The European Infrastructure for Quantum Computing and Simulation: an RTO Perspective

STOA Workshop Quantum and Chips | European Parliament, Brussels | October 12, 2022 | KRISTEL MICHIELSEN

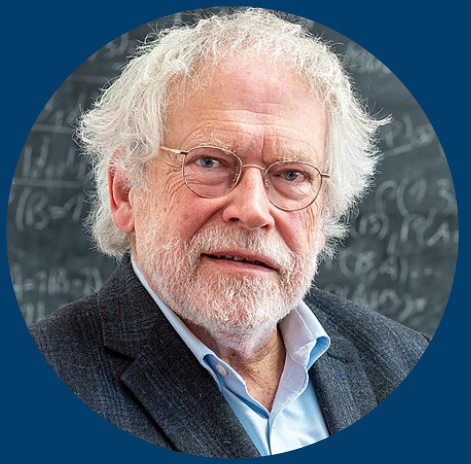
Quantum Information Processing in Europe

Long tradition of excellence in quantum research

The Nobel Prize in Physics 2022

Alain Aspect
Université Paris-Saclay
Paris, France
École Polytechnique
Palaiseau, **France**

John F. Clauser
J.F. Clauser & Assoc.
CA, **USA**



Anton Zeilinger
University of Vienna
Vienna, **Austria**

"for experiments with **entangled** photons, establishing the violation of Bell inequalities and pioneering quantum information science"

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Quantum Computing

What is needed?

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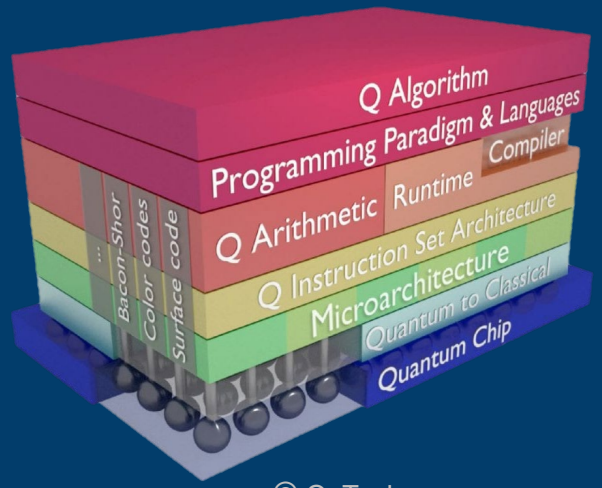
Quantum computer hardware
Quantum processor/chip



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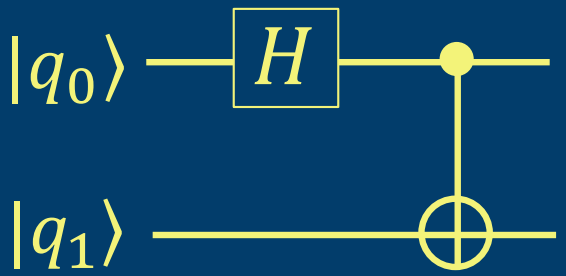
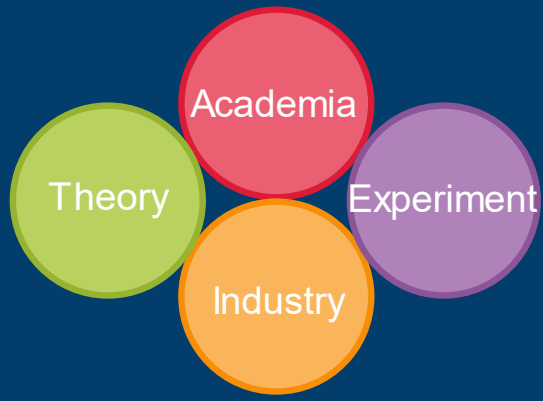
Quantum software stack
Quantum control, quantum error correction, compiler, user interfaces, …



