Welcome To The 57th HPC User Forum Meeting September 2015

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BRONZE
- Bright Computing
- Engility
- Mellanox
- Panasas
- SUSE

Tuesday:
- Dinner – SGI and IDC

Wednesday:
- Breakfast – Mellanox
- AM Break – Engility
- Tuesday Lunch – AMD
- PM Refreshments – Panasas
- Dinner – HP and Intel

Wednesday:
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- AM Break – Bright Computing
- Lunch – Altair

HPC USER FORUM

Important Dates For Your Calendar

FUTURE HPC USER FORUM MEETINGS:

2015 Meetings:

- October 12 to 13 in Paris
- October 14 to 15 in Munich Germany, LRZ

2016 Meetings:

- April 11 to 13, Tucson, Arizona
- September 6 to 8, Austin Texas
- October in Asia and/or Europe

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Monday Dinner Vendor Updates: 8 Minutes

- Altair
- Cray
- Bright Computing
- Engility
- Nvidia
- Panasas
- SUSE

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Thank You To:
Mellanox
For Breakfast

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Introduction: Logistics

Ask Mary if you need a receipt

We have a very tight agenda (as usual)

- Please help us keep on time!

Review handouts

- Note: We will post most of the presentations on the web site
- Please complete the evaluation form

HPC USER FORUM

Welcome

Paul Muzio
HPC User Forum
Chairman

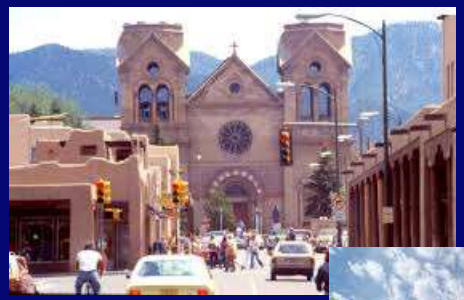
56 Meetings Worldwide Since 2000

Amsterdam, Netherlands (SARA)
Annecy, France
Bangalore, India (Indian Institute of Technology)
Beijing, China (Chinese Academy of Sciences)
Bologna, Italy (CINECA)
Bristol, UK
Bruyères-le-Châtel, France (Teratec)
Canberra, Australia
Geneva, Switzerland (CERN)
Kobe, Japan (RIKEN)
Lausanne, Switzerland (EPFL)
London, UK (Imperial College)
Manchester, UK (Manchester University)
Melbourne, Australia
New Delhi, India (Indian Institute of Science)
Seoul, Korea (National Institute of Supercomputing & Networking)
Stuttgart, Germany (HLRS)
Warsaw, Poland (University of Warsaw)
Yokohama, Japan (Earth Simulator Center)
Zurich, Switzerland (ETH Zurich)
United States (many locations)

Recent HPC User Forum Meetings

2014:

- April: Santa Fe, New Mexico
- July: Kobe, Japan (RIKEN)
- September: Seattle, Washington
- October: Canberra & Melbourne, Australia
- October: Stuttgart, Germany (HLRS)



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HPC User Forum Mission

To Improve The Health Of The

High Performance Computing Industry

Through Open Discussions, Information-sharing And Initiatives Involving

HPC Users In Industry, Government And Academia

Along With HPC Vendors

And Other Interested Parties

Steering Committee Members

- Paul Muzio, City University of New York, Chairman
- Rupak Biswas, NASA Ames, Vice Chairman
- Earl Joseph, IDC, Executive Director
- Swamy Akasapu, General Motors
- Vijay Agarwala, Virginia Tech.
- Alex Akkerman, Ford Motor Company
- Doug Ball, The Boeing Company
- Jeff Broughton. NERSC/Lawrence Berkeley National Lab
- Paul Buerger, Avetec
- Simon Burbidge, Imperial College London
- Chris Catherasoo, Caltech
- Jack Collins, National Cancer Institute
- Steve Conway, IDC Research Vice President
- Steve Finn, Cherokee Information Services
- Merle Giles, NSCA/University of Illinois
- Keith Gray, British Petroleum
- James Kasdorf, Pittsburgh Supercomputing Center
- Arno Kolster, Paypal
- Doug Kothe, Oak Ridge National Laboratory
- Jysoo Lee, National Institute of Supercomputing and Networking
- Michael Resch , HLRS, University of Stuttgart
- Vince Scarafino, Industry Expert
- Suzy Tichenor, Oak Ridge National Laboratory

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CHECK OUT OUR WEB SITE: www.hpcuserforum.com

