



Update

Summary of HPC and HPDA Technology, Development, and Applications: HPC User Forum, September 15-17, 2014, Seattle, Washington

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IN THIS UPDATE

This IDC update summarizes the proceedings at the 54th HPC User Forum held in Seattle, Washington, September 15-17, 2014. Presentations included major HPC initiatives at U.S. and European government sites, innovative technologies and applications and emergent use cases in high-performance data analytics, user experiences with accelerators and coprocessors, cloud-based HPC developments, and user insights on practical HPC operations.

A series of IDC-produced documents that captured the highlights of the 2014 Seattle HPC User Forum in greater detail can be obtained through IDC. See the Related Research section for more information.

Major Global High-Performance Computing Initiatives

Government HPC centers are facing an increasingly complex set of requirements that include growing capabilities and payoff for existing scientific applications, inclusion of new requirements for big data and analytics, and exploration of architectures that use accelerators and coprocessors. IDC notes that, to address these requirements, government HPC centers are looking to share costs and technical resources by exploring new partnerships that include intra-government cooperation and expanding industrial partnerships.

Presentations included:

- Marek Niezgodka, ICM, University of Warsaw, covered Poland's primarily academic HPC domain with a funding level set at about \$200 million for research, \$400 million for e-infrastructure for academia, and \$1.5 billion to \$2.0 billion for e-infrastructures.
- Jay Srinivasan, NERSC, reported that surveyed users liked NERSC's data-intensive systems because of their policy flexibility, local disk, large memory, very large memory, and communication with databases.
- Manuel Vigil, Los Alamos National Laboratory, noted that it has become harder to acquire large systems, especially because they have been partnering with more parts of the government.

Technologies and Applications in High-Performance Data Analysis

High-performance data analytics are still in the early stages of development, and both HPDA vendors and users are exploring the myriad technologies, architectures, and application spaces of the sector. IDC believes that innovations and investments in high-performance data analysis will be needed on a sustained basis to catalyze the academic, commercial, and government sectors to create a full range of HPDA support technologies.

Presentations included:

- John Feo, Pacific Northwest National Laboratory, covered experiences on building scalable technologies for semantic analysis.
- Nima Negahban and Amit Vij, GIS Federal, presented details about their real-time geospatial-rendering project.
- Charlotte Crain, SAS Institute, shared insights on how commercial firms are exploiting multicloud grids for data-intensive computing.

Emergent Use Cases in High-Performance Data Analysis

Many in the HPDA user community are already creating new and technically demanding HPDA-based applications to meet existing research agendas as well as driving innovation in new research areas. IDC believes that the HPDA user community will increasingly press HPDA vendors to provide the hardware and architectures needed to meet critical mission requirements and that they will be a source of innovative thinking for both established and aspirant HPDA providers seeking new product ideas and markets.

Presentations included:

- Arno Kolster and Ryan Quick, PayPal, shared insight on using DSPs to develop a real-time analytics platform at PayPal.
- Shane Corder, Children's Mercy Hospital, shared details on using genomic sequencing and HPC to help save the lives of critically ill children.
- Jack Collins, the National Cancer Institute, presented details on the use of HPC in cancer research, citing HPC challenges such as integrating big data into the enterprise workflow, integrating heterogeneous computational technologies, and finding enough skilled people.

Experiences with Accelerators and Coprocessors in High-Performance Computing

Accelerators and coprocessors offer the potential for breakthrough performance gains in a number of critical academic, government, and commercial applications, but there is still significant work to be done porting existing codes and generating new ones that can fully capture the computational capabilities of these devices. IDC believes that, in the near term, continued progress in accelerator/coprocessor hardware capabilities, along with increasingly sophisticated software development tools, will yield additional performance payoffs and attract a growing base of users.

Presentations included:

- Seid Koric, NCSA, spoke about GPUs and industrial achievements.
- Edoardo Apra, Pacific Northwest National Laboratory, spoke on the development of Intel MIC codes in NWChem.
- Troy Porter, Stanford University, spoke on experiences with the Intel Phi and astrophysics.
- John Turner, ORNL, talked about accelerators used for R&D related to light water reactors.

Technologies and Applications of High-Performance Computing in the Cloud

Cloud computing, which is certainly a growing trend in the traditional IT commercial space, offers strong potential for a wide range of HPC applications as well. However, it is unclear yet what the true technical and financial costs may be in shifting a critical HPC application to a cloud environment. IDC assesses that, although there are many successful examples of HPC-based cloud applications, the technology is still relatively new and requires users to carefully consider the costs and benefits of moving their HPC workload into the cloud.

