omii europe

open middleware infrastructure institute

Production Grids

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Production Grids - examples

1. **EGEE: Enabling Grids for e-Science**
2. **National Grid Service – UK's grid infrastructure**
3. **DEISA: linking high performance supercomputers**

Initial EGEE project: April 2004-2006

- **From April 2006, natural continuation of EGEE**
  - Expanded consortium
  - Emphasis on providing an infrastructure
    - → increased support for applications
    - → interoperate with other infrastructures
    - → more involvement from Industry

SA: service activities

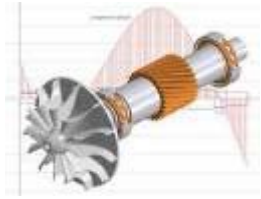
- establishing operations

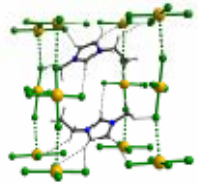
NA: network activities

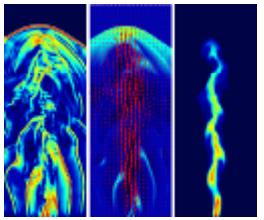
- supporting VOs

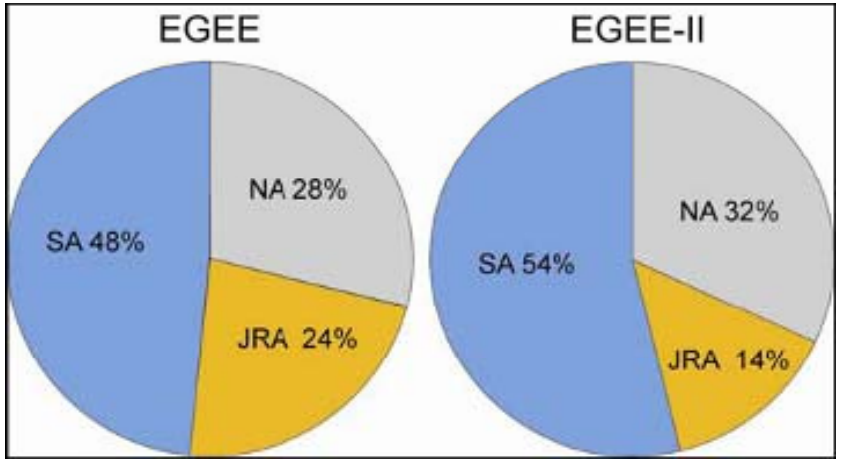
JRA: “joint research activities”

- e.g. hardening middleware

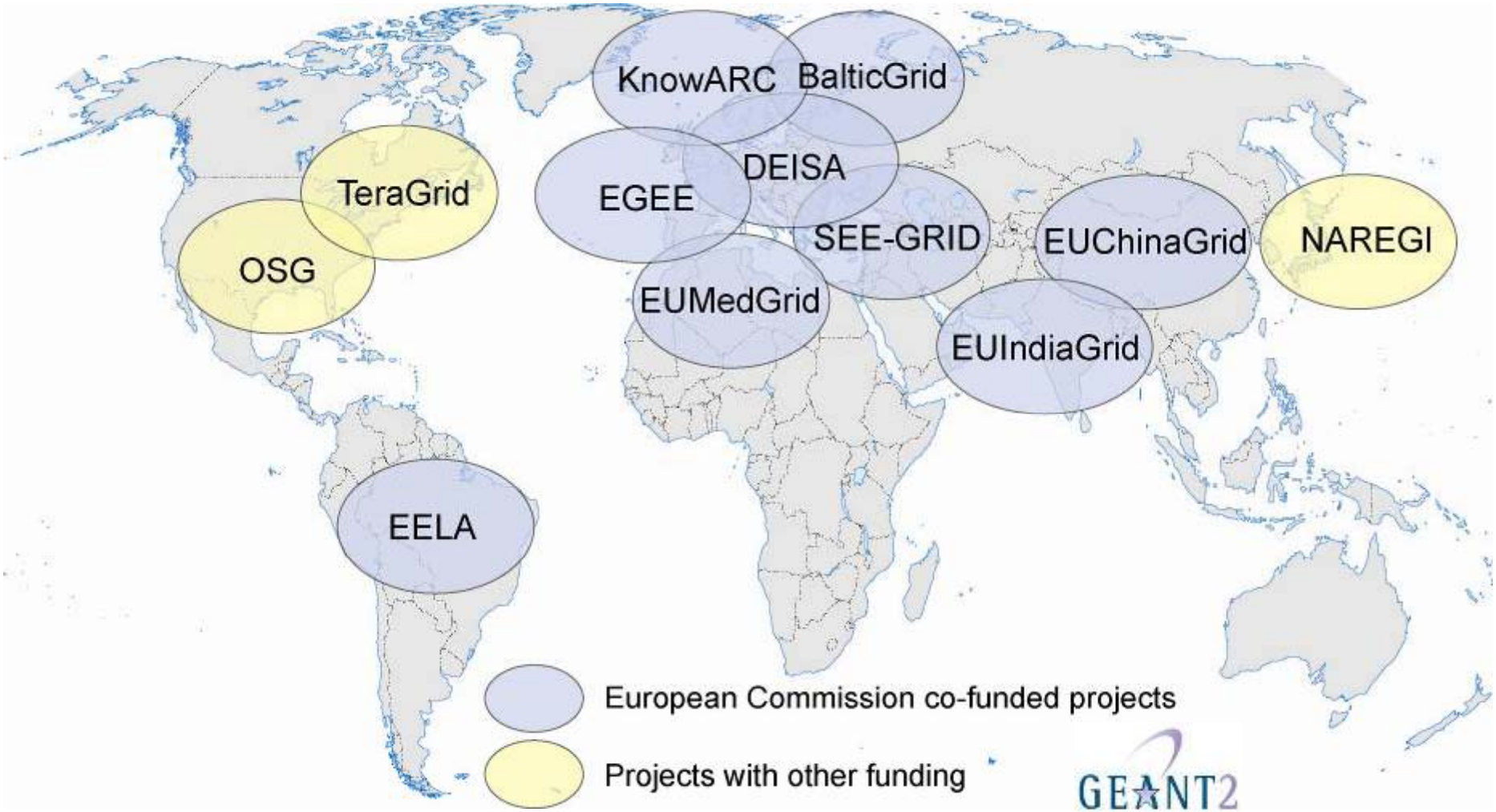








Collaborating e-Infrastructures



Potential for linking ~80 countries by 2008

Related projects: infrastructure, engineering, education

Name	Description
BalticGrid	EGEE extension to Estonia, Latvia, Lithuania
EELA	EGEE extension to Brazil, Chile, Cuba, Mexico, Argentina
EUChinaGRID	EGEE extension to China
EUMedGRID	EGEE extension to Malta, Algeria, Morocco, Egypt, Syria, Tunisia, Turkey
ISSeG	Site security
eIRGSP	Policies
ETICS	Repository, Testing
OMII-Europe	to provide key software components for building e-infrastructures;
BELIEF	Digital Library of Grid documentation, organisation of workshops, conferences
BIOINFOGRID	Biomedical
Health-e-Child	Biomedical – Integration of heterogeneous biomedical information for improved healthcare
ICEAGE	International Collaboration to Extend and Advance Grid Education

The EGEE Infrastructure

Test-beds & Services

- Certification testbeds (SA3)
- Pre-production service
- Production service

Support Structures

- Operations Coordination Centre
- Regional Operations Centres
- Global Grid User Support
- EGEE Network Operations Centre (SA2)
- Operational Security Coordination Team

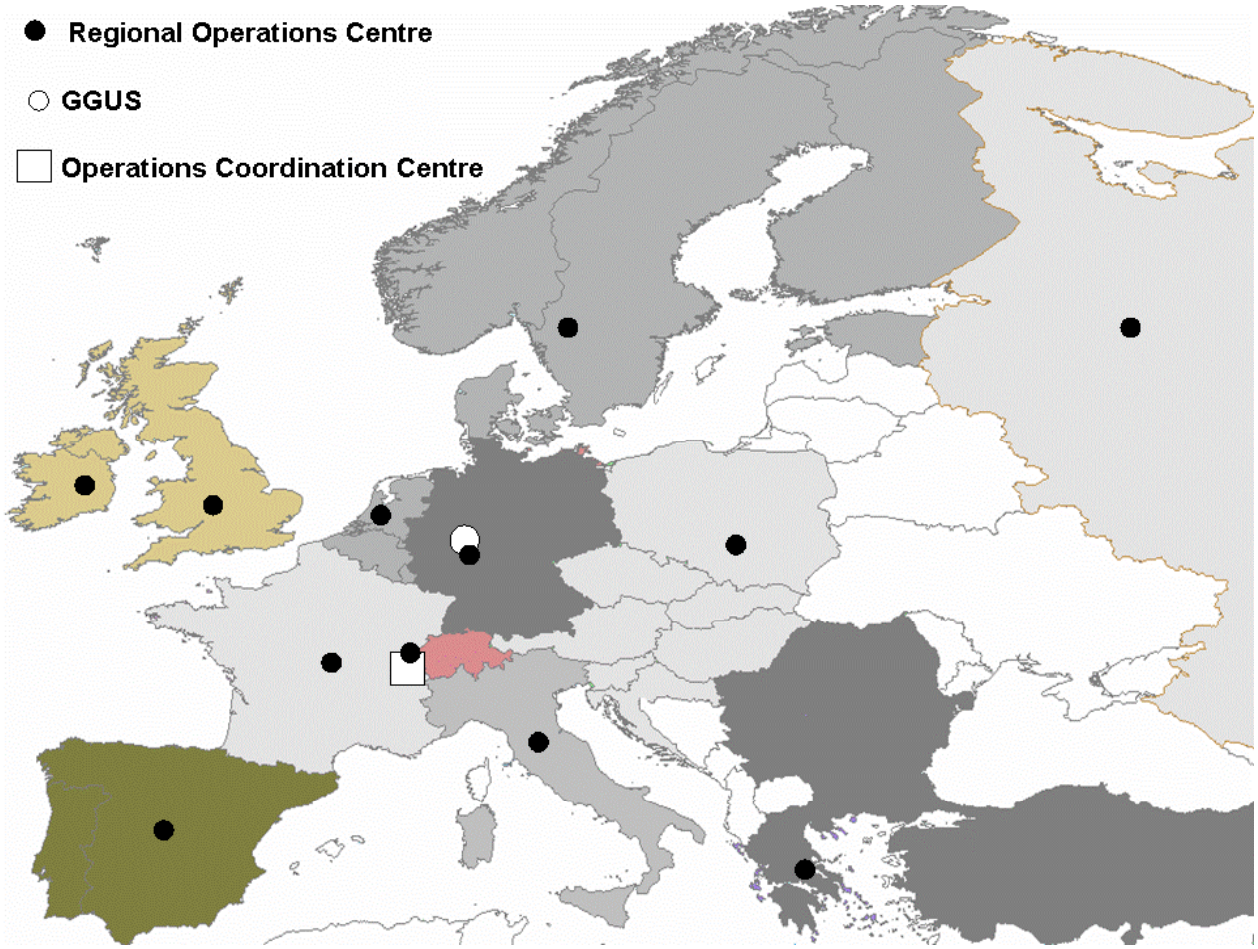
Infrastructure:

- Physical test-beds & services
- Support organisations & procedures
- Policy groups

Security & Policy Groups

- Joint Security Policy Group
- EuGridPMA (& IGTF)
- Grid Security Vulnerability Group
- Operations Advisory Group (+NA4)

Grid management: structure



- **Operations Coordination Centre (OCC)**
  - management, oversight of all operational and support activities
- **Regional Operations Centres (ROC)**
  - providing the core of the support infrastructure, each supporting a number of resource centres within its region
  - **Grid Operator on Duty**
- **Resource centres**
  - providing resources (computing, storage, network, etc.);
- **Grid User Support (GGUS)**

To join EGEE

- **Begin by asking:**
  - To which VO would I belong?
    - With whom do I share resources?
    - International collaboration?
  - Or do *we* need to create a new VO?
- **Gain experience of EGEE and its gLite middleware**
  - GILDA infrastructure for new users
    - Individuals as well as new VOs
    - Best-efforts grid – not production quality
  - Also:
    - OMII-Europe Evaluation Infrastructures now available – see later today!

EGEE is …

- **EU-funded project that has established the largest multi-VO production grid in the world!**

Further information

- EGEE digital library: http://egee.lib.ed.ac.uk/
- EGEE www.eu-egee.org
- gLite http://www.glite.org

- UK-Ireland EGEE Federation: http://www.eu-egee.org.uk/home.cfm

- What's happening now? http://gridportal.hep.ph.ic.ac.uk/rtm/

1. EGEE: Enabling Grids for e-Science
2. National Grid Service – UK's grid infrastructure
3. DEISA: linking high performance supercomputers

NGS

National Grid Service

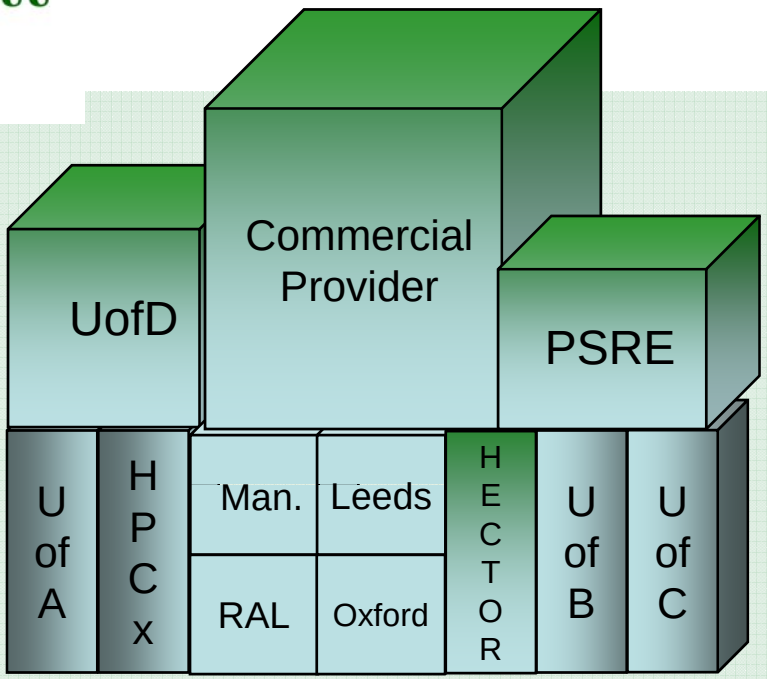
The National Grid Service

The National Grid Service

- The core UK grid, resulting from the UK's e-Science programme.
  - Grid: virtual computing across admin domains
- Production use of computational and data grid resources
  - For projects and individuals
  - Free at point of use to UK academics
  - Note: Scalability demands universities/VOs contribute resources
- Supported by JISC: “core sites”, operations, support
  - Entered 2nd phase of funding in October 2006: 2 ½ years
  - Longer terms plans being laid

National Grid Service

NGS Vision



NGS Core Nodes: Host core services, coordinate integration, deployment and support
+free to access resources for all VOs. Monitored interfaces + services

NGS Partner Sites: Integrated with NGS, some services/resources available for all VOs
Monitored interfaces + services

NGS Affiliated Sites: Integrated with NGS, support for some VO's
Monitored interfaces (+security etc.)

General principle here: establish core and grow it:
compute, data and operational services

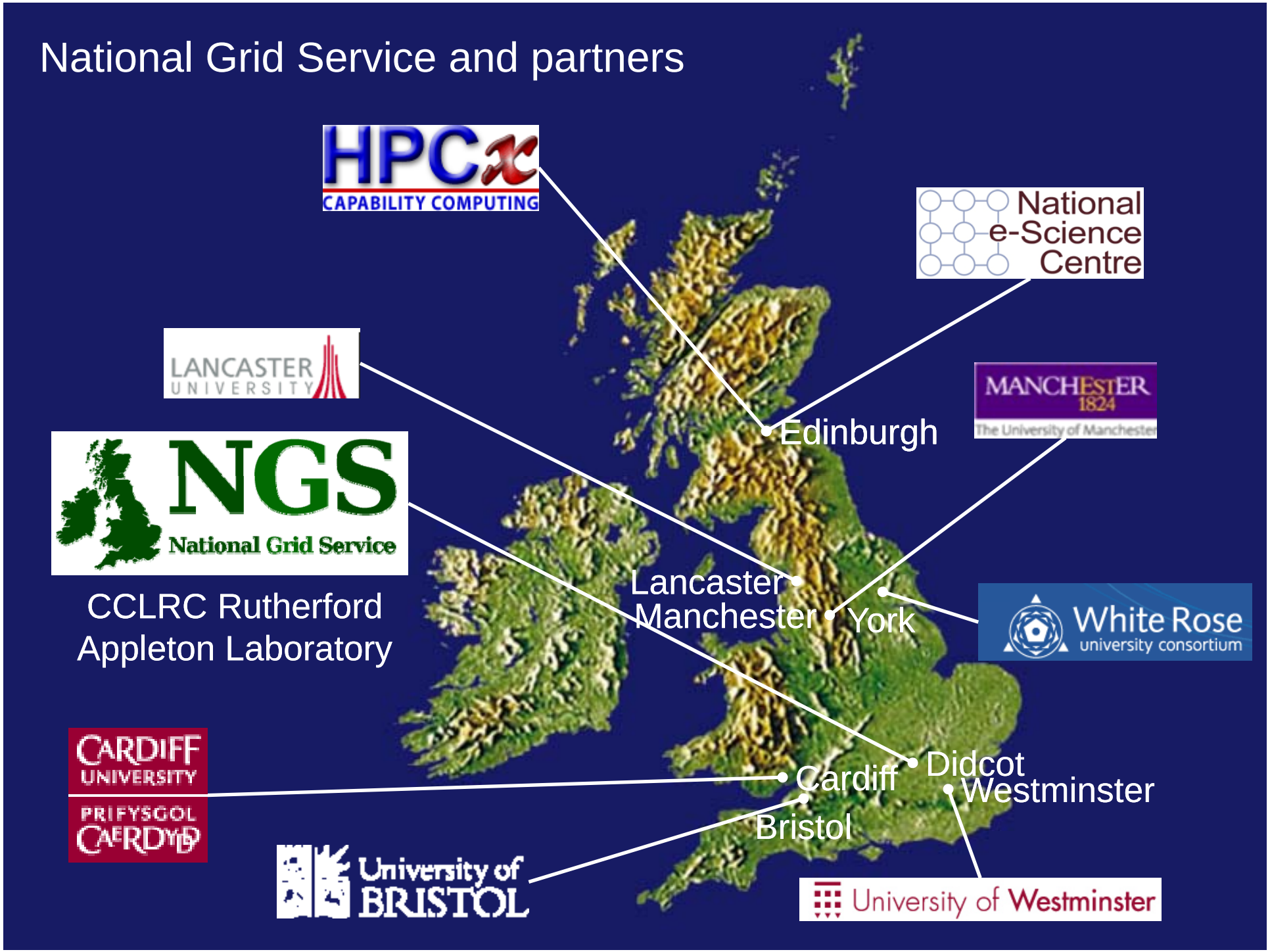
NGS Compute Facilities

- **Leeds** and **Oxford (core compute nodes)**
  - 64 dual CPU intel 3.06GHz (1MB cache). Each node: 2GB memory, 2x120GB disk, Redhat ES3.0. Gigabit Myrinet connection. 2TB data server.
- **Manchester** and **Rutherford Appleton Laboratory (core data nodes)**
  - 20 dual CPU (as above). 18TB SAN.
- **Bristol**
  - initially 20 2.3GHz Athlon processors in 10 dual CPU nodes.
- **Cardiff**
  - 1000 hrs/week on a SGI Origin system comprising 4 dual CPU Origin 300 servers with a Myrinet™ interconnect.
- **Lancaster**
  - 8 Sun Blade 1000 execution nodes, each with dual UltraSPARC IIICu processors connected via a Dell 1750 head node. ***UPGRADE IN NEAR FUTURE!***
- **Westminster**
  - 32 Sun V60 compute nodes
- **HPCx**
  - …

For more details: http://www.ngs.ac.uk/resources.html

Note: heterogeneity of compute nodes

National Grid Service and partners



Membership options

Two levels of membership (for resource providers):

1. Affiliates
   - run compatible stack, integrate support arrangements
   - adopt NGS security policies
   - all access to affiliate's resources is up to the affiliate
     - except allowing NGS to insert probes for monitoring purposes
2. Partners also
   - make "significant resources" available to NGS users
   - enforce NGS acceptable use policies
   - provide accounting information
   - define commitments through formal Service Level Descriptions
   - influence NGS direction through representation on NGS Technical Board

