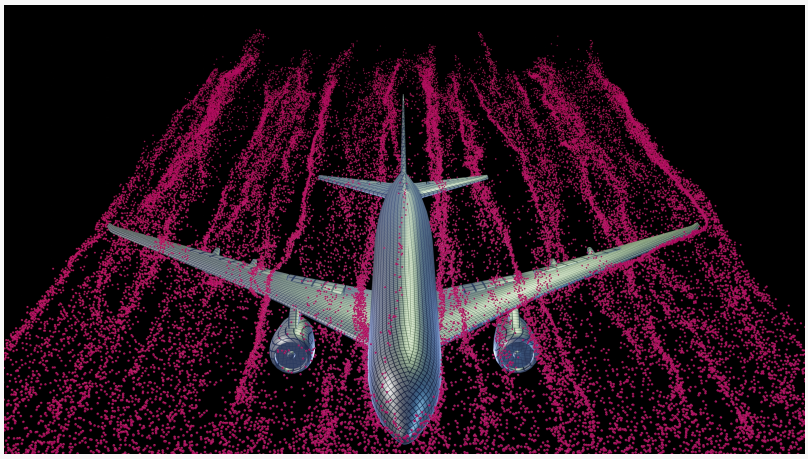
BQP Demonstrates Possibility of Large-Scale Fluid Dynamic Simulations with Quantum Computing in Latest Research

Researchers estimate that a large-scale jet engine simulation which took 19.2M HPC cores can be conducted using a quantum computer with 30 logical qubits



NEW YORK, NY, UNITED STATES, September 12, 2024 / EINPresswire.com/ -- BQP, a startup leading the development of quantum-based engineering simulations, today announced a significant research milestone for simulating Computational Fluid Dynamics (CFD). The milestone was achieved using a hybrid quantum-classical solver which is part of BQP's next-gen simulation platform, BQPhy®.

After conducting ~100000 experiments, BQP researchers published their work in a paper where they estimated that large-scale CFD simulation of a jet engine can be achieved with only 30 logical qubits on a quantum computer, leading to better accuracy, efficiency, and costs than current methods. A prior study, which inspired the BQP team to undertake this research, found that it required 19.2M compute cores to perform this same simulation with classical algorithms on state-of-the-art High-Performance Computers (HPCs).

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>
> *Abhishek Chopra, founder, CEO, and Chief Scientific Officer at BQP*

"This study is pivotal as it would democratize large-scale CFD simulation for every engineer once quantum computers become utility-scale," said Abhishek Chopra, founder, CEO, and Chief Scientific Officer at BQP. "In the future, what would engineers have easier access to – 19.2M HPC cores or 30-logical-qubit quantum computers? I bet on the latter."

“With continued research, we believe that quantum computing has the potential to revolutionize the way simulations are conducted, allowing engineers to push the boundaries of design and engineering,” Chopra added.

“BQP’s results signal the introduction of drastically higher computing power to flow field analysis and simulation. This capability can unlock new methods in aerospace development, enabling higher confidence during design and more proactive maintenance during the aircraft life cycle,” said Dan Hart, Senior Aerospace Executive and Member of the National Academy of Engineering.

For the research, BQP scientists estimated scalability, accuracy, and consistency for jet engine simulations using BQP’s Hybrid Quantum Classical Finite Method (HQCFM) solver. The study demonstrated the scalability of the HQCFM solver, by simulating a non-linear time-dependent Partial Differential Equation (PDE) from 4 to all the way to 11 qubits.

Researchers found that accuracy and consistency were comparable to classical computers, while the HQCFM distinguished itself by running inside a time loop in a transient problem, without propagating any error to the next time step. Obtaining such high accuracy consistently is a significant breakthrough toward more complex simulations beyond the capacity of classical devices.

BQP believes that BQPhy’s solver will allow CFD engineers to simulate a full aircraft for the first time, allowing aerospace engineers to greatly improve flight patterns during turbulence. Given current trends in supercomputing computational advances, simulating an entire aircraft via classical computing would not be possible until 2080.

In fact, BQPhy’s physics-based solver can also be used to solve other PDEs to capture interactions in gas dynamics, traffic flow or flood waves in rivers. Combined with quantum algorithms, the technology can accurately solve complex equations with reduced hardware demands compared to traditional high-performance computing (HPC) methods, while enabling sophisticated and intricate simulations to be performed effectively.

“Building on our successful collaborations with leading academic institutions, government research agencies such as AFRL, DARPA, industry pioneers, and top academic institutes, BQP is eager to partner with organizations that share our vision for advancing quantum computing solutions,” said Chopra.

The BQP team has already made significant progress towards its next milestone which will be presented at one of the world's largest aerospace research, development, and technology events in January 2025.

About BQP:

BQP (BosonQ Psi) is a software platform startup that leverages the power of quantum computing to accelerate simulations. With their next-gen simulation platform, BQPhy®, the startup aims to help customers from aerospace, defense, and other heavy industries dramatically shorten their product cycles and save them billions of dollars.

BQPhy is leveraging the power of quantum algorithms today with its quantum-inspired solvers running on today's HPCs and hybrid approaches for forthcoming quantum computers. They have demonstrated 10X computational advantages with five aerospace and defense customers.

BQP was named winner of the Griffiss Institute's HUSTLE Defense Accelerator and 2023 Quantum World Congress National Security Startup Award. The company has graduated from prestigious programs like Intel Ignite Accelerator and Alchemist Accelerator. As of August 2024, BQP has raised $1.7m from venture capital, and won $600k worth of grants from the U.K., Netherlands, and Indian Governments.

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