



What's New in HPC Research: Volcanoes, Mobile Games, Proteins & More

By Oliver Peckham

July 14, 2020

In this bimonthly feature, *HPCwire* highlights newly published research in the high-performance computing community and related domains. From parallel programming to exascale to quantum computing, the details are here.

Using AI to enhance the energy efficiency of HPC

(<https://www.researchgate.net/publication/342292554>) Artificial Intelligence An Energy Efficiency Tool for Enhanced High performance computing

As supercomputers soar in computing ability, the energy necessary to power them is soaring in tandem. These researchers – a team from Nigeria and Korea – present a database to sample system components' power consumption at regular intervals to serve as input data for energy efficiency optimization. Further, they discuss applications of AI to assess this database and automatically adjust components to maximize energy efficiency.

Authors: Anabi Hilary Kelechi, Mohammed H. Alsharif, Okpe Jonah Bameyi, Paul Joan Ezra, Iorshase Kator Joseph, Aaron-Anthony Atayero, Zong Woo Geem and Junhee Hong.

(<https://6lli539m39y3hpkelqsm3c2fg-wpengine.netdna-ssl.com/wp-content/uploads/2020/07/volcanic-eruption-simulation.png>) Estimating volcanic emissions using supercomputing

(https://link.springer.com/chapter/10.1007/978-3-030-50420-5_5)

When volcanoes erupt, they spew massive amounts of sulfur dioxide into the atmosphere – sometimes enough to change local or global climates for weeks or months. A team of researchers from Guangzhou, Beijing and Jülich conducted a high-performance case study of these volcanic emissions, using a particle dispersion model running on the Tianhe-2 supercomputer to estimate volcanic emissions.

Authors: Mingzhao Liu, Yaopeng Huang, Lars Hoffman, Chunyan Huang, Pin Chen and Yi Heng.

Cloud HPC for exhaustive protein-protein docking (<https://arxiv.org/pdf/2006.08905.pdf>)

As cloud computing continues its upward trajectory, its applications in bioinformatics are growing in number. In this paper, a team of Japanese researchers discuss a port of MEGADOCK, a protein-protein interaction prediction model, to Microsoft Azure. The researchers find a strong scaling value for both the CPU and GPU instances and cite high portability.

Authors: Masahito Ohue, Kento Aoyama and Yutaka Akiyama.

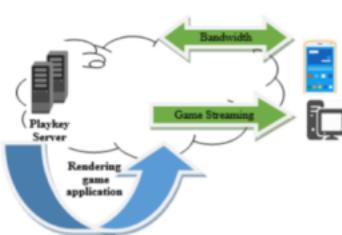


Figure 3. Rendering and streaming cloud gaming

(<https://6lli539m39y3hpkelqsm3c2fg-wpengine.netdna-ssl.com/wp-content/uploads/2020/07/using-an-hpc-environment-for-cloud-gaming.png>) Using an HPC environment for mobile cloud gaming

(<https://search.proquest.com/openview/da59e0a3e6adcc17cfda06d677d58b17/1?pq-origsite=gscholar&cbl=376296>)

Even as mobile gaming becomes increasingly popular, the types of games playable on mobile systems remains hardware-limited. Cloud gaming – rendering games remotely and streaming them in real-time to client devices – is emerging as a solution to this bottleneck. This paper, written by a team of researchers from Indonesia, discusses the use of HPC cloud environments to manage and distribute these gaming workloads.

Authors: Dedy Prasetya Kristiadi, Ferry Sudarto, Evan Fabian Rahardja, Naufal Rayfi Hafizh, Christopher Samuel and Harco Leslie Hendric Spits Warnars.

Characterizing and identifying HPC applications at a leadership computing facility (<https://dl.acm.org/doi/abs/10.1145/3392717.3392774>)

Understanding the applications running on a supercomputer is crucial for planning its design, development and operation. In this paper, a team from Argonne National Laboratory, Oak Ridge National Laboratory and Northern Illinois University outline the use of correlative analysis of subsystem logs to show patterns in the applications running on leadership supercomputers.

