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Quantum Optimization of Worldwide LHC Computing Grid data placement

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The Worldwide LHC Computing Grid (WLCG) processes all LHC data and it has been the computing platform that has allowed the discovery of the Higgs Boson. Optimal usage of its resources represents a major challenge. Attempts at simulating this complex and highly non-linear environment did not yield practically usable results. For job submission and management, a satisfactory solution was implemented, based on a local optimisation of the workload, but optimal data placement remains a problem. Currently, it can be distributed according to some “reasonable” heuristics, such as topological distance between the data producer and the storage element.

With the increase in the data produced by the HL-LHC experiments, a better data placement strategy becomes extremely relevant. While this problem has shown to be intractable till now, Quantum Computing can substantially improve the optimization of the storage.

This contribution describes the development of a quantum algorithm for the optimisation of the WLCG storage distribution, starting from the specific case of the ALICE experiment. We intend to determine the optimal storage, movement and access of the data produced by the ALICE experiment in quasi real-time, in order to improve resource allocation and usage and to increase the efficiency of data handling workflow. This work is done in collaboration with Google, which is developing one of the most advanced hardware and software Quantum Computing programmes.

Consider for promotion

No

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