Inspired

Summer 2012

European Grid Infrastructure

News from the EGI community

This Issue

Welcome to the Inspired Summer 2012 issue!

In this edition we have...

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> Steve Brewer summarises the EGI Federated Cloud Task Force's activities
> The MPI Virtual Team reports on a number of problems solved
> Stephen Burke & Jelena Tamuliene talk about their secondement projects
> Sara Coelho profiles VO auger
> Sergio Andreozzi ponders the costs of e-science and introduces the first numbers
> Gergely Sipos writes about the latest developments in Federated Identity Management
> And Owen Appleton rounds up the achievements of the gSLM project

As always, your comments / feedback and ideas for stories are very welcome.

Sara Coelho
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"We think our castles of sand are the ramparts of the universe."
John Buchan, The Power House. (Illustration: wikicommons)

The EGI Campus Champions Scheme

Are you a champion?

EGI is looking for grid champions from all corners of the research galaxy

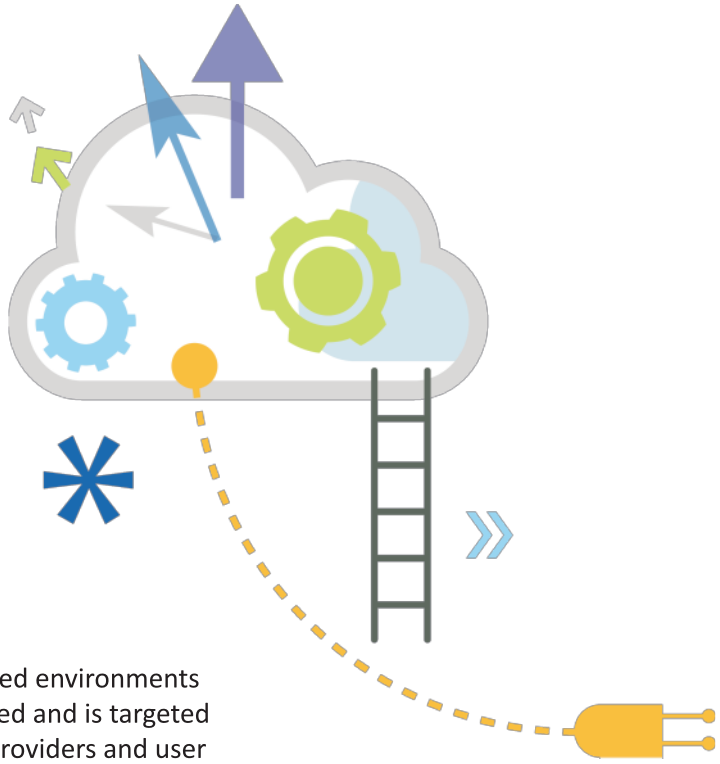
Spreading the benefits of the grid, our superheroes
will help research peers to get their data problems
solved faster than a speeding bullet.

In return, you will travel, network and make new acquaintances
at our expense.

More information will be available soon at http://go.egi.eu/champs

The EGI Federated Cloud Task Force

Steve Brewer on the plans to deliver virtualised resource solutions from proof of concept to blueprint



The EGI Federated Cloud Task Force is developing prototype services for a range of research communities who have stepped forward to help EGI develop cloud solutions that also incorporate all of the legacy benefits of their previous infrastructure services. These prototypes are being built on top of a testbed that meets the core requirements of cloud computing in the area of grid infrastructures. These generic services will be tailored to a number of use cases.

In the humanities field, the British National Corpus (a dataset of 100 million English words) and Peachnote (database of 1.6 million musical scores) both require intensive processing to support easy access and use. In the structural biology field, virtualised services need to scale out across a wider range of resources for both teaching and research purposes. Astronomers can also capitalise on the flexibility offered by the cloud model, with large datasets that must be open for access and queries by various applications. Finally, the Task Force is working with the science gateways project SCI-BUS, to provide seamless access to a broader range of federated resources.

