http://www.grid-support.ac.uk

http://www.ngs.ac.uk

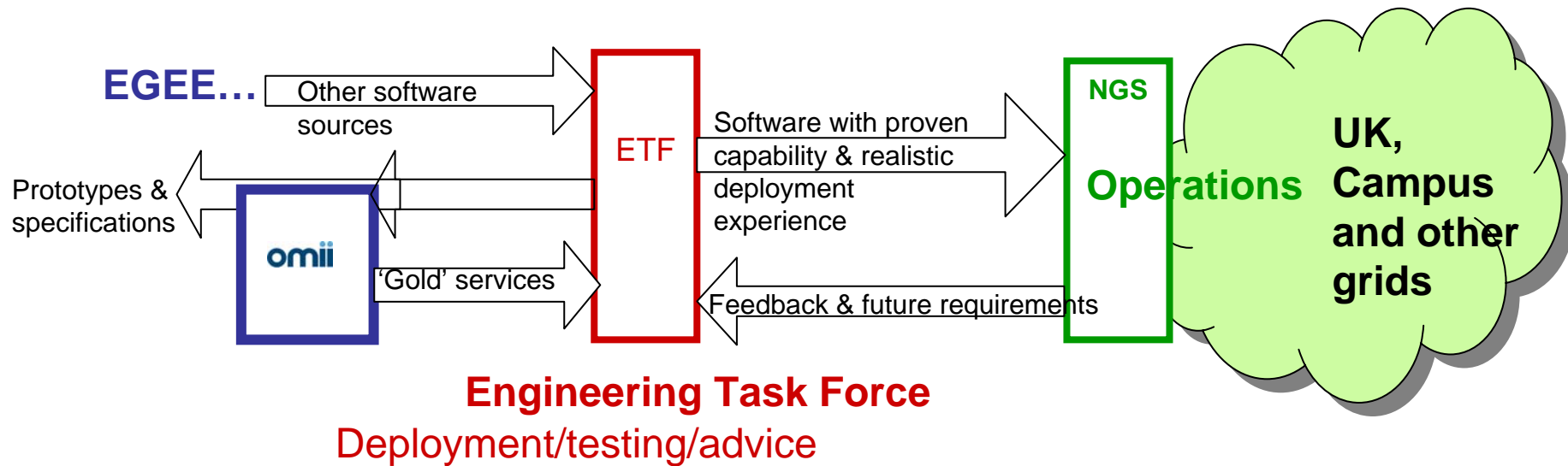# NGS in the future: emerging middleware

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!!

Goal of talk

- The NGS is running a production service

- Different middleware may be deployed in the future.

