Integrating Quantum and High Performance Computing - Expectations and Challenges

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Recent advances in Quantum Computing (QC) have generated high expectations from scientific and industrial communities. While first prototypes are already moving out of the physics labs into the data centers, it is still unclear how the expected benefits will support research and development. The Quantum Integration Center (QIC) at LRZ addresses these challenges with an approach, where QC is integrated with High Performance Computing (HPC). The idea is that the HPC delegates specific tasks, which are better suited to the QC, to a quantum accelerator inside the HPC system. As a consequence, the overall achieved performance of scientific simulations can be improved. To realize this integration, a number of gaps need to be addressed, mostly on the software engineering and computer science aspects of integration. In this talk, we will provide an overview of the current developments in the QIC@LRZ and the larger Munich Quantum Valley (MQV) initiative.

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