



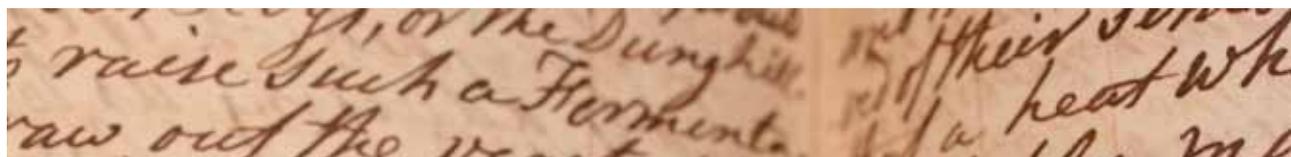
Empowering Research & Education across the Mediterranean: the Role of eInfrastructures

“In the era of the economy of knowledge, the availability of widespread, reliable and fast ICT-based infrastructures for research and education should be regarded as a key to economic development. Hence, we consider them an important priority for building the future of the Arab world.”

*H.E. Amre Moussa,
General Secretary of the Arab League.*



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Preface



The e-Infrastructures vision as a key collaboration factor world-wide

It is my pleasure to introduce the second edition of this booklet dedicated to e-Infrastructures across the Mediterranean.

In the period since the first edition we have witnessed the consolidation of e-Infrastructures as a key enabler, bringing together researchers, allowing the sharing of resources and giving access to data and facilities. More than ever, the scientific collaboration needs to be carried out at a global scale: only by bringing together the best minds and resources around the world can we effectively address the major challenges faced by our societies and our planet. The more people, machines and data are connected to a global e-Infrastructure, the more is the value of the research and the easier cooperation gets.

We are proud that very significant progress has been achieved at all levels;

- » The pan-European research and education network GEANT is at the centre of the connectivity world map, extending its reach –just to mention a few examples- to Central Asia (the CAREN network connects over half a million users in more than 500 universities and research institutes), South Asia (TEIN3 is linking over 45 million researchers, students and educationalists in 8,000 institutions), the American South Cone (enabling virtual Access to Latin-American Southern Observatories and integrating the European Southern Observatory instrument via the RedCLARA 2 network). In Sub-Saharan Africa, the AfricaConnect initiative aspires to help filling up one of the last “empty spots” in the regional research and education connectivity world map.
- » On the computational side, the European Grid Initiative (EGI) is establishing a sustainable computing infrastructure and grid-based services in Europe for research communities, and several projects and support actions are supporting the extension and consolidation of this model to other world regions (EUMEDGRID-Support, GISELA, CHAIN, EU-India-Grid2, etc.). At the top of the High Performance Computing (HPC) pyramid, the Partnership for Advanced Computing in Europe, PRACE, is a persistent pan-European Research Infrastructure for HPC, providing Europe with world-class systems for world-class science, strengthening Europe’s scientific and industrial competitiveness. Current PRACE system provides computing power of several Petaflop/s (one quadrillion operations per second), and PRACE targets Exaflop/s performance (one quintillion) in the longer term (2020).

- » The High-Level Group on Scientific Data charged by the European Commission to prepare a “vision 2030” for the evolution of e-Infrastructures to scientific data, recently presented its final report (“Riding the Wave: How Europe can gain from the rising tide of scientific data”¹). The report describes long term scenarios and associated challenges regarding scientific data access, curation and preservation as well as the strategy and actions necessary to realise the vision. A large part of the 2011 budget (€70 million) is devoted to bringing this vision a step closer to reality².

We can claim that the e-Infrastructure cooperation vision is a success, and in particular for the relations with the developing world, it has created pools of local and regional ICT expertise, has promoted research collaboration within the regions and with Europe and is helping to alleviate the brain drain and to bridge the digital divide.

Finally, and particularly in view of the historical changes that are taking place in the region, let me mention the EUMEDCONNECT network: with its 2 Million users and 800 centres in the Mediterranean rim, it is a concrete example of our commitment to boost collaboration between our regions, to further integrate the regional e-Infrastructures and to support the development of Virtual Research Communities. This mutual commitment has been reflected in the inclusion of the third phase of EUMEDCONNECT in the South ENPI (European Neighbourhood Policy) regional programme, and the recent official launch in Cairo of the Arab States Research and Education Network (ASREN) under the patronage of the Secretary General of the League of Arab States, to support the full involvement of the regional research and education networks in the development and operation of EUMEDCONNECT.

These developments, together with all the other initiatives and success stories that are presented in this booklet, make us believe that the e-Infrastructures have an important role to play not only to connect and support researchers but also to provide benefits to the people and society at large. I would like to thank all of the people involved in this effort for their vision, dedication and hard work which make it all possible. Enjoy your reading!

*Kostas Glinos
Head of Unit GEANT & e-Infrastructures
Information Society and Media Directorate-General³*



1] <http://cordis.europa.eu/fp7/ict/e-infrastructure/docs/hlg-sdi-report.pdf>

2] http://en.wikipedia.org/wiki/European_Grid_Initiative - cite_note-0#cite_note-0

3] “The views expressed in the article are the sole responsibility of the author and in no way represent the view of the European Commission and its services”.

It is my pleasure to introduce this booklet and provide an Arab point of view, not to *compete* with, but to *complete* what was written by Kostas Glinos, head of the e-Infrastructure unit at EC INFISO, esteemed colleague and ally in creating an EU-Arab collaboration on e-Infrastructures. You will notice that I said “Arab” and not “Mediterranean”, despite the title of this booklet. This collaboration started as Euro-Mediterranean, i.e. as collaboration between the Northern and Western rims of the Mediterranean Sea and the Southern and Eastern ones. This is probably only too natural, because of the geographical and historical contiguity between them – and being Jordan, and thus *Mediterranean* myself I can see very well what our European colleagues had in mind when they started this all. However I believe it is now high time that this collaboration shifts from being Euro-Mediterranean to become Euro-Arab: after all, “Mediterranean” is just a geographical name, while our first and most fundamental identity is the Arab one, and that defines us in a way which is much the same than for a Finn and a Greek being both European. What is happening right now in the creation of ASREN shows that this is a common feeling and not just my personal opinion: besides the Arab-Mediterranean countries, we are raising much interest and consensus from other Arab countries, from the Gulf states, to sub-Saharan countries. It is a fact that the United Arab Emirates’ Research and University Network, ANKABUT, is already collaborating with the e-Infrastructure projects operating in the area, i.e. EUMEDGRID-Support and EUMEDCONNECT2; while at the ASREN launch ceremony, among the subscribers of the ASREN statement of support we had not only Mediterranean countries such as Egypt or Morocco, but also Oman, Kingdom of Saudi Arabia, and Sudan.

In a world where borders are becoming increasingly undefined, and collaboration is becoming more important than competition, we believe that this widening of our present collaboration is for everyone’s benefit and that overlooking this would be losing an opportunity to bring the Arab and the European worlds closer.

We won’t achieve this all alone, but with our great partners, the European Commission, whom I won’t ever thank enough for inspiring us to start this all and guiding us with their experience and success stories. The joint work with the European Union is very important, as the success of projects such EUMEDGRID and its follow up EUMEDGRID-Support show very well, and should be in our opinion further strengthened in the future. This is already a point in our strategic plan, and will be made easier by the recent legal incorporation of ASREN.

