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QC Ware Joins The Growing Ranks Of Companies Offering Quantum Cloud Computing Services

QC Ware, a Palo Alto, California, startup that offers quantum computing-as-a-service, announced this week that it's opened up a public beta of its quantum cloud service, called Forge. With this offering, the company joins IBM, Rigetti and D-Wave as another entrant into the growing market for quantum cloud services, but unlike those companies, QC Ware is focused on software development rather than building its own quantum computers.

"We're specifically focused on finding ways to accelerate hard enterprise problems," says CEO Matt Johnson.

Through Forge, customers can gain access to a library of the quantum algorithms that QC Ware has spent the past years developing in collaboration with its customers. Quantum algorithms take advantage of the fact that unlike a traditional computer, where a bit is always represented as a "0" or a "1," a quantum bit, or "qubit," can exist indeterminately as one or the other while a computation is being run. This enables a quantum computer to perform particular types of computation much faster than a regular computer.

For QC Ware's customers, those algorithms can be integrated to suit their needs, and once it's ready, Forge can run them either on a high-performance computer capable of simulating quantum operations or on an actual quantum computer. Customers will be able to choose to run on machines owned by D-Wave, IBM or Rigetti.

Despite rumors earlier this week that Google was able to achieve "quantum supremacy" on a particularly hard problem (meaning that its quantum system may have solved a problem faster than a classical computer), most experts agree that the achievement of a real quantum advantage (where a quantum computer solves a meaningful problem faster than a traditional solution) is still between three and ten years away. That said, companies across many different industries, such as J.P. Morgan or Volkswagen, are already investigating how quantum advantage can improve their businesses once they arrive. Gartner estimates that 20% of organizations will be budgeting for quantum products by 2023.

"If you look at Wall Street, for instance, and look at the five largest banks—all of those banks have a quantum computing program running at this point," says Johnson.

Johnson cofounded QC Ware in 2014, having become enamored with the idea of quantum computing after meeting a group of researchers at NASA Ames talking about it a couple of years earlier. He says that for him, part of wanting to get moving on developing quantum software was "the allure of commercializing a technology that I thought was going to be really important to commercial industry but also to the government." The company has raised $8.2 million in venture backing so far, and according to Johnson is close to being

cash-flow positive.

A large part of the commercialization that drew Johnson into this industry involves the development of quantum algorithms. Right now they can be simulated on a regular computer, but once hardware has achieved quantum supremacy, they'll run significantly more quickly. The idea behind developing quantum algorithms now is so organizations don't have to play catch-up once quantum supremacy arrives.

One of the challenges, though, is that while classical computers all run on the same basic architecture, there are currently multiple competing quantum computing architectures—and as the hardware develops, it's likely to turn out that the best architecture to use may well depend on the problem at hand. Which is why QC Ware's head of simulations (and *Forbes* Under 30 alumnus) Robert Parrish is actively involved in developing hardware-agnostic software stacks.

"It's very unclear at the moment which one of these technologies is going to succeed first and which is going to be the right one to use for a given problem," he says.

Forge customers will be able to experiment with this themselves, as the cloud service will enable them to make use of several different types of quantum hardware. Potential customers will have an opportunity to have a 30-day evaluation of the service that includes one minute of quantum computing time, after which they'll have an opportunity to subscribe to it. Pricing for the service starts at $2,500 for one hour of quantum computing time—a bargain compared to the tens of millions of dollars it currently costs to develop or purchase quantum hardware. In offering these services, the company believes it will move quantum computing closer to a useful reality.

"Practical quantum advantage will occur," Johnson said in a statement. "Most experts agree that it's a matter of when, not if. The way to pull that horizon closer is by having the user community fully engaged in quantum computing application discovery."

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