



# **e-IRG** recommendations 2009

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### Global Collaboration

#### Background:

Most activities supported by e-Infrastructures are not restricted to national borders; therefore, in order to get a full return on its e-Infrastructure investments and to contribute to the development of an effective and competitive scientific ecosystem, Europe needs to be part of the global e-infrastructure. Worldwide collaboration between the various e-Infrastructures will increase cross-fertilization of novel ideas across broad scientific communities, and drive harmonisation of policies and best practices between trans-continental large-scale e-Infrastructures. Some key steps in moving towards this worldwide “knowledge society” include supporting cooperation at the global level between existing communities, such as those in the fields of bio-medical sciences, environmental sciences and high energy physics, while preparing for the extension of these working paradigms to other areas. In the long term, harmonization of e-Infrastructures and collaboration between providers of trans-national e-Infrastructures should create superior economies of scale, through facilitating seamless access to resources worldwide and accelerating innovation and deployment of high quality services to research and education institutions. Broader socio-economic benefits can also be expected, through providing opportunities for more efficient technology transfer and for harnessing the greater innovation potential of the global research communities.

- The e-IRG acknowledges the global nature of science, research and education and recognises the strategic importance of global collaboration between worldwide parties involved in e-Infrastructures as a key element for the global competitiveness of the European e-Infrastructures.
- The e-IRG recommends that global collaboration should move from its ad-hoc character to a more structured and continued mode adequately supported by the EC and national funding agencies; Europe should continue to take a leading role in global collaborations.

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### e-IRG commitment required

- The e-IRG in collaboration with the EC should seek to stimulate inside Europe best practices on a global level in the supply and use of e-Infrastructures, and to support the transfer of advanced global technical and operational know-how to all its Member States.
- The e-IRG recognises potential synergies with the work of the recently established CREST SFIC configuration (Strategic Forum for International S&T Co-operation).

### Education and Training in the Use of e-Infrastructure

#### Background:

Relevant education and training programmes exist in many European countries. However, investment is needed if these are to become significantly more widespread across disciplines, across institutions and across all geographic regions. This can be achieved more economically through cooperation among Member States. Such cooperation should result in mutually recognised curricula and qualifications that facilitate worker mobility and multi-national teamwork. Policy measures are needed to accelerate this cooperation and to make it more effective.

- The e-IRG recommends that the national, regional or European level of investment in e-Infrastructure education should be balanced to the investment that is going into e-Infrastructure provision. This may be achieved by embedding e-Infrastructure education at the undergraduate level, as well as developing curricula at the post-graduate level to improve exploitation of e-Infrastructures.
- The e-IRG recommends the harmonisation of education across the ERA to support student, researcher and worker mobility, mutual recognition of qualifications and equal opportunities. Standards need to be developed for sharing training material and e-Infrastructure between institutions, as well as for student and teacher identification enabling access to e-Infrastructure facilities and resources use.
- The e-IRG recommends the formation of user community support infrastructures in each European country. It especially encourages the collaboration of several countries in order to increase the efficiency of such infrastructures.

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### e-IRG commitment required

- Advise Member States and EC on funding to be allocated - and if necessary coordinate the proposed ERA-wide activity.
- Monitor the harmonisation processes in education and facilitate the appropriate links among related e-Infrastructure stakeholders.



### Grid and Cloud Computing

#### Background:

In the move towards a sustainable pan-European e-Infrastructure, Europe must continue to have a pluralist and open-minded approach in terms of which distributed IT services (based on various technologies and service offerings) might prevail and which to support, while in parallel seeking to consolidate its areas of investment.

