Région îledeFrance

AQADOC

Distributed Quantum Algorithms for Energy Production

Scientific Day 2025

Welinq EDF PASQAL QUANDELA SORBONNE UNIVERSITÉ le lab quantique Teratec

Welinq

2022

Funded by Tom Darras, Julien Laurat, Eleni Diamanti

2023

Seed Round

2024

World-record quantum memory as a product

2025

Full-stack & multi-platform quantum networking solutions

We have a very strong early traction

Pasqal

QUANDELA

EDF

EIC Transition

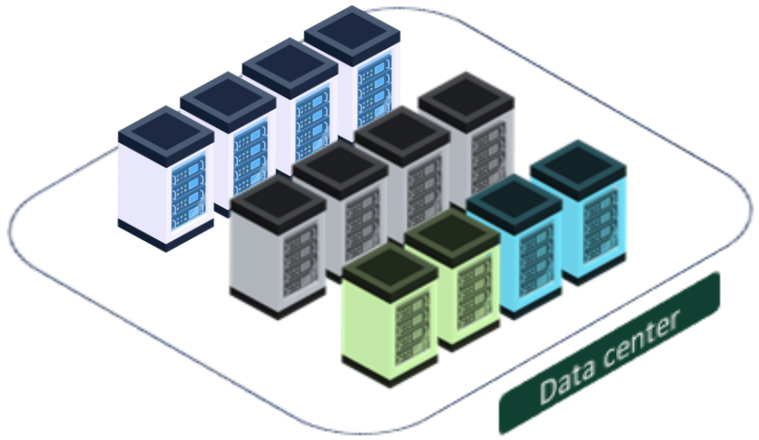
EIC Accelerator

Team of 30 experts in business, science, and tech

We pave the way for quantum data centers

Quantum computers are here to boost data centers

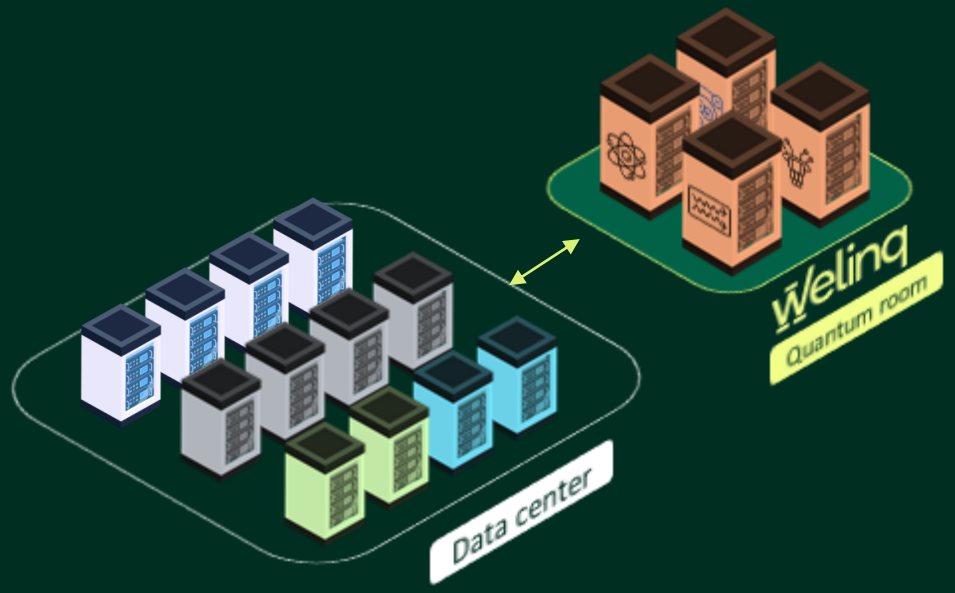
Data centers are at the core of the AI revolution and contribute to massive value creation. [1]



$3000B+
Global market value (20% CAGR)

$500B+ [2]
Investment in Data Centers for 2025

The next step is to supercharge them with quantum computers.



[3]

"QPUs will be added to GPUs or CPUs to extend classical computing, to do things it otherwise can't"

Jensen Huang, CEO

NVIDIA.

1 . Bärtschi, Andreas, et al. "Potential Applications of Quantum Computing at Los Alamos National Laboratory." arXiv:2406.06625 (2024).

2 . https://www.enr.com/articles/60211-openai-oracle-softbank-vow-to-invest-500b-for-more-us-data-centers

3. https://www.hpcwire.com/2025/03/25/gtc-quantum-day-jensens-mea-culpa-nvidias-growing-quantum-bet/

Quantum computers alone are not enough

Quantum computers are already here…

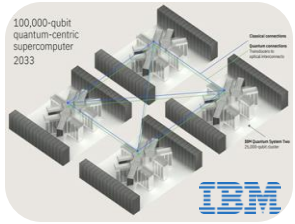
Number of quantum computers deployed world-wide according to *Global Quantum Intelligence*

…but individual quantum computers are unscalable

Individual quantum computer

Isolated. Incompatible. Unscalable.

