



Enabling Grids for E-science

# Overview of the EGEE project and middleware

*Presented by Mike Mineter, [mjm@nesc.ac.uk](mailto:mjm@nesc.ac.uk)*

*With thanks to EGEE colleagues for many of these slides*

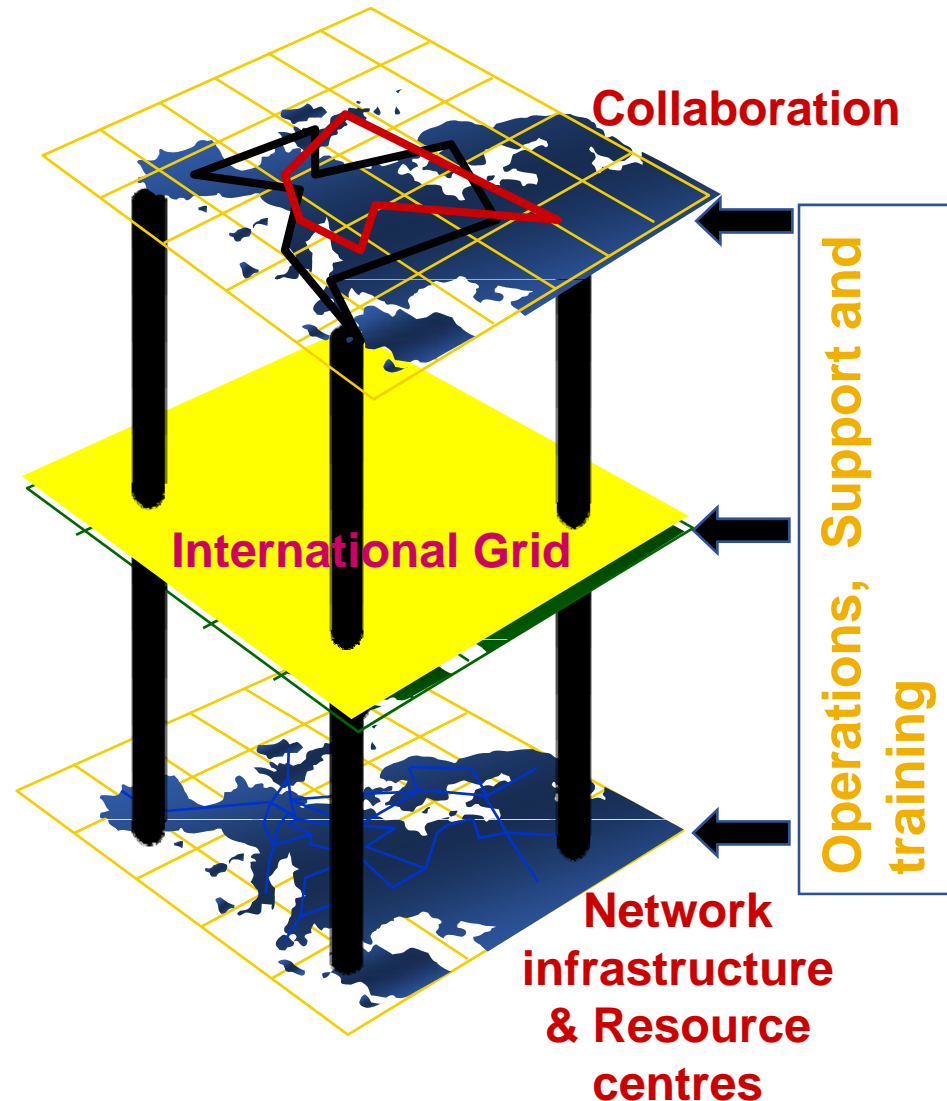
[www.eu-egee.org](http://www.eu-egee.org)



- **What is EGEE?**
  - Goals
  - Status
  - Activities
- **EGEE's Grid middleware: gLite 3**
- **Sources of further information**



