E-Infrastructures to support scientists and supercomputing developers

With technological developments drastically changing the nature of computing, high-performance computing (HPC) can ease navigation of complex systems for researchers

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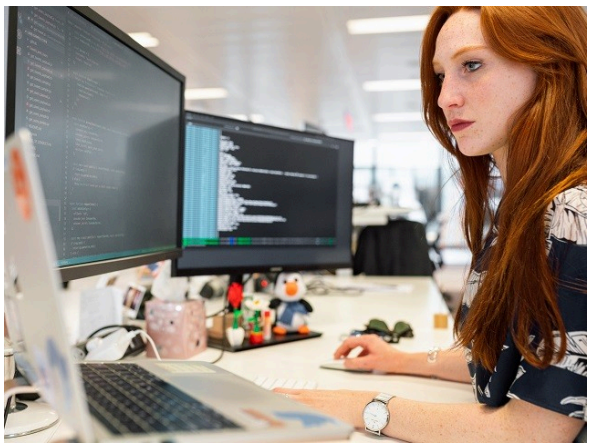

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High-performance computing (HPC) brings together supercomputers and parallel computing techniques to solve complicated, computation-intensive tasks. With its hardware, software and algorithmic advances, HPC is a tool often used in science and engineering fields such as health, energy and materials.

In recent years, supercomputers have become more powerful, flexible and faster in order to process big data or perform simulations. However, this also brings new challenges, including more complexity, less productivity in program execution and increased energy consumption.

To address this, two EU Future and Emerging Technologies-funded projects are currently exploring how HPC can better support researchers by providing computing service e-infrastructures: European joint Effort toward a Highly Productive Programming Environment for Heterogeneous Exascale Computing (EPEEC) and the Interactive Computing E-Infrastructure (ICEI/Fenix), which is part of the European Flagship Human Brain Project (HBP).

Helping researchers with coding issues

EPEEC is developing a parallel programming environment that will turn new and

varied exascale supercomputers into manageable platforms for domain application developers. The consortium, led by the Barcelona Supercomputing Center (BSC), will significantly advance and integrate existing state-of-the-art components based on European technology with key features, to reach three objectives: high coding productivity, high performance, and energy awareness. This will facilitate the use of supercomputers for developing big applications for different domains in a faster and portable way.

EPEEC's work will ensure that researchers can use the same codes in all types of HPC systems and thus devote more time to their work by not thinking about coding issues. The team has provided support for developing programs that target accelerators leveraging high-level abstractions.

They combine two highly efficient programming models: OmpSs-2 and OpenACC. ArgoDSM is another component for which a patent has been submitted, which will work under OmpSs-2 to automatically distribute data among compute nodes, releasing application developers from that burden.

EPEEC has also made contributions to massively parallel mesh adaptation. Mesh networks are topologies without a centre point, in which infrastructure nodes inter-connect non-hierarchically and cooperate to efficiently route data. Simulations on meshes with millions or even billions of elements require the mesh to be distributed over the cores of massively parallel computers.

EPEEC developments are now being tested using five applications that represent different science disciplines. "Our work toward high programming productivity in HPC will speed up the development of simulations in fields like earth sciences, climate, astrophysics or cancer. We have already published a set of programming guidelines for parallel applications. We've also contributed to the first simulation of a full aircraft engine. By the end of the year, we plan to release the stable version of all of our software components for widespread use," said Antonio J. Peña, Coordinator of EPEEC and Lead of the Accelerators and Communications for HPC Team at BSC.

Powering brain simulations

Federated to form the Fenix Research Infrastructure, ICEI aims to provide the researchers working on the HBP initiative, which uses mapping, modelling and simulation techniques to gain a better understanding of the human brain, with e-infrastructure services. But it's not only about neuroscience as the aim is to assist other research communities as well.

Read the full article on: http://www.fetfx.eu/story/e-infrastructures-support-scientists-and-supercomputing-developers/

Parole chiave

brain, supercomputing, computers, science, neuroscience, future

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