Welcome To The 44th HPC User Forum Meeting at HLRS October 2011

Important Dates For Your Calendar

FUTURE HPC USER FORUM MEETINGS:

International Meetings:

- **2012 Imperial College, UK July 5 & 6**

2012 US Meetings:

- **2012 April 16 to 17, Richmond, Virginia**
- **2012 September 17 to 19, Dearborn, Michigan**

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- Bright Computing
- Bull
- Qlogic
- Spectra Logic

XSEDE-HPC USER FORUM

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HPC USER FORUM

WELCOME TO THE HPC USER FORUM
Reshaping the Industry... Together

IDC Analyze the Future

Next Meeting:
- Register
- Information

Download Presentations
About The Forum
Prior Meetings
IDC Research
Contact us
SC10 Conference
International Supercomputing Conference

FUTURE MEETINGS

2011 US Meetings:
- April 5 to 7 Houston, Texas
- September 8 to 8 San Diego, California

2011 International Meetings
(Dates will be announced)
- CEA, France
- HLRS, Germany

THE INNOVATION EXCELLENCE AWARD

HPC WIRE
High Performance Computing News

CLICK HERE FOR A FREE SUBSCRIPTION TO HPWIRE!
Stay up-to-date with the latest news for supercomputing professionals. Gain access to peer discussions, HPC industry resource tools

HPC@IDC

2011 HPC INTERNATIONAL MEETINGS

CEA, France
October 3 and 4

REGISTER NOW

AGENDA

HLRS, Germany
October 6 and 7

REGISTER NOW

AGENDA

2011 HPC US MEETINGS

HPC USER FORUM
SEPTEMBER 8-8 2011
Omni San Diego Hotel,
San Diego, California

AGENDA

REGISTRATION INFORMATION

STEERING COMMITTEE

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Cherokee Information Services
Chairman

Sharon Kalwani
KAUST
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Michael Resch
HLRS, University of Stuttgart

Vince Scarafino
Industry Expert

Robert Singleterry
NASA/Langley

Allan Snavely
San Diego Supercomputer Center

Rupak Biswas
NASA Ames

New Research Studies

Special Study: Power & Cooling Practices and Planning at HPC Data Centers
IDC and DICE, the HPC Research Division of Avetec release a groundbreaking study on HPC data center power and cooling challenges, practices, trends and technology.

To access the study, click on image to reach DICE website and select Reports & Publications.

HPC Buyer Case Study: TACC

Council on Competitiveness, IDC Release Study on HPC and Innovation

New HPC Innovation Award Program: www.hpcuserforum.com/innovationaward/

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IDC Analyze the Future

THE INNOVATION EXCELLENCE AWARD

For the Outstanding Application of HPC Computing for Business and Scientific Achievements

HOME GOALS OBJECTIVES RANKING PROCESS PRIZES APPLICATION FORM CONTACT US

IDC is launching a new program to recognize noteworthy achievements made by users using High Performance Computing (HPC) technologies.

SUBMIT ENTRY HERE

Deadline for Submissions
March 31, 2011

How winners will be selected

» All submissions will receive a careful and complete review

» Submissions must contain a clear description of the dollar value or scientific value received in order to qualify

Program Goals

- Showcase success stories involving HPC in science and industry
- Help other users better understand the benefits of adopting HPC and justify HPC investments, especially for SMBs
- Demonstrate the value of HPC to funding bodies
- Expand public support for increased HPC investments
- If you have one or more HPC success stories you would like to see recognized through our program, we encourage you to complete and submit this application form. Please submit a separate form for each success story that you want considered.

Program Objectives

While there are multiple benchmarks to measure the performance of technical computers, there currently isn't an adequate methodology to evaluate the economic and scientific value HPC systems contribute. The HPC Innovation Excellence Award Program is designed to help close that gap.

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APPRO Supercomputer Solutions

Bronze Sponsors

Welcome

Steve Finn
HPC User Forum
Chairman

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

- Steve Finn, Cherokee Information Services, Chairman
- Sharan Kalwani , KAUST, Vice Chairman
- Earl Joseph, IDC, Executive Director
- Vijay Agarwala, Penn State University
- Alex Akkerman, Ford Motor Company
- Doug Ball, The Boeing Company
- Rupak Biswas, NASA Ames
- Paul Buerger, Avetec
- Steve Conway, IDC Research Vice President
- Jack Collins, National Cancer Institute
- Jeff Broughton. NERSC/Lawrence Berkeley National Lab
- Merle Giles, NSCA/University of Illinois
- Chris Catherasoo, Caltech
- James Kasdorf, Pittsburgh Supercomputing Center
- Doug Kothe, Oak Ridge National Laboratory
- Paul Muzio, City University of New York
- Michael Resch , HLRS, University of Stuttgart
- Vince Scarafino, Industry Expert
- Allan Snavely, San Diego Supercomputer Center

