WHITE PAPER ON THE IRISH E-INFRASTRUCTURE

A Roadmap for Irish Research and Development

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"e-Infrastructure is essential, not optional, to the aspirations of research communities."

Cyberinfrastructure report, US National Science Foundation 2006

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"Investment in R&D and innovation is a key driver of productivity growth. ICT accounts for 40% of Europe's productivity growth, and so an important part of R&D investment should go to ICT.".

Mrs Viviane Reding,
Commissioner for Information Society and Media
(06 July 2006 - EPoSS - Brussels)

1 Executive summary

The purpose of this document is to focus attention on the key role of e-Infrastructure for research and innovation. In particular, the continued success of national policy on research and development (R&D) needs sustainable infrastructures. This applies at national, European and global levels, so it is important that in Ireland we make the right decisions so as to leverage transnational investments, while at the same time exploiting the unique strengths of Ireland.

The partners in this document are deeply concerned about the future of the e-Infrastructure in Ireland, and consider that it is their mission and their responsibility to provide visionary leadership and expertise in this area. The aim is to stimulate debate among researchers, policy-makers and stakeholders on the types of e-Infrastructure we need at home and abroad, and to identify the means of providing for their sustainability. With the prospect of a new national programme for R&D in the period 2006-2013, and also with the European Union's (EU) 7th Framework Programme (FP7) being prepared for the same time period, it is timely to have such a debate on strategic objectives and on actions to be taken. The sums involved – 4 billion euro in Ireland and 50 billion euro across Europe – demand that we set clear goals and use coherent measures to achieve them.

The main targets for the Irish community in a near future should be to foster coordination and synergies around the e-Infrastructure, to build on a global perspective to rational investments in expensive resources, to think global to ensure maximum added value and finally to promote the stability and operational nature of the e-Infrastructure, looking ahead for a long term sustainability. One should focus on reliability, self-sustainability, standards and technology layers with common services to users from the Higher Education to the Health sector, and the involvement of industry and of society at large.

This document proposes the creation of a federation, denominated e-INIS (e-Irish National Infra-Structure) of the main facility stakeholders, namely HEAnet, GridIreland, ICHEC, and a data oriented structure yet to be created. The cohesion of the federation will be reinforced by a virtual school. Finally, the federation will strongly support public outreach activities as well as industrial involvement in the information technology sector. The federation of electronic infrastructures will constitute a powerful force to sustain the high level of quality of the research facilities and will attract scientists, experts and business from outside the country and the continent. Moreover the exchange of knowledge and the creation of powerful cross-boundary tools will further enhance Irish competitiveness.

2 The European landscape of the e-Infrastructure

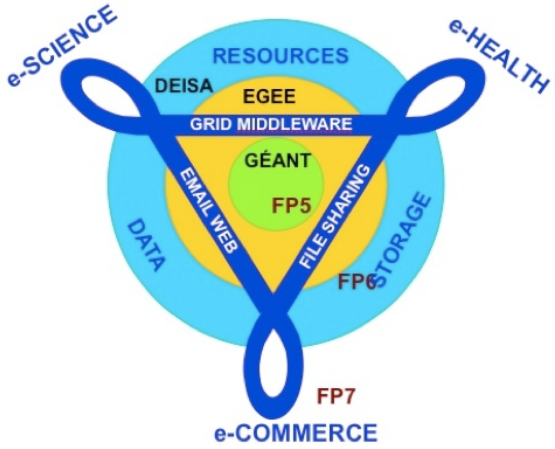
At its meeting in Lisbon in March 2000 the European Council, facing the challenges posed by globalisation and the emergence of the knowledge-based economy, declared its intention to turn the European Union into the world's most dynamic knowledge-based economy by 2010. Clearly this cannot happen in a day and without substantial increases in the levels and efficiency of research activity in Europe. High performance computing, advanced networking and the associated Grid technologies are seen within the European Commission as key strategic areas for the ERA (See the report entitled "facing the challenges" from a High Level Group headed by Mr Wim Kok, former Prime Minister of the Netherlands, who was asked to carry out an independent review to contribute to the mid-term review of the Lisbon Strategy http://europa.eu.int/information_society/essentials/reports/kok/index_en.htm) which must be supported on a European level by facilitating the integration of national efforts (the Union, under the principle of subsidiarity, does not support national facilities directly). Interestingly enough, the recently published "list of opportunities" for new large-scale research infrastructures within the European Research Area compiled by the European Strategy Forum on Research Infrastructures (ESFRI) includes facilities in Information and Communication Technology (ICT) such as a large-scale super-computing centre. Therefore the present initiative could be a milestone to sustain and reinforce the Irish e-Infrastructure for a potential participation of the Irish community in these new European Research Infrastructures.

The ESFRI group has set up 3 steering groups in (1) Physical Sciences and Engineering, (2) Biological and Medical Sciences, and (3) Social Sciences and Humanities. A fourth group was already in existence, namely the eIRG (e-Infrastructure Reflection Group) dedicated to the e-Infrastructure. The present document is directly in the spirit of this group and encompasses applications in the three other areas.

The term e-Infrastructure is used to indicate the integrated ICT-based Research Infrastructure. Of course such an infrastructure builds on many ICT components that have been around for quite a while, such as networks, supercomputers and storage. There are many interdependencies between these components, so their future should be planned coherently. The e-Infrastructure viewpoint allows one to join and fit all interrelated infrastructures together and start thinking of them as a system – and optimise not for each individual part, but for the whole.

