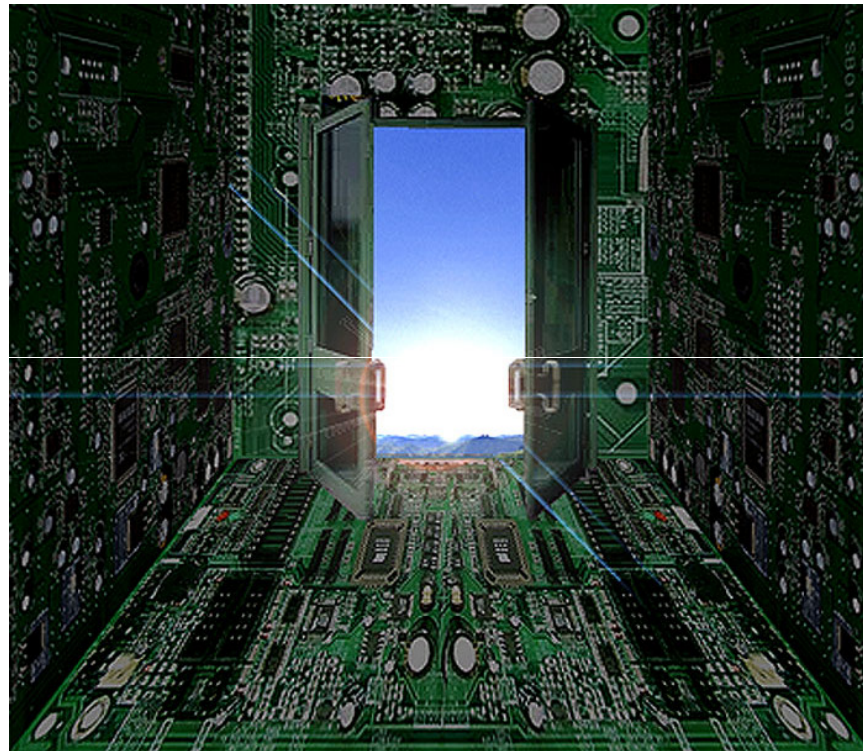




# The Race to Petascale Competitiveness

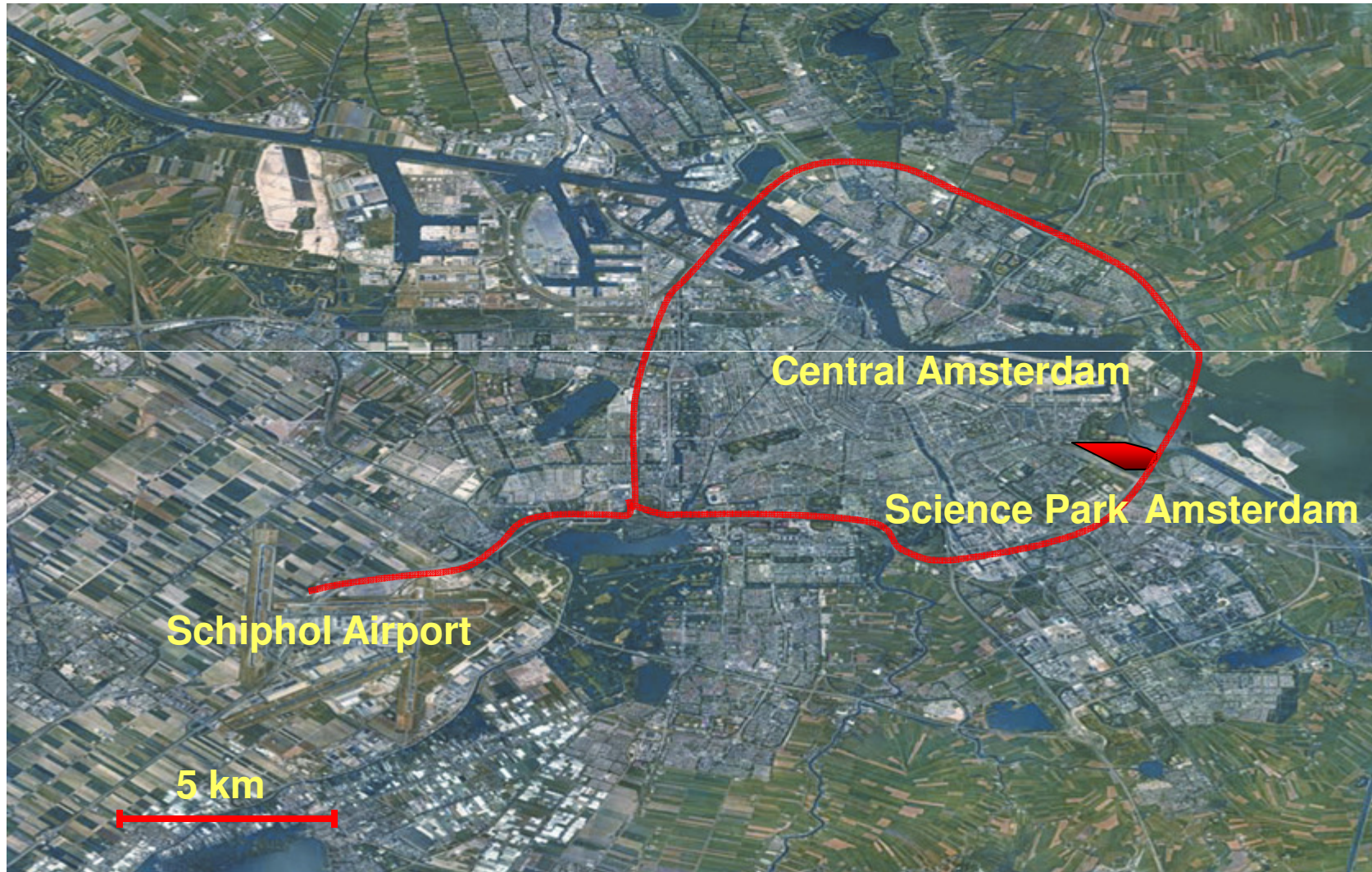


**Anwar Osseyran**  
**Managing Director SARA**  
11 October 2010





# Welcome to the Science Park Amsterdam







# Science Park Amsterdam

## a world of science in a city of inspiration

- ▶ Faculty of Science of the “Universiteit van Amsterdam”
- ▶ National Institute for Particle and High Energy Physics (NIKHEF)
- ▶ Institute for Atomic and Molecular Physics (AMOLF)
- ▶ National Research Institute for Mathematics and Computer Science (CWI)
- ▶ SARA Computing and Networking Services
- ▶ AMsterdam Internet eXchange (AMS-IX)
- ▶ Matrix Innovation Center, with 80+ innovative companies in life sciences, ICT and other areas





# SARA's Mission: Support Innovation

SARA Foundation is an independent (hybrid) organization with ~140 fte's in 2 locations (Amsterdam and Almere)

The mission of SARA is 2-fold:

1. Supporting research in the Netherlands by providing high-end Providing not-for-profit ICT services to geographically dispersed education and research communities [SARA for Science & Innovation]
2. Offering commercial high-end commodity ICT services based on the expertise built in the high-end activities [Vancis for adVANCed Ict Services]



**Amsterdam**



**Almere**





# The Race to Petascale Computing



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The largest catalogue on Grid Computing in the world.

- All the companies
- All the projects
- All the organisations
- Checked by editorial team

## Japanese 'Computenik' Earth Simulator shatters US supercomputer hegemony

**Tokyo 20 April 2002** The Japanese Earth Simulator is online and producing results that alarm the USA, that considered itself as being leading in supercomputing technology. With over 35 Tflops, it five times outperforms the Ascii White supercomputer that is leading the current TOP500 list. No doubt that position is for the Earth Simulator, not only for the next list, but probably even for the coming two years. In the New York Times, bench mark compiler Jack Dongarra compares the event with the Sputnik, hence he dubbed the Earth Simulator "Computenik".



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From Times Online  
November 13, 2007

### India breaks into supercomputing elite

Tata, the tea-to-cars conglomerate, comes in at No 4 in the super league, as the dominance of the United States fades

Rhys Blakely

India has broken into the top tier of supercomputing after a new machine built by Tata, the country's largest industrial conglomerate, was listed as the fourth fastest in the world.

