

European Network for co-ordination of policies and programmes on e-Infrastructures



D1.1.1 – Overview of the National Programmes in Europe – general survey

<i>Deliverable Lead:</i>	SURFFoundation
<i>Related Work package:</i>	WP1 – Information Exchange
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<i>Dissemination level:</i>	Public
<i>Submission date:</i>	23.12.2010
<i>Project Acronym:</i>	e-InfraNet
<i>Website</i>	e-infranet.eu
<i>Call:</i>	FP7-INFRA-2009-3.1
<i>Project Number</i>	246651
<i>Instrument:</i>	Coordination action (CA) – ERA-NET
<i>Start date of Project:</i>	01/01/2010
<i>Duration:</i>	36 months

Project funded by the European Commission within the Seventh Framework Programme		
Dissemination Level		
PU	Public	x
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

History chart

Version	Date	Changed pages / reason	Modified by
v.01	20-10-2010	1 st draft by Lilian van der Vaart	
v.02	11-11-2010	1 st review by partners	MB, LV
v.03	25-11-2010	2 nd review by PC & NW	LV
v.04	09-12-2010	3 rd review by NW	NW, LV

ACKNOWLEDGEMENTS

This report has been developed within the project “European Network for co-ordination of policies and programmes on e-Infrastructures” (e-InfraNet.eu). The project is an ERA-NET co-funded by the 7th Framework Programme of the European Commission.

The consortium of the project is presented in the table below:

Participant organisation name	Short Name	Country
Higher Education Authority	HEA	IE
Higher Education Funding Council for England	HEFCE	UK
SURFfoundation	SURF	NL
Foundation for Science and Technology	FCT	PT
Latvian Academy of Sciences	LAS	LV
Ministry of Science and Innovation	MICINN	ES
CSC - IT Center for Science	CSC	FI
National Information Infrastructure Development Institute	NIIFI	HU
The Scientific and Technological Research Council of Turkey	TUBITAK	TR

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EXECUTIVE SUMMARY

This Report summarizes the findings of the first questionnaire among project participants on current e-Infrastructure programmes in their countries. The objective of this questionnaire was to inform the e-InfraNet project and provide a factual and qualitative basis for the further development of the project and specific actions plans. As this was the first such initiative for the partnership, its development and processing took longer than expected but the final outputs will benefit from the added focus.

Information on e-Infrastructure programmes and activities was received for 8 countries, who reported in total 36 relevant programmes. Main findings are:

- Up to €180 M per year are being invested in e-Infrastructure projects across the countries.
- Most programmes funded are in the range of €1 - €5 M per year, and run for a period of 3-5 years.
- Many are national coordination programmes including shared use of resources and digital repositories.
- Technology areas affected most are networking, HPC/Grid and Data Storage and Management.
- Over a third of the programmes relate to Green IT, a quarter to Cloud Computing, and three quarters to the Open Agenda.
- There is very little industry involvement in the projects.

Good feedback was provided on suggestions for cooperation which will be useful for the further development of e-InfraNet's activities. Included in these were:

- Coordinate efforts in Green IT and Cloud Computing.
- Stimulate shared and efficient use of financial and local resources, and share knowledge and experience.
- Provide for secure online Data Storage and Management.
- Provide for open, dynamic collaboration infrastructure and assist regional research.
- Work towards sustainability and stability of e-Infrastructure(s).

Discussion of the results of the questionnaire and their implications for the further development of e-InfraNet's work have led to the observation that e-InfraNet's focus on the three topical areas of Green IT, Cloud computing and the Open Agenda puts it in a unique position to cut across all infrastructural, institutional and disciplinary boundaries. This thematic approach offers an opportunity for oversight and coordination from a different perspective than existing organisations/institutions or scientific discipline/community are bound to take. e-InfraNet can examine how the three chosen topics affect and connect the

various infrastructure layers; what opportunities and solutions those topics, individually or in combination, may bring to issues and problems encountered at the various levels; and what policy, standards and guidance is required across the EU to ensure these opportunities and solutions are effective. Taking the standpoint of a group of researchers across Europe needing to collaborate on a large set of data in an open yet secure online environment, it becomes clear that facilitating their need poses questions with respect to the (layers in the) e-Infrastructure for which answers can be found in combined solutions from Green IT, Cloud Computing and Open (access, software, standards, etc) – e.g. a ‘green cloud for open collaboration’. e-InfraNet can contribute with recommendations, briefings and advice on policy measures and actions aimed, not so much at the technical aspects of implementation, but more at the organisational, social or cultural level, since it is here that the most difficult questions are faced. Thus, the work of e-InfraNet will e.g. contribute to the realisation of a ‘framework for a collaborative data infrastructure’ that the High Level Expert Group on Scientific Data has called for in its recent report “Riding the Wave – how Europe can gain from the rising tide of scientific data”.¹

¹ “Riding the Wave – How Europe can gain from the rising tide of scientific data”; Final report of the High Level Expert Group on Scientific Data, a submission to the European Commission, October 2010; http://ec.europa.eu/information_society/newsroom/cf/document.cfm?action=display&doc_id=707>

1 INTRODUCTION

The main objective of Work Package 1 is to gain a good overview of relevant e-Infrastructure programmes on national and regional level and to promote networking and trust-building among programme owners or managers in the e-Infrastructures field. WP1, with its inventory work, kicks off the other work packages and activities in the programme, and supports them with ongoing information gathering and exchange.

One of the activities within WP1 is the development of a questionnaire to gather the required information on current e-Infrastructure initiatives in partner countries and other European countries. This deliverable reports on the first results of this questionnaire. It contains a general survey of the programmes reported by the partner countries and suggested areas for policy alignment and coordination at European level; and it establishes sharper focus for further e-InfraNet activities.

2 METHODOLOGY

2.1 Questionnaire and reporting process

A first version of the questionnaire was drafted by the WP-leader in March-April 2010, parallel to the preparations of the first Scoping Dimension Workshop of 15-16 April 2010 in Leuven. This first draft was given for review to the work package participants, and important feedback on the length and level of detail of the questionnaire was received from a number of them. Based on this, it was decided to simplify the questionnaire and thus improve the chances of relevant responses and possibilities for processing the data received. Length and level of detail of the questionnaire were reduced; the possibility was built in to follow up with further questions by phone or email as and when that would appear relevant.

The questionnaire was sent out on April 28, 2010 to the representatives of the 9 participating countries, with a covering letter explaining the aims, set-up and procedures of the questionnaire. These documents are attached to this report as Annex 1.

The amount of information included in the collected questionnaires was so substantial, that a first processing round was chosen to produce a survey of facts and figures of all programmes. Furthermore, the programmes reported to relate to Green IT were selected and merged into one overview. In a number of cases, representatives were approached with a few further questions about the Green IT programmes. The reason to concentrate on one of the three focus areas first was to check whether the approach chosen would work well enough to use as a model for the other two focus areas. The choice for the Green IT programmes was based on the fact that it was the topic of the first Exchange Workshop (Task 1.4) on October 27-28, 2010; input from the questionnaire was part of the programme.