Quantum algorithms
Sequence of controlled one- and two-qubit operations



Collaboration

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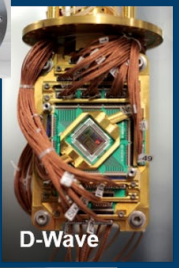
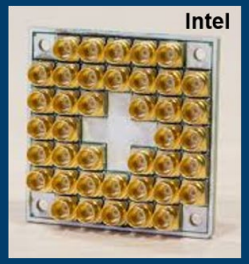
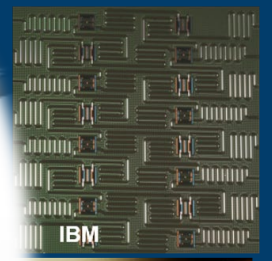
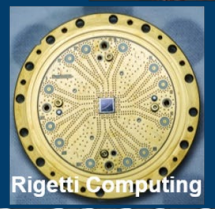
Practical Quantum Computing

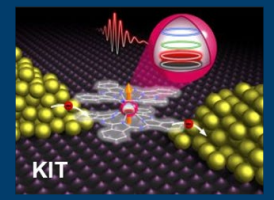
Link High Performance and Quantum Computers

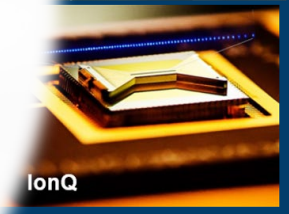


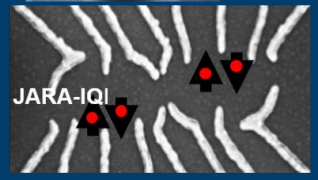


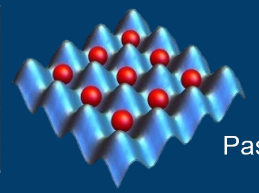












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Hybrid HPC/Quantum Infrastructures

JUNIQ - Jülich UNified Infrastructure for Quantum computing (2019 – today), Germany

EuroQCS

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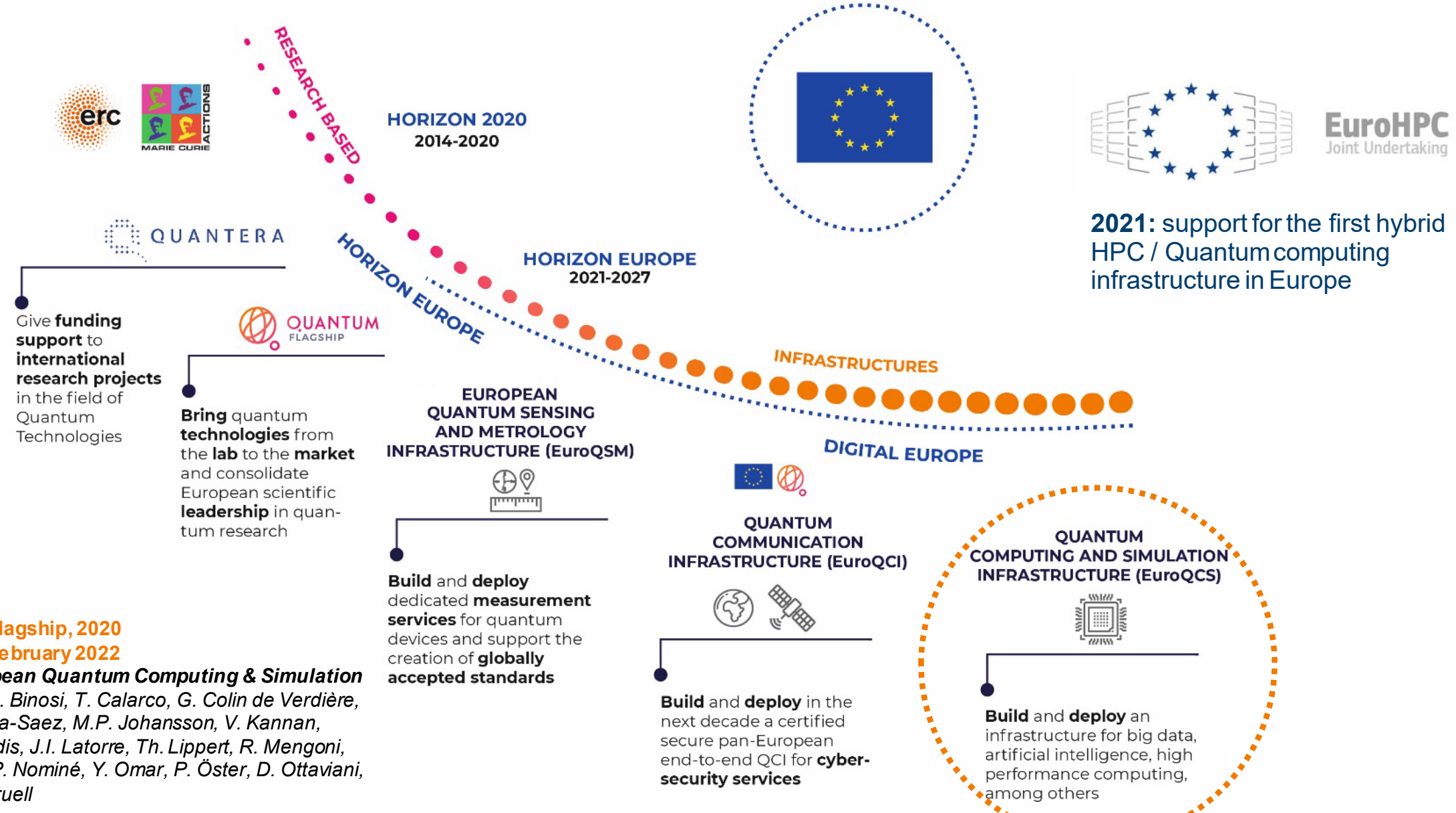
FROM VISION TO REALITY – THE EU'S COMMITMENT



