Towards the Development of Effective Drugs for Alzheimer's Disease.
How e-Science Can Help Solve Pressing Societal Problems

neuGRID   outGRID

Report: High-Level Seminar at the European Parliament - January 26, 2011

Executive summary

Event objectives

The seminar aimed to:

- Discuss the advancements being made on the innovative idea of building a global virtual imaging laboratory based on grid/cloud computing.
- Call for more action at the political level, generate support from EU policy-makers and advocate for an allocated budget, which will be necessary to implement neuGRID globally.
- Address the possible barriers to harmonisation, namely financial support, interoperability and transparency.
- Facilitate pan-European research on degenerative brain diseases and help develop effective treatments for these diseases.
- Igniting the process to lead these three e-infrastructures to converge into one unique worldwide facility.
- Promote the exchange of technical information, direct the development of the infrastructures towards interoperability and promote specific international calls aiming to achieve full interoperability.
- Increase awareness among policy-makers and populations of the great impact that research infrastructures could have on drug development and medicine as a whole.

> " This event creates an opportunity for a debate which will pave the way for actions at the political level. Today, we can work to facilitate a better budget line for the promotion of ICT for Health
>
> said MEP Mario Mauro.

e-Science in action: about neuGRID/outGRID

neuGRID is a user-friendly online network that was created to dramatically accelerate the rate of research into Alzheimer's and other neurodegenerative diseases, facilitating the development of markers of disease progression (such as glicated hemoglobin for diabetes). These will foster the development of effective drugs in clinical trials.

The online platform provides neuroscientists across Europe with a vast database of 3D brain scans and powerful yet accessible computational tools to analyse them. It thus represents a platform of understanding and collaboration between ICT technical experts and the clinical cmmunity.

The neuGRID project, which was implemented from 2008-2011, achieved a major success in September 2009 when it extracted an Alzheimer's disease marker through the use of neuGRID's online archive of thousands of brain scans. With the use of the neuGRID infrastructure, a process that used to take as much as five years was completed in only two weeks. Now that neuGRID has proven its usefulness, the next step will be to harmonise and unify the neuGRID infrastructure with similar networks around the world. outGRID, neuGRID's international umbrella organization, is currently working to coordinate projects across the United States, Canada and Europe.

neuGRID is currently funded by the European Commission. However, in order to maximise the effectiveness of the platform, the project needs to be implemented globally. Harmonizing neuGRID with the few but significant homologous initiatives worldwide will increase the data available, and in turn, render the analysis of brain images significantly more conclusive.

outGRID was created to foster harmonisation and collaboration between neuGRID and two major initiatives in the US and Canada. In Canada and the United States, CBRAIN and the Laboratory of NeuroImaging at UCLA (LONI) currently offer computational resources and algorithm pipelines. By shifting the brain scan analysis process to cloud-computing and delocalising all data to a global, online platform, outGRID will ultimately lead to the development of a user friendly, easily accessible global virtual imaging laboratory.

Event conclusions

On EU initiatives for the development of new technologies for medical research:
- ICT sector is a key tool to finding new drugs.
- Funding for research in new innovative computing systems should be increased.
- Governments should start investing in the link between research and innovation, which will ultimately lead to healthier lives.

Challenges ahead:
- The global online network should provide a provenance system in neuGRID allowing users to determine where the medical data comes from.
- In order to make sure that the quality and capacity of the infrastructure is fully used, it is necessary to ensure the complete transparency of the software .
- The question of interoperability remains the major technical obstacle. Establishing a system that is operable and downloadable from anywhere around the world, and useable by any medical expert, is the key priority.

Next steps:
- Advocating for continued financial support which is necessary to develop a global infrastructure.
- Continuing expert discussions on improving worldwide interoperability.
- Increasing awareness among policy-makers and the public on the role that innovative technologies can play in helping the research for neuro-degenerative diseases, through the organisation of informative seminars.

“ If this infrastructure is made global, the long term scenario is that many more scientists will contribute to the successful development of disease markers for Alzheimer's disease, the markers will be used in clinical trials, and the drug development process will be greatly facilitated

explained Dr. Giovanni Frisoni.

