Future Directions

The INFNGrid Project Team

Partly based on input of the EU DataGrid Project (http://www.edg.org)

Overview

- Where are projects going?
  - How to preserve the work done in DataGrid after the project ends
  - EGEE
- Web Services and Open Grid Services Architecture
  - Where Grid computing is heading in the coming years

EU DataGrid and other projects

Interaction with Sister Projects

- CrossGrid
  - Using the same security certs.
  - Testbed sites install EDG software
    - Extending it for needs of intensive interactive applications
  - Participating in the EDG testing activities
  - Representatives in each projects architecture & management groups

- DataTAG (EDT)
  - EDT is deploying EDG sw to investigate inter-operability with US projects (iVDGL, GriPhyN, PPDG)
  - Results feedback into EDG software releases
    - (e.g. GLUE compatible information providers/consumers)

- NorduGrid
  - Using the same security certs.
  - Involved in EDG architecture work
    - Good ideas for gatekeeper and MDS configuration
    - Helped develop GDMP and GSI extensions for Replica Catalog
    - Involved in Glue schema work
    - Security policy
  - Mware testing
  - Working in WP8 (HEP applications)

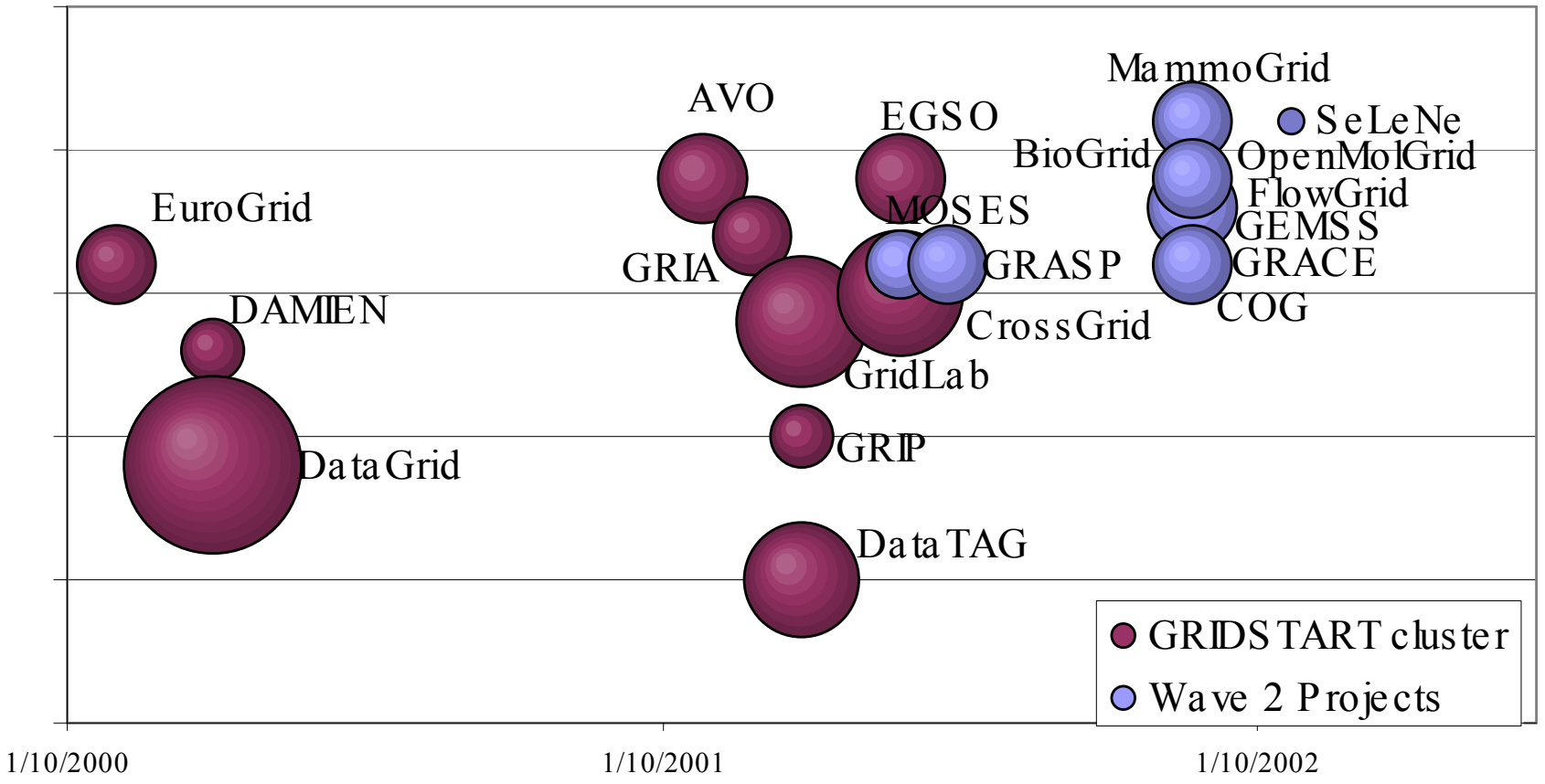
- iVDGL/GriPhyN/PPDG
  - Common underlying toolkit (VDT
  - US members in EDG architecture group
  - Looking for common packaging and toolkit usage solutions

