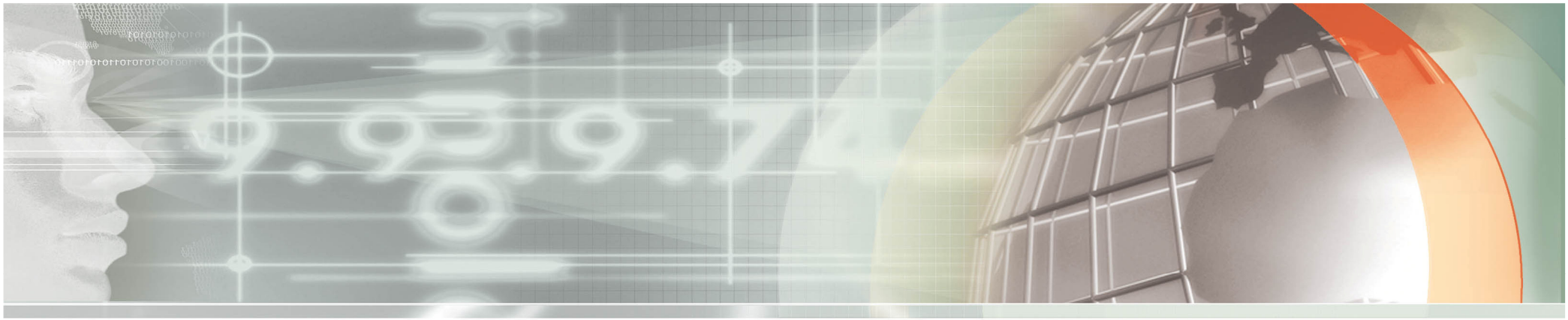


E-IRG:
Ensuring Future Infrastructures are relevant for Research and Business

Mirco Mazzucato

Italian Member of eIRG

On behalf Leif Laaksonen (e-IRG Chair)

22.2.2010

e-IRG
e-Infrastructure Reflection Group

e-IRG and ESFRI: The RI policy bodies in Europe

ESFRI European Strategy Forum on Research Infrastructures

- **Constituency:** Representatives of EU Member States and Associated States, appointed by Ministers in charge of Research, and one representative of the European Commission.
- **Main objective**: to support a coherent approach to policy-making on Research infrastructures in Europe, and to act as an incubator for international negotiations about concrete initiatives.
- http://cordis.europa.eu/esfri/

e-IRG e-Infrastructure Reflection Group

- **Constituency:** Representatives appointed by Ministers in EU Member States, Associated States to the EU Research Framework Programme and the European Commission.
- **Main objective**: to support the creation of a framework (political, technological and administrative) for the easy and cost-effective shared use of distributed electronic resources across Europe.
- http://www.e-irg.eu/

Purpose of e-IRG

The e-Infrastructure Reflection Group (e-IRG) was founded to define common policies and recommend innovative best practices for the pan-European ICT infrastructure efforts.

-> The e-Infrastructure layered services:

- Networking
- High Performance Computing
- Commodity Computing
  - Grids, Data Grids, Clouds, Clusters and Cycle-scavenging
- Data
- e-Infrastructures are the place where innovation in ICT becomes a reality of new reliable services

Mission and Vision of the e-IRG

e-IRG Meeting in Lugano (Switzerland) in 2008:

The e-IRG mission is to pave the way towards a general-purpose European e-Infrastructure source of innovation

The vision for the future is an open e-Infrastructure enabling flexible cooperation and optimal use of all electronically available resources for Research and beyond and serving as innovation engine.

