

Customer profile



**UNIVERSITY OF  
CAMBRIDGE**

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## Energy-efficient supercomputing helps drive breakthrough research

The University of Cambridge and Dell Technologies collaborate to support advanced and sustainable research through a reduction in power consumption and carbon-neutral energy innovation.



By providing powerful, energy-efficient supercomputing to scientists and organizations, the University of Cambridge enables breakthroughs in innovation that rely on AI, analytics and simulations performed on increasingly large data volumes. This helps to support the U.K.'s green energy ambitions, through state-of-the-art computational resources and the design of carbon-neutral fusion technologies.

### Transformations



Delivering advanced technology and powering human progress with minimal environmental impact.



Enabling cross-industry collaborations and sustainable scientific research.

### Outcomes



Achieves the best possible ratio of scientific output to energy consumption.



2x energy efficiency,  
5x the simulations capability  
and 20x faster AI performance.



Eases the adoption of supercomputing for new entrants.



Provides a model for academic and industry collaboration to support the UK's green energy ambitions.



“An AI task that previously would have taken two years is now achievable in just a month.”

### Dr. Paul Calleja

Director of Research Computing and the Exascale Lab, University of Cambridge

Research Computing Services and the Cambridge Open Exascale Lab at the University of Cambridge have worked with Dell Technologies to create a high performance computing (HPC) infrastructure that revolutionizes what researchers can accomplish. Together, they have developed an advanced supercomputer that can deliver 20 times the AI performance and five times the simulation capability of previous technologies.

Dr. Paul Calleja, Director of Research Computing Services and the Exascale Lab at the University of Cambridge, says, “At the University of Cambridge, we provide the U.K.’s largest academic supercomputer to solve some of the world’s most demanding research problems. An AI task that previously would have taken two years is now achievable in just a month.”

## Lowering the power consumption threshold of research

Research Computing Services supports many scientific efforts to mitigate climate change and reduce the carbon footprints of businesses and consumers. For example, through a major collaboration with the UK Atomic Energy Authority (UKAEA) — the UK’s national fusion laboratory — the University of Cambridge is providing state-of-the-art computational resources. UKAEA uses this to research fusion energy and is designing world-leading carbon-neutral reactors built around the physics that powers the stars in an effort to help solve the climate crisis.<sup>1</sup> It also aims to reduce its own environmental impact and the power consumed by supercomputing systems. Doing so could facilitate research that would otherwise face a power consumption threshold. “You just can’t provide enough power to solve the largest problems,” Calleja explains. “Our [exascale] systems in planning will consume 20–30 megawatts of power. This is not sustainable and really sets a high bar of entry for HPC. We have to look at how we can lower that power footprint.”

## Balancing energy efficiency and performance

In collaboration with Dell Technologies, Research Computing Services and the Exascale Lab have succeeded in reducing the power consumption of supercomputing without slowing innovation. The team has optimized the Wilkes3 supercomputer to be the third-most energy-efficient in the world.<sup>2</sup> It is also the U.K.’s fastest academic supercomputer.<sup>3</sup> Physically, this extremely large system resides on a hundred racks in the data center, comprises 2,500 servers and consumes a megawatt of power. Calleja notes, “By working with Dell, we can mix different computing technologies in a single system to give us the best bang for the buck in terms of cost per scientific output, and, more importantly, the best power per scientific output.”

This accomplishment is great news for over 3,000 researchers working on 700 breakthrough projects, as well as for 400 annual Ph.D. students and postdoctoral fellows who depend on Cambridge University’s supercomputer. They can pursue their research goals with confidence in the supercomputer’s performance and energy efficiency.

## Building a sustainability breakthrough quickly

Research Computing Services, the Exascale Lab and Dell Technologies have accomplished a high level of power efficiency without reengineering the HPC platform. “In the first six months, we’ve managed to dramatically lower the power consumed by the system,” Calleja concludes. “We’ve almost doubled its energy efficiency by means of quite straightforward optimizations. This has enabled us to have the third-most energy-efficient supercomputer in the world, as ranked in the international Green500 list.”

1. CCFE.

2. Green500, as of October 2021.

3. Top500, as of October 2021.

See how University of Cambridge drives sustainability.



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