Event overview

The seminar event brought together a total of 60 guests, including technical scientists from Europe and North America, policy officers from DG Research and DG INFSO, and a number of third party organisation members and European medical professionals. The objective of the event was to **create momentum for debating how the link between computational power and medical research could be put to best use.** There was **unanimous agreement that funding for research in new innovative computing systems should be increased,** and that the **ICT sector was a key tool to finding new drugs.**

The structure of the event comprised of three parts: an introductory outline of the role which ICT and innovation play in research; a technical outline of the existing grid-computing infrastructures in Europe, the U.S and Canada; and a policy roundtable on the outreach and future of the project.

Speakers and panellists

The event featured a range of high-profile speakers and participants. The policy part involved speeches by **Mr. Robert Madelin**, Director General INFSO and **Mr. Mario Campolargo**, Director of Emerging Technologies and Infrastructures at DG INFSO. The technical section comprised presentations by **Dr. Giovanni B. Frisoni**, Coordinator of neuGRID and outGRID and Deputy Scientific Director of the IRCCS Fatebenefratelli Institute in Brescia, Italy; **Prof. Richard McClatchey**, Technical Supervisor or neuGRID and Research Director of the Centre for Complex Cooperative Systems, University of the West of England in Bristol, UK; **Dr. Alan Evans**, Principal Investigator of CBRAIN in Montreal, Canada; and **Mr. David Manset**, Technical Coordinator of outGRID and CEO of maatG in Archamps, France.

The presentations were followed by a policy roundtable. The aim of the panel discussion was to **identify common grounds for partnership and address any obstacles to the development of a fully compatible system at the global level**. Composed of North American researchers and European policy-makers in the fields of research and information technologies, the panel was able to bring together perspectives that are relevant and necessary to the global implementation of the neuGRID/outGRID projects. **Mr. Rémi Quirion**, Executive Director of the Canadian Institute of Health Research in Montreal, discussed the current developments in the area of cloud-computing in Canada.

Two members of the European Commission's Directorate General for Information Technologies, **Mr. Kostas Glinos**, Head of Géant & e-Infrastructures Unit, and **Mr. Pēteris Zilgalvis**, Head of ICT for Health Unit, expanded on the Commission's current and planned involvement in e-Infrastructures. **Dr. Philippe Cupers**, scientific officer in the Major Diseases Unit and Joint Programming Representative at DG Research, **advocated a comprehensive approach on technology for the improvement of drug treatments in Europe**, an opportunity enabled by Joint Programming. **Ms. Karin Lohmann**, WP Chair Process Plan in Euro-Imaging, promoted the deployment of biomedical imaging infrastructure in Europe and fostered the liaison and cooperation of all relevant experts in Europe.

Policy landscape

All participants were focused on the options for working together to make this research platform a global tool for medical research. Mr. Mario Campolargo, who introduced Mr. Madelin and chaired the first two parts of the event, emphasised that this project was addressing an issue which was not only European, but global.

The current lack of awareness with regards to the need for a harmonised effort is mirrored in the still insufficient public resource allocation. In view of this situation, the speakers all called for a revision of the current mindset, and referred to the neuGRID project as a great example of the promising prospects for drug development. **MEP Mario Mauro**, who hosted of the event, called for more action at the political level. He explained that **the challenges ahead laid in sensitising policy-makers and populations** of the great impact which research infrastructures could have on drug development, and medicine as a whole.

"Scientific research can help solve health problems which are present in every house and every street around us", stated Mr. Madelin. "We should see neuGRID and outGRID as the platforms that will begin to bring solutions. We should overcome the tendency of the neuroscientists to resist cross-disciplinary work. **neuGRID is the perfect example of the sort of scientific cooperation that the world requires today."**

Such discussions are crucial in generating the broad support without which scientific endeavours could not bear fruit

emphasised the Director General INFSO Mr. Robert Madelin.

Technical overview

Dr Giovanni B. Frisoni explained that Azhleimer's disease develops because, over time, two toxic proteins accumulate in a patient's brain. For maybe 10 or 20 years, the disease remains asymptomatic. After a certain threshold, mild memory problems start to appear. Previously, we were diagnosing the disease on clinical ground within the dementia window, but we now believe that we can diagnose the disease earlier, before the symptoms appear through the extraction of a disease marker. **"The long term scenario is that we will be able to pick patients with very early Alzheimer's and develop effective drugs on this population. The drugs will hopefully prevent the loss of self sufficiency and keep the patient in the window of mild memory loss."** In this complex chain, neuGRID aims to foster the implementation of drug trials.

