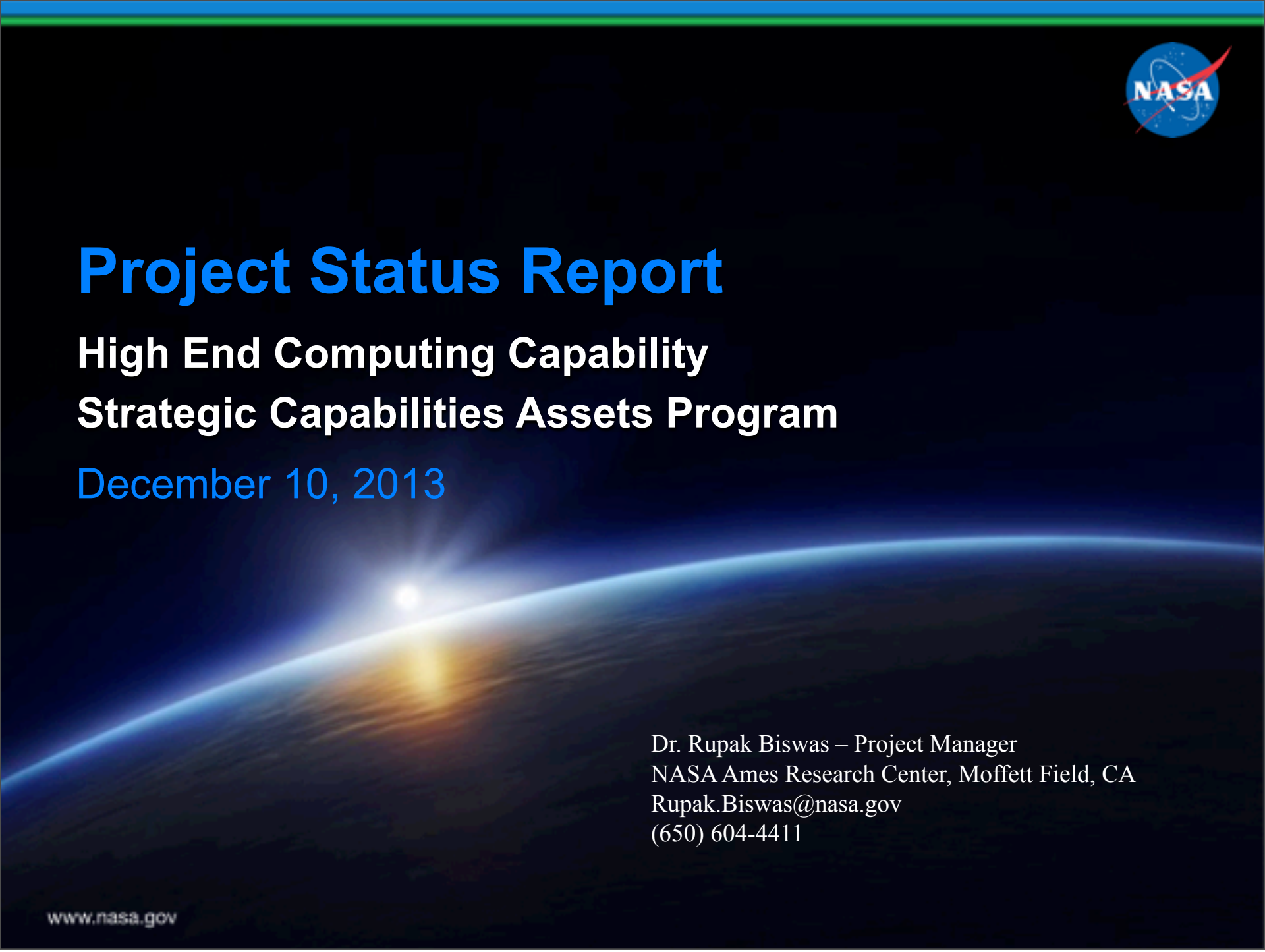


Project Status Report

High End Computing Capability
Strategic Capabilities Assets Program

December 10, 2013

Dr. Rupak Biswas – Project Manager
NASA Ames Research Center, Moffett Field, CA
Rupak.Biswas@nasa.gov
(650) 604-4411

Network Team Completes HECC Core Switch Upgrade

- Network engineers successfully completed an upgrade of the core switch in the HECC computing environment to the latest technology from Cisco Systems.
  - The new switch provides much faster performance, with 550 gigabit-per-second (Gbps) fabric switching per module; the previous hardware supported only 40 Gbps per module.
  - Each module can support up to 48 1-Gigabit Ethernet (GigE) or 10GigE connections; the previous modules could support no more than eight 10GigE connections. This improvement significantly increases the 10 GigE port density.
  - Before the upgrade, switch ports were oversubscribed by 2:1, causing contention for high-usage hosts. With the new fabric, no ports are oversubscribed.
- The team moved 150 copper and fiber connections in a short time with very little impact to users – only a few seconds of interruption per host.

Mission Impact: The faster backplane and higher port density of the new core switch in the HECC computing environment provides improved scalability and increased performance for NASA users.

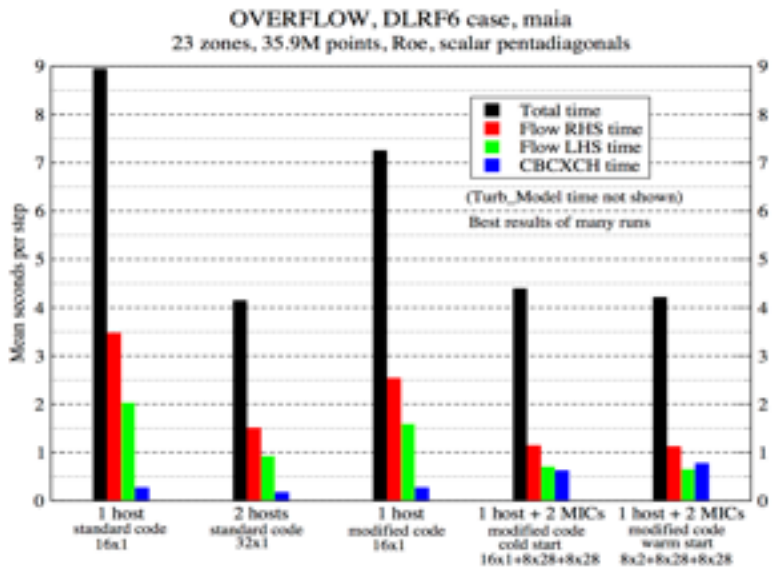
The new HECC core switch features the latest technology from Cisco Systems. To improve performance and maintainability, the 1-Gigabit Ethernet (GigE) and 10GigE switches were merged into a single, multi-function device.

POCs: Nichole Boscia, nichole.boscia@nasa.gov, (650) 604-0891; Harjot Sidhu, harjot.s.sidhu@nasa.gov, (650) 604-4935, NASA Advanced Supercomputing Division, Computer Sciences Corp.

Early Performance Evaluation Completed for Maia, HECC's Intel Xeon Phi-Based Cluster

- The Maia system, deployed for performance testing in spring 2013, is a 128-node Intel Xeon Phi-based system built by SGI, with each node containing 2 Xeon processors and 2 Xeon Phi coprocessors.
- HECC code performance and optimization experts completed an early evaluation of Maia's usability and performance using the NAS Parallel Benchmarks, micro-benchmarks, and applications.
- Comprehensive findings, shared among NASA, SGI, and Intel, generated positive feedback.
  - Xeon Phi software is maturing gradually. During testing, revised versions of the software provided enhanced performance and stability.
  - Code porting and library builds were eased with an "as-if-native" compilation environment developed by HECC staff.
  - High systems software overhead makes application software optimization necessary.
  - Good performance on the Xeon Phi requires sufficient parallelism in the code and careful design of data structures and memory access.
- HECC will continue to work with experts from SGI and Intel to make further improvements.

Mission Impact: Evaluating leading-edge technologies reduces risks and increases the probability of selecting cost-effective systems that provide the best solutions to meet the agency's supercomputing requirements.



Performance comparison of the OVERFLOW Computational Fluid Dynamics code running in *host+MIC* mode (with both Xeon and Xeon Phi) and in *host-only* mode (Xeon only). With the Xeon Phi, improvement is shown for the flow solver but not for boundary exchange (CBCXCH). *Warm start* and *cold start* refer to running with or without dynamic load balancing.

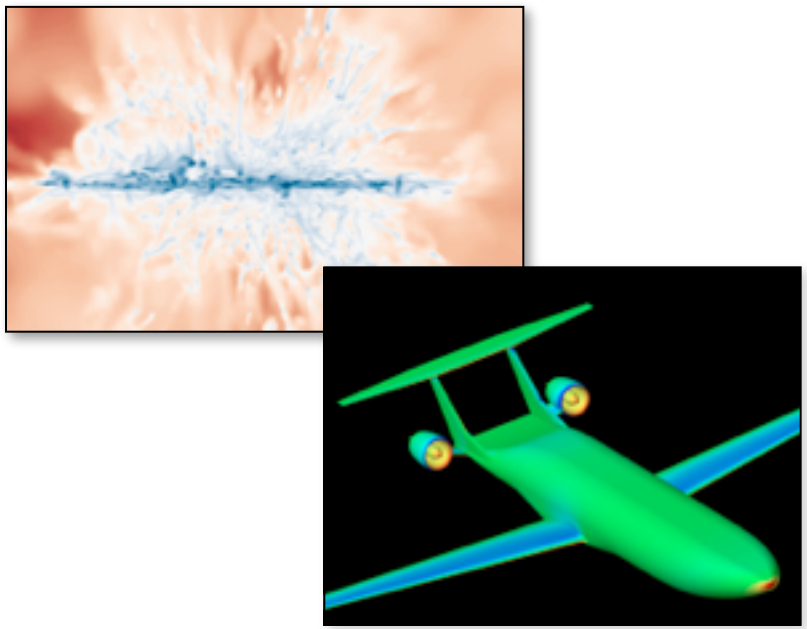
POCs: Henry Jin, haoqiang.jin@nasa.gov, (650) 604-0165; Jerry Yan, jerry.c.yan@nasa.gov, (650) 604-4381, NASA Advanced Supercomputing Division

New Allocation Period Begins for Two NASA Mission Directorates

- November 1, 2013 marked the beginning of a new allocation period for the Aeronautics Research Mission Directorate (ARMD) and the Science Mission Directorate (SMD).
- These two organizations awarded new allocations on Pleiades and Endeavour for over 230 computing projects that support their science and engineering activities.
  - The combined awards, distributed equally between ARMD and SMD, total 75 million Standard Billing Units (SBUs)* — 50% more than the directorates' awards in November 2012.
  - The 50% increase in awards was enabled by continued expansion of HECC resources.
- The new allocation period is an opportunity for each organization to assess requirements for computing time and to rebalance allocations to meet computing needs for the next year.
- HECC staff updated the list of Mission Directorate programs, projects, and points of contact; notified the users of the call for requests; collected, consolidated, and submitted the requests for approval; implemented the new allocations; removed expired projects; and got identity accounts for new users.

*1 SBU equals 1 hour of a Pleiades Westmere 12-core node.

Mission Impact: NASA programs and projects periodically review the distribution of supercomputer time to assess requirements and to assure consistency with mission-specific goals and



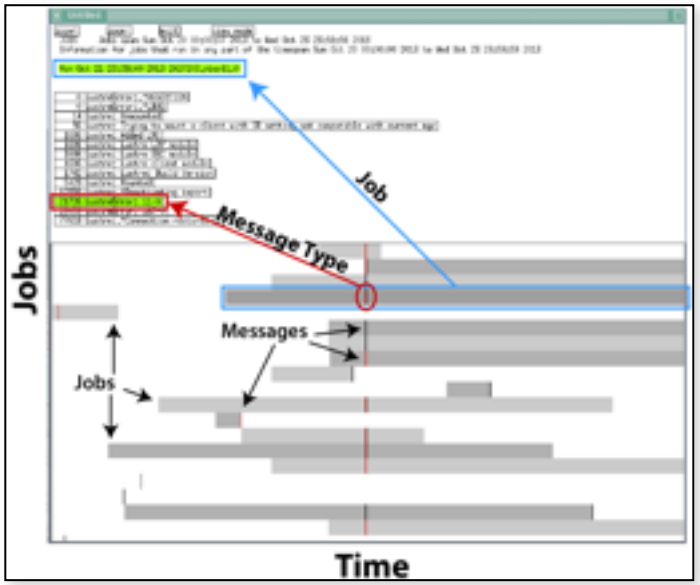
Representative images of SMD and ARMD projects supported by HECC resources. Above left: An edge-on projection of gas density in a simulated galaxy. Lower right: The pressure field over a D8 aircraft.