Authors: Zhengchun Liu, Ryan Lewis, Rajkumar Kettimuthu, Kevin Harms, Philip Carns, Nageswara Rao, Ian Foster and Michael E. Papka.

(<https://6lli539m39y3hpkelqsm3c2fg-wpengine.netdna-ssl.com/wp-content/uploads/2020/07/modeling-the-climate-with-cloud.png>) Modeling the climate with cloud computing (<https://www.mdpi.com/2073-431X/9/2/52>)

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Climate modeling is typically conducted on supercomputers – but with the boom in cloud computing, new possibilities are emerging. These authors (from Australia, Spain and the UK) discuss the use of cloud computing for climate science by evaluating two different climate models customized to run in public cloud computing environments by Amazon, Google and Microsoft.

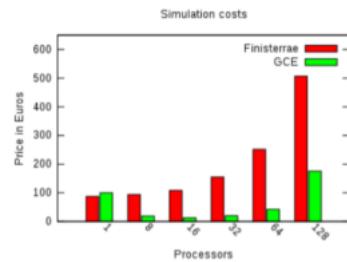
Authors: Diego Montes, Juan A. Añel, David C. H. Wallom, Peter Uhe, Pablo V. Caderno and Tomás F. Pena.

Benchmarking state-of-the-art HPC clusters with a production CFD code

(<https://dl.acm.org/doi/abs/10.1145/3394277.3401847>)

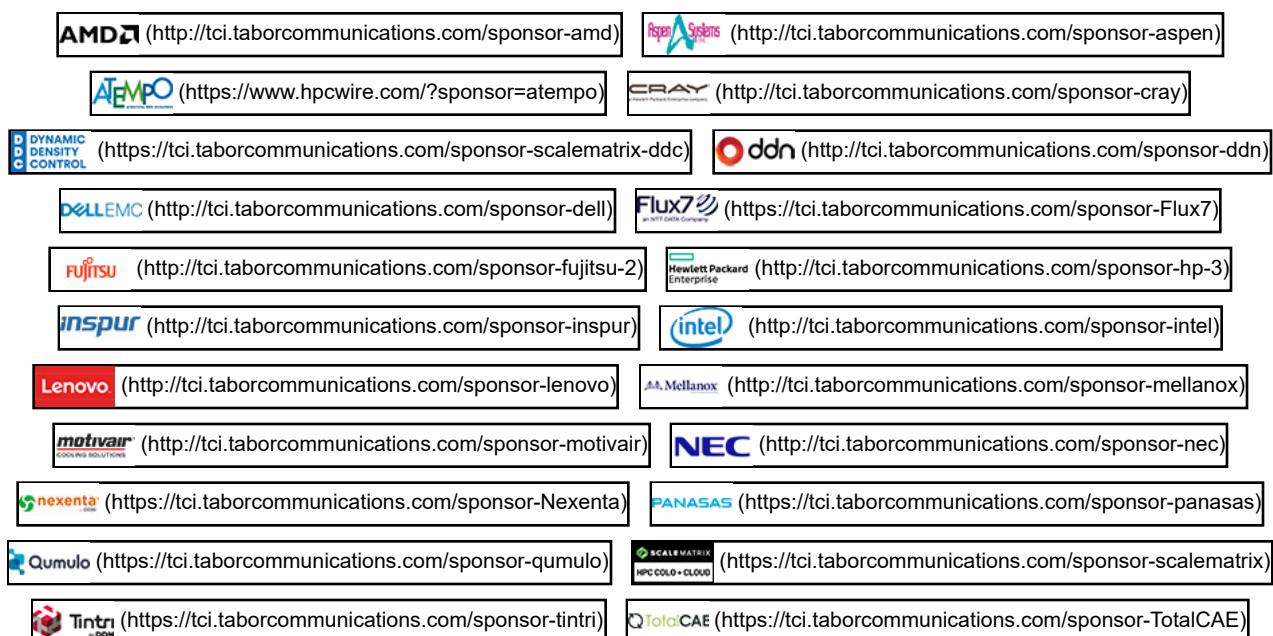
With the increasing complexity and heterogeneity of HPC clusters, effective programming for these platforms is becoming a more difficult task. In this paper, four researchers from the Barcelona Supercomputing Center conduct micro-benchmarking of three HPC clusters with diverse architectures present in the Top500 list of the world's most powerful publicly ranked supercomputers using a production computational fluid dynamics (CFD) code.

