JSC'S QUANTUM COMPUTING STRATEGY



A quantum computing strategy with four pillars

- Modeling and emulation of quantum computers on supercomputers
- Provision
- High performance computing (HPC) quantum computing (QC) integration
- Establishment of a hybrid HPC-QC user infrastructure JUNIQ

Pillar I: Modeling and emulation of quantum computers (QC) on supercomputers

Development of software to

- · validate designs for quantum processors;
- investigate the performance of quantum algorithms.



Emulator JUQCS "Jülich Universal Quantum Computer Simulator"



Pillar II: Provision strategy



An analog quantum computer with super conducting qubits

Hosting since 2022



A

An analog quantum computer with neutral atom qubits

Hosting planned for



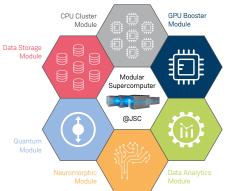
Quantum compute

A digital quantum computer with trapped ion qubits and one with semiconductor qubits Hosting planned for 2025 - 2026

or superconducting qubits, ...
Hosting and cloud access
planned for 2024 - 2026

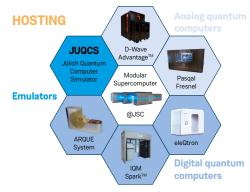


the best of both computer technologies must be combined.



- Pursue the tightest integration of quantum computers in HPC:
- The modular supercomputer architecture is ideal to integrate quantum computer functionality into HPC workflows.

Pillar IV: Establishment of a hybrid HPC quantum computing user infrastructure - JUNIQ



- QC user facility for science and industry;
- Installation, operation and provision of QCs;
- Unified portal for access to QC emulators and to QC devices at different levels of technological maturity;
- Development of algorithms and prototype applications;
- Services, training and user support;
- Modular quantum-HPC hybrid computing.









Rolling Call for peer-reviewed access: go.fzj.de/juniq