SEVENTH FRAMEWORK PROGRAMME

Inventory of existing PA-RIs cooperation – Update

Introduction to the Deliverable

FP7-ICT-248295/INFN/R/PU/D3.2-ID

1. Introduction

In the following "Introduction to Deliverable" we summarize the inventory we created for the ICT *Research Infrastructures* (RIs), listing the most relevant cases of current cooperation between *Public Authorities* (PAs) and *National Champions* (NCs) within existing ICT RIs.

PAs are National, supra-national, sub-national Governments or similar Public Bodies; NCs are Research Institutions (e.g., industry leader in a specific research or public area, National Research Centre) that drive or have exceptional knowledge in the chosen research field. Our task in the D3.2 was to analyse examples of existing ICT RIs including their relation with PAs and NCs.

The D3.2 Deliverable is presented as follows:

- D3.2 Part I, containing the inventory of PA/NC-RIs models and collaborations,
- D3.2 Part II, detailing the PA/NC-RIs collaborations for a limited number of selected cases.

The following *ICT RI environments* were selected as the main reference points to identify relevant cases of current cooperation among Public Authorities and National Champions within existing (and future) ICT RIs, namely:

(E1) European and National *Network* RI environment,

(E2) (Grid & Cloud) European and National Research DCI framework,

(E3) (HPC) *high end / performance parallel computing* RI ecosystem,

(E4) MNT collaboration *facilities interchange* RI framework,

(E5) *Research Data Infrastructure* framework,

(E6) *Remote Instruments* access model,

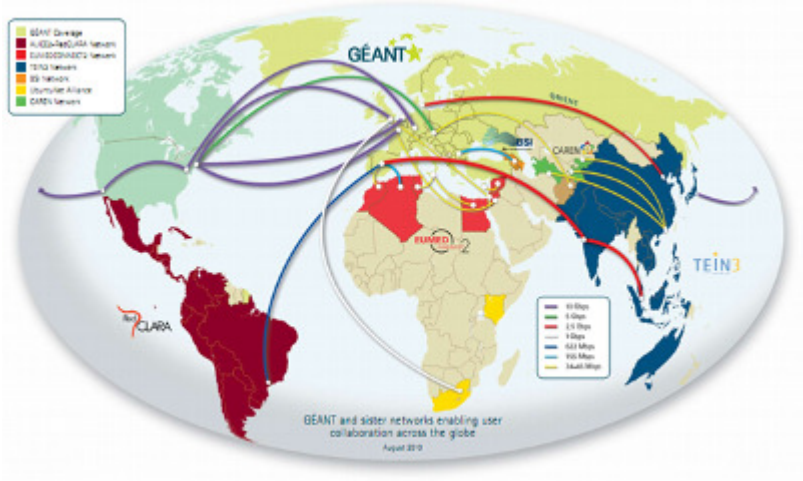
(E7) *Future Internet* (FI) service-oriented vision.

These domains have been identified on the basis of several publications, including "The Future of Internet, Report from the National ICT Research Directors WGFI" [WGFI, 2008], "e-IRG Report on Data Management [DMTF, 2009], "Riding the wave - How Europe can gain from the rising tide of scientific data" [HlEGSD, 2010], "Trends in European Research Infrastructures Analysis of data from the 2006/07 survey", [EC-ESF, 2007], "Research Infrastructures and the Europe 2020 Strategy" [ESFRI, 2010], "EGI Blueprint" [EGI_DS, 2008], and the recommendations by consortium members and the stakeholder group.

These domains are analysed in detail in the D3.2 Part I document.

A brief description of each follows.

E1. The European and National Network RI environment



The high bandwidth European Research Network provides to the research sector the connectivity over which other pan-European RIs can be put into operation. The network service use case is simplest for this group and its governance model the oldest – GÉANT is currently celebrating ten years of operation. Its mature governance model is structured on the per-country specialized internet service providers, namely *National Research and Education Networks* (NRENs), supporting the needs of the research and education communities. NRENs are usually distinguished by support for a high-speed backbone network, often offering dedicated channels for individual research projects and other specialised needs.

