Amendment 2
Quantum Computing As-A-Service – Questions and Answers

Q1. Does the solution need to be hosted in Canada?

A1. The proposed solutions could be Cloud-based if hosted in Canada. The bidder must provide the option to the user of selecting computing capability based in Canada. Understanding that the required computing capability are still developing, it is acceptable for the bidder to use a simulator to support their proposed QCaaS solution.

Q2. The document states:
- **Analysis results are returned to the computing interface for visualization.**
- **Support interfacing with other software tools commonly used in the particular domain workflows. For example, the outputs of a simulation may appear in spreadsheet format, and be usable in decision support and statistical analysis tools or for publications in various forms, such as executive-support reports, or traditional and social media communications.**

For these points, what metrics will be used to evaluate the output, if any? For example, the time it takes to get the output or the quality of the output (accuracy etc.)?

A2. One of the evaluation metrics will be 'domain interface usability'. The goal of this Challenge is to make quantum computing (QC) available to domain experts (for domains mentioned in the challenges, such as logistics, financial optimization, etc.) by creating a 'level of abstraction' corresponding to the chosen domain, thus insulating them from needing to know details of quantum computing and algorithms. Such a level of abstraction includes the terminology, as well as ways of expressing and manipulating problems in the domain. An example (pre-dating QC) is spreadsheet software (Excel, Lotus, Visicalc, etc.) which provides a level of abstraction (cells, columns, rows, formulae, what-if scenarios, etc.) suitable for accounting and book-keeping. Usability evaluation frameworks (e.g. Jakob Nielsen Usability Heuristics, usability.gov, W3C) will be loosely adapted to evaluate 'domain interface usability'. Running time will depend upon the proposed QCaaS system (submitted in response to the Challenge) and the underlying QC system used. The implementation of the underlying QC is outside the scope of the challenge and not under control of the participants, and therefore its running time is not an evaluation metric. will be partially a function of the underlying QCaaS – and that is not one of the metrics. The running time of the challenge entry itself will be part of the evaluation metric to encourage interactive usage in exploring 'what if' scenarios in the problem domain.
The quality of the outputs (accuracy, etc.) will depend partly on the proposed QCaaS system (submitted for the Challenge), for example the chosen quantum algorithms and mapping from the domain variables to the quantum algorithm inputs, but also on the underlying Quantum Computing used. As with the running time, the underlying Quantum Computers are not under control of the challenge participants, as a result quality of outputs will not be a metric – except where the quality depends upon the submitted QCaaS system.

Q3. What would be the typical size of the problem(s) that the QCaaS solution would be expected to address (in terms of the number of variables etc.)?

A3. While answering this query one must keep in mind that the domain and level of complexity, that can best answered by the actual end-users, that is those who will consume the QCaaS. The challenge is agnostic to the particular type and vendor of quantum computer, as those fall outside the direct control of the challenge participants. Already now, the maximum problem sizes vary by orders of magnitude depending on the type of quantum computation – and that metric will continue to improve. As a result, the specific problem sizes are not a direct evaluation metric and submissions will be expected to support 'best effort' for the underlying quantum computer and will be more focused on the abstractions and usability that the QCaaS will provide the user.

Q4. Would you consider extending the deadline on this challenge until the end of December?

A4. Understanding that this an emerging field, we extend the bidding period to January 15, 2020.