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

http://www.ngs.ac.uk

NGS in the future: emerging middleware

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

http://www.pparc.ac.uk/

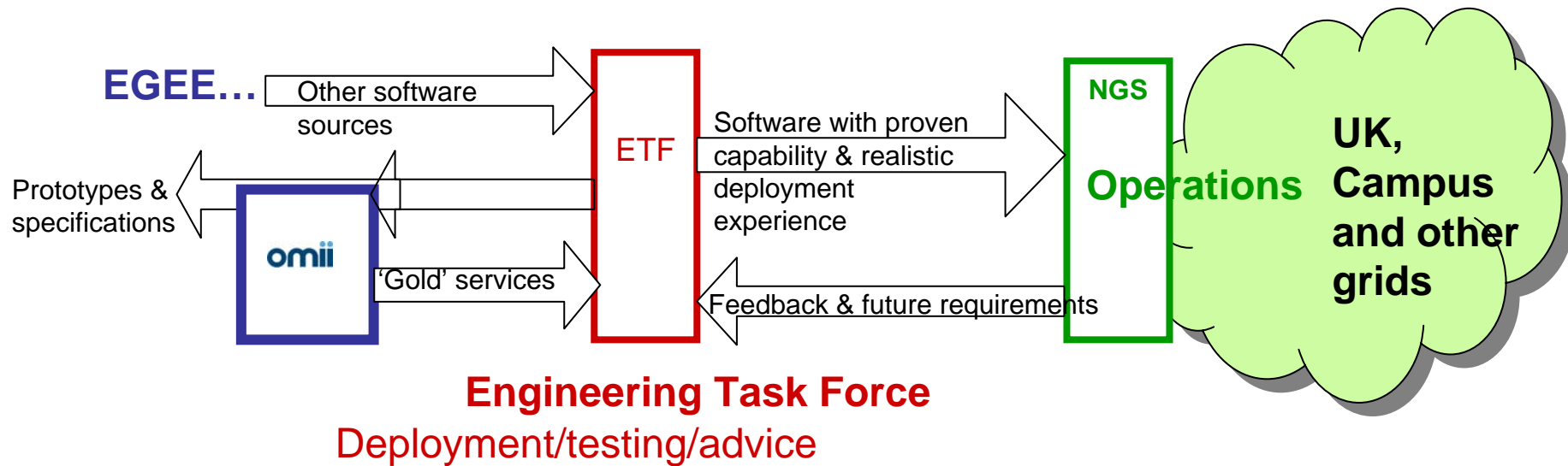http://www.eu-egee.org/

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

ETF

Software with proven capability & realistic deployment experience

NGS

Operations

UK, Campus and other grids

Prototypes & specifications