Authors: Fabio Banchelli, Marta Garcia-Gasulla, Guillaume Houzeaux and Filippo Mantovani.



Do you know about research that should be included in next month's list? If so, send us an email at oliver@taborcommunications.com (<mailto:oliver@taborcommunications.com>). We look forward to hearing from you.

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Industry Headlines



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- ➋ DOE Selects Three Projects to Increase Industry Access to High-Performance Computing Capabilities (<https://www.hpcwire.com/off-the-wire/doe-selects-three-projects-to-increase-industry-access-to-high-performance-computing-capabilities/>)
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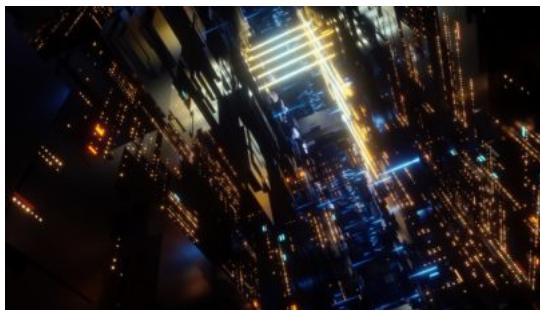
July 16, 2020

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- ➋ AMD Promotes Methodology Architect Alex Starr to Corporate Fellow (<https://www.hpcwire.com/off-the-wire/amd-promotes-methodology-architect-alex-starr-to-corporate-fellow/>)
- ➌ Supermicro Announces First Storage Summit (<https://www.hpcwire.com/off-the-wire/supermicro-announces-first-storage-summit/>)
- ➍ Ansys Discovery Improves Product Design Processes (<https://www.hpcwire.com/off-the-wire/ansys-discovery-greatly-improves-product-design-processes/>)
- ➎ Arizona Universities Join Research Computing Fight Against COVID-19 (<https://www.hpcwire.com/off-the-wire/arizona-universities-join-research-computing-fight-against-covid-19/>)
- ➏ Alfa Laval Assists Fugaku Supercomputer in the Fight Against COVID-19 (<https://www.hpcwire.com/off-the-wire/alfa-laval-assists-fugaku-supercomputer-in-the-fight-against-covid-19/>)
- ➐ Dell Technologies Explores VMware Spin-Off (<https://www.hpcwire.com/off-the-wire/dell-technologies-explores-vmware-spin-off/>)
- ➑ National Supercomputing Center in Korea, KISTI, Joins COVID-19 HPC Consortium (<https://www.hpcwire.com/off-the-wire/national-supercomputing-center-in-korea-kisti-joins-covid-19-hpc-consortium/>)
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DDR5 Memory Spec Doubles Data Rate, Quadruples Density

[\(https://www.hpcwire.com/2020/07/16/ddr5-memory-spec-doubles-data-rate/\)](https://www.hpcwire.com/2020/07/16/ddr5-memory-spec-doubles-data-rate/)

Standards group JEDEC announced the publication of the DDR5 SDRAM spec, the next-generation standard for random access memory (RAM). Compared to DDR4, the DDR5 spec doubles the data rate and quadruples the density.

