

Scaling-up quantum computing by interconnecting quantum processors

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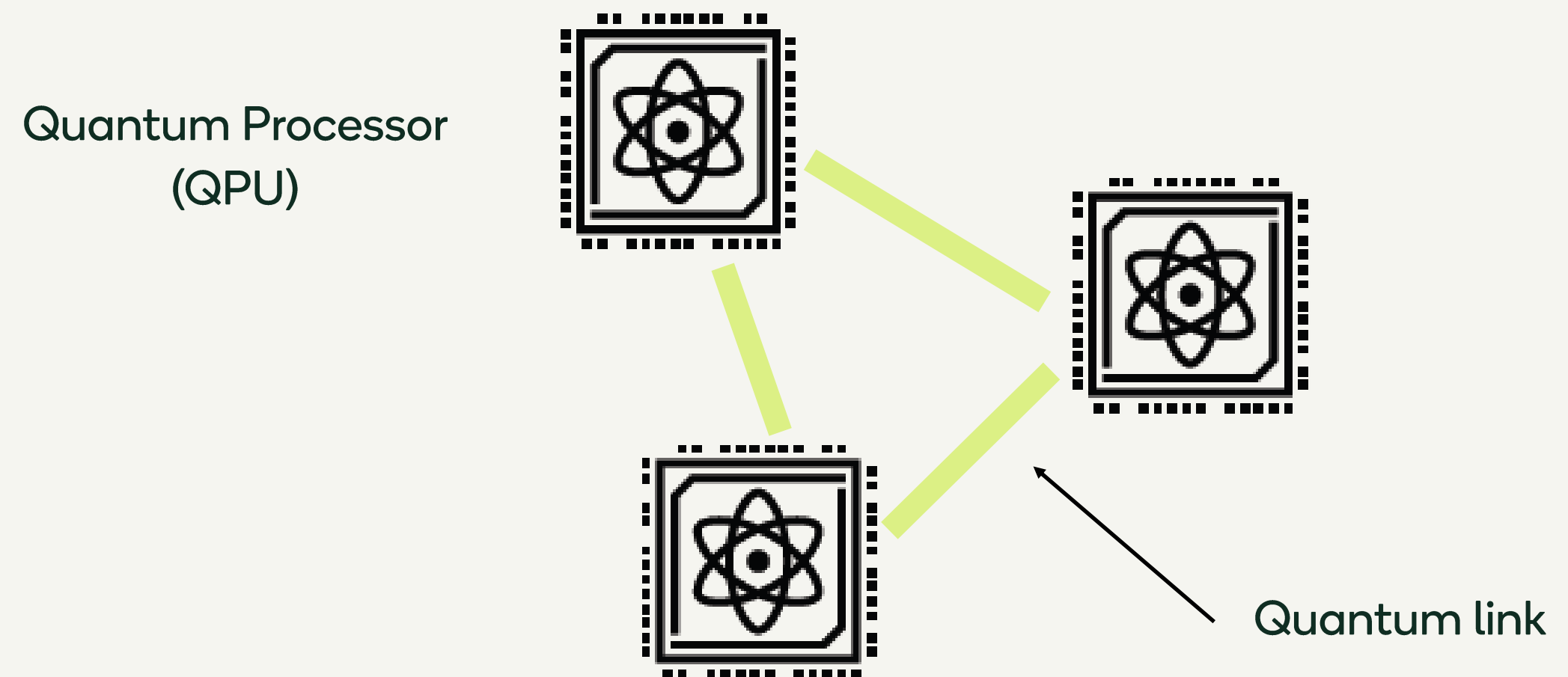


Towards the full adoption of Quantum Computing by the industry

Solving problems relevant for the industry will require a high number of high-quality qubits.

This is not possible within a single quantum computer.

Hopefully there is a solution.



Quantum processors (QPUs) interconnected in clusters.

The parallelization of Quantum Processors is on the roadmap of most of the QPU vendors

Horizon 2030

(Source: www.ibm.com/quantum)



“scaling to 100 k qubits with quantum links”



“Photonicallly networked multi-core architecture”

