

Compete.

Building Solutions *with Modeling, Simulation & HPC*

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Compete.
Council on
Competitiveness

Council Mission



The Council on Competitiveness is the only group of **corporate CEOs, university presidents and labor leaders** committed to the future prosperity of all Americans and enhanced U.S. competitiveness in the global economy through the creation of high-value economic activity in the United States.



Council basics

- Founded in 1986 by John Young
- Non-profit, non-partisan
- 170+ members and affiliate organizations
- Set public policy action agenda to drive
 - U.S. productivity growth
 - High living standards
 - Success in global markets

Council leadership

- **Deborah L. Wince-Smith**, *President*
- **Charles O. Holliday, Jr.** (DuPont), *Chairman*
- **Shirley Ann Jackson** (Rensselaer Polytechnic Institute), *University Vice Chairman*
- *Labor Vice Chairman*
- **F. Duane Ackerman** (BellSouth Corporation), *Chairman Emeritus*



Council HPC Initiative

- The Council's High Performance Computing Initiative (HPC) is intended to stimulate and facilitate wider usage of HPC across the private sector to propel U.S. productivity, innovation and competitiveness
- Begun in ~2003
- Presently engaged with grants from DARPA, DOE, and others to facilitate **public-private partnerships** and better understand HPC adoption in industry to make modeling and simulation a best practice



HPC Initiative leadership



HPC Advisory Committee

A brain trust of senior executives from the government, academia, private industry, vendors, and other key constituencies.

Co-Chair

University Co-Chair

David E. Shaw, *Chief Scientist and CEO*
D.E. Shaw Research

The new path to prosperity

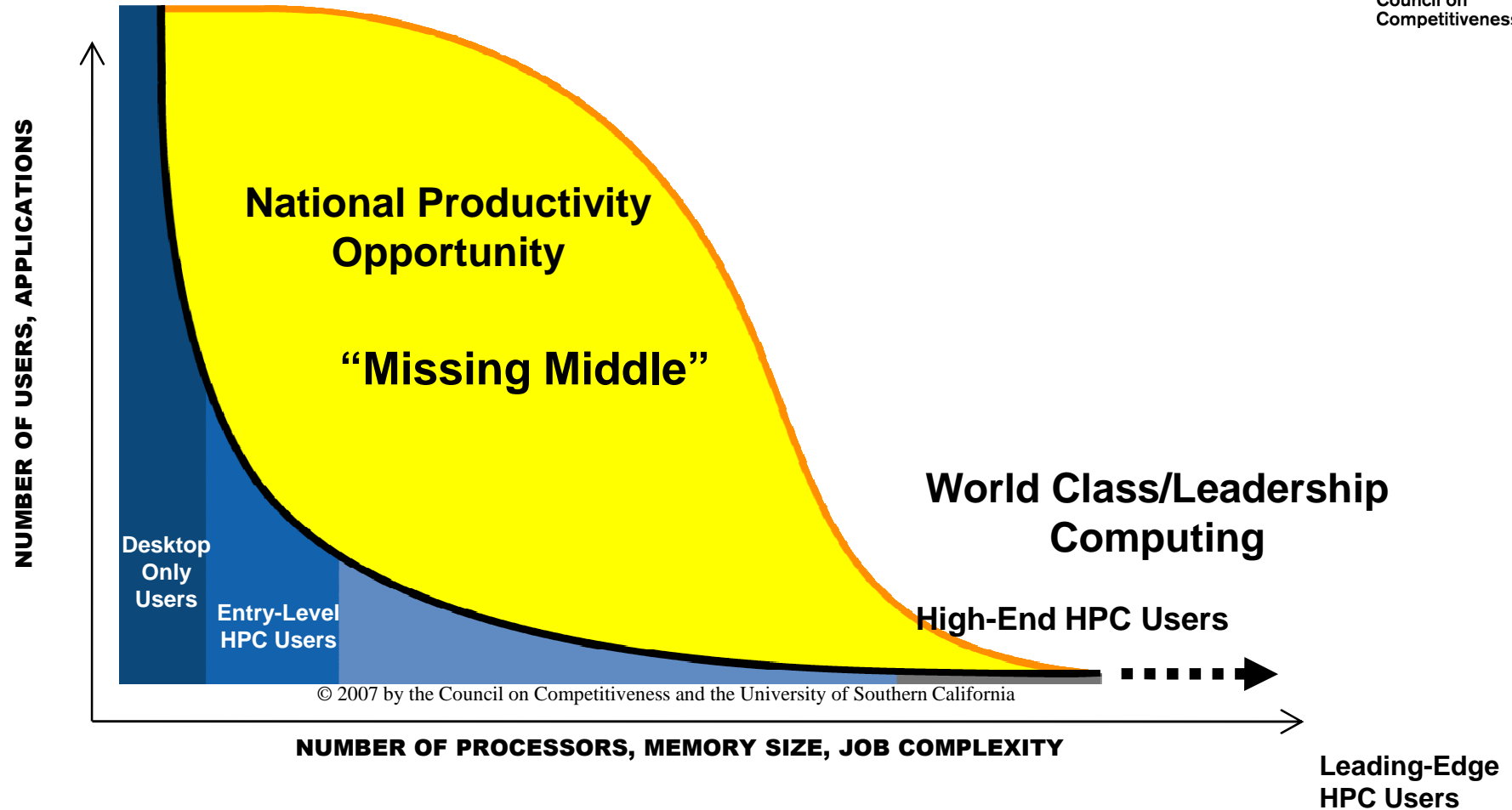
- U.S. facing more serious global competitive challenges than ever before
- We can no longer compete on traditional cost and quality terms
- The ability to create new value will determine competitive advantage
- *Innovation* is the path to sustained competitive success and economic strength
 - *and HPC is a proven innovation accelerator*



