GÉANT

CONNECT

tnc19
Forging Digital Societies

Tallinn, Estonia

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Welcome from Cathrin Stöver

Welcome to CONNECT32, and welcome to TNC19 in Tallinn – let me start by congratulating Anna Wilson to the GÉANT Community Award and Claudio Allocchio to the Vietsch Foundation award! You are pillars of our community and I am chuffed to see your work, dedication and positive influence being recognised!

Holding CONNECT in your hands, you will notice that we changed the layout – we hope that you find it easier to navigate through the clearly marked sections of the magazine. And also, look at the new GÉANT global map on the inside back cover! Yes, we have said goodbye to the spaghetti map and are proud to launch this new global map while we are in Tallinn!

This issue of CONNECT teems with interviews. We interviewed our TNC19 Closing Plenary keynote speaker Tusu Tusubira, as well as the new CEO of the UbuntuNet Alliance, Dr. Matthews Mtumbuka and we spoke to Omo Oaiya, WACREN's Chief Strategy Officer about LIBSENSE. Closer to home, we spoke to Bram Peeters about his ambitions in GN4-3N and why it feels like "changing an F1 engine whilst the car is still lapping the circuit!"
In addition, I went to Brussels and talked to Jean-Eric Paquet, Director-General of DG RTD, who shared his ambitions for Europe, how research results should feed into policy making and what Horizon Europe means for all of us. A must read for any organisation interested in the opportunities Horizon Europe offers!

Have a great read and a great TNC19! I look forward to seeing you all and talking to you during the next few days here in Tallinn! Make sure to vote for the Best Lightning Talk Award!

Cathrin Stöver, GÉANT

tnc19

Tallinn, Estonia 16-20 June 2019

Welcome to
TNC19

Forging Digital Societies

tnc19.geant.org

The 35th edition of TNC, the largest and most prestigious European research and education networking conference, is ready to welcome representatives from the global R&E community in Tallinn, the Baltic capital city where old and new live together in harmony. Tallinn has one of the best-preserved medieval old towns in Europe and has been listed among the top 10 digital cities in the world.

TNC19's theme, Forging Digital Societies combines the idea that computer networks help to create and forge digital societies by supporting human interactions, with the innovative model of Estonia's e-residency programme. TNC is the place where our community gathers to shape the future of research and education, forging the society of the future with digital 'fire' and passion for innovation and progress.

TNC19's programme covers an impressive range of topics that will get the community buzzing. The following titles will give you a little taste of what TNC19 has in store: Opening Data Silos: Are we done with T&I?, Is it time to go back to the drawing board?, Are you ready for your next crisis?, Crypto for Now.

Have we whet your appetite?

This year's prestigious keynote speakers (in order of appearance)

Siim Sikkut - Government CIO of Estonia

Siim is the Chief Information Officer (CIO) of Estonia, in charge of keeping the #eEstonia digital innovation engine humming ever faster. Nominated by Apolitical, a global network for government representatives and public servants, for the 2018 list of the world's Top 20 most inuential people in digital government.

Linnar Viik - Founder and Programme Director, Estonian e-Governance Academy

Linnar Viik, who will co-present the opening plenary jointly with Siim Sikkut, is an information technology scientist and visionary. Currently a visiting lecturer at University of Tartu, he founded the Estonian e-Governance Academy and is a board member of several companies. Linnar has been instrumental in the rapid development of the network infrastructure and the internet voting and eSignature projects in Estonia.

Merike Kaeo - CEO and founder, Double Shot Security

Merike is the CEO/Founder of Double Shot Security Inc. with 25-year-plus experience in pioneering internet technology deployments and developing strategic security initiatives. In 2014, she was part of the EU Network and Information Security Working Group that created guidelines promoting the sharing of cyber threat information and incident coordination in public and private sectors.

Social Events
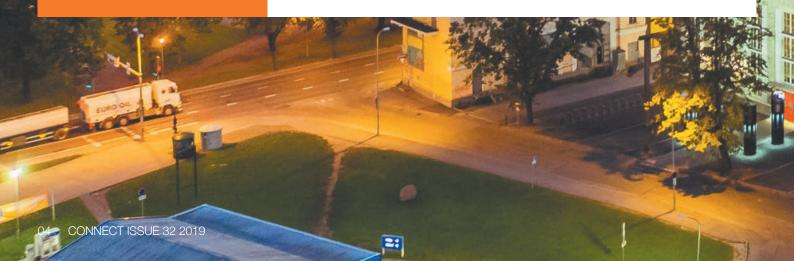
This year we have given a boost to the programme of events to create more opportunities for delegates to meet, be sociable and get to know each other from the start of the conference. Join in, don't miss out on the networking fun!

tnc19 Morning Run
Kultuurikatel
Monday 17 June 08.00 - 09.00

tnc19 Opening Reception
Kultuurikatel
Monday 17 June 17.30 - 19.00

tnc19 Kick-off Party
Bar F-Hoone
Monday 17 June 20.30 - 24.00

tnc19 Conference Dinner
Seaplane Harbour Museum
Tuesday 18 June 19.30 - 23.00

John Womersley - Director General, European Spallation Source

John is Director General of the European Spallation Source (ESS), a European intergovernmental laboratory. He held the position of Chief Executive of the Science and Technology Facilities Council (STFC), the United Kingdom's funding agency for large-scale science facilities and national laboratories, particle physics, nuclear physics and astronomy.

Tusu Tusubira - Managing Partner, Knowledge Consulting

Tusu is the founder and former CEO of the UbuntuNet Alliance, and the Managing Partner of Knowledge Consulting Ltd. He received the Network Information and Infrastructure Service Award (NI&I) 2015, and served on the boards of RENU and TENET, Uganda and South Africa RENs. Tusu continues to research topics ranging from change management to ICT infrastructure design and implementation, and is author and co-author of many books and papers.
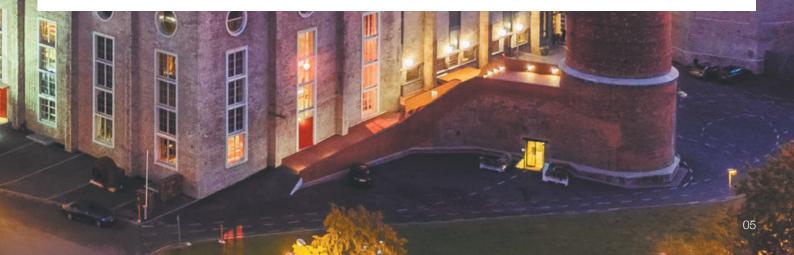
The TNC keynote speeches will focus on: how technology has helped to strengthen the Estonian society; on the meaning of security, privacy and safety in today's global interconnected digital world; on how major research infrastructures can tackle current large research challenges, and on the need for a community-based approach in an environment of accelerating change.

tnc19
Best Lightning Talk Award

Best Lightning Talk Award

TNC19 will be the stage of the brand new Best Lightning Talk Award. We are proud of this year's line-up and look forward to celebrating the first winner. Everybody in the audience and remote viewers will be invited to vote during the conference and the winner will be announced after the closing plenary on 19 June.

Keynote Speaker Interview: Tusu Tusubira

Tusu Tusubira, founder of the UbuntuNet Alliance, received the Network Information and Infrastructure Service Award and served on the boards of RENU and TENET, in Uganda and South Africa. He worked for Makerere University for 32 years and continues to actively participate in research. CONNECT caught up with Dr. Tusubira before he travelled to join TNC19 as a keynote speaker (Wednesday Closing Plenary 16:00-17:30).

The theme of TNC19 is 'Forging Digital Societies'. What does it mean to you?

I always think of a society in the sense of a community, a group bound together by common values and common aspirations, and that they will do everything decent to promote and defend. Forging digital societies therefore means creating communities that are adapted to life in a digital environment, all bound together by common values and aspirations. The forging must therefore start with a clear statement of values and aspirations. The research and education networks of the new dawn could be like this, especially when scientific and technological capability have developed to the level where they challenge traditional ethical values. In so far as ethics are driven by societal values, is this the time to rethink who we are?

You have often discussed the challenges of R&E networks on the African continent. How can African NRENs deal with such challenges? What can the GÉANT community do to help?

I would like to believe that I never talk about challenges without recognising the many opportunities first – and we have many of both. Then again, we can either philosophically or through science recognise the opportunities in any challenge. Gravity, for example, may be seen as a hinderance to space travel, and yet without gravity, we would not be using sling-shot physics to aid deep space exploration. How can the GÉANT community help? Understand: a baby learning how to walk has opportunities and challenges. The adult must learn when to encourage, when to move a table out of the way, and when to leave the table there as possible transitional support – or maybe as a lesson. Come to us, listen to us, understand us, listen to our solutions and share you own experience. Recognise the obstacles to remove – and know when apparent obstacles can be an aide.

In your view, what lies ahead for the UbuntuNet Alliance after the appointment of the new CEO, Dr Matthews Mtumbka?

Exciting times, reconsolidation, and growth! To achieve this, it is important to remember that the caterpillar, the chrysalis, and the butterfly may look different, but they have the same genetic code defining its various forms. Matthews is young, the new generation, and I believe he recognises that it may be time for the chrysalis to change to a butterfly. So long as the genetic code – the values that define the Alliance – hold true, the Alliance will go to greater heights.

In 2015 you received the African Network Information and Infrastructure Award. What did it mean to you and to the community?

I believe it was a statement that the African community is doing a lot. I believe that any award is never really a personal achievement because whatever one does builds onto what others have done before. The toddler who sits on her father's shoulder is excited and happy about their reach, but never has any illusion about who has enabled it: they clutch tightly on to the head. A recognition is therefore always a challenge to do more so that those who follow can reach even higher.

We are really pleased that you will deliver a keynote address at TNC. What do you expect from TNC19?

I am excited, delighted, and challenged! First and foremost, I look to renewing friendships and making new friends. A meeting with people for the first time is a voyage of exploration, a smorgasbord of cultural and individual experience waiting to be enjoyed. I am a dedicated life-long learner: there will be new ideas, new perspectives, new ways of thinking. There will be the excitement of listening to young people, creative and innovative minds designing the future – indeed forging the digital societies. I also look forward to experiencing Estonia, a country that is a step in the future ahead of most in terms of exploiting technology in government and governance.

Tell us a bit about yourself: hobbies, travels and plans for the future.

I love music and dancing – any genre: from the classics to the excitement and energy of African drums; from the haunting melodies of the Pacific to the melting pot music of the Caribbean. I led choirs. I was in a band. I love reading and writing. I am a life-long teacher supporting people to develop their values, thinking, and themselves. I am a Rotarian and love working with communities. I have had the opportunity to travel my exciting continent Africa and the world, to appreciate both the wide variations in environments and people – and especially the great similarity among peoples of the world. I love travelling most when I am with my friend and spouse Dorcas. Future plans? I hope to give an increasing amount of time working with communities, both as a Rotarian and in my personal capacity.

GÉANT Community Award 2019: Transforming the Community

One winner and one category triumphed at the 2019 GÉANT Community Award. This year's award panel had no hesitation in selecting the successful nominee in the category 'impactful contributors to the GÉANT project or wider community activities over a sustained period of time'.

Anna Wilson (HEAnet) was honoured for her contribution to research and education networking. In particular, she is seen as 'the perfect example of how continuous dedication to work can transform society'. The award was presented on Monday, 17 June, during TNC19's opening plenary in Tallinn.

Anna is a member of the TNC Programme and the GÉANT Community Committees. This is an undeniable demonstration of commitment to grass-roots support, giving an enormous insight and making a difference to the way we work. Her activism on IPv6 and engagement in RIPE and other bodies beyond our direct community has helped to keep NRENs' 'finger on the pulse' of major developments in internet governance.

One of Anna's greatest, lasting achievements is to bring to the attention of our community the impact that technology has on LGBT communities and people's lives in general. We very often focus on the highly technical aspect of our work and overlook the influence it has on those who use our technology or services daily, let alone on the marginalised communities. In addition, her personal observations of our long-held beliefs have shown where we need to adapt and evolve.

About Anna Wilson

Anna Wilson graduated in Computer Science from University College Dublin in 1996, and straight away went next door to work for the NREN. Anna has been with HEAnet in some capacity ever since. Her focus throughout has been on the IP network, and she is known for her work in various GÉANT activities and her participation in RIPE, including a recent stint as co-chair of the IPv6 working group. Aside from performing with her improv group, she is currently building a robot army for the Services Architecture Team in HEAnet.

Anna commented: "I am thrilled and really quite stunned to receive this award. The work we do in the GÉANT community and as NRENs is important. We have shaped the internet for our users and for the industry as a whole, and we continue to do that. Sometimes it can be tough to remember that as we focus on our work, day in, day out. Moments like this are a wonderful reminder. I'm very grateful, and proud to be a part of this community."

The following words, which summarise the reasons behind the nominations submitted are a strong recognition of the role Anna plays within the NREN community.

Picture
Anna Wilson

2019 GÉANT COMMUNITY AWARD

More about the GÉANT Community Award

With the Community Award, GÉANT honours people who have contributed significant ideas, time and expertise to the development of the research and education networking community's collaborative achievements. This year's panel of judges comprised Valter Nordh, Chair of the GÉANT Community Committee, Christian Grimm, Chair of the GÉANT Board of Directors, Kristina Lillemets, host of TNC19 and Josva Kleist, Chair of the TNC19 Programme Committee.

2019 Vietsch Foundation Award: Medal of Honour

TNC19 will be the stage for the award of the prestigious Medal of Honour by the Vietsch Foundation.

The Trustees of the Vietsch Foundation announced the unanimous decision to award Claudio Allocchio (GARR, Italy) the Medal of Honour for the demonstrated achievements and long-lasting benefit delivered to the research and education networking community throughout his career.

Valentino Cavalli, representing the Board of Trustees, explains: "Claudio's contribution to research and education networking has been impressive, and as a senior manager of GARR he has contributed enormously to developing communities internationally. It has been a pleasure to work for many years with Claudio and to witness the competence and enthusiasm he put into supporting the LOw LAtency audio visual streaming system (LoLa) and reaching out to new communities in the arts and humanities."

Picture
Claudio
Allocchio

Claudio Allocchio

Claudio Allocchio studied astrophysics, particle physics and music (piano). In 1985, he started his computer networking activities at CERN, where he helped to create the world first multi-protocol mail gateway service for universal messaging. In 1991, among the founders of the Italian NREN GARR, he managed the COSINE mail gateway services and the Italian Naming Authority (".it" regulator). Claudio has worked in various roles in all the GÉANT projects and he is currently also one of the main advisors for the EaPConnect project. In 2005, he started a collaboration with Conservatorio Tartini in Trieste, where he is currently Chief Network Engineer for LoLa development.

Claudio commented: "Since my early days in networking I always tried to use the network to allow people to communicate easier and better and to create groups. 'Anyone should be able to talk and send messages to anyone', I said at a time when this was just a dream and, with a bunch of colleagues we created the global email service. So, when some years later I came across the apparently impossible dream of LoLa – to make distances disappear at the click of a mouse – I decided to embark on another adventure, helping to make it happen. I strongly believe in collaboration, which is the fundamental engine which moves the research and education community – where we are all peers."

About the Vietsch Foundation and the Medal of Honour

The Vietsch Foundation was officially established in 2014 by the will of the late Karel Willem Vietsch, former Secretary General of TERENA. As a charity under Dutch law, the foundation is capable of making and receiving grants that satisfy the objectives and purpose of the organisation: to support research and development of advanced internet technology for scientific research and higher education. Every year the Vietsch Foundation awards a Medal of Honour to people who, through their career, have contributed to achievements of great value for research and education in a sustainable and lasting way. For more information visit: **http://www.vietsch-foundation.org**

The GÉANT Emerging NREN Programme Returns to TNC

Following last year's success, GÉANT's Emerging NREN Programme welcomes a new delegation of professionals from emerging NRENs to share the TNC19 experience and provide an opportunity for further integration with the dynamic, international R&E networking community.

Picture
Leila Dekkar

Emerging NRENs from around the world were invited to nominate representatives to take part in the Programme. A total of 18 participants, from 16 organisations, in 16 countries, on 4 continents were selected to attend TNC19. Each participant has been paired with GÉANT or NREN personnel, according to common professional interests, to facilitate knowledge sharing, build relationships, and to provide a point of reference during the busy conference.

Leila Dekkar, GÉANT's International Relations Project Manager and Emerging NREN Programme Coordinator comments, "I am delighted to be involved in such an enriching exchange and I am very impressed with the schedule that our host, EENet of HITSA, has put together for our guests from all corners of the globe. I look forward to welcoming new colleagues in Tallinn. I am sure it will be a great experience for all of us."

As well as attending TNC19, all participants will benefit from a tailor-made programme that includes a meeting with the CEO of GÉANT and a full day of activities organised by EENet of HITSA. They will also have the opportunity to visit a high-performance computing farm and tour three floors of start-ups, laboratories and hi-tech showrooms at the TalTech Mektory Innovation and Business Centre. In the afternoon, the group will visit HITSA and learn how the organisation enables graduates at all levels of education to obtain the necessary digital skills for the development of economy and society. The visit will end at the E-Estonia Briefing Centre, where the group will be able to take a "peek inside the e-state" and learn the success story of the Estonian digitalisation in an innovative atmosphere.

For more information on the Emerging NREN Programme at TNC19, please contact Leila Dekkar **Leila.dekkar@geant.org**

Participating Emerging NREN countries in 2019: Afghanistan, Albania, Armenia, Azerbaijan, Benin, Bhutan, Cyprus, Guatemala, Honduras, Kosovo, Kyrgyzstan, Malawi, Nigeria, Somalia, Tajikistan and Tunisia.