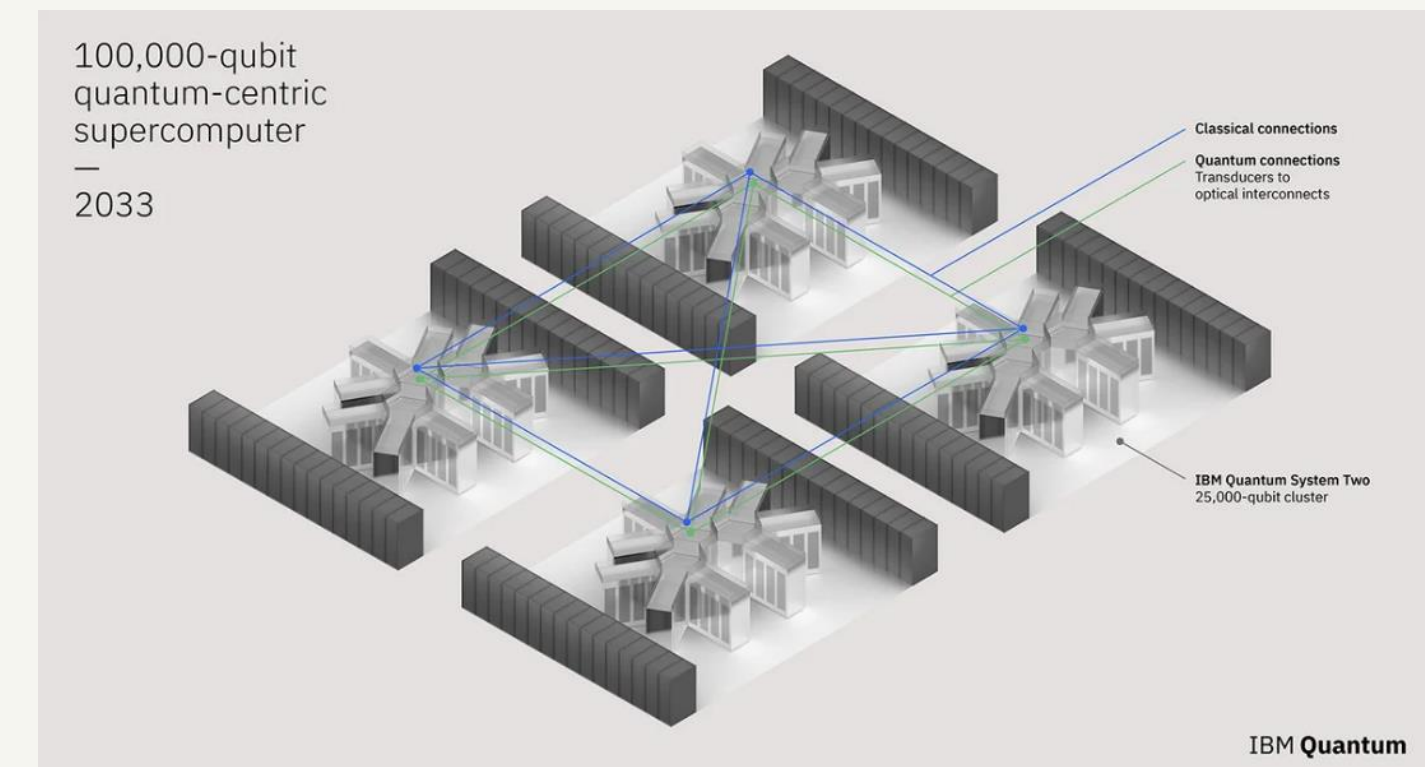
(Source: www.ionq.com)



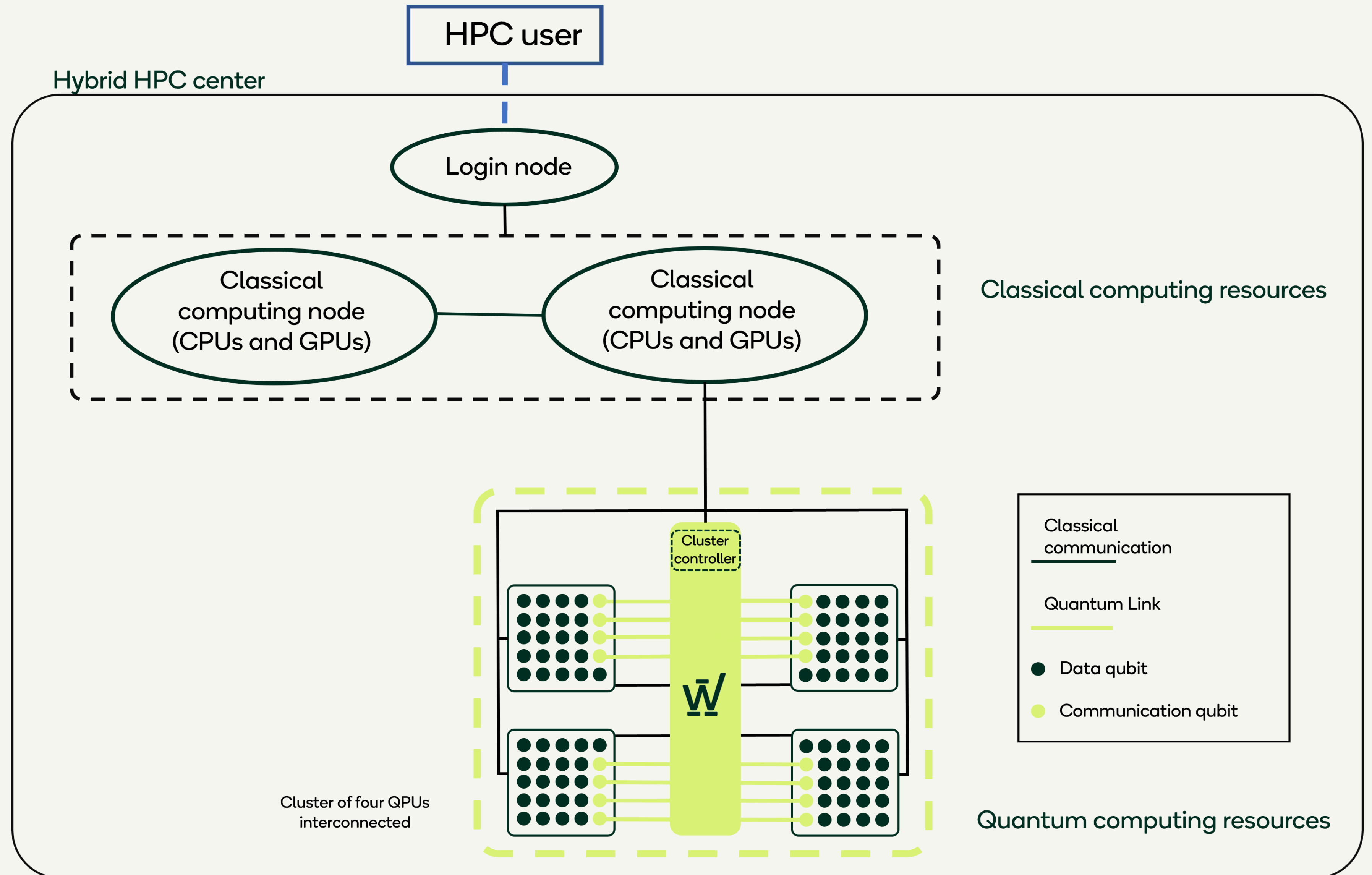
“interconnect towards scalability and practical quantum computing”



