

EU Projects



SWITCH

Serving Swiss Universities

Christoph Witzig

christoph.witzig@switch.ch



Outline

- EU Projects
- Grid Projects in ERA
- EGEE, EGI, EMI
- Outlook

Slides: Courtesy of A. di Meglio, T.Ferrari, B.Jones, D.Kranzlmüller, S.Newhouse

EU



- “Europe will not be built all at once, or as a single whole: it will be built by concrete achievements which first create de facto solidarity”

Jean Monnet (quoted in economist Sept 3, 2011, pg 26)

- 1951: Treaty of Paris (ECSC)
- 1992: Maastricht Treaty
 - European Community → European Union



Framework Program (FPx)

- Framework programs for research and technological development in order to support and encourage research in the European Research Area (ERA)
 - Objectives and actions vary between funding periods

FP	Period	Budget [€ bn]
1	1984 – 1988	3.75
5	1998 – 2002	14.9
6	2002 – 2006	17.9
7	2007 – 2013	50.5
8	2014 – 2020	~80

FP7



- **Comprises several programs**
 - **Cooperation** → collaboration industry/academia in key technology areas: (€ 32.4bn)
 - **Ideas** → supporting basic research (implemented by the European Research Council): (€ 7.5bn)
 - **People** → supporting mobility and career development for researchers inside/outside Europe: (€ 4.7bn)
 - **Capacities** → for research and innovation for knowledge-based economy: (€ 4.0bn)
 - **Nuclear research (Euratom)** → fission/fusion research: (€ 2.7bn)

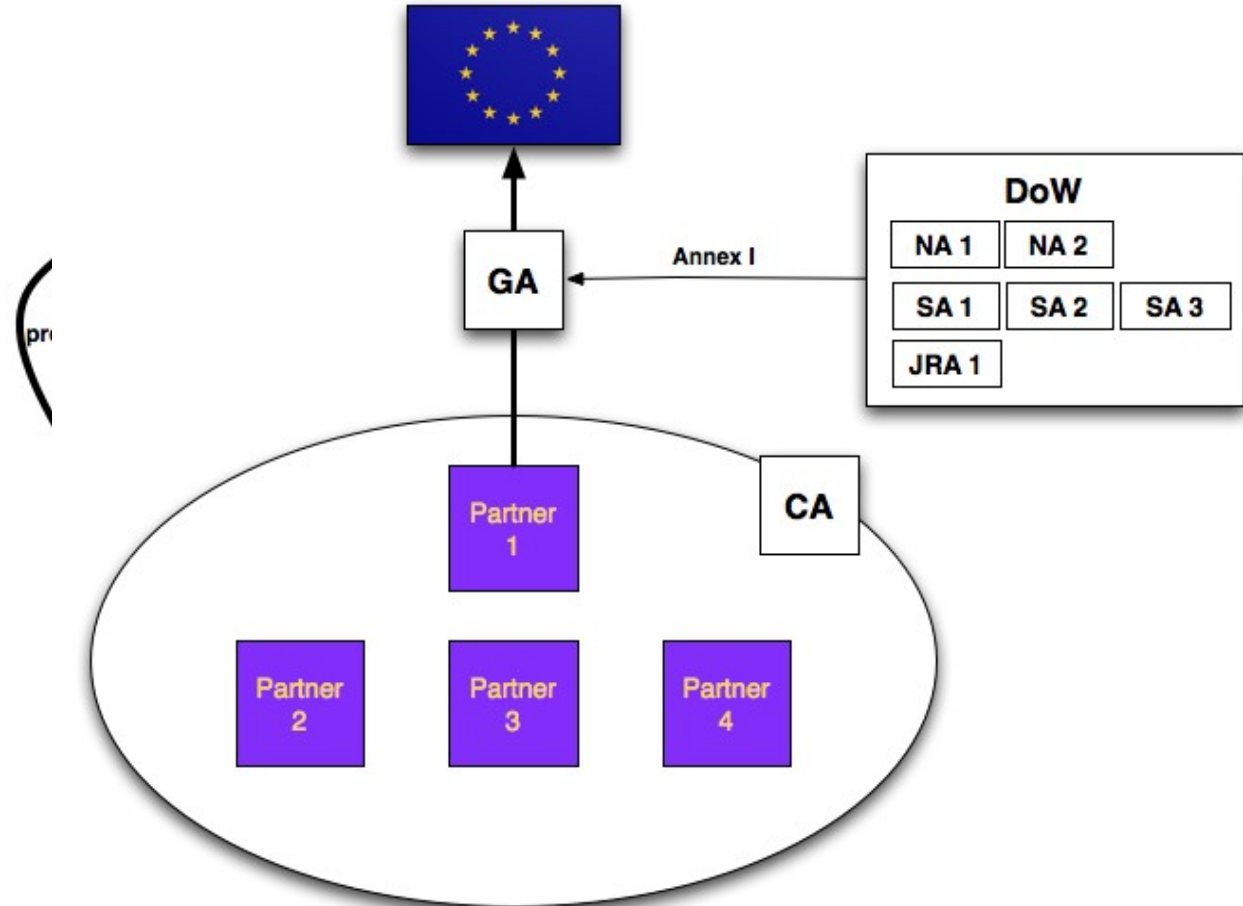
e-infrastructures



- ICT-based infrastructures and services across broad range of user disciplines
 - High-capacity and high-performance network (GEANT)
 - Distributed computing infrastructures
 - Supercomputing infrastructures
 - Simulation software
 - Scientific data infrastructures
 - a.o.
- Budget: (€ 1.8bn)
- ESFRI: European Strategy Forum on Research Infrastructures