Weling



Cluster of quantum computers

In Quantum

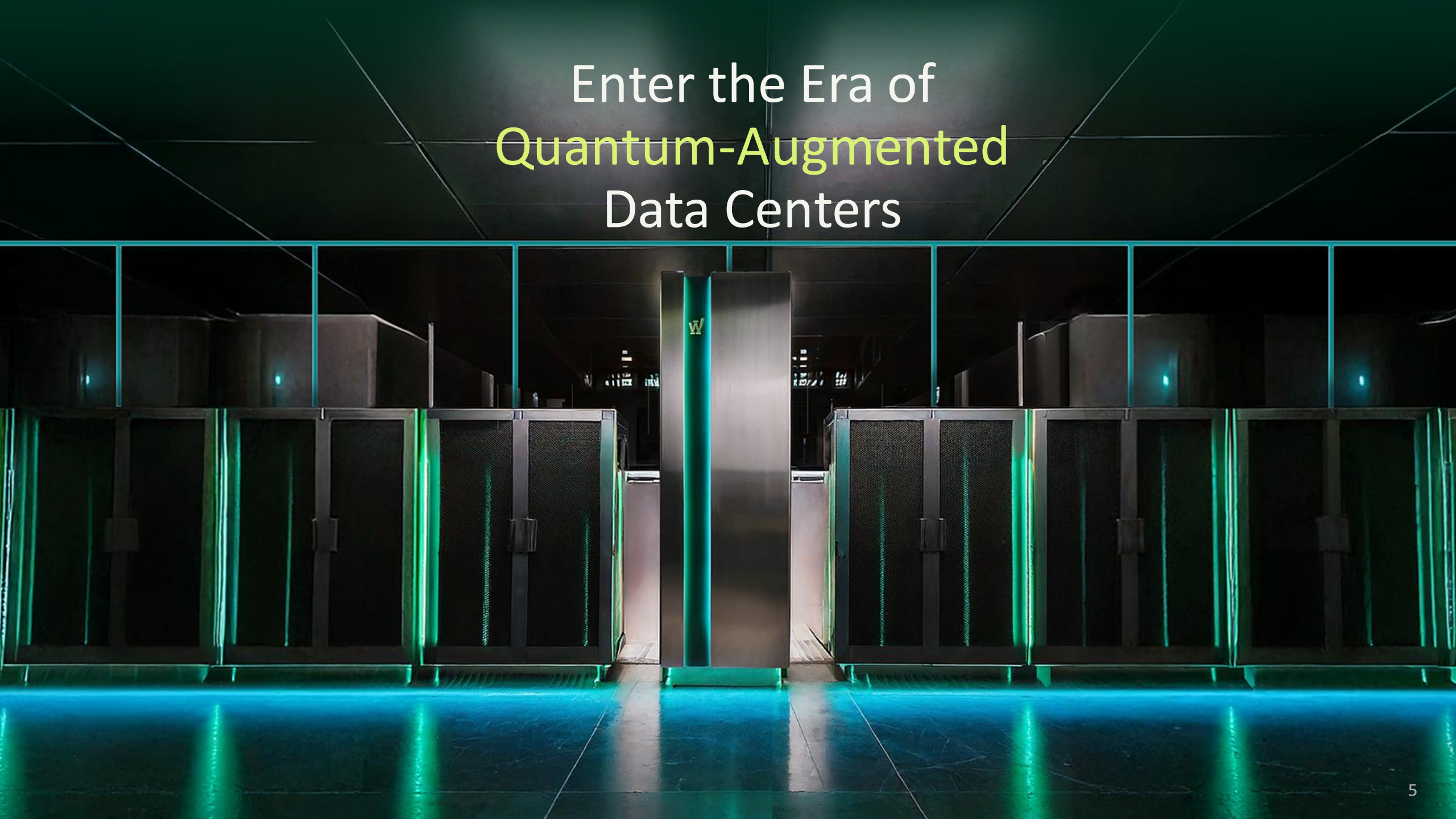
Standalone classical computers

intel. CISCO NVIDIA. Mellanox

Data centers

In Classical

Enter the Era of Quantum-Augmented Data Centers



Welinq's full-stack solution for quantum networking

Welinq

- Use Cases
- Distributed QEC
- Quantum Compiler
- Optical Quantum Network
- Quantum Memory Buffer
- Qubit-Photon Interfaces
- QPUs

AQADOC, world's largest initiative dedicated to distributed use-cases

araQne, world's most performant compiler for modular QC

QDrive, world's most performant quantum memory

Highly-performant qubit-photon interfaces, integrated in our partners' QPUs

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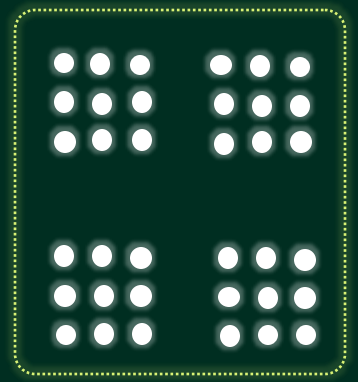
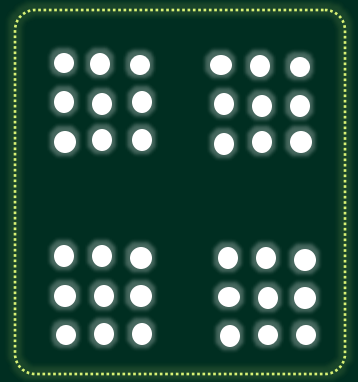
Distributed Quantum Computing

Achieving computational quantum advantage requires numbers of qubits far beyond current capabilities.