“enable the full potential of quantum computing via networked quantum computers”

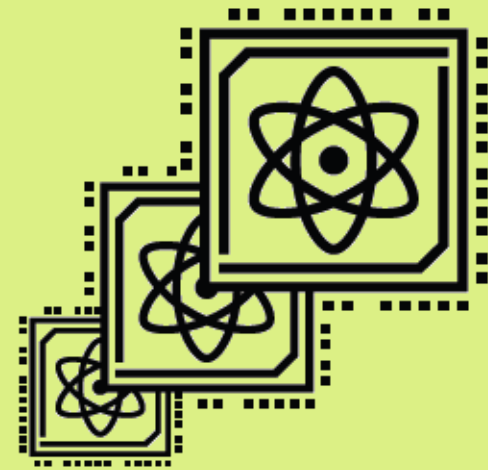


Scaling up with clusters of interconnected QPUs



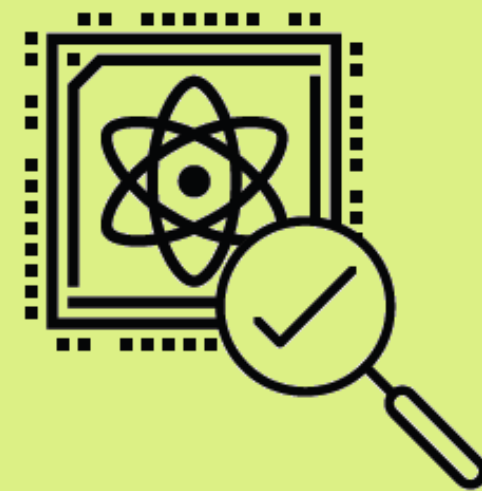
Our Mission at Welingq

Scale-up
quantum computing
by interconnecting QPUs



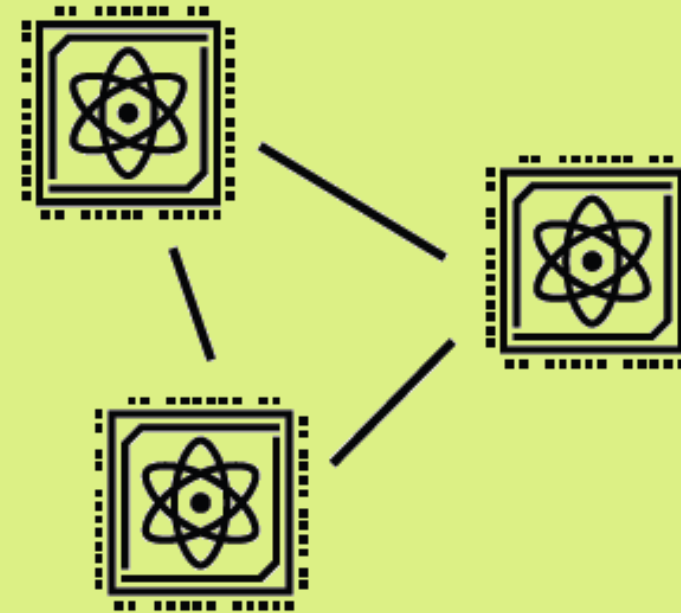
Number of qubits
Circuit depth

Accelerate
error correction



Lower overheads
wider range of codes

Quantum Information
Networks



- Providing Quantum Links based on the world's most efficient Quantum Memories, leveraging mature cold-atom technologies
- Our links can support local and long-distance Quantum Interconnects
- We work towards heterogeneous links interconnecting different types of Qubits

Founding team: experts in business, science and technology



Tom Darras, CEO and co-founder

Engineer ESPCI Paris, PhD in Quantum Physics
Expert in quantum communication and quantum computing
Grand Prix iLab 2022, Hello Tomorrow Global Challenge Winner 2023



Julien Laurat, CSO Hardware and co-founder

Distinguished Professor at Sorbonne Université, Laboratoire Kastler Brossel
ERC Advanced Grant, expert in quantum memories
Coordinator of the French National Plan on Quantum Memories



Eleni Diamanti, CSO Protocols and co-founder

CNRS Research Director, LIP6 Laboratory of Sorbonne Université
ERC Starting Grant, expert in quantum information protocols
Coordinator of the French National Plan on Test-beds quantiques



Jean Lautier-Gaud, Head of Business Development and co-founder

Engineer Institut d'Optique, MBA, PhD in Quantum Physics
Head of Business development at Exail Quantum Sensors (ex Muquans) for 8 years
Expert in the commercialization of quantum systems



Providing quantum links
to interconnect quantum processors



Founded in 2022 as a spin-off Sorbonne University (France)



25 employees, Scientific Board chaired by Nobel Prize Alain Aspect



350 m2 of labs and offices downtown Paris



Hello Tomorrow Global Challenge, EIC Transition, EIC Accelerator

**With its neutral-atom approach,
Welinq raises €5 million to scale
up quantum computing**



La mémoire quantique bat des records

Les importants fonds investis dans le domaine –la start-up française Welinq boucle un tour de table à 5 millions d’euros –, laissent espérer un prototype dans deux ans.