With ASREN, we want to change the concept of Education and Research in the Arab world, to become student-centred and digitally focused. Old people won’t change the world – not anymore: youngsters will do it. Young people are the real innovators, and there is neither progress nor prosperity without innovation. As you will read in the following, ASREN will help making available leading-edge dependable, widespread e-Infrastructures to Arab students and young researchers, thus providing them with a fundamental tool to produce new culture and scientific knowledge, and help shaping tomorrow’s world. Nor they will need to move from their countries anymore to attend specialized courses in western universities, or to work as researchers, because thanks to very-high capacity networks, remotely controlled instrumentation and the wide availability of computing power and storage from their very pc, they will be able to learn and to research from wherever they are. Thus, the Arab countries won’t lose their most brilliant brains, while their skills won’t go wasted nor will they be relegated in a peripheral corner of this increasingly globalised world. Even more importantly, they will be able to exchange experience and information and to collaborate transparently with their peers in Europe and all around the world. For their benefit, and for the progress and welfare of their country, but also for contributing to the advancement of science, technology and culture worldwide. We do not have complexes – nor we should have any: as you know Arab science has a very long and prominent tradition and we believe that, thanks to the creation of regional “digital highways” our young researchers can live up to the excellence of our ancestors, and achieve in the future even more than they did in a glorious past.

Today we feel a new sense of possibility and we’ll work hard with our colleagues and with our politicians to make this vision a reality.

*HE Senator Talal Abu-Ghazaleh,
ASREN chairman*



1 About this document



This booklet was written in the framework of the EUMEDGRID-Support project, funded by EC as a part of FP7 thanks to the contribution of several collaborating initiatives, including CHAIN, EUMEDCONNECT2, LinkSCEEM2, MIRA, SESAME, and a very important new one: ASREN, the Arab States Research and Education Network, launched last December in Cairo, that has already become a key actor in the field of e-Infrastructures in the Mediterranean Region.

The booklet comes three years after the first edition, and its main purpose is to provide an overview of the progress made and of the lessons learnt in these last few years, within European projects and experiences of regional scope, as well as the open issues. We highlight the importance to take this progress further and propose a roadmap for future initiatives and actions.

We address European and Arab decision makers in the ICT and Research domain (politicians, civil servants, Directors of large research organizations and facilities, senior ICT consultants to Ministers in the Euro-Mediterranean area, as well as relevant International organisation and agencies and Private Companies) with the single aim of drawing their attention to the status and perspectives of e-Infrastructures in the Mediterranean Region, and more generally of EU-Arab collaboration in this field. Users' testimonials illustrate how e-Infrastructures can make the difference in the daily work of researchers, teachers and students, and benefit the society at large.

2 Introduction



2.1 EU and the Arab region: neighbourhood, co-operation and opportunities

The Mediterranean region is of strategic importance to the EU, in both economic (trade, energy, migration) and political terms. It is thus not surprising that Europe regards with interest any opportunities for strengthening co-operation bonds between the two rims of the Mediterranean Sea, as well as to favour the economic development, welfare and stability of the Region. The Southern Mediterranean and Middle East countries are members of the Euro-Mediterranean Partnership established by the Barcelona Declaration (1995) and the importance of the region is also witnessed by the creation of a specific financial instrument (MEDA) which was recently replaced by the more general European Neighbourhood and Partnership Instrument (ENPI).

The Euro-Mediterranean Partnership was renewed with the establishment of the Union for the Mediterranean at the Paris Summit for the Mediterranean in July 2008, and with the new network of relations endorsed at the Marseille Meeting of the Euro-Mediterranean Ministers of Foreign Affairs in November of the same year. This renewal aimed at infusing new vitality into this long-lasting partnership and to raise the political level of the strategic relationship between the EU and its southern neighbours.

Because of its geographical and cultural contiguity with Europe, the Mediterranean Area can be regarded as a natural outlet for the expansion of the European Research Area (ERA), and one of paramount importance for consolidating the widespread collaborations established across the two sides of the Mediterranean, of which the projects discussed in the following pages are a good example.

e-Science and e-Infrastructures as an enabler for economic and social development

In the last few years, the scenario of international collaboration in Research and beyond has swiftly evolved with the gradual but impressive deployment of large bandwidth networks.

A number of advanced services and applications have been using these networks, enabling new ways of remote collaboration. The environment offering networking, computing, storage, instruments and related systems is known as e-Infrastructure. Knowledge can nowadays be regarded as one of the major elements of progress and economic welfare and e-Infrastructures are, in turn, one of the major enablers of development in a knowledge economy. It is not surprising, then, that most advanced economies are investing considerable amounts of money in order to set up and evolve widespread, dependable and fast e-Infrastructures. In Europe, e-Infrastructures are considered one of the pillars of the creation of a Virtual Research Area as wide as Europe, and even wider.

However, while their availability and widespread usage by the research and education community is an invaluable

opportunity, their lack threatens to widen the gap between developing economies and the most advanced ones, where knowledge is a commodity, and where an important part of the budgets of companies and governments is allocated to R&D and Education.

As a return for their conspicuous investments, the latter get more and more advanced infrastructures and techniques that, in turn, enable new developments; the former, having taken off late and with fewer resources, and pressed by more fundamental needs, seem incapable of reducing the gap. At a first glance, developing countries have much more compelling priorities to fund than building e-Infrastructures. Nevertheless, it is important to understand the role of e-Infrastructures in breaking the loop of mere subsistence. Science is the basis for long-term innovation in production activities, and digital infrastructures are in turn necessary to allow researchers to participate in cutting edge scientific activities, to share competences and experiences with their counterparts all around the world, thus being up with the most recent tools and methods.

2.2 The need for Research and Education Infrastructures in the Mediterranean Countries

It is well known that Arab countries as a group have been lagging in the resources they devote to R&D, as compared to other regional groups, as documented lately by UNESCO Science Report, published in November 2010: on average, Arab states devote 0.3% of their GDP to R&D, as compared to the 2.2% spent in OECD countries.

The UNESCO report warned about the high unemployment rate within the R&D community and about the social and economic risks connected to the fact that Arab governments have been so far unable to expand the productive capacity to create a repository of jobs. This difficulty of many governments in the region may well have played a role in the recent social upheaval that several countries in the region have recently faced, and others are still facing. Yet Arab science has a very ancient tradition and in the present day, the University system (from Morocco to Egypt) is solidly anchored. The solution therefore lies in the political decision making. Education is another major challenge for the Arab world: more than half of the Arab region's overall population of around 400 Million people is younger than 25. This fast growing population places limits and creates challenges for the competitive and economic vitality of the region. Unless effective policies are matched with accelerated structural reforms, and combined with an up-scaling education and training efforts, Arab countries are unlikely to capture the vital energy of today's youth, nor to meet their ambitions for more opportunities and translate it into scientific and social development. Educational reforms, advancement of research, and integration of ICT infrastructures are critically needed not only to unlock the region's creative potential but

also to accelerate the dawn of sustainable economies to meet the growing regional challenges in education, environment, energy, water, health, security, and governance.

Signs of awareness raising of these challenges in the region are encouraging: Saudi Arabia has created KAUST (King Abdullah University of Science and Technology), SESAME, a world-class international synchrotron facility in Jordan, due to come on stream in 2014 under the auspices of UNESCO will create a place for cooperative work. Morocco has carved itself a remarkable place in the physics community working around CERN.

These modern ICT facilities are an essential tool for integration into international projects. ASREN, the recently created cluster of Research and Education Network under the aegis of the Arab League should not only facilitate work with European and worldwide scientists, but more interestingly, sponsor common initiatives between Arab scientists.

