

THE MAGAZINE FROM THE GÉANT COMMUNITY | ISSUE 13 OCTOBER 2013

DNA DATA DELUGE

GÉANT AND THE GLOBAL SHARING OF **GENOMIC** DATA

CREATING NETWORKS:

BEHIND THE SCENES AT GÉANT'S NETWORK MIGRATION

BUILDING COMMUNITIES: VIA NETWORK PERFORMANCE AND MONITORING

SUPPORTING NRENS: CELEBRATING 20 YEARS OF EENET, THE INTERNET AND INDEPENDENCE

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CONNECT is the quarterly magazine from the GÉANT community; highlighting key areas of interest, updates on the project and its vital work supporting European research and education. We give insights into the users who depend on the network, and the community that makes GÉANT what it is. We welcome feedback at **connect@geant.net**

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BUILDING ON SUCCESS

inding the time to write this was a challenge, as this time of year always proves especially busy! Not only is there the usual backlog of work after the well-earned summer break, but there are numerous conferences, committee meetings, planning sessions... the list goes on. It does feel like everybody in the GÉANT project is busier than ever, but this is a highly positive signal: this demanding workload stems not only from an ambitious and on-schedule GN3plus project, but also from the fact that GÉANT's importance to the world of research and education is growing ever greater.

We see this from the vast research projects with whom we are working closely; we see it from the strengthening collaboration between networking partners across the world; we see it in the way GÉANT is embedded in the European Union's Digital Agenda for Europe; and we see it in the closer ties with industry.

These links to industry are being strengthened through GÉANT's Open Call initiative: a €3.3 million funding program for multi-domain network R&D activities. The objective is to source new and innovative users and projects to work with GÉANT, developing future innovations to help promote the unimpeded movement of scientific knowledge across highspeed networks. The Open Call was oversubscribed by a factor of 3, drawing 70 responses from Europe and beyond, a reflection of the high regard in which GÉANT is held.

Open Call project representatives will be joining us at our annual project symposium in October, which brings together around 250 project participants in Vienna for the opportunity to gain a wider appreciation of the project and an update on its status. Ideas are



shared, and work programmes progressed in the collaborative, team-work spirit for which the project has become known.

For those in Vienna, we hope you enjoy the event and for those unable to join us, we hope you enjoy the magazine!

Words

Matthew Scott and Niels Hersoug, Joint Project Managers of GN3plus.

DNA DATA DELUGE

ur ability to read DNA is advancing so fast, it's hard to understand how revolutionary genomics could be to human health and medical advancement. But when the topic is brought into the public eye by figures such as Angelina Jolie, who earlier this year had a preventative double mastectomy following analysis of her DNA, it brings home how far we've come in recent years. And with the cost of sequencing a single human genome dropping from \$2.7bn in 2003 to less than \$5,000 today, biologists are acquiring data on a scale that is revolutionising traditional means of data collection, storage and dissemination.

This raises questions around the ethical handling of this data - a hot topic in bioinformatics today. How do you ensure data is responsibly handled and kept private? On page 4, learn how open-data champions EMBL-EBI and ELIXIR have joined a global alliance, and together with GÉANT are building an evidence base that adheres to the highest standards of ethics and a means to manage the growing volumes of data that are exchanged. On page 8 we give you the story of the terabit migration from the eyes of the people who planned and built it - a new perspective on this enormous achievement. Thank you to everybody who contributed.

As well as being an award winning network, GÉANT is now also a Guinness World Record holder! (See page 2). While somewhat difficult to explain, the record demonstrates a network that continues to set the standard in networking excellence – a key message for millions of users who rely on its bandwidth to learn and discover. And, of course it's always nice to be recognised for being the first to do something!

If you haven't already connected with us on social media, we encourage you to join the conversation. Find out how on page 3.

We hope you also enjoy the usual mix of interviews and news from around the world. Let us know what you're up to, in particular if your research project relies on GÉANT! You can write to us at **connect@geant.net**





Editors Paul Maurice & Tamsin

& Tamsin Henderson



WHAT'S THE BEST WAY TO SHOW OFF YOUR NEW 500G NETWORK?

n August, staff at DANTE celebrated a new – unsurprisingly never recorded before – Guinness World Record for the fastest provisioning of long-haul multi-terabit transmission capacity on a live network.

While for some of the more technically minded, this might mean a great deal, to the average person however, it simply demonstrates that GÉANT is a network at the forefront of technological innovation, pushing boundaries in data networking. The message here is for the research and education community, which will reap the rewards of the best data infrastructure available in Europe.

Michael Enrico, CTO of DANTE, said; "While somewhat unusual for your average Guinness World Record, it helps communicate the power, speed and capacity of the GÉANT network and the rapid plug and play provisioning functionality now available. It is important for our users to know that we are able to turn up extra capacity as and when it is needed, offering the scalability and efficiency demanded by today's scientists."

HOW THE RECORD WAS ACHIEVED

Together with Infinera, the DANTE team enabled enough capacity to support the simultaneous streaming of 1.6 million HD films in both directions, in less time than your average coffee break.





GET CONNECTED!

GÉANT's growing social communities are a great way to keep up to date with news, events and what people are saying about the network. We encourage lively participation with our supporters, partners and users, so why not share your thoughts on what we're up to and join in the discussion!

HAVE YOU CHECKED OUT GEANTTV?

At the GÉANT **YouTube** channel you can learn more about the projects we support via interviews with DECIDE, EMBL-EBI, GEO and EIT and about the GÉANT project as a whole with interviews with representatives from the European Commission.

WANT TO UNDERSTAND HOW OUR SERVICES CAN HELP YOU?

Find out how you can benefit from interfederating through eduGAIN in just four minutes.



http://www.youtube.com/ watch?v=x1YhuFPxMz8

Sign up to receive alerts when new videos are uploaded and keep connected to our latest news.

FANCY A CHAT?

Our Twitter followers have grown by 100% in less than a year, so we must be doing something right! We hope you'll follow us too. Find us on:

twitter🎔

@GEANTnews



https://www.facebook.com/ GEANTnetwork

We look forward to connecting with you!



GÉANT AND THE GLOBAL ALLIANCE

READY FOR THE SECURE, GLOBAL SHARING OF GENOMIC DATA

Open-data champions EMBL-EBI and ELIXIR have joined a global alliance to enable the secure and responsible sharing of genomic and clinical data. These big-data heavyweights add substantially to the informatics expertise the alliance needs to build its evidence base for data sharing between genomic research and medicine. Crucially, this data sharing adheres to the highest standards of ethics and privacy. s sequencing costs continue to fall, more individuals are choosing to make their genetic data available for research. There is a lot of enthusiasm in study participants, not least because pooling all this information opens up new possibilities for developing new approaches to medical treatment. But large-scale genome sequencing is a relatively recent phenomenon, and study participation on this scale represents a big change. In light of this, data protection has become a burning topic in the life sciences.

"ELIXIR has joined the global alliance because we are dedicated to ensuring the responsible sharing of data," says ELIXIR Director Niklas Blomberg. "It is a very large-scale endeavour involving a lot of data producers and researchers the world over. I honestly think that an undertaking of this size is only feasible with a robust, flexible technical architecture – and we know that GÉANT and its partners can support whatever practical measures the global alliance decides to undertake."

ELIXIR was initiated in response to the flood of new data being produced in the life sciences, and is building a non-centralised system for collecting, storing and archiving data across Europe. Dr Blomberg explains that GÉANT provides the fundamental networking architecture underpinning ELIXIR services, and its scalability is essential to managing the huge and growing volumes of data that are exchanged.

The central activity of EMBL-EBI, a founding member of ELIXIR, is to share molecular data and information. EMBL-EBI manages the European Genome-phenome Archive (EGA), an exemplar for the global alliance's technical standards for interoperability, data access and security.

The EGA matches up genome data with other features while protecting key information about the research subjects. The individuals whose personal genomic data are contained in the archive have expressed a desire for this information to be used in research, but gaining access requires researchers to put in more effort than they would for openaccess data sets. By developing a secure, centralized, access-approval system that facilitates access while ensuring the appropriate level of privacy, the global alliance could have a dramatic, positive impact on

"The global alliance will rely on the stability and sustainability of resources like the EGA, which connects genomic research data with those wishing to access it," says Paul Flicek, who leads genome resources at EMBL-EBI. EMBL-EBI deals with around 18 petabytes of data, including EGA, European Nucleotide Archive, 1000 Genomes Project and ENCODE datasets – so it has large bandwidth and connectivity requirements as well as access restrictions. GÉANT offers the capacity to manage such heavy usage: EMBL-EBI's inbound bandwidth requirements often peak at around 8Gb per second. "What makes research like this so

"What makes research like this so powerful is that we can compare very large datasets like the ones in EGA with similar resources that are developed in many different parts of the world," Dr Flicek explains. "Making these data available to researchers worldwide – GÉANT has been critical to doing that. Public services like these could not exist without GÉANT, and initiatives like the global alliance could not move ahead without them."

In addition to the EGA, the 1000 Genomes Project and other population-level genome studies (for example the Korean Genome Project) are providing baseline information about human DNA, to be used for comparison against new clinical data. These baseline datasets will constantly undergo improvements and revisions as science progresses. "Ultimately, researchers are going

"Ultimately, researchers are going to need guaranteed access to new data in real time, and data providers are going to need secure authentication to make sure identifiable information is in the right hands," Dr Blomberg says.

Members of the alliance are committed to creating a common framework that supports clinical and genomic data analysis while protecting the autonomy and privacy of participating individuals. Scaling up a federated authentication service and adapting it to different legal and cultural environments is a basic need of the global alliance, which comprises over 100 organisations in Asia, Australia, Africa, Europe, North America and South America.

