With Software From Eviden and Pasqal, FZJ, GENCI and CEA Prepare European Research Communities for the Quantum Era

Hamburg, May 23rd 2023

Forschungszentrum Jülich (FZJ), GENCI and CEA announce today that they will provide access to hardware-agnostic (EVIDEN QaptivaTM) and hardware-specific (PASQAL Pulser) programming and emulation environments as part of the pan-European hybrid HPC/quantum pilot project HPCQS. These first services will allow European research communities to prepare for the arrival of two twin 100+-qubit PASQAL quantum simulators, one at the Jülich Supercomputing Centre (FZJ/JSC) and one at CEA/TGCC, by the end of this year. In between, FZJ, GENCI and CEA will gradually deploy additional noisy emulators of such type of Fresnel analog quantum computers based on the technology of neutral atoms and will provide remote access to an identical Fresnel system hosted by PASQAL.

Launched in December 2021, HPCQS aims to develop, deploy and coordinate a European federated infrastructure, tightly integrating two quantum simulators, both controlling about 100+ qubits, one in the Tier-0 HPC systems Joliot Curie of GENCI, hosted and operated at CEA/TGCC, and one in the JUWELS modular supercomputer at FZJ/JSC. The European High-Performance Computing Joint Undertaking (EuroHPC JU) and six European countries (Austria, France, Germany, Ireland, Italy and Spain) are already involved in HPCQS.

The seamless integration of quantum hardware with classical computing resources, creating a hybrid system, is an essential step forward to unleash the power of quantum computers to handle first practical applications.

By providing access to the programming and emulation environments ahead of the implementation of the quantum simulators, FZJ, GENCI and CEA are encouraging potential end-users to explore hybrid HPC/quantum simulations to take advantage of these new accelerators. In order to reach this goal, EVIDEN and PASQAL will organize training sessions on myQLM (part of QaptivaTM) and Pulser. Adding noisy emulators of the envisaged PASQAL Fresnel system to the programming environment in the coming weeks will allow users to develop algorithms that are more likely to behave properly on a real quantum simulator.

“Users are thrilled to gain expertise in programming quantum simulators with the various tools provided in the framework of HPCQS in preparation for the arrival of the Fresnel devices.”, stated Prof. Kristel Michelsen, Head of Quantum Computing at JSC. Jacques-Charles

HPCQS has received funding from the European High-Performance Computing Joint Undertaking (JU) under grant agreement No 101018180. The JU receives support from the European Union’s Horizon 2020 research and innovation programme and Germany, France, Italy, Ireland, Austria and Spain in equal parts.

Lafoucrière, Program Director at CEA, added that "by providing a phased access to programming environments and emulators, we want to build adoption among different end-user communities and make sure they acquire the right skill set to benefit from the actual quantum simulators when they are available."

HPCQS also aims at monitoring and assessing emergent and promising quantum computing technologies. Therefore, FZJ, GENCI and CEA offer in addition access to other programming environments in the same fashion as myQLM and Pulser. Examples are Qiskit, Cirq, D-Wave Systems Ocean and the Linear-Optics Quantum Computing (LOQC) paradigm using Perceval (Quandela). Soon, users will also be able to explore NVIDIA cuQuantum. Other innovative frameworks tied to additional technologies such as silicon spins in carbon nanotubes, or cat qubits, should follow soon, along with applications libraries, to complement and enrich this ecosystem.

In the framework of EuroHPC JU's deployment of six additional quantum-computing devices in the coming months, HPCQS is helping to pave the way for the adoption of these new devices, which will be added to a pan-European federated hybrid HPC/quantum computing and simulation (HPC-QCS) infrastructure. Stay tuned for the introduction of additional services for the benefit of European research communities.

About HPCQS

HPCQS is an open and evolutionary infrastructure that aims at expanding in the future by including a diversity of quantum computing platforms at different technology readiness levels and by allowing the integration of other European quantum nodes. The HPCQS infrastructure realises, after the Jülich UNified Infrastructure for Quantum computing (JUNIQ), a second step towards a European Quantum Computing and Simulation Infrastructure (EuroQCS), as advocated for in the Strategic Research Agenda of the European Quantum Flagship.

Project Key Facts

Acronym	HPCQS
Title	High-Performance Computer and Quantum Simulator hybrid
Start date	1st December 2021
Duration	4 years
Budget	€ 12 Mio (50% funded by EuroHPC)
Coordination	Forschungszentrum Jülich, Prof. Dr Kristel Michielsen
Partners	FZJ, CEA, GENCI, BULL, CNR, NUIG-ICHEC, University of Innsbruck, EURICE, CNRS, Inria, CINECA, BSC, FlySight, ParityQC, Fraunhofer IAF
Linked 3rd parties	ParTec, Sorbonne Université, CentraleSupélec
Website	www.hpcqs.eu
Twitter	https://twitter.com/HPCQS_EU
LinkedIn	https://www.linkedin.com/showcase/hpcqs-eu

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About CEA

The CEA is a major research organisation working in the best interests of the French State, its economy and citizens. Thanks to its strong roots in fundamental research, it is able to provide tangible solutions to meet their needs in four key fields: low-carbon energy (nuclear and renewable), digital technology, technology for medicine of the future, defense and national security.

About FZJ

Shaping change: This is what drives us at Forschungszentrum Jülich. As a member of the Helmholtz Association with roughly 7,000 employees, we conduct research into the possibilities of a digitised society, a climate-friendly energy system, and a resource-efficient economy. We combine natural, life and engineering sciences in the fields of information, energy, and the bioeconomy with specialist expertise in high-performance computing and we also use unique scientific infrastructure.

About GENCI

Created by the public authorities in 2007, GENCI is a major research infrastructure. This public operator aims to democratise the use of digital simulation through high performance computing associated with the use of artificial intelligence, and now quantum computing to support French scientific and industrial competitiveness.

GENCI is in charge of three missions:

- To implement the national strategy for the provision of high-performance computing resources, storage and processing of massive data associated with AI technologies for the benefit of French open scientific research in conjunction with the three national computing centers.
- Support the creation of an integrated HPC ecosystem at the national and European levels.
- Promote digital simulation through HPC to academic research and industry scale.

GENCI is a civil company, 49% of which is owned by the French government, represented by the Ministry of Higher Education and Research, 20% by the CEA, 20% by the CNRS, 10% by Universities represented by France Université and 1% by Inria.

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