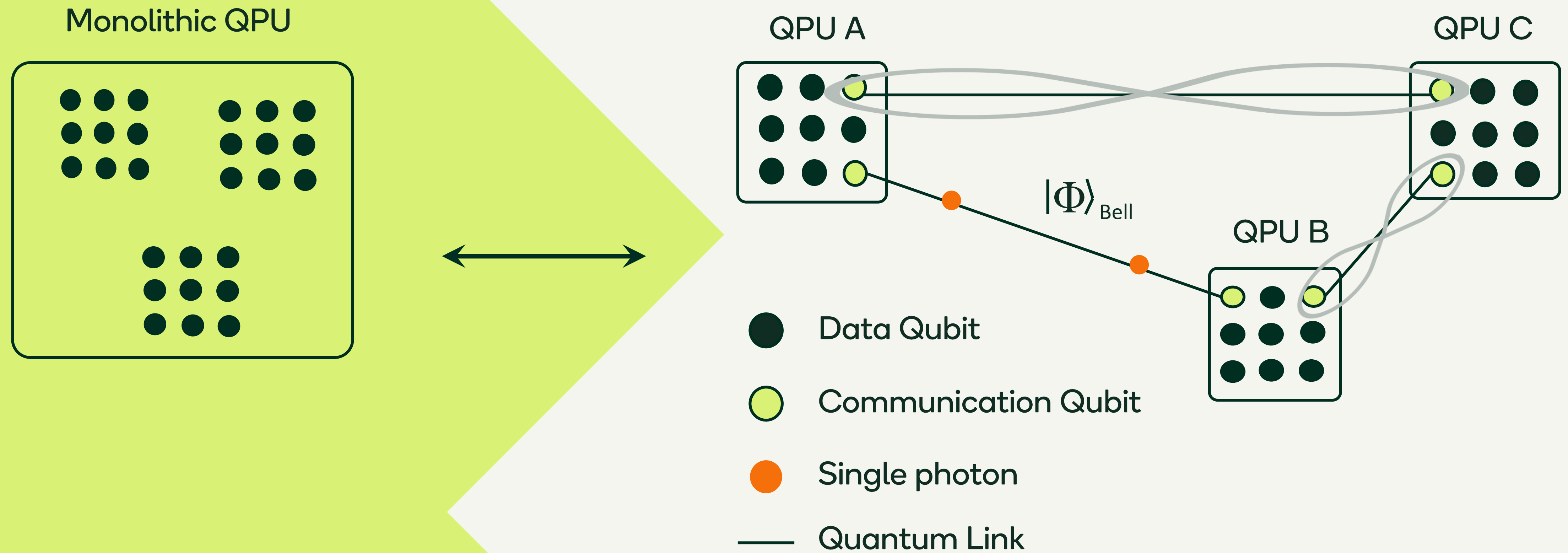
Par David Larousserie
Publié le 07 février 2023 à 06h01 · Lecture 2 min.

