Distributed
European
Infrastructure for
Supercomputing
Applications

DEISA Extreme Computing Initiative (DECI) and Science Community Support

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DEISA Mini-symposium
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www.deisa.eu

e-infrastructure

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What is DEISA?

Distributed European Infrastructure for Supercomputing Applications

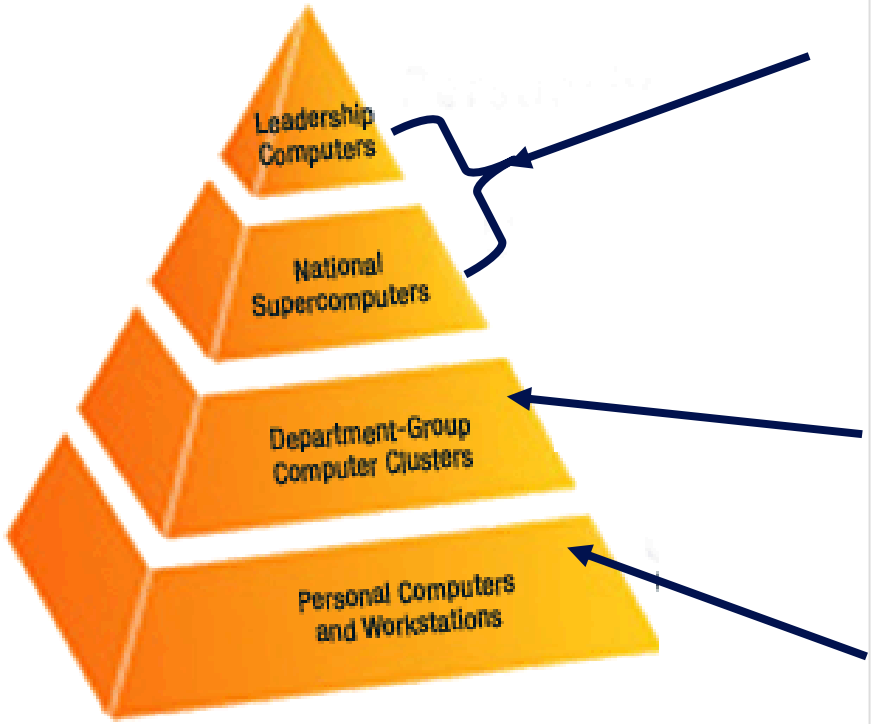
DEISA is a consortium of European supercomputing centres who jointly deploy and operate a distributed high performance computing infrastructure (“the DEISA Infrastructure”) composed of national HPC facilities (tier-1 facilities) linked by a dedicated network

DEISA’s primary objective is to “foster and advance computational science in Europe” by providing European researchers with CPU, application support and user services

DEISA2 is an EC Framework 7 Project which is providing financial support to the DEISA consortium from 2008 to 2011

DEISA works closely with PRACE (The Partnership for Advanced Computing in Europe) who are working towards the creation of a persistent pan-European HPC service, consisting of several tier-0 centres providing European researchers with access to capability computers and forming the top level of the European HPC ecosystem.

The model for HPC provision in Europe



Tier-0 and Tier-1 systems - funded by national funding agencies (with EC support for leadership computers)

- access through national peer-review process or European peer review process

University or research centre computing

Personal computing

Researchers want access to HPC facilities at all levels in the research resources pyramid

DEISA Partners and Associate Partners

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15 partners, 10 countries, EC support 2004-2011

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DEISA Supercomputers

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State-of-the art supercomputers > 1 PF aggregated peak performance

DEISA supercomputers in Top 100, with two in the Top 10

- Cray XT4/5, Linux
- IBM Power5, Power6, AIX / Linux
- IBM BlueGene/P, Linux
- IBM PowerPC, Linux (MareNostrum)
- SGI ALTIX 4700 (Itanium2 Montecito), Linux
- NEC SX8/9 vector systems, Super UX

