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DARPA Enters Phase 2 of Project Targeting ‘Quantum Advantage’

Rigetti and USRA are supporting this future-facing effort

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Rigetti Computing and the Universities Space Research Association or USRA on Thursday confirmed they’re kicking off the second phase of a Defense Advanced Research Projects Agency-led effort to develop next-level, quantum computers.

Building on the first phase of the Optimization with Noisy Intermediate Scale Quantum devices program, which launched in 2020, the entities are now pushing DARPA’s ONISQ further—with ultimate aims to demonstrate quantum advantage on intermediate scale quantum computers with hundreds of qubits.

Demonstrating quantum advantage would mean proving that a quantum computer is capable of solving a problem that would essentially take forever, or an unfeasible amount of time on a classical computer.

“Specifically, the program is looking to solve a class of problems called combinatorial optimization problems,” a Rigetti spokesperson told Nextgov on Friday. “In practical terms that can be things like complex scheduling tasks, supply chain logistics or network optimization, which are important for both military and civilian operations.”

So far, the work has resulted in more than 10 scientific papers that were published or presented at international conferences, or are currently under review.

Quantum information science is an emerging field that exploits unusual physics that occurs at subatomic levels to process data and information in new and even unimaginable ways, and holds potential to introduce disruptive breakthroughs across many sectors. While the basic units of information in traditional computers are known as binary bits, quantum computers run on qubits.

The initial phase of this DARPA-backed pursuit was conducted on Rigetti’s 32 and 40-qubit systems, and the team’s algorithm development reached a milestone called “ $N.p > 100$.”

“This means that the number of qubits (N) multiplied by the number of operations performed on those qubits (p) is greater than or equal to 100,” Rigetti’s spokesperson explained.

Phase 2 will begin on the company’s recently announced 80-qubit system, known as Aspen-M. And over the two and a half years-long project phase, officials also plan to leverage future systems currently in Rigetti’s research and development pipeline.

“More qubits and improved error rates will allow us to encode more information and tackle more complex instantiations of the problem, measured by higher $N.p$ scores,” the spokesperson said. “Phase 2 also includes benchmarking the quantum algorithm against classical computers, to rigorously test whether the quantum solution in fact provides a performance enhancement over current approaches.”

They added that those involved believe that their “ability to achieve the ambitious milestones set in the first phase and advance to the second phase of the ONISQ program” was partly due to the fact that they’re using superconducting systems to power this work.

The official did not say whether ongoing supply chain challenges are impacting this initiative, but noted that Rigetti launched several new systems over the course of the first phase.

“We own and operate Fab-1, the industry’s only dedicated and integrated quantum device manufacturing facility, which allows us to design, test and [fabricate] new devices on significantly shorter timelines than third party foundries,” the spokesperson said.

See associated press release at nextgov.com.

About Rigetti Computing

Rigetti Computing is a pioneer in full-stack quantum computing. The company has operated quantum computers over the cloud since 2017 and serves global enterprise, government, and research clients through its Rigetti Quantum Cloud Services platform. The company’s proprietary quantum-classical infrastructure provides ultra-low latency integration with public and private clouds for high-performance practical quantum computing. Rigetti has developed the industry’s first multi-chip quantum processor for scalable quantum computing systems. The company designs and manufactures its chips in-house at Fab-1, the industry’s first dedicated and integrated quantum device manufacturing facility. Rigetti was founded in 2013 by Chad Rigetti and today employs more than 140 people with offices in the United States, U.K., and Australia.

Rigetti Computing announced in October it has entered into a definitive merger agreement with Supernova Partners Acquisition Company II, Ltd. (“Supernova II”) (NYSE:SNII), a publicly traded special purpose acquisition company. When the transaction closes, the publicly traded company will be named Rigetti Computing, Inc. and its common stock is expected to be listed on the NYSE under the ticker “RGTI.” Learn more at www.rigetti.com.

Additional Information and Where to Find It

Supernova has filed a registration statement on Form S-4 (as amended, the “Form S-4”) with the Securities Exchange Commission (the “SEC”), which includes a proxy statement/prospectus, that will be both the proxy statement to be distributed to holders of Supernova’s common shares in connection with its solicitation of proxies for the vote by Supernova’s shareholders with respect to the proposed business combination and other matters as may be described in the registration statement, as well as the prospectus relating to the offer and sale of the securities to be issued in the business combination. After the registration statement is declared effective, Supernova will mail a definitive proxy statement/prospectus and other relevant documents to its shareholders. This communication does not contain all the information that should be considered concerning the proposed business combination and is not intended to form the basis of any investment decision or any other decision in respect of the business combination. Supernova’s shareholders and other interested persons are advised to read, when available, the preliminary proxy statement/prospectus included in the registration statement and the amendments thereto and the definitive proxy statement/prospectus and other documents filed in connection with the proposed business

combination, as these materials will contain important information about Rigetti, Supernova and the business combination. When available, the definitive proxy statement/prospectus and other relevant materials for the proposed business combination will be mailed to shareholders of Supernova as of a record date to be established for voting on the proposed business combination. Shareholders will also be able to obtain copies of the preliminary proxy statement, the definitive proxy statement and other documents filed with the SEC, without charge, once available, at the SEC's website at www.sec.gov, or by directing a request to Supernova's secretary at 4301 50th Street NW, Suite 300 PMB 1044, Washington, D.C. 20016, (202) 918-7050.

Participants in the Solicitation

Supernova and its directors and executive officers may be deemed participants in the solicitation of proxies from Supernova's shareholders with respect to the proposed business combination. A list of the names of those directors and executive officers and a description of their interests in Supernova is contained in Supernova's prospectus dated March 3, 2021 relating to its initial public offering, which was filed with the SEC and is available free of charge at the SEC's website at www.sec.gov. To the extent such holdings of Supernova's securities may have changed since that time, such changes have been or will be reflected on Statements of Change in Ownership on Form 4 filed with the SEC. Additional information regarding the interests of such participants will be contained in the proxy statement/prospectus for the proposed business combination when available.

Rigetti and its directors and executive officers may also be deemed to be participants in the solicitation of proxies from the shareholders of Supernova in connection with the proposed business combination. A list of the names of such directors and executive officers and information regarding their interests in the proposed business combination will be included in the proxy statement/prospectus for the proposed business combination when available.

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Certain statements in this communication may be considered forward-looking statements. Forward-looking statements generally relate to future events and can be identified by terminology such as "pro forma", "may", "should", "could", "might", "plan", "possible", "project", "strive", "budget", "forecast", "expect", "intend", "will", "estimate", "anticipate", "believe", "predict", "potential" or "continue", or the negatives of these terms or variations of them or similar terminology. Such forward-looking statements are subject to risks, uncertainties, and other factors which could cause actual results to differ materially from those expressed or implied by such forward looking statements. These forward-looking statements are based upon estimates and assumptions that, while considered reasonable by Supernova and its management, and Rigetti and its management, as the case may be, are inherently uncertain. Factors that may cause actual results to differ materially from current expectations include, but are not limited to: the outcome of any legal proceedings that may be instituted against Supernova, Rigetti, the combined company or others following the announcement of the business combination and any definitive agreements with respect thereto; the inability to complete the proposed business combination due to the failure to obtain approval of the shareholders of Supernova or to satisfy other conditions to closing; changes to the proposed structure of the business combination that may be required or appropriate as a result of applicable laws or

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