

DEISA Extreme Computing



DEISA PRACE Symposium 2010

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RI-222919

DEISA

**DEISA's fast continental
file system built on
GEANT2**

Six years of operation

*Most powerful
European Supercomputers
for most challenging projects*

*Grand Challenge
projects performed
on a regular basis*

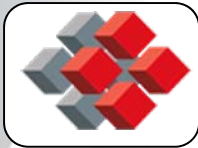
*Top-level Europe-wide
application enabling*

*Virtual Science Community
Support*

 DEISA 10 Gb/s network infrastructure 



Distributed
European
Infrastructure for
Supercomputing
Applications



15 partners, 10 countries

TOP Sites List Generator

The ranking is determined using the sum of the Rmax share of every site in every list since 1993. For example:

Total Rmax in 1993 was 1.12 TFlops and Los Alamos National Laboratory had a total of 7 systems with a combined Rmax of 86.34 GFlops, thus, the share of LANL for June 1993 would be approx. 0.077. We then add those shares per site and rank the sites using the sum of the shares then we divide the sum by the number of the lists since June 1993.

Rank	Site	Country	% in all lists
1	ECMWF	United Kingdom	1.02
2	Forschungszentrum Juelich (FZJ)	Germany	0.87
3	United Kingdom Meteorological Office	United Kingdom	0.66
4	Commissariat a l'Energie Atomique (CEA)	France	0.58
5	HWW/Universitaet Stuttgart	Germany	0.57
6	Leibniz Rechenzentrum	Germany	0.51
7	Max-Planck-Gesellschaft MPI/IPP	Germany	0.49
8	University of Edinburgh	United Kingdom	0.46
9	Deutscher Wetterdienst	Germany	0.44
10	CINECA	Italy	0.36
11	IDRIS	France	0.35
12	Barcelona Supercomputing Center	Spain	0.33
13	CSAR at the University of Manchester	United Kingdom	0.31
14	CSC (Center for Scientific Computing)	Finland	0.30
15	Atomic Weapons Establishment	United Kingdom	0.28
16	Commissariat a l'Energie Atomique (CEA)	France	0.26
17	SARA (Stichting Academisch Rekencentrum)	Netherlands	0.26
18	Ecole Polytechnique Federale de Lausanne	Switzerland	0.26
19	BMW AG	Germany	0.25
20	Swiss Scientific Computing Center (CSCS)	Switzerland	0.22

