Distributed European Infrastructure for Supercomputing Applications

The European HPC Infrastructure

DEISA

Distributed European Infrastructure for Supercomputing Applications

www.deisa.eu

Topics

- ⇨Vision and Strategy for DEISA
- ⇨DEISA HPC Infrastructure & Services
- ⇨Impact on Science & Research

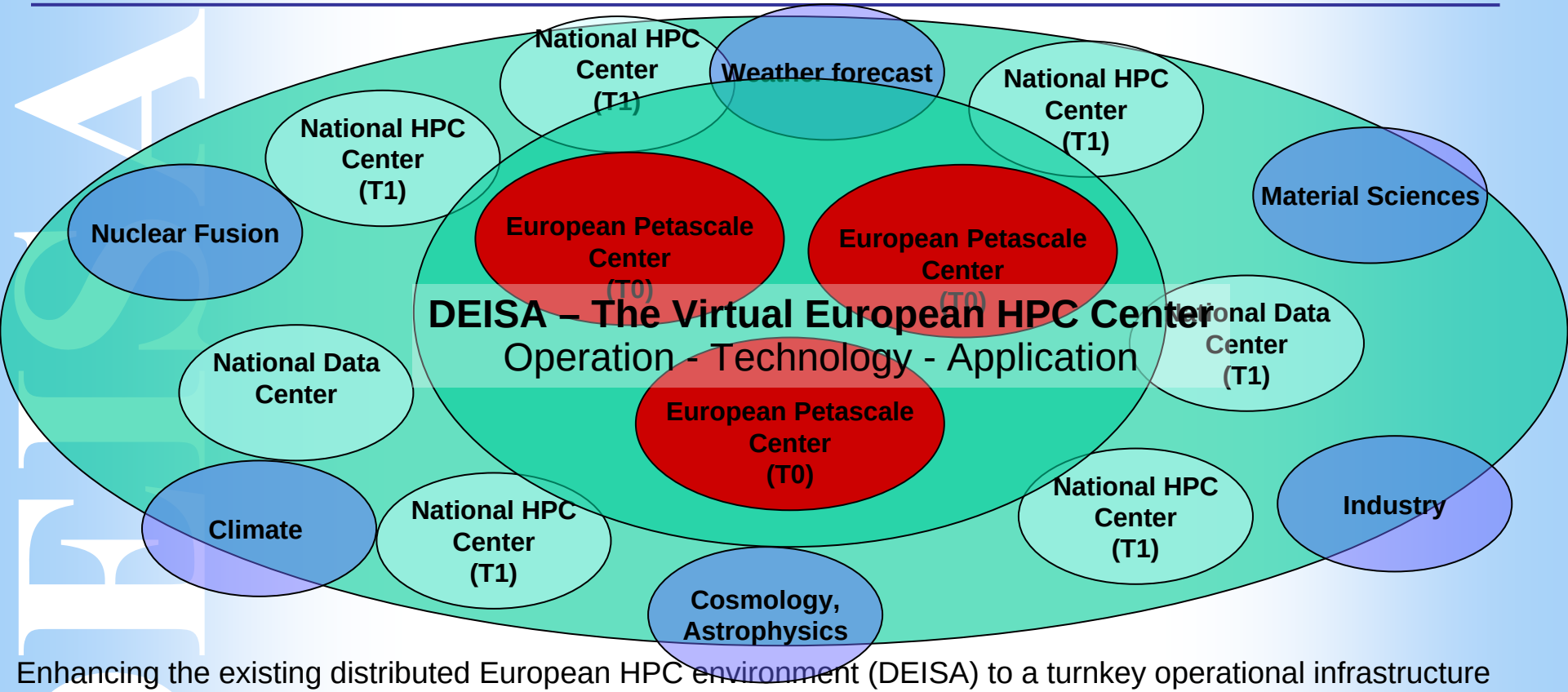
Partners

Distributed European Infrastructure for Supercomputing Applications

DEISA: May 1st, 2004 – April 30th, 2008

DEISA2: May 1st, 2008 – April 30th, 2011

Vision and Strategy



Enhancing the existing distributed European HPC environment (DEISA) to a turnkey operational infrastructure

