

4.2 Adaptive Hybrid, Distributed Quantum Systems

Antonio Brogi (University of Pisa, IT), Shahram Dustdar (TU Wien, AT), Michael Felderer (DLR – Köln, DE), Hausi A. Müller (University of Victoria, CA), Juan Manuel Murillo (University of Extremadura – Cáceres, ES), Ricardo Pérez-Castillo (University of Castilla-La Mancha, ES), Antonio Ruiz Cortés (University of Sevilla, ES), Shinobu Saito (NTT – Tokyo, JP), and Ulrike Stege (University of Victoria, CA)

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The working group discussed the different types of adaptation [1] that hybrid [2], distributed quantum systems [3] should feature and classified them into three main dimensions: cost-driven, resource-driven, and quality-driven.

The working group highlighted the important need to trade off the aforementioned three dimensions (cost, resources, and quality) in order to realize valuable adaptations of quantum systems.

The working group then focused on identifying the new specific parameters to be taken into account for adapting quantum systems, such as circuit depth and height, coherence, entanglement, measurement, and noise.

The working group discussed two possible use cases for adaptive quantum systems: the travelling salesperson problem and the shot-wise distribution of quantum computations.

Hybrid quantum-classical and distributed quantum computing require dynamic adaptation due to evolving hardware, quantum networks, runtime system software, and problem constraints. Continuous monitoring and automated adaptation are essential for the long-term evolution of hybrid quantum systems. One promising avenue is to develop model-based frameworks [4] to explore, evaluate, and track different design choices systematically using autonomic computing techniques.[5]

References

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