

Julia Joins Petaflop Club

September 12, 2017

BERKELEY, Calif., Sept. 12, 2017 — Julia has joined the rarefied ranks of computing languages that have achieved peak performance exceeding one petaflop per second – the so-called ‘Petaflop Club.’

The Julia application that achieved this milestone is called [Celeste](https://newsletter.juliacomputing.com/sendy/I/2ITN9ryYIH0aXrqgRXYMgw/Swu2T9xrhdMVcCJ87638tpTw/gBVU763iKTgYsyZJejOUym763w)

(<https://newsletter.juliacomputing.com/sendy/I/2ITN9ryYIH0aXrqgRXYMgw/Swu2T9xrhdMVcCJ87638tpTw/gBVU763iKTgYsyZJejOUym763w>). It was developed by a team of astronomers, physicists, computer engineers and statisticians from UC Berkeley, Lawrence Berkeley National Laboratory, National Energy Research Scientific Computing Center (NERSC), Intel, Julia Computing and the Julia Lab at MIT.

Celeste uses the Sloan Digital Sky Survey (SDSS), a dataset of astronomical images from the Apache Point Observatory in New Mexico that includes every visible object from over 35% of the sky – hundreds of millions of stars and galaxies. Light from the most distant of these galaxies has been traveling for billions of years and lets us see how the universe appeared in the distant past.

Since SDSS data collection began in 1998, the process of cataloging these stars and galaxies was painstaking and laborious.

So the Celeste team developed a new parallel computing method to process the entire SDSS dataset. Celeste is written entirely in Julia, and the Celeste team loaded an aggregate of 178 terabytes of image data to produce the most accurate catalog of 188 million astronomical objects in just 14.6 minutes with state-of-the-art point and uncertainty estimates.

Celeste achieved peak performance of 1.54 petaflops using 1.3 million threads on 9,300 Knights Landing (KNL) nodes of the Cori supercomputer at NERSC – a performance improvement of 1,000x in single-threaded execution.

The Celeste research team is already looking to new challenges. For example, the Large Synoptic Survey Telescope (LSST), scheduled to begin operation in 2019, is 14 times larger than the Apache Point telescope and will produce 15 terabytes of images every night. This means that every few days, the LSST will produce more visual data than the Apache Point telescope has produced in 20 years. With Julia and the Cori supercomputer, the Celeste team can analyze and catalog every object in those nightly images in as little as 5 minutes.

The Celeste team is also working to:

- Further increase the precision of point and uncertainty estimates
- Identify ever-fainter points of light near the detection limit
- Improve the quality of native code for high performance computing

The Celeste project is a shining example of:

- High performance computing applied to real-world problems

Cross-institutional collaboration including researchers from UC Berkeley, Lawrence Berkeley National Laboratory, National Energy Research Scientific Computing Center (NERSC), Intel, Julia Computing and the Julia Lab at MIT

Cross-departmental collaboration including astronomy, physics, computer science, engineering and mathematics

Julia, the fastest modern open source high performance programming language for scientific computing

Parallel and multithreading supercomputing capabilities

Public support for basic and applied scientific research

About Julia and Julia Computing

Julia is the fastest modern high performance open source computing language for data, analytics, algorithmic trading, machine learning and artificial intelligence. Julia combines the functionality and ease of use of Python, R, Matlab, SAS and Stata with the speed of C++ and Java. Julia delivers dramatic improvements in simplicity, speed, capacity and productivity. Julia provides parallel computing capabilities out of the box and unlimited scalability with minimal effort. With more than 1 million downloads and +161% annual growth, Julia is one of the top 10 programming languages developed on GitHub and adoption is growing rapidly in finance, insurance, energy, robotics, genomics, aerospace and many other fields.

Julia users, partners and employers hiring Julia programmers in 2017 include Amazon, Apple, BlackRock, Capital One, Comcast, Disney, Facebook, Ford, Google, Grindr, IBM, Intel, KPMG, Microsoft, NASA, Oracle, PwC, Raytheon and Uber.

Julia is lightning fast. Julia provides speed improvements up to 1,000x for insurance model estimation, 225x for parallel supercomputing image analysis and 10x for macroeconomic modeling.

Julia provides unlimited scalability. Julia applications can be deployed on large clusters with a click of a button and can run parallel and distributed computing quickly and easily on tens of thousands of nodes.

Julia is easy to learn. Julia’s flexible syntax is familiar and comfortable for users of Python, R and Matlab.

Julia integrates well with existing code and platforms. Users of C, C++, Python, R and other languages can easily integrate their existing code into Julia.

Elegant code. Julia was built from the ground up for mathematical, scientific and statistical computing. It has advanced libraries that make programming simple and fast and dramatically reduce the number of lines of code required – in some cases, by 90% or more.