A message from GÉANT Learning and Development (GLAD):
Boost your Performance at TNC19 with GLAD Skills PoP

We are so excited about TNC19! Did you know that GLAD will be hosting drop-in skills sessions during this year's conference? These sessions are called GLAD skills PoP sessions are scheduled every day of TNC19.. Throughout the conference the GLAD team will be on site and available to help, advise and answer your questions.

Who will benefit from these sessions?

All the conference participants. If you are attending TNC19, YOU are welcome to drop by and talk to us.

What is the objective of these sessions?

They have been designed to give first line advice and support to conference participants on effective presentations and meeting facilitation. If you are scheduled to speak at TNC19 and you would like to add the 'WOW' factor to your presentation, come and talk to us. Whether you are running a workshop or facilitating a meeting, and want maximum engagement and commitment from your audience, we can help. We will have our BIG tool box filled with easy-to-use tricks that could help you make a difference right on the spot. We also bring years of personal and professional experience because our job is to make you feel relaxed and prepared for your spotlight moment on the TNC stage.

The Skills PoP sessions can be useful for any of your current training or professional development challenges and projects. Come and see us if you would like to explore solutions that meet your training needs, build collaborations or learn about specific training providers. We can help you and would be delighted to share our experience and expertise with you.

What will happen?

We will listen to your requirements, we will collaboratively discuss some options and give you the opportunity to choose those that suit you best, then we will apply them to your session and practise it. We are confident that you will leave the Skills PoP prepared to rock that crowd.

Where will you find the Skills PoP?

In the Glass Box in the Fuel Lounge. Check out the TNC19 agenda for details.

Pictures
GLAD Skills PoP Team

Above: (Left to right) Irina Mikhailava, Irina Matthews, Nadia Sluer, GÉANT

Left: Gabriella Paolini, GARR

Questions?

Do not hesitate to contact us at any time before TNC19. Drop us an email **glad@geant.org**. We look forward to hearing from you!

Future Talent Programme 2019 Conquering the TNC Stage

Since the launch of the Future Talent Programme (FTP) in 2017, TNC has become a key event to showcase the work of talented IT students. This year, the programme welcomes 11 new talents from European NRENs and their local institutions, who have enrolled and followed a training course to prepare for the challenge.

The students were given the opportunity to submit their ideas for the Lightning Talk Challenge. This initiative is aimed at offering finalists the opportunity to experience TNC for the first time and to provide an introduction to the international R&E community. Supported by their NRENs, six finalists impressed the TNC programme committee with their submissions: Pierre van Houtryve from Belgium (Belnet), António Ferreira from Portugal (FCT/FCCN), Era Ajdaraga from Macedonia (MARNET), and Luca Coviello, Agnese Sbrollini and Enrico Pietrocola from Italy (GARR).

All candidates were trained by professional speaker and TEDx Senior Speaker Coach, Barbara Rogoski, who has been working with the Future Talent Programme from the start of the programme. Barbara commented: "As the speaker coach of the Future Talent students who present their ideas at the TNC conference, I am able to teach them how to take their great ideas and build these into interesting talks, and how to present their talks with clarity and passion. I really enjoyed the process to go from shy students to confident speakers!"

Upskilling Europe's IT Workforce

Irina Mikhailava, Head of GÉANT Learning and Development (GLAD) explains: "At GÉANT, we believe it is crucial to engage, foster and develop future IT professionals. This sentiment holds true now, more than ever, as the sector undergoes a period of considerable growth.

We set up the GÉANT Future Talent Programme to demonstrate our commitment to the up-skilling of Europe's future IT workforce. The FTP is the gateway for young professionals to the European and global networking community. It offers them an opportunity to grow and develop their skills through a series of free webinars. Furthermore, it rewards learning by offering free admission to prestigious international events to those individuals whose work is recognised by an independent panel."

The GLAD team designs and executes the programme and provides coaching and learning to student talent across the community with engaging activities to further their academic studies. This approach enables NRENs to play a major role in developing young people's skills and inspire fresh thinking. By participating in the FTP, NRENs can strengthen relationships with their member institutions, motivate high-quality students, and spark excitement about their work with stimulating opportunities.

Pictures
Left: Agnese Sbrollini

Right: Luca Coviello

FTP at TNC19:

- 6 Lightning Talks accepted
- 11 ideas submitted
- Student lightning talks: 17–18 June 2019.

Talk Topics

- **Building Community Machine Learning Tool for Agriculture and Forest Species Identification** – António Ferreira, University of Trás-os-Montes e Alto Douro (UTAD), Portugal (FCT/FCCN).
- **FOG Computing as a Lifeline for E-Health Users** – Era Ajdaraga Krluku, Ss. Cyril and Methodius University, Macedonia (MARNET).
- **Content-Interaction-Powered Distance Learning – Contact, pointing, immersion and feeling of presence** – Enrico Pietrocola, Conservatorio G.Verdi, Milano, Italy (GARR).
- **Sport-Related Sudden Cardiac Death: A New In-Cloud System for Athletes Prevention** – Agnese Sbrollini, Università Politecnica delle Marche, Italy (GARR).
- **Project Fox, a Quest for a Statically Typed Embeddable Programming Language** – Pierre van Houtryve, HEPH Condorcet, Mons, Belgium (BELNET).

CONNECT Interview: Director-General Jean-Eric Paquet, European Commission

Jean-Eric Paquet is Director-General for the European Commission's DG for Research and Innovation (DG RTD). This European Commission department is responsible for EU policy on research, science and innovation, with a view to help create growth and jobs and tackle Europe's biggest societal challenges. Cathrin Stöver, GÉANT Chief Collaboration Officer spoke with Jean-Eric about Open Science, Horizon Europe and tomorrow's scientists.

Cathrin Stöver: Jean-Eric, many thanks for your time today, I do not know if you remember, but we've met once before at the launch of the European Open Science Cloud in November 2018, in the Library of the University of Vienna. What struck me sitting next to you and listening to your speech is that you come across as a very ambitious person, and so my initial question to you is: What are your ambitions for Europe?

Jean-Eric Paquet: I don't know if I'm an ambitious person, but I am indeed ambitious in developing policies for Europe! And these need to be policies which drive the transitions that our societies are confronted with, such as the ecological and climate transitions and the related social and economic transitions. This means that we need to have more conversations about the directionality of research.

What I think is lacking today is the focus on what our research is for! For me, the ambition needs to be that research outputs, such as knowledge of course, but also research solutions, are feeding into the policy process for these ecological, economic and social transitions, meaning that we need to see research much more as a key contributor to European policies. So, there is a real need to have a more strategic and more policy-oriented discussion on research and that's indeed an ambition I have.

CS: And how can GÉANT, as a community which delivers access for scientists around Europe, support you?

JEP: Yes, as you say GÉANT delivers access and that means that you also very much deliver the structure for the research space. This is not your purpose per se, but it is clearly one of the impacts which GÉANT has and that is of course a big responsibility. Being properly connected to the EOSC and GÉANT makes a big positive difference to researchers and if you are less-well connected that can also have a big downside. Therefore, we need your coverage to be as broad and open as possible to ensure that the knowledge is exchanged and used across the world. Because the transitions I mentioned earlier are not particularly European of course. Our European social fabric is our responsibility, but when you look at the economic transition, this becomes much broader. How do you create wealth in the most sustainable way within our planetary boundaries? That is clearly a global challenge.

So, harnessing research communities around the globe and exchanging knowledge is key.

CS: This is interesting and reminds me how Carlos Moedas talks about the need for reciprocity in global science. How do we create reciprocity in Open Science?

JEP: Well there is a bit of a tension there. This is clearly one of the challenges and we had a lot of discussion as we were preparing Horizon Europe. Clearly politically, the notion that science is global and open is of course accepted, but at the same time in this competitive global world the notion of reciprocity not just for policymakers but also for scientists is increasingly important. There are three dimensions to reciprocity that we are looking at: funding of underlying and interconnected infrastructure – as you have in GÉANT; reciprocity in access to funding mechanisms, such as access to research programmes, which is key. The third dimension is related to the exploitation, valorisation and results. This is clearly one of the more tricky ones, where reciprocity may not need to be absolute.

I would say that the developments in Open Science are generally very slow. We have seen great progress with EOSC over the last 18 months and a growing commitment, such as GÉANT's who supported your appointment as Co-Chair of the EOSC Executive Board, but the developments are not going to happen naturally or easily, and there is a need for much outreach effort, to be done, to ensure that the diversity of the scientific community can indeed come together. The disciplines will have to make an additional effort in making their data available so that EOSC becomes a deep reality. But making our datasets available to the world requires similar investments into Open Science from policy makers and funders across the world, in order to create real reciprocity. I am always puzzled by the figure that only 13% of research data is re-used. This is an unacceptable constraint on resources, but also intellectual and financial waste.

It is here that GÉANT and the EOSC can make a real difference.

What are Plan S and cOAlition S?

Public bodies across Europe are funding vital research in a huge range of fields. However, unless this research is accessible, the full benefits cannot be realised. Therefore, Plan S aims for full and immediate Open Access to publications from publicly funded research.

"By 2020 scientific publications that result from research funded by public grants provided by participating national and European research councils and funding bodies, must be published in compliant Open Access Journals or on compliant Open Access Platforms."

In September 2018, as part of this plan, a group of 15 national research funding organisations and four charitable foundations, with the support of the European Commission and the European Research Council (ERC), announced the launch of cOAlition S, an initiative to make full and immediate Open Access to research publications a reality.

https://www.coalition-s.org

CONNECT Interview

CS: How do you judge virtual mobility offered in our digital environments, i.e. the fact that the software will bring the datasets to the scientist?

JEP: It's a great facilitation. I have been visiting all of Europe's key research infrastructures in my first year on the job here, and I think I have visited them all. Indeed there is more and more of the lab work no longer done by the scientists, but rather done by the facilities for the virtual scientific team, wherever they are based. That requires data to be immediately available wherever the scientist is based and that is of course a big challenge for GÉANT.

CS: Horizon Europe is currently under preparation. Can you share the main changes and priorities with our readers?

JEP: Let me start with highlighting the lightning speed with which the Horizon Europe negotiations with the European Parliament and Council were carried out, over only a 10-month period and with an early agreement in March 2019, which – after the agreement of the budget later this year, will allow for one year of preparation involving our stakeholders.

Of course, it all still depends on ensuring that the member states support the budget associated with this ambitious programme.

Beyond the budget, all other parameters are agreed. But Horizon Europe is very different from Horizon 2020, even though some key activities are being carried over. For the GÉANT community, it is important to understand that Horizon Europe creates the EIC (European Innovation Council), where the idea is to create a very powerful instrument to scale up the disruptive innovation. We need our innovators to grow fast and within Europe! The EIC will

tell Europe to stay in Europe to innovate – or even better: come to Europe to innovate!

The major change in Horizon Europe is that there will be no longer any standalone programmes, but a limited and well-defined set of horizontal and cross-cutting clusters in six areas:

- Food, Bio-economy, Natural Resources, Agriculture and Environment
- Climate, Energy and Mobility
- Digital, Industry and Space
- Culture, Creativity and Inclusive Society
- Civil Security for Society
- Health.

This means that in Horizon Europe, the individual DGs no longer own their own programmes or budgets, but have to cooperate, plan and agree across clusters thus avoiding the fragmentation that we see today. For Horizon Europe, we see real co-creation across the DGs, thus bringing the added value of linking Horizon Europe to all the other EU programmes, such as Digital Europe or the Connecting Europe Facility.

In that sense Horizon Europe will of course be a disruption to our stakeholders, who are used to working with specific teams in our organisation. To ensure that this will not be a problem and create the ownership in the research community, we will start a process of co-design with our stakeholders over the next year. A structured discussion will take place in our Research and Innovation Days, taking place in Brussels from 24–26 September 2019, and it will be important that the GÉANT community becomes part of the co-design process and attends the September event.

Picture
Jean-Eric Paquet and Cathrin Stöver, Brussels

The new approach will lead to hybrid data between public and research data, which will have a huge potential impact on the GÉANT network.

Another particular novelty are the five research missions:

- Adapting to climate change, including societal transformation
- Cancer
- Healthy oceans, seas, coastal and inland waters
- Climate-neutral and smart cities
- Soil health and food.

Over the summer, 15 key appointments will be made to each of the mission boards, with the responsibility to identify the specific delivery objectives for each of the five areas. The key here is to move beyond the research, as I have once been told: "a scientific publication has never cured a patient." You need a doctor, a hospital, so you have to move into the public policy, which brings us back to the beginning of this interview and my ambitions.

CS: My last question concerns Europe's future scientists. How do we prepare our children and young adults for the future?

JEP: Just like your daughter, three of my children are studying biology. On the university level, the digital infrastructure is all there, from eduroam to access to genome sequencers. But I am quite struck that the didactics behind it are quite similar to when my generation studied. The students are not pushed to understand the interface between the content of their studies and the digitalisation of it. It is offered, of course, but it is not central. However, I have to be modest about what I say here, because this is of course in the area of education, which is largely, and for historically good reasons, member-state led. But there is of course the expectation to better connect the education world to the research world. The instruments available here are of course ERASMUS, Marie Curie and the ERC.

However, the career of researchers, outside industry, is a genuine problem in Europe, and this is well identified by Member States, but not easily brought forward. So, we work with Member States to team up better and then also help them and focus the discussion on the skills of the people.

The education and research sides of the Commission are working closer together than ever before.

EOSC Governance Board Meets in Munich: Our elephant takes a clearer shape

Words: Cathrin Stöver, EOSC Executive Board Vice Chair

There is an excellent parable of the blind men and the elephant, which originated in ancient India, I believe. It is the story of a group of blind men who have never come across an elephant before and who are to describe the elephant by respectively touching one – only one – different part of the elephant. Each blind man feels a different part of the elephant's body, such as the tail, the trunk, the leg. They describe the elephant based on their different experience and of course, the descriptions are entirely different from one another.

I am certain that there are a few stakeholders who see it differently, but very often when we hear and talk about the EOSC, the above parable comes at least to my mind. There is a level of uncertainty felt in the community of stakeholders when it comes to EOSC past, present and future. Added to this is the fact that the EOSC received a new and complicated governance structure this year with the Executive Board and Governance Board being appointed and meeting for the first time in January.

Looking at the EOSC present and future, it is essential that the partners in the governance need to work hand in hand and in a relationship of mutual trust. To build the basis for this relationship, the Executive Board and Governance Board, DG CNECT and DG RTD came together in the first week of May for a two-day teambuilding event in Munich, organized for us by the EOSC Secretariat. In a series of plenary sessions, workshops around the EOSC working groups and team-building exercises, including a beer tasting (how not, when in Munich?), we laid the foundational stones of the EOSC building. Listening to the colleagues in the room, a common set of values emerged over the two days.

These can be articulated as being:

- Focused on research needs
- Community-driven
- Inclusive and respectful of diversity
- Accessible to all from large equipment and computers and "big data" to "small
- data" and the "long-tail" research
- Open by default – closed where necessary
- Hands-on and participatory
- Transparent and trustworthy.

In order to make EOSC work we need close coordination between scientific communities and continual engagement to co-create a platform and set of services which meet diverse user needs. EOSC will be a living system that is flexible by design and can adapt to the changing landscape and technological advances. This necessitates an incremental and iterative approach, where we remain pragmatic and start small. We cannot afford to wait for the perfect solution or control of our scholarly commons will be lost to more agile and innovative initiatives. We should release early and often, continually testing and improving the best practices, tools and services until open science is no longer spoken about but becomes standard scientific practice.

Across the room, experts, EC, representatives of the governments felt that the above forms the core vision of the EOSC and a collegiate, collaborative and constructive dialogue arose on how this vision can be jointly developed and delivered over the next 18 months. This team-building exercise was constructive and collaborative, open dialogue took place between the governance board, the executive board and the EC. We have taken a major step in these two days building the foundation for the future collaboration within the governance structure.

It is also to be noted that many member states and associate countries have now proposed experts to the EOSC working groups. As a consequence, work in the groups will now commence in parallel to appointing additional members and running an open call in the stakeholder community. Now that we have agreement on the direction, we have to start hitting the ground running in order to make the tight deadlines associated with the delivery of the EOSC.

What's next? We will have regular communications between the Chairs of the EB and GB. We will also meet again for a similar event before Christmas. And, of course, the stakeholder engagement takes shape as well – we will reach out to the stakeholders alongside the RDA meetings taking place in the week of 21-25 of October in Helsinki and during a two-day event in November in Budapest.

GN4-3

NREN Consultation on Network and Cloud Service Evolution in GN4-3

From 9 to 10 May, the first GN4-3 NREN service consultation took place in Amsterdam to gain NREN strategic-level guidance and feedback, and to build consensus on the GÉANT Network and Cloud Service Evolution in GN4-3.

A total of 70 representatives from 34 NRENs and affiliated organisations participated in person and remotely in this first-of-its-kind strategic workshop, which was jointly organised by the GN4-3 work packages: Network Technologies and Development (WP6), Online Services and Delivery Development (WP4), and the Partner Relations and Engagement Task from User and Stakeholder Engagement (WP3).

Within GN4-3, the aim is to establish an ongoing NREN consultation process that covers business and technical aspects of the development and evolution of services to ensure the GÉANT Service portfolio is tailored to the needs of NRENs. The consultation was held as an interactive workshop to allow intensive discussion and knowledge exchange among participants. The first day focused on Orchestration, Automation and Virtualisation (covered in WP6) and the second day was dedicated to Cloud evolution (covered in WP4).