Fixed fractions of resources dedicated to DEISA usage (minimum 5%)

Systems interconnected with dedicated 10Gb/s network

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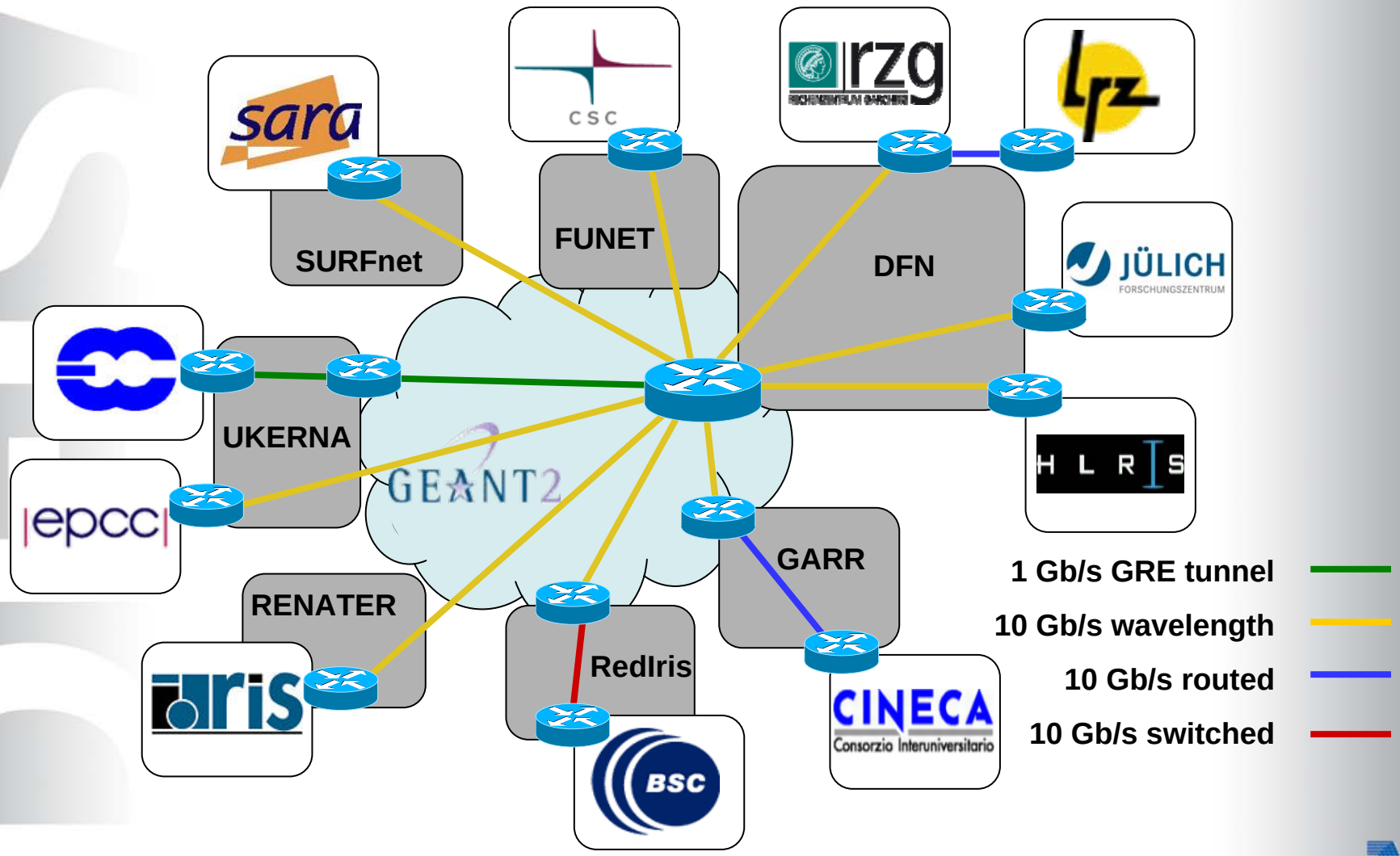
DEISA dedicated high speed network



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DEISA2 Essentials & Goals

Distributed European Infrastructure for Supercomputing Applications

- To consolidate the existing DEISA infrastructure and to continue those activities and services that currently contribute to the effective support of world-class computational science in Europe .