Public-Private Partnerships

- Allow for increased critical strategic work and advance R&D
- Help solve specific problem to get products to market faster
- Expose industry to top of the line machines, often provides expertise
- Help narrow the gap between industry and university knowledge

Let's fill in the missing middle



Adapted from OSC Graphics

Council on Competitiveness - HPC Initiative

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Let's fill in the missing middle

- Public-Private partnerships expose missing middle to increased computational power and more advanced hardware and software
 - DOE: Innovative and Novel Computational Impact on Theory and Experiment (INCITE)
 - DOE: Scientific Discovery Through Advanced Computing (SciDAC)

Modeling & Simulation Success Stories

Building the Business Case

High Performance Computing

Case Study.


Delivering High Performance Computing **to the Masses**



High Performance Computing

Case Study.


High Performance Computing Drives a **"Can-Do" Attitude** at Alcoa



High Performance Computing

Case Study.


Breakthroughs in **Brain Research** with High Performance Computing



High Performance Computing

Case Study.


Bringing the **Universe Down to Earth** with High Performance Computing



High Performance Computing

Case Study.


High Performance Computing Helps Create **New Treatment for Stroke Victims**



High Performance Computing

Case Study.


Driving the **Cellular Revolution** with the Help of High Performance Computing



High Performance Computing

Case Study.


A Tale of **Stylish Shades** and High Performance Computing



High Performance Computing

Case Study.


Supercomputers and **the Secret Life of Coffee**



High Performance Computing

Case Study.

Learning to Cope With the **Sun's Stormy Weather** Using High Performance Computing



Goodyear



Goodyear leveraged high performance computing resources to design and launch the Assurance® all-weather tire, a hit that helped them not only improve their competitive position, but helped them launch a flurry of new tires that resulted in record profits.

System: Linux clusters, also partnered with Sandia National Laboratory

PING Golf



PING Golf relies on its powerful supercomputing system and advanced simulation software to design newer, better golf clubs and stay at the top

System: Cray, LS-DYNA

Pioneer Hi-Bred



Pioneer Hi-Bred uses HPC to open a window into the future, allowing them to make more informed decisions about their applied breeding programs and giving them the ability to help meet some of the world's most pressing demands regarding the availability of food, feed, fuel, and materials.

System: In-house clusters

Whirlpool Corporation



Whirlpool Corporation uses HPC to take a systems approach in designing its broad and varied line of appliances, including the packaging that protects products during shipping

System: SGI machine, 168 cores

Procter & Gamble



Procter & Gamble research scientists studied the complex interactions of billions of atoms and created simulations at the atomic level to determine how tiny submicroscopic structures impact the ingredients in their products.