Ranked No. 10, the Dawning 5000A based on AMD's Opteron processor and running Windows HPC, at the parade of U.S. supercomputers, which swept the top nine positions of the 32nd Top500 list.

The honor of being the world's fastest supercomputer went to IBM's Roadrunner, which dethroned the BlueGene/L, five months ago. The BlueGene/L, also from IBM, took fourth spot in the new rankings.

In the latest results, Cray and IBM dominated the top 10 supercomputer spots while Hewlett-Packard had the most systems--209 of the 500 on the list. Microsoft also delivered a much improved performance over June's Top500 run, when only five systems were Windows-based of which the best performer was ranked No. 23.

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India's entry into the top flight of high-speed computing comes amid a significant reshuffle among the

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### China supercomputer in world top 10

By Vivian Yeo, ZDNet Asia  
Tuesday, November 13, 2008 01:41 PM

**UPDATE** A machine from the Shanghai Supercomputer Center has made it to the top 10 of the world's fastest supercomputers for the first time.

Ranked No. 10, the Dawning 5000A based on AMD's Opteron processor and running Windows HPC, at the parade of U.S. supercomputers, which swept the top nine positions of the 32nd Top500 list.

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## Germany, Saudi Arabia muscle into Top500 supercomputer list

Gepubliceerd: Dinsdag 23 juni 2009  
Auteur: Mikael RicknÅs

Computers in Germany and Saudi Arabia are now among the fastest in the world, but the bi-annual Top500 list of the world's most powerful supercomputers is still topped by the Roadrunner system at the U.S. Department of Energy's Los Alamos National Laboratory.

Computers in Germany and Saudi Arabia are now among the fastest in the world, but the bi-annual Top500 list of the world's most powerful supercomputers is still topped by the Roadrunner system at the U.S. Department of Energy's Los Alamos National Laboratory.

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U.S. supercomputing lead rings Sputnik-like alarm for Russia

Russia's President says country's ranking 'very difficult' when compared with America's

By Patrick Thibodeau  
July 29, 2009 07:31 PM ET

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Computerworld - Russia's launch of Sputnik in 1957 triggered a crisis of confidence in the U.S. that helped drive the creation of a space program. Now, Russia is comparing the U.S.'s achievements in supercomputing with theirs, and they don't like what they see.

In a speech on Tuesday, Russia's President, Dmitry Medvedev, criticized his country's IT industry almost to the point of sarcasm for failing to develop supercomputing technology, and urged a dramatic change in Russia's use of high-performance computing.

Medvedev, at the opening address of a Security Council Meeting on Supercomputers in Moscow, told attendees that 47% out of the 500 supercomputers on the Top500 list were manufactured in the United States. "Therefore, in general, our situation is very difficult," he said.

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Medvedev was clear about his blame for this gap.



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### China chases US in latest supercomputer ranking

Takes second spot with UK also doing well

By John E. Dunn | TechWorld  
Published: 10:57 GMT, 01 June 10

China has finally achieved its ambition of becoming a calculating superpower with news that one of the country's supercomputers is now the second most powerful number-cruncher on earth.

The Nebulae system at the National Supercomputing Centre in Shenzhen in southern China has been ranked by the prestigious Top500 list as having a sustained calculating power of 1.271 petaflops, or in layman's terms, 1,271 trillion calculations per second.

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# The Japanese Kei Starts to Ship

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BUSINESS TECHNOLOGY | OCTOBER 5, 2010

## One Goal: 10 Quadrillion Calculations

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BY DAISUKE WAKABAYASHI

On an overcast day in western Japan, the "Star Wars" theme song blared as a truck carrying supercomputer hardware pulled out from a Fujitsu Ltd. factory.

Fujitsu workers erupted into cheers as the truck inched forward. Local children unfurled a sign that read: "We aim to be No. 1 in the world."

The hardware was headed last week for Kobe, where installation has begun on a government-funded supercomputer project, aimed at giving Japan the world's fastest computer, the "K Computer." K Computer is a play on the Japanese word "kei" for the number 10 quadrillion (10,000 trillion), which will be ...



