Performance Optimisation and Productivity
A Centre of Excellence in HPC

POP Newsletter 19 – Issue June 2021

Welcome to the 19th newsletter from the EU POP Centre of Excellence.

In this edition, we are pleased to present our resources for co-design, which have now been integrated into the main POP website, and we provide details about our mini-symposium in July. We review a couple of our recent training events, including our POP training for underrepresented groups. We also include our forthcoming training events, recent webinars and a couple of interesting technical success stories. As always, we will tell you where you can (virtually) meet POP staff.

If you would like to contribute technical content for this newsletter on the topic of parallel performance profiling, please contact us at pop@bsc.es.

This issue includes:

For past editions of the newsletter, see the POP newsletter web page.

Resources for Co-design

During this second phase of the POP project, we have been developing the **resources for co-design** website. It has now been completely integrated with our main website and you can visit it at https://co-design.pop-coe.eu. Its main purpose is to offer a resource for application developers, performance analysts and system designers (hardware and software) to understand the sort of problems they can encounter when executing on HPC systems.

Find out more about this resource here.

POP Webinars

In March, Joachim Protze of RWTH Aachen gave an excellent talk on **Debugging Tools for Correctness Analysis of MPI and OpenMP Applications**. This 30-minute webinar presented two runtime correctness analysis tools, MUST (for MPI) and Archer (for OpenMP), both freely available under open-source licenses and allowing analysis even during large-scale execution. The recording, slides and handouts can all be found here.

This was followed in May by **The Scalasca Scalable Parallel Performance Analysis Toolset - for POP Assessments and Beyond**, an interesting and informative introduction to the toolset by Bernd Mohr of Jülich Supercomputing Centre. This 30-minute webinar introduced the design of the Scalasca tool framework and how it can be used to analyse the performance of parallel applications, even on extreme-scale HPC systems. It also described the enhancements made to the tool components during the POP project, which greatly simplify its usage for performance assessments. The recording, slides and handouts can all be found here.

Recordings of all our webinars are archived to our YouTube channel shortly after the live event and these are proving to be a very popular resource, having now exceeded a combined total of 10,000 views. Browse the list and catch up on all our previous webinars here.

Expect more webinar announcements soon!

POP Mini-Symposium

POP is organising a two-part mini-symposium "Performance Optimisation and Productivity for EU HPC Centres of Excellence (and other European parallel application developers preparing for exascale)" as part of the PASC21 Platform for Advanced Scientific Computing conference, which will be held 5-9 July as a digital event this year. Sectorial HPC Centres of Excellence will report on their experience collaborating with POP and using POP services as part of preparing their flagship application codes for forthcoming exascale computer systems.

The first part on Wednesday 7 July (11-13 CEST) has presentations from EoCoE, ChEESE and CompBioMed, followed on Thursday 8 July (11-13 CEST) with presentations from MaX, ESiWACE and on the Alya code, which features in multiple HPC Centres of Excellence. The mini-symposium opens with an introduction to POP and reviews best practice for efficient and scalable application performance, which is also the topic of a virtual poster, and concludes with a panel discussion on exascale readiness and suggestions for POP service improvements and extensions.

Technical Blogs

Run time halved for OpenMP code

POP recently undertook a Proof-of-Concept study to address the problem of low IPC (Instructions Per Cycle) that we had previously been identified in a computational fluid dynamics code. By improving the memory access and removing redundant code, a 2.1x speed-up was achieved.

Read the full story here.

Asynchronous I/O Scheme for openFOAM/ashee

Another recent Proof-of-Concept, in collaboration with the ChEESE CoE, was on one of their flagship codes, called ASHEE. The customers foresee a future use-case, which will require them to dump simulation results at high frequency. This seems only feasible with an asynchronous I/O scheme, where the application can continue computation in the foreground while I/O is done concurrently in the background. This blog post describes the development of such a scheme.

Recent POP Training Events

Diversifying the HPC community: boosting the uptake of advanced HPC training by women and underrepresented groups

From the 19th to the 21st April 2021, POP ran a performance optimization workshop aimed at women and underrepresented groups. This workshop was organised and taught by an all-female team. The event was supported by POP CoE in collaboration with the NAG Women in HPC (WHPC) chapter and VI-HPS.

Find out more about the successes of this workshop in this blog post from the training team.

A one-day online training for SURF

POP recently provided a one-day online training to the users and HPC support team of SURF (formerly SURFsara), structured around the interests of the participants and tailored to their own machine (Cartesius). Divided into theoretical and practical sessions, the training day provided the attendees with an extensive introduction to profiling parallel codes on HPC machines, the POP profiling methodology and tools, and a review of real cases where POP services have been used to improve the performance of parallel codes.

The trainers reflect on the event here.

Performance Tuning Workshops

VI-HPS Tuning Workshops

14 - 18 June 2021 | online

POP experts will give an overview of the VI-HPS programming tools suite, explain the functionality of individual tools and how to use them effectively, and offer hands-on experience and expert assistance using the tools at the 40th VI-HPS Tuning Workshop at LRZ, Garching, Germany.

2021 Code Performance Series: From analysis to insight

24 June, 15 July | online

This series of workshops, as announced in a previous POP newsletter, continues with workshops on MAQAO in June and Likwid in July. This is an ExCALIBUR Knowledge Integration Activity in collaboration with POP, Durham's Department of Computer Science, DiRAC and the N8 CIR (N8 Centre of Excellence in Computationally Intensive Research).

Click here to learn more about the workshops, including registration.

POP Online Training

We have previously introduced our online training modules, a series of short training videos on topics related to performance optimisation and our methodology and, in the last newsletter, we mentioned three new modules on more advanced topics, aimed at users who already have some familiarity with Paraver. A fourth such module has now been added to further develop your skills.

- Paraver: On Sampling in Traces
    - Learn how sampling can usefully complement instrumentation in a code and how to analyse sampled data with Paraver

We have also added links on the online training page to two recordings of POP/VI-HPS workshops, which are a great resource for anyone learning to use the POP tools.

POP Out and About

Teratec Forum | 22 – 24 June 2021 | online

By connecting the best international experts in Digital Simulation, High Performance Computing (HPC), massive data processing, Artificial Intelligence and Quantum Computing, the Teratec Forum is a major European event, highlighting the importance of these new technologies in developing companies' competitiveness and innovation capacities. Please visit the Teratec booth at this event for information about the POP service.

ISC High Performance 2021 Digital | 24 June – 2 July 2021 | online

On the 24th and 25th June 2021, various POP partners will present tutorials at this leading European HPC conference. This will be a great opportunity to learn directly from POP analysts.

- Determining Parallel Application Execution Efficiency and Scaling using the POP Methodology (BSC, JSC)
- Mastering Tasking with OpenMP (BSC, RWTH)
- Hands-on Practical Hybrid Parallel Application Performance Engineering (JSC)
- Introduction to HPC: Applications, Systems, and Programming Models (JSC)

For more information on the conference, please click here.

If you feel that POP should be attending an event, please contact us at pop@bsc.es - suggestions are most welcome!

Apply For Free Help with Code Optimisation

We offer a range of free services designed to help EU/UK organisations improve the performance of parallel software. If you are not getting the performance you need from parallel software or would like to review the performance of a parallel code, please apply for help via the short Service Request Form, or email us to discuss the service further and how it can be beneficial.

These services are funded by the European Union Horizon 2020 research and innovation programme so there is no direct cost to our users.

The POP Helpdesk

Past and present POP users are eligible to use our email helpdesk. Please contact our team of experts for help analysing code changes, to discuss your next steps and to ask questions about your parallel performance optimisation.