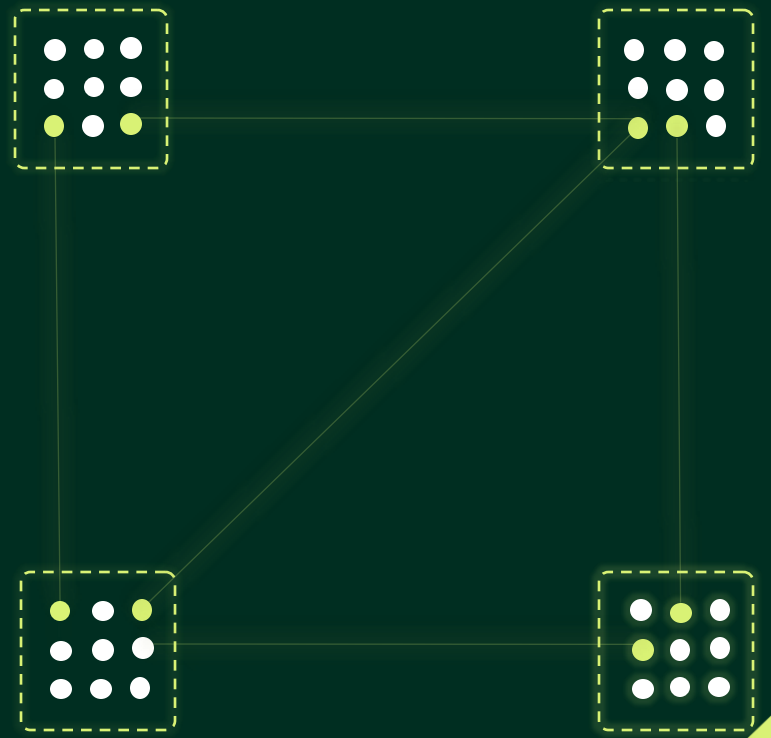
- Achieving computational quantum advantage requires numbers of qubits far beyond current capabilities.

- Rather than relying on monolithic devices, consider **network** of smaller quantum processors, interconnected via **entanglement**:

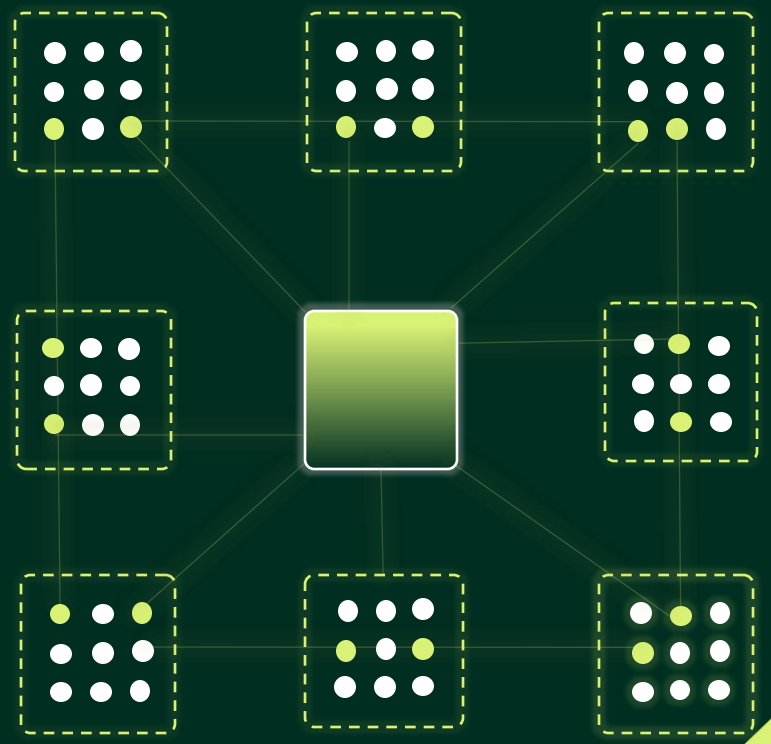


Distributed Quantum Computing

- Distributing quantum algorithms over QPU networks
- Pathway towards **scalability** & improved **fault tolerance**, especially when combined with techniques for entanglement distillation and modular error correction.



