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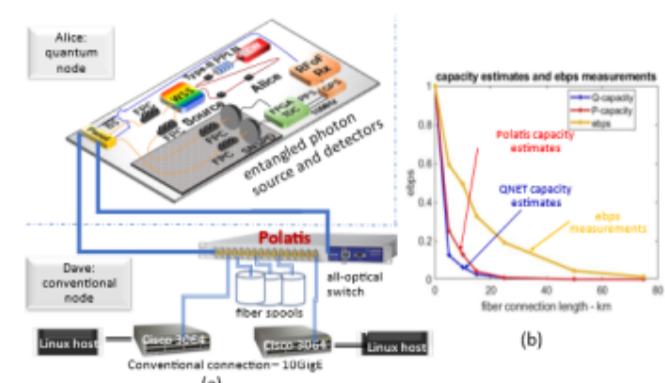
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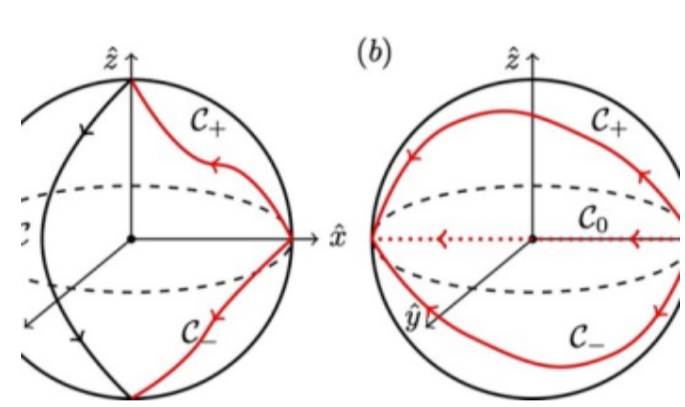
Highlights

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Thoughts Compare Throughput for Quantum vs. Conventional Networks

A comparison of throughput measurements and analytical capacity estimates for quantum networks finds surprising patterns.



Novel Hardware Approach Produces a New Quantum Computing Paradigm

New theoretical approach to quantum computing hardware design via an algorithm avoids some of the complex difficulties in modern quantum computers.

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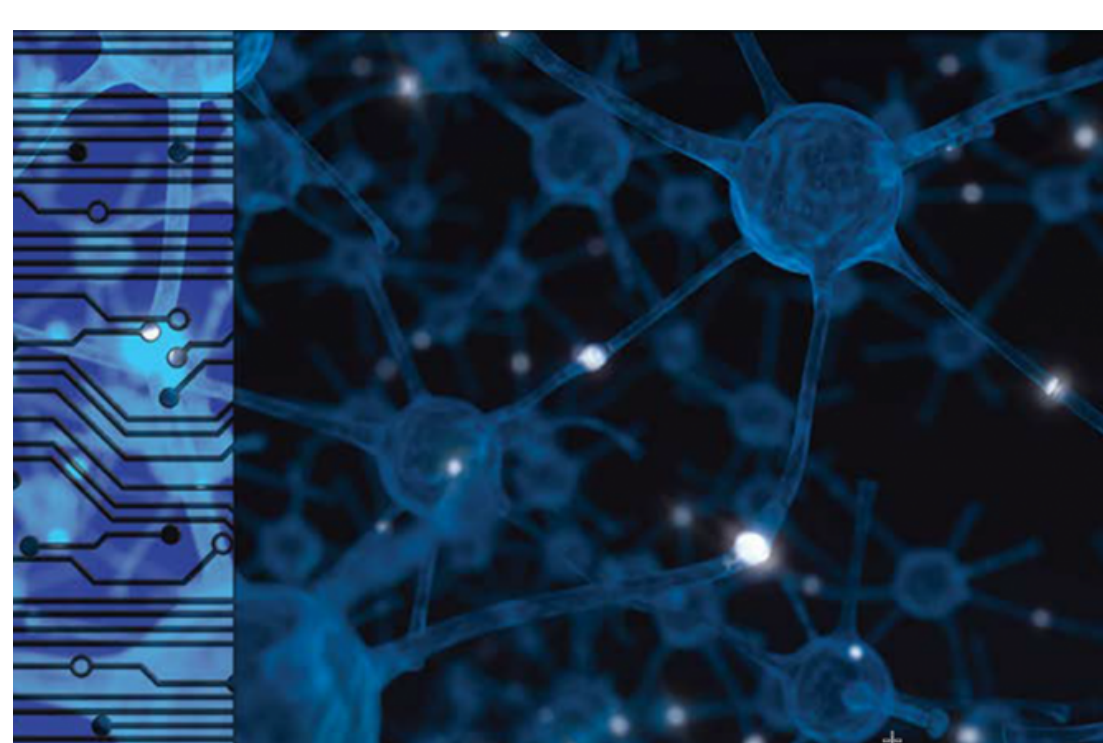
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Computer Science