POC: Catherine Schulbach, catherine.h.schulbach@nasa.gov, (650) 604-3180, NASA Advanced Supercomputing Division

New GUI for Lumber Log File Tool Supports Rapid Problem Analysis for HECC Systems

- The HECC-developed Lumber tool reads and processes live Pleiades system logs at ultra-fast speeds. With a new graphical user interface (GUI), Lumber presents the logs in an innovative way, providing visual analysis of system errors that affect user jobs.
  - User support staff can make flexible data requests, using regular expressions, to view messages of various system log types.
  - A graph shows occurrences of the requested messages across a given timespan, correlating the time of each message with the affected job, node, or both.
  - The resulting visual patterns, combined with the ability to easily "drill down" for detailed information about each instance, provides HECC support staff with valuable insight into the root causes of system issues.
- As user support teams gain experience using the tool to assist in resolving system issues, further work will be done to enhance the capabilities and "look and feel" of the GUI.

Mission Impact: The ability to rapidly and flexibly visualize the occurrence of system events across all Pleiades nodes and jobs helps both system and user support staff to more quickly and efficiently identify and resolve system issues that impact NASA users.



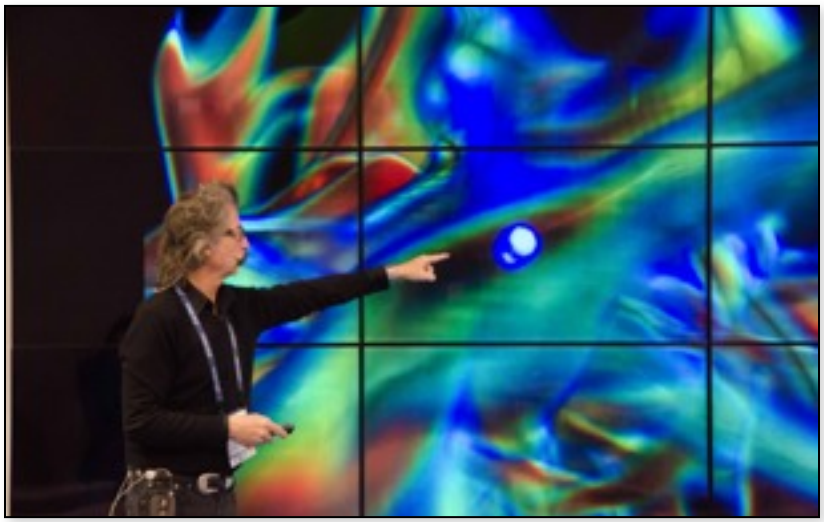
The new Lumber GUI displays jobs across a requested timespan, with system log messages appearing as vertical lines. In the image, the job details and message type for a selected message are highlighted in green.
<SELECT IMAGE FOR FULL SCALE>

POC: David Barker, david.p.barker@nasa.gov, (650) 604-4292, NASA Advanced Supercomputing Division, Computer Sciences Corp.

HECC/NAS Staff Lead Agency's 26th Exhibit at Annual Supercomputing Conference

- A team from the HECC Project and the NAS Division coordinated NASA's presence at SC13, the International Conference for High-Performance Computing, Networking, Storage, and Analysis, held November 17–22 in Denver.
- This is the 26th consecutive year that NAS has led the agency's effort at this conference.
- Users from universities and 7 NASA centers, representing all technical mission directorates, presented results of their recent science and engineering projects, many enabled by Pleiades and supported by HECC experts in visualization, optimization, and networking.
- Drawn by the spectacular scientific visualizations shown on the HECC-developed 10-foot-wide traveling hyperwall, conference attendees crowded into the NASA booth to meet the researchers and learn more about their work.
- Our staff also met with students and recent graduates interested in NASA internships and job opportunities, and exchanged knowledge with colleagues and peers from around the world.

Mission Impact: Participation in SC13 provided an important opportunity to exchange information with peers and HEC industry leaders from around the world, convey the importance of NASA missions, and meet with candidates for internship/job opportunities.



HECC user Richard Klein (Lawrence Livermore National Laboratory, University of California, Berkeley) drew many SC13 attendees with 3D movies of the formation of massive stars from giant, turbulent molecular clouds, shown on HECC's traveling hyperwall. Klein's computational work, enabled by the Pleiades supercomputer, supports NASA's goals to understand the origins of stars and galaxies in our universe.

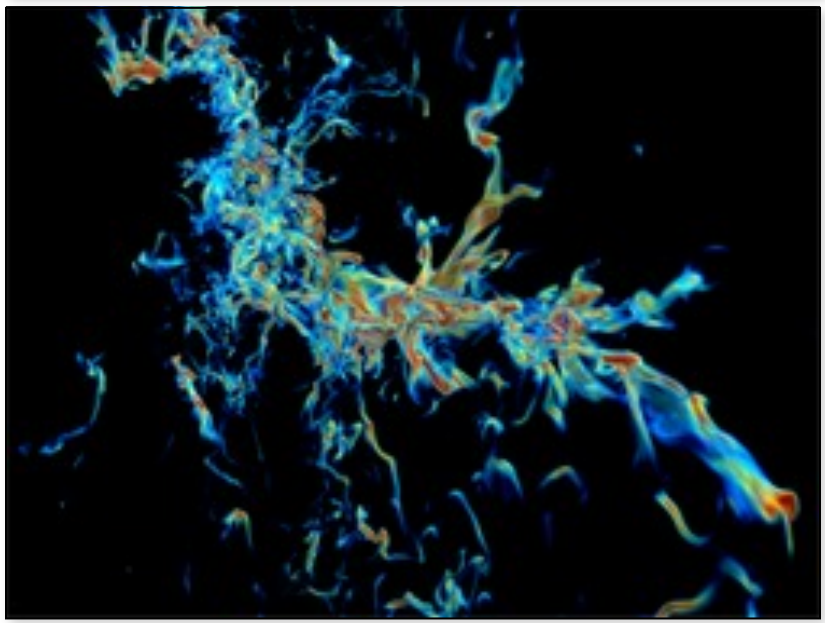
Visit the NASA@SC13 website at: www.nas.nasa.gov/SC13

POC: Gina Morello, gina.f.morello@nasa.gov, (650) 604-4462, NASA Advanced Supercomputing Division

Simulating Formation of Massive Stars from Giant, Turbulent Molecular Clouds*

- Astrophysicists at the University of California, Berkeley and Lawrence Livermore National Laboratory are running large-scale simulations on Pleiades to investigate the mysterious processes involved in the formation of massive stars—one of the most significant unsolved problems in astrophysics.
- These radiation-magnetohydrodynamic simulations (using ORION, the 3D astrophysics code developed at UC Berkeley) show how massive, magnetized, infrared dark turbulent clouds gravitationally collapse to form turbulent filaments, which then fragment into star-forming cores.
- The simulations are the first to include feedback from magnetic fields, radiation, and outflows, and to be evolved far enough to show the fragmentation properties of the bulk of the gas in the core.
- Results show that the coupled effects of magnetic fields and radiative feedback strongly suppress core fragmentation, leading to the production of single, massive star systems rather than small stellar clusters of low-mass stars.

Mission Impact: These large-scale astrophysics simulations, enabled by HECC supercomputing resources, support NASA's goals to understand the origins of stars and galaxies in our universe.



Snapshot from a simulation showing gas filaments that formed in an infrared dark cloud 800,000 years after the region began gravitational collapse. In the highest density fragments in the filament (red), molecular cloud cores are developing and will collapse further until they form stars. *Tim Sandstrom, NASA/Ames*

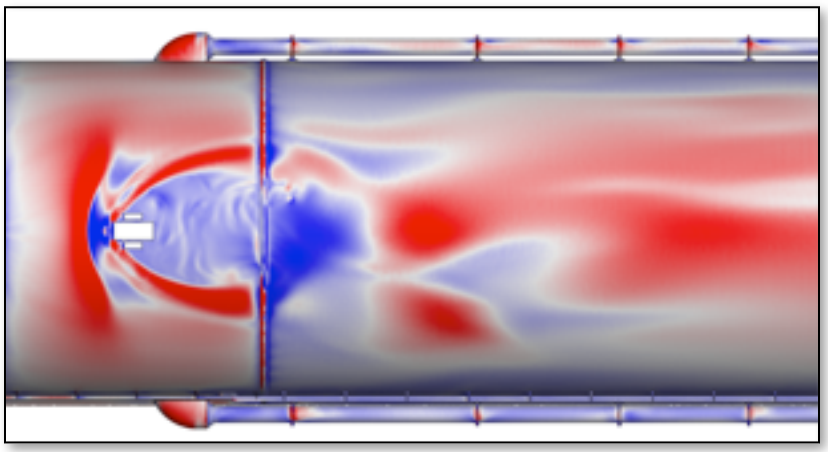
POC: Richard I. Klein, rklein@astron.berkeley.edu, (925) 422-3548, University of California, Berkeley, Department of Astronomy, and Lawrence Livermore National Laboratory

** HECC provided supercomputing resources and services in support of this work*

Rapid Assessment of Buffet Loads for Space Launch System (SLS)*

- NAS Division applied modeling and simulation experts performed computational fluid dynamics (CFD) analyses of aerodynamic buffet loads for the Space Launch System (SLS).
- These simulations are used to investigate unsteady pressure oscillations in the wake of the solid rocket booster (SRB) forward attachment struts to help assess buffet loads and aerodynamic induced environments.
  - Extensive CFD studies were performed to evaluate and select viable strut attachment designs prior to wind tunnel testing at NASA Ames Research Center.
  - A variety of strut attachment design options were modeled to identify the most effective concept.
  - Numerous variations of the leading mitigation concept were modeled to define the most effective features and configurations.
- Each case was simulated using the high-fidelity NAS-developed LAVA CFD code, and took 4–5 days to run on the Pleiades supercomputer.
- Results provided detailed insight into aerodynamic buffeting, and enabled rapid assessment and identification of promising design modifications for the SRB attachment struts.

Mission Impact: Enabled by HECC resources, these simulations help to improve the safety and performance of the Space Launch System by allowing rapid assessment of of SRB strut attachment concepts and identifying the most effective options.



Visualization of a Space Launch System buffet analysis simulation, showing the vehicle's core stage colored by skin friction in the axial direction. *Emre Sozer, Mike Barad, NASA/Ames*

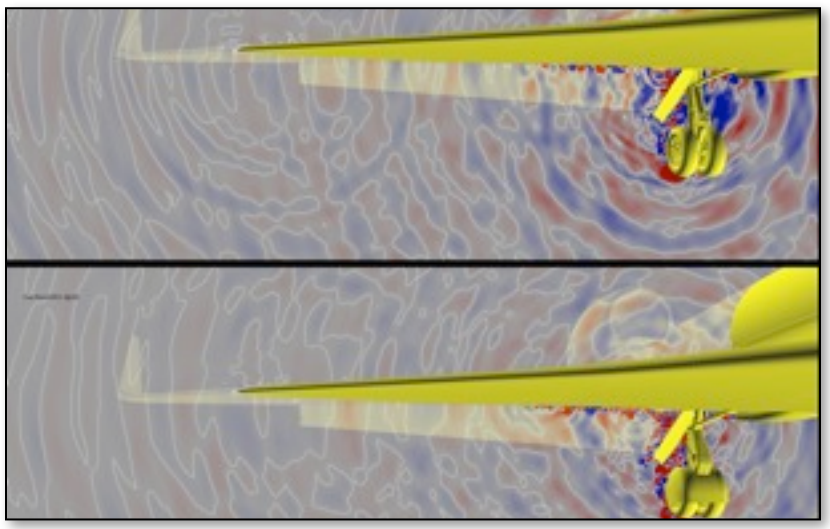
POC: Cetin Kiris, cetin.c.kiris@nasa.gov, (650) 604-4485, NASA Advanced Supercomputing Division

** HECC provided supercomputing resources and services in support of this work*

Simulating a Quieter Approach for Aircraft Landing*

- In support of NASA's Environmentally Responsible Aviation project, scientists at Langley Research Center are performing large-scale aerodynamic simulations on Pleiades to develop and evaluate novel noise-reduction concepts for aircraft.
- The project's recent studies target noise generated by the landing gear and wing flaps, based on an 18-percent scale, semi-span model of a Gulfstream aircraft.
- These advanced simulations capture:
  - Complex aerodynamic mechanisms that impact aircraft noise, such as vortex formation and bluff-body flow separation.
  - Interactions between the landing gear and wing flap flow fields.
  - How wing flap and landing gear deployment enhance the global sound field radiating toward the ground.
  - Effects of applying noise-reduction technologies to the wing flap and main landing gear.
- Insights provided by these simulations have enabled the development, evaluation, and refinement of several viable noise-reduction concepts for aircraft wing flaps and landing gear.