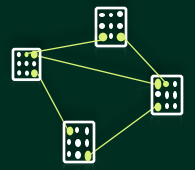
Quantum Computers in Data Center clusters



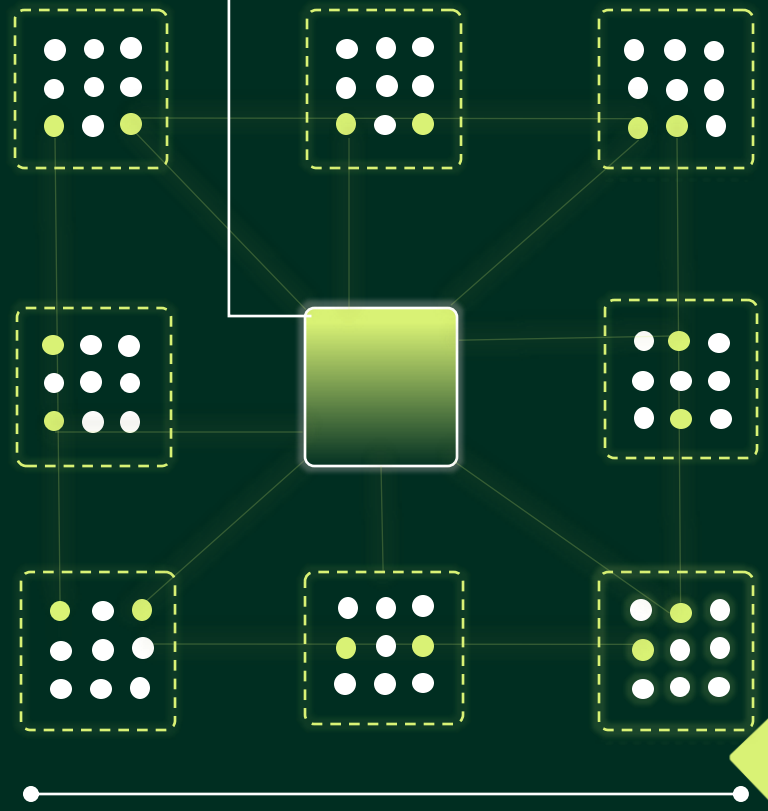
Quantum Computers in Data Center clusters

Orchestration Unit

- We need **full-stack** quantum interconnection:



Algorithms



Cluster of interconnected QPUs

Quantum Computers in Data Center clusters

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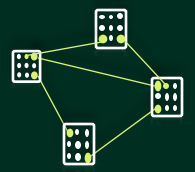
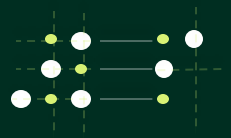
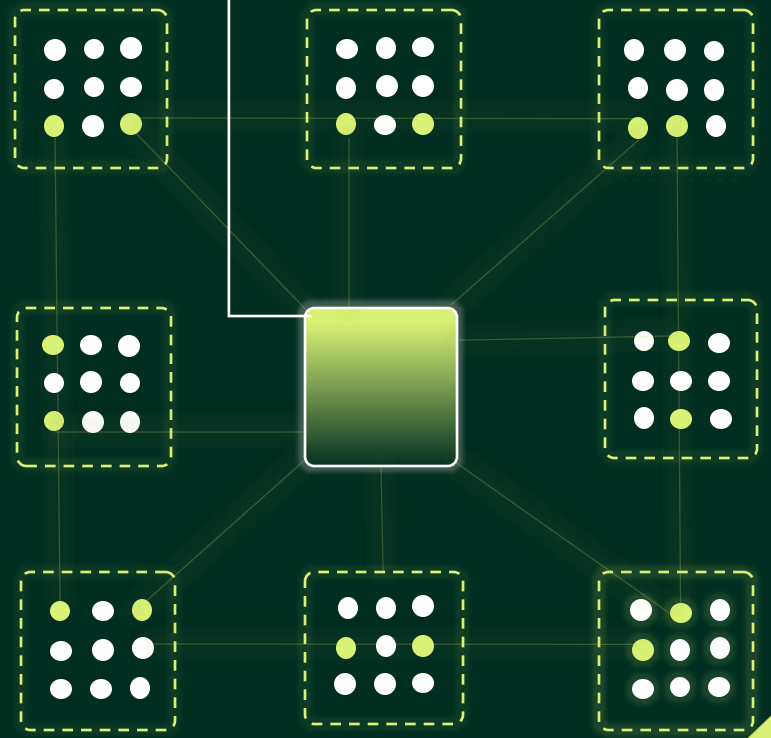


Algorithms



Protocols



Quantum Computers in Data Center clusters

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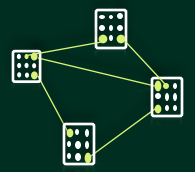
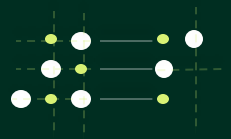
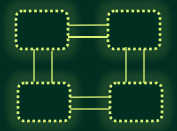


