



Position statement on Future trends and e-Infrastructures application: towards sustainable development

This statement takes into account the discussions that took place on the 16th and 17th of July, 2009, during the 4th BELIEF Symposium which took place in São Paulo, Brazil. The symposium was organized by the BELIEF II project, and was additionally supported by the GLOBAL project. The primary goal of the symposium was to identify obstacles and highlight opportunities for a sustainable development in the future trends and e-Infrastructures application and thereby to set the axes of the related research agenda.

The Policy Makers' Point of View – Remarks from the Policy Makers Round Table discussion

Discussion about e-Infrastructures sustainability has not only to put a number of ideas on the table but also to try to identify common areas which can be exploited in collaboration between Latin America and Europe. Topics of common interest that should be addressed are the following:

Sharing resources

One of the drivers in research networking has always been the idea of sharing resources, pulling resources with the final aim of obtaining a better cost for the final user. Organisations that are bringing facilities together are reusing the facilities. This allows them to be able to have the means of buying power in a larger scale. Advanced networks are trying to verticalise their business, trying to get hold of basic infrastructure, trying to do all by themselves when they used formerly to buy services e.g. from Telecommunication companies. This reduces the real cost to them and this is passed as a benefit to the users.

This is the direction in which the industrial Grid community is moving nowadays. Industry has essentially moved away from the *Grid concept* simply because they could not devise any viable business models that they could go after. The concept of *Cloud Computing* may partially sound like a buzz word; however there are actually some fundamental technical benefits which come out of the notion of virtualisation. The Grid concept came from large and extensive science projects, while people tried to federate resources across different sites. That is actually not in competition with the Cloud concept. Cloud is about dynamic provisioning of abstract or virtualised resources. As soon as we start talking about federating those resources across different sites, then we have the same Grid problem again.

In terms of sustainability, if this provides a business model for commercial providers of a few capabilities, then obviously they will gravitate towards these business models. In terms of sustainability for distributed users of what we have been calling *Grid or Distributed Computing Platform*, if the Cloud model of dynamic provisioning becomes economically viable, then



organisations that need to have a federated computing environment or storage environment or data archives could essentially provision their capabilities from those commercial resources. An aspect of this: Amazon or Google can buy servers and storage for a small fraction. That gives them a distinct economic advantage for being able to put these large data centers together and then sell those resources in this Cloud concept. This is a very serious attempt for achieving sustainability. Essentially this could be a solution for many Grid projects, to move away from research funding cycles and towards more operational budgets.

This model has been largely adopted by industrial organisations, but this could also be the case for communities of users. In this regard, the collaboration between EGEE and the EU funded project Reservoir, with the aim to integrate some type of on-demand resources meaning some type of cloud services, is an interesting and very welcomed development.

Bridging the Digital Divide

Latin America is facing several problems with regards to the adoption and use of e-Infrastructures. These issues are still very “young” for large parts of the region. For example, Argentina introduced a National Digital Agenda only this year. E-Infrastructures are of course a heavy part of it.

With the exception of the scientific community, which is relatively well-served; one of the major problems many Latin American countries are facing is the lack of connectivity outside of the big cities. In Argentina for example, only 50% of the people are internet users, most of them in the big cities. The technology needs to be upgraded as well, as right now Latin America has the kind of bandwidth that Europe had 10 years ago.

Overall, national public policies on the Information Society need to be put in place in order to support sustainability of e-Infrastructures. In Argentina, again, the National Office for Information Science is organising a number of co-centric calls, where several stakeholders are invited to participate: First they invited National Civil Servants and Experts, then enterprises, then Universities and NGOs. It is worth to mention that the enterprises are mainly e-Infrastructures enterprises participating very actively in the formulation of national policies for the information society.

An excellent example about how this digital divide can be bridged is offered by the efforts undertaken in the small province of Saint Louis in Argentina. There the local government spent 100 million dollars in the last 10 years with the result to increase the penetration of internet from barely 20% to 80% of the population. Every school, every municipality, every official building is connected, every small village, even in the middle of the mountains has connectivity. Most of the money (almost 80%) was spent in the very beginning, in the first 20% of the time. As an additional incentive, the connectivity costs are kept very low: With a total of almost 400.000 inhabitants each habitant of Saint Louis paid 2 dollars per month for having this connectivity.

