



An Ecosystem for Competitiveness and Innovation

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High Performance Computing

High Performance Computing is essential for Science, but also for Industry in all domains and all size of enterprises.

It has become a strategic factor of competitiveness and innovation in most sectors of the economy, with a major impact on employment and national wealth.

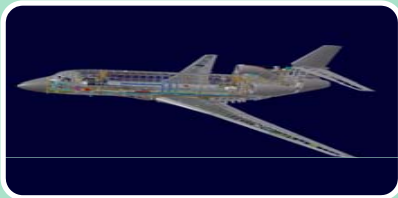
- **Industry** needs large computing power to design complex systems and to accelerate the introduction of innovative products.
- **Research** relies more and more on simulations to produce new knowledge.

**HPC is a key element
of our competitiveness and our innovation capacity**



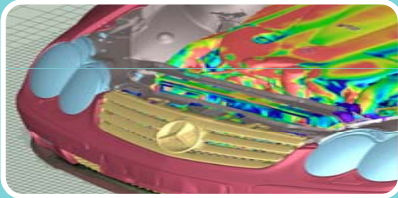
In Industry

Examples of industrial challenges where HPC (High Performance Computing) is a key technology :



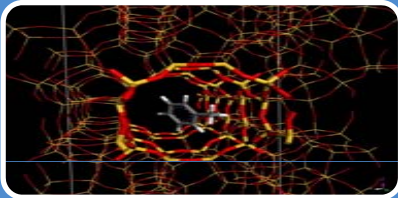
Aeronautics

where the design of airplanes more energy efficient and less noisy cannot be done without simulations involving very large models of the entire aircraft and analysis of physical phenomena at different scales,



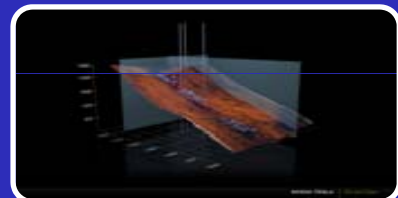
Automotive industry

which wishes to reduce consumption and CO2 emissions while increasing the level of comfort and security,



Pharmaceutical industry

where the discovery of new active molecules and new drugs is accelerated by numerical simulations,



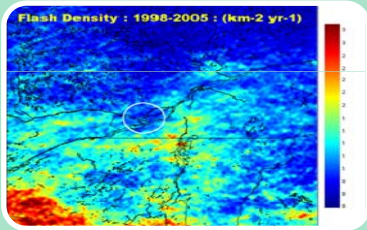
Oil industry

which needs supercomputers to discover new oil fields and to optimize production of existing reservoirs.



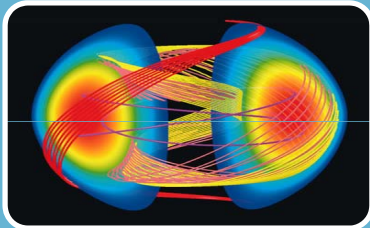
In Science

In science, simulation and HPC have become the third pillar - alongside theory and experimentation – for the creation of knowledge. Many key scientific issues for tomorrow's society depend in part on supercomputing :



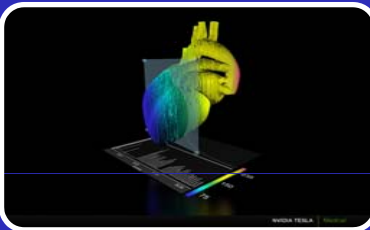
Climatology

requires computing power to make a precise diagnosis of the situation, and evaluate the impact on climate change of measures which could be put in place,



Fusion energy

where the existence of a tool such as ITER reactor can not be conceived without large computing power,



Biology and medicine

are using simulation to better understand the mechanisms involved in the cells and organs and also to model pathologies.