"The global alliance will need a truly global network to be effective, because data will need to be transferred between global partners, traversing many networks," adds Dr Flicek. "An endeavour of this size can only work because the research and education networks are ready for them. We know it can be done because GÉANT gives us the speed, security and capacity we need."

EXTERNAL LINKS

www.elixir-europe.org www.ebi.ac.uk theglobalalliance@oicr.on.ca

QQAATRYFONTRYFONCHOFOFHEAD OFGÉANTPROJECTOF



In September Tryfon Chiotis joined DANTE as head of the GÉANT Project Office, following the departure of Milos Karapandzic. With the Project Office fundamental to the successful running of the GÉANT project, Tryfon faces a challenging and demanding task. Fortunately his track record in securing and managing EC-funded projects stands him in excellent stead! CONNECT spoke to Tryfon to understand more about his role and his objectives for the Project Office.

WHAT IS THE ROLE OF THE PROJECT OFFICE?

The Project Office (which is also known as the Programme Management Office, or PMO) is there primarily to support and assist the Project Managers. We handle the day-to-day management and administration of GÉANT, assisting in the collation and exchange of information such as financial and manpower reporting, run the technical authoring service for reporting, and generally ensuring all participants have the collaboration tools they need to carry out their work. This includes areas such as managing the project intranet, and also organising internal events such as the GÉANT Project Symposium (held each autumn/fall in Vienna) and the GÉANT Project Convention - which this vear was the kick-off point for the GN3plus project. However, it also means arranging the other internal events such as the Project Management Team (PMT) meetings, the Exec meetings, and so on. We also deal with risk, issues and change management, training needs and of course coordinate the Project Management Framework (PMF). It's a pretty big remit!

HOW DOES IT INTERACT WITH THE OTHER AREAS OF THE PROJECT?

The Project Office is part of the Governance and Management area of the project. We work closely with the Project Managers, Activity Leaders (via the PMT) and with the Executive Board and Partners' Assembly. Of course, where required we liaise with individual Task Leaders and project participants on many areas of work.

Over the summer, the Project Office has put in place a number of new processes to improve efficiency, and to better fit into the GN3plus governance model. This, and the new Advisory Boards and the more intensive use of the Coordinators in the day-to-day running of the project, should ensure a wider technical consultation before decisions about the execution of the Work Programme are taken.

WHO ELSE IS IN THE PROJECT OFFICE TEAM?

Alongside me, the team includes our Project Manager Linda Mesch, Technical Writers Sue Tyley, Bridget Hannigan and Colin Duly, and Jill Compton who has recently joined us as PO Administrator.

Tor Bloch has been running the Project Office on an interim basis to ensure a seamless handover period from Milos to myself. Following the handover, Tor will remain as a consultant to myself and the Project Office for a suitable period, given the busy times ahead!

WHAT DO YOU SEE AS THE MAIN OBJECTIVES AND CHALLENGES IN YOUR NEW ROLE?

Initially, my objective is to be up to speed as fast as possible, and in this my relationship with Tor will be highly beneficial. Following the formal handover, Tor and I will work together to liaise with the Advisory Boards and Coordinators to plan for the remainder of GN3plus and beyond. Of course, another objective is to close the GN3 project with excellent remarks. One main challenge is to provide the channel and point of cohesion between what needs to be delivered for GÉANT, understanding the requirements of senior stakeholders (EC and NREN managers), and making sure it is translated into real project deliverables.

WHERE DID YOU WORK PRIOR TO THIS ROLE?

I worked as Chief Technical Officer at GRNET, the Greek NREN, where I spent the past 14 years building up a strong organisation, and securing and managing EC-funded projects. So I have a lot of experience of the GÉANT community! I have also served as a board member for the Greek Chapter of the Project Management Institute (PMI) and I have ample experience in Project and Programme Management. I was a member of the Future Internet Forum (FIF), where I have dealt with next generation networking. Last but not least. I have served as a board member for the Infosoc SA, where I spent considerable time with public administration networking.

WHAT DO YOU ENJOY MOST ABOUT YOUR WORK?

I would have to say the exceptional quality of the people I work with from all countries and their ingenious minds. They are all remarkably knowledgeable and never seize to amaze me. At DANTE, I particularly enjoy the workplace as everything is deftly organized and working with such a proficient team daily motivates me enormously.

LAST MOVIE YOU WATCHED?

"The Call", and I have to admit that I was gravely unnerved. I went home thinking whether I should put a tracking device on my children.

WHAT ARE YOU READING?

"The elephant song" by Wilbur Smith. I am fascinated by the African continent.

WHAT'S IN YOUR MUSIC LIBRARY?

Anything from Frank Sinatra to Rihanna.

WHAT DO YOU DO FOR DOWNTIME?

I cycle a great deal with my family or I just relax at home with a good movie or book.

GÉANT - THE PEOPLE'S NETWORK

Research and education networks are known for empowering people to learn and discover, as well as the amazing science projects they facilitate. But as networking technology becomes as important as the science itself, the story of the people that build and maintain the networks deserves recognition of its own.

In the last issue we announced completion of 100Gbps capacity across the entire GÉANT network. To some it might appear to have happened at the flick of a switch! But with over 34 countries involved, a vast and complex procurement process, and 50,000 km of infrastructure to refresh, the upgrade was anything but simple and has been years in the making.

CONNECT caught up with just a handful of the talented people who created the network we have today, asking: "What was it like to be part of such a ground-breaking project?"

PRE-MIGRATION



MICHAEL ENRICO, CTO, DANTE

I was involved in the first technical workshops in 2008 to map out and define the specifications for the network. DANTE worked very closely with the National Research and Education Networks (NRENs), sometimes with up to 40 attendees, to agree how we wanted the network to look. With so many stakeholders, a long procurement and decision making process followed over the coming years.

While this was happening, consolidation of competitive forces came into play, with a previous duopoly of vendors giving way to a much more open and competitive market. As one of our main goals was to provide a cost-effective, but cutting-edge network, we were able to create strategies for future proofing the network up to 2020 and perhaps beyond.

The process required long-term vision and cooperation from a diverse and geographically dispersed group of technical and procurement experts who had to make big and difficult decisions. While in no way plain sailing, the end result is a network that not only serves everybody's purposes but facilitates a more cohesive environment and a stronger team; an aspect of working with GÉANT I feel very proud of.



PER NIHLEN, CTO, SUNET

Early in the pre-migration stage I was on the phone discussing a plan to find an NREN resource to assist with procurement, part of DANTE's inclusive vision. It rang a bell for me and I wondered whether that person could be me! I had a big decision to make, with my family in Sweden and two children under five. And yet, the opportunity was very appealing. I decided to go for it and spent a year on secondment with DANTE, but compromised by renting a flat in Cambridge for two months with my family and commuting the rest of the time.

It was an interesting time with a lot of steps and political hurdles to manage. Governance needed sorting out before we could focus on getting the technical solutions and operations in place. It required really careful handling. Not many people get the chance to work on competitive dialogue procurement, a massively complex procedure, so it was a very useful experience.

A particular benefit I noticed as a result of the vast collaborative project was improved understanding among the community. I also made life-long friends in the process and gained a new perspective on DANTE. I have increased respect and understanding for them, having seen first-hand the difficulties in trying to keep so many different organisations happy; an almost impossible task.





SCOTT INNES, SENIOR NETWORK ENGINEER, JANET

I joined DANTE to assist and learn with the pre-migration, with little knowledge of what I had signed up for. I had my baptismof-fire on my second day at an Infinera meeting and with no time to sit back and casually learn the ropes, quickly learnt how agile and 'on it' the migration team were. I was fully immersed in the process from day one.

From week two we were firmly into the planning of power and accommodation. Would the routers fit in the current racks? Would there be enough power? How would we get rid of extra heat from the larger chassis?

We were right to question. At several POPs they were unable to deal with DANTE's new housing requirements. Paris, for example, required us to source a completely new room.

For every small change, new contracts had to be drawn. And then there was the DTN-X - a behemoth piece of kit that had the POPs questioning our knowledge of power. All this had to be planned, and re-planned until gradually we worked to a point where it could be shipped and installed.

In some cases we had no choice but to attend site. Paris, Tallen, London, Geneva, Copenhagen; all sound like film star locations, but hours spent in noisy POPs are really not that great. Copenhagen proved a nightmare. After much planning and arranging of access, myself and an engineer from Infinera ended up stuck in the middle of nowhere outside the PoP in freezing horizontal rain, trying to hatch a plan and gain access as we had arranged. Freezing wet nights, soaked through, on the entry phones apologising for our lack of Danish was not what we dreamt of on the flight out!

However it was an enjoyable eight months and I drew much knowledge from the friendly staff at DANTE as well as from engineers at Imtech and Infinera. My ability to converse at a higher-level led to me being offered a senior engineering position at Janet. I now have a new skill-set and can offer my organisation an insight into working at DANTE.

I'd like to make a special mention to the migration team, a bunch of guys like no other. The bond we had was awesome. I'm not sure how many cups of tea we drank together in my time but we were literally one-for-all-and-all-for-one.

GABOR IVANSZKY, SENIOR NETWORK ENGINEER, NIIF/HUNGARNET

I worked as a member of the migration team, having agreed with my home organisation NIIF Institute to a secondment at DANTE. I looked at understanding the pre-migration state, preparation of the POPs, electrical power, space and logistical issues. It was great to become a valuable part of a major service provider's team of experienced, multi-cultural staff, although having never used English in an everyday work situation, getting around had its moments! I gained a great deal of professional experience and learnt more about life in the UK.

THE MIGRATION ROLL-OUT





MARK JOHNSTON, CHIEF NETWORK OPERATIONS OFFICER, DANTE

FEATURE

I joined DANTE as a contractor just before the start of the migration. Coming from a commercial telecoms environment, with a much more regimented structure, I was struck by the difference in working culture, with less defined roles and more fluidity of planning.