Research e-Infrastructure and innovation

- The Research Communities (RC) traditionally express very specific, challenging needs well ahead of the general ICT-market impossible to satisfy by commodity solutions in standard configurations.
- RC have developed in the past new ICT components or specific Open solutions (e.g. the World Wide Web from CERN or grids) which do not yet exist in the commercial world
  - Being also the first customers and building innovative powerful general innovative e-Infrastructures on top of those (GEANT, EGI, PRACE..)
- The close interaction between users, service providers and developers of new technologies and services typical of the research communities has been one of the key factors of their success and a unique place for a successful Open process
  - The Openness favour the interoperability of the different components and the global standardization efforts involving also private companies.

e-IRG works for policy impact on a global scale

- Publish e-IRG White Paper
  - “Snapshot of the policy and state of the art in technology”;
  - Short- to medium-term scope;
  - 5 White Papers.
- Develop the e-IRG roadmap
  - Long-term strategic issues;
  - Responses to emerging technologies, paradigm shifts;
  - One Roadmap + one update.
- Set up Task force work
  - Last task force on Data management finished recently its work.
- Four annual e-IRG delegates meetings
  - Two open workshops addressing the broad community;
  - Two internal delegates meetings.
- Collaboration with MS, the EU Presidency and EC

e-IRG aims at global challenges with a high societal impact

- Targeting audiences:
  - Policy makers on the governmental and inter-governmental levels and EC, dealing with funding, privacy and other issues that are becoming more and more crucial due to the broader uptake of the e-Infrastructure–enabled technologies and processes.
  - Service-providers on the e-Infrastructure domain, such as organisations operating research networks or computing centres – or projects that build on this base in order to provide higher-level multidisciplinary services.
  - Existing and new user communities, looking for a broad overview of the capacities and capabilities that the current and near-future e-Infrastructure can provide.

An important step towards an European Roadmap for Research e-Infrastructures (1/2)

- Competitiveness Council Conclusions, 3-12-2009:
  - **RECALLS**
    - **The Commission** to pursue sustainability, global connectivity, interoperability and unimpeded use of pan-European e-Infrastructures,
    - **The Member States** to consider the role of e-Infrastructures in their national roadmaps and/or programmes for research infrastructures;
  - **WELCOMES** the 3 Commission's communications entitled
    - "A Strategy for ICT R&D and Innovation in Europe: Raising the Game",
    - "ICT Infrastructures for e-Science"
    - Moving the ICT frontiers – a strategy for research on future and emerging technologies in Europe";
  - **STRESSES** that the digital revolution is still in its early stages and that a research and innovation capacity is essential to be able to shape, master and assimilate technologies and exploit them to economic, societal and cultural advantage;
  - **UNDERLINES**, in this regard, the necessity to ensure the availability, appropriate treatment and conservation of an unprecedented amount of data;

An importante step towards an European Roadmap for Research e-Infrastructures (2/2)

- Competitiveness Council Conclusions, 3-12-2009:
  - **RECOGNISES** the critical role of e-Infrastructures in achieving scientific excellence, their potential for improving accessibility and their transformative impact on the way research is performed, mainly e-Science, as well as their role as innovation platforms and precursor markets for novel ICT, notably in computing;
  - **WELCOMES** the work of the e-IRG to address policy related barriers for the shared use of e-Infrastructures e-Infrastructures Reflection Group (www.e-irg.eu);
  - **INVITES** the Member States and the Commission to ensure that research infrastructure of major importance in Europe enjoy e-Infrastructure support both in terms of access to state of the art computing and data resources and in order to extend the benefits of their operation across Europe;