No strict boundaries with a large cross-fertilization of ideas, software and people
DataGrid is learning from the experiences in these projects

Plans for the Future

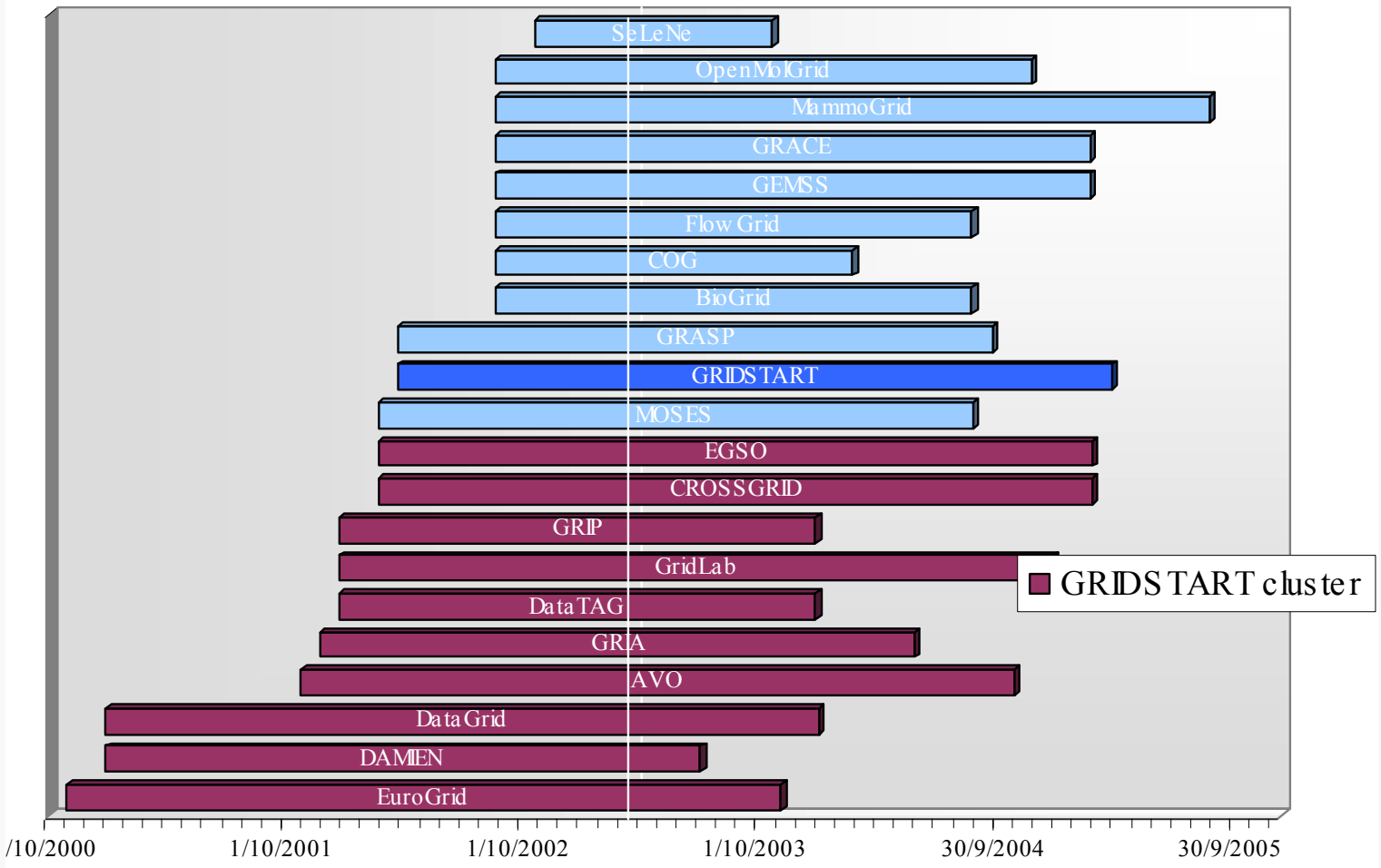
- Final review of EDG Project
  - February 2004
- Interaction with LHC Computing Grid (LCG)
  - LCG deploys LCG-2 January
  - Main components of EDG 2.1 release build the basis for LCG middleware
- New EU project
  - Based on the experience of existing grid projects to provide common grid infrastructure for multiple-sciences
    - **EGEE – Enabling Grids for E-Science in Europe**
    - http://www.cern.ch/egee