EuroHPC Joint Undertaking

2021: support for the first hybrid HPC / Quantum computing infrastructure in Europe

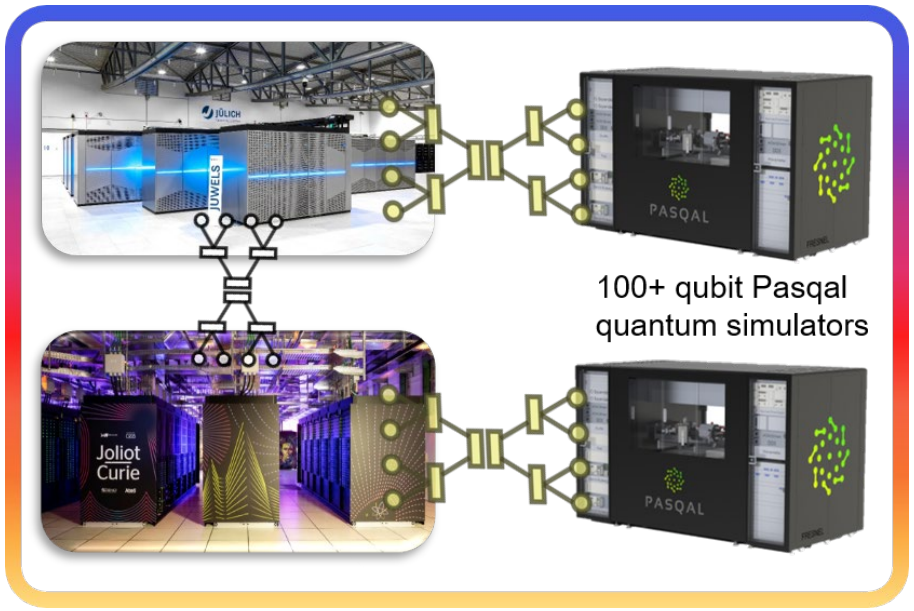
SRA Quantum Flagship, 2020 White paper, 2 February 2022

***EuroQCS: European Quantum Computing & Simulation Infrastructure**, D. Binosi, T. Calarco, G. Colin de Verdière, S. Corni, A. Garcia-Saez, M.P. Johansson, V. Kannan, N. Katz, I. Kerenidis, J.I. Latorre, Th. Lippert, R. Mengoni, K. Michielsen, J.P. Nominé, Y. Omar, P. Öster, D. Ottaviani, M. Schulz, L. Tarruell*