Day 1: Exploring NREN Consensus on the Future Adoption of Orchestration, Automation and Virtualisation (OAV)

The first day focused on sharing the results of a comprehensive OAV assessment of the NREN landscape, followed by breakout sessions on developing a higher-level strategy and the immediate next steps that could be taken on a future collaborative path.

As more and more NRENs move towards orchestration and automation in their workflow processes and see a need for increased virtualisation, the question arises whether a common understanding of how to manage OAV can be reached within the GÉANT community, and if this could lead to consensus and mutually beneficial cooperation in moving forward in this area.

Within the new GN4-3 project, WP6 was tasked to explore consensus building within the GÉANT and NREN community. As a first step, it decided to conduct a survey with a view to:

- Learn about the strategy and actions of each NREN related to network and service OAV;
- Explore if there are common use cases, ideas, needs and issues in the community in the areas of OAV;
- Recognise possible areas of collaboration amongst NRENs, and between NRENs and GÉANT;
- Determine and recommend possible future work within WP6 (or other WPs) of the GN4-3 project that could benefit as many partners as possible for identified use case(s).

The survey was issued in April and led to 30 responses from NRENs. The survey results confirmed the diversity in approaches and OAV-related activities in the community. As expected, NRENs are at different stages of their OAV journeys. It also confirmed that there will be no single solution that will fit the needs of all NRENs, taking into consideration that many NRENs already have some Operations and Business Support Systems (OSS/BSS) that are very much tailored to their individual needs. However, there was also clear interest in sharing experiences and exploring common approaches that may lead to common architectural building blocks for a streamlined effort towards OAV in GÉANT.

Day 2: Taking Clouds to the Next Level - Together

On Day 2 the participants gathered again for what turned out to be an energetic workshop on cloud services.

In GÉANT, the NRENs have been collaborating for a number of years to make cloud services safe and easy to use. A service portfolio is available, service usage is established and a new cloud tender is planned to launch in October 2019 through the Open Clouds for Research Environments (OCRE) project. For many institutions, using cloud services is now the norm. On the other hand, cloud uptake varies substantially across regions.

The aim of this session was to share an overview of the current cloud landscape, discuss delivery, business models and organisational scenarios for increasing the collaboration on clouds and taking cloud delivery and adoption to the next level.

The NRENs discussed their joint efforts in three key areas.

Brokerage of Commercial Cloud Offers

The NRENs have put an attractive cloud portfolio in place. IaaS framework agreements with commercial suppliers are currently used by over 300 institutions in 18 countries, who have consumed more than €13 million. The NRENs discussed how to facilitate further adoption and a new cloud tender which will launch in early October, through the OCRE.

Community Cloud Development and Offers

Through the GN4-3 project, the NRENs are planning the development of joint community cloud services on a European scale: where NRENs / GÉANT act as cloud providers by aggregating national clouds into collective offerings.

Cloud Expertise

The third topic involved how the NRENs can provide more support to institutions, to help them with their transition to using more cloud services and have NRENs and GÉANT act as cloud competence centres.

These three areas were discussed in the context of broader initiatives, such as the European Science Cloud and how to interact with other e-infrastructures, projects and with commercial suppliers.

Results and next steps

On Day 1, the survey results and the following discussions proved that there is a healthy appetite for cooperation and sharing best practices within the community to minimise duplication of work and maximise the potential for future interoperability, including inter-domain OAV.

The outcomes of the workshop will be published as part of a GN4-3 Deliverable due in September 2019, and also via events such a TNC 2019 (as a side meeting on 20 June) and at the STF meeting in Dublin on 3–4 July. As the mechanisms for knowledge exchange are arranged and future focus groups are tasked to progress other collaborative activities, more concrete actions will also start to be defined over the coming weeks.

The second day showed that cloud services have become an important topic for NRENs and that research and education institutions in Europe look to their NREN for support in using cloud services in a safe and easy manner. Above all, much valuable material was gathered for use in the next steps of the NREN collaboration on clouds in GÉANT.

Flow Monitoring Tools Discussion at the 9th SIG-NOC meeting

If you had to explain what a Network Operation Centre (NOC) does, what would you say? In the last two TF-NOC/SIG-NOC surveys, we asked NOC managers and engineers which functionalities they are responsible for. Among the many varied answers they gave, one common feature stood out: monitoring. Getting the right information about what is happening on the network is fundamental to taking care of it.

Flow monitoring is one of the most popular mechanisms used in NOCs to analyse network operation, with functionalities that often go far beyond pure monitoring (DDoS mitigation, capacity planning, etc). During the last SIG-NOC meeting in April 2019, hosted by ARNES, a one-hour flow monitoring session was held, during which an overview of existing monitoring tools was given, followed by a discussion on the need for new flow monitoring functionalities.

Some relevant and interesting topics came up during the ensuing debate: all NRENs and institutions already have some form of Flow Monitoring tools in place, developed in-house in several cases as open source tools are often difficult to manage and require further development and customisation to work properly. On the other hand, some currently commercial tools were initially developed with the help of R&E communities and are now more widely used, although of course these come at a cost. The SIG-NOC group wanted to

GN4-3 Holds Workshop on White Box Technology

The GN4-3 project held a workshop, White Box Technology and Use Cases, on 4 April 2019, kindly hosted by SUNET at their offices in Stockholm, back-to-back with the SIG-NGN meeting supported by the GÉANT Partner Relations team.

assess the need for extensions to the portfolio of flow monitoring tools that NRENs use as new types of network data analyses emerge, such as machine learning.

The most relevant additional functionality the SIG-NOC members would like to see is DDoS mitigation. Other important functionalities to have would be quick overview information with the possibility of digging deeper into the data, support for all flow standards, and support for open APIs and for multi-tenancy. Telemetry, data enrichment from external sources, anonymisation of IP addresses, capacity planning, smart alerting, distributed processing, and reputation list cross-checking were also mentioned among other desirable supported features.

An important aspect mentioned by most was that if a new tool was developed, they would prefer to integrate it with their existing tool rather than use it as a standalone product.

The Flow Monitoring Tools presentation can be found on the SIG-NOC wiki page: **https://wiki.geant.org/display/SIGNOC/9th+SIG-NOC+meeting**

Workshop attendees came from 25 organisations, including: GRNET, PSNC, FUNET, GIP RENATER, SUNET, Jisc, AMRES, CESNET, UNINETT, DFN, SURFnet, NORDUnet, SWITCH, RoEduNet and GÉANT.

One objective of the Network Technologies and Services Development Work Package (WP6) of the GN4-3 project is to "improve GÉANT and the NRENs' independence from router vendors and gain greater control over network appliances by assessing the utility of white boxes and data plane programmability for use cases relevant to the community. The workshop was held as a key milestone to gauge community interest in white box technology and use cases.

The work being undertaken in Task 1 of WP6 falls under three strategic areas:

- Validating the white box platforms currently available on the market in an NREN context;
- Router for Academia, Research and Education (RARE), which investigates how a specific control plane can be used in a research and education-specific context by integrating different components of a network operating system;
- Data Plane Programming (DPP), exploring how to create advanced network services for the research and education community through white box programmability, in particular using the P4 programming language.

At the workshop, the team presented its white box strategy, use cases and current work and solicited feedback from the audience about their own use cases, assessing their interest in piloting, implementation and uptake of the ideas presented.

The most interest was received by the use cases presented by WP6. The Customer Premises Equipment (CPE), big science and Cloud Fabric use cases were identified as relevant to NRENs. It was recognised that RARE could be used, among other things, for CPE, data centre and campus network use cases, while acknowledging the need to adapt it to implementation specifics. NRENs are also interested in DPP technology, especially for the purposes of DDoS detection and mitigation and network monitoring. In the forthcoming months, the WP6 T1 team will provide updates and engage in further discussions on their emerging results.

The team is also organising a P4 side meeting to be held on 20 June at TNC19 in Tallinn, and welcomes anyone interested in white boxing and P4 to join the meeting; registration and further details are available on the TNC19 website.

Security Gets Dedicated Work Package in GN4-3 Project

The security and integrity of the GÉANT and NREN networks and their services have always been essential elements of the GÉANT project, but until now this work had been distributed across a range of Service Activities and supported on a voluntary basis through various Task Forces and Special Interest Groups. Now, reflecting the increasing emphasis on proactive security across the NREN community, all these disparate activities are being consolidated under a new work package (WP8) as part of the GN4-3 project.

WP8 brings together 43 people from 19 different organisations making it one of the most distributed and inclusive work packages within GN4-3. This breadth of contributions is one of the work package's core strengths; By combining expertise and skills from across the community, WP8 aims to become a centre of excellence for networking security and will enable knowledge transfer between NRENs.

Such knowledge transfer is crucial because, regardless of their size, all NRENs are facing very similar threats and for each organisation to have to climb the same learning curve independently can be costly and mean that many could be left vulnerable for longer than necessary.

The main work streams within WP8 are covered by three tasks, each focused on a different aspect of security: Business Continuity, Security Baseline and Products and Services.

Business Continuity (T1)

The business continuity task focuses on supporting NRENs and Institutions in a range of areas including:

- Security Awareness – consolidating this aspect across the community considerably lightens the individual workload in terms of security management for each NREN.
- Training, particularly Crisis Management – the worst possible time to learn how to manage a security incident is in the moment when it happens, so it is very important that different team members across various areas (NOC, IT, PR and Management) be trained to understand their roles and responsibilities should a major incident occur.

- Evaluation and Sharing of Best Practices – The NREN community is very diverse (particularly in terms of languages) and organisations may have different experiences and skill sets when it comes to security. Nevertheless, the threats they face are similar, so formalising knowledge on methodology to mitigate risks into best practices will enable individual NRENs to benefit and avoid steep learning curves when faced with each new technology or threat.

Security Baseline (T2)

In order for NRENs and institutions to understand how to enhance their security policies, it is essential to first assess where they stand currently and where to focus efforts. The security baseline task will help build sample security checklists to identify the key areas where NRENs can make the biggest improvements.

Security work can often seem like a never-ending arms race, with attackers finding and developing new ways to attack networks and services all the time, making the task of keeping track of the threat landscape daunting and time-consuming. The team will work to identify the 10 greatest areas of risk for NRENs and work with Task Forces and Special Interest Groups (especially SIG-ISM) to keep up to date with the latest security threats and relative counter-measures.

Leveraging skills and expertise across the community and helping communicate outcomes and results via the SIGs and TFs will ensure that all NRENs, and not just those in a position to contribute resources, will benefit from this work.

Products and Services (T3)

The products and services task will be supporting the development of a range of new security and security-related services to support NRENs, institutions and end-users, including:

- SOC Tools – A range of tools to help NRENs build efficient Security Operation Centres will be made available across the community.
- Vulnerability Assessment as a Service – A common framework for vulnerability assessment tools will help NRENs ensure that their networks and services are protected against many external threats.
- DDoS Mitigation – Distributed Denial of Service (DDoS) is a major and growing concern for all network-based organisations and services, as these types of attacks can be easy to implement and can damage not only the system or location under attack but also have major knock-on effects across the whole network. Tools to help mitigate these attacks will therefore be developed to support SOCs.
- Firewall on Demand (FoD) – Firewalls can protect individual services from a wide range of attacks but as attacking traffic traverses R&E networks it can interrupt other services. FoD seeks to block attacks, especially DDoS-related ones, closer to their source so as to reduce their impact on R&E networks.
- eduVPN – End users also require security and privacy and using third-party networks can expose them to several risks. Opening up institutional services to access from third-party networks can also expose them to attack. eduVPN allows users to connect securely to the Internet and services to better control access to protect themselves from external threats.

Network and service security is an ever-evolving field and can consume vast amounts of resource within NRENs and Institutions. By instituting the Security Work Package in GN4-3, GÉANT hopes to work with the community to provide a hub of expertise and give NRENs access to the latest security knowledge, skills and tools by the most effective means possible.

For more information about the work of the GN4-3 Security work package see **https://wiki.geant.org/display/gn43wp8/GN4-3+Security+Workpackage+WP8**

eduVPN – Providing Extra Security and Privacy for Mobile Researchers and Students

With tens of thousands of hotspots in over 100 countries, eduroam has become an invaluable tool for every mobile student and researcher. However, when eduroam is not available or an additional layer of security and privacy is needed, the question how to protect your privacy when using public WiFi becomes an issue.

Although VPN services can help, they are not without pitfalls. Commercial VPNs may still leave you exposed or generate a digital footprint of your access. Also, if you need to access services inside your institutions network, public VPN access may not be sufficient. This is where eduVPN provides a solution that addresses these issues.

As part of the new Security Work Package in the GÉANT project, eduVPN has been adopted by a number of R&E institutions as their enterprise VPN solution and an increasing number are considering eduVPN as the solution for giving their users secure access to protected resources on their internal networks.

Using a fully open source solution that has been developed by the NREN community and been subject to a robust auditing process (both the server and clients have been audited multiple times) is usually attractive to institutions. In addition to providing strong encryptions, eduVPN offers a number of compelling features. It provides full IPv6 support, both inside and outside the tunnel (providing IPv6 addresses to clients and connecting to the server over IPv6). It also integrates with existing identity managements systems using SAML, LDAP or Radius. Another major benefit eduVPN offers NRENs and institutions is the support for generic hardware to operate the VPN gateway. New features do not require a new VPN box, instead the open-source software can simply be upgraded. Where additional VPN capacity is needed, it is easy to add additional CPU cores or bandwidth.

For end-users, there are other benefits, in particular the user-friendliness of the apps. Inspired by the idea that VPN configuration should be simple on any device, once authenticated through their federated identity, eduVPN users can configure their device, activate or deactivate a VPN in just a few clicks. eduVPN apps for Windows, macOS and Android have been available for some time and, following the successful resolution of some licensing issues, an iOS app became available in March 2019. Native applications are available for all major platforms.

In addition to connecting to protected resources at institutions eduVPN also increases security when surfing the web. On selecting a national instance in the apps, which is typically operated by an NREN, the user can route their traffic to the Internet via a VPN to a trusted gateway. The number of national instances used to connect to the Internet is growing, and this is particularly useful when connecting on an unsecure network – for example a public WiFi network where eduroam is not available. As an added benefit the client can use IPv6 and if the network is restricted in some sense, circumvent that.

Last but not least, on these national instances, all current operators have chosen to allow "guest usage". This permits the user to route their traffic via eduVPN to a gateway to the Internet operated by their own NREN or by a participating NREN in another country. Using this eduroam-inspired approach, eduVPN enables easy, secure and free access to Research and Education networks.

For more information visit: **eduVPN.org**

Additional news from GN4-3/GN4-3N

Project Management Convention – Cologne, February 2019

All GN4-3/GN4-3N Work Package Leaders, Task Leaders, Coordinators, PMO met on 11- 13 February in Cologne for a Project Management Convention to ensure that the GÉANT project had a smooth kick-off across all our work packages and tasks.

During PMC, a high-level introduction of the project and its work packages was shared, the changing environment (EOSC/EDI), service uptake and value were discussed, as well as the review processes and PMO support.

Introducing the Trust & Identity Incubator

On 5 April, the GÉANT Trust & Identity Incubator presented its very first "Sprint Demo" showcasing its first results. The blog below provides some information about the T&I Incubator and its methodology. **https://blog.geant.org/2019/05/09/introducing-the-trust-identity-incubator**.

The Incubator aspires to be an open environment. To this end, the Incubator tries to, whenever possible, engage relevant other stakeholders, such as people from the broader GÉANT community or specialist working groups, such as REFEDs.

Date and time for the incubators are published on the GÉANT Trust & Identity Incubator wiki pages. **https://wiki.geant.org/display/gn43wp5/T2+-+Trust+and+Identity+Incubator**

Special Interest Group on the Management of Service Portfolios (SIG-MSP) Meeting at University of Cyprus

The SIG-MSP meeting took place on 5 March in Nicosia, hosted by the University of Cyprus. SIG-MSP meetings are a great opportunity to develop collaboration between research and education networking organisations in Europe and other regions on the topics of strategic, business and cooperative management of services. The main focus on the Cyprus meeting was Data Transfer Enhancing Services and Service Portfolio Management, demonstrating value and current best practice in Europe. This included:

- Data transfer technologies or products being used
- Process enhancements being made in NRENs on this subject
- Architectural changes which support better data transfer
- Choosing what goes into the service portfolio
- Trust & identity and security
- Implementation of service from concept onwards
- Demonstrating the value of new Services– before, during and after implementation
- Danish NREN DeiC's plans for a satellite communications service.

GN4-2 Period 2 Successful EC Review

The GN4-2 Period 2 EC Review took place in Luxembourg on 26-28 March 2019. The objectives of the review were to assess the degree to which the work plan has been carried out in addition to whether all deliverables were completed, and how resources were planned and used in relation to the achieved progress and if their use respected the principles of economy, efficiency and effectiveness. We are delighted to report that the GN4-2 project EC review was successfully completed after a thorough examination by a very engaged team of external reviewers.

On the first day, the new Head of Unit, Andreas Veispak was also present. Andreas was able to meet many activity leaders involved in the project and had the opportunity to spend some time together where discussions were very positive and encouraging. The reviewers were clearly extremely impressed and recognised the excellence and commitment of all the contributors and their work being so effectively communicated over the three-day review.