The ASCR Computer Science research program supports long-term, basic research that enables computing and networking at extreme scales and the understanding of extreme scale and complex data from both simulations and experiments. It aims to make high-performance scientific computers and networks highly productive and efficient to solve scientific challenges, while attempting to reduce domain science application complexity as much as possible. The computer science program does this in the context of sharp increases in the heterogeneity and complexity of computing systems; the need to integrate simulation, data analysis, and other tasks seamlessly and intelligently into coherent and usable workflows; and the challenges posed by highly novel computing platforms, such as neuromorphic and quantum systems.

Key activities include support for foundational research in:

- Developing adaptive, portable, high-performance scientific software, including testing, validation, and verification
- Programming technologies and tools for, and co-design of, state-of-the-art and future computing systems, including quantum-computing systems
- Distributed systems, including quantum networks, and workflow development integrating simulation, experimental control, data analysis, and data visualization
- Techniques for integrating and scaling scientific AI along with making research data and AI models findable, accessible, interoperable, and reusable (FAIR)

These activities provide the foundation for increasing the capability of the national scientific computing and data ecosystem by focusing on long-term research to develop software, algorithms, and methods that anticipate future hardware challenges and opportunities as well as science application needs.

ASCR Funding

- FY2024: Microelectronics Science Research Center Projects for Energy Efficiency and Extreme Environments: [Press Release](#), [Award List](#), [Lab Funding Opportunity](#)
- FY2024: EXPRESS: 2024 Exploratory Research for Extreme-Scale Science: [Press Release](#), [Award List](#), [Funding Opportunity](#)
- FY2024: FY2024 Reaching a New Energy Sciences Workforce (RENEW): [Press Release](#), [Award List](#), [Funding Opportunity](#)
- FY2024: Data Reduction for Science: [Press Release](#), [Award List](#), [Funding Opportunity](#)
- FY2024: Accelerated Research in Quantum Computing: [Press Release](#), [Award List](#), [Funding Opportunity](#)
- FY2024: Advancements in Artificial Intelligence for Science: [Press Release](#), [Award List](#), [Funding Opportunity](#)
- FY2024: Competitive Portfolios for Advanced Scientific Computing Research: [Press Release](#), [Award List](#), [Lab Funding Opportunity](#)
- FY2024: FY2024 Funding for Accelerated, Inclusive Research (FAIR): [Press Release](#), [Award List](#), [Funding Opportunity](#)
- FY2024: Early Career Research Program: [Press Release](#), [Award List](#), [Funding Opportunity](#)
- FY2023: Scientific Enablers of Scalable Quantum Communications: [Press Release](#), [Award List](#), [Lab Funding Opportunity](#)
- FY2023: Accelerate Innovations in Emerging Technologies: [Press Release](#), [Award List](#), [Lab Funding Opportunity](#)
- FY2023: Biopreparedness Research Virtual Environment (BRaVE): [Press Release](#), [Award List](#), [Lab Funding Opportunity](#)