EU Project Setup



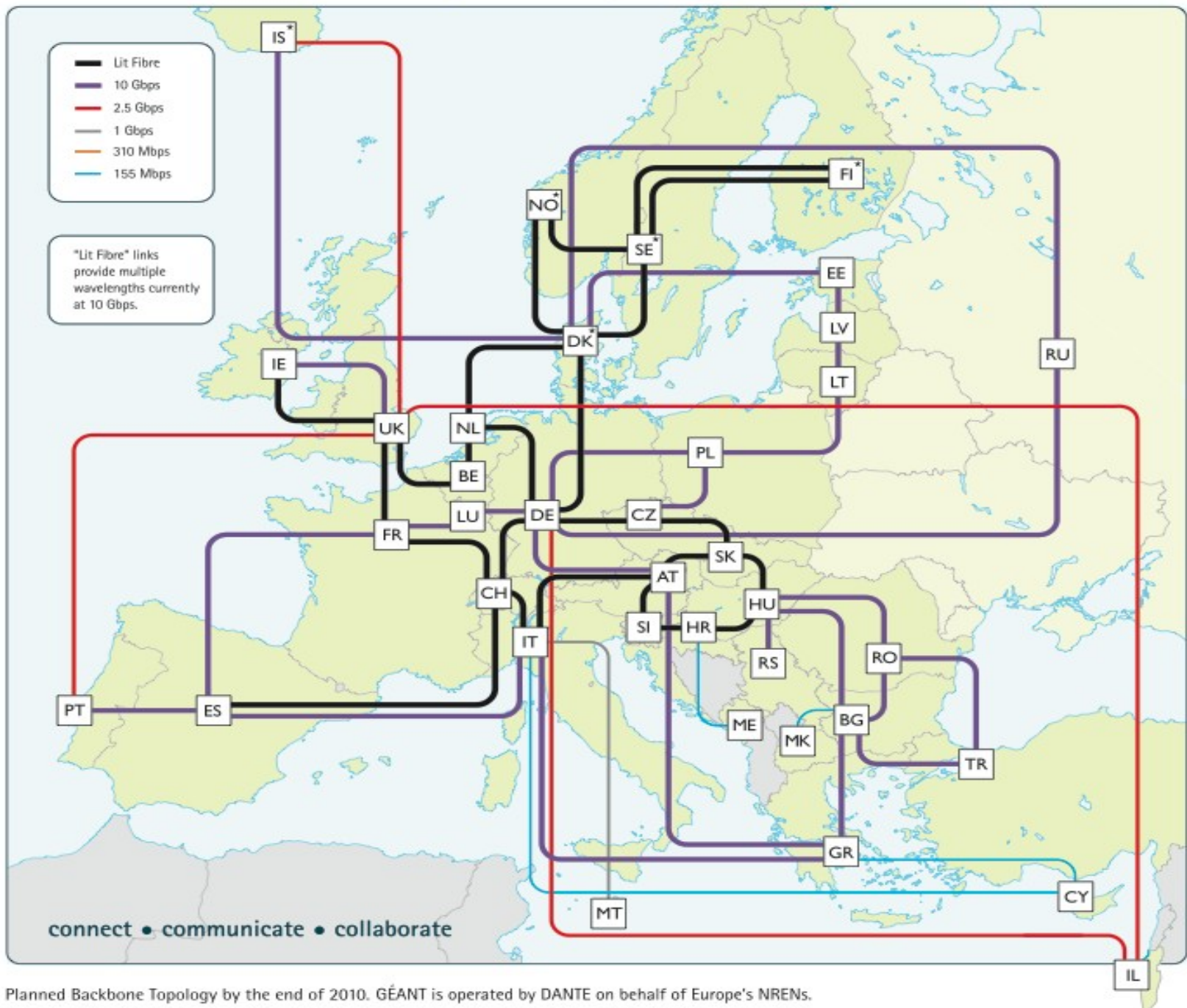
Outline

- EU Projects
- **Grid Projects in ERA**
- EGEE, EGI, EMI
- Outlook

Networking in ERA (1/2)

- Every country has its NREN
 - National Research and Education Network
 - Germany: DFN
 - Switzerland: SWITCH

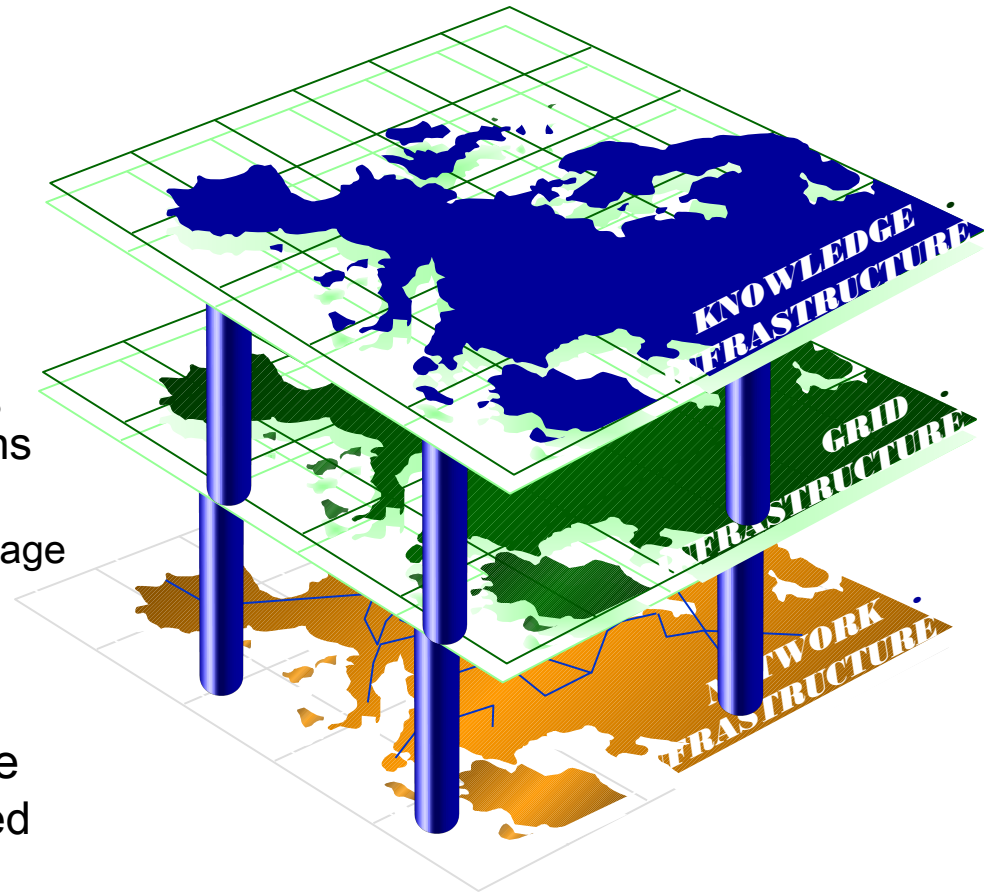
- Terena:
 - Association of NRENs
 - Forum to collaborate, innovate and share knowledge



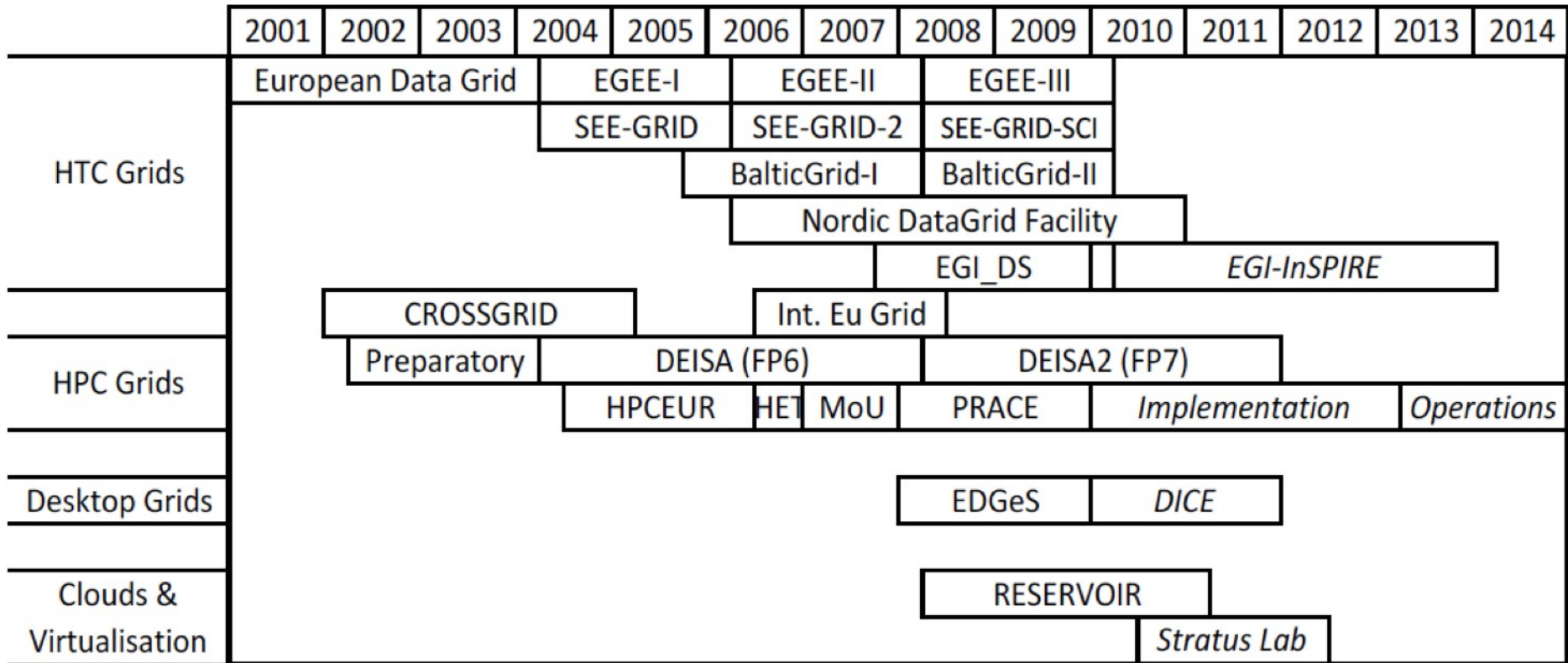
Planned Backbone Topology by the end of 2010. GÉANT is operated by DANTE on behalf of Europe's NRENs.