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IDC HPC Market Update

About IDC: IDC HPC Activities

- Track all HPC servers sold each quarter
- 4 HPC User Forum meetings each year
- Publish 75 plus research reports each year
- Visit all major supercomputer sites & write reports
- Assist in collaborations between buyers/users and vendors
- Assist governments in HPC plans, strategies and direction
- Assist buyers/users in planning and procurements
- Maintain 5 year forecasts in many areas/topics
- Conduct special research studies
- Developing a worldwide ROI measurement system

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The ROI With HPC Is Very High

New results indicate higher ROI returns related to investments in HPC, compared to the pilot study

- On average, from the latest data:
  - $**514.7** in revenue per dollar of HPC invested
  - $**43.2** of profits/cost savings per dollar of HPC invested
  - The average HPC investment per innovation was $**3.0M**

- From the 2013 pilot study:
  - $357 in revenue per dollar of HPC invested
  - $39 of profits/cost savings per dollar of HPC invested
  - The average HPC investment per innovation was $3.1M

- **Note that an additional outcome of this research is an expansive list of HPC success stories**

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Top Trends in HPC

2015 is looking fairly strong, except for the very extreme supercomputers

- Top10 system purchases has slowed for ~2 years
- The IBM/Lenovo deal also delayed many purchases
- 1H 2015 is up over 12% !

Big data combined with HPC is creating new solutions

- Adding many new users/buyers to the HPC space

We have adjusted our tracking data in two areas:

- **The finance sector grew faster than what we reporting over the last two years (by ~50% higher)**
- **As we find new HPDA users, we add them to the HPC market space – we have created 4 new verticals in this area (see next page)**

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New HPC Segments from HPDA Buyers

1. **Fraud and anomaly detection.** This "horizontal" workload segment centers around identifying harmful or potentially harmful patterns and causes using graph analysis, semantic analysis, or other high performance analytics techniques. The patterns may point to fraud, which is the deceptive exploitation or annotation of data for wrongful or illegal personal gain, or they may point to cyber security crime or insider threats, significant errors, or other anomalies that may deserve further investigation.
2. **Marketing.** This segment covers the use of HPDA to promote products or services, typically using complex algorithms to discern potential customers' demographics, buying preferences and habits.
3. **Business intelligence.** The workload segment uses HPDA to identify opportunities to advance the market position and competitiveness of businesses, by better understanding themselves, their competitors, and the evolving dynamics of the markets they participate in.
4. **Other Commercial HPDA.** This catchall segment includes all commercial HPDA workloads other than the three just described. Over time, IDC expects some of these workloads to become significant enough to split out of this "other" category and command their own segments. An example of such a high-potential workload is the use of HPDA to manage large IT infrastructures, ranging from on premise data centers to public clouds and Internet-of-Things (IoT) infrastructures.

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Top Trends in HPC: Growing Use of Clouds

Do you use cloud computing today for any of your HPC workloads?	
	Percentage of Responses
Yes	25.5%
No	74.5%
Total	
N = 1,269 Servers at 157 sites	
Source: IDC, 2015	

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Top Trends in HPC: Growing Use of Clouds

Level of Use of Clouds for Sites that are Currently Using Clouds	
	Percent of HPC Workload in Clouds
Sites Currently Using Clouds	31.2%
N = 40 Sites out of 157	
Source: IDC, 2015	

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Top Trends in HPC: Evolving Issues On Our Minds

Non-x86 processors could alter the landscape

- ARM, Power, others
- Coprocessors, GPUs, FPGAs

China looms large(r)

- Lenovo, growing domestic market, export intentions
- Other Chinese vendors are planning to extend to Europe

Growing influence of the data center in IT food chain

- Impact on HPC technology options
- Perhaps providing new approaches?

HPC in the Cloud Gaining Traction

- How much, how soon?

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Top Trends in HPC: HPC Storage

Storage is the fastest-growing part of the HPC market

HPC storage revenue will grow to record levels

The HPC storage market remains fragmented

The big players are turning their attention to this market

The HPC interconnect market is in transition

Data movement/management is a major pain point

- Multi-year shift away from today's extreme compute-centrism
- Many buyers still not savvy enough about purchasing storage