Mission Impact: These simulations identify key sources of airframe noise and enable the development of technologies that significantly reduce noise pollution in communities around airports.



Visualizations of simulated airframe noise sources for a Gulfstream aircraft, showing the acoustic fields emanating from the deployed landing gear and wing flap region, both without (top) and with (bottom) noise-reduction concepts applied. *Ehab Fares, Exa Corp., Patrick Moran, NASA/Ames*

POC: Mehdi Khorrami, mehdi.r.khorrami@nasa.gov, (757) 864-3630, NASA Langley Research Center

** HECC provided supercomputing resources and services in support of this work*

HECC Facility Hosts Several Visitors and Tours in November 2013

- HECC hosted 4 tour groups in November; guests learned about the agency-wide missions being supported by Pleiades, and viewed scientific results on the hyperwall system. Visitors this month included:
  - NASA Chief Scientist Ellen Stofan presented at an Ames Colloquium, met with senior staff, and greeted members of the press during a media event hosted by the NAS facility. Stofan also met with quantum computing experts at the NAS facility and received a tour of the quantum computer room.
  - Actor Harrison Ford was featured in a Showtime production hosted at NASA Ames, where a crew filmed scenes for a documentary on climate issues. A discussion panel that included NAS researcher Rama Nemani took place in front of the hyperwall, and Landsat data was used for the production. Mr. Ford also toured the NAS facility, including the quantum computer room.
  - A group from the NASA X program filmed a documentary showing computational fluid dynamics simulations of the MIT D8 “double bubble” aircraft geometry.
  - A group of nine Air Force personnel also visited the facility this month.

Top: NASA Chief Scientist Ellen Stofan speaks to members of the media, with the hyperwall-2 in the background. Bottom: Actor Harrison Ford tours the NAS facility with NAS Division Chief Piyush Mehrotra (left) and visualization group lead Chris Henze.

POC: Gina Morello, gina.f.morello@nasa.gov, (650) 604-4462, NASA Advanced Supercomputing Division

Presentations and Papers

- **2013 Supercomputing Conference,** November 17-22, 2013, Denver
  - "**An Early Performance Evaluation of Many Integrated Core Based SGI Rackable Computing System**," S. Saini, H. Jin, D. Jespersen, H. Feng, J. Djomehri, W. Arasin, R. Hood, P. Mehrotra, R. Biswas (NASA/ARC) – Paper Presentation in main technical program
  - "**Performance Evaluation of the Intel Sandy Bridge Based NASA Pleiades Using Scientific and Engineering Applications**," S. Saini, J. Chang, H. Jin (NASA/ARC) – Paper Presentation in the Workshop on Performance Modeling, Benchmarking and Simulation of High Performance Computer Systems (PMBS13)
  - "**HECC—Continuing NASA's 30-Year Legacy of Supercomputing Innovation**," W. Thigpen (NASA/ARC) http://www.nas.nasa.gov/SC13/demos/demo25.html
  - "**Maia: An Early Evaluation of an Intel Xeon Phi-Based System**," H. Jin (NASA/ARC) http://www.nas.nasa.gov/SC13/demos/demo26.html
  - "**NASA Embarks on the Quantum Computing Path**," R. Biswas (NASA/ARC) http://www.nas.nasa.gov/SC13/demos/demo31.html
  - "**Supercomputing: A Ground-Based Instrument for Exploration**," R. Ciotti (NASA/ARC) http://www.nas.nasa.gov/SC13/demos/demo27.html - Presented in the NASA booth and at the Mellanox reception/dinner as a keynote address http://www.mellanox.com/sc13/event.php
  - "**Future of Memory Technology for Exascale and Beyond**," S. Saini (NASA/ARC) – Panel Session
  - "**Advancing Rotorcraft Simulation Using Computational Fluid Dynamics**," N. Chaderjian (NASA/ARC) * http://www.nas.nasa.gov/SC13/demos/demo4.html

** HECC provided supercomputing resources and services in support of this work*

Presentations and Papers (continued)

- **2013 Supercomputing Conference,** November 17-22, 2013, Denver (continued)
  - "**Designing Aircraft Engines to Burn Lean and Clean**," J. Moder (NASA/GRC) * http://www.nas.nasa.gov/SC13/demos/demo1.html
  - "**Efficient Physics-Based Analysis and Design for Complex Aerospace Configurations**," E. Nielsen (NASA/LaRC) * http://www.nas.nasa.gov/SC13/demos/demo34.html
  - "**Enabling a Quieter Approach for Aircraft Landing**," M. Khorrami (NASA/LaRC) * *http://www.nas.nasa.gov/SC13/demos/demo2.html*
  - "**Innovating the Future of the Passenger Airplane**," M. Barad (NASA/ARC) * http://www.nas.nasa.gov/SC13/demos/demo3.html
  - "**Improving Predictions of Sea Level Rise with the Ice Sheet System Model**," E. Larour (NASA/JPL) * http://www.nas.nasa.gov/SC13/demos/demo15.html
  - "**Modeling Hurricanes and Other High-Impact Weather Systems in High Resolution**," X. Li (NASA/GSFC) * http://www.nas.nasa.gov/SC13/demos/demo14.html
  - "**Understanding Our Planet's Evolving Ocean, Ice, Carbon, and Ecology**," C. Hill (MIT) * http://www.nas.nasa.gov/SC13/demos/demo13.html
  - "**Zooming in with the NASA Earth Exchange**," P. Votava (NASA/ARC) * *http://www.nas.nasa.gov/SC13/demos/demo30.html*
    "**Computational Fluid Dynamics Support for Space Launch Vehicles**," C. Kiris (NASA/ARC) * http://www.nas.nasa.gov/SC13/demos/demo5.html

** HECC provided supercomputing resources and services in support of this work*

Presentations and Papers (continued)

- **2013 Supercomputing Conference,** November 17-22, 2013, Denver (continued)
  - "**Exploring Nonlinear Slosh Damping in Propellant Tanks**," H.Q. Yang (NASA/MSFC) * http://www.nas.nasa.gov/SC13/demos/demo36.html
  - "**Long Live the International Space Station**," M. Grygier (NASA/JSC) * http://www.nas.nasa.gov/SC13/demos/demo6.html
  - "**Predicting Rocket Blast Environments**," B. Williams (NASA/MSFC) * http://www.nas.nasa.gov/SC13/demos/demo7.html
  - "**Simulations of Fluid-Structure Interactions in Propulsion Systems**," H.Q. Yang (NASA/MSFC) * http://www.nas.nasa.gov/SC13/demos/demo29.html
  - "**Exciting Waves in Accretion Disk Boundary Layers**," M. Belyaev (Princeton University) * http://www.nas.nasa.gov/SC13/demos/demo18.html
  - "**Formation of Massive Stars from Giant, Turbulent Molecular Clouds**," R. Klein (LLNL/UCB) * http://www.nas.nasa.gov/SC13/demos/demo12.html
  - "**Kepler Lives On: It's All in the Data**," S. Seader (NASA/ARC) * http://www.nas.nasa.gov/SC13/demos/demo11.html
  - "**Magnetic Carpet on the Sun**," I. Kitiashvili (NASA/ARC, Stanford University) * http://www.nas.nasa.gov/SC13/demos/demo16.html
  - "**Our Nearest Star: The Enigmatic Sun**," A. Kosovichev (New Jersey Institute of Technology) * http://www.nas.nasa.gov/SC13/demos/demo17.html
  - "**Plumes on Venus: Clues to the Planet's Interior**," T. Ovcharenko (NASA/JPL) * http://www.nas.nasa.gov/SC13/demos/demo33.html
  - "**State-of-the-Art Galaxy Formation Simulations**," R. Cen (Princeton University) * http://www.nas.nasa.gov/SC13/demos/demo10.html

** HECC provided supercomputing resources and services in support of this work*

Presentations and Papers (continued)

- "**Infrared Properties of z=7 Galaxies from Cosmological Simulations**," R. Cen, T. Kimm, arXiv:1311.1828 [astro-ph.CO], November 7, 2013. * http://arxiv.org/abs/1311.1828
- "**A Global Wave-Driven Magnetohydrodynamic Solar Model with a Unified Treatment of Open and Closed Magnetic Field Topologies**," R. Oran, B. van der Holst, E. Landi, M. Jin, I. V. Sokolov, T. I. Gombosi, The Astrophysical Journal, vol. 778, no. 2, November 13, 2013. * http://iopscience.iop.org/0004-637X/778/2/176
- "**Alfven Wave Solar Model: Part 1, Coronal Heating**," B. van der Holst, I. V. Sokolov, X. Meng, M. Jin, W. B. Manchester, G. Toth, T. I. Gombosi, arXiv:1311.4093 [astro-ph.SR], November 16, 2013. * http://arxiv.org/abs/1311.4093
- "**An MHD Simulation Model of Time-Dependent Global Solar Corona with Temporally Varying Solar-Surface Magnetic Field Maps**," K. Hayashi, Journal of Geophysical Research: Space Physics (Early View), November 25, 2013. * http://onlinelibrary.wiley.com/doi/10.1002/2013JA018991/abstract