- 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



<http://gridportal.hep.ph.ic.ac.uk/rtm>

- **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

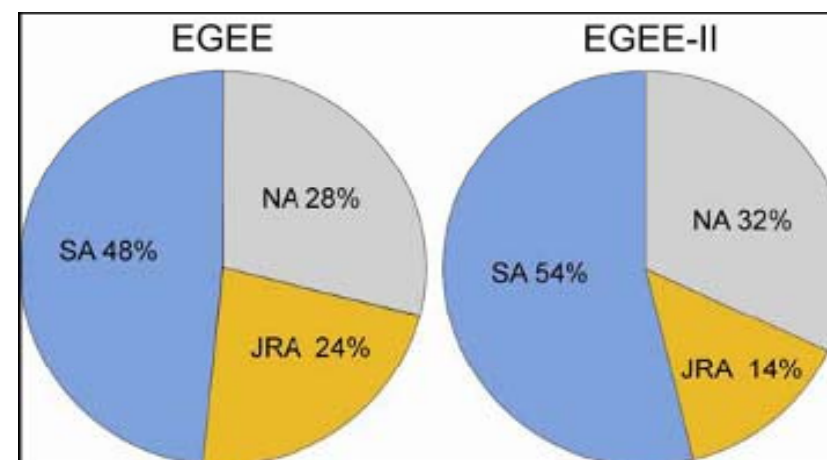
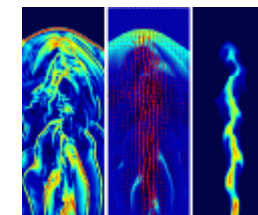
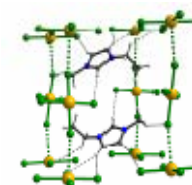
- establishing operations

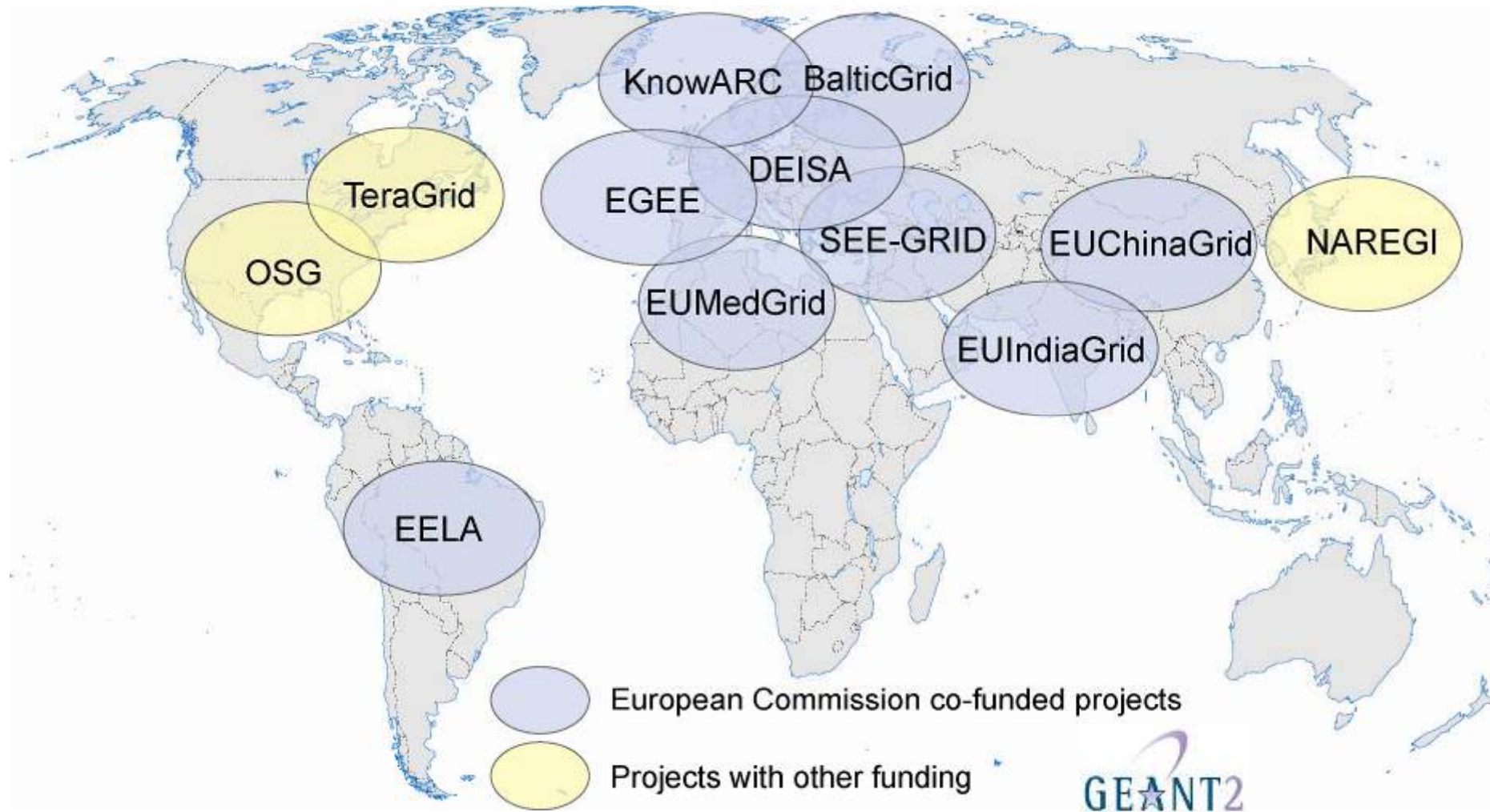
NA: network activities

- supporting VOs

JRA: “joint research activities”