DEISA



Top500 List

Top Sites since 1993

Continent: Europe

DEISA Supercomputers

State-of-the art supercomputers

> 2 PF aggregated peak performance

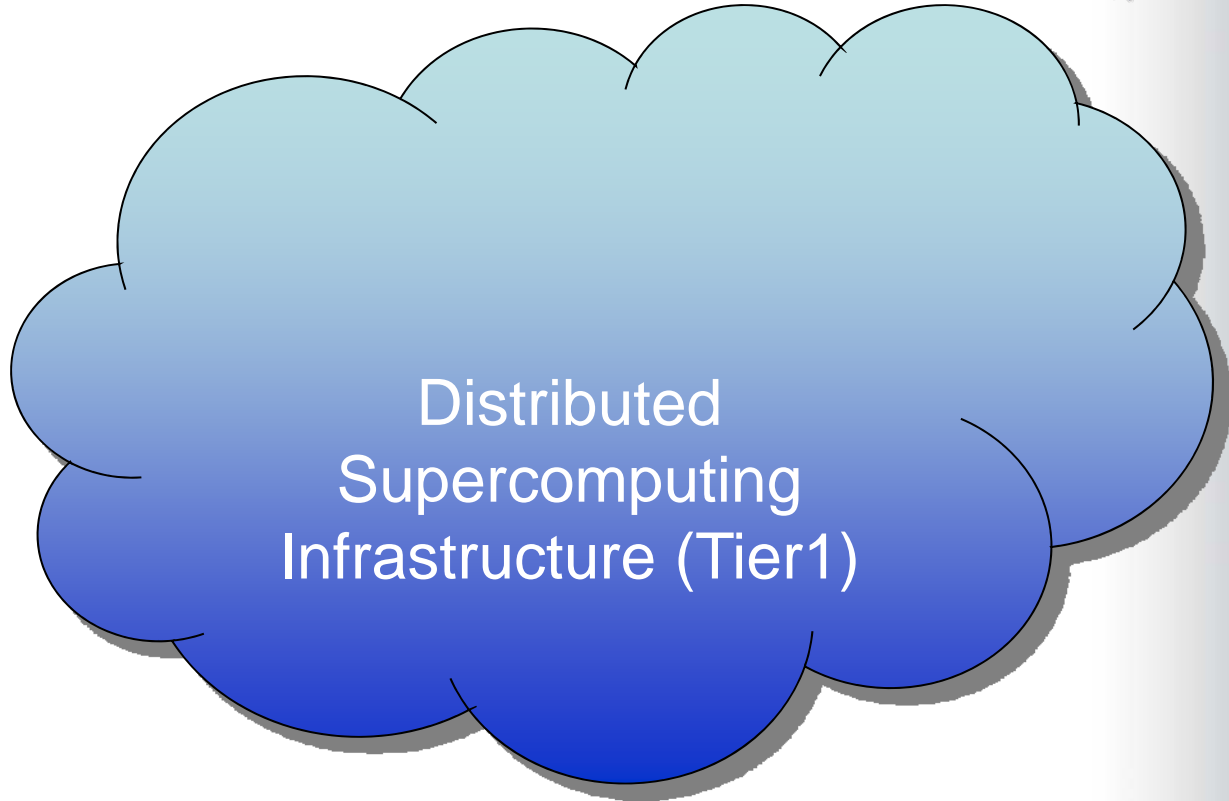
- Cray XT4/5/6, Linux
 - IBM Power6, AIX / Linux
 - IBM BlueGene/P, Linux
 - IBM PowerPC, Linux (MareNostrum)
 - SGI ALTIX 4700, Linux
 - NEC SX9 vector system, Super UX
-
- Fixed fractions of resources dedicated to DEISA usage
 - Systems interconnected with dedicated 10Gb/s network

Service Structure

Applications

Users
(single projects)

Science
communities



Application
support team

Operation & user
support team

Technology
team

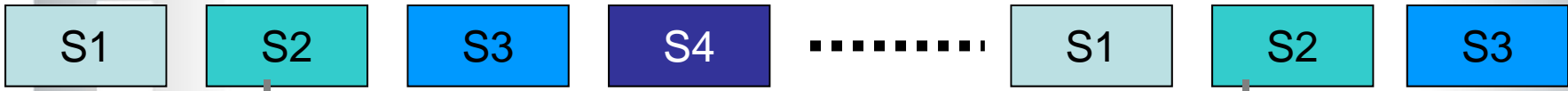
Distributed Supercomputing Infrastructure (Tier1)