By Tiffany Trader

Twitter (<https://twitter.com/intent/tweet?status=DDR5%20Memory%20Spec%20Doubles%20Data%20Rate%2C%20Quadruples%20Density+https%3A%2F%2Fwww.linkedin.com/shareArticle?mini=true&url=https%3A%2F%2Fwww.hpcwire.com%2F2020%2F07%2F16%2Fddr5-memory-spec-doubles-data-rate%2F&title=DDR5%20Memory%20Spec%20Doubles%20Data%20Rate%2C%20Quadruples%20Density&source=https%3A%2F%2Fwww.hpcwire.com%2Fmemory-spec-doubles-data-rate%2F&title=DDR5%20Memory%20Spec%20Doubles%20Data%20Rate%2C%20Quadruples%20Density/>)



Graphcore Introduces Next-Gen Intelligence Processing Unit for AI Workloads

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British hardware designer Graphcore, which emerged from stealth in 2016 to launch its first-generation Intelligence Processing Unit (IPU), has announced its next-generation IPU for AI workloads.

By Oliver Peckham

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heFFTe: Scaling FFT for Exascale

[\(https://www.hpcwire.com/2020/07/14/whats-new-in-hpc-research-volcanoes-mobile-games-proteins-more/\)](https://www.hpcwire.com/2020/07/14/whats-new-in-hpc-research-volcanoes-mobile-games-proteins-more/)

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Exascale computing aspires to provide breakthrough solutions addressing today's most critical challenges in scientific discovery, energy assurance, economic competitiveness
By Jack Dongarra and Stanimire Tomov

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There's No Storage Like ATGC: Breakthrough Helps to Store 'The Wizard of Oz' in DNA

(<https://www.hpcwire.com/2020/07/15/theres-no-storage-like-atgc-breakthrough-helps-to-store-the-wizard-of-oz-in-dna/>)

Even as storage density reaches new heights, many researchers have their eyes set on a paradigm shift in high-density information storage: storing data in the four nucleotide bases of DNA.

By Oliver Peckham

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Get a Grip: Intel Neuromorphic Chip Used to Give Robotics Arm a Sense of Touch

(<https://www.hpcwire.com/2020/07/15/get-a-grip-intel-neuromorphic-chip-used-to-give-robotics-arm-a-sense-of-touch/>)

Moving neuromorphic technology from the laboratory into practice has proven slow-going. This week, National University of Singapore researchers moved the needle forward ([give-robotics-arm-a-sense-of-touch/](#))

By John Russell

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INEOS TEAM UK Accelerates Boat Design for America's Cup Using HPC on AWS (https://www.hpcwire.com/solution_content/aws/ineos-team-uk-accelerates-boat-design-for-americas-cup-using-hpc-on-aws/)

The America's Cup Dream

The 36th America's Cup race will be decided in Auckland, New Zealand in 2021. Like all the teams, INEOS TEAM UK will compete in a boat whose design will have followed a complex process of simulation and optimization using AWS services.