- e.g. hardening middleware





**Potential for linking ~80 countries by 2008**

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

## Test-beds & Services

Certification testbeds (SA3)

Pre-production service

Production service

### Infrastructure:

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

## Support Structures

Operations Coordination Centre

Regional Operations Centres

Global Grid User Support

EGEE Network Operations Centre (SA2)

Operational Security Coordination Team

## Security & Policy Groups

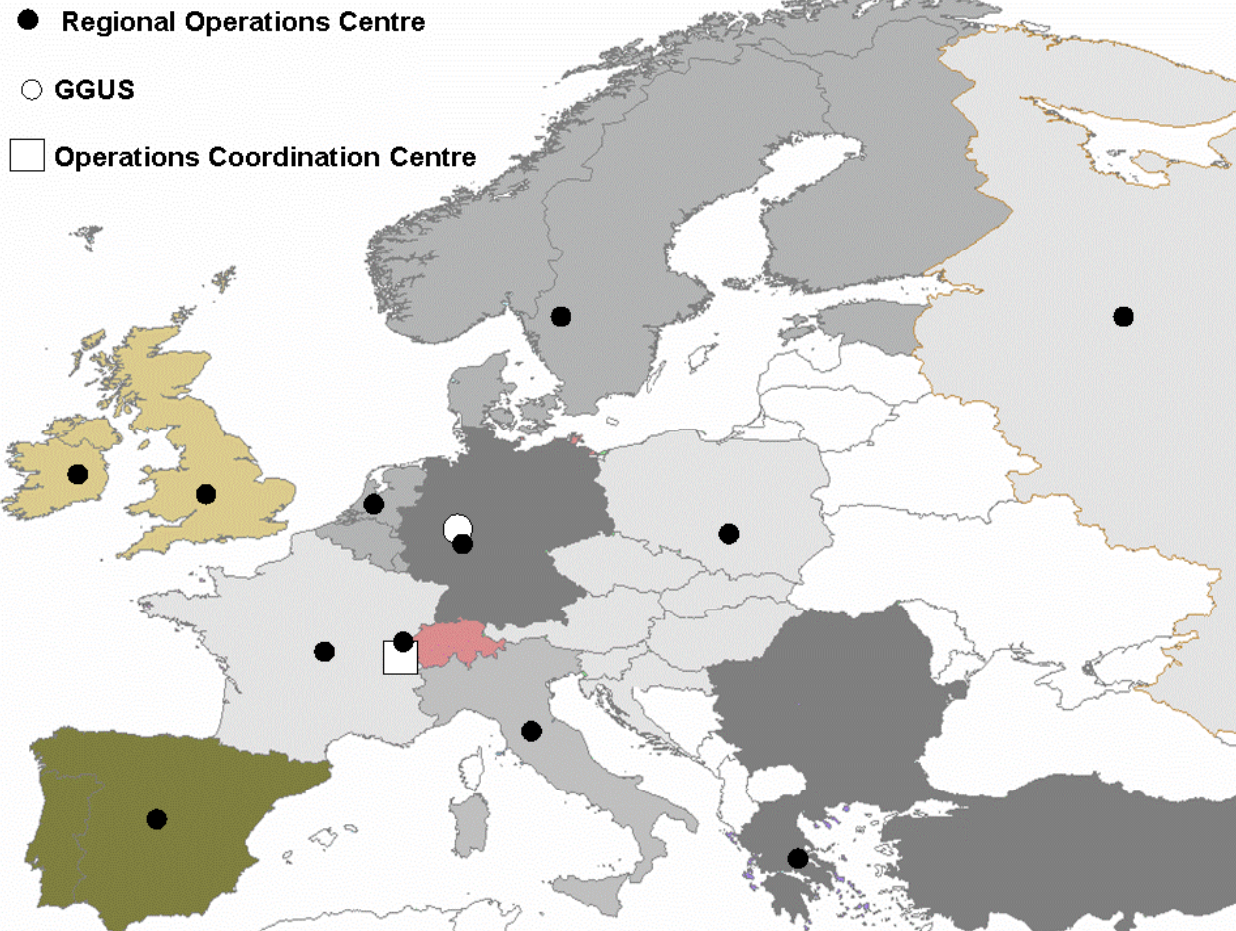
Joint Security Policy Group

EuGridPMA (& IGTF)