- To evolve the DEISA infrastructure towards a robust and persistent European HPC ecosystem, by
  - enhancing the existing services
  - including support for European Virtual Communities
  - collaborating with new European initiatives, especially PRACE that will enable shared European PetaFlop/s supercomputer systems.

- To advance the existing distributed European HPC environment to a turnkey operational solution for a persistent European HPC infrastructure

DEISA Application Support (2008-2011)

Distributed European Infrastructure for Supercomputing Applications

Joint European Effort to address the new challenges for applications in an emerging heterogeneous HPC ecosystem in Europe through the formation of the Applications Task Force (ATASKF) – a distributed team of experts to support users from all research domains

Goal

To enhance the impact of the DEISA infrastructure on leading European Science and Technology

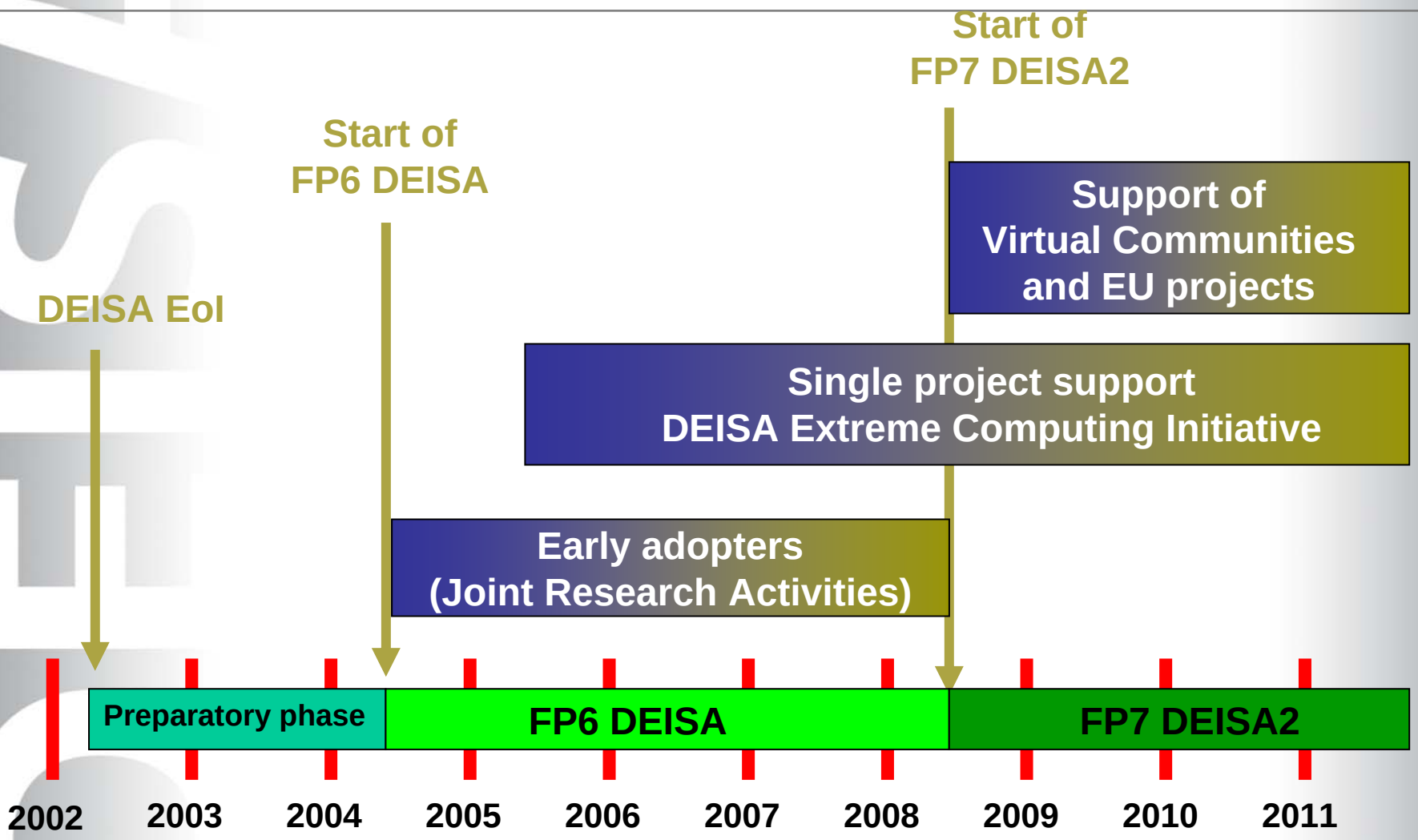
Essential components:

- Continuation of the DEISA Extreme Computing Initiative DECI

- Extension of the single project oriented support model (DECI) to a persistent support for Virtual European science communities and European computational science projects

Evolution of User Categories in DEISA

Distributed European Infrastructure for Supercomputing Applications



DEISA Extreme Computing Initiative (DECI)

Distributed European Infrastructure for Supercomputing Applications

- DECI launched in early 2005 for complex, demanding, innovative simulations requiring the exceptional capabilities of DEISA
- Multi-national proposals especially encouraged
- Proposals reviewed by national evaluation committees
- Projects chosen on the basis of innovation potential, scientific excellence, relevance criteria, and national priorities
- Most powerful HPC architectures in Europe for the most challenging projects
- Most appropriate supercomputer architecture selected for each 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

Objectives of DECI

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Support DEISA's objective to "foster and advance computational science in Europe"

Offer single-project access though open, competitive calls to

- HPC Infrastructure (cycles, services etc.)
- Applications enabling expertise

Facilitate a better understanding of the likely requirements of future users of the Tier-0 systems (European leadership-class supercomputers)

- Supplement PRACE survey of usage of national HPC facilities (snapshot in 2008)
- … by collecting real use-case information about what European computational scientists want and about the differences between usage of national and European resources and facilities

DEISA Extreme Computing Initiative

Distributed European Infrastructure for Supercomputing Applications

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

DEISA Extreme Computing Initiative

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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+)