Presentations included:

- Tim Carroll, Cycle Computing, spoke on clouds as an HPC alternative.
- David Pellerin, AWS, covered HPC clouds and their use cases.
- Charlie Gonzales, IBM, spoke on cloud customer requirements.
- Steve Legensky, Intelligent Light, discussed HPC cloud software requirements.
- Alex Sutton, Microsoft, covered growing HPC workloads in the cloud.

High-Performance Computing in Practice

High-performance computing innovation will be driven by disruptive developments in a host of enabling technologies. A wide and diverse range of HPC developers, vendors, and users will be key players in driving innovation that will eventually make its way to a wider audience through either the commercial market or openly available public or academic research. Either way, the ultimate impact will be the creation of novel mechanisms to improve the effectiveness and efficiency of HPC research to an increasing base of users.

Presentations included:

- Stephen Bique, Naval Research Laboratory, spoke on initial experiences in programming using Xilinx Virtex-6 FPGAs inside Convey's HC-1ex system.
- Jan van Lunteren, IBM Research Labs, presented details about memory-driven near-data acceleration and its application to the DOME/SKA program.
- Michael Brown, Intel, spoke on advances in alternative energy and bioengineering simulations driven by many-core processors and accelerators.

- Jack Deslippe, NERSC, highlighted the use of many-core processors with BerkeleyGW code.
- Igor Bolotnov, North Carolina State University, presented advances in multiphase flow modeling and simulation.
- Steve Hammond, NREL, showcased utilization of warm water cooling in NREL supercomputing ecosystems.
- Jon Summers, University of Leeds, shared results of a study comparing liquid cooling methods.
- Key vendor updates were given by Mike Lafferty from Intel, Ed Turkel from HP, and Brian Connors from IBM.

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Related Research

Additional research from IDC in the technical computing hardware program includes the following documents:

- *High-Performance Computing in Practice: HPC User Forum, September 15-17, 2014, Seattle, Washington* (IDC #251975, October 2014)
- *Experiences with Accelerators and Coprocessors in High-Performance Computing: HPC User Forum, September 15-17, 2014, Seattle, Washington* (IDC #251973, October 2014)
- *Emergent Use Cases in High-Performance Data Analysis: HPC User Forum, September 15-17, 2014, Seattle, Washington* (IDC #251976, October 2014)
- *Technologies and Applications of High-Performance Computing in the Cloud: HPC User Forum, September 15-17, 2014, Seattle, Washington* (IDC #251974, October 2014)
- *Major Global High-Performance Computing Initiatives: HPC User Forum, September 15-17, 2014, Seattle, Washington* (IDC #251971, October 2014)
- *Technologies and Applications in High-Performance Data Analysis: HPC User Forum, September 15-17, 2014, Seattle, Washington* (IDC #251972, October 2014)
- *New Cray Urika-XA System Targets HPC-Big Data Convergence* (IDC #lcUS25203814, October 2014)
- *Lenovo Completes Acquisition of IBM's x86 Server Business* (IDC #lcUS25176214, September 2014)
- *USPS Touts Benefits of HPC for Big Data* (IDC #lcUS25123014, September 2014)
- *Worldwide Broader HPC 2014-2018 Forecast: Servers, Storage, Software, Middleware, and Services* (IDC #248835, June 2014)
- *When Massive Data Never Becomes Big Data* (IDC #lcUS24922014, June 2014)
- *Worldwide Technical Computing Server 2014-2018 Forecast* (IDC #248779, May 2014)

- *Perspectives on High-Performance Data Analysis: The Life Sciences* (IDC #248348, May 2014)
- *Global HPC Market Dynamics in 2013* (IDC #248137, April 2014)
- *Industrial Partnership Programs and High-Performance Computing: HPC User Forum, April 7-9, 2014, Santa Fe, New Mexico* (IDC #248113, April 2014)
- *International Perspectives on Industrial High-Performance Computing Partnerships: HPC User Forum, April 7-9, 2014, Santa Fe, New Mexico* (IDC #248122, April 2014)
- *Worldwide HPC Public Cloud Computing 2014-2017 Forecast* (IDC #247846, April 2014)
- *IDC's Worldwide High-Performance Computing Predictions 2014* (IDC #WC20140211, February 2014)
- *Micron Demonstrates Technologies to Address Emerging Challenges in Big Data Applications* (IDC #244843, December 2013)

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