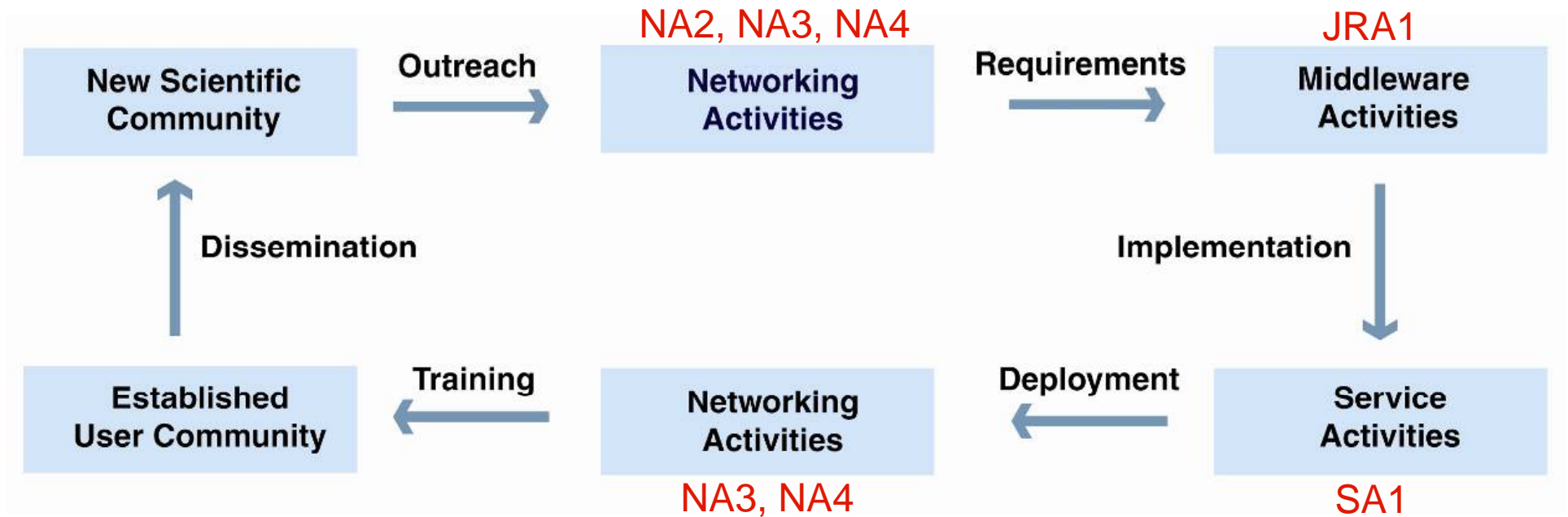
Grid Security Vulnerability Group

Operations Advisory Group (+NA4)





- **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)**
  - At FZK, coordination and management of 9