e-Infrastructure domains providing functions and services

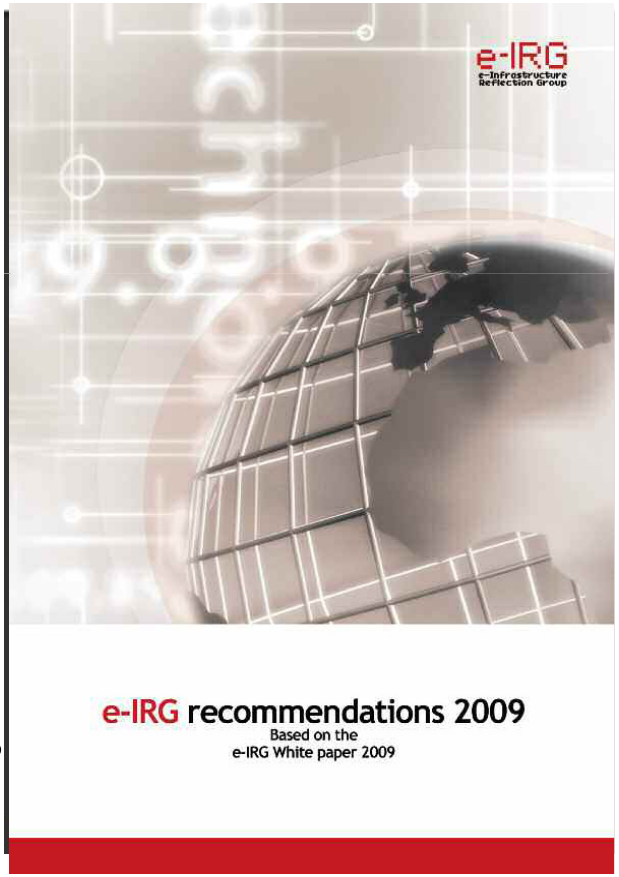
- GÉANT is the world's largest multigigabit communication network dedicated to research and education.
- e-Science Grids, as recently created EGI, respond to the requirements of the most demanding scientific disciplines (e.g. high-energy physics, bioinformatics) to share and combine the power of computers and sophisticated, often unique scientific instruments.
- The scientific data domain tackles the accelerated and uncontrolled proliferation of data elementary of the scientific discovery process.
- Supercomputing e-Infrastructures address the complex challenges of providing modern science with the new computing and simulation capabilities.
- Global Virtual Research Communities, anticipating the advent of research 2.0 paradigms, opens new perspectives for cross-border multi-disciplinary collaboration among research communities
- In all domains e-Infrastructures are acting as innovation platforms and precursor markets for novel ICT services

ICT INFRASTRUCTURES FOR e-SCIENCE
Communication from the Commission 5.3.2009

The e-IRG White paper

- One of e-IRG's main publications dealing with e-Infrastructure technologies and projects ***requiring policy-level actions***
- A collection of independent and self-sustained topics from different e-Infrastructure areas; Examples:
  - **Grid and Cloud computing**
  - A "holistic" approach to **Security** (seen "as a whole")
  - **Sustainability** of the computing related e-Infrastructure
  - **Remote instrumentation** (and its integration with e-Infras)
  - **Education** and **Training** (outcome of e-IRG E&T Task Force)
- Topics selected and content produced by e-IRG delegates and experts in a multi-stage consultation process
- Studying technological, economical, societal and policy developments and limitations requiring appropriate actions
- Targeting different audiences:
  - Policy makers, e-Infrastructure providers and users

http://www.e-irg.eu/ --> Publications



White paper: the current challenges (1) Networks

- Recognized a general move towards service-orientation (from technology- or product-orientation) in all of the e-Infrastructure components domains.
- Network: continue to increase flexibility, cost effectiveness and performance while fostering innovation and focus on providing accessibility through reliable interoperable services in a multi-domain environment (standardisation of functions and interfaces)
  - Promote the broad uptake of hybrid networking, next to IP-based services)

White paper: the current challenges (2)
Commodity computing

- **Commodity computing : Grid, Cloud and Virtualization**
- **Grid infrastructures** have successfully managed to effectively support regional, national and international collaborations through enabling the federation and sharing of distributed heterogeneous ICT resources+data
  Essential for e-Science in Europe -> 36 NGIs +CERN and EMBL in EGI or NRENs in GEANT
  Slow in getting full interoperation, standardization and easyness-of-use
- **Cloud** commercial solutions have paved the way towards the efficient and easy resource provision from a single provider (Lack of sharing and federation)
  - The current multitude of interfaces from different vendors may endanger the e-IRG vision of an open e-Infrastructure that allows optimal use of all electronically available resources
- Virtualization technologies and service offerings are now being introduced in e-Infrastructures
- **eIRG recommendations**:
- Major e-Infrastructure initiatives should investigate the integration of commercial and non-commercial infrastructure services and of Grid and cloud-like technologies especially for achieving the provision of on-demand virtual computing and storage resources into existing e-Infrastructures;
- EC and MS support should not be limited to a single distributed computing technology and infrastructures, promoting an open approach, when aiming to set up sustainable pan-European e-Infrastructure organizations within Grid, Cloud and High Performance Computing.