The 'Facts and Figures' survey of all programmes and the further information from the Green IT programmes were presented in the Steering Committee meeting of September 30, 2010. The presentation contained a number of questions, related to a) further development of the questionnaire/information gathering, b) ways of reporting of the results and c) further development of the programme. It was agreed to add a descriptive report to the 'Facts & Figures', both for the total survey, and the Green IT survey, highlighting the main observations and questions. The report of the total survey follows in this deliverable; the report for the Green IT programmes will form a separate deliverable.

2.2 Expansion of coverage of the questionnaire

A first effort to expand the number of countries participating in the questionnaire was made by checking the results from a survey run by SEERA-EI in South East Europe Research Area for e-Infrastructures to see whether they could be incorporated in the e-InfraNet questionnaire results. However, it was apparent that the difference between the two surveys was too great to make meaningful comparisons; on the one hand, the focus of e-InfraNet was wider in terms of topics, on the other hand the SEERA-EI survey covered a much wider field of application than e-InfraNet.

2.3 Some remarks on interpretation of the questionnaire and results

From the responses received it is clear that respondents have in some cases interpreted questions in somewhat different ways. For instance, in some cases, reported programmes could be called 'projects' or 'activities'; in others, the 'programme' and the organisation carrying out the programme overlap 100%. In some cases, programmes have been reported that 'relate to' (one of) the focus areas, i.e. the programme scope is wider, but contains activities/elements that relate to e.g. Green IT or Cloud. Others have reported programmes that specifically address a focus area. This difference in interpretation explains to quite some extent the difference in numbers of programmes reported between the participating countries.

Since the main aim of the questionnaire is to get an overview of e-Infrastructure development at the national/regional level, it has been decided not to distinguish in this report between these differing interpretations, but rather to focus on the actual aims and activities mentioned in the answers. These do give a picture of what type and level of development is going on, whether reported as one or more programmes or as part of a programme.

Furthermore, in a few cases, ESFRI-programmes were reported separately; other countries mentioned them as EC-programmes supporting and/or related to the national programme. In this case, the latter interpretation has been given preference, which means that in the further analysis of the survey, the ESFRI-programmes have not been included as separate programmes.

3 PROGRAMMES REPORTED

3.1 General

There are nine participating countries in eInfraNet:

Finland (FI), Hungary (HU), Ireland (IE), Latvia (LV), The Netherlands (NL), Portugal (PT), Spain (ES), Turkey (TR) and Great-Britain (UK). In total, 8 countries returned a completed questionnaire and one from Portugal is pending.

Annex 1 gives a full list per country of programme titles, aims and deliverables. In this list, all programmes have also been given a number, which is used for reference to individual programmes throughout this report.

The countries that returned their questionnaires reported 43 programmes in total, of which 7 ESFRI-programmes (not included further in the analysis, as explained in paragraph 2.3). In three cases (Hungary, Turkey, and one of the two programmes reported by The Netherlands), the leading organisation and the programme were reported as one, with the indication that activities are carried out in a range of small(er) subprogrammes or projects. For the total survey, no further specification was asked of those subprogrammes/projects, to avoid extensive work for the respondents and overly detailed information in the survey; in the case of the survey on Green IT further specification was asked, to get a clearer picture of the type of activities carried out. The same will be done for the surveys on Open and Cloud.

Table 1 - Number of programmes

	FI	HU	IE	LV	NL	ES	TR	UK	Total
Total no. of programmes reported	7	1	4	4	2	5	1	19	43
No. of ESFRI-programmes in total	4			1				2	7

Two countries (Spain and Turkey) mentioned explicitly that the e-Infrastructure projects/activities are not part of a specific, separate, e-Infrastructure programme, but part of broader e-science programmes in which the e-Infrastructure improvement is a special focus area or theme. In a number of other cases (e.g. Finland's programme no. 2, Latvia's programme no. 3 and UK's programme nos. 1 and 2) projects/activities are reported that seem to indicate a similar approach.

3.2 Focus areas

Although no specific reporting on the three focus areas is done in this total survey, an indication of numbers of programmes reported to relate to the focus areas is given. Since programmes can relate to more than one focus area, the totals per country can be more than the total number of programmes reported.

Table 2 – Focus areas

No. of programmes related to	FI	HU	IE	LV	NL	ES	TR	UK	Total
Green IT	1	1	1	2	1	4		4	14
Cloud computing	1	1	1		1			4	8
Open	1	1	4	2	2	4		13	27

For Latvia, no information was given on programmes relating to Cloud computing. Turkey indicated that the relation to Green IT, Cloud computing and the Open agenda was not applicable yet, but that Green IT and Cloud computing are becoming areas of higher interest.

3.3 Technology areas

One of the questions in the survey asked for technology area(s) to which the reported programmes apply most. A number of examples was given, and most respondents used those to classify their programmes. These are included in table 3 below. For most programmes the emphasis is primarily on networking, HPC/Grid and/or Data storage and management. Three countries (Hungary, Ireland and The Netherlands) also reported programmes or subprogrammes primarily aimed at Open repositories/archives/libraries. In some cases, the aims/deliverables of programmes indicate a relation with e.g. open archives, VRE's or VRE-type activities (e.g. UK's VRE-programme, Finland's National Digital Library, Spain's e-Science programme, The Netherlands' SURFShare programme), but they are not classified as such²; instead, e.g. classifications are used like data storage & management, HPC/Grid computing or Research Technologies (a self-selected category). In these three cases, the separate question whether the programmes *relate to* the Open Agenda was answered in the affirmative by the respondents.

Table 3 – Technology areas

No. of programmes related to	FI	HU	IE	LV	NL	ES	TR	UK	Total
networking		1	1	1	1	2	1	1	8
HPC/Grid		1	1	3		4	1	2	12
Data Storage and management/data services	1	1	1	1	1	2		6	13
Authorization and Authentication			1		1			1	3
service integration	1	1						2	4
Repositories / open access		1	2		1				4
VRE's					2				2

In a number of cases, respondents have chosen their own categories to classify their programmes. Table 4 below lists these, per country.

² This may be because respondents do not consider Open archives, VRE's etc. to be 'technology areas'

Table 4 – Self-selected classifications

FI	Programme 1: software	Programme 2: computational science	
NL	Programme 2: identity management		
ES	Programme 2: simulation		
UK	Programme 1: distributed computing	Programmes 8 & 17: training and support	Programme 9: research technologies
	Programme 11: Green computing		

4 TYPES OF LEADING, PARTICIPATING AND FUNDING ORGANISATIONS, AND TARGET GROUPS

The questionnaire asked to indicate for each programme the leading, participating and funding organisations. In all but one case, they are public organisations – whether governmental, academic/research/educational, European governmental or other public organisations (e.g. independent publicly funded organisations like CSC, SURF and JISC). This is not surprising, considering that all programmes are (primarily) aimed at the academic/research and educational sectors (see Table 5 below). In one case only – the Finnish programme no. 1 - a private organisation is in the lead, participating organisations form a public-private partnership, and funding comes from a public organisation.

