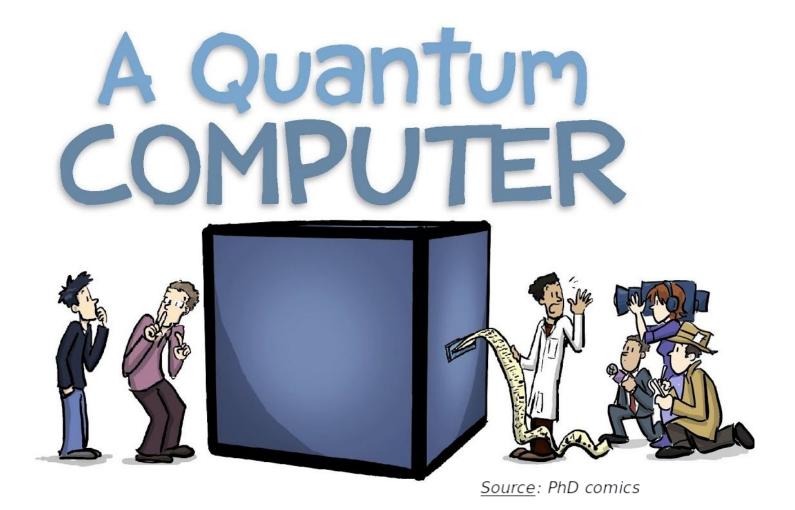


QUANTUM DISCOVERY

Quantum computing as a service

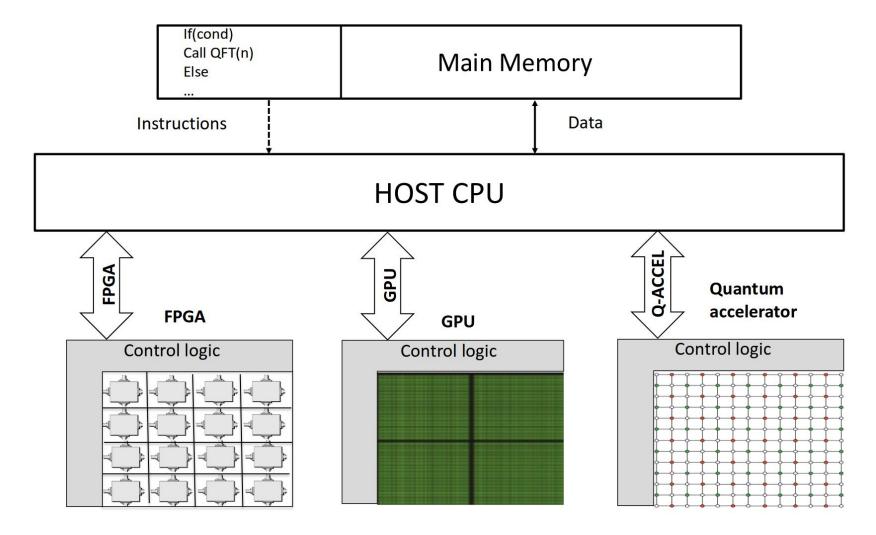
PASQAL www.pasqal.com office@pasqal.com 7 rue Léonard de Vinci 91300 Massy France

Quantum "computer" or quantum "accelerator"?





Heterogeneous multicore architecture

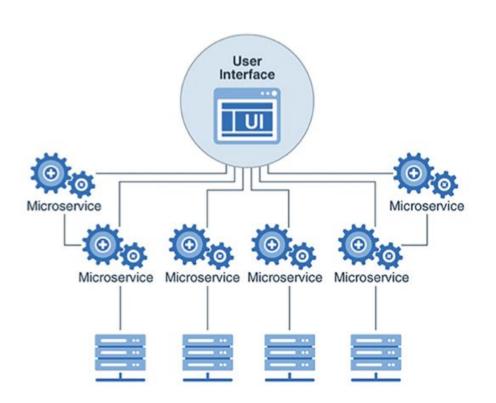


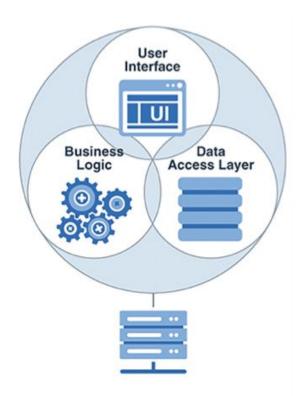


Microservice architecture

Microservice architecture

Monolithic architecture







Cloud quantum computing



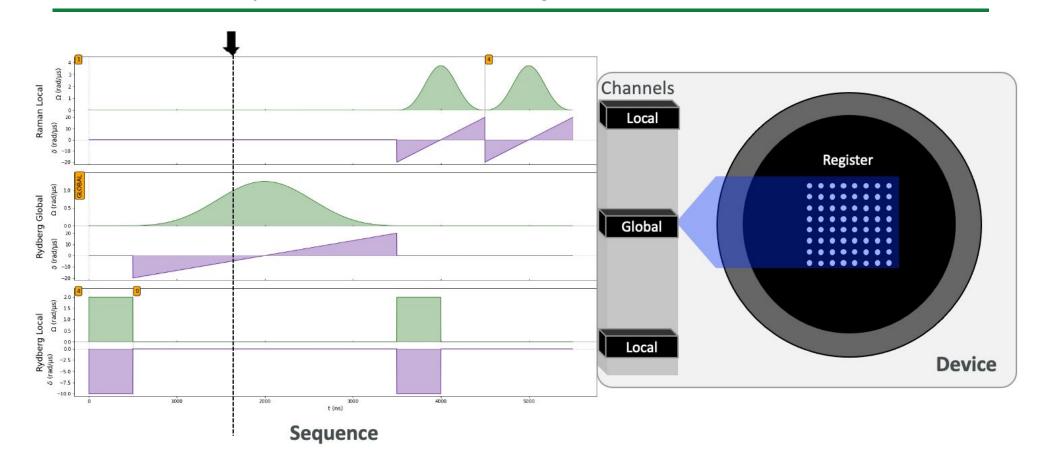


Quantum computing workflow

Quantum stack Metrics **Applications** Computational problems Quality, speed or reliability of the **Quantum Simulation** Optimization, Machine procedure in comparison with Chemistry, Material science, Learning, partial differential state-of-the art classical methods Drug discovery ... Quantum software Complexity of the procedure, and/ **Digital control Analog control** or gate count Sequence of gates in a Sequences of Quantum Hamiltonians Quantum circuit Sequence of laser pulses **Quantum Hardware** Number of atoms, gate fidelity ${\mathcal F}$ quality factor ${\widehat{\mathbb Q}}$, and repetition rate Laser controls of the QPU Quantum **Electronics Detection system** register

Application domain libraries

Pulser: library for pulse-level/analog control of neutral atom devices





Conclusion

- → Quantum computers are co-processors
- → The solving of many hard computational problem across industries can be accelerated with quantum computers
- → To run quantum algorithms, cloud quantum services such as "Pulser Studio" offer access to quantum processors and emulators
- → Programming quantum computers requires domain specific libraries and programming languages
- → Digital and analog quantum computing are two different and complementary frameworks for operating quantum computers
- → Neutral-atom platforms are very promising candidates for quantum information processing as they can be operated in both modes

