EARTH SCIENCES AND ASTRONOMY: NEW WORLDS IN e-INFRASTRUCTURES APPLICATIONS

eSOCIETY
DANCING TO THE SOUNDS OF VOLCANOES: A FUSION OF ART AND SCIENCE

e-LABS: ENABLING COLLABORATION BETWEEN HEALTH AND SOCIAL RESEARCH

eHEALTH
e-INFRASTRUCTURES REVOLUTIONISING THALASSAEMIA TREATMENT
THE BRAZILIAN TELEMEDICINE UNIVERSITY NETWORK
AIITION: A SCALABLE DATA MINING PLATFORM FOR MEDICAL APPLICATIONS

e-INFRASTRUCTURE TECH
e-IRG WHITE PAPER 2008: JOIN THE DISCUSSION ON THE FUTURE OF e-INFRASTRUCTURES!

INTEROPERABILITY
DRIVER: THE DIGITAL REPOSITORY INFRASTRUCTURE VISION FOR EUROPEAN RESEARCH
STANDARDS

GRIDS, CLOUDS AND COMMUNITIES: AN OPEN GRID FORUM PERSPECTIVE
**E pur si muove!**

This issue of Zero-In brings you a focus on earth sciences and astronomy. It was in 1609, exactly 400 years ago, that Galileo observed and proved that the Earth was not the only centre of movement in the Universe. His observations showed that the Earth moved around the Sun, a heretical belief which had him imprisoned. Rather than being viewed as subversive or heretical, today’s science is viewed for the most part as enriching our philosophy and benefiting our societies. Yet given the weight of data and the complexity of the experiments necessary for major advances in our day, we cannot limit ourselves to being “one man and a telescope”. The modern equivalent – “one researcher and a computer” – has now become “global virtual research communities” thanks to e-Infrastructures. They allow us all to be Galileo at the same time: images from one telescope can be accessed and elaborated by many scientists worldwide, just as the data from the Large Hadron Collider can be stored and analysed by thousands of others in global virtual research communities. e-Infrastructures are not only a revolutionary way of doing science; the very observations and calculations that e-Infrastructures perform can provide us with glimpses of our world that will transform our knowledge, benefit our societies and even impact on humanity’s perception of itself. *E pur si muove* as Galileo said... We therefore invite you to enjoy this issue which starts with a focus on earth sciences and continues to offer you stimulating articles on the many pioneering technological developments in e-Infrastructures and their exciting innovations for society. We are also pleased to bring you some important e-Infrastructure policy initiatives in this issue. Following this editorial, Kostantinos Glinos outlines the European Commissions’ EU level plans for the advancement of European research and there is a call from e-IRG for grass roots action to give input to their White paper.

*Stephen Benians*
BELIEF II Project Coordinator
ICT INFRASTRUCTURES FOR eSCIENCE: THE WAY TOWARDS A NEW SCIENTIFIC RENAISSANCE

The European Commission put forward a renewed strategy for ensuring that European researchers have access to state-of-the-art infrastructure for computing, simulation and networking so that Europe can take the lead in developing the science of the future.

The strategy, presented in the Communication “ICT infrastructures for eScience”, is based on three vectors: eScience, e-Infrastructures and innovation. A number of concrete actions frame its implementation, requiring the coordination of efforts and reinforced commitment of national and EU funding authorities.

The new Communication to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions was adopted by the European Commission on 5 March 2009. The Communication highlights the strategic role of e-Infrastructures as a crucial asset underpinning European research and innovation policies. It calls on Member States and the scientific communities, in cooperation with the European Commission, to reinforce and coordinate efforts to further develop world-class ICT infrastructures (also known as e-Infrastructures) to pave the way towards a Scientific Renaissance in the 21st century. 21st century science is experiencing major changes in the way it is performed. Researchers are facing unprecedented levels of complexity in tackling scientific challenges with global societal impact. These challenges cannot be addressed by a single researcher, institution or country. For example, researching climate change requires complex computer simulations that access data stored in online repositories all over the globe; creating individualised models of humans for targeted healthcare requires increasingly sophisticated modelling and simulation; and emulating catastrophes such as nuclear disasters, pandemics and tsunamis, to design civil protection schemes, requires researchers to increasingly experiment in virtual worlds rather than in real environments.

In all these examples it is essential to bring together scientists from different scientific fields, and to give them access to top-of-the-line computational and data resources. This is what e-Infrastructures are about: enabling collaboration, sharing resources, and providing access to information. In fact, today we cannot imagine advanced research without the intensive use of sophisticated e-Infrastructures. There is both a need and an opportunity to further develop these resources as a strategic platform underpinning European scientific and innovation leadership. This calls for a renewed effort from the Member States, the European Commission and scientific communities to boost investment in e-Infrastructures and to ensure the proper coordination and alignment of national and Community strategies.

Furthermore, e-Infrastructures need to include a richer set of functionalities, such as new generations of system and application software, virtual machines, service delivery platforms, visualisation tools, semantic-based search engines, and so on, in order to support multi-disciplinary teams in transforming bits, bytes and flops into scientific discoveries and complex engineering.

At the same time, while developing the conditions for the 21st century science, the aspects of innovation and sustainability have also to be addressed. For example, the potential impact of e-Infrastructures in domains with a clear public dimensions, such as health, eGovernment, civil protection and education, is large and still unexplored. A successful implementation of the proposed strategy will position Europe as a world hub of scientific excellence and contribute to the consolidation and further development of a cohesive European Research Area.

Kostantinos Glinos
European Commission Head of Unit DG INFSO/F3 GÉANT & e-Infrastructure
Earth from Space
Earth Observation (EO) monitors the status of natural and built environments, gathers information about our planet’s physical, chemical and biological systems. Earth observations cover both space and time and provide fundamental input into earth sciences. Example applications include:

- preventing geohazards (floods, earthquakes, tsunamis, volcanoes, etc.)
- measuring land-use (deforestation, urban expansion, etc.)
- tracking biodiversity (oceanography, carbon cycles, etc.)
- monitoring climate change
- forecasting weather

Satellite Acquisitions: Data Management Issues and Requirements
The quality and quantity of Earth observations is increasing rapidly with the launch of new satellites and technological advances. As an example, around 150 terabytes of EO data was archived during ’90s, with about 20 petabytes expected in the next 10-15 years. The ESA has excellent contacts within the earth science and EO communities, allowing the most urgent requirements for EO data dissemination and exploitation (for example, in the management of geohazards and climate change) to be identified.

Needs within different communities also differ. For example, geohazards experts want standardised and interoperable access to distributed data and sensors, while climatologists are increasingly focused on access to historical data archives.

EO data archives extend back from a few years to decades and have considerable value in the study of global change. It will be soon necessary to re-analyse, on a global scale, the climate information currently locked inside large thematic archives. Major application areas include the environment (forest, soil, urban development, air quality monitoring), civil protection, and disaster monitoring. Such long term monitoring of the Earth’s environment will enable a reliable assessment of the global impact of human activity and the likely future extent of climate change.

Increasing Earth Observation Take-up
As well as supporting operational EO-based services under the Global Monitoring for Environment and Security umbrella (www.gmes.info/), the ESA are also working to address the above requirements using a wide range of conceptual and technological solutions, from applying new data dissemination strategies to data preservation and (re-)processing.

Solutions for dealing with these large data volumes include both cloud computing (on-demand procurement of IT capacity) and grid computing, technologies that allow for simultaneous large scale data sharing (especially useful for those concerned with geohazards, who may have real-time constraints) and tailored data processing services (allowing user-specific processing of raw digital data from satellites, for example.) The ESA is working with all European EO data owners to identify long-term data preservation needs, with attention to archives maintenance and operation; data integrity, security, access, interoperability and reprocessing; data exploitation and standardisation. As a result, the ESA has established and now coordinates the European framework for the long-term preservation of EO data.
The ESA works to increase EO take-up by encouraging the development of new applications and services centred on user needs, supporting projects aimed at optimising the accessibility and use of the EO data (>5000 projects have free access to data), and actively promoting the adoption of innovative IT solutions.

