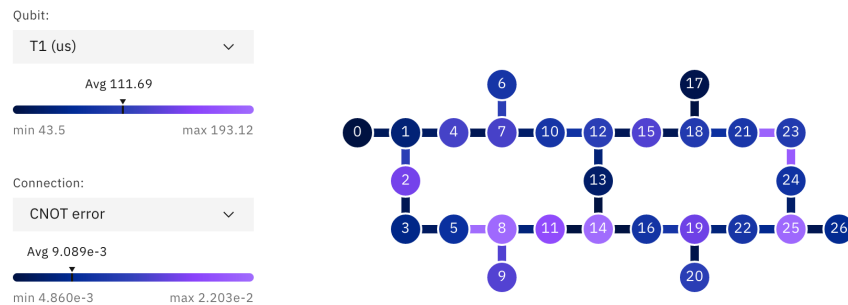


Design & build a web interface for a quantum computer



A graphical visualization of quantum chip connectivity map and additional chip properties.

Background

The Wallenberg Centre for Quantum Technology (WACQT) is a flagship research initiative at Chalmers that aims to develop a high-end quantum computer within the next few years. The ultimate goal is to build a quantum computer capable of solving problems far beyond the reach of the best conventional supercomputers.

The WACQT computer is based on silicon chips containing so-called superconducting qubits. These qubits need to be regularly calibrated. When this happens, measurement results of hundreds of finely tuned parameters need to be processed, stored in a database and communicated to a high-level software tool that is used to program the quantum chip.

Project description

The qubit calibration process consists of several steps, involving a number of components.

1. The parameters are read out from the chip (or a test module producing dummy values) and stored in a key-value store (e.g. MongoDB).
2. The data from the key-value store is translated into a handful of JSON configuration files for the high-level Qiskit software. The files are served via a web-based REST API.
3. A human user can inspect a visual representation of the calibration results in the key-value store via a Web GUI.

The goal of the project is to design and implement some or all of these components and interfaces. Note that different tasks require different kinds of skills/interests. E.g. low-level/back-end/machine programming for the REST API and the MongoDB interface vs. high-level/front-end/HCI programming for the WebUI. So the project is well-suited for a group or two of students with different strengths and backgrounds.

Suggested introductory material

<https://www.youtube.com/watch?v=CgCE8LdeJlg>

Target group

D, DV, E and IT.

Mainly BSc students in computer science (DV/D/IT) though students from physics, micro technology or nano science are welcome too, provided they have the necessary programming background. As explained above, the project is well-suited for a group of students with different strengths and backgrounds.

Special prerequisites

The applicants should have some experience with Python or a similar programming language. Prior experience with web programming, especially the use of REST APIs, key-value stores (such as MongoDB and Redis), and/or data visualization are helpful. No prior knowledge in quantum physics or quantum computation is required but curiosity about the subject is a plus!

Number of groups

1-2

Team size

4-6 students

Supervisors

Sandro Stucki (CSE) and Miroslav Dobsicek (WACQT)