Thank you to all the contributors from the many partners involved in making GN4-2 project another highly successful project.

eduroam Managed IdP Simplifies eduroam Delivery to Smaller Institutions

With millions of users across 101 countries, the value of eduroam for both institutions and users is huge and growing. Providing eduroam to smaller institutions can be tricky, however, as they often do not have the in-house skills needed to integrate their user management systems with eduroam and manage these accounts.

eduroam Managed IdP provides a simple web-based interface to provide these institutions with a means to enable their users with secure eduroam access. By integrating with the Configuration Assistant Tool it gives a simple way to configure large numbers of user devices without needing the in-house IT team to manually manage the process.

eduroam Managed IdP is another step in eduroam's mission to deliver easy-to-use, secure, free WiFi access to R&E users around the world.

For more information on how institutions and Roaming Operators can use eduroam Managed IdP, visit the eduroam site. **https://www.eduroam.org/eduroam-managed-idp/**

GN4-3N

Planning for the Future

GÉANT is undertaking the most significant refresh of the GÉANT network in a decade, with a major project designed to support the needs of Europe's research and education community for the next 15 years.

CONNECT spoke to Bram Peeters, GÉANT's Chief Network Operations Officer, to understand more about the GN4 Phase 3 Network (GN4-3N) project and what it will deliver to the research and education community.

Bram, GN4-3N is one of the largest and most expensive projects ever planned in the research and education networking sector, why do we need GN4-3N?

This project will help to future-proof Europe's R&E network – anticipating and staying ahead of the expected growth in data transfer, and to provide cost efficiencies and stabilise costs. We can realise this in the GN4-3N project by investing in fibre now.

The current GÉANT network has been instrumental in delivering advanced network services to European NRENs and supporting worldwide connectivity for international research but it is now reaching the limits of its capabilities and is currently fairly inflexible in service provision. If we remain stuck to the current approach it will become progressively more expensive to support growth, new user needs and new services.

GÉANT is experiencing growth of 35% per annum, which means that in 10 years, traffic will grow 20 times, and in 15 years, traffic will be around 90 times larger! The challenge is to build a network infrastructure that can not only support this kind of growth, but is also able to cope with un-known needs

Across Europe, countries have significant plans to develop data-intensive services, including supporting the next generation of "big science" projects. The aim is to be able to bridge the digital divide to ensure that, wherever possible, access to network services and capacity is an enabler for countries, not a roadblock to these projects.

What are the aims of this project?

There are three main aims for GN4-3N.

First, we're aiming to directly connect 24 countries on the fibre backbone. When combined with the NORDUnet network, this gives 75% fibre coverage for European NRENs.

Second, we will focus on optical networking using open line systems. This will decouple the photonic layer from transmission layer to future-proof service provision – essential for a 15- year project.

Finally, these open optical systems will be able to carry traffic across other networks and to carry other network traffic across ours – to remove the "hard edges" between GÉANT and NREN networks. The result of this will be the ability to more easily deliver dedicated networks for our larger partners.

This is a vast project for GÉANT, what are the challenges you anticipate?

This is both a huge network project and also a paradigm shift in our procurement policy, and as such, there are a number of challenges. There is new technology, new suppliers and a new approach to working and this is a steep learning curve. The concepts of spectrum sharing is still new and we will need to work with vendors and NRENs to find solutions that are scalable, sustainable and that will stand the test of time.

Fifteen years is a long-term investment and so the relationship with suppliers will need to be adapted, with suppliers becoming partners rather than vendors. This ability to work with them and to share a clear, common roadmap will be crucial to success.

There is a huge amount of skill and knowledge in the community and we will need to continue to leverage this to understand the future needs of our NREN partners. One challenge will be managing expectations of 38 different NRENs, each with their own specific needs and vision.
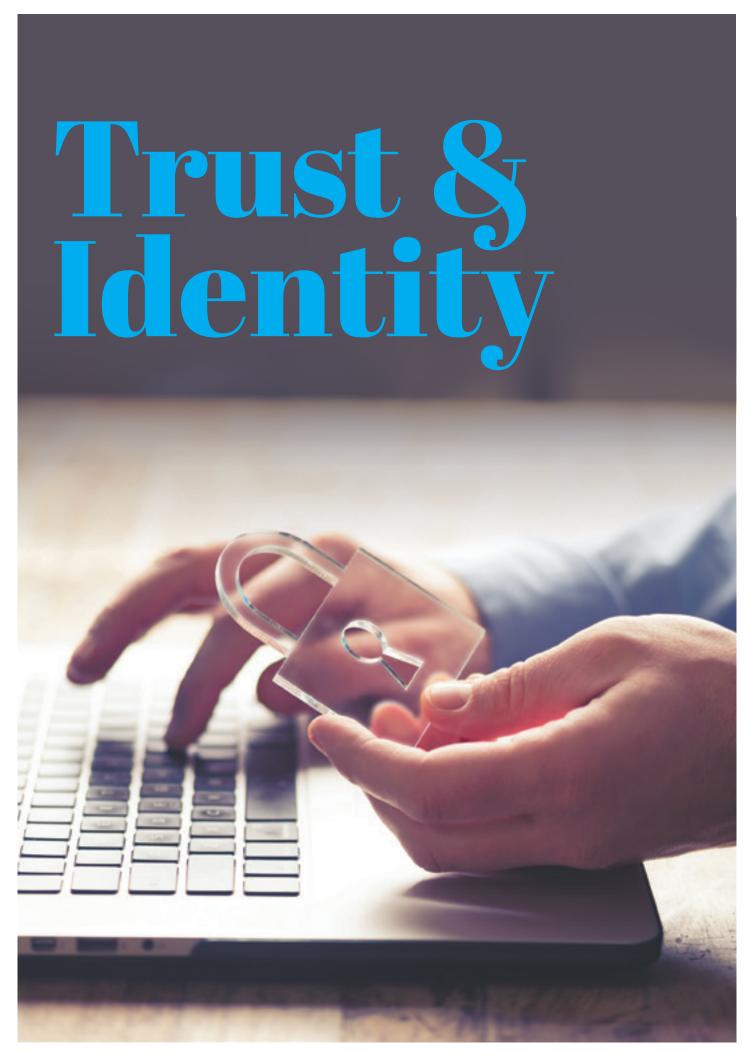
Of course, while this is happening we still need to maintain the existing quality of the network and support our current users and services. It is a bit like changing an F1 engine whilst the car is still lapping the circuit! Our team is crucial to this build and support work.

What has been done so far, and where do you expect the project to be by the end of 2019?

Like all big projects, getting the groundwork prepared is crucial and in this instance, it is literally the case, with the first two elements: the procurement of fibre optic services and launching the optical transmission equipment tender. By the end of 2019, we anticipate the first fibre to be in place.

In addition the process of community engagement started in 2017, and will continue throughout the project, ensuring the community understands what is happening and we understand what the community needs and expects.

For more information on GN4-3N visit: **geant.org/GN4-3N**

Trust & Identity

Introducing the Trust & Identity Incubator

The Trust & Identity Incubator introduces a new methodology in the GN4-3 project, to provide a container where new and potentially disruptive topics emerging in the area of T&I can be addressed and new technologies that currently have no place (yet) in the services ecosystem of GN4-3.

Words: Niels van Dijk is Technical Product Manager for Trust & Security at SURFnet. He works in the GN4-3 project as Task Leader for Work Package 5 Task 2 (Trust & Identity Incubator).

The Incubator, which is run by Task 2 of WP5 (Trust & Identity) in GN4-3, will test and experiment with totally new concepts, as well as investigate new features for existing GÉANT services. Business case development for potential new services and developments that would improve data protection and privacy aspects are also in scope.

This approach is designed to provide a high degree of flexibility and to enable the task to react to new developments much faster than previously possible.

Activities and Sprints

The Incubator will run a number of sequential cycles – or 'Activities' – typically lasting six months, during which a team focuses on a number of topics in parallel. The development process used for this engagement is a loose implementation of the Scrum development methodology.

Activities are divided into a series of 'Sprints' – time-boxed efforts during which a team works on a specific set of 'stories', that is, very high-level definitions of a requirement. Each sprint runs for four weeks after which its results are presented in a Sprint Demo. Completing the Sprint cycle six times concludes an Activity.

When an Activity comes to an end, its results are evaluated by an Incubator Advisory Board comprised of several senior members of the GÉANT Trust & Identity community, aided by a few subject matter experts from outside of GÉANT, including from Internet2, research communities and one NGO. Based on the board's evaluation, a decision is made on how to best proceed with the Activity's outcomes.

The Incubator Pipeline

One of the challenges faced by the Incubator will be to remain relevant over the four-year period of the GN4-3 project. To this end, it will adopt an agile approach towards the items it is working on and keep a list of other potential activities in a 'backlog', known as the Pipeline.

Items are added to the Pipeline based on the recommendations of the Incubator Advisory Board at the end of an Activity. The board may also suggest new activities where they believe these to be relevant to the community. Finally, NRENs will also be able to submit new items directly.

The Incubator Advisory Board will periodically review the activities in the Pipeline, and the Incubator's management will then decide which of

these to act on for the new cycle, taking into account both their level of priority as indicated by the board and the availability of resource and expertise.

The initial set of activities for the Pipeline was drafted based on the Trust & Identity Whitepaper written near the end of the GN4-2 project, as well as the work of GN4-2 that was handed over to the Incubator. These are:

- Community Tagging (aka Pixie Dust)
- Cryptech HSM - Preparation phase
- Discovery Pilot
- IdP as a Service Business case
- ORCID as IdP of Last Resort
- Second Factor Authentication – Distributed Vetting
- Shibboleth OIDC Extension.

Sprint Demos Open to All

The Incubator aspires to be an open environment. To this end, it seeks whenever possible to engage other relevant stakeholders from the wider GÉANT community, as well as specialist working groups such as REFEDs. Additionally, the monthly Sprint Demos are open to all interested parties. The dates and times of the Demos will published on the GÉANT Trust & Identity Incubator wiki pages.

A Decade of eduGAIN: Around the World in 10 Years

Brook Schofield, departing Chair of the eduGAIN Steering Group, reflects on the past 10 years and looks to the future.

eduGAIN enables simple, secure single-sign-on access to content, services and resources for the global research and education community. Its continued support, development and promotion in Europe is provided through the GÉANT project (GN4-3), with MAGIC and TANDEM projects helping to promote eduGAIN uptake in other world regions.

Much has changed since this early eduGAIN videoconference, chaired by Valter Nordh (SUNET) in 2009. This meeting marked many decisions that helped to shape eduGAIN, such as its focus on SAML2, the launch of a pilot version of the service, and growing the federation community to encompass wider representation of the R&E community.

The initial research project behind eduGAIN focused on a translation-bridging element between federation technologies. eduGAIN's transition to a service required focus on providing value to federations and their membership. Ultimately, the 22 federations that existed or were forming in 2009 committed to eduGAIN, and by 2019, the service has reached 60 members.

eduGAIN was always envisaged as a community service. It grew from a task force within the community programme, driven by the goal of identity federation interoperability, and was incubated as a research activity by earlier iterations of the GÉANT project. In 2011, it launched as a service to encompass and support the needs of identity for research and education, a global authentication infrastructure. With continued development it now supports more complex requirements of research communities and the differing trust models of industry providers, enabling a more advanced use of federated identity.

The start of a new project funding cycle for GN4-3 has begun, and my term as Chair of the eduGAIN Steering Group term ends mid-2019. It is timely to return eduGAIN to the hands of the community that have worked tirelessly to develop, support and grow it.

As this edition of CONNECT is published, a new Chair of the eduGAIN Steering Group will take over. The future of eduGAIN remains bright, and the challenge of meeting the diverse needs of identity for research and education and our integration with commercial services requires community engagement and collaboration at all stages.

eduGAIN in Numbers

Federations in eduGAIN	
Members	60
Voting-only Members	4
Candidates	11

Entities in eduGAIN	
IdPs	3075
SPs	2450
All Entities	5525

BACKFIRE:
Broadening Federated Identity in the Asia–Pacific Region

As Identity federations have become a central part of the NREN landscape over the last ten years, the Asia–Pacific region has been largely underrepresented in this space. The APAN Task Force on Identity and Access Management (TF-IAM), spearheaded by Terry Smith of the Australian Access Federation, has been bridging the gap with a series of training events, webinars and meetings aligned with the Asia Pacific Advanced Network.

Since 2018, attendance of TF-IAM meetings has been bolstered by funding from Asi@Connect for the Broadening Asi@Connect Knowledge on Federated Identity, Roaming and E-infrastructure (BACKFIRE) project. This is focused on bringing the least-represented members of the Asia–Pacific R&E community to engage in federated identity topics.

Sharing Best Practice

Thilina Pathirana used the group discussions at APAN45 in Singapore to question Terry Smith (TF-IAM Chair and Australian Access Federation) on federation models and architectures. Thilina's role at the Sri Lankan NREN (LEARN) is to provide technical assistance to the NRENs members and to mentor them on new technologies and systems. Participation at TF-IAM (supported by the Asi@Connect BACKFIRE project) allowed him to engage with peer identity federations and skip development dead ends and hurdles that have been encountered and overcome. In the space of less than 18-months, the LEARN Identity Access Federation (LIAF) has gone from zero to become one of the newest members of eduGAIN. Thilina's role is quickly moving from student to mentor of the TF-IAM community.

A Broad Community

Some members of the community are not able to attend these meetings, due to a range of factors (such as geographical, financial and organisational priorities) and as such, they continually miss out on the training and knowledge sharing opportunities available at APAN events.

Pictures
Top Left: The Bangladesh NREN team (BdREN) meet with Brook Schofield at APAN46 in Auckland, NZ

Top right: Thilina Pathirana (centre) and Terry Smith (TF-IAM Chair/ AAF) (right, seated) in group discussion at APAN45/ Singapore

By specifically supporting beneficiaries from the 16 least-active economies of Asia (Afghanistan, Bangladesh, Bhutan, Cambodia, India, Indonesia, Laos, Malaysia, Mongolia, Myanmar, Nepal, The Philippines, Pakistan, Sri Lanka, Thailand and Vietnam), the seed of federated identity has been firmly planted in the development of NREN services for the region.

Where next?

APAN48 in Putrajaya, Malaysia (16-20 July 2019) will be the last opportunity for the BACKFIRE project to bring people together physically at a TF-IAM meeting, but that isn't the end of the journey. The Task Force will continue to develop a pool of talent in the region, share experiences with their peers globally, and fulfil the specific use cases for federated identity in the R&E community.

eduroam End-User Diagnostics

Helping users get online

eduroam is a roaming consortium that successfully serves millions of users around the world, with billions of successful roaming authentications every year. What is even more impressive is that it does this by linking WiFi services from thousands of independent campuses and institutions, each run by their own IT teams.

However, WiFi is a complex technology and sometimes, things go wrong. When that happens, the technologies eduroam relies on are not always very user-friendly. Error messages can be unhelpful, misleading or non-existent, and where issues occur in the roaming infrastructure, it is not possible to convey a meaningful message to the user at all.

In spite of this lack of proper diagnostics almost becoming the status quo, eduroam Operations set out to improve the situation by developing a diagnostics toolset which can be accessed from a web browser. Users can use alternate means of network access such as a 4G connection on their mobile phone to trigger an analysis of their current roaming situation and device configuration. The web-based tool then tries to find the most probable reason for the failure.

A beta version of the tool is already available on the eduroam CAT website (https://cat.eduroam.org) and can be accessed by selecting Help and Diagnostics from the drop-down menu.

In its current version, the tool helps identify the likely cause of the issue, exploiting both automated infrastructure monitoring and asking the user some simple questions about the nature and context of the issue. The next version, which is currently under development, will also provide advice on how to address the issue (e.g. by pointing end users to the download page of CAT installers if the suspected issue is their own device configuration) and on other steps that can be taken (e.g. if a piece of roaming infrastructure is defective, users are pointed towards an appropriate contact).
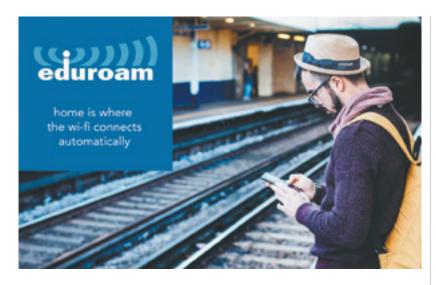
This is part of an ongoing activity to help eduroam Operations leverage diagnostics, including addressing diagnosing hotspot problems more efficiently and effectively through dedicated hardware monitoring devices at the hotspots, which can be used both for regular monitoring and for user-triggered real-time diagnostics.

cesnet

Rolling out eduroam Across the Czech Republic

The number of eduroam users grows every year, reflecting the significant increase of the number of involved institutions and access points in the Czech Republic. As reported in CONNECT 31, eduroam is available at the 12 largest train stations of the country and now also at primary, secondary and further-education schools.

Expanding Access

The Czech Republic currently has 26 public colleges and universities with over 260,000 students, who account for 90% of students in tertiary education. All these students have access to eduroam. Over time, eduroam has virtually become the default WiFi at universities, and is used by so many students that many think it is simply the name of their school hotspot!

eduroam can also be used by the researchers of some of the Czech Academy of Sciences institutes. In addition, CESNET creates eduroam access points for other relevant institutions, such as in libraries, hospitals, primary and secondary schools, and some regional authorities.

Information Campaigns

CESNET strives to motivate organisations to expand the eduroam infrastructure at a national level. A key message is that by joining the infrastructure, an institution gains a simple and secure user authentication system, allowing its users to connect throughout the world. There are now more than 25,000 such locations in 101 countries.

