Edinburgh
e-Science
TOE

Training Outreach and Education

http://www.nesc.ac.uk/training

http://www.ngs.ac.uk

**NGS**
National Grid Service

# The National Grid Service

## Richard Hopkins
## rph@nesc.ac.uk

# **Policy for re-use**

- This presentation can be re-used for academic purposes.

- However if you do so then please let training-support@nesc.ac.uk know.  We need to gather statistics of re-use: no. of events, number of people trained.  Thank you!!

# **Acknowledgements**

- Some NGS slides are taken from talks by Stephen Pickles and Andy Richards

- Also slides from Malcolm Atkinson on the UK e-Science programme

# Overview

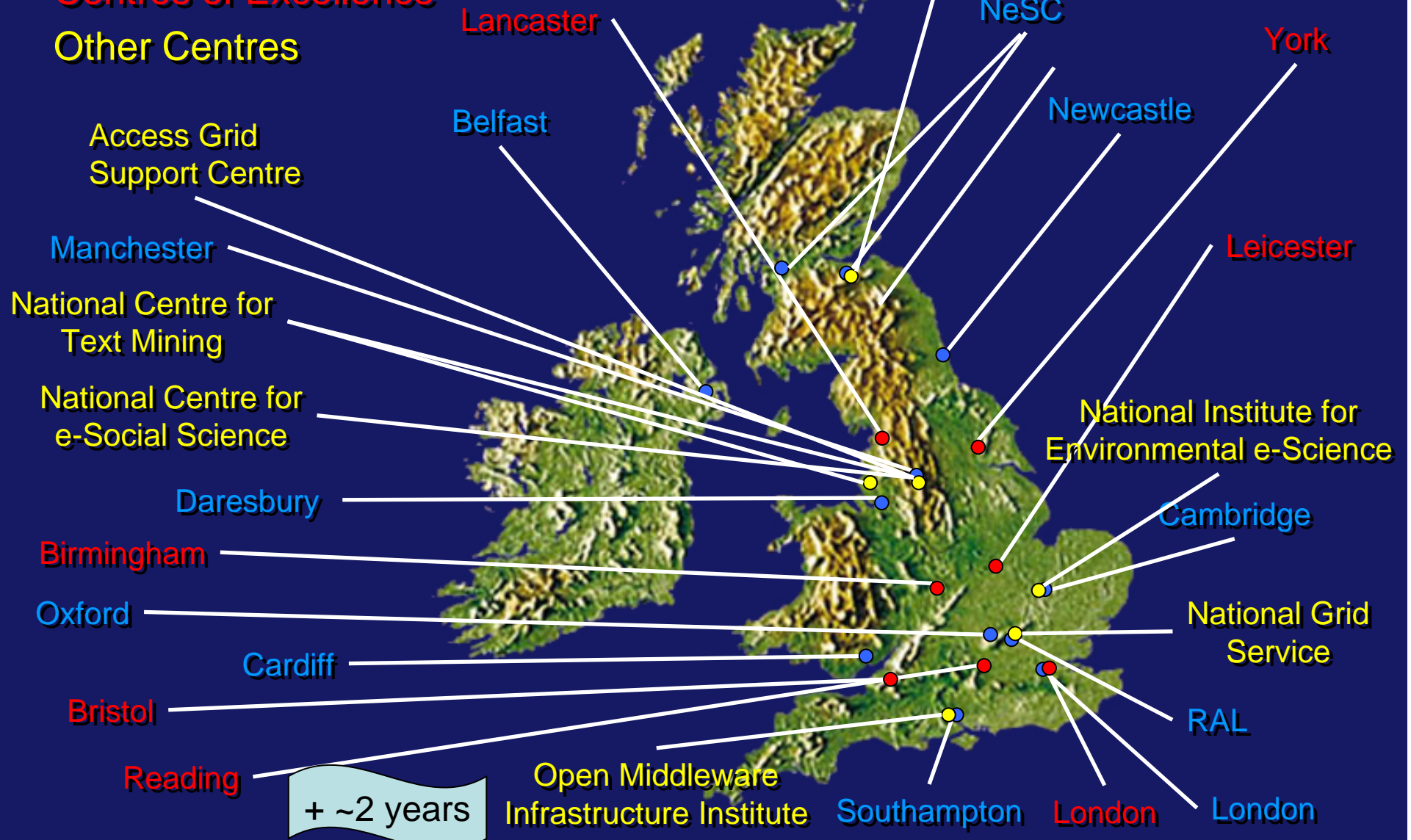- e-Infrastructure in the UK

- The National Grid Service

e-Science Centres in the UK