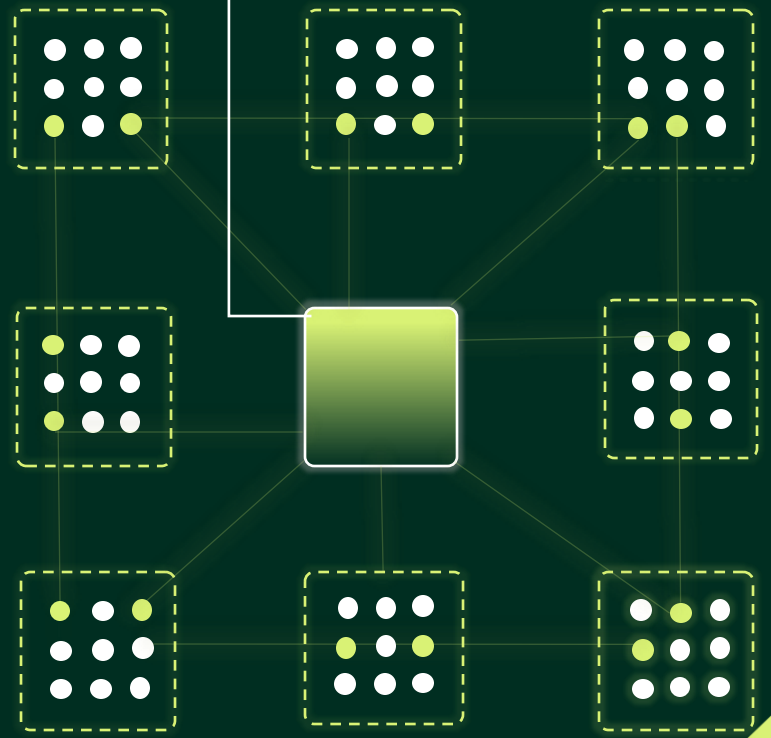
Algorithms



Protocols

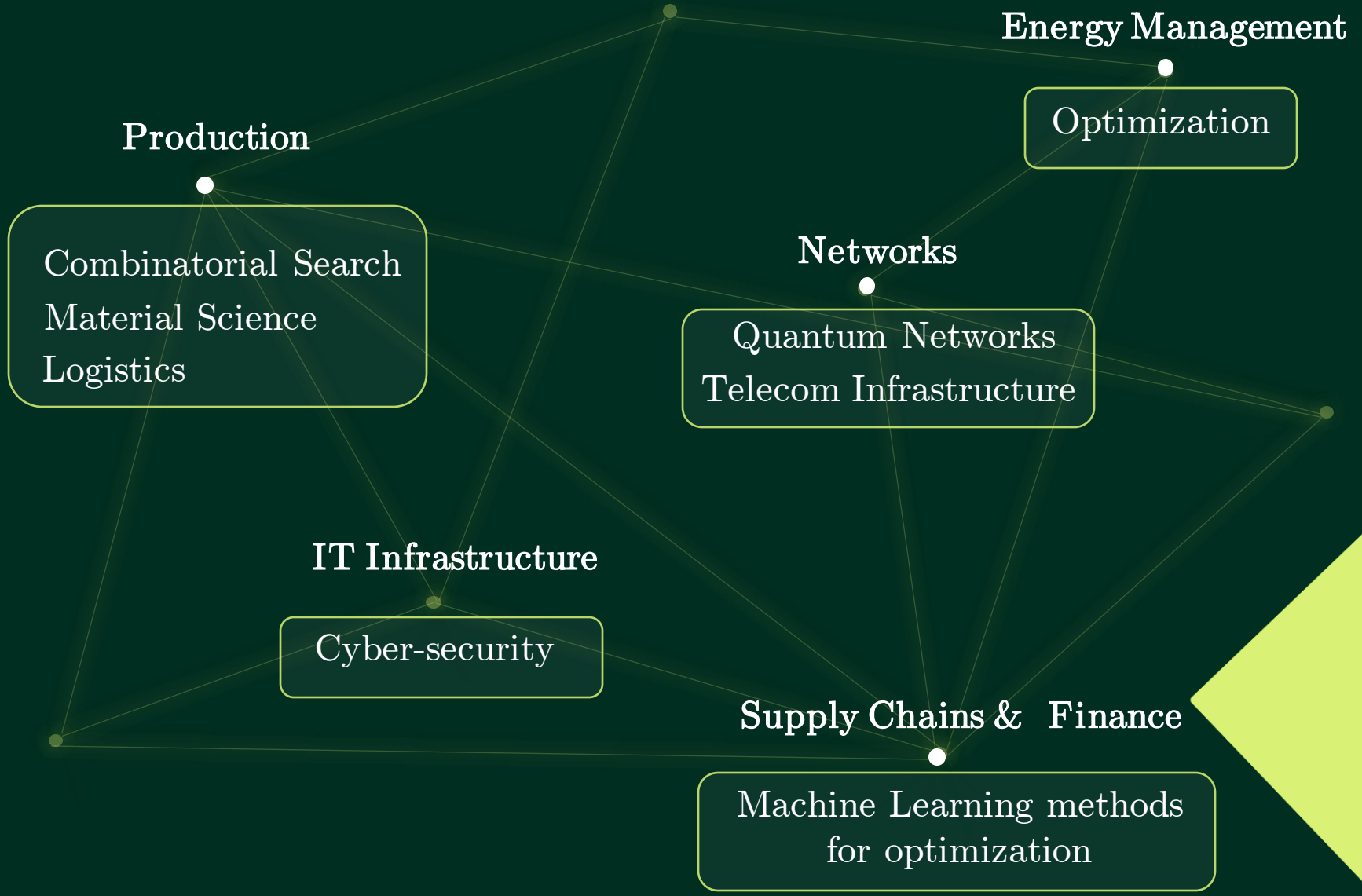


Hardware



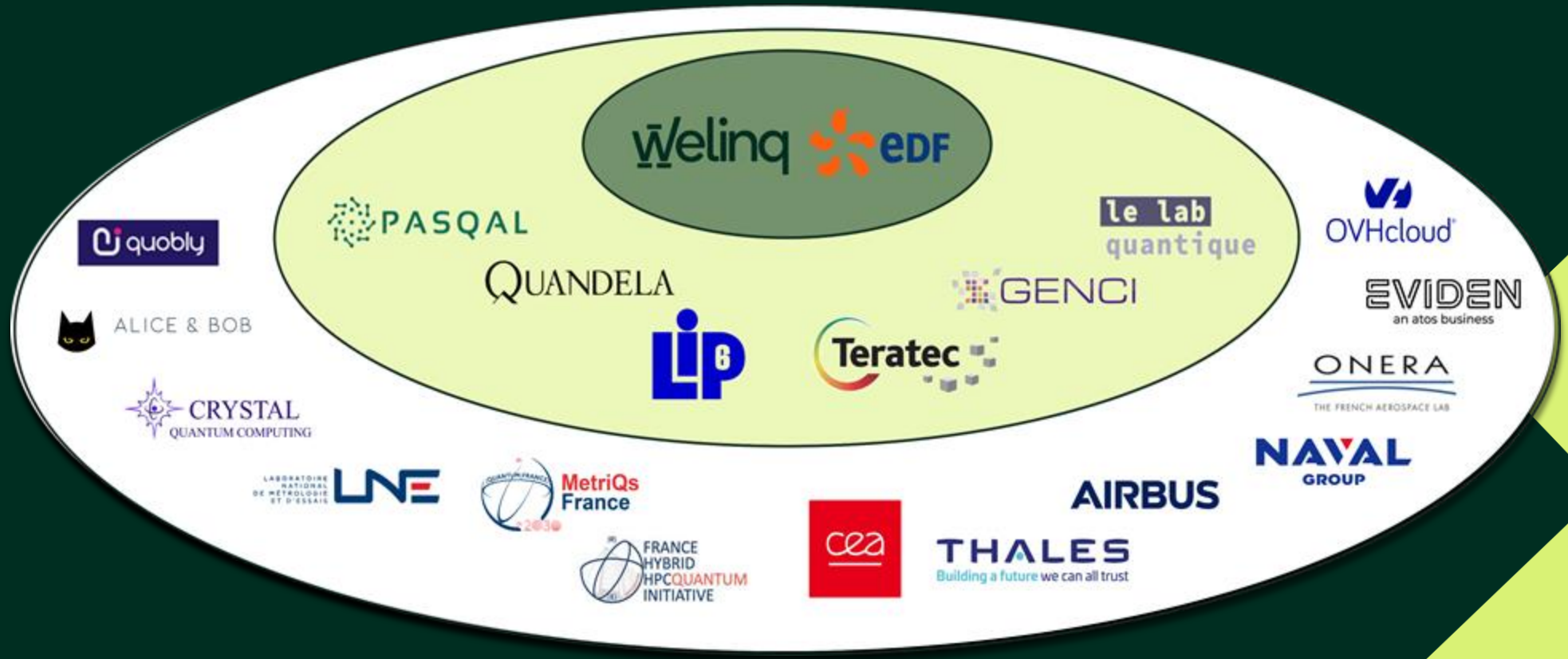
Cluster of interconnected QPUs

Impact on the energy sector (and not only)



Introducing :

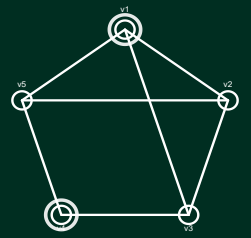
- Gathering an ecosystem around Distributed Quantum Computing
- Development of Distributed Quantum Algorithms for use-cases in the energy sector



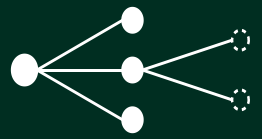
Decisive initiative rendering the French Ecosystem the landmark in networking quantum computers