HPDA will boost storage budgets

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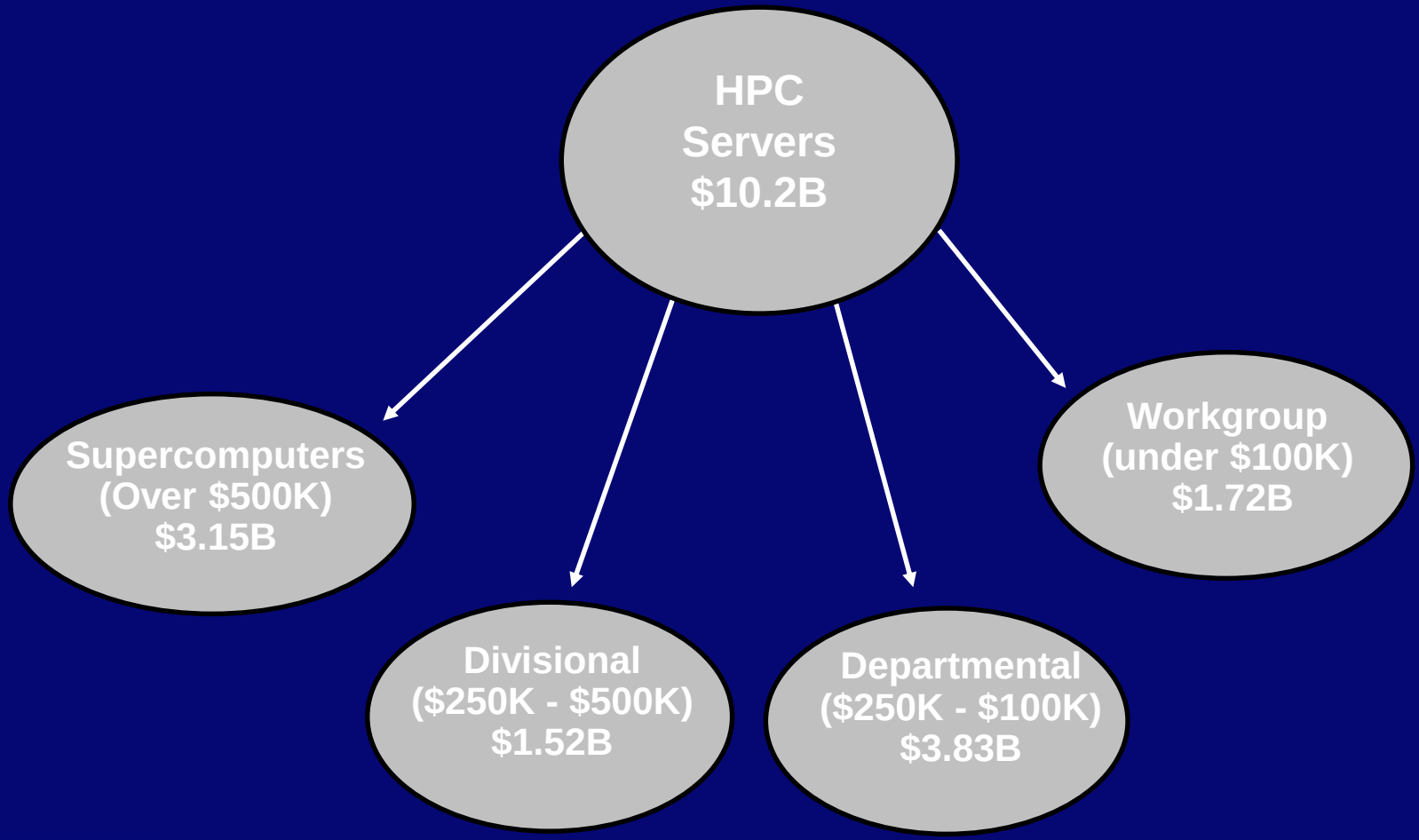
IDC HPC Competitive Segments: 2014



2014 HPC Revenue Results

New Competitive S	2010	2011	2012	2013	2014
cs1-Supercomputer	3,475,577	4,370,194	5,654,960	3,994,740	3,149,520
cs2-Divisional	1,268,735	1,236,684	1,216,187	1,355,097	1,524,240
cs3-Departmental	3,342,747	3,467,314	2,979,230	3,363,263	3,830,867
cs4-Workgroup	1,411,264	1,225,920	1,247,375	1,585,666	1,717,656
Grand Total	9,498,323	10,300,111	11,097,752	10,298,766	10,222,283

IDC
Analyze the Future

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HPC Revenues: By Vendor

Mftr	2013	2014	2015 Q115	
HP	3,343,758	3,483,471	911,131	36.1%
IBM	2,856,334	2,364,528	118,888	4.7%
Lenovo			377,782	15.0%
Dell	1,478,322	1,510,845	426,200	16.9%
Cray	436,741	459,900	52,463	2.1%
SGI	310,581	344,455	60,189	2.4%
Fujitsu	127,988	134,285	37,015	1.5%
NEC	72,901	130,482	37,621	1.5%
Bull	77,322	98,468	22,150	0.9%
Sugon (Dawning)	200,497	217,200	54,468	2.2%
Other	1,394,321	1,478,650	425,910	16.9%
Grand Total	10,298,766	10,222,283	2,523,818	100.0%