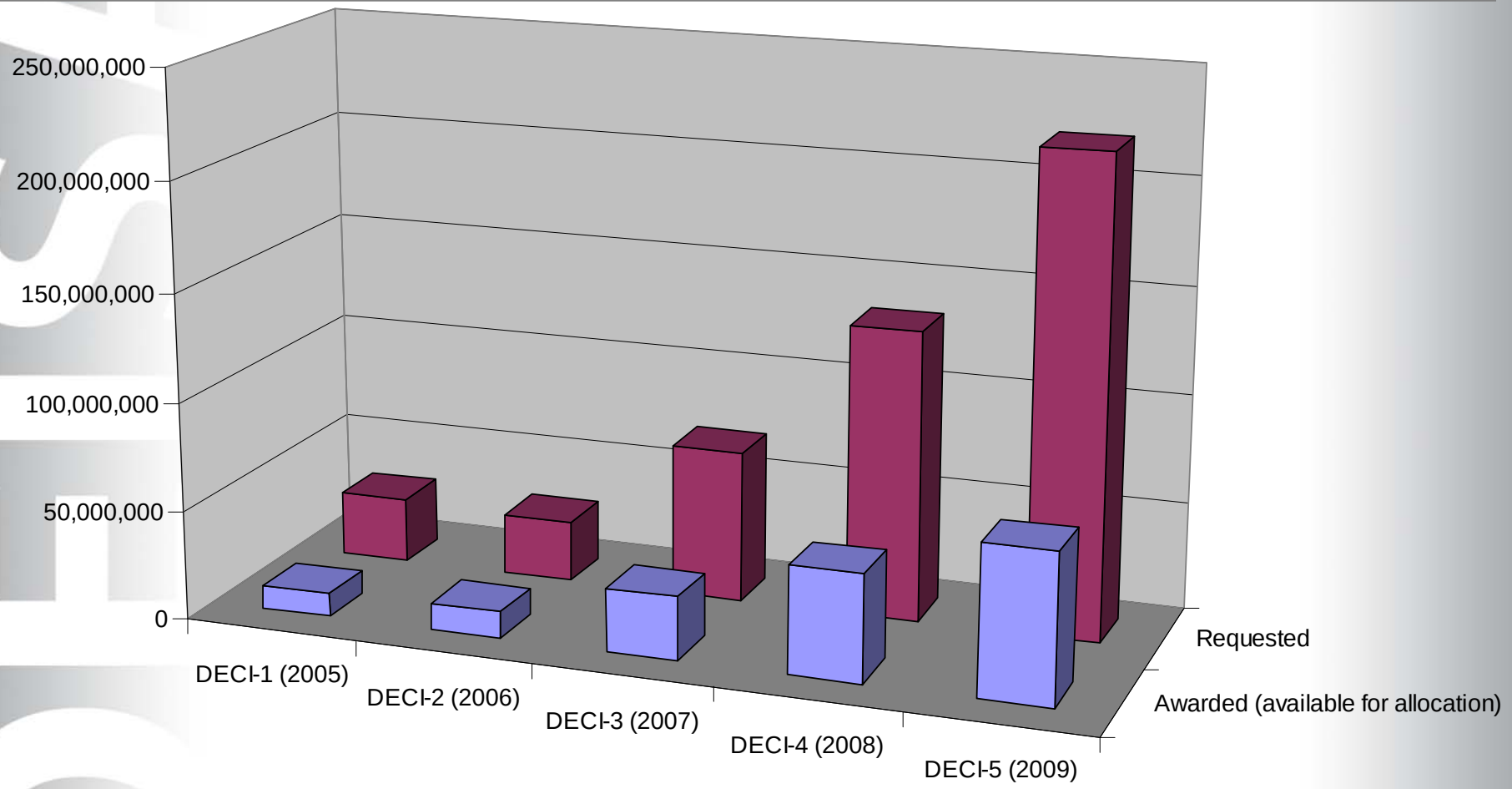
DECI call 2008

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

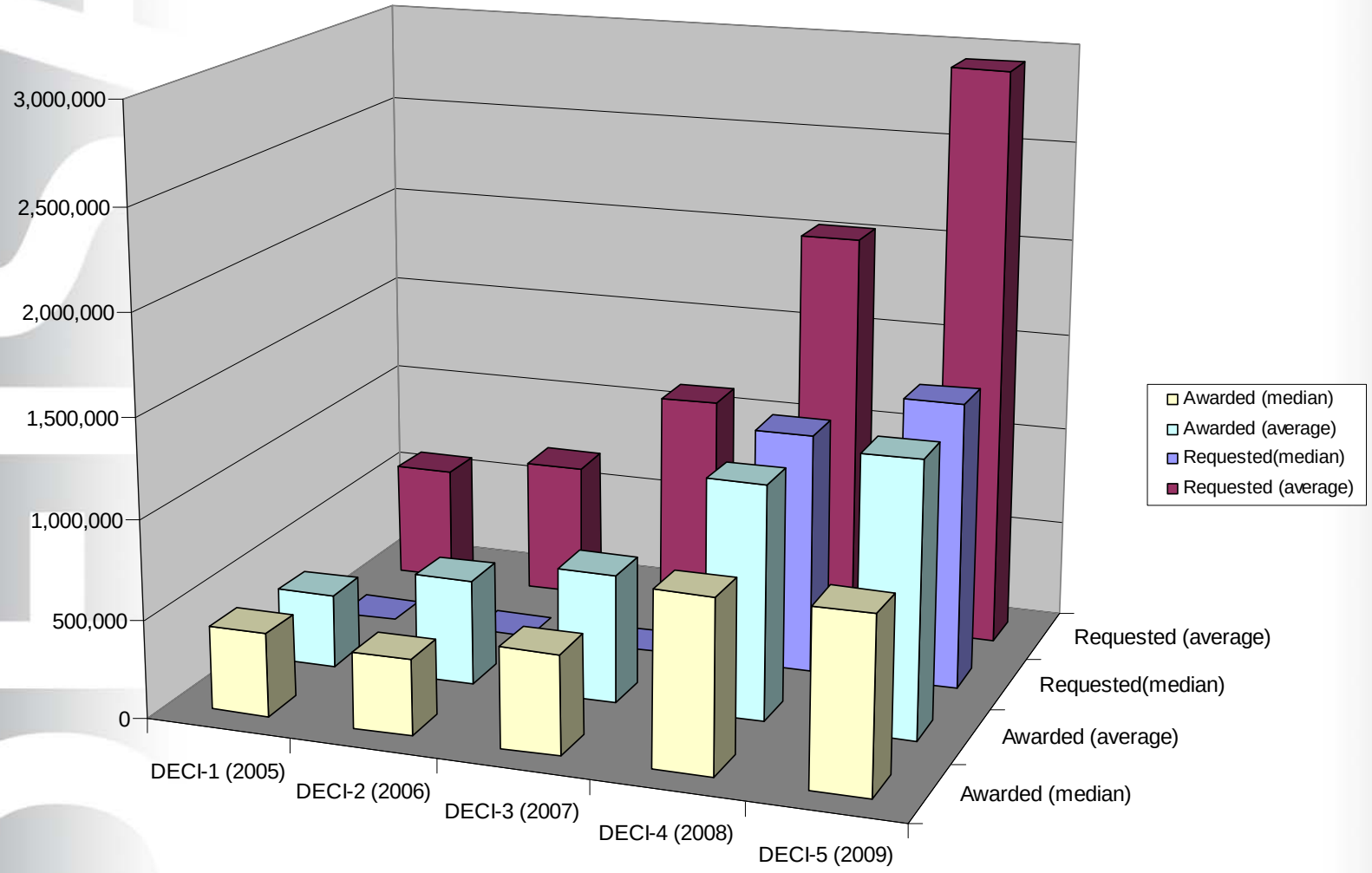
75 proposals, 21 European countries involved, co-investigators from N America, Asia
220 mio cpu-h requested (normalized to IBM P4+)
50 proposals accepted, 60 mio cpu-h awarded

CPU requested in DECI proposals



Demand for CPU increasing at a faster rate than supply

CPU awarded per project



Sharp increase in the size of the average request for CPU

Observations from DECI-4 (current projects)

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Strong focus on collaborative European science

- Average number of investigators per project is 2.7, total number 115
  - 77% of total from DEISA countries
  - 17% from other European countries
  - 7% outside Europe
- Median number of institutes is two
- 55% of projects have investigators from more than one country
  - 19% involve scientists from three or more countries
- Average number of CPU hours is 1.2m, median award is 868,000
- 42 projects used 54 different parallel codes
  - Wide variety of science being undertaken in DECI
  - Partial overlap with PRACE survey of national usage by codes, suggests that DECI usage does not replicate national usage (e.g. VASP rarely used in DECI projects)
  - Strong focus in DECI on capability science