Prof. Richard McClatchey: the approach used to develop neuGRID was to consult the end user community, run requirements analyses and technical reviews, and test the prototypes with periodic data challenges. "Having reached the extraction of marker in 2009, **we focused throughout 2010 on training scientists to use the infrastructure prototype, and used the feedback received to build a business plan for the future."** The development of a provenance server in neuGRID was developed specifically so that people can determine where the data come from.

Prof. Alan Evans: Similar activities have been running in Canada and the US, notably with the creation of CBRAIN in Montreal (McGill University) and LONI in Los Angeles (UCLA), two platforms similar to neuGRID which allow to process data in flexible manner. **Our ultimate objective is to expand this process at the global level, and create one single interoperable online platform for research.** "The scientific projects currently undertaken in various parts of the world are highly compatible, and we should now work on ways to make them converge."

David Manset: "outGRID aims at promoting interoperability between the three infrastructures, CBRAIN, neuGRID and LONI". Facing the task of reaching semantic interoperability, meaning, solving the question of how to make one system understand the other, the outGRID developed a preliminary prototype. "**If the current tests succeed, we will be able to prove the reliability and viability of the concept, and start developing a grid-cloud based infrastructure for neuroscientists to expand biomarkers development**, especially for Alzheimer's, reduce costs of clinical trials, accelerate the rate of research for new drugs, and improve care and health of patients. We therefore need the strong commitment of decision-makers to initiate a larger effort of development worldwide."

Roundtable and Q&A

During the roundtable, panellists discussed the **interoperability between CBRAIN in Canada, LONI in Los Angeles, and neuGRID in Europe**, and address the possible barriers to harmonisation. **Mr. Rémi Quirion** gave an overview of the initiatives currently under way at the Canadian Institute of Health Research (CIHR), which are seeking to implement an international collaborative research strategy combining clinical research, personalised research, genetics, Alzheimer's and dementia. Mr. Quirion concluded by stating that the priority was for partners to identify common priorities on research

" We are open for business; we want to partner with colleagues around the world. We can have an impact in terms of treatment

said Mr. Rémi Quirion.

and establish funding and support necessities. "I hope that the outcome of today's conference is that Alan (Dr. Alan Evans) will knock on our door asking to partner with his team and with the Europeans."

The question of interoperability remains a challenge but should not be an obstacle. Such events are organised to ensure that all compatibility issues are overcome. Mr. Kostas Glinos explained that we are entering an era where e-infrastructures are important because they allow sharing. Knowledge sharing has great potential, but a number of obstacles, such as interoperability issues, need to be removed. "The challenge today is not how the science itself, but the way you use it. neuGRID and outGRID are a testament of an effort to remove such obstacles to allow scientific progress to advance enormously. This should be a convincing argument to increase funding in the area of e-infrastructures." **For this reason, the Commission will publicise a number of documents outline its plans in terms of access and sharing and its views for the next framework programme**.

Changes at the EU policy level are noticeable, notably with the funding for research currently having reached 100 million Euros a year. However, in order to make sure the quality and capacity of the infrastructure, complete transparency of the software is crucial, so that neuro-scientists know the scope of the software tools they are using. **To achieve this, the tasks of the ICT for Health Unit will be to analyse the current barriers to innovation and map existing initiatives**.

Mr. Philippe Cupers provided an overview and political horizon of the Joint Programming on Neuro-Degenerative Research (JPND). Behind the establishment of this initiative was the desire to develop a common strategy to address certain societal problems, in this case, neuro-degenerative diseases. **The JNPD is a voluntary platform which allows Member States to join, share ideas, and maximize the efficiency of national funding schemes**. The commission will hold an observer role. Throughout this year, the board will define its strategic agendas and priorities, and launch its pilot call, which might be: "Harmonisation of Cerebrospinal Guild Biomarkers for Neurodegeneration" (tentative topic). The pilot project will be implemented in 2012.

" Seeing the crucial role which innovation plays in the Europe 2020 Strategy, it is now important to turn societal challenges into opportunities, and start investing in the link between research and innovation, and ultimately build prospects for healthier lives

explained Mr. Pēteris Zilgalvis.