- The talk seeks to outline some of the possibilities

NGS middleware evolution

EGEE…

Other software sources

Prototypes & specifications

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'Gold' services

ETF

Software with proven capability & realistic deployment experience

Feedback & future requirements

NGS

Operations

UK, Campus and other grids

Engineering Task Force
Deployment/testing/advice

Outline of Current Status

- **Middleware recently deployed**
  - Portal v2
  - INCA monitoring: http://inca.grid-support.ac.uk/
  - Windows access - gsissh
- **Being prepared for possible deployment**
  - Resource broker
  - VOMS
- **Under assessment / observation**
  - middleware from EGEE
  - OMII-UK middleware
  - GT4 – previous talk
- **Under development**
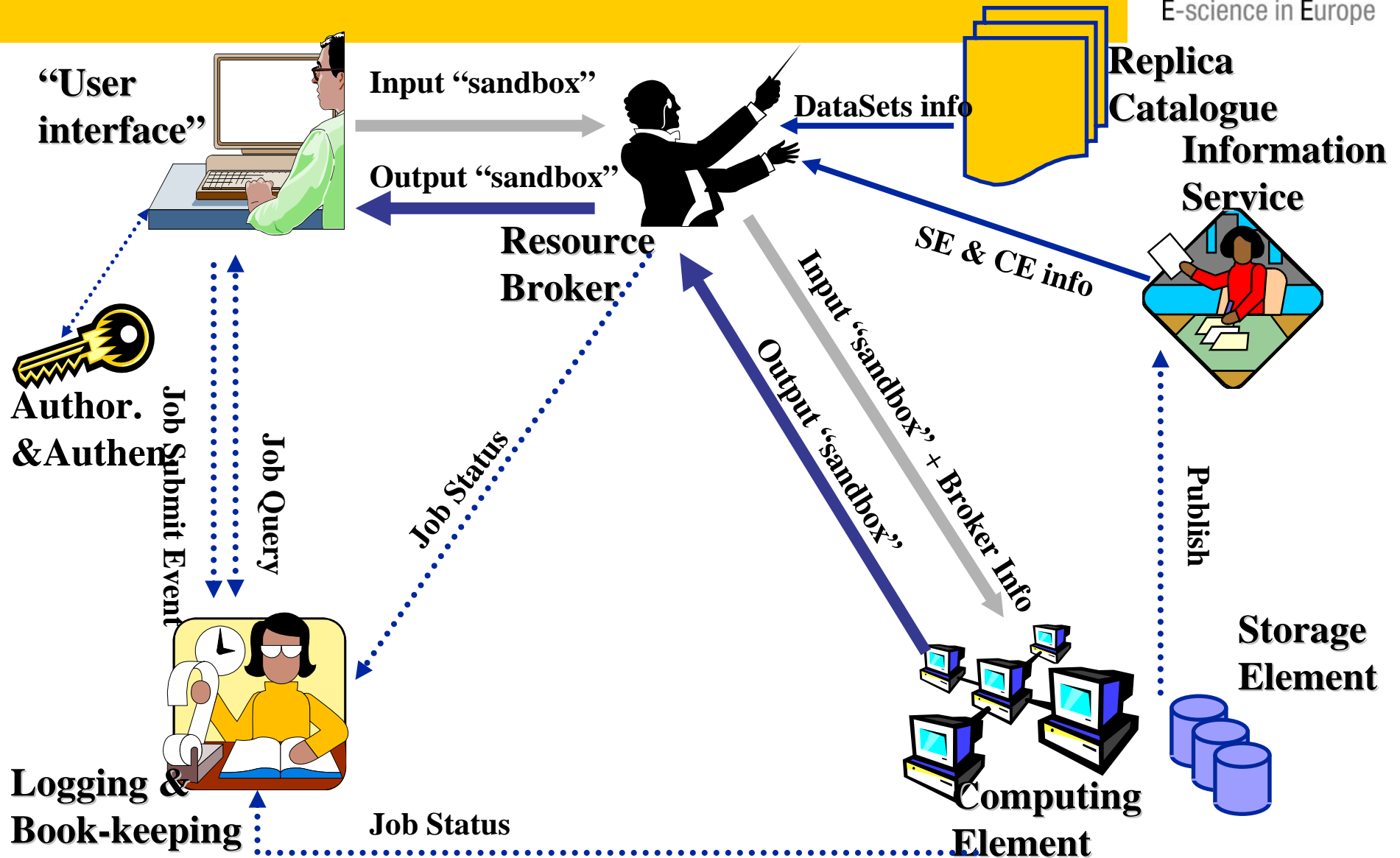 - Shibboleth integration – AuthN, AuthZ for UK

EGEE Resource broker

- (This is NOT the SRB!!!)

- Current NGS middleware comprises toolkits inviting development of higher level services

- On the current NGS we have
  - GRAM to submit jobs
  - Information service – resources available, state of queues…

- The RB will take the work out of deciding where to run a job
  - Submit job to the grid, not a specified "compute element"

- Challenge delaying RB deployment:
  - RB is tightly coupled to rest of EGEE middleware

EGEE grid - Major components

"User interface"

Input "sandbox"

Output "sandbox"

Resource Broker

DataSets info

Replica Catalogue

Information Service

SE & CE info

Author. &Authen.