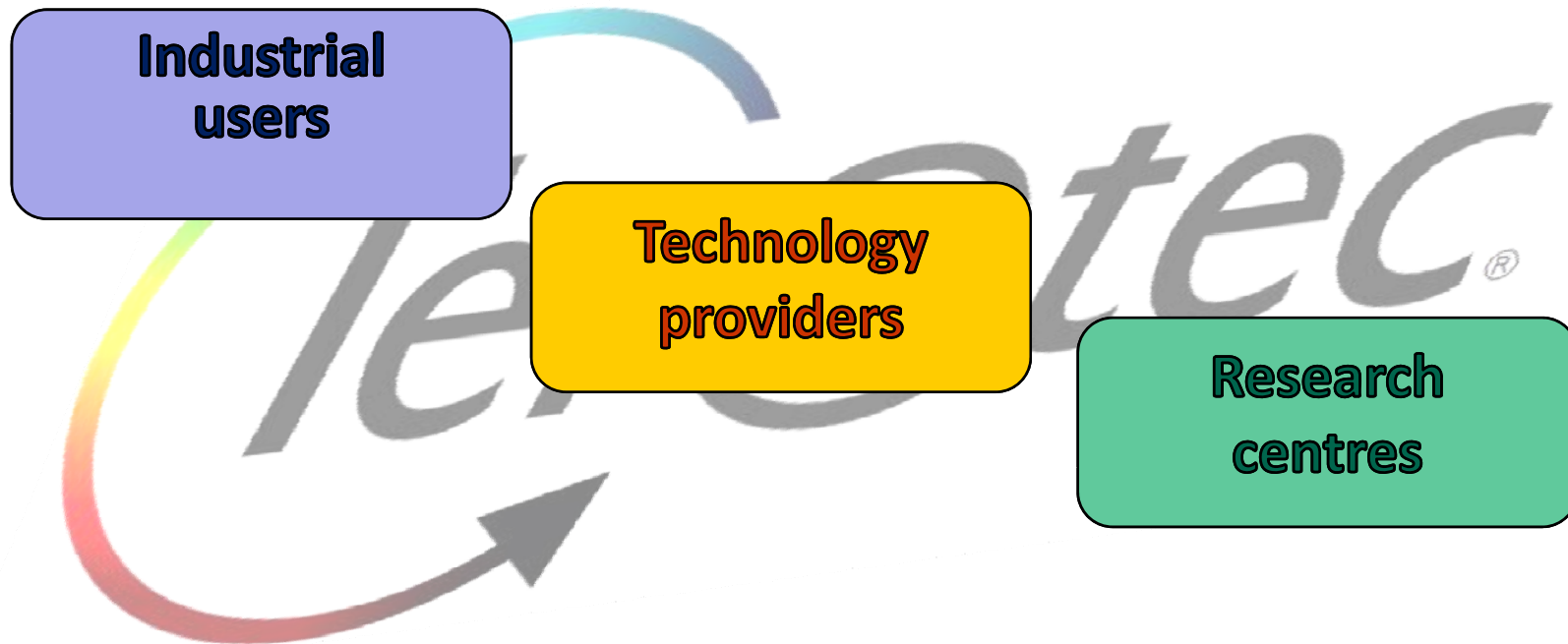
HPC is essential in many domains

- In a domain like **Energy**, HPC is mandatory to progress on more efficient transport systems (car, aircraft), better exploitation of resources (oil industry) and development of new resources.
- In **Health**, development of new drugs, of new and personalized treatments, as well as brain biology or bespoke prosthesis, need supercomputing power.
- The **Services** industries will need more and more computing power to develop new and optimized services (in Finance, risk assessment and new financial services).
- The **Media industry** (movie and video creation and distribution) is redefining itself around HPC, like many other sectors, including national and regional security.