**ICT INFRASTRUCTURES FOR eSCIENCE**

These solutions can converge and co-operate in the same ‘virtual’ environment, meeting the European Commission (EC) definition of an ‘e-Infrastructure’, i.e. ‘an environment […] where resources can be readily shared and accessed […].’

In this context, the ESA also participates in a number of EC-funded projects, sharing best practices with its user communities and other international organisations. For example, the ESA participates in D4SCIENCE (www.d4science.eu/), GENESI-DR (www.genesi-dr.eu/), CASPAR (www.casparpreserves.eu/), and PARSE (www.parse-insight.eu/); these projects focus on e-solutions for the earth science domain and have made important steps towards enhancing access to quality scientific information.
FORESEEING THE DELUGE

By Danielle Venton, EGEE Communications/CERN, Switzerland

The forces of nature are not controllable, and thus natural disasters are not preventable. However, improving our ability to predict natural disasters can drastically reduce the associated loss of human life. Increasingly, advances in technology are making disaster forecasting more available and sophisticated.

THE CÉVENNES STORMS

During the last decade, flash floods have become one of the most significant natural hazards in Europe. One example occurred in 2002, in the Cévennes mountain range in south central France. During the autumn, the Cévennes mountains draw warm, humid lightning storms from the Mediterranean. Depending on the cloud system, the storms can remain in the area, stuck churning in the mountains, dumping moisture, for many hours.

In 2002, one such storm lasted 15 hours and caused 600 mm of rain equivalent to a year’s rain in just one day. Resulting flash floods caused the deaths of more than 20 people and economic damage estimated at 1.2 billion Euros. Five hours later, the storm water had cleared from the land.

“There were no warning systems set up in 2002,” says Vincent Thierion, a geo-informatics researcher working on a grid-enabled flood forecasting application. “Such events had been rare, and now they are more common, occurring also in 2005, non-catastrophically, and last fall in 2008. You have no chance of knowing that one could happen until about 10 hours before.”

ADVANCED WARNINGS SAVE PROPERTY AND LIVES

Thierion works on the European project CYCLOPS—Cyber-Infrastructure for Civil Protection Operative Procedures—a project aimed at bridging the gap between European civil protection agencies and the grid computing community. Supporting the work of the French Grand Delta flood forecasting service, CYCLOPS has developed a platform for running the forecasting application G-ALTHAIR on a distributed computing grid and ported this to the Enabling Grids for E-sciences infrastructure.

This style of computing allows the application to multi-task: researchers can simultaneously run forecasts for several watersheds, and for several rainfall scenarios, as well as incorporate new data or add additional
layers of forecasting complexity in real-time. CYCLOPS researchers hope this will aid authorities in making decisions when managing crises.

Thierion believes G-ALTHAIR, currently in prototype phase, will be in production by 2010. “We met with the civil protection service a few weeks ago and they are very interested in this prototype, so we must work to finish it so they can use it!”

The application uses data from about 170 regional monitoring stations spread around France’s flood-prone zone, as well as radar images and rainfall forecasts from MeteoFrance, using grid computing to simulate the real-time hydrological situation, and to forecast possible scenarios.

“The existing system is mostly dedicated to monitoring a flash flood which is already occurring,” Thierion says. “With G-ALTHAIR, the most important innovation is use of the grid to prevent damage. We can share richer hydrological information with the civil protection services, to protect the population.” Thierion demonstrated G-ALTHAIR at the 4th Enabling Grids for E-sciencE User Forum in Italy in early March. Watch the demonstration through the GridCast video blog (http://gridtalk-project.blogspot.com/2009/03/cyclops-hydrology-app-fights-flash.html ) or learn more about CYCLOPS at http://www.cyclops-project.eu/

REGIONAL EARTH SCIENCE COMMUNITIES SUPPORTED BY SEE-GRID-SCI

By Cevat Şener, METU Middle East Technical University, Turkey

The South Eastern Europe (SEE) e-Infrastructure, developed by the previous and current SEE-GRID projects, is enabling new scientific collaborations thanks to the work of SEE-GRID-SCI (www.see-grid-sci.eu). SEE-GRID-SCI aims to accelerate e-Infrastructure uptake by new user groups extending over the region, with an emphasis on three strategic earth science Virtual Organisations (VOs): seismology, meteorology and environmental protection. These VOs attract application developers, scientists, users, beneficiaries and many others.

SEISMOLOGY VO

Scientists in the seismology field need computational resources for mathematical modeling of seismic phenomena, as well as storage resources for massive collections of seismic data from geographically distributed sensors. The Seismology VO aims to use the grid platform for its seismology data and applications, which include models for detecting earthquake locations, fault-planes or seismic risks. In this way, they aim to encourage more seismologists from the SEE countries to use grid resources. To realise this aim, the VO require distributed seismic data to be logically organised, indexed and updated, and programming tools that provide easy access to this data.

METEOROLOGY VO

Weather prediction, which uses parallelisable numerical calculations that are CPU-intensive and demand significant disk storage space, is well suited to the grid infrastructure. The Meteorology VO uses an innovative approach to weather forecasting, using a number of limited-area weather models under various initial conditions with the aim of producing regional scale “ensemble” forecasts. These forecasts are based on the multitude of model outputs, and thus assess the prediction uncertainty. The VO also uses the grid infrastructure to perform very fine resolution simulations, aiming to reproduce and forecast airflow patterns over the complex terrain common to many SEE countries.
ENVIRONMENTAL VO

Environmental protection addresses practical problems related to security and quality of life, and is hence of great interest to SEE countries. The Environmental VO covers two main domains—environmental protection and response, and environment-oriented satellite image processing. These applications bring together scientists and research institutions from across the SEE region, forming collaborations that aim to leverage SEE-GRID resources to create applications of sufficient temporal and spatial resolution to be relevant on a regional level.

As outlined above, modern earth science research involves solving problems at orders of magnitude much larger than anything previously attempted. This involves not only huge amounts of data, but also regional applications able to process that data, and software that enables regional and national collaborations. This in turn requires significant computing power, storage and connectivity.

SEE-GRID-SCI makes this by providing the e-Infrastructure together with application-level services and operational tools, collaboration facilities, and also mechanisms for development, deployment and user support.

EXPReS: DEVELOPMENT OF EARTH-SIZED TELESCOPE FURTHERS GRID COMPUTING

By T. Charles Yun, EXPReS project, The Netherlands

EXPReS (Express Production Real-time e-VLBI Service) is an FP6 funded project that aims to improve what astronomers can “see” using a radio astronomical technique called “electronic very long baseline interferometry” (e-VLBI).

e-VLBI observations rely on a global network of radio telescopes. The telescopes gather information about celestial objects and send the data in real time over fiber optic networks to the “correlator”, a purpose-built supercomputer operated by the Joint Institute for VLBI in Europe (JIVE; www.jive.nl/) in the Netherlands. Connecting the telescopes in this way creates a virtual telescope of continental dimensions, almost 11,000 kilometers in diameter. The correlator processes the data and produces information used to create an image of the object observed. In this way, by transferring data electronically and correlating it in real-time, weeks of waiting can be eliminated: the old method required posting boxes of hard disks to the correlator.

ENABLING NEW SCIENCE: SUPERNova FLARES

e-VLBI is more than just a way to bypass the “snail mail” postal system; it also enables new types of science. For example, EXPReS has developed tools that support rapid response observations, such as those involved in short duration events like supernova flares.

Historically a supernova flare could only be observed long after it had occurred. This was due to the time required to ensure an observing telescope was pointing in the correct direction: the telescope had to record data, send it to the correlator, and an astronomer needed to analyse the data to determine if redirection was necessary. If the time cycle between observation and analysis was weeks, then a short-lived event could not be seen.

However, since e-VLBI’s real-time data transfer and analysis provides immediate feedback, astronomers can now dynamically adjust telescope observations, allowing telescopes to respond quickly and see the most interesting, early stages of short-lived events.