The NREN Policy Committee, with one representative per country, provides the general policy and coordination body at European level. The GÉANT series of projects (currently GN3) are co-funded by the NRENs and the EU to guarantee harmonized necessary innovation and future evolution. GÉANT is coordinated by the managing partner, namely *Delivery of Advanced Network Technology to Europe* (DANTE), which operates the European general backbone, and is supported by the dissemination and research partner namely *Trans-European Research and Education Networking Association* (TERENA), which provides a Forum for the coordination of the R&D efforts between the NRENs.

E2. The (Grid & Cloud) European and National Research DCI framework

The pan-European *Distributed Computing (& Storage) Infrastructure* (DCI), incorporated as *European Grid Initiative* (EGI), includes more than 300 Compute and Storage Resource

Centres in Europe to which it arranges general access and sharing of services.EGI consolidates ten years of research and development that achieved by the *Enabling Grids for E-sciencE* (EGEE) series of European projects.

The EGI model, designed according to the framework of the EGI Design Study project and then later refined, is grounded on the per-country *National Grid Initiatives* (NGIs), responsible for the national grid e-Infrastructure and for maintaining relationships with customers, by the EGI.eu organization which provides global services to all NGIs and by the EGI Council which provides the general coordination and policy decision framework.

The *cloud paradigm* introduces further flexibility and elasticity in the DCIs offering and has favoured the decoupling of the physical layer from the software environments available to users at the same time. On the other hand, it favours a rapidly growing service model that is also being warmly accepted in the private industry sector due to its simplicity.

E3. The (HPC) high end / performance parallel computing RI ecosystem

The European *High Performance Computing* (HPC) infrastructure is targeted towards providing the highest sustained parallel peak computing capacities to scientific research communities. The *Partnership for Advanced Computing in Europe* (PRACE), which has already commenced operation will maintain a pan-European HPC computing infrastructure consisting of up to six *top of the line* leadership systems (Tier-0) which are well integrated into the European HPC ecosystem as a single European entity.

Each system will provide computing power of several Petaflop/s, in the longer term targeting the Exaflop/s computing power range. Four nations (France, Germany, Italy and Spain) have agreed to collectively provide 400 million Euro to implement supercomputers with a combined computing power in the multi Petaflop/s range over the next five years. This funding is complemented by up to 70 million Euros from the European Commission which is supporting the preparation and implementation of this infrastructure.

E4. The MNT collaboration facilities interchange RI framework

Considered as a research infrastructure, *Micro & Nano Technology* (MNT) is built around a limited number of extremely expensive facilities and laboratories, each requiring heavy investment and highly specialized personnel to maintain them. Due to its large fabrication facilities and clean rooms requirements, *microelectronics* is one of the most capital intensive production and research activities globally and is making contributions in the nanotechnology domain. At the present time *nanotechnology* requires more moderate requirements for its facilities, but still needs costly instrumentation and laboratories. Both of these were considered in our analysis, but it should be noted that the dimensions of the technologies in question are somewhat different. More specifically, MNT ICT technologies span five major domains: *Micro/Nano-electronics*, *MEMS*, *Electro-optics*, *Top-down nano-technology*, *Bottom-up nanotechnology*.

Strategic alliances and multilateral collaborations between MNT Research Centers could then integrate their capabilities towards a combined *European MNT Research Infrastructure*.

E5. Research Data Infrastructure framework

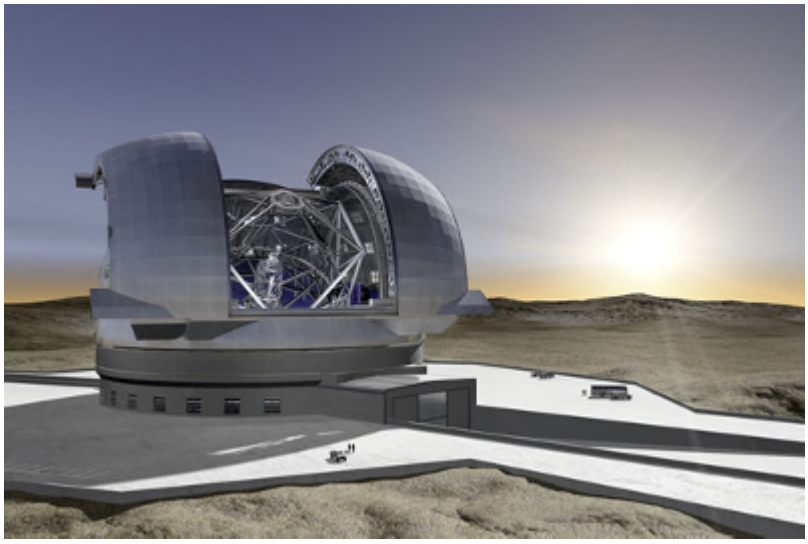
Data infrastructures are on hand a very new part of e-Infrastructures open to many activities but on the other hand, although many data infrastructures exist, they are not always