HPC USER FORUM

Summarizing the September HPC User Forum meeting

Some Highlights

Steve Finn
steve@sfinn.com
Cherokee Information Services Inc.
Chairman, HPC User Forum Steering Committee

Meeting Topics

HPC in Materials Science * (Ping Golf)
Datacenter Power and Cooling * (TACC only)
The path to Exascale * (Sriram Swaminarayan only)
Clouds for HPC ?
The Future of Lustre *
Invited vendor presentations
Other invited speakers:

- 1000 Genome Project
- The AFRL Condor Cluster
- Update on HECToR
- Data Intensive Computing at SDSC *
- Networking Information Technology Research and Development (NITRD)
- HPC as an Ecosystem
- IDC Updates

Final agenda:
http://www.hpcuserforum.com/registration/sandiego/sandiegoagenda.pdf
Videos of some talks: http://insidehpc.com/category/events/hpc-user-forum/ talks marked with * available
Presentations: http://www.hpcuserforum.com/download.html

Materials Science

Presentations from:

- Tim Germann, Los Alamos National Laboratory
- Bobby Sumpter, Oak Ridge National Laboratory
- Charles R. Welch, US Army Corps of Engineers
- Andres Jaramillo-Botero, Caltech
- Eric Morales. Ping Golf

Common theme among 1st 4 speakers on need to match codes to future architectures including challenges of heterogeneous and hierarchal aspects of future architectures

Tim Germann

Co-design is a process by which computer science, applied math, and domain science experts work together to enable scientific discovery

- Hardware is changing dramatically
  - *Increased concurrency*
  - *Increased heterogeneity*
  - *Reduced memory per core*
  - *"Business as usual" is not going to work*
- Algorithms and methods will have to be rethought / revisited
  - *Flops are (almost always) free*
  - *Memory is at a premium*
  - *Power is a constraint for large scale systems*
  - *Resiliency is a challenge*
- Few domain scientists have the extended expertise "from hardware to application" to enable applications to run at exascale
- Success on the next generation of machines will require extensive collaboration between domain scientists, applied mathematicians, computer scientists, and hardware manufacturers

Summary

- Our objective is to establish the interrelationship between algorithms, system software, and hardware required to develop a multiphysics exascale simulation framework for modeling materials subjected to extreme mechanical and radiation environments.
- This effort is focused in four areas:
  - *Scale-bridging algorithms*
    - » UQ-driven adaptive physics refinement
  - *Programming models*
    - » Task-based MPMD approaches to leverage concurrency and heterogeneity at exascale while enabling fault tolerance
  - *Proxy applications*
    - » Communicate the application workload to the hardware architects and system software developers, and used in performance models/simulators/emulators
  - *Co-design analysis and optimization*
    - » Optimization of algorithms and architectures for performance, memory and data movement, power, and resiliency

ExMatEx

Datacenter Power and Cooling Panel

Tommy Minyard, Texas Advanced Computing Center

- Energy efficient strategies in a large data center
- Servers suspended in mineral oil

Henry Tufo, University of Colorado Boulder

- Modular datacenter built by Epsilon in Ontario Canada, assembled on-site , measured PUE of 1.1

Steve Jones, Stanford University

- Retrofitting an existing building as a datacenter
- 560 dual socket nodes, 120 NVIDIA M2050 GPU's
- Chilled Water, PUE 1.5

Exascale

Sriram Swaminarayan, Los Alamos National Laboratory

- Focused on changes to programming models

Peter Beckman, Argonne National Laboratory

- International Exascale Software Project
- Need for investment in software to handle future architectures, recent HPC focus has been on hardware but software needs keep up

Jeff Nichols, Oak Ridge National Laboratory

- Partnerships will be crucial for the success of Exascale initiatives, including with industry. Many think Exascale will cost us $5B over the next 5 years, or about $600M a year.

The AFRL Condor Cluster

Integration, Development and Results of the 500 TeraFlop Heterogeneous Cluster (*Condor*)