Unsurprisingly nobody had ever worked on a roll-out of this scope before, so there was no defined approach in place to help us implement it. Theoretically we were sound, but in practice life for 10 months became an endless round of last minute adjustments and finding our feet as we went along. We often found ourselves implementing and planning at the same time.

Availability of information often presented a challenge, which, along with financial constraints and governance, certainly kept us busy with day-to-day problem solving. When I look back at the magnitude of what was achieved I'm still completely dumbfounded we delivered as well as we did without any major problems.

I got a real sense of achievement seeing how quickly everybody gelled and pulled together. The less experienced engineers were able to draw knowledge and skills from the group. From individuals we formed a really strong team helping each other to get the job done and are a hell of a lot more knowledgeable as a result.

Operations is a much more open relaxed environment now. I think people feel more confident and empowered. They are coming up with more ideas and discussion, are more willing to debate and to suggest ideas. It's been a big enabler across other departments too. Working closely with finance, procurement, business development and marketing reflects the level of collaboration essential to a project of this scale.

Likewise working with our European partners, the NRENs, has facilitated greater understanding, on both sides, of the challenges each other face. We are particularly proud of the wonderful feedback we received (see box out) and look forward to building on these improved relationships as we watch the community reap benefits from the new GÉANT infrastructure.

On a personal note, it's been an amazing career opportunity. I was delighted to get the chance to add real value and make a difference as part of an award winning team.

"ONE OF THE BEST PROJECTS I HAVE WORKED ON. LEARNT A LOT. GREAT TO BE PART OF THE TEAM THAT DEPLOYED A RECORD BREAKING NETWORK."

DOM TAILOR, HOSTING INFRASTRUCTURE LEAD, DANTE



HENRY AGBENU, TRANSPORT ENGINEER, DANTE

Having worked at DANTE for almost five years I had a good understanding of the network and the services running on it, so acted as a consultant for the service migration and was also heavily involved in POP logistics.

The migration process was not so different to the methodologies used in project management. Except on a massive scale! The initial planning phase involved a lot of meetings to try to understand the scope of the migration. For instance how to migrate the GÉANT plus services from the legacy SDH equipment to the new Juniper Ethernet switches and the Lambda services and Dark fibre to the new Infinera solution. But there's nothing like a good team putting their heads together.

With these types of challenges and of course the need to maintain operation of the existing network at the same time, we needed a willing and motivated team to deliver, and that was what we had. We all have varying skills but perfectly complement each other and the fantastic leadership from Mark Johnston really helped pull everyone together.

Although not part of the procurement process, I got to know some of the commercial activities involved. This is a project that happens once every ten years, so to be part of one has been great. As an organisation the process of building a network of the size and scale of GÉANT is clearly understood now.

When I have a small project now, the first thing that comes to mind is, what could happen here that I haven't dealt with before? This thought is very motivating.



POST-MIGRATION



GABOR IVANSZKY, SENIOR NETWORK ENGINEER, NIIF/HUNGARNET

We were one of the first to take advantage of the upgrade, by adding a 100Gbps service connecting CERN's new datacenter in Hungary to CERN directly. As 100Gbps Ethernet was not a mature technology yet, we faced new challenges during the service turn up process but thanks to cooperation between CERN, DANTE, CERN@Wigner and NIIF/Hungarnet most of the difficulties were handled quickly during the initial warm up period. My advice for anyone planning to do similar is to allow a long testing period and be prepared for issues you had never thought of.

I'm proud to have been associated with NIIF Institute in Hungary for many years - and now also proud of my involvement with DANTE. I've really enjoyed working with the very delightful staff and with the numerous experts representing the NRENs that keep close contact with DANTE. And last but not least, I fell in love with Cambridge and the local atmosphere.

I hope that the last decade of research networking success will be repeated both on the GÉANT and the NREN levels. This is only possible if we do our best to cope with the fast increasing demands of our changing world. Keeping pace with the global technological development, extending the service portfolio, and widening the user community, are all needed if we really want to continue the success story.

STUART WARE, TRANSPORT NETWORK MANAGER, DANTE

I joined DANTE in June 2012 coming from a carrier network operations background. I could not have been more shocked at the reception I received, having never been made more welcome on day one, so all good. The following week the storm broke... we had a little over 5 months to prepare for the most aggressive network build I have ever had to work on.

The operations team though technically excellent had little or no experience of a major network roll out. Some had spent their careers in house, never even visiting a telehouse, let alone negotiating with dark fibre providers or trying to get a cost reduction on fibre patch leads. A baptism of fire to say the least. But as is the DANTE way, the team rose to the challenge, picking up new skills quickly. They played off each other's strengths, nothing was ever too much trouble and everybody rolled up their sleeves and dug into the preparation work. Five months flew by and next was the delivery phase.

"It's all about the delivery." This became our motio for the build, nobody cared how late you worked, or how much you cried, it was all about getting the network delivered. To say this phase was agile project management is an understatement. Every one of the 268 days (not that we counted) had challenges, but thanks to the team's performance and support from other staff at DANTE, every challenge was met and goals exceeded. Also, without the support of the NRENs and flexibility we could not have finished on time.

So post migration we now have a big network for big science. You have to love that idea. After all it is why we spent a year of our lives building something truly special.

It's also a record breaker, with 2Tbs in 20 mins and the Guinness World Record of 8Tbs in 19 minutes, demonstrating a network technically able to carry the NREN requirement into 2020. But to me it is also a network that is now run by people who can achieve anything they set their minds too. Pretty good team if you ask me.

For more information, please visit www.geant.net/network



NETWORK PERFORMANCE AND MONITORING ACROSS THE EQUATOR

Words Paul Maurice, Senior Communications Officer, DANTE



ith scientific and research collaboration becoming ever more global in its scope, so the need for data to be carried across the world grows. These vast high performance networks criss-cross the world, and their applications and their data traffic need to be monitored to ensure the highest performance.

So behind the networks and powerful tools are the people across different countries, continents and time zones, who ensure these networks and tools perform to their very best. And just like the research communities they support, they too need to work closely together, collaborating and sharing knowledge and expertise.

So in July this year, Domenico Vicinanza (DANTE) and Alessandra Scicchitano (SWITCH) crossed the equator to visit the NRENs of New Zealand (REANNZ) and Australia (AARNet) with the objectives of sharing knowledge and best practice, and further strengthening collaboration and community building in the areas of network monitoring and performance.

Domenico is the driving force behind perfSONAR MDM, the multidomain monitoring tool for GÉANT, and which is fully interoperable with perfSONAR PS – an equivalent tool used in some regions of the world, including Australia and New Zealand.

His view behind the trip is clear: "The main purpose was sharing tools and knowledge, but also feeling like we are all part of the same community. We don't just need powerful tools like perfSONAR, we need a network of people who know they can count on each other. This is what eduPERT is doing. And the experience of our colleagues in AARNet and REANNZ is really valuable to us – because of their location they are facing every day what we occasionally – though more and more frequently – face: long-haul intercontinental network monitoring."

Alessandra leads eduPERT, the federated community that, as part of GÉANT, combines all the independent PERTs (Performance Enhancement and Response Teams) across Europe, providing multidisciplinary knowledge and support in solving end to end performance issues.

The users of both perfSONAR MDM and eduPERT are part of a community that improves with size – growth in the number of monitoring points means an ever greater view of the network, whilst eduPERT's knowledge sharing can only benefit from a greater pool of knowledge! Indeed, the model used for eduPERT in Europe is inspiring new communities to be established in other parts of the world, for example Latin America and now New Zealand and Australia.

Alessandra adds, "The fact that these regions are beginning to establish eduPERT communities based on our European model is really satisfying to see. GÉANT is the only R&E network that fosters such a community passionate about network monitoring and troubleshooting, and it seems this approach has been well noticed by other regions. We are delighted to be working with them to develop their own communities, which will be closely inter-linked to ours. It means stronger support and more seamless networks for all of us."

SPREADING THE WORD AND SHARING EXPERIENCES

The trip began in REANNZ, for an intensive training course for local engineers on improving performance; firstly covering perfSONAR MDM for monitoring and also looking at the general concept of virtualisation and how firewalls can have an impact on performance.

Picture

Wellington, New Zealand

Inset

Domenico Vicinanza and Alessandra Scicchitano

The monitoring session included live measurements on transatlantic data between GÉANT (London) and REANNZ in Wellington using perfSONAR MDM, as well as discussing future developments and sharing methodologies. Domenico showed how deployments of the two versions of perfSONAR were interoperable, and how to use the perfSONAR MDM web user interface, performing on-demand measurements between New Zealand and the rest of the world. In fact, the web user interface proved so easy to use, engineers were able to set up new nodes and run measurements in less than a minute!

BUILDING THE EDUPERT COMMUNITY

The two then travelled with REANNZ colleagues to Christchurch to help run a workshop at the eResearchNZ conference run for the universities and research centres in New Zealand, titled "All about performance: network, end hosts and everything in between", and including presentations on perfSONAR MDM and eduPERT.

the audience was full of enthusiasm and interest for growing and joining the eduPERT community, testament to the importance given to performance and knowledge sharing.

The final leg of the trip was the QUESTnet 2013 Conference. Queensland Education Science and Technology Network (QUESTnet) is the regional component of AARNet and their annual conference was a valuable opportunity for Domenico and Alessandra. After presenting on eduPERT and perfSONAR MDM to an enthusiastic audience, highly constructive meetings were then held. Part of the perfSONAR MDM training included using the innovative 'perfSONAR on a stick' – a USB stick pre-loaded with perfSONAR MDM and which installs the network monitoring software in less than a minute, enabling any computer to become a fully-functioning perfSONAR MDM measurement point. No installation, no configuration, just 'plug in and switch on'!