The prime goal of the e-Infrastructure may be to support e-science, e-health and e-culture, but at the same time opportunities are created for many other application domains that contribute to society such as e-commerce, e-government, e-training and e-learning. The e-Infrastructure makes applications dramatically easier to develop and deploy, thus expanding the feasible scope of applications possible within budget and organisational constraints, and shifting the scientist's and engineer's effort away from information technology development and concentrating it on scientific and engineering research.

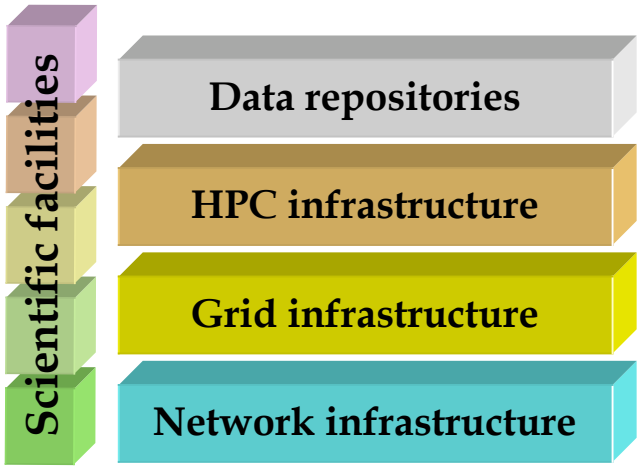
Key components of the e-Infrastructure are networking infrastructures, middle-ware and organisation and various types of resources (such as supercomputers, sensors, data and storage facilities). In the diagram below, the relationships between those components becomes clear. The network (in this case, the pan-European research and education network, GÉANT) is at the heart of everything. In the age of hybrid networks, 'internet' should probably just read 'network' in order to also apply to lambda-networking. The middle-ware and virtual organisations connect the distributed resources, data and storage facilities in a seamless way. The application domains (such as e-science and e-health) are on the outside of the chart to exemplify the parties served by the infrastructure; these are only relevant insofar as they bring in resources.



Schematic representation of the e-Infrastructure areas in the various European Framework Programmes

3 The Irish research community

In the past decade, major structural changes have occurred in Irish policy on research and its funding. The change to competitive tendering for research grants was an explicit move to attract the best researchers. This was clearly the policy and practice of the newly-established Science Foundation Ireland (SFI) and was also adopted by the HEA (Higher Education Authority) in its PRTLI (Programme for Research in Third-Level Institutions) scheme, by the Health Research Board (HRB) and by other funding agencies. This was a new departure and was driven with vigour and foresight by the Government and its research agencies. The research community has embraced this philosophy and has competed openly for grants for new research projects. As appropriate, consortia have formed to recruit the requisite expertise and resources. In many cases, new centres of excellence have been set up, and this trend has been endorsed by the recent OECD report on Irish third-level institutions. The research community will have to develop and sustain the general structure of the e-Infrastructure as shown in the diagram below, in order to remain competitive and develop the knowledge economy.



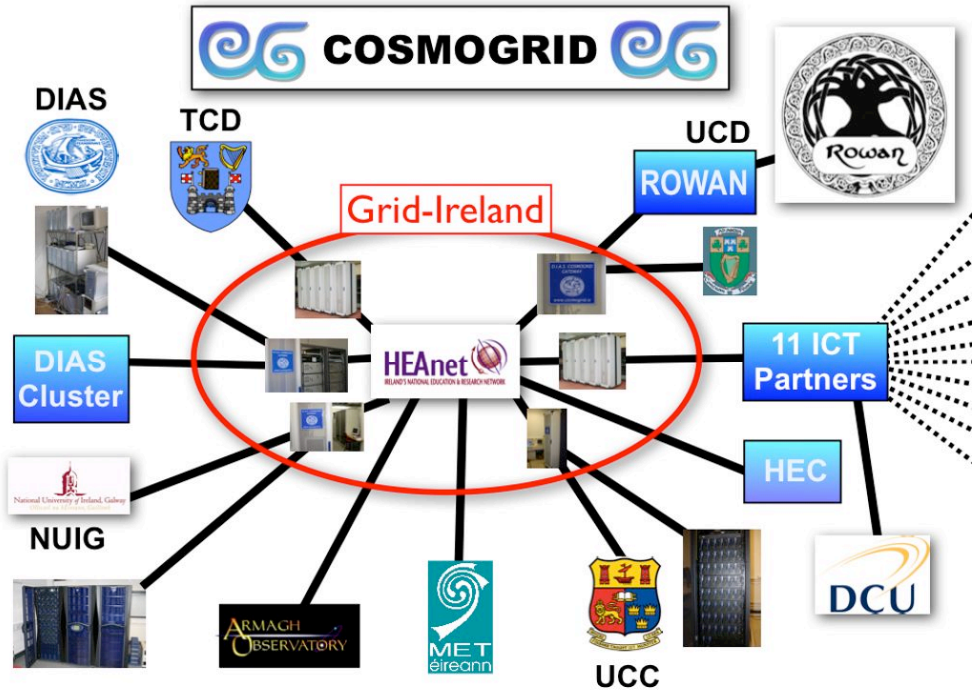
3.1 THE NETWORKING INFRASTRUCTURES

The approach to providing the necessary electronic infrastructure has been somewhat varied. The research network, for instance, has been in operation since the 1980s as HEAnet. It has always had a national, cross-sectorial dimension and has been centrally supported in providing enhanced network services to the research community. It has established and used European and other affiliations to secure cost-effective continental and inter-continental connectivity at unprecedented capacities. In terms of strategic connectivity and services, HEAnet ranks among the leading national research and education networks (NRENs) in the world. It has been able to combine cohesion among its 40+ institutional clients at third and fourth levels with flexibility in exploiting new technologies in an increasingly competitive market; the deployment of a dark fibre network, nationally and in regions, is indicative of the success of this strategy. The financial model of HEAnet combines revenue from services to clients with grant aid towards central services and capital expenditure.