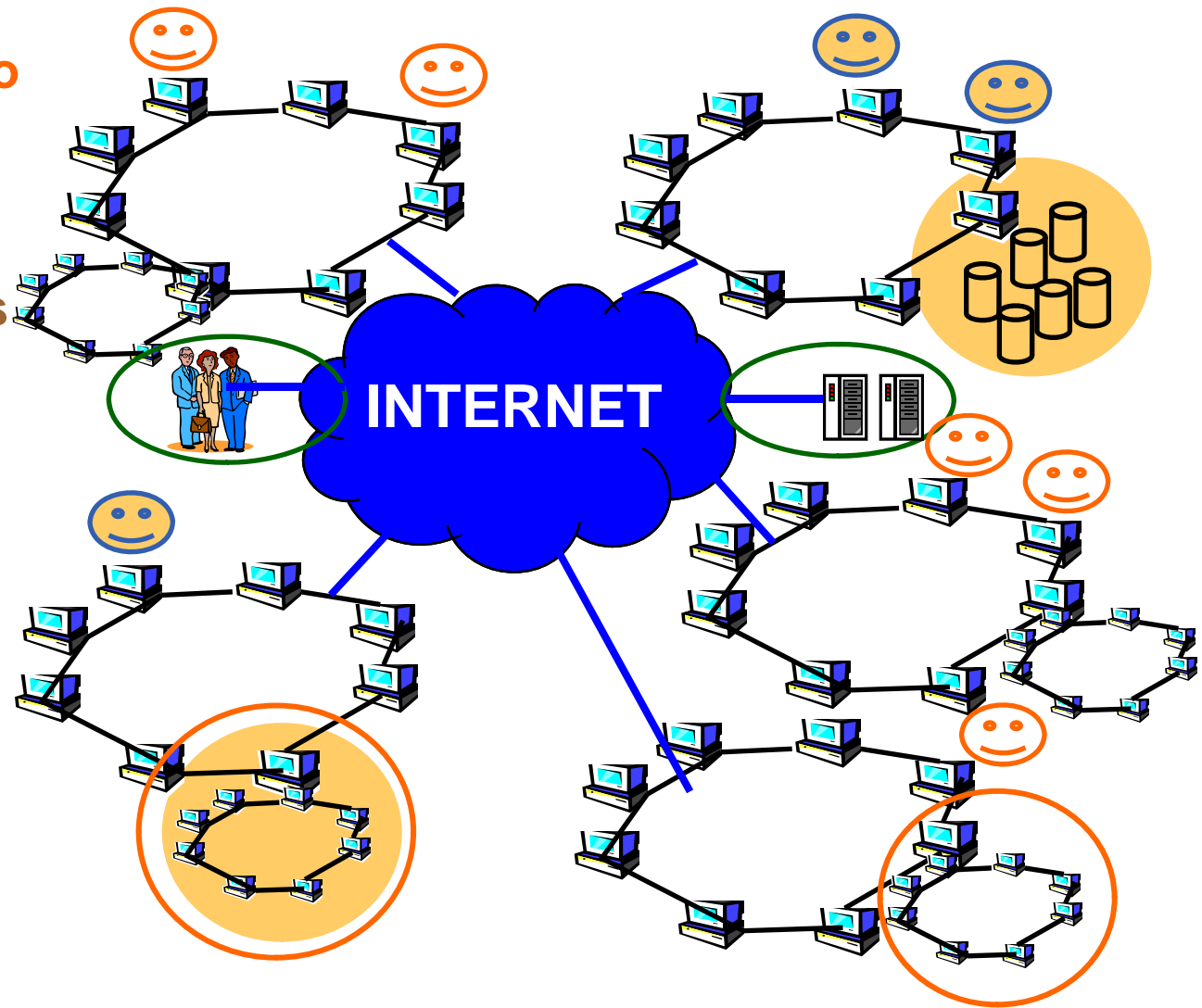
## Building effective user communities

- **What is EGEE?**
  - Goals
  - Status
  - Activities
- **EGEE's Grid middleware: gLite 3**
- **Sources of further information**

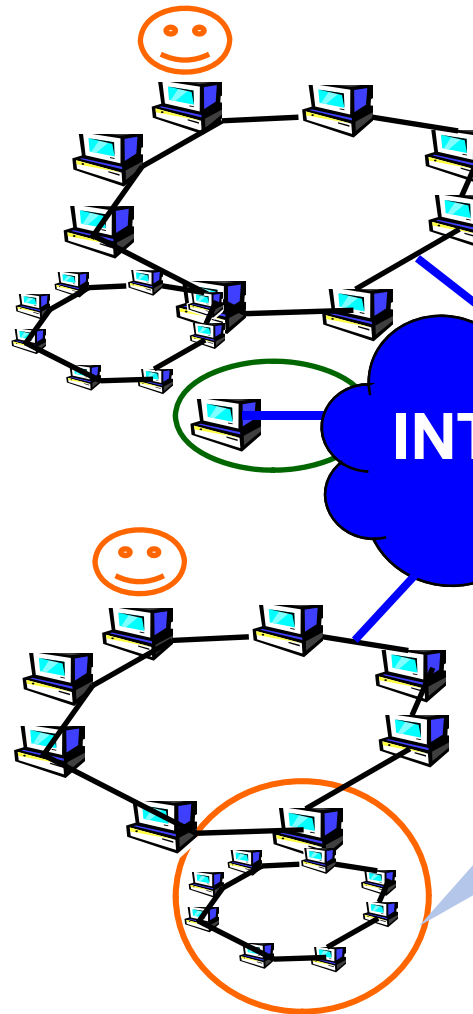


- **What is a Virtual Organisation?**
  - People in different organisations seeking to cooperate and share resources across their organisational boundaries
  - E.g. A research collaboration
- **Each grid is an infrastructure enabling one or more “virtual organisations” to share and access resources**
- **Each resource is exposed to the grid through an abstraction that masks heterogeneity, e.g.**
  - Multiple diverse computational platforms
  - Multiple data resources
- **Resources are usually owned by VO members. Negotiations lead to VOs sharing resources**

- **Virtual organisations negotiate with sites to agree access to resources**
- **Grid middleware runs on each shared resource to provide**
  - Data services
  - Computation services
  - Single sign-on
- **Distributed services (both people and middleware) enable the grid**