Julia solves the two language problem. Because Julia combines the ease of use and familiar syntax of Python, R and Matlab with the speed of C, C++ or Java, programmers no longer need to estimate models in one language and reproduce them in a faster production language. This saves time and reduces error and cost.

Julia Computing was founded in 2015 by the creators of the open source Julia language to develop products and provide support for businesses and researchers who use Julia.

Source: Julia Computing

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Industry Headlines



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- Research on Blue Waters Points to Cheaper DNA Sequencing with Graphene (<https://www.hpcwire.com/off-the-wire/research-blue-waters-points-cheaper-dna-sequencing-graphene/>)
- Adaptive Computing Announces Release of Moab HPC Suite 9.1.2 (<https://www.hpcwire.com/off-the-wire/adaptive-computing-announces-release-moab-hpc-suite-9-1-2/>)

February 16, 2018

- Moab/NODUS Cloud Bursting 1.1.0 Released by Adaptive Computing (<https://www.hpcwire.com/off-the-wire/moab-nodus-cloud-bursting-1-1-0-released-adaptive-computing/>)
- TACC Panel Discusses Advanced Computing and Water Management (<https://www.hpcwire.com/off-the-wire/tacc-panel-discusses-advanced-computing-water-management/>)

February 15, 2018

- Cray Reports 2017 Full Year and Fourth Quarter Financial Results (<https://www.hpcwire.com/off-the-wire/cray-reports-2017-full-year-fourth-quarter-financial-results/>)
- Embrace AI, NVIDIA's Ian Buck Tells US Congressional Committee (<https://www.hpcwire.com/off-the-wire/embrace-ai-nvidias-ian-buck-tells-us-congressional-committee/>)
- NCSA Announces Spring 2018 Call for Illinois Allocations on Blue Waters (<https://www.hpcwire.com/off-the-wire/ncsa-announces-spring-2018-call-illinois-allocations-blue-waters/>)
- Technical Program Chair David Keyes Announces Changes for SC18 (<https://www.hpcwire.com/off-the-wire/technical-program-chair-david-keyes-announces-changes-sc18/>)

February 14, 2018

- DOE Gets New Office of Cybersecurity, Energy Security, and Emergency Response (<https://www.hpcwire.com/off-the-wire/doe-gets-new-office-cybersecurity-energy-security-emergency-response/>)
- PNNL, OHSU Create Joint Research Co-Laboratory to Advance Precision Medicine (<https://www.hpcwire.com/off-the-wire/pnnl-ohsu-create-joint-research-co-laboratory-advance-precision-medicine/>)
- NCSA Researchers Create Reliable Tool for Long-Term Crop Prediction in the U.S. Corn Belt (<https://www.hpcwire.com/off-the-wire/ncsa-researchers-create-reliable-tool-long-term-crop-prediction-u-s-corn-belt/>)
- Physics Data Processing at NERSC Dramatically Cuts Reconstruction Time (<https://www.hpcwire.com/off-the-wire/physics-data-processing-nersc-dramatically-cuts-reconstruction-time/>)
- OLCF-Developed Visualization Tool Offers Customization and Faster Rendering (<https://www.hpcwire.com/off-the-wire/olcf-developed-visualization-tool-offers-customization-faster-rendering/>)

February 13, 2018

- Hampton Partners Advises High-Performance Computing Company CPU 24/7 In Sale To IAV (<https://www.hpcwire.com/off-the-wire/hampton-partners-advises-high-performance-computing-company-cpu-24-7-in-sale-to-iaav/>)

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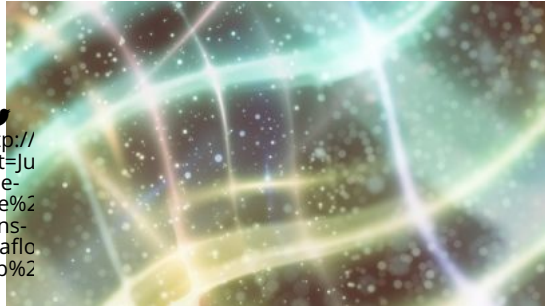
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Fluid HPC: How Extreme-Scale Computing Should Respond to Meltdown and Spectre

(<https://www.hpcwire.com/2018/02/15/fluid-hpc-extreme-scale-computing-respond-meltdown-spectre/>)