1024 MBPS: WHY BOTHER?

Over the course of EXPReS, operational e-VLBI has improved from 128 Mbps to 1024 Mbps (just a bit faster than a gigabit per second). Achieving 1024 Mbps means that e-VLBI now performs at the same speed as the older disk-based system. So why bother with the effort to move from disk to network? Because the foundational network infrastructure improves over time, and the tools we build now will easily evolve to take advantage of the improved infrastructure. And although the old disk-based systems will
also evolve, the costs and benefits are not shared, since the equipment is not shared across different research communities or geographies. Attentive readers will immediately wonder: what of your “purpose-built” correlator? How can it benefit from e-Infrastructures? EXPReS is now researching how this correlation could be conducted on distributed computer systems. The final product will rely on network, computational and storage infrastructures that are being developed both by EXPReS and other projects.

LOOKING TO THE FUTURE
Without the rich mesh of existing continental and international networks, e-VLBI would not be possible. Looking to the future, as e-Infrastructures continue to develop, faster network connections will allow more telescope data to be sent to the correlator, which will allow more detail in observed objects. For this to be possible, the correlator must then run more calculations, which in turn will increase the load on computing infrastructure, exposing the limits of our current systems. EXPReS is confident that the future of astronomy will continue to rely on and benefit from the shared e-Infrastructures being developed around Europe.

AUSCOPE: AUSTRALIAN EARTH SCIENCE e-INFRASTRUCTURE

By Robert Woodcock, CSIRO, Australia

The major earth science challenges of today involve complex system interactions and require collaboration between multiple disciplines and organisations to gather, share, exchange and analyse information, often at a national and global scale. Such collaborations are hampered by the use of different vocabularies and data formats, as well as different regimes for access to appropriate analysis software and equipment hosted by other organisations specialised in their operations. These interactions present a significant operational challenge for researchers and service providers.
THE AUSCOPE GRID

AuScope (www.auscope.org.au) is addressing this challenge by establishing an e-Infrastructure for Australian earth science. AuScope consists of several components – Earth Imaging, Composition and Age, Virtual Core Library and Geospatial – which are principally about new data acquisition to enable an increasingly clear and rich picture of the subsurface to be created. They will result in the acquisition and publication of seismic, magneto-telluric, geochemical and hyperspectral core logging data and products. All of this data will be underpinned by an enhanced geospatial reference system from the Geospatial component.

To draw together information from this new national infrastructure and from other existing sources in academia, industry and government, AuScope has developed a world-leading geoscience network: the AuScope Grid (www.auscope.org.au/category.php?id=10). This e-Infrastructure provides access to independently managed data and computing facilities across Australia. The network uses open geospatial consortium standards and GeosciML (www.geosciml.org) to allow real time access to data, information and knowledge stored in distributed repositories hosted by different organisations. All of this information, and the associated services, are accessible via the AuScope Discovery Portal (portal.auscope.org). An open source Spatial Information Services Stack is also available to allow organisations to add data holdings and computational services to the network.

ACCESSIBILITY THROUGH OPEN STANDARDS

The use of open standards means researchers are able to build their own client access tools to pull together information, perform analysis and publish their results – scientific workflow “mash-ups”. As more researchers and organisations do this the amount of accessible information and tools will increase, allowing for service chains to be built with simplified interactions between collaborating parties. Computationally demanding geoscience programs, ranging from earthquake and tsunami simulation through to ore formation and block caving, can be used to process observational information created by one party and as a basis for policy or hazard management business decisions at the far end of the service chain.

A key to success will be achieving sufficient participation and open access to enable a thriving community to develop and use the infrastructure, and more importantly, to contribute to our understanding of the structure and evolution of the Australian continent.

Further information on AuScope can be found at www.auscope.org.au or by contacting Robert.Woodcock@csiro.au. AuScope Ltd is funded under the National Collaborative Research Infrastructure Strategy (NCRIS), an Australian Commonwealth Government Programme.

SOUTH AFRICAN e-INFRASTRUCTURE SUPPORTS INTERNATIONAL Collaborative astronomy research

By Jeff Chen, Meraka Institute/CSIR, South Africa

Southern African scientists and engineers are highly active in the astrophysics arena. Most recently, South Africa helped to design and build the Southern African Large Telescope (SALT) at Sutherland, in the Northern Cape Province. This is the largest single optical telescope in the southern hemisphere, with a hexagonal mirror array of 11 metres. The High Energy Stereoscopic System (HESS) gamma ray radioscope, located in southern Namibia, is also a proud showcase of fruitful collaboration between South African, Namibian, German and other European scientists and engineers.
**THE SQUARE KILOMETRE ARRAY: PREPARATIONS UNDERWAY**

With a strong commitment from the South African government, South Africa is making good headway in the preparation phase towards hosting one of the most exciting scientific endeavours in the recent years: the Square Kilometre Array (SKA) project. The first phase, a one-dish prototype, has already been constructed at the Hartebeesthoek Radio Astronomy Observatory (HartRAO) in Gauteng and a seven-dish engineering test-bed, to be built near Carnarvon in the Northern Cape Province, will be commissioned towards the end of 2009.

South Africa’s commitment to the success of the SKA project is further highlighted by the initiation of the MeerKAT frontier project, which aims to implement an array of more than eighty 12-metre-diameter dishes to enable test-bed technology that will be required for the SKA. These dishes are situated in the Karoo region of the Northern Cape Province and are due to be fully operational by 2012.

**THE WORLD’S LARGEST TELESCOPE**

South Africa and Australia are the two remaining countries in the bid to host the SKA. With a proposed budget of €1.5 billion, the SKA project plans to simulate a giant radio telescope that is capable of extremely high sensitivity and angular resolution. By gathering the signals received from thousands of small antennae that cover a receiving area of up to one million square metres, this gigantic telescope will be 50 times more sensitive than any other radio instrument to date. The antennae will utilise a wide range of frequencies, thus permitting many independent observations at one time. As a result of these impressive features, the SKA will be able to survey the sky at a rate more than 10,000 times faster than ever before.

**MEETING AN UNPRECEDENTED DATA CHALLENGE**

The SKA telescope will be able to probe previously unexplored parts of the distant universe. In doing this, it is expected to generate an immense volume of data streaming: between 70 and 100 terabytes per second. A large e-Infrastructure will be needed to manage this potentially overwhelming data volume and still permit seamless remote operations from both regional researchers and global partners. This should include high capacity data transport networks, large volume data repositories and superior high-end computing capacity.

To ensure both the short and long-term success of this undertaking, South Africa’s Department of Science and Technology (DST) has already implemented two important elements of the e-Infrastructure, both hosted by the Meraka Institute of the Council for Scientific and Industrial Research (CSIR).

The first, the Centre for High Performance Computing (CHPC), will be host to cutting-edge computational platforms of more than 45 Teraflops/s capacity by the end of April 2009. The second is the South African National Research Network (SANReN), a 10 Gigabits per second (10 Gb/s) ring network designed to provide a very high capacity Next Generation Network to the research community in South Africa, and later to SADC and the rest of Africa. A third and complementary element of the e-Infrastructure is the Very Large Data Repository initiative, proposed by the DST and currently undergoing rapid formulation.
DANCING TO THE SOUNDS OF VOLCANOES: A FUSION OF ART AND SCIENCE
By Danielle Venton, EGEE Communications/CERN, Switzerland

In March of this year, patrons of the Washington DC-based CityDance company were treated to a unique event: a dance performance set to sounds from volcanoes. The dance, titled The Mountain, was part of CityDance Ensemble’s Carbon, a work-in-progress about climate change. The Mountain’s choreographer, Jason Garcia Ignacio, based the dance on the structure of melodies created out of seismic waves recorded from volcanoes around the world specifically Mount Etna in Italy, Mount Tungurahua in Ecuador, and the Mountains Pinatubo and Mayon in the Philippines. Seismic data from these mountains was transformed into audible sound waves using a volcano sonification technique developed by DANTE engineer Domenico Vicinanza, also the music’s composer. The technique is being used in research to translate the patterns in a volcano’s behaviour into sound waves to help predict volcanic eruptions.

