Application View

OQSSw Report

Motivation

Survey application teams and vendors to map out current and emerging use cases, evolving requirements, and interface approaches.

- How will application evolve from NISQ to FT regime
  - Evolution of algorithms
  - Software stack architecture (static vs changing aspects?)
  - Plasticity of the quantum systems as FT prospects advanace (combination of error resilient methods)

- What should the (software) interfaces to the to the hybrid classical/QC hardware look like?
  - Reasonable “lower level” stack, e,g, job control (circuit submission, obtaining results, information about backends, etc)
  - “Higher-level” libraries for composite workflows (specific algorithm implementation)
    - tradeoffs: generality vs performance
  - Seems that standards are hard to define; they “arise” from need and use cases
    - Implications on joint efforts planned from the ground-up

- Are there specific software metrics which would be useful to expose to the application layer?
  - details of latest calibration information along with job information
  - more detailed error messages; when thins go wrong, **where** in the stack they go wrong (i.e. does app developer have a say in fixing things)
  - All and any information that may help with reproducibility (e.g. run application 6 months from now)

Challenges:

- Entire hybrid and quantum software ecosystem has grown (organically); confusing for the user, application **portability** suffers
- **Standardization very difficult**
  - Emergence from different platforms
  - Tools at different levels of development
  - … and different levels of adoption

Open Questions and Next Steps

- How do we encourage and facilitate standardization
  - Will emerge naturally (e.g. from leading applications and use cases)
  - What do we need to more for long term stability

Overlap