EC-funded strategic e-Infrastructure projects such as EUMEDCONNECT2, EUMEDGRID-Support and LinkSCEEM2, as well as other initiatives on a national scale, i.e. the creation of Research and Education Networks and National Grid Initiatives, that have already mobilized a number of R&E users in many Arab countries, demonstrates the value of e-Infrastructures in providing an effective answer to these challenges.

These initiatives have raised awareness and created competences on e-Infrastructures across the Mediterranean and, in parallel, identified new research groups, helping them to exploit e-Infrastructures' enormous potential to improve their own research activities.

Many research fields have indeed very demanding needs in terms of network bandwidth, computing power and storage capacity, which normally are provided by wide area Networks, large computing systems or supercomputing centres. Furthermore, sophisticated instruments may be needed to perform specific studies. Such resources pose different challenges to developing economies: they are expensive, they need to be geographically located in a specific place and they cannot attract a critical mass of users because they are usually very application-specific and are relevant only for small communities of researchers scattered across the country/region. This is the case even in some strategic areas such as water management, climate change, biodiversity and biomedical activities on neglected or emerging diseases. Thus a significant part of researchers is forced to move to more developed countries to be able to continue their scientific careers. However, thanks to the creation of global virtual research communities and distributed e-Infrastructure environments, all these drawbacks can be overcome: through an appropriate access policy, different user groups can use resources wherever dispersed, according to their availability. Furthermore, geographically distributed communities working on the same problem can collaborate in real time thus optimizing not only hardware and software resources but also human effort and "brainware".

3 E-Infrastructure experiences in the Mediterranean



3.1 Ten years of co-operation

The story of Euro-Mediterranean cooperation in e-Infrastructures started ten years ago in the framework of the EUMEDIS programme⁴. Funded by the European Commission's EuropeAid directorate, whose main aim is to develop cooperation activities with emerging regions worldwide, EUMEDIS framed a number of interventions with the aim of speeding up the establishment of the Information Society in the Mediterranean.

Different levels of actions were foreseen, including the implementation of a regional IP-based communication network devoted to Research and Education. Thus, the EUMEDCONNECT project was born 10 years ago and, in a few years, created the first high-speed regional data communication network dedicated to research and education in the Region. In 2006, the first e-Science regional project, EUMEDGRID, started operations, taking advantage of the high-bandwidth EUMEDCONNECT network, and triggered the deployment of a number of different applications in different domains, for hydrology, to biomedicine, from engineering to archaeology. From that moment on, the e-Infrastructure community has grown in size, skills and activity and a number of results were reached.

3.2 The network: EUMEDCONNECT towards the third generation

The EUMEDCONNECT2 project provides a dedicated data-communications network for over 2 million researchers, academics and students in seven southern Mediterranean countries - Algeria, Egypt, Jordan, Morocco, Palestine, Syria and Tunisia. With its direct links to its pan-European counterpart GÉANT, it is the gateway for the Mediterranean community to participate in world-class research and education initiatives.

The EUMEDCONNECT network was first established in 2004 under the European Commission's EUMEDIS Programme to contribute towards the objective of an inclusive Information Society in the region. A seamless continuation and smooth transition to EUMEDCONNECT2 was secured in 2008 thanks to the ongoing interest and co-funding of the European Commission and the commitment of the project partners. EUMEDCONNECT2 maintains the high bandwidth connectivity in a more cost-effective way and continues to serve the growing number of projects for which the network had become an essential infrastructure up to mid 2011.

In addition to providing dedicated connectivity to the Mediterranean research and education communities, the EUMEDCONNECT2 project also contributes to capacity building by the Mediterranean NRENs through technical training programmes and the exchange of best practices between

Mediterranean and European NRENs. EUMEDCONNECT2's European NREN partners – Cyprus, France, Greece, Italy and Spain – have taken the lead in delivering these programmes, which have included the following topics: BGP, Multicast, AAI, security and NOC (Network Operation Centre) management. In addition to interconnecting the Mediterranean countries, the project has also stimulated the development of national research and education networks in the partner countries, whilst the joint purchasing power of combined tendering has achieved more cost-effective connectivity and secured economies of scale.

The EUMEDCONNECT2 network has points of presence (PoPs) in Sicily, at Catania and Nicosia, Cyprus, while some countries connect via links to the GÉANT network. Access capacities range from 34 to 155 Mbps and circuits are connected in each case to the EUMEDCONNECT2 partners' national research and education network. The network provides the highest capacities and the best quality of service available in the region, and projects with significant requirements for data exchange internationally are welcome and encouraged to use the network, via the national partner.

EUMEDCONNECT2 is scheduled to end in the second half of 2011, and its successor, EUMEDCONNECT3 is on its way. To date, negotiations are taking place with the EC to secure co-funding for the network, while the connectivity call for tenders has just closed and offers are being evaluated. New connectivity options have recently been emerging for the region, as new cables have been laid between Europe and the Southern Mediterranean countries, while several new cables between Europe and Asia run through the Mediterranean Sea. Thus, although market competition in international telecommunications in the region is still weaker than desirable, it is expected that the retendering will result in more value for money, that it will help to rationalize the network topology and provide Arab-Mediterranean countries with higher capacity, cost-effective connectivity.

4] http://europa.eu/ISPO/eumedis/englishversion/i_welcome_en.html

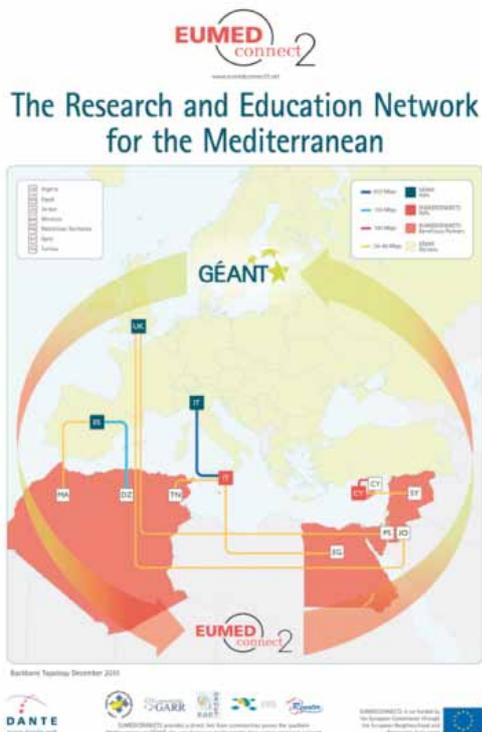


Figure 1: EUMEDCONNECT2 connectivity map as of December 2010

3.3 The Grid: EUMEDGRID-Support

EUMEDGRID-Support started on the first of January 2010, lasting for two years, as an EU FP7 co-funded project aimed at fostering e-Science and promoting e-Infrastructures in the Mediterranean region. It builds on the results of the previous edition of this project (within FP6, 2006-2008) in terms of e-Infrastructure, human networking and community building. Its three main objectives are to:

1. Reinforce the perceived relevance of European e-Infrastructures in the Mediterranean area towards the scientific communities;
2. Strengthen the existing e-Science human network built by the previous EUMEDGRID project, widening it to new user communities;
3. Consolidate the EUMEDGRID e-Infrastructure with emphasis on sustainability and high level policy support.

A relevant goal is the establishment of new digital Certification Authorities in the Mediterranean countries, thus enabling the usage of X.509 PKI Digital Certificates for users and servers, currently representing a key component of Authentication and Authorization Infrastructures adopted by many distributed Grid infrastructures world-wide.