September 2011

Mark Barnell
Air Force Research Laboratory

Integrity ★ Service ★ Excellence

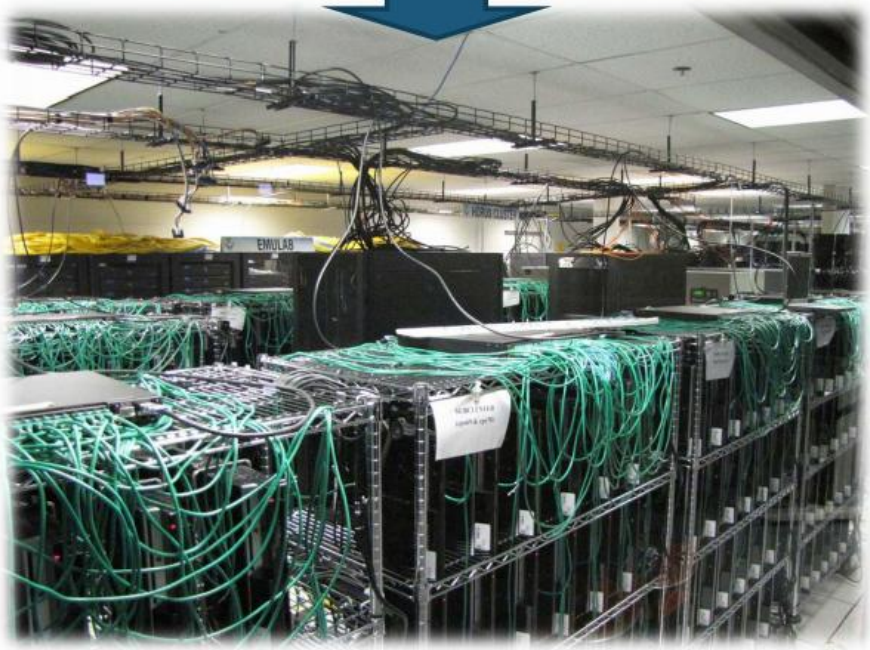
DISTRIBUTION A. Approved for public release; distribution unlimited (88ABW-2011-3208, 06 Jun 2011)

The *Condor* Cluster

FY10 DHPI Key design considerations: **Price/performance** & **Performance/Watt**

84 head nodes
- **6 gateway access points**
- **78 compute nodes**
  - Intel Xeon X5650 dual-socket hexa-core
  - (2) NVIDIA Tesla GPGPUs
    - 49 nodes – (98) C2050
    - 15 nodes – (30) C2070
    - 14 nodes – (28) C1060
  - 24 GB RAM (*48GB)

1716 SONY Playstation3s
- STI Cell Broadband Engine
  - PowerPC PPE
  - 6 SPEs
  - 256 MB RAM



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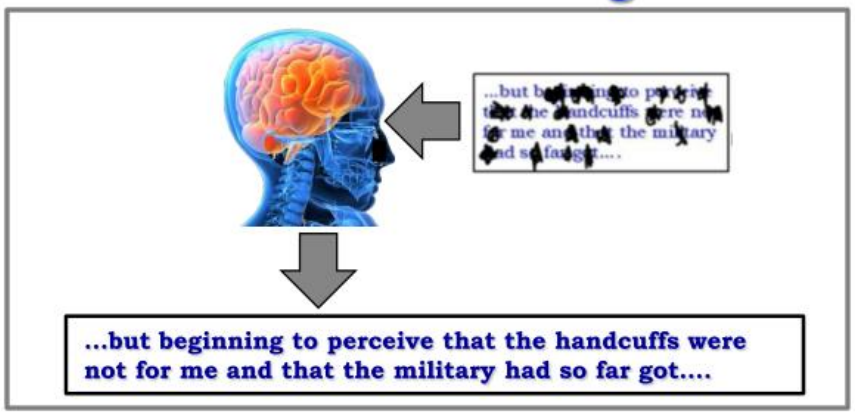
Solving Demanding, Real-Time Military Problems

Radar processing for high resolution images

Occluded text recognition



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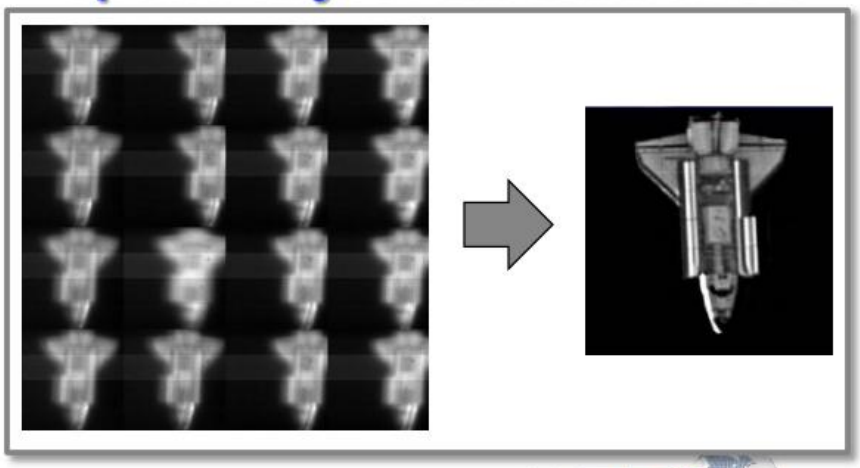

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Skip Garner VBI

Analysis of the 1,000 Genomes data is enabling us to understand the basal level of variation in microsatellite loci – to discover new diagnostic markers, drug targets and toxicology tests

HPC Users Forum
September 7, 2011

Virginia Bioinformatics Institute
Virginia Tech

We have established a pipeline for the 1000 Genome Project and TCGA data

- Repeat 2,000,000 times per genome
- Thousands of genomes
- Data mine the finished product

bwa aln part: ~4GB file (14 million 76 bp ready) takes 2 minutes on Convey HC-1. Or ~4 hours running on a sngle node 2x AMD Opteron 4174 (6 cores each, 2.8GHz, 6M Cache), 48GB RAM 1333MHz, with 4 NVidia Tesla GPU cards.