How Cyber-Infrastructures help e-Science

- Cyber-Infrastructures provide easier access for
 - Small research groups
 - Scientists from many different fields
 - Remote and still developing countries
- To new technologies
 - Produce and store massive amounts of data
 - Transparent access to millions of files across different administrative domains
 - Low cost access to resources
 - Mobilise large amounts of CPU & storage on short notice (PC clusters)
 - High-end facilities (supercomputers)
- And help to find new ways to collaborate
 - Develops applications using distributed complex workflows
 - Eases distributed collaborations
 - Provides new ways of community building
 - Gives easier access to higher education

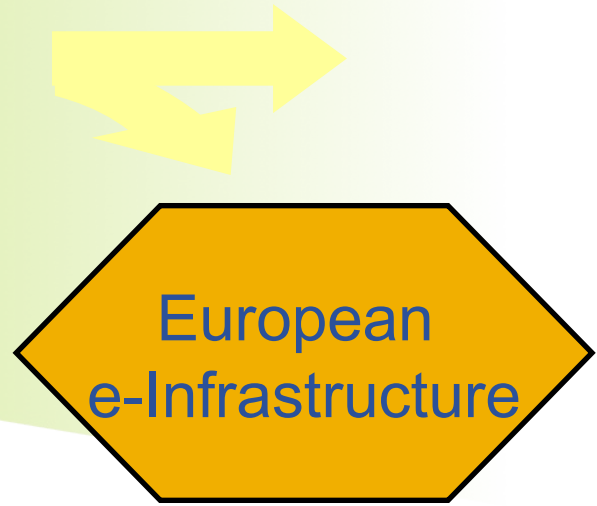


EU Grid Projects



Evolution of Grid Projects in Europe

National



Global



Testbeds

Routine Usage

Utility Service

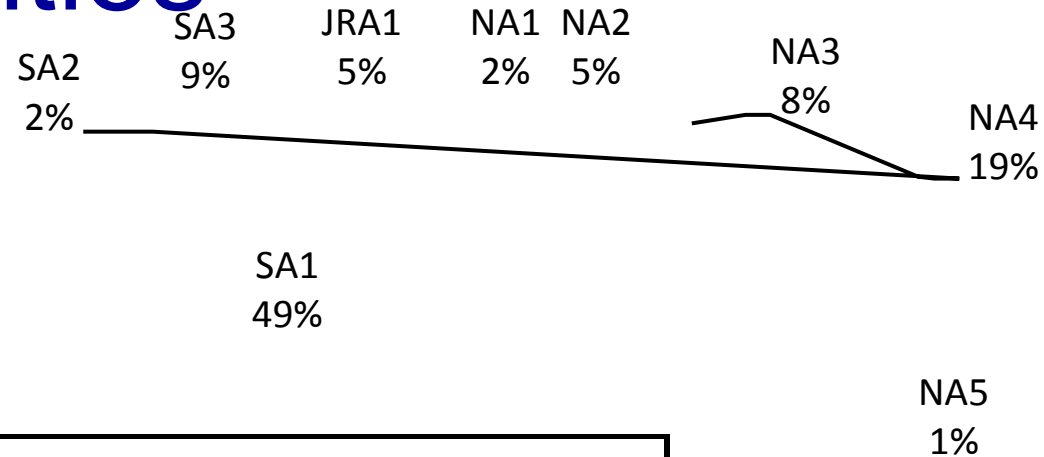
Outline

- EU Projects
- Grid Projects in ERA
- **EGEE, EGI, EMI**
- Outlook

EGEE-III

- EGEE-III
 - Co-funded under European Commission call INFRA-2007-1.2.3
 - 32M€ EC funds compared to ~37M € for EGEE-II
 - 9010 person months/375 FTEs (~20% less than EGEE-II)
 - 2 year period – 1 May 2008 to 30 April 2010
- Key objectives
 - Expand/optimize existing EGEE infrastructure, include more resources and user communities
 - Prepare migration from a project-based model to a sustainable federated infrastructure based on National Grid Initiatives
- Consortium
 - Structured on a national basis (National Grid Initiatives/Joint Research Units)
 - From 91 partners in EGEE-II (+ further 48 JRU members) to 42 beneficiaries in EGEE-III (+ 100 JRU members)

EGEE-III activities



NA1: Management Bob Jones, CERN	
NA2: Dissemination Hiring in progress, CERN	SA1: Operations Maite Baroso Lopez, CERN
NA3: Training Robin McConnell, UEDIN	SA2: Networking Support Xavier Jeannin, CNRS
NA4: Applications Cal Loomis, CNRS	SA3: Integration, testing & cert. Oliver Keeble, CERN
NA5: International Coop. & Policy Panos Louridas, GRNET	JRA1: Middleware engineering Francesco Giacomini, INFN

EGEE – What do we deliver?

- Infrastructure operation - ***Sites distributed across many countries***
 - Large quantity of CPUs and storage
 - Continuous monitoring of grid services & automated site configuration/management
 - Support multiple Virtual Organisations from diverse research disciplines
- Middleware - ***Production quality software distributed under business friendly open source licence***
 - Implements a service-oriented architecture that virtualises resources
 - Adheres to recommendations on web service inter-operability and evolving towards emerging standards
- User Support - ***Managed process from first contact through to production usage***
 - Training
 - Expertise in grid-enabling applications
 - Online helpdesk
 - Dedicated support for specific disciplines
 - Networking events (User Forum, Conferences etc.) for cross-discipline interaction



Grid in Northern Europe (1/2)

- Nordugrid Collaboration

- 11 partners from 10 countries
- Development, distribution and support for ARC middleware