“As a scientist, it was my priority to develop tools to help us predict eruptions and ultimately reduce the loss of lives,” said Vicinanza. “As a musician and artist too, it was a natural step for me to take these seismic sonification sounds and apply them to the arts. I am delighted that the results, or songs of the earth, are being turned into a dance performance that will help raise awareness of climate change.”

e-Infrastructures for research and arts

The technology behind Vicinanza’s seismic sonification was facilitated by DANTE, a provider of high-speed research and education networks, and two distributed computing projects, Enabling Grids for E-sciencE (EGEE) and E-science grid facility for Europe and Latin America (EELA). DANTE’s research and education data communications networks—GÉANT2 in Europe and TEIN3 in Asia-Pacific—as well as Latin America’s RedCLARA (operated by CLARA), underpin the immense computing power provided by EGEE in Europe and EELA in Latin America. The complex sonification algorithms used by Vicinanza harness the power of computing grids, enabling the seismic data to be converted into melodies, a process that would be impossible using standard bandwidth networks or computing resources.

“High bandwidth research and education internet networks together with grid computing power have played a vital part in making this project a reality,” said Paul Gordon Emerson, CityDance Ensemble choreographer and Carbon curator.

“This proves that if we can create a musical score from the earth’s natural sounds with the help of a global computer infrastructure, then we can find the innovation needed to improve the planet. The fact that this work uses the voices of the earth from three continents is a very powerful metaphor for Carbon as a project and as a concept.”

Originally presented in sold-out performances on the 14th and 15th of March at the Music Centre, Maryland, USA, and restaged the following weekend, The Mountain is now available to view at http://www.dante.net/volcanodance.
e-Labs are secure, online environments that connect data, research methods and investigators to enable timely, comprehensive insights. The University of Manchester is developing a range of prototype e-Labs, including the ESRC-supported Obesity e-Lab (ObE) (www.obesityelab.org.uk).

What is obesity e-Lab (ObE)?
ObE is working to find more effective ways to share expertise and data between social and health sciences. It uses obesity research in academia and the public health service as a case study of slow, fragmented research that could be accelerated and expanded using e-Labs.
An initial finding is that the Health Surveys for England (HSE) are under-used, largely because of the difficulty in extracting data relevant to specific questions. Similar problems have been addressed in the life sciences through workflow-sharing technologies, and ObE is therefore collaborating with the myExperiment project (www.myexperiment.org) to produce a prototype e-Lab that simplifies access to HSE and similar datasets.

What are research objects?
The basic currency of an e-Lab is the research object: a package of ingredients for reproducing an answer to a question and sharing it. A research object might contain an extract of data, the database query used to extract the data, statistical scripts (for data cleaning, deriving variables and modelling), reports, slides, and so on. The extent to which a research object is shared with others is the choice of the user, much like the trust model in networks like Facebook.

Why is e-Lab important for social researchers?
Social researchers form a particularly diverse, multi-disciplinary community: different researchers differ also in their degree of familiarity with data sources, their expertise with research methods, and the knowledge underpinning their interpretation of findings. This is a strength when researchers work together, leading to richer insights, but a weakness when they work in isolation.
For example, in the systems map for the UK Foresight Obesity project (www.shiftn.com/Obesity/Full-Map.html), the organising principle is energy balance. However, evidence on social determinants of obesity tends to be isolated to over-eating (energy in) or physical activity (energy out), when the key outcome is energy balance. Given easier access to data, methods, and a diverse community of researchers via e-Labs, the true complexity of problems like obesity might better be reflected in research, which in turn leads to outcomes more relevant to policy.

A typical use case for an e-Lab?
Say a social researcher wants to explore relationships between socio-economic status, gender, obesity, and geographic location using HSE data. By querying the e-Lab, she finds that a health researcher has asked a similar question and shared their analysis as a research object: the health researcher has commented on the potential bias of occupation on Body Mass Index (BMI) reflecting muscle rather than fat mass. The social researcher clones this research object, extends the analysis and adds detailed metadata on the strengths and weaknesses of educational attainment vs. household income as a relevant socio-economic measure. Thus by sharing this research object, the social researcher has lowered the barrier for the health researcher to use and understand existing research and data.

Organisational value
e-Labs can also increase organisational memory: for example, a new recruit would inherit a set of research objects showing how information was arrived at, rather than a set of reports that provide only a rough notion of the data and methods behind the information. In addition, a new post-holder could quickly tap into a community of social researchers linked to their research objects. As the uses of data are more explicit when they are set in research objects, organisations could improve information governance and could apply more appropriate security models around sensitive data and information. In addition, with easier sharing and reproducibility of data uses, learning and professional development opportunities would be easier to identify.
So named for the fact that its sufferers tend to live near the sea ('thalassa' and 'haemia' are the Greek words for 'sea' and 'blood'), thalassaemia is the most prevalent of a group of blood diseases called haemoglobinopathies, all inherited genetic disorders of haemoglobin—the red blood cell molecule that carries oxygen. Haemoglobinopathies and their related conditions affect some 300,000 newborn infants every year, compromising the ability of their blood to carry oxygen.

Funded by the EU, the ITHANET project (Electronic Infrastructure for Thalassaemia Research Network) is strengthening thalassaemia research by helping scientists across Europe and the Mediterranean to share their medical expertise. The project aims to link relevant Mediterranean research centres with those in the wider European research community, using the power of the high-speed EUMEDCONNECT2 and GÉANT2 networks. Researchers are thus able to co-operate in multi-centre studies, to exchange information, to provide second opinions using videoconferencing, and to develop effective treatments and innovative drug therapies.

Saving lives

ITHANET is transforming the outlook for children affected by these diseases. Without effective treatment, thalassaemia is usually fatal within the first decade of life. Prevention of the disease is of primary importance. There has been considerable success implementing preventative programmes in European countries such as Cyprus, Greece and Italy, but countries with poorer economic resources face considerable obstacles to effective treatment. Until the launch of ITHANET, understanding and experience of treatment was spread unevenly among a variety of research centres, limited in their ability to co-operate by the basic e-Infrastructure tools available. ITHANET has since introduced a range of advanced tools, including videoconferencing, grid computing and e-learning, that are strengthening research throughout the Mediterranean region, bringing benefits to people for whom sophisticated diagnostic and treatment programmes were previously inaccessible.

A rich toolbox

The rich variety of e-Infrastructure tools used by ITHANET supports the fast-moving field of haemoglobinopathy research and offers speedy access to news, communications systems, streamed online training courses and grid computing facilities. The ITHANET community is working to use the power of EUMEDCONNECT2 to leverage the technical work of research institutes across the European mainland and the Mediterranean fringe. For example, researchers at the Cyprus Institute of Neurology and Genetics, the Makarios Hospital in Cyprus, the Erasmus Medical Centre in the Netherlands and ThalLab at Ferrara University in Italy are working together to develop a grid-enabled application that will model the behaviour of different drugs and thus assess their suitability as thalassaemia therapies.
The ITHANET community is also investigating the possibility of using grids and their underlying network infrastructure for other applications that require the rapid and secure transfer of large volumes of data, including management of patient records, comparison and evaluation of MRI techniques, and the diagnosis of thalassaemia-related osteoporosis. For example, one collaboration, involving researchers from ThalLab in Ferrara in Italy, the University of Cairo in Egypt, and the Hadassah University Hospital in Jerusalem, is looking for drug-based alternatives to blood transfusion, currently the principal treatment for thalassaemia. Although transfusion is a life-saving therapy, there is a risk to patients of transmitted infections and viruses like hepatitis, which is a substantial risk in less developed countries, where blood reserves are scarce and screening is less advanced. This project is using the flexibility and power of grid computing to seek and develop chemical compounds that can induce the production of haemoglobin as an alternative therapy to transfusion.

THE BRAZILIAN TELEMEDICINE UNIVERSITY NETWORK

By Nelson Simões, Wilson Coury, José Luiz Ribeiro Filho and Luiz Ary Messina, RNP- Rede Nacional de Ensino e Pesquisa, Brazil

After providing telecommunication infrastructure to over 350 education and research institutions, helping an estimated public of over a million users, and linking all the Brazilian regional academic networks, RNP is looking to build user communities. At the beginning of the century, there was still no integration of Brazilian eHealth communities nor was there a national consensus. Isolated projects started in the late 90s.