Access via Internet

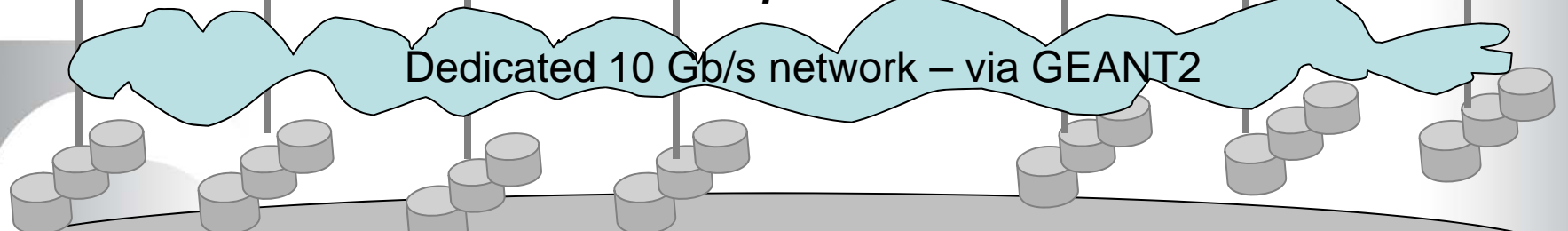
Single sign-on, secure login

DEISA Common Production Environment

Different Software *Environments*



Different *Supercomputers*



DEISA highly performant continental global file system

DECI

DEISA Extreme Computing Initiative

2005

1st DECI call

2006

2nd DECI call

2007

3rd DECI call

2008

4th DECI call

2009

5th DECI call

2010

6th DECI call

DECI

DEISA Extreme Computing Initiative

- Target: Complex, demanding, innovative simulations
- Multi-national proposals especially encouraged
- Review by national evaluation committees
- Selection criteria: innovation potential, scientific excellence, relevance, and national priorities
- Most powerful HPC architectures in Europe available for the most challenging and excellent projects
- Most appropriate supercomputer architecture selected per project
- Mitigation of the rapid performance decay of a single national supercomputer within its short lifetime cycle of typically about 5 years, as implied by Moore's law

DEISA Extreme Computing Initiative



DECI call 2005

51 proposals, **12** European countries involved, co-investigator from US
30 mio cpu-h requested
29 proposals accepted, 12 mio cpu-h awarded (normalized to IBM P4+)

DECI call 2006

41 proposals, **12** European countries involved
co-investigators from N + S America, Asia (US, CA, AR, ISRAEL)
28 mio cpu-h requested
23 proposals accepted, 12 mio cpu-h awarded (normalized to IBM P4+)

DECI call 2007

63 proposals, **14** European countries involved, co-investigators from
N + S America, Asia, Australia (US, CA, BR, AR, ISRAEL, AUS)
70 mio cpu-h requested
45 proposals accepted, ~30 mio cpu-h awarded (normalized to IBM P4+)

DEISA Extreme Computing Initiative



DECI call 2008

66 proposals, **15** European countries involved, co-investigators from N + S America, Asia, Australia
134 mio cpu-h requested (normalized to IBM P4+)
42 proposals accepted, 48 mio cpu-h awarded (normalized to IBM P4+)