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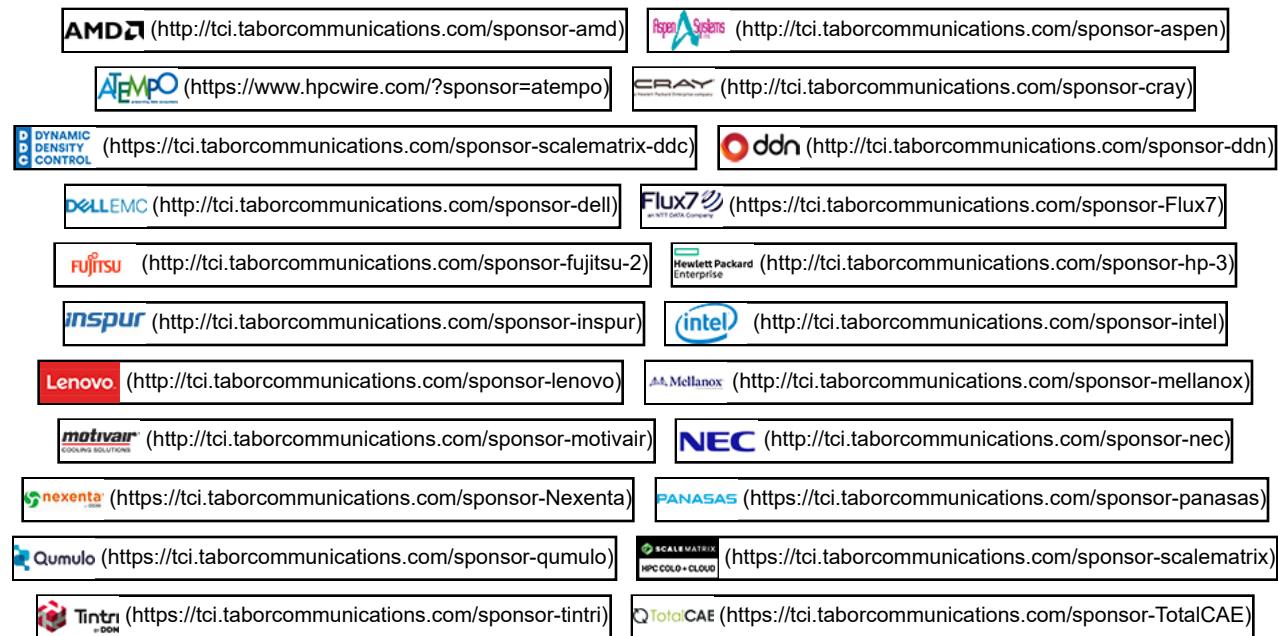
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By Oliver Peckham

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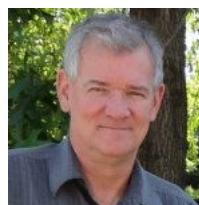
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Tiffany Trader
Managing Editor



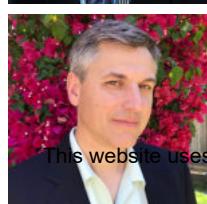
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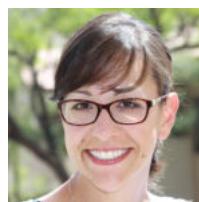
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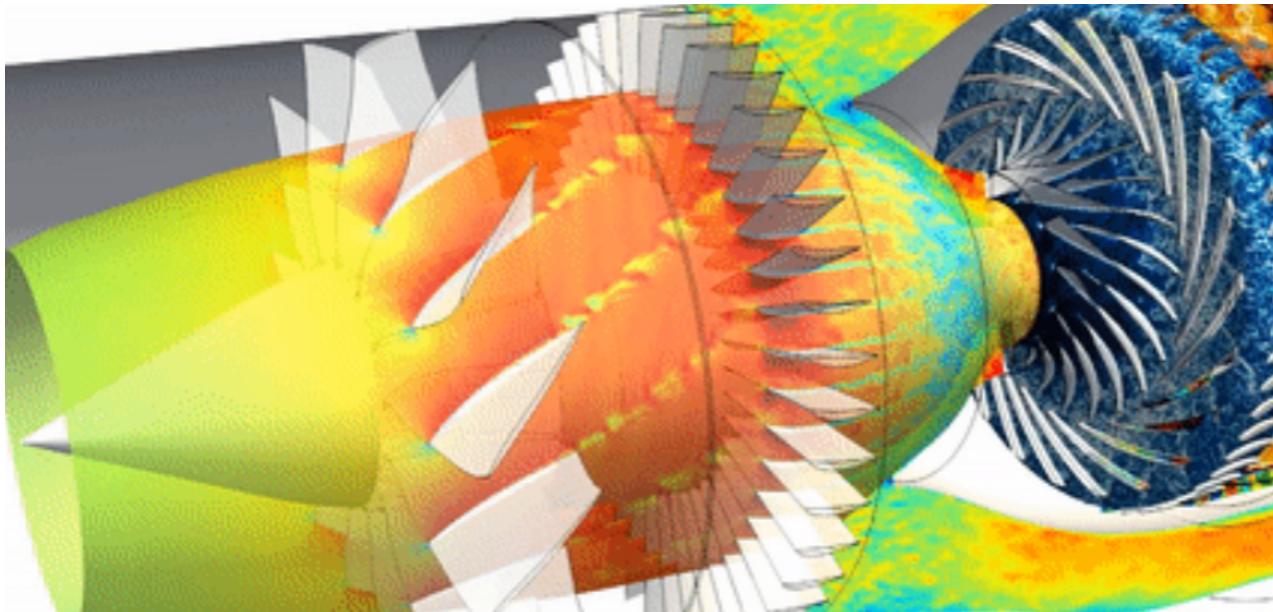
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Joliot-Curie Supercomputer Used to Build First Full, High-Fidelity Aircraft Engine Simulation