- FY2023: EXPRESS: 2023 Exploratory Research for Extreme-Scale Science: [Press Release](#), [Award List](#), [Funding Opportunity](#)
- FY2023: Advanced Scientific Computing Research – Reaching a New Energy Sciences Workforce (ASCR-RENEW): [Press Release](#), [Award List](#), [Funding Opportunity](#)
- FY2023: FY2023 Funding for Accelerated, Inclusive Research (FAIR): [Press Release](#), [Award List](#), [Funding Opportunity](#)
- FY2023: Distributed Resilient Systems: [Press Release](#), [Award List](#), [Funding Opportunity](#)
- FY2023: Early Career Research Program: [Press Release](#), [Award Abstracts](#), [Funding Opportunity](#)
- FY2022: Advanced Scientific Computing Research – Reaching a New Energy Sciences Workforce (ASCR-RENEW): [Press Release](#), [Award List](#), [Funding Opportunity](#)
- FY2022: Advanced Computer Modeling and Epidemiology for Biopreparedness and Response: [Press Release](#), [Award List](#), [Lab Funding Opportunity](#)
- FY2022: Data Visualization for Scientific Discovery, Decision-Making, and Communication: [Press Release](#), [Award List](#), [Funding Opportunity](#)
- FY2022: Management and Storage of Scientific Data: [Press Release](#), [Award List](#), [Funding Opportunity](#)
- FY2022: EXPRESS: 2022 Exploratory Research for Extreme-Scale Science: [Press Release](#), [Award List](#), [Funding Opportunity](#)
- FY2022: Early Career Research Program: [Press Release](#), [Award Abstracts](#), [Funding Opportunity](#)
- FY2021: Data Science for Reduction: [Press Release](#), [Award List](#), [Funding Opportunity](#)
- FY2021: Integrated Computational and Data Infrastructure (ICDI) for Scientific Discovery: [Press Release](#), [Award List](#), [Funding Opportunity](#)
- FY2021: Entanglement Management and Control in Transparent Optical Quantum Networks: [Press Release](#), [Award List](#), [Funding Opportunity](#)
- FY2021: X-Stack: Programming Environments for Scientific Computing: [Press Release](#), [Award List](#), [Funding Opportunity](#)
- FY2021: Early Career Research Program: [Press Release](#), [Award Abstracts](#), [Funding Opportunity](#)
- FY2020: FAIR Data and Models for Artificial Intelligence and Machine Learning: [Press Release](#), [Award List](#), [Funding Opportunity](#), [Lab Funding Opportunity](#)
- FY2020: Early Career Research Program: [Press Release](#), [Award Abstracts](#), [Funding Opportunity](#), [Lab Funding Opportunity](#)
- FY2019: Artificial Intelligence, Machine Learning, and Data Analytics CoDesign: [Press Release](#), [Award List](#), [Lab Funding Opportunity](#)
- FY2019: Transparent Optical Quantum Networks for Distributed Science: [Press Release](#), [Award List](#), [Lab Funding Opportunity](#)
- FY2019: Accelerated Research in Quantum Computing (ARQC): [Press Release](#), [Award List](#), [Funding Opportunity](#), [Lab Funding Opportunity](#)
- FY2019: Early Career Research Program: [Press Release](#), [Award Abstracts](#), [Funding Opportunity](#), [Lab Funding Opportunity](#)
- FY2018: Exploratory Research for Extreme-Scale Science: [Quantum Computing Application Teams \(QCATS\): \[Press Release\]\(#\), \[Award List\]\(#\), \[Lab Funding Announcement\]\(#\)](#)
- FY2018: Early Career Research Program: [Press Release](#), [Award Abstracts](#), [Funding Opportunity](#), [Lab Funding Announcement](#)

Award abstracts and information about awards made prior to FY2018 can be found [here](#) [↗](#).