A consortium of complementary actors involved in the development of the project

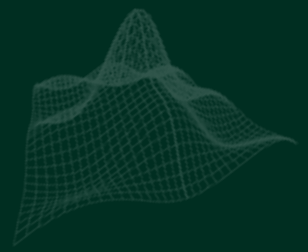
Aim: Development of distributed quantum algorithms for resolving use-cases central to the **energy sector**



Smart charging of EVs

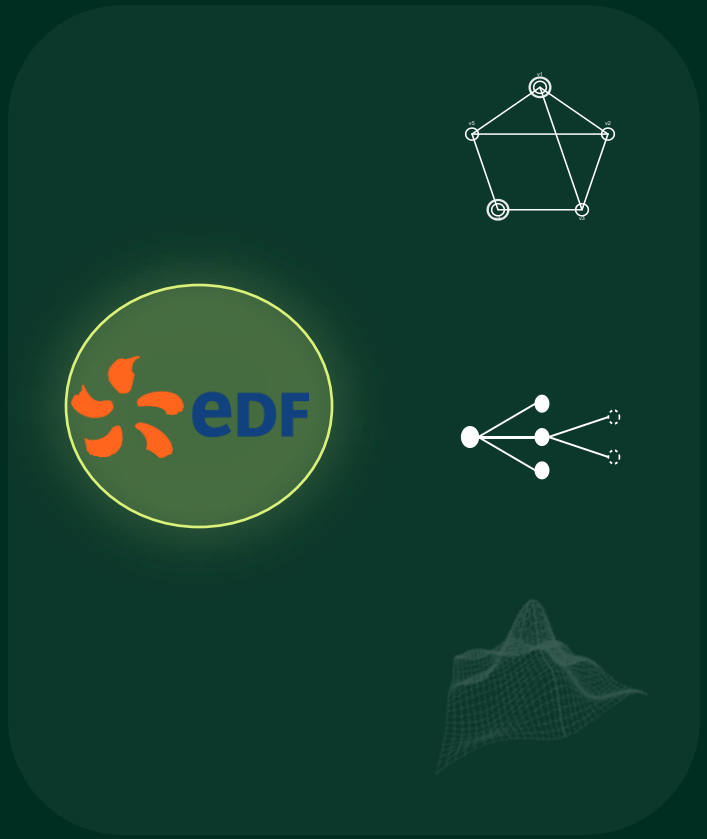


Probabilistic Safety Asssesment



Material Science

Aim: Development of distributed quantum algorithms for resolving use-cases central to the **energy sector**



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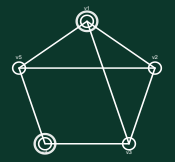
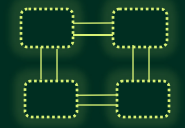
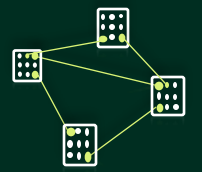
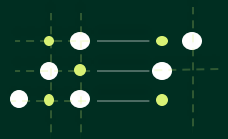


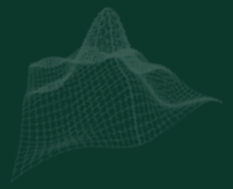




Welinq



EDF



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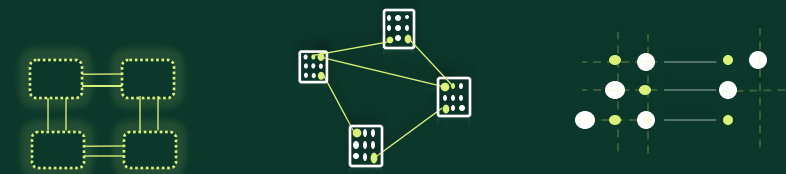

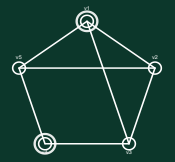

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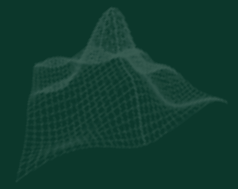
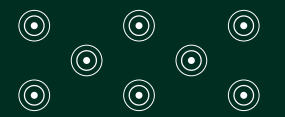