More recently, the network has been enlarged to include all primary and secondary schools in Ireland. As part of its policy for the Information Society, the government has teamed up with Irish industry to fund the connection of almost 4,000 schools to HEAnet, thus extending the network infrastructure to first and second level education. Already, students are using learning applications layered over the national infrastructure.

3.2 THE GRID INFRASTRUCTURES

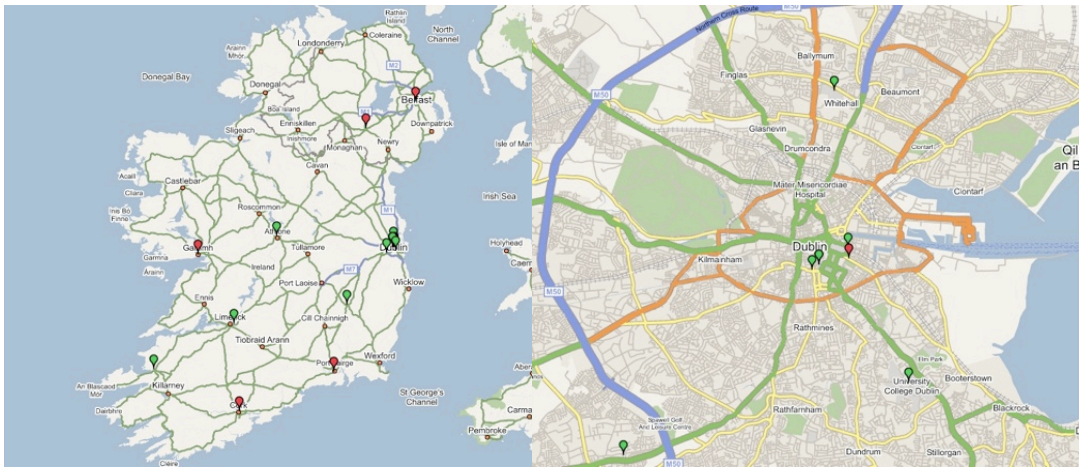
The Grid infrastructure began with Enterprise Ireland funding, then used and improved in four large EU and two large national projects. The national projects have been good examplars, particularly the Cosmogrid project, which competed successfully for PRTLI funding. Comprising research endeavours in a wide range of thematic areas, and with involvement from many major institutions, Cosmogrid has been a loose confederation with common resource and support requirements, but with diverse objectives in research topics. The model here is similar to that of a funded research project, albeit a large and diverse one with a central leadership and management function.



Schematic representation of the present sharing of Cosmogrid major resources linked through Grid-Ireland and using the network provided by HEAnet

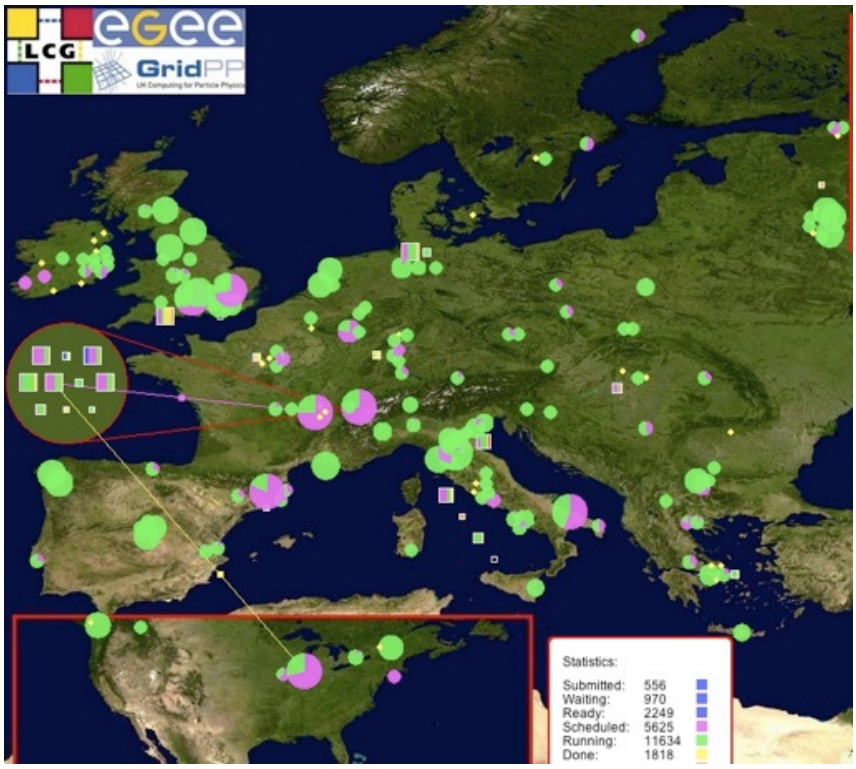
Grid Ireland, with its OpsCentre in Trinity College, Dublin, provides systems support for Grid computing, as well as policies and procedures for use of the Grid. It has addressed the functions of training and points-of-presence. For the latter, it has leveraged HEAnet's national coverage and service contracts with academic and research institutions to rollout its grid gateway systems. However, the support and maintenance of this network of gateways is now an important issue. As the grid grows, and as users become more dependent on it for mission critical work, planning and coordination becomes essential.