IDC HPC

Market Update

USER FORUM

Top Trends in HPC

The global economy in HPC is growing again

- 2010 grew by 10%, to reach $9.5 billion
- We are forecasting ~7% growth over the next 5 years

Major challenges for datacenters

- Power, cooling, real estate, system management
- Storage and data management continue to grow in importance

Software hurdles will rise to the top for most users

SSDs will gain momentum and could redefine storage

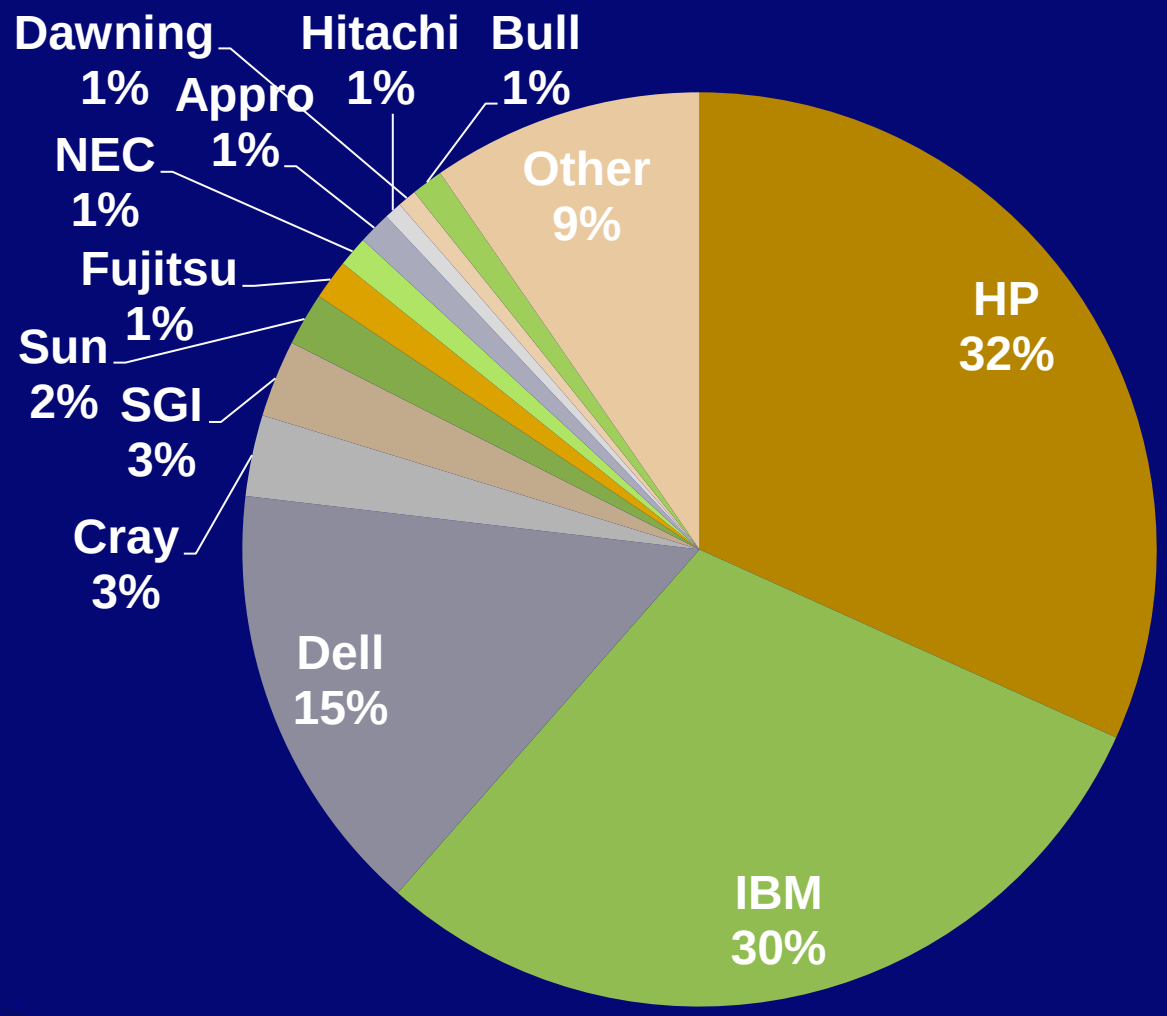
GPUs are seeing real tractions in certain verticals

