QBridge

Seamlessly integrating Quantum into HPC

OVERVIEW

It has become evident that early adoption of Quantum Computing will require the concerted use of classical HPC and QC systems to run hybrid classical quantum algorithms. QBridge, a software co-developed by ParTec and Quantum Machines, is able to bridge the gap, enabling users to harness the power of quantum alongside their classical computing resources by seamlessly integrating QC into their existing HPC set-up.

WHO CAN BENEFIT?

- Large HPC centers who are looking to integrate Quantum Computers into their existing HPC resources

- Research groups who are looking to efficiently share the experimental QC system between team members and collaborators

- Organizations who are looking for solutions that help them economically scale as qubit capacity grows

- Industry (partners) seeking investment protection through a solution allowing for a broad range of qubit modalities

Unifying HPC and QC

- Highly efficient utilisation of quantum resource through tight HPC QC integration

- Integration of virtualised QC under one HPC scheduler

- Bi-directional acceleration: Using QC for application acceleration, HPC for quantum error correction and gate optimisation

- Protecting existing investment in classical compute

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FEATURES

- Co-Scheduling and low latency coupling of classical and QC resources
- Common HPC APIs - SLURM workload manager integration
- QPU virtualization with fine-granular time slicing
- Ties into standard Linux user environments
- Token-based security model
- Dynamic circuit execution on Quantum Machines' state-of-the-art pulse processor

BENEFITS

- Provides foundation for seamlessly embedding HPC & QC
- Quick adoption, short learning curve for existing HPC centers
- Use with any existing HPC system management solution
- Transparency and flexibility of the quantum stack
- Ensures swift time-to-solution for hybrid algorithms
- Maximises QPU utilization, user productivity and best-performance
- Ensures secure access to multiple users
- Secures economic scalability and support for a large span of qubit modalities
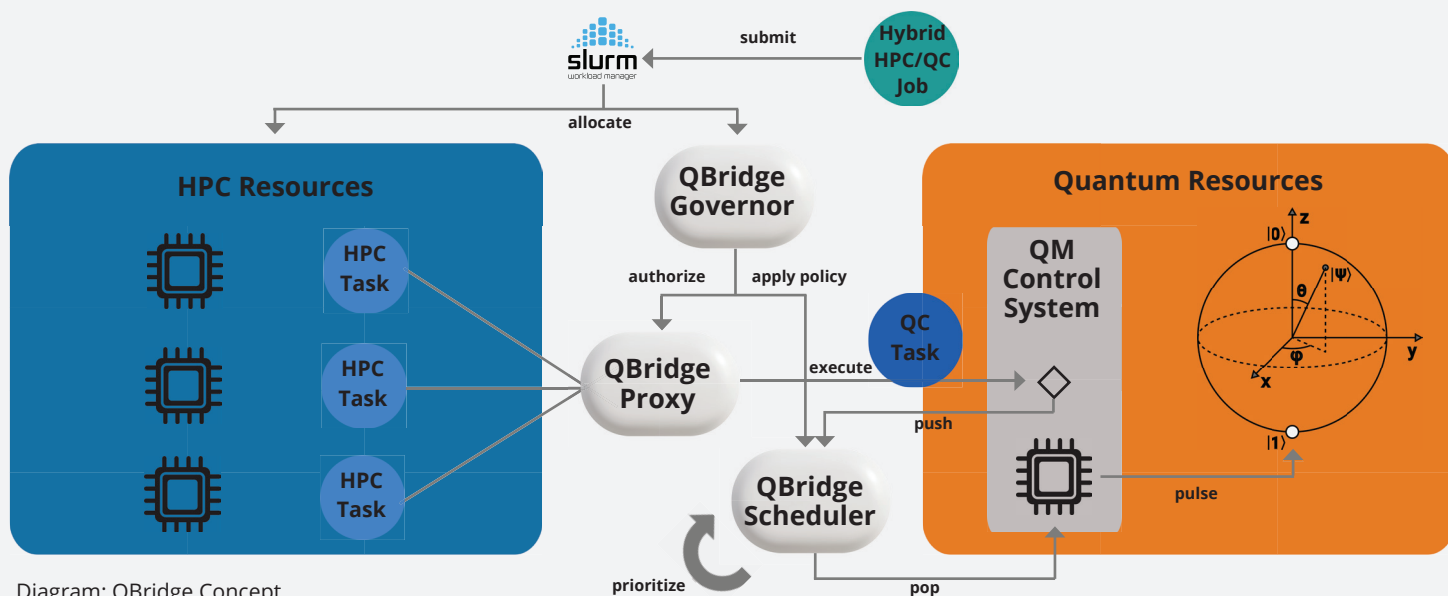

Diagram: QBridge Concept

WHO WE ARE

At ParTec we design, build and support purpose-built heterogeneous supercomputer solutions using our modular supercomputing architecture approach. We are a full-stack quantum solutions integrator. What makes us different?

- We can draw on our extensive experience in HPC revolutionizing large-scale, modular workloads and providing hardware- agnostic system management.

- We have a deep understanding of supercomputer users and operators of supercomputing centres, making us first in line to find solutions to customer challenges.

- ParTec is heavily involved in numerous European R&D projects. The experience gained significantly influences the design of our Quantum products and solutions.

- We offer a unique, easily integratable qubit-agnostic QC solution with a component-based design and the necessary expertise in quantum software, API, and hardware stack to provide the ideal system.

REFERENCES

QBridge has undergone early deployment at the Israeli Quantum Computing Center in Tel Aviv, and the Cryo Quantum Computing, the co-funded lab environment by ParTec and Research Centre Jülich. QBridge will be generally available as of May 2024.