**HPC is becoming an engine of the economy,
with potential major impact on our daily life.**



This is why we have created Teratec,
an eco-system regrouping



on one subject :

How to master this critical technology and enlarge its usage

Ter@tec

I.T. Companies

⇒ Create, develop and optimize

Research

⇒ Knowledge progress

Industrial Users

⇒ Increase competitiveness



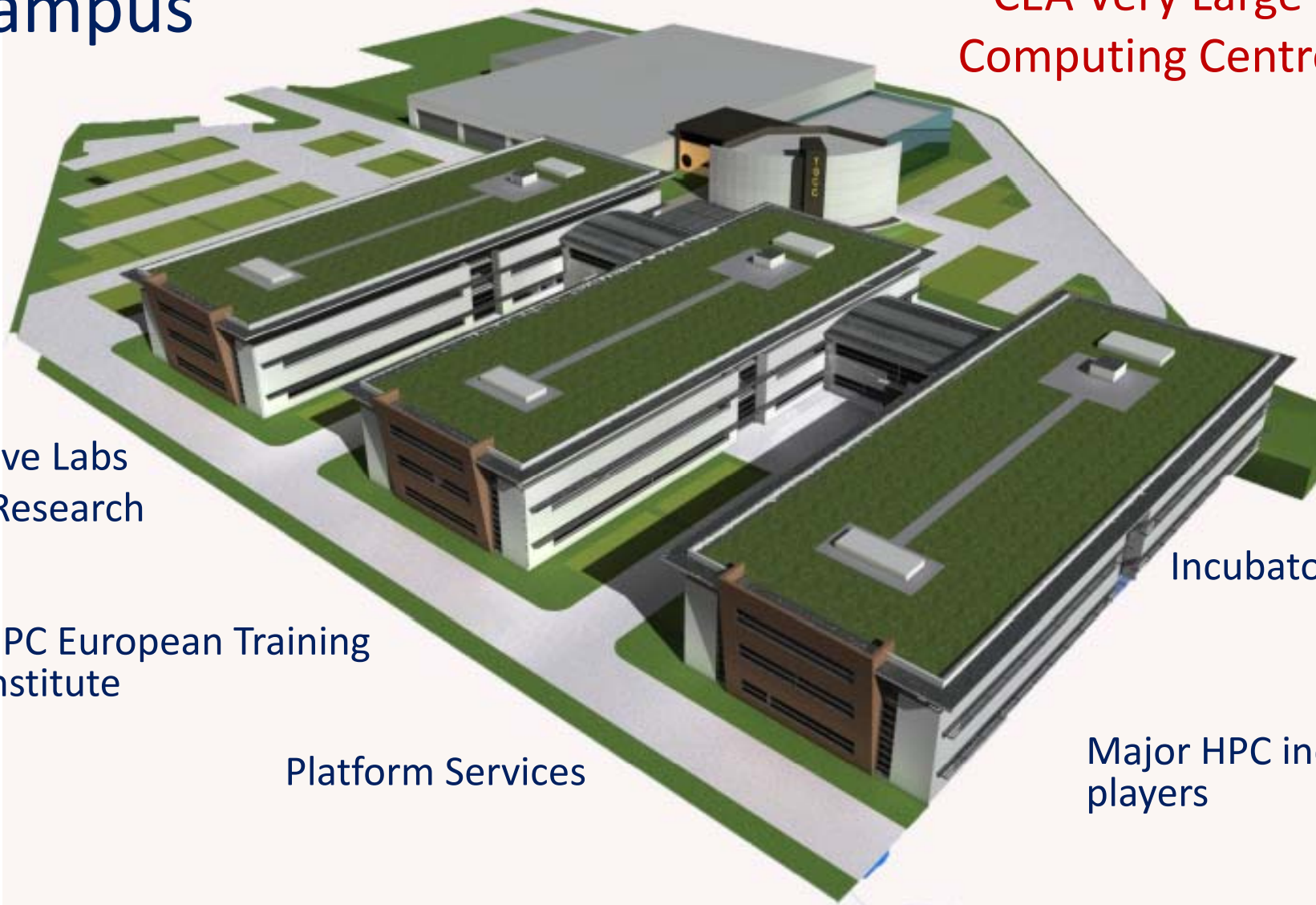


*We are building a technopole
dedicated to
High Performance Computing
for Design and Simulation*