coordinated at national levelor at European level. Two most important recent events in the domain of European data infrastructures are the report from the High Level Expert Group on Scientific Data: "Riding the wave: How Europe can gain from the rising tide of scientific data" and the recently commenced EUDAT project.

The report describes the large amount of information that will become available between now and 2030, makes a wish list of how an ideal data infrastructure will look, reflects on the benefits of data infrastructures for researchers and citizens and also tackles challenges that need to be overcome. The report includes a series of recommendations to make data infra structures with a European view in mind and addresses these recommendations to national governments, the European Commission and researchers alike.

EUDAT is a project to create a *collaborative scientific data infrastructure* with the capacity and capability for meeting future researchers' needs in a flexible and sustainable way, across geographical and disciplinary boundaries. EUDAT will undertake the first comprehensive European review of the approaches to deployment and use of a common and *persistent* data e-Infrastructure, the services being built and delivered on top of this infrastructure and the limitations of its services. EUDAT will be ensuring the *authenticity*, *integrity*, *retention* and *preservation* of data deposited by its users, especially those marked for long term archiving.

E6. The Remote Instruments access model



European RIs' *instruments and facilities* – such as *synchrotrons*, databases, *telescopes*, *sensor networks*, and *biomedical facilities* – are an unrivalled asset. In Europe there are *more than 500* such facilities, of which at least 300 have strong international visibility, attracting world class researchers, representing an aggregate European investment of more than €100 billion.

The increasing availability of instruments and facilities (*physical* infrastructures) for researchers, combined with the flexibility and versatility of the deployed e-infrastructures (*digital* infrastructures) is opening a completely new paradigm for the undertaking of science experiments, where scientists will have the possibility of interacting remotely with their instruments, reducing the geographical distances thanks to the *Remote Instruments access model*.

E7. Future Internet (FI) service-oriented vision

A multiplicity of new usage patterns and a plethora of requirements not foreseen when the Internet was designed, justifies a fresh look at the Internet architecture.

We list some of the key emerging usage trends: *mobility*, *end to end very high rate throughput* (broadband), *security and trust - privacy*, *device connectivity - coupling of virtual world data with physical world information* (RFID, sensors), *user-generated services* as a follow up to *user generated content*, *3D becoming mainstream*, *negotiated management and control of resources / SLA's*, *user controlled infrastructure*.

Several EU Member States have initiated research activities that are directly or indirectly related to the Future of the Internet. These national activities are complemented by EU level activities, and notably through FP7. One specific objective (FIRE: Future Internet Research and Experimentation) is dealing with advanced Future Internet RIs, including fixed and wireless testbeds, cloud and IMS service infrastructures and smart city experimental facilities.

2. Inventory of PA/NC-RIs Collaborations

In order to better investigate the collaborations in more detail, the OSIRIS project selected a subset of the collaboration models within each RI domain for deeper scrutiny. The selected cases were enumerated with a (C#) code and assigned to an individual project partner.

For this survey we followed a *common template* structure according to the following items:

a) Description of RI
Reporting a synthetic description of the Research Infrastructure.

b) PA/NC collaboration explanation
Targeted at the understanding the nature of cooperation involvement of Public Authorities and/or National Champions.

c) Budget, funding model, economic sustainability
Budget of the PA/NC RI collaboration – both initial and recurrent investments. Running costs, the funding model and the basis of the economic sustainability of the RI.

d) Governance / Management
The governance bodies, their relations and the management model.

e) Users and interaction model
Within this item we collected quantitative and qualitative aspects regarding RI users – how many, from where, how they use the facilities and how they obtain access to the RI.

f) Countries and international collaborations
Countries involved and the international collaboration within and outside Europe.

g) History and evolution
RI evolution from the first experiences to the current model, relevant previous projects and collaborations.

h) Security
Privacy, protocols, trust, procedures and property rights for the RI.

i) Operations
Activities needed for the everyday operation of the RI and the related efforts.