Picture

perfSONAR

user interface

measurement

showing live

London and Wellington

(REANNZ)

between

The first of these was with representatives of AARNet, looking at troubleshooting performance issues on international links, in collaboration with networks outside of Australia. Engineers from AARNet are very keen on joining the eduPERT community, with the hope of one day establishing their own. A further meeting was then held with representatives of ESnet (Energy Sciences Network, USA) about the possibility of a future joint event

between ESnet and eduPERT, and the expectation is that this will be scheduled for early 2014. Overall, this was a highly valuable

trip and a clear reminder (if it were needed!) that collaborating on performance and troubleshooting is vital if networks are to deliver the seamless experience relied on by large scale, international research projects such as the Large Hadron Collider (LHC) and the upcoming Square Kilometre Array (SKA). The success of this trip and the actions arising out of it are also strong indicators that services established in GÉANT are increasingly being seen as the role model for others around the world.



About perfSONAR MDM perfSONAR MDM is the multi-

domain monitoring service for the GÉANT Service Area (and beyond), enabling NREN Network Operations Centres (NOCs) and Performance Enhancement Response Teams (PERTs) to collaborate in providing seamless network performance for their network users. As perfSONAR is the result of a global collaboration effort and a shared protocol, GÉANT's perfSONAR MDM is fully interoperable with similar services developed and offered by international partners, facilitating monitoring and trouble-shooting on a global scale. It is also compatible with single domain monitoring tools that might already be in use by a NOC or PERT.

For more information, please visit **perfSONAR.geant.net**

About eduPERT

As networks and networked applications grow and develop, so do the demands they make on performance and reliability. Performance Enhancement and Response Teams (PERTs) are therefore a crucial R&E community resource, helping to solve their users' problems quickly and efficiently. eduPERT to helping network users get the best performance from their connections, providing a federated PERT that combines the independent PERTs (GÉANT, National, Local and Project PERTs) with a portfolio of central services to aid them in their network investigations.

For more information, please visit **eduPERT.geant.net**

EDUGAIN MEMBERSHIP GROWS AS NEW CONSTITUTION AGREED

his summer, the GÉANT eduGAIN inter-federation service made great progress towards students and researchers collaborating via online research and education (R&E) services and content hosted across many countries. With a new constitution agreed by participating identity federations and coming into effect from the end of September, the goal of widespread, trusted interfederation has moved closer.

eduGAIN originally had 15 identity federations in its sights; now 25 have signed a declaration agreeing to abide by the new constitution and are full participants in the service or are close to completing the process qualifying them to join. Five more candidate federations have begun preparations and another twelve are future targets for inclusion.

The new eduGAIN constitution. which was approved by the eduGAIN Steering Group and ratified by its Executive Committee in June, gives the member federations greater technical flexibility and more say in the direction of the service. Simplification of the constitution means interfederation activities can be better supported by eduGAIN and with fewer obstacles. And for the first time the constitution specifies voting



Words Laura Durnford,

TERENA

Picture Paola Arellano of REUNA, Chile signing the eduGAIN Declaration to start the process of COFRe formally joining eduGAIN 6 June 2013

procedures that clarify the decision making process member federations follow in expanding and improving the service

To support federations' compliance with the constitution's technical requirements, and to achieve overall consistency, eduGAIN has commissioned templates for describing federation policies and practices. This will allow more federations to complete the joining process in the coming months and simplify the comparison of federation practices across its membership. Some federations have received

support for their creation or development with the assistance of eduGAIN, through training at national conferences, other events, or through consultation on policy. The GÉANT project further fosters the growth of identity federation activities through the 'Digital Inclusion' and 'Federation as a Service' tasks, bridging the digital divide between countries where no national federation efforts exist. In this way, the GÉANT project is providing a coordinated approach to interfederation for the ultimate benefit of students and researchers around the world

For full details of current eduGAIN members, joining federations and candidates, see: http://www.edugain.org/ technical/status.php

Targeted federations are: MATE (Argentina), CARSI (China), INFED (India), ISRAGRID (Israel), Litnet Federation (Lithuania), Knowledge ID (Oman), INCA (Peru), PIONIER.Id (Poland), RoEduNet Federation (Romania), **Φ**EDUrus AAI (Russia), iAMRES (Serbia), SAIF (South Africa)



To learn how eduGAIN helps to connect researchers with their services, visit youtube.com/GEANTtv

QQAAAFRODITEAFRODITESEVASTIACTIVITY LEADER(JRA2)



Afrodite Sevasti of Greek NREN GRNET, leads the Joint Research Activity (JRA2) focusing on Technology Testing for Service Specific Applications. CONNECT caught up with Afrodite to learn more about the work in this area, and how it encourages innovation in the project.

HOW LONG HAVE YOU BEEN PART OF GÉANT, AND HAS YOUR ROLE ALWAYS BEEN IN THAT OF THE JRA?

I am privileged to have been part of the GÉANT family for almost 10 years, starting as a network engineer involved in both Service and Joint Research Activities in the early years and leading JRA teams for the last 7 years.

WHY IS THE ROLE OF THE JRAS IMPORTANT TO GÉANT? WHAT VALUE DO THEY ADD TO THE PROJECT?

JRAs are the sources of innovation for GÉANT. User community requirements, service activity needs, blue-sky research initiatives and new service concepts all blend within the JRA environment, leading to innovative results in the areas of service provisioning, operations, middleware, network architectures and more. JRAs follow the latest developments in standard bodies, the IT service markets, the vendor community, partner organizations, R&D projects and initiatives globally and make sure that upcoming GÉANT services and capabilities are aligned with them or at times even leading progress. At the same time, researchers from within the GÉANT community often bring forward and develop clean slate concepts and models. JRAs provide the fertile grounds upon which novel service offerings and competencies are conceived. elaborated, defined, designed, proven and very often prototyped before being handed over to SAs and ultimately delivered as value to the GÉANT user community.

HOW HAS THE FOCUS OF YOUR RESEARCH TEAM (JRA2) IN THIS PROJECT (GN3PLUS) CHANGED FROM THE PREVIOUS PROJECT (GN3)?

GN3 JRA2 was a diverse activity aiming at innovating in all aspects of the GÉANT multi-domain network services, including network management and operations to support services, monitoring, security, resource provisioning. JRA2 developments in GN3 were multi-threaded and at the same tightly integrated with the corresponding service roadmaps.

In GN3plus the scope is narrower. JRA2 is focusing on the latest developments in software defined networking and network virtualization to generate value for the GÉANT user community. These technologies are currently shaping the internet of tomorrow. So, JRA2 is not only setting the foundations for the next generation of GÉANT provisioning services but also paving the way for specialized serving of advanced applications as well as the cloud in the near future.

HOW DOES JRA2 INTERACT WITH THE OTHER JRA WORK PACKAGES?

Within the GÉANT ecosystem, JRAs are constantly interacting to make sure their research agenda is aligned. Joint workshops and working meetings on designated topics are organized regularly. In certain cases, the best of expertise from different JRAs is combined in joint ventures, where one JRA team might be focusing on the exploration of a new technology while the other JRA team is producing prototype software to prove the concept. At the Activity Leader level, there are often informal discussions on common interests and decisions to plan collaboratively on future steps.

IN WHAT WAYS DO YOU SEE THE WORK OF JRA2 IMPACTING THE END-USERS, OVER TIME?

JRAs are often delivering prototypes and proofs of concept for new services and capabilities that eventually enter the GÉANT service portfolio. Thus, they are providing utility to the end user community. In other cases, new operational capabilities, increased flexibility in accessing the resources available, enabling of federated functions and improving the performance of existing services are also delivering warranty and value to the end user community by meeting specialized and advanced requirements.

IN TERMS OF THE JRAS, WHAT AREAS WOULD YOU LIKE TO SEE INCLUDED IN FUTURE PROJECTS?

So far, network-related JRAs in GÉANT mostly focus on solutions developed on top or aside of industry solutions in the areas of transport technologies as well as management and control of network infrastructures. Future projects should pursue joint developments with the industry to deliver innovative results on autonomic and user-empowered networking, always with focus on serving the specialized needs of the R&E community. GÉANT JRAs have the potential to lead in the areas of federated service provisioning and operations.

WHAT DO YOU SEE AS THE MAIN OBJECTIVES AND CHALLENGES IN YOUR ROLE AS ACTIVITY LEADER?

Being an Activity Leader in a research activity is primarily about setting the scene so that the best of ideas from talented and foresighted colleagues are cultivated to generate value. Identifying the research priorities with an eye on project-wide objectives as well as specific needs, making sure worthwhile research results are picked up properly, inspiring the teams to innovate despite of working away from the users of their research outcomes are among the challenges of the job.

WHAT DO YOU ENJOY MOST ABOUT YOUR WORK?

Diversity and originality of daily activities

LAST MOVIE YOU WATCHED?

'Before midnight'

WHAT ARE YOU READING?

Trying to finish up a Greek novel for several months now

WHAT'S IN YOUR MUSIC LIBRARY?

Bands such as Pink Floyd, The Cure, Pearl Jam, James and lots of Greek music

WHAT DO YOU DO FOR DOWNTIME?

Playing with my son, jogging



20 YEARS OF # EENET, THE INTERNET AND INDEPENDENCE

n a way, the internet has been a symbol for national success and democracy in Estonia.

Twenty years ago during the first years of re-independence the Estonian Education and Research Network (EENet) was established to manage, coordinate and develop the computer network of science, education and culture in Estonia.

Infrastructure and availability of information played a crucial part in the early 1990s, the time of reindependence when political tensions in the Soviet Union culminated. So it did not lose vital information channels with the rest of the world, Estonia needed to find an independent channel to avoid possible information blockades during the critical political situation.

The internet and independence

Awareness of computers was already there in 1950s and demand was growing thanks to the radio 'Voice of America'.

