

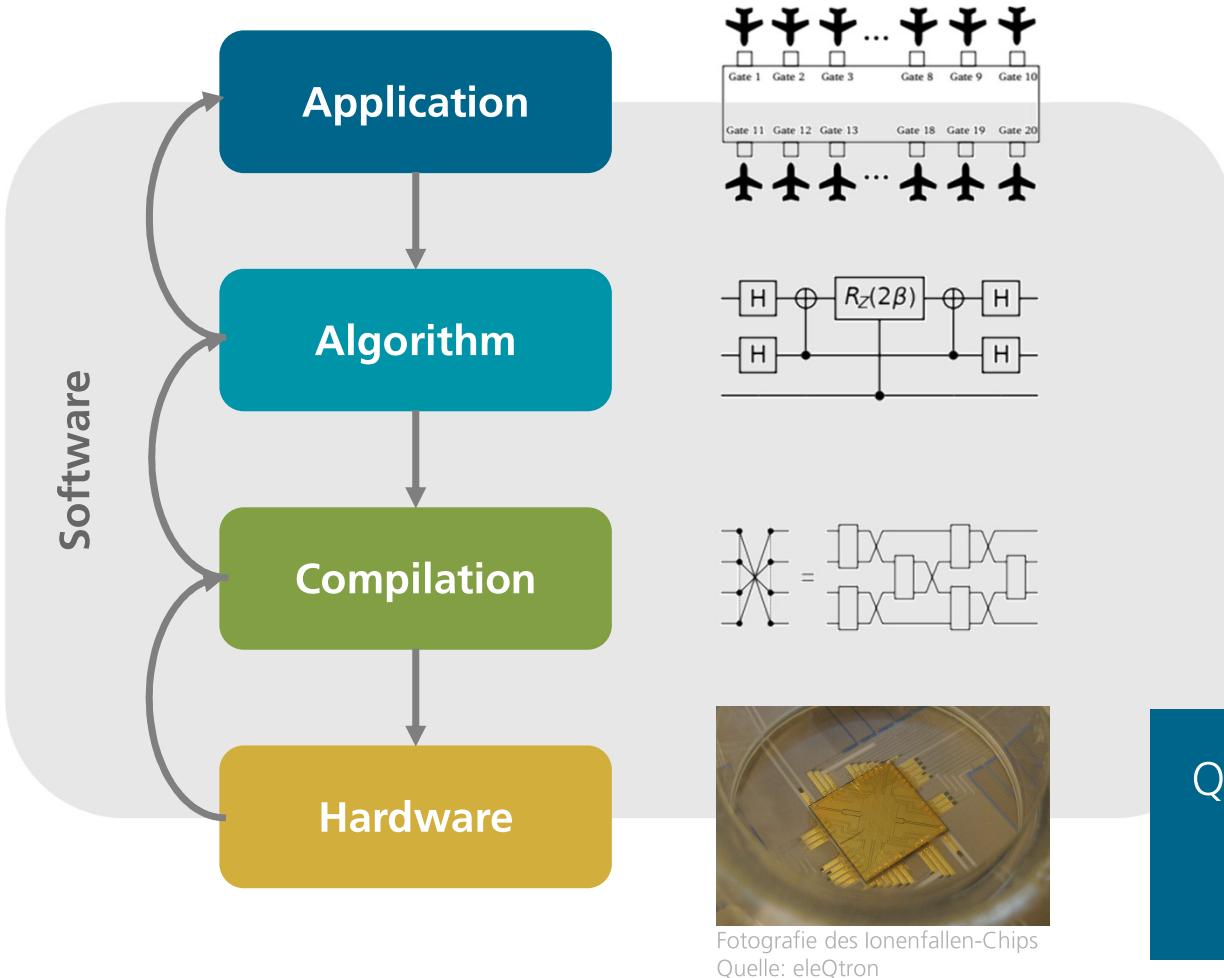
QUANTUM-SOFTWARE-STACK – FROM APPLICATION TO HARDWARE

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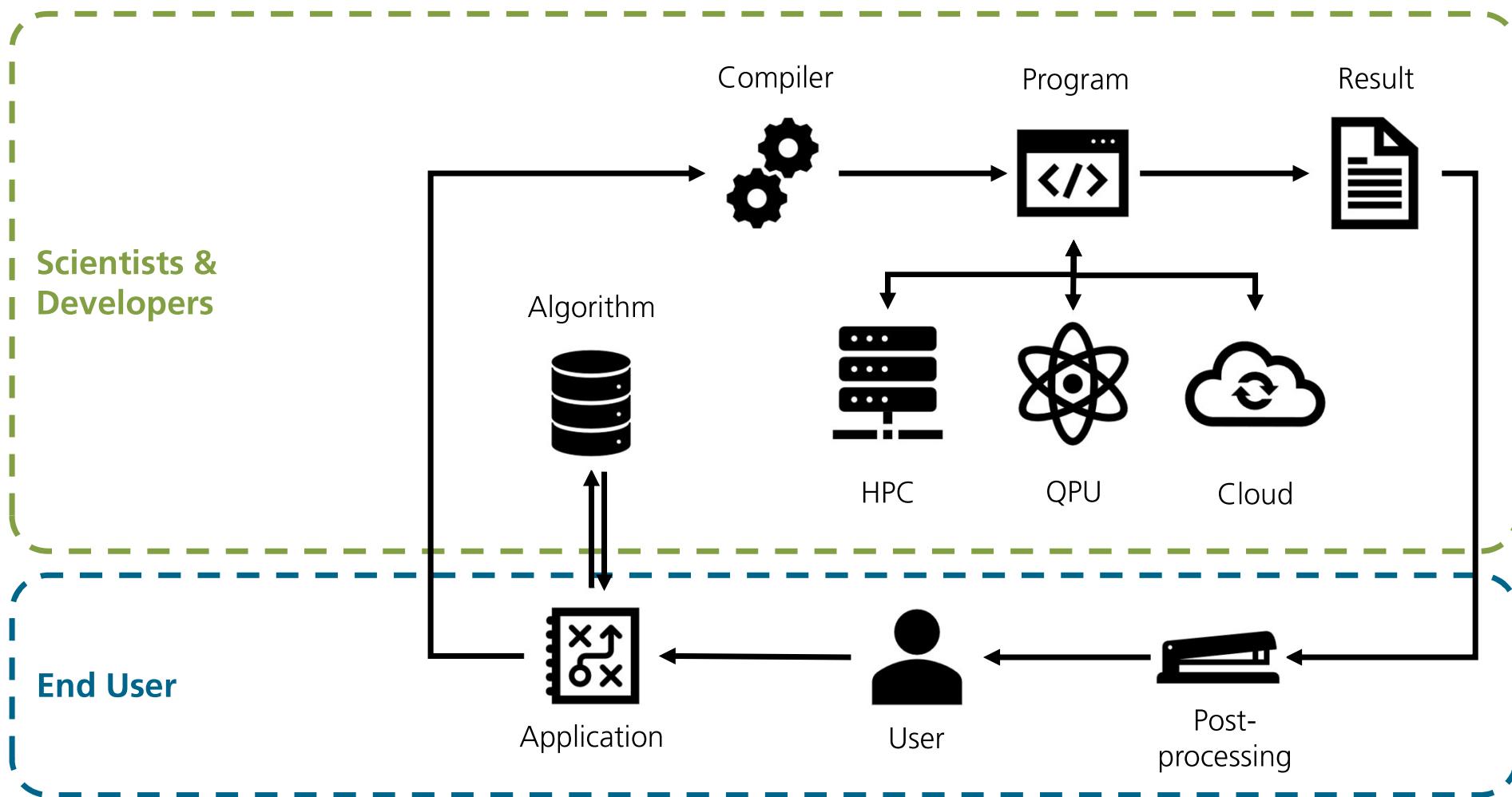
QC-Software-Stack: Performance by Co-Design



- Hardware-limitations need to be considered in any level of the software stack.
- (Industrial) applications need to be explored in harmony to current and foreseeable hardware development

Quantum advantage can only be achieved, if any level of the QC software stack is of **high-performance!**

Vision: User Experience

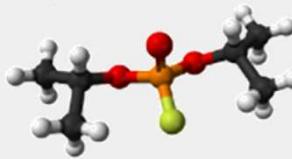


Performant Quantum-Software-Stack



Applications

- Smart decomposition into classical and quantum parts
- What applications are well suited: quantum simulation & optimisation

A 3D ball-and-stick model of a molecular structure, showing carbon (black), hydrogen (white), oxygen (red), and sulfur (yellow) atoms.

Platform

- Orchestration
- Communication between HPC and QC
- Real-time requirements

A black icon representing a network or orchestration, showing a central node connected to four peripheral nodes.

Compilation

- Short circuits and hybrid Co-Optimisation
- (Classical) Runtime-optimisation of the compilers
- Optimal embedding for limited connectivity

A black icon representing a compiler or optimization, showing two interlocking gears.

Analysis

- Benchmarking
- Analysis and visualisation of the results
- Understanding quantum advantage

A black icon representing analysis or visualization, showing a document with a bar chart.