Le Monde

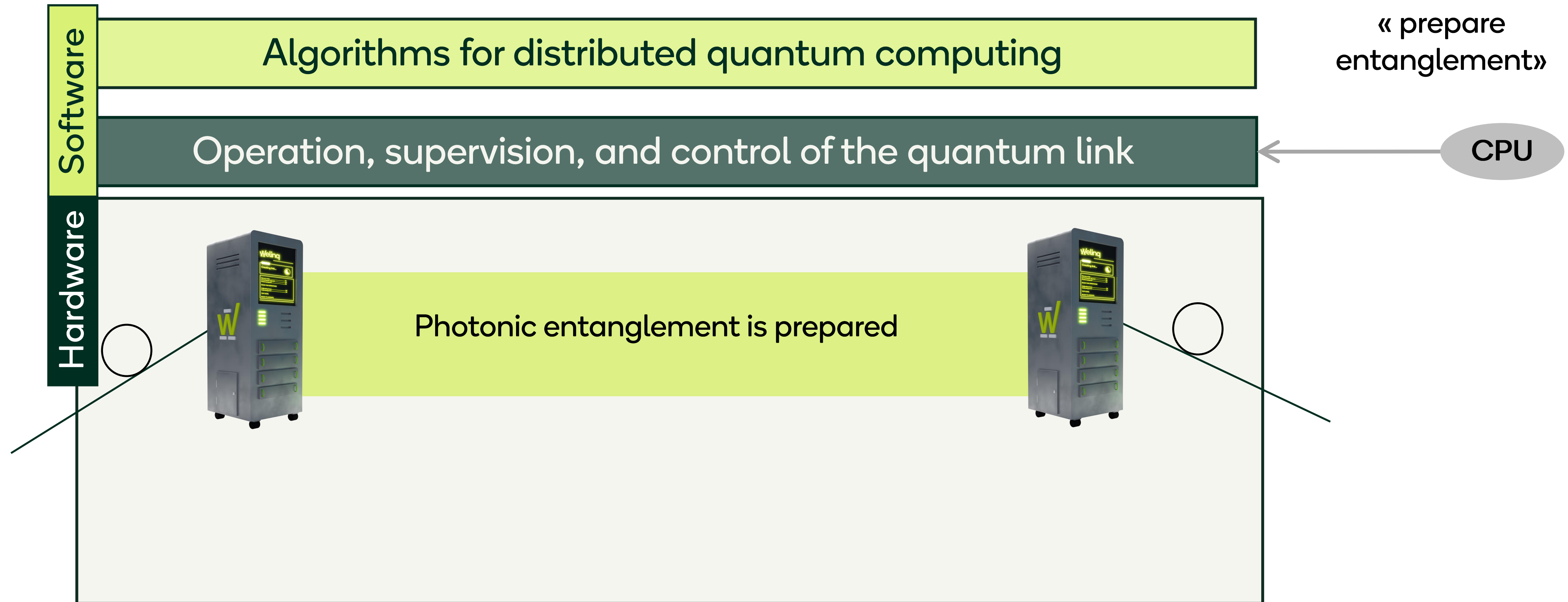


What does it mean to interconnect QPUs?

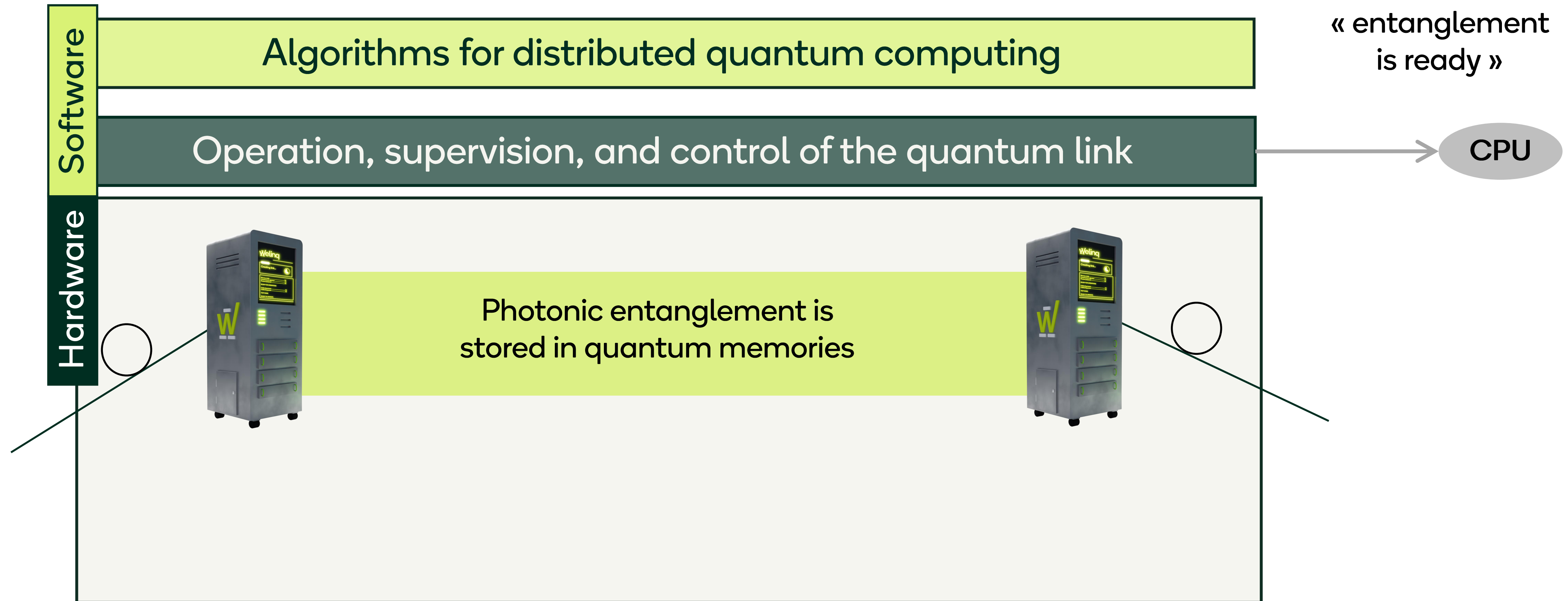
Establishing entanglement between separated qubits