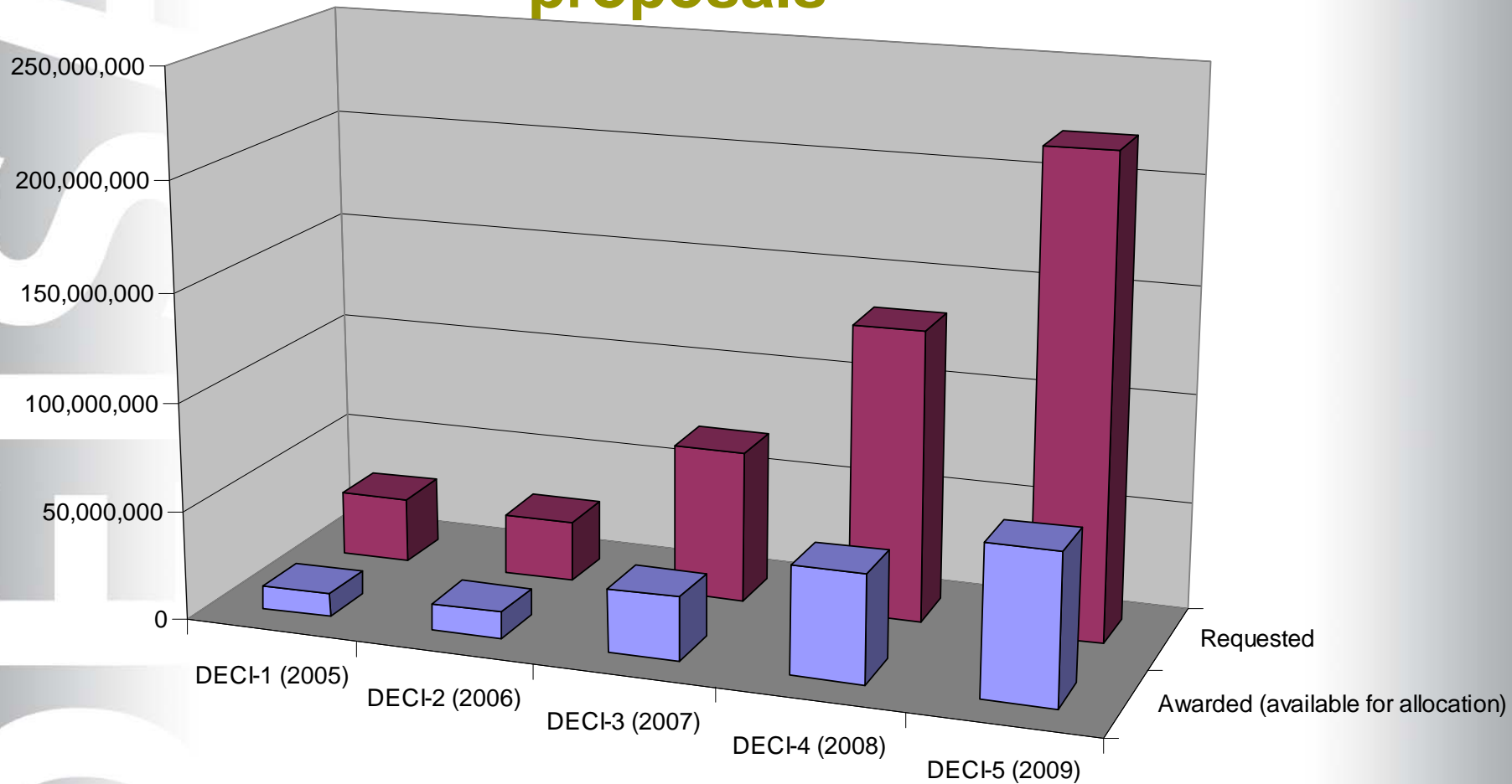
DECI call 2009

75 proposals, **21** European countries involved, co-investigators from N America, Asia
220 mio cpu-h requested (normalized to IBM P4+)
50 proposals accepted, 60 mio cpu-h awarded

DECI call 2010

122 proposals, **24** European countries involved, co-investigators from N America, Asia
570 mio cpu-h requested (normalized to IBM P4+)

CPU requested in DECI proposals



Demand for CPU increasing at a faster rate than supply

DEISA Extreme Computing Initiative



Projects from DECI calls 2005, 2006, 2007, 2008, 2009:

Involvement of over 180 research institutes and universities from 25 European countries:

Austria	Belgium	Cyprus	Denmark	Finland
France	Germany	Greece	Hungary	Ireland
Italy	Latvia	Norway	Poland	Portugal
Romania	Russia	Slovak Rep.	Spain	Sweden
Switzerland	Netherlands	Turkey	Ukraine	UK