While academia has approached distributed computing infrastructures using the grid computing paradigm (useful for its federating ability and collaborative approach), the introduction of commercial service concepts based on the emergence of a “cloud computing” paradigm requires a fresh assessment. While grid computing typically offers optimised access to distributed storage and computing power hosted in different administrative domains through a batch-like processing environment, cloud computing opens up a space for the provision of virtual computing environments by private companies. Industry has recognised a business case through virtualisation which at the same time offers easy access to virtual resources, economies of scale, pay-as-you-go, flexibility and interactive services to users. Thus far grids have effectively addressed the demand for effective sharing of physical distributed resources by global collaborations. It is now time for those involved in academia and research to widely adopt virtualisation in key e-Infrastructures, in order to facilitate access, increase flexibility and enhance resource utilization.

Hence, attempts to utilise cloud computing (or better, virtualization and easy pay-for-use access) in academia and research should be supported, in order that the complementary potential of grid and cloud computing be better exploited, with regard in particular to differences in service concepts and spheres of utilisation between the two paradigms.

- The e-IRG acknowledges the apparent rapid growth of commercial Cloud-like services, providing on-demand virtual computing resources, data storage and software services. The e-IRG recommends that major e-Infrastructure initiatives 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.
- e-IRG recommends that the EC and Member States 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 organisations within Grid, Cloud and High Performance Computing.

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### e-IRG commitment required

- Participate actively in the discussions among the relevant research and industrial stakeholders.

- Study the economic aspects of commercial and non-commercial cloud infrastructure services and compare them with current grid ones.
- Closely monitor activities in this area with a view to issuing further recommendations as the need arises, for example in relation to the funding and support of such initiatives on the European level.



### Security: A “holistic” approach

#### Background:

Security is a fundamental and indispensable component of all e-Infrastructures; it should be dealt with in a more systematic and integrated manner than it is at present. The development and implementation of policies to date has in most cases taken place independently in the different e-Infrastructure domains. These domains are guided, to a large extent, by a number of flagship projects financed by the European Commission. A coherent framework that will act as a working base for the implementation of a unified security-services policy is essential. The framework should also consider the new standardisation efforts in the field of data services, aiming at building a common ground for projects and communities, which today manage large amounts of data in a closed way.

- The e-IRG strongly encourages the harmonisation of approaches in access management between the NREN and Grid e-Infrastructure providers.
- The e-IRG recommends evaluating whether the well-established CSIRT collaboration platform in the NREN-community could possibly accommodate the needs of other e-Infrastructure components before development of domain-specific structures for analogous tasks.
- The 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.

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### e-IRG commitment required

- Facilitate the interaction of the related e-Infrastructure stakeholders in order to encourage the harmonisation of the security approaches.
- Monitor progress with a view to issuing further recommendations as required, possibly in relation to funding and support for harmonization at the European level and beyond.

### Service-centric e-Infrastructures through virtualisation

#### Background:

Enabling more robust, efficient and flexible usage of resources would significantly influence the ways in which e-Infrastructures are utilized and shared in the future. However, at present the term “virtualisation” is understood differently depending on the technological context of different technologies (such as storage, processing, visualisation and networking) in which it is being invoked. To realise the full benefits of virtualisation, used currently even by production services and by industry, further research is required; and common standards must be defined in order to “build bridges” between technologies and facilitate interoperability.

The applicability of virtualisation in e-Infrastructures should be assessed and policy benefits along with related implications should be presented. The issue of virtualisation is of relevance to a variety of e-Infrastructure layers such as networking, grids, cloud-computing, high-performance computing, storage, advanced visualisation and applications, as well as of future internet services. The applicability of virtualisation to the above e-Infrastructure layers should be exploited. Integrating virtualisation and green-IT approaches can have an important impact in terms of the development of cost-effective, robust and scalable e-Infrastructures.

- The e-IRG notes the emerging use of virtualisation in ICT service provision, whereby physical resources can be shared by users in a manner which appears to support each user independently, optimizing 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 the integration of tools from different vendors and academia in order to support the emergence of a competitive marketplace in this domain.