During the discussion of the first results in the Steering Committee in Leuven on 30 September 2010, it was pointed out that in several cases (e.g. JISC, SURF) the programme leader listed is in charge of the entire programme, but the programme consists of a range of sub-projects which are led by (consortia of) academic/educational institutions; these show up in the questionnaire as participating organisations.

Table 5 – target groups

types of target groups:	FI	HU	IE	LV	NL	ES	TR	UK	Total
governmental								2	2
academic/research	2	1	3	3	2	5	1	12	29
education	1	1	2	1	2		1		8
industry/private organisations	1	1			1				3
general public	1	1			1				3
other public organisations		1		1					2
senior management								2	2
not specified								3	3

The ‘general public’ is listed as target audience in programmes for Digital Libraries/Archives and Open Access repositories. In the UK, senior management of HE/Research institutions is the target group in programmes on Green IT and Flexible shared services; awareness raising is an important aim in these programmes. Finland lists industry as the primary target group for programme no. 1; in Hungary Telecom and ICT organisations are listed as partners and beneficiaries/target groups; in The Netherlands, programme no. 2 is also aimed at corporate R&D departments.

5 RUNNING TIMES AND FUNDING LEVELS OF PROGRAMMES

5.1 Running times of programmes

Running times of programmes, when limited, range from 2 years to 10 years, with the largest number ranging between 3-5 years. This is related to the average government funding cycle in most countries; it is possible that a programme goes through various such 3-5 year cycles, but this is not always directly visible in the survey. Research Council funding cycles can be significantly longer.

In 16 cases, running times are either ongoing, open-ended or unspecified. In the case of Hungary, The Netherlands and Turkey, this is in part due to the fact that the leading organisation and the programme are reported as one, and in part because an ongoing (network, grid, data centre) service is offered. This is also the case e.g. in Ireland (HEANet) and the UK (JANET, UK Data Centres and UK Advance – knowledge and expertise centres).

5.2 Funding levels of programmes

Funding levels have been reported in a variety of ways: a total budget for programmes with a limited running time, annual budgets, budgets for a specific year. It is therefore not possible to give a precise figure for the total funding level for all programmes taken together. A rough calculation points towards a total figure of ca. 180-190 M Euro per year.

Funding levels vary significantly as well: from 125.000 Euro/year to over 90 M Euro/year. Most programmes range between 1 M – 10 M in total, and 1-5 M per annum.

6 TYPES OF PROGRAMMES IN RELATION TO FUNDING LEVELS AND RUNNING TIMES

Quite a few of the programmes in the 1-5 M per annum bracket concern coordination activities, to achieve better interconnections and/or cooperation or shared use of services. Programmes concerned with the establishment of open access digital archives/resources also fall into this funding category.

When such programmes have a running time of four or more years, they can easily add up to an investment of over 10 M in total; if we take into account that they may go through more than one four-year funding cycle, investment may easily reach 20 M Euro over the total period.

Eleven of the programmes show a noticeably high funding level: Finland (1), Latvia (1), The Netherlands (1), Spain (2) and UK (6). In four cases, these programmes concern the upgrade and/or operation of the national research and education network. Hungary has reported as a sub-programme a similar upgrade activity, the investment for which was not included in the annual budget figures. Some more detail on these programmes is included here to give an impression of their aims and scope.

Finland's programme concerns the development of Cloud Software (in a public-private partnership), with the aim to improve the competitive position of Finnish software intensive industry in global markets and to achieve new business innovations. Its investment level is 10 M Euro in the first year; the programme is scheduled to last four years.

Hungary runs a specific programme which concerns the update of the Hungarian NREN and related e-Infrastructure (dark fibre networking, computing and storage infrastructure, federative identity management, collaboration tools and systems, information databases, etc.). The two related major projects are completed in 2011 and the investment is 15 M Euro in total (85% funded by the European Regional Development Fund, 15% by the state), on top of the regular annual budget. Operation expenses of the Hungarian NREN are supposed to decrease by some 1 M euro/year as a result of the development.

Latvia's programme concerns the update of the Latvian NREN and related e-Infrastructure (computing and storage infrastructure, Eduroam, information databases). It will run for three years and the investment is 15 M Euro in total (85% funded by the European Regional Development Fund, 15% by the state).

Spain's two programmes concern improvement of the NREN and the HPC infrastructure. A new infrastructure of dark fibre will be deployed as backbone of the NREN and the regions, connecting all research centres and resources in Spain. The deployment period is 4 years, after which an Indefeasible Right of Use (IRU) is foreseen of 21 years (for the Spanish Peninsula) and 30 years (for the connection with the Canary Islands). The budget is 138 M Euro, jointly funded by the Ministry of Science and Innovation, regional governments and EU structural funds (FEDER). The HPC programme aims to provide 'one-stop shopping' to HPC in Spain. It has a 35 M Euro budget and a running time of in principle 4 years.

Both The Netherlands and the UK report an ongoing programme related to the operation and upgrading of their NREN: SURFNet and JANET. SURFNet is reported as organisation and programme in one, and it reports a budget of 35,8 M Euro for 2008. This is the total organisation's budget. For JANET, an annual budget of 51 M Euro is reported.

The UK's other five programmes are run and financed by Research Councils. One programme has a European dimension and aims to construct and operate a sustainable infrastructure for

biological information in Europe to support life science research and its translation to medicine and the environment, the bioindustries and society. Its total budget is over 85 M euro, its running time 10 years. Two programmes are concerned with the provision of up to date data services, as well as an integrated national research and training programme to promote a step change in the quality and range of methodological skills and techniques, for the (UK) Social Sciences. The budgets are 28 M euro and 24 M euro respectively. One programme provides High Performance Computing resources (budget 57 M euro, running time 5 years); and the last programme builds a UK Biobank (budget 93 M euro, running time 5 years).

7 OPPORTUNITIES FOR EUROPEAN COOPERATION

The questionnaire asked to give a first indication of possibilities for cooperation / coordination at the European level, whether strategic or operational. Answers given were in many cases fairly general; in some cases quite concrete suggestions were given. The workshops and further reports per focus area that are to follow are a good opportunity to gather more detailed suggestions and ideas in this respect.

The answers given can be divided between

- a) suggestions with respect to implementation of technology itself and related coordinating efforts (operational and tactical) on the one hand, and
- b) suggestions with respect to strategy/policy aimed at the organisational level.