The Brazilian Telehealth initiatives achieved their federal ministerial integration stage as the National Health Ministry, MS – Ministério da Saúde; the Permanent Commission of Telehealth, created in March 2006; and in January 2007 the National Telehealth Program in the Primary Care. These acts followed the first initiative of the Brazilian National Science and Technology, MCT – Ministério da Ciência e Tecnologia, to establish a Telemedicine University Network called RUTE – Rede Universitária de Telemedicina. This network was to be based on the implementation of telecommunication infra-structure in the University Hospitals, starting in January 2006.

A particularly important initiative is the Brazilian Telehealth National Program. In its first phase, it applies to nine states Amazon, Ceará, Pernambuco, Rio de Janeiro, Minas Gerais, Goias, São Paulo, Santa Catarina and Rio Grande do Sul and uses as reference centers the nine University Hospital members from the Telemedicine University Network- RUTE. These are all already equipped with TICs infra-structure and Videoconferencing systems, running education and collaborative research works alongside European institutions. These are being improved, increased and stimulated.

In order to promote the expansion of Tele-health Clusters in the States not yet participating in the National Tele-health Project in the first stage, a two point strategy of high speed Internet access and infrastructure is being implemented. With hopes to hereby achieve an initial nation wide health care network in all Brazilian states.

An ongoing project in Brazil, run by RNP – Rede Nacional de Ensino e Pesquisa, is building Metropolitan Area Networks (MANs) on the 27 state capitals where RNP has its PoPs (Redecomep, Education and Research Community Network ). The purpose of this project is to connect all major public universities and research centers in the country with optical fibers owned and managed by local consortia formed by these institutions and RNP. The initial capacity that will be available for the member institutions on each MAN is 1Gbps based on Gigabit Ethernet optical switching technology.
Those MANs are being established at this time, already operational in 10 state capitals, and they are expected to be fully operating by 2010. On top of this infrastructure the network is being prepared to support specific areas such as health with telemedicine, grid computing, and high energy physics, to give some examples. The health area is showing the most interest and feasibility. The project Rute1 - Rede Universitária de Telemedicina (Telemedicine University Network), funded by the Ministry of Science and Technology, is building and updating the application-level infrastructure of 19 university hospitals, in the major cities of the country. The project goal is to allow all participating hospitals to use RNP network in order to run telemedicine and telehealth applications including video conferencing for information exchange, second opinion, continuous education and web conferencing. It builds the basis for the interhospital collaboration. Additional funding, also by the Ministry of Science and Technology, has been approved to expand the Rute project to include 38 more university hospitals and health universities, and therefore connect all the 45 public federal university hospitals in the country. This would yield a telecommunication and Telehealth infrastructure project of 57 health institutions. RUTE, the Telemedicine University Network is now represented in every Brazilian state.

As part of the RUTE project, a council was established, including members of the major university hospitals, RNP, the Brazilian Association of University and Education Hospitals, a representative of each Ministry of Health, Education, Science and Technology and FINEP, the National Funding Agency for Projects and Studies, to discuss and define the policies, procedures and all subjects related to the use of the Telemedicine Network.

Conclusions

A recently approved expansion for RUTE 2009 will benefit certified educational public hospitals and federal health institutions. They are to include: cardiology, oncology, rehabilitation, orthopedic and trauma, deaf, hearing impaired and blind, and Indian health. Around new 50 eHealth Centers are to be established and integrated to the Telemedicine Network University. The main objectives hereby to be attained are: stimulate certification procedures and the use of Telehealth technologies, optimise formal and remote education of the health family program, and deliver precise assistance in remote diagnosis and treatment to undeserved regions in Brazil.

Each RUTE institution receives benefits and provides:

- Connection to the Network PoP to 1Gbps in the MANs
- Telemedicine and Telehealth Center
- Videoconference Room
- Teleconsult and Telediagnostic room
- Telehealth courses
- Participation in Special Interest Groups SIGs

The SIGs in operation are: Telehealth Standards, Quality and Security in Hospitals, Radiology and Image diagnosis, Child and Adolescent Health, Dermatology, Ophthalmology, Pediatrics Oncology, Aids, Rural Assistance, eHealth Innovation R&D, Nursing, and Psychiatry, among others.

There are today already 23 University Hospitals fully operational in 14 federal states. With the additional resources from Health Ministry in the Telehealth National Program, 9 RUTE Telehealth Centers assist 2900 teams. In a partnership with the Health State Secretary of Minas Gerais, the RUTE University Hospitals from the federal universities of UFMG, UFJF, UFU, UFTM and the state university of Montes Claros already assist more than 300 municipalities in Telecardiology. They have provided more than 170.000 diagnostics remotely by specialists, answering ca. 600 consultations/day.

**AITION: A SCALABLE DATA MINING PLATFORM FOR MEDICAL APPLICATIONS**

By Harry Dimitropoulos, Omiros Metaxas and Manolis M. Tsangaris, Department of Informatics, University of Athens, Greece.

AITION is a new and powerful tool in the quest for improved medical care. User-friendly and designed to run on grids, clouds or ad-hoc clusters alike, AITION allows doctors to investigate and integrate clinical, imaging, genetic and other patient data to find relationships between different medical variables. Based on generative state-of-the-art causal-probabilistic algorithms, AITION generates graph-based “knowledge models” that doctors can interactively explore to answer diagnostic and predictive questions.

Inside the AITION machination

The AITION system consists of four major components:

- User Interface: the heart of the system, the User Interface (UI) allows for user interaction and provides visualisation tools;
Backend: all the core data mining algorithms take place in the backend, along with the overall coordination of the data mining flow;

ADP engine: the Athena Distributed Processor (ADP) engine uses user-defined or “custom” operators to express, optimise, schedule and execute tasks or “queries” in a distributed system;

Relational database: the database stores both the original data and the derived data models. The backend uses a collection of algorithms, most lifted from the open source data mining platform WEKA. These algorithms have been modified to run in a data streaming mode and to use multiple threads, implemented as user-defined ADP custom operators.

Instead of running these algorithms alone, the backend uses ADP to run queries that compose custom operators as a pipeline or sequence of simpler steps. AITION packages custom operators inside containers, then assigns them to different hosts and provides compute, memory, and other resources. AITION's ADP optimizer then decides which operator implementation to use, the number of threads, the container to assign operators to, and so on. The execution plan is then evaluated using the selected computing resources.

Design benefits

Early in the design of AITION, we mapped each complex data mining algorithm to one or more ADP custom operators, so the ADP optimiser has the choice of using a low overhead compact implementation for small problems, or a relatively higher overhead distributed version for larger problems. AITION makes these choices automatically. We have thus been able to make several key algorithms scalable. In this way, we have reduced needs for memory and increased needs for parallel processing.

AITION's primary focus is on providing our users – doctors in particular – with user-friendly and transparent access to the knowledge models it generates. In this, it differs from traditional data mining, since it provides ways to present, navigate, visualise, and very often, interact with knowledge models. The end result is that users not only understand the process that led to a statistical conclusion, but also the impact of that conclusion on their medical hypotheses.

Further, since AITION users can easily “experiment” with alternative hypotheses, models and parameters – something very rare with traditional data mining approaches or tools – AITION is a real boon for discovering new medical leads.

AITION was developed by the University of Athens, under the Health-e-Child IST project (http://www.health-e-child.org/).
Passionate about the future of Europe’s e-Infrastructures? Want your voice to be heard? The e-Infrastructure Reflection Group (e-IRG) is about to release its new White Paper, and is inviting policymakers, service providers and user communities to participate in the discussion.

The e-IRG White Papers provide a “snapshot” of developments in the e-Infrastructure domain, and makes related recommendations. The 2008 White Paper examines seven key issues requiring policy action at the national and European Union levels: global collaboration, education and training, grid and cloud computing, security, virtualisation, remote instrumentation, and sustainability.

Clouds and virtualisation
Cloud computing and virtualisation are among the most promising and innovative of the emerging ICT technologies, and we must account for developments in these areas when re-assessing the future of e-Infrastructure and related policies. Cloud computing enables on-demand and pay-per-use access to leased computing power and services, and represents a new paradigm in distributed computing. The e-IRG believes that the long term interests of the research community would be best served by increasing access to and use of a mixture of grid and cloud based services and technologies, and the White Paper encourages the integration of cloud-based services into existing e-Infrastructures.

