DEISA Extreme Computing
DEISA

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's fast continental file system built on GEANT2

DEISA 10 Gb/s network infrastructure
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.

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

DEISA
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

Distributed Supercomputing Infrastructure (Tier1)

Applications

Users (single projects)

Science communities

Application support team

Operation & user support team

Technology team
Distributed Supercomputing Infrastructure (Tier1)
DEISA highly performant continental global file system

Different Software Environments

E(S1)  E(S2)  E(S3)  E(S4)  E_2(S1)  E_2(S2)  E_2(S3)

S1     S2     S3     S4     S1     S2     S3

Different Supercomputers

Dedicated 10 Gb/s network – via GEANT2

Access via Internet

Single sign-on, secure login

DEISA Common Production Environment
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


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  Slovac 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
Curvy membranes make proteins attractive

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

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

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

www.enes.org
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:

European Fusion Development Agreement

Legal entity
26 EU countries, 31 EU partners

EU Fusion fOR Iter Applications (EUFORIA)

EU FP7 project
14 EU countries, 14 EU partners

www.efda.org

www.euforia-project.eu
“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
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