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'Gold' services

Feedback & future requirements

Engineering Task Force
Deployment/testing/advice

National e-Science Centre

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**
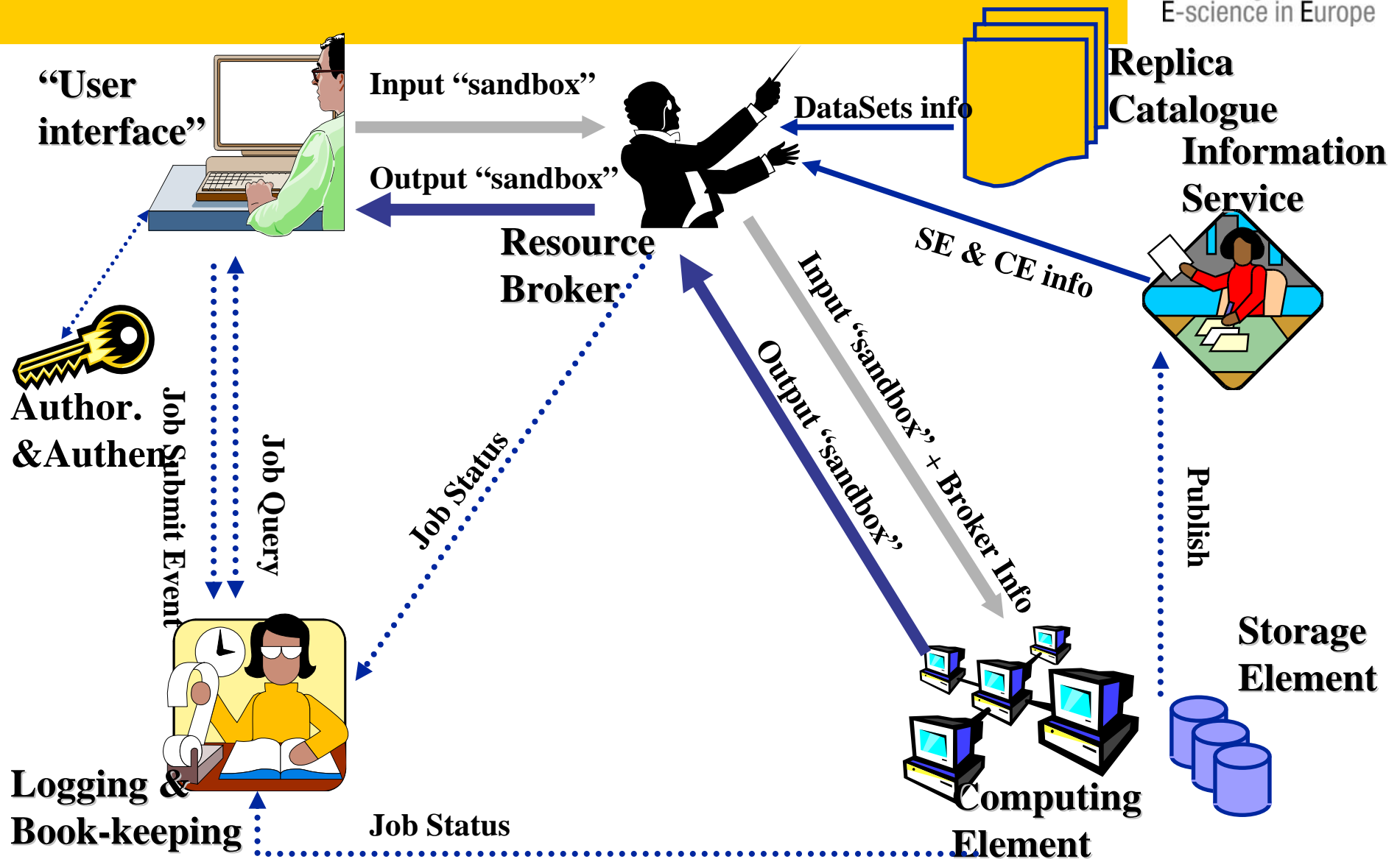 - Shibboleth integration – AuthN, AuthZ for UK

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

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**
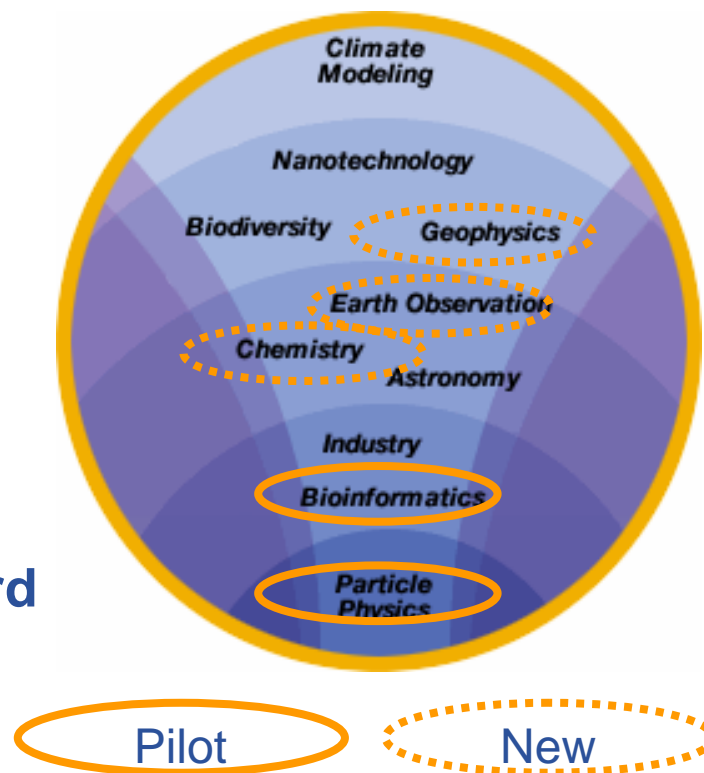
- **voms-proxy-init**