Grid-Ireland has set up, developed and currently supports the national Grid infrastructure providing Grid access to several national virtual organisations (VOs), including CosmoGrid, WebCom-G, GeneGrid and MarineGrid. It now has a gateway in 18 institutions within Ireland, including two in Northern Ireland (QUB and Armagh Observatory). In addition, it has firmly established the Irish Grid infrastructure within the European and International Grid via EU projects, especially the EGEE project. Under EGEE, the UK and Ireland (UK/I) form one of nine federations amongst 27 countries. There are important issues of international interoperability which require, not just national coordination, but constant liaison with international groups.



Locations of computing nodes attached to the Irish Grid managed by Grid-Ireland

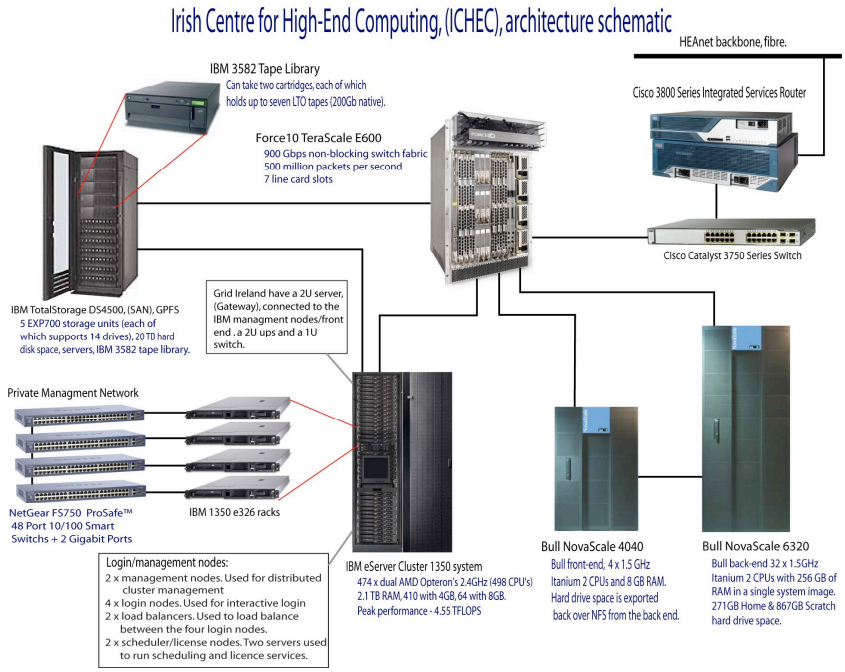
Together with Cosmogrid, Grid-Ireland has achieved the following targets; (1) sustainable architecture of homogeneous core infrastructure and heterogeneous resources, (2) installation of grid gateways at 18 third-level institutions, (3) centralised management and deployment of grid middleware, (4) support for heterogeneous site resources via ports of the grid middleware to other operating systems, (5) effective Grid security, (6) development of a scaled virtual replica of the full Irish Grid for certification, porting and experimentation, and (7) training courses, with eLearning in development.



Activity of computing nodes attached to EGEE including the Irish Grid

3.3 THE HIGH END COMPUTING INFRASTRUCTURES

Finally, Ireland's ability to perform internationally competitive research and to attract the best computational scientists has increased due to the creation of national High-End Computing (HEC) facility. The Irish Centre for High-End Computing (ICHEC) aims to fulfill that role, as well as to extend both the computational capability and computer science expertise of Ireland. The Centre has given Ireland a national infrastructural resource in computational science with both capacity and capability beyond what could be provided by any one institution. Before ICHEC, High Performance Computing in Ireland was restricted to a number of university/institute groups with medium scale resources. Through ICHEC, Irish researchers now have access to TFlops facilities with professional consummate support.



Schematic representation of the connectivity of ICHEC equipment

The mission of ICHEC is the cost-effective delivery of high-end computing services to the academic and industrial research communities in Ireland through:

- access to high-end computing facilities as an integral part of the national research infrastructure;
- provision of a professional support service for Irish users;
- training in high-end computing to increase the national skills base;
- promotion of the wider adoption of high-end computing as an enabling technology of the knowledge economy and a fundamental tool in modern research;
- participation in national research projects using high-end computing;
- collaboration with international initiatives in high-end computing.

3.4 DATA REPOSITORIES

The last component of the e-Infrastructure corresponds to the data repositories and management. There is a need to deploy data repositories for the scientific community and future generations of scientists supporting, in a coordinated way, digital libraries, archives, data storage, data curation, access to information and the necessary pooling of resources. Dealing with the massive quantity and diversity of data generated by research and industry presents one of the defining challenges to data management, data mining and information discovery. There is now widespread recognition that it is possible to extract previously unknown knowledge from large data-sets. For this reason there is a growing body of research concerned with the use of parallel and grid computing for data mining. The challenge is not only algorithmic but also the management of the very large amounts of associated data. The core problem is one of information management, both with respect to the volume and variety of data types (images, complex data, array type data, sensorised information, and records) being produced, and to its quality and provenance from laboratories across academic institutions and the private sector. Issues of security and authorised access to appropriate data resources also impinge on the element of infrastructure.