Advancing the computational sciences in Europe by supporting user communities and extreme computing projects

Enhancing the service provision by offering a complete variety of options of interaction with computational resources

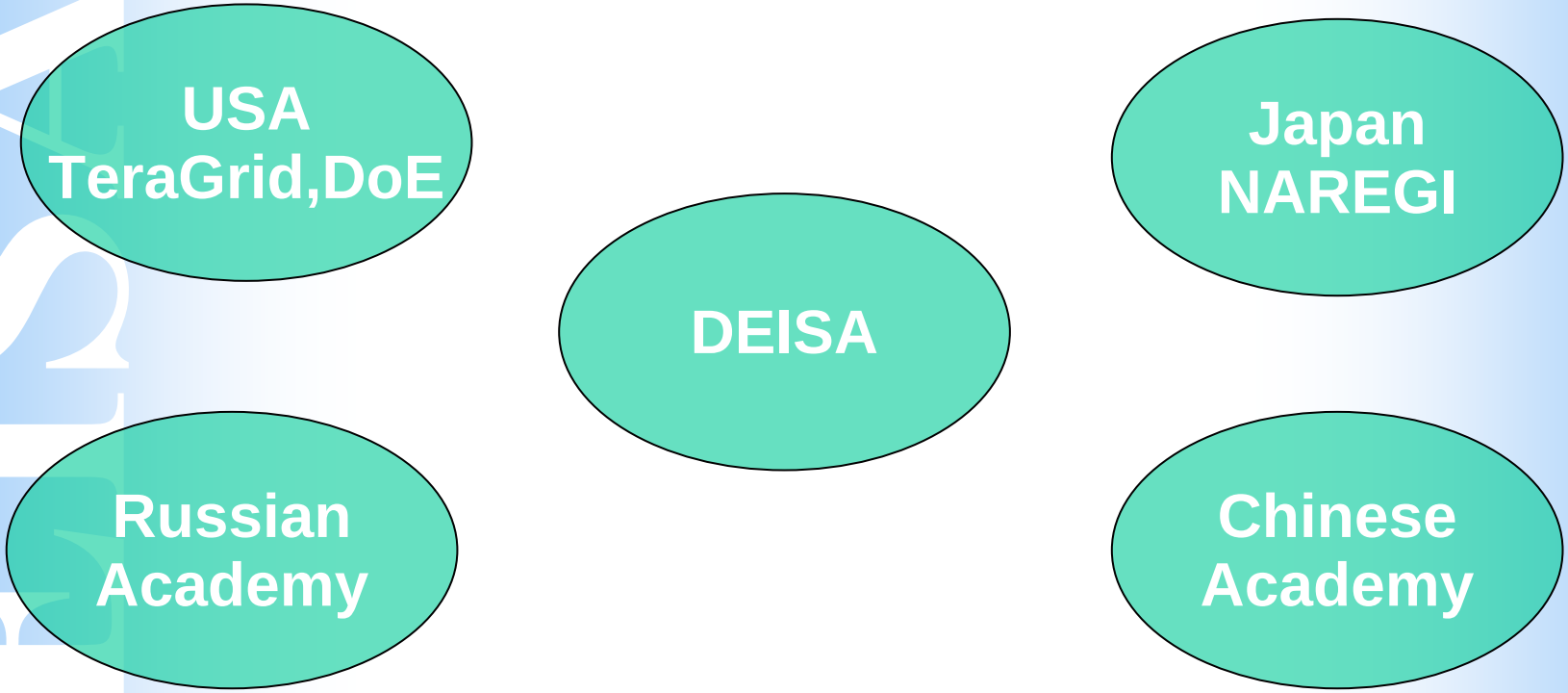
Integration of T-1 and T-0 centres

The Petascale Systems need a transparent access from and into the national data repositories

