

Atos research activities

Simon Martiel

kickoff défi EQIP

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Quantum Circuit compilation

FTQC compilation

Quantum circuit to error corrected computation :

CIFRE PhD: Vivien Vandaele with Simon Perdrix and Christophe Vuillot

Goal: Quantum Circuit \rightarrow ZX-calculus \rightarrow Code deformation

Quantum circuit optimization:

Non-clifford resource optimization (T count reduction)

Resource estimation:

Develop tools for resource estimation in the FTQC setting

Quantum Circuit emulation

Distributed simulation – generic circuits

Currently:

- Standard linear algebra approach + parallelism
 - Some tensor based approaches (MPS)
- Designed to run on a single (fat) node

Future work:

- Move on to distributed algorithms
 - Handle heterogeneous architectures (i.e GPU + CPU)
- Designed to run on a full cluster

Quantum Circuit emulation

Other tracks

Clifford + T simulation :

Extend our stabilizer simulators to near-stabilizer regime

Noise modeling:

Develop realistic model and methodology to benchmark QEC

Quantum Programming & formal methods

Scalable programming:

Develop a programming language/library:

- Based on a system language
- HPC compatible (i.e supports distributed/parallel programming)
- (at least partly) open source

→ Move away from the static quantum circuit description languages

Formal methods:

- Support interface with potential static analysis tools