# China's 'big hole' marks scale of supercomputing race

## COMPUTERWORLD

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### China's 'big hole' marks scale of supercomputing race

1,000 U.S. scientists are involved in exascale development, but China and Europe have stepped up their investment, IBM warns

Patrick Thibodeau

September 24, 2010 [\(Computerworld\)](#)

WASHINGTON -- To make a point about China's interest in supercomputing, David Turek, IBM's vice president of deep computing, displayed a slide with a picture depicting a large construction site for a building that will house a massive computer.

Speaking at an IEEE-USA forum here on Thursday, Turek pointed to a photo (below) of a supercomputing center being built in Shenzhen, China, and said, "That's a truck -- that's a big truck, that's a big hole, and that's going to be a big building. And that's only the first building they are going to build there."



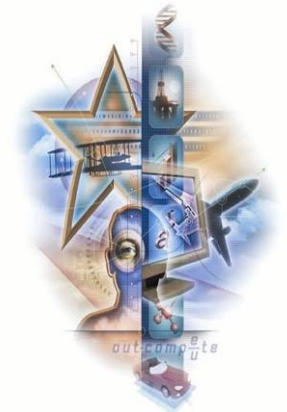
Under construction: China's massive new supercomputing center site in Shenzhen.



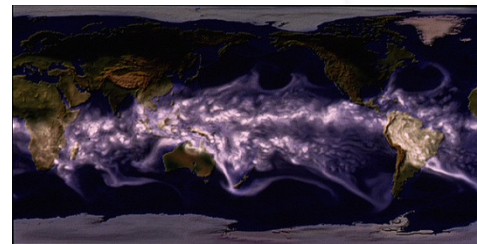
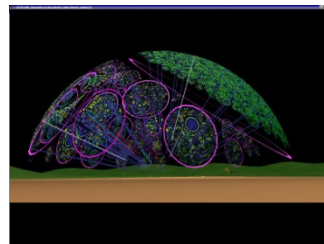
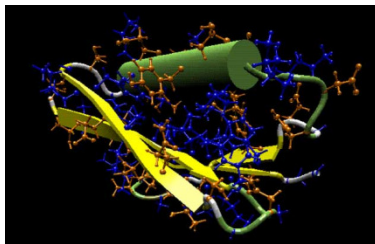
# Why the race to Petascale Computing?

- *“HPC has become a competitive weapon – global competitiveness is driving R&D.*
- *Governments view HPC leadership as critical – national pride and economic prosperity.*
- *There are critical issues that need HPC to be solved – global warming, alternative energy, national security, etc.*
- *“Live” science and “live” engineering – time to solution is months faster with simulations”*