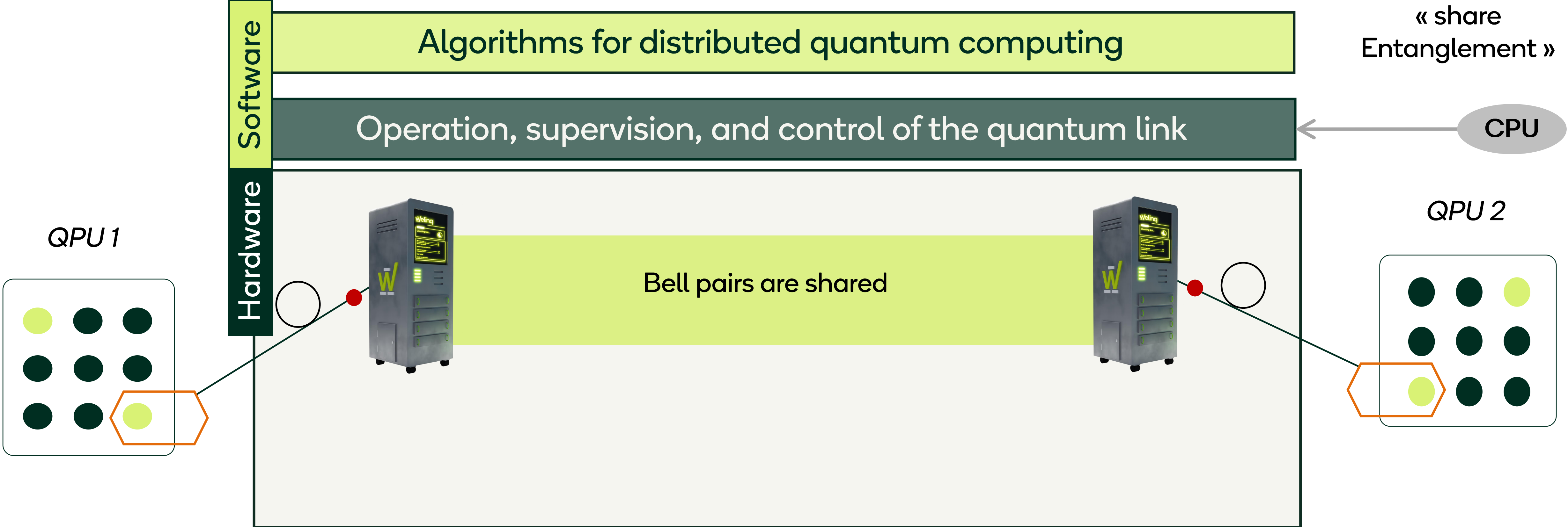
Full-stack quantum link



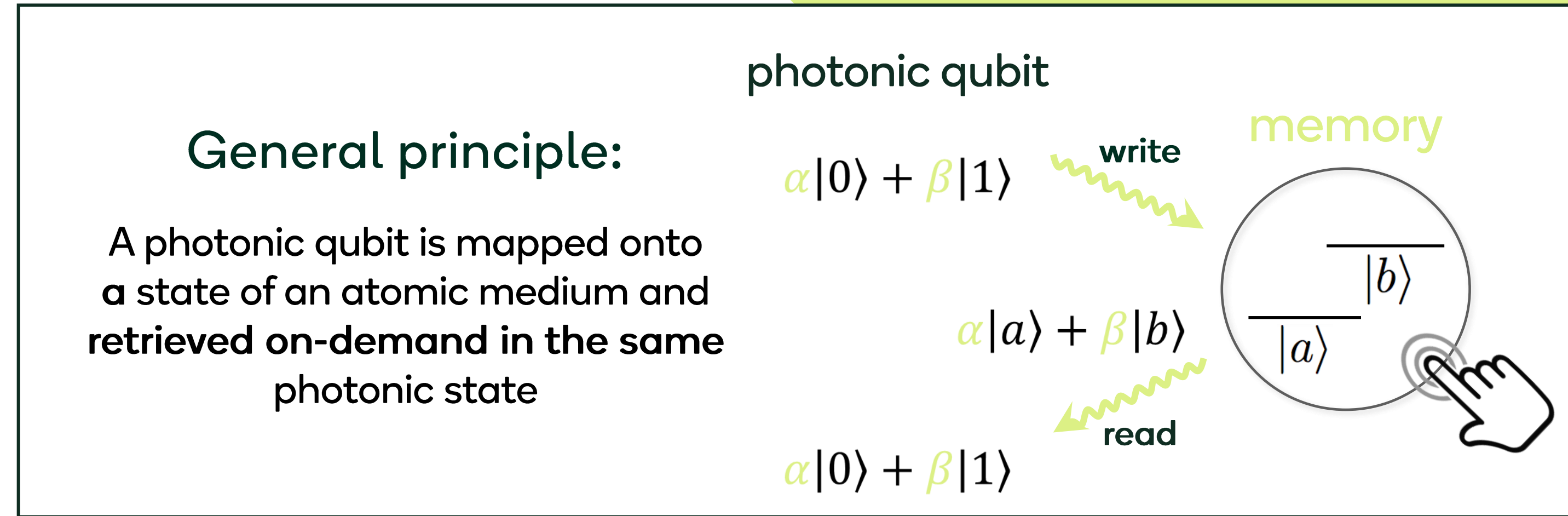
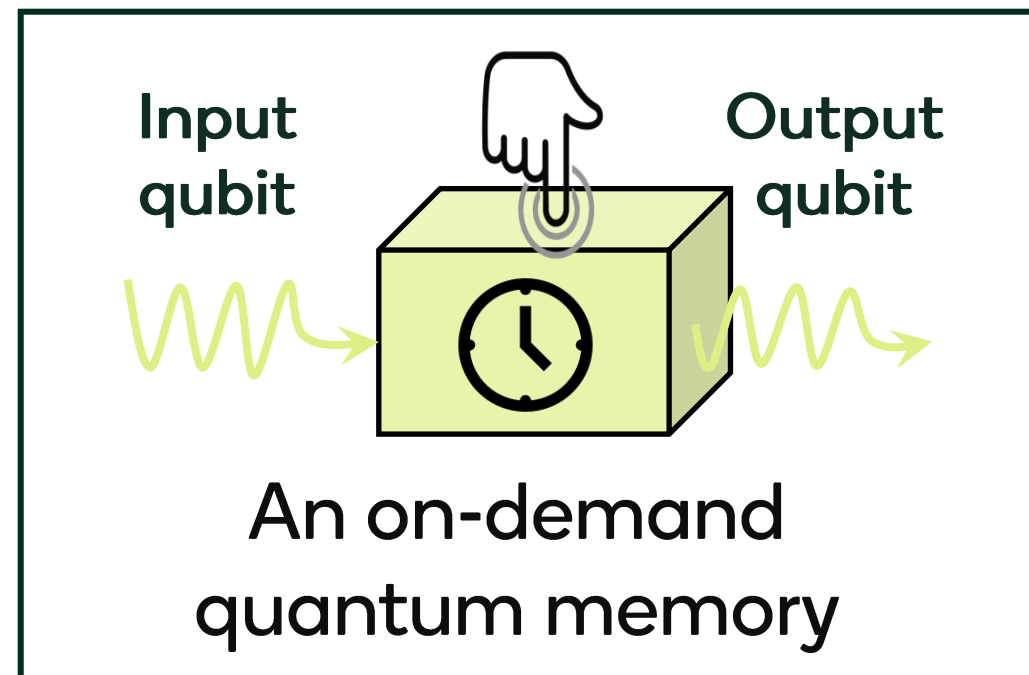
Full-stack quantum link