The EGI Federated Cloud Task Force is able to achieve all of this by taking advantage of the skills and knowledge across the EGI community and can draw from projects such as StratusLab and organisations such as the Oxford University e-Research Centre (OERC). The Task Force is also commited to open standards such as the Open Cloud Computing Interface (OCCI), which is being developed within the Open Grid Forum for all of the service models in the cloud computing paradigm.

The goal of the Task Force is to deliver a blueprint defining how federated virtualised environments can be implemented and is targeted at both resource providers and user communities. The blueprint is grounded on a proof-of-concept workable test bed that is evolving into a showcase of essential scenarios, ranging from simply running a prepared virtual machine image to more complex tasks related to the sharing and reuse of machine images across different sites.

One of the added benefits of embracing open standards is that it supports the application-agnostic approach of the Task Force. Tools can be adopted to develop the evolving testbed but then replaced as more detailed requirements are understood.

The three phases of the 18 month project are timed to coincide with the EGI Forums so that progress can be both demonstrated to and reviewed by the wider EGI community. The halfway point of the project was marked by a 'plugfest' held in Amsterdam to dig deeper into some of the emerging use case-driven prototypes that the team is developing. These demonstrator prototypes will then be presented at the workshop and demonstration sessions planned for Prague in September. Attendees represented five different research communities in addition to the developer team and much progress was made in capturing the practical aspects of what researchers need from federated cloud services in addition to the technical constraints. Sharing video links with academics in their laboratories enabled the developers to fully grasp these needs whilst putting the users at ease and minimising the disruption to their research.

Now the task force can proceed with implementing a number of community-specific prototypes. These will reinforce the ongoing testbed design and hence inform the blueprint which is a key focus in the future strategy of the European Grid infrastructure. •

More Information

Federated Clouds Taskforce wikipage: http://go.egi.eu/FCT

High Performance Computing Goes Mainstream

High-powered technical computing increasingly is used to solve practical problems in manufacturing, life sciences, oil and gas, and other industries, but many companies still aren't fully tapping its potential.

Over **70%** of members of the National Center for Manufacturing Sciences (NCMS) believe increased adoption of advanced computing would lead to **competitive advantages.**[1]

Only **6%** of the estimated 285,000 small to medium manufacturers in the US are fully taking advantage of **technical computing** today.[2]

Technical computing achievments

The Boeing Company aims to use simulations to redesign the vertical tail of a commercial jet, potentially saving **$300 million** in fuel costs annually.

Using IBM technical computing, **Vestas Wind Systems** reduced their wind turbine placement analysis from weeks to less than **one hour.**

Red Bull Racing used IBM technical computing software to simulate new car designs and achieved a **20% increase** in performance and throughput, coming up with a design that reduces their cars' drag on the track.

[1] InterSect 360
[2] NCMS

IBM

MPI within EGI

The MPI Virtual Team solves the issues blocking the uptake of EGI by communities who want to run MPI applications

The Message Passing Interface (MPI) is a widely used standard for developing parallel applications in scientific and industrial domains. MPI defines the syntax and semantics of a set of library routines that allows writing portable and efficient message-passing programs in Fortran, C or C++. There are several well-tested and efficient implementations of MPI used in resources ranging from large HPC centres to smaller cluster sites.

The support for MPI in the grid has a long history. The int.eu.grid project (2006-2008) focused on developing and improving middleware tools for better and more user-friendly support of these kinds of jobs. This work was then continued by the MPI Working Group in the EGEE projects (2008-2010) and now in the EGI era, by a team working under the EGI-InSPIRE SA3 activity – Services for Heavy User Communities. These groups have analysed MPI problems, checked middleware limitations, proposed solutions and defined short-term and long-term actions to improve parallel job support. Although parallel jobs are essential for some scientific communities, they were not massively used by the heavy users of the infrastructure, so it has not received the attention it deserves.

The EGI MPI Virtual Team (VT) was brought together to address emerging requests from multiple domains to enable better MPI support, and to be able to present EGI as a modern and attractive infrastructure to new user communities.

During this short-term project (November 2011 – May 2012), the VT collaborated with different user communities, NGIs user support teams, middleware technology providers and resource providers to identify issues and to establish services by which MPI applications can work successfully in the European Grid Infrastructure. The work spanned across a number of technical areas: documentation, monitoring, information system, accounting and batch systems support.

