VOL. 22 JUNE 2022

NTU Q

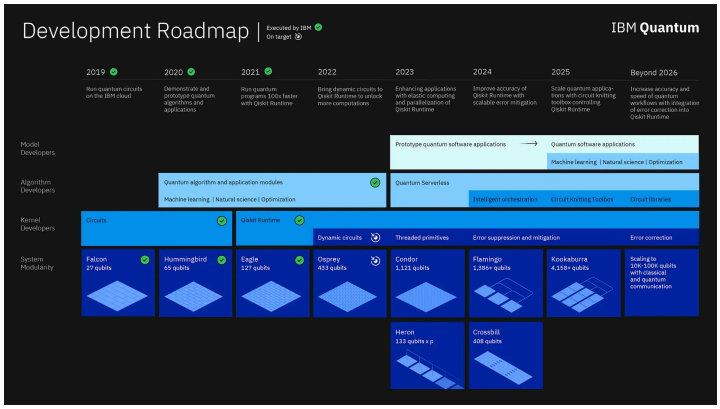
EXPANDING THE IBM QUANTUM ROADMAP TO ANTICIPATE THE FUTURE OF QUANTUM-CENTRIC SUPERCOMPUTING

IBM has presented an update to their roadmap. They extended the quantum processor roadmap and added four additional processors that will be introduced between 2023 and 2025.

In 2023, IBM will introduce the first processor, called Heron, with a density of 133 qubits per chip. Heron will incorporate redesigned gates and tunable couplers. Moreover, Heron will be the ability of multiple Heron chips to communicate classically and use common control hardware.

In 2024, IBM will introduce quantum communication between processors with two different processors using two different methods. The first will be to configure a system consisting of three Heron chips within the same dilution refrigerator that are connected via quantum chip-to-chip couplers. This method will create a 408 qubit chip called Crossbill. The second processor will be a 1386+ processor called Flamingo that will consist of three or more 462 qubit chips networked together. Different from Crossbill, Flamingo will use what IBM calls long-range couplers for connecting qubit chips located in different dilution refrigerators through a cryogenic cable of about a meter long.

In 2025, IBM will continue extending these technologies to network together three or more of the Flamingo chips to create a 4,158+ system called Kookaburra and pave the way for continued developments based upon these technologies in 2026 and beyond.



Source:IBM

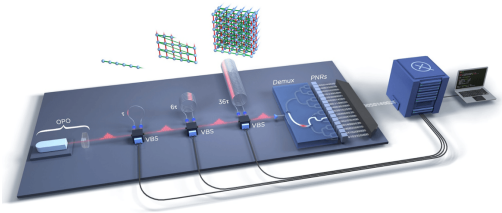
READMORE

XANADU LAUNCHES BOREALIS, A 216 SQUEEZED-STATE QUBIT PHOTONIC PROCESSOR

Xanadu recently announced the launch of Borealis for public access over the cloud. With 216 squeezed-state qubits. Borealis is the largest photonic quantum computer ever built, and the first of its kind to ever be made accessible to the public.

Borealis provides remarkable power on a very specific type of mathematical problem known as Gaussian Boson Sampling. Borealis was designed to access this problems, allowing remote users to run their own quantum programs to encode matrices, and returning to them the output of the machine — samples from the Hafnian-based probability distribution specified by the user. In fact, Borealis is first computer capable of quantum computational advantage to be deployed on the cloud. The runtime advantage over classical computers is extreme. It would take, on average, 9000 years for the most powerful supercomputer in the world to produce a single output when running this task via direct simulation. However, Borealis requires only 36 microseconds. The results of this test were peer-reviewed, and are now published in the scientific journal **Nature**.

Aside from its cloud deployment, Borealis also lays claim to a number of other important firsts. Most crucially, it is the first photonic quantum computer with quantum computational advantage to offer users full programmability over all its gates — over 1200 parameters can be freely specified by the user encoding their program, as well as the brightness of the input squeezed-state qubits.



Source: Xanadu

READMORE

計畫補助單位：MOST 科技部 Ministry of Science and Technology

IBM Quantum Computer Hub at National Taiwan University

Rm.711, Dept. of Physics /Center for Condensed Building

No. 1, Sec.4 Roosevelt Rd., Da'an Dist. Taipei City 106319, Taiwan

ntuq2018@gmail.com :+886 2-33669928 http://quantum.ntu.edu.tw/