*“HPCWire, June 2010”*

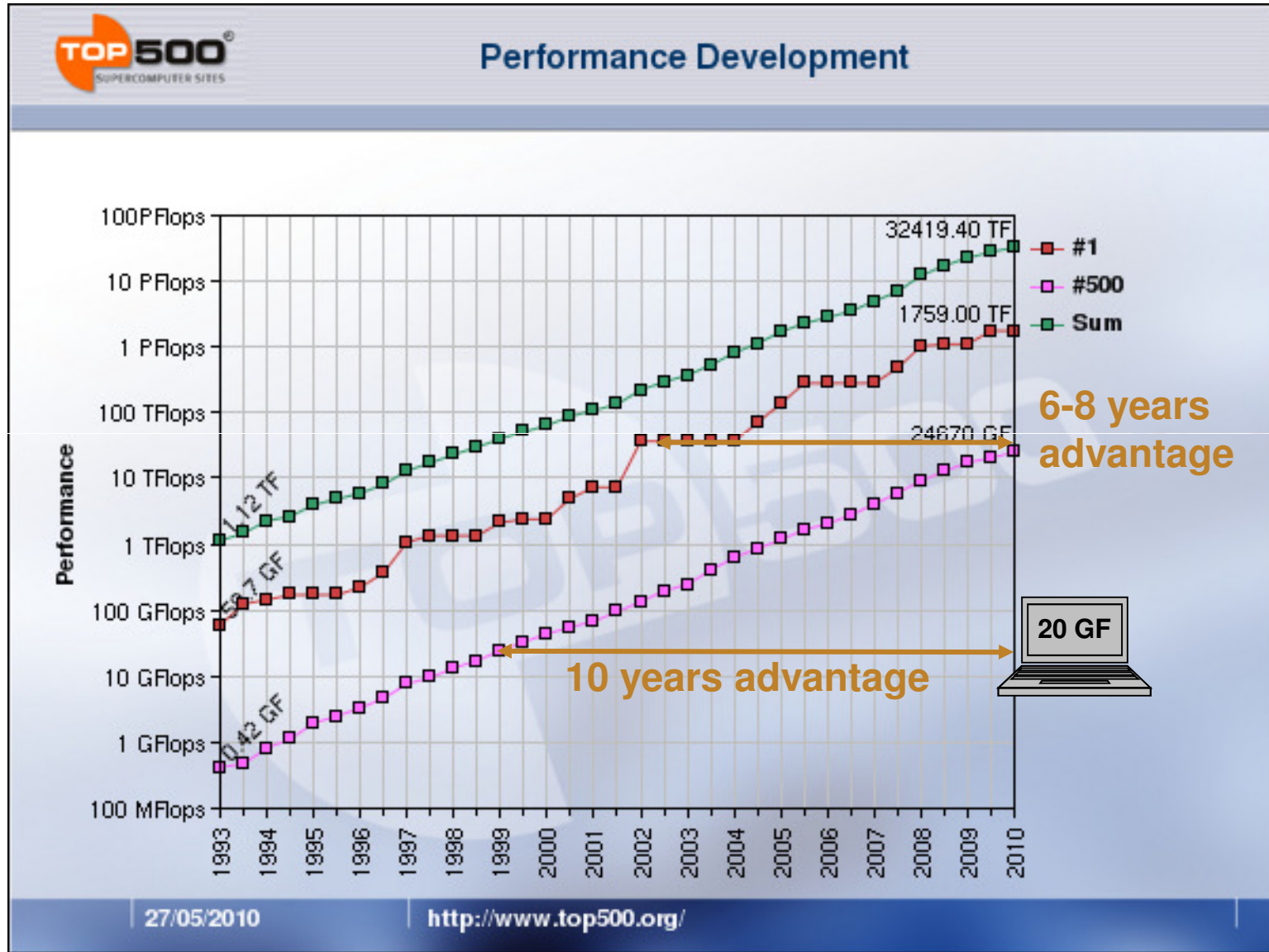


*“Out-compute to Out-compete”*





# Competitive Advantage



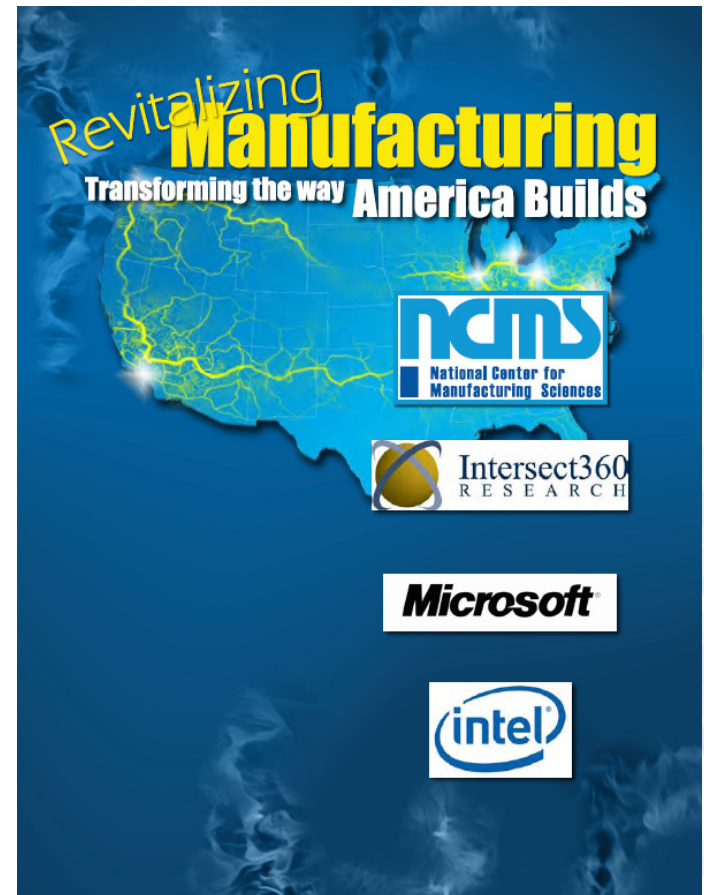


# HPC for creating jobs and revitalizing U.S. manufacturing

## *The Opportunity*

- *“Nearly 300,000 small and medium sized manufacturers exist in the U.S.*
- *HPC modeling and simulation capabilities are a key American asset.*
- *Advanced computational methods provide a competitive advantage for SMMs.”*

*NCMS September 2010*





# 10 Everyday Products Designed by Supercomputers

## Bloomberg Businessweek



SPECIAL REPORT October 5, 2010, 12:19AM EST

text size: T | T

insideHPC > HPC > 10 Everyday Products Designed by Supercomputers

### 10 Everyday Products Designed by Supercomputers

10.8.2010

 Like  In many ways, what was once considered HPC is now being used to design and optimize everyday products. Bloomberg Businessweek ran an **interesting slide show** this week showcasing 10 products designed by Supercomputers. They require you to click through each item to get the details, so we've compiled the list of stories for our readers.



- **Whirlpool Appliances.** Whirlpool uses thermal simulations to make its appliances more energy-efficient.
- **Speedo Olympic Swimsuits.** Designed with the supercomputings running Ansys software, the Speedo swimsuit worn by Michael Phelps helped Phelps shave precious time off his laps, says Tom Waller, head of Speedo's research and development facility, Aqualab. Phelps went on to win eight gold medals in the 2008 Olympics.
- **Renault Formula One Car.** Using CFD simulation-testing on an HP cluster to measure aerodynamics, the ING Renault F1 Team improved car performance with faster lap times.





# GENCI, INRIA and OSEO Join Forces to Support SMEs in first-time Access to HPC

LE PROGRES TECHNIQUE