During the MPI VT lifetime, the following key milestones were achieved:

> Documentation: MPI documentation for MPI users and MPI site administrators was improved, and is now accessible in the EGI wiki.

> Monitoring system: New monitoring probes were defined for the EGI Service Availability Monitor (SAM). EGI-InSPIRE's SA3 team is now developing the new probes to check different MPI capabilities and features.

> Information system: The problems with the registration of MPI resources have been collected and reported to Operations. The Nagios probes have been updated to be automatically able to detect these problems in the future.

> Accounting: Issues with collecting accounting information about parallel applica-tions have been compiled and reported to the appropriate technology developers. An MPI accounting system should be deployed based on MPI VT experience and feedback.

> Batch system integration: Issues regarding the interface of MPI applications with the most common local batch job schedulers used in EGI have been collected and addressed.

The MPI VT has also created a report delivered at the end of the project, describing in detail the technical areas covered by the work, reports about achievements, and issues identified by VT members, as well as actions which should continue to be followed within the EGI-InSPIRE project.

The MPI VT was a strong collaborative effort made by EGI.eu and by the NGI that participated, producing an extraordinary added value. It is now up to the EGI project to make the most of it.

The achievements of the Virtual Team and some of the applications benefiting the new developments will be demonstrated at the Technical Forum in Prague.•

The MPI Virtual Team was lead by:

> Alvaro Simon,
> Gonçalo Borges
> Enol Fernández del Castillo
> Gergely Sipos
> Zdenek Sustr

More Information

MPI VT report:
https://documents.egi.eu/document/1260

MPI VT wikipage:
https://wiki.egi.eu/wiki/VT_MPI_within_EGI

Updates from our seconded staff

Earlier this year, EGI.eu established a short-term (3-6 month) secondment programme to allow technical staff affiliated with partners from the community to share their expertise and help the EGI.eu to develop projects for the benefit of the EGI ecosystem. Stephen and Jelena are the programme's pioneers and shared their experience with Inspired.

Stephen Burke: Migrating to GLUE 2.0

Stephen has a PhD in Particle Physics, and has worked on experiments in Geneva, Hamburg and Chicago. He joined the European DataGrid project in 2001, based at the Rutherford Appleton Laboratory in the UK, and has been working on grids ever since, particularly on the development of the information system. He is now on secondment to EGI.eu to work on the deployment of the GLUE 2.0 information schema. Here is Stephen's roundup of the work:

The GLUE schema provides a way to describe grid services in the Information System, and is used in one way or another by most of the grid middleware. In 2009 the Open Grid Forum defined a major new version, GLUE 2.0, which has been progressively implemented in the middleware in parallel with the existing GLUE 1.3 schema. With the release of EMI 2 the support for the new schema is complete, so the time has come to begin a migration process in EGI. As an expert on the schema I am working with EGI.eu on secondment to define how to manage this process, which must be done in a smooth way without disrupting the operation of the grid.

The main output of this work will be a profile document, to be formally presented to the community at the Technical Forum in Prague. The schema specification is deliberately flexible and leaves many decisions open to the implementation, so for use in EGI we need to have a more detailed definition which specifies exactly what information should and should not be published, what the structure should be and how the schema attributes should be interpreted. As well as a reference for the middleware developers this will be used to develop monitoring software to verify that the published information is correct.

Over the next few months, as the EMI 2 middleware is deployed, EGI will monitor the information and provide feedback about any problems to developers and site managers. By next year it should finally be possible to begin to use GLUE 2 for real - but don't worry, GLUE 1 will still keep working!

Jelena Tamuliene: Computational Chemistry Applications

Jelena studied Physics and Astronomy at Vilnius Pedagogical University in Lithuania. She defended a PhD in Theoretical Physics at Institute of Theoretical Physics and Astronomy, Vilnius, Lithuania and became involved in grid computing activities in the beginning of 2005. She is now at EGI.eu on secondment from NGI-LT, the Lithuanian grid initiative, to work on computational chemistry applications.

My tasks as an Application Expert are to review existing applications in the Computational Chemistry and Material Science domain and to identify key scientific applications that could benefit from resources and services of the National Grid Infrastructures (NGIs).

