



Performance Optimisation and Productivity

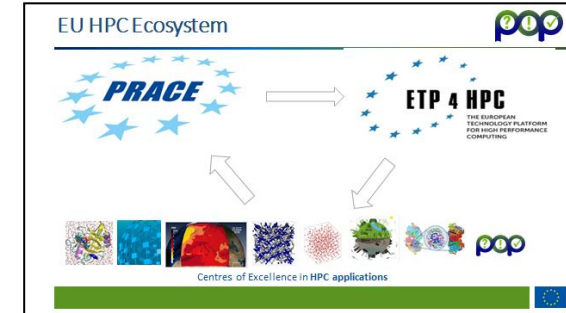
EU H2020 Centre of Excellence (CoE)



Grant Agreement No 676553

1 October 2015 – 31 March 2018

- A **Centre of Excellence**
 - On **Performance Optimisation and Productivity**
 - Promoting **best practices in parallel programming**
- Providing **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 (your?) academic AND industrial codes and users !**



Partners



• Who?

- BSC (coordinator), ES
- HLRS, DE
- JSC, DE
- NAG, UK
- RWTH Aachen, IT Center, DE
- TERATEC, FR



A team with

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





Why?

- Complexity of machines and codes
 - Frequent lack of quantified understanding of actual behaviour
 - Not clear most productive direction of code refactoring
- Important to maximize efficiency (performance, power) of compute intensive applications and productivity of the development efforts

What?

- Parallel programs, mainly MPI/OpenMP
 - Although also CUDA, OpenCL, OpenACC, Python, ...



The process ...



When?

October 2015 – March 2018

How?

- Apply
 - Fill in small questionnaire describing application and needs
<https://pop-coe.eu/request-service-form>
 - Questions? Ask pop@bsc.es
- Selection/assignment process
- Install tools @ your production machine (local, PRACE, ...)
- Interactively: Gather data → Analysis → Report

The screenshot shows the 'Request Service Form' on the Performance Optimisation and Productivity (POP) website. The form is titled 'Request Service Form' and is part of a 'Request Service Form' page. It includes a sidebar with navigation links such as 'News', 'Blog', 'Newsletter', 'Partners', 'Tools', 'Services', 'Request Service Form', 'Target Customers', 'Success Stories', 'Customer Code List', 'Further Information', 'Learning Material', and 'Contact'. The main form area is divided into several sections: 'Contact Details' with fields for 'Applicant's Name', 'Institution', and 'e-mail'; 'Code' with a 'Name of the code' field, a dropdown for 'Scientific/technical area and class of problems it solves', and radio buttons for 'Contribution' (Core developer, Module developer, User) and 'Access to sources' (Yes, No); 'Programming languages' with checkboxes for C, C++, Java, Fortran, Python, and Others; 'Parallel programming models' with checkboxes for MPI, OpenMP, OpenMPs, Pthreads, CUDA, OpenCL, and Others; and 'Performance Service' with a dropdown for 'Service request' and a text area for 'Describe your perception of the performance problem'. A 'Subscribe to our Newsletter' section is also present on the left side of the form.



Services provided by the CoE



? Parallel Application Performance Audit

⇒ Report

- Primary service
- Identify performance issues of customer code (at customer site)
- Small effort (< 1 month)

! Parallel Application Performance Plan

⇒ Report

- Follow-up on the audit service
- Identifies the root causes of the issues found and qualifies and quantifies approaches to address them
- Longer effort (1-3 months)

✓ Proof-of-Concept

⇒ Software Demonstrator

- Experiments and mock-up tests for customer codes
- Kernel extraction, parallelisation, mini-apps experiments to show effect of proposed optimisations
- 6 months effort



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 provider

- **Infrastructure operators**

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

- **Vendors**

- Benchmarking
- Customer support
- System dimensioning/design



- **Install and use already available monitoring and analysis technology**
 - Analysis and predictive capabilities
 - Delivering insight
 - With extreme detail
 - Up to extreme scale
- **Open-source toolsets**
 - Extrae + Paraver
 - Score-P + Cube + Scalasca/TAU/Vampir
 - Dimemas, Extra-P
 - SimGrid
- **Commercial toolsets**
(if available at customer site)
 - Intel tools
 - Cray tools
 - Allinea tools



- **Customer advocacy**

- Gather customers feedback, ensure satisfaction, steer activities

- **Sustainability**

- Explore business models

- **Training**

- Best practices on the use of the tools and programming models (MPI + OpenMP)





Performance Optimisation and Productivity

A Centre of Excellence in Computing Applications

Contact:

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