Bridging worldwide HPC and Grid projects

Vision and Strategy

Distributed European Infrastructure for Supercomputing Applications



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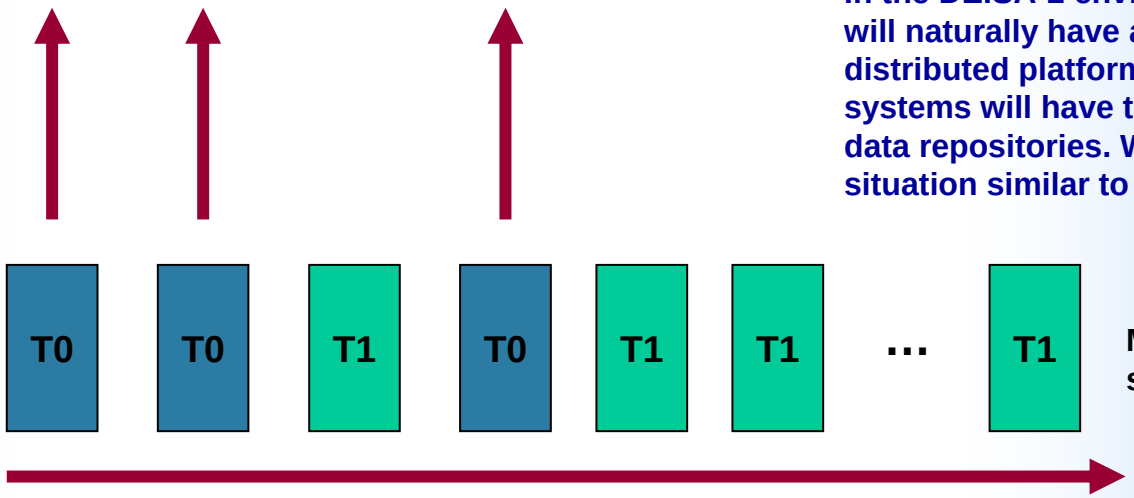
Tier0 / Tier1 Top Layer of the HPC Ecosystem

T0 : future shared petascale European systems
T1 : leading national supercomputing systems

PRACE
Designing an infrastructure that will enable the operation of shared petascale European systems
Enhancing performance in selected sites and providing wide access to shared systems

In the DEISA-2 environment, scientists will naturally have access to several distributed platforms, and shared systems will have to access remote data repositories. We will be in a situation similar to TeraGrid.



Member states sites

DEISA-2 : strong integration of T0 and T1 systems (automatically provides wide, seamless and efficient access to shared systems and data repositories)

The DEISA-1 services have been tailored for this mode of operation. There is a positive feedback between the two orthogonal lines of action:
- ***DEISA is paving the way to the efficient operation of T0 systems.***
- ***T0 systems will drive the massive adoption of the DEISA services.***

Tier0 / Tier1 Centers

Are there implications for the services?

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Main difference between T0 and T1 centers: policy and usage models !

T1 centers can evolve to T0 for strategic/political reasons
T0 machines automatically degrade to T1 level by aging

T0 Centers

Leadership-class European systems in competition to the leading systems worldwide, cyclically renewed

Governance structure to be provided by European organization

T1 Centers

Leading national Centers, cyclically renewed, optionally surpassing the performance of older T0 machines

National Governance structure

The Services have to be the same in T0/T1

Because of the change of the status of the systems, over time

For user transparency of the different systems

(Only visible: Some services could have different flavors for T0 and T1)