(<https://www.hpcwire.com/2020/07/14/joliot-curie-supercomputer-used-to-build-first-full-high-fidelity-aircraft-engine-simulation/>)

When industrial designers plan the design of a new element of a vehicle's propulsion or exterior, they typically use fluid dynamics to optimize airflow and increase the vehicle's [supercomputer-used-to-build-first-full-high-fidelity-aircraft-engine-simulation/](#)

By Oliver Peckham

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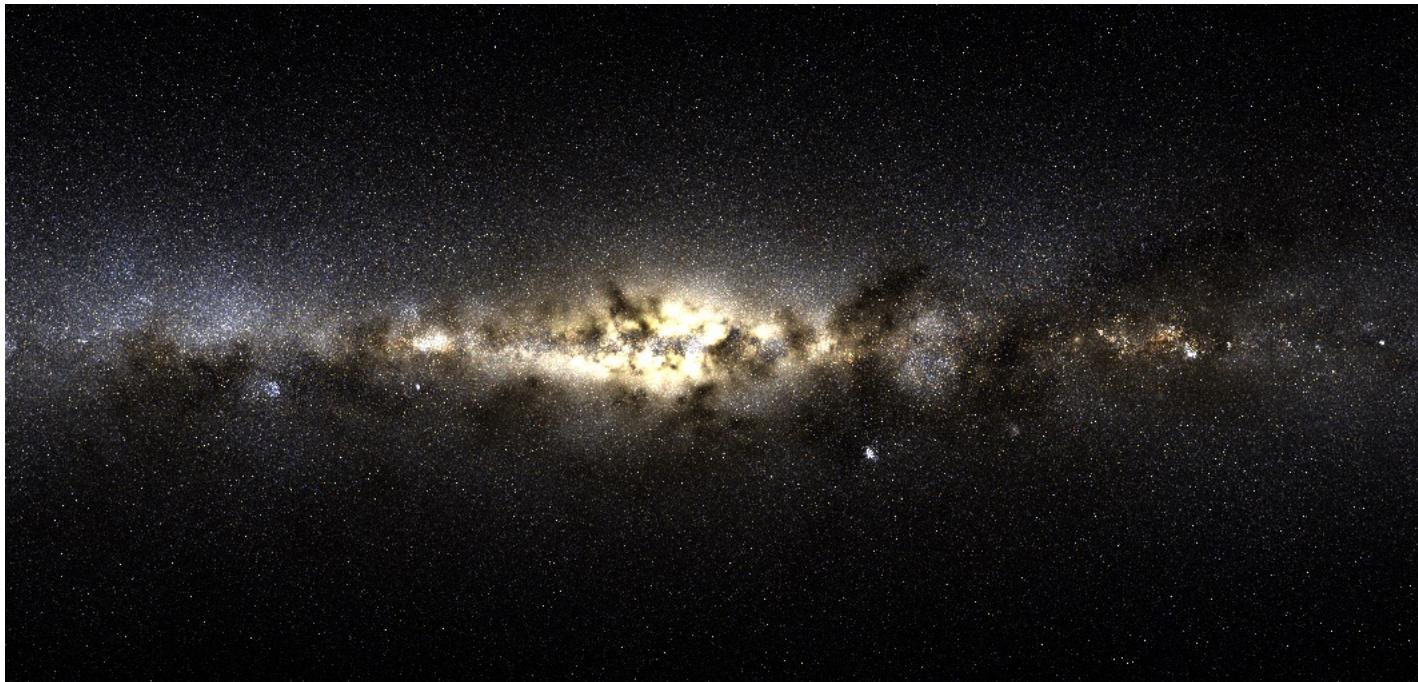