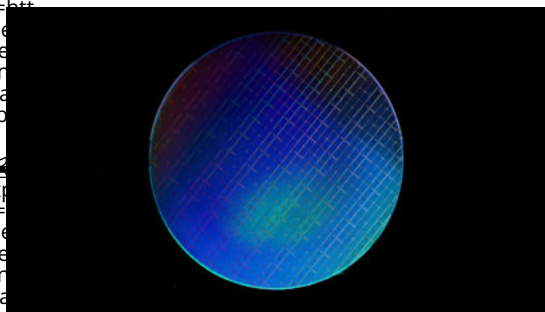
The Meltdown and Spectre vulnerabilities are proving difficult to fix, and initial experiments suggest security patches will cause significant performance penalties to HPC applications. (<https://www.hpcwire.com/2018/02/15/fluid-hpc-extreme-scale-computing-respond-meltdown-spectre/>)

By Pete Beckman

(<http://twitter.com/intent/tweet?status=Fluid%20HPC%3A%20How%20Extreme-Scale%20Computing%20Should%20Respond%20to%20Meltdown%20and%20Spectre+https%3A%2F%2Fwww.hpcwire.com%2F2018%2F02%2F15%2Ffluid-hpc-extreme-scale-computing-respond-meltdown-spectre%2F>) in (<http://www.linkedin.com/shareArticle?mini=true&url=https%3A%2F%2Fwww.hpcwire.com%2F2018%2F02%2F15%2Ffluid-hpc-extreme-scale-computing-respond-meltdown-spectre%2F&title=Fluid%20HPC%3A%20How%20Extreme-Scale%20Computing%20Should%20Respond%20to%20Meltdown%20and%20Spectre&source=https%3A%2F%2Fwww.hpcwire.com%2F2018%2F02%2F15%2Ffluid-hpc-extreme-scale-computing-respond-meltdown-spectre%2F>) G+ (<https://plus.google.com/share?url=https%3A%2F%2Fwww.hpcwire.com%2F2018%2F02%2F15%2Ffluid-hpc-extreme-scale-computing-respond-meltdown-spectre%2F>)

(<http://www.hpcwire.com/2018/02/14/intel-touts-silicon-spin-qubits-quantum-computing/>)

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Intel Touts Silicon Spin Qubits for Quantum Computing

(<https://www.hpcwire.com/2018/02/14/intel-touts-silicon-spin-qubits-quantum-computing/>)

Debate around what makes a good qubit and how best to manufacture them is a sprawling topic. There are many insistent voices favoring one or another approach. Referencing (<https://www.hpcwire.com/2018/02/14/intel-touts-silicon-spin-qubits-quantum-computing/>)

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Brookhaven Ramps Up Computing for National Security Effort

(<https://www.hpcwire.com/2018/02/14/brookhaven-ramps-computing-national-security-effort/>)

Just last week, Dan Coats, the director of Director of National Intelligence for the U.S., warned the Senate Intelligence Committee that Russia was likely to meddle in the 2016 Presidential election. [Read more...](https://www.hpcwire.com/2018/02/14/brookhaven-ramps-computing-national-security-effort/) (<https://www.hpcwire.com/2018/02/14/brookhaven-ramps-computing-national-security-effort/>)

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u=https%3A%2F%2Fwww.hpcwire.com/2018/02/14/brookhaven-ramps-computing-national-security-effort%2F) G+ (<https://plus.google.com/share?url=https%3A%2F%2Fwww.hpcwire.com/2018/02/14/brookhaven-ramps-computing-national-security-effort%2F>)

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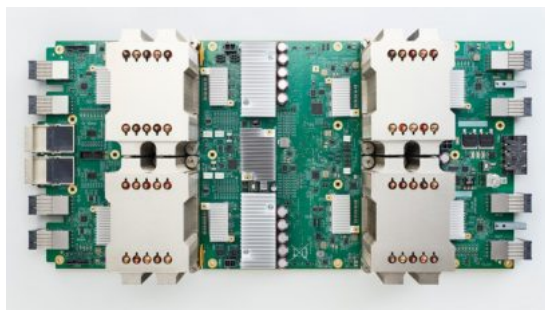
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




















Competition in the white hot AI (and public cloud) market pits Google against Amazon this week, with Google offering AI hardware on its cloud platform intended to make it easier (<https://www.hpcwire.com/2018/02/12/ai-cloud-competition-heats-googles-tpus-amazon-building-ai-chip/>)

By Doug Black

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Russian Nuclear Engineers Caught Cryptomining on Lab Supercomputer (https://www.hpcwire.com/2018/02/12/russian-nuclear-engineers-caught-cryptomining-lab-supercomputer/)

Nuclear scientists working at the All-Russian Research Institute of Experimental Physics (RFNC-VNIIEF) have been arrested for using lab supercomputing resources to mine cryptocurrency. Read more... (https://www.hpcwire.com/2018/02/12/russian-nuclear-engineers-caught-cryptomining-lab-supercomputer/)