Remote instrumentation
The development and spread of techniques and technologies that allow virtualised and shared access to remote scientific instruments is opening new opportunities for scientific communities. The White Paper recommends support for further research into these technologies, and their progressive integration into the e-Infrastructure framework.

Education and training
Education and training of European citizens in the use of e-Infrastructure is essential if we are to maximise the benefits that derive from investments in e-Infrastructures. The White Paper builds on the work of the e-IRG Education and Training Task Force, proposing a plan of action that includes a call for harmonisation and standardisation of knowledge and skills related to distributed computing, in accord with the Bologna framework. To maximise the use of computing facilities available within e-Infrastructures, relevant user communities must have access to a seamless computing ecosystem.

Sustainability
The goal of securing self-sustainable funding for European e-Infrastructure services requires careful analysis of the organisational and funding models embraced by all stakeholders, including resource users and providers. The White Paper suggests that the models and experience of existing National
Research and Education Networks (NRENS) can guide the computing components of the e-Infrastructure and future data-related initiatives. As an interim step, connecting the proposed new capacity and capability computing service schemes will provide an integrated computing service environment capable of fulfilling the diverse requirements of the end-users.

Security and global collaboration
The White Paper also addresses the issues of security and global cooperation, in particular in terms of their organisational aspect. To achieve and maintain an acceptable level of overall security in a cost-effective manner, the e-Infrastructure community needs to develop common ways of specifying and measuring security across grid, network, supercomputing and data domains. The need to deepen global collaboration is driven by the expanding user community, which includes scientific domains with well-established institutional structures governing the intercontinental collaboration activities, as well as disciplines with more fluid collaboration models. These new and globally collaborative activities pose additional challenges at political, organisational and technological levels. The absence of a clearly defined, hierarchical organisation for bringing together and prioritising the needs of the user community means that it is necessary to establish other venues for exchanging information about best practices and future plans on the global scale. The e-IRG intends to play a major role in this information exchange.

For further information, visit the e-IRG website: www.e-irg.eu

**ENABLING GRID-NETWORK SERVICES VIA CONTROL PLANE: THE PHOSPHORUS G²MPLS WAY TO THE e-INFRASTRUCTURES**

by Artur Binczewski, PSNC Poland, Dimitra Simeonidou, University of Essex United Kingdom and Nicola Ciulli, Nextworks Italy

The Phosphorus project has built a pan-European research networking testbed that delivers advanced network services to grid users and applications, interconnected by heterogeneous grid and network infrastructures. Phosphorus researchers are demonstrating different approaches to the seamless provisioning of on-demand grid and network services: on the one hand, vertical integration among grid middleware, the AuthN/AuthZ Service Plane, the Network Control Planes and the underlying optical transport infrastructure; on the other hand, horizontal interoperations between multiple and technologically heterogeneous administrative domains that deploy different Network Control Plane architectures (either NRPS or enhanced ASON/GMPLS).

Phosphorus research records are achieved using demanding e-Science applications running on its distributed optical testbed, with remote laboratories interconnected through GÉANT2 to the worldwide optical infrastructures.

**Grid-aware network services and the Grid-GMPLS (G²MPLS)**

The paradigm of grid-aware networking (Grid Network Services), based on the flexible and holistic control of network and non-network resources, promises to be a key enabler for the optimized control of massive data transfers, very fast and guaranteed connections, and scheduled and transport services through multiple administrative domains. Phosphorus has designed and is experimenting with solutions that facilitate vertical and horizontal communication among applications middleware and different types of Control Planes.

In particular, Phosphorus researchers have developed an extremely challenging grid-aware GMPLS Control Plane (G²MPLS), capable of implementing new GNS scenarios on top of a first-class pan-European optical and multi-domain field trial, deploying the most innovative optical transport technologies interconnected through GÉANT2.

**G²MPLS rationale**

G²MPLS is an enhancement of the ASON/GMPLS Control Plane architecture with single-step provisioning of network and grid resources, though a set of seamlessly integrated procedures.

G²MPLS innovations include:
- fast dynamics for service setup in the same time-scale as for Network Control Plane setups
- availability of well-established procedures for traffic engineering, resiliency, crankback and multi-domain reservations at the network layer
- generalised interface for users to trigger grid and network reservations (Grid-Optical User Network Interface, G.OUNI)
- support for advance reservations on network transport services
- ability to implement innovative “anycasting” network transport services (i.e. with the dynamic selection of the optimal transmission sink by Control Plane, e.g. in case of distributed storage).
From a user’s perspective, G^2MPLS enables a real node-to-node deployment of on-demand grid services, because it exposes specific interfaces towards the grid layer.

From a network operator perspective, G^2MPLS allows the integration of grids and automated network control plane technologies in real operational networks. This overcomes the current limitation of grids that operate as stand-alone overlaid infrastructures upon “always-on” networks.

**G^2MPLS experimental facilities**
The G^2MPLS Control Plane currently runs in two Phosphorus laboratories interconnected through the GÉANT2 infrastructure. These local test-beds, one at PSNC-PIONIER (Poland) and the other at the University of Essex (UK), represent two different administrative domains that internally deploy two types of optical switching capabilities:

- the Fiber Switching Capability (FSC), built around the Calient Diamond Wave Fiber Connect equipment;
- the Lambda Switching Capability (LSC), based on an optical DWDM ring of ADVA FSP 3000RE-II ROADMs with 40 wavelengths.

Each is individually controlled by a G^2MPLS controller and the overall Control Plane is bridged to the application/grid layer through G.OUNI client nodes.

Different e-Science applications have been adapted and integrated in the G^2MPLS testbed: the Distributed Data Storage Systems (DDSS), the Collaborative Data Visualisation (KoDaVis) for atmospheric simulations, and Wide In Silico Docking On Malaria (WISDOM) for large-scale molecular dockings on malaria study.

DDSS and G^2MPLS were publicly demonstrated at Supercomputing 2008 and ICT’08, showing the successful and dynamic any cast storage of data contents.
The EU-funded project DRIVER (www.driver-community.eu), or "Digital Repository Infrastructure Vision for European Research", has two main aims:

• to set up a European confederation for advocating and promoting EC Open Access mandates across European researchers and institutions;

• to enable a technical infrastructure of European Institutional Repositories to aggregate Open Access content and make it accessible throughout Europe.

The DRIVER confederation
The DRIVER confederation is moving towards a global, interoperable, trusted, long-term data repository infrastructure, the European nucleus for which DRIVER has built in Europe.

The confederation encourages collaboration in repository development and represents European and international repository communities, subject-based communities, repository system providers and service providers, as well as organisations sharing the DRIVER vision. DRIVER also liaises with institutions from across Europe, as well as the U.S., Canada, Latin America, China, Japan, India and Africa.

The DRIVER guidelines
The DRIVER guidelines were developed enable data harmonisation and validation, and aim for interoperability on two layers: (i) syntactical (use of OAI-PMH and OAI_DC), and (ii) semantic (use of vocabularies). Data in the technical infrastructure is based on locally hosted resources that are collected in digital repositories, then harvested and aggregated by DRIVER.

DRIVER then makes aggregated data available via OAI-PMH to all partners in the DRIVER network, whilst respecting the provenance of resources by "branding" them with information from the local repository.

The DRIVER guidelines help data repository managers to define new data-management policies, take steps towards improved services, and encourage the addition of supportive functionalities. Repositories following the guidelines can become part of the DRIVER network and can re-use DRIVER data for the development of local services. Thus, the DRIVER guidelines assist repository managers in making their material more widely available. Interoperability in this sense means standardised metadata for harvested records.