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INFORMATION INTERNATIONALE POUR LE PILOTAGE DE L'ENTREPRISE INDUSTRIELLE

L'essentiel de l'actualité industrielle du moment

**GENCI, l'INRIA et OSEO s'associent pour accompagner les PME dans leur premier accès au calcul haute performance**  
► [Innovation](#) Lundi 6 Septembre 2010

Initiative HPC-PME, c'est le nom du programme que lancent conjointement GENCI, l'INRIA et OSEO, en partenariat avec quatre pôles mondiaux de compétitivité, pour faciliter et encourager l'accès des PME au calcul haute performance (HPC). Bâti en cohérence avec les recommandations du plan France Numérique 2012, ce programme vise à soutenir et accroître la compétitivité des PME dont les projets d'innovation industrielle peuvent tirer parti de l'utilisation du calcul haute performance. Au cœur du dispositif : un accompagnement dans la durée pour garantir une intégration efficace des capacités de développement offertes par le HPC.



**Ouvrir le calcul haute performance aux PME pour soutenir et accroître leur compétitivité**

En les accompagnant tout au long de leur première approche du calcul haute performance, le programme aidera les PME, aussi bien du point de vue technique, commercial que financier, à construire un projet d'innovation industrielle. Qu'il s'agisse d'optimiser les performances de leurs technologies ou de préparer les innovations de demain, l'objectif est d'aider les PME à prendre la mesure de l'intérêt économique du HPC au regard de leur modèle de croissance.

Le programme « Initiative HPC-PME » s'appuie sur la complémentarité des compétences de chaque partenaire : GENCI pour un accès accompagné aux ressources de calcul haute performance, l'INRIA pour son expertise scientifique et technologique, OSEO pour sa maîtrise des outils de soutien et de financement de l'innovation.