Job Submit Event

Job Query

Job Status

Input "sandbox" + Broker Info

Output "sandbox"

Publish

Storage Element

Logging & Book-keeping

Job Status

Computing Element

EGEE Resource broker

- Job Description Language file: describes resources needed by a job

- Commands analogous to GT2:
  - edg-job-submit <jdl filename>
  - edg-job-status <job-id>
  - edg-job-get-output <job-id>

- Why "edg": European Data Grid, precursor to EGEE

Example

- **edg-job-submit myjob.jdl**
  - Myjob.jdl
    - *JobType = "Normal";*
    - *Executable = "$(CMS)/exe/sum.exe";*
    - *InputSandbox = {"/home/user/WP1testC","/home/file*", "/home/user/DATA/*"};*
    - *OutputSandbox = {"sim.err", "test.out", "sim.log"};*
    - *Requirements = other. GlueHostOperatingSystemName == "linux" && other.GlueCEPolicyMaxCPUTime > 10000;*
    - *Rank = other.GlueCEStateFreeCPUs;*

More about the RB

- To try using EGEE middleware:
  - GILDA is a dissemination grid running the EGEE middleware
  - Go to the demo site: https://grid-demo.ct.infn.it/

Resource broker - summary

- The resource broker receives a job description in JDL

- It chooses a batch queue for job submission, using the information services

- Its an example of the higher services that can be deployed for the NGS, built upon the current toolkits

eGee

Enabling Grids for E-sciencE

Before VOMS

- **User is authorised as a member of a single VO**

- **All VO members have same rights**

- **Gridmapfiles are updated by VO management software: map the user's DN to a local account**