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
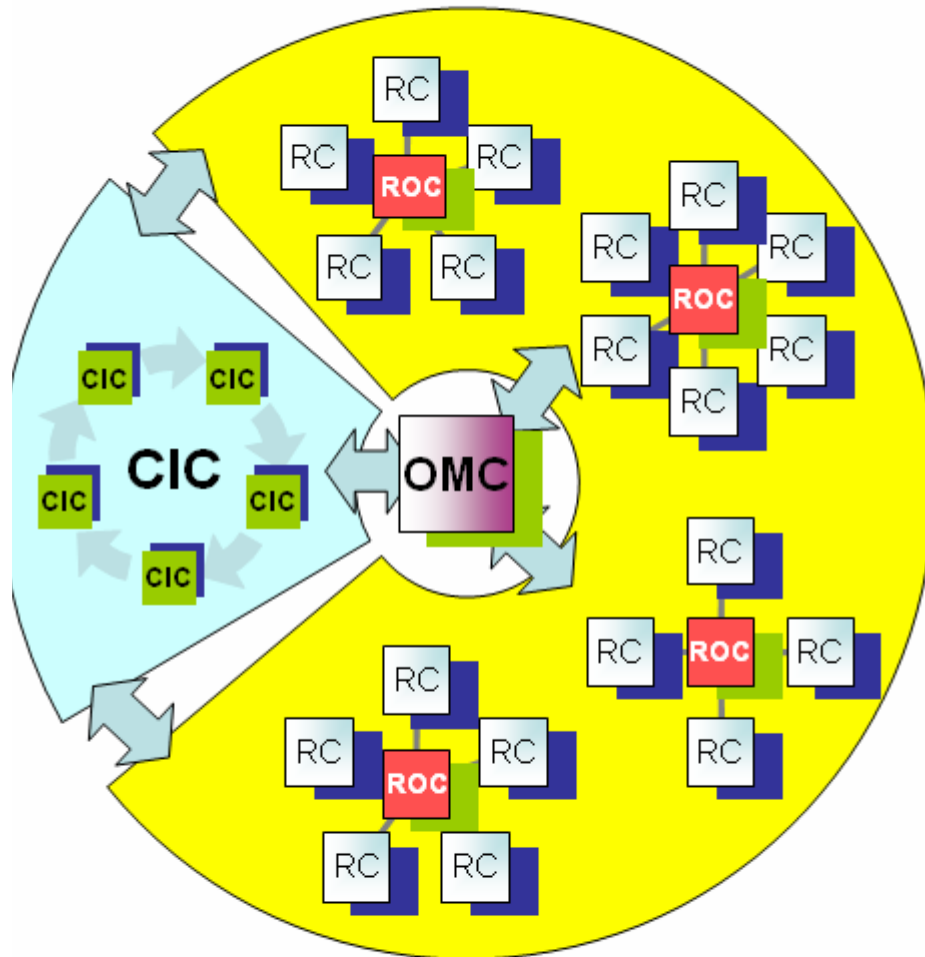- 1 level is possible today – application level

