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## N4U

NeuGRID for you:

expansion of NeuGRID services and outreach to new user communities

**Combination of Collaborative Project and Coordination and Support Action**

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# 1. Introduction

## 1.1 Purpose of the Document

The D2.5 Concertation plan aims to present the preliminary strategy of the concertation activities that has been designed out and the overall strategy that will be undertaken in order to optimize synergies with initiatives working on the same problem areas (from clusters and projects).

The whole concertation strategy will proceed according to the following steps:

1. Scouting and idea-gathering regarding related initiatives, in order to provide users a wider range of tools and services.
2. Selection of the initiatives most suitable for collaboration and clear-cut definition of the potential outcome of such collaboration.
3. Establishment of a workplan describing the joint networking research and development efforts, as well as mutual testing, validation and evaluation of the project results.
4. Whenever possible, developing formal cooperation agreements (e.g. MoU)

## 1.2 Document Organization

The document is organized as follows:

Section 1 gives a general description of the document, its purpose, its organization and its review process.

Section 2 introduces the topic and analyses N4U starting situation regarding concertation.

Section 3 identifies the initiatives that have been planned.

Section 4 describes key messages and channels that will be used to build collaborations with selected projects.

Section 5 defines the indicators to monitor N4U performance in this regard.

Section 6 draws conclusions.

## 1.3 Document Review

According to the Description of Work (DoW), the Concertation Plan will be updated in June 2013 (M24) under the name of D2.7 *Concertation Plan* in order to better target the planned actions in the last phase of the project.

## 2. Background

N4U aims to deliver a Virtual Laboratory in order to offer image neuroscientists access to a wide range of datasets, algorithm applications, access to computational resources, services and support. This implies that N4U must be able to support a new and growing range of data-intensive services, managed and shared within a digital environment whose members have common needs.

This goal can be achieved only if N4U proves capable of establishing and renewing international collaborations and constructing solid, long-lasting partnerships that will secure sustained and effective progress with respect to the current state of the art, enhance the mobility of researchers and promote the efficient sharing of resources.

Due to its international and user-oriented Consortium, N4U faces this challenge from a privileged position: the partners of N4U are already actively involved in a number of national and international efforts related to the scope of N4U. This represents a “dowry” that partners bring into N4U and will allow N4U further expansions and due regard or formal cooperation agreements with a number of relevant initiatives in Europe and worldwide in the field of imaging of Alzheimer’s disease, imaging of multiple sclerosis, imaging of psychiatric diseases, grid computing, and broadband connectivity.

<i>TABLE 1. N4U-related initiatives where N4U partners are involved</i>					
<b>PROJECT</b>	<b>FUNDING AGENCY</b>	<b>GEOGRAPHICAL BREADTH</b>	<b>SCIENTIFIC FIELD</b>	<b>Description</b>	<b>Partner involved</b>
ActionGrid <a href="http://www.action-grid.eu/">http://www.action-grid.eu/</a>	European Commission	Global	Grid Computing.	ACTION-Grid is a Specific International Cooperation Project on healthcare information systems based on Grid capabilities and Biomedical Informatics and nanoinformatics between Latin America, the Western Balkans, North Africa and the European Union (EU).	P11 CNRS
CATI <a href="http://cati-neuroimaging.com/">http://cati-neuroimaging.com/</a>	French Gouvernement	National (France)	Biomedical Imaging	The Centre pour l'Acquisition et le Traitement de l'Image (CATI) represents the leading imaging initiative in Alzheimer's disease in France. CATI aims at implementing all the resources required by imaging scientists to perform multi-center neuroimaging studies at the highest world standards.	P1 FBF, P7 CEA
CBRAIN <a href="http://cbrain.mcgill.ca/">http://cbrain.mcgill.ca/</a>	CANARIE (Canadian government-supported non-profit corporation)	National (Canada)	Biomedical Imaging	CBRAIN is a network of Canada's five leading brain imaging research centres.	P10 MNI

DECIDE <a href="https://www.eu-decide.eu/">https://www.eu-decide.eu/</a>	European Commission	European	Clinical Neuroimaging	DECIDE aims to provide the medical community with a dedicated e-infrastructure relying on neuGRID to deploy a service for the early diagnosis of dementia and other brain diseases.	P1 FBF, P2 maatG
EGI <a href="http://www.egi.eu/">http://www.egi.eu/</a>	European Commission	European	Grid Computing.	The European Grid Initiative (EGI) ensures the sustainability of the European grid computing infrastructure.	P2 maatG P11 CNRS
EUAsiaGrid <a href="http://www.euasiagrid.org/">www.euasiagrid.org/</a>	European Commission	Global	Grid Computing.	EUAsiaGrid is a support action aiming to encourage collaborative approaches across scientific disciplines and communities using existing European expertise in building grid infrastructures and scientific applications.	P11 CNRS
EUMedGrid <a href="http://www.eumedgrid.eu/Copia_cache">www.eumedgrid.eu/Copia_cache</a>	European Commission	Global	Grid Computing.	Funded within the Sixth Framework Program for Research and Development, EUMedGRID aimed to support the development of a Grid e-Infrastructure in the Mediterranean Area and promote the porting of new applications on the Grid platform, thus allowing	P11 CNRS