Tables 6a and 6b below list the answers given in the questionnaire, as well as the suggestions that were already brought forward in the Scoping Dimension Workshop held in Leuven in April 2010; overlap has been eliminated.

Table 6a Suggestions for European cooperation on implementation

Implementation of technology/ coordinating efforts
Cross-border fibres
For projects like DEISA and PRACE also coordination at the national level
Coordinate efforts of deployment of Green IT in installations
Extrapolate local/regional initiatives, e.g. sharing servers or accounting systems in NGI's
Infrastructure updated in the context of specific projects can be put to wider use
Shared efficient use of local and financial resources
Models like EGI
Open, dynamic collaboration infrastructure for online applications and cloud services
Cloud computing
Data storage and management, Secure online data storage (location in EU?)
Assisting regional research (e.g. marine, climate, energy)
Developing / setting standards, e.g. for interoperability
Persistent identifiers
Current Research Information System (CRIS)
Visualization and integration of large datasets.

Table 6b Suggestions for European cooperation on strategy/policy

Strategic efforts/ organisation
Sustainability and stability of e-Infrastructure(s)
Business model pan-european e-Infrastructure
Sharing of experience and knowledge through new partnerships
Principles and public-private partnership issues
Dealing with the excellence/cohesion dilemma
Agreements and policies with respect to e.g. standards, licensing, privacy and security
Build one eco-system
Credits for research (social impact grey literature, re-use datasets)
Guidelines, e.g. for functional aspects, licenses

8 DISCUSSION OF E-INFRA NET IN RELATION TO E-INFRASTRUCTURE LAYERS

In the Leuven Scoping Dimension Workshop in April 2010, the question was posed *how* European policy alignment might help. Several possibilities were identified:

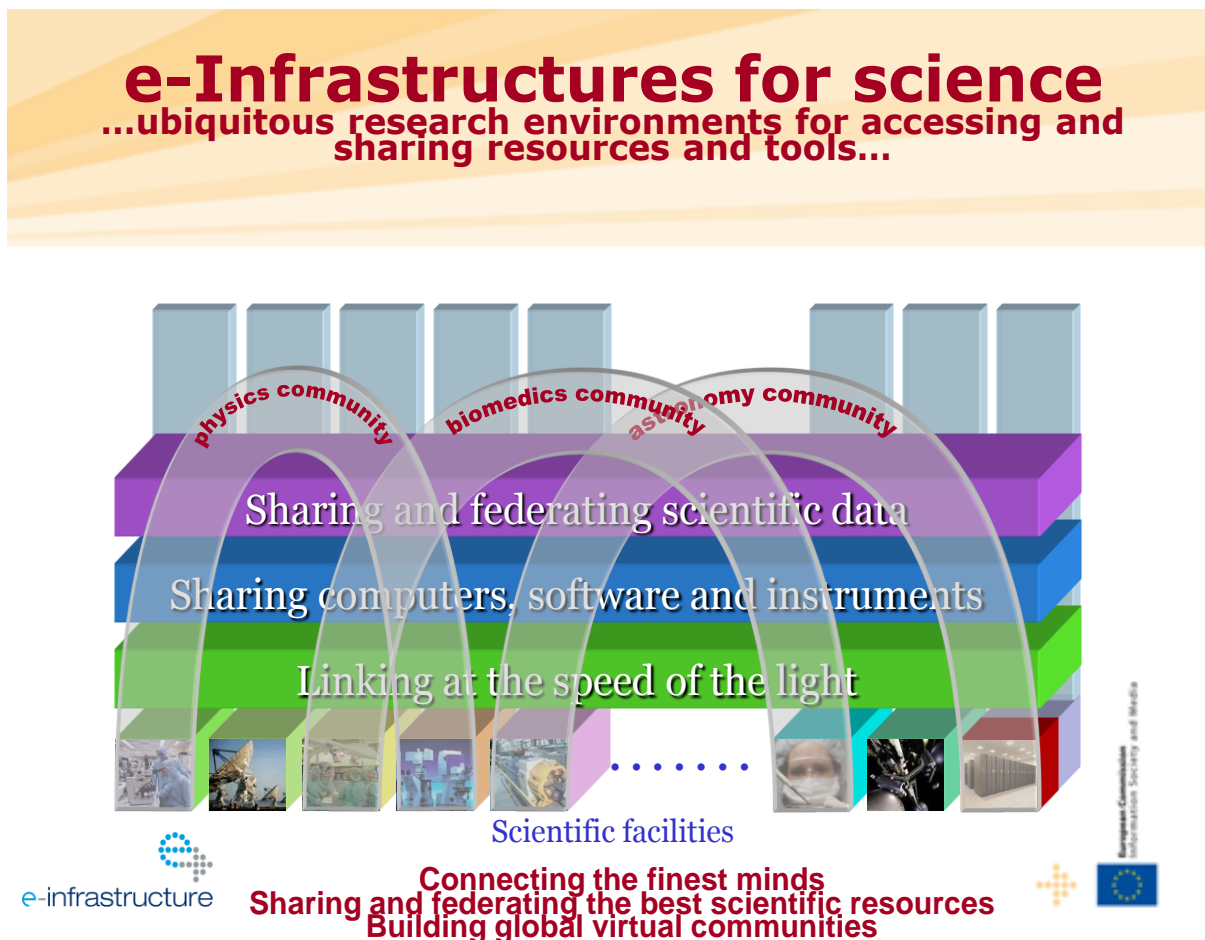
- It may provide push to national developments and reinforce deployment of national initiatives
- It may provide equal conditions for all members, and a unified communications infrastructure
- It may create economy of scale and help build shared systems
- It may enhance awareness at the European level of related, non-technical issues like privacy, security, data storage, legal and IP
- It may act as a catalyst for coordination and create awareness among ((inter)national) funding and policy formulation organisations.

At the same workshop, there was also some discussion on what added-value e-InfraNet can have, in relation to existing organisations/institutions and the new EC e-Infrastructures policy group. The project, and therefore the questionnaire, has cast its net rather wide: it ranges from technology focused research & education networking services through (large-scale) data storage to open source software and open access to all types of digital resources for research and education. Considering the wide disparity in terms of development backgrounds, technologies, needs, competences, topics, applications, etc it is not surprising that none of the existing organisations/institutions cover every one of the areas. This disparity also makes it very hard, and probably even impossible, for one organisation or project to address all aspects of every area. This obviously also goes for the e-InfraNet project.

Yet, these areas are interconnected, and will become even more so as e-Infrastructures develop – as is clear from the EU vision for e-research infrastructure pictured in Figure 1. This growing interconnectedness also increases the need for more oversight and coordination across multiple disciplines as well as up and down the technology stack.

