Developing Software for the Quantum Era

Intel Labs Releases Beta Version of the Intel Quantum Software Development Kit

Sept. 28, 2022 — Quantum computing promises to dramatically speed up complex problem-solving and has the potential to enable significant breakthroughs in materials, chemicals and drug design, financial and climate modeling, and cryptography. Advances in quantum bits, or qubits, are one step toward achieving quantum practicality, but significant breakthroughs are needed across the full hardware and software stack to realize its full potential.

To advance this journey, Intel Labs has developed a full-stack Software Development Kit (SDK), called the Intel® Quantum SDK, that interfaces with Intel's quantum computing stack. The kit allows developers to program new quantum algorithms for executing qubits in simulation and on real quantum hardware in the future. Beta users are already exploring chemistry, materials and fluid dynamics simulations, as well as algorithms for solving linear systems of equations, which could be used in real-life situations such as financial modeling.

About the Intel Quantum SDK

The Intel Quantum SDK includes an intuitive user interface based [on C++, a low-level virtual machine (LLVM)-based compiler](#) toolchain with a quantum runtime environment optimized for executing hybrid quantum-classical algorithms and a high-performance Intel® Quantum Simulator (IQS) qubit target backend. Future releases will feature different qubit target backends, including a quantum dot qubit simulator and, eventually, an Intel quantum dot qubit device as the target backend will also be offered.

Building a Quantum Ecosystem

Intel is lowering the barrier of entry for quantum developers by using the industry standard LLVM compiler, a more user-friendly interface familiar to classical computing developers. Beta users include the Deggendorf Institute of Technology in Munich, Germany, which is utilizing the SDK to explore a fluid dynamics problem important for aerodynamics and hydrodynamics, and Leidos, which is exploring applications like computational chemistry and materials modeling as well as distributed computing with data privacy and security.

In addition, Intel is funding curriculum to help build an ecosystem of developers to begin exploring programming applications for quantum computing. Universities will develop and share quantum course curricula to proliferate the use of the Intel Quantum SDK. The universities that received Intel grants this year include The Ohio State University, Pennsylvania State University, the University of Pennsylvania, Deggendorf Institute of Technology and Keio University in Japan.

What's Next?

The release of the Intel Quantum SDK is a preliminary step in advancing full-stack quantum development. As part of the beta testing process, Intel will incorporate user feedback into version 1.0, expected to be released in early 2023. The beta version of the Intel Quantum SDK is available now on the Intel Dev Cloud.

For more information, visit: www.intel.com/labs