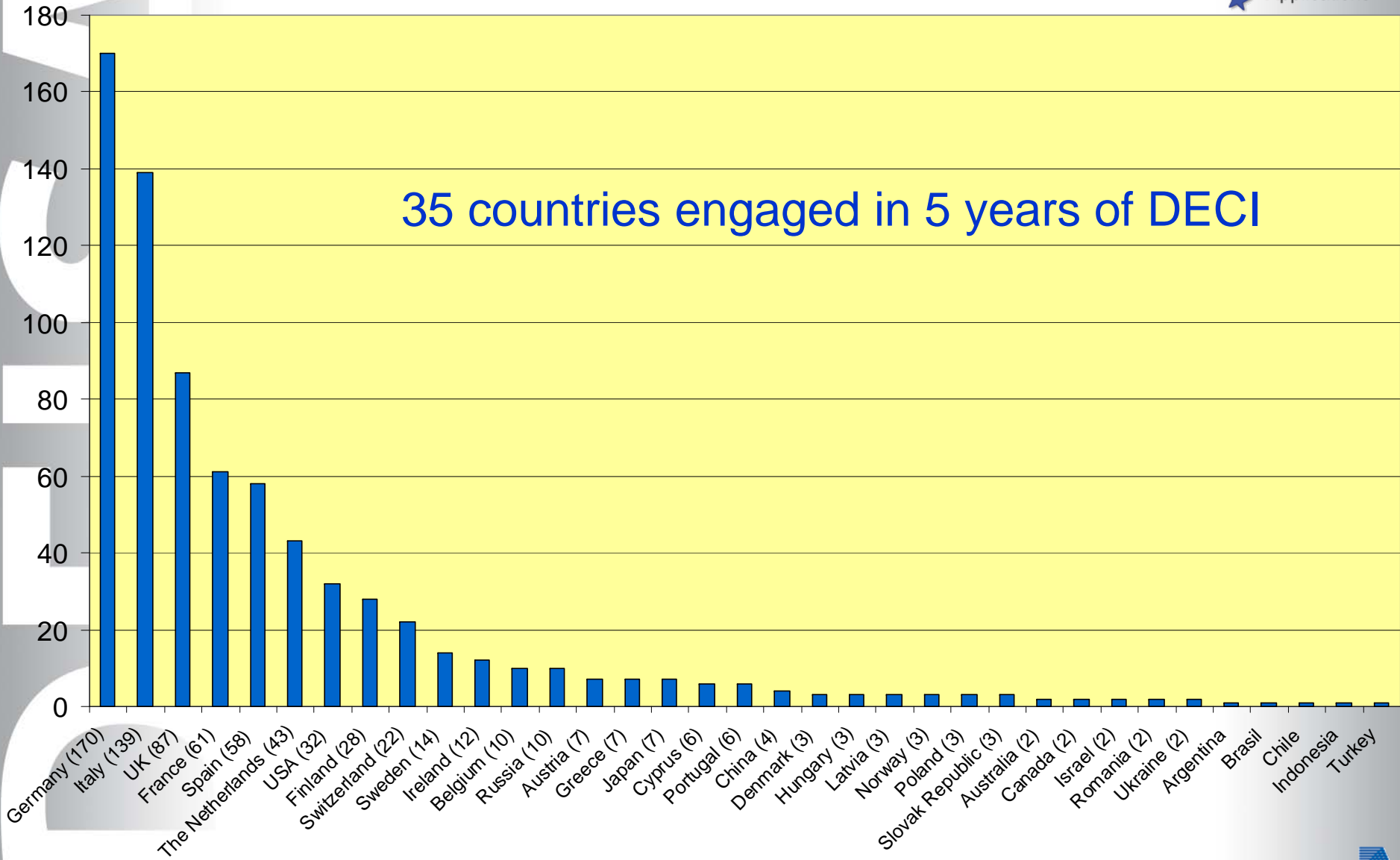
with collaborators from four other continents

North America, South America, Asia, Australia

DECI – Investigators by Countries



35 countries engaged in 5 years of DECI



Cover Story of Nature

Curvy membranes make proteins attractive

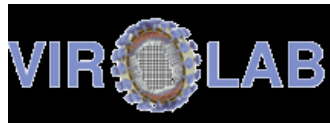


Nature 447 (2007), 461-464

For almost two decades, physicists have been on the track of membrane mediated interactions. Simulations in DEISA have now revealed that curvy membranes make proteins attractive