The approach that e-InfraNet has chosen, viz. to select a number of topical focus areas – Green IT, Cloud Computing, Open - across the wide range of infrastructure areas, offers an opportunity for oversight and coordination from a different perspective than existing organisations/institutions or scientific disciplines/communities would normally take. Of course, existing organisations/institutions can and do deal with one or more of those three topical focus areas; but they usually do so in relation to the part of the e-Infrastructure they are responsible for. Further, scientific disciplinary communities are unlikely to pay the necessary attention to generic issues across disciplines.

Figure 1: EU vision for e-research Infrastructure



e-InfraNet is in a unique position to cut across all infrastructural, institutional and disciplinary boundaries. It can examine how the three chosen topics affect and connect the various infrastructure layers; what opportunities and solutions those topics may bring to issues and problems encountered at the various levels by themselves or in combination; and what policy, standards and guidance is required across the EU to ensure these opportunities and solutions are effective .

For example, if researchers from 7 different European countries³ wish to collaborate on the collection, manipulation, visualization and interpretation of climate data in the cloud, how does this impact the network and what bottlenecks are there? What data centre facilities are easily available and accessible? Which coordinating policies and actions are necessary at a European level to facilitate such easy access to a well-functioning fast network and distributed data storage and management services? How to facilitate easy access while ensuring data remains secure?

Similarly, looking at the same example from the Green IT perspective, other questions arise and other opportunities are offered: how can the network and data centre facilities deal

³ We use Europe as a pars pro toto example: it is understood that the questions raised also apply on a global level.

with growing demand for high performance computing without undue impact on energy use? How can the use of existing facilities be optimized? How can a paradigm shift like “from ‘time to solution’ to ‘kWh to solution’” be realized? And how can it be achieved that, for example, researchers and research managers will use off-site facilities – possibly outside their own country – as confidently as they would use local on-site facilities under their own control?

Many of these questions are difficult to answer, not so much at the technical level, but at the organisational, social or cultural level. Policies and actions aimed at implementation need to focus at those levels as much as on the technical level. It is at those levels that e-InfraNet can play a role.

9 E-INFRA^{NET} AND THE THREE FOCUS AREAS

The example of European research collaboration on climate research and the questions it poses from the viewpoint of the individual focus areas also points towards a further defining of the work area for e-InfraNet. For not only does each of the focus areas interact with the various e-Infrastructure layers; they also interact with each other. The wish of the climate researchers from 7 countries to collaborate implies the wish for an open, dynamic collaboration infrastructure for online applications and cloud services. This infrastructure needs to be sustainable and the data subject to long-term curation for researchers to entrust their research efforts to it. Standards and licences need to be in place to ensure interoperability and an equal, secure playing field. These needs cross national and institutional boundaries but require a coordinated approach. Cloud computing can be seen to offer the required environment for the open collaboration. Or, formulated the other way around, open collaboration requires the cloud to be really successful. For such a solution to be sustainable – and thus trustworthy – Green IT solutions are also necessary; in other words, green IT is intricately linked to cloud solutions, and thus to open collaboration.

Thus, e-InfraNet can work towards the facilitation of broad aspirations, such as the development of Europe-wide infrastructure and the applications that can use it (eg a ‘Green Cloud for Open Collaboration’) through examination of combinations of multiple elements of the infrastructure and associated, non technical issues such as cultural shift and capacity building. The goal is to provide recommendations, briefings, advice and awareness etc. to help countries and the Commission coordinate developments and define policy measures and actions at various governance levels.

e-InfraNet’s evolving way of developing its programme enables a gradual build-up to grapple with the complexities of such a simultaneous interconnection between the focus areas amongst each other *and* with the different e-Infrastructure layers. For example, the Green IT workshop held in Helsinki in October 2010 looked at two broad questions: ‘greening of IT’ and ‘greening by IT’ in relation to (primarily) networking, HPC and Data Centres. The next workshop on Cloud, scheduled for late March 2011, can then look at the interaction between Cloud and the e-Infrastructure layers (including the layer of Virtual Research Environments), *and* bring in the Green IT perspective in order to facilitate the development of the concept of the ‘sustainable cloud’. The subsequent workshop on Open later in 2011 can build on the insights gained from the two previous workshops to see how Green IT and Cloud can facilitate Open Collaboration, and what demands this poses on the various e-Infrastructure layers. In this way, e-InfraNet works towards a close-knitted coordination approach for the European e-Infrastructure based on a combination of the Green IT, Cloud and Open perspectives.

10 CONCLUSION

The first results of the e-InfraNet questionnaire on current e-Infrastructure initiatives in the partner countries have helped to clarify the direction and focus for further e-InfraNet activities.

The overview of the reported programmes (Annex 1) shows a variety of programmes, activities and degrees of experience, which indicates that well-coordinated ‘exchange of information and experience’ can contribute significantly to the development of e-Infrastructure at the national and European level.

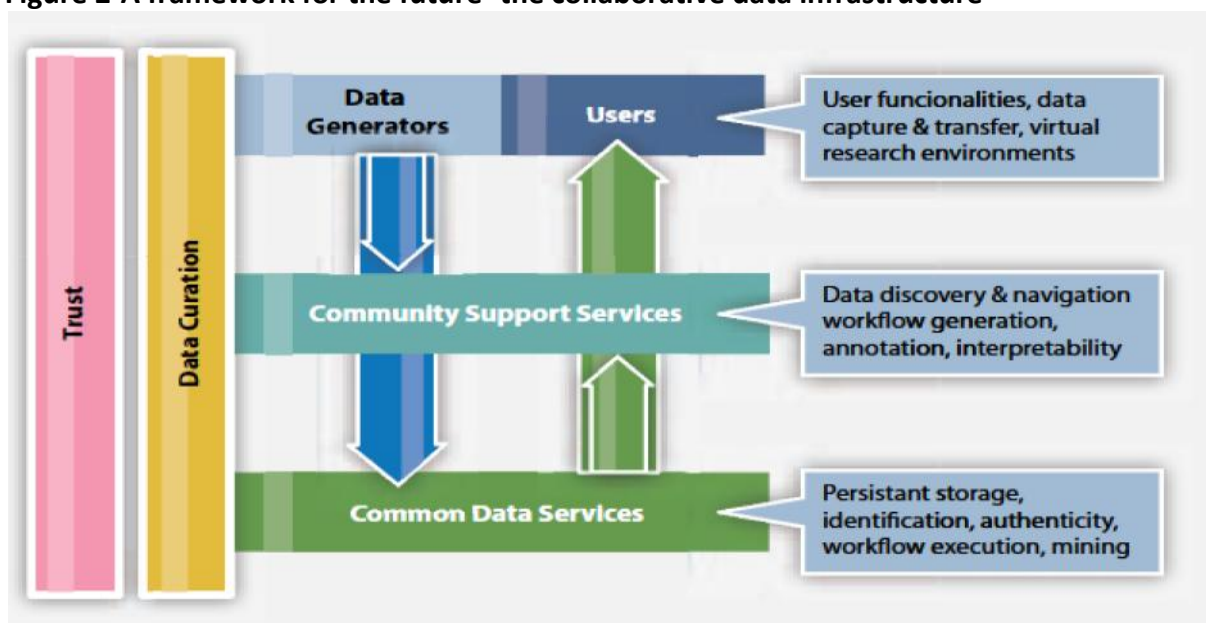
The questionnaire has also generated a clear ‘wish-list’ for coordination and cooperation at the European level (Chapter 7), ranging from operational, technical issues like setting interoperability standards to strategic policy issues like sharing knowledge and resources and developing a business model for a pan-european e-Infrastructure.