In order to achieve the first task, I reviewed the EGI Application database (AppDB), in respect of the users needs and expectations. The review highlighted the difficulties that new and existing EGI users can meet when using AppDB. Direct communication with contact persons further clarified what is preventing AppDB being more attractive and, as consequence, more helpful. The next step of this task will be to analyse the comments of the NGI International Liaisons (NILs) in the context of this review and find the best solutions to make AppDB more user friendly.

To identify key applications from the Computational Chemistry and Material Science domain, I analysed the applications offered by HPC, NGIs, and various projects such as PRACE, HPC-Europa2, HP-SEE, focusing on surveys, highlights of the applicant proposals, trending applications, and so on. The key applications we found were: GAUSSIAN and GAMESS for Quantum Mechanics and GROMACS and NAMD for Molecular Mechanics, as well as other applications that could be more popular in the near future.

Now, with the EGI.eu User Community Support Team and with scientific communities, we are ready to identify resources that should be considered to integrate these applications with EGI. Our goal is to offer a compelling software portfolio for computational chemistry researchers. •

VO auger: a window into the strange world of cosmic rays

Sara Coelho looks into the work of one of EGI's largest VO

The VO auger processes data collected by 1,600 surface detectors (such as the one here illustrated with the Andes in the background) scattered across the Argentinian Pampas. (Image courtesy: Pierre Auger Observatory)

Cosmic rays were discovered 100 years ago and have been baffling scientists ever since. Most of them are textbook subatomic particles (protons, electrons) or nuclei of light elements (hydrogen, helium), showering on Earth from the Sun.

But a very small minority are not playing by the book. Some cosmic rays show up on Earth with an energy so high that it is not even theoretically possible. To put it into context, ultra-high energy cosmic rays are detected in the 10^{20} eV range: that is eight orders of magnitude above the detection limit of the Large Hadron Collider at CERN, and above the theoretical maximum, known as the Greisen–Zatsepin–Kuzmin (GZK) limit.

Where do they come from? Do they come from our galaxy? But the Milky Way does not have a mechanism to produce such high energies. Or do they come from really far away? And, if so, how did they keep their ultra-high energy on the long route to Earth?

The Pierre Auger Observatory

Ultra-high energy cosmic rays are not easy to observe and part of the reason is because they are very rare. An extreme 10^{20} eV event, for example, will only occur once in 100 years for every square kilometer on Earth.

The solution for this big problem was to build a big observatory. The Pierre Auger Observatory comprises 1600 surface detectors, spread across 3000km^2 of the Argentinian Pampas in the Mendoza province. The surface detectors are complemented by an additional 24 fluorescent detectors that scan the skies in dark nights.

The observatory, completed in 2008, is a huge collaboration project, involving 490 scientists based at research institutions from 18 countries across the world.

The other problem with ultra-high energy cosmic rays is that they cannot be observed directly: they burst into a shower of billions of particles when they hit the Earth's atmosphere. So the detectors on the ground measure the properties of these particle showers (e.g. intensity, orientation).

Taking this information, it is possible to reconstruct the cosmic ray before the particle shower – just as you can see what a broken vase looked like, if you glue all its pieces together.

A VO to manage it all

Storing and analysing the data collected by the detectors of the Pierre Auger Observatory requires immense computing power, especially for reconstructing the particle showers through Monte Carlo simulations. Grid computing is the perfect solution for this task, given that simulations can be parsed into single parallel jobs. The grid also offers the storage capacity that the collaboration needs.

The computing demands of the project were such that a Virtual Organisation - VO auger - was set up in 2006 with the collaboration of CESNET and the Czech Institute of Physics to support the Pierre Auger Collaboration.

Six years on, VO auger is the fifth largest virtual organisation operating within EGI, second only to the four VOs set up for the LHC experiments. In the last year (August 2011 to July 2012), the VO auger executed 7,082,667 jobs, averaging more than 19,000 computing jobs per day.