NGS
National Grid Service

NGS software

- **Computation services** based on Globus Toolkit
  - Use compute nodes for sequential or parallel jobs, from batch queues
  - Can run multiple jobs concurrently
- **Data services**:
  - Storage Resource Broker:
    - Primarily for file storage and access
    - Virtual filesystem with replicated files
  - "OGSA-DAI": Data Access and Integration
    - Primarily for grid-enabling databases (files, relational, XML)
  - NGS Oracle service
- Authorisation, Authentication
  - Built on GSI, VOMS – details later

NGS Software - 2

- Middleware recently deployed
  - Portal v2
  - GridSAM – alternative job submission and monitoring
- Developed by partners:
  - Application Hosting Environment: AHE
  - P-GRADE portal and GEMLCA
- Being deployed
  - VOMS support
  - WS-GRAM: GT4 job submission
  - Resource Broker
- Under development
  - Shibboleth integration

Gaining Access

Free (at point of use) access to core and partner NGS nodes

1. Obtain digital X.509 certificate
   - from UK e-Science CA
   - or recognized peer
2. Apply for access to the NGS

National HPC services

- HPCx

- Must apply separately to research councils
- Digital certificate and conventional (username/ password) access supported

Web Sites

- NGS
  - http://www.ngs.ac.uk
  - To see what's happening: http://ganglia.ngs.rl.ac.uk/
  - Wiki service: http://wiki.ngs.ac.uk
  - Training events: http://www.nesc.ac.uk/training
- HPCx
  - http://www.hpcx.ac.uk

NGS
National Grid Service

Summary

- NGS is a production service
  - Therefore cannot include latest research prototypes!
  - Formalised commitments - service level agreements
- Core sites provide computation and data services
- NGS is evolving
  - New sites and resources being added
  - Growing support for VOs (as well as individual users)
  - New software deployed recently
- Why join?
  - To access resources on the NGS
  - To collaborate across universities

1. EGEE: Enabling Grids for e-Science
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3. **DEISA: linking high performance supercomputers**

1 - DEISA objectives

Distributed European Infrastructure for Supercomputing Applications

- *To enable Europe's terascale science by the integration of Europe's most powerful supercomputing systems.*
- *Enabling scientific discovery across a broad spectrum of science and technology is the only criterion for success*
- DEISA is an European Supercomputing Service built on top of existing national services. This service is based on the deployment and operation of a persistent, production quality, distributed supercomputing environment with continental scope.
- The integration of national facilities and services, together with innovative operational models, is expected to add substantial value to existing infrastructures.
- Main focus is High Performance Computing (HPC).

THE DEISA SUPERCOMPUTING GRID

Distributed European Infrastructure for Supercomputing Applications

21.900 processors and 145 Tf in 200
more than190 Tf in 200

AIX distributed super-cluster

Vector systems (NEC, …)

Linux systems (SGI, IBM, …)

3f - How is DEISA enhancing HPC services in Europe?

Distributed European Infrastructure for Supercomputing Applications

- Running larger parallel applications in individual sites, by a cooperative reorganization of the global computational workload on the whole infrastructure, or by the operation of the job migration service inside the AIX super-cluster.
- Enabling workflow applications with UNICORE (complex applicaions that are pipelined over several computing platforms)
- Enabling coupled multiphysics Grid applications (when it makes sense)
- Providing a global data management service whose primordial objectives are:
  - Integrating distributed data with distributed computing platforms
  - Enabling efficient, high performance access to remote datasets (with Global File Systems and stripped GridFTP). We believe that this service is critical for the operation of (possible) future European petascale systems
  - Integrating hierarchical storage management and databases in the supercomputing Grid.
- Deploying portals as a way to hide complex environments to new users communities, and to interoperate with another existing grid infrastructures.

(Some of the) Production Grids

1. **EGEE: Enabling Grids for e-Science**
   cluster, VOs sharing their resources, international collaboration (+local federations)

2. **National Grid Service – UK's grid infrastructure**
   core resources provided, individual as well as VOs supported, heterogeneity of resources,….

3. **DEISA: linking high performance supercomputers**
   towards extreme computing across supercomputers