Technical infrastructure
An important outcome of the DRIVER project is D-Net (http://www.driver-repository.eu/D-NET_release), a software toolkit that allows data and service providers to (i) aggregate OAI-PMH PMH-compliant institutional repositories into shared information spaces, and (ii) build and customize their digital library applications to operate over such spaces. This technology supports a service-oriented e-Infrastructure, where distributed and shared resources are implemented as standard Web Services and applications consist of sets of interacting services.
D-Net currently offers services required to build distributed aggregation systems and end-user applications. Aggregation systems enable uniform information spaces to be constructed using records harvested from heterogeneous institutional repositories. Here, Store Services, Index Services and Aggregation Services offer advanced tools for OAI-PMH harvesting, cleaning and integrating metadata records. The resulting information spaces can then be accessed using digital library applications built using D-Net services such as Recommendation, Collection, Browsing, User Interfaces and so on.

D-Net is notable for its scalability and openness: an instance of DRIVER can scale up to an arbitrary number of services, applications and organisations, while the application framework is open to the introduction of new services and functionality.

Successes so far
Since July 2008, DRIVER has maintained a running instance of D-Net that hosts one main aggregation system, integrating Open Access metadata records from a growing number of European Institutional Repositories. At present, the infrastructure runs 36 services distributed over nine partner sites. As a result of confederation efforts, the resulting information space numbers 1,000,000+ records out of more than 200 repositories across 27 countries, and the number of repositories is growing.

Currently, the space is accessed by three digital library applications: the Belgium national repository portal, offering search over the Belgium Repository Federation subset; the Recolecta national repository portal, offering search on the Spanish Repository Federation subset; and the main DRIVER portal, providing access and advanced functionality over the whole space.
GRIDS, CLOUDS AND COMMUNITIES: AN OPEN GRID FORUM PERSPECTIVE

By Paul Strong, Secretary, Board of Directors, OGF & Craig A. Lee, President, OGF, United States

Open Grid Forum’s initial focus on grids has broadened over time, reflecting evolution in community needs and in technologies such as virtualisation and cloud computing.

Grids have been widely adopted across academia and industry. Their evolution and deployment has been driven by several desires: to share data and computation resources, to get results faster, to improve efficiency and to collaborate. Clouds are driven by different needs, primarily the desire for financial flexibility, offered by platforms such as “pay-per-use”, and business agility, such as reduced time to market and/or the ability to engage in fast, low risk experimentation. The cloud model relies on the provider first achieving economies of scale, through sharing resources, and then offering infrastructure, platforms and software as services via the network. Ultimately, this model enables outsourcing of everything that has no differentiating value.

Shared ground

Cloud and grid implementations tend to share many technologies and techniques. Both are realised as distributed systems and often leverage virtualisation in one form or another. In many cases, grid owners are looking to take advantage of the capabilities and benefits of clouds.

Perhaps the most important thing that larger grids and clouds share is that both run on shared infrastructures accessed via the network, often remotely. It is this common attribute that also results in shared problems, which both the grid and cloud communities need to address. These problems include, but are not limited to portability of services and data between grids or clouds; secure access to and operation of those services; secure movement and storage of data; the need for location awareness to cater for disparate regulatory requirements; unified management for both internal and external platforms, and so on. Many of these issues are major impediments to the wider commercial exploitation of clouds, yet they are also areas that the grid community, and thus OGF, has experience and expertise in.

Driving discussion

Consequently, OGF is actively engaging with the cloud community including advocacy groups, standards organisations and user groups as well as the grid and IT community, specifically in terms of understanding the opportunities and challenges that the cloud paradigm offers.

This engagement is exemplified by OGF Europe, a project funded as part of the European Commission’s FP7 platform, and its Industry Expert Group. In January 2009, this group held a very successful workshop, called “Cloudscape”, which explored the impact of cloud computing on Enterprise IT. Cloudscape was followed by a workshop at OGF25 that focused on how existing grid users or owners can take advantage of the flexibility of cloud computing, and what the current trends mean with respect to existing grid infrastructure.

OGF and OGF Europe will continue to drive the discussion around the grid/cloud intersection in the autumn with a workshop focused on grids as a service in the cloud.

Open Grid Forum (www.ogf.org/) is an open community forum driving the rapid evolution and adoption of applied distributed computing. Its members share their experiences, discuss new trends and solve shared problems, the latter typically through the development of standards that facilitate interoperability and integration.
The NCSA team has previously produced high-resolution animations for productions such as the Academy Award-nominated IMAX film “Cosmic Voyage” and the NOVA programs “Monster of the Milky Way,” “Hunt for the Supertwister,” and “Runaway Universe.” The group produced visualizations for the space shows “Black Holes: The Other Side of Infinity,” “The Search for Life: Are We Alone?” and “Passport to the Universe.” For show times and other information, see: www.adlerplanetarium.org.

NSF’s Largest Supercomputer in Full Production Mode
Released: 03.03.2009
Source: NICS
Author: Gregory Scott Jones
Web link: http://www.nics.tennessee.edu/category/nics/nsf%E2%80%99s-largest-supercomputer-full-production-mode

The world’s fastest academic supercomputer is now up and running. Kraken, a Cray XTS system located at the National Institute for Computational Sciences (NICS), managed by the University of Tennessee (UT) and funded by the National Science Foundation (NSF), promises to push the limits of simulation science. The formal “acceptance” of the machine follows a series of rigorous tests designed to gauge its abilities and to ensure it can withstand the coming months of data-intensive simulations. Kraken (named after a mythological sea monster) met a number of criteria for numerous software codes, including HOMME (climate), NAMD (biochemistry), and LSMS (physics), demonstrating its ability to facilitate today’s most challenging high-performance computing (HPC) research projects. All of the codes utilized the full machine, an important metric for the scalability of a system like Kraken.

“Kraken will be a premier simulation science tool for years to come, greatly enhancing both our knowledge of the world and our ability to translate that knowledge for human benefit,” said Thomas Zacharia, vice-president of science and technology at the University of Tennessee and associate laboratory director for computing and computational sciences at Oak Ridge National Laboratory (ORNL), where NICS is housed.

A recent upgrade brought Kraken from its original 167 teraflops (trillion calculations per second) to a peak performance of more than 607 teraflops, making it the world’s fastest supercomputer managed by academia. The machine, which features 66,048 computational cores and more than 100 terabytes of memory, officially entered full production mode on February 2. Kraken will remain in full production mode until the next scheduled upgrade in late 2009, granting time to more than 100 research teams on one of the world’s premier supercomputing resources and enabling research in a vast range of areas.

Through his work on Kraken, Jeremy Smith, who holds a Governor’s Chair at the University of Tennessee, is studying the natural process of breaking down grasses, husks, and other cellulose-rich plant sources into sugars for the more efficient conversion of cellulose to biofuels (overcoming the resistance of cellulose to enzymatic hydrolysis is a major obstacle in getting effective, affordable biofuels to market). This research will guide those who are engineering proteins to speed up this natural process of producing energy. For more information, visit the NICS Web site at www.nics.tennessee.edu.
Antarctic Ice Velocity Data Now Available through A-CAP
Released: 12.03.2009
Source: NSIDC

The NSIDC Antarctic Cryosphere Access Portal (A-CAP) now contains VELMAP Antarctic ice flow velocity data. The goal of VELMAP is to compile ice flow velocity for the whole Antarctic continent. Understanding ice flow and its temporal changes is essential to answering questions about whether Antarctic ice volume is changing and how it may change in the future. Since changes in Antarctic ice have an impact on sea level, this is a problem with global importance.

The VELMAP collection on A-CAP is composed of 47 selectable layers. Each of these can be displayed as either a data location map, to help differentiate the different layers, or a graded ice velocity map. The opacity of these maps is also configurable. All layers are queryable so that a user can determine the ice velocity, bearing/azimuth, collection date, station name, and magnitudes of error for each point observation. As with all A-CAP layers, the info icon opens a pop-up window with pertinent citation and summary information about each VELMAP layer. A-CAP is a geo-visualization and data download tool developed at the National Snow and Ice Data Center (NSIDC) Antarctic Glaciological Data Center (AGDC). A-CAP provides AGDC data and other Antarctic-wide parameters, including glaciology, ice core data, snow accumulation, satellite imagery, Digital Elevation Models (DEMs), sea ice concentration, and many other cryosphere-related scientific measurements. For more information on how to access data using A-CAP, see the A-CAP User Manual (http://nsidc.org/agdc/acap/user_manual.html).