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### e-IRG commitment required

- Participate actively in the discussions with the scientific user communities about their need for virtualisation on an international scale, and in the discussions between the related research and industrial stakeholders.
- Closely monitor the activities in the area with a view to issuing further recommendations as the need arises, for example in relation to the funding and support of such initiatives at regional and European level, both for scientific users and for service providers.



### Remote Instrumentation

#### Background:

The term instrumentation covers a wide range of laboratory equipment that is necessary for experimental sciences, such as biochemistry, physics, astronomy, and industrial R&D applications. Access to unique and expensive equipment infrastructures is very often a precondition for successful research in many scientific disciplines. However, this kind of equipment is often not available locally, depriving those researchers based in societies that are unable to provide these material resources not only of the basic tools of their work, but also of the full benefits of participation in broader international scientific collaboration. In addition to solving this problem, the remote use of scientific equipment can substantially reduce the human and financial costs of research. This improves the efficiency of the use of researchers' time and increases the returns on investments in large installations, such as the ones listed in the ESFRI roadmap.

However, shared instrumentation also creates new challenges for the users, while generating a need for supporting economy and security concepts. This support should, in addition, also enhance the integration of instrumentation within the existing and future e-Infrastructure, like grids, clouds, advanced computing and data repositories.

Thus the development and spread of remote instrumentation techniques and technologies opens new opportunities for scientific communities.

- The e-IRG recognises the benefits of remote instrumentation, especially for large and costly research infrastructures.
- The e-IRG recommends the development of mechanisms enabling fair remote access to state-of-the-art equipment, including the preparation of a sustainable sharing scheme, both for public and private research, and research on standards for integrating remote instrumentation into the current e-Infrastructure (grids, advanced computing and data repositories).
- The e-IRG invites the EC and Member States to strengthen their support for research on remote instrumentation. This should cover technological, economic, policy and security aspects.

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### e-IRG commitment required

- Facilitate and participate in the discussions among the EC and Member States on fair access in the context of remote instrumentation and integration within the remainder of the e-Infrastructure.

### Sustainability of the computing-related e-Infrastructure

#### Background:

One of the key issues in ensuring broad cross-disciplinary adoption and use of the e-Infrastructure by user communities is confidence that the e-Infrastructure services will be reliably available and stable for the estimated duration of their current and planned collaborative projects. This requires a common perception and implementation of cost-sharing models and related policies across national borders. The necessary steps in this regard are being investigated by the EGI and PRACE initiatives. Moreover, the smooth interaction and interoperation of all existing components of e-Infrastructure services in Europe are vital to the generation of this confidence. It is anticipated that most future users of the common European e-infrastructure will lack a thorough education in computer science or computer engineering; they will, therefore, need to be supported in using the infrastructure. To this end, we need to establish support for user communities that provide applications, appropriate user interfaces, training and support in case of problems. This support structure is ultimately just as important as the hardware infrastructure.

- The e-IRG notes the importance of the steps undertaken by the EGI and PRACE initiatives to promote sustainability of the computing-related e-Infrastructure, such as the development of policies, business models and funding schemes for the new required structures. The e-IRG recommends that adequate levels of funding should be granted by the EC and Member States for the development of the new structures both on the national and European levels.
- The e-IRG recommends that major e-Infrastructures initiatives such as EGI and PRACE cooperate closely in order to define complementary and interoperable environments for the benefit of European researchers. This environment should ensure that access to resources in Europe is granted through an open and transparent process, based on international standards and interoperable middleware.
- The e-IRG recommends the funding of activities that help national user communities to cooperate with corresponding user communities in other countries, in order to foster the European research activities in using the e-infrastructure.

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### e-IRG commitment required

- Participate actively in the discussions among the governments of the EC Member States on the development of a sustainable computing ecosystem.
- Help to establish the regulations for ensuring fair access to and the integration of the distributed e-Infrastructure.
- Advise Member States and EC on policy actions to be taken and funding to be allocated.





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