Use-Cases

PASQAL

QUANDELA



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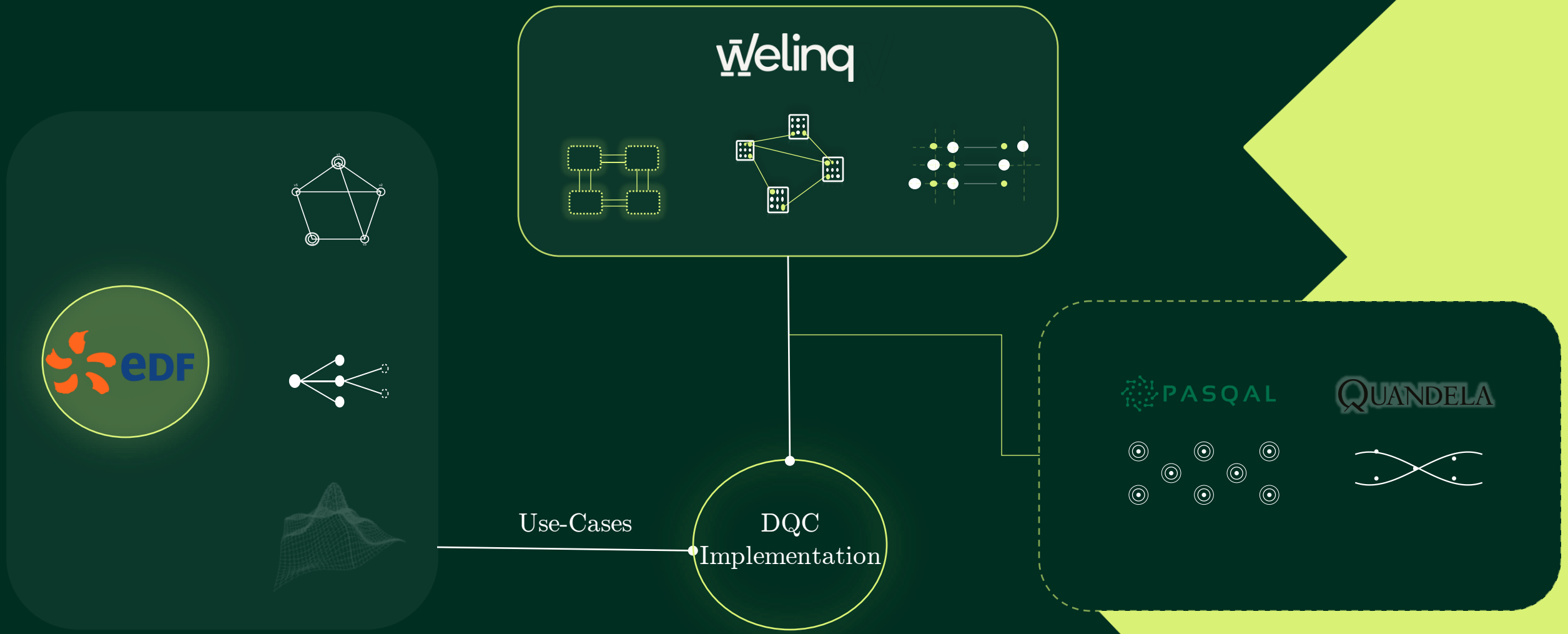

In progress

In progress

Analog Distributed Quantum Algorithm for the MIS problem [*]

Specifications on interconnection of *Neutral Atom* QPUs

In progress

- Analog Distributed Quantum Algorithm for the MIS problem [*]
- Specifications on interconnection of *Neutral Atom* QPUs
- Distributed PSA

In progress

Analog Distributed Quantum Algorithm for the MIS problem [*]

Specifications on interconnection of *Neutral Atom* QPUs

Distributed PSA

Distributed Quantum Algorithm for Variational PDE Solver [*]

Specifications on interconnection of *photonic* QPUs

[*] Talk by Riccardo Mengoni

In progress

- Analog Distributed Quantum Algorithm for the MIS problem [*]
- Specifications on interconnection of *Neutral Atom* QPUs
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- Distributed Quantum Algorithm for Variational PDE Solver [*]
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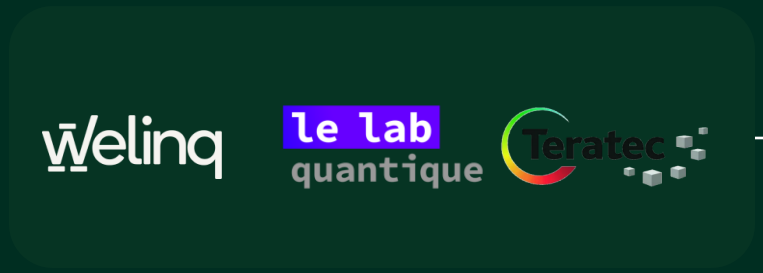

- Dissemination and Communication

Program of the Scientific Day

Morning Session

Distributed Quantum Algorithms: PDEs and MIS problems

Riccardo Mengoni, WELINQ

Hybrid Quantum Approaches to Risk Analysis in Complex Industrial Systems

Mohamed Hibti, EDF

Coffee Break ☕

A Quantum Compiler for Distributed Quantum Computing

Walter Nadalin, Welinq & Sorbonne Université (LIP6)

Distributed quantum computing and other tasks

Damien Markham, LIP6

Emitter-Based Photonic Entanglement: from multiplexed sources to deterministic graph state generation

Paul Hilaire, TELECOM PARIS

Lunch Break 🍕

Afternoon Session

Panel Conversation with active audience participation: « Use cases, challenges, and pathways in distributed computing »

Thomas Nieddu, WELINQ

Thank you for your presence
and active participation !

Enjoy the workshop !