The worldwide Race on Petascale is in full speed

HPC WW Market Results

	2006	2007	2008	2009	2010
WW HPC System Units	236,147	230,724	174,091	105,054	119,845
WW HPC Revenue	10,054,577	10,076,423	9,771,849	8,614,145	9,504,323
Processor Package Volume	3,384,417	3,519,906	3,417,490	2,854,105	2,995,695
HPC Core Volume	5,652,695	7,148,661	9,878,665	9,973,910	10,454,022

HPC Vendor Revenue Shares, 2010



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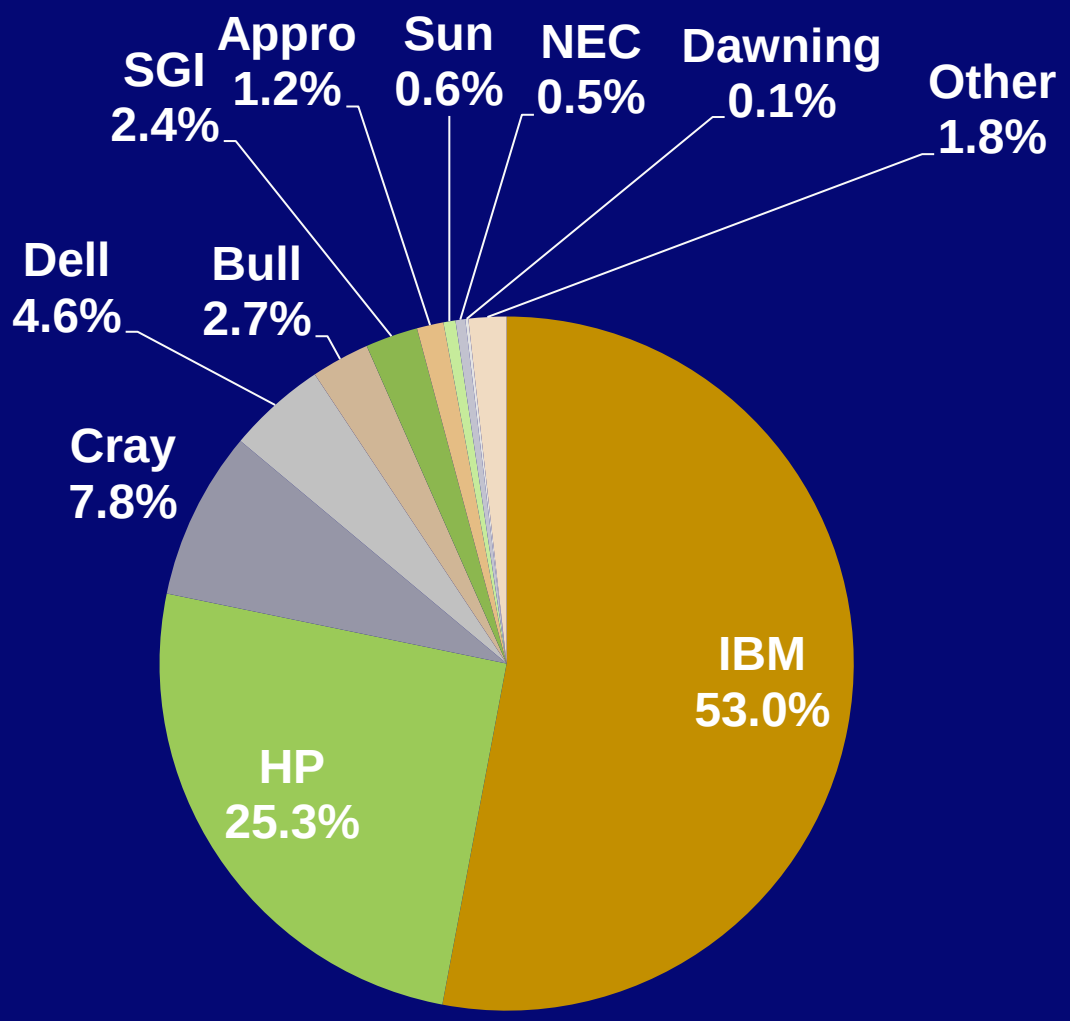
2010 HPC WW Market Results

	Q110	Q210	Q310	Q410	**Full Year**	
Supercomputer	669,521	780,655	847,960	1,183,441	**3,481,577**	36.6%
Divisional	273,752	299,286	316,688	379,009	**1,268,735**	13.3%
Departmental	688,785	791,416	842,511	956,507	**3,279,219**	34.5%
Workgroup	372,914	333,110	348,131	420,638	**1,474,792**	15.5%
Total	2,004,973	2,204,466	2,355,289	2,939,595	**9,504,323**	100.0%