2014 HPC Market: By Industry/Applications

	2014
Bio-Sciences	1,131,025
CAE	1,170,135
Chemical Engineering	158,574
DCC & Distribution	633,413
Economics/Financial	342,767
EDA / IT / ISV	646,974
Geosciences	700,308
Mechanical Design	52,202
Defense	968,441
Government Lab	2,035,665
University/Academic	1,827,542
Weather	458,928
Other	96,310
Total Revenue	10,222,283
Source: IDC 2015	

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HPC
Market Forecasts

Why HPC Is Projected To Grow

1. **The low half of the market is finally back to a recovery mode**
2. **It has become a competitive weapon**
3. **Governments view HPC leadership as critical**
   - For national pride, but more importantly for economic prosperity
4. **There are very critical HPC issues that need to be solved**
   - Global warming, alternative energy, safe NE, financial disaster modeling, healthcare, homeland security, …
   - And 3D movies and large scale games are fun

HPC Forecasts

- Forecasting a 8.2% yearly growth from 2014 to 2019
- 2019 should exceed $15 billion

Worldwide Total Technical Computer Market Shipments Forecast				
	2013	2014	2019	CAGR (14-19)
Supercomputer	3,995	3,150	5,034	9.8%
Divisional	1,355	1,524	2,156	7.2%
Departmental	3,363	3,831	5,406	7.1%
Workgroup	1,586	1,718	2,569	8.4%
Total	10,299	10,222	15,165	8.2%

Source: IDC 2015

OpenHPC USER FORUM

The Broader HPC Market

The Broader HPC Market Growth to 2019

Worldwide HPC Compute, Storage, Middleware, Application and Service Revenues ($M)

	2014	2015	2016	2017	2018	2019	CAGR (14-19)
Server	10,222	10,718	11,467	12,958	14,073	15,165	8.2%
Storage	4,229	4,504	4,865	5,546	6,123	6,796	9.9%
Middleware	1,163	1,217	1,294	1,426	1,534	1,645	7.2%
Applications	3,598	3,769	4,028	4,479	4,824	5,167	7.5%
Service	1,819	1,895	2,006	2,223	2,356	2,497	6.5%
Total	21,032	22,103	23,660	26,632	28,910	31,270	8.3%

Source: IDC 2015

Conclusions

HPC is still expected to be a strong growth market

- Growing recognition of HPC's strategic value is helping to drive high-end sales
- Low-end buyers are back into a growth mode

Vendor share positions will shift greatly in 2015

Recognition of HPC's strategic/economic value will drive the exascale race

The formative HPDA market will expand opportunities for vendors

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Questions?

Please email:
hpc@idc.com

Or check out:
www.hpcuserforum.com

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Agenda: Day One Morning

10:15am Focus Area: HPC in the Earth Sciences (Continued)

- MITgcm And How High Performance Computing Has Led To Significant Scientific Discoveries In Earth Science, Christopher Hill, MIT
- The New York City Solar Map, Paul Muzio, City University of New York
- Refactoring Climate And Weather Applications For Exascale, Rich Loft, NCAR

11:45pm Vendor Technical Update: HP R&D Plans for HPC

12:00pm Networking Lunch

Lunch Thanks to:
AMD

Please Return Promptly at 1:00pm

HPC USER FORUM

Agenda: Day One Afternoon

Session Chair: Jim Kasdorf

1:00pm Technology Focus Area: HPDA/Big Data Supporting Technologies, Security, Interconnects and Storage (15 minute presentations)

- Update on DMF/LiveArc, Kirill Malkin, SGI
- Dell HPC Update: Jim Ganthier, Dell
- Intel Plans for HPC, Bret Costelow, Intel
- Best Practices in Private Sector Cyber Security, Bob Sorensen, IDC
- HPC + D + A = HPDA? Trends in High Performance Computing, Data and Analytics, Barry Bolding, Cray
- Panel Discussion and Q&A

2:45pm Break

3:15pm Leveraging HPC for Alzheimers Research and Beyond, Joe Lombardo, UNLV/NCSEE

3:45pm The Inspur-Intel China Parallel Computing Joint Lab, Qing Zhang, Inspur

4:15pm HPC Best Practices: Lessons observed from 40+ HPC procurement & service review projects, Andy Jones, NAG