Processing the results of the questionnaire also made clear that the sheer range of levels, developments, technologies, needs, topics, applications etc. in the e-Infrastructure field, as well as the range of scientific disciplines affected by it, calls for a strong focus that can cut across the disciplines and the technology stack (Chapter 8). The three thematic focus areas chosen by e-InfraNet – Green IT, Cloud Computing and Open – form a good starting point for overview and coordination from a different angle than taken so far by existing organisations. e-InfraNet can examine how each of these three topics affects and combines the various layers in the e-Infrastructure. Yet, it can also take a step further, and examine how the three topics interact with each other, and together affect the development of the European e-Infrastructure. The results of the questionnaire, and the Green IT workshop in Helsinki, already indicated the close connection between Green IT and Cloud Computing. The recent Report of the High Level Expert Group on Scientific Data “Riding the Wave – how Europe can gain from the rising tide of scientific data”⁴ points to the connection between the Open Agenda on the one hand and Cloud Computing and Green IT on the other: there will be no open collaboration on the increasing amounts of scientific data without an appropriate sustainable e-Infrastructure to support it. Their call to action includes as recommendations:

“1. Develop an international framework for a Collaborative Data Infrastructure

The emerging infrastructure for scientific data must be flexible but reliable, secure yet open, local and global, affordable yet high-performance. There is no one technology that can achieve it all. So we need a broad, conceptual framework for how different companies, institutes, universities, governments and individuals would interact with the system. We call this framework a Collaborative Data Infrastructure, and we urge the European Commission to accelerate efforts – in Europe and around the globe – to make it real.

⁴ “Riding the Wave – How Europe can gain from the rising tide of scientific data”; Final report of the High Level Expert Group on Scientific Data, a submission to the European Commission, October 2010; http://ec.europa.eu/information_society/newsroom/cf/document.cfm?action=display&doc_id=707>

Figure 2-A framework for the future- the collaborative data infrastructure

2. Earmark additional funds for scientific e-Infrastructure

5. Create incentives for green technologies in the data infrastructure”

For e-InfraNet, taking the perspective of a group of scientists across Europe needing to collaborate on a large set of data means it can combine the three chosen focus areas in a meaningful and productive way, and from that perspective can work towards the facilitation of broad aspirations, such as the development of Europe-wide infrastructure and the applications that can use it (e.g. a ‘Green Cloud for Open Collaboration’) through examination of combinations of multiple elements of the infrastructure and associated, non technical issues such as cultural shift and capacity building. The recommendations, briefings, advice, awareness, etc. resulting from e-InfraNet’s work will help countries and the Commission to gradually realize e.g. the framework for the Collaborative Data Infrastructure depicted by the High Level Expert Group.

E-InfraNet’s evolving way of developing its programme enables a gradual build-up to grapple with the complexities of such a simultaneous interconnection between the focus areas amongst each other *and* with the different e-Infrastructure layers. The workshops on the focus areas are planned with intervals, which allows for the insights and results of the earlier workshops to be used and incorporated in the programmes of the later ones. The gradual expansion of the coverage of the questionnaire will bring new questions, experiences and application areas to e-InfraNet and growing awareness to the participating countries. In this way, e-InfraNet works towards a close-knitted coordination approach for the European e-Infrastructure based on a combination of the Green IT, Cloud and Open perspectives.

ANNEX 1 OVERVIEW NAMES, AIMS AND DELIVERABLES OF THE PROGRAMMES

	Name of the programme	Aims of the programme	Deliverables of the programme
FI Progr.no. 1	TiViT Cloud Software	To improve the competitive position of Finnish software intensive industry in global markets	New business innovations
2	Computational Science Research Programme (LASTU)	To unite the development of computational methods with research that addresses computationally intensive problems that are also fundamental issues in science and engineering. Topical examples include climate change, energy issues, health and well-being, the security of global information networks, and management of the global economy.	Project-based outcomes
3	National Digital Library (KDK)	The project improves the accessibility and long-term preservation of the electronic materials of libraries, archives and museums	National digital library
HU Progr.no. 1	NIIFP (National Information Infrastructure Development Programme)	Develop, maintain and operate the e-Infrastructure, provision of services - in conformance with the other similar European e-Infrastructure activities	Systems, facilities and services in networking, HPC, grid, archives, remote access, distant collaboration, etc.
IE Progr.no. 1	HEANet	Broadband national education and research network	High speed data communication
2	e-INIS	National e-Infrastructure including HPC, Grids and Data Storage	Improved research capability
3	IRel Open	National Research Portal. Open-Access Institutional repositories	Promote National Research
4	NDLR	Repository of Open-Access digital Learning objects	Improved learning experience for students
LV Progr.no. 1	Improvement of research ICT infrastructure and information systems (Latvian NREN)	Update of: network (campus, local and international connections); computing and storage infrastructure; Eduroam, software, information databases.	Updated research network (NREN) and related eInfrastructure.

	Name of the programme	Aims of the programme	Deliverables of the programme
2	BalticGrid http://www.balticgrid.org	Development and integration of Grid infrastructures into European e-Infrastructure and involvement of the scientists of Baltic States and Belarus into ERA.	49 deliverables available from http://www.balticgrid.org/Deliverables
3	EURATOM-University of Latvia (AEUL), http://www.cfi.lv/resource/show/453	Coordinate the EU research programmes for the peaceful use of nuclear energy.	Annual reports
NL Progr.no. 1	SURFshare programme, infrastructure for scholarly communication and Open Access to research output.	Development and implementation of a repository based infrastructure for scholarly communication and Open Access to research output.	Standards for storage, presentation and retrieval of Enhanced Publications (scientific publication with related datasets and other objects).
2	SURFnet	SURFnet enables groundbreaking education and research. We design and operate the hybrid SURFnet6 network and provide innovative services in the field of security, authentication and authorisation, group communication and video.	no specification given
ES Progr.no 1	RedIRIS NOVA	To deploy an new infrastructure of dark fiber as backbone of the NREN and the regions	42+108 points of presence connecting all the research centres and resources in Spain
2	RES	To coordinate the HPC in Spain	To offer one stop shop to the HPC in Spain
3	Red Española de e-Ciencia	To coordinate the e-Science in Spain	Information to users about e-Science and collaboration of e-Infrastructures
4	ES-NGI	To establish a common Grid infrastructure in Spain	To deploy all the elements of a NGI
5	Ibergrid	Collaborate in e-Science. To finish the interconnection of fibres	Interconnection of networks. NGIs cooperation. Mobility and common calls related to e-Science
TR Progr.no. 1	KYP-Kamu Yatirim Programi (Public Investment programme)	The program is applicable to all R&D thematic areas and e-Infrastructures is one the main thematic areas. Under e-Infrastructures there are two main focus. One is network and the other is Grid & High Performance Computing infrastructures. As no formal e-Infrastructure titled program exists we can mention only the supported e-Infrastructure projects objectives: increasing the efficiency and scientific quality of research increasing the opportunities of new research Increasing the competitiveness of researchers .	Yearly Policy Programme and Yearly Public Investment Programme are two main policy and implementation documents endorsed by the assembly. The objectives related to subject can be listed as: - Technological studies and e-Government are among high priority areas of investment - Regional development and achieving convergence - Investments that are necessary for EU accession will be accelerated - Private sector participation is encouraged.