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Michael Kratsios, the U.S. Chief Technology Officer, has been appointed acting Undersecretary of Defense for research and engineering. [Read more... \(https://www.hpcwire.com/about-hpcwire/cookie-policy/\)](https://www.hpcwire.com/about-hpcwire/cookie-policy/)
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Supercomputer Research Reveals Star Cluster Born Outside Our Galaxy

(<https://www.hpcwire.com/2020/07/11/supercomputer-research-reveals-star-cluster-born-outside-our-galaxy/>)

The Milky Way is our galactic home, containing our solar system and continuing into a giant band of densely packed stars that stretches across clear night skies around the world. (<https://www.hpcwire.com/2020/07/11/supercomputer-research-reveals-star-cluster-born-outside-our-galaxy/>)

By Oliver Peckham

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Max Planck Society Begins Installation of Liquid-Cooled Supercomputer from Lenovo

(<https://www.hpcwire.com/2020/07/09/max-planck-society-to-deploy-lenovo-supercomputer/>)

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Xilinx Announces First Adaptive Computing Challenge

(<https://www.hpcwire.com/2020/07/09/xilinx-announces-first-adaptive-computing-challenge/>)

A new contest is challenging the computing world. Xilinx has announced the first Xilinx Adaptive Computing Challenge, a competition that will task developers and startups with

Challenge in partnership with Hackster.io, a developing community... [Read more... \(https://www.hpcwire.com/2020/07/09/xilinx-announces-first-adaptive-computing-challenge/\)](https://www.hpcwire.com/2020/07/09/xilinx-announces-first-adaptive-computing-challenge/)

By Staff report

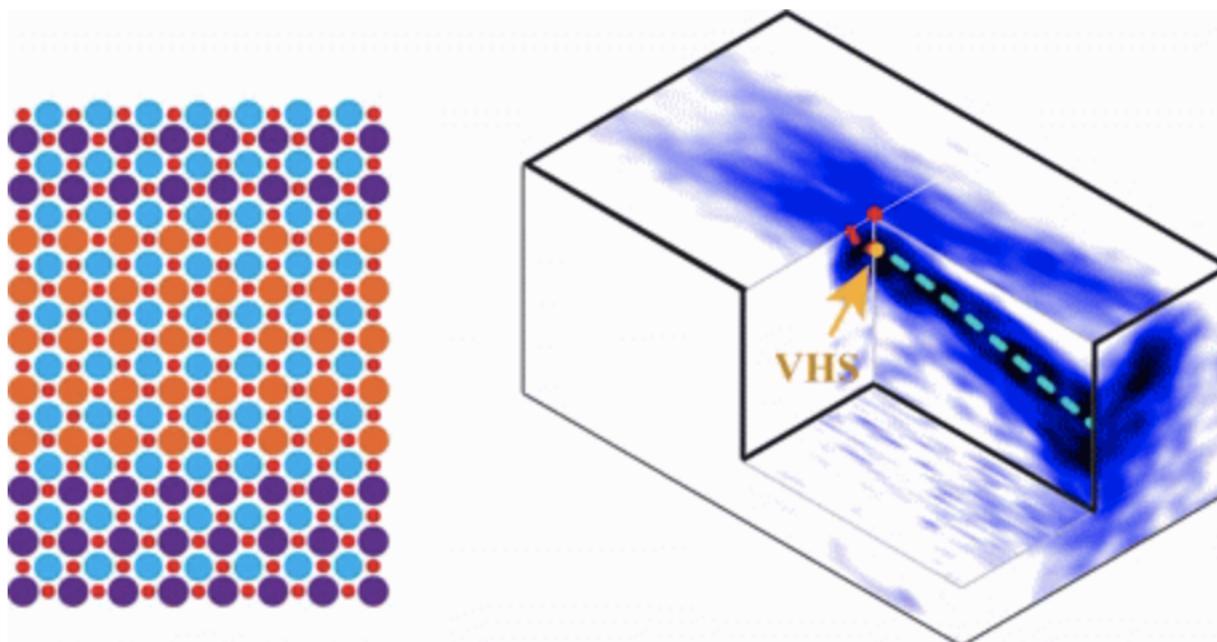
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Reviving Moore's Law? LBNL Researchers See Promise in Heterostructure Oxides