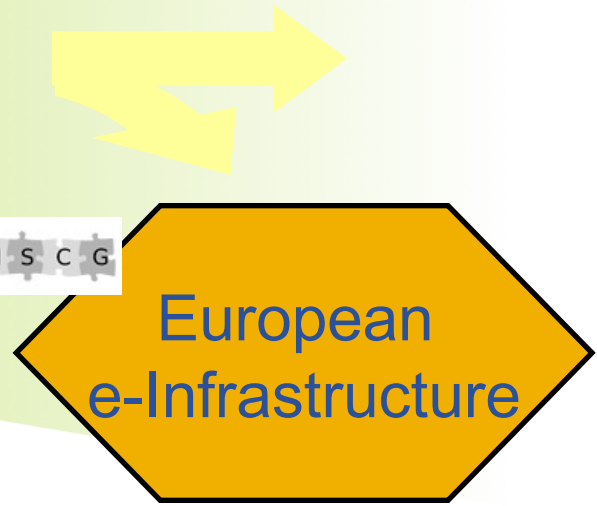
- KnowArc Project

- FP7
- 2006-2009
- 9 partners



Evolution of Grid Projects in Europe

National



Global



Testbeds

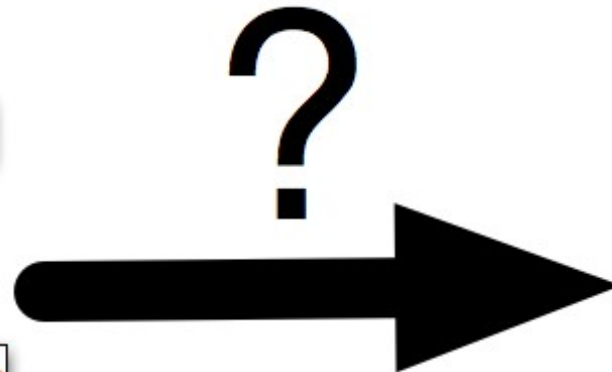
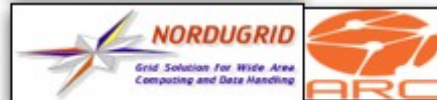
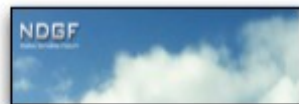
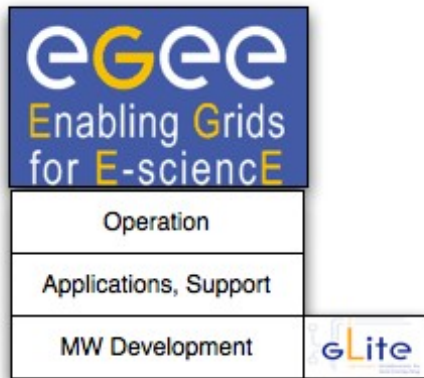
Routine Usage

Utility Service

Challenges at the end of EGEE

- **Project-based funding**: Typical funding cycles of today's grid infrastructures => 2-4 years
- **Protection of Investment**: Investments in grids, both from funding organizations and from users, need to be protected
- **Dependency**: Some application domains depend on production grids
- **Long-term perspective**: Grid users ask for a longer term perspective
- **Diversity**: Duplicate services, missing interoperability and standards, “fuzzy” separation software development – deployment/operation

Transition from EGEE --> EGI



Grids in Europe

www.eu-egi.eu

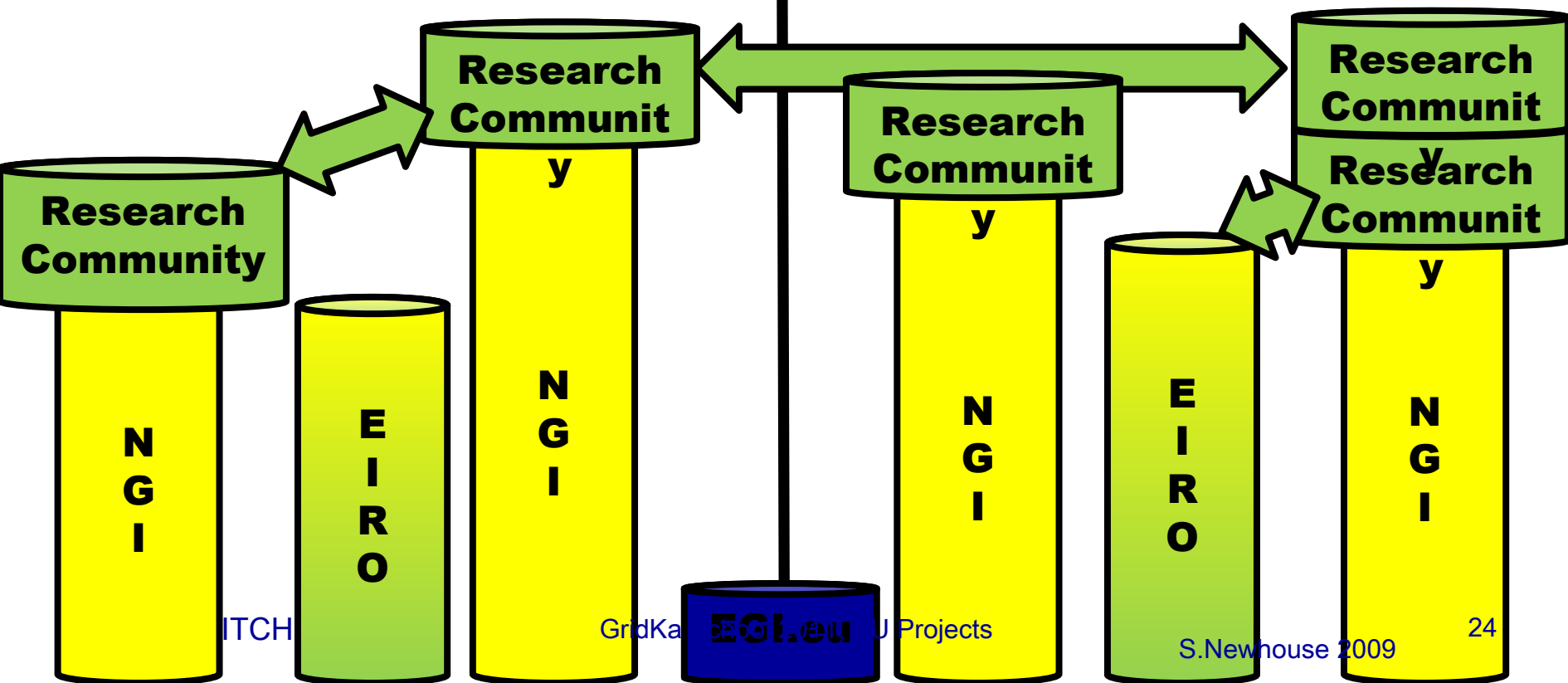


Each NGI

- ... should be a recognized national body with a **single point-of-contact**
- ... should mobilize national funding and resources
- ... should ensure the operation of a national e-Infrastructure
- ... should support user communities
- ... should contribute and adhere to intl. standards and policies