The project is also committed to raise awareness about the importance of e-Infrastructures for the development of the region and the creation of strategic partnerships between the EU and Arab countries, while providing a marketplace for policy makers and stakeholders to meet and exchange visions,

5] <http://applications.eumedgrid.eu>

6] <http://roc.africa-grid.org>

discuss possible synergies and plan the roadmap ahead. Currently in its middle life phase, the project has already achieved remarkable results in terms of the original goals:

- » The EUMEDGRID e-Infrastructure (which had been kept operational from 2008 to 2010 on a best effort, unfunded basis, thanks to a Memorandum of Understanding among the former project partners) was restored, upgraded and expanded, and it currently spans 36 Sites in 11 countries. Currently (May 2011), it provides Grid services based on the gLite Grid middleware, for a total of around 4000 CPUs and 600 Terabytes of Storage Capacity;
- » New Certification Authorities were set up in Syria, Algeria and Jordan, and are being accredited by the EUGridPMA organisation; furthermore Egypt is starting its new Certification Authority, that is expected to complete the accreditation process by the end of 2011;
- » The current consolidated e-Infrastructure is providing support to 17 applications spanning different domains⁵: physics, fluid dynamics, social science and humanities, engineering, computing science and mathematics, biomedicine. Most applications, provided by local scientific communities, were ported to the Grid during the Grid Schools for application porting, jointly organized with the EPIKH project;
- » The project has already started a dedicated deployment of general, reference applications and tools belonging to different disciplines and scientific domains, in order to offer the scientific communities a portfolio of popular applications and tools, being general enough to attract new users from different application domains. These include ROOT, Intel compilers for specific parallel applications, GCC 4.3, Octave, BLAST, Fluent, OpenFOAM, Rosetta;
- » The EUMEDGRID-Support e-Infrastructure is providing support to the execution of parallel applications within the OpenMP and MPICH2 standards for Message Passing Interfaces, thus allowing the inclusion of HPC Clusters within the infrastructure;
- » Jointly with the South African Grid Initiative, a Regional Operation Centre for Africa was set up⁶. Although the ROC has just started operations, it already offers relevant services to monitor control and manage both the EUMEDGRID-Support and South African Grid infrastructures, including a user support ticketing system, Grid and Network monitoring based on reference tools adopted by international Grid projects and initiatives.



Figure 2: The EUMEDGRID-Support sites as reported by the GSTAT monitoring tool

The project has just terminated the initial phase devoted to the reorganization of the infrastructure, and is now aiming at further attracting new users and new sites, to consolidate its impact in the Mediterranean region.

At a policy and collaboration level, the project is actively contributing to consolidate best practices and standards for enabling transparent e-infrastructure provisioning to scientists worldwide across different regional initiatives and permanent infrastructures, such as the EU flagship initiative, EGI. EUMEDGRID-Support is also collaborating with other regional initiatives within the roadmap sketched by the CHAIN project, aiming at ensuring interoperability and long term sustainability to regional initiatives and interfacing them to the EGI infrastructure.

EUMEDGRID-Support aims at working in the second half of its lifetime as successfully as it did in the first part of the project: the challenges ahead are now related to the consolidation of the Support to applications, the improvement and enrichment of the AFRICA ROC, and the involvement of new user communities. Given the importance of the latter objective, several actions are ongoing to achieve it, including further training and tutoring activities, and the organization of the first EUMEDGRID User Forum at the end of September 2011, which is intended to demonstrate the users' success stories in the exploitation of the EUMEDGRID e-Infrastructure.

3.4 High Performance Computing: LinkSCEEM

The LinkSCEEM initiative (Linking Scientific Computing in Europe and Eastern Mediterranean) aims to promote the development of the computational science community in the Eastern Mediterranean and to build strong collaborative links with the European scientific community. LinkSCEEM will establish an e-Infrastructure capable of serving the needs of scientists from the region by enabling them to perform high quality research utilizing available High Performance Computing (HPC), data storage and visualization resources available through the platform developed.

The initiative, originally conceived by the Computation-based Science and Technology Research Centre (CaSToRC)⁷ of the Cyprus Institute (Cyi)⁸, has gained widespread support from governments, institutions and individual scientists throughout the Eastern Mediterranean region. Cyl is by design a European research institution with a regional dimension driven by its geographical location. CaSToRC, intended to become a regional centre of expertise in HPC, data intensive computing and computational science, plans to include an HPC facility with scale of regional significance and to attract high-level research projects from the entire region.

The LinkSCEEM Support Action project (April 2008-January 2010)⁹ aimed at ensuring that in its planning and early development phases CaSToRC develops strong anchors in both the European ICT infrastructure and the Eastern Mediterranean scientific community, thereby helping to build

scientific and technological bridges between Europe and the Middle East and to narrow the digital gap between the Eastern Mediterranean and the Western World.

In order to serve this goal, LinkSCEEM has sought to raise awareness of the targeted groups concerning the importance of computational science and technology in general, the necessity of its development in the Eastern Mediterranean region and the potential contribution of CaSToRC and its future collaborations on the European and regional scales. These goals have been achieved through the organisation of some 14 Users' Meetings, an International Conference, lecture series, newsletters, a comprehensive website, outreach meetings and a 3-day HPC workshop. These activities have generated a User Database of 600 people representing an impressive spectrum of nationalities, positions and research areas. LinkSCEEM has also resulted in ongoing collaborations and has helped to seed training and education activities. Moreover, LinkSCEEM activities resulted in an extensive study on network connectivity in the region, contributing a coherent regional strategy for the upgrade of exiting connectivity, a concrete implementation and action plan for the connection and integration of the HPC facility in Cyprus with existing European initiatives and projects, and, the identification of a number of programs and opportunities focusing on establishing, sustaining and supplying a persistent research community in the region.

Following the successful completion of LinkSCEEM, LinkSCEEM-2¹⁰, was initiated to implement the findings of the first project. The LinkSCEEM-2 project (September 2010-August 2014) aims to establish an HPC eco-system in the Eastern Mediterranean region by interlinking and coordinating regional compute, storage and visualization resources to form an integrated e-Infrastructure. The main objective is to enable scientific research in the region by engaging and supporting research communities with an initial emphasis in the fields of climate research, digital cultural heritage and synchrotron radiation applications. To achieve its mission, the project will link e-resources, provide user support and training, carry out targeted networking activities, and, develop and implement a well-structured HPC resource allocation mechanism. Three regional HPC centres, namely CaSToRC, Bibliotheca Alexandrina (Egypt) and the National Authority for Remote Sensing and Space Sciences (Egypt) contribute computational resources to the integrated e-Infrastructure of LinkSCEEM-2.

Collaboration with the EUMEDCONNECT2 and EUMEDGRID-Support projects' communities has been established already during the first phase of LinkSCEEM, with the LinkSCEEM network study focusing on the Eastern Mediterranean and links with Cyprus, carried out in close collaboration with the former, and a joint action plan focusing on e-Infrastructures awareness creation both at the policy and user level, as well as targeted training and tutoring programmes.

7] See <http://castorc.cyi.ac.cy>

8] <http://www.cyi.ac.cy/>

9] http://www.linksceem.eu/joomla/index.php?option=com_content&view=article&id=8&Itemid=73

[10] <http://www.linksceem.eu/>

4 Applications and Virtual Research communities



From the first EUMEDGRID's start of operations, several applications were selected to be deployed on the regional e-Infrastructure, spanning several fields of interests: High Energy Physics, Biology and BioMedicine, Hydrology, Archaeology, Seismology, Volcanology and Finance. Many of them were selected through surveys targeting leading scientific groups in the region, while others were chosen because of their regional relevance. This is the case for the archaeology application ArchaeoGRID and the hydrology application CODESA-3D, whose initial application involved regions in Tunisia.