** HECC provided supercomputing resources and services in support of this work*

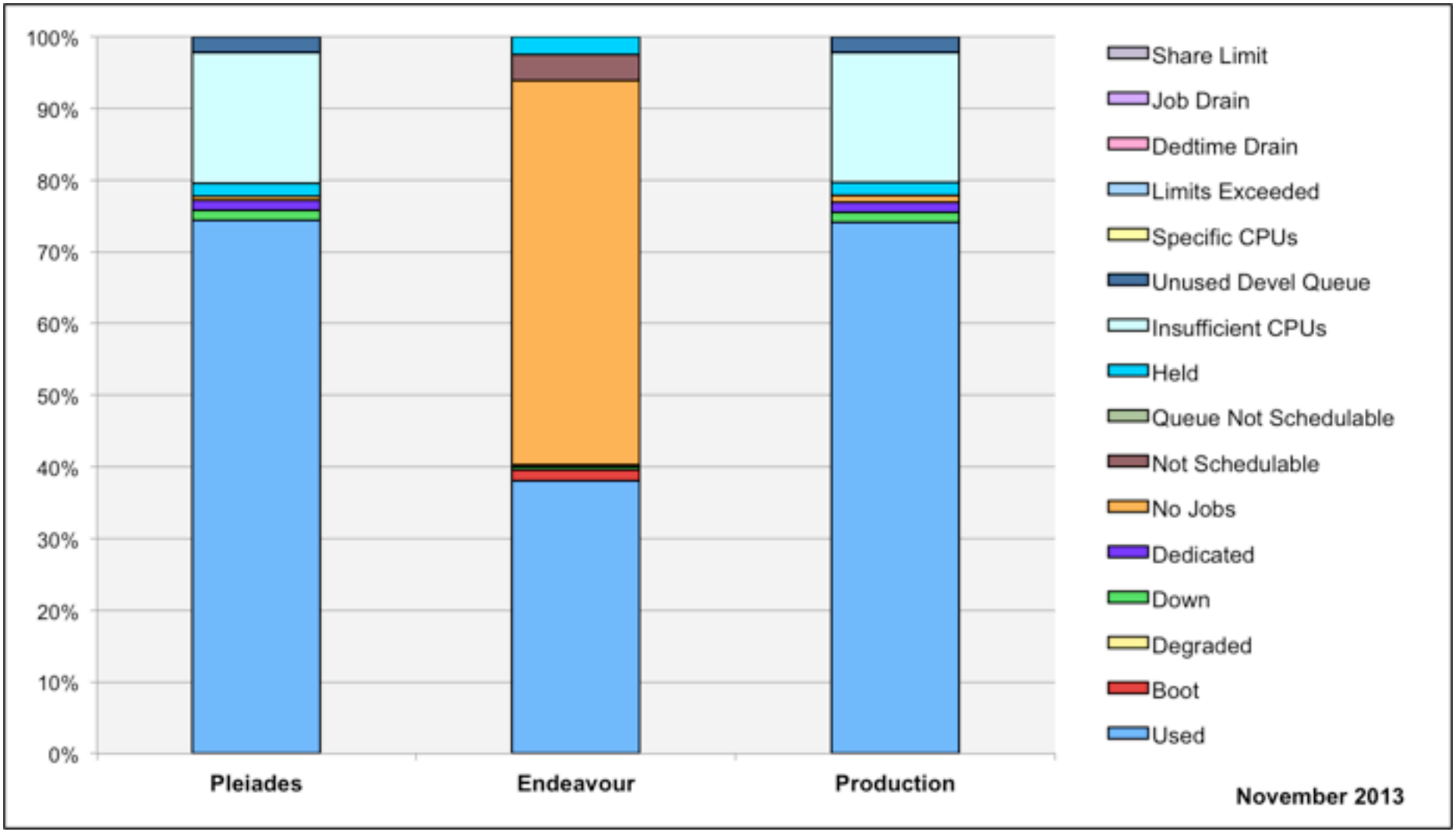
News and Events

- **Affordable Big Data Computing**, *HPCwire*, November 4, 2013—William Thigpen, HECC Deputy Director and NAS Engineering Branch Chief, talks about the benefits of shared memory systems to compute big data.
  http://archive.hpcwire.com/hpcwire/2013-11-04/affordable_big_data_computing.html
- **NASA Brings Earth Science 'Big Data' to the Cloud with Amazon Web Services**, *NASA press release*, November 12, 2013—The NASA Earth Exchange (NEX), which utilizes HECC resources for running data analysis and modeling and simulation on a large scale, is using Amazon Web Services cloud storage to make climate and Earth science data available to researchers and educators around the world.
  http://www.nasa.gov/press/2013/november/nasa-brings-earth-science-big-data-to-the-cloud-with-amazon-web-services
  - **NASA Making Satellite Data Available on Amazon's Cloud**, *redOrbit,* November 12, 2013. *http://www.redorbit.com/news/space/1113001099/nasa-earth-science-satellite-data-amazon-web-services-aws-cloud-111213/*
  - **NASA to Share Data Through Amazon Cloud**, *GCN.com,* November 15, 2013. *http://gcn.com/articles/2013/11/15/nasa-amazon-cloud.aspx*
- **NASA Experts Showcase Science, Technology at Supercomputing Conference**, *NASA Ames press release,* November 13, 2013—More than 30 of the agency's exciting computational achievements were on display at the 2013 supercomputing conference.
  http://www.nasa.gov/ames/nasa-experts-showcase-science-technology-at-supercomputing-conference

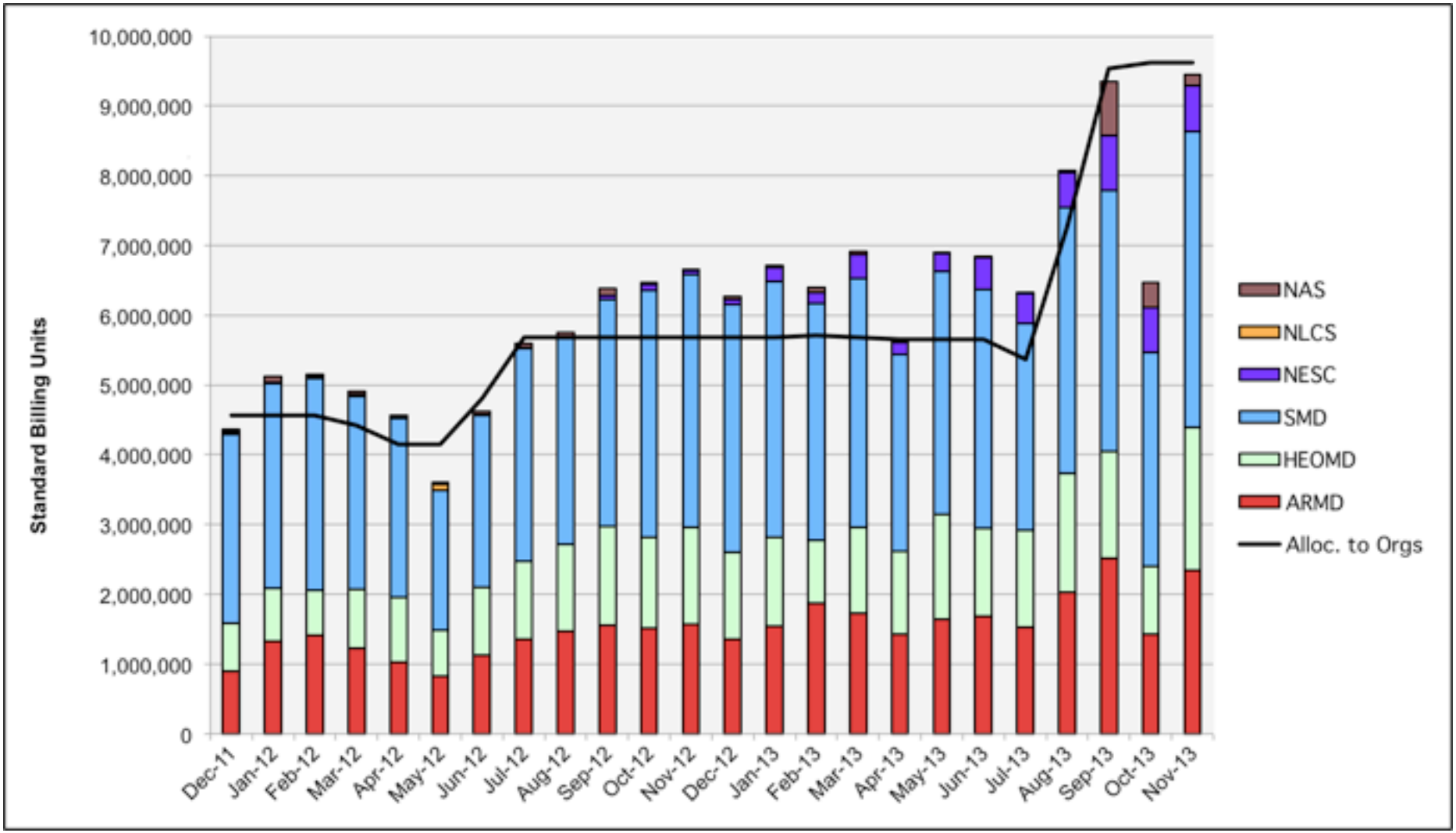
News and Events (continued)

- **Google Races Quantum Computer Against Its Own Web Empire**, *Wired.com,* November 14, 2013—Robert McMillan talks to NASA's Rupak Biswas and Google's Jason Freidenfelds about what the partners are planning to do with the D-Wave Two quantum computer housed at the NASA Advanced Supercomputing (NAS) facility. *http://www.wired.com/wiredenterprise/2013/11/quantum_nasa/*
- **What Will NASA Be Doing with Its New Quantum Computer?**, *i09.com*, November 20, 2013—George Dvorsky talks to Rupak Biswas about the agency's plans for the Quantum Artificial Intelligence Laboratory (QuAIL). *http://io9.com/what-will-nasa-be-doing-with-its-new-quantum-computer-1468333514*
- **NASA Begins Exploring Quantum Computing**, *FCW.com,* November 22, 2013—Frank Konkel interviews Rupak Biswas about NASA's early applications to be explored by the QuAIL team. *http://fcw.com/Articles/2013/11/22/NASA-quantum-computer*

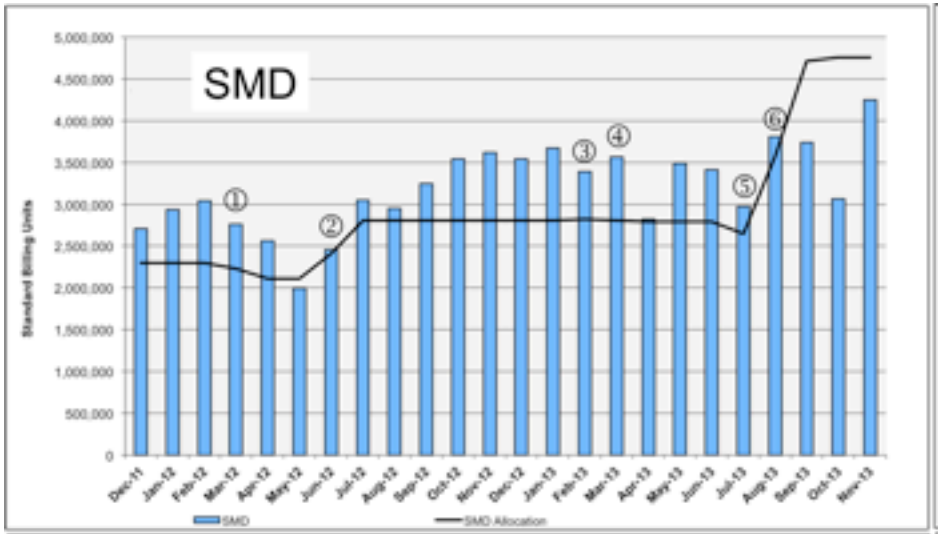
HECC Utilization

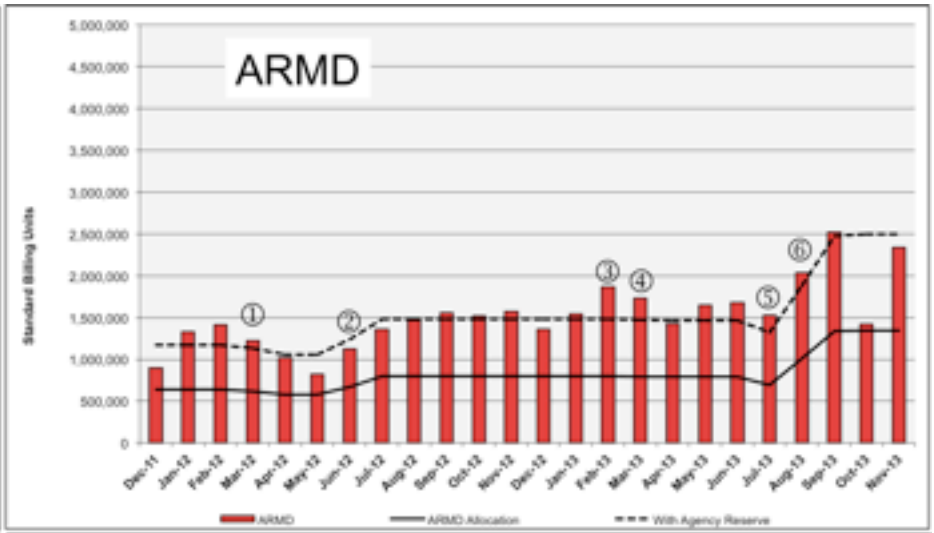


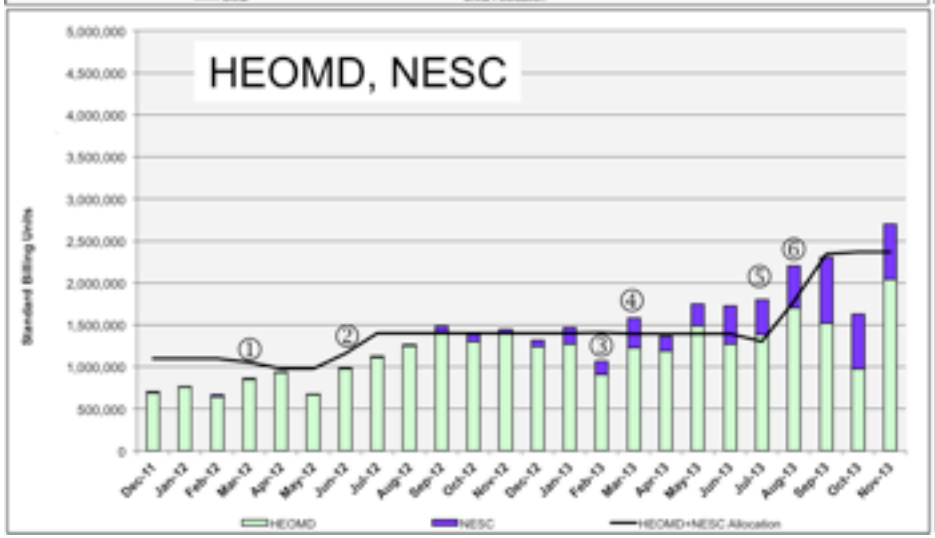
HECC Utilization
Normalized to 30-Day Month



