

DEISA Symposium
Bologna, 4-5 May 2006

EU e-Infrastructure plans for FP7

- The discussion on a new European Supercomputing policy -



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e-Infrastructure: <http://www.cordis.europa.eu.int/ist/rnl>

■ Role of EU investment on Research Infrastructures (RI)

- Each 1€ of public R&D leads to 93 cent of business R&D investment (FP7 Impact Analysis)
- Effect typically much bigger when investment concerns multiple purpose and cross-border RI (notably ICT)
 - Higher economic multiplier effect from trans-national collaboration
 - Lower investment risk through involvement of key research players and of broad range of expertise
 - Used and exploited by large community of scientists & industries
- Research increasingly based on cross-organisational, cross-national virtual collaborations...sharing of knowledge and resources through the use of appropriate facilities becomes key

The e-Infrastructure today



European Commission



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The e-Infrastructure today - strategic building blocks

production quality grid, 20000 CPUs, ~5PB storage, 500 sites, training, 27 countries, 71 partners, HEP, Biomed..., int. links (€32 M - CERN)

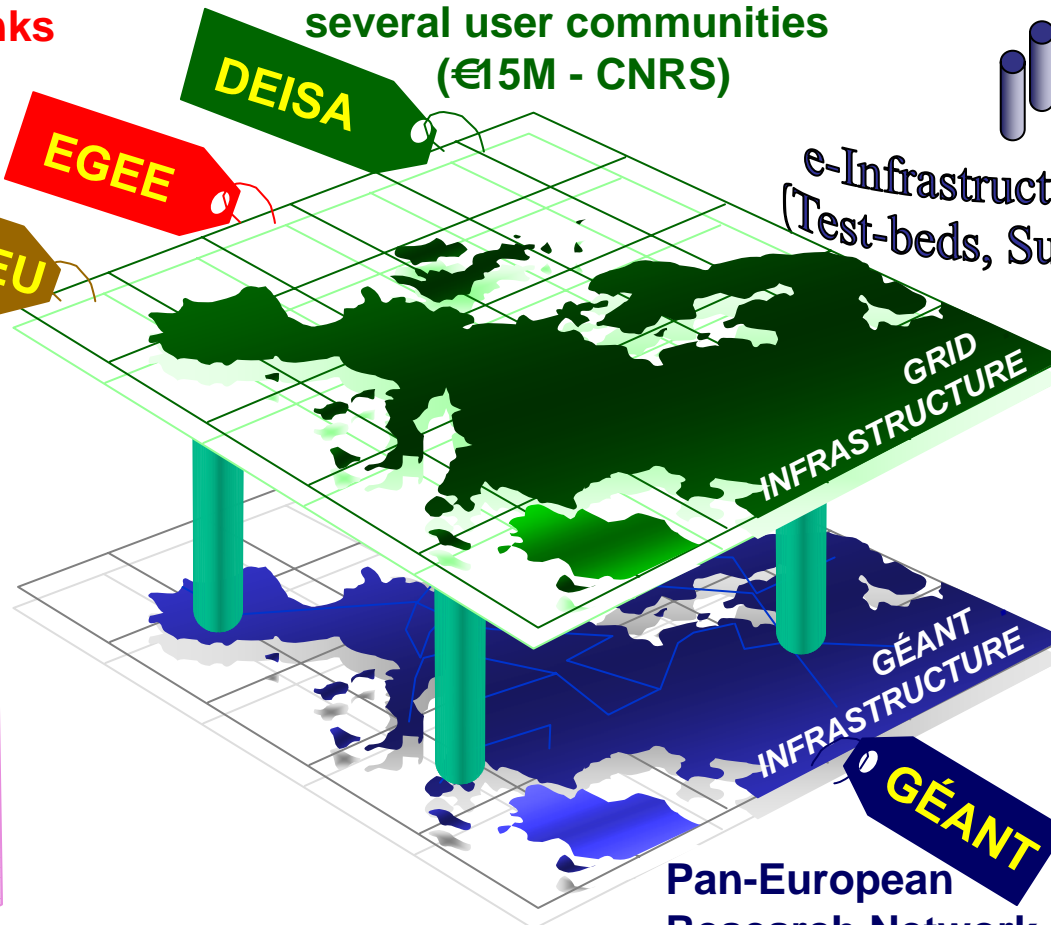
grid of EU supercomputers networked at Gbps, focus on global filing system, >120 Tflop/s, several user communities (€15M - CNRS)

building blocks to construct grid-infrastructures in flexible & robust way; (€5 M – SOTON)

e-Infrastructure Periphery (Test-beds, Support projects)



EU Research programmes on Grids, networks, etc



➤ €250m in FP6

Pan-European Research Network, 3700 institutes, IPv6 enabled (93 M€- DANTE)

■ The e-Infrastructure today - periphery expanding fast

Geographical expansion of collaboration

Eastern Europe, NIS, Caucasus
Latin America
Asia (China)
Baltic States
Mediterranean
South-Eastern Europe

OCCASION, PORTA OPTICA STUDY
ALICE, EELA, AUGERACCESS
TEIN2 (EUChinaGrid, ORIENT)
BalticGrid
EUMedConnect, EUMedGrid, ITHANET
SEEREN(2)/SEEFIRE, SEEGRID(2)

e-Infrastructure

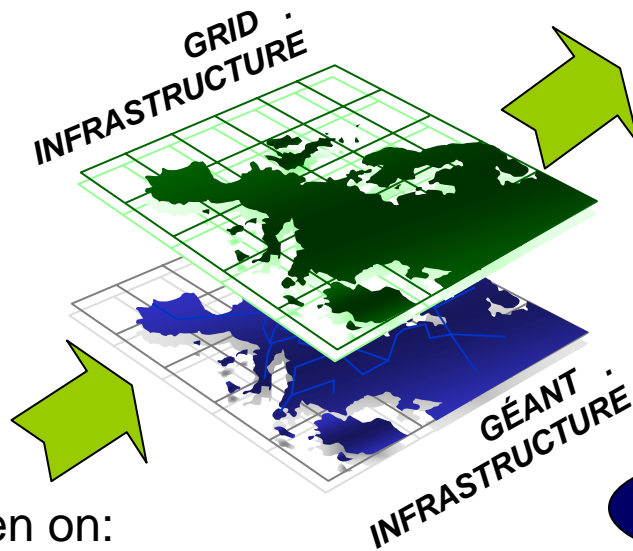
New Applications

Molecular, Clinical	ITHANET
Bioinformatics, Biology	BioInfoGrid
Civil Protection	CYCLOPS
Astronomy	EuroVO-DCA, EXPRES
Grids & Digital Libraries	DILIGENT
Applications on IPv6	6DISS, IPv6TF

Support, Enhancements

Synergy, Outreach, Users	BELIEF, GO4IT
Security, Policy support	ISSeG, E-IRGSP
Training	ICEAGE
SW-interoperability, testing	ETICS
Grid interactive services	int.eu.grid
Control remote instruments	GridCC
QoS, Traffic Monitoring	EUQoS, LOBSTER
Optical networks	MUPPED
Connected Test-beds	EUROLabs

■ Evolution of the e-Infrastructure (Research Networks)