				Mediterranean scientist to collaborate more closely with their European colleagues.	
LONI <a href="http://www.loni.ucla.edu/">www.loni.ucla.edu/</a>	Laboratory of Neuro Imaging, UCLA	National (USA)	Biomedical Imaging	The Laboratory of NeuroImaging (LONI) at UCLA, hosts the world's largest public database for Alzheimer's imaging studies and provides algorithm pipelines to perform a wide range of brain image analyses that come with an intelligent and interactive distributed visual programming environment.	P9 UCLA
outGRID <a href="http://www.outgrid.eu">www.outgrid.eu</a>	European Commission	Global	Biomedical Imaging	outGRID is a support action to harmonise existing e-infrastructures, thus creating a Worldwide e-infrastructure for Computational Neurosciences.	P1 FBF, P2 maatG, P11 CNRS, P9 UCLA, P10 MNI
Pharmacog <a href="http://www.alzheimer-europe.org/PharmaCog">www.alzheimer-europe.org/PharmaCog</a>	European Commission	European	Clinical Neuroimaging	PHARMACOG is the largest effort on Alzheimer's disease in Europe, comprising a large clinical imaging section. N4U will give particular regard to the requirements of users coming from the PHARMACOG consortium	CO1 FBF



<p>Sim-e-child (former Health-e-Child)  <a href="http://www.sim-e-child.org/">www.sim-e-child.org/</a></p>	<p>European Commission</p>	<p>European</p>	<p>Biomedical Imaging</p>	<p>Sim-e-Child is an FP7 EC funded STREP that is working to develop a grid-enabled platform for large scale simulations in paediatric cardiology, providing a collaborative environment for constructing and validating multi-scale and personalized models of a growing heart and vessels.</p>	<p>P2 maatG</p>
<p>VPH-NoE  <a href="http://www.vph-noe.eu/">www.vph-noe.eu/</a></p>	<p>European Commission</p>	<p>European</p>	<p>Biomedical informatics</p>	<p>Virtual Physiological Human, Network of Excellence. The VPH NoE is a project which aims to help support and progress European research in biomedical modelling and simulation of the human body. This will improve our ability to predict, diagnose and treat disease, and have a dramatic impact on the future of healthcare, the pharmaceutical and medical device industries.</p>	<p>P2 maatG</p>

Table 1 shows that the heterogeneity of the N4U Consortium in terms of scientific area of interest (biomedicine or computer science); core business (neuroscience in the field of Alzheimer's disease, multiple sclerosis, or psychiatric disorders; medical grid community; e-infrastructures); and business type (academic or SME); represent a key asset, ensuring that the project's activities are well orchestrated with similar initiatives worldwide.

### **3. Targeted Initiatives**

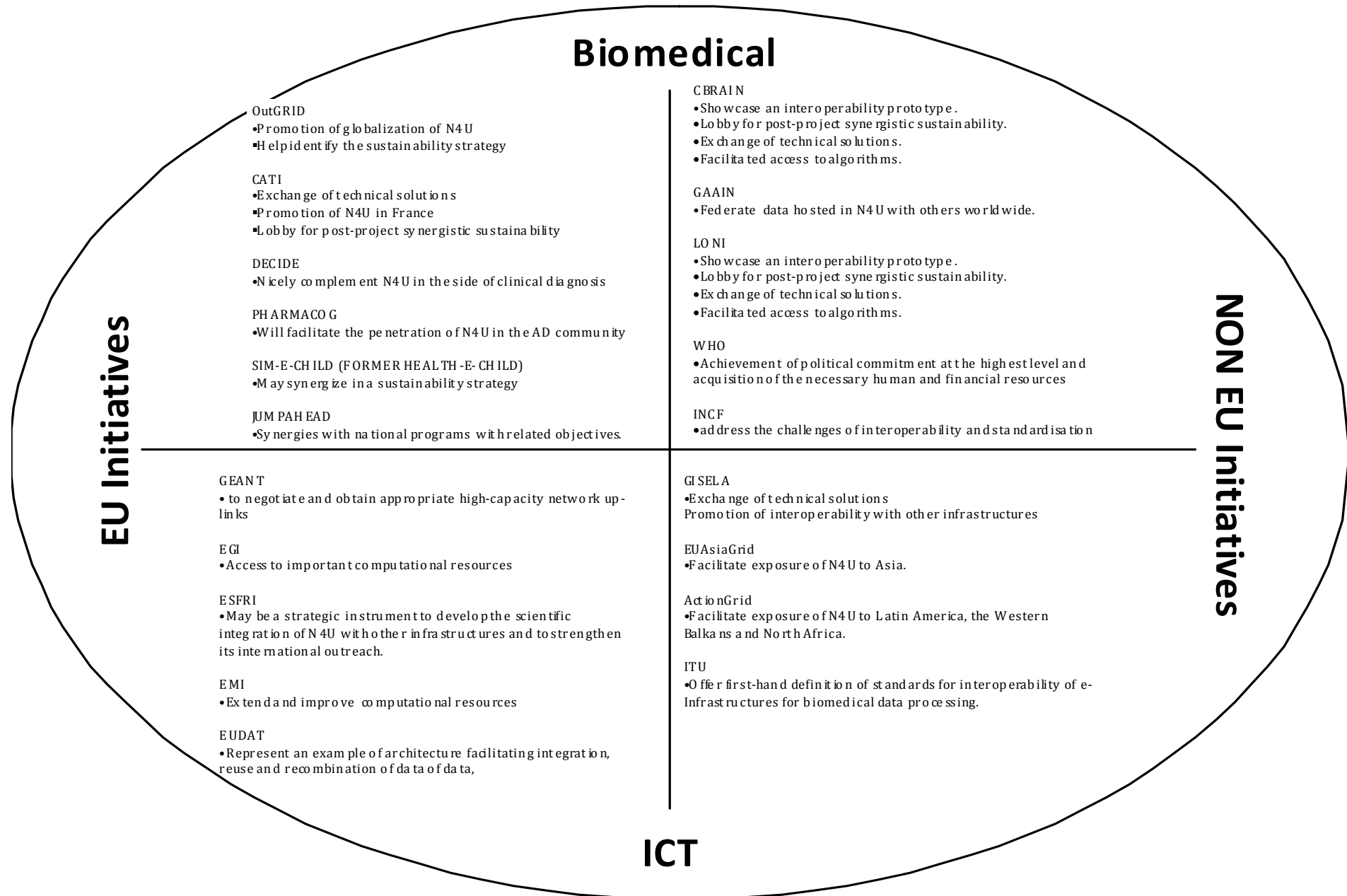
To expand its influence and exponentially enhance the potential of its solutions and standards, N4U will encompass specific activities in connection with the most relevant initiatives in Europe and worldwide related to its scope.