The TERATEC Technopole

Campus



CEA Very Large Computing Centre

Collaborative Labs
Industry - Research

HPC European Training
Institute

Platform Services

Incubator

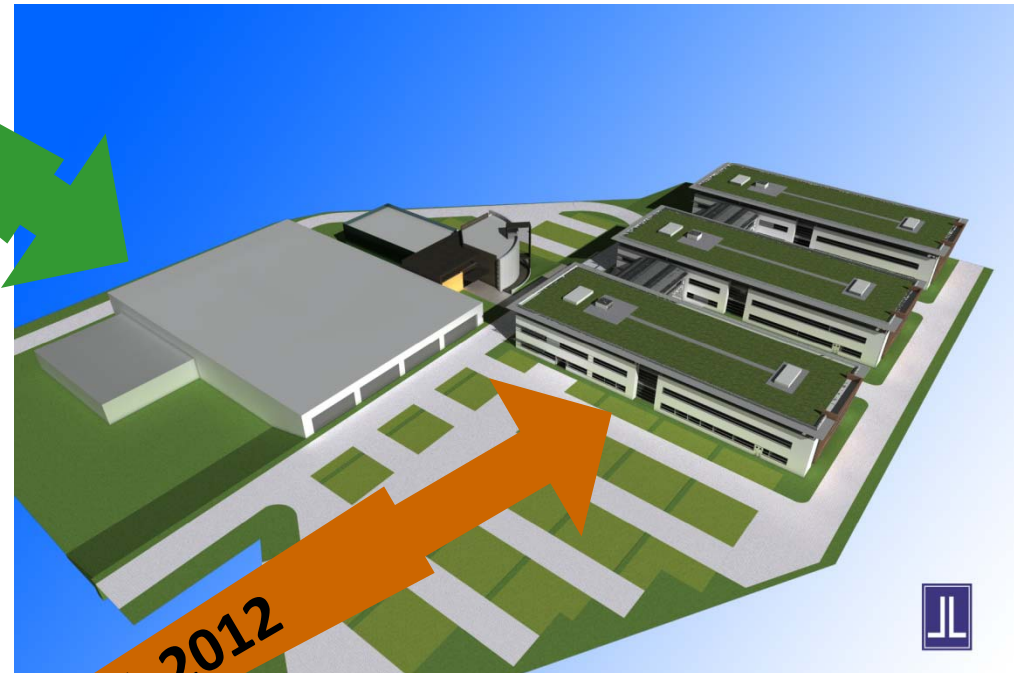
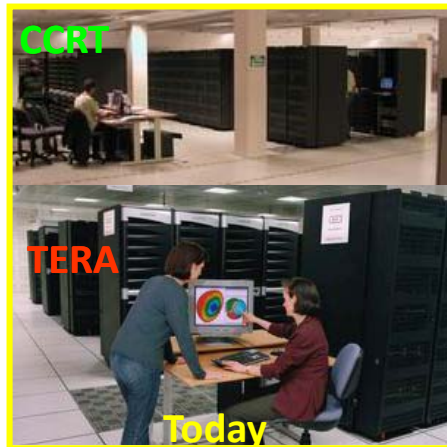
Major HPC industrial
players



The planning

**CEA
Scientific Computing
Complex**

CEA Very Large Computing Center



Offices and Labs



**Integration of Major R&D Labs
Public and private**



CEA Very Large Computing Center

The CEA Very Large Computing Center regroups the CCRT machines (CEA) and the PRACE European machine financed by GENCI.