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url=https%3A%2F%2Fwww.hpcwire.com%2F2018%2F02%2F12%2Frussian-nuclear-engineers-caught-cryptomining-lab-supercomputer%2F)





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The Food Industry's Next Journey — from Mars to Exascale

(<https://www.hpcwire.com/2018/02/12/food-industrys-next-journey-mars-exascale/>)


Global food producer and one of the world's leading chocolate companies Mars Inc. has a unique perspective on the impact that exascale computing will have on the food industry. <https://www.hpcwire.com/2018/02/12/food-industrys-next-journey-mars-exascale/>

By Scott Gibson, Oak Ridge National Laboratory


([http://twitter.com/intent/tweet?](http://twitter.com/intent/tweet?status=The%20Food%20Industry%E2%80%99s%20Next%20Journey%E2%80%94from%20Mars%20to%20Exascale+https%3A%2F%2Fwww.hpcwire.com%2F2018%2F02%2F12%2Ffood-industrys-next-journey-mars-exascale%2F)

status=The%20Food%20Industry%E2%80%99s%20Next%20Journey%E2%80%94from%20Mars%20to%20Exascale+https%3A%2F%2Fwww.hpcwire.com%2F2018%2F02%2F12%2Ffood-industrys-next-journey-mars-exascale%2F) in (<http://www.linkedin.com/shareArticle?mini=true&url=https%3A%2F%2Fwww.hpcwire.com%2F2018%2F02%2F12%2Ffood-industrys-next-journey-mars-exascale%2F&title=The%20Food%20Industry%E2%80%99s%20Next%20Journey%E2%80%94from%20Mars%20to%20Exascale&source=http%3A%2F%2Fwww.hpcwire.com%2F2018%2F02%2F12%2Ffood-industrys-next-journey-mars-exascale%2F>)


Exascale%2F&title=The%20Food%20Industry%E2%80%99s%20Next%20Journey%E2%80%94from%20Mars%20to%20Exascale&source=http%3A%2F%2Fwww.hpcwire.com%2F2018%2F02%2F12%2Ffood-industrys-next-journey-mars-exascale%2F&title=The%20Food%20Industry%E2%80%99s%20Next%20Journey%E2%80%94from%20Mars%20to%20Exascale/) G+ (<https://plus.google.com/share?url=https%3A%2F%2Fwww.hpcwire.com%2F2018%2F02%2F12%2Ffood-industrys-next-journey-mars-exascale%2F>)




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Optalysys Optical Co-processor Hits Milestone with GENESYS Project


<https://www.hpcwire.com/2018/02/12/optalysys-optical-co-processor-hits-milestone-genesys-project/>

 Optalysys, a U.K company seeking to commercialize optical co-processor technology, today announced completion of its Genetic Search System (GENESYS) project conducted by John Russell. <http://www.earlham.ac.uk/>. Read more... <https://www.hpcwire.com/2018/02/12/optalysys-optical-co-processor-hits-milestone-genesys-project/>

By John Russell




[\(http://twitter.com/intent/tweet?status=Optalysys%20Optical%20Co-processor%20Hits%20Milestone%20with%20GENESYS%20Project+https%3A%2F%2Fwww.hpcwire.com%2F2018%2F02%2F12%2Foptalysys-optical-co-processor-hits-milestone-genesys-project%2F&title=Optalysys%20Optical%20Co-processor%20Hits%20Milestone%20with%20GENESYS%20Project&source=https%3A%2F%2Fwww.hpcwire.com%2F2018%2F02%2F12%2Foptalysys-optical-co-processor-hits-milestone-genesys-project%2F&title=Optalysys%20Optical%20Co-processor%20Hits%20Milestone%20with%20GENESYS%20Project\)](http://twitter.com/intent/tweet?status=Optalysys%20Optical%20Co-processor%20Hits%20Milestone%20with%20GENESYS%20Project+https%3A%2F%2Fwww.hpcwire.com%2F2018%2F02%2F12%2Foptalysys-optical-co-processor-hits-milestone-genesys-project%2F&title=Optalysys%20Optical%20Co-processor%20Hits%20Milestone%20with%20GENESYS%20Project&source=https%3A%2F%2Fwww.hpcwire.com%2F2018%2F02%2F12%2Foptalysys-optical-co-processor-hits-milestone-genesys-project%2F&title=Optalysys%20Optical%20Co-processor%20Hits%20Milestone%20with%20GENESYS%20Project)



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Singularity HPC Container Start-Up – Sylabs – Emerges from Stealth

<https://www.hpcwire.com/2018/02/08/startup-brings-hpc-containers-enterprise/>