White paper: the current challenges (3) Security

- The e-Science collaborative projects which today are a reality and span the different layers of e-Infrastructures of many European countries require a general Authentication and Authorisation Infrastructure (AAI)
- Recommendation:
  - eIRG strongly encourages the harmonization of approaches in Access Management between the NREN and Grid e-Infrastructure providers;
  - e-IRG recommends the promotion of a coherent framework that will act as a working base for the implementation of unified security services. In particular, the full extent of cross-disciplinary synergies of a coherent model for data security should be studied and exploited.

White paper: the current challenges (4) Service orientation

- There are today many examples of successful deployment of virtualization in e-Infrastructure centres resulting in better resource utilization, increased flexibility, enhanced provision of user required environments and introduction of additional unique features.
- The use of resource virtualisation allows for shifting from a hardware-centric to a service-centric view where all the underlying hardware, be it storage, computing or networking, is perceived as a pool of resources that one can allocate dynamically on demand to exactly meet the current user need of specific environments and services
- The emerging use of virtualisation in ICT service provision optimizes resource utilization, reliability, energy efficiency and maintenance costs.
- The e-IRG recommends the investigation of virtualisation in key e-Infrastructure projects;
- The e-IRG recommends that further research on virtualisation concepts is supported, including development of open standards for integration of tools from different vendors and academia in order to support the emergence of a competitive marketplace in this domain

Science and society builds on data

Data ⟷ Information ⟷ Knowledge ⟷ Wisdom/Laws of Nature

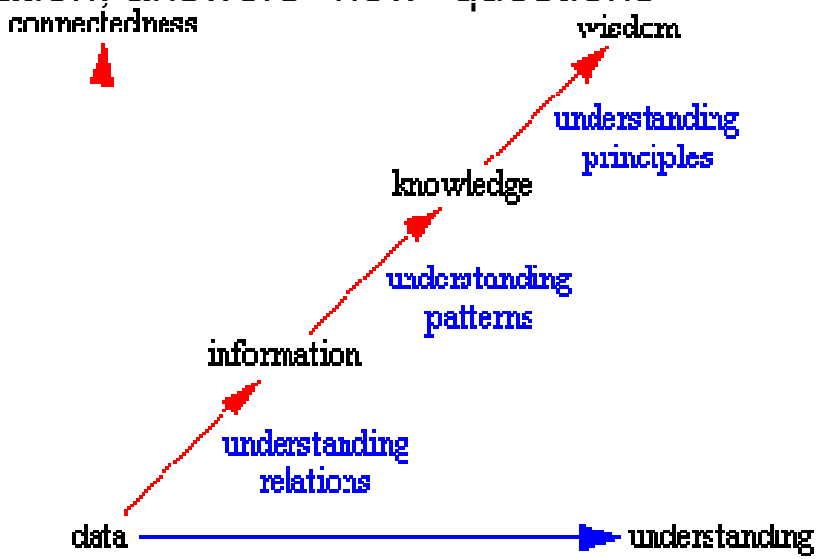
Data: symbols/raw measurements

Information: data that are processed to be useful; provides answers to "who", "what", "where", and "when"

Knowledge: application of data and information; answers "how" questions

Understanding: appreciation of "why"

Wisdom: evaluated understanding.