In the realm of e-learning, the HEA has already supported a significant initiative in the form of the National Digital Learning Repository. The NDLR project has made significant progress in managing diverse media from various teaching disciplines. With its inclusive approach across all sectors, its close collaboration between technical and subject specialists, and its use of infrastructure and applications, it has shown how foresight and vision can deliver an integrated platform for e-learning.

To close this section, we summarise the usage of the e-Infrastructure in Ireland by the scientific community in the following table.

e-Infrastructure usage	Arts, Social Science and Humanities	Biological and Medical Sciences	Physical Sciences and Engineering
Data repositories	X	X	X
HPC infrastructures	-	X	X
Grid infrastructures	-	-	X
Networking infrastructures	X	X	X

4 Strengths and weaknesses

To help us to learn from experience, we summarise the strengths and weaknesses of research policy and practice in Ireland.

4.1 Strengths

- Support for R&D has been a matter of national policy in the past decade. From the involvement of the Department of the Taoiseach (which has appointed the government's chief scientist), through various departments and agencies, there are resources for fundamental and applied research in many areas.
- With its academic institutions and research agencies around the country, Ireland has a good distribution of expertise in many areas of research.
- There are relatively few legacy agencies in Ireland, so that there can be a flexible approach to setting up new centres of excellence.
- There are good models for success in research projects and in research infrastructure.
- Researchers and research infrastructures are affiliated with many European and world bodies, can often leverage their resources, and can collaborate and contribute at international level.
- The e-Infrastructure is working successfully in areas such as networking and high-end computing; quality services are readily available to researchers.
- The relatively small and compact size of Ireland provides a manageable scale for the national e-Infrastructure.
- The Irish market has been extensively de-regulated, and there are competitive advantages when it comes to procuring leading edge goods and services.

4.2 Weaknesses

- There are few centres of excellence in Ireland, where the tradition has been one of multi-school third-level institutions.
- In consequence of this tradition, there are often "turf wars" between institutions when it comes to consolidating existing expertise and resource, or setting up a new centre of excellence.
- Third-level education comprises the universities and the institutes of technology. There is very little collaboration or mobility between these two sectors.
- While there is some evidence of partnership between academe and industry in research, it tends to be the exception rather than the norm. Again, this constrains the opportunities for innovation and research.

- There is no policy to maintain minimum levels of expertise in the country. Thus, expertise that is built up in a R&D programme can be lost by the time the next round starts.
- There is some aversion to change, less so in academe but often in public administration.
- With competitive tendering for research grants, there has been a trend away from collaboration in some areas, a loss of the national dimension.
- Ireland is not a member of CERN or ESO, and there are other missing affiliations which constrain our researchers in the work they can undertake.
- Due to the transient funding of some research infrastructure, much of our future research activity is put at risk.

5 Lessons learned

From the observed strengths and weaknesses, we can learn lessons and be better informed when it comes to planning for research activities and support in the future. For example:

- The e-Infrastructure must be cross-sectoral and open, to avoid wasteful replication and to provide integrated and inclusive service and support.
- The e-Infrastructure must be strategically compatible with e-Infrastructures elsewhere, so that we collaborate and contribute to the global research effort.
- Similarly, there must be compatibility at the technical level, so that our research infrastructures interoperate universally.
- As a consequence of interoperability, we must be able to pool infrastructures to provide enhanced, scalable and resilient services.
- We need a "joined-up" infrastructure, with vertical integration so that, for instance, there is a common access policy, and an identity management system that embraces universality and mobility.
- The user's perspective must be paramount in developing and operating the e-Infrastructure.
- The e-Infrastructure must be easy to use and their uptake must be monitored and stimulated.
- In the case of new services for researchers, the use of "demonstrators" and "playgrounds" to prove benefits to users should be considered.
- The use of communications technology to facilitate collaborative working should be encouraged; this includes wikipedia, video-conferencing, multimedia streaming, pod casting etc.
- The use of the e-Infrastructure should not require specialist training. However, researchers need to be able to share knowledge, and to engage in interactive workshops.

6 Some new challenges

As far as the e-Infrastructure is concerned, the research landscape is acquiring new features and a richer variety of activities. This is already evident at the level of the network, where there has been a very pronounced demand for connectivity from the teaching and research hospitals; HEAnet is in the process of providing high-end connections to medical research centres, affiliated to universities.

In the area of life sciences, access to specialist databases is very important. A bioinformatics portal, to provide unique and seamless access to such information, distributed over the globe, is a major requirement. Prototypes need to be developed and demonstrated, and this demands that infrastructures such as network and middleware can support the use of the applications and datasets.

In the humanities, there is not just awareness but innovative uses being made of information technology in areas of research and education. The strides made by the NDLR project clearly show what can be done in a collaborative effort involving many institutions and different disciplines. The use of digital repositories to store a rich mix of resources for learning provides for a network of such resources across the country. And the use of a portal to widen access to other repositories, particularly in the research area, enhances the knowledge environment for our researchers. Once again, a common substrate or e-Infrastructure can tie all these disparate materials together.