4:45pm NOAA's Software Engineering for Novel Architectures Project, Leslie Hart

5:00pm Networking Break

6:30pm Special Dinner Event: 6:30pm – 10:00pm

Thank You To:
Mellanox
For The Break

Dinner Logistics

- Special Dinner Event:
  - Location: In the Pavilion, Outside, Behind the Swimming Pool
  - 6:30pm -- Reception
  - 7:00pm -- Dinner
- Sponsored by Intel and HP

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Welcome To Day 2 Of The HPC User Forum Meeting

Dinner
Thanks to:
Intel and HP

Breakfast
Thanks to:
SUSE

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HPC USER FORUM

Agenda: Day Two Morning

8:00am Panel on US Plans for Advancing HPC: Potential Implications Of The White House Executive Order and NSCI

- Panel moderator: Bob Sorensen
- Panel members: Randy Bryant, OSTP, Irene Qualters, National Science Foundation, DOE Office of Science, Doug Kothe, Oak Ridge National Laboratory, Will Koella, Department of Defense, NASA, and other agencies

9:15am Open Forum Discussion and Q&A of the NSCI Plans and Directions

- Panel members: Bill Kramer, NCSA, Rob Leland, Sandia National Laboratory, Bert Still, LLNL, Nathan Baker, PNNL, Piyush Mehrotra, NASA Advanced Supercomputing Division, and David Lifka, CASC

10:15am Break

10:45am Disruptive Technology Panel: Panel members are asked to present in under 5 minutes a disruptive technology that could change the HPC industry.

- Panel moderators: Earl Joseph and Paul Muzio
- Each panel presenter is asked to use 3 slides: a) What is the disruptive technology, b) Why it is disruptive – What does it do for the end user? and c) What do you expect it will do in the market place?
- Then three of the HPC User Forum steering Committee members will probe: 1) Is this really a disruptive technology? 2) Who will likely be able to use it? and 3) What can be done to bring it to market sooner?

12:15pm Networking Lunch

Thank You To:
Bright Computing
For The Break

Disruptive Technologies Panel: Process

Panel members are asked to present in under 5 minutes a disruptive technology that could change the HPC industry.

Each presenter is asked to use 3 slides:

a) What is the disruptive technology
b) Why it is disruptive – What does it do for the end user?
c) What do you expect it will do in the market place?

Then three of the HPC User Forum steering Committee members will probe:

1) Is this really a disruptive technology?
2) 2) Who will likely be able to use it?
3) 3) What can be done to bring it to market sooner?

Disruptive Technologies Panel: Presenters

- All and none of the above, Paul Muzio, CUNY
- 3D Xpoint technology, Ken Gibson, Intel
- Processing 1 EB per Day for the SKA Radio Telescope, Peter Braam, Cambridge University
- Accelerating Content Distribution and Enabling Collaboration, Chris Myhill, Data Direct Networks
- The D-Wave 2X Quantum Computer: 1,000 Qubits, Bo Ewald, D-Wave
- Challenging Data Analytics Architectures, Joseph George, Hewlett Packard
- ExaNest technology: Targeting Exascale in 2018, Peter Hopton, Iceotope
- Leveraging Containers in Elastic Environments, Nick Ihli, Adaptive Computing
- Breaking the Disk IO Bottleneck in CFD by Eliminating It, Steve Legensky, Intelligent Light
- NVLink Interconnect for GPUs, Stan Posey, Nvidia
- Heterogeneous On-Demand Storage for HPC Workflows in the Cloud, Leo Reiter, Nimbix
- Optimizing Cloud and HPC Technologies through a Disruptive Business Model for Advanced Simulation, Robert Walsh, Altair Engineering
- Optical Processing in HPC, Optalysys, Nicholas New

Lunch Thanks to:
Altair

Please Return Promptly at 1:00pm

HPC USER FORUM

Agenda: Day Two Afternoon

Session Chair: Suzy Tichenor

1:15pm Panel: Energy Efficiency and Renewables Panel, Moderated by Steve Hammond, NREL
- HPC in Energy Applications, Steve Hammond, NREL
- Wind Plant Flow Physics, Michael Sprague, NREL
- Simulations for Enhanced Drilling Techniques, Joel Moxley, ForoEnergy
- Materials by Design, Vladan Stevanovic, NREL

3:15pm Break

3:45pm Update on the ROI with HPC, Highlighting HPC Success Stories, Earl Joseph, IDC

4:15pm EU/European HPC Plans for the Next Decade, Bob Sorensen, IDC

4:30pm HPC site update: Doug Kothe, ORNL

5:00pm Meeting Wrap-Up, Paul Muzio and Earl Joseph

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