HECC Utilization
Normalized to 30-Day Month

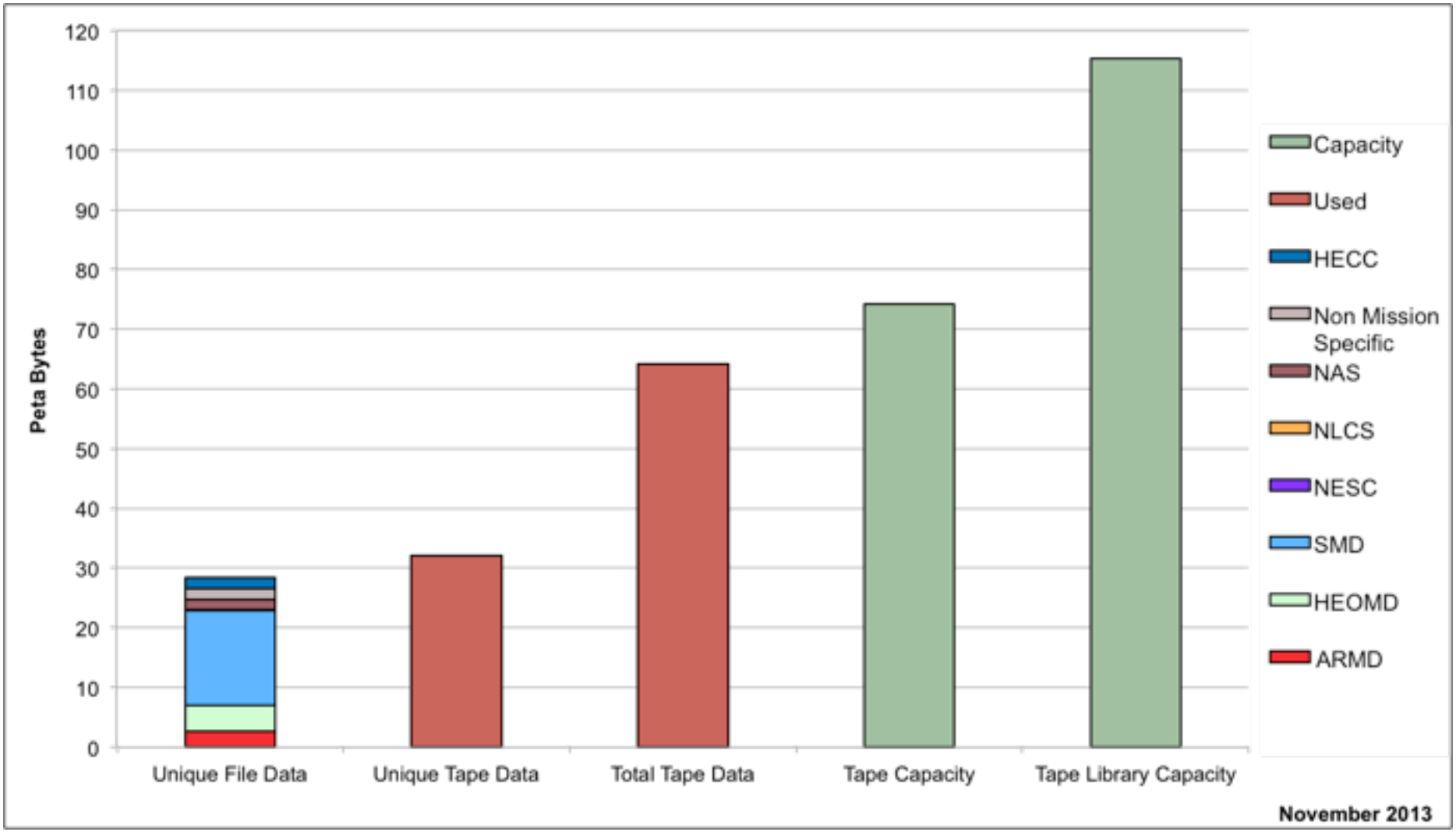




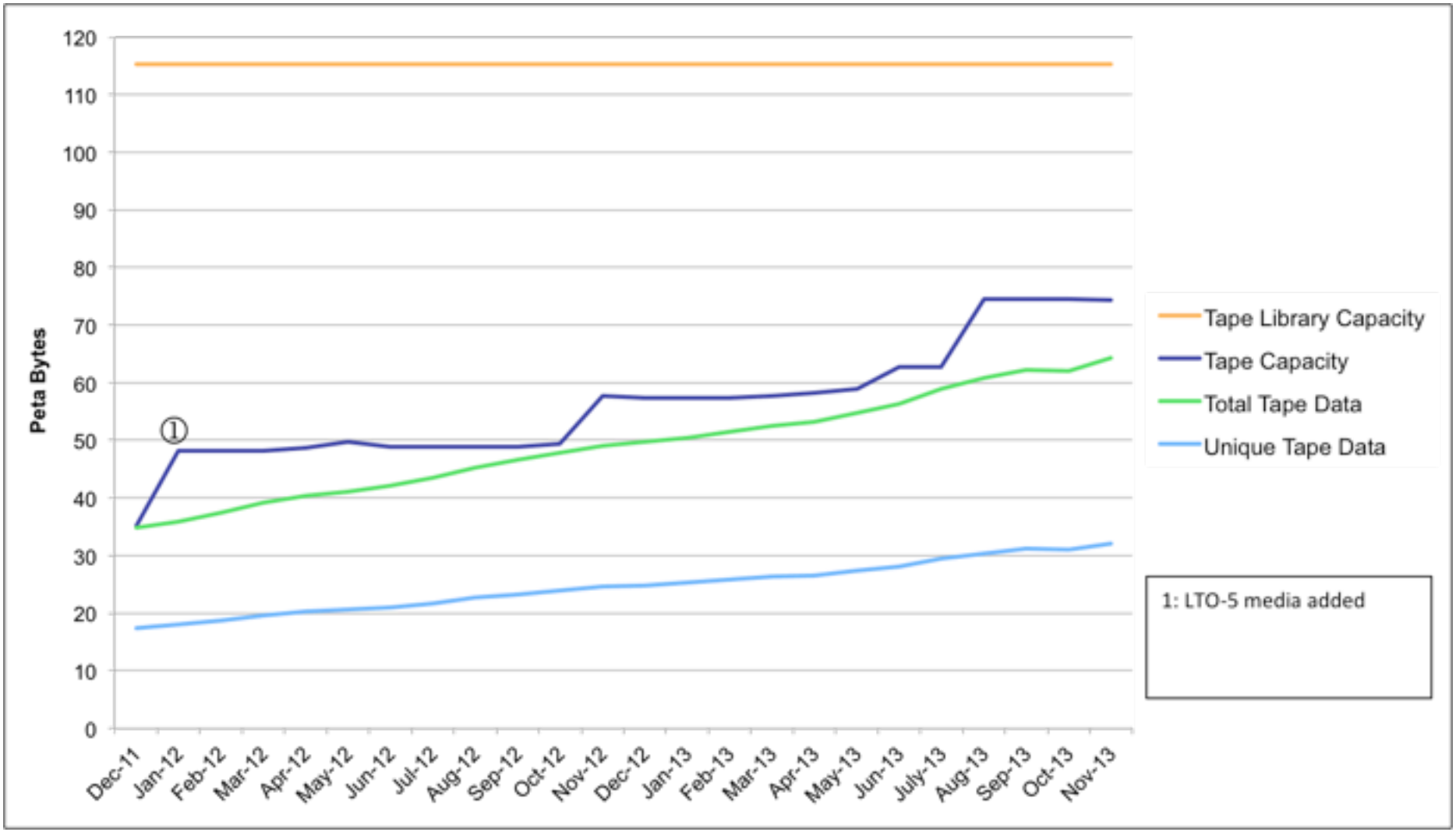


① 28 Harpertown Racks retired
② 24 Sandy Bridge Racks added
③ Columbia 21, 23, and 24 retired, Endeavour 2 added
④ Columbia 22 retired; Endeavour 1 added
⑤ 32 Harpertown Racks retired
⑥ 32 Harpertown Racks retired; 46 Ivy Bridge Racks added