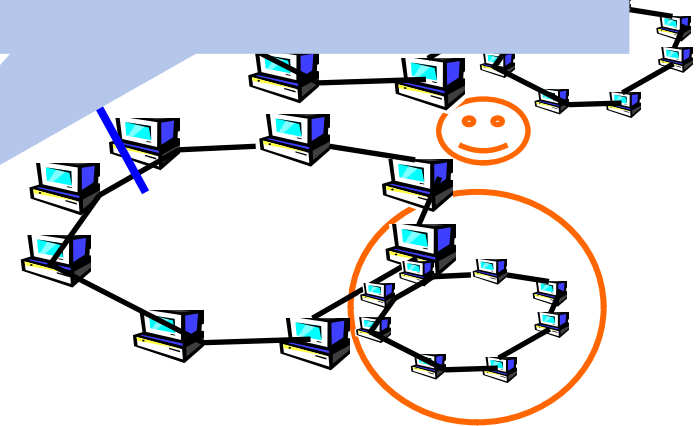


- **Grid middleware runs on each shared resource**
  - Data storage
  - (Usually) batch queues on pools of processors
- **Users join VO's**
- **Virtual organisation negotiates with sites to agree access to resources**
- **Distributed services (both people and middleware) enable the grid, allow single sign-on**



At each site that provides computation:

- Local resource management system
- (= batch queue)
  - PBS
  - ...
- EGEE term: queue is a "Computing element"



- **When using a PC or workstation you**
  - Login with a username and password (“Authentication”)
  - Use rights given to you (“Authorisation”)
  - Run jobs
  - Manage files: create them, read/write, list directories
- **Components are linked by a bus**
- **Operating system**
- **One admin. domain**
- **When using a Grid you**
  - Login with digital credentials – single sign-on (“Authentication”)
  - Use rights given you (“Authorisation”)
  - Run jobs
  - Manage files: create them, read/write, list directories
- **Services are linked by the Internet**
- **Middleware**
- **Many admin. domains**



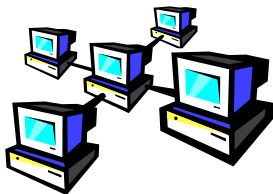
**User Interface (UI):** The place where users logon to the Grid



**Resource Broker (RB) (Workload Management System (WMS):**  
Matches the user requirements with the available resources



**Information System:** Characteristics and status of CE and SE



**Computing Element (CE):** A batch queue on a site's computers where the user's job is executed



**Storage Element (SE):** provides (large-scale) storage for files





User Interface (UI):

The place where users logon to the Grid

**built upon authorisation,**

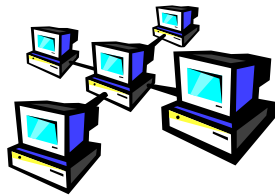
Resource Broker (RB): Matches users' requirements with the available resources on the Grid



**authentication,**

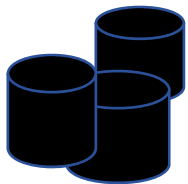
Authentication System: Authenticates and manages CE and SE (Uses "GLUE schema")

**security**



Computing Element (CE):

