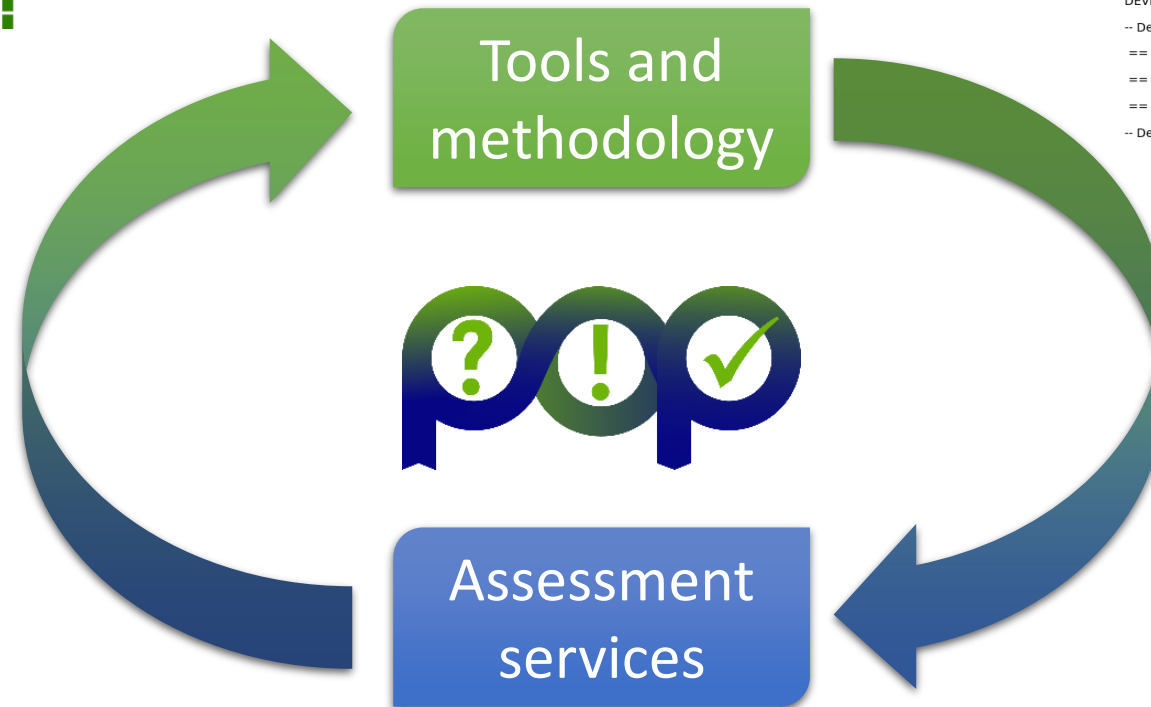
A team with

- Expertise and diversity in performance tools and programming models
- Research and development background AND proven commitment in application to real academic and industrial use cases

Objectives



	16(4x4)(4GPUs)[1]	32(8x4)(8GPUs)[2]	64(16x4)(16GPUs)[3]	Percentage(%)
HOST Global efficiency	39.13	22.14	12.53	
-- Host Parallel efficiency	39.13	53.71	57.81	
== MPI Parallel efficiency	95.34	93.66	91.63	
-- MPI Load balance	99.50	99.02	99.09	
-- MPI Communication efficiency	95.81	94.59	92.47	
-- Serialization efficiency	99.17	99.84	99.42	
-- Transfer efficiency	96.61	94.74	93.01	
== Device Offload efficiency	41.05	57.35	63.09	
-- Host Computation scalability	100.00	41.22	21.67	
== IPC scalability	100.00	141.77	174.15	
== Instruction scalability	100.00	32.89	12.01	
== Frequency scalability	100.00	88.41	103.64	
DEVICE Global efficiency	29.03	16.43	9.29	
-- Device Parallel efficiency	29.03	16.05	8.76	
== Device Load balance	98.95	99.26	98.57	
== Device Communication efficiency	61.91	58.71	53.66	
== Device Orchestration efficiency	47.39	27.55	16.57	
-- Device Computation scalability	100.00	102.32	106.05	





- **Performance Assessment (First Level Service)**

- Initial analysis measuring a [range of performance metrics](#) to assess quality of performance and identify the issues affecting performance (at customer site)
- If needed, undertakes further performance evaluations to identify the root causes of the issues found and qualify and quantify approaches to address them (recommendations)

- **Second Level Services**

- May follow after conclusion of an initial performance assessment:
 - **Proof-of-concept**: explore the potential benefit of proposed optimisations by applying them to selected regions of the applications
 - **Correctness check**: evaluate the correctness of hybrid MPI + OpenMP applications
 - **Energy-efficiency study**: investigate improvements of energy consumption and efficiency
 - **Advisory study**: ongoing consultancy for customers that choose to implement proposed optimisations on their own