Target initiatives have been categorized according to:

- Scientific Area (Biomedical or ICT)
- Geographic Area (European or Non-European)

## Figure 1. N4U CONCERTATION VISION.

The table lists relevant projects and initiatives and the potential benefit to N4U of the cooperation



## 3.1 Targeted ICT Initiatives

As far as the ICT field is concerned, liaisons will be implemented with the most important Research Infrastructures within and outside Europe, targeting in particular:

- Connectivity Infrastructures which provide high-capacity networks
- Grid Infrastructures which provide computing resources and connect Virtual Communities

While figure 1 lists initiatives by geographical location, the following text will describe them by scope.

### 3.1.1 Research infrastructures

E-Infrastructures are playing an ever increasing role in data acquisition and management, digital repositories, access to standardised, calibrated and inter-operable data, data curation, the mining of archived data and its release for broad access.

E-Science infrastructures are being developed all over the world with the aim to provide all researchers—whether working within their home institutions or in national or multinational scientific initiatives—with shared access to unique or distributed scientific facilities (including data, instruments, computing and communications).

To support the development of a policy on research infrastructures at European level, **ESFRI** ([ec.europa.eu/research/esfri](http://ec.europa.eu/research/esfri)), the **European Strategy Forum on Research Infrastructures** was created in 2002 by the Member States and the European Commission. Being a strategic instrument to develop the scientific integration of Europe and to strengthen its international outreach, ESFRI gives national authorities the opportunity to explore common and integrated activities for the best development and use of Research Infrastructures of pan-European relevance. In this way, it contributes to the implementation of a critical, strategic part of the Lisbon agenda by integrating national policies and bringing together national and EU resources to develop the European Research Area (ERA).

Among the infrastructures of ESFRI, N4U will take contacts with **EuroBioImaging** ([www.eurobioimaging.eu](http://www.eurobioimaging.eu)), the ESFRI infrastructure aiming to create a coordinated and harmonized plan for biomedical imaging infrastructure deployment in Europe; to provide access, service, and training to state-of-the-art imaging technology; and to foster the liaison and cooperation of all stakeholders (scientists, industry, regional, national, and European authorities).

One of the main goals of N4U is to foster the convergence of European and non-European infrastructures towards a worldwide infrastructure that will constitute a global virtual imaging laboratory. This facility will need to comprise high-speed networking, high-capacity grid systems and specialised high-performance computing centres and servers. For the first 2 elements, N4U already leverages on key infrastructural layers that were developed and deployed over the last decade and which form the high-speed and powerful computational base to the European Research Area. More particularly, in its design N4U will integrate the **GÉANT network** ([www.geant.net](http://www.geant.net)), as well as the **European Grid Infrastructure (EGI)** ([www.egi.eu](http://www.egi.eu)), and provide cost-effective, user-driven and user-friendly interfaces. All three layers having developed roots to countries and continents targeted by N4U, it will facilitate its design and feasibility study on a global scale, while helping reaching out stakeholder communities internationally.

### 3.1.2 Connectivity infrastructures

At the lowest infrastructural level (connectivity), N4U will thus benefit from the **GÉANT network**. GÉANT is an advanced pan-European backbone network that interconnects National Research and Education Networks (NRENs) across Europe and provides worldwide connectivity to the European research and education communities.

GÉANT connects over 30 million researchers with a multi-domain topology spanning 34 European countries and linking to a number of other world regions. GÉANT is at the heart of global research networking. In addition to its pan-European reach, the GÉANT network has already links to networks in other world regions, including extensive connectivity to TEIN (Asia-Pacific), ALICE (Latin America), EUMEDCONNECT (Mediterranean), ORIENT (China) and UbuntuNet Alliance (Southern African). GÉANT is also working towards connecting to Central Asia (CAREN) and South Eastern Africa.

To liaise with North America, DICE, an operational collaboration between European (GEANT) and North American Research and Education Networking partners Internet2, ESNet, Indiana University, CANARIE and USLHCNet, has been activated. The DICE collaboration includes workshops and ongoing collaboration in specific areas within the GÉANT research programme, where engineers work together to advance research for the benefit of all. Moreover, for the sustainable operation of N4U, it is crucial to interact with technology and infrastructure providers, as well as with user communities outside Europe to drive the evolution of services.

In N4U a specific team, the **DCI (Distributed Computer Infrastructure) Liaison team**, has been set up which will take care of accompanying centres receiving N4U sites (so called Data Archive and Computing Site, DACS), in their interactions with GÉANT/DANTE responsible to negotiate and obtain appropriate high-capacity network up-links, feeding newly deployed N4U computing resources at onsite premises.

### 3.1.3 GRID infrastructures and Virtual Communities

The second pillar on which the N4U infrastructure leverages, forming the backbone of its computing resources, is the **European Grid Infrastructure (EGI)**, which brings together resources from more than 50 countries to support 18,000 users worldwide. So far the infrastructure has delivered nearly 1,500 million CPU hours to benefit European research. Its mission is to allow scientists from all fields to make the most out of the latest computing technologies for the benefit of their research.