EU Funded Grid Projects (1)



Source: http://www.gridstart.org/download/GRIDSTART-IR-D2.2.1.2-V1.3.doc

EU Funded Grid Projects (2)



EU Funded Grid Projects (3)

- Globus vs. UNICORE
  - Globus 11 projects, UNICORE 5 projects
  - GRIP provides interoperability between them
- Local Resource Management Systems
  - Condor, LSF, PBS, SGE, LoadLeveler, Maui, ...
- Other tools, languages, protocols
  - CondorG, DAGMan, gridmapdir, NWS, ...
  - ClassAds, XML, ...
  - SOAP, Globus and UNICORE protocols, ...

EGEE: Goals

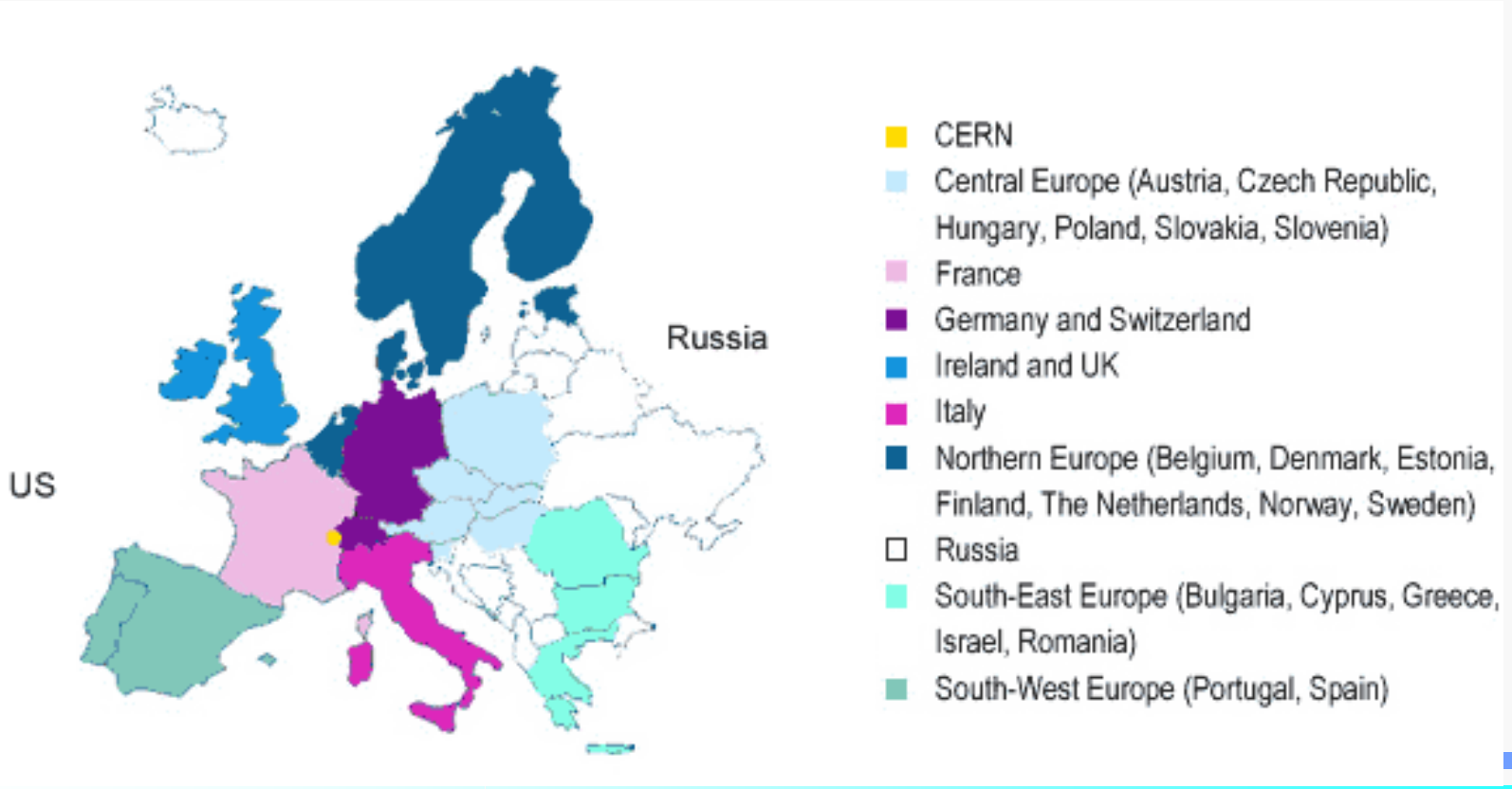
- Create a wide European Grid production quality infrastructure on top of present and future EU RN infrastructure
- Provide distributed European research communities with "round-the-clock" access to major computing resources, independent of geographic location
- Change of emphasis from grid development to grid deployment
- Support many application domains with one large-scale infrastructure that will attract new resources over time
- Provide training and support for end-users

EGEE: Strategy

- Leverage current and planned national and regional Grid programmes, building on
  - the **results of existing projects** such as DataGrid and others
  - the EU Research Network **Geant** and work closely with relevant industrial Grid developers and **NRENs**
- Support Grid computing needs common to the different communities
  - **integrate** the computing infrastructures and agree on **common access policies**
- Exploit International connections (US and AP)
  - Provide interoperability with other major Grid initiatives such as the US NSF Cyberinfrastructure, establishing a **worldwide Grid infrastructure**

EGEE: Partners

- Leverage national resources in a more effective way for broader European benefit
- 70 leading institutions in 27 countries organised into regional federations



EGEE Service Activity (II)