Virtual Community Support

Life Sciences



www.virolab.org

Virtual laboratory for infectious diseases

EU FP6 project

8 EU countries, 11 EU partners



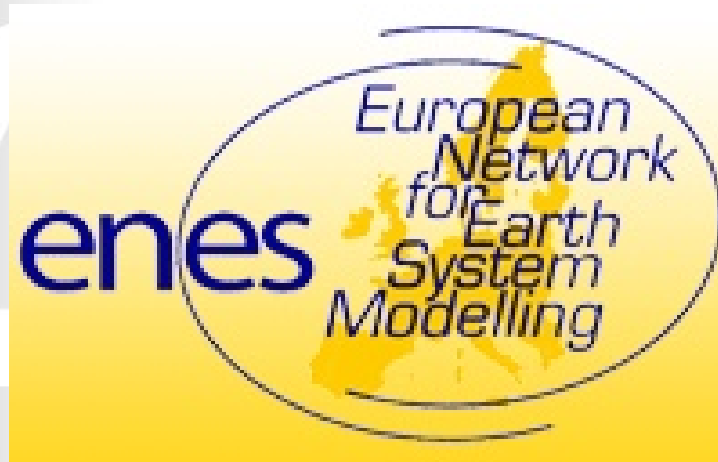
www.vph-noe.eu

EU FP7 project

7 EU countries, 13 EU partners

Virtual Community Support

Climate Research



www.enes.org

European Network for Earth System Modelling operating the IS-ENES Project

Consortium and international project
15 EU countries, 44 EU partners, plus USA

Virtual Community Support

Space Science



LFI-PLANCK

www.esa.int/SPECIALS/Planck

Planck space mission of European Space Agency
(Low Frequency Instrument part)

Project of EU organisation
6 EU countries, 6 EU partners, plus USA

Virtual Community Support

Fusion Energy Research:



www.efda.org

European Fusion Development Agreement

Legal entity

26 EU countries, 31 EU partners



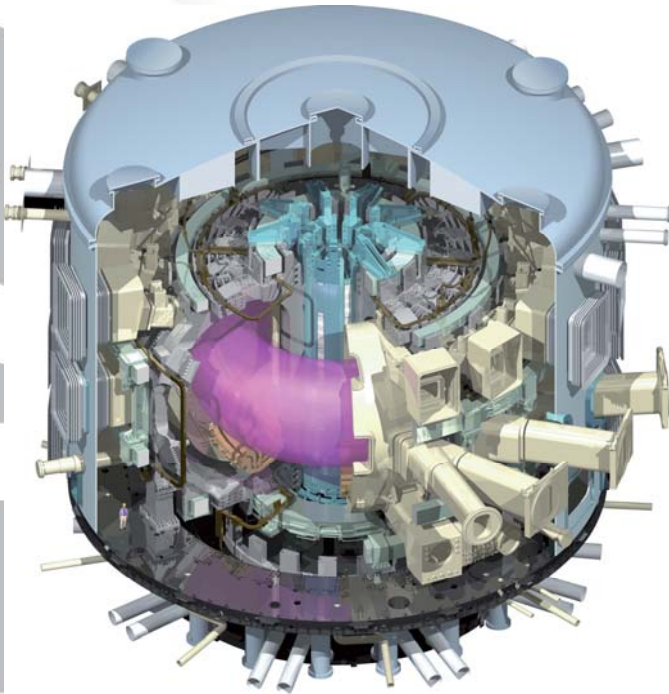
www.euforia-project.eu

EU Fusion fOR Iter Applications (EUFORIA)

EU FP7 project

14 EU countries, 14 EU partners

Fusion Energy Research



ITER

„The fusion community has benefited from over 10 million hours of computer resources under DEISA in the last couple of years, via the different organizations and projects.