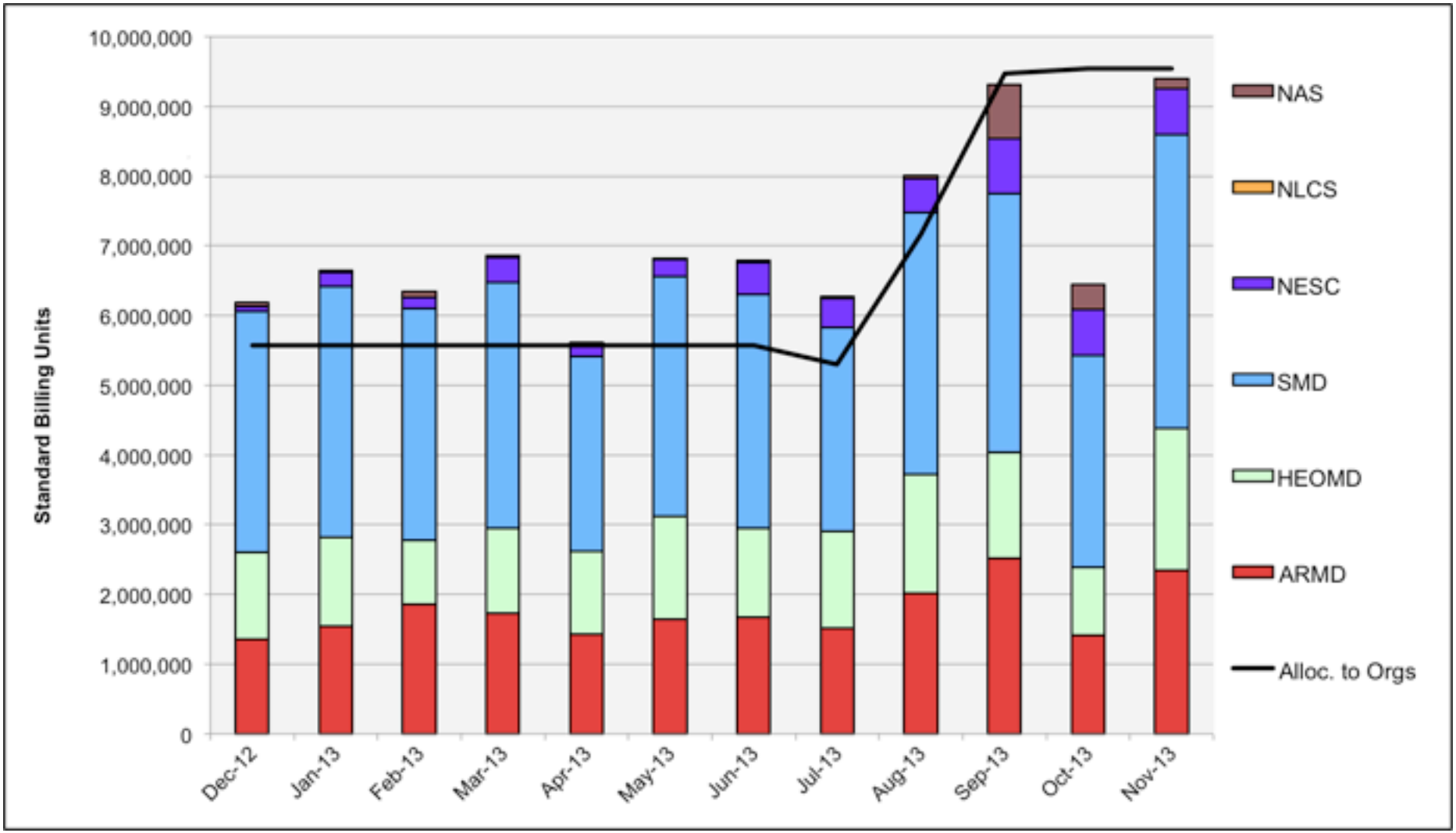
Tape Archive Status



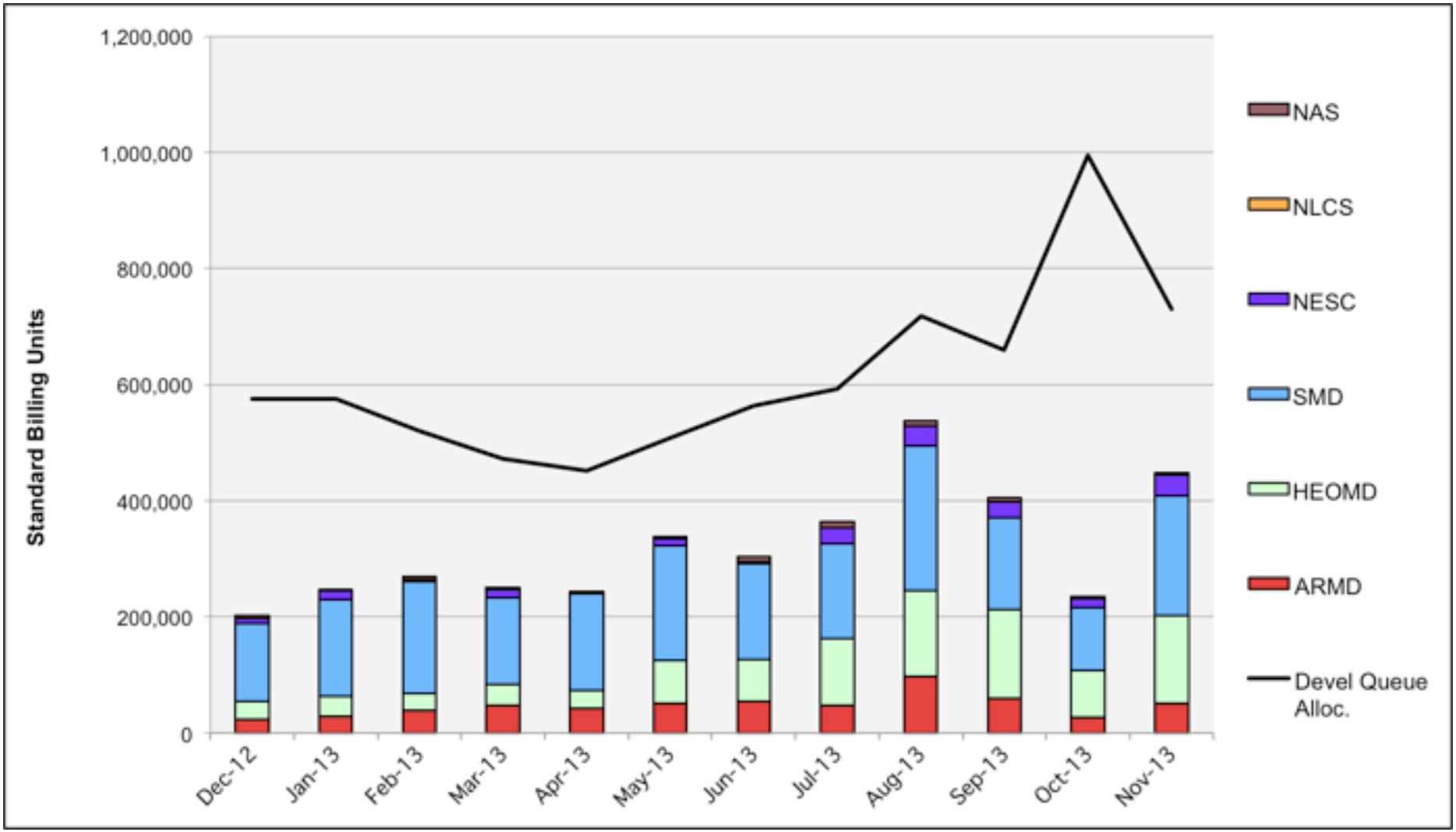
Tape Archive Status



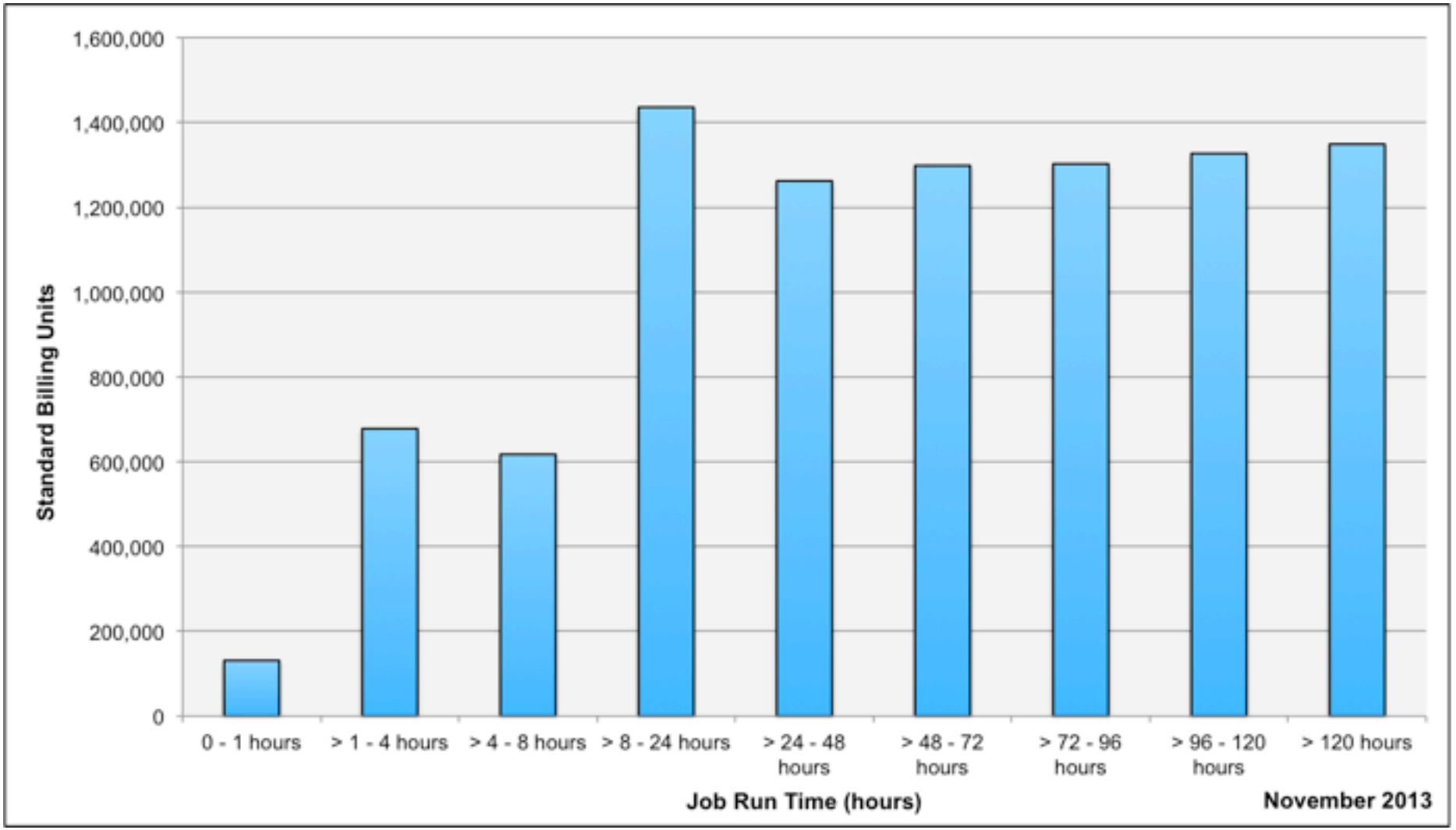
Pleiades:
SBUs Reported, Normalized to 30-Day Month



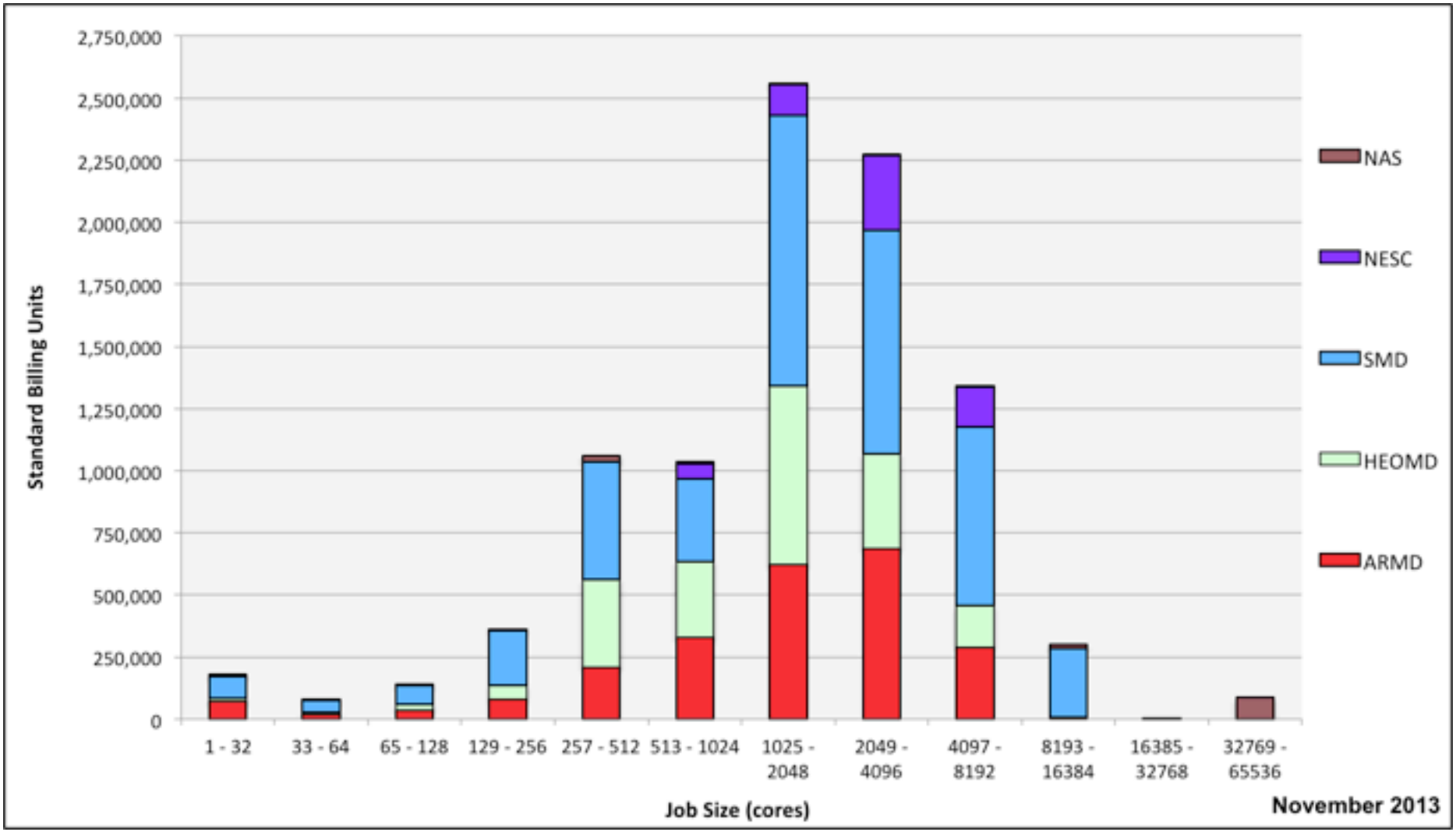
Pleiades:
Devel Queue Utilization



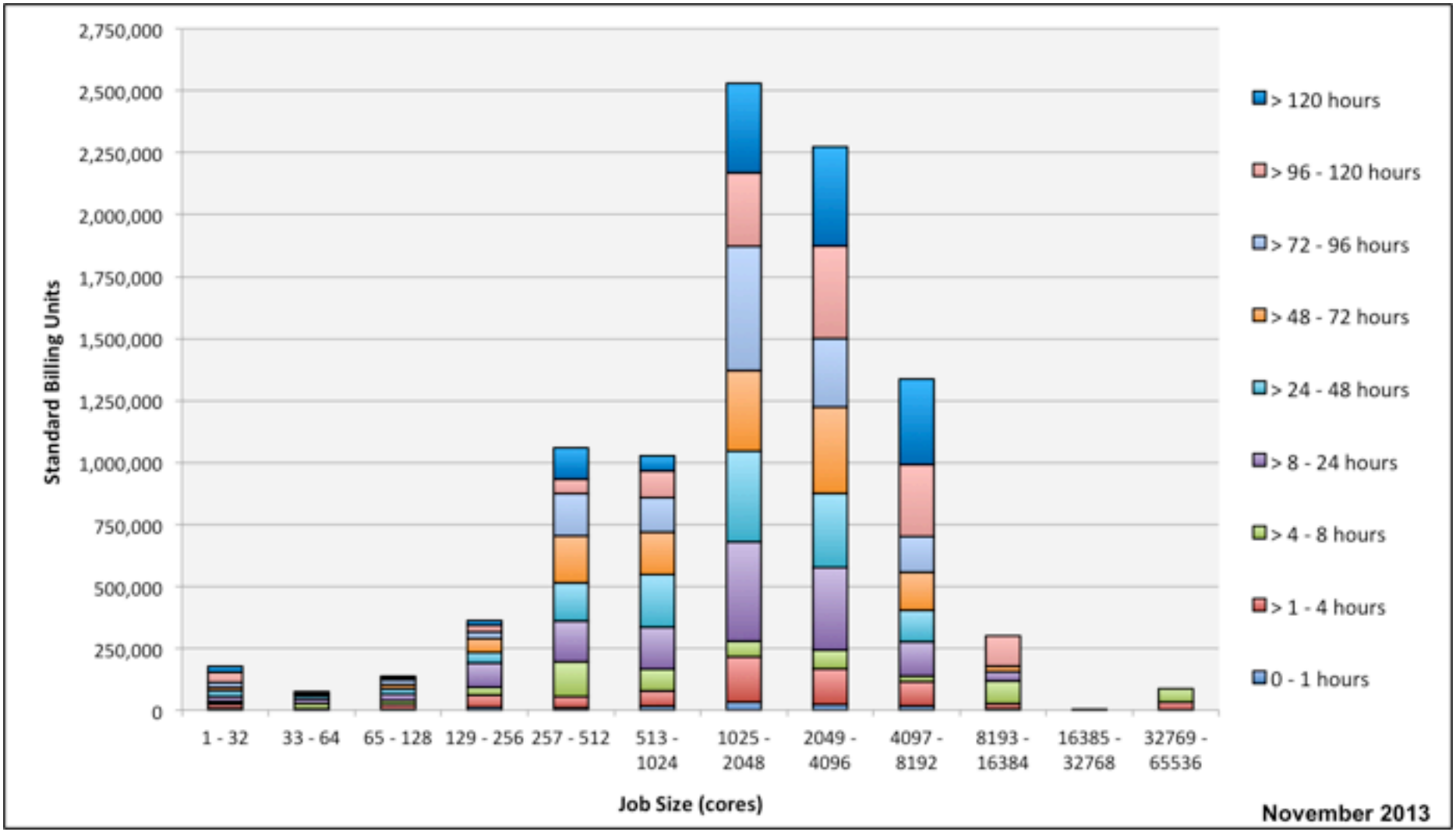
Pleiades:
Monthly Utilization by Job Length