New applications were deployed as a part of the EUMEDGRID-Support activities. For five years now, the multi-national EUMEDGRID team has helped scientists coming from different scientific domains, to adopt the eScience paradigm for their daily work, thus changing the way research is carried out, and allowing for a much wider international collaboration, even when the researchers' mobility across borders is not easy.

The regional infrastructure currently supports 17 applications of regional /national interest in the Mediterranean and others are being identified, but the expected impact in the next few years is far greater, and figures increase relevantly if we consider also applications running at the national level, especially in most active countries such as Algeria, Egypt and Morocco.

4.1 Health and Life Sciences

e-Infrastructures are being used today to address global challenges in the field of life sciences and public health. Their impact is already demonstrated in several fields:

- » Epidemiological studies and public health: e-Infrastructures allow securely federating distributed storage resources at a national or international level, thus catering for the creation of wider patients' databases and opening new avenues for epidemiology and personalized public health services
- » Drug discovery applications: thanks to the availability of computing resources on a scale comparable to a supercomputer, but with significantly smaller costs, e-Infrastructures enable *in silico* research on new drugs against diseases, such as rare and tropical diseases, that are nowadays neglected because they are not as financially rewarding as cancer or cardiovascular diseases.
- » To build sensor networks and run high throughput analysis of the data they produce for the purpose of health monitoring and surveillance, i.e. in case of chronic or elderly patients being nursed at home.
- » Early diagnosis of specific diseases (e.g. Alzheimer's disease), to enhance the confidence level in the proactive diagnostic process, and to guide and support their clinical praxis.

The following paragraphs provide some outstanding examples of domains that are benefiting from the exploitation of eScience distributed facilities, in the region and beyond.

A first example of the e-Infrastructures value for healthcare in Mediterranean countries is ITHANET (e-Infrastructure for THAlassaemia research NETWORK), a project co-funded by EC FP6 that built a network of research centres conducting molecular and clinical research on thalassaemia and related haemoglobinopathies. The ITHANET consortium comprises all major European research institutions active in the field and a number of collaborating partner institutions from non-EU Mediterranean and Black-Sea countries. Through ITHANET and the training provided within its framework, the thalassaemia community established a modern community database for globin mutations and gained experience in using e-Infrastructure tools for research and academic activities. As thalassaemia is a disease that mainly affects major Mediterranean islands, west Asia and North Africa, the benefits of jointly tackling the problem and sharing data and experiences are enormous.

Another example of the eScience potential impact lies in the field of pharmaceutical research: a major obstacle to fight diseases prevailing in developing countries is the growing cost for drug discovery. Discovering 'lead' compounds with the potential to become usable drugs is a critical first step to ensuring a sustainable global pipeline for innovative products. While the establishment of public-private partnerships has helped to stimulate product R&D for some neglected diseases, increased emphasis needs to be placed on the high-risk early discovery phase. Virtual screening is about selecting and ranking *in silico* the best molecules that could impact the biochemical activity of a drug target. Screening the millions of compounds that are made available due to advances in the combinatorial chemistry takes years and terabytes of storage. In addition to the availability of the huge number of chemical compounds, there is also a tremendous increase in the number of highly resolved X-ray crystal structures which are available in electronic format in Brookhaven protein database¹¹. Since 2005, the WISDOM (World-wide *In Silico* Docking On Malaria) initiative has screened *in silico* selected biological targets for avian flu, diabetes and malaria against large public databases of chemical compounds using in excess of one millennium of CPU cycles using computational chemistry tools such as Amber, Autodock, FlexX, and GOLD on e-Infrastructures including EUMEDGRID. For each biological target, virtual screening resulted in the selection of a focused list of compounds that were further tested *in vitro*. On average, 20% of the compounds selected *in silico* did demonstrate an inhibition activity *in vitro*, resulting in several patents and numerous publications.

The third example of the potential impact of e-Infrastructures lies in the field of public health.

Recent years have seen the emergence of diseases which have spread very quickly around the world, either through human travel, like SARS and swine flu (H1N1), or animal migration,

11] www.pdb.org

like avian flu (H5N1). Emerging infectious diseases raise a number of challenges to public health authorities, including their early detection and global surveillance as new cases can appear anywhere as a consequence of the globalization of exchanges and the circulation of people and animals around the world, as was recently demonstrated by the avian flu epidemics. An international collaboration of research teams has been exploring some innovative *in silico* approaches to better monitor the evolution of influenza viruses, taking advantage of the very large computing resources available on international e-Infrastructures.

Existing data sources have been integrated towards a global surveillance network¹² for molecular epidemiology, based on Service Oriented Architecture (SOA) and Grid technologies. The idea is to dynamically analyze the molecular biology data, made available on public databases using computing, storage and automatic updating services offered by e-Infrastructures.

4.2 Earth Science

Earth Science is an important domain for e-Infrastructures in the Mediterranean and Middle East region. Many large scale European and Global initiatives and projects are very relevant to the Region's priorities (i.e. water management, climate change, disaster management, security, etc) and some of them already involve local Earth Science Communities. Major examples are:

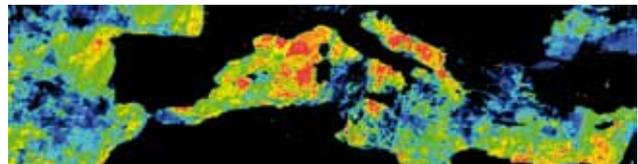
- » The Global Earth Observation System of Systems (GEOSS) ten year Implementation Plan which, since 2005 sets out the intent, operating principles, and institutional frame for the establishment of the intergovernmental Group on Earth Observation (GEO).
- » The Kopernikus initiative (formerly known as Global Monitoring for Environment and Security, or GMES in brief), jointly initiated by the EC and the European Space Agency (ESA), and now considered the European contribution to GEOSS.
- » The MyOcean implementation project of the GMES Marine Core Service, aiming at deploying the first integrated pan-European capacity for Ocean Monitoring and Forecasting.
- » The ESA TIGER (water for Africa) initiative, launched by ESA in 2002 in the framework of the Committee of Earth Observation Satellites (CEOS) with the objective of assisting African countries in the collection, analysis and use of water related geo-information by exploiting the advantages of Earth Observation (EO) technology.

The implementation and the systematic monitoring of international Environmental conventions need tools and worldwide infrastructures to gather and share the data: a common e-Infrastructure will allow the Earth Science communities to derive objective information and to share knowledge in all environmental sensitive domains over a continuum of time and a variety of geographical scales. Directly or indirectly, data plays a central role in Earth Science and is the basic input to any ES application, as they validate the results. Data comes from sensors on different platforms, satellite, plane, boat, balloon, buoy or mast, or located at ground on the land. In order to facilitate the access to data, its processing and visualisation,

the ES community is developing portals providing access to service-based Grid for high performance processing.

An example of the potential impact of this approach is the dedicated Grid and SOA- based Earth Science platform developed by ESA. Some ESA applications exploit Grid technology for bulk processing of huge amounts of products allowing e.g. the user to obtain large-scale high-resolution mosaics of EO data, others provide fast access to large volumes of data. It is important to note the wide diversity of EO application themes, such as meteorology, chemistry of the atmosphere, oceanography, simulations, operational generation of Level 3 products, generation of different products relevant to Essential Climate Variables (ECVs) defined by GCOS, and production of maps for fast damage assessment.