Source: IDC HPC Qview 2012

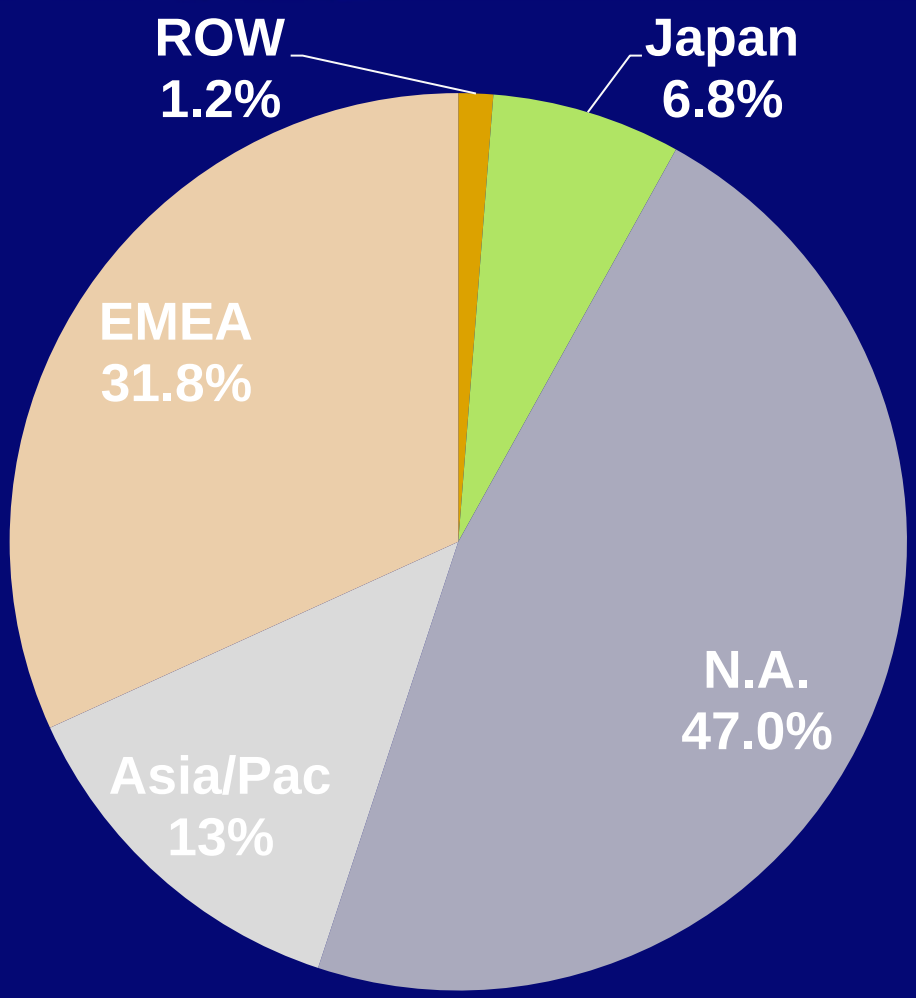
Revenue Share by Vendor Supercomputer Segment