To deliver a consolidated set of middleware components for deployment in EGI and other DCIs, the **EMI, European Middleware Initiative ([www.eu-emi.eu](http://www.eu-emi.eu))** has been set up, to bring together the major middleware providers in Europe – in particular ARC, gLite, UNICORE and dCache. The main goals of **EMI** are to extend the interoperability between grids and other computing infrastructures; strengthen the reliability of services; and establish a sustainable model to maintain and evolve the middleware for the benefit of its user communities. By collaborating with EMI, N4U will be able to get in contacts with the large scientific infrastructures within the ESFRI roadmap, by means of EMI particular collaborating projects as well as targeted usability studies. At the same time, EMI will allow N4U to get in touch with non-European infrastructures like OSG (Open Science GRID) and with the software providers delivering middleware (for example VDT) used on those infrastructures, through the collaborative initiatives in interoperability and standardization which EMI will put in place

Along with EGI, the **European Grid Initiative Integrated Sustainable Pan-European Infrastructure for Researchers in Europe (EGI-InSPIRE)** is a collaborative effort involving more than 50 institutions in over 40 countries. The associated European Grid Infrastructure (EGI) includes in excess of 350 sites across 50 countries, offering around 300,000 processor cores, and more than 100 petabytes of tape and disk storage. The infrastructure is available to users around the clock achieving a sustained workload of nearly a million computer tasks (or jobs) everyday. EGI-InSPIRE is coordinating the transition from the previous project-funded system to a sustainable pan-European e-Infrastructure, by supporting 'Grids' of high-performance computing (HPC) and high-throughput computing (HTC) resources. EGI-InSPIRE is also ideally placed to join together the new Distributed Computing Infrastructures such as Clouds, Supercomputing networks and desktop Grids, for the benefit of user communities within the ERA.

N4U will connect to EGI through the **Life-Science Grid Community**. This, besides offering N4U access to additional resources and innovative technical solutions and facilitate contacts to National Grid Initiatives, will represent a means to further engage with researchers and users from the Life Science Heavy User grid Community and Life Science Grid Community (LSGC).

N4U will liaise with LSGC represented here by P11 CNRS which is the LSGC coordinator. N4U will look to establish a Memorandum of Understanding with the latter in order to access additional Grid resources from NGIs in light of its 3 analyses challenges to be operated in WP5 at M12, M24 and M36.

At the same time, N4U will actively collaborate with more generic, non content-related e-infrastructures such as **EUDAT (www.eudat.eu)**. EUDAT aims to deliver a Collaborative Data Infrastructure (CDI) with the capacity for meeting future researchers' needs in a sustainable way, on the basis that, although research communities from different disciplines have different ambitions, particularly with respect to data organization and content, they also share basic service requirements. EUDAT can represent for N4U an example of architecture facilitating integration, reuse and recombination of data, through innovative integration and interoperability solutions. Moreover throughout EUDAT User Forums will be held on a regular basis, and be open to all stakeholders interested in adapting their solutions or contributing to the design of the CDI. Together with OpenAIREplus, EUDAT will help to establish an international **Data Access and Interoperability Task Force (DAITF)** as an open forum. This task force will facilitate the bi-directional interaction between EUDAT and DAITF on standards, APIs,(Application Programming Interfaces), policy rules, etc. that will determine the future European and Global Collaborative Data Infrastructure. Attention will be put in the mechanisms for interoperability of data from the very basic layers to the semantic and regulatory levels.

Collaborations with e-Infrastructure providers outside Europe will ensure a truly worldwide set of resources able to support research collaborations envisioned in N4U. For example, N4U will try to reach ICT resources and Virtual Communities in Latin America, by connecting with **RedCLARA**, which develops and operates the only Latin-American advanced Internet network for research, innovation and education. This will be done through **GISELA (www.gisela-grid.eu)**, a FP7 funded project with encompass 19 partners from 15 countries in Europe and Latin America. The long-term idea of GISELA is to establish a powerful e-Infrastructure facility built on the legacy of the 'e-science grid facility for Europe and Latin America' (EELA) project series, as well as to develop and implement a sustainability model for the e-Infrastructure, which forms the backbone of computing resources for projects as N4U, which can provide cost-effective, user-driven and user-friendly interfaces together with appropriate support to end-users. With the same philosophy, N4U will expand in the Mediterranean region, in Latin America, in the Western Balkans and North Africa, by establishing collaborations with projects as EUMEDGRID and ACTION-Grid.

### 3.1.4 Institutional Partners

N4U Concertation strategy would be incomplete if together with User involvement, technological solidity, it did not consider political endorsement. This is why liaison will be implemented between N4U and global political institutions and regulatory agencies, such as **ITU (International Telecommunication Union) (www.itu.int)**. ITU is the United Nations specialized agency for ICT. ITU allocates global radio spectrum and satellite orbits, develops the technical standards that ensure networks and technologies seamlessly interconnect, and strives to improve access to ICTs to underserved communities worldwide. ITU is committed to connecting all the world's people – wherever they live and whatever their means. Through ITU's work, everyone's fundamental right to communicate is protected and supported. ITU is based on public-private partnership and currently has a membership of 193 countries and over 700 private-sector entities and academic institutions. Its membership is a representative cross-section of the global ICT sector, from the world's largest

manufacturers and carriers to small, innovative players working with new and emerging technologies, along with leading R&D institutions and academia. ITU is headquartered in Geneva, Switzerland, and has twelve regional and area offices around the world. The liaison with ITU will offer N4U first-hand definition of standards for interoperability of e-Infrastructures for biomedical data processing.

## 3.2 Targeted Biomedical Initiatives

Improving health, including the increase of effectiveness in fighting emerging epidemics is a topic that requires urgent attention. Life sciences infrastructures will contribute to the solution of these important questions.

At the European level, the Biological and Medical Sciences (BMS) initiative is a constituent pillar to implement the ERA by providing world-leading Research Infrastructures in this field.