Cosmological Simulations Key To Understanding The Universe
Released: 22.02.2009
Source: Science Daily

Tiziana Di Matteo, associate professor of physics at Carnegie Mellon University is harnessing the power of supercomputing to recreate how galaxies are born, how they develop over time and, ultimately, how they collapse. Working with machines at Carnegie Mellon’s Bruce and Astrid McWilliams Center for Cosmology and the Pittsburgh Supercomputing Center, Di Matteo crafts computer simulations to better understand the physics of black holes and the role they play in galaxy formation. The superior computing power available using computers like the Cray XT3 system allow Di Matteo to input the extensive calculations necessary to incorporate black hole physics into such simulations. In fact, such computing power has enabled Di Matteo to complete the most detailed and accurate recreation of the evolution of the universe to date.

The simulation begins with conditions seen at the birth of the universe as evidenced by observed cosmic microwave background radiation. Seeded with a quarter of a billion particles that represent everyday measurable matter, and factoring in gravity exerted by dark matter and other forces associated with various cosmic phenomena, including cooling gas, growing black holes and exploding stars, the simulation progresses, providing snapshots of galaxy development in frames of half a million years each. Strung together, the frames create a movie of cosmic evolution over the past 14 billion years. The high-resolution afforded to the researchers by the state-of-the-art computers allows them to zoom into a particular event in the galaxies formation, like the formation of a black hole.

Using data from such simulations, Di Matteo and colleagues have been able to get a better understanding of the role black holes play in galaxy regulation. The researchers hope that the theoretical simulations can be used to aid observational astrophysics by helping to predict what the next-generation telescopes should see as they peer back to the Big Bang, and by providing guidance to observational astrophysicists as they look to locate the earliest cosmic events and untangle the origins of the universe.

Di Matteo presented an overview of her cosmological simulations as part of the “Big, Small, and Everything in Between: Simulating Our World Using Scientific Computing” session at the 2009 American Association for the Advancement of Science (AAAS) Annual Meeting in Chicago.
e-IRG Workshop
14-15 May 2009 - Prague, Czech Republic
This workshop will be organised by CESNET under the Czech EU-presidency.
http://www.e-irg.eu/index.php?option=com_content&task=view&id=192&Itemid=1

HealthGrid Conference
28 June - 1 July 2009 – Berlin, Germany
The HealthGrid conference is the premier conference on the transformation of biomedical research, education and medical care through the application of Grid technologies. This event is dedicated to enhancing biomedical research and healthcare delivery, creating an open collaborative virtual community and communicating the collective knowledge of the HealthGrid community.

TeraGrid’09
http://www.teragrid.org/tg09/
This international conference will showcase the capabilities, achievements, and impact of the TeraGrid in research and education through presentations, posters, visualizations, and more. The conference will also provide information and training to enable current and future users to achieve maximum impact.

8th International e-VLBI Workshop - Science and Technology of Long Baseline Real-Time Interferometry
22nd – 26th June 2009 - Madrid, Spain
http://www.oan.es/express09
The conference will focus on scientific applications of real-time operation to astronomy, geodesy and other applications. How to best coordinate emerging e-VLBI arrays for best scientific return. Connections to transient monitoring in other wavebands including Fermi Gamma-Ray Space Telescope observations.

Second BELIEF international symposium
16th – 17th July 2009 - São Paulo, Brazil
http://www.beliefproject.org/events/2nd-belief-international-symposium
This symposium will focus on "e-Infrastructures and Sustainability Development".
The event will be supported by the GLOBAL consortium. It will be opened by representatives from the Government of São Paulo and from the EC Delegation to Brazil. It will engage experts from the areas of eHealth, eEducation, and eScience in order to discuss and understand in deeper detail what has already been done in terms of sustainable development by adopting e-Infrastructures and the necessary future steps to be addressed and taken into account by policy makers and decisions makers.

ICEMC2 2009
27-29 July 2009 –Bangalore, India
http://www.pes.edu/mcnc/icemc2/
The ICEMC2 2009 is a premier conference which brings together professionals, academics, industry experts, students, enthusiasts to discuss various emerging trends, innovation, share research results and new directions in the field of Embedded systems, Mobile Communication and Grid Computing.

The Euro-Par 2009 conference
25th – 27th August 2009 - Delft, the Netherlands.
http://europar2009.ewi.tudelft.nl/
Euro-Par is an annual series of international conferences dedicated to the promotion and advancement of all aspects of parallel and distributed computing. Euro-Par focuses on all aspects of hardware, software, algorithms and applications for parallel and distributed computing. The objective of Euro-Par is to provide a forum within which to promote the development of parallel and distributed computing both as an industrial technique and an academic discipline, extending the frontier of both the state of the art and the state of the practice.

IEEE GRID 2009
13-15 October 2009 - Banff, Canada
http://www.grid2009.org/
IEEE’s Grid conference series is an annual international meeting that brings together a community of researchers, developers, practitioners, and user involved with Grid technology. The conference will feature invited talks, pre-coordinated workshops and refereed paper presentations.

eChallenges e2009
21-23 October 2009 -Istanbul, Turkey
www.echallenges.org/e2009/
This is the nineteenth in a series of Annual Conferences supported by the European Commission, which regularly attracts over 650 delegates from leading commercial, government and research organisations around the world to share knowledge and experience, lessons learnt and good practice in the areas of ICT for Networked Enterprise & RFID, eGovernment & eDemocracy, eHealth, Collaborative Working Environments, Living Labs, e-Infrastructures; Technology Enhanced Learning and ICT Skills, Knowledge and Content Technologies, Security and Identity Management, High Performance Computing - Applications and Mobility.
e-INFRAStructure
The new generation of integrated ICT-based infrastructure. E-Infrastructures, which exploit and seamlessly interconnect several separate components and layers, such as networks, supercomputers and other computing resources, storage, and other remote resources.

eScience
An innovative approach to research, thanks to the use of advanced technologies of communication and regardless to geographical location of instruments, resources and last but not least, brains. Today, the paradigm is used in several application fields: Astrophysics, High Energy Physics, Computational Chemistry, Biomedicine, Earth Sciences, Meteorology, Environmental Sciences but also Finance, Cognitive Sciences and Archaeology.

Grid
Grids are a set of services over the Internet, allowing geographically dispersed users to share computer power, data storage capacity and remote instrumentation. The term Grid was coined in the mid-1990’s to indicate the “coordinated resource sharing and problem solving in dynamic, multi institutional virtual organisations”. Although Grids are still in a prototype phase, experts believe that they will have a dramatic impact, comparable to WWW, in the next few years.

Middleware
A software layer able to manage and allocate resources in an optimal way to all users and applications that need them, just like the Operative System does with programs running on your PC.

NREN – National Research and Education Network
A NREN is a unique organization that plans, manages and operates the IP telecommunication network infrastructure devoted to R&E in a country. They implement the network requirements of the scientific and academic community and are the privileged partner for dealing with Telecom operators and provider of apparatuses on their behalf.

NGI – National Grid Initiative
An NGI is an organization that coordinates on a national basis the Grid projects and initiative and is entitled to deal with counterparts worldwide on themes such as standardization and interoperability of middleware and procedures. It is the NREN-equivalent at a Grid level.
Review Panel
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Alex Delis, NKUA, Greece
Johan Eksteen, Meraka Institute, South Africa
Bob Jones, EGEE-III, Switzerland
Wolfgang Gentzsch, DEISA2, Germany
Melanie Pankhurst, DANTE/GEANT2, United Kingdom
Christy Burne, iSGTW and GridTalk, United Kingdom
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This publication is supported by EC funding under the 7th Framework Programme for Research and Technological Development (FP7). This eMagazine has been prepared within the framework of FP7 BELIEF-II Project, funded by the European Commission (contract number 223759). The views expressed in this edition are those of the authors and the BELIEF consortium and are, under no circumstances, those of the European Commission and its affiliated organizations and bodies.

The project consortium wishes to thank the Review Panel for its valuable support in the selection of the articles, the GEANT & eInfrastructure Unit of the Information Society and Media Directorate-General of the European Commission and all the authors and projects for their valuable articles and inputs.