As mentioned above, the demands from medical researchers for seamless onward connectivity and for enhanced levels of bandwidth are indicative of new leading edge research in this sector. The demands here are for secure and reliable infrastructure, just the kind that could be used in an enhanced national health service.

The structuring effect of the e-Infrastructure is expected to follow from the applications and services provided by the partners. Irish computational science, data management and access to the e-Infrastructure will benefit from the integrated environment. Facilities and services, such as the distributed system, the transparent global access to data, the transparent data pipelining across applications running on different platforms, a programming and production environment adapted to demanding, grid enabled, complex and distributed applications over the country, and technical experts providing user support at all levels, are expected to have a profound impact in computational science and technology.

7 Achieving the vision: strategic objectives

7.1 Structural Objectives

7.1.1 The building of an open shared e-Infrastructure

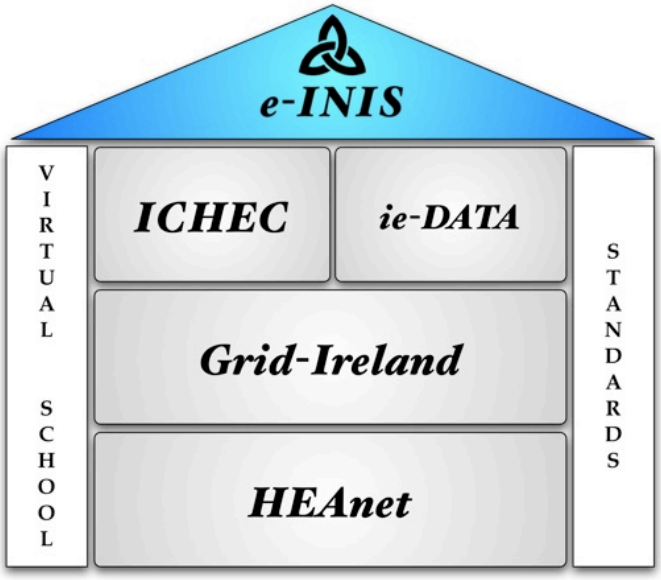
It is not enough to set up the infrastructure; there must be real take-up, and this means that usage must be stimulated, and also evaluated.

7.1.2 The sustainability of the overall e-Infrastructure

The key elements of the e-Infrastructure – the data and computing resources, the underlying network that links them with users, and, in between, the middle-ware that seamlessly and securely connects users with the requisite resources – are indicated in the e-INIS schematic. Each of these elements must be sustainable, capable of providing services under an appropriate contract, collaborative in overseeing common objectives, and responsible to the HEA.

7.1.3 The creation of a virtual school to ensure cohesion

In research, as in education or any other activity, the principle of subsidiarity applies – it is preferable to do locally that which can best be done locally. So if researchers can work in their own environments and use the infrastructure to communicate and collaborate, then they should be left to do so, rather than imposing a central solution on them. Virtual teams, or even a virtual school, can combine the best of local resources and local support in a national resource. It could be envisaged that the Dublin Institute for Advanced Studies, due to its specific and unique structure, could host such a school of a new type in addition to the existing schools, namely the Schools of Cosmic Physics, Theoretical Physics and Celtic Studies. The present partners envision the virtual school as functioning as a hub, connecting groups with specialised expertise.



7.1.4 A Framework to map the e-Infrastructure to users

The e-Infrastructure, through e-INIS, will support a federation of research users, working from their institutions and with identification provided locally. Virtual organisations, with specific purposes and access to resources, will be set up, with identity management based on mappings back to the base institution.

7.2 National Objectives

7.2.1 The promotion of Information Technology

Above all, e-INIS will use and promote Information Technology. It will enable world-class research by eliminating the barriers, in space and in time, that keep researchers apart, and remote from the tools and the materials they need for their work. Rather than investing in new buildings, it will create virtual communities, and use digital multimedia technology to provide the environment in which people can meet and work together. The virtual organisation will also engage with all research sectors, with schools, with industry, and with the public generally, and will adopt best practice in environmentally and ethically sound ways of working. Indeed, powerful computer systems and virtual reality enabled communications are easily demonstrated to the public and have broad popular appeal. There is thus considerable scope to go outside the strictly academic and industrial environments and involve the wider community in the excitement of the e-Infrastructure through media exposure, open days and other public relations exercises. Such education, in the widest sense, is important to secure continued public support for basic and innovative research and to counteract the decline in interest in the physical sciences among school students. Increasingly there is recognition that, in accepting large sums of public money, one has a duty to inform and, where possible, involve the public in research and innovation initiatives.

7.2.2 The use and development of standards

By using and promoting open source systems, the e-Infrastructure will be open to service providers, and thus provide opportunities for advanced product development in Ireland. The continued input of Irish researchers to standards bodies will be maintained. In this context, the Irish e-Infrastructure could play a role of advisor for the funding agencies or the government in its areas of expertise, i.e. Networks, Grids, large computing facilities and large data-set management.

7.2.3 The fostering of "demonstrator" services for use in prototyping and validating research

The name "demonstrator" suggests an area for experimentation without responsibility or constraint. This sums up precisely the rationale for fostering demonstrators using the combined resources of an interconnected e-Infrastructure. Users will be encouraged to draw on the services of their local network whilst having the opportunity to take advantage of those offered in the remote networks. Users will choose services based on their requirements, this mixture of services will make up the user's own specialised demonstrator.