Building upon the experience gained so far with the EO Grid Processing on Demand (G-POD) environment, the EC funded GENESI-DR project enables scientists to locate, access, combine and integrate historical and fresh Earth-related data from space, airborne and in-situ sensors archived in large distributed repositories. The platform foresees services to enable expert users exploiting computational and network resources in order to produce the final desired product. This means either passing input data to a processing service (an OGC Web Processing Service, for instance) available at some site or running a user application/algorithm on Grid resources on specified data sets. An example output of the Algal Bloom Detection service is provided in the following picture.



GENESI-DR provides users and applications with data and tools to access, combine and integrate the Earth-related data they need for performing domain-specific analyses; depending on the kind of data analysed and the way the analysis itself is performed, derived information can be of use for most GEOSS Societal Benefit Areas.

In particular, the specific areas earlier addressed by GENESI-DR are:

- » **Disasters:** reducing loss of life and property from natural and Human-induced disasters
- » **Ecosystems:** improving management and protection of Terrestrial, coastal and marine resources
- » **Agriculture:** supporting sustainable agriculture and fighting desertification

GENESI-DR is also analysing common approaches to preserve the historical archives and the ability to access the derived user information as both software and hardware transformations occur. Ensuring access to Earth Science data for future generations is of utmost importance, because it allows for the continuity of knowledge generation improvement. For instance, scientists accessing in 50 years from now the climate

12] <http://g-info.healthgrid.org>

change data of the then past 50 years will be able to better understand and detect trends in global warming and apply this knowledge to ongoing natural phenomena.

GENESI-DR was recently replaced by the new project GENESI-DEC that has inherited and enhanced its operation platform, by enlarging the geographical extension of the federation and addressing the needs of new Earth Science communities. GENESI-DEC and EUMEDGRID-Support have signed a Memorandum to cooperate in fostering ES applications and stable and sustainable e-Infrastructures in the south Mediterranean and Middle-East.

4.3 The importance of e-Infrastructures for the Digital Cultural Heritage

Research in digital cultural heritage (DCH) is rapidly becoming data intensive, in common with the broader humanities, social science and life and physical sciences. This is largely due to the creation of large repositories of digital material through mass digitisation programmes¹³; best estimates suggest that only a small proportion of all cultural heritage material has been digitised to date, and there is significant commitment to further digitisation at national and institutional levels across Europe¹⁴.

Moreover, substantial amounts of born-digital material exist, such as heritage-related data produced by scientific research and by the digital analysis of cultural objects.

With regard to the digital collections, much of this is accessible online, having been published by the organisations responsible. However, the online collections exhibit a great deal of variation in terms of self-description (i.e. the nature, scope, etc. of the collections themselves), services available, policies and access rules, format, quality and availability of the digital objects in the collections, models used to describe the collections and the objects within them, classification taxonomies and terminologies and persistent identification of the collections.

As a result, the data infrastructure landscape for DCH is still an archipelago of independent information islands, where the user can easily get lost, no matter how much rich in material and services a single island is. The lack of a general picture where each part can coherently fit, means that the nature and value of other collections are often not apparent to the

research users of a particular collection.

An additional problem is connected to the fact that a large amount of cultural heritage material is hosted on commercial platforms, with varying service level agreements, quality control, availability and performance. Content is the most important asset that the DCH community possesses, and so a reliable and high-quality platform is essential and, as more processor-intensive functionalities such as visualisation, adaptive interfaces, semantic search and 3D interaction, are being widely adopted, this requirement becomes more prominent. E-Infrastructures offer an economically feasible option for the DCH community to roll out and maintain such advanced services.

Research e-Infrastructures represent an ideal environment for DCH to develop, because they offer high-end performances, services, and network and storage capacity, while being mainly supported through public funding and thus less exposed to commercial issues or changes in market strategies. It is therefore envisaged that the availability of widespread e-Infrastructures in the region will have a tremendous impact on the availability, searchability and ease of use of Arab content, both digital-born and digitized, that is currently underdeveloped in comparison with the richness of the Arab cultural and scientific production of the present and of the past. This availability will, in turn, result in a great boost in the Region's Research and Education sector, and ultimately will benefit the Arab society at large. According to a rough estimate, there are currently more than three hundred million Arab speakers and a significant part of them will have the opportunity to exploit this newly available content through the Internet.

The availability of Arab content effectively described and organised, and its interoperability with those of other world regions would, however, be beneficial also for non-Arab researchers and students, as the digitization and preservation of ancient heritage collections represent a legacy of all humankind. In the Mediterranean area, several initiatives and projects in this area are already ongoing, and they often exploit leading edge technologies as it is the case of Bibliotheca Alexandrina¹⁵.

13] Funded by different agencies, including national programmes, by the EU eContent+ programme, and by Google.

14] For details, see the NUMERIC project final report at http://cordis.europa.eu/fp7/ict/telearn-digicult/numeric-study_en.pdf

15] <http://www.bibalex.org/>

5 The policy level: engaging a dialogue with institutional parties



In 2006, the Monitoring Committee for the Euro-Mediterranean S&T Cooperation in RTD, also known as the Barcelona RTD Committee or MoCo in brief, has welcome the proposal of the European Commission to include as an activity of the INCO Program within the Capacities program of FP7 an INCO-Net coordination platform for selected target areas, including the Mediterranean Partners Countries.

The MIRA (Mediterranean Innovation and Research Co-ordination Action) aims to bring together policy makers and stakeholders of Mediterranean and EU countries in the framework of the dialogue structured through the MoCo, in order to identify common interests in research areas, set-up S&T priorities and supporting capacity building activities. Thus, MIRA promotes actions in order to monitor, develop, and stimulate synergies among different programs, and foster the participation of the Mediterranean countries in the Framework Programme.

The MIRA consortium is composed of institutional partners all across the European and Arab rims of the Mediterranean and have gained a wide expertise in several policy-level actions aimed at analyzing and supporting the scientific cooperation between them. A synergistic approach with the e-Infrastructure component is thus possible, both across the entire region and vertically, inside each country. To this end, a MIRA and EUMEDGRID-Support joint action plan is in place in order to (i) identify existing advanced uses of existing e-Infrastructures in the region and promote new ones for progressing eScience among the Mediterranean Research and Education community, and (ii) raising the policy maker's awareness about the e-Infrastructures' benefits and impact on science, development and society at large, so to have them included as priorities in the Countries' policy agendas.



6 Towards sustainability: a Roadmap for the future



As already stated, several initiatives were undertaken to make the e-Science vision a reality on the south-eastern rims of the Mediterranean as much as it is on the northern ones, by enabling reliable, leading-edge network and distributed computing infrastructures and mobilising the rich and diverse scientific community in the Region. From the experience gained in this framework, however, it appears that in an increasingly globalised world, the roadmap to overcome this challenge lies beyond the Mediterranean itself. It lies, on one hand, with the Arab countries as a whole taking responsibility over their own e-Infrastructures, their model and evolution, as the ASREN initiative is showing these days. On the other hand, it lies with overcoming the digital divide by optimising the sparse and often meagre resources available nowadays, in the region and beyond; and by creating local centres of competence that can sustain the maintenance and technical evolution of e-Infrastructures from inside, while training new and existing users to make the best of it. This is what the creation of Africa ROC is trying to achieve.

6.1 ASREN, the strategy shift

The Arab MED NRENs signed the Rome Declaration in September 2006 and prepared the necessary agreement to create the Consortium of Arab Mediterranean Research and Education Network (CAMREN) in 2007. CAMREN was supposed to improve the regional research infrastructure in the Arab Mediterranean Region and to help promoting the collaboration in the field. However, unfortunately CAMREN never got to its operational phase, mainly due to a lack of policy support and a clear commitment by national governments, which prevented most National Research and Education Networks from signing, no matter how much interested, and notwithstanding the important effort they had deployed in order to mobilise this support and commitment.