- **grid-proxy-init**

VOMS

- **User can be in multiple VOs**
  - Aggregate rights

- **VO can have groups**
  - Different rights for each
    - Different groups of experimentalists
    - …
  - Nested groups
- **VO has roles**
  - Assigned to specific purposes
    - E,g. system admin
    - When assume this role
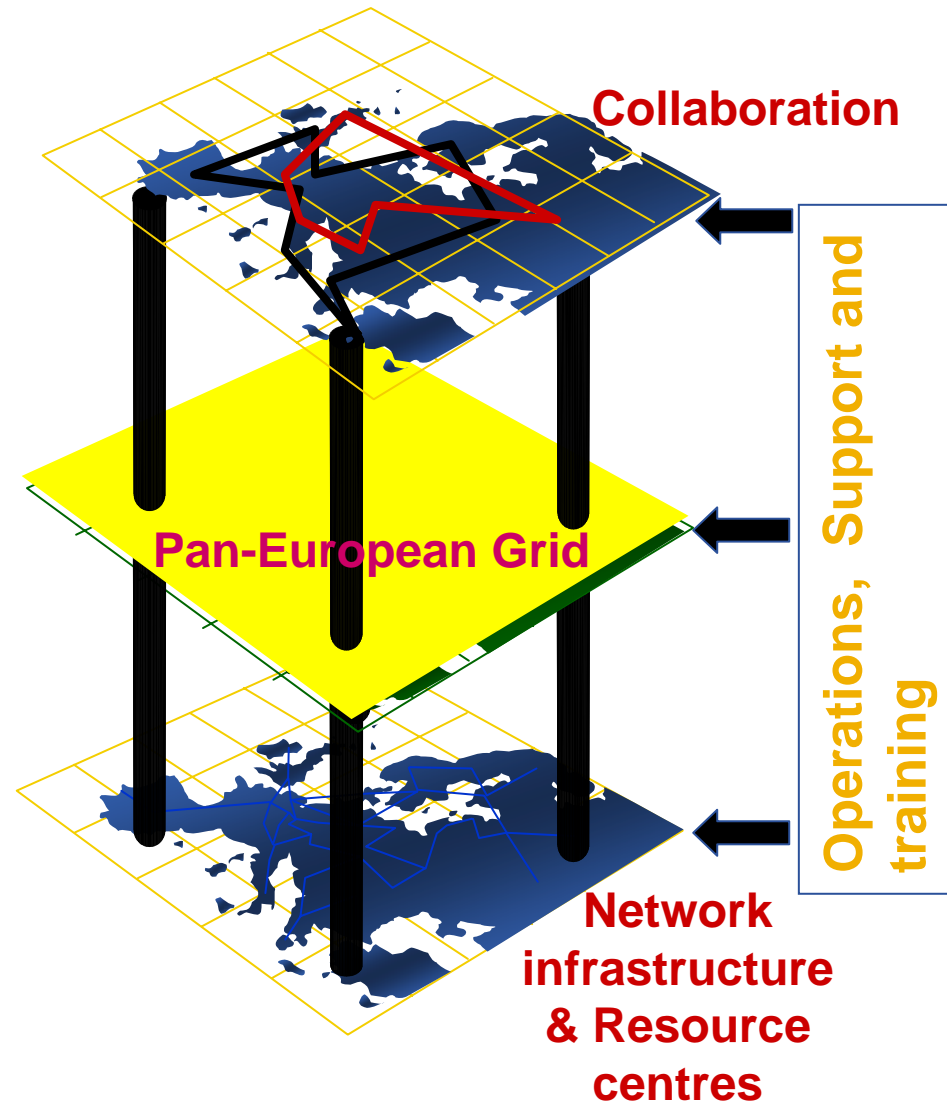- **Proxy certificate carries the additional attributes**
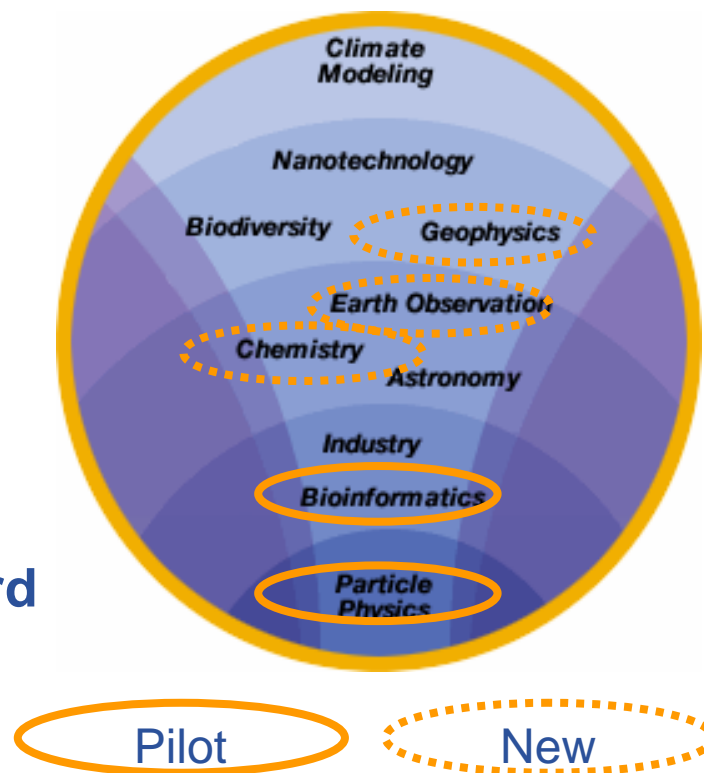
- **voms-proxy-init**

EGEE

- Creating international grid infrastructure

- Important to NGS to interoperate with EGEE – collaborations cross national boundaries!