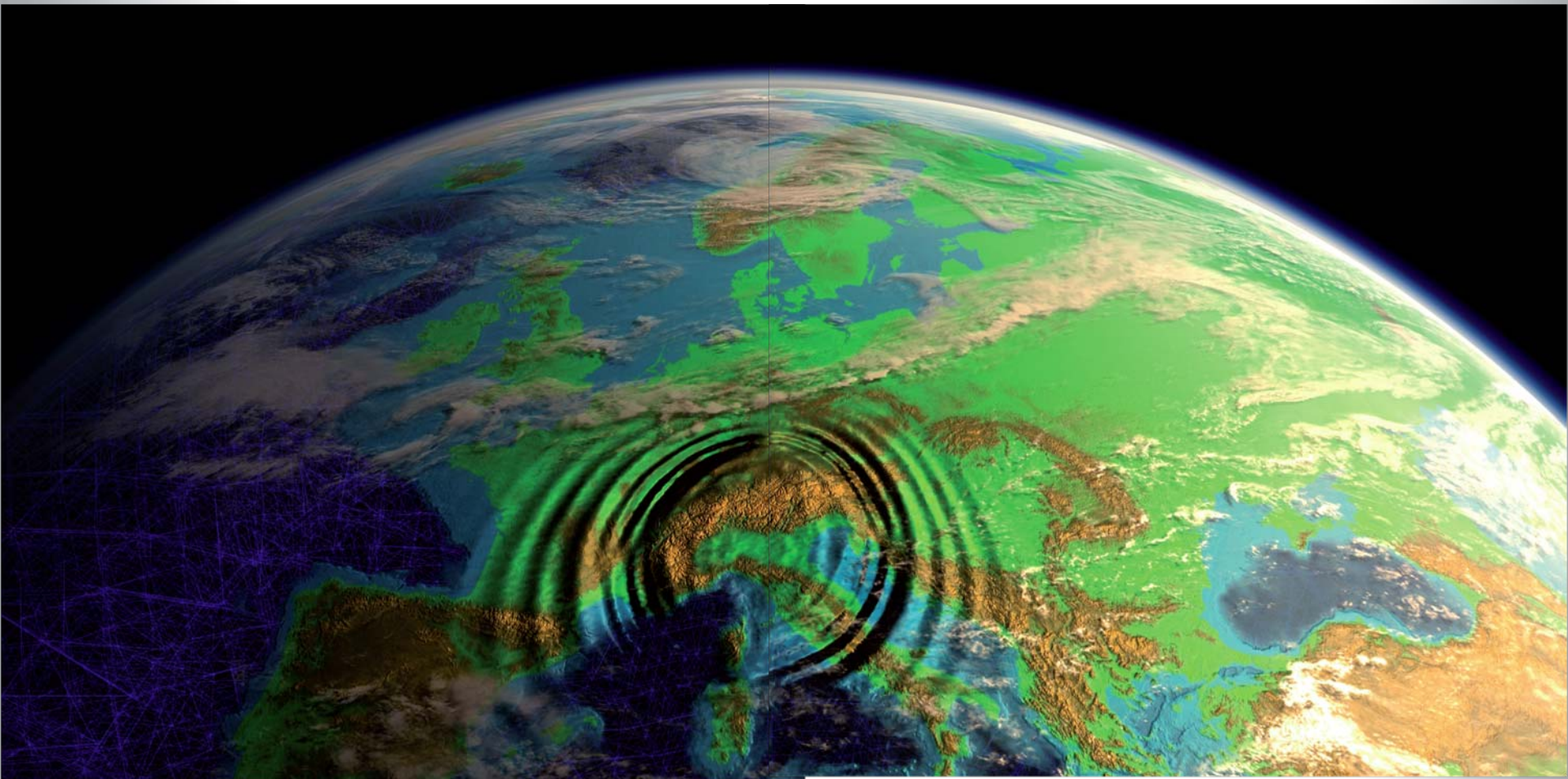
This has allowed significant progress to be made in the use of large-scale computer resources for fusion applications.

DEISA facilitates access to a diverse set of computer architectures, which has created new opportunities for the fusion community.“