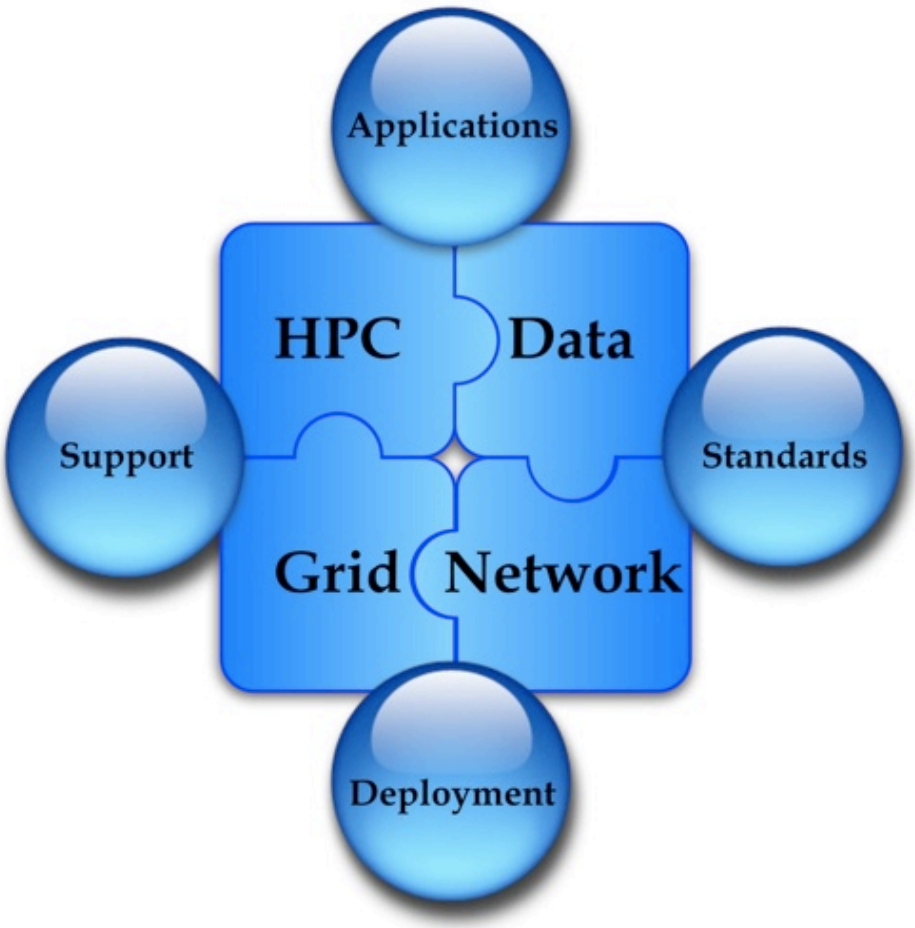
7.2.4 The deployment and constant adaptation and evolution

The e-Infrastructure must satisfy the constant changing landscape of IT. Changes will happen in the 2006 - 2013 timeframe due to demands from the market and new tech-

nological innovations. To continually evolve with these changes, it is necessary to provide a map of developments for the e-Infrastructure, attempting to future-proof its existence, based on users requirements. Moreover funding agencies could envisage an acceleration of the contribution of Academia and industry by funding equipment and research projects subject to the connection of the equipment to the e-Infrastructure. The funding agencies could also require the projects to provide a percentage of the funded resources to researchers outside the funded organisation, but only via the National e-Infrastructure.

7.2.5 A contribution to the economic development of Ireland

The e-Infrastructure will act as a strategic catalyst to develop and attract the talent necessary to create a sustainable R&D cluster in Ireland. It will provide interdisciplinary training and knowledge transfer of high quality to industrial partners and SMEs by capitalising on the training and transfer activities of all the partners. Indeed, there must be close interaction between industry, academia and the State. Technological development and the sophistication of business demands higher levels of academic achievement and stronger links between education and enterprise sectors. Ireland must continually upskill the general workforce and improve the quality and quantity of graduates and researchers.



7.3 International Objectives

7.3.1 International inter-operability

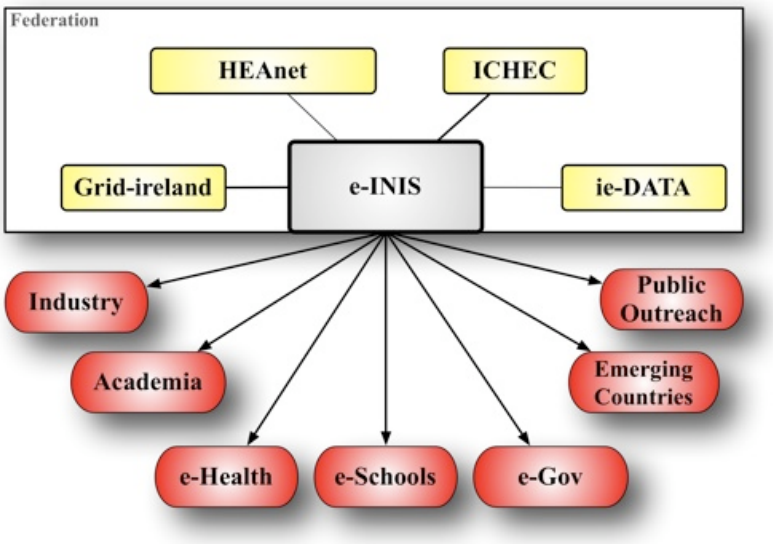
This demands collaboration – both at home and abroad – successful interoperation and the creation and use of synergies, scalability and resilience. The e-Infrastructure could be certified and compliant against the main other e-Infrastructures in Europe (i.e GÉANT, EGEE, DEISA,..) and in the world (i.e TeraGrid, international networks, ChinaGrid,...). The e-Infrastructure could provide a "certification" that named user projects can successfully be deployed and use the National Irish e-Infrastructure. In the same spirit, e-INIS could also provide a certification of interoperability, valid for local, national and international user projects.

7.3.2 Involvement in EU projects

The e-Infrastructure will focus on getting involved and also lead European projects in areas related to its expertise. Several projects have already been identified such as HPC-EUR, DEISA, HPC4all or HPC-Europa for the high end computing area, EGEE2, HealthGrid, Jetset or Data-MERMAIDS in the Grid area, the Virtual Observatory, eHealth applications and G-Sky for data management, and finally GÉANT, ANT2, EUMED, ALICE, TEIN2, Advance, Canarie and Internet2 for the networking activities. Against the background of growing competition at world level, the development of an open European labour market for researchers and the diversification of skills and career paths of researchers are crucial to support a beneficial circulation of researchers and their knowledge, both within Ireland and in a global setting. This will directly impinge on the development and participation of Ireland to the knowledge economy.

7.3.3 Emerging countries objective

The e-INIS organisation will undertake to stimulate collaboration and inter-working with people in emerging countries. It will leverage the larger European and global infrastructures to help give effect to Irish policy on aid and development. Collaborations with South Africa and other sub-Saharan countries have been initiated.



8 Implementation

To build on the success of PRTLI and other research programmes, to provide integrated services and support for future research, to leverage involvement and interoperability with international research endeavours, and to link research findings and methodologies into educational programmes, the National e-Infrastructure (e-INIS) needs recognition and support. It will have an activity plan to address the following challenges:

8.1 Integrated testbed activities

Some development or investigative activities will require a national infrastructure and yet would adversely affect a production e-Infrastructure, perhaps because of stability, security or other conflicts. Nevertheless, such activities have been accommodated in some specific solutions by the use of explicit structures, for example the GEANT Testbed or PlanetLab for networking, or TCD's TestGrid, and have proven to be extremely valuable. Thus far no solution has emerged at a national scale. An effort should be directed to creating a single Testbed Infrastructure, separate from the production e-Infrastructure, but perhaps hosted by it, extending from HEAnet through Grid-Ireland to ICHEC and ie-DATA.

8.2 Integrated service activities

The e-INIS will undertake service activities in the following areas; (1) deployment and operation, (2) network monitoring, (3) distributed filesystem, (3) security, (4) helpdesk, (5) training and workshops, (6) end-to-end troubleshooting.

8.3 Service development activities

Service review and development will be a key element of the service. Items to be investigated include (1) the development of a Grid filesystem, (2) user-controlled network resources, (3) federated identity management

8.4 Management, outreach and cohesive measures

The National e-Infrastructure will be open in the sense of providing service and support across all education/research sectors and for all disciplines within the scope of the funding programmes. It will use its contacts, and the infrastructure itself, to enable participation from all corners of the country, and will stimulate the use of multimedia, shared workspace and pervasive access to remove obstacles to collaboration and progress.

8.5 Leverage links with education programmes

As appropriate, the results and methodologies of leading-edge research will be incorporated in the courseware of undergraduate programmes. In this way, the next cohort will be equipped to carry on world-class research, to think of resources in the wider scale and fully to exploit the infrastructure.

8. 6. DEVELOP COMPETENCE IN DATA MANAGEMENT

There are more and more large datasets generated by research endeavours and much of it is unavailable, even on a secure basis to bona fide researchers. The e-INIS federation will collaborate in projects with European and other partners to show how obstacles to research can be overcome, while at the same time preserving personal, commercial and intellectual property, and integrating access to data in a range of media.

8. 7. FOSTER DEMONSTRATORS OF INTEGRATED USE OF RESEARCH DATA

It is recognised that investments in compute capabilities are being coordinated and based on collaboration between institutions. E-INIS will apply this concept to data by fostering demonstrators that show how a managed approach to sharing data securely can deliver optimal results. It is expected that such a federation would also sustain academic and industrial research and development, for example in the following strategic areas, given here just for illustrative purpose, such as Biomolecular and Pharmaceutical Modelling, eHealth, Digital Media, Financial and Service Systems Modelling, and Earth and Space Sciences, with the Virtual Observatory. These examples have been selected stemming from their relevance to the knowledge economy in Ireland, the presence of established or emerging critical mass in the research community nationally, and the potential to deliver world-class research output from each field. Many other areas will be of interest for the Irish e-Infrastructure and an exhaustive review of those domains remains out of the purpose of the present document. However, the e-Infrastructure should look forward to develop competence in the data management area by participating in collaborative projects with European partners. To this end, contacts have been made with Dr Jennifer Schopf, the UK e-Infrastructure advisor, who suggested a number of candidate projects for collaboration, both in Europe and in the US.

8. 8. SUSTAINED SUPPORT FOR RESEARCH

e-INIS aims to embody the core expertise needed to deliver this programme of activities. It will do so within a proven organisational structure like HEAnet, helped by a virtual school and with identified contacts/clients in each of the institutions.