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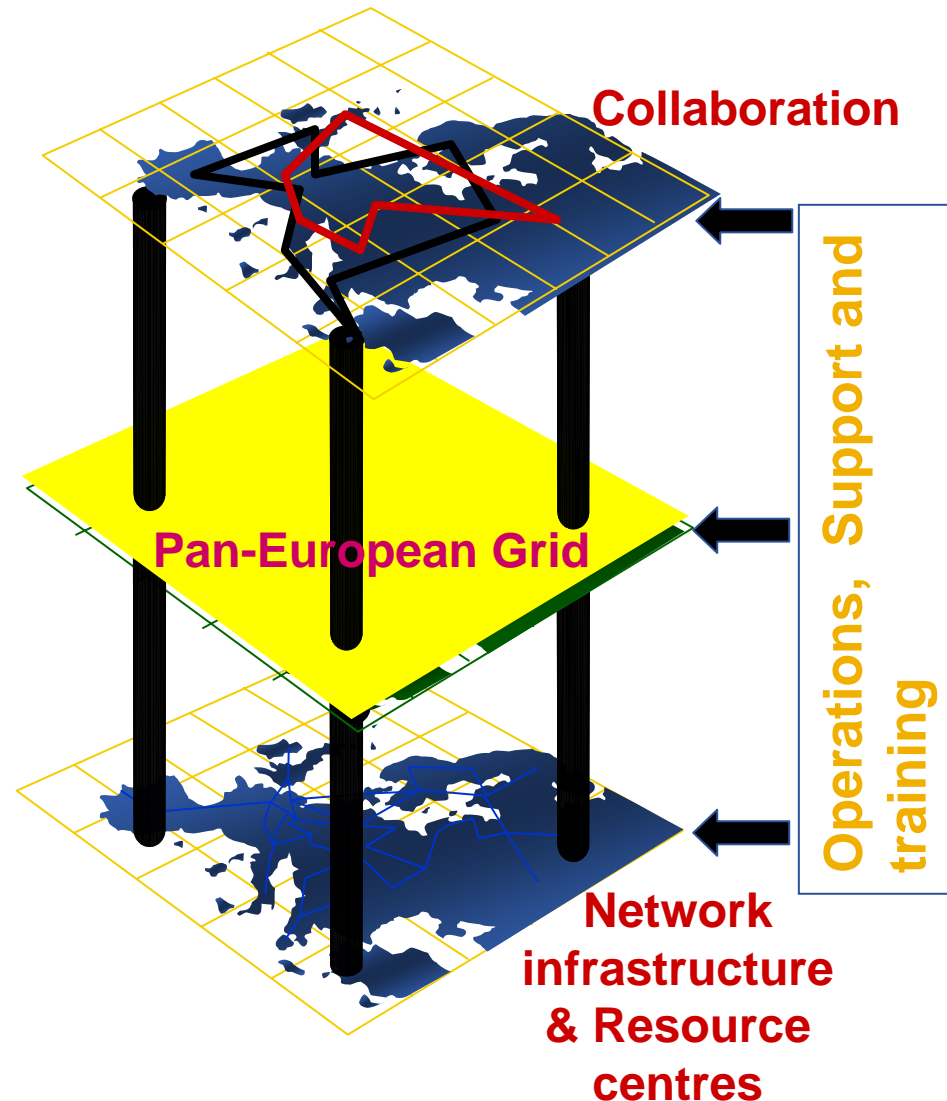
- **Established production quality sustained Grid services**
  - 3000 users from at least 5 disciplines
  - integrate 50 sites into a common infrastructure
  - offer 5 Petabytes (10^{15}) storage

- **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

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
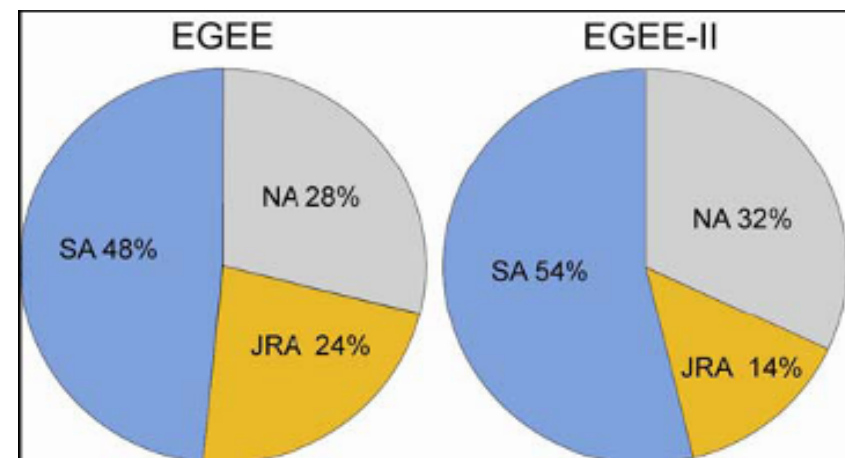   - → more involvement from Industry
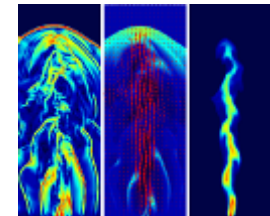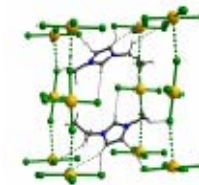
SA: service activities