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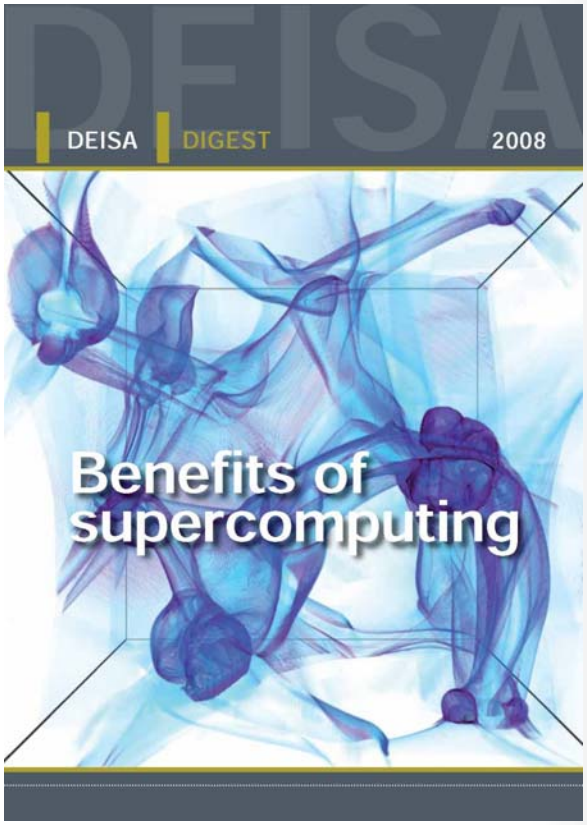
DEISA Achievements and Scientific Impact



DEISA brochures

Brochures can be downloaded from http://www.deisa.eu/publications/results

DEISA Video 2009

Video: DEISA - Towards a European High Performance Computing Infrastructure

This professional video production highlights the motivation and relevance of high-performance computing in general and portraits the DEISA infrastructure, its scientific applications and success stories in particular. A selection of high-impact DECI projects documents the scientific relevance of DEISA. Read more and obtain the video ...

Download from www.deisa.eu

Emphasis on highlighting the importance of supercomputing for scientific progress in many fields as a key technology in an easy understandable way

Why do scientists apply to DECI?

Distributed European Infrastructure for Supercomputing Applications

Range and volume of computational resources available

"The DEISA infrastructure will enable us to perform electrophysiological "in-silico" experiments with "virtual hearts" at an unprecedented level of detail. This will increase the predictive value of computer simulation studies for a wide range of therapeutical applications" – PI based in UK

"In order to attain the goals of our project and to arrive at conclusive results, we need computational resources which exceed our previous approvals. Thanks to DEISA, we will be able to perform simulations in sufficiently large lattice volumes and sufficiently small lattice spacings to obtain relevant results." – PI based in Germany

"Access to DEISA will permit setting new standards by solution of a problem one order of magnitude larger than the currently largest application, thereby further advancing the current research frontiers and consolidating European lead in this technologically significant area." – PI based in Spain

Why do scientists apply to DECI?

Distributed European Infrastructure for Supercomputing Applications

Quality of scientific support offered

"The support of our calculations by DEISA staff members, concerning implementation and optimization of our program codes, is of very high value for our project." – PI based in Germany

"Besides big computers, DEISA also brings a remarkable network of experts on computer simulations, which is extremely valuable for the project." – PI based in France

"Both (codes) are expected to benefit from tuning or adaptation to such architectures and the perspective of complete large scale production runs is without precedent." – PI based in France

Why do scientists apply to DECI?