SEVENTH FRAMEWORK PROGRAMME

DEISA
Operating the European HPC Infrastructure

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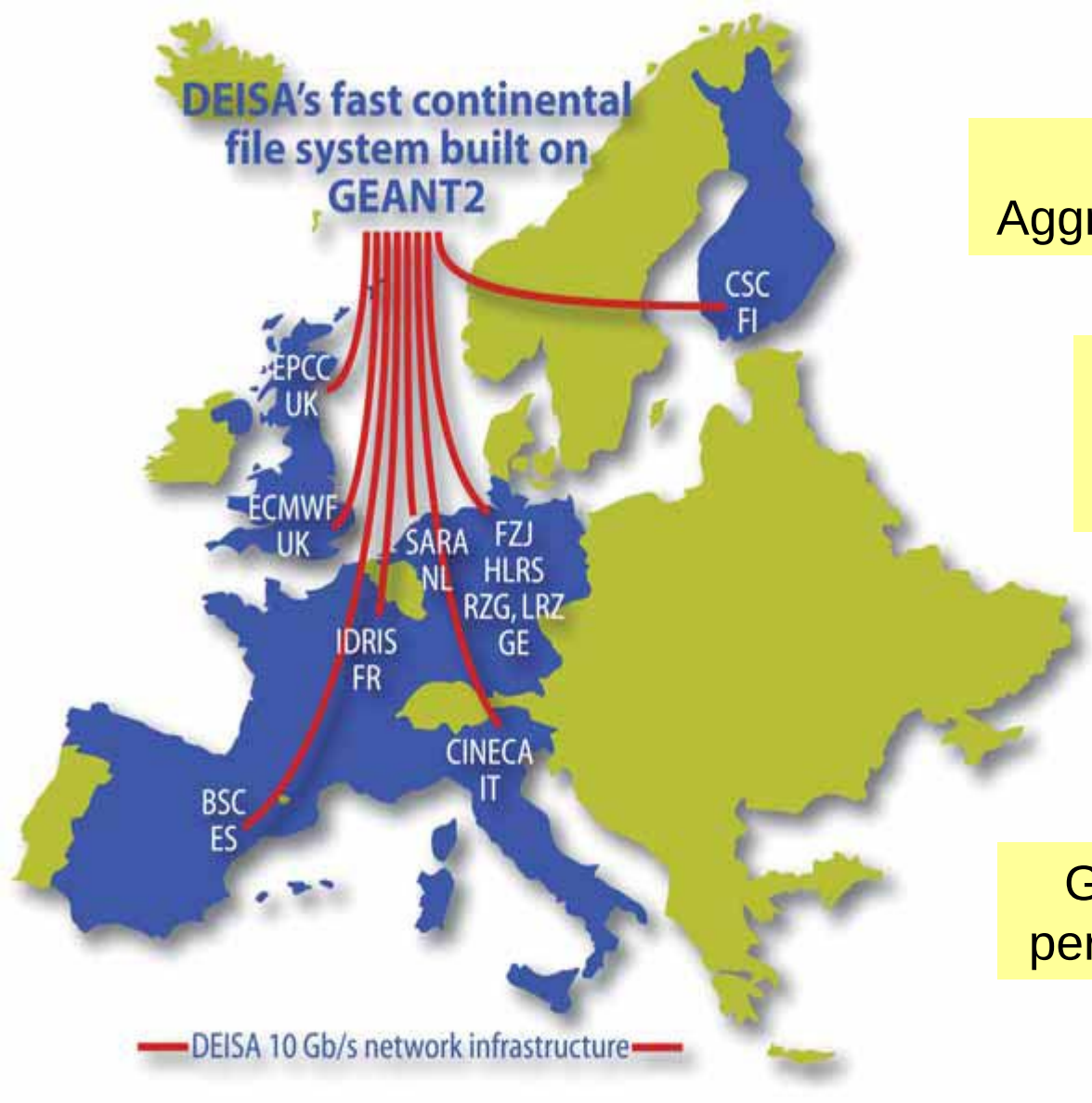

~1 PetaFlop/s
Aggregated peak performance

Most powerful European supercomputers for most challenging projects

Top-level Europe-wide application enabling

Grand Challenge projects performed on a regular basis

DEISA Status 2008

Distributed
European
Infrastructure for
Supercomputing
Applications

Infrastructure and Services

- Dedicated 10 Gb/s GEANT2 network interconnecting systems
- Transparent high speed data access
- Unified and seamless access to European supercomputing resources
- Portals for transparent access to complex supercomputing environments
- Deployment and operation of a continental HPC eInfrastructure