- High-volume Data
- Long Term Storage
- Curation

- Cumulative
- Multidimensional
- Constant attention

Data Management Task Force report 2009

- A collaborative effort between e-IRG and ESFRI carried out during 2009.
- The report is divided into three parts:
  - a survey of existing data management initiatives;
  - metadata and quality;
  - interoperability issues in data management.
- The report ends with conclusions of the study and a set of proposed recommendations for further analysis and discussion by the e-IRG.
- The findings were presented to the e-IRG and to ESFRI to create a final set of recommendations endorsed by the two bodies.
- Endorsed by e-IRG and ESFRI during december 2009.
- Data accessibility in multi-domains requires layers of industry standards

The eIRG Roadmap: goal, method & timing

- Coherent e-Infrastructure scenarios to support policy formation (2020 and beyond)
  - Opportunities – technology trends, user communities needs, use cases,...
  - Service provision: organisational and policy development
  - Requirements: science, society as a whole
- Iterative consultation
  - e-IRG delegates + appointed ESFRI experts, external experts, e-IRG community, general public
- “Discussion opener” for public consultation
  - Final draft circulated for consultation until end of January 2010
  - Roadmap and e-IRG recommendations public by March 2010

Sustainability of e-Infrastructures

e-IRG recommendations by the task force 2006:

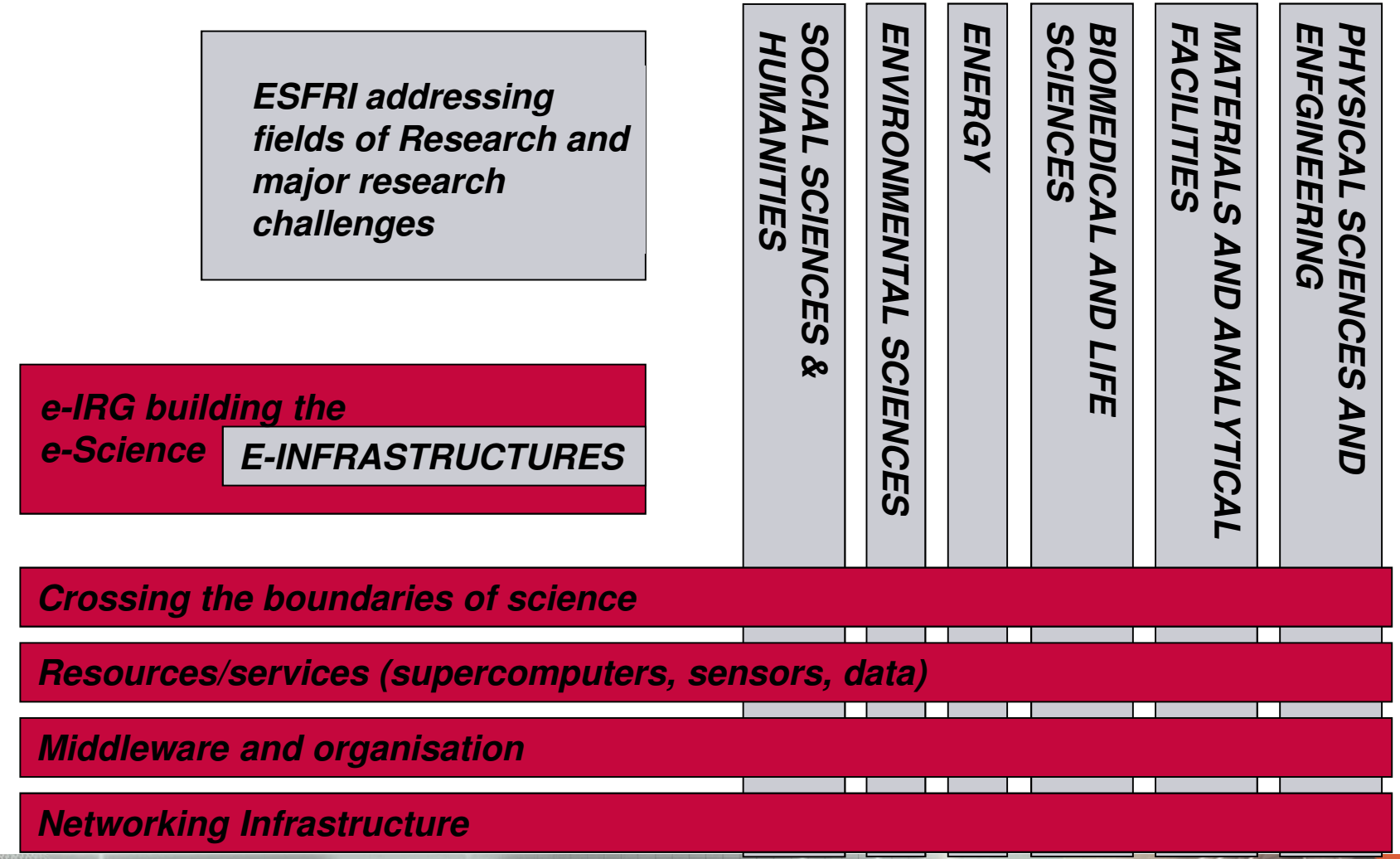
1. Governments and the Commission should develop policies and mechanisms to encourage increased investment in a more coherent and interoperable way across Europe.
2. The existing e-Infrastructure projects must be superseded by integrated sustainable services at national and European levels.
3. e-Infrastructures must be application-neutral and open to all user communities and resource providers. National funding agencies should be encouraged to fund multi-disciplinary and inclusive infrastructures rather than disciplinary-specific alternatives
4. e-Infrastructures must inter-operate and adopt international standard services and protocols in order to qualify for funding
5. The Commission should, within the seventh Framework Programme, develop a pan-European e-Infrastructure which explicitly encourages the further integration of national e-Infrastructure initiatives.