   - establishing operations

NA: network activities

   - supporting VOs

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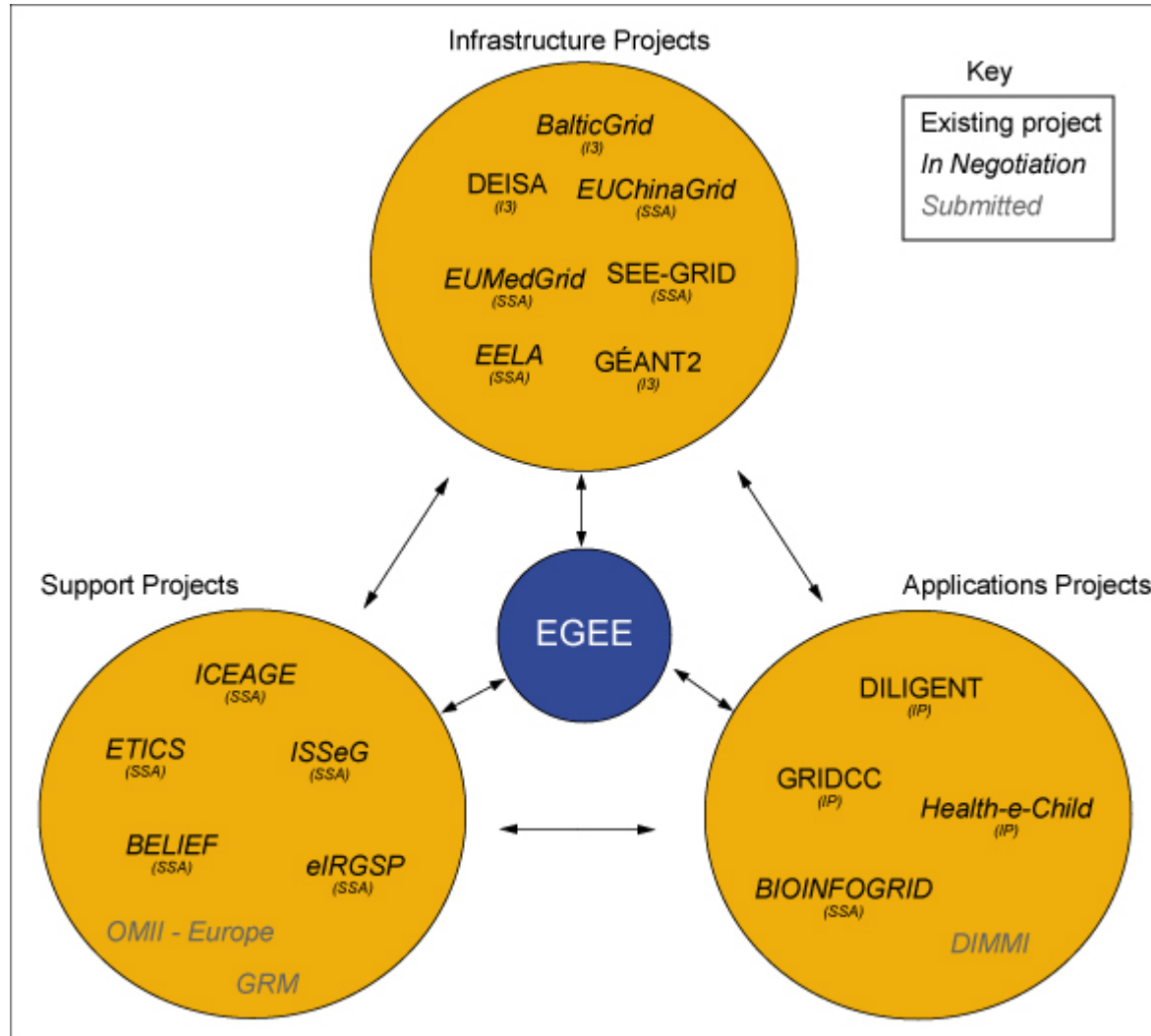
   - e.g. hardening middleware