Resources

- Offering most powerful supercomputers for most challenging projects
- Aggregated peak performance: ~ 1 PetaFlop/s
- Providing best suited supercomputer architectures
- Provisioning of a European Benchmark Suite

Enabling Science

- Europe-wide top-level support for applications enabling
- Enabling of co-operative extreme computing in Europe
- Grand Challenge projects performed on a regular basis

DEISA Core Infrastructure and Services

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Dedicated high speed network

Common AAA

- Single sign on
- Accounting/budgeting

Global data management

- High performance remote I/O and data sharing with global file systems
- High performance transfers of large data sets (e.g. GridFTP)

User Operational infrastructure

- Distributed Common Production Environment (DCPE)
- Job management service
- Common user support and help desk

System Operational infrastructure

- Common monitoring and information systems
- Common system operation

Global Application Support

SEVENTH FRAMEWORK PROGRAMME

DEISA Additional Services

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Supported Services

Workflow management and alternative access method
Grid middleware: UNICORE, DESHL

Science gateways to supercomputing resource, Portals

Job rerouting between identical architectures

Additional Services

Co-Allocation

Other middleware components, e.g. from the Globus Toolkit

Integration of Associate Partners

DEISA Software Layers

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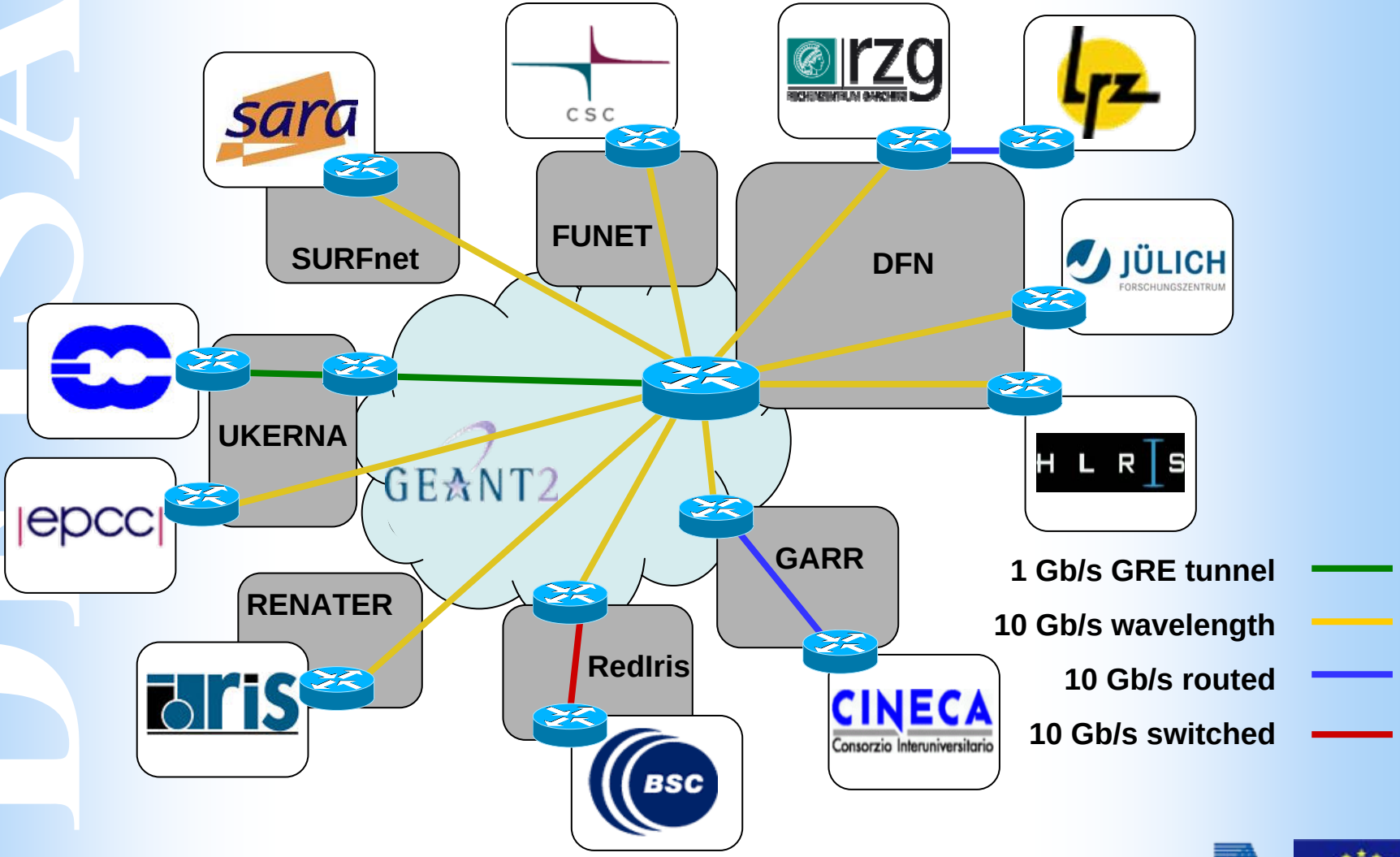
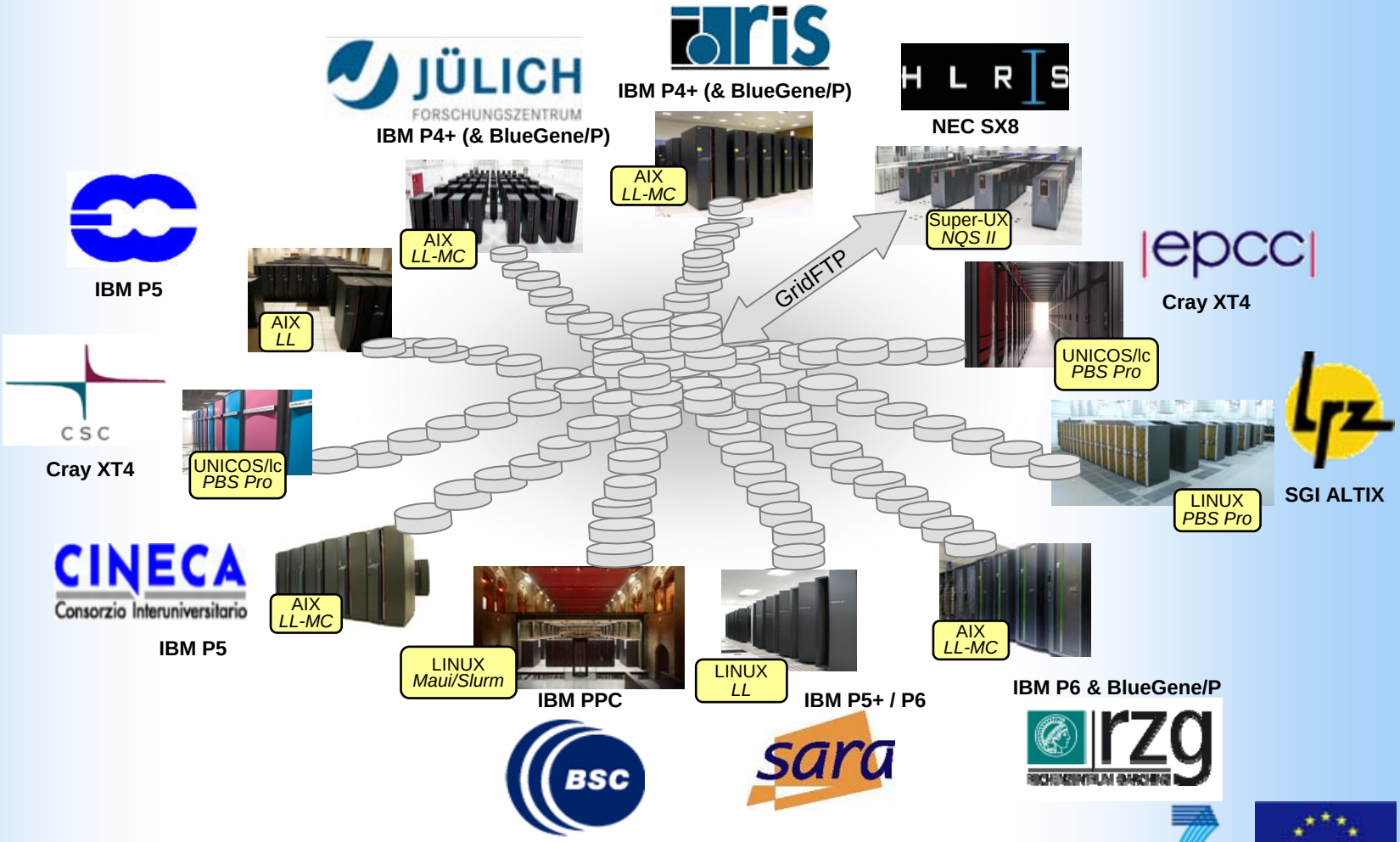
Multiple ways to access	Workflow managem.	Common production environm.	*Presen-tation layer*
Single monitor system	Job rerouting	Co-reservation and co-allocation	*Job manag. layer and monitor.*
Data staging tools	Data transfer tools	WAN shared filesystem	*Data manag. layer*
Unified AAA	DEISA Sites	Network connectivity	*Network and AAA layers*