Coordination & Leadership:
NeSC & e-Science
Directors' Forum

e-Science Centres
Centres of Excellence
Other Centres

Digital Curation Centre
NeSC

Lancaster
York
Belfast
Newcastle

Access Grid
Support Centre

Leicester
Manchester

National Centre for
Text Mining

National Centre for
e-Social Science

National Institute for
Environmental e-Science

Daresbury
Cambridge

Birmingham

Oxford
National Grid
Service

Cardiff

Bristol
RAL

Reading

Open Middleware
Infrastructure Institute

Southampton
London
London

+ ~2 years

e-Science
Institute

Edinburgh

+5 years

# OMII-UK nodes

EPCC & National e-Science Centre

School of Computer Science
University of Manchester

School of Electronics and
Computer Science
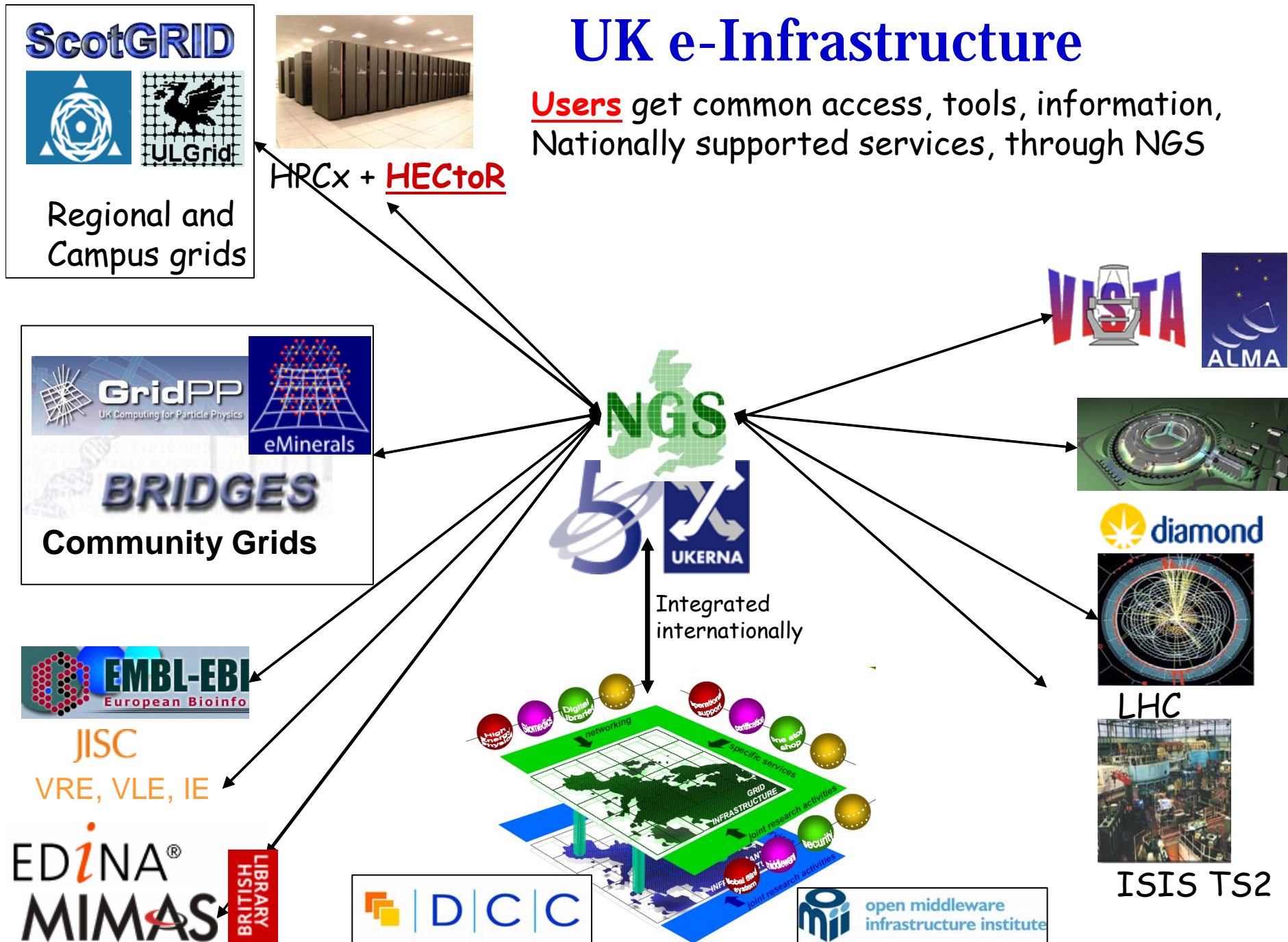University of Southampton

Edinburgh

Manchester

Southampton

open middleware
infrastructure institute uk
www.omii.ac.uk

+3 years

# UK e-Infrastructure

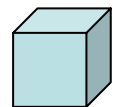**Users** get common access, tools, information, Nationally supported services, through NGS

**ScotGRID**
ULGrid

Regional and Campus grids

HRCx + **HECtoR**

NGS

UKERNA

Integrated internationally

**GridPP**
UK Computing for Particle Physics

eMinerals

**BRIDGES**

**Community Grids**

**EMBL-EBI**
European Bioinfo

JISC

VRE, VLE, IE

EDINA
MIMAS

BRITISH LIBRARY

DCC

open middleware infrastructure institute

VISTA

ALMA

diamond

LHC

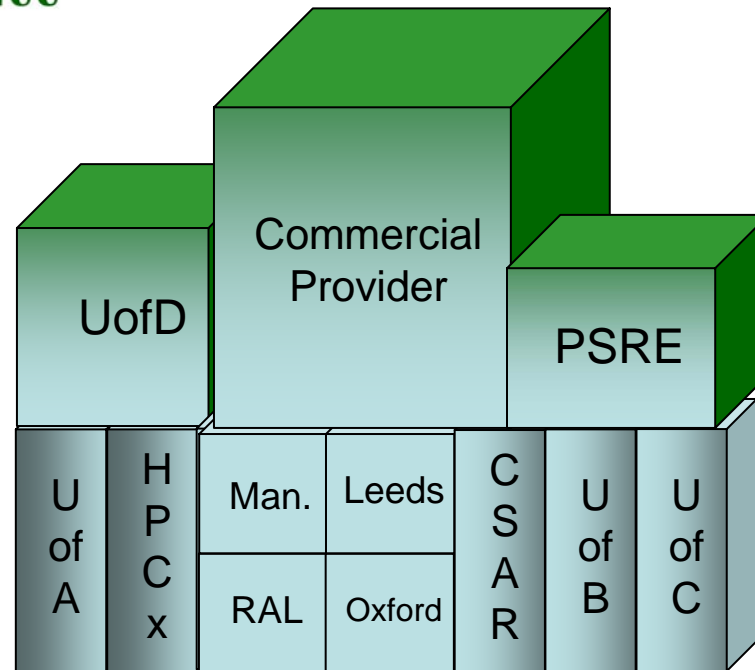ISIS TS2

# The National Grid Service
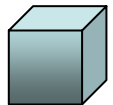
# The National Grid Service

- 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.

- Supported by JISC
  - October 2006: entered 2$^{nd}$ phase of funding, 2 years

![NGS National Grid Service logo]



**Commercial Provider**

**UofD**

**PSRE**

| U of A | H P C x | Man. | Leeds | C S A R | U of B | U of C |
|--------|---------|------|-------|---------|--------|--------|
|        |         | RAL  | Oxford|         |        |        |

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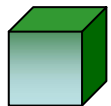
NGS Affiliated Sites: Integrated with NGS, support for some VO's
    Monitored interfaces (+security etc.)

# National Grid Service and partners



HPCx CAPABILITY COMPUTING

National e-Science Centre

LANCASTER UNIVERSITY

MANCHESTER 1824
The University of Manchester

NGS National Grid Service

CCLRC Rutherford Appleton Laboratory

White Rose university consortium

Edinburgh

Lancaster
Manchester · York

CARDIFF UNIVERSITY
PRIFYSGOL CAERDYDD

Cardiff

Didcot
Westminster

Bristol

University of BRISTOL

University of Westminster

+2.5 years
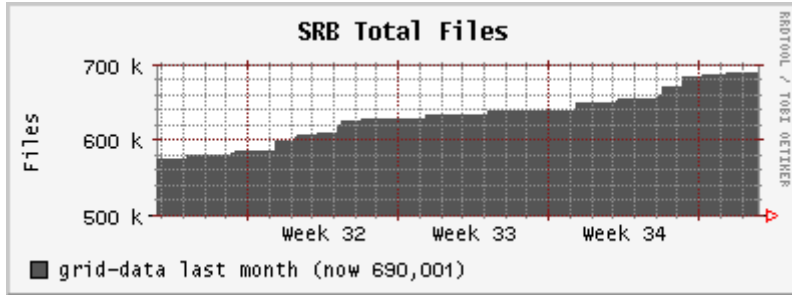
# NGS Use



**Files stored**

**~400 users**
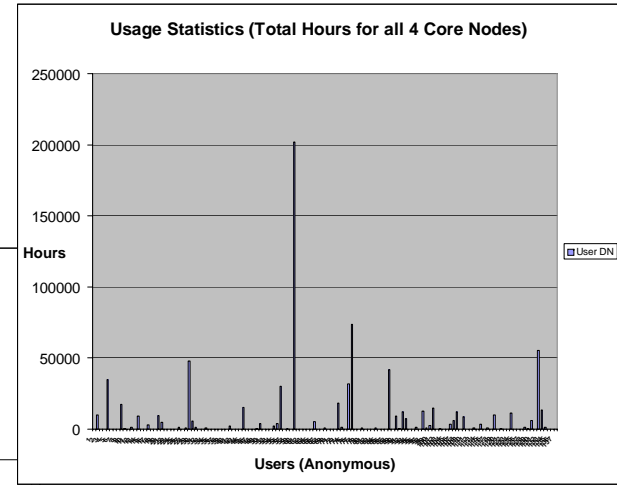
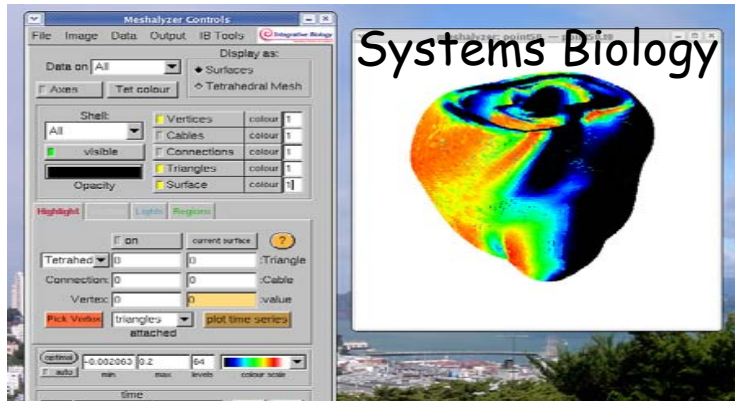**CPU time by user**
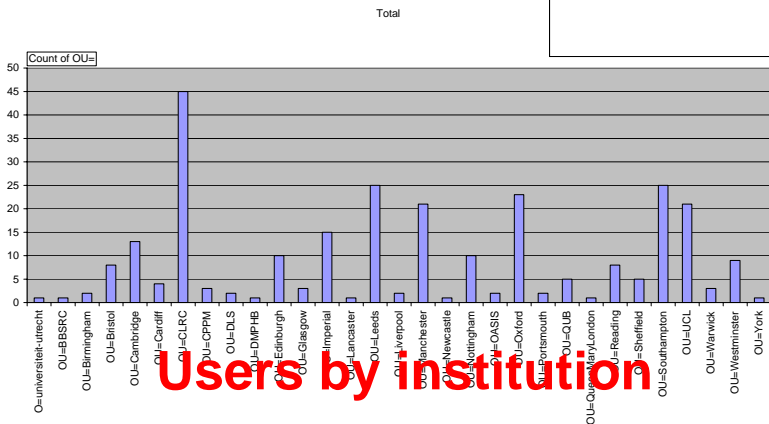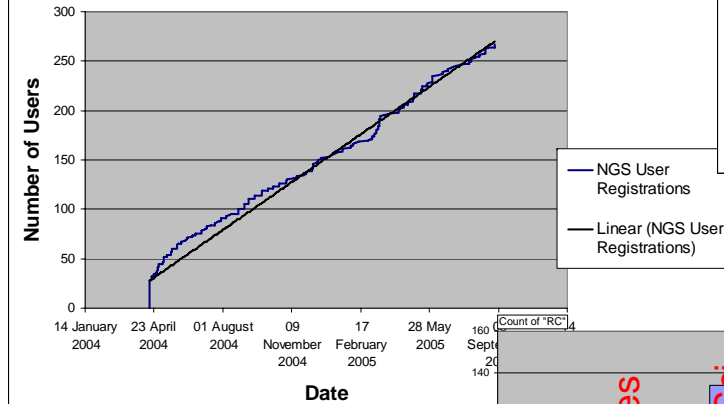
**Users by institution**
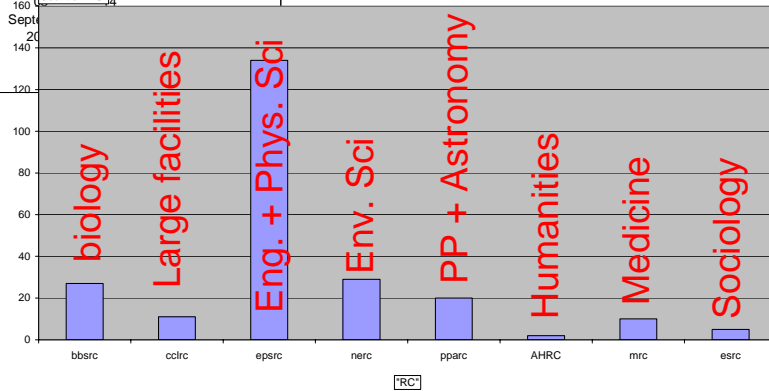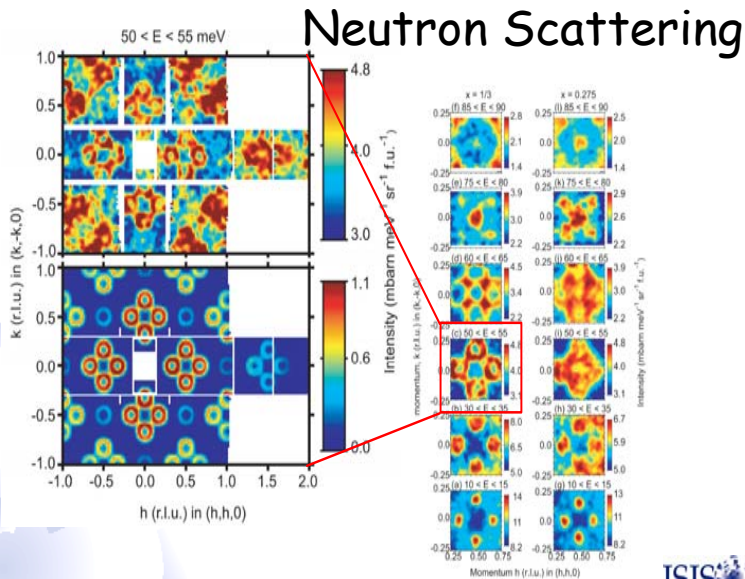
**Users by discipline**

13

# Supporting Services

- UK Grid Services
  - National Services
    - Authentication, authorisation, certificate management, VO registration, security, network monitoring, help desk + support centre.
  - NGS Services and interfaces
    - Job submission, simple registry, data transfer, data access and integration, resource brokering, monitoring and accounting, grid management services, workflow, notification, operations centre.
  - NGS core-node Services
    - CPU, (meta-) data storage, key software
  - Services coordinated with others (eg OMII, NeSC, EGEE, LCG):
    - Integration testing, compatibility & Validation Tests, User Management, training

- Administration:
  - Policies and acceptable use
  - Service Level Agreements and Definitions
  - Coordinate deployment and Operations
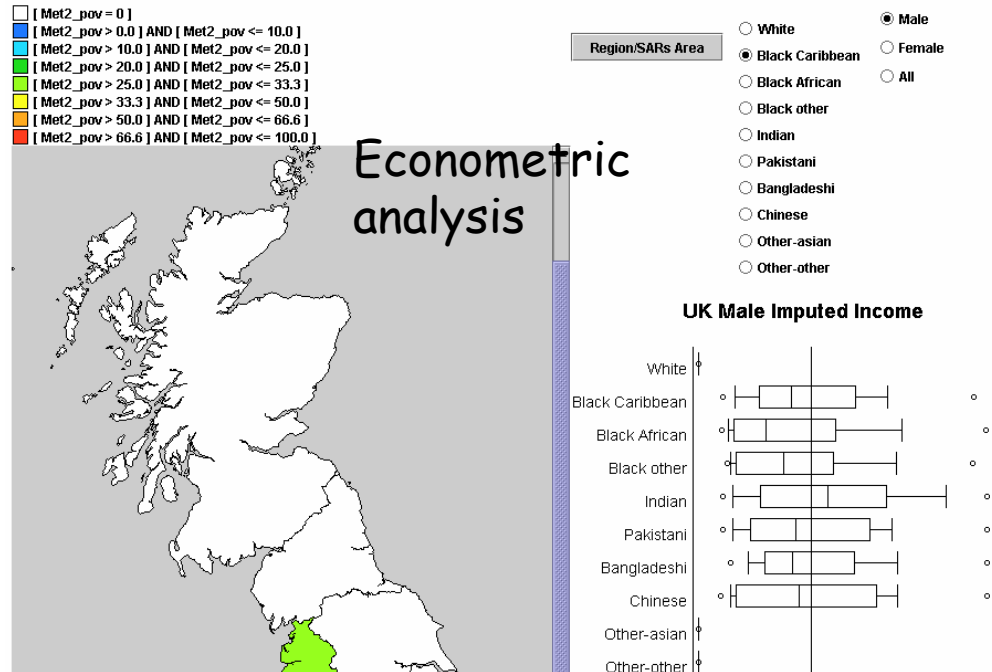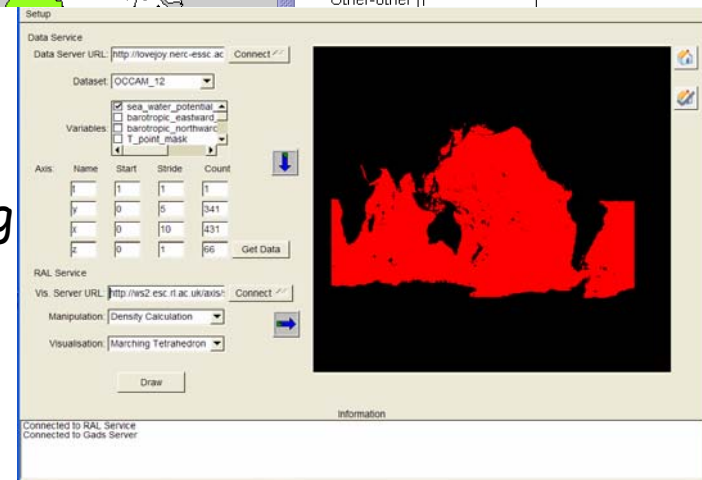  - Operational Security

NGS
National Grid Service

Systems Biology

Example: La$_{2-x}$Sr$_x$NiO$_4$

Neutron Scattering

50 < E < 55 meV

Econometric analysis

[ Met2_pov = 0 ]
[ Met2_pov > 0.0 ] AND [ Met2_pov <= 10.0 ]
[ Met2_pov > 10.0 ] AND [ Met2_pov <= 20.0 ]
[ Met2_pov > 20.0 ] AND [ Met2_pov <= 25.0 ]
[ Met2_pov > 25.0 ] AND [ Met2_pov <= 33.3 ]
[ Met2_pov > 33.3 ] AND [ Met2_pov <= 50.0 ]
[ Met2_pov > 50.0 ] AND [ Met2_pov <= 66.6 ]
[ Met2_pov > 66.6 ] AND [ Met2_pov <= 100.0 ]

Region/SARs Area

White
Black Caribbean
Black African
Black other
Indian
Pakistani
Bangladeshi
Chinese
Other-asian
Other-other

Male
Female
All

**UK Male Imputed Income**

White
Black Caribbean
Black African
Black other
Indian
Pakistani
Bangladeshi
Chinese
Other-asian
Other-other

Climate modelling

# Membership options

Two levels of membership (for sharing resources):

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 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.
- **Westminster**
  - 32 Sun V60 compute nodes
- **HPCx**
  - …

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

# NGS software

- **Computation services** based on Globus Toolkit 2
  - Use compute nodes for sequential or parallel jobs, primarily from batch queues
  - Can run multiple jobs concurrently (be reasonable!)
- **Data services**:
  - Storage Resource Broker:
    - Primarily for file storage and access
    - Virtual filesystem with replicated files
  - "OGSA-DAI": Data Access and Integration
    - grid-enabling data (relational, XML; files)
  - NGS Oracle service

# 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

# Key facts

- Production: deploying middleware after selection and testing
- Evolving:
  - Middleware
  - Number of sites
  - Organisation:
    - VO management – for collaborative projects
    - Policy negotiation: sites, VOs
- International commitment
- Gathering users' requirements – National Grid *Service*

# Web Sites

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


- HPCx
  - http://www.hpcx.ac.uk

# **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
  - OMII, EGEE, Globus Alliance all have m/w under assessment for the NGS
    - Selected, deployed middleware currently provides "low-level" tools
  - New deployments will follow
  - New sites and resources being added