The first lecture about programming was held in 1958 under code name "Additional Chapters of Algebra" at the University of Tartu in the deep communist period. The university was lucky to get its first computer URAL-1 the following year, as there were no other competitors for it in the whole Soviet Union: Moscow and Leningrad (St. Petersburg) already had a computer. At the same time with the first computer centre in Tartu in 1965, another computer centre at Nõo Secondary School was established. Nõo was the first school of general education in the Soviet Union that owned a computer: the same URAL-1 based on electron tubes. Computer lectures started in Nõo in the same year.

The preparations for connecting Estonia to the internet started in 1992, culminating in two 64 kbps satellite links to the Swedish Royal Institute of Technology: one from Tartu and the other from Tallinn. In the same year Estonia became an official member of

Words Maria Ristkok, Project Manager - Network Department, EENet





the internet with its own country code TLD (.ee), registered by the National Institute of Chemical Physics and Biophysics.

In 1993 EENet was established as a governmental nonprofit organisation. The TLD.ee was managed by the Registrar EENet for 17 years (1993-2010) and was handed over to the Estonian Internet Foundation 3 years ago. During the first development years EENet was supported by the philantropist George Soros, as well as the Nordic Council of Ministers and the Finnish national research network FUNET.

New legal form of EENet

From 1997 until 2013, EENet operated as a state agency administered by the Ministry of Education and Research. The ministry streamlined management information and communications technology for education and research. This year EENet got its legal form changed and became a structural unit of the Information Technology Foundation for Education (HITSA). EENet continues as part of HITSA with its mission to provide a high-quality infrastructure for research, education and culture and is still financed by the state. **Picture** EENet office at the Town Hall Square in Tartu, July 2013

EENet Customer base and network

EENet provides services to educational, cultural and research institutions not engaged in commercial activities in the network. EENet services are used by 1090 organisations with 218,000 end users. The field of education and research has always been a pioneer in networking, hosting critical users of new technologies. A fast internet connection is crucial for the majority of researchers collaborating with other communities outside Estonia.

The backbone is currently upgraded in the framework of an EU funded project "Estonian Research and Education Optical Backbone Network". The capacity will be Nx10Gbps. Another project funded by the European Regional Development Fund is "The Estonian Scientific Computing Infrastructure" (ETAIS).

For ensuring the long-term sustainability and international collaboration platform for scientists the Estonian National Grid Infrastructure has been connected to the European Grid Initiative (EGI). ETAIS is developed in collaboration with Estonian universities and institutes. Furthermore, the academic authentication and authorisation infrastructure TAAT was developed as part of ETAIS. The major universities have already joined as identity providers and EENet is currently undergoing technical preparations to join Kalmar2 and eduGAIN interfederations.

Looking into the future

The peculiarity of the Estonian network derives from the size of the country and its population - less than 1.3 million people. Small countries like Estonia need a large customer base for more effective operation and collaboration across the infrastructure. According to the user survey (2011) half of the higher education institutions need fiberoptic connections next year (2014) and a third need up to 10 Gbps. In addition, almost 40% of the research institutions need 10 Gbps connections in the nearer future. Thus the EENet optical backbone network project is being carried out just in time.

In 2013 EENet, the Estonian Information Technology Foundation and the Tiger Leap Foundation were consolidated under the roof of HITSA. In addition to developing the basic infrastructure for the needs of education and research, HITSA will also become a competence centre for increasing the quality of teaching and promoting ICT education at all educational levels.

For more information, visit http://www.eenet.ee/EENet/ EENet_en

TOWARDS E-EDUCATION IN CROATIA

roatian Academic and Research Network – CARNet is investing lots of effort into implementing an e-Education in Croatia. Over the past 7 years a series of projects have been implemented in order to achieve that. Here we'll present the most recent ones.

Classroom of the Future

The Kamesnica Elementary School in Otok, Split-Dalmatia County, has become the first 'Classroom of the Future', enabling over 470 students, along with those in satellite schools in villages of Ruda and Udovicici, access to interactive learning supported by the latest information technologies. This implementation of Samsung School platform, implemented in joint forces by the Croatian Academic and Research Network - CARNet, Samsung Electronics Adriatic and the Croatian Ministry of Science, Education & Sports, is one of the first in the region. The school has been equipped with a smart board (a 65" LFD with touch overlay), tablet PCs and accompanying software and server infrastructure, to serve students in the higher grades of elementary school - from 5th to 8th grade. IX. Gymnasium (secondary school) in Zagreb followed this and was the second school to join this project.

National Information Admission System for Secondary Schools

For the first time ever in Croatia enrollment to secondary schools was conducted completely online. The National Information Admission System for Secondary Schools has been developed and implemented in the past year enabling easier enrollment to secondary education. The figures indicate that 45,672 students submitted their application during the first admission term, out of a total of 46,157 students. As of today, 45,313 students are enrolled in one of the general education programmes, while 1,524 students will have to face the autumn admission term, where 9,748 free spots will be available for them. Talking about the complexity of the project, Zvonimir Stanić, CARNet Chief Executive Officer, pointed out that the system contains more than 10 million data, and CARNet's Helpdesk, which provides help and support to students, parents, school principals and other participants of the process, received 36,630 inquiries. "There were numerous hacking attempts as well, but they were all prevented successfully", Stanić said. The whole system is hosted in CARNet and is running on CARNet infrastructure.

Schools 2.0 Project

The Schools 2.0 Project of the Croatian Academic and Research Network -CARNet was chosen as one of the three most innovative initiatives in the category of Initiative for the Education and Research of the European Prize for Innovation in Public Administration. The aim of this project is to enable high-quality and comprehensive distance learning and e-learning for an increasing number of users - both teachers and students. As part of the project, 25 school locations were connected to high-speed Internet via an optical network (7 main schools with corresponding branch schools). Wireless networks (including eduroam) are set up in these schools to enable students and teachers to access online learning materials and digital textbooks via the tablet, and use them for videoconferences and distance learning. All of these schools also took part in the e-Class Register project.

For the project, CARNet received just over €1,5 million through a public tender conducted by the Croatian Post and Electronic Communications Agency - HAKOM, which was used not Words Goran Skvarc, CARNet



only to finance the mentioned network and videoconferencing infrastructures and connections, but also for the purchase of tablets for teachers and students, as well as any necessary teacher education aimed at improving their digital competence, specialized education for the use of technology and the planning and implementation of project-related cooperation among schools. Schools are also equipped with scientific learning technologies (sensors) for natural sciences - biology, chemistry, physics and ecology.

e-Class Register

In the fall of 2011, with the beginning of the new school year, the new CARNet project, e-Class Register, began, keeping class registers in



electronic form. The pilot phase of this project then included 9 freshman classes in three secondary schools and today has grown to more than 250 schools that implemented e-Class Register as the sole source of tracking all aspects of a pupil's performance. The application was developed by CARNet and it has all the functionalities of existing class registers with additional functionalities that enable the use of ICT technologies. Along with the existing functionalities of the paper-based class register, the application has the added value of a reporting system that helps the teachers in monitoring the students and preparing reports for sessions of the teacher's council. In a quick, simple and reliable way, homeroom teachers, teachers and principals will be able to see various reports on grades and

absences, and there will also be the possibility of alerting the homeroom teacher about students with a large number of negative marks or absences and alerting the principal about backlogs in the execution of the curriculum.

An additional advantage will be the prevention of misuses concerning unauthorized entries as well as cases of theft and accidental or intentional destruction of the class register with which schools are sometimes faced. Connecting the e-Class Register with the central e-main registry is planned in order to extract the data from the applications so as to decrease repeated data input.

"One of CARNet's priorities is to encourage the implementation and use of ICT in education. We have recognized the potential of these projects as the ones that will significantly contribute to the goal of achieving e-Education in Croatia. CARNet will monitor the advantages of these projects and their use of ICT in the classroom and continue to apply this knowledge in improvement of that project as well as other CARNet services. In synergy with our awardwinning project Schools 2.0, CARNet will, along with the 'Classrooms of the Future', continue to build on activities that enable each student, teacher and parent unlimited access to technology and internet which are the basic prerequisite for the access to knowledge," highlighted CARNet CEO, Zvonimir Stanić.

For more information, see http://www.carnet.hr/en

Picture Classroom of the Future



THE HEANET NATIONAL CONFERENCE 2013, 6 - 8 NOVEMBER AT THE SHERATON ATHLONE HOTEL, CO WESTMEATH



he HEAnet National Conference attracts delegates from across the education and research sector as well as industry leaders and technology experts. It provides a unique opportunity for you to learn about, present and discuss the latest developments in networking technology and services for the research and education community.

This year's programme has a strong and varied mix of topics with a range of stimulating speakers from across the HE sector and industry.

Featured topics include: Big Data, Cloud, e-Learning, Networking, SDN and WiFi with the spotlight on "Strategies for e-Infrastructure Delivery". The programme also includes client case studies, the workshop area and the ever popular Lightning Talks.

The conference will be of particular interest to managers of computing, networking and information services along with researchers, senior network personnel and information systems professionals. The event will also be of interest to professionals with an interest in research and education networking and internet developments.

For full details, please visit our website:

http://www.heanet.ie/ conferences/2013/home Words Fi Coyle, HEAnet





TNC2014 – NETWORKING WITH THE WORLD

TERENA

Picture The Ha'penny Bridge is a pedestrian bridge built in 1816 over the River Liffey in Dublin.

Words Cora Van den Bossche – TERENA Communications Officer



he TERENA Networking Conference (TNC) is Europe's largest and most prestigious research and networking conference, with a record participation of more than 650 participants during the 2013 edition in Maastricht, the Netherlands.

Fuelled by this success, preparations for TNC2014 are currently in full swing. The 30th edition will take place between 19-22 May 2014 in Dublin, Ireland, hosted by HEAnet, the Irish national research and education network (NREN). The conference will bring together decision makers, managers, networking professionals, collaboration specialists, and identity and access management experts from all major European networking and research organisations, universitities, world-wide sister institutions, as well as industry representatives.