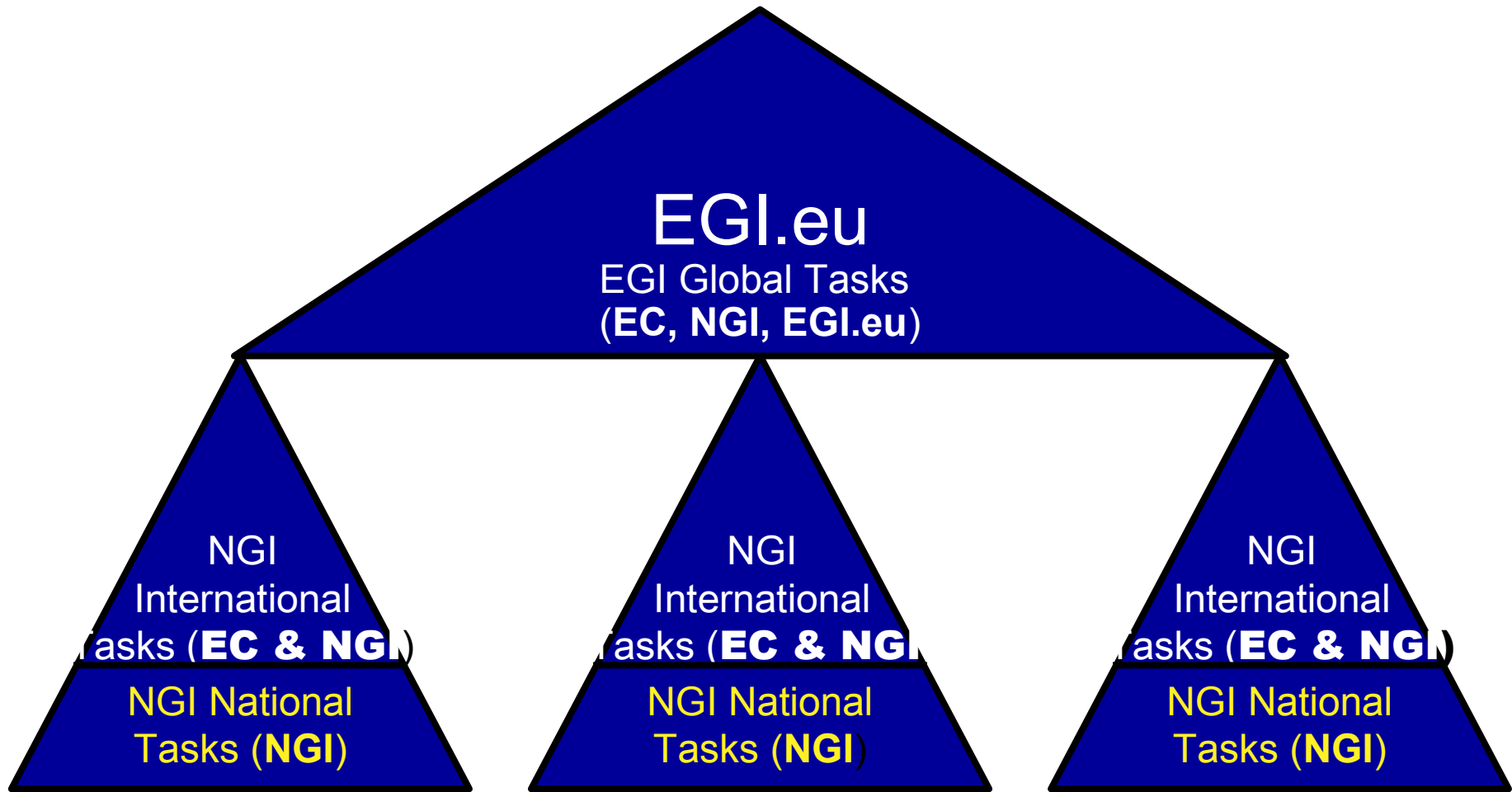
EGI Collaboration



EGL.eu

- Coordination for European Grid resources
 - Roadmap to integrate HTC, HPC, Data, Instruments, ...
 - Policy & services needed to run a grid
- Governance & ownership by its stakeholders
 - EGL Council votes proportional to GDP
 - EGL Council fees proportional to votes
 - Sustainable small coordinating organisation (EGL.eu)
 - Builds on resources from within its stakeholders
- Foundation located in Amsterdam
 - Distributed staff with a core (currently ~20) in Amsterdam

Relationship between NGIs & EGI



26

EGI-InSPIRE Project



Integrated **S**ustainable **P**an-European
Infrastructure for **R**esearchers in **E**urope

- A 4-year project with
€25M EC contribution
- Project cost €72M
 - Total Effort ~€330M
 - Effort: 9261PMs

Project Partners (50)

EGI.eu, 38 NGIs, 2 EIROs

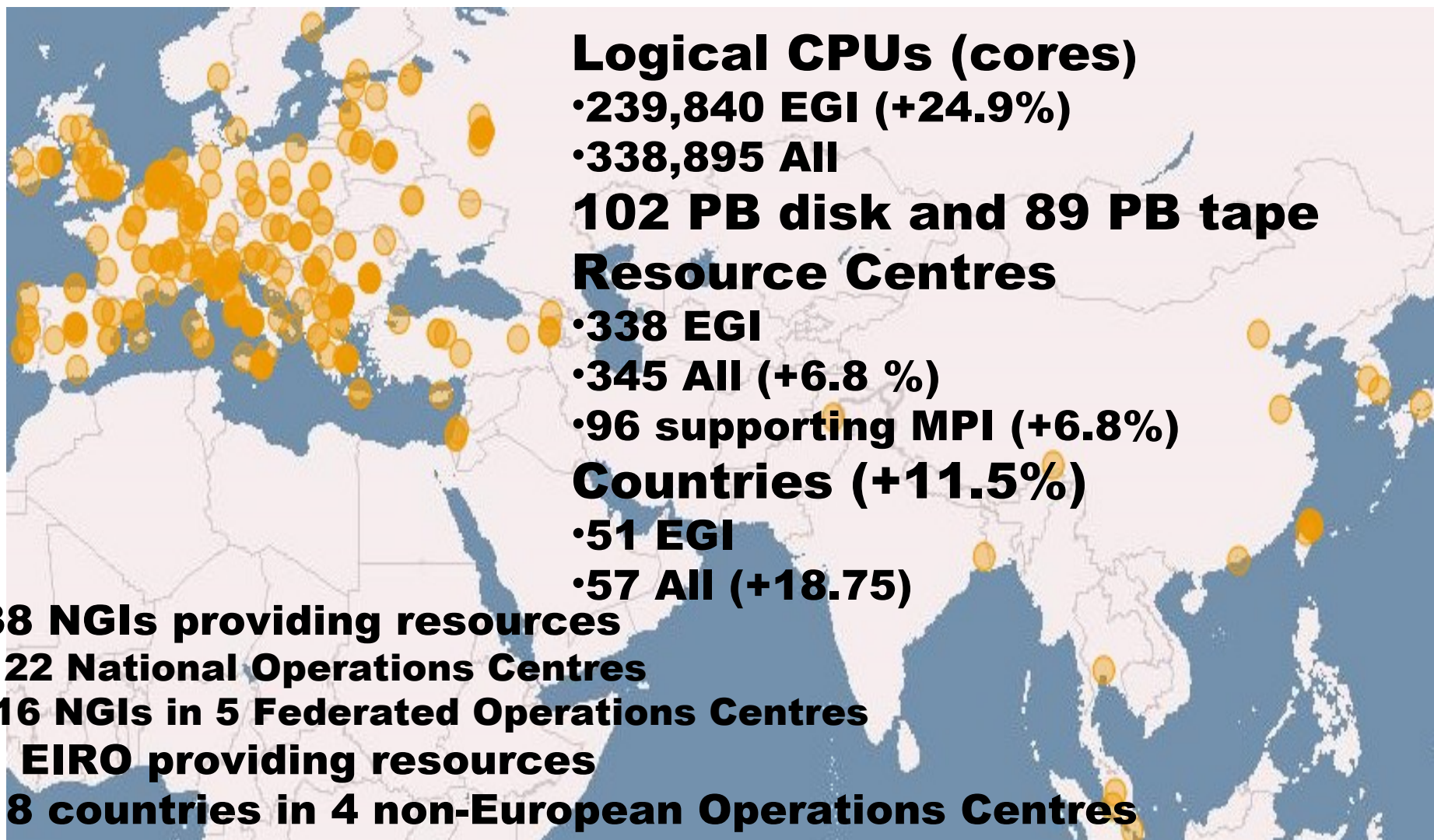
Asia Pacific (9 unfunded partners)



Project Goals

- Operating a sustainable production infrastructure
 - Evolve infrastructure to new technologies
- Support international research
 - Support services for existing users
 - Attract new user communities
 - e.g. ESFRI - European Strategic Forum on Research Infrastructures

European Grid Infrastructure



Logical CPUs (cores)

•239,840 EGI (+24.9%)

•338,895 All

102 PB disk and 89 PB tape

Resource Centres

•338 EGI

•345 All (+6.8 %)

•96 supporting MPI (+6.8%)

Countries (+11.5%)

•51 EGI

•57 All (+18.75)