is where

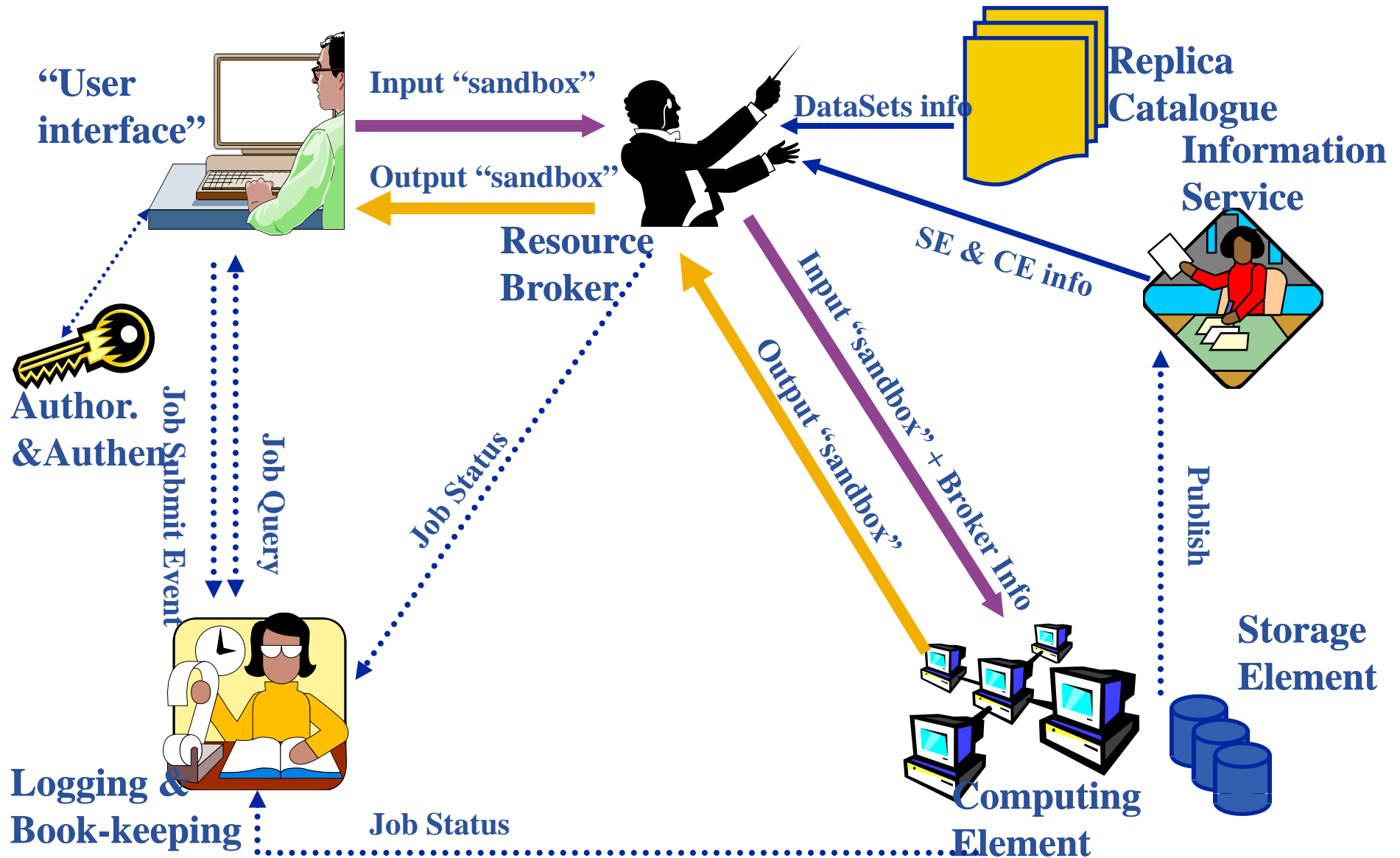


Storage Element (SE):



Grid Security Infrastructure: Single logon with security and trust

# Current production middleware

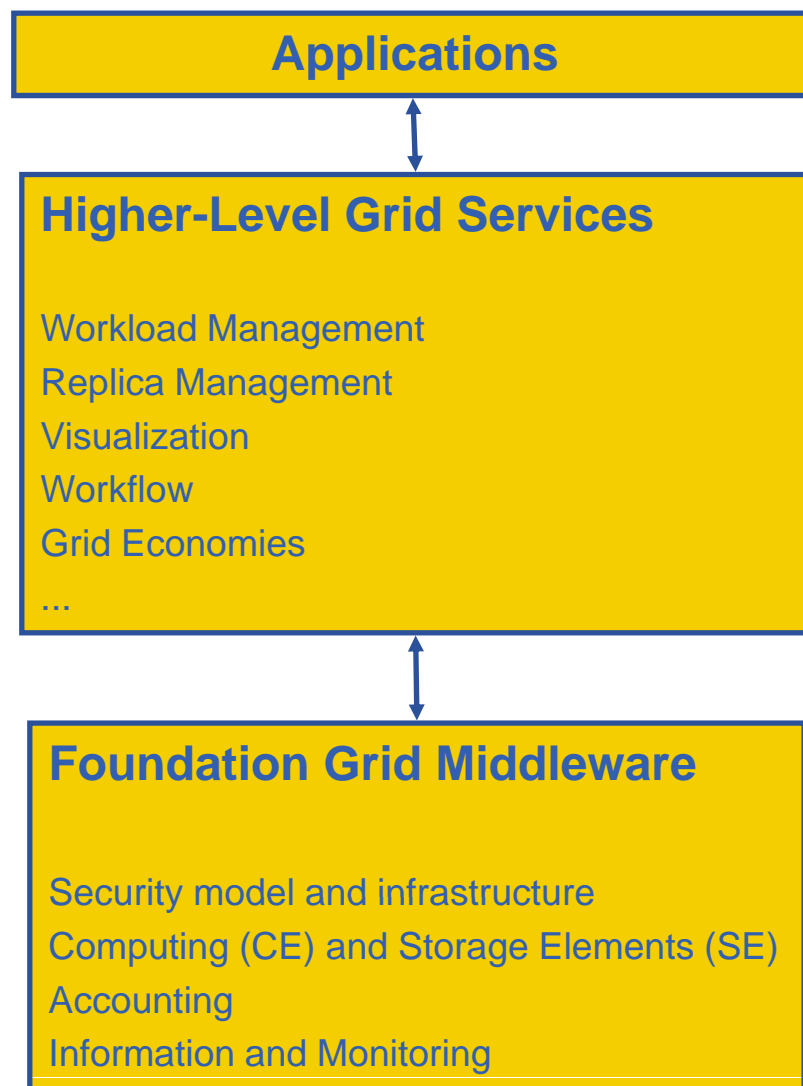


# Who provides the resources?!

<u>Service</u>	<u>Provider</u>	<u>Note</u>
<u>Access service</u>	User / institute / VO	Computer with client software
<u>Resource Broker (RB)</u>	VO	
<u>Information System:</u>	Grid operations	
<u>Computing Element (CE)</u>	VOs - EGEE does not fund CEs	Scalability requires that VOs provide resources to match average need
<u>Storage Element (SE)</u>	VOs	