Duration and Partners

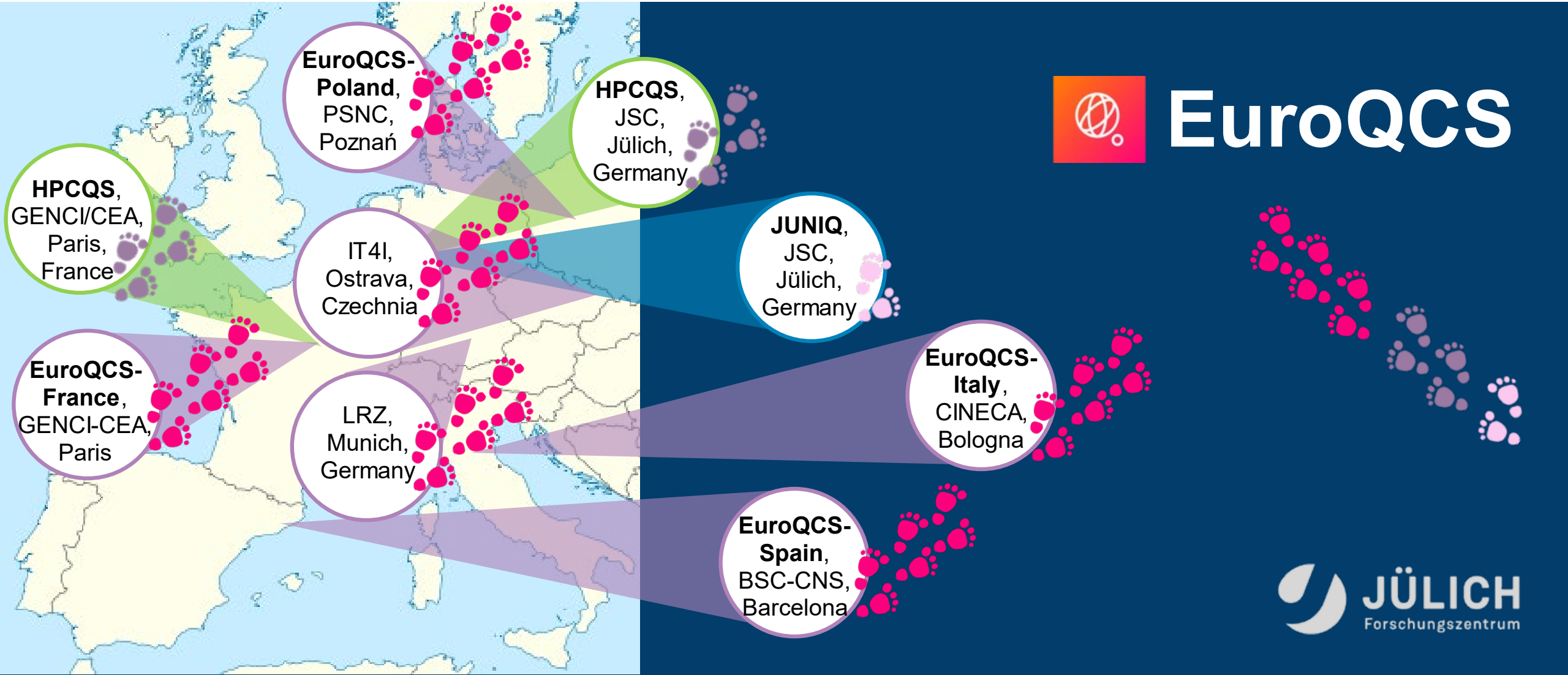
- December 1st 2021 - November 30th, 2025
- Coordinator: Forschungszentrum Jülich GmbH
- 15 partners + 3 linked 3rd parties from 6 countries

Project Aim



Hybrid HPC/Quantum Infrastructures

HPCQS - High Performance Computer and Quantum Simulator hybrid infrastructure (2021 – today)
EuroHPC hosting entities (2022)



European Sovereignty

European Chips Act

"In Europe we cannot just develop software for hybrid quantum-classical computing and run the software solely on non-European computing systems. Quantum computing should also be integrated in the EU Chips Act."

Kristel Michielsen

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