Focus has been on:

- ✓ Provision of a pan-European and reliable communication backbone – 10 Gbit/s
- ✓ Service to 30 Million users in 35 countries (production quality infrastructures)
- ✓ A test platform for advanced communication experiments

Core connectivity project

GÉANT2

NREN

NREN

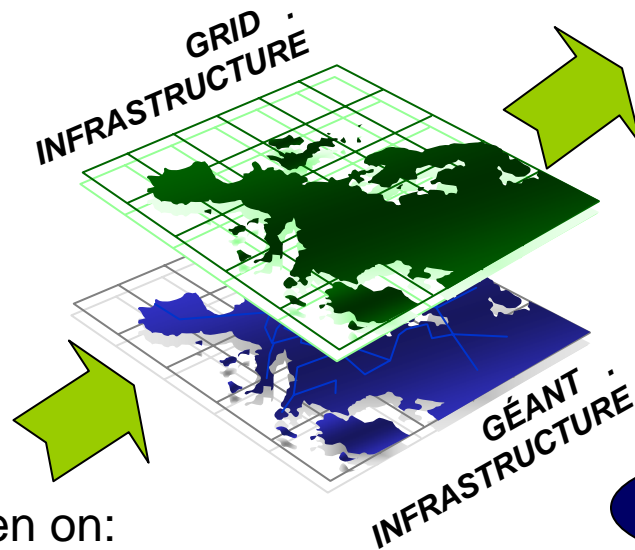
NREN

NREN

RN: Research Network

NREN: National Research Network

■ Evolution of the e-Infrastructure (Research Networks)



New emphasis now on:

- ✓ End-to-end service provision
- ✓ Deployment of light-paths (12 000 km fibre, 400+ active elements)
- ✓ New services to the users (AAI, high speed transfers, access to network measurement data, interface to Grid layer)
- ✓ Hybrid network (photonics + IP)

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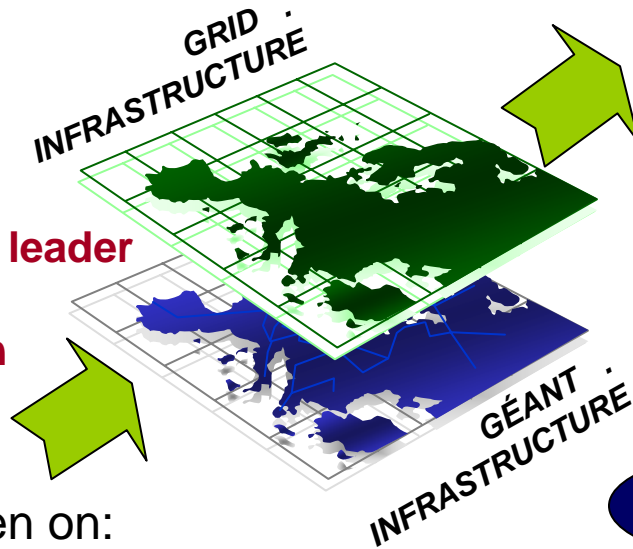
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Stay the global leader for advanced communication technologies



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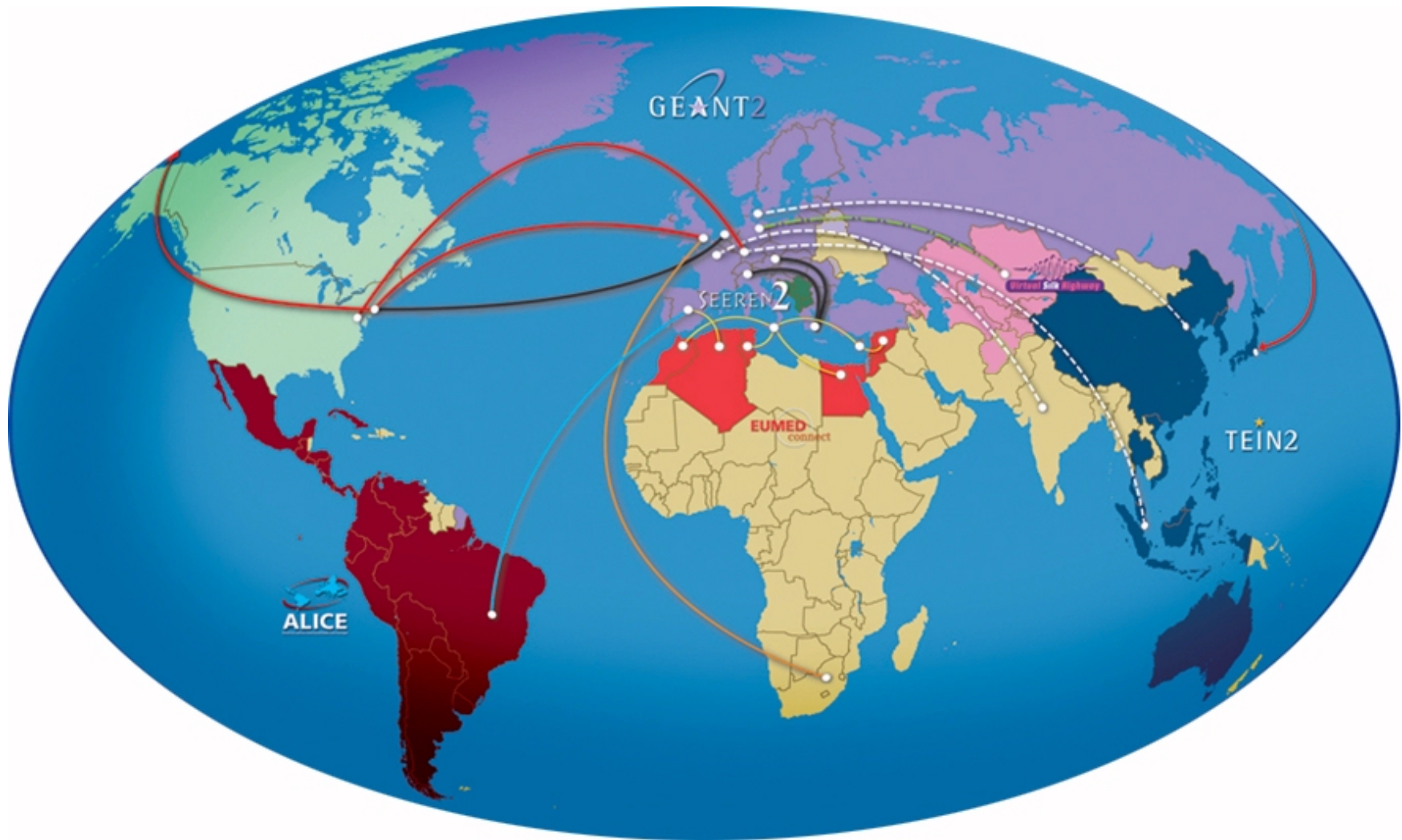
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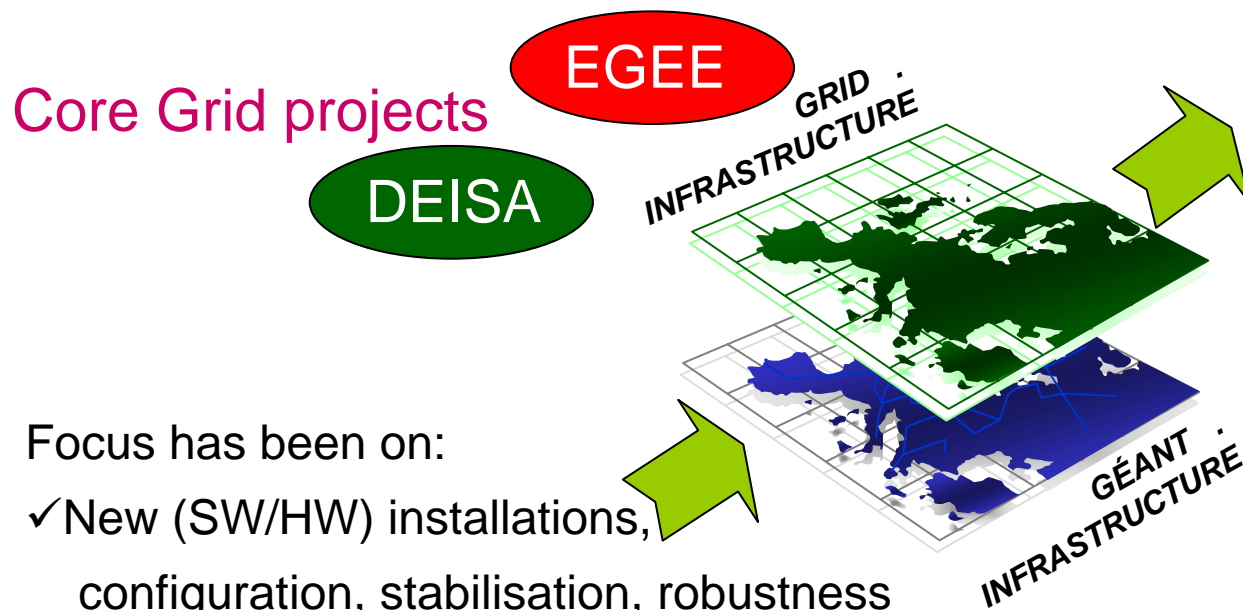
RN: Research Network

