Performance Optimisation and Productivity

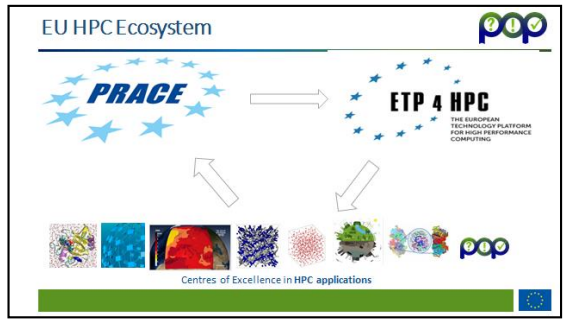
EU H2020 Centre of Excellence (CoE)

1 October 2015 – 31 March 2018

Grant Agreement No 676553

POP CoE

- 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

Motivation

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, …

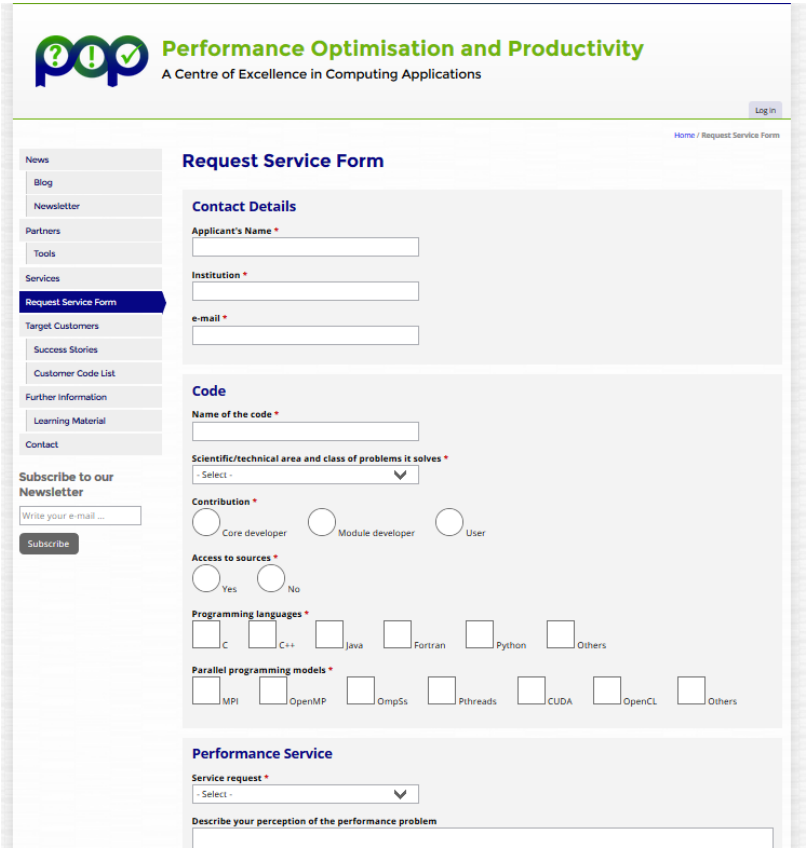
The process …

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



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

Tools

- **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

Other activities

- **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:

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