The origin of ultra-high energy cosmic rays is still a work in progress but the Pierre Auger Collaboration has already made important contributions: five of the Top10 hottest articles in Astroparticle Physics published by Elsevier are papers describing their achievements. •

More Information

The Pierre Auger Observatory
http://www.auger.org/

VO auger
http://egee.cesnet.cz/en/auger/

The cost of e-science

Sergio Andreozzi analyses the price tag of ICT support for research

E-infrastructures such as EGI result from the federation of autonomous ICT resources belonging to different institutions and pooled together for access by large scientific collaborations. All these resources are sourced independently through different funding streams, which means that understanding the overall cost is difficult due to the lack of suitable cost models or easy access to accounting data. On the other hand, knowing how much services cost is key to planning for sustainability and to support strategic planning.

The EU-funded e-FISCAL project addresses this challenge and has been working during the last year in order to assess the overall cost of computing service provision for research in Europe.

The project applies the e-FISCAL annual cost model, which allows for the execution of high-level cost analysis. Complementary approaches, such as literature search and benchmarking are also used to complement survey data.

At the beginning of July, the project organised a two-day workshop to bring together financial and e-infrastructure experts to evaluate the results from the first year activity and improve ICT infrastructure cost assessment approaches.

The discussions focused on the results of the initial analysis of data collected from institutions covering 14 countries. The analysis revealed that:

1) there is a broad range of cost ratio results ranging by a factor-of-six difference;

2) selecting metrics was challenging; the commonly used low-level metrics are not necessarily related to application-level performance, although more meaningful comparisons are possible by coupling metrics with performance benchmarking;

3) the proportion of personnel that would be needed for administrative duties in the case of outsourcing to external cloud services is difficult to calculate;

4) it was noted that the initial e-FISCAL results are aligned with results from the EGI preparatory phases based on Total Cost of Ownership (TCO) methodology;

5) the e-FISCAL median values are around 0.05€/CPU core-hour in 2010 and 0.034€/CPU core-hour in 2011, while averages are similar to the previously conducted e-IRGSP2 study (i.e. 0.10€/CPU core-hour in 2010 and 0.08€ in 2011); the significant difference between the median and average values show the outliers in the sample that are being analysed and verified by contacting the survey respondent individually.

The second day of the workshop opened with three keynote presentations – from the EC, e-IRG and 451 Research – illustrating different facets of the e-Infrastructure cost and sustainability challenges. The final panel discussed focused on discovering high-level architectural models as well as concrete next steps towards optimal e-Infrastructure service provision. The most likely future scenario was deemed to be a 'hybrid solution', where ICT services are provided using a combination of dedicated hardware at the provider's premises and different kinds of outsourced solutions. The importance of marketing and awareness-raising related to the new opportunities of the different e-Infrastructure services was brought up as one of the key concrete actions towards ensuring sustainability and broadening the user base of the e-Infrastructure. Improved cost modelling as well as development of metrics that are more relevant to the users than the standard low-level units – such as core hour – were seen as prerequisites for this awareness raising as well as for more efficient engagement with both user communities and funding agencies.

The e-FISCAL project will present updated key findings and next steps on Friday 21 September 2012 in a workshop co-located with the EGI Technical Forum. If you are interested in the sustainability and effectiveness of the e-Infrastructure service provision, do not miss the event! •

More Information

e-Fiscal workshop
> http://www.efiscal.eu/2nd-workshop

e-Fiscal Deliverables
> http://www.efiscal.eu/deliverables

e-Fiscal at the EGI Technical Forum
> http://go.egi.eu/tf12-efiscal

Federated Identity Management in EGI

Gergely Sipos summarises the latest activities

In a distributed environment many information services—such as e-mail, library databases, data repositories, portals, grid/cloud computing applications—requires an authentication from users. Institutional identity management system can simplify this authentication for the users. Rather than having separate credentials for each system, users can employ a single digital identity to access all resources to which they are entitled within the organisation. Federated identity management extends this approach beyond the institutional level, creating a trusted authority for digital identities across multiple organisations.

Federated identity management is an area where there is a common interest from the largest, multinational, European scientific collaborations including the ESFRIs. The representatives from a variety of research communities started a workshop series in 2011 to discuss the technical and political issues around adopting federated identity solutions for research collaborations.