- 3 potential levels of interoperability
  - Application (P-GRADE for example)
  - Grids – jobs submitted to one grid potentially run on another
  - Service – services from one stack deployable on another
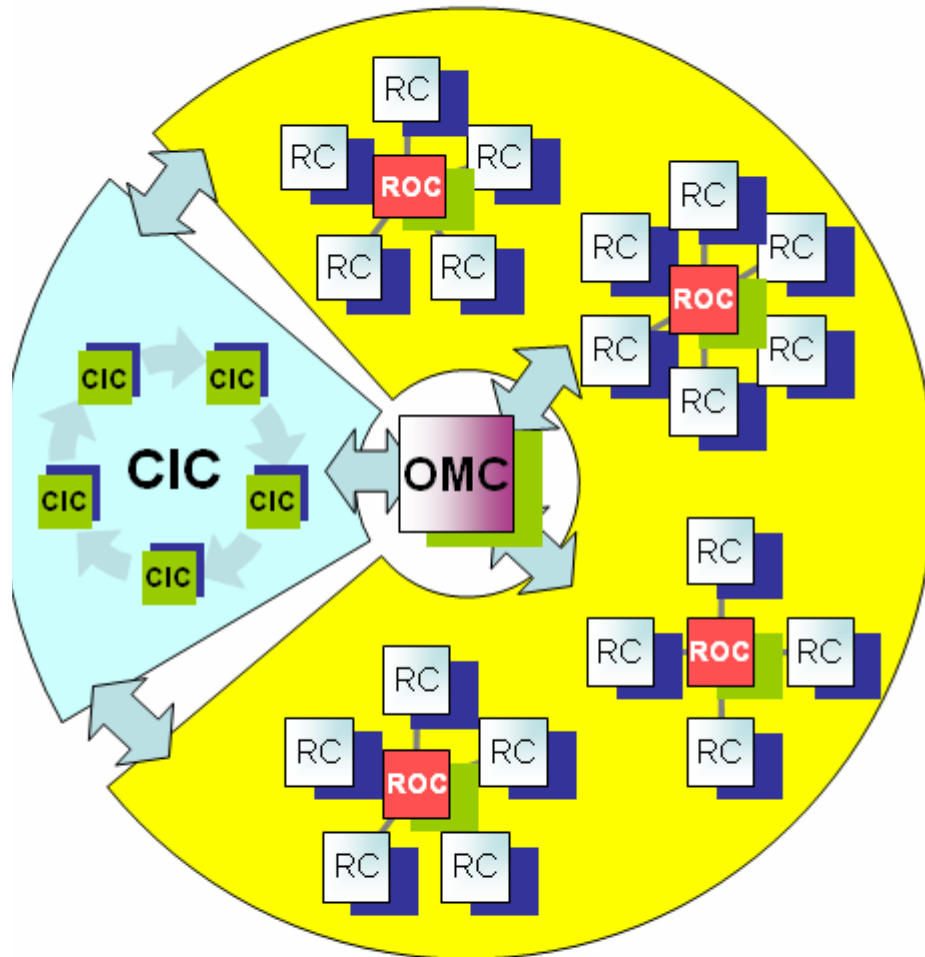- 1 level is possible today – application level

A four year programme:

- **Build, deploy and operate a consistent, robust a large scale production grid service that**
  - Links with and build on national, regional and international initiatives
- **Improve and maintain the middleware in order to deliver a reliable service to users**
- **Attract new users from research and industry and ensure training and support for them**

Collaboration

Pan-European Grid

Operations, Support and training

Network infrastructure & Resource centres

- **Established production quality sustained Grid services**
  - 3000 users from at least 5 disciplines
  - integrate 50 sites into a common infrastructure
  - offer 5 Petabytes (10^{15}) storage

- **Demonstrated a viable general process to bring other scientific communities on board**

- **Secured a second phase from April 2006**

Climate Modeling

Nanotechnology

Biodiversity   Geophysics

Earth Observation

Chemistry   Astronomy

Industry

Bioinformatics

Particle Physics

Pilot   New

**eGee**

Enabling Grids for E-sciencE

RC = Resource Centre
ROC = Regional Operations Centre
CIC = Core Infrastructure Centre
OMC = Operations Management Centre

- **CICs act as a single Operations Centre**
  - Operational oversight *(grid operator)* responsibility
  - rotates weekly between CICs
  - Report problems to ROC/RC
  - ROC is *responsible* for ensuring problem is resolved
  - ROC oversees regional RCs
- **ROCs responsible for organising the operations in a region**
  - Coordinate deployment of middleware, etc
- **CERN coordinates sites not associated with a ROC**
- **Global Grid User Support**