L'offre comporte quatre volets combinant l'ensemble de ces compétences : formation, expertise, accès aux équipements et intégration dans les dispositifs de financement de l'innovation.





# HPC Supernodes: Innovation Hot Spots

- ▶ HPC Supernodes will be the centers of large scale research in Europe
- ▶ With large concentrations of scientific and industrial user communities
- ▶ And European Hard- and Software industries

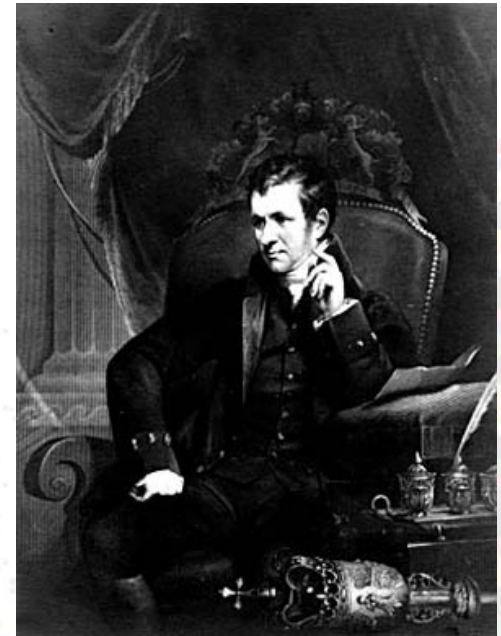
The screenshot shows a BusinessWeek article page. At the top is the BusinessWeek logo in a red box, with a search bar and 'Register Sign In' links. Below the logo is a navigation menu with 'HOME', 'INVESTING', 'COMPANIES', 'TECHNOLOGY', 'INNOVATION', and 'MANAGEMENT'. Underneath is a secondary menu with 'Europe Home', 'Autos', 'Companies', 'Economy', 'Energy', 'Innovation', and 'Investing'. The main content area features a 'SPECIAL REPORT' dated April 28, 2008, 1:52AM EST. The article title is 'Europe's Innovation Hot Spots' with a sub-headline: 'Governments are making efforts to propel innovation on t competitive clusters centered around a specific sector'. The author is 'by Jennifer Fishbein'. There is an image of a woman holding a circuit board, and a 'View Slide Show' link. The article text begins: 'Europe may be known as the Old World, but these days it deserves credit for much that is new. As the continent continues to be transformed by the expansion of the European Union and rising competition from China and India, it is harnessing its longstanding tradition of creativity to sharpen its economic edge.'



# Why the need for HPC Hot Spots in Europe?

- ▶ Petaflops machine acts as a Super-magnet for talent and businesses
- ▶ Direct interaction with hardware and firmware is necessary for innovation
- ▶ “Nothing tends so much to the advancement of knowledge as the application of a new instrument.”

Sir Humphrey Davy





# Supercomputers To Attract Researchers

## MARINE TECHNOLOGY REPORTER

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### KAUST: Supercomputers Attract Researchers

10/22/2008

A new science and technology university in Saudi Arabia will house one of the world's largest supercomputers and it is helping lure top researchers to the conservative desert state, according to a report on Reuters.

The King Abdullah University of Science and Technology (KAUST) is due to open in 2009 near Jeddah.

Inside the campus, male and female students will be able to mingle freely, contrary to strict gender segregation enforced in most of the country. The university is part of a series of reforms by King Abdullah aiming to open the country up.

The Supercomputer, dubbed Shaheen and named after the peregrine falcon, which reaches speeds of over 200 mph, Shaheen is expected to reach 222 teraflops, a measure equaling a trillion floating point operations per second, reportedly making it the sixth most powerful computer in the world.

Shaheen, according to the report, will be able to simulate the Red Sea environment and model oil fields in three dimensions.

(Source: Reuters)

## Study in Germany Gateway for Students and Scientists

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GI



### German supercomputers among ten fastest in the world (07/04/2009)

The two computers, which are both located at the Research Center Juelich, are the first models from Germany to simultaneously be in the top ten fastest supercomputers in the world. The first has been dubbed Europe's fastest computer. Its name is JUGENE and it was ranked third on the list of the Top 500 supercomputers, which was recently published at a supercomputer conference in Hamburg. The other computer from Juelich – JUROPA/HPC-FF – was tenth on the list. According to the Research Center Juelich, that's the first time in the history of the world rankings that two computers from a single European institute have been in the top ten at the same time. Both computers were developed by experts at the Juelich Supercomputing Center with support from partner firms. The computer JUGENE can complete more than one quadrillion computations per second, which is around 50,000 times faster than a modern PC.

### Further Information

Juelich Supercomputing Center  
[www.fz-juelich.de/...](http://www.fz-juelich.de/)

DW Interview with Thomas Lippert, director of the Juelich Supercomputing Center  
[www.dw-world.de/...](http://www.dw-world.de/)

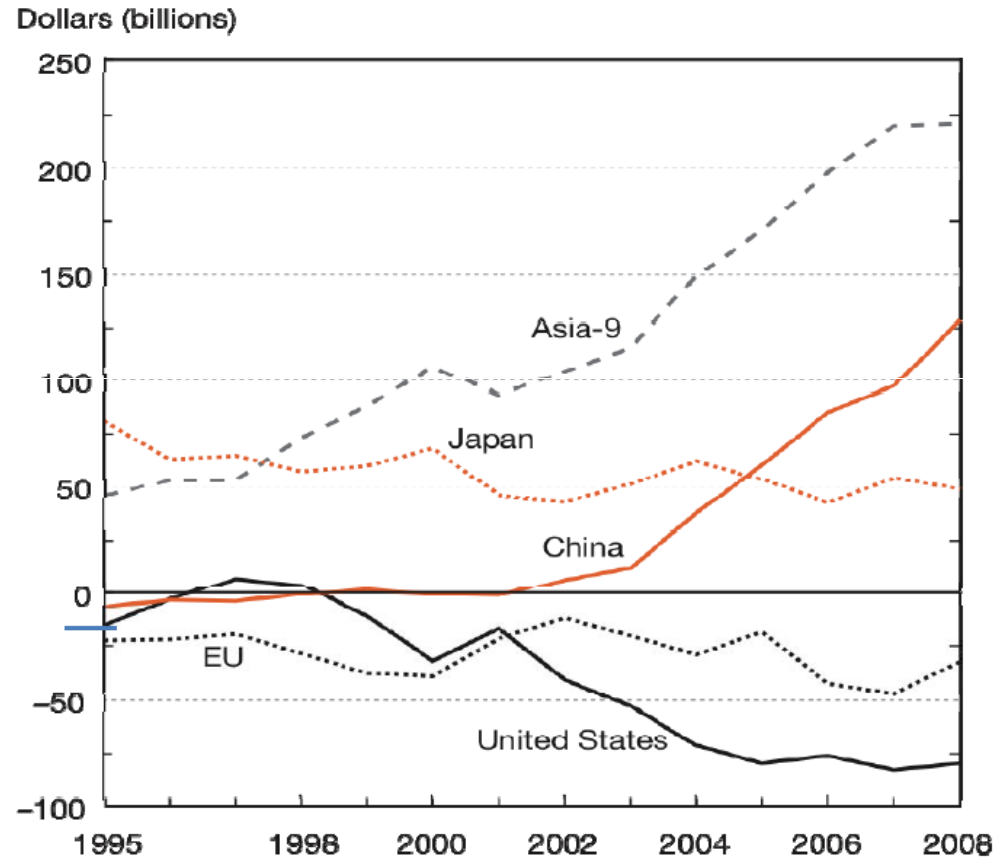
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# So let us deploy HPC is to improve our High Tech Trade Balance

## Trade balance in high-technology goods 1995–2008



NOTES: Asia-9 includes India, Indonesia, Malaysia, Philippines, South Korea, Singapore, Taiwan, Thailand, and Vietnam. China includes Hong Kong. EU excludes Cyprus, Estonia, Latvia, Lithuania, Luxembourg, Malta, and Slovenia.

Source: NSF Science and Engineering Indicators 2010



# Thank You

Out-Compute  
to  
Out-Compete™

