Big Blue's Big Leap: Quantum center takes on 53 qubit system

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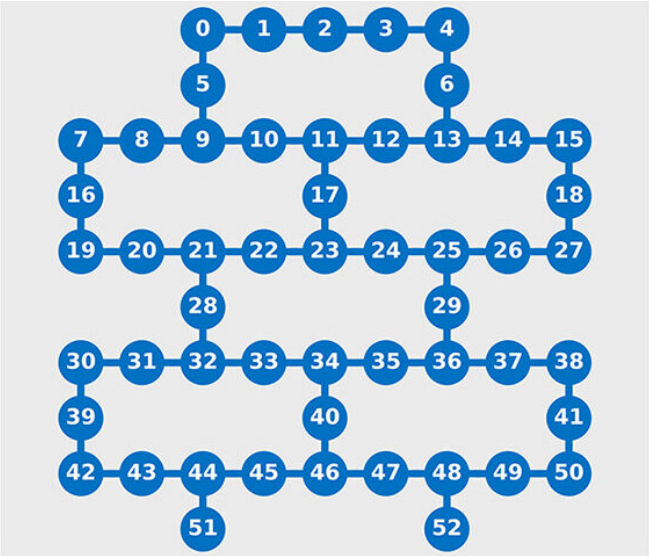

The 53-qubit system offers a larger lattice and gives users the ability to run even more complex entanglement and connectivity experiments. Credit: IBM

IBM has a fleet of quantum computers. That much is fairly well known since IBM has been actively promoting quantum computing for several years. But IBM's quantum story will get all the more interesting next month, when a 53 qubit computer joins the line, making it the most powerful quantum computer available for use outside IBM.

"Next month, IBM will make a 53-qubit quantum computer available to clients via its Q Network quantum cloud computing service," said *Bits&Chips* . That network, said *Asian Scientist Magazine*, and grew into an "ecosystem of Fortune 500 companies, start-ups, universities and national research labs."

IBM's new machine will be part of the company's quantum computation center in Poughkeepsie, New York State, marking an unveiling of its 14th quantum computer. The center "is essentially a data center for IBM's quantum machines," said Frederic Lardinois in *TechCrunch*.

The facility houses an array of other quantum computers. "The involvement of Poughkeepsie is no coincidence," said John Dunn in *Naked Security*. Poughkeepsie is the heritage site where IBM built many of the mainframes that made its name synonymous with business computing.

Building computers that operate under a totally different set of rules—that is how an IBM staffer starts off to explain quantum computers to a teen in an educational video.

"Quantum mechanics is a branch of science...and we are using it to totally reimagine how computing works." She spins a penny. Never just head nor just tails but a combo of heads and tails.

As CNET described the behavior of quantum computing, it is simultaneously evaluating multiple possibilities.

"Quantum physics promises to change computing by ditching the traditional zeroes and ones of computing states in favour of quantum phenomena like superposition and entanglement—where separate particles influence each other and wave interference," wrote John Oates in *The Register*. "In research terms, it promises to allow fundamentally different approaches to research in fields from chemistry and physics to financial analysis."

Lucian Armasu clarified what IBM means in talking about "quantum volume" and why it matters—just chasing higher qubit counts has not excited IBM.

"A high qubit number doesn't mean too much unless the error rate is sufficiently small, too," he said in *Tom's Hardware*. This is why IBM uses a "quantum volume" formula that takes into account both the number of qubits and the error rate.

Earlier this year, Rebecca Tan in *Asian Scientist Magazine* discussed how quantum computing had its share of challenges. There's something called coherence time of qubits, "the length of time that researchers can maintain a qubit's quantum state. To protect them from random interference such as mechanical vibration, electromagnetic waves and temperature fluctuations, a quantum processor's qubits are kept in a dilution refrigerator that is cooled to extremely low temperatures of 10–15 milliKelvin, about a hundred times colder than outer space."

Fabienne Lang in *Interesting Engineering* noted we're still at an early phase. She added, "quantum computing is limited by tricky physics, and the fact that quantum computers need to be stored at very cold and specific temperatures means that it limits the development of these systems."

Stephen Shankland made a similar point in CNET: "Quantum computing remains a highly experimental field, limited by the difficult physics of the ultra-small and by the need to keep the machines refrigerated to within a hair's breadth of absolute zero to keep outside disturbances from ruining any calculations."

Early phase indeed. Interest among potential users mounts but don't expect to see these devices turning up in dorm rooms.

IBM Q's Doug McCLure said "our goal is to help the global IBM Q community get "quantum ready"—to prepare to take full advantage of the quantum computing era as it arrives."

IBM's vision of quantum computing adoptions does not take the shape of expectations they will replace classical computers any time soon. IBM's Talia Gershon said this was just the beginning of a "many-decade adventure."

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