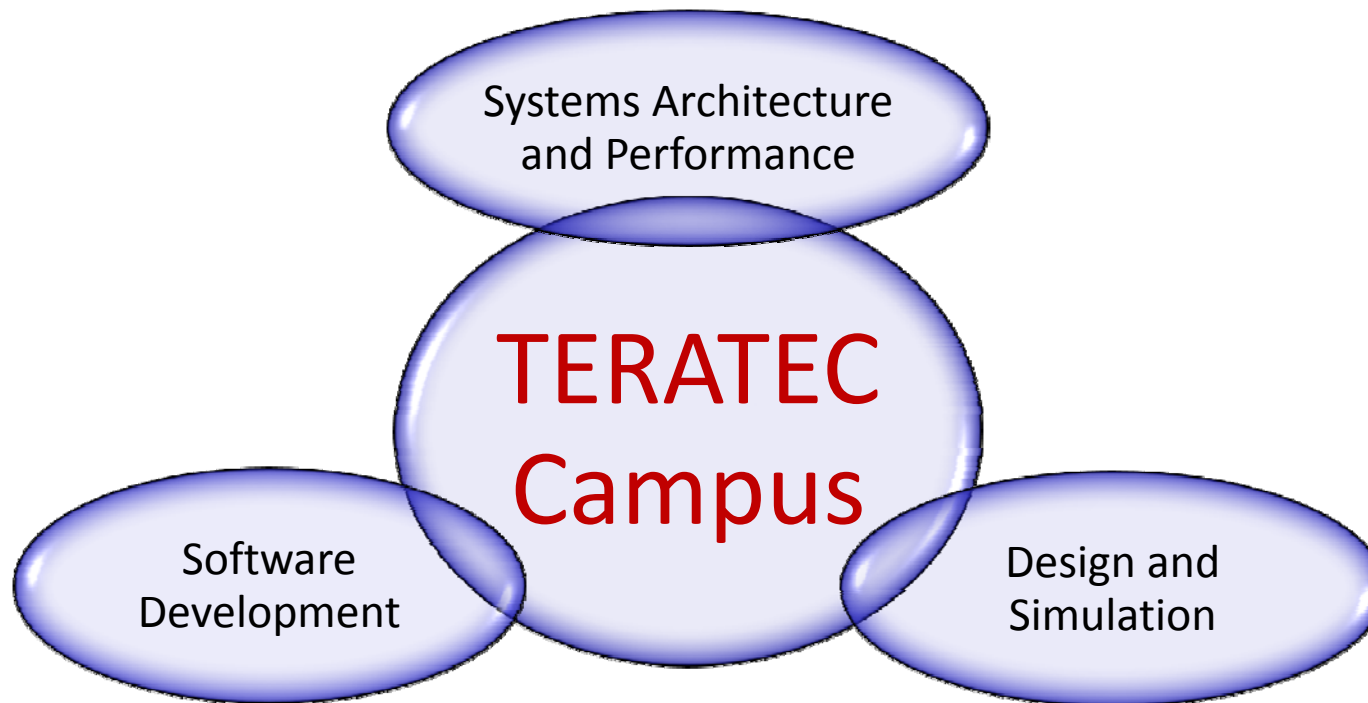
- *Computer rooms: 2600 m²*
- *Technical area: 3000 m²*
- *Conference room: 200 p.*
- *Scientific exchange area: 2100 m²*
- *Power : 60 MW electric line*
- *0.5 petaflop for CCRT systems(Computing Center for Research and Technology)*
- *Petascale level for the future European Tier-0 system*





The TERATEC Campus

The TERATEC Campus regroups industrial users and techno providers in a site dedicated to High Performance Simulation and Computing, organized around three major domains :



Together with research labs, an incubator and a training institute



The TERATEC Campus





Inside the Campus



www.imaconcept.tv



Creation of several major European laboratories

TERATEC is working on the set-up of large Research & Industry labs :

- One **Architecture & Systems Performance Lab**, regrouping the necessary research capabilities and facilities to master and design future generations of very high performance architectures and systems.
- One on basic **HPC software and middleware development**.
- One **Complex Systems Design Lab (CSDL)**, covering all aspects of the development of design methods for all types of complex systems, and make it available to public and private research, and to the industry.
- Mixing teams coming from research centers, technology companies and industrial users.
- In cooperation with their international equivalents.