Government Support

The successful development of the eduroam infrastructure in the Czech Republic was achieved due to the Czech Ministry of Regional Development being persuaded by the advantages it offers, and incorporating a move to connect to the network in its strategic IROP project for Primary School Infrastructure (Socially Excluded Communities) intended for primary, secondary and further-education schools.

Thanks to this initiative, users can now use their credentials from their home institution to connect to the eduroam wireless network at 850 locations throughout the Czech Republic. In the past year alone, the number of locations at which eduroam is available has increased by a quarter, the number of involved institutions almost doubled and the number of unique user names logged on to the network increased by 12%.

eduroam has been a huge success in the Czech Republic and with the support of the Czech Ministry of Regional Development, this is likely to continue in the future.

Further information

https://www.eduroam.cz/en/start

AARC:
The Legacy Begins

The second Authentication and Authorisation for Research Collaborations (AARC2) project ended on 30 April 2019. All major research and e-infrastructures in Europe and beyond recognised the value of AARC results and are considering deploying its Blueprint Architecture (BPA) and the policy frameworks. Thousands of researchers from the AARC partners representing research collaborations will benefit from the work done in the project pilots. The results of the pilots, along with policy and training materials will continue to support AARC BPA deployments in future, and, as the AARC community continues to meet and work together in other forums, the AARC products will be further developed and updated.

Pictures
Clockwise from top: Participants at the final AARC 'All Hands' meeting in March 2019; Licia Florio thanks AARC partners; Sweet success with the AARC BPA (cake)!; Nicolas Liampotos (GRNET), BPA team leader, enjoying a slice of BPA-decorated cake

#StartWithAARC

The AARC output materials give a head start to anyone seeking an Authentication and Authorisation Infrastructure (AAI) solution for their research collaboration.

- Blueprint Architecture - building on top of eduGAIN, the Blueprint Architecture defines a proxy architecture and adds functionalities that are required to support common use cases within research collaborations, such as access to resources based on community membership. The AARC BPA identifies key AAI components that can be combined according to specific research collaboration needs and offers policy frameworks to secure the resulting AAI. A flexible approach that allows inter-operable AAIs to be created in a scalable and secure way. **bit.ly/aarc-bpa**
- Policy Development Kit – a toolbox of information, template documents, training materials and guidelines on specific topics relating to policies that support the secure use of the BPA. **bit.ly/aarc-pdk**
- AARC in Action – research collaborations examples from the AARC pilots, including their AAI requirements, and the technical components and training materials they used. These provide a useful basis for comparison to other research collaborations and find the best starting point for their AAI without having to reinvent the wheel. **bit.ly/aarc-in-action**
- Guidelines - to help research collaborations deploy and operate their AAI more effectively these advice documents support the BPA and policies. **bit.ly/aarc-guidelines**
- Training – materials from face-to-face and online courses and tools aimed at research communities and service providers. **bit.ly/aarc-training**

Engaging and Inspiring

AARC provided an opportunity to bring together research communities, and e- and research-infrastructures to understand common challenges and needs. The AARC Engagement Group for Infrastructures (AEGIS) was created to ensure the BPA and guidelines could be adopted by AAI operators. This forum will continue beyond the project. **bit.ly/aarc-aegis**

AARC also liaised with established groups such as FIM4R (Federated Identity Management for Research) and REFEDS (Research & Education Federations). Inspired by AARC and FIM4R, FIM4L, a new group for libraries, has been launched. **daasi.de/de/fim4l/**

AARC: A Framework that will Benefit Research Collaborations

The second AARC project built on the achievements of the first, to expand and deploy the BPA and policy frameworks, working closely with research collaborations so they could build interoperable authentication and authorisation infrastructures (AAIs). Thanks to the efforts of the 25 partners and other contributors, AARC has created a legacy that can benefit other research collaborations worldwide.

Discover the full story of the AARC project: **bit.ly/2PWA9Zv**

AARC at TNC19

Several members of the AARC team are presenting relevant developments in the following sessions:

Session 3B: Are we done with T&I? (Monday)
This session highlights how Identity Federations and NRENs are evolving and changing the way they think about identity to meet the needs of students, staff and researchers. One presentation reveals how the AEGIS group will continue beyond AARC and ensure continuity in federated access for research collaborations. This outlines the main concepts of the AARC Blueprint Architecture (BPA), how the BPA model leverages eduGAIN, so users can access services using their home organisation credentials, and how the BPA underpins community AAI services in EOSC and its implementation projects. The plans for shepherding and further evolving the BPA and its accompanying set of guidelines will also be revealed. **bit.ly/2YcigZG**

Session 4B: eduTEAMS – Enabling digital communities (Tuesday)
eduTEAMS enables users to create digital communities through which they can collaborate by sharing digital resources and services in a secure, flexible and scalable manner. This session shows how eduTEAMS is being used by several communities to enhance their IT security, identity management and user experience and take full advantage of federated access. It introduces the GN4-3 project's strategic Trust & Identity goals and details how eduTEAMS will help GÉANT achieve these. The session includes a discussion of how eduTEAMS implements the AARC BPA, its capabilities and roadmap, and how it can enable communities across a spectrum of disciplines and sizes to create and manage their collaborative environments. **bit.ly/2J3Pua1**

REFEDS (Sunday)
For anyone joining the REFEDS meeting the day before TNC19, the agenda includes a retrospective of the achievements of AARC. **bit.ly/2WwgQsy**

Further information

Join the TNC19 sessions or see the slides / video streams: **tnc19.geant.org**

AARC2 was funded by the European Union's Horizon 2020 research and innovation programme under Grant Agreement 730941.
aarc-project.eu
bit.ly/aarc-videos

Increasing cloud usage in European Research and Education via GÉANT:

300 institutions, €13 million

Over 300 research and education institutions in 18 European countries are now using the GÉANT Infrastructure as a Service (IaaS) framework agreements to safely and easily access market-leading commercial cloud service providers.

The GÉANT IaaS has undergone a rigorous EU-compliant tender process so that adopting institutions do not need to run their own tender procedure but can simply benefit from reduced costs and tailor-made service offerings through ready-to-use agreements under their local laws. As a result, R&E institutions have now collectively consumed commercial cloud services through the IaaS for a value of over €13 million.

Reducing Barriers to Service Use

Using the cloud services in the GÉANT framework offers several additional advantages to institutions. It reduces their capital expenditure and provides them with increased flexibility through access to a wealth of online services. Moreover, they no longer have to worry about over-provisioning in-house services or having to expensively upgrade services that turn out not to be needed or to be less popular than anticipated, and the services provided are always up to date, helping institutions to future-proof their offering.

However, many organisations are concerned about the perceived lack of control that using commercial providers may imply. GÉANT has drawn up agreements with the service providers in the framework to ensure that institutions are guaranteed the level of technical and financial control that they need. GÉANT and the service providers also organise cloud workshops and training to help institutions grow their skills in deploying and using cloud solutions with confidence.

Next step: OCRE

The success of the GÉANT IaaS framework shows that by working collaboratively the European research and education community can establish the right conditions of use for commercial cloud services. GÉANT will apply the lessons learned from this process in its next project for the delivery of commercial digital services: Open Clouds for Research Environments (OCRE).

OCRE promotes the usage of commercial cloud offerings as part of the European Open Science Cloud. It will aggregate the requirements and demand for cloud services of the European research and education community into a public procurement (tender) to establish agreements with capable cloud providers as well as Earth Observation service providers. The tender is planned to be published in October 2019, with service agreements signed and available in March 2020.

OCRE will facilitate the uptake of these services and, in addition to institutions buying resources, the research community will be able to benefit from an EC cloud adoption fund of €9.5 million.

GÉANT coordinates the OCRE consortium, alongside CERN (**https://home.cern/**), RHEA (**https://www.rheagroup.com/**) and Trust-IT (**http://www.trust-itservices.com/**).

More information

https://clouds.geant.org
https://www.ocre-project.eu

"After moving 98% of our infrastructure in Azure, we don't have to worry about the physical hardware and administrative and contract costs are much lower."

Dr. Ray O'Neill, Head of ICT and Procurement, Quality & Qualifications Ireland

"My first experience in working with a cloud service was very positive. All in all, the cloud service, in my opinion, offers many advantages in teaching scenarios on ICT topics."

Teacher of the Lycée des Arts et Metiers (LAM), Luxemburg

"We're collaborating with the universities of Bergen and Oslo to demonstrate how we can create a common market place, a sort of AppStore, where the universities can act as both consumers and suppliers. In this work we have utilised both container technology and Kubernetes."

Hildegunn Vada, UNINETT

Accelerating Growth if IPv6 Traffic Driven by Big Science

Since the official IPv6 Launch day in June 2012 (**https://www.worldipv6launch.org/**) the deployment of IPv6 within network providers has accelerated rapidly with an estimated 80-90% deployment of IPv6 within their networks (usually running in parallel with "traditional" IPv4 networking). However, the data volumes using IPv6 over commercial networks are still very low. The Amsterdam Internet Exchange (IX), for example, transfers an average of 3.7 Terabits per second of which less than 3% is IPv6 traffic. By contrast Research and Education networks have not only embraced IPv6 deployment but are seeing substantial increases in traffic using IPv6.

GÉANT implemented IPv6 across the whole network over 15 years ago with 100% of the network now fully enabled and the deployment of IPv6 across NREN networks is rapidly expanding.

In April 2018, the GÉANT network was transferring an average of 20 Gbit/s of IPv6 traffic (approximately 6% of total traffic) and only 12 months later this has increased to an average of 110 Gbit/s or 22% of total traffic – an increase of 5.5 times.

A detailed analysis of this increase is ongoing, but the IPv6 traffic flows appear to be more consistent and not as subject to either the weekly peaks and troughs of IPv4 traffic or the more seasonal variations across summer and Christmas. This would indicate that this traffic is more closely associated with the many "big science" projects that use GÉANT's network to transfer and share data – suggesting it is more black hole data than black cat videos!

Whatever the true cause of the rise in IPv6 traffic, it is clear that GÉANT and the NRENs are likely to see even more growth in the future as big science requirements ramp up and institutional traffic increasingly migrates from v4 to v6.

These changes in both traffic patterns and profiles will help GÉANT better understand the trends in R&E networking and assist in the planning and design of the new GN4-3N network over the next few years.

THE NEXT GENERATION INTERNET FORUM 2019

25 SEPTEMBER 2019 | HELSINKI, FINLAND

RESHAPING THE INTERNET THROUGH COLLECTIVE AND NETWORKED INTELLIGENCE

The The Next Generation Internet - NGI - initiative brings together some of Europe's top internet researchers, innovators and policy makers, who are shaping the internet of tomorrow.

To be on top of the relevant technologies and market developments, the NGI needs the best players to be on board.

Join us at the NGI Forum 2019 on the 25 September in Helsinki in Finland to discuss priorities and challenges for building a better internet for all.

The event will include a mix of expert talks, open discussions and interactive working groups.

NGIFORUM.EU

🐦 **@NGI4eu | #NGIForum19**

Registration is FREE, but seats are limited. Found more details about the NGI Forum 2019 at NGIFORUM.EU.

Tom Fryer,
Head of International Relations, GÉANT

Tom Fryer is Head of International Relations at GÉANT. With over 10 years' experience in GÉANT's international activities, he is the person to ask about the IR team and why global collaboration is more important than ever.

It is said that GÉANT is at the heart of global R&E networking. What are the next steps for GÉANT?

In answering that, it's important to first take a step back and remember our purpose. With the world facing so many challenges, researchers are helping us all to understand more about the environment, health, medicine, space… even the more philosophical areas of life! Research and education networking plays a major role in all of this, ensuring researchers and academics can work together across the world. Our community is at the centre of global R&E networking, and we need every day to keep in mind the people who are relying on these networks.

So, what are we working towards? Well, one of the key areas of the IR team's work is the projects that support development of regional networks outside Europe. GÉANT has long played a key role in the management and implementation of these projects that have been made possible by European Union funding and the European Commission's commitment to these networks and how they can support the development of countries and regions.

Over the next 12 to 18 months, a number of these projects will end (AfricaConnect2, CAREN, EaPConnect) so we are working with the Commission and our regional partners on planning for

successor projects. And for the Eastern Partnership (under EaPConnect) we are focusing on the possibilities of securing long-term IRUs (Indefeasible Rights of Use) that provide more sustainable connectivity – and therefore long-term stability – rather than leased links. This model is already used effectively in the GN4-3N and BELLA projects.

On BELLA itself, our team is heavily involved in the transatlantic part of the project, and we're closely following the construction process of the EllaLink cable, tracking project progress and making sure everything is going as planned.

What are your day-to-day priorities?

Whilst our priority is to ensure the successful and seamless continuation of a number of projects beyond their current funding cycle, on a day-to-day basis we are continuously working with all our global partners (across North America, Latin America, the Eastern Partnership countries, Africa, Western Asia, Central Asia and the Asia-Pacific region) on specific elements of connectivity, liaising with different user groups to ensure they have the support they need, looking at service collaboration, and providing general support for our operational interactions. In the same way that GÉANT has a partner relations function in Europe, so International Relations provides a liaison function for our global partners.

We're also working right now with GÉANT's design team to update

our global maps and working with a number of NREN partners on taking the principles of GÉANT's interactive map to the next level. This might seem like a small item, but the maps are a great way to get across to people the benefits of global collaboration: how their local connection means they are connected – via their NREN and their regional network – to peers all around the world.

What are the challenges you expect your team to face?

Firstly, we are a small team, with five people currently managing six EU-funded projects (BELLA, EUMEDCONNECT, EaP, CAREN, and AfricaConnect2 Clusters 2 and 3) and preparing for their successors. So simply balancing our workload is a challenge. But also, we need to keep our minds on the wider picture with our global partners beyond the regional projects, for instance on service collaboration and day-to-day operational support, as well as engaging more generally with the European Commission on future planning. Of course, we're not alone in this regard!

In the wider environment, connectivity prices in certain areas remain a challenge. In the past getting connectivity into Africa was a real challenge, but now with more and more cable systems in operation, that has been greatly improved and is far more cost-effective. However, for our West and Central African partners we are

We are heavily involved in numerous meetings covering such areas as the global PR network, AfricaConnect coordination and global cloud service collaboration. We have a long list of partner meetings we're looking forward to, we're giving updates at the GÉANT booth on the BELLA project and the global maps, MoU signings… the list goes on!

The IR team is also organising the Emerging NREN Programme, which brings staff from emerging NRENs around the world to TNC where they are paired with a European contact to accompany them at the conference, introduce them to peers in their area of work, and further help global collaboration. We have a good number of candidates attending this year, and many will be giving Lightning Talks.

It will be non-stop for the IR team at TNC, and we can't wait!

now seeing inter-country connectivity as the issue, where prices are higher even than other parts of Africa. Our challenge is to convince suppliers that everybody benefits once sustainable high-speed connectivity is in place. Connectivity brings users, which brings greater demand for connectivity and services, and supports the economic development of the region. All stakeholders – suppliers, regulators, governments – need to work together to achieve this.

But it's great to note the successes as well. For example, during the Arab uprisings, we saw that certain NRENs were disconnected. Thanks to collaborative AfricaConnect2 project-led efforts, we see Morocco and Tunisia back in the global fold, and research and education moving forward in those regions.

Connectivity is of course vital, but what are you doing to expand the availability of Trust & Identity, and Cloud services?

Connectivity is the foundation and you need more than that to collaborate. Trust & Identity is a key element of our service offering, and, for example, through the ELCIRA and MAGIC programmes, we have seen the establishment of identity federations in Latin America and the

basis for continued growth in T&I services

In GN4-3 we have a Task dedicated to Global Partnerships and Service Outreach. This area looks at all the services that are offered in a European environment and considers where there is scope for those services to be shared with our global partners. This might also include tools, software, or training. The intention is to encourage involvement in wider community efforts and collaboration.

Essentially, we analyse which services can be shared, speak to our partners and explain the service and its benefits, identify gaps in their offerings, and look at how we can work with them to fill those gaps. But it's two-way: we can learn from our partners if there are gaps in our service areas and how they might be addressed. It all feeds into service development.

TNC is when the global community all comes together. What is your team involved in at TNC19?

TNC18's participants represented 73 countries, with just over half of those European countries. That is a very significant global presence and means that around 70% of the countries reached by GÉANT will likely be at TNC19. So yes, we'll be very busy and the whole team will be there!

The Quick-Fire Round:

Favourite work trip?

Probably the kick-off meeting of the TANDEM project that was held near Dakar. We took a boat trip out to the idyllic island of Gorée, where the environment and amazing local food set the scene for a very successful meeting.

Favourite drink?

Yorkshire tea, Spanish ale or a drop of red wine (depending on time of day and year)!

Last holiday?

For relaxing holidays, we like to head to France or the Spanish coast.

Dream job (apart from this one)?

Something in a multicultural environment where people are at the heart of things – my experience as part of the support team for Spanish athletes at the Beijing Paralympics will stay with me forever!

Rosanna Norman,
Communications Officer, GÉANT

I am part of the marketing and communications team, providing support to the activities of the GÉANT project and the GÉANT organisation. I am currently also the marcomms lead for our flagship conference TNC and part of the CONNECT magazine editorial team.

In addition, I support visibility efforts for BELLA, a regional network project, which will deliver direct connectivity between Europe and Latin America. With my work I also help promote the activities of the GÉANT Community Programme and Learning and Development Team.

What do you enjoy most about working at GÉANT?

I love to connect, communicate and collaborate. I am a typical extrovert, I get an incredible buzz from working in such a multi-cultural environment here at GÉANT, being surrounded by like-minded, committed, enthusiastic and stimulating people with incredible depth and experience who share the belief that what we do is for the greater good. Since joining GÉANT I have understood the meaning of collaboration. This place just takes it to a different level.