Examples like this have to be widely discussed and promoted in order to be used as case studies that can be exploited and serve as “best practice” paradigms for the whole region.

Finally, focusing on and promoting the results of the ongoing projects can also bring e-Infrastructures closer to the broad public and contribute to the sustainability of these efforts. People must be given the option to realise the concrete impact of projects dealing for example with e-Health or e-Security etc.



Connectivity costs

In addition to the low connectivity, Latin American e-Infrastructures are suffering from high cost as well. High costs and low connectivity are the main issues that need to be addressed in order to foster the adoption of e-Infrastructures in the region and enforce innovation across the countries.

Currently Latin American countries are paying about 10 times the prices in bandwidth that the northern hemisphere pays. Because of the larger economical basis in Europe and North America more cables connecting countries inside Europe or connecting Europe to North America can be laid out.

However, the question of sustainability of e-Infrastructures related to costs needs to be examined not only from the technological point of view. Actually, this should be the minor problem, as the technological achievements are pushing prices down worldwide.

Sharing resources by working in research networks around the world, taking control of the e-Infrastructures in a bottom-up approach, using cloud computing and grid computing, these are possible ways to reduce the cost. Because the e-Infrastructures can be managed in a very different manner, using new technologies of optical networking, the impact is that basically infinite amount of bandwidth over the same infrastructure will be available, resulting in lower costs compared to today.

In this frame, the role of companies and industry can be supportive: they can buy or install things. However, because of the fact that research needs more advanced applications, the sustainability issue within the research communities cannot be resolved by others than the communities themselves, which have to find their own collaborative models.

Moreover, maybe part of the discussion about sustainability of e-Infrastructures should be to talk about earnings. Many papers and studies from the OECD, the European Union, and the United States reason for the increase of productivity one can have in the society because of technology investments in e-Infrastructures. Some studies mention about 1% increase of productivity. Though this level cannot be reached in Latin America, partially because of the low industrialisation level in many regions, still the growth of e-Infrastructures can contribute a lot to the increase of productivity, assuring to the Governments enough money for paying the maintenance, the upgrades and the enhancement of the networks, the systems, the data centres. We have to work towards making e-Infrastructures sustainable, and we will achieve this only if e-Infrastructures impact the economy of the country.

To this end, efforts spearheaded by Europe and European policy bodies should be mentioned as well. Europe has been over the last years investing in the evolution and deployment of e-Infrastructures, Grids, Data Repositories, Super Computing power. Europe is very open to international cooperation, because the resources that are available for the challenges being faced are very limited; and hence people need to work together not only in Europe but also with the international partners.

Particularly for Latin America over the last years, Europe has been supporting several projects in the field. The figure in terms of financing is 1,005,000 Euros to support Latin American partners; half of the figure is only for Brazil. In the new European strategy for the evolution of infrastructures up to 2020, the importance to focus on international cooperation is stressed as well.



A number of aspects need to be promoted: to increase the investments in this field, to create stronger links between policies for research and innovation, to exploit the results of our research.

e-Science vs. e-Business?

Talking about sustainability we have also to define the “target group” of the e-Infrastructures users. It is obvious that academia and industry do not have the same priorities. In order to ensure long term sustainability in research policy, top-down and bottom-up approach, very strong interaction with decision makers and politicians are needed. Unlike in business, where decisions can be taken on a more pragmatic basis and where the consultation of policy makers is not needed.

This difference is also reflected in the middleware or in the type of computing needed. At least up to now, Grid computing, distributed computing or HPC is reserved for research, and for large infrastructures and centres. It looks like, progressively, the industry is not more interested in Grid. It seems that Cloud, as a different philosophy, is more adapted to industry. However this does not necessarily mean that we will have two totally different approaches/models for sustainability of (1) the e-Business and (2) the e-Science.

The public policies are very important to establish a very strong e-Infrastructure. However, the government cannot be the only or the main partner for this business. The government can support, help, incentivise, supervise, make some efforts, but it is also important that all parts of society play an important role in formulating these public policies. We cannot rely only on the government. We have to share the responsibility. Therefore we should continue the joint effort between the private and the public bodies and the investment of the private sector and industry should be further encouraged as well as the exchange between communities of users.