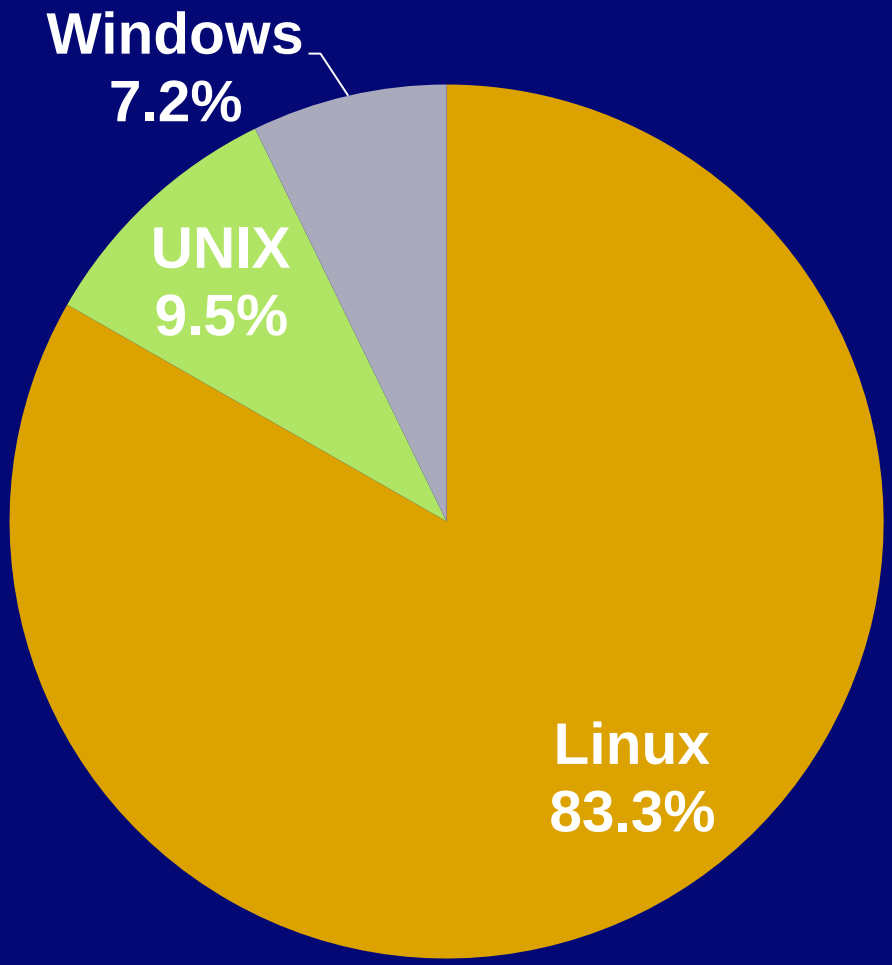
Industry/Application Segments

HPC Server Revenue by Application/Industry			
	2009	2010	Growth
Bio-Sciences	1,171	1,294	10.4%
CAE	913	1,060	16.1%
Chemical Eng	187	203	8.6%
DCC & Distribution	478	549	15.0%
Economics/Fin	205	266	30.1%
EDA/IT/ISV	559	629	12.5%
Geosciences	564	605	7.2%
Mechanical Design	75	80	6.5%
Defense	894	951	6.3%
Government Lab	1,418	1,520	7.2%
University	1,721	1,832	6.4%
Weather	371	412	11.0%
Other	80	104	29.2%
Total Revenue	8,637	9,504	10.0%
Source: IDC 2011			

By Region 1Q201



By Operating System 1Q201



HPC Market Forecasts

HPC Server Revenue ($M) Forecast

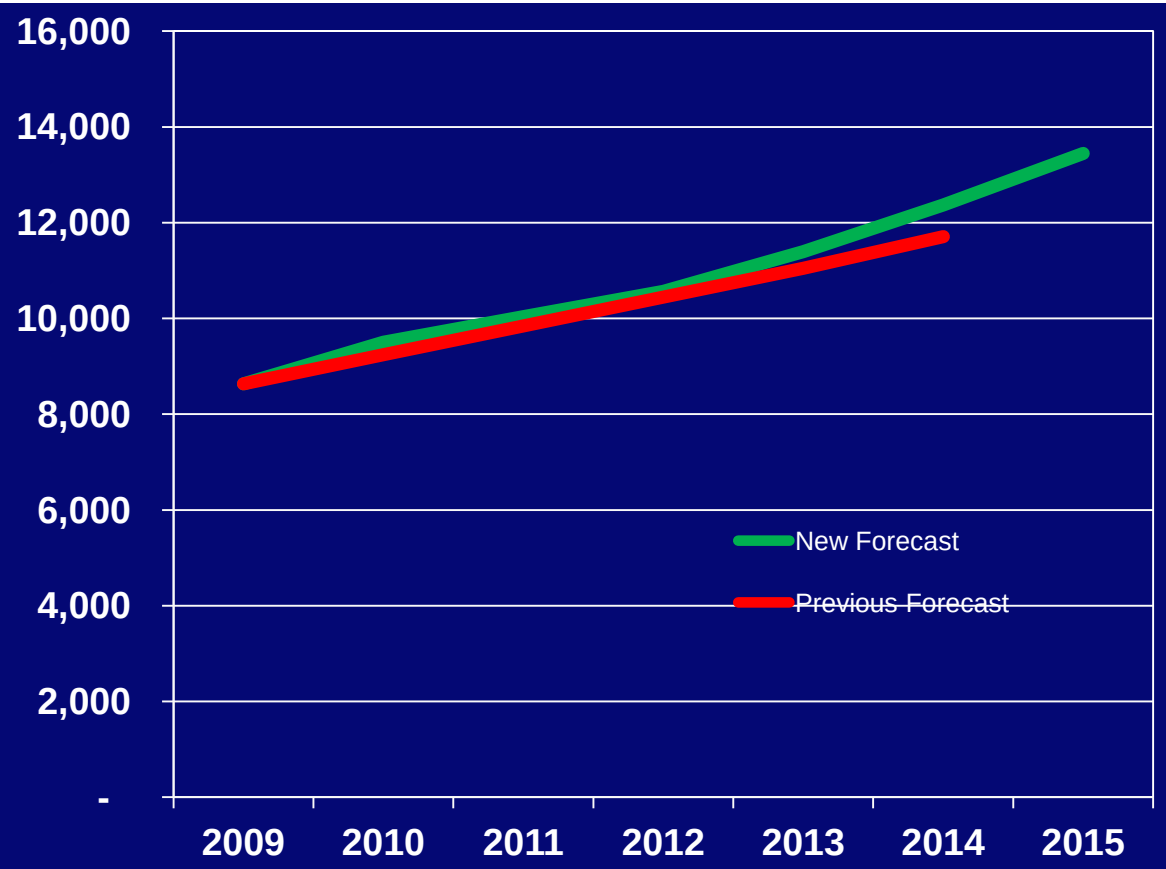
	2010	2011	2012	2013	2014	2015	CAGR
HPC Revenues	9,504	10,034	10,564	11,397	12,371	13,449	7.2%
System Units	119,845	133,044	146,243	165,391	172,306	179,515	8.4%
Source: IDC 2011							