Resource Centers

Month 1: 10 RCs

Month 15: 20 RCs

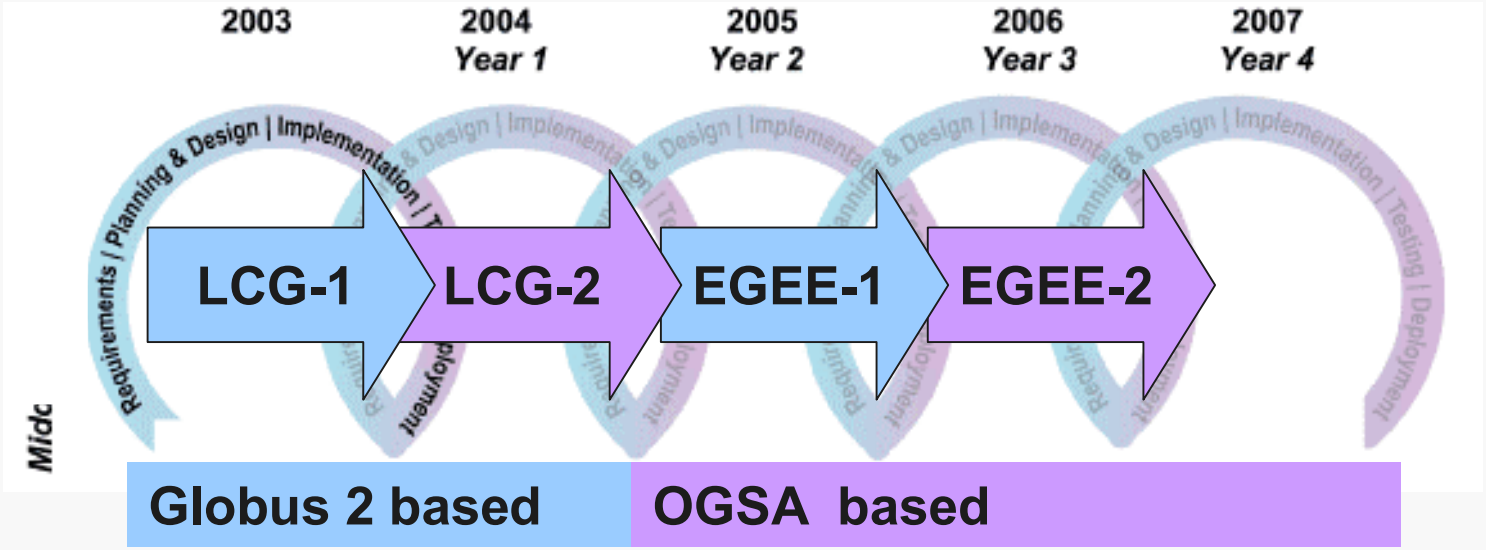
Region	CPU nodes	Disk (TB)	CPU Nodes Month 15	Disk (TB) Month 15
CERN	900	140	1800	310
UK + Ireland	100	25	2200	300
France	400	15	895	50
Italy	553	60.6	679	67.2
North	200	20	2000	50
South West	250	10	250	10
Germany + Switzerland	100	2	400	67
South East	146	7	322	14
Central Europe	385	15	730	32
Russia	50	7	152	36
Totals	**3084**	**302**	**8768**	**936**

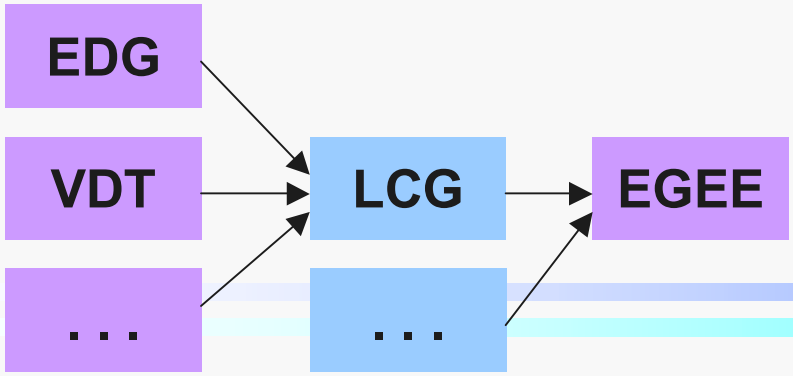
RCs are not funded via the project
Expect to attract many more RCs

EGEE and LCG (II)

LCG Deployment Manager will be the EGEE Operations Manager

Production Middleware deployment in EGEE





Grid Technologies

Open Grid Service Architecture (OGSA)

- Defined in Physiology of the Grid
  - http://www.globus.org/research/papers/ogsa.pdf
  - Original version of the proposal by
    Ian Foster, Carl Kesselman, Jeffrey M. Nick, Steven Tuecke
- Grid Services
  - Need for Virtual Organisations
  - General standard for Grid services:
    - Web service that provides a set of well-defined interfaces and that follows specific conventions
- Now: Standardisation work in Global Grid Forum working group
  - Base for OGSA is called *Open Grid Services Infrastructure (OGSI)*
  - http://www.gridforum.org/ogsi-wg/

OGSA Concepts

- Naming and bindings
  - Every service instance has a unique name, from which can discover supported bindings
- Information model
  - Service data associated with Grid service instances, operations for accessing this info
- Lifecycle
  - Service instances created by factories
  - Destroyed explicitly or via soft state
  - Transient service
- Notification
  - Interfaces for registering interest and delivering notifications

OGSA Features vs. Web Services

- Web Services is a conceptual framework to access services to build dynamic applications over the Internet, have them executed
- Dynamic (in the WS scheme) means here we do not necessarily know the format of all the information which will be involved along the path done by our application while executing, but we will access this information anyhow. This is done through **a query to the UDDI directory**.
- OGSA is further concerned by
  - The **creation of transient instances of web services**,
  - The management of service instances, to address the real issue of creating and destroying dynamically accessible interfaces to the states of distributed activities.

The Web Service architecture

- Three primary players , pillars
  - 1. Providers of the services
  - 2. Directory functions, i.e. Service Broker
  - 3. Service Requester

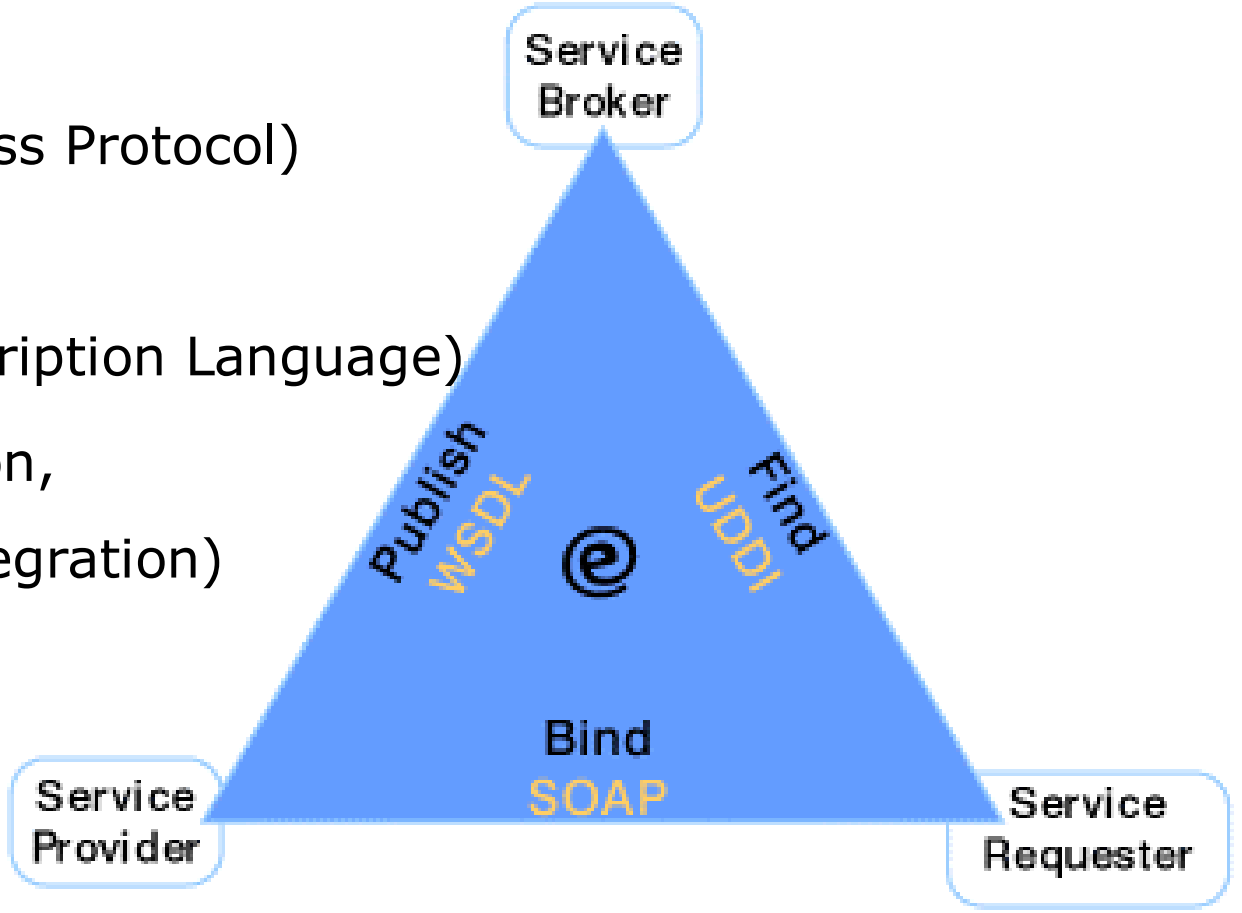
SOAP (Simple Object Access Protocol)