Collaborative Projects Industry - Research

Important participation of TERATEC members in major projects of the SYSTEMATIC cluster, ANR and ITEA2:

- **ACTIVOPT** : Optimization and robust design are now growing concerns in the industry
- **COLLAVIZ** : Collaborative platform for the simulation-based design applications
- **COOL-IT** : Optimisation énergétique des data centers
- **CSDL** : Complex System Design Lab
- **EHPOC** : Environnement Haute Performance pour l'Optimisation et la Conception
- **H4H** : Hybrid for HPC
- **OASIS** : Optimization of Addendum Surfaces In Stamping
- **OPEN GPU** : Graphics Processing Units
- **OPEN HPC** : The virtual Open HPC platform
- **OPSIM** : Numerical optimization and robust design techniques
- **OPUS** : High Performance Environment for Optimization and Design
- **PARMA** : Parallel Programming for Multi-core Architectures
- **PARMAT** : Parallélisation pour la simulation des Matériaux
- **POPS** : Peta Operations Par Seconde



Collaborative Projects Industry & Research (1)



OPEN H.P.C.
openhpc-project.org

Building a coherent, interoperable and accessible HPC software platform

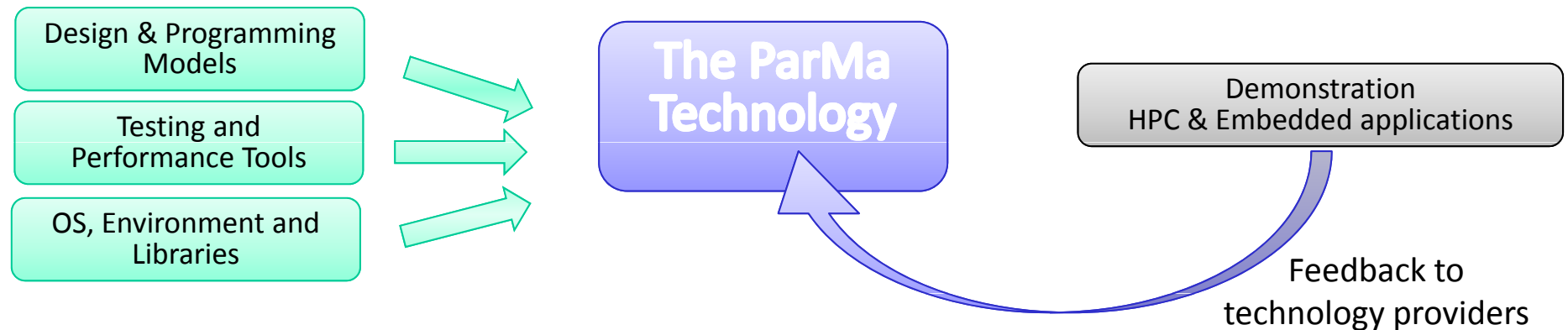
- Simulation and design on High Performance Computing are now strategic for industrial competitiveness and overall innovation capacity.
- Both for Industry and Research one of the most critical elements of the HPC chain is application software.
- It has to be accessible to all the actors of the market, especially for small and medium-sized firms.
- Users ask for global software solutions on HPC architecture, mixing both free and commercial software.
- In the context of this project, Open Source software will be improved in term of quality, interoperability and performance.
- These developments have to be structured and interconnected in order to create a coherent software platform, linked with other initiatives such as the Complex Systems Design Lab (CSDL) and the PCS platform of services.



Collaborative Projects Industry - Research (2)

ParMa - Parallel Programming for Multi-core Architectures

- Three-year project (ITEA2) from 2007 to 2010 (elected best ITEA2 project).
- Main objectives :
 - Develop advanced technologies to exploit fully the power of multi-core architectures
 - Deliver substantial performance improvements for conventional HPC (High Performance Computing) and for mainstream applications
 - Enable the advent of power-intensive innovative embedded applications



Each domain (simulation, virtual reality, avionics, etc.) having its own characteristics, it is necessary to validate the approach and identify commonalities and specificities.