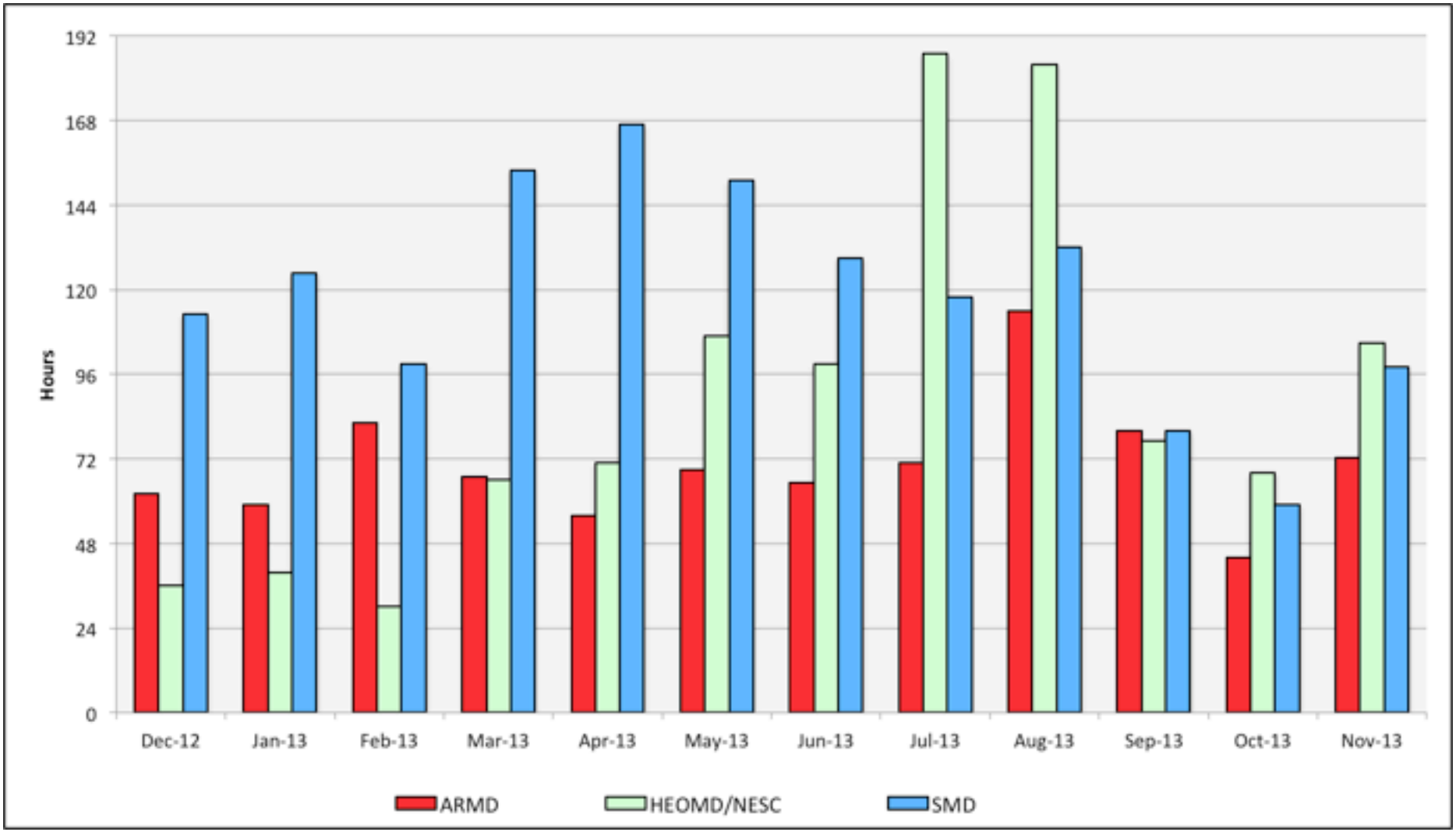
Pleiades:
Monthly Utilization by Size and Mission



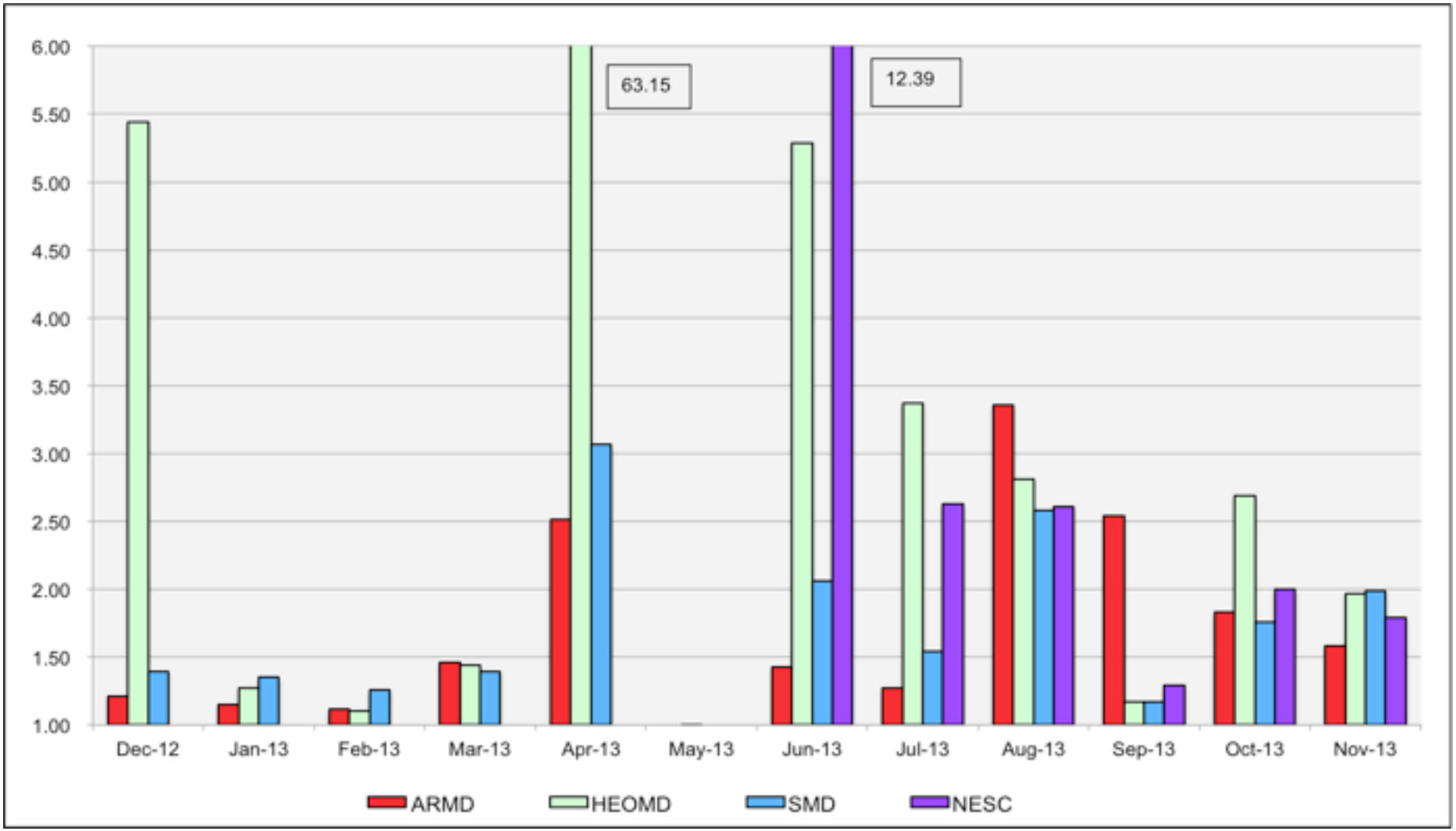
Pleiades:
Monthly Utilization by Size and Length



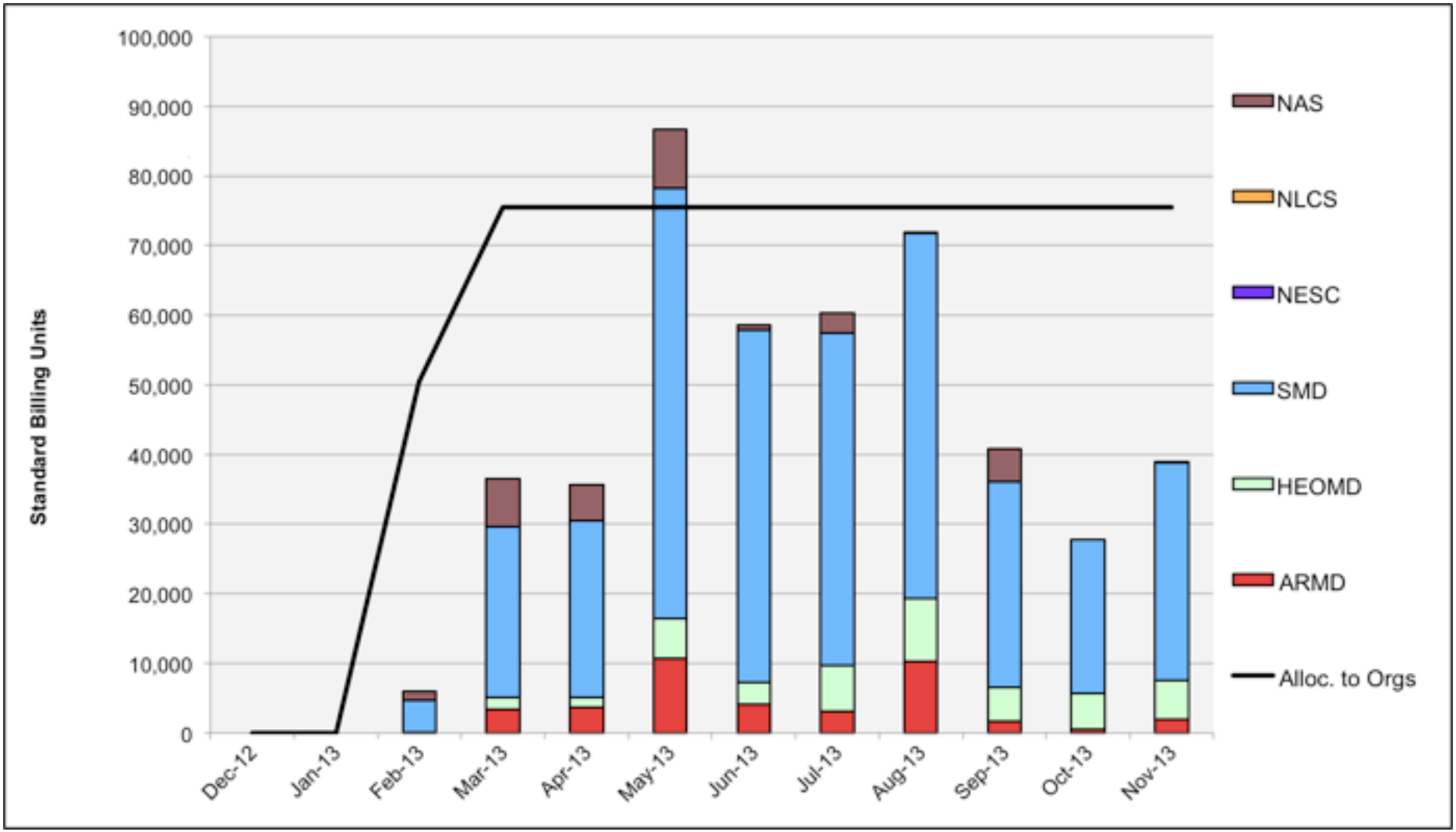
Pleiades:
Average Time to Clear All Jobs