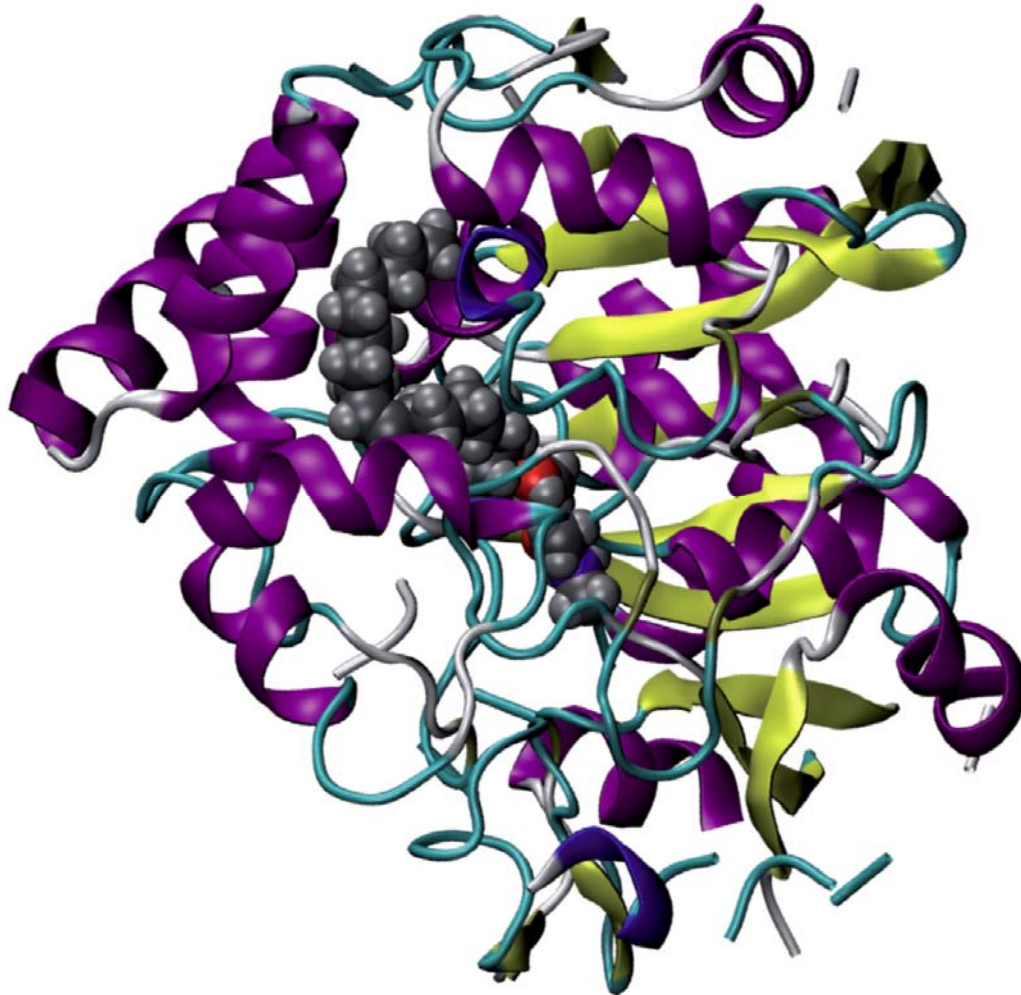
DECI Project EUQUAKE

Earthquake scenarios for Europe



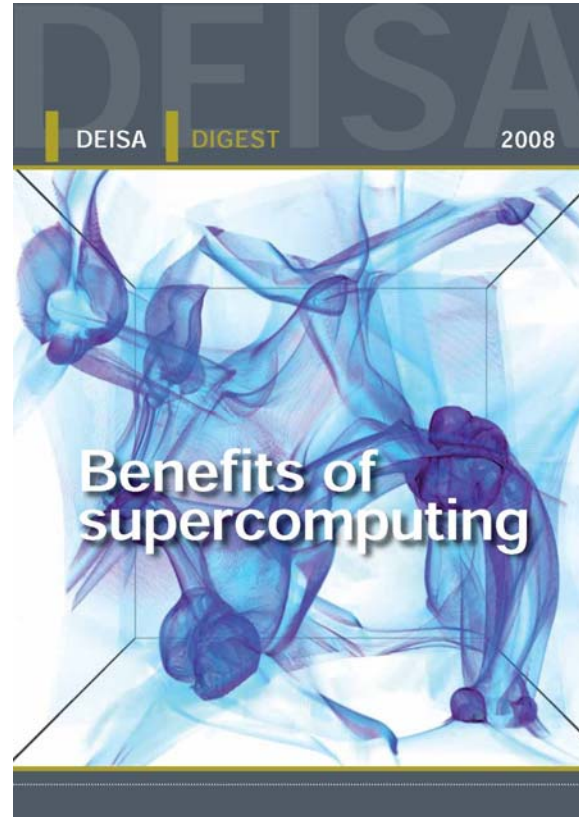
DECI Project TotalEnz

Modeling Enzymes: Catalysis of Life



First
principles
calculation
of free
energy
barriers of
enzyme
catalysed
reactions

Scientific Impact



Brochures and video can be downloaded from <http://www.deisa.eu/publications/results>