ASCR Workshops and Reports

- [2024 Workshop on Energy-Efficient Computing for Science \(September 2024\)](#) [↗](#)
- [2024 Workshop on Analog Computing for Science \(September 2024\)](#) [↗](#)
- [2024 Workshop on Neuromorphic Computing for Science \(September 2024\)](#) [↗](#)
- [Integrated Research Infrastructure Blueprint Activity \(July 2023\)](#)
- [Report for the ASCR Workshop on Basic Research Needs in Quantum Computing and Networking \(July 2023\)](#)
- [Visualization for Scientific Discovery, Decision-Making, and Communication \(March 2023\)](#)
- [Envisioning Science in 2050 \(June 2022\)](#)
- [Reimagining Codesign for Advanced Scientific Computing \(April 2022\)](#)
- [Computer Science Research Needs for Parallel Discrete Event Simulation \(PDES\) \(May 2022\)](#)
- [Basic Research Needs for Management and Storage of Scientific Data \(January 2022\)](#)
- [Lessons from the COVID Era and Visions for the Future \(July 2021\)](#)
- [Data Reduction for Science \(April 2021\)](#)
- [AI for Science: Report on the Department of Energy Town Halls on Artificial Intelligence for Science \(February 2020\)](#)
- [From Long-distance Entanglement to Building a Nationwide Quantum Internet: Report of the DOE Quantum Internet Blueprint Workshop \(February 2020\)](#)
- [Data and Models: A Framework for Advancing AI in Science \(December 2019\)](#)
- [Quantum Networks for Open Science \(QNOS\) Workshop \(April 2019\)](#)
- [Workshop Report on Basic Research Needs for Scientific Machine Learning: Core Technologies for Artificial Intelligence \(February 2019\)](#)
- [ASCR Workshop on In Situ Data Management: Enabling Scientific Discovery from Diverse Data Sources \(January 2019\)](#)
- [Storage Systems and Input/Output: Organizing, Storing, and Accessing Data for Scientific Discovery \(September 2018\)](#)
- [Crosscut Report: Exascale Requirements Reviews \(January 2018\)](#)
- [Extreme Heterogeneity 2018: Productive Computational Science in the Era of Extreme Heterogeneity Report for DOE ASCR Basic Research Needs Workshop on Extreme Heterogeneity \(January 2018\)](#)
- [ASCR Report on a Quantum Computing Testbed for Science \(December 2017\)](#)
- [Report of the HPC Correctness Summit \(October 2017\)](#)

Workshop and reports completed prior to FY2018 can be found [here](#).

ASCR Meetings

- [2024 ASCR Computer Science Principal Investigators Meeting](#) [↗](#)

Other Notable Reports

- [National Artificial Intelligence Research and Development Strategic Plan, 2023 Update \(May 2023\)](#) [↗](#)
- [Advanced Research Directions on AI for Science, Energy, and Security: Report on Summer 2022 Workshops \(May 2023\)](#)
- [National Strategy to Advance Privacy-Preserving Data Sharing and Analytics \(March 2023\)](#) [↗](#)
- [Pioneering the Future Advanced Computing Ecosystem: A Strategic Plan \(November 2020\)](#) [↗](#)
- [Office of Basic Energy Sciences Roundtable on Producing and Managing Large Scientific Data with Artificial Intelligence and Machine Learning \(October 2020\)](#)
- [National Strategic Computing Initiative Update: Pioneering the Future of Computing \(November 2019\)](#) [↗](#)
- [Opportunities and Challenges from Artificial Intelligence and Machine Learning for the Advancement of Science, Technology, and the Office of Science Missions \(September 2020\)](#)
- [Basic Energy Sciences Roundtable on Opportunities for Basic Research for Next-Generation Quantum Systems \(October 2017\)](#) [↗](#)

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