Call for papers

The TNC2014 Programme Committee has issued a Call for Papers exploring the conference's theme 'Networking With the World'. Papers on all subjects relevant to the spirit and objectives of the conference and the theme can be submitted as extended abstracts of 600-1200 words from 7 October until 30 November 2013. More information can be found on the TNC2014 website:

http://tnc2014.terena.org

Demonstrations

An exhibition area dedicated to demonstrations and exhibits will be

set up in the conference venue. Companies and projects wishing to participate should contact: tnc2014@terena.org.

Sponsorship

Companies who want to gain exposure in, and build relationships with, the European research and education networking community can become a sponsoring partner of TNC2014. For more information please contact Gyöngyi Horváth, TERENA's Conference and Workshop Organiser, at **horvath@terena.org**.

Registration earlier with bigger discount

To allow participants to benefit from extra time in planning their travel, registration for TNC2014 will open several months earlier than usual. Moreover, everyone using early-bird registration from 1 November 2013 to 24 February 2014 will benefit from a new €100 reduction on the fee instead of the usual €50. Normal registration continues from 25 February to 9 May 2014.



WORKING TOGETHER TO PROMOTE THE NETWORK AND SERVICES

n the excitement of thinking about new technologies and services, it's sometimes possible to overlook the role of marketing and communications in ensuring that users get what they really need.

Recognition for this area of GÉANT and NREN work has been growing in recent years and in April 2013, for the first time, GÉANT support for community task forces was extended to include marketing and communications. But the relationship between GÉANT and the TERENA Task Force on Communications and Public Relations (TF-CPR) goes back much further: with TF-CPR passing it's 10th anniversary in October 2013, we review the growth and achievements in this area.

TF-CPR was set up to support the exchange of ideas, experience, information and best practices across the full range of topics NRENs need to communicate. Some NREN staff assigned 'PR' tasks were actually technical or legal experts rather than communications specialists, and the task force supported professional development as well as the chance to explore commonalities and make trusted contacts.

From 2006, TF-CPR met back-toback with the GÉANT PR Network, which has similar goals but a firm focus on the project and its activities. Through these gatherings and mailing list exchanges, the community's communications, marketing and PR individuals have come together as an extended team. With shared online tools and resources they have produced and shared materials to promote services such as eduroam, eduGAIN and bandwidth-on-demand network access: they have collected and created materials for re-branding and re-use; and they shared information for their own use and for use by other sectors of the research and education networking community.

In a recent survey of TF-CPR, more than 83% of active members responded, including several members who founded the group 10 years ago. The survey responses show that members are very satisfied with the task force and its activities, feeling that their work had benefited from covering a range of topics about strategy, materials, social media, events and how to reach specific user groups, among others.

Invited speakers from external groups such as EGI.eu, RIPE-NCC and Internet Society and co-location with TF-MSP (Management of Services Portfolios) have all been welcome additions to the breadth of topics that the task force covers. Suggestions for enhancing the collaboration were gained through the survey, and the results confirmed that TF-CPR continues to be valuable to all participants in this community-wide team.

Words Laura Durnford, TF-CPR Secretary

Picture

GÉANT PR Network and TF-CPR participants were joined by ex-members online to mark the 10-year anniversary in Rome, hosted by GARR

SLIPSTREAM – A NEW WEB INTERFACE FOR THE EUROPEAN GRID'S FEDERATED CLOUD

Revealed to the the arrive this month the European Grid Infrastructure (EGI) demonstrated SlipStream, a new interface for scientists to access the EGI Federated Cloud resources. The integration of SlipStream allows researchers to use the EGI cloud the same way they access commercial cloud providers.

Over the last few years the European Grid Infrastructure (EGI) has been building their Federated Cloud platform with many partners both in academia and the commercial sector. This latest demonstration of the current state of the Federated Cloud was shown at EGI's Technical Forum in Madrid. The work, a proofof-concept from the European Space Agency (ESA) is a result of collaboration with the developers of SlipStream, SixSq.

SlipStream provides a web interface that allows users to configure multiple cloud services and set up custom deployments of multiple virtual machines. The software has previously been tested by the HelixNebula project as a technology solution to act as a broker between the user and the different clouds on offer.

Salvatore Pinto, EGI.eu's cloud technologist, presented the demonstration. "The demo showed how you can easily start a complex deployment on EGI Federated Cloud resources using the SlipStream web interface," Salvatore says. "I used a real use case and as an example, I repeated the work performed by the European Space Agency during their proof of concept on EGI's Federated Cloud."

In the demonstration, Salvatore deployed a computing cluster, based on the Globus grid middleware starting from basic OS image and connected it to ESA's grid. He also demonstrated how to submit processing jobs to it using the ESA grid-processing on demand service.

Using SlipStream, users will be able to "see all FedCloud resources under the same hood, allowing them to provision reliably across them all, improving resource sharing and utilisation," adds Marc-Elian Bégin, SlipStream product lead and cofounder of SixSq.

"The demonstration shows how academic and commercial cloud resources can be successfully run alongside each other," says Steven Newhouse, director of EGI.eu. "This is also an example of how the EGI community promotes innovation by partnering up with commercial technology providers such as SixSq."

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You can learn more about the EGI Federated Cloud on the EGI website at http://www.egi.eu/solutions/ fed-cloud/

There is a video of the demonstration on YouTube at http://youtu.be/U5KwmvLvovA Words Neasan O'Neill, Communications Manager, EGI

JOINT RESEARCH ACTIVITIES NOVATION ACROSS BORDERS

GÉANT's Joint Research Activities (JRAs) have a strong record of developing innovative solutions to the needs of the R&E community. Within the GÉANT (GN3plus) project this research has been consolidated into three core JRAs, each investigating a different aspect of the future of networking and all focused on improving the services available to the entire community.



JRA1 – NETWORK ARCHITECTURES FOR HORIZON 2020, LEADER TONY BREACH

The core architectures and technologies used in the GÉANT and NREN networks and the internet in general have developed rapidly in the past 20 years and the capacities and speeds of the network have grown enormously. However these have been mainly evolutionary changes with much of the underlying structure still recognisably consistent. The challenges of the "data deluge", the "internet of things" and the growth of cloud applications and computing will require potentially radical changes to the core network architectures in use today. This Research Activity will investigate three key areas:

1. Future Network Architectures – researching how GÉANT and the NRENs can build their future networks and liaising with industry to help guide emerging network technologies.

2. Network Architectures for Cloud Services – cloud services represent a paradigm shift in the way computing power and applications are delivered to users. This area of work is investigating how the demands of fluid supply and demand and "always there" application delivery affect the network at both the core and delivery structure.

3. High Speed Mobile Architectures – Mobile access is now considered an essential for users but will become increasingly important to the "internet of things". This area of work is researching Wi-Fi based broadband access architectures to support and drive these innovations in mobile access.



JRA2 – TECHNOLOGY TESTING FOR SERVICE SPECIFIC APPLICATIONS, LEADER AFRODITE SEVASTI

Technologies such as server virtualisation and Virtual Private Networks are now becoming relatively commonplace with commercial service providers offering these facilities to a huge variety of users. However this Activity is investigating the next generation of networks' virtualisation and specialisation – in particular the concepts of Network as a Service (NaaS) and Testbeds as a Service (TaaS). Within these concepts, virtualisation extends into the network with the ability to define, create and manage virtual networks for specialised applications. It focuses on two areas:

1. Openflow/SDN – SDN and the Openflow technology offer the opportunity to decouple the control logic of a network from the actual data transport. This enables the creation of virtual network infrastructure slices for specific applications (for example cloud service support). It can also be exploited to deliver advanced traffic engineering capabilities (e.g. load management and congestion control) to support the most demanding applications. This area of work is investigating delivery of software-defined services, building upon the experience of GN3 in implementing an OpenFlow-enabled facility, as well as OpenFlow technology enhancements. It will also research multi-domain (federated) SDN to enable SDN service offerings across the NREN-GÉANT domains and globally.

2. NaaS, Virtualisation and NSI - At present, most networks have to be pre-defined and configured and have limitations on user configuration – this limits flexibility and usability. This area of work focuses on shaping innovative service offerings on behalf of GÉANT and the NRENs based upon the Network as a Service (NaaS) concept, accompanied by virtualisation capabilities and NSI framework extensions. It also investigates novel management capabilities towards the paradigm of Management as a Service.

NaaS capabilities are particularly interesting for the value they can provide to cloud services delivered by the GÉANT-NREN backbones, as they can deliver a seamless inter-datacentre service across backbones. This area of work will study the capabilities in this area, aiming at complementing the service architectures for cloud support.



JRA3 – IDENTITY AND TRUST TECHNOLOGIES, LEADER LICIA FLORIO

Collaboration across institutional borders is a recurring theme in the research and education community, and is one of the strengths of the R&E community. Therefore, providing infrastructure support for such collaborations is a very important aspect to advanced collaboration, as well as innovation.

R&E is working in an increasingly virtualised world with services and systems being delivered remotely using networks, hardware and applications neither owned nor directly controlled by the user. In this environment trust and identity are crucial elements that are needed to ensure that only authorised users can access data and services and equally so that users can be sure that the services they are using are valid and trustworthy.

SUPPORTING ACCESS WITH ENHANCED SECURITY

There is a careful balancing act between supporting collaboration for research activities whilst guaranteeing users' privacy and security. The NREN community and the GÉANT project have been amongst the greatest innovators in this area – demonstrated by the success of both eduGAIN and eduroam®.

This research will focus on areas that, if not addressed, may hinder wide adoption of research and education Identity Federations, and consequently of eduGAIN, and the deployment of other GÉANT services. There are two focus areas to this research being undertaken by GÉANT.