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Valued-added services

"DEISA will add value to our research by providing the supercomputing resources and the necessary middleware such as UNICORE as well as by supporting the enabling of the programs at the particular supercomputing site." – PI based in Germany

"The DEISA infrastructure provides access to top-level supercomputers and enables a workflow bringing input data generated at sites connected to the US TeraGrid and transferring output data back to those sites and to our UK sites." – PI based in UK

Virtual communities

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"A **virtual scientific community** is a group of people, often researchers and students, who share multiple resources related to the scientific field and whose main medium of communication is the internet" – Wikipedia

DEISA has no definition of a virtual community but seeks to offer an alternative access mechanism for larger, loosely or closely coupled European research consortia to access DEISA facilities for a longer period of time than a DECI project can guarantee

The Virtual Community is given an allocation of DEISA resources

Responsibility for the allocation of resources amongst the members of the community is delegated to the community

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Virtual Community Support by DEISA

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Communicative involvement of existing European Virtual Scientific Communities and supporting or, if necessary, initiating the establishment of new communities with the aim of identifying and supporting European computational grand challenges in science to boost Europe's scientific and technological competitiveness.

DEISA Call for Expressions of Interest for Community Support

Call open from Dec 2008 to Feb 2009

Press release: **Virtual Community Call** (Dec 9, 2008)
http://www.hpcwire.com/industry/government/DEISA-Announces-Virtual-Community-Support-Initiative-36014839.html

Result: Seven requests for Community support

Virtual Community Support Requests

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Fusion Energy Research:

EFDA EUROPEAN FUSION DEVELOPMENT AGREEMENT **www.efda.org**

European Fusion Development Agreement

Legal entity
26 EU countries, 31 EU partners

EUFORIA **www.euforia-project.eu**

EU Fusion fOR Iter Applications (EUFORIA)

EU FP7 project
14 EU countries, 14 EU partners

Virtual Community Support Requests

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Life Sciences

www.virolab.org

Virtual laboratory for infectious diseases

EU FP6 project
8 EU countries, 11 EU partners

www.vph-noe.eu

Virtual Physiological Human network of excellence

EU FP7 project
7 EU countries, 13 EU partners

Virtual Community Support Requests

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Space Science / Cosmology

LFI-PLANCK **www.esa.int/SPECIALS/Planck**

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

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

www.virgo.dur.ac.uk

International VIRGO Consortium and Cosmocomp project

Consortium and FP7 project
6 EU countries, over 6 EU partners, plus US, CA, AR, JP, CN

Virtual Community Support Requests

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

January 23, 2009

European Researchers Access DEISA to Study Fusion

More information on research Infrastructures: http://cordis.europa.eu/fp7/ict/e-infrastructure/home_en.html

The European Commission funded the DEISA project under research programmes from 2002-2006 and 2007-2013 with a total €26 million. DEISA is a consortium of leading national Supercomputing Centres in Europe to advance computational sciences in the area of supercomputing. The consortium operates a Europe-wide complex high performance computing infrastructure. More than 160 European research institutes and universities (and others from North and South America, Asia and Australia) use DEISA

Off the Wire

May 18, 20

- Speeding Facilities
- Appro Lau
- Rackable
- ANSYS Sc
- SiCortex A
- Altair TAR

APPR
Supercomputer S
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Virtual Community Support Requests

DEISA asked the communities the question:

What types of DEISA services and resources will be of community interest for the collaboration?

1) High Performance Compute resources

2) Access to state-of-the-art HPC architectures

3) Community data repository

4) Application enabling

5) Technology support

Virtual Community Support Requests

Types of services requested

1) High Performance Compute resources **6 x**

2) Access to state-of-the-art HPC architectures **4 x**

3) Community data repository **4 x**

4) Application enabling **5 x**

5) Technology support **5 x**

On-going dialogue with every Virtual Community to understand their requirements and how these requirements change over time

Summary

Requests for both CPU and applications enabling support are increasing steadily suggesting a strong continuing demand for collaborative access to Tier-0 and Tier-1 supercomputers and to applications support for porting, scaling, optimisation etc.

Two routes for accessing the DEISA infrastructure:

- DECI – single project access, next call will open in Nov 2009 and close in Feb 2010
- Virtual Communities – contact DEISA directly if you would like to discuss virtual community access

DEISA Applications Task Force (ATASKF) is a single team to support all users of the infrastructure, both DECI users and Virtual Communities

Contact: ataskf@deisa.eu

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