DEISA network infrastructure



DEISA Global File System (based on MC-GPFS)



Evolution of Supercomputing Resources

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2004 **DEISA partners´ compute resources at DEISA project start:**

~ **30 TF** aggregated Peak performance

2008 **DEISA partners´ resources at DEISA2 project start:**

Close to **1 PF** aggregated Peak performance on state-of-the art supercomputers

- Cray XT4, Linux
- IBM Power4+, Power5, Power6, AIX / Linux
- IBM BlueGene/P, Linux (frontend)
- IBM PowerPC, Linux (MareNostrum)
- SGI ALTIX 4700 (Itanium2 Montecito), Linux
- NEC SX8 vector system, Super UX

Systems interconnected with dedicated 10Gb/s network links provided by GEANT2 and NRENs

Fixed fractions of resources dedicated to DEISA usage

DEISA Extreme Computing Initiative

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Most powerful European supercomputers for most challenging European projects

Involvements in projects from DECI calls 2005, 2006 and 2007:

157 research institutes and universities from **15** European countries

Austria	Finland	France	Germany	Hungary
Italy	Netherlands	Poland	Portugal	Romania
Russia	Spain	Sweden	Switzerland	UK

with collaborators from

4 other continents

Asia, Australia, North America, South America

DEISA Extreme Computing Initiative (2)

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DECI call 2005

51 proposals, 12 European countries involved
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
28 mio cpu-h requested
23 proposals accepted, 12 mio cpu-h awarded

DECI call 2007

63 proposals, 14 European countries involved
70 mio cpu-h requested
45 proposals accepted, ~30 mio cpu-h awarded

DECI call 2008

4th call for proposals currently open until June 30th, 2008
http://www.deisa.eu/science/deci/projects2008-2009/deci-call-for-proposals

DECI Projects – Publications

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Cover story of Nature
May 24, 2007
DECI project POLYRES

Benedict J. Reynwar, Gregoria Illya, Vagelis A. Harmandaris, Martin M. Müller, Kurt Kremer & Markus Deserno:
Aggregation and vesiculation of membrane proteins by curvature mediated interactions,
NATURE Vol 447|24 May 2007| doi:10.1038/nature05840

Many publications so far, among them
NATURE, Phys Rev B, Phys Rev Lett, PNAS

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