1. Attributes and Groups - This activity is working to extend the current services provided by Identity Federations (such as eduGAIN) to support managing user groups and managing user attributes to allow finer-grained identity and trust management

2. Identity and Trust Technologies – This will extend the benefits of these services in three ways

- a. By linking the R&E Identity Federations to Commercial provider services to enable greater access to commercial services
- b. By investigating the use of physical token systems to enhance user security
- c. By working to extend Identity Services beyond the current web-based systems

These developments will help to build a secure and trusted platform for the next generation of applications and services to support. For more information, visit **www.geant.net/innovation**



RESEARCH AND EDUCATION ADVANCED NETWORK NEW ZEALAND



AN INTRODUCTION TO REANNZ, THE NREN OF NEW ZEALAND

The words Lord of the Rings, Square Kilometre Array and genomics sequencing are not often seen in the same sentence, but these are all aspects of high end data use that are increasingly used in the far off research, software and engineering labs of New Zealand.

Lke most modern developed economies New Zealand is attempting to make the transition from 20th century agricultural producer (as "the farm for the United Kingdom") to those high value-add products that result from creativity, software, and advanced services. These have been termed as resulting from the "weightless economy" – it's no longer sufficient to send low value commodity items around the globe.

New Zealand's remote location means that it is at a competitive disadvantage in global markets, because it costs more and takes longer to get to market. This is particularly so because New Zealand tends to send relatively heavy, relative low value exports to distant markets.

As well as supporting pure science, REANNZ assists applied research institutes that add value to our (predominantly) agriculturally based economy. Our primary trading partners and OECD countries in particular already had mature specialised networking organisations that helped drive their economies through innovation. Since then the network has also supported a range of innovative science and research initiatives with institutions around the world.

NEW LEADERSHIP BRINGS NEW INITIATIVES

In late 2011 Steve Cotter joined REANNZ as CEO, coming from leading organisation ESnet (Energy Sciences Network) at the University of California Berkeley, and with a wealth of experience in the global R&E world behind him. Under Steve's leadership there has been a raft of new initiatives including an expansion of the network engineering team, a stronger focus on member engagement and the rollout of a new Infinera-based network that will provide Kiwi researchers with the ability to access up to 100Gbps capacity over the medium term.

Given New Zealand's geographic location (over 3 hours flying time from our nearest neighbour Australia – about the same as London to Athens!) relationships with external organisations are highly regarded.

Connections with GÉANT were strengthened at the recent University of Canterbury eResearch Symposium that attracted researchers, IT specialists and educationalists from across the country and abroad. DANTE's own Domenico Vicinanza and Alessandra Scicchitano (SWITCH) ran an excellent and very wellreceived workshop (in conjunction with REANNZ engineers Sam Russell and James Wix) that showed local researchers how to tune their hardware and global network connections through the use of tools such as perfSONAR (link below)



Along with topical research of local relevance (Pacific tsunami warnings, earthquake-proofing and how to build a bigger and better sheep), Kiwi researchers are closely involved in Large Hadron Collider projects with their peers globally and are now looking forward to the rollout of the Square Kilometer Array (SKA) telescope. As a precursor to that project the Murchison Widefield Array is now on stream and undertaking surveys for radio astronomers in a number of countries including New Zealand. The tyranny of distance that Pacific nations have suffered from is increasingly being eroded in a globally interconnected, sub-100 millisecond world!

FOR MORE INFORMATION, SEE:

Murchison Widefield Array: http://www.mwatelescope.org/

REANNZ news: http://news.reannz.co.nz/

eResearch Symposium presentations: http://goo.gl/joOPMb

REANNZ (Research and Education Advanced Network New Zealand) is a Crown-owned company that was launched in 2006. It now connects all of New Zealand's universities and research institutes, most polytechnics, and a number of cultural institutions. A staff of 17 based in the heart of the capital city, Wellington, provides a range of advanced network services to around 170 members nationwide.

Picture Steve Cotter, <u>CEO</u>

Words Douglas Harre, REANNZ

GLOBAL NEWS

By Tom Fryer, International Relations Officer, DANTE and Helga Spitaler, Senior Communications Officer, DANTE

> 1st CAREN Regional Networking Conference

Modern Network Technologies for Education and Science 28-29 May 2014, Almaty, Kazakhatan

> Visit www.orre2014.learning to find out more

Connect - Access - Innovate

ASREN e-AGE 2013 Conference 3rd International Platform on Integrating Arab e-Infrastructure in a Global Environment 12-13 December 2013, Tania, Taniala

Visit www.asrenorg.net/eage2013 to findeut more



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GLOBAL NEWS

SEEKING GLOBAL CASE STUDIES

GÉANT case studies aim to raise awareness of the benefits of the connectivity and services made available by GÉANT and its global connectivity to the European R&E community. They inform stakeholders of how R&E networks are used and why they are needed, and help explain to similar users what they can potentially do and achieve using the global R&E networking infrastructure. Work to identify use cases for publication as case studies is an on-going effort.

Global Collaboration Case Studies aim specifically to showcase the use of GÉANT's global links to other world regions, which reach over 60 countries outside Europe. Efforts are focused on tropical diseases at the moment, and learning more about how institutions participating in tropical disease research projects are collaborating. There is interest also in other use cases with a societal benefit, such as telemedicine, the environment, e-learning, etc. GÉANT would be very interested to hear about any European or global tropical disease research projects or other use cases of the GÉANT network and its connections to the rest of the world. For more information, or to share a case study with the global collaboration team, please contact: **Tom.Fryer@dante.net**.

To view GÉANT case studies, please visit **www.geant.net**

ALICE2 IS COMPLETED AS REDCLARA CELEBRATES ITS TENTH ANNIVERSARY

In June this year, RedCLARA (Cooperación Latinoamericana de Redes Avanzadas), the Latin American Research and Education Networking Organisation, reached the milestone of its tenth anniversary, following its formation in Valle de Bravo, Mexico on 9th June 2003.

he story of how RedCLARA started, however, dates back to the previous year and the EC-funded CEASAR study, the aim of which was to evaluate the possibility of a direct interconnection between GÉANT and similar activities in Latin America. As part of the CAESAR project, a workshop in Toledo, Spain, was organised for June 2002. It was here that the initial idea for the creation of RedCLARA as the research and education networking organisation for Latin America was first floated.

Significantly, the CAESAR project led to the establishment of the ALICE (Latin America Interconnected with Europe) project which provided ECfunding of €10 million with an additional €2.5 million from Latin American NRENs towards the creation of an inter-regional R&E network, RedCLARA, and its interconnection with Europe.

Starting in 2003, the DANTE led ALICE project established a regional network, enabling traffic between Latin Americans to be exchanged within the region, and provided a 622Mbps interconnection with GÉANT. ALICE also fostered the creation of NRENs in countries where they had previously not existed. By the end of ALICE in 2008, a total of 12 Latin American national networks were connected to RedCLARA, with a further 6 countries eligible to connect.

The success of ALICE led to the

ALICE2 project, with increased funding of €12 million from the EC and €6 million from Latin American NRENs. In a ground-breaking move, RedCLARA took over the coordinating role of ALICE2 from DANTE. Together with Latin American NRENs and the European NRENs FCCN (Portugal), GARR (Italy), RedIRIS (Spain) and RENATER (France), DANTE remained a partner in the ALICE2 project.

Starting in December 2008, ALICE2 aimed to improve the RedCLARA network and its interconnection with Europe, and also to work with beneficiary countries which at the time were not connected to RedCLARA (Bolivia, Costa Rica, Cuba, Honduras, Nicaragua and Paraguay) to assist their development and interconnection with RedCLARA. In addition, ALICE2 placed much greater emphasis on promoting use of the network and supporting user groups within the region. An additional focus point was appropriate training for both the technical and management staff of Latin American NRENs. Significantly, the ALICE2 project also aimed to develop the sustainability of RedCLARA for the future

ALICE2 ended on 31st January this year. Among the highlights of the project are the following:

• The RedCLARA network saw significant improvements with capacities on most trunks increasing from speeds typically of 155Mbps or lower, to 1Gbps and 2.5Gbps, as well as capacity between Argentina and Brazil at 10Gbps. Some sections of the network (e.g. in Central America and between Chile and Argentina) are dark fibre owned by RedCLARA, providing the ability to upgrade the capacity on those sections of the network. In addition, the capacity of the transatlantic link to GÉANT was multiplied by a factor of four from 622Mbps to 2.5Gbps.

- The re-procurement of the network brought about a substantial reduction in network and maintenance costs to 38% of the level at the beginning of the project, making a major contribution to the long-term sustainability of RedCLARA.
- Considerable efforts were made by RedCLARA and the ALICE2 partner NRENs in Latin America to raise the profile of RedCLARA in non-connected countries and to assist them in their development. This included ALICE2 meetings held in Bolivia, Costa Rica, Honduras, Nicaragua and Paraguay, as well as technical training for those countries and assistance in the development of business plans.



- An early success was the connection of Costa Rica to RedCLARA, taking the total number of connected networks to 13. For the remaining countries, difficulties of varying types have prevented them from connecting thus far. Nevertheless, Bolivia and Paraguay have formal NREN initiatives and plans exist for their future connection to RedCLARA. In Honduras and Nicaragua, interest has been shown from different players, though no formal proposals for connection currently exist. RedCLARA is continuing its efforts to help these countries overcome their difficulties and connect to the global R&E networking infrastructure.
- The ComCLARA (Comunidades RedCLARA – RedCLARA Communities) programme, established under ALICE2 and developed in two editions (COMCLARA 2010 and COMCLARA 2010), provided support to user communities spread across various Latin American countries. RedCLARA assisted these communities by offering information on potential funding sources as well as through a suite of collaboration tools (such as wiki-hosting,

videoconferencing, webconferencing, video-hosting, a collaboration partner search tool, file transfer, and an event management tool) made available via the RedCLARA portal. assistance also included funding for a user group coordinator and for a leading member of the user group to attend a relevant international event in their field.