Today EGI and PRACE are a reality and join DANTE and Geant!

Current trends driving the research continue to anticipate general society needs

- System level science
  - The integration of diverse sources of knowledge about the constituent parts of a complex system with the goal of obtaining an understanding of the system's properties as a whole [Ian Foster]
- Multidisciplinary research
  - Each discipline can solve only part of a problem
  - Collaboration between different research groups
  - Distributed across states, countries, continents
- Research driven by (distributed) data
  - Data explosion, both in volume and complexity
  - Simulation and experiment combined
  - Exploring data-sets with no up-front hypothesis
- Research carried out using simulation and modelling
  - HPC and Grid computing together with high speed networks enable totally new visions in simulations of complex phenomenon

Roadmap to an ESFRI Research Infrastructure eco-system (update 2008)



Governance model to meet the user needs!

Governance models for the e-Infrastructure:

- Need to encourage ***innovation*** and prevent any kind of “one solution fits all” situation.
- Resulting in ***advanced services*** where all countries, independent of size, can contribute based on their skills.
- Without sacrificing the ***reliability*** of the services offered to the communities.
- Must be ***sustainable*** to create the needed credibility and trust for the science communities to make their investments into the environment.

Conclusions

- Research Communities traditionally anticipate the general ICT more advanced needs of the society
- RC have provided and continue to provide the open environment where users, service providers and developers of new technologies and services can collaborate to develop innovative Open solution
- The Research e-Infrastructures constitute a unique place where such solutions can be transformed into real general Open innovative reliable advanced services
  - The Cloud services offer by e-Infrastructure is the example of today
- The e-IRG has recommended EC and MS to support further research on the virtualisation concepts, including development of open standards for integration of tools from different vendors and academia in order to support emergence of a competitive marketplace in this domain

e-IRG Knowledge Base

- Contains information on European e-Infrastructures
  - HPC, grids and storage resources for science and research
  - National and European policies and policy organizations
  - National and European research networks
  - Projects and initiatives
  - Funding programmes
  - Contact points
- Available both to the e-IRG members and the general public via website (http://knowledgebase.e-irg.eu)
- Implemented using standards: Topic Maps and XSLT tools

Contact

e-IRG secretariat

c/o CSC - IT Center for Science Ltd.
(Keilaranta 14)
P.O. Box 405, FI-02101 Espoo, Finland
Phone: +358(0)9 457 2281

www.e-irg.eu
www.e-irg.eu/support
secretariat@e-irg.eu