### 3.2.1 General biomedical research Infrastructures

N4U will actively participate in the concertation activities with BMS infrastructures in order to provide input and receive feedback from working group addressing activities of common interests.

The target of these activities will be Research Infrastructures in countries hosting equivalent resources and capacity, or hosting very specific yet essential assets from which N4U Infrastructures may benefit. These partnerships developed may, in turn, have an influence in the development and implementation of N4U.

In particular, with the support of P2 maatG and P11 CNRS and the other technical partners, CO1 FBF will constantly and carefully monitor the technical and strategic conditions for potential productive contact with:

**BBMRI** (Biobanking and Biomolecular Resources Research Infrastructure) ([www.bbmri.eu](http://www.bbmri.eu)). BBMRI aims to be a pan-European distributed infrastructure of existing and new bio-banks and bio-molecular resource centres. It will provide access to human biological samples that are considered as essential raw material for the advancement of biotechnology, human health and research and development in Life Sciences (e. g. blood, tissues, cells or DNA that are associated with clinical and research data). It will also comprise bio-molecular research tools and bio-computational tools to optimally exploit this resource for global biomedical research. The collaboration with BBMRI can provide N4U access to a large EU-wide community of imaging scientists and to innovative technical solutions.

**ECRIN** (European Clinical Research Infrastructures Network) ([www.ecrin.org](http://www.ecrin.org)). ECRIN is designed to bridge the fragmentation of clinical research in Europe through integration of national networks of clinical Research Infrastructures. It will provide 'one-stop shop' services to investigators and sponsors in multinational clinical research studies. Users will be investigators and sponsors in the academic and SME sector. Through ECRIN, N4U can get in contact with neurological and psychiatric medical communities.

**EATRIS** (European Advanced Translational Research Infrastructure in Medicine) ([www.eatris.eu](http://www.eatris.eu)). EATRIS aims to provide infrastructure allowing a faster and more efficient translation of research discoveries into new products to prevent, diagnose or treat diseases. EATRIS will operate through a pan-European consortium of leading biological and medical sciences research centres providing the necessary infrastructure facilities and expertise. They will form strong new innovation clusters, the EATRIS Translation Centres. These centres will provide cutting edge infrastructure and knowledge for the entire development from basic research to the clinic. According to their core expertise the EATRIS Centres will focus on certain disease(s) and product(s). Liaison with EATRIS will offer N4U access to neurological and psychiatric medical communities.



### 3.2.2 Neuroimaging infrastructures

Image data sets of unprecedented size from healthy and pathologically aging individuals are posing new challenges related to availability and accessibility of data, computational resources, and visualization tools. In Europe and North America e-infrastructures are being developed based on grid computing, to offer a suite of services to facilitate advanced computational analyses on brain images.

**CATI, the Centre pour l'Acquisition et le Traitement de l'Image**, represents the leading imaging initiative in Alzheimer's Disease in France. CATI aims at implementing all the resources required by French imaging scientists working in the field of Alzheimer's disease to perform multi-center neuroimaging studies at the highest world standards.

CATI is the main component of the French Alzheimer Plan, which so far represents the most ambitious national programme on imaging on Alzheimer's disease, with 9M euros of funding. It presents important similarities to what N4U aims to develop at the European level. Therefore, the liaisons can, at the same time, be technical, with the exchange of innovative solutions, and strategic, since it can represent a virtuous example of national project-N4U synergies to provide sustainability during and after the project lifetime. P7 CEA of N4U is the coordinator of CATI and in this context will develop databasing and image quality assurance tools that might be usefully implemented in N4U. Notably, the coordinator of N4U (GB Frisoni) is in charge of the international relationship work package of CATI, which will greatly facilitate the integration and harmonization of N4U's with CATI's activities.

A recurrent problem with the way research data are stored, processed, and accessed is that scientific work environments, as well as research data infrastructures, remain isolated solutions that focus on data from specific disciplines or data produced within specific geographic regions like the European Union or the United States. Moreover, scientific work environments and research data infrastructures are based on a wide range of different technical architectures; this hampers the exchange of data between systems. In most cases, the research data infrastructures that are currently in operation remain isolated data silos that supply scientists with the data the systems were designed to deliver, but do not allow scientists to discover all data that is available world-wide on a topic or to discover data on related topics provided by a different data infrastructure.

The possibility of a data infrastructure offering interoperability-enabling tools and services is a real service that has to be constitutive of any global research data infrastructure as N4U. The larger the array of tools and facilities in place to support data interoperability is, the more effective the research data infrastructure will be. However, it is almost impossible to have a single research data infrastructure capable of supporting any data interoperability case. Rather, it is feasible that the infrastructure will be equipped with a comprehensive set of tools and approaches promoting a 'minimal' level of data management facilities oriented to interoperability and promoting data sharing, discovery and consumption across the boundaries posed by the intrinsic characteristics of the data and those of the data sources they belong to. These basic facilities are expected to be complemented with specific services and resources, e.g. mappings, tailored to enhance the level of integration between a specific set of data sources and with respect to the interoperability needs of a specific application scenario.

This need for harmonisation and interoperability has already been partially addressed with FP7 **outGRID (www.outgrid.eu)**, a support action aimed to ignite the process of converging three e-infrastructures (**CBRAIN** in Canada, **LONI** in the United States and **neuGRID** in Europe) into one unique worldwide platform.

Despite the common vision of opening up the imaging laboratory to the non-imaging specialist, the three infrastructures were designed and developed at different times and in different scientific contexts to address specific contingent needs. As a consequence, while they had many commonalities, they also had differences regarding the types of imaging data sets that they offer, algorithm pipelines and tools, computational resources, and related services. The imaging data made available by LONI are



focused on AD and aging, while CBRAIN also encompasses brain development. The neuGRID platform is not home to its own data set; rather, it allows processing of the ADNI data set that can be accessed through LONI.