Identity federations can enable users to access EGI services with the username-password they were given by their home institutions and what they traditionally use for accessing institutional services such as email or intranet. There are basically two ways in which federated authentication can be integrated with the grid or federated cloud offerings that NGIs provide:

> The grid/cloud sites could host middleware to connect to identity federations as service providers;

or

> The sites are integrated with identity federations through intermediary services that translate federated identities to grid/cloud specific identities, i.e. to X.509 certificates.

The first option requires significant changes to the middleware or hypervisor technologies and therefore could be achieved only with significant development work. The second case requires less effort and can be build on top of the existing grid middleware and cloud mechanisms.

No surprise then that several NGIs already provide bridging technologies to interface identity federations with grid, cloud middleware or portal environments. The most notable examples are provided by INFN Catania (using the Catania Science Gateway Framework), the SCI-BUS project (WS-PGRADE Science Gateway Technology) and the Swiss NGI (GridCertLib). These solutions – alongside with other mechanisms – will be presented at the day-long Authentication & Authorisation Infrastructures (AAI) workshop of the Technical Forum, which aims to define an action plan for the harmonised adoption of emerging AAI solutions within the European Grid Infrastructure.

Another important development in EGI is the 'Grid Identity Pool' federation (GrIDP in short) which was recently established by the Grid Team at INFN Catania. GrIDP is an open federation that aims to facilitate cross-institutional, cross-national access to e-infrastructure services. The federation already includes 14 science gateways that provide project or community-specific services. Among the five GrIDP identity providers there is EGI.eu, with its Single Sign On identity database (SSO). Those who have an EGI SSO account, which is, by the way, free to anyone, can access services from the GrIDP federation, and services from EGI, such as the Applications Database. In the next future we would like to:

> Expand the GrIDP federation with additional services and identity providers;

> Establish identity providers that can perform strong identity validation, i.e. ensure that the credentials they issue really belong to the persons identified;

> Extend the federation with an 'attribute provider service' that could be used to link project specific, experiment specific or other types of attributes to personal identities in order to simplify user authorisation for service providers. Current candidates to fill this role are Grouper from Internet2 and COIP from Nordunet.

These developments and possible new ones will be discussed at the EGI Technical Forum in Prague. •

Managing grid services

Owen Appleton on the relationship between gSLM and EGI

August 2012 saw the conclusion of the gSLM project, which has spent the last two years working on how to adapt IT Service Management to grids and other e-Infrastructures.

EGI and gSLM have cooperated closely in this effort, through a Memorandum of Understanding, numerous meetings, workshops and tutorials at EGI Technical and Community Forums and gSLM events such as the MDGS workshop at EuroPar 2011, Bordeaux, France.

The gSLM project has worked with service management experts from the commercial sector, grid operations staff, policy makers and representatives of other e-Infrastructure communities such as clouds in order to understand the challenges of managing federated services. Through developing models, analysing operational infrastructures and examining commercial frameworks, gSLM has come up with tools guidance to assist the grid community in making their services better managed.

By improving service management, grid infrastructures should be able to better monitor and improve their reliability, be able to make firmer guarantees to user communities, and increase the confidence users have in EGI and other federated infrastructures. This will both help with challenges currently facing grids as well as assisting them in building more sustainable structures.

The outputs of this process are seen in the gSLM strategic roadmap for Federated Service Management, published at the end of August. The roadmap seeks to address a wide range of stakeholders from the e-Infrastructure community. It introduces the challenges faced by current e-Infrastructures and how service management can address them, before providing both policy level and more operational guidance on how the situation can be changes and how IT Service Management can be introduced in a realistic and incremental manner. This advice builds on ITSM frameworks like ITIL and COBIT as well as international standards like the ISO/IEC 20000 family. Such an approach gives e-Infrastructures access to proven techniques and methods in a manner they can comprehend and introduce.