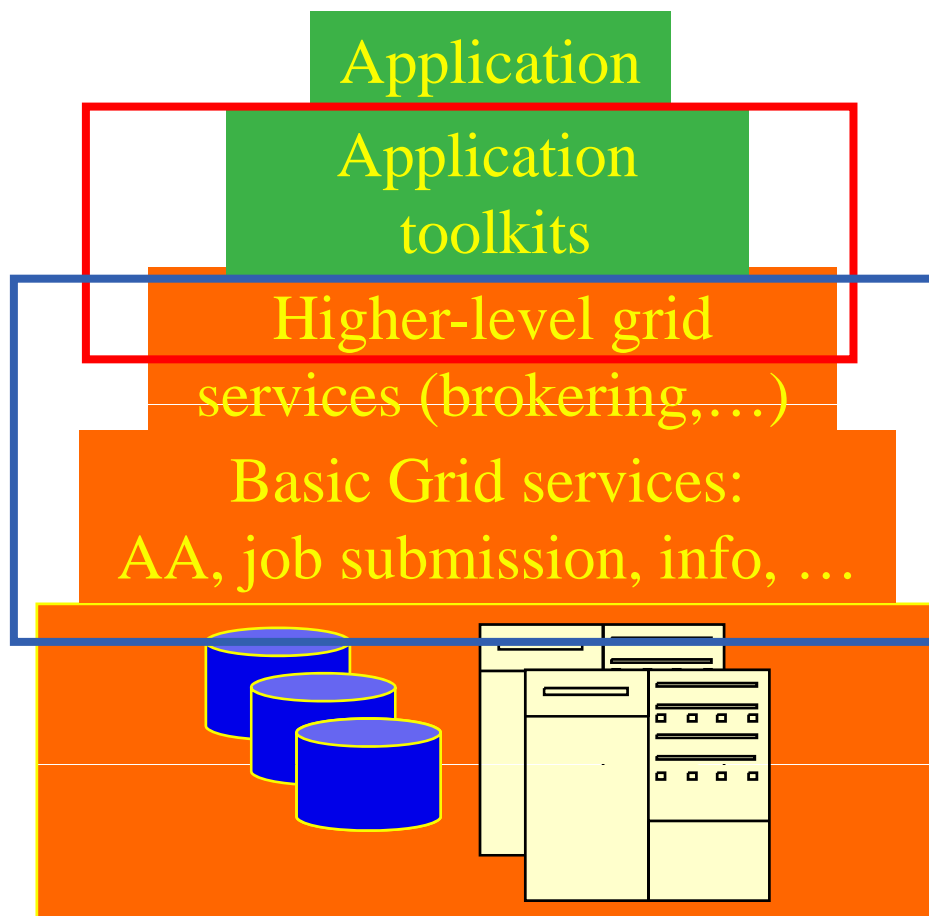
“VO”: virtual organisation

“Grid operations”: funded effort



- **Access for applications to:**
  - Higher-level Grid Services
  - Foundation Grid Middleware
- **Higher-Level Grid Services are supposed to help the users building their computing infrastructure but should not be mandatory**
- **Foundation Grid Middleware will be deployed on the EGEE infrastructure**
  - Must be complete and robust
  - Should allow interoperation with other major grid infrastructures
  - Should not assume the use of Higher-Level Grid Services

Overview paper <http://doc.cern.ch/archive/electronic/egee/tr/egee-tr-2006-001.pdf>



**Where computer science meets the application communities!**

**High level toolkits and services:**

- Portals – P-GRADE
- Job management – Ganga
- Alternative WMS - GridWAY
- Workflow
- Semantics, ontologies
- Registries of VO services

**Production grids provide these services.**

- **EGEE digital library:** <http://egee.lib.ed.ac.uk/>
- **EGEE** [www.eu-egee.org](http://www.eu-egee.org)
- **gLite** <http://www.glite.org>

- **EGEE is running the largest multi-VO grid in the world!**
- **Creating the “grid layer” in e-Infrastructure for research, public service and industry**
- **Key concepts for EGEE**
  - Sustainability – planning for the long-term
  - Production quality
- **EGEE’s middleware: gLite**