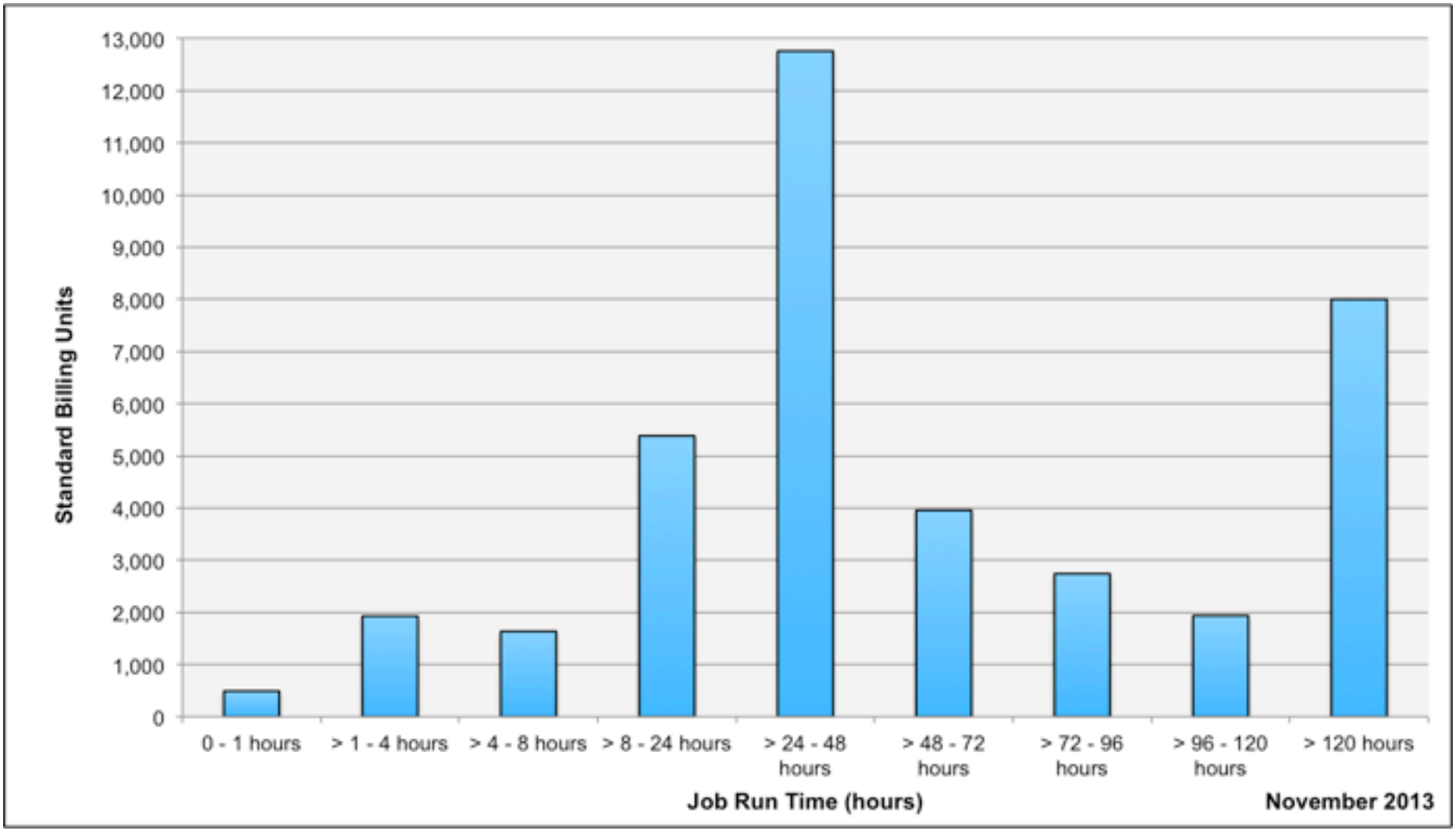
Pleiades:
Average Expansion Factor



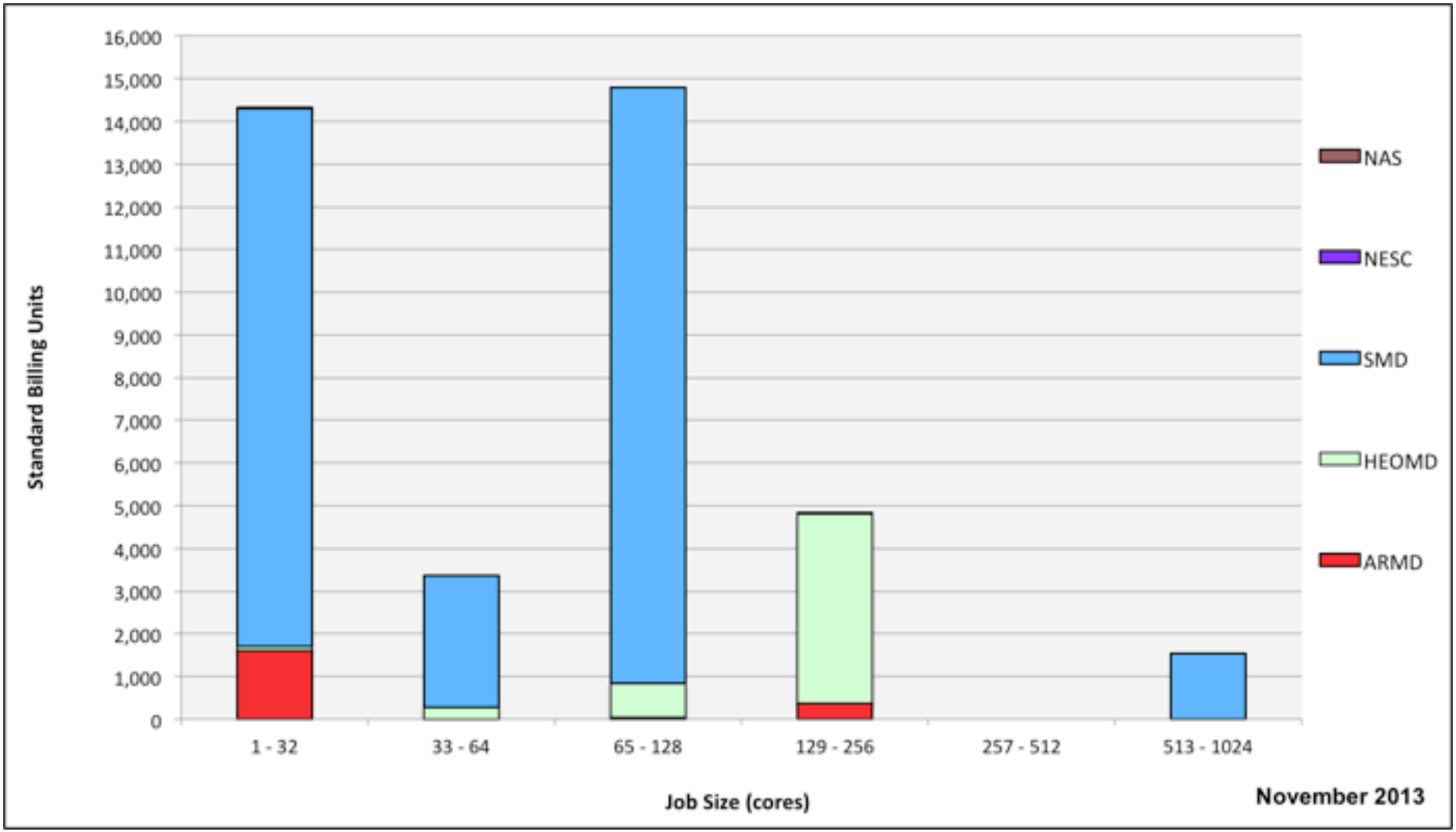
Endeavour:
SBUs Reported, Normalized to 30-Day Month



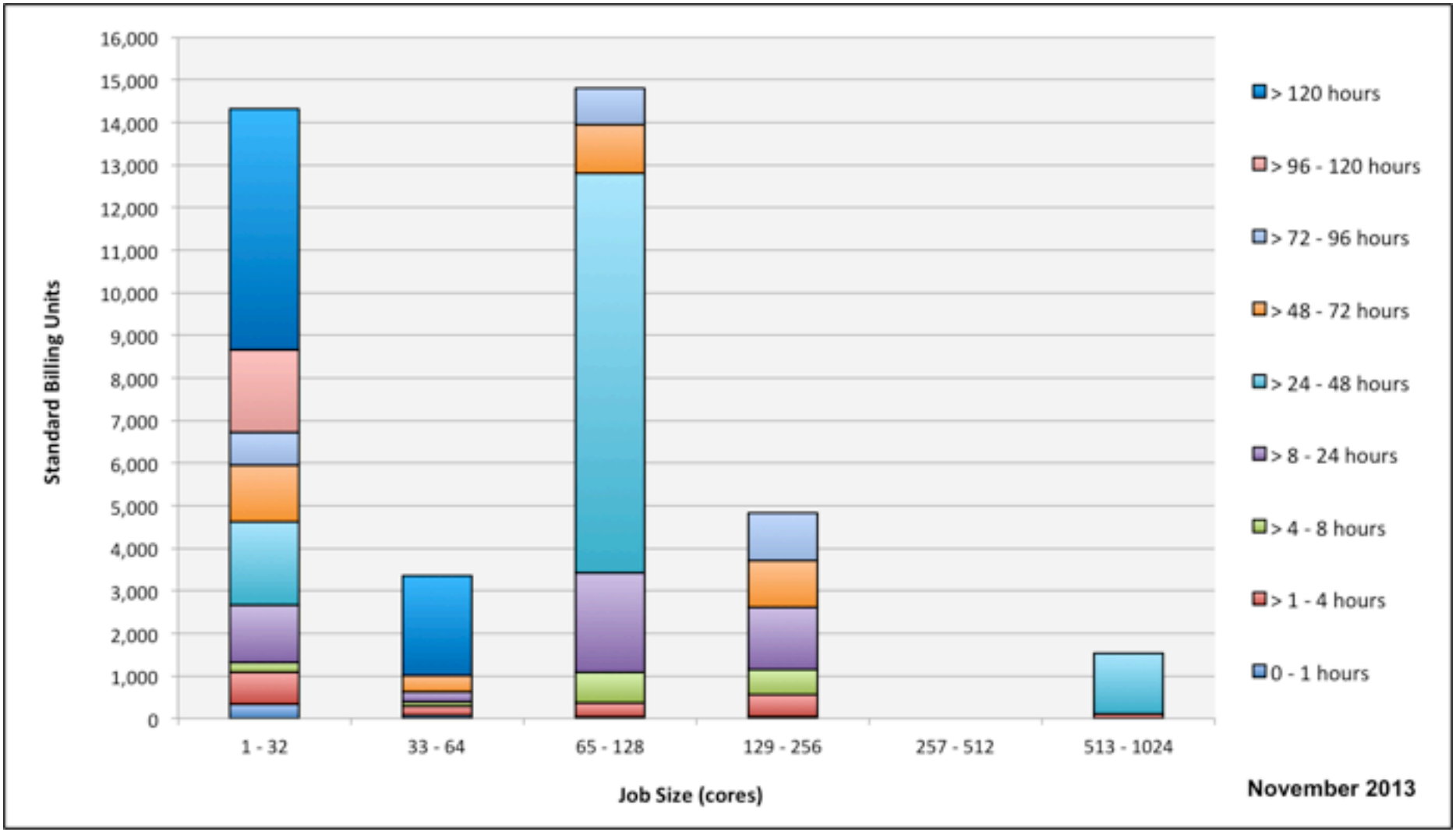
Endeavour:
Monthly Utilization by Job Length



Endeavour:
Monthly Utilization by Size and Mission



Endeavour:
Monthly Utilization by Size and Length



Endeavour:
Average Time to Clear All Jobs