EGEE / EGEE-II

SA 48% NA 28% JRA 24%

SA 54% NA 32% JRA 14%

- **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

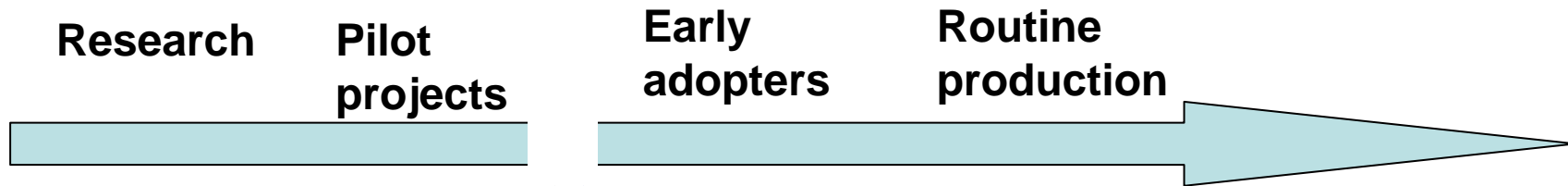| Name	Description	Common partners with EGEE
BalticGrid	EGEE extension to Estonia, Latvia, Lithuania	KTH – PSNC – CERN
EELA	EGEE extension to Brazil, Chile, Cuba, Mexico, Argentina	CSIC – UPV – INFN – CERN – LIP – RED.ES
EUChinaGRID	EGEE extension to China	INFN – CERN – DANTE – GARR – GRNET
EUMedGRID	EGEE extension to Malta, Algeria, Morocco, Egypt, Syria, Tunisia, Turkey	INFN – CERN – DANTE – GARR – GRNET – RED.ES
ISSeG	Site security	CERN – CSSI – FZK – CCLRC
eIRGSP	Policies	CERN – GRNET
ETICS	Repository, Testing	CERN – INFN – UWM
ICEAGE	Repository for Training & Education, Schools on Grid Computing	UEDIN – CERN – KTH – SZTAKI
BELIEF	Digital Library of Grid documentation, organisation of workshops, conferences	UWM
BIOINFOGRID	Biomedical	INFN – CNRS
Health-e-Child	Biomedical – Integration of heterogeneous biomedical information for improved healthcare	CERN

- **… the largest multi-VO production grid in the world!**

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

- **What resources are connected?**
  http://goc.grid-support.ac.uk/gridsite/monitoring/

OMII-UK: Open Middleware Infrastructure Institute

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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
  - myGrid 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)
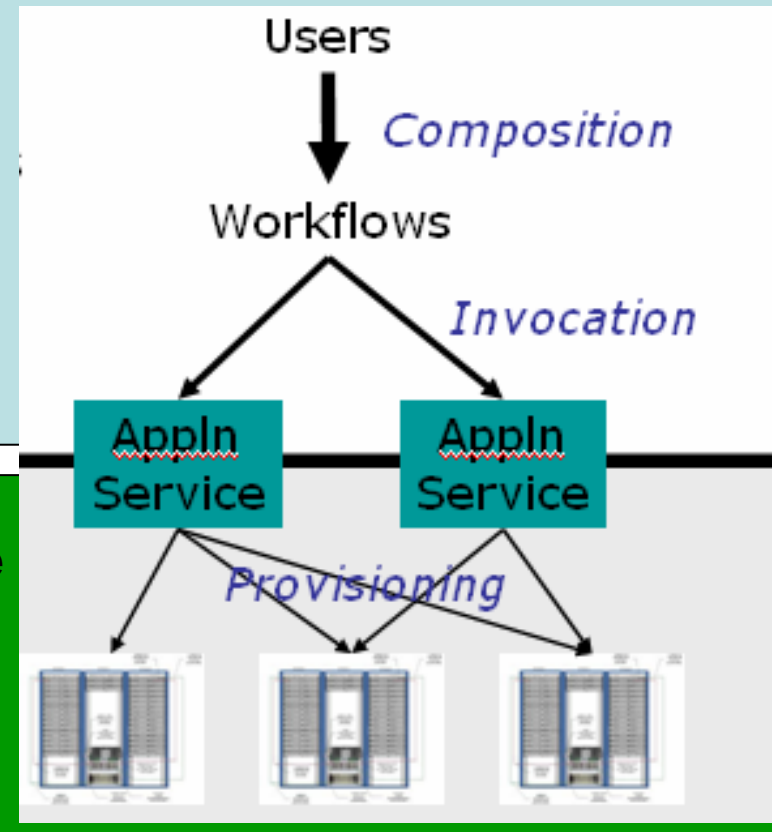 - FIRMS (Reliable messaging)

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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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