(<https://www.hpcwire.com/2020/07/09/reviving-moores-law-lbnl-researchers-see-promise-in-heterostructure-oxides/>)

The reality of Moore's law's decline is no longer doubted for good empirical reasons. That said, never say never. [Read more... \(<https://www.hpcwire.com/2020/07/09/reviving-moores-law-lbnl-researchers-see-promise-in-heterostructure-oxides/>\)](https://www.hpcwire.com/2020/07/09/reviving-moores-law-lbnl-researchers-see-promise-in-heterostructure-oxides/)

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President's Council Targets AI, Quantum, STEM; Recommends Spending Growth

(<https://www.hpcwire.com/2020/07/09/presidents-council-targets-ai-quantum-recommends-spending-growth-stem/>)

Last week the President Council of Advisors on Science and Technology (PCAST) met (webinar) to review policy recommendations around three sub-committee reports: [Read recommends-spending-growth-stem/](#).

By John Russell

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Penguin Computing Brings Cascade Lake-AP to OCP Form Factor

(<https://www.hpcwire.com/2020/07/07/penguin-computing-brings-cascade-lake-ap-to-ocp-form-factor/>)

Penguin Computing, a subsidiary of SMART Global Holdings, Inc., announced yesterday (July 6) a new Tundra server, Tundra AP, that is the first to implement the Intel Xeon S Project (OCP) form factor. [Read more... \(https://www.hpcwire.com/2020/07/07/penguin-computing-brings-cascade-lake-ap-to-ocp-form-factor/\)](https://www.hpcwire.com/2020/07/07/penguin-computing-brings-cascade-lake-ap-to-ocp-form-factor/)

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Google Cloud Debuts 16-GPU Ampere A100 Instances

(<https://www.hpcwire.com/2020/07/07/google-cloud-debuts-ampere-a2-family/>)

On the heels of the Nvidia's Ampere A100 GPU launch in May, Google Cloud is announcing alpha availability of the A100 "Accelerator Optimized" VM A2 instance family on Google Cloud Platform. This family combines two HGX A100 8-GPU baseboards using... [Read more... \(<https://www.hpcwire.com/2020/07/07/google-cloud-debuts-ampere-a2-family/>\)](https://www.hpcwire.com/2020/07/07/google-cloud-debuts-ampere-a2-family/)

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Q&A: HLRS's Bastian Koller Tackles HPC and Industry in Germany and Europe

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 In this exclusive interview for HPCwire – sadly not face to face – Steve Conway, senior advisor for Hyperion Research, talks with Dr.-Ing Bastian Koller about the state of HPC in Germany and Europe. [Read More \(<https://www.hpcwire.com/2020/07/06/qa-hlrss-bastian-koller-tackles-hpc-and-industry-in-germany-and-europe/>\)](https://www.hpcwire.com/2020/07/06/qa-hlrss-bastian-koller-tackles-hpc-and-industry-in-germany-and-europe/)

By Steve Conway, Hyperion

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