

Flame & EntropyHub: Open-source stack for scalable, heterogeneous and distributed quantum workflows

Presenting Author

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management. Together Flame & EntropyHub provide infrastructure for building solutions needed for both complex quantum experiments as well as remotely deployed and controlled quantum processing units.

Abstract

Writing control software for quantum experiments in a scalable and modular manner is crucial for successful creation of complex quantum workflows. This is challenging since such experiments tightly incorporate experiment control and classical processing, using potentially heterogeneous hardware and software. We present an open-source software stack for creating modular and scalable workflows required for the evolving quantum ecosystem. Our architecture, Flame, allows creation of testable program nodes, written in a language of choice. Nodes are independent processes which are orchestrated into the final solution by writing a workflow that specifies communication between nodes, using expressive Python syntax. Using asynchronous, direct node-to-node communication, workflows can span in scalable manner multiple hosts, joining heterogeneous languages and operating systems. The underlying actor based processing model allows easy access to scalable performance thanks to implicit parallelism. Uniting this low-level experiment creation with high-level management is EntropyHub: a web based interface providing facilities for experiment authoring and result