The template-based survey was then assigned to OSIRIS project partners for submission to (internal or) external contributors. The result of the survey was an inventory of PA/NC-RIs *collaborations*, which is the subject of D3.2 Part II document.

The cases collected are representative of the following RI classes of collaboration models:

- **ICT National Initiatives**
  (*i.e.*, NRENs, NGIs, HPC National Centres, MNT National Centres / Initiatives):
  C01-04 (NRENs), C06-08 (NGIs), C15-16 (HPC NCs), C18-19 (MNT NCs/NIs);
- **European ICT RIs and Collaborations**:
  C05 (GÉANT), C09 (EGI), C17 (PRACE), C20-23 (MNT inter-centre collaborations), C24-25 (OpenAIRE & EUDAT);
- **(ICT RI) R&D-related Projects**:
  C10-12 (DCI middleware), C29-30 (IE/GMES), C31 (FIRE);
- **Domain-related Community Networks**:
  C13-14 (VRCs), C26-28 (ESFRI-related).

The table below lists the representative cases that were selected for the inventory.

Table 1 – Domains and cases selected for the inventory.

ICT RI Environment	Cod.	PA/NC Research Infrastructure Case	Class
(E1) European and National Network RI environment	(C01)	SURFnet: Dutch NREN	NREN
	(C02)	Belnet: Belgian NREN	NREN
	(C03)	SUNET: Swedish NREN	NREN
	(C04)	CESNET: Czech NREN	NREN
	(C05)	GÉANT Project Collaboration	EU ICT RI/Coll
(E2) (Grid & Cloud) European and National Research DCI framework	(C06)	IGI: Italian NGI	NGI
	(C07)	BEgrid: Belgian NGI	NGI
	(C08)	BiG Grid: Dutch NGI	NGI
	(C09)	EGI.eu Organization and EGI-InSPIRE Project collaborations	EU ICT RI/Coll
	(C10)	The EMI Grid Mware Provider collaboration	R&D
	(C11)	The StratusLab OS Cloud Middleware Provider Collaboration	R&D
	(C12)	The Venus-C Public/Private Cloud M.Ware Provider Collaboration	R&D
	(C13)	The WLCG HEP Physics VRC	VRC
	(C14)	The WeNMR VRC	VRC
(E3) (HPC) high end / performance parallel computing RI ecosystem	(C15)	The Netherlands Computing Facilities Foundation (NCF)	HPC NC
	(C16)	The CSC Finland HPC Centre	HPC NC
	(C17)	The PRACE/DEISA HPC Centres Collaboration	EU ICT RI/Coll
(E4) MNT collaboration facilities interchange RI framework	(C18)	The Irish Tyndall National Research Centre	MNT NC
	(C19)	The Belgian IMEC National Research Centre	MNT NC
	(C20)	The Epixnet Network of Excellence	EU ICT RI/Coll
	(C21)	The MNT Europe Project Collaboration	EU ICT RI/Coll
	(C22)	The Sinano Institute Collaboration	EU ICT RI/Coll
	(C23)	The MNT Heterogeneous Technology Alliance (HTA)	EU ICT RI/Coll
(E5) Research Data Infrastructure framework	(C24)	The Open Access Infrastructure for Research in Europe (OpenAIRE)	EU ICT RI/Coll
	(C25)	The EUDAT (EUropean DATa) Project	EU ICT RI/Coll
	(C26)	The Digital Cultural Heritage Network DC.NET	ESFRI
	(C27)	DARIAH ESFRI	ESFRI
	(C28)	Lifewatch – Italian National Network	ESFRI
(E6) Remote Instruments access model	(C29)	The Instrument Element (IE) Infrastructure Access Model	R&D
	(C30)	The Global Monitoring Access Model (Cyclops)	R&D
(E7) Future Internet (FI) service-oriented vision	(C31)	The FP7 FIRE Initiative	R&D