Starting in 2009, outGRID was able to impact on the respective e-infrastructures developments towards a preliminary and basic level of interoperability, which N4U aims to bring one step further.

N4U will further expand outGRID's attitude and aims to span across the whole spectrum of functionalities provided by the three infrastructures (neuGRID, LONI, CBRAIN). For that purpose, as in outGRID, N4U will test interoperability by proposing different data challenges, which will exercise interconnected e-infrastructures simultaneously towards a common scientific and technical objective, thus validating achieved interoperability.

At the same time, N4U will benefit from all the activities carried out in outGRID to impact on policy making. In outGRID a great effort has been dedicated to conduct an active networking and awareness raising work, organizing workshops and events to interact with stakeholders. Stakeholders consist of the triad made of biomedical scientists (i.e. the final users), ICT scientists (i.e. those who will deploy and maintain the local infrastructure), and funding agencies (i.e. those who will mobilize resources for local seeding).

A virtuous example was the workshop "*How e-Science Can Help to Solve Pressing Societal Challenges: Fostering a Global Effort to Develop a Worldwide e-Infrastructure for Computational Neuroscientists to Fight Alzheimer's Disease*" held on 20<sup>th</sup> -21<sup>st</sup> February 2012 at United Nations' International Telecommunication Union (ITU) in Geneva. This event and its conclusions will be described in details in the section "*3.2 Participation to high-level workshops*"

### 3.2.3 Other Related Biomedical Initiatives

Three international initiatives, related in different ways to neuGRID, have been identified as priorities for concertation activities since they can contribute know-how and expertise to the design of N4U. Of these, 2 are focusing on the clinical requirements of physicians (FP7 Sim-e-Child, and FP7 DECIDE), and 1 on the research requirements of neuroscientists (GAAIN).

#### Initiatives Focusing on the Requirements of Clinical Medicine:

**FP7 Sim-e-Child (former Health-e-Child) ([www.sim-e-child.org](http://www.sim-e-child.org))** is a pioneer initiative in the field of paediatric diseases. Besides representing another example of translational medicine using a distributed database (grid), interconnecting several clinical centers worldwide, it may become an important collaboration in order to guarantee N4U post-project sustainability. In fact, both projects have deployed a network of nodes at clinical centres, capitalizing data and constituting the base of a simulation platform for various pathologies. The grid-enabled platform for large scale simulations developed both by N4U and by Sim-e-Child will be able to provide seamless integration of traditional and emerging sources of biomedical information, regardless of the kind information, so they are adaptable to other user communities.

**FP7 DECIDE - Diagnostic Enhancement of Confidence by an International Distributed Environment ([www.eu-decide.eu](http://www.eu-decide.eu))** aims to capitalize on the experience developed in the context of FP7 neuGRID, extending the solutions and infrastructures to deliver a service for computer-aided image-based individual patient diagnosis.

While neuGRID was developed to address the needs of neuroscientists and offers applications to study brain scans of patient groups, FP7 DECIDE targets clinical physicians (i.e. neurologists, geriatricians, and psychiatrists), to whom it offers applications to study / diagnose from brain scans of individual patients. DECIDE can favour the adoption of N4U in a clinical diagnostic public health context, expanding in terms of quantity and quality the catchment area of N4U.

Concertation with DECIDE will be facilitated by the Coordinator of N4U being also the Scientific Coordinator of DECIDE.

#### Initiatives focusing on research requirements of neuroscientists.

Outside Europe, one important target is the **Global Alzheimer's Association Interactive Network (GAAIN) ([www.gaain.org](http://www.gaain.org))**. GAAIN is a collaborative project, funded by the Alzheimer's Association, aiming to provide access to a vast repository of Alzheimer's disease research data.

The main outcome expected in GAAIN is the successful launch and ongoing operation of the data repository, so that anyone worldwide can utilize an ever-expanding library of sophisticated tools to analyze and relate images, genetic information and clinical and biological data.

The innovation of GAAIN lies in the fact that the data repository will be built on an existing international infrastructure that includes the considerable centralized computational facilities at LONI, which hosts the North American, Japanese and Australian ADNI databases and provides a large suite of image processing applications, and the neuGRID which provide all over Europe a uniform access through a simple web browser to large imaging databases, sophisticated disease marker extraction algorithms and computing power.

Thus, GAAIN will be the US-based research and development arm of a closely concerted effort where N4U represents the European arm. Their close integration and synergy will be ensured by the fact that key investigators are involved in both initiatives: the Principal Investigator of GAAIN is Arthur Toga from P8 UCLA, Co-Principal Investigator is Giovanni B Frisoni from CO1 FBF, and Co-Technical Coordinator is David Manset from P2 maatG.

#### **3.2.4 Most important working groups involved in related research**

Another target of N4U concertation activities will be the user communities with the aim to attract and involve them in N4U. Due to the liaison already existing between neuGRID and the community of neuroscientists working in the field of Alzheimer's disease these stakeholders will be contacted first.

In particular the major representatives of Alzheimer's Disease imaging and clinical research communities will be contacted. At the European level, one of the main target will be, through CO1 FBF, the **European Alzheimer's Disease Consortium (EADC)([eadc.alzheimer-europe.org](http://eadc.alzheimer-europe.org))**. The EADC is a network of over 50 European centres of clinical and biomedical research excellence working in the field of Alzheimer's disease and related dementias. It aims to provide a setting in which to increase the basic scientific understanding of, and to develop ways to prevent, slow, or ameliorate the primary and secondary symptoms of Alzheimer's Disease. This will be done by facilitating the standardisation of diagnostic criteria, assessment tools and of data collection methods which requires an integrated archival/computational, pan-European Infrastructure as N4U.