Target Customers



- **Code developers**

- Assessment of detailed actual behaviour
- Suggestion of most productive directions to refactor code

- **Users**

- Assessment of achieved performance in specific production conditions
- Possible improvements modifying environment setup
- Evidence to interact with code developers

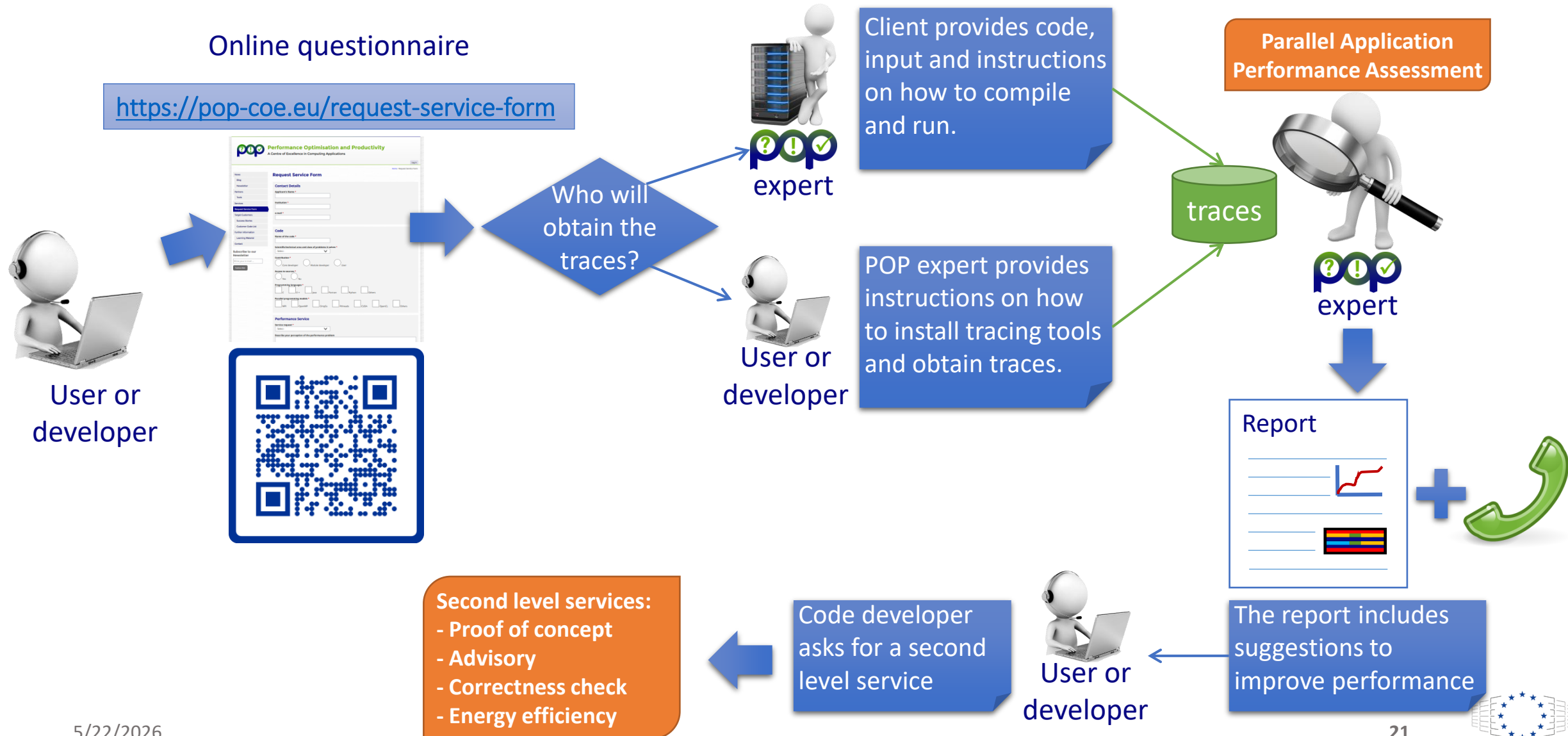
- **Infrastructure operators**

- Assessment of achieved performance in production conditions
- Possible improvements from modifying environment setup
- Information for computer time allocation processes
- Training of support staff

- **Vendors**

- Benchmarking
- Customer support
- System dimensioning/design

POP3 services





Performance Optimisation and Productivity 3

A Centre of Excellence in HPC

Contact:

 <https://www.pop-coe.eu>

 pop@bsc.es

 [@POP_HPC](#)

 [youtube.com/POPHPC](https://www.youtube.com/POPHPC)