System: Argonne National Lab system, in-house HPC cluster with near 2,000 processors

Boeing Corporation



Boeing researchers used ORNL leadership class systems to tackle multiple development issues such as aeroelasticity and composites. This work has been an asset to the development of their new Dreamliner.

System: ORNL system, in-house Linux-based clusters with 792 nodes

DreamWorks Animation SKG



DreamWorks Animation SKG's software engineers needed to test new software concepts to improve the capabilities of their proprietary tools. Leadership-class supercomputers at the Oak Ridge National Laboratory enabled the company to refine and test its redesigned software.

System: Jaguar XT3 at ORNL

Medrad



Medrad purchased patents for a promising interventional catheter device to mechanically remove blood clots associated with a stroke. Breaking with a long tradition of building numerous physical prototypes to research the potential of a new technology, Medrad used modeling and simulation to determine if the catheter technology was worth pursuing.

System: Pittsburgh Supercomputing Center systems

PPG Industries



PPG Industries enlisted the help of high performance computing to advance photochromic technology used in their Transitions® eyewear. PPG's R&D organization was able to rapidly create the next generation of photochromic dyes, and move out in front of its competition.

System: Pittsburgh Supercomputing Center systems

Procter & Gamble



Procter & Gamble used high performance computing to solve a number of problems related to gas build up in their new metal containers during shipment and a problem associated with the coffee cans imploding while being trucked to their destination.

System: In-house, Opteron, equipment from IBM and HP

Salk Institute

Salk Institute researchers are using supercomputers to investigate how the synapses of the brain work. Their research has the potential to help people suffering from mental disorders such as Alzheimer's, schizophrenia and manic depressive disorders- and to help to change the very nature of biology.

System: San Diego Supercomputer Center's systems



Microsoft



Microsoft is working to develop high performance computing software products that can be used by hundreds of thousands of users throughout both the public and private sectors.

System: Supercomputers at University of Illinois National Center for Supercomputing Applications

Science Applications International Corporation



SAIC have used high performance computing to advance their understanding of the physics of solar activity and allow them to move to 3-D models to more accurately predict the impact of these phenomena, which have a major impact on Earth's power grids, communications, satellites and other essential systems.

System: San Diego Supercomputer Center's systems

American Museum of Natural History



American Museum of Natural History's

Hayden Planetarium conducts leading edge astrophysical research, educates the public, and creates its spectacular and highly popular shows based on real science using high performance computing.

System: San Diego Supercomputer Center's systems

Alcoa



Alcoa used high performance computing to handle the complex modeling and simulations needed to get the jump on their competitors by successfully redesigning cans for the beverage industry and a variety of components for the automotive, aerospace, building and construction industries.

System: Pittsburgh Supercomputing Center's supercomputer

Motorola



Motorola has employed high performance computing to create highly complex models of their wireless devices and infrastructure as different communications technologies emerge. They are now creating models that reflect the newest generation of cellular systems.

System: Supercomputers at University of Illinois National Center for Supercomputing Applications

Council focus on HPC in manufacturing



- Leveraged the experience and insight within our advisory committee and meetings with key stakeholders from industry, academia, and government
- Realized the enormous potential for HPC to enable next-generation manufacturing in the U.S. – especially as modeling and simulation push deeper into the supply chain
- Developed two white papers to inform policymakers about this important national opportunity

First white paper: High performance computing to enable next-generation manufacturing



Makes the case that HPC is the real “game-changer” for US manufacturers and calls for

- Improved coordination of the overall federal approach to HPC (seek a more balanced program across DOE, NSF, and so on)
- Increased outreach to manufacturing CEOs
- Establish industry focused HPC center
- Invest in US HPC expertise (e.g., education, training etc.)

Second white paper: U.S. manufacturing – global leadership through modeling and simulation



National *call to service* to manufacturing sector leaders

1. Create a national manufacturing initiative to leverage leaders' expertise and experience with modeling and simulation
2. Facilitate formation of a software consortium of advanced computing users to address some of the most difficult software issues (e.g., moving legacy code to new architectures, algorithm development, licensing, etc.)
3. Establish advanced computing service centers to serve each of the 50 states to coordinate and increase access to resources, provide for professional development, and facilitate discovery of modeling and simulation for innovation
4. Focus on “simulation-based manufacturing” and demystify HPC

Contact the Council HPC Team



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See <http://www.compete.org/hpc/> for more information
and access to all our HPC publications