- **Natural continuation of EGEE**

  – Expanded consortium

  – Emphasis on providing an infrastructure

    → increased support for applications

    → interoperate with other infrastructures

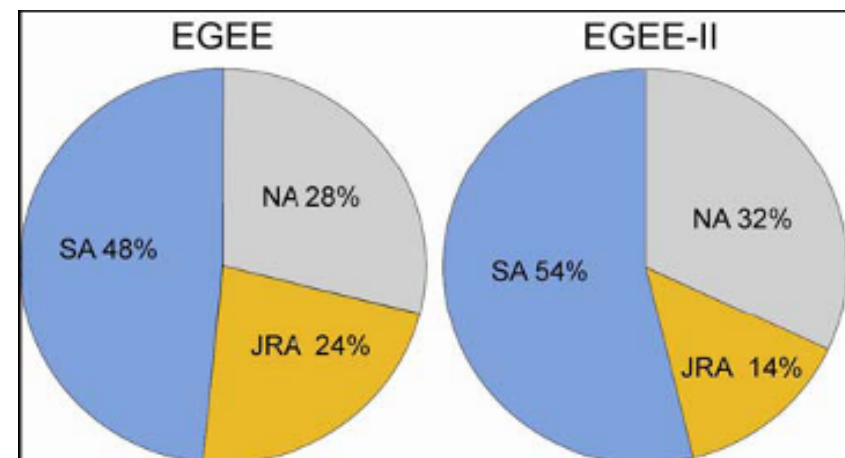   → more involvement from Industry
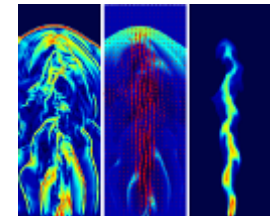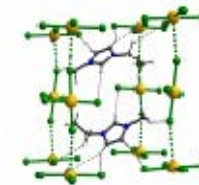
SA: service activities

   - establishing operations

NA: network activities

   - supporting VOs

JRA: "joint research activities"
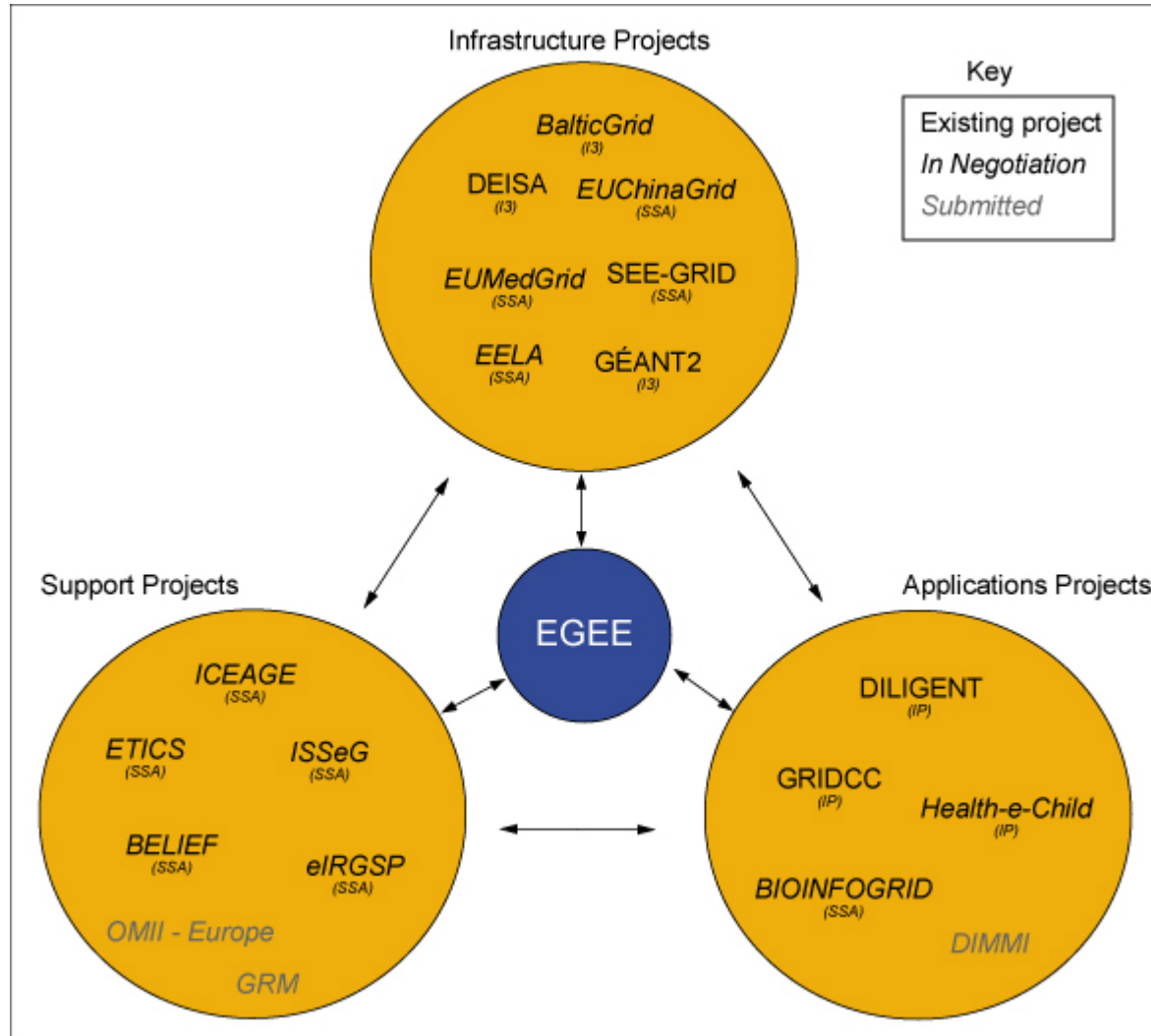
   - e.g. hardening middleware