After two years of efforts, it was decided to abandon the CAMREN project. But this was not the end of the story. TAG-Org (Talal Abu-Ghazaleh Organization - www.tagorg.com) and JUnet, the Jordan Research and Education Network and one of the major supporters of the creation of a Regional Organisation that would rationalise and give momentum to the e-Infrastructure activities and efforts of the Arab-Mediterranean countries, created ASREN.

ASREN, which stands for the organization of Arab States Research and Education Network, was first presented at the EUMEDCONNECT2 meeting in Cairo - January 2010, where all partners of the former initiative welcomed its replacement of CAMREN. The idea was that ASREN would include National Research and Education Networks (NRENs) in the Arab region, as well as their strategic partners, and aim to implement, manage and extend sustainable Pan-Arab e-Infrastructures dedicated for the Research and Education communities and to boost scientific research and cooperation in member countries through the provision of world-class e-Infrastructures and e-Services. Thus, the new initiative brought forward a major shift in the strategy pursued up to that moment, as the new target was to cover all Arab countries, and not just those in the Mediterranean area. This was expected to

make membership more appealing for most Arab countries, while allowing fresh forces, as the Gulf countries, to join the endeavour.



Figure 3 - The Launch Event of ASREN at the Arab League 8 December 2010

These expectations proved to be true and ASREN received pledges of very high level support from the Arab Governments, the European Commission, and a number of NRENs and Scientists during its launch meeting in Cairo 8-9 December 2010. The launch of the initiative, chaired by HE Senator Talal Abu Ghazaleh, Chairman of United Nations Global alliance for ICT and Development (UN-GAID), was under the Patronage of HE Mr. Amre Moussa, Secretary General of the League of Arab States, who accepted to honorary chair the Association.

Thus ASREN, which has only recently (April 2011) been incorporated as an independent legal entity, had already fulfilled one of its early objectives: to overcome the challenges faced by CAMREN, and namely the need for political support and acceptance from all Arab Governments.

The first signs of ASREN reaching beyond the Mediterranean are already apparent: the launch meeting was attended by high-level representatives from most of the Arab Countries including the Gulf. Several countries in the region had indeed expressed interest for e-Infrastructure initiatives and the desire to collaborate and dedicated organisation have recently started to flourish that can boost this process.

Challenges ahead are numerous and ambitious and ASREN's specific objectives are to:

- » Establish research and education networks at national level (NREN) in each country.
- » Establish a network at regional level linking all NRENs.
- » Connect the regional network to global research & education networks.

ASREN has developed a full-fledged shared strategic plan, to reach these objectives and to provide an adequate answer to the corresponding requirements.

6.2 Africa ROC

The Africa Regional Operation Centre (Africa ROC)¹⁶ was created as a coordination and support tool for organizations in the continent willing to participate in the challenging endeavour of creating a common Grid infrastructure to foster e-Science. The initiative is currently managed thanks to the contribution of several projects and initiatives: the South-Africa Grid (SAGrid) initiative and the EPIKH, CHAIN and EUMEDGRID-Support EU co-funded projects, whose participation allowed to extend the initiative's geographical coverage to the Middle-East and Gulf area.

Endorsement by Arab-Mediterranean countries and ASREN would, in a longer-term perspective, allow Africa ROC to become a permanent infrastructure and competence centre and a key element to enforce well defined operation level agreements and service level agreements to certify the quality of the e-Infrastructure providers. This would, in turn, represent a major step towards the establishment of stable infrastructures, providing support to sites and users, and interfacing to the permanent Grid Infrastructure in Europe (EGI) and its peers worldwide.



Figure 4 - The Africa Regional Operation Centre (Africa ROC) web site

16] <http://roc.africa-grid.org/>

7 Conclusions and recommendations



The south Mediterranean, Middle-East and Gulf regions are in the process of leapfrogging old obstacles to create coherent and harmonised e-Infrastructures that serve the Education and Research of the Arab countries.

The time seems to be mature from several points of views. Policy is witnessing a radical change in the scenario and there is the feeling that great new opportunities are opening. At the same time new scientific challenges concerning problems of worldwide relevance such as Climate Change, Agriculture and food, Water management and Energy require the participation of all the best scientists across all continents. The Communication Networks and Grid infrastructures are now allowing researchers to work together as users of advanced e-Infrastructures, irrespective of their geographical location and organisational boundaries. Scientists can run their simulation and analyse large data volumes in collaboration with their colleagues across the oceans without the need to travel and remain in their home country. The high-quality science produced in the Arab countries will stimulate high level education in the universities and will attract new young researchers, who will further stimulate the development by means of new ideas.

e-Science, e-Education and e-Infrastructures should be at the top of the list of priorities of governments and always referred to in the context of international cooperation and bilateral and multilateral agreements among Arab Countries and between them and the European Union.

Several components of the political world, the scientific and academic community, and civil society must work together for this grand vision to become reality.

Unwavering political support, both at the national level and from international organizations such as the League of Arab States, the EC and the UN is vital to enforce an action plan that will take several years to deploy its full potential. Policy

levels also can help to boost e-Infrastructures by breaking down national telecom monopolies, or negotiating special prices for e-Science infrastructures, or adapting regulations for facilitating the exploitation of existing dark fibre capacity along electrical power lines, pipelines and railways.

Understanding of the e-Infrastructures' specificity in terms of requirements and business model by the private sector, and namely by telecom operators and major technology providers, is also important so they are not perceived as a competitor, nor as a cash-cow to be squeezed, but rather to develop mutually beneficial strategic collaborations.

Deep involvement of the diverse and gifted scientific community in the region is mandatory if the e-Infrastructures being built today are to answer their real needs, and to provide them with useful tools to progress their research. Training and supporting them to make the best of the e-infrastructures available, and working to make access to these infrastructures as easy and transparent as possible is also fundamental for the conspicuous investments needed by e-Infrastructure to be justified and to bring real scientific and technological benefits, as well as social advancements.

Last, but not least, the active involvement of the most dynamic and innovative sector of the society, namely the students, is mandatory to bring fresh forces and ideas into e-Infrastructures, to create real innovation and to make sure that the new born e-Infrastructures keep pace with a fast evolving world. As part of their training, students should have broad access to advanced tools, to scientific content, and most importantly have the opportunity to communicate with their peers and with teachers and researchers worldwide to absorb ideas and suggestions and become the skilled professionals who will shape tomorrow's e-Infrastructures.

This is an ambitious plan but we believe we have set the basis to achieve it.



8 Insights



"The Association of Arab Universities includes among its members 220 Arab universities, teaching more than 60 million students and more than 2 million academics and researchers. These universities have a desperate need for a regional network to support the aspects of collaboration and joining efforts, namely in students development, faculty and researchers cooperation, universities' libraries and the Arabic contents. The establishment and launch of the Arab States Research and Education Network (ASREN) can be regarded as a quantum leap in scientific and academic cooperation and research at the level of the Arab world, and in our ability to co-operate with our peers in Europe and worldwide."

(Dr. Saleh Hashem is Secretary General of the Association of Arab Universities and he warmly welcomed the invitation to join ASREN as a key reference community)



"We call on LAS to help us get the political support from high level ministers and decision makers in the Arab states, and we call on the EC to fund EUMEDCONNECT3 as it is crucial for the success of ASREN. We call on Arab national Research and Education Networks to be more involved in planning and supporting ASREN. Last, but not least, we call on scientists and researchers, to start exploring and exploiting these long-awaited for e-Infrastructures."