The conclusions of this roadmap include a concerted approach for improving service management. In a community as complex as a multinational grid infrastructure, many stakeholders play different roles that must be coordinated in order to achieve a working service. Improving and harmonising the overall service provision approach, such as introducing formal service management, requires similarly concerted action. Each stakeholder group must recognise the common objectives to be achieved, but also to understand what specific actions must be carried out to achieve them. For policy makers this may be ensuring that those receiving funding to provide services address service management topics, while for user groups it is important to come together to define the levels of service necessary for their work and then clearly express these to service providers and require Service Level Agreement that guarantee them.

The gSLM roadmap includes input from EGI and also forms the basis for future work in the area. EGI and partners from the gSLM project are cooperating in the FedSM project, launched on September 1st. FedSM will include representatives of three e-Infrastructures: EGI.eu representing EGI, Cyfronet representing PLgrid (the Polish NGI) and CSC representing the Finnish grid Infrastructure.

Some of these topics will also be discussed in two sessions on September 20th at the EGI Technical Forum 2012 in Prague, Czech Republic. Members from gSLM will contribute to discussion on sustainability plans for e-Infrastructures. There will also be a special training session on Service Portfolio design for National grid Infrastructures. These sessions will introduce some of the experiences from gSLM to the NGI community, and will mirror efforts gSLM has made to assist EGI in looking at sustainability and Service Portfolios in the past two years. •

More Information

gSLM website
http://www.gslm.eu

Programme highlights: EGI Technical Forum 2012

17-21 September, Prague

Cloud services for science

Cloud integration in the European Grid Infrastructure is one of the key topics in discussion at the Technical Forum.

The scene will be set on Tuesday with 'Providing cloud services', a day-long session in room Aquarius, where cloud platform operators will talk about service design, customer support and integration into operational infrastructures.

Tuesday's highlight will be the demonstration introducing the EGI Federated Cloud testbed and services (16:00, Aquarius). It's a unique opportunity for team leaders and representatives of research collaborations to evaluate the advantages of a federated public sector cloud infrastructure.

Wednesday starts with Matteo Turilli's keynote on the progress of the Federated Clouds Task Force, focusing on the achievements of the team's first year of work, followed by a talk by Steve Tuecke on cloud-based services for science. Later, on Friday, Joe Baguley will wrap up the forum with a talk on the future of clouds, highlighting the major trends and initiatives in cloud computing today.

Making it work: EGI Operations

Operations HQ will be in the Zenith room, where Tiziana Ferrari chairs a series of community events to discuss the implementation of the EGI operations roadmap, workshops, training events and thematic sessions. There will be opportunities to discuss the future and the contribution of EGI operations to international Open Science, focusing on use cases for integration of EGI operations with new Research Infrastructures, and the extensions of the EGI operational services needed for a coupled usage of HTC and HPC resources.

Research infrastructures (RIs)

RIs play an important role in innovation. Room Taurus will host a series of sessions reporting on the challenges and computing solutions for large-scale research infrastructures. The focus will be software services, workflow systems, science gateways and virtual research environments.

On Thursday morning, we'll have two keynotes about the computing challenges of ESFRI projects: Vlastimil Ruzicka introduces the ELI beamlines project, while Esa Turunen's keynote rounds up the discussion with a case study of large-scale data management focusing on the experiences of the EISCAT_3D project.

More programme information

http://go.egi.eu/tf12

Sustainability challenge

How to guarantee long-term, sustainable services is a key topic at the Technical Forum. Sergio Andreozzi chairs two sessions to discuss the topics of sustainability of Technology Providers and National Infrastructures on Thursday (room Leo). Following up on the discussion, Friday starts with a workshop analysing the costs of the European e-Infrastructures (room Aquarius) and presenting the latest results of the e-Fiscal project. •

Confirmed Invited Speakers

Tuesday
> Kostas Glinos, recent EU policy developments related to e-infrastructures
> Steven Newhouse, EGI: round-up and future plans

Wednesday
> Matteo Turilli, the achievements of the EGI Federated Clouds Task Force
> Steve Tuecke, cloud-based services for science

Thursday
> Vlatimil Ruzicka, ELI beamlines project
> Esa Turunen, data handling and computing solutions for the EISCAT_3D ESFRI Roadmap project

Friday
> Joe Baguley, on the major trends and initiatives in cloud computing today, where they are most likely headed and why.