At a global level, collaborations will be built with the **Neuroimaging Professional Interest Area (NIPIA)**, representing the Alzheimer's Imaging worldwide community. The NIPIA gathers more than 400 neuroscientists from all over the world seeking to develop and advance clinical and research applications of brain imaging in Alzheimer's disease and related disorders. For N4U it can represent a huge source of user requirements gathering and a great mean for dissemination.

To facilitate the acquisition and the annotation of diverse datasets to achieve multiscale and multiomic data integration, N4U will build contacts with the **International Neuroinformatics Coordinating Facility (INCF)( [www.incf.org](http://www.incf.org))** which coordinates the development of a large scale international cyberinfrastructure for neuroinformatics. Thanks to INCF, N4U can bring together the world's leading scientists to address the challenges of interoperability and standardisation.

One of the main objectives of N4U is to expand the scientific coverage of neuGRID to meet the requirements of new research communities; such as neuroscientists working in the field of neurodegenerative diseases (NS-NDD), of white matter disease (NS-WMD), and of psychiatric disorders (NS-PSY). As the base of N4U users broaden, also concertation activities will involve representatives of the related user communities

### 3.2.5 Pharma companies

In order to ensure the widest impact to the N4U results and to guarantee it a long-term economic sustainability, the industrial community of pharma companies will also be targeted.

To start, this will be achieved through the setup of a scientific cooperation agreement with the **PHARMACOG project** (Prediction of cognitive properties of new drug candidates for neurodegenerative diseases in early clinical development) ([www.alzheimer-europe.org/PharmaCog](http://www.alzheimer-europe.org/PharmaCog)) a 22M euro effort Funded by European Commission under the IMI Innovative Medicines Initiative scheme, a large scale public-private partnership between the European Union and the pharmaceutical industry (EFPIA - European Federation of Pharmaceutical Industries and Associations).

Pharmacog represents the largest effort on Alzheimer's disease in Europe and it comprises a large clinical imaging section represented by Work package 5 of (Identification of biomarkers sensitive to disease progression: Clinical Studies - European Alzheimer's Disease Neuroimaging Initiative, E-ADNI), aiming to develop markers to track the progression of the disease in humans that will be homologous to those used in animal models.

The entire PharmaCOG datasets will be loaded into N4U and the tools available in the infrastructure will allow the Pharmacog Consortium to carry out MR computational analyses on data collected from phantoms, local volunteers, and patients. This collaboration can prove to be very profitable for both the projects. As far as N4U is concerned, it will facilitate the penetration of N4U in the Alzheimer's scientific community, and will represent a very important Usage Example of the infrastructure and therefore a very important occasion for gathering requirements of users. But, above all, through Pharmacog, N4U will get in contact with the R&D departments of 12 global pharmaceutical companies which owe huge datasets of patient data collected in the context of clinical and experimental studies and need computational resources, as those provided by N4U, to analyse them.

### 3.2.6 Institutional Partners

Success of initiatives like N4U rests, first and foremost, on achievement of political commitment at the highest level and acquisition of the necessary human and financial resources. One way to achieve these prerequisites is to establish productive partnerships with global political organisations and regulatory agencies. As far as health is concerned, **WHO (World Health Organisation)** ([www.who.int](http://www.who.int)) is the lead technical agency. It is the directing and coordinating authority for health within the United Nations system. It is responsible for providing leadership on global health matters, shaping the health research agenda, setting norms and standards, articulating evidence-based policy options, providing technical support to countries and monitoring and assessing health trends. The WHO Department of Mental Health and Substance Abuse (MSD) provides leadership in the area of mental health, neurological disorders and substance use. The WHO Department works closely with the WHO regional and country offices and other global partners to support countries to strengthen the evidence base and develop guidance for prevention, diagnosis and management of mental, neurological and substance use disorders. The collaboration with WHO can be an asset for N4U concertation strategy, since WHO is well placed to systematically implement key activities that have been identified in the framework of a single program or of a single country.

## 4. Messages and Channels.

To reach the ambitious goal of delivering a Virtual Laboratory for Neuroimaging research it is crucial for N4U to interact with technology and infrastructure providers, as well as with our user communities to drive the evolution of our services.

Building effective collaborations may be accomplished through:

- sharing of technical solutions to improve services and operations
- synergic Lobbying to obtain post-project sustainability
- synergies in dissemination
- common exploitation of results with scientific operational agreements.

To nurture such collaborations, many different means will be used, both at a technical and a strategic level

- formalised agreements for scientific and technical cooperation;
- participation to high-level events;
- participation to Concertation meetings.

### 4.1 Formalised agreements

Whenever possible, collaborations will be formalised through contractual arrangements. **Memorandum of Understandings (MoU) or Scientific and Technology Agreements (S&T agreements, STAs)** are signed documents written to confirm and define the framework of collaboration between N4U and individual partners. They are considered as efficient tools to open wide and long-term activity and cooperation with partners. Such collaborations will ultimately bring visible benefits to scientists and researchers. In addition, external collaborations will be formalised through membership and participation in international policy bodies.

The aim of formal partnerships is to strengthen the ability of the parties involved to mutually solve problems, benefit from the interchange of ideas and practices and strive towards a common goal. The agreements define these objects and assign roles, responsibilities and communication methods. They also specify areas of confidentiality, periodic review of the document, milestones and monitoring of their achievement as well as joint participation in technical (e.g. data challenge) and/or dissemination activities.

Even though there are different types of formal agreements, to a large extent they normally follow a common structure made up of the following points:

- 1) Purpose
- 2) Definitions
- 3) Principles
- 4) Areas of cooperative activities
- 5) Forms of cooperative activities
- 6) Coordination and facilitation of cooperative activities
- 7) Funding
- 8) Entry of personnel and equipment
- 9) Diffusion and utilization of information
- 10) Territorial application
- 11) Entry into force, termination and dispute settlement

As an important integral part of the agreements, intellectual property rights issues are clarified in a specific annex in most cases.

The N4U Consortium will also encourage the expression of support by other projects to N4U and vice versa, through **letters of intent** and **letters of support**, expressing the will to endorse the project and build strong collaborations.

## 4.2 Participation to high-level workshops and meetings

The N4U Consortium plans to start talking to high level representatives of all the initiatives and institutions that can strengthen N4U strategic position, eliciting added value and efficiency. To do that, contacts will be taken, at first at the technical and then at the political level. This is the plan of action:

- a. Establish contact with the appropriate representatives of the biomedical and ICT communities.
- b. Establish contact with the appropriate political representatives. Contacts will be sought in order to:
  - i. raise awareness of the timeliness of a specific dedicated effort worldwide
  - ii. receive feedback about the feasibility and appropriateness of such an initiative at the larger political level
  - iii. obtain, if possible, indications about other funding agencies with whom to start dialoguing

Since these activities to promote awareness are extensive and time-consuming, N4U will try to achieve this target by participating to workshops organised by other projects.

A virtuous important example was the workshop *“How e-Science Can Help to Solve Pressing Societal Challenges: Fostering a Global Effort to Develop a Worldwide e-Infrastructure for Computational Neuroscientists to Fight Alzheimer’s Disease”* held on 20<sup>th</sup> -21<sup>st</sup> February 2012 at United Nations’ International Telecommunication Union (ITU) in Geneva.

The workshop was organised by FP7 outGRID, a project strictly linked to N4U, in collaboration with the United Nations’ International Telecommunication Union (ITU). This event brought together a vast audience of international scientists, policy officers from the European Commission, WHO, ITU and other national and international governing bodies, as well as a number of international third party organisation members and medical professionals.

Meetings like this are fundamental for projects like N4U representing the occasion to bring stakeholder institutions and projects, international funding agencies, global neuroscientists together in order to pave the way to the mobilization of resources to progress in the fulfilment of these projects’ vision.

The objective of the event was to launch a global effort to develop a worldwide e-infrastructure to support treatments and ultimately a cure for Alzheimer’s disease. At the end of the workshop, there was unanimous agreement that there is a need to develop a global e-infrastructure to help harmonise and boost current research initiatives for Alzheimer’s and other neurodegenerative diseases. This infrastructure will need to combine existing e-infrastructures, among which N4U has been openly appointed as one of the most important.

The need to build on and integrate with existing initiatives worldwide to avoid reinventing the wheel and creating a new stand-alone infrastructure was underlined. The enabling action of the JPND programme was considered to be very relevant for a global initiative. The **Joint Programming for Neurodegenerative Diseases (JPND)** ([www.neurodegenerationresearch.eu](http://www.neurodegenerationresearch.eu)) is a European Union member state-led initiative to tackle one of the 'grand challenges' which the European society faces. The 'grand challenges' are areas where the scale of investment needed cannot be justified by the benefits resulting from one country alone, and when the work needs a coordinated effort from several groups in different countries. Neurodegenerative diseases will be the first area to benefit from this new approach, with particular emphasis on Alzheimer’s disease. The ultimate goal is to establish

multi-national, collaborative research projects that will add value to existing research through addressing novel approaches to improve and harmonize the use of biomarkers in the area of neurodegenerative disorders to allow the sharing of data among the researchers. Joint research efforts like the JPND require the existence of an interoperable federated platforms which need to combine existing e-infrastructures like N4U, C-BRAIN, and LONI.

The N4U deems appropriate to refer to JPND to develop a global-scale network of collaborations, since the JPND is uniquely positioned to examine how initiatives as N4U can maximise their lasting sustainability, attract users and provide linkages to other resources in such a way to make each one an indispensable component of a larger whole.

### **4.3 Concertation Meetings**

N4U plans to attend the Concertation meeting organised by the European Commission. The purpose of these meetings is to bring together the ongoing FP7 projects and facilitate exchange of results and achievements, and build consensus.

In particular, the objectives of these meetings are:

- To support the ongoing FP7 projects in sharing their latest research achievements
- To enhance the project cooperation activities, share best practices and opportunities for (pre-) standardisation
- Set future activities and topics of common interest for each cluster
- To facilitate networking and discussion among the participants

Since the beginning, N4U sought to establish its presence in these meetings, participating, upon invitation of the EC project Officer, to the 9<sup>th</sup> e-Infrastructures Concertation Meeting which was held in Lyon on 22-23 September 2011 in parallel with EGI Technical Forum. The meeting aimed to introduce the new e-Infrastructures projects starting in 2011, to take stock of progress in e-Infrastructures and to discuss future perspectives on data, cloud technologies and e-Science environments, HPC and Software. The event also included a short presentation of the currently open Call 10. The objectives and the vision of N4U have been presented with a poster.

## **5. Definition of indicators to monitor N4U performance**

In order to measure the impact of the actions of this plan, the following are the evaluation criteria that have been established:

- The cooperation among initiatives in the member states and EC initiatives has increased.
- The number of contacts with extra-European initiatives has increased
- The influence of N4U in the global research community has increased.
- Collaboration within new (clinical and research) user communities has increased.

Each evaluation criterion has further indicators:

- Number of formal agreements signed
- Participation of N4U noted in official scientific publication or project reports.
- Number of international events organized.
- Number of international events attended.

## **6. Conclusions**

This document sets the framework for an optimal concertation strategy of N4U with a number of targeted stakeholders. Ensuring consistent communication and representation strategy to stakeholders as well as establishing a positive word of mouth experience among other similar initiatives is of prime importance. Collaboration among project partners for sharing of results and building on dynamicity and adaptability are key words for the success of N4U.