On-demand supply of Bell pairs



But what is a quantum memory?



	Today	In 3 years from now
Efficiency	85 %	> 95 %
QPU to QPU Fidelity	> 93 %	> 99 %
Storage Time	40 μ s	> 1 ms
Multiplexing	1 mode	100 modes



Our solutions will be provided to

Develloppers of
Quantum
Processors



PASQAL

IQM

QUANDELA

AQT

IBM

High-Performance
Computing
centers



GENCI
HPC at the service of knowledge



CINECA

lrz

End-users

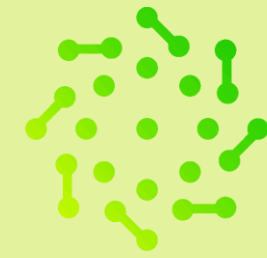


AIRBUS

THALES



Developers of
Quantum
Processors



PASQAL

IQM

QUANDELA



IBM

Welinq is working to interface with four qubit modalities

Neutral Atoms

Welinq PASQAL

Photons

Welinq QUANDELA

Ions

Welinq Announced soon

Superconducting

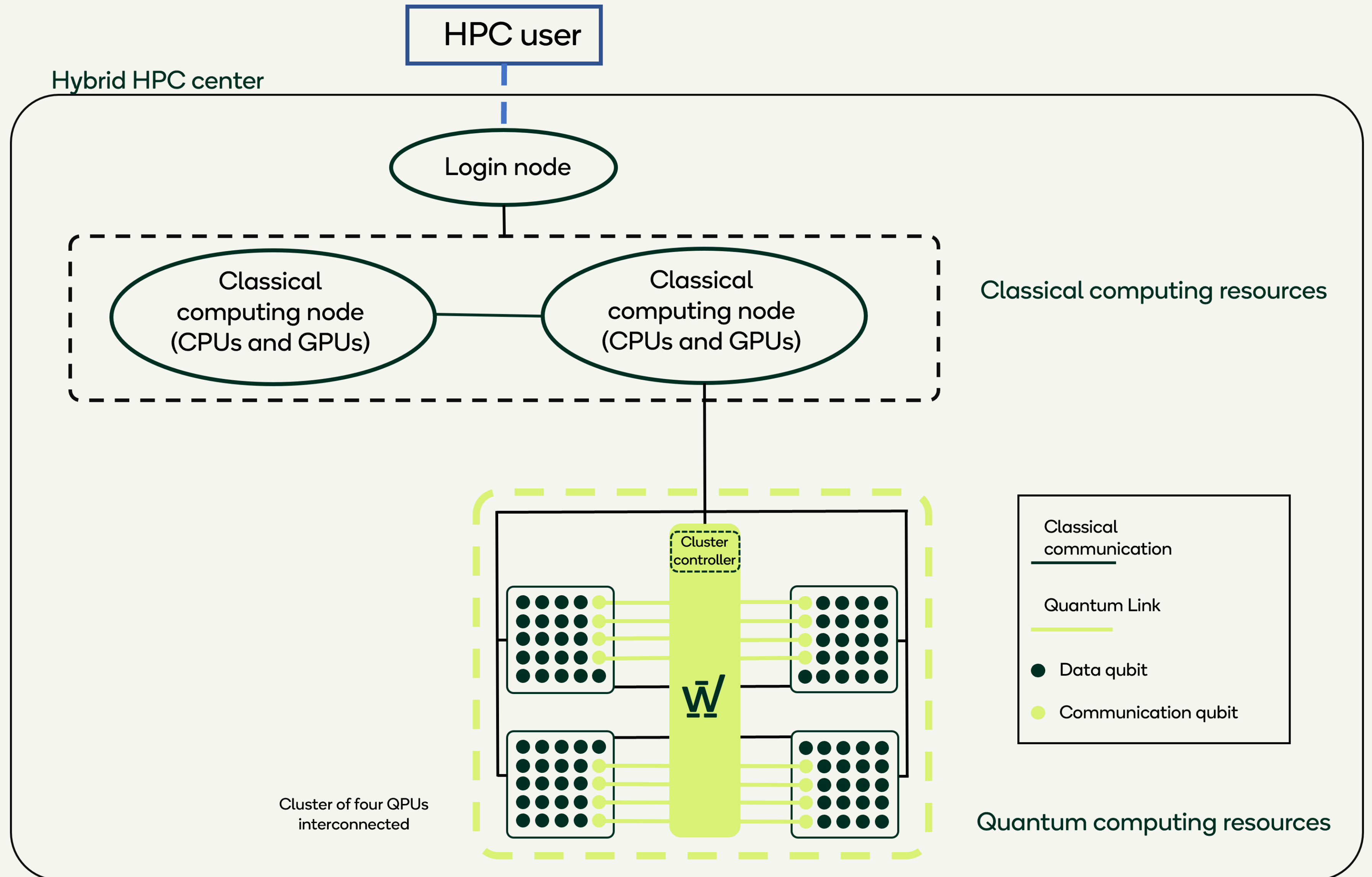
Welinq Announced soon



High-Performance Computing centers



Hybrid HPC center hosting interconnected quantum processing units





End-users



AIRBUS

THALES

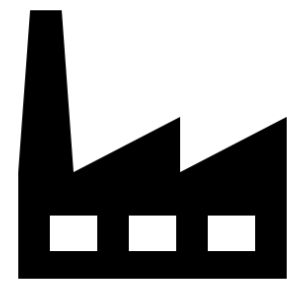
AQADOC: Distributed Quantum Computing for the energy sector