	Name of the programme	Aims of the programme	Deliverables of the programme
UK Progr.no. 1	National Centre for e-Social Science	to stimulate the development of new computer based infrastructure for exploitation by social scientists, enabling them to address the key research challenges in new and novel ways	no further specification given
2	Provision for High Performance Computing	RCUK provide High Performance Computing resources that complement the desktop and mid-range provision based at universities.	HPC Facilities
3	Economic and Social Data Service	UK social science data infrastructure providing access and support for an extensive range of key economic and social data - both quantitative and qualitative - spanning many disciplines and themes. It includes a number of specialist data services that promote and encourage data usage in research, learning and teaching.	ESDS Government: aims to promote and facilitate increased and more effective use of government datasets. ESDS International: provides access to, and support for, a range of international datasets - both macro and micro sources. ESDS Longitudinal: promotes and facilitates increased and more effective use of major longitudinal survey datasets. ESDS Qualidata: provides access and support for a range of social science qualitative datasets.
4	UK Biobank	UK Biobank will be a unique resource, recording lifestyle and environmental information, medical history, physical measurements, and biological samples from about 500,000 people in the UK aged 40-69. Their health will be followed for many years through medical and other health records.	no further specification given
5	European Life-Science Infrastructure for Biological Information	The mission of the European Life-Science Infrastructure for Biological Information (ELIXIR) is to construct and operate a sustainable infrastructure for biological information in Europe to support life science research and its translation to medicine and the environment, the bioindustries and society. This will enhance all research and industry associated with living systems including health and medicine, the environment, food security, the bioindustries and society. The facility builds on the existing EBI (European Bioinformatics Institute - located at Hinxton, Cambridge), expanding the range of biological data being managed, and working through a network of distributed nodes located in member state of the EU, coordinated through a central hub	no further specification given

	Name of the programme	Aims of the programme	Deliverables of the programme
6	Secure Data Service	To support the development of the National Strategy for Data Resources for Research in the Social Sciences, ESRC has established a pilot Secure Data Service (SDS). This service will provide controlled access to sensitive and/or disclosive personal or organisational information which cannot be released for research purposes under End User Licence or Special Licence conditions	no further specification given
7	Administrative Data Liaison Service	<p>The Service does not hold or store data, but acts as an intermediary between researchers and the organisation(s) providing access to administrative data for research purposes. To achieve these aims, the Service:</p> <ul style="list-style-type: none"> • helps researchers to gain access to and link with administrative data resources, • collects, develops and helps disseminate information about the variety of administrative data resources potentially available for research in the social sciences and related disciplines, • works closely with the departments/agencies responsible for the guardianship of administrative data resources, to explore the potential that such data have to inform research in the social sciences and related disciplines, • explores the scope for linkage between various administrative data sources and to other personal records (e.g. survey data, census information), thereby enhancing and extending existing resources. 	no further specification given
8	National Centre for Research Methods	The overall mission of the National Centre for Research Methods (NCRM) is to provide a strategic focal point for the identification, development and delivery of an integrated national research and training programme aimed at promoting a step change in the quality and range of methodological skills and techniques used by the UK social science community.	<p>The NCRM training and capacity building programme has two broad aims:</p> <ul style="list-style-type: none"> • upgrading the quality and range of the methodological skills base across the general social science community, • facilitating the diffusion of cutting-edge methodological expertise to a new generation of social scientists.

	Name of the programme	Aims of the programme	Deliverables of the programme
9	JISC VRE Programme	<p>Virtual Research Environments (VREs) can be considered shorthand for the tools and technologies needed by researchers to undertake their research, collaborate with other researchers and make effective use of the e-Infrastructures available to them, and also both the technological and social context for those tools.</p> <p>The VRE programme aims to build capacity in the sector for developing and using such technologies via funding activities on a variety of scales aimed either at particular research problems or at integration with institutional and national e-Infrastructures.</p>	no further specification given
10	JISC Flexible Shared Services Programme	It is designed to help universities and colleges overcome some of the barriers to adoption of flexible and shared services and to progress and support them in exploring the possibilities and realising some of the benefits.	no further specification given
11	JISC Green Computing Programmes	<p>The Getting Greener Programme will allow JISC to deliver on its key strategic priority of enabling the greening of ICT in the Higher and Further Education sectors through organisational change.</p> <p>The Institutional Innovation programme represents a £13.08m investment aimed at supporting existing institutional strategies by providing solutions to institution-wide problems.</p> <p>The institutional exemplars programme is a £1.4 million programme to generate exemplar projects demonstrating change at the institutional level.</p> <p>JISC Organisational Support Programme: to harness the potential offered by ICT requires the consideration and understanding of a range of issues. These focus on the implications associated with using ICT rather than the technology.</p>	no further specification given
12	National Grid Service	The NGS is the core UK grid, intended for the production use of computational and data grid resources. NGS is the core service resulting from the UK's e-Science programme. NGS is supported by JISC, and is run by the Grid Operations Centre (GOC). The sister organisation of GOC, the UK e-Science Engineering Task Force (ETF) is responsible for developing the future grid services via the e-Science research grid.	no further specification given

