

Press release: Europe's High-Performance Computing (HPC) Training and Education Needs Revealed in Comprehensive Survey

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To remain competitive at the cutting edge of simulation science, Europe's top computational scientists will be required to harness the huge computing potential offered by Petascale computing architectures which can deliver over one quadrillion calculations per second (to put this into perspective, a quadrillion strands of hair laid side-by-side would stretch 50,000,000 km). Unfortunately, traditional training materials may not now be enough to instruct users on how to fully exploit these complex systems comprising potentially hundreds of thousands of powerful processing elements, large memories, fast communication interconnections, and sophisticated supporting software.

Recently, a comprehensive survey of HPC training and education needs was conducted amongst the top-tier computational users across all partner sites within the PRACE (Partnership for Advanced Computing in Europe) consortium. The mission of the survey was to evaluate the current educational needs of PRACE HPC users by assessing existing proficiency and satisfaction in traditional HPC techniques as well as soliciting their training requirements for next-generation Petascale systems. To realise this objective, users were invited to participate in an online survey that examined a broad range of HPC topic training areas including MPI (Message Passing Interface), OpenMP (Open Multiprocessing), hybrid MPI-OpenMP programming, PGAS (Partitioned Global Address Space) languages, parallel I/O, visualization, parallel debugging, performance optimization, multi-core programming, numerical libraries and distributed computing tools. Over a hundred responses were received. This survey is amongst the most comprehensive evaluations of user training requirements and satisfaction ever undertaken by top European HPC users, the results of which will be expected to steer future training and education programs within the PRACE HPC Research Infrastructure.

Multi-core and Hybrid MPI-OpenMP Weaknesses Highlighted

The results obtained from the survey highlighted both the strengths and weaknesses of current HPC training among top-tier European HPC users. It also revealed an important need for centralised HPC training repositories and HPC technology dissemination channels. Other significant trends that were identified are:

1. There is a deficiency amongst a significant proportion of the HPC user community (including those with many years of experience in the HPC field) in understanding the fundamental principles of HPC programming and practice on both existing and novel architectures;
2. Ninety-three per cent (93%) of users were unfamiliar with Partitioned Global Address Space (PGAS) languages (a programming paradigm that is gaining widespread attention as an alternative model for developing HPC codes);

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3. There is a significant shortcoming in expertise with mixed-mode (MPI-OpenMP) programming. More than two-thirds of respondents indicated they had no competency in this important Petascaling technique. Furthermore, a third of respondents rated the quality of training they had received in mixed-mode programming as 'poor';
4. Only one-fifth of respondents has received some training in multi-core programming techniques, the majority of which regarded their proficiency as basic or non-existent;
5. Over ninety per cent (90%) of respondents believed they would benefit from formal training in the following areas: performance optimization, debugging tools and techniques, code testing and compiler optimisations;
6. Ninety per cent (90%) of users considered that there is an important need for improved HPC training programmes.

While many areas of HPC training were highlighted as currently deficient in content and quality, encouragingly the vast majority of respondents were enthusiastic about the opportunity to benefit from training delivered through a PRACE HPC Training and Education Infrastructure. Furthermore, ninety-five per cent (95%) of all respondents agreed that they would profit from a pan-European centralised repository of regularly updated, high-quality training material.

Over the coming months, members of the PRACE Training and Education team will begin to implement the recommendations presented by this survey via a series of European summer schools, winter schools and workshops, as well as introduce new initiatives for PRACE HPC knowledge and education dissemination.

About PRACE:

The Partnership for Advanced Computing in Europe (PRACE) prepares the creation of a persistent pan-European HPC service, consisting of several tier-0 centres providing European researchers with access to capability computers and forming the top level of the European HPC ecosystem. PRACE is a project funded in part by the EU's 7th Framework Programme. The PRACE project receives funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° RI-211528.

More information: The document related to this survey can be found on the PRACE website: www.prace-project.eu

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