interconnects 1,2,3

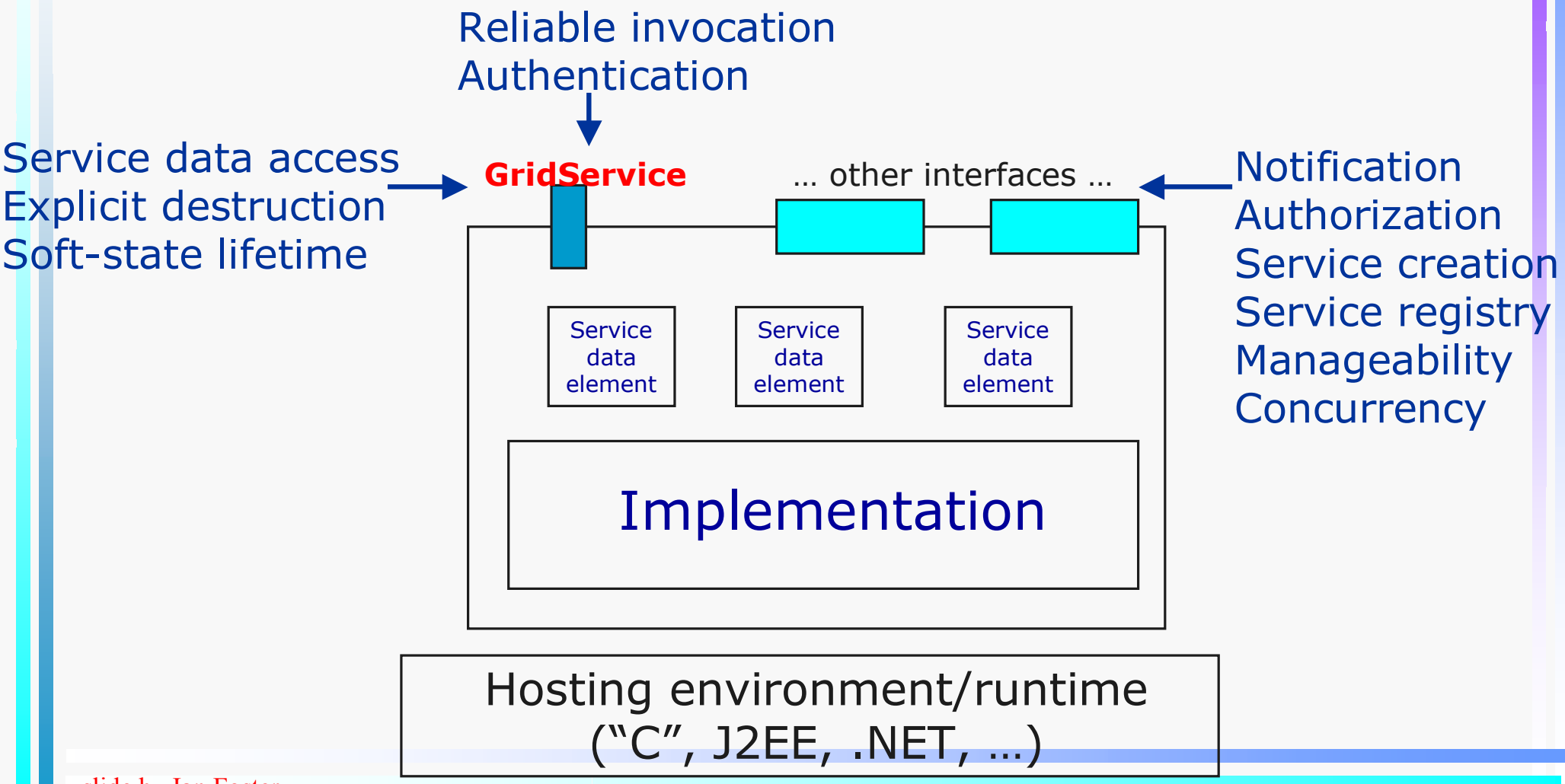
WSDL (Web Services Description Language)

UDDI (Universal Description,

Discovery & Integration)



The Grid Service = Interfaces + Service Data



slide by Ian Foster

Usage of OGSA (OGSI) - Future

- Currently: Globus has provided a first release
  - http://www.globus.org/ogsa/
  - Open for preliminary testing and exploring
- Supposed to be stable by end of year
- Several Grid projects and Industry invest into OGSA
  - Web services in general seem to be the current trend
  - Industry partners like IBM support Globus in implementing the standard
  - Many Grid projects currently think of a way of using OGSA or getting ready to adapt the standard
- For EU DataGrid OGSA is not applicable within the lifetime of the project but several services are already prepared to be OGSA compliant in the future
- However, WSRF (Web Service Resource Framework) was announced middle of Jan. 2004

Predicting the future …

- If I could do so, I'd not be here ☺
- Several (EU funded) projects available that will develop and deploy Grid middleware and applications
  - The Grid is not ready yet
- OGSA was the big trend until a week ago
  - Now WSRF seems to take over
  - However, not yet clear what community will do
  - Web services will most probably dominate the market
    - Currently the trend in may fields of computer science

OGSA and DataGrid

- Next major version of Globus toolkit (version 3) will be based on WSRF structure
  - Will be called Globus Toolkit 4
- DataGrid members are participating to the OGSA specifications
- Mapping between existing DataGrid middleware components and OGSA and being defined and we are following closely the evolution of OGSA
- EGEE plans to 'OGSAfy' existing EDG mware

Outlook

- The EDG work now finished
  - Support for release 2.x
  - Applications evaluated in December 2003
  - Final review February 2004 (project ends March 2004)
- The project is following the development of the OGSA paradigm for distributed computing.
- EDG mware has been taken over by other projects
- EGEE follow-up project to produce common Grid infrastructure for multiple-sciences