HPC USER FORUM

HPC Server Revenue ($M) Forecasts Compared To Last Year

Comparison of Old and New HPC Revenue Forecasts							
	2009	2010	2011	2012	2013	2014	2015
New Forecast	8,637	9,504	10,034	10,564	11,397	12,371	13,449
Previous Forecast	8,637	9,240	9,842	10,444	11,047	11,706	-

Source: IDC 2011



The Broader HPC Market

	2009	2010
Servers	8,637,114	9,504,323
Storage	3,022,990	3,328,312
Middleware	1,062,365	1,103,797
Applications	2,971,167	3,164,293
Service	1,658,326	1,727,976
Total	17,351,963	18,828,701

Conclusions

- **2010 was a year of return to healthy growth in the worldwide HPC market**
- **IDC predicts the HPC market will continue growth in 2011 and grow by 7% to 9% in 2011**
  - And then will rebuild to reach $13.5 billion by 2015
- **The recovery will benefit HPC segments unevenly:**
  - With hard-hit verticals such as automotive recovering more slowly than oil and gas, or government and academia
  - The Supercomputer segment growth will remain turbo-charged by government spending aimed at HPC leadership and “petaflop club” membership
    - And could exceed our current forecasts

But There are Still Major Customer Pain Points

Software is still the #1 roadblock

- Better management software is needed
  - HPC clusters are still hard to setup and operate
  - New buyers – require “ease-of-everything”
- Parallel software is lacking for most users
  - Many applications will need a major redesign
  - Multi-core will cause many issues to “hit-the-wall”

Clusters are still hard to use and manage

- System management & growing cluster complexity
- Power, cooling and floor space are major issues
- Third party software costs
- Weak interconnect performance at all levels
- RAS is a growing issue
- Storage and data management are becoming new bottle necks
- Lack of support for heterogeneous environment and accelerators

Questions?

Please email:
hpc@idc.com

Or check out:
www.hpcuserforum.com

HPC USER FORUM

Agenda: Day One

THURSDAY, OCTOBER 6

12:00	Lunch
12:45	HPC User Forum Welcome/Introductions, Steve Finn (Chair, HPC User Forum), Earl Joseph (IDC) and Steve Conway (IDC)
13:00	HLRS Welcome/Introductions, Michael Resch
13:15	Overviews of HPC Research Activities at HLRS, Stefan Wesner
13:45	Ideas about the Future of HPC in Europe, Pekka Karp
14:15	HPC for Business Intelligence, Sven Holzmann, HMI
14:45	Vendor Technical Update: Bright Computing
15:00	Break
15:30	HPC in Pharmaceutical Research: From Virtual Screening to All-Atom Simulations of Biomolecules, Jan Kriegl, Boehringer-Ingelheim
16:00	Vendor Technology Update: Spectra Logic
16:15	HPC and the Apple TV Cluster, Dieter Kranzlmueller, Ludwig-Maximilians-Universitaet
16:45	Real-time rendering in the Automotive Industry, Cornelia Denk, RTT
17:15	EU Parallel Software Landscape, Earl Joseph and Steve Conway
17:30	After Meeting Socializing

Welcome
To Day 2 Of The
HPC User Forum
Meeting

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XSEDE-HPC USER FORUM

Important Dates For Your Calendar

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Agenda: Day Two

FRIDAY, OCTOBER 7

9:00	Welcome/Logistics, Earl Joseph and Steve Finn
9:00	A Perspective on HPC, Michael Resch, HLRS
9:30	Handling of Large Data Sets, Rolf Fischer, INTES
10:00	HPC at NASA, Rupak Biswas, NASA Ames Research Center
10:30	Vendor Technology Update: Bull and Qlogic
11:00	Turning HPC System Heat into Cooling: the Landauer Princiiple, Lidia del Rio, ETH-Zurich
11:30	Break
11:45	Optimization of the Direct Fuel Injection for the 4-Stroke Combustion Engine, Josef Dubsky, Porsche AG
12:15	Current Status and Future Perspectives of HPC at Insilico Biology, Klaus Mauch, Insilico Biology
12:45	Wrap Up and Plans for future HPC User Forum Meetings, Earl Joseph and Steve Finn
1:00	Farewell and Lunch

Thank You
For Attending The
HPC User Forum

Questions?

Please email:
hpc@idc.com

Or check out:
www.hpcuserforum.com

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