Power plant security



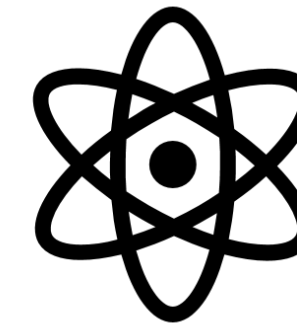
- Fault tree processing

Simulation of structures



- Cracks
- Water flows

Simulation of materials



- Aging
- Battery simulation

Logistics



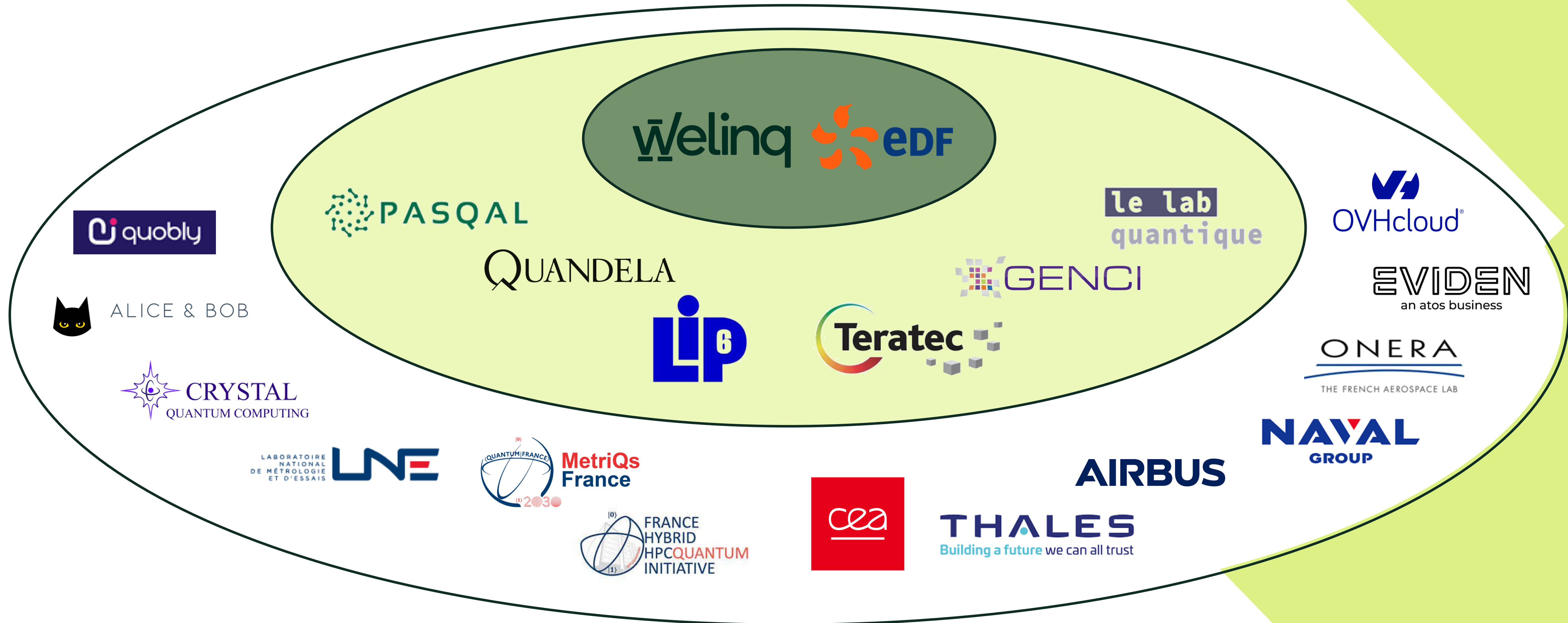
- Routing fleets of vehicles

Develop Distributed Quantum Algorithms for the Energy sector

Accelerate the development of quantum links to implement such algorithms

Lay the ground for a future multi-core quantum computing resources

AQADOC: the flagship consortium for Distributed Quantum Computing in France



Funded for three years by  île de France

Interface with the main qubit modalities by 2027



- On-going strategic partnerships QPU providers
- Anticipating an integration of Quantum Links in HPC
- AQADOC, nation-wide initiative to scale-up quantum computing with interconnects

welinq

Providing links
to the future.

Join us on October 2nd 2024 in Paris
for the first scientific day of AQADOC,
open to the community