

# Atos Quantum

EPIC - European Photonics Industry Consortium

Online Technology Meeting on Quantum Computing Platforms

7 February 2022

# Atos Quantum : a long-term strategic R&D investment of disruptive innovation, set up in 2016

- ▶ Atos worldwide leader in supercomputing and European leader in cybersecurity

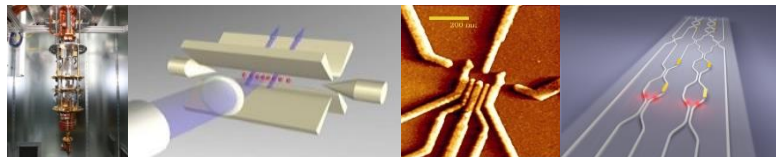
Quantum Computing will affect sooner and later supercomputing customers and cybersecurity customers

- ▶ **Business rationale**
  - **strategic move to keep business leading positions**
  - **aiming mid-term RoI**
  - **in close touch with customers**



# Quantum hardware is not enough

- ▶ “Good qubits”: necessary... but not sufficient
- ▶ Beyond hardware:



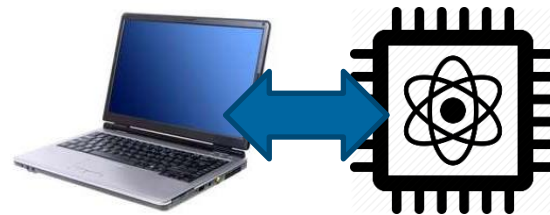
**Quantum algorithmics:** very few known algorithms...  
- how to quickly program+validate new ideas?

**NISQ era:** before fault-tolerance

- how to **compile** a program for a targeted hardware?
- can we design **noise-resilient** algorithms?
- **analog vs digital** approaches? ...

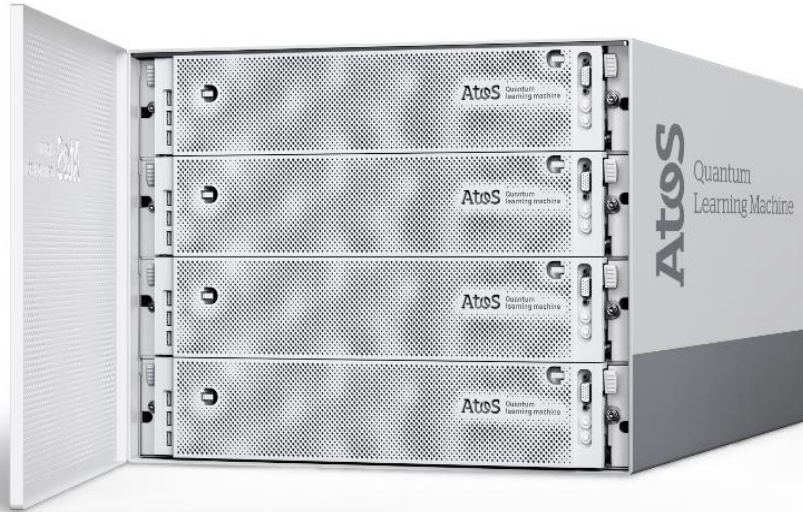


**Quantum applications:** “killer app(s)” yet to be found!  
- quantum-classical hybridization? (variational methods, error mitigation, pre- and post-treatment, parallelism...)



Need for (classical) programming/simulation/optimization tools

# the Atos QLM – A Unique Platform to Design and Test Quantum Software

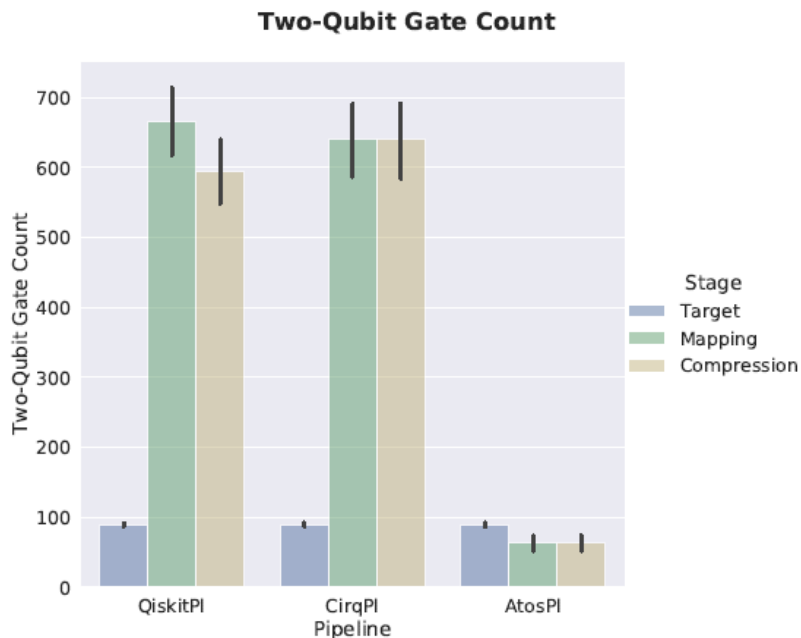


- ▶ complete platform for research, training, test & experimentation of quantum software
- ▶ emulation capability of 41 qubits and more, depending on applications, computes **final probabilities of all  $2^n$  states**
- ▶ emulation of quantum annealing, gate-based circuits, and analog simulation
- ▶ emulation of main physical QPUs (gate-set and topology compilation, noise simulation):
- ▶ free desktop version **myQLM**:  
<https://atos.net/en/lp/myqlm>
- ▶ **50+ patents**
- ▶ **QLM or myQLM cited in 30+ published scientific articles**

# They have bought an Atos QLM:



# Quantum Compilation performance



- ▶ **Atos QLM is the most powerful platform in the world – far ahead of competition**
- ▶ World's best compiler
- ▶ Produces code more compact than IBM's compiler and Google's compiler
- ▶ Protected by 20+ patents

[https://github.com/ArlineQ/arline\\_benchmarks](https://github.com/ArlineQ/arline_benchmarks)

# What's next : Quantum-accelerated hybrid HPC