I also enjoy being part of the TNC team. Yes, at times it gets a bit hectic, but seeing how it all comes together in the end, culminating in a great event, is just so satisfying.

I never stop learning, networking technology is complex and in parts obscure, but I have wholeheartedly embraced the challenge to translate such complexities into clear and compelling messages – ultimately, I want to help get the word out loud and clear, about our impact and how we enable ground-breaking research and innovative delivery of education.

I feel very privileged to be part of this organisation, and also of the wider community – this is just such a special place!

About Rosanna

Rosanna is an international marcomms specialist with experience in technology. Before joining R&E networking she worked for a world-leading provider of critical communications solutions following 10 formative and exciting years at UUNET, the first commercial ISP and Imperial College, London. Rosanna is from the sunny Italian 'heel of the boot' and LOVES her life in Cambridge, but frequently escapes to the South for her regular dose of iodine (it's in sea air) and mamma's cuisine.

The Quick-Fire Round:

Latest book
How to hug a porcupine by Julie A. Ross (yes, I have a teenage son)

Latest film
"How to Train Your Dragon the hidden world" (erm … I have a 7-year-old daughter too)

Favourite holiday
Rarotonga, Cook Islands – one of the most beautiful, friendliest and most peaceful places on earth.

Focus on the GÉANT Community Programme

CONNECT meets **Esther Wilkinson** and **Baiba Kaskina**, who chair the SIG-Transnational Education and TF-Computer Security Incident Response Teams, with the highlights of this year's Network Performing Arts Production Workshop.

Esther Wilkinson, Special Interest Group on Transnational Education

Since 2017, the GÉANT Special Interest Group on Transnational Education (SIG-TNE) has discussed the technical challenges for education that is developed in one country and delivered in another. SIG-TNE Chair, Esther Wilkinson, Head of International at Jisc, describes her vision of what the group is trying to achieve.

What does your involvement with the SIG-TNE mean to you?

The SIG-TNE has attracted much attention from the global research and education (R&E) community. Over 150 members from R&E networks, governments, academics and library and IT staff strive to raise the profile and importance of the technological aspects of TNE. In Europe, the UK, France and Germany are in the top six countries that deliver TNE to the rest of the world, and in the UK, we deliver globally to all but 15 countries.

Transnational education takes many forms: from 'branch' campuses (or multi-location institutions), to partnerships between universities in different countries, and distance and online learning. All require an alternative approach to deliver real-time teaching, synchronised exams and administrative systems, to name but a few.

TNE is on a growing trajectory, and our R&E networks and their respective communities need to deliver seamless, efficient and ubiquitous connectivity and services to underpin teaching and learning in globalised world. Looking back, the focus of connecting R&E organisations has been on research rather than education, but we also need to support those involved in teaching and learning – students and staff who need to be globally mobile and globally connected.

Fundamentally, the students and staff that we serve and support deserve high-quality education, with at least an equitable experience to their peers studying in the home country. This requires access to wi-fi, applications and Virtual Learning Environments (VLEs) at all hours of the day or night, as well as access to content, and being equipped with the digital skills to optimise their experiences.

In your opinion, what are the main achievements of this group?

Our steering group, including members from the USA, China, Netherlands, Italy and the UK, works to share best practice within the community of TNE professionals. Key areas of work include: collecting data, reviewing connectivity policies between sending and receiving countries, and developing resources and toolkits for R&E networks and their respective communities.

We need to lead the way in using technology in more sophisticated ways. I want the SIG-TNE to explore connecting global education by using technologies such as virtual and augmented reality, machine learning and artificial intelligence. Such innovation aligns with the global fourth industrial revolution (Industry 4.0) and the Education 4.0 agenda. However, how can we make this step-change in using technology in international education when we are not optimising its use today?

Picture
Esther Wilkinson

What are the benefits that SIG-TNE brings to the R&E community?

I believe we are strengthening the value proposition for education in our global R&E community. Erik Huizer, GÉANT's CEO, has said that: "NRENs can provide the tools and act as the enabler for governments, educators and students to tackle challenges to the educational systems and thus to cater for the individual rather than the mass brain."

Global connections are just as important for research as for education. Eliminating the geographical, technical, physical and cultural boundaries of knowledge transfers is at the heart of what we do, regardless of political decisions, such as Brexit.

To find out more information on the GÉANT SIG-TNE, please access our Wiki site at **https://wiki.geant.org/display/TNE/SIG-TNE+Hom**e or contact **esther.wilkinson@jisc.ac.uk**.

COMMUNITY
PROGRAMME

Baiba Kaskina, Task Force on Computer Security Incident Response Teams

What does your involvement with TF-CSIRT mean to you?

Being the Chair of TF-CSIRT is a great responsibility. The aim of our Task Force is to ensure the success and guarantee the future of the European CSIRT collaboration forum. I want this group to succeed and I have been devoting a great deal of my energy and passion to the colboration with the Steering Committee and the GÉANT Security team, to advance the way TF-CSIRT operates. How? By making our meetings more stimulating and interesting, engaging with members who are new to the community, and improving transparency of our procedures.

In your opinion, what are the main achievements of this group?

TF-CSIRT provides an all-inclusive forum for collaboration and cooperation of CSIRT teams from all over Europe and beyond. In my view, the main achievements of TF-CSIRT can be summarised as follows:

- Community building: our Trusted Introducer directory has information about more than 350 CSIRT teams.
- Our three meetings per year continue to be very engaging and interesting events, attracting more than 150 participants at a time.
- Our Trusted Introducer certification is CSIRT's maturity assessment scheme, the first certification framework in the world created especially for CSIRTs.

What are the benefits that TF-CSIRT brings to the R&E community?

TF-CSIRT provides an international forum for CSIRTs from the R&E community as well as from government, national, commercial, military and other groups to meet and exchange their experiences. To the R&E community in particular, it offers the possibility to meet people dealing with similar issues, but working in different domains, and provides an opportunity to compare tools and methods used to solve incidents and analyse attacks. Our group also provides the chance to meet potential partners for future projects, establish working groups, tackle particular problems, but most importantly, to establish a relationship based on trust with colleagues from other CSIRT teams and creating connections that will be very beneficial in case of incidents and crises.

For more information on TF-CSIRT, visit **https://tf-csirt.org/**

Picture
Baiba
Kaskina

2019 Network Performing Arts Production Workshop: At the Crossroads of Music, Technology and Science

LoLa

Developed by GARR, by musicians (the initial project was designed by Trieste Music Conservatory) for musicians, LoLa is an ultra-low-latency Windows platform that allows synchronous performances above CD audio and HD video quality.

Ultragrid

A cross-platform software application that uses consumer devices for streaming up to 8K resolution video and multi-channel, high resolution audio. Ultragrid runs on standard laptops and is a great entry level tool for musicians who want to start using research and education networks to connect remotely.

MVTP

A hardware low-latency, high-quality streaming solution developed by CESNET (the Czech Republic NREN), offering up to 4K at 60FPS with TICO compression.

Ambisonics

A special audio surround sound format that provides the ability to capture a completely immersive (360 degrees) picture of the environment in which it was recorded.

Four sessions comprised topics ranging from technology for distance collaboration to community projects, from research and experimental work to a very successful panel discussing different aspects of multi-site performances, across three very busy days. The full programme is available at **https://npapws.org/npapw19-programme/**

In addition, the event included the first ever Art & Technology Hackathon (NPAPW HackAThon), where all participants working in teams using LoLa, Ultragrid and MVTP could set up remote connections and create or improvise performances with remote hosts.

NPAPW sits at the crossroads of music, technology and science, in the very spot where these disciplines push boundaries, even challenging each other. It is, in fact, only at this juncture that new spaces are explored, new distances reached and something new, special and unique is created.

A beautiful and sunny day framed the 2019 edition of the Network Performing Arts Production Workshop (NPAPW19) held in Prague, Czech Republic, at the Academy of Performing Arts (HAMU) 2–4 April 2019.

NPAPW is an annual, vibrant hands-on and interactive conference hosted in Europe and the United States in alternate years. It is a single-track workshop during which attendees learn about technologies that use advanced networks to enable arts instruction and performance, experience master classes and live performances, and meet colleagues and representatives from institutions that are advancing this field of work.

The event included presentations, demonstrations and tutorials on the most advanced technology solutions for music and performing arts. This year's edition of NPAPW showcased:

CLAW returns. Save the date.

Following the success of the first two annual Crisis Management Workshops for the community, GÉANT announces the third edition of CLAW, which will take place at PSNC in Poznan, Poland on 6-7 November 2019. After seeing its number of participants grow year on year, CLAW, which stems from an idea generated by the GÉANT Community Programme, has become an unmissable appointment for the international R&E community.

How well is your organisation prepared for a network or cyber crisis? Do you have crisis management procedures in place? Do you know who should be involved when crisis hits? And do you know how to reach out to – and work with – other organisations, in the eventuality of a pan-European crisis?

Imagine… you're part of the crisis management team of the NREN in an unspecified country. The crisis coordinator has called you and the entire team in the 'war room': a crisis has just hit your organisation. 200,000 students are set to take a nationwide test, but because of an unspecified glitch in your network, the test is not yet available (it is not uploading) in some locations. To make matters worse, this test is very much in the country's spotlight and in the eventuality of a cancellation due to network failure, the reputational damage for your NREN would be immense.

This was the case presented to more than 60 participants at the start of the tabletop exercise during GÉANT's second crisis management and communications event, CLAW

2018, in November last year. Attendees were divided in teams of 12, comprising representatives from a variety of NRENs with NOC, CSIRT, communications and information security management backgrounds. Most participants had met the night before during a working dinner and, just before the start of the exercise, had undergone a training session on how to perform under pressure – as a team. Having said this, they had only been given half an hour to lay down some ground rules, decide on the different roles each member would play during the exercise and get through the crisis.

The whole exercise reminded participants of crisis management's main components: how do you create clarity about what is going on; how do you decide what information is pertinent and what is not; and how can you make sure you communicate about a technical problem in such a way that it is understandable for non-technical people?

We will explore many more during the third CLAW Crisis Management Event, hosted by PSNC in Poznan Poland, on 6-7 November 2019. If you want your NREN to join CLAW, please send representatives from your Communications, NOC, CSIRT and Information Security Management teams. Together, we will experience a crisis situation, exchange knowledge and best practices and work on skills to deal with such scenarios successfully. Leading up to the event, we will be sharing further information, news and guidelines on Crisis Management in a dedicated microsite. Stay tuned for more news on this.

If you have questions and/or want to get involved, please contact Charlie van Genuchten: **charlie. vangenuchten@geant.org**

To register for CLAW, go to: **eventr.geant.org/events/3087**

Towards a Blockchain Dedicated to Education:

A Means to Certify Diplomas and Certificates, Respect Personal Data and Protect Intellectual Property

When people consider blockchain the majority of the population usually thinks of bitcoin and other crypto-currencies. Indeed, the blockchain community seems to enjoy the esoteric nature of the technology, with a range of jargon difficult for most people to understand, including: distributed system (peer-to-peer, disintermediation), certification (common law notarisation that identifies signatories and issues verified copies), ledgers, proof of work, tokens, governance, etc.

Blockchain was conceived as an open source technology resource to ensure anyone could see proof of a transaction (transparency) in a record. At its core, blockchain is primarily a distributed data ledger, using large numbers of independent machines to authenticate data and transactions (Server A and Server Z have exchanged data at such date/hour). The authenticated data can represent anything from "coin" transactions worth pennies to real-estate sales and purchases.

Words: Perrine de Coëtlogon, University of Lille, France

How Blockchain Works

In blockchain technology, connected servers are in competition to resolve a complex mathematical problem based on the transactions they authenticate ("mining"). The system is able to decide which server was successful, and therefore, to certify the "block" containing a number of transactions and to link it to the previous block – making a chain of blocks. No human intervention is required, which is a major informatics innovation. By using large numbers of independent, distributed systems in competition, the level of trust in the authentication is increased because an issue with one system/organisation does not affect data integrity.

How could Blockchain be used by the R&E Community?

In an R&E context, the attractive concepts of security and trust have led many to identify blockchain technology as an interesting solution to a number of problems:

*   Distributed and open ledgers: constitutes shared records of all learning outcomes (diplomas, competences, diploma supplement, open badges…), in initial or lifelong learning, on a lifelong basis. Any world citizen having studied at some point would be able to find a certified copy of his or her diploma at any stage of life.
*   Disintermediation: empowers teachers to recognise and directly award their students with something other than a diploma (disintermediation), credentials or open badges. Whereas credentials can be seen as higher education credits that, when combined, will constitute a diploma, open badges can be considered as a more flexible way to recognise skills and competences, including those acquired outside formal institutions.
*   Identity, open licenses and reward of contributions in Open Educational Resources (OER): ensures the traceability of remixed open educational resources and rewards the contributors, thanks to the issuing of "credits" that could be used as proof of work for their career path.

Blockchain as the "Netflix" of Open Educational Resources?

This last use case has led the author of this article to conceive a blockchain capable of certifying the intellectual property rights of teachers, researchers, and even students, bound to their professional identity. The idea is to create a global platform comparable to "Netflix", dedicated to Open Educational Resources and subject to open licenses.

Such a platform could be tested on the 30 000 French open education resources already documented and available, which can be found through a single search engine.

The platform would be free for anyone to use, with the possibility of fee payment for commercial use, in order to explore a sustainable model for OER.

It would mimic the activity of plagiarism software, tracking the legal use and reuse of OER.

It would provide a "family tree"-like visualisation of the use and modification of a resource, growing over time.

Finally, the application of blockchain technology would recognise and reward contributions to the OER movement or any contributor of an open family (Open Access, Open Sciences, Open data, Open Gov). An open badge / digital credit would identify the contributor and their contributions, be easily embedded in records, displayed in curricula, and serve as official proof in support of career path development.

The European Blockchain Partnership on Certification of Diplomas and Credentials

The blockchain use case identified by most governments and institutions in R&E aims to create distributed ledgers of diplomas and competences.

More European governments and institutions have been convinced that blockchain technology can make an important contribution to student mobility.

Norway, Lichtenstein and 26 member states of the European Union have set up a partnership on blockchain. This partnership has also identified a use case on certification of diplomas as an innovative public service to citizens. In this regard, 2019 will be the year to set up a global project.

The French Ministry for Education and Youth set up a Blockchain & Education working group at the national level, based at the University of Lille. One of the objectives of this working group is to help test the sovereign and sustainable blockchain developed within the Directorate-General for Informatics (DIGIT) of the European Commission.

RENATER, the French NREN, participates in this working group, for the infrastructure element. Three institutions will test the sovereign blockchain and its application to certifying diplomas:

*   Centre International d'Etudes Pédagogiques (CIEP), holder of ENIC-NARIC network for France, is in charge of foreign diploma recognition.
*   Canopé Network is working on open badges at a national level.
*   Centre de Recherches Interdisciplinaires CRI-Paris is also working on open badges.

In addition, Belnet has already shown an interest to contribute to the project, and CIMEA and CINECA are currently working with blockchain.

Setting up nodes of the European sovereign blockchain on other NRENs and the use of OpenID Connect would be another interesting project, as the network build between all NRENs can be seen as a huge and sovereign distributed system; the blockchain of the higher education system.

in April 2019, MIT and a team of nine universities launched another initiative with the aim to create a global infrastructure for digital academic credentials, with researchers developing a new standard for issuing, sharing, and verifying academic credentials.

The universities working on this effort include: Delft University of Technology (Netherlands), Harvard University Division of Continuing Education (USA), Hasso Plattner Institute at the University of Potsdam (Germany), MIT (USA), Tecnologico de Monterrey (Mexico) Technical University of Munich (Germany), University of California at Berkeley (USA) University of California at Irvine (USA) and the University of Toronto (Canada).

Picture
Perrine de Coetlogon, Université de Lille

Consortium GARR

Rehabilitation Robots Support Care from a Distance

Effective, pleasant and customised rehabilitation for children can now take place in the comfort of home, thanks to the new technologies of the Stella Maris Foundation and the BioRobotics Institute of Scuola Superiore Sant'Anna in Pisa, Italy.

Words: Maddalena Vario, GARR

Thanks to the latest generation of robotic platforms, more and more rehabilitation treatments can be performed directly at home in a simple and intuitive way, while at the same time, the Remote Rehabilitation Team can plan and monitor treatment. With the Tele-UPCAT and CareToy projects (both funded by the Italian Ministry of Health), it is now possible for children to get the most out of a home rehabilitation treatment.

In an environment recognised as safe and comfortable, a child is able to follow his/her own rhythm and timing, which reduces costs and travel to rehabilitation centres. Access to the knowledge and experience of the Research Hospital staff at the Stella Maris Foundation Excellence Centre from anywhere in Italy ensures best practice and helps reduce mistakes. First, all data is collected during the remote observation and monitoring of the child, and then analysed by doctors with special algorithms created by Sant'Anna engineers, with the aim to make the treatments as personalised as possible.

We talked to Dr. Giuseppina Sgandurra, Scientific Director of Tele-UPCAT, and Clinical Project Manager of CareToy.

Doctor Sgandurra, Tele-UPCAT and CareToy are changing the rules of the rehabilitation therapy, but can a parent replace a therapist?

There are some rehabilitation treatments that parents can safely do at home with their child, identifying the best time to work with them, and combining rehabilitation with a moment of relaxing and playing together. In this case, the role of the parent is not the same as the therapist, who remotely plans and monitors the activities to be performed through the technology, and guides the parent in the activities to be done with the child. In particular, we developed platforms that monitor and support parents and the child step-by-step through the treatment.