(Dr. Yousef Torman is ASREN Executive Director. In these years he tirelessly contributed to the creation of a Regional Association to support the development of e-Infrastructure in Arab Countries)



"Our team at the Ain Shams University is using EUMEDGRID resources to investigate more about the interaction between wind turbine wakes in micro-scale wind farms. Studying such interaction is not easy as it requires wind simulation over micro-scale wind farms, independent of its terrain complexity, with several wind turbines. Environmental Computational Fluid Dynamics (CFD) problems such as the one we're working at are often very large, tightly-coupled, and multi-scale. The need to transcend Moore's law through parallel computing on clusters, grids and scalable parallel systems has augmented in recent years. The EUMEDGRID e-Infrastructure is at date one of the most important means researchers in Mediterranean countries can exploit to carry out such environmental simulations with large domains and/or sophisticated models. Furthermore, as a collaborative project, it also offers synergy and experience exchange between researchers and experts."

(Pr. Ashraf S. Hussein is Director at Higher Education Information Centre, MOHE, Egypt. He is also professor at the Faculty of Computer and Information Sciences at Ain Shams University, where he studies CFD problems)



"EUMEDGRID and other EU funded projects (e.g. EPIKH) has given major contributions to the Scientific community in Egypt. The e-infrastructure has helped scientists implement their high intensive computation and intensive storage applications in parallel. Egyptian Scientists used the grid infrastructure to implement the WRP as a package for weather modelling and simulation. They also implemented and calculated health hazardous effects due to radiation from mobile base station on the grid.

EUMEDGRID support project has helped, in cooperation with other EU funded projects, to disseminate the HPC information and help scientists implement their algorithms on the grid. One of the main benefits of the Grid in general is to help building scientific communities, from Europe and the middle East, in different fields of research working together, sharing researches and contributing to the science together."

(Prof. Dr. Salwa M. Nassar, Head of Grid and High Performance Computing Technologies Group & Head of the Computer and Systems Department, Electronics Research Institute; High Performance Computing Blue Gene Team Supervisor, National Authority for Remote Sensing and Space Sciences – NARSS, Egypt)



"The availability of an integrated e-Infrastructure platform thanks to EUMEDGRID and EUMEDCONNECT projects has been a great opportunity for HIAST scientific community to launch new research projects which need high-performance computing capabilities, and successfully implement them. Our institute is planning to port more research applications, especially MPI-based programs.

Meanwhile, we're reaching out to the wider Syrian scientific community by disseminating these success stories on this infrastructure, with the aim of becoming a focal point for the diffusion of e-Science in Syria. This might in turn require extending e-Infrastructures in our country, to connect newly created grid sites in most important research centres and universities."

(Dr Nizar Al Hafez is lecturer and researcher at the Higher Institute for Applied Science and Technology (HIAST) in Damascus, Syria. He has been actively involved in EUMEDGRID-Support since several years and supports his Syrian colleagues in exploiting the infrastructure)



"As many of its neighbour Arab countries, Lebanon is nowadays experiencing an accelerated progress in researches and academic facilities. With more than 20 universities and research centres having an international reputation, the number of researchers, students and scientific projects is still increasing, making the widespread diffusion of higher education a major wealth for the country. However this young and dynamic scientific community faces a serious lack of e-Infrastructures. This is a severe limitation, because

many theoretical researches developed in Lebanon in diverse application fields, from medical physics, to agronomy, are based on simulation and modelling and would benefit from exploiting e-Infrastructures, as well as of the collaboration with colleagues in other Arabic countries, Europe and worldwide. It becomes mandatory to overcome this limitation, and integrate Lebanon in the wider texture of global e-Science."

(Dr. Ziad El Bitar is a researcher at CNRS, France. He has got both citizenships, French and Lebanese and never ceased collaborating with scientists in his country)



"We joined the ATLAS International collaboration back in 1996, and we are involved in a number of researches, some of them promising immediate benefits to the society, as the ones in medical physical. The detector, dubbed ATLAS, is one of the four detectors located at a powerful new accelerator, the Large Hadron Collider (LHC) at the CERN Laboratory (Geneva). Physicists will use the LHC to recreate the conditions that occurred right after the Big Bang, by colliding the two beams head-on at a very high energy. Morocco is one of the 37 countries involved; more than 2100 researchers working in 165 teams all around the world collaborate in it. The Moroccan network alone, RUPHE, involves teams from 5 universities located in 5 different cities all over Morocco, plus the National Center for Energy, Science and Nuclear Techniques. Without exploiting e- Infrastructures, this collaboration would simply be impossible. Thanks to them, we can communicate, collaborate and exchange data with the whole ATLAS network, regardless where the single centre or even the single researcher happens to be."

(Prof Rajaa Cherkaoui El Moursli is a researcher at University Mohammed V-Agdal, Morocco. By exploiting the existing e-Infrastructures available in the region her group is part of the ATLAS collaboration. Corresponding member of Hassan II Academy of Science and Technology).



"Our group was looking for a way to perform radiotherapy dose calculation in a more precise way, and we decided to adopt GATE, advanced open source software dedicated to numerical simulations in medical imaging and radiotherapy. That posed us a big challenge, because GATE performs simulations which are quite computing intensive. Now, in clinical routine we need to perform the calculations in a reasonably short time, because if the therapy needs adjustments you want to know it as soon as possible, so to tailor the therapy and make it as much effective and as less toxic as possible. When we could not exploit largely parallel computing, we had to stay with methods, which are much less precise. When we had GATE ported in the EUMEDGRID environment last year, this scenario changed completely: now we can propose a much more effective approach to radiotherapy treatment planning"

(Dr. Nourndjoum Alioui Bendjaballah is a researcher at Laboratoire des Sciences Nucléaires et Interaction Rayonnement-Matière, Université des Sciences et de la Technologie Houari Boumedienne in Algiers, Algeria. Last year her group started running GATE in a grid environment and achieved a tremendous decrease in computing time)



"Through ages, in the Mediterranean countries, Arabic Culture and Heritage always had at a time similarities in tradition and varieties in life style. The similarities allow an opportunity for different researchers to access to each regional metadata and to analyze the different factors of similarity like immigration type which study the population movement from the desert to the northern region "desertification" and from the eastern to the western region "Industrialization". Some other factors which can likely have influence on the study are the different types of weather all over the region, including the concentration of water and the fertile landscapes.

To do all these researches, a creation of an impressive database of different manuscripts dispatched over the concerned countries, should be available. The study will be based on how to avoid the mass immigration. Researches in weather and water location need also an important grid infrastructure to localize and to compute the available resources over the region and maybe to come up to some new concentrations. To collaborate with different research group to come up to this results, a need to a robust e-Infrastructure based on distributed computing is a must, like EUMEDGRID-Support, which makes available to the research community all kind of grid services to facilitate the built-up of a grid-site and a full managed support of the e-Infrastructure. Ankabut has a seed site and currently is studying the opportunity of a growth to be a UAE National Competence Center in Grid-Computing."

(Dr. Ahmed Dabbagh, Technology Development Manager, UAE Advanced Network for Research and Education, Ankabut, UAE and managing the activity of the UAE Grid-Initiative)



9 Editorial Board



Vincent Breton	Institut des Grilles - CNRS, <i>France</i>
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Federica Tanlongo	GARR, <i>Italy</i>
Yousef Torman	Junet – ASREN, <i>Jordan</i>

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- » GENESI-DEC (L. Fusco - ESA)
- » HP-UNESCO projects (B. Becker - Meraka Institute - South Africa)
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