- ALICE2 provided a platform for the continued work of RedCLARA's Technical Working Groups which have worked on areas such as IPv6, Mobility with eduroam, IPTV, security, Mobility with OpenFlow; SciFi (intelligent control system wireless networks); performance monitoring; VoIP (Voice over IP) and web-conferencing. A significant highlight has been a pilot measurement scheme which is up and running with perfSONAR measurement points in Peru, Guatemala, Uruguay, Chile, Brazil and Ecuador.
- Since 2008, RedCLARA has organised regular training opportunities for NREN technical staff in a variety of themes, including VoIP, IPv6, security, OpenFlow technologies and the creation of national identify federations. Management training has also been made available to NREN management staff.

A final important highlight of the ALICE2 project has been the continued strengthening of the relationship between the Latin American and European R&E networking communities, seen today for example in the continued collaboration between RedCLARA and GÉANT on the implementation of the EC-funded ELCIRA project (Europe Latin America Collaborative e-Infrastructure for Research Activities: see CONNECT Issue 12), as well as on-going joint efforts to re-procure the GÉANT-RedCLARA transatlantic link.

The successes of the ALICE and ALICE2 projects have placed the Latin American R&E networking community in a position barely imaginable when RedCLARA was formed ten years ago. Today, the importance of the role played by RedCLARA for the Latin American Research and Education Community over the past decade has been recognised by LACNIC, the Latin American and Caribbean Internet Address Registry, with the presentation of a plaque that commemorates its tenth anniversary.

To learn more about RedCLARA

visit: www.redclara.net

Picture The final ALICE2 meeting, held in Cuenca, Ecuador, 12-16 November 2012



Picture Universities across the US stand to benefit from the

interoperability

BANDWIDTH ON DEMAND OVER THE ATLANTIC

Closer ties with US brings full BoD interoperability with 800 US sites

he GÉANT Bandwidth-on-Demand (BoD) service offers users the ability to reserve bandwidth across the GÉANT network and the networks of participating NRENs quickly and easily using a simple web-based user interface. These connections can be reserved for as little as an hour or for months at a time and can be scheduled in advance to support demanding network requirements. They offer a tremendous advance on traditional static point-to-point circuits which are expensive and have much longer lead times.

Similar services operate in the United States provided by Internet2 and ESnet and are in great demand. However, the tools used to implement the bandwidth-on-demand services in the USA were developed separately, leading to interoperability issues with the GÉANT BoD service. This has meant that, until recently, transatlantic BoD connections have been complicated to arrange. For the past 2 years, GÉANT has worked with its US partners, ESnet, Internet2 and Indiana University, on a pilot bandwidth-ondemand service between Europe and the United States that allows seamless integration of the services.

In August this year, as a result of this collaboration between GÉANT and its US partners, the transatlantic BoD service to the United States became a production service. As a consequence, GÉANT Bandwidth on Demand can now reach in the region of 800 end points behind Internet2 and ESnet in the United States, providing enhanced capabilities for European and US researchers.

To learn more about Bandwidth on Demand visit:

http://www.geant.net/Services/ ConnectivityServices/Pages/ Bandwidth on Demand.aspx

To learn more about service collaboration between GÉANT and other world regions, visit:

http://www.geant.net/Network/ Global-Connectivity/Pages/ Global_Service_Collaboration.aspx

GLOBAL NEWS

Picture

Meeting, 19 August, 2013, Daejeon, Korea

TEIN Governors'



TEIN UNDER NEW MANAGEMENT: ONE YEAR ON AND GOING STRONG

n September 2012 DANTE successfully transferred management responsibility for the TEIN project to Asian-led TEIN*Cooperation Center in Korea, but has continued to actively support the new TEIN4 phase by providing professional services assistance in areas such as marketing, strategic planning procurement, and financial management.

A year on, the project is continuing to flourish. At the recent TEIN project meeting which took place in August alongside the 36th APAN meeting in Daejeon, Korea, over 60 attendees from 17 Asian-Pacific project partner countries took stock of the latest TEIN achievements and exciting developments for the future.

As reported in the latest CONNECT issue, Afghanistan has recently joined the TEIN programme and is due to be connected to the TEIN network backbone in 2015.

One of the priorities of the TEIN programme remains to support the development of R&E networking in the emerging Southeast Asian countries Laos, Cambodia and Myanmar and their connection to TEIN. With Myanmar starting to open up and increasingly interested in developing connectivity for research and education, feasibility studies have commenced and it is hoped that it may



connect to TEIN during the course of 2014.

For the first time ever, representatives attended from Mongolia stressing their country's firm intention to join the international R&E networking community via TEIN. Mongolia has established an NREN, ErdemNet, which already links 10 universities and is developing fast. A feasibility study is underway with ErdemNet for connecting to the TEIN network next year, bringing the number of connected partner countries to 17.

In Daejeon, the TEIN community not only welcomed new members, but

also saw exciting developments in terms of intra-regional collaborations. Representatives of the TEIN project met earlier this year with their colleagues from the Central-Asian R&E network CAREN, to explore collaboration opportunities. As an early result, for the first time representatives of NRENs and medical doctors from all four CAREN partner countries (Kazakhstan, Kyrgyzstan, Tajikistan and Turkmenistan) participated remotely in Medical Working Group sessions during APAN, thus paving the way for tele-medicine collaborations in the future, supported by the CAREN, TEIN and GÉANT networks.

Picture

Dr Saw Sanda Aye from the University of Computer Studies in Yangon outlining Myanmar's plans to join TEIN

GÉANT IN THE FIELD: ICT2013 AND SUPERCOMPUTING13

ovember sees GÉANT exhibiting at premier events in Europe and the United States. Exhibitions, conferences and workshops are a key part of the project's outreach strategy and a valuable opportunity to speak face to face with current and potential user groups, international partners, funding bodies and ICT professionals.

The first of these is ICT2013, to be held November 6-8 in Vilnius, Lithuania. With the theme of 'Create, Connect, Grow' this annual European Union event attracts over 4000 researchers, innovators, entrepreneurs, industry representatives, politicians and students, and will focus on Horizon 2020 – the EU's Framework Programme for Research and Innovation for 2014-2020.

GÉANT will be exhibiting together with two flagship users – the European Bioinformatics Institute (EBI) and ITER (a large scale scientific experiment that aims to demonstrate that it is possible to produce commercial energy from fusion, and part of the Fusion for Energy [F4E] initiative). The booth will feature information displays and various demonstrations from each exhibitor, with staff available to discuss the latest developments in networking and services.

LITNET, the Lithuanian NREN has been working closely with the organisers and the venue to provide high capacity networking to the venue and secure eduroam® access for the exhibitors and visitors for the duration of the event. Together GÉANT and LITNET will be demonstrating the power and flexibility of GÉANT networking services.

For more information, please see: http://ec.europa.eu/digital-agenda/en/ict-2013 or check the Events page on www.geant.net Then it's across the Atlantic to Colorado, home to this year's SuperComputing event, SC13. This longrunning show, celebrating 25 years in 2013, brings together the international high performance computing (HPC) community for a program of technical papers, tutorials and exhibitors. Over 350 exhibitors are expected over nearly 140,000 square feet of exhibit space.

GÉANT had great success here in previous years, exhibiting with local partners such as Indiana University, boosting our international profile and spreading the word of our transatlantic connectivity. DANTE's Domenico Vicinanza even collaborated with NASA, using the combined power of grid computing and multiple research networks to turn the data received from Voyager 1 into a musical piece, played live to event attendees. This year, Domenico has again been invited back to the NASA booth, one of the most popular and visible booths at SC, to do something similar. Watch this space!

Also this year, engineers from HEAnet will also be part of the prestigious team arranging SCinet, the powerful and advanced network set up each year for the conference that links to research networks around the world. It is this network upon which exhibitors rely to show demonstrations. The team includes volunteers selected from academia, government and industry who work together to design and deliver the SCinet infrastructure.

The SC13 conference runs from November 17-22, with the exhibition from November 18-21. For more information, please see **sc13.supercomputing.org**.







Words Paul Maurice, DANTE

TAXABLE PARTY IN COLUMN

Picture Denver, Colorado



GÉANT is the pan-European research and education network that interconnects Europe's National Research and Education Networks (NRENs). Together we connect over 50 million users at 10,000 institutions across Europe, supporting research in areas such as energy, the environment, space and medicine.







www.geant.net

GÉANT Partners

ACOnet www.aco.net

Belnet www.belnet.be

BREN www.bren.bg

CARNet www.carnet.hr

CyNET www.cynet.ac.cy

CESNET www.ces.net

EENet www.eenet.ee

> RENATER www.renater.fr

DFN www.dfn.de

GRNET

www.grnet.gr **NIIF** www.niif.hu

HEAnet www.heanet.ie

IUCC www.iucc.ac.il

GARR

www.garr.it

SigmaNet www.sigmanet.lv LITNET www.litnet.lt

RESTENA www.restena.lu

MARNet www.marnet.mk

MREN

PSNC

University of Malta www.um.edu.mt

www.mren.ac.me

SURFnet www.surfnet.nl

NORDUnet www.nordu.net

FCCN www.fccn.pt

RoEduNet www.nren.ro

eARENA www.e-arena.ru

AMRES

www.amres.ac.rs

SANET www.sanet.sk

www.man.poznan.pl

ARNES www.arnes.si

RedIRIS www.rediris.es

SWITCH www.switch.ch

ULAKBIM www.ulakbim.gov.tr

JANET www.ja.net

DANTE www.dante.net

TERENA www.terena.org

BASNET www.bas-net.by

RENAM www.renam.md

URAN www.uran.net.ua

ASNET-AM www.asnet.am

AzRENA www.azrena.org

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