Which technological solution did you use?

Together with the engineers of the BioRobotics Institute of the Scuola Superiore Sant'Anna, we created a platform with dedicated software that automatically alternates moments of monitoring and activity. Everything is built in a playful way. The activity involves a clumsy alien, Ubi, who invites the child to help him in the mission of conquering a world every day.

Ubi interacts with the child, asks for help and involves the little patient, with the help of the parents, who have a box with numbered objects to be used day by day. In this way, the child performs the action-observation exercises designed for him or her. In addition, the child wears sensor bracelets, actigraphs, which are the same as those used by athletes to track kilometres and calories. We were the first to have the idea of wearing these bracelets on both upper limbs, because in this way we are able to measure the difference in use between the two limbs, especially in children with hemiplegia. In fact, what we aim for is not the healing of the hemiplegic limb, but its cooperation with the healthy limb and the reduction of asymmetry between the two. These bracelets are worn not only during therapy but for 24 hours during the first three weeks of treatment and during

any subsequent treatment. We are now working on the collected data with Sant'Anna engineers who have created the algorithms.

What was the feedback of parents and children?

It was very positive. Before conclusion of the testing, we invited all families to Stella Maris, to have a moment of sharing and discussion with the parents, children and teenagers involved who made the project a success. They were delighted to come. Our auditorium was full, and parents asked to keep them in mind for the future projects.

Which results did you achieve? What is the next step?

We got excellent results. We enrolled children and teenagers from ten different areas of Italy and recorded significant group results, demonstrating that, thanks to technology, action observation is feasible and effective, even at home. Furthermore, each child has improved in a different way. These results open new perspectives in relation to the precision medicine, because it will be possible to intervene in an increasingly personalised way for each child. Also, the work with the engineers of the Sant'Anna BioRobotics Institute on the creation of algorithms and the collaboration with GARR on the network side provided us with the essential technological base to be able to work on data easily and be able to extract the information we need for our business.

Let's talk now about the other project, CareToy. How does it work?

CareToy is a biomechatronic gym (equipped with diagnostic instruments) that babies at high risk of cerebral palsy can use during the first months of life. The parent switches on the computer, places the child in a prone, supine or sitting position (depending on what is planned remotely by the therapist), activates the system by pressing a button and then is free to play and interact with the child. The system, based on the scheduled activity, stimulates the child and recognises his/her responses by providing feedback.

For example, if the rehabilitator's goal is to increase the strength of the pressure that the child exerts by grabbing the game, a determined pressure is fixed by the system that, when reached, causes the game to turn on and/or emit a sound. Once the first game scenario is over, the system asks the parent if he or she wants to continue. If the answer is positive, the system goes to the next exercise, with a total of about 30 to 40 minutes of game play per day.

Is it possible to monitor the exercises from a distance?

The CareToy system is equipped with more than 2,000 sensors that record the activity of the child. In the evening, the data is processed, compressed and automatically sent to the Stella Maris server, where the rehabilitation team, through a dedicated interface, downloads and analyses it in detail. Thanks to this daily analysis, the activities to be proposed to the child are remotely updated. We are therefore in front of an architecture of tele-rehabilitation, where data is sent online from the house of the child to the Stella Maris Foundation.

Which results did you achieve with CareToy?

We first tested the system on pre-term babies without brain damage, from 28 to 32 weeks, then on children at risk for psychomotor delays and neurodevelopmental disorders. We collected data on more than 60 children, demonstrating that 4 weeks of treatment in the experimental group improved visual and motor development. We have now begun a new, wholly Italian project funded by the Ministry of Health, where we are testing CareToy on children with brain injuries at risk of childhood cerebral palsy.
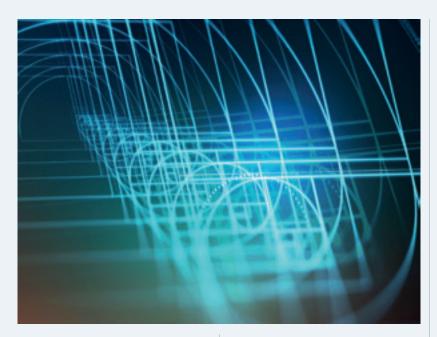
For more information:
irccs-stellamaris.it/
santannapisa.it

Paving the Way Towards Exascale Computing in Europe

We are experiencing a data-driven scientific revolution. Traditional computing models are increasingly complemented by data-driven approaches and artificial intelligence. The EuroHPC Undertaking and PRACE are working together to create a world-class HPC ecosystem to keep Europe ahead.

For European research and industry to compete effectively, there is an urgent need for an expanded European high performance computing (HPC) ecosystem to cover a broad range of applications, training and support. While European researchers lead algorithm and software development in many fields, the present infrastructure's computing capacity and insufficient investments in algorithms and software are major bottlenecks to European leadership and industrial impact. This is where the EuroHPC Joint Undertaking comes in, in partnership with PRACE (the Partnership for Advanced Computing in Europe).

Cooperation and Collaboration are Key

The EuroHPC Joint Undertaking is a €1 billion joint initiative between the EU and European countries to develop a world-class supercomputing ecosystem in Europe. This will permit the EU and participating countries to coordinate efforts and share resources in order to acquire and provide cutting edge petascale and pre-exascale supercomputing and data infrastructure for European users by 2020.

As the major provider of high-quality services to the European scientific and industrial community for over a decade, PRACE is a key enabler of this new initiative. Sharing a common vision and complementary missions, EuroHPC acts as a high-level funding agency and must essentially be a top-down activity. PRACE is a science-driven infrastructure developed as a bottom-up activity. By joining both in a strong partnership, Europe will deliver on the promise to create the best possible synergies to benefit its scientific and industrial HPC communities.

What PRACE brings to the table

Infrastructure services developed and operated by PRACE are essential for the successful execution of this ambitious European HPC ecosystem. These include:

- The PRACE Peer Review-based access for both academic and industrial simulation projects.
- Pan-European training and education offerings, focused on the convergence of HPC, HPDA and AI, at PRACE Training Centres (PTCs) and European Centres of Excellence.
- Extended High-Level Support Teams (HLST).
- Enabling services, programs and industry-specific offerings.
- Operational HPC services to foster the transparent usage.
- HPC procurement and prototyping support, including technical specifications of future EuroHPC Exascale technologies.
- Dissemination and documentation.

More on how PRACE contributes to the evolving pan-European HPC ecosystem can be found in its recently published Position Paper PRACE in the EuroHPC Era and in the latest edition of the Scientific Case for Computing In Europe 2018-2026. For more information on the EuroHPC Joint Undertaking, please visit **https://eurohpc-ju.europa.eu/**

NREN Panel at RIPE SEE 8 Meeting

The 8th RIPE South Eastern Europe meeting took place in the capital of Bosnia and Herzegovina, Sarajevo, 16–17 April 2019. The meeting hosted around 200 participants from various institutions and corporations from the region, representing academic, government and NGO sectors, internet exchanges and telecoms.

Words: Anastas Mishev, UKIM, Member of the GN4-3 Partner Relations and Engagement Team

The GÉANT Partner Relations Team recognised the excellent opportunity presented by the conference to raise the issue of Bosnia and Herzegovina (BiH) being the last European country not to have its own national research and academic network and not be part of the GÉANT community.

Thanks to the support provided by RIPE, a separate panel dedicated to NRENs was set up. Participants in the panel included representatives from two regional NRENs, CARNet and GRNET (the latter via videoconference), GÉANT and three Bosnian Universities.

The panel opened with a presentation by Anastas Mishev, representing the GÉANT Partner Relations team, which went some way towards dispelling the myth that simply being connected to the GÉANT network carries the same advantages as becoming part of the GÉANT

international community. He presented the benefits GÉANT offers to its members, from governance to service offering and human capital development through the numerous projects it coordinates.

The representatives of two leading regional NRENs, Darko Parić from CARNet and Michalis Oikonomakos from GRNET, then presented the achievements of their respective institutions, stressing the importance of NRENs for the development of the educational, scientific and research communities in their countries.

The final presentation was given by Samir Lemes from the University of Zenica, who provided a historical overview of the failed attempts to establish an NREN in BiH.

Participants in the panel, including Salko Kovacic from University Djemal Bjedic in Mostar, Elmedin Selmanović,

Director of UTIC, University of Sarajevo, and Tomislav Volaric from the University of Mostar agreed on the necessity of establishing a partnership with GÉANT and taking the necessary steps to create an NREN in BiH to benefit all researchers, students and educators in the country.

Becoming an official eduroam partner was identified as the first step toward this goal, common to all potential users of the GÉANT network and services in BiH. This will open up possibilities for the R&E community in the country to participate in joint European efforts such as the European Open Science Cloud.

The Partner Relations team will continue to support the region in their efforts to support the R&E community in BiH.

eInfraCentral – Building the EOSC Catalogue of e-Services and Resources

One of the main challenges for research communities is the fragmentation of the e-infrastructure landscape. End-users, such as researchers, innovators or industry actors, often are unaware of the e-infrastructure services available in Europe that could aid them in their work. Similarly, service providers and data producers have difficulties reaching out to potential users due to the lack of coordination and harmonisation across various e-infrastructures. Even if users find out about the availability of a certain e-service, it is difficult to gather further information and compare it with other existing services. Service providers also lack user feedback on the ways they could improve their offerings. This leads to inefficient funding patterns through the emergence of overlapping efforts and slower rates of open innovation due to the lack of competition in the field.

eInfraCentral wants to make the services and resources offered by numerous e-infrastructures more visible to the end users to give them a bigger and better picture of what is available to them. In this way, the project aims to address the challenge of fragmentation that research communities face by focusing on service harmonisation and uniform representation of European e-infrastructures.

eInfraCentral has received funding from the European Union's Horizon 2020 research and innovation programme (Grant Agreement No 731049). The project started in January 2017, with the goal of promoting the discovery and utilisation of existing and developing e-infrastructure capacity by a broader and more varied set of users (including industry) by 2020. The project is being delivered by a Consortium of nine organisations – EFIS Centre (Project Coordinator), JNPartners Co., University of Athens, University of Hannover and five leading e-infrastructures including GÉANT, EGI, EUDAT, OpenAIRE and PRACE.

eInfraCentral – Delivering Effective Data and Systems for EOSC

It is important to note that eInfraCentral was designed before the European Open Science Cloud was in place and other EOSC-related projects (e.g. EOSC-hub) had started. However, as the scene evolved, so did the project. One of its key evolutions was integrating the eInfraCentral catalogue into the development of the EOSC Portal. The European Commission has mentioned eInfraCentral (alongside other H2020 funded projects EOSC-hub and OpenAIRE-Advance) as being one of the key building blocks of the EOSC Portal as recognised in the Implementation Roadmap for the European Open

Science Cloud. The focus on the other three major outcomes of eInfraCentral has remained unchanged.

A harmonised Service Description Template: Back in 2017 when the project started, there were visible differences in how e-infrastructures described their services, ranging from good to poor descriptions, to no description at all. In some cases, services were given multiple different descriptions, making it difficult for the users to compare them to other services. Hence the first area of focus for the project and its key achievement was to come up with a harmonised template for the description of services/resources. The e-Infrastructure community now recognises that a common approach to both describing and exchanging service-

related information is the way forward to enhance the discoverability and thus potential uptake of services.

The Service Description Template (SDT) addresses this goal and has been adopted as the standard scheme for the representation of service-related information in the EOSC Catalogue. The SDT is based on prior modelling efforts (FitSM, FedSM,e-IRG KPIs, TMForum) and it is the proposition for:

- a common service management scheme applicable to different service providers from the public and private sector; and
- a common representation format for the exchange of service-related information between different service catalogues.

The current version of the SDT, as agreed by the flagship e-Infrastructures, is available online at **https://github.com/eInfraCentral/docs**. It is an evolving standard, which incorporates new emerging features from incoming e-infrastructures and research infrastructures in the EOSC ecosystem.

A catalogue of e-infrastructure services and resources: Started as the eInfraCentral catalogue, this output of the project grew into the EOSC Catalogue (**http://catalogue.eosc-portal.eu/home**). The catalogue makes it easier for researchers to find information about a broad range of e-infrastructure services they may be interested in, discover new ones, compare various service offerings in one place, and assess the relevance of the offered services, rating them and leaving feedback. The catalogue enables various e-infrastructure service offerings to be aligned according to a commonly agreed service description. This approach to defining and monitoring e-infrastructure services is bound to increase their uptake and enhance understanding of where improvements can be made in delivering services, which in turn supports research processes to ultimately advance scientific knowledge and the cause of open science.

The beta version of the Catalogue was announced during the official launch of the European Open Science Cloud on 23 November 2018 in Vienna, Austria.

Harvesting of information via an Application Programming Interface: Service registration in the Catalogue (which was done manually by the Service Providers at the start of the process) is now automated. Once Service Providers are familiar with how the Service Description Template works, they can then access a rich set of REST API methods (**available at https://catalogue.eosc-portal.eu/openapi**) for the exchange of information between the service providers and the EOSC Catalogue as well as its provisioning to third party applications. The API offers authenticated users the ability to programmatically add and update a service, as well as access, search and retrieve the contents of the catalogue.

Next Steps

The official end date of the project is June 2019 but the eInfraCentral outputs will continue to be used by other initiatives. The Service Description Template is being adopted by the EOSC-hub and partners of eInfraCentral are involved in other projects linked either to EOSC or other service cataloguing efforts for public and private research infrastructures. These projects will utilise or further develop the outcomes of eInfraCentral, and include EOSC-hub, EOSC Secretariat, thematic and regional EOSC projects, and projects such as OCRE and CatRIS.

eInfraCentral's work has the potential to deliver both social and economic advantages. As the e-infrastructures listed in the catalogue are mostly publicly funded, the more these e-services/resources are used by a growing group of researchers, the better use will be made of such funding. The EOSC Catalogue and portal can also simplify and speed up access to needed e-services and resources to facilitate the work of researchers which could contribute to new discoveries and innovations, potentially leading to further societal and financial benefits.

Further information:
contact@eInfraCentral.eu.

EaPConnect
Eastern Partnership Connect

Happy birthday, EaP!

The Eastern Partnership (EaP) is 10 years old. For some EaPConnect project partners this means a double anniversary, as GRENA (Georgia) and RENAM (Moldova) reach 20 and ASNET-AM (Armenia) turns 25.

EaPConnect is the latest partnership to bring closer integration with the European network and community. After the Cold War, NATO's Science for Peace and Security Programme opened up to support collaboration. In 2002, the NATO Virtual Silk Highway project funded connectivity for academic and scientific communities of three Southern Caucasus countries as well as Central Asia. The Black Sea Interconnection project of 2008-2010 then provided connectivity to the GÉANT network. The EaPConnect project, launched in 2015, builds upon these foundations.

For GRENA, the 2008 Russia-Georgia war proved the value of its new Computer Emergency Response Team, CERT-GE, the first CERT in Georgia. It mitigated cyber-attacks during this conflict and cybersecurity has been an area of GRENA's expertise ever since. CERT-GE provides incident handling and response, information dissemination, a hotline and an Intrusion Detection System. And, in response to demand, GRENA developed the cybersecurity training portal **https://cyber-lab.tech/**.

Training and certification has become a significant GRENA activity. Other activities are managing and participating in projects, and providing services. GRENA has connected 2200 schools and provided network management and technical support, and trained 800+ school ICT managers in Linux and Windows OS administration. The NREN has also assessed the IT infrastructure at 32 governmental institutions.

For RENAM, one of the great successes has been close and fruitful collaboration with its Romanian NREN neighbour RoEduNet. Since 2003 initiatives have been implemented, creating a direct link between the NRENs to ensure RENAM users access

GÉANT. Dialogue between RENAM, RoEduNet, EU experts and NATO's Scientific Council supported the creation of a cross-border fibre link in 2010. These initiatives paved the way for an EaPConnect cross-border fibre link between RENAM and the GÉANT PoP in Bucharest - based on new technological solutions. Fibre links to Ukraine and other regions are also planned.

In Armenia, ASNET-AM has become a well-known national network, cloud computing and IT e-infrastructure and services provider. Its current (fibre-optic) connections to other networks, including Armenian Internet eXchanges, ISPs and GÉANT, total more than 1 Gbit/s. It interconnects 65 academic, scientific, research, educational, cultural and other organisations in six cities.

RENAM celebrates its anniversary on 3 October with an international conference in Chisinau: 'RENAM E-infrastructure – Supporting Excellence in National Research and Education'. GRENA will hold an anniversary event on 12 September and later that month ASNET-AM will host this year's conference, EaPEC 2019, where participants will mark all these significant anniversaries.

Further information:

Eu Neighbours East – 10 years of EaP: **bit.ly/2EwhTBT**

RENAM: **https://renam.md/**

ASNET-AM: **https://asnet.am/**

GRENA: **www.grena.ge**

EaPConnect: **www.eapconnect.eu**

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EaPConnect
Eastern Partnership Connect

EaPEC 2019

Pictures
Yerevan,
Armenia

Connecting with Culture:
EaPEC 2019

The 4th Eastern Partnership E-infrastructures Conference, EaPEC 2019, will be held 25–26 September, in Yerevan, Armenia. Registration is open and you are welcome to join policy makers, researchers, NREN representatives and entrepreneurs from the Eastern Partnership (EaP) countries – Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine – at the Matenadaran Museum.