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■ Interconnecting international RNs



■ Evolution of the e-Infrastructure (Grids)



Focus has been on:

- ✓ New (SW/HW) installations, configuration, stabilisation, robustness
- ✓ Provision of 24/7 operation service (production quality infrastructures)
- ✓ Resource sharing procedures & policies

■ Evolution of the e-Infrastructure (Grids)

- interoperability, inclusiveness...

New emphasis now on:

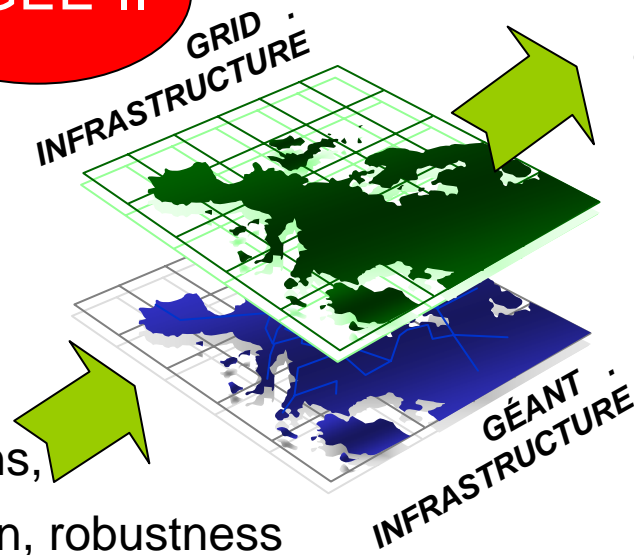
- ✓ Interoperability, standards
- ✓ Integration of off-the-shelf components, SW-certification, increased functionality
- ✓ Outreach new user communities, all-inclusive infrastructures, lower digital divide
- ✓ Strengthening intern. links

Core Grid projects

OMII-Europe

eDEISA

EGEE-II



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■ Evolution of the e-Infrastructure (Grids)

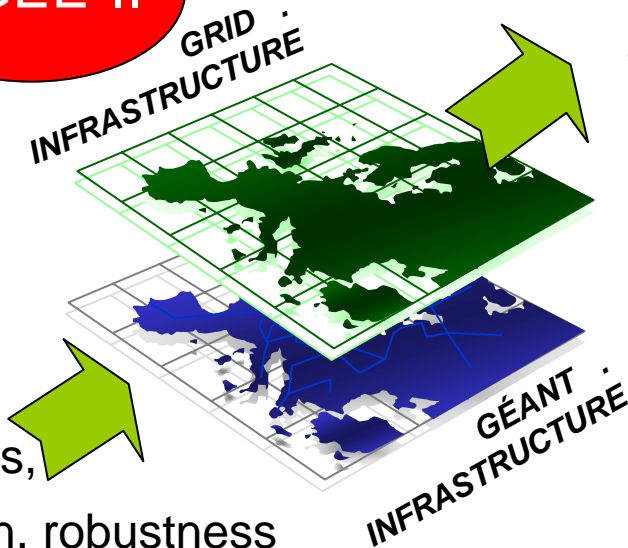
- interoperability, inclusiveness...

Re-engineer, provide building blocks for grid-infrastructures to be constructed in a flexible and robust way; build on EGEE (gLite), UNICORE, GLOBUS

OMII-Europe

eDEISA

EGEE-II



New emphasis now on:

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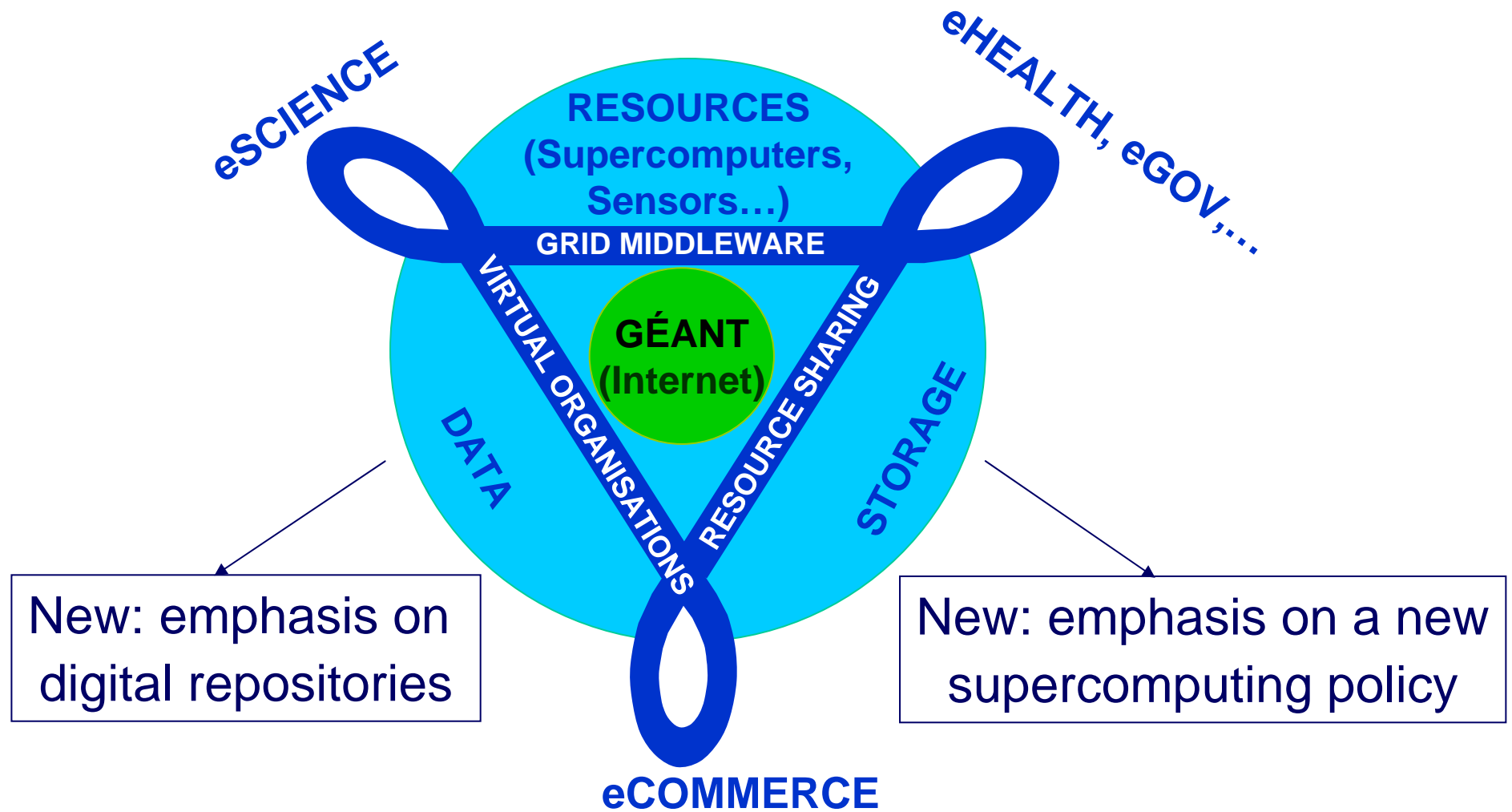
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*A Roadmap for the future **e-Infrastructure** (FP7 and beyond)*

■ e-IRG proposes a Roadmap for the future (FP7 and beyond)



Need for a European approach on Capability Computing (Supercomputing)

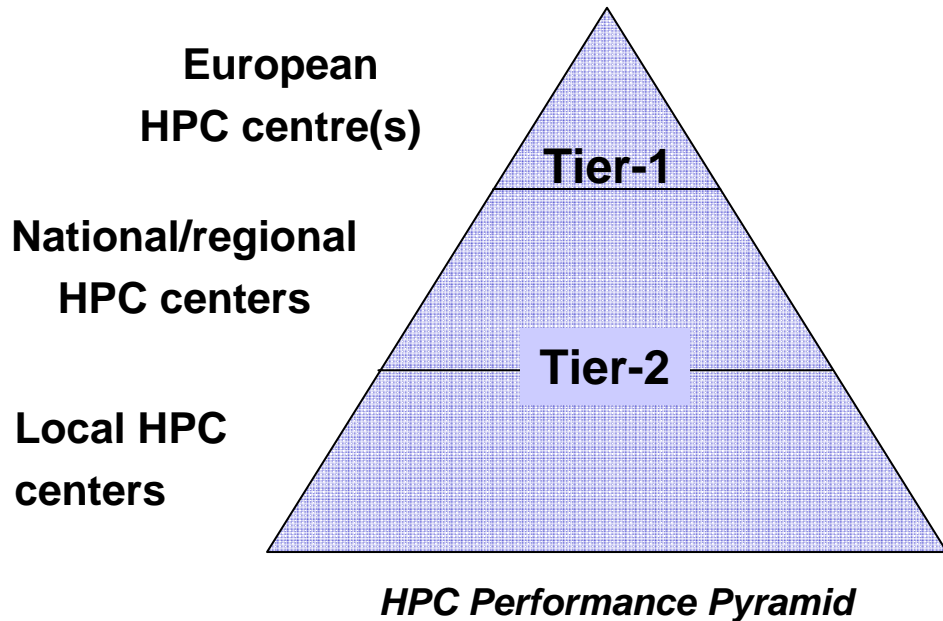
Conclusions of a Workshop (21/03/06) on preparing a Supercomputing agenda for FP7

(<http://www.cordis.europa.eu.int/ist/rn/>)

■ Workshop objectives

- The *vision* on what should be the European HPC landscape
- Identification of concrete steps to *co-ordinate* and *fund* activities to develop an HPC infrastructure in Europe in FP7
- Identification of associated *research areas* to HPC developments in Europe

■ Implement a European HPC Platform – vision & ecosystem



- To support scientific applications *exceeding capacities* of national resources
- Any European HPC system needs to be significantly bigger than national systems in the same time frame
- Petaflop capacity by 2009
- The HPC infrastructure is a needed integral resource component of the *European Science Grid* infrastructure
- *Pyramid or two-tier shape* for infrastructure: Petaflop machines (Tier-1) at the pyramid top; existing National/Regional centres form Tier-2
- The two tiers to be strongly integrated together into *a global grid “à la DEISA”* with a unique operational & service provisioning model

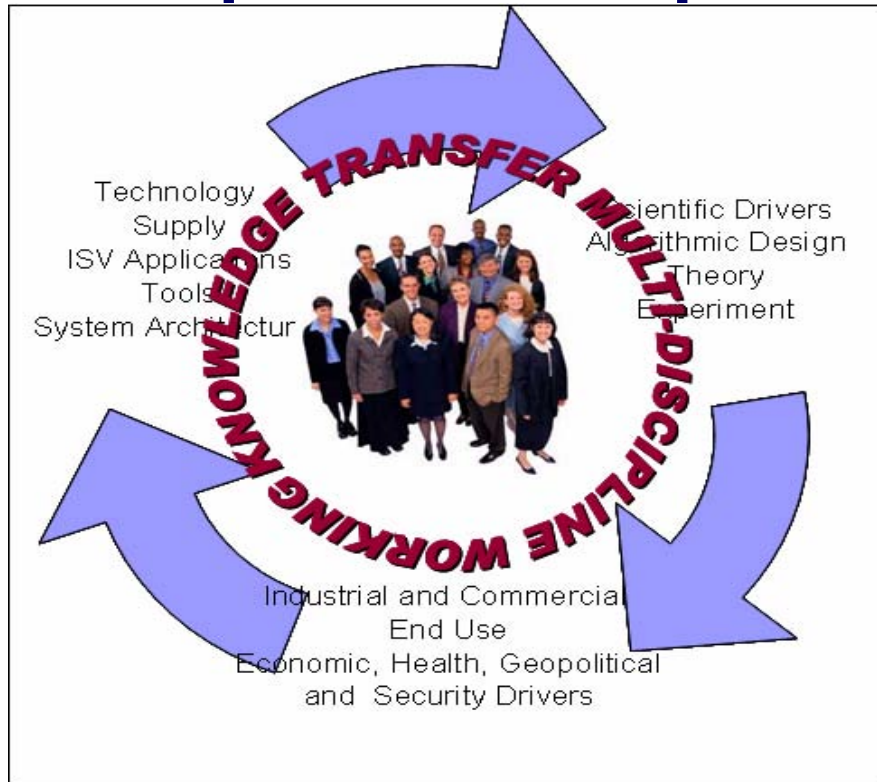
■ Implement a European HPC Platform – vision & ecosystem

- Different architectures to support *different algorithmic processes* (rather than different disciplines)
- *Centres of Excellence* to host Peta-scale facilities
- A sustainable ecosystem for exploiting Computational Science through HPC requires a European *Expertise and Services infrastructure* (for *code optimisation, numerical analysis, code porting, data mng ...*) along with investments on HW, logistics...
- Implement a steady program to *continuously invest and upgrade* on top of national infrastructures rather than a single one-time investment

■ Implement a European HPC Platform – Research activities

- Address *all levels* of performance pyramid and *different aspects* of overall HPC problem
(such as porting applications to top-end machines, new algorithms and simulation methods, new operating system primitives, languages, compilers and tools etc)
- Different *time spans*
(e.g. some activities to prepare applications for petaflop machines while others to address longer-term goals)
- All activities to be defined as *inter-disciplinary* efforts
(including e.g. application experts, mathematicians, computer scientists, platform experts etc)
- Prepare to explore *new HW/SW architectures* and expand the *open source* basis of HPC

■ Implement a European HPC Platform – involve industry

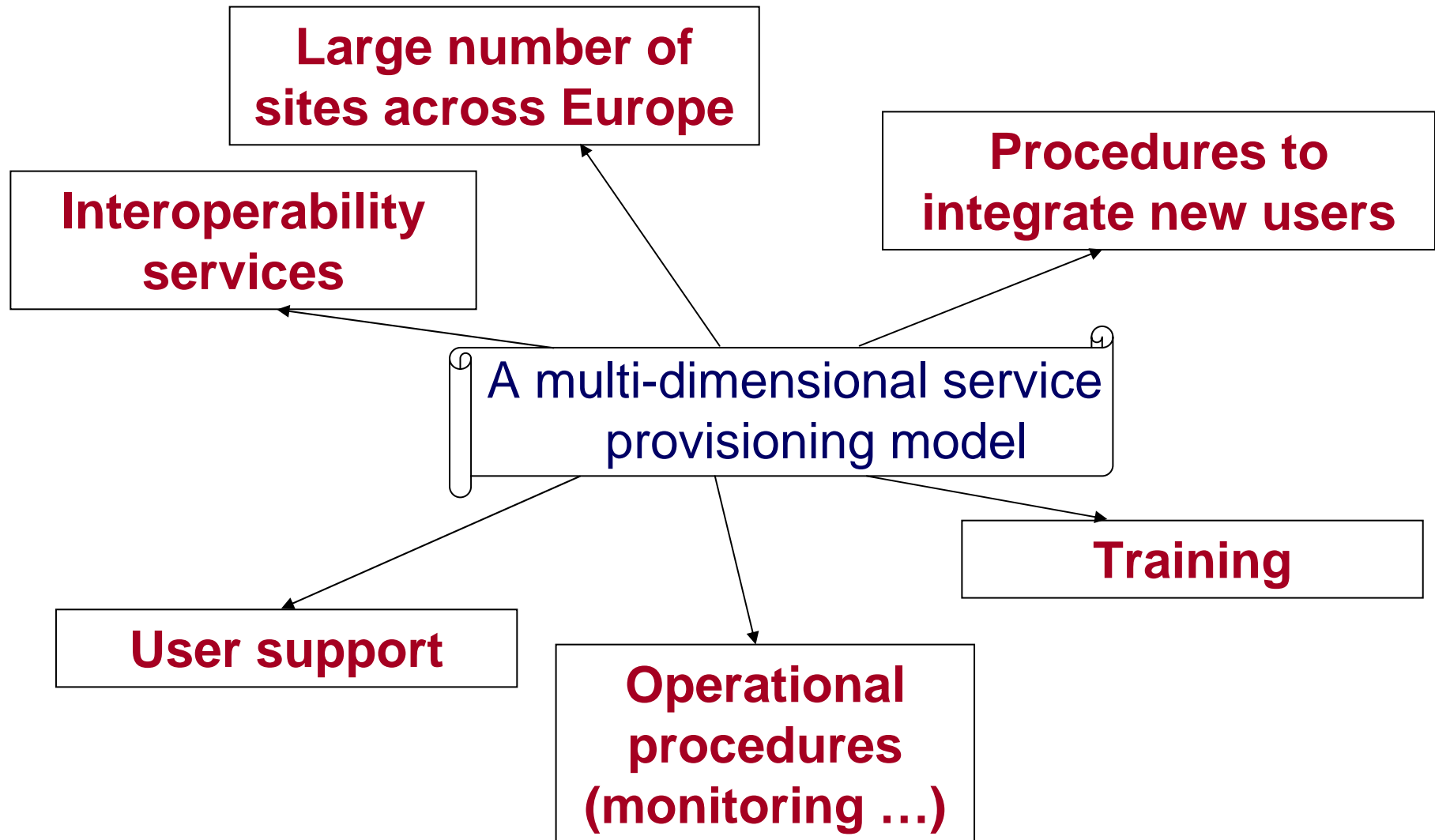


- *Peta-scale computing* expected to be key to a number of *businesses* in next 10 years (e.g. Airbus, EDF)
- Installing top-level supercomputers will *drive up middle-level systems*
- To sustain and return on HPC investments, necessary to *enhance cycle of innovation in Science* (to involve existing & new industrial end-use coupled with technology supply)

- *Huge expertise* in HPC related area in Europe; however dispersed and not well co-ordinated
- *Collaboration with public institutes* can make HPC better affordable for (the smaller) industry, e.g. by sharing experiences, training, risks..
- Current ISV applications do not scale to size that supercomputers require; initiative to *scale (commercialize) these codes* recommended

Toward Sustainable Service Provisioning e-Infrastructures

■ e-Infrastructure : a service oriented approach



■ Production quality facilities but various service schemes

Connectivity service model

- Full-fledged operational service to all research institutes in Europe
 - “One-stop-shop” service on National (NREN) and EU-level (DANTE/GÉANT)
 - Policy-committee to harmonise policies across Europe

Grid service model

- Based on two core projects (EGEE, DEISA); others enhance, expand or use the infrastructure that above projects provide
- Strong role of some user communities (HEP, Biology); new user communities can only join within the limited resources, structure, duration and support of above projects
- EGEE, DEISA become overcrowded as many organisations want to join for more efficient infrastructure use
- Stable funding scheme



■ e-IRG raises the need for the current grid-based service provisioning schemes to evolve

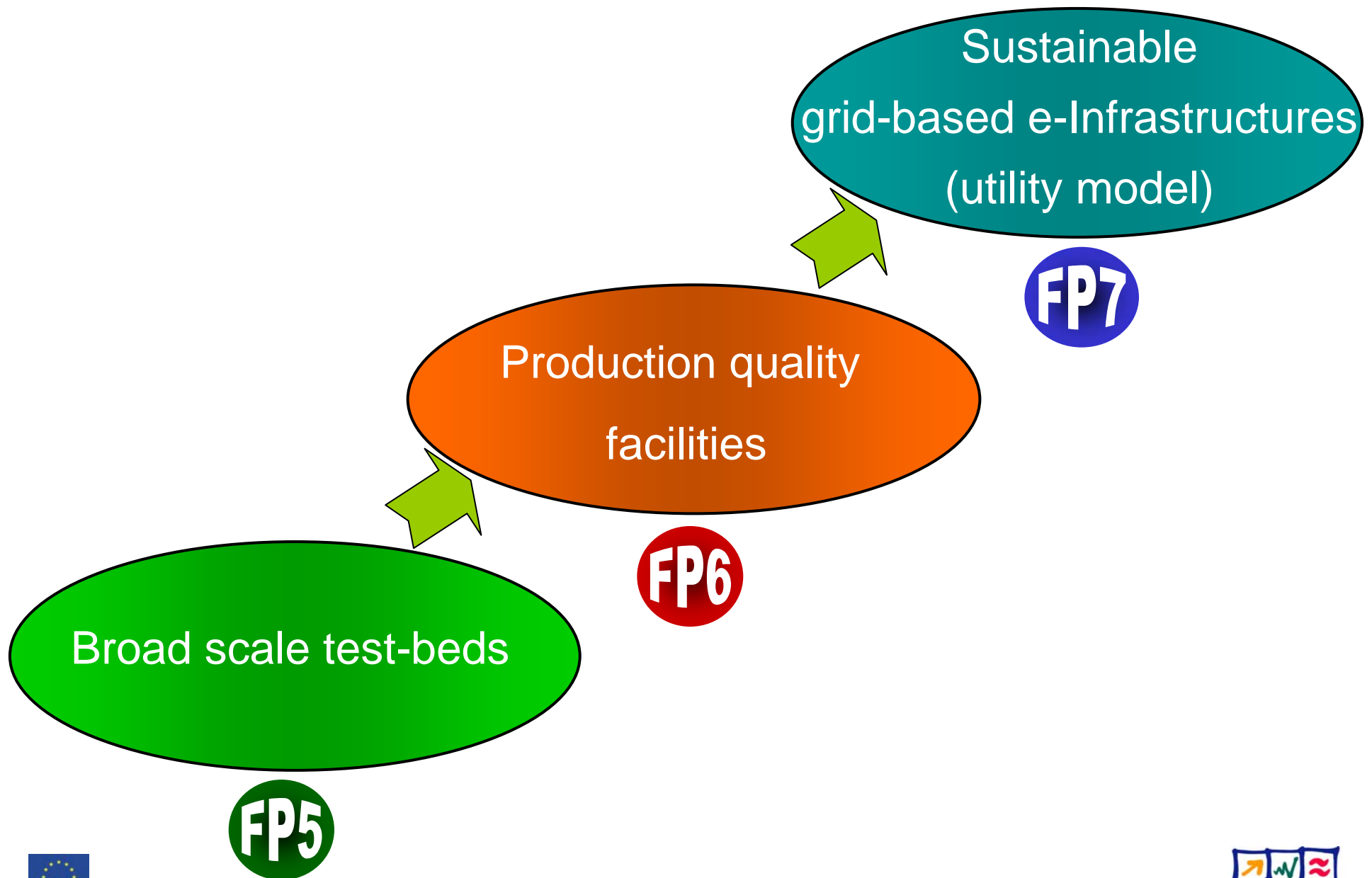
Committees like the e-IRG point that the current project-based financing model of grids presents continuity and interoperability problems, and that new financing and governance models need to be explored taking into account the role of national Grid Initiatives...

Recommendations:

- Existing e-Infrastructure projects to be superseded by integrated sustainable services at national and European levels
- e-Infrastructures to be application neutral and open to all user communities and resource providers
- National funding agencies to fund multidisciplinary & inclusive infrastructures (rather than disciplinary specific alternatives)
- e-Infrastructures to interoperate in order to qualify for funding
- FP7 to facilitate a model which specifically encourages the further integration of national e-Infrastructure initiatives



■ Towards sustainable grid-based e-Infrastructures



Emergence of a new European Supercomputing policy



European Commission



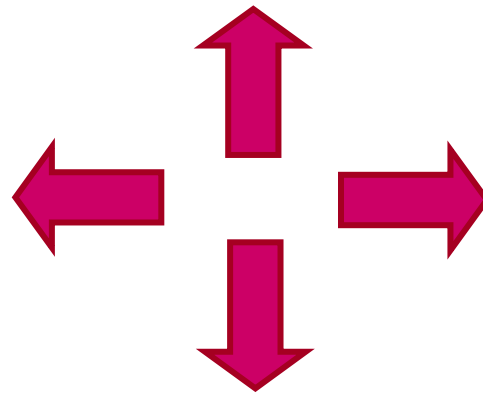
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■ Emergence of a new European Supercomputing policy

Draft

EC and Member States to co-fund Tier-1 of a European HPC Platform and related research efforts

Ensure sustainability of new HPC infrastructure (in link also with other EU infrastructures)

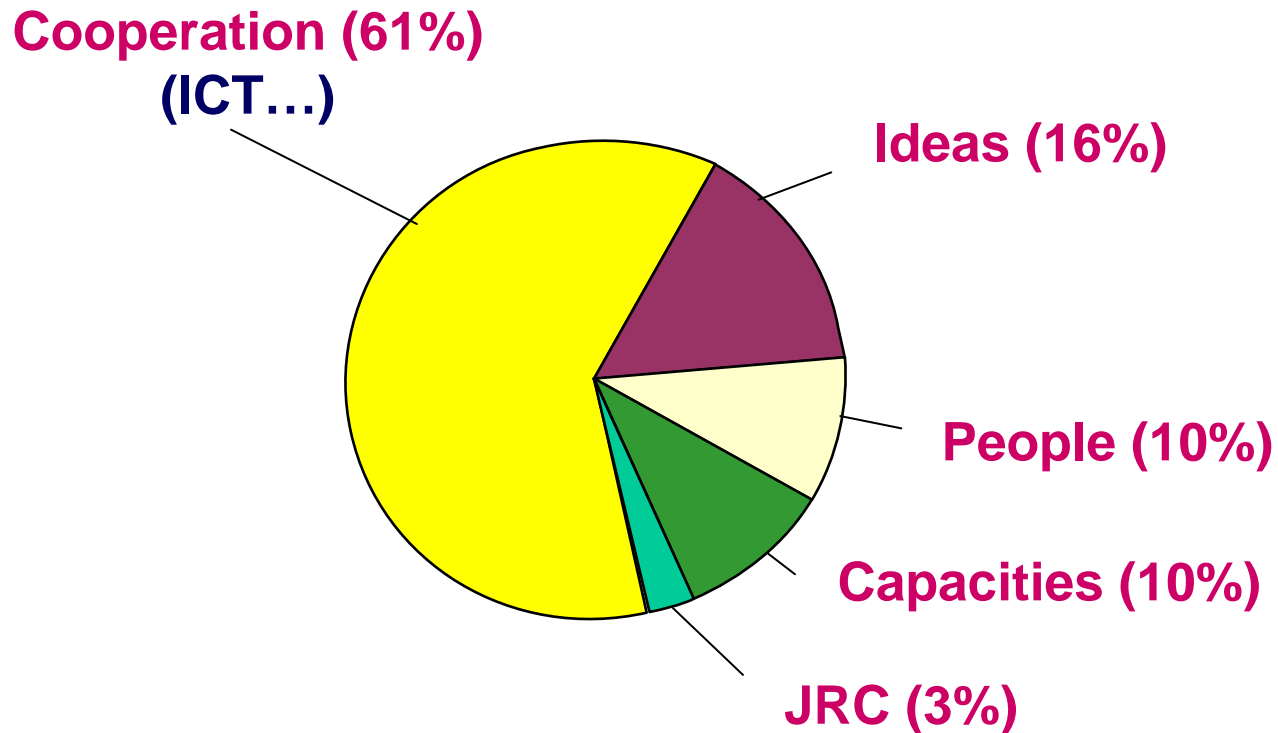


Foster involvement of EU industry (explore also new mechanisms like the *pre-commercial procurement of innovation* etc)

The HPC infrastructure to be an integral resource component of the European and global grid-infrastructure (e.g. à la DEISA)
Ensure continuous higher interoperability with other infrastructures (EGEE, GÉANT, international etc)

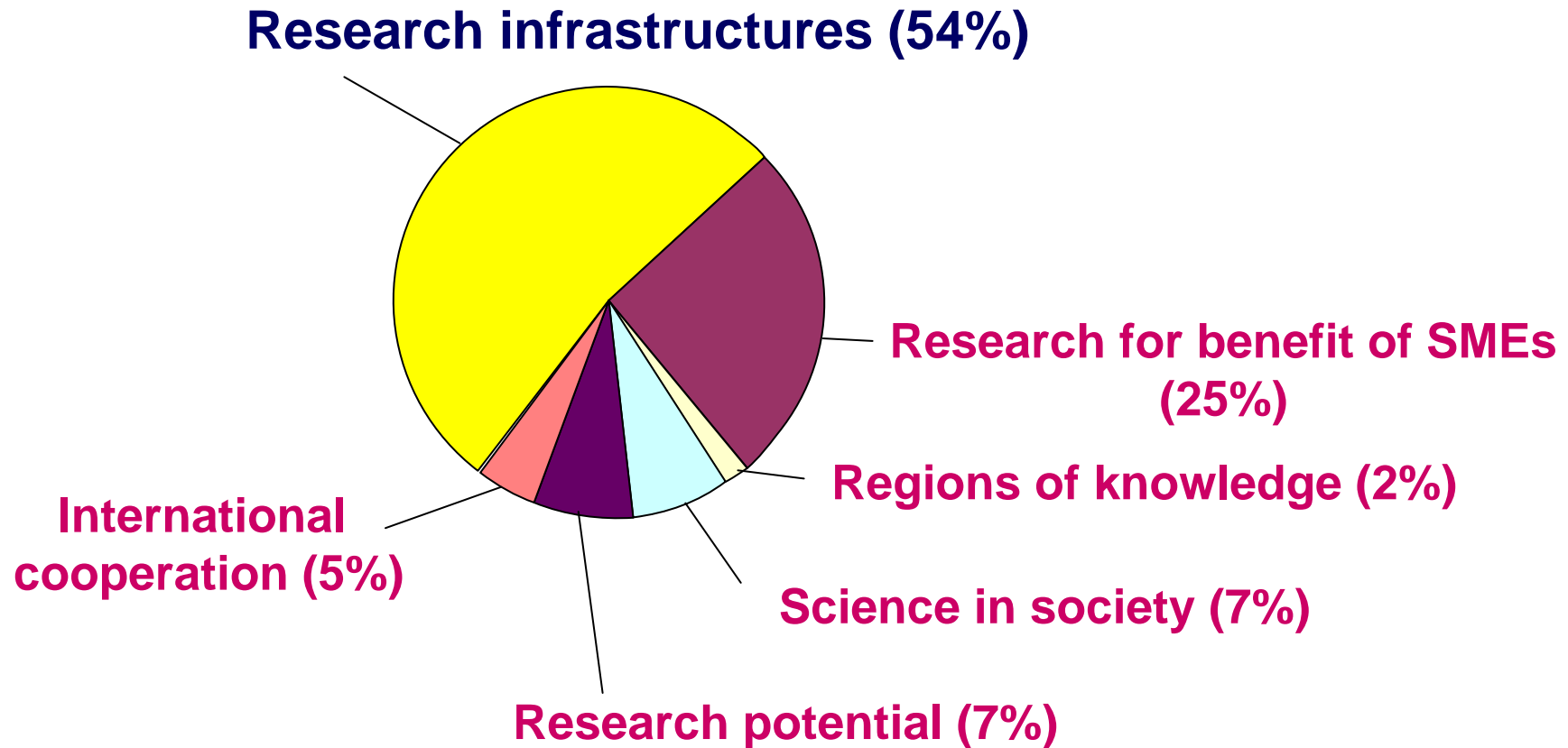
The 7th European Research Framework Programme (FP7)

■ FP7 overview (Commission proposal) – 2007-2013



http://europa.eu.int/comm/research/future/documents_en.cfm

■ The Capacities Specific Programme of FP7



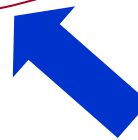
http://europa.eu.int/comm/research/future/documents_en.cfm

■ The 7th EU Research Framework Programme (FP7), 2007-2013



e-Infrastructure in FP7
(Capacities Prg.)

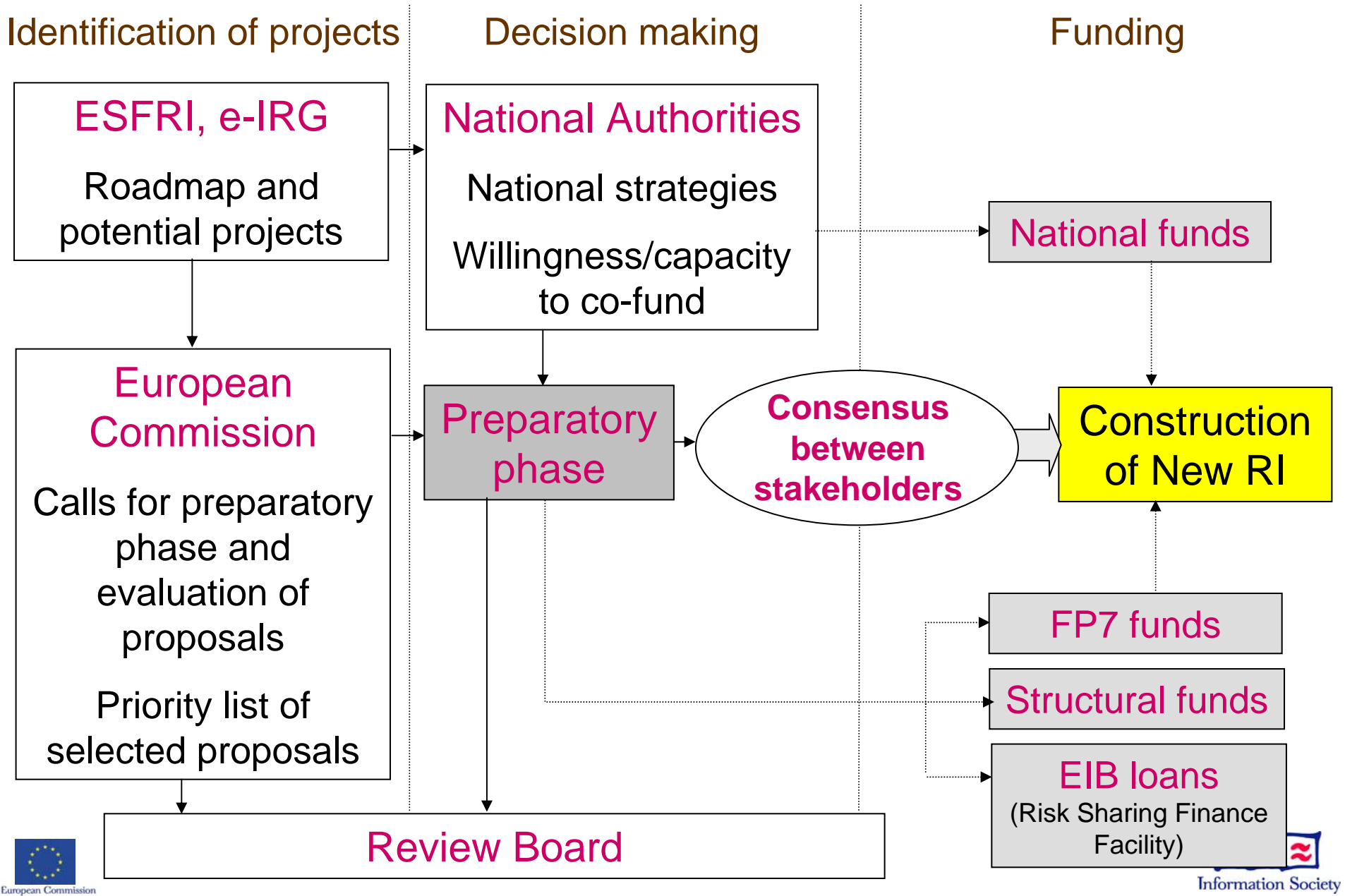
Continuation scheme
(optimizing access to
and utilisation and
performance of
existing
infrastructures)



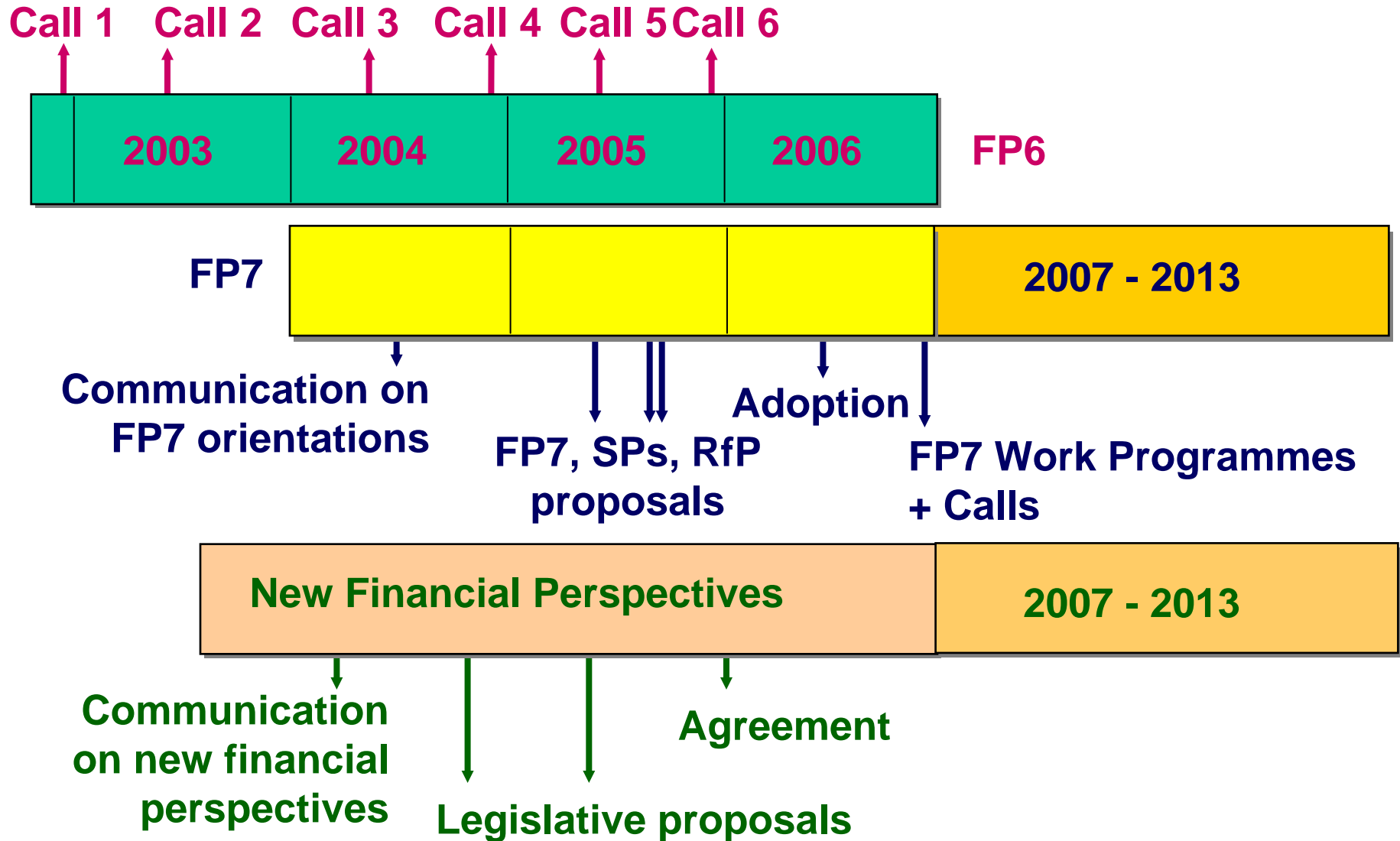
New research
infrastructures of pan-
European interest
scheme (e.g. new
supercomputers, EGI)
– Roadmap-based

Co-ordinated funding from different sources (FP7, national, EU-structural funds, European Investment Bank loans etc)

■ A stage-gate process towards new RI in FP7



■ FP7 implementation: Timetable



■ Summary

- DEISA is a core element today of the e-Infrastructure
- There is a need for Europe to enhance its efforts on HPC in FP7
- A new European supercomputing policy is in this context emerging
- The co-funding (EU and MS) of peta-scale computing, the integration of the HPC infrastructure into the European and global grid, the sustainability of the model, and the involvement of European industry are some core elements of the new policy under discussion
- The available resources in FP7 will be critical for the implementation of the above policy

Thank you for your attention!