38 NGIs providing resources

• 22 National Operations Centres

•16 NGIs in 5 Federated Operations Centres

1 EIRO providing resources

18 countries in 4 non-European Operations Centres

EGI Usage (April 2011)

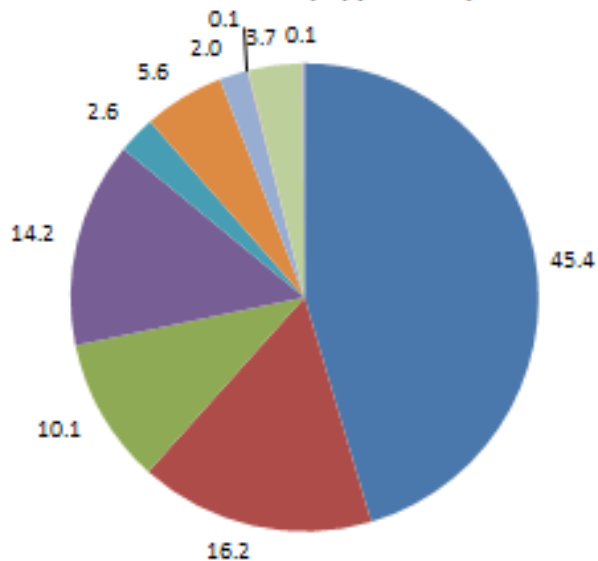
Average usage 2010-2011 vs 2009-2010

- 27.8M jobs/month, 914,000 jobs/day (+82%)
- 74.8M CPU wall clock hours/month (+35%)
- 2.8M jobs/month for non-HEP users (+47%)

Year to Year Increase

- 18,271 End-users (+47%)
- 219 VOs (+17.7%)
- ~30 high activity VOs (no change)

User distribution (%) per discipline



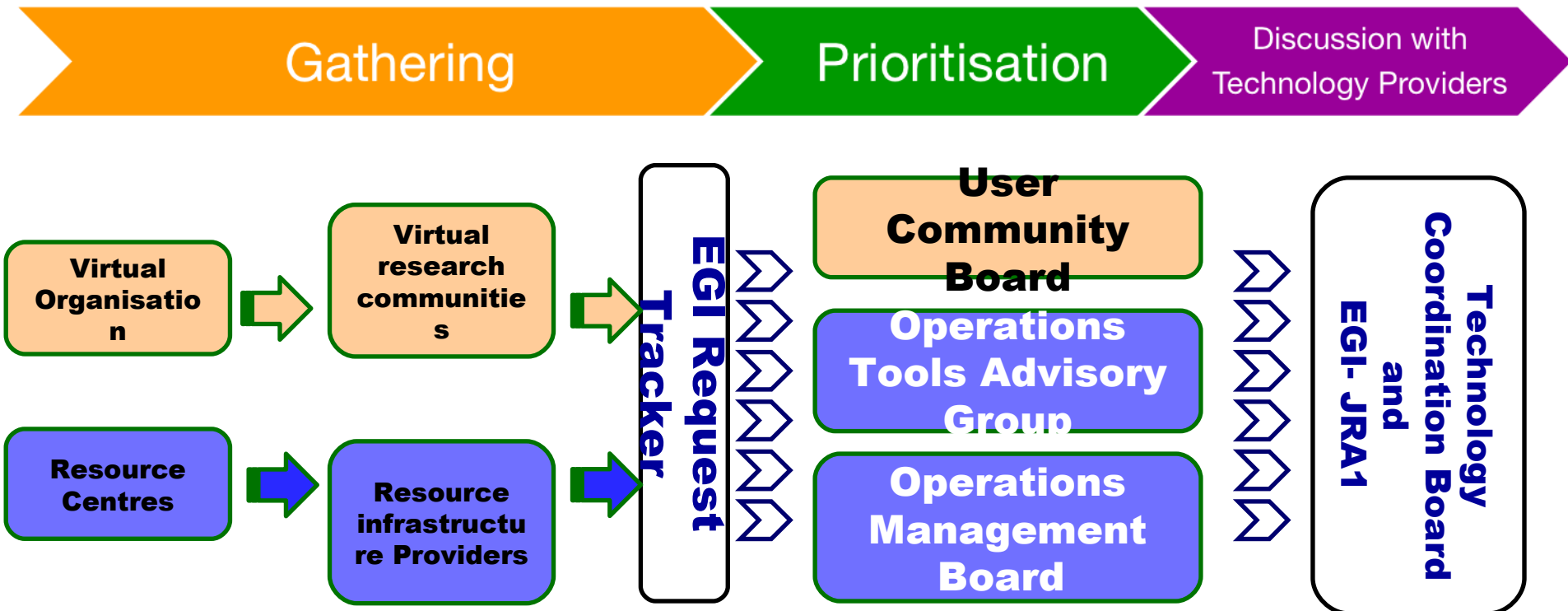
User Communities

- | | |
|------------------|---------------------|
| Archeology | Fusion |
| Astronomy | Geophysics |
| Astrophysics | High Energy Physics |
| Civil Protection | Life Sciences |
| Comp. Chemistry | Multimedia |
| Earth Sciences | Material Sciences |
| Finance | ... |

- High-Energy Physics
- Multidisciplinary VOs
- Astronomy Astrophysics Astro Particle Physics
- Earth Sciences
- Comp. Chemistry
- Others
- Infrastructure
- Life Sciences
- Computer science and mathematics
- Fusion

EGI Requirements Gathering

New process for requirements gathering (tools and deployed software) every 3 months



Staged Rollout

- **New** software updates (grid middleware and tools) are deployed into the production infrastructure incrementally through a **staged rollout** to ensure that they are reliable in actual use, following successful verification of the software component against published criteria
- **Early Adopters** are the **production** Resource Centres willing to deploy one or more new releases
 - automation of the process based on RT
 - process tested with the validation of gLite 3.1/3.2 releases and SAM

Achievements	Value
Max number of components tested/rejected in staged rollout per PQ	29/3
Max number of staged rollout tests undertaken	40 (PQ4)
Number of EA teams	45
Middleware stacks/components	ARC, gLite, UNICORE, SAM, CA trust chain, GLOBUS - in progress

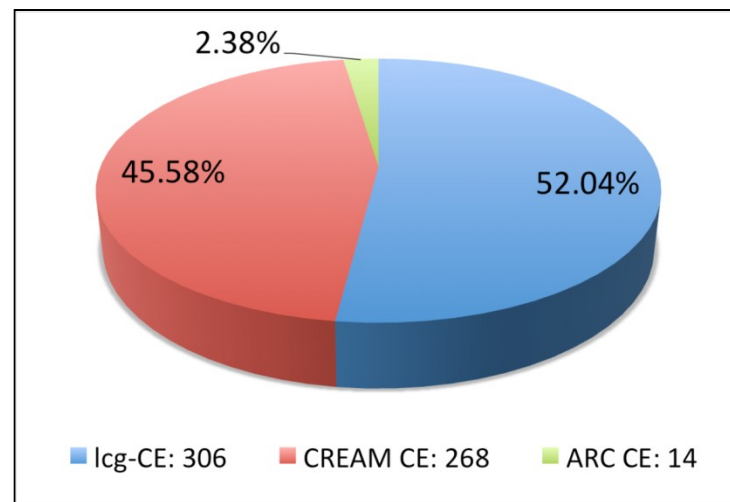
Interoperability

- Deployed middleware

- ARC (2.38%), gLite (97.62%), UNICORE (1 RC)
- more ARC and UNICORE installations expected in 2011
- Croatia, Germany, Poland, Romania, The Netherlands, UK integrating GLOBUS and/or UNICORE → GLOBUS and UNICORE task forces

- Accomplishments

- ARC fully integrated in to GOCDB, accounting and SAM
- integration of UNICORE and GLOBUS in progress
- Open Grid Forum
 - Production Grid Infrastructure WG
 - Grid Interoperability Now WG
 - Infrastructure Policy Group



Operational security

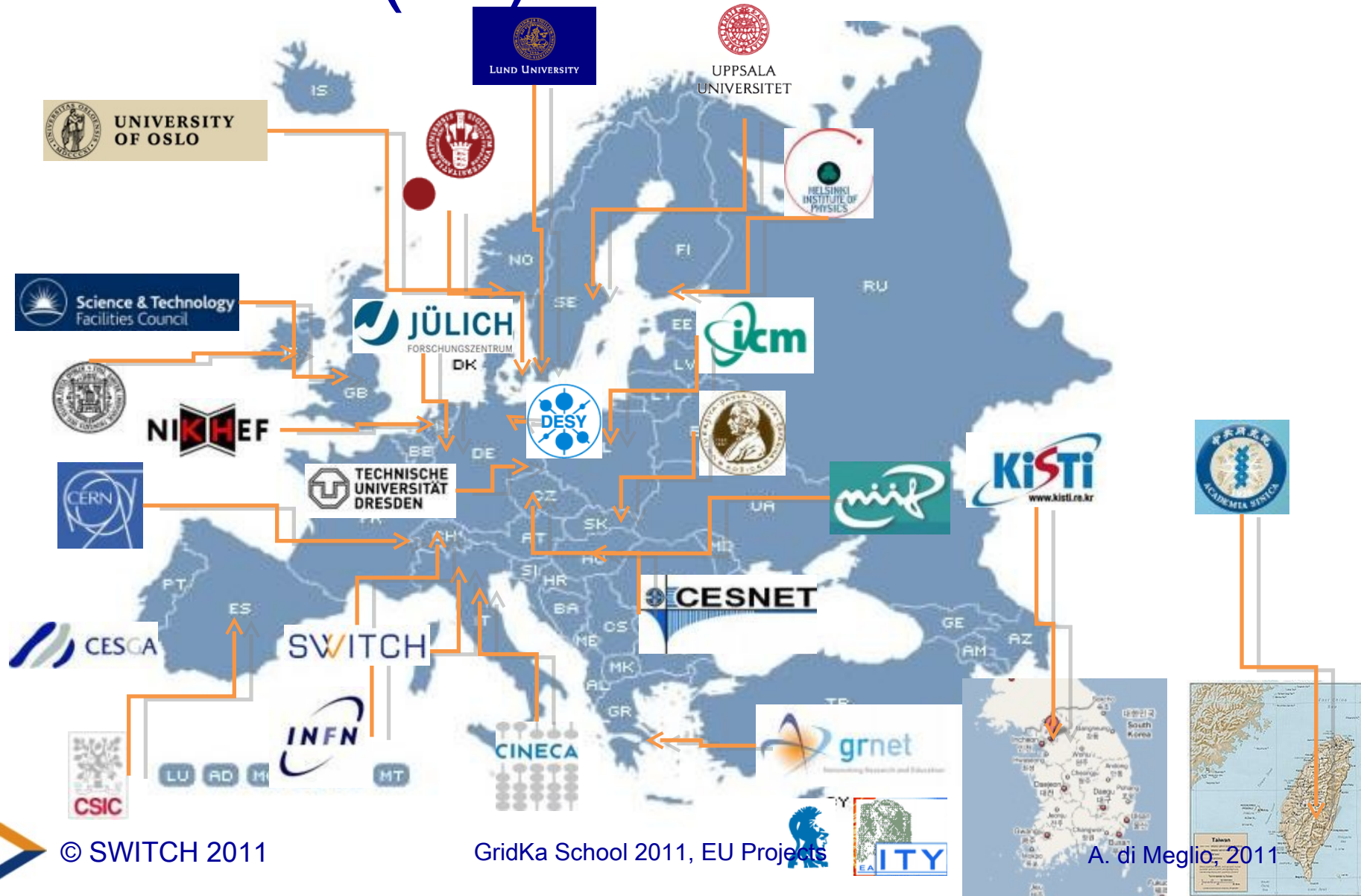
	Achievements
<ul style="list-style-type: none"> Handling potential reported vulnerabilities Vulnerability assessment Secure coding education 	Security Service Challenge 4 → 13 RCs tested (including WLCG Tier1 sites) 9 security incidents handled 12 advisories issued (3 critical) 3 critical vulnerabilities mitigated within 7 days 1 security training session (EGLTF)
SVG	29 software vulnerabilities reported → 15 concerning Grid middleware → 4 fixed (others have not passed their Target Date yet)
Procedures	3 new procedures Software vulnerability handling Critical vulnerability handling Security incident (exploited vulnerability) handling
Resource Centres suspended	0

What is EMI?

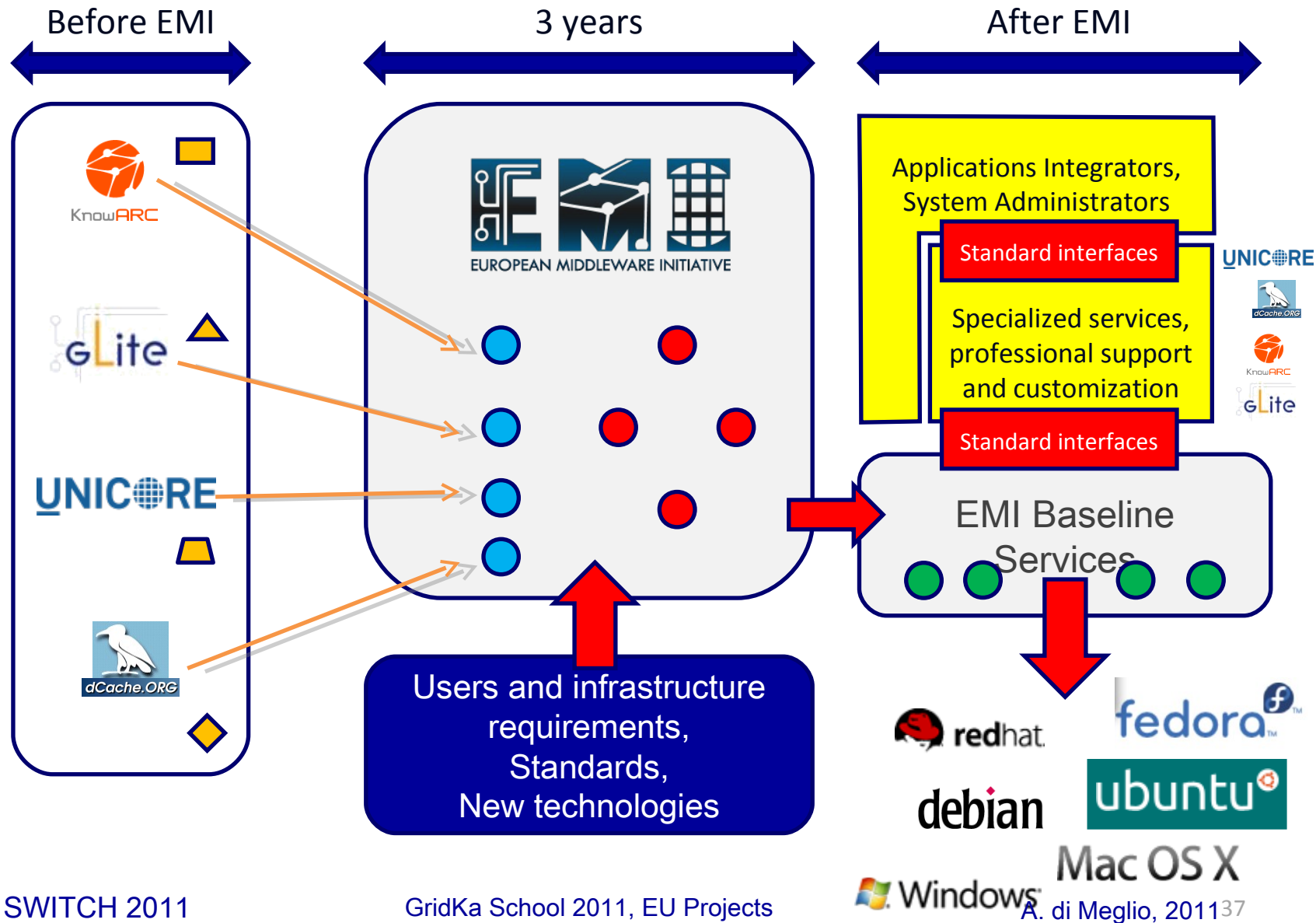
- European Middleware Initiative
- Collaboration among the four major European middleware providers
- Three-year project, 24 M EUR, 50% from the European Commission, 50% from the partner Institutes
- 26 partners
- Work in three major areas:
 - Consolidation of common libraries, clients, interfaces across the four MW stacks, decommissioning of unused services
 - Development of new functionality based on user requirements
 - User support



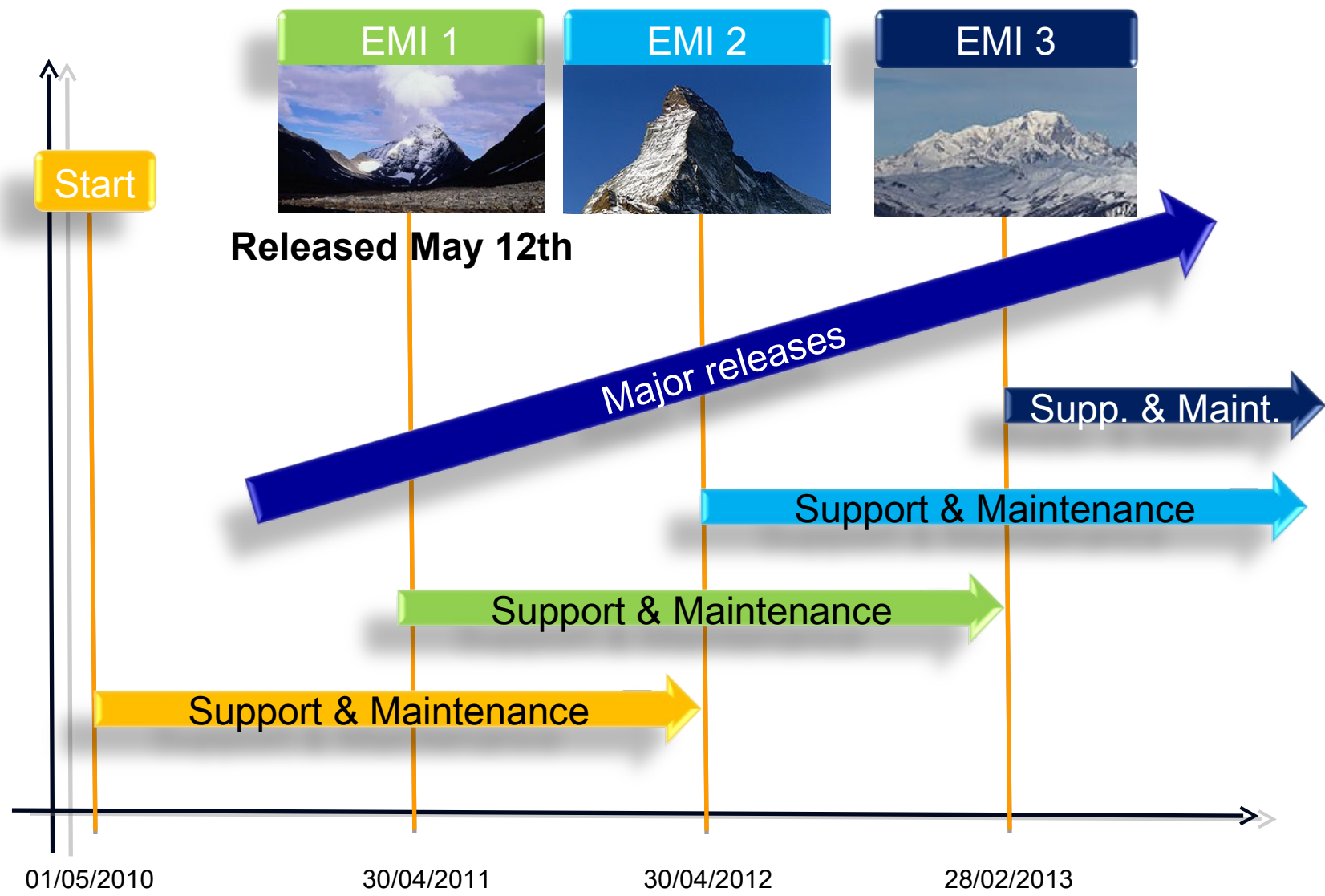
Partners (26)



EMI Middleware Evolution



EMI Release and Software Timeline



Technical Areas and PTs



Outline

- EU Projects
- Grid Projects in ERA
- EGEE, EGI, EMI
- **Outlook**

Outlook (1/3)

- Increase of large multi-national scientific collaborations in *all* scientific disciplines
 - Increase in complexity and cost of doing science
 - Computing demand will always be bigger than supply
- Increasing investment in e-Infrastructure / cyber-infrastructure
 - Two fundamental questions:
 - Single vs multi-science focus
 - What is the business model for these infrastructures?

Outlook (2/3)

- EU funding will
 - substantial for these infrastructures (ESFRI)
 - Focus on innovation rather than operation

The ESFRI roadmap

Identifies 44 new (or major upgrade of) Research Infrastructures of pan-European interest

The EC funds 3 additional projects from the CERN Council strategic roadmap for particle physics*

Social Sc. & Hum. (5)	Life Sciences (10)		Environmental Sciences (10)		Material and Analytical Facilities (6)	Physics and Astronomy (11)		Energy (4)	e-Infra-structures (1)
SHARE	BBMRI	ELIXIR	ICOS	EURO-ARGO	EUROFEL	ELI	TIARA *	ECCSEL	PRACE
European Social Survey	ECRIN	INFRA FRONTIER	LIFEWATCH	IAGOS	EMFL	PRINS	CTA	JHR	
CESSDA	INSTRUCT	EATRIS	EMSO	EPOS	European XFEL	SPIRAL2	SKA	IFMIF	
CLARIN	EU-OPENSREEN	EMBRC	SIAEOS	EISCAT_3D	ESRF Upgrade	E-ELT	FAIR	HiPER	
DARIAH	Euro Biolmaging	ERINHA BSL4 Lab	COPAL	AURORA BOREALIS	NEUTRON ESS	KM3NeT	ILC-HIGRADE *		
					ILL20/20 Upgrade	SLHC-PP *			

Distributed research infrastructures

Single sited research infrastructures

The term "distributed RI", as used by ESFRI, refers to a facility with one unique name and legal status, one management structure, one strategy and development plan, and having one annual report and fiscal address although its research facilities are located in different sites and different countries

Outlook (3/3)

- Trends:
 - Grid vs Cloud
 - Virtualization
 - Data management
 - Single sign on (→ federated identity)

Infrastructures take a long time to build
(and also a long time to replace)



Q & A