Master of Science in Informatics High Performance Computing and Simulation



This master is the first Master of Science in France dedicated to train managers specialized in this vital area. By using tools and techniques from high performance computing and simulation, students will master the most recent technical developments coming from simulation tools and methods, and from the continuous increase of systems performance.

MIHPS is devoted to the training of top scientists able to acquire two major technological developments:

- the systematic use of parallelism (from multicore systems to supercomputers)
- the use of numerical design and simulation tools and methods

This master gives future graduates multidisciplinary skills, with high level expertise in high performance computing and in modeling / simulation techniques.





Competitiveness clusters

■ Systematic Paris-Région

- TERATEC is member of Systematic Paris-Région, a world class Cluster dedicated to ICT and complex systems.
- TERATEC is heavily involved in the activities of the Working group OCDS (Design Tools and Systems Development).

■ Cooperations and perspective :

- **Cap Digital**, on digital content and services.
- **Mov'eo**, private and public transportation, safety and environment.
- **Medicen Paris Région**, health technologies and new medicines.
- **Astech Paris-Région**, aerospace.
- **Advancity**, green and sustainable cities.





TERATEC Forum

Plenary sessions

The plenary sessions illustrate the increasing impact of HPC in many industrial and research fields and its role in major scientific and technological challenges. With the participation of leading international industrial users, technologies providers and key responsables from the political, economic and academic worlds :

- Christine LAGARDE, Minister of Economy, Industry and Employment
- Valérie PECRESSE, Minister of Higher Education and Research
- Janez POTOČNIK, European Commissioner for Research and Science
- Philippe CHALON, Vice-President, TOTAL
- Bruno STOUFLET, Vice-President for Scientific Strategy, Advanced Business and R&D, DASSAULT AVIATION
- Guillaume DEVAUCHELLE, Vice-President R&D, VALEO
- James TRUCHARD, President and CEO, NATIONAL INSTRUMENTS
- Jen-Hsun HUANG , President and CEO, NVIDIA
- Alain de ROUVRAY, President and CEO, ESI Group
- Tadashi WATANABE, RIKEN R&D Center
- Daniel ZAMPARINI, Directeur des Systèmes d'Information, PSA PEUGEOT CITROËN
- Vincent GARNIER, Vice-president Recherche et Technologie, SNECMA
- Rudolf HAGGENMUELLER, President, ITEA 2





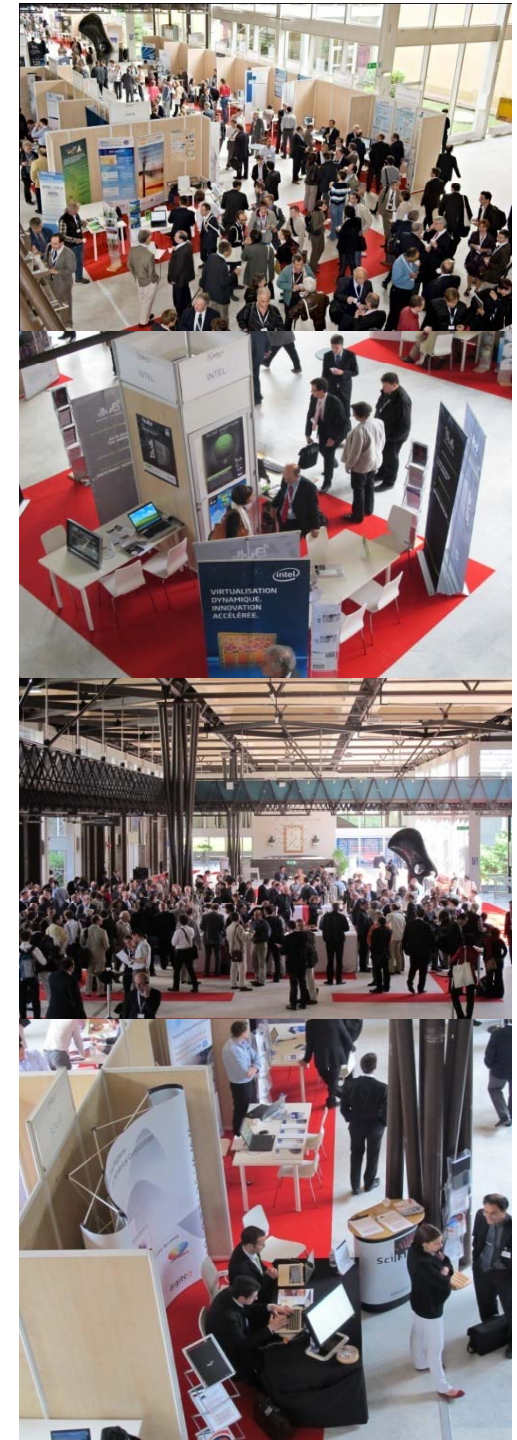
TERATEC Forum

Exhibition & Networking

A large exhibition presents products and innovations from the major HPC players : manufacturers and editors, systems integrators and services providers, universities and research centres, competitiveness clusters and public organisations, etc.

TERATEC Forum 2011 Exhibitors

- ALINEOS
- ALLINEA SOFTWARE
- ALTAIR ENGINEERING
- ALYOTECH
- AMD
- ANSYS FRance
- BULL
- CAPS ENTREPRISE
- CARRI SYSTEMES
- CD ADAPCO
- CEA
- CENAERO
- CHAMBRE DE COMMERCE ET D'INDUSTRIE DE L'ESSONNE
- CLUSTERVISION
- COLLAVIZ PROJECT
- COMMUNAUTE DES COMMUNES DE L'ARPAJONNAIS
- COMMUNICATION & SYSTEMES
- CONSEIL GENERAL DE L'ESSONNE
- DATADIRECT NETWORKS
- DELL
- ENGIN SOFT
- ESI GROUP
- EXASCALE COMPUTING RESEARCH
- FRAUNHOFER ITWM
- FRAUNHOFER SCAI
- FUJITSU SYSTEMS EUROPE
- GENCI
- HEWLETT PACKARD
- HPC PROJECT
- IBM
- INRIA
- INTEL
- MATHWORKS
- MICROSOFT
- MIHPS
- MSC SOFTWARE
- NAFEMS
- NICE SOFTWARE
- NOESIS SOLUTIONS
- NUMTECH
- NVIDIA
- OPENSIDES
- OXALYA
- PANASAS
- SAMTECH
- SCILAB
- SGI
- SODEARIF
- SYSFERA
- SYSTEMATIC
- TERATEC
- TRANSTEC





TERATEC Forum

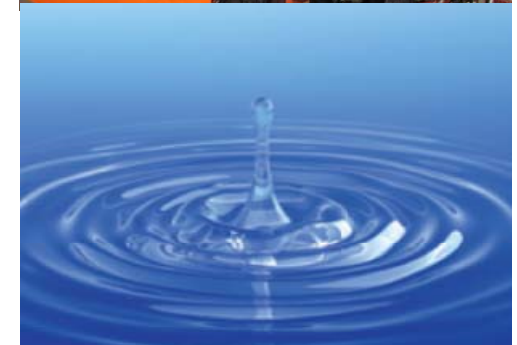
Technical workshops

The technical workshops address major technical HPC topics. It gives the possibility to review the most important collaborative projects involving industry and research.

- Systems Engineering
- Scientific Visualization
- Images production
- Systems architecture
- Parallel applications on manycore architectures
- HPC and complex systems design
- HPC in Life sciences
- HPC and sustainable development
- HPC and risk evaluation
- GPU, State of art and future evolutions
- HPC in manufacturing (virtual prototyping)

Save the date !

**The 7th edition of the TERATEC Forum
Tuesday and Wednesday, June 26 & 27, 2012
Ecole Polytechnique (91120 Palaiseau, France)
You are welcome !**





13 000 m2 of offices and labs - 1000 people

**We are building the first European technopole dedicated
to High Performance Simulation and Computing**

Association TER@TEC

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