- **More than 90 partners**
- **32 countries**
- **12 federations**
→ **Major and national Grid projects in Europe, USA, Asia**

+ 27 countries through related projects:
  – BalticGrid
  – SEE-GRID
 – EUMedGrid
  – EUChinaGrid
  – EELA

Enabling Grids for E-sciencE

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
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

OMII-UK: Open Middleware Infrastructure Institute

Building e-Research

Research	Pilot projects	Early adopters	Routine production
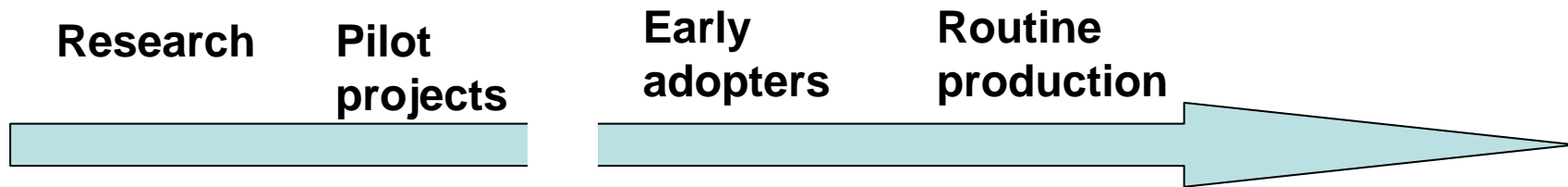
Researchers are not funded to provide production quality software for others to use

OMII-UK exists to help bridge this gap!

Open Middleware Infrastructure Institute

To be a leading provider of reliable interoperable and open-source Grid middleware components services and tools to support advanced Grid enabled solutions in academia and industry.

- Formed University of Southampton (2004)
  - Focus on an easy to install e-Infrastructure solution
  - Utilise existing software & standards
- Expanded with new partners in 2006
  - OGSA-DAI team at Edinburgh
  - ^{my}Grid team at Manchester

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Activity

- By providing a software repository of Grid components and tools from e-science projects

- By re-engineering software, hardening it and providing support for components sourced from the community

- By a managed programme to contract the development of "missing" software components necessary in grid middleware

- By providing an integrated grid middleware release of the sourced software components

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The Managed Programme:

- Integrated with the OMII Distribution
    - OGSA-DAI (Data Access service)
    - GridSAM (Job Submission & Monitoring service)
    - Grimoires (Registry service based on UDDI)
    - GeodiseLab (Matlab & Jython environments)
    - FINS (Notification services using WS-Eventing)
- Delivering into the repository
    - BPEL (Workflow service)
    - MANGO (Managing workflows with BPEL)
    - FIRMS (Reliable messaging)

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OMII-UK and the NGS

Some elements of OMII-UK managed programme and MyGrid are at this "VO-specific" level

Potential for use of OMII-UK middleware to invoke NGS to provision services

NGS provides resources that can be invoked from WS-I and WS-RF services.

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