	Name of the programme	Aims of the programme	Deliverables of the programme
13	JISC Research Data Management Programme (including Digital Curation Centre)	<p>To build capacity, support and recognition in the sector for research data management and curation by:</p> <ul style="list-style-type: none"> Data sharing, data linking, data publication pilots to increase motivation for data management Research focused pilots to determine good practice and issues Institutional pilots to increase/implement capacity/services within Universities to support researchers in data management Using Digital Curation Centre for synthesis, dissemination and outreach of good practice and policy. 	no further specification given
14	UK Data Centres (MIMAS/EDINA)	<p>Mimas is an organisation of experts. Our role is to support the advancement of knowledge, powering world-class research and teaching. Technology is at the heart of everything we do. As a nationally designated data centre, we host a significant number of the UK's research information assets. But our core expertise is building applications that enable a wide range of users to make the most of this rich resource – from students and researchers working with census data to investigate social inequalities, to scientists using satellite imagery to survey and protect our environment.</p> <p>EDINA is the JISC national academic data centre based at the University of Edinburgh*. Together with the University Data Library, it is a division of Information Services. Our mission and purpose is to 'enhance the productivity of research, learning and teaching' across all universities, research institutes and colleges in the UK.</p> <p>We do this by delivering first-rate online services, by working with support staff in universities and colleges, and with other partners in the academic community, and beyond and by carrying out successful R&D projects.</p>	no further specification given

	Name of the programme	Aims of the programme	Deliverables of the programme
15	JANET	<p>JANET is the network dedicated to the needs of education and research in the UK. It connects the UK's education and research organisations to each other, as well as to the rest of the world through links to the global Internet. In addition, JANET includes a separate network that is available to the community for experimental activities in network development.</p> <p>The JANET network connects UK universities, FE Colleges, Research Councils, Specialist Colleges and Adult and Community Learning providers. It also provides connections between the Regional Broadband Consortia to facilitate the DfES initiative for a national schools' network. Over 18 million end-users are currently served by the JANET network.</p>	no further specification given
16	JISC Access Management Programme	<p>To maintain development and innovation in Access and Identity Management Facilitating uptake of the UK Access Management Federation within both the sector and service providers in the sector via toolkits such as the Identity Management Toolkit Collaboration with other Federations world-wide (including Europe via TERENA, US, NZ/Australia) via International "Inter-Federations" To pilot activities to prepare the sector for future technological developments particularly in the space of user centric access and identity management and the co-existence and migration issues between institution and user centric systems.</p>	no further specification given
17	JISC Advance	<p>JISC Advance is a not-for-profit company financed by grants from the UK funding councils for further and higher education. Consisting of eight advisory and complementary services, JISC Advance will coordinate and develop upon the provision of excellence within the education and learning sectors, providing inspiration and advice to support the innovative use of technology.</p> <p>Focussed clearly on the needs of its users, the Company is committed to providing agile, holistic services, developing new services where required and ensuring the community meets the emerging technology challenges across education sector.</p>	no further specification given

Annex 2 e-InfraNet Questionnaire

	Questions	Extra information about the questions		Project 1
	Please provide your first name:	<i>To be filled in if one or more other person(s) than the recipient of the email (also) fills in the questionnaire; e.g. for every project there is a different person answering the questions</i>		
	Please provide your last name:	<i>To be filled in if one or more other person(s) than the recipient of the email (also) fills in the questionnaire; e.g. for every project there is a different person answering the questions</i>		
	Please provide your job-title and organisation:			
	Please provide your email address:	<i>To be filled in if one or more other person(s) than the recipient of the email (also) fills in the questionnaire; e.g. for every project there is a different person answering the questions</i>		
	Please provide your telephone number:	<i>We may want to follow up this questionnaire with more in-depth questions by phone. If you are willing to participate in this, please list your phone number (also per project in case of different respondents); please also list the international prefix</i>		
1	What is the name of the national programme?	<i>Please provide acronym and full name of the programme</i>		
2	What is the leading organisation for this programme?	<i>Please provide the name of the organisation that is in charge of or responsible for the programme</i>		
3	Who are participating organisations in the programme?	<i>Please provide the names, and type of the organisations involved</i>		
4	Who is funding the programme?	<i>Please provide the name of the source that provides the funding. Please indicate if the programme is part of a national government policy approach</i>		
5	What is the size of / what are the resources available to the programme?	<i>Please indicate the number of people involved and the budget of the programme</i>		
6	What country/countries hosts/host the programme?	<i>Please indicate in which country/countries the programme is taking place; if in more than one country: please describe the level of collaboration</i>		

7	What is the aim of the programme?	<i>Please identify the problem/challenge that the programme addresses, and please explain the actual goal</i>		
8	What are the deliverables of the programme?	<i>Please describe the expected tangible outcomes</i>		
9	What is the running time of the programme?	<i>Please indicate starting date and end date, or give the number of years the programme will run</i>		
10	To what technology area(s) does the programme relate most?	<i>Please indicate the two most important areas, examples: Data Storage & Management; High Performance Computing, Grid Computing; Networking, Service Integration, etc.</i>		
11	What discipline or stakeholder area does the programme address?	<i>e.g. Biochemistry, Humanities, Administration, Telecom, Public-Private, Secondary Education, Research Community, etc.</i>		
12	Who are the target group(s) that will experience most benefit from the outcomes of the programme?	<i>Please indicate who, what community, will benefit most from the programme. Examples: Space Research, general public, Higher Education, SMTs, Health department, etc.</i>		
13	Please list any related or similar national or international programmes that you know of ?!	<i>Please give name of the related programme and explain how the programmes are related</i>		
14	To which national (regional) policy aims does the project contribute?	<i>Please tick the aims that are applicable to each programme; more than one answer is possible</i>		
	Government policy			
	Research Council strategy			
	Higher education			
	Research IT strategy			
	Other, viz. Academy of Sciences, Public collections			
15	Are there any EC programmes, ambitions or policies that support this national programme?	<i>e.g. in Directorate General policy or in EC funding programmes</i>		
	Yes			
	No			
	Not aware of any			
16	Does the programme support or relate to a specific EC funding programme or call?			

	Yes			
	No			
	Not aware of any			
17	Does the programme have a European/international focus?	<i>with regards to Cloud Computing, Openness, Green-IT</i>		
	Yes			
	No			
	Not applicable / not certain			
18	Does the programme relate to Cloud Computing and/or SaaS, IaaS, PaaS etc?			
	Yes			
	No			
	Not applicable / not certain			
19	Does the project relate to the Open agenda?	<i>e.g. Open Access, Open Innovation, Open Source, Open Data etc.</i>		
	Yes			
	No			
	Not applicable / not certain			
20	Does the programme relate to the Green-IT/Environmental Sustainability agenda?			
	Yes			
	No			
	Not applicable / not certain			
21	Do you see options for European (international) cooperation (at policy and/or operational level) regarding e-Infrastructure policies?			
	Yes			
	No			
	Not applicable / not certain			

22	From your perspective: what would be the first theme/area/challenge regarding e-Infrastructure that could benefit from a cooperative approach?	<i>(please indicate what (direction of) activity you would like the eInfraNET project to engage in. This may include Cloud, Open and Green issues, but also others)</i>		
	Would you mind if we contact you by phone for more in-depth information about your answers above?			
	Yes			
	No			