The Matenadaran Museum is part of the Mesrop Mashtots Research Institute of Ancient Manuscripts and houses exhibitions that track Armenian culture from the creation of the Armenian alphabet in 405 AD to the present day. Where better to explore the conference theme "Connecting with Culture"?

Topics of interest include: Digital Libraries & Cultural Heritage Digitisation alongside Open Science, Cyber Security, Data Science, Machine Learning and AI, and E-Infrastructure Applications. Experts on cultural heritage are encouraged to participate alongside experts on networking and ICT.

The conference agenda features presentations on 'Emotional storytelling in Cultural Heritage' and CLARIN (Common Language Resources and Technology Infrastructure), which supports the sharing, use and sustainability of language data and tools for research in the humanities and social sciences.

Satellite-Based Research & GeoSciences and Cybersecurity will be the focus of other sessions. Lightning talks, workshops, Enlighten Your Research awards, a panel discussion and a keynote presentation by Erik Huizer, CEO of GÉANT, also promise a lively event.

Hosted by ASNET-AM, the NREN operated and managed by the IIAP (Institute for Informatics and Automation Problems) of the National Academy of Sciences of the Republic of Armenia, the conference will also showcase the activities of ASNET-AM and other partners in the EaPConnect project, which is coordinating the organisation of EaPEC 2019.

Previous EaPEC conferences were held in Tbilisi (2016), Minsk (2017) and Chisinau (2018) and succeeded in raising the visibility of the host NRENs in their national media, among their governing ministries, and at research and education institutions. EaPEC 2019 aims to continue this tradition by inviting Armenian officials, funders and decision makers to participate alongside the speakers and audience.

See you in Yerevan!

Further information:

https://www.eapconnect.eu/conferences/

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RNP: 30 Years of Advanced Networks in Brazil

To mark the 30th anniversary of Brazillian NREN, Rede Nacional de Ensino e Pesquisa, Nelson Simões, RNP CEO, illustrates and evaluates the manifold achievements of R&E networks in Brazil.

Networks are the best architects of a contemporary society's creation and evolution. They enable data streams, interconnections, progress and knowledge development. Research is the networks' prime mover and the most remarkable application. The Brazilian network's adventure started 30 years ago when the academic community joined forces with the government to build RNP.

Brazil is the fifth largest nation in the globe by territory: it comprises the world's largest rainforest, which expands through to our neighboring countries in South America. We are developing, in quite a complex scenario, connectivity solutions to meet our customers' needs in a fairer and more sustainable manner. In the last few years, our job has become increasingly demanding, due to the faster pace – often quite vertiginous - of technological and social change, and our main challenge is to continue creating value for our community.

In 2019, the year when the internet celebrates its 50th anniversary, RNP is present throughout the Brazilian national territory and connects 1,174 university campuses, 800 organisations and more than 4 million users. Students, teachers and researchers benefit from an advanced network infrastructure for communication, computing and research, which contributes to the development of quality educational, scientific and technological output. In addition, thanks to its economies of scale, RNP enables a six-fold cost reduction of the Brazilian academic network.

Three major elements boosted RNP's operations in recent years. The first is innovation: learning by experimenting with new business and technology models. Since unique or optimal solutions do not exist, being open to innovation improves our services to the community and increases our productivity. In the last 17 years, RNP research, development and innovation programmes delivered 94 applications and services prototypes, 58 pilots and 12 spin-offs, in areas such as identity management, video collaboration and cyber security.

The second element is the community, where trust, our social capital, takes shape. Each joint successful initiative increases our maturity and serves as a model for the viability of new shared projects. In Brazil, we are particularly active in areas such as biodiversity, health and climate, just to name a few. For instance, collaborative networks were specifically created for digital health, such as the Telemedicine University Network (RUTE), and after 12 years, it now counts 136 units in teaching hospitals and research centres.

Together with the international community, collaboration with the American and European networks creates solutions for global integration. One of the best examples is the BELLA project, which is building the first direct

Picture
Left: Nelson Simões, RNP CEO

Above: Courtesy of RNP

connection between Europe and South America, another example is the collaboration in the astronomy field, with the interconnectivity of the Large Synoptic Survey Telescope (LSST) between Chile and North America.

Finally, what I believe to be the most important element of all: people. People are instruments of change, which at times can be laborious, uncertain and questionable. Our strategies to develop people and bring talents together create opportunities and alternatives for change. The deployment of sub-fluvial optic fibres in the Amazon rivers or the addition of academic cloud demands to the marketplace are clear examples of the discovery of new models aimed at increasing wealth, whilst enabling progress with social and environmental responsibility. There is an incredible interest in sharing successful experiences, supporting and promoting the development of people who can change reality, especially in collaborations within Latin America and with Africa.

RNP aims to be the best digital platform for education, research and innovation in Brazil. We are a community that, by integrating its talents and resources globally, delivers enormous value for society. We were able to progress also thanks to the valuable contribution of those who preceded us, and despite different stages of maturity, we work to share knowledge for a better world for all.

100Gbps Ring Connection Around the Globe Supercharges EU-Japanese Science Collaborations

Scientific communities across Europe and Japan are set to benefit from the recent interconnection upgrade to 100Gbps between the pan-European GÉANT network and the Japanese Science Information Network (SINET), operated by the National Institute of Informatics (NII).

Picture
SINET international connectivity development (before / after 1 March 2019) - courtesy of NII

Globe-Spanning High Capacity

The new GÉANT-SINET interconnection in Amsterdam is part of the deployment of NII's globe-spanning ring of 100 Gbps links from Tokyo to Los Angeles, across to New York, on to Amsterdam and from there back to Tokyo.

In addition, NII has also upgraded SINET's intraregional capacity within Asia at 100 Gbps between Tokyo and Singapore, contributing capacity to the regional TEIN backbone.

Demand-Driven Upgrade

The capacity boost comes in response to the increasing data transfer requirements of cutting-edge large-scale research projects, along with the demands from cloud computing and developments in artificial intelligence (AI) and Internet of Things (IoT) research.

The capacity upgrade from 20 to 100 Gbps is set to accelerate in particular EU-Japanese collaborative scientific research on the Large Hadron Collider (LHC) experiments, the Belle II electron collider facility due to become operational next year at KEK in Tsukuba, with large parts of computation and storage resources being hosted in Europe, the ITER energy fusion reactor, the worldwide e-VLBI radio-astronomy network, and the Hayabusa2 and BepiColombo satellite missions, jointly operated by the European Space Agency Operation Centre (ESOC) and the Japanese Aerospace Exploration Agency (JAXA).

More information:

www.sinet.ad.jp

"Over the last few years we have come a long way. Up to 2016, connections between GÉANT and SINET had been achieved by peering in North America. Subsequently, SINET brought 2 x 10 Gbps directly to GÉANT which meant that we could jointly support European and Japanese researchers in their cutting-edge scientific endeavours with faster and higher capacities as well as lower latency. As anticipated, we have since seen a major ramp-up of traffic exchanged over our networks as further EU-Japan user projects have come to fruition. We therefore welcome this substantial capacity upgrade in support of these exciting scientific ventures."

Erik Huizer, CEO GÉANT

"With its 100 Gbps full-mesh backbone, SINET5, the current network iteration launched in 2016, has opened up new possibilities for 3 million users at over 900 connected universities and research centres across Japan. Enhanced international connectivity, including a direct, high-capacity connection to Europe, is a vital element of NII's strategy to support our user communities. We are very proud to have implemented this ultra-high-speed global network infrastructure, a milestone that will undoubtably contribute to advancing global scientific research."

Shigeo Urushidani, Deputy Director General of NII

WACREN2019: Time to go Further!

"Last year, we asked the community to unleash their potential as we launched our new network. This year, it is time to go further…"

The week of 11-15 March provided room for a variety of activities, from librarians and NRENs collaborating on repositories during the LIBSENSE workshop, to AfricaConnect2 coordination meetings, to knowledge exchange during the annual WACREN conference. This year, the Ghanaian NREN GARNET hosted the conference in the capital city of Accra. Representatives of several NRENs, institutions, universities and other relevant organisations from West and Central Africa gathered during the two-day conference and presented ideas, challenges and opportunities whether it was during a session or breaks.

Pictures
Panel and participants at WACREN 2019

The Africa we want!

The first day of the conference kicked off with an opening ceremony, including inspiring words from WACREN's CEO Boubakar Barry and GARNET's chairman of the board Clifford Nii Boi Tagoe who highlighted that all bodies should cooperate to create the Africa we want. This was followed by African Internet pioneer Nii Narku Quaynor's engaging chant saying, "when I say AfREN you say connected!". An empowering and inspiring start of the conference one would say! After messages of welcome and goodwill, the two Internet Hall of Fame inductees Erik Huizer (GÉANT CEO) and Nii Narku Quaynor (WACREN Chairman of the Board) opened up the knowledge-sharing floor with a discussion on the importance of global collaboration to support national research and education development.

Five lessons were spread over two days, each containing four to five paper presentations. A variety of topics were discussed, covering repositories and open science, end-user engagement, data security, World Bank collaboration, several tools for specific fields of research, digital services, and the role of NRENs amongst others. The lunches and coffee breaks offered room for further discussions which always appears to be essential as time flies during the plenary sessions.

"There is no reason why we can't educate children in Ghana. The future of Ghana is in OUR hands!"

And with these words, the conference ended. Emphasis was laid on the fact that countries, in this case Ghana, can do many things to keep their youth attracted to study and work in their own country rather than going abroad due to lack of opportunities.

WACREN2020: Benin on arrive! Will we meet you there?

BELLA Team Visits Submarine Cable Factories

Tom Fryer, Head of International Relations at GÉANT, visited the Alcatel Submarine Networks (ASN) factories, where the EllaLink submarine cable will be manufactured. Tom shared with CONNECT his impressions of the visit.

January 2019 saw the start of the construction process of the EllaLink submarine cable system that will carry research and education data between Europe and Latin America for the next quarter of a century, as a result of the BELLA Programme. To mark this significant milestone, the BELLA team was invited, along with other anchor tenants and stakeholders of the EllaLink system, to visit the factories where the equipment and cable will be manufactured, and to tour one of the ships that lays submarine cables.

I was joined by two BELLA pioneers, Fernando Liello of GARR (Italy) and Michael Stanton of RNP (Brazil), GÉANT's Head of Procurement, Paul Rouse, the Executive Director of RedCLARA, Luis Eliécer Cadenas, and João Nuno Ferreira, President of FCCN (Portugal). The DG CNECT Project Officer for BELLA, Enrique Gómez, also joined the tour. As we have all been

working on BELLA for a number of years we did not want to miss out on this opportunity.

The first stop was an equipment factory in Greenwich, UK, where the submerged repeaters and electrical power feed equipment for the system are manufactured. We started with a presentation on the construction process and the milestones that will mark progress, followed by a guided tour of the factory floor.

The equipment used must be built to manage pressure levels corresponding to water depths of up to 8,000–9,000 metres for 25 years! Equally, the pressure at the bottom of the ocean (for EllaLink, the maximum depth will be about 5,000 metres), presents a risk of hydrogen seeping through the seals into the equipment. This is managed by adding a catalyst that causes the hydrogen to combine with oxygen in the equipment to form water. Water cannot be allowed in the equipment, however, so an absorbent is used to mop it up.

The second leg of the visit took us to Calais, France, where the cable is manufactured. During our visit we were able to witness the cable loading process onto a ship dock.

In the factory, pairs of fibre that are the heart of the cable are encased in the layers of protection (depending on the depth of deployment and the likelihood of external aggression), as well as the copper tube that carries electricity down the cable to power the repeaters. Once made, the cable is stored in massive drums until the ship is ready for loading. Most of the process is automated, but one manual element has remained unchanged for 150 years: the loading of the cable into the cylindrical cable tanks on board the ship.

The cable reaches the ship along a 1km conveyor belt hidden in a tunnel as it makes its way to the ship's cable tanks. Two individuals stand at the bottom of the tank as the cable is down-fed. One person takes the cable, walks backwards around the tank guiding the cable to where it should lay. After one turn of the tank, the operative passes the cable to a colleague, who does another turn, then hands it back to his/her colleague, and so on, working in eight-hour shifts until the cable is loaded.

Copper is used to transmit power down the cable. It is an excellent conductor, but costly. A completely innovative approach using aluminium has recently been developed, which may soon become the norm for submarine cables, as it lowers manufacturing costs. The EllaLink cable will, however, use the industry standard copper conductor.

The ship itself is staffed by a range of teams: from the bridge crew, to the operatives who guide the feeding of the cable into the ocean, to others who guide machinery through the ocean floor to bury the cable in the seabed. There is also the ship's chef, who has to ensure that meals are available 24/7 for all shifts. The crew continuously lay the cable, even in weather up to storm force 6 (gale force). Only when the sea gets too rough and conditions risk crew safety is the cable cut and the ship moved to calmer waters or to port until the weather is good enough to go back, pick up the cable, splice it to the remaining cable onboard and carry on laying it again.

Overall, the visit was an eye-opener for us all, and provided a reminder that the Internet, and everything it enables us to do, is entirely dependent on the unsung women and men who staff ships all year round to lay new cables and to repair the damaged ones.

About BELLA

BELLA (Building the Europe Link with Latin America) provides for the long-term interconnection needs of European and Latin American research and education communities by procuring and deploying a long-term Indefeasible Right of Use (IRU) for spectrum on a direct submarine cable between the two regions, and deploying a 100Gbps-capable research and education network across Latin America.

BELLA is implemented by a Consortium of the Regional Research and Education Networks GÉANT (Europe) and RedCLARA (Latin America), and the National Research and Education Networks of Brazil, Chile, Colombia, Ecuador, France, Germany, Italy, Portugal and Spain.

BELLA receives funding from the European Union through the Horizon 2020 programme via DG CNECT, from DG DEVCO and from DG GROW. BELLA also receives funding from Latin American NRENs. For more information visit **http://www.bella-programme.eu**, follow us on Twitter: **@BELLA_Programme**.

Pictures
Top right: (From left to right) Luis Eliécer Cadenas, Paul Rouse, Fernando Liello, João Nuno Ferreira, Michael Stanton, Tom Fryer, Enrique Gomez.

Pictures Courtesy of ASN

Open Access and Open Science in Africa:
An interview with one of the LIBSENSE Pioneers

Omo Oaiya, Chief Strategy Officer at WACREN – the West and Central Africa Research and Education Network – tells CONNECT about a relatively new collaboration called LIBSENSE, where librarians and NREN advocates aim to develop sustainable approaches to benefit researchers in science, global collaboration and improve the ease of accessing valuable data. Let us introduce you to one of the LIBSENSE champions…

Omo, tell us about yourself

I am a long-time NREN advocate currently serving as the Chief Strategy Officer for WACREN. I was the pioneer CTO and led the infrastructure committee of the task force that set up the regional REN. Before that, I had been offering consultancy and project management support to research and academic institutions in Nigeria and other parts of Africa for the better part of the last two decades.

Could you tell us more about LIBSENSE?

LIBSENSE is a collaboration between libraries and NRENs to develop sustainable and relevant approaches for Open Access and Open Science in the African context. Open Science, an international trend aimed at sharing research outputs widely, is transforming science and greatly increasing the impact of research. In nature, however, there are important local and regional aspects of how Open Science is implemented. Services, policies and infrastructure that may be appropriate in the "global north" do not necessarily resonate with other regions. You will find more information at **https://spaces.wacren.net/display/ LIBSENSE**

The history of WACREN and Librarians

Librarians have always been key stakeholders in our community but the activities that led to LIBSENSE started in 2016.

In the TANDEM project, funded in the framework of European Commission Horizon 2020 Programme, we established a Focal Point community. These were people tasked by the REN to establish and coordinate the contact with their communities and raise awareness for the NREN activities and services. Within the NREN, an Institutional Focal Point (iFP) is a dedicated contact person embedded within a higher education institution or research organisation. Librarians were consequently identified as having a natural role as iFPs.

In Sci-GaIA, another H2020 project WACREN was involved in at the same time, we were working with Science Gateways and federated Open Science platforms, and engaging the researcher community with hackfests to provide use cases to help clarify e-Infrastructure requirements and adopt new methods. I led a task in the project to monitor the successful implementation and uptake of e-Infrastructures in Africa through a survey which ran for 2 years. Over 60% of the respondents identified the development of a repository as a current or planned infrastructure. This mirrored results from the earlier TANDEM survey on the needs of NREN users in West and Central Africa, where access to content and ability to share data was ranked by more than two-thirds of the respondents as highly desirable and useful.

The requirement for Open Access repositories further highlighted the role of the librarian, so we embarked on the LIBSENSE (Library Support for embedding NREN services and e-Infrastructure) initiative to address both infrastructure and human capacity needs.

How successful was the third LIBSENSE Workshop?

The Tunis event hosted by ASREN was very successful and followed in the pattern of the preceding workshops in the other African regions. Although there were regional specificities like the need to improve the visibility and

Pictures
Far Left:
Omo Oaiya

Above:
Discussions at
WACREN 2019

discoverability of Arabic content, most of the other needs were common and included hosted repositories, exposing content in a common and coordinated way, federated identity management for libraries, institutional support for open scholarship, user support frameworks and capacity building.

This final event successfully concludes the first phase of LIBSENSE networking activities which aimed to establish a community of practice related to Open Science across the continent. This community will share experiences and information, support the participation of new voices in the scholarly communication landscape, and lay the foundation for their leadership in the implementation of Open Science in their countries.

How can LIBSENSE benefit researchers in Africa?

Open Access is one of the most significant conduits for inclusive and free access to scholarship for the marginalