XACC Article Published at Eclipse Newsletter and JAXenter.com

Achievement: Article on open-source quantum programming and XACC published by two different sources with thousands of subscribers.

Significance and Impact: This work has increased the publicity of XACC, and demonstrated its utility to a large audience

Research Details:

- Wrote popular article on quantum computing, quantum programming, and XACC.

Sponsor/Facility: ORNL LDRD

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Publication: https://jaxenter.com/eclipse-xacc-quantum-computing-137182.html and https://www.eclipse.org/community/eclipse_newsletter/2017/august/article4.php

Overview:

Scientific computing and data mining are important tools that help us better understand nature and develop novel solutions to pressing problems in energy, health, logistics, and finance. Prominent examples include computational chemistry simulations to investigate new pharmaceuticals and long-range models to predict global climate change. These problems and others like them can only be solved using large-scale high-performance computing (HPC) resources. Ongoing advances in computing architectures support these large-scale scientific computing and data mining tasks, and recent trends in HPC system design focus on heterogeneous architectures that combine many CPU cores with other specialized accelerators. For example, the Titan supercomputer at Oak Ridge National Laboratory relies on many GPUs to implement high-performance numerical calculations.

Extensible, modular, and open-source software plays an important role in making heterogeneous HPC systems accessible to application developers. High-level programming models, software systems, and application programming interfaces (APIs) are necessary to use these large-scale scientific devices, which continue to push the scientific computing envelope. As the U.S. pushes towards the development of an HPC system that operates at exascale (or a machine that can execute a billion billion operations per second), there is also an effort to consider what heterogeneous HPC architectures are required to go beyond exascale. A number of research efforts across the world are beginning to demonstrate novel computing architectures that may aid accelerating a post-exascale computing world. One such effort at the forefront is ***quantum computing*** and the idea of leveraging the non-intuitive laws of quantum mechanics and quantum information to perform computation.

Oak Ridge National Laboratory has started investigating what it means to enhance an HPC system with quantum acceleration, and has put forth an open-source hybrid programming model and reference implementation called the e**X**treme-scale **ACC**elerator programming framework, **Eclipse XACC**. The good news is that XACC is now a fully fledged Eclipse project, the first in an on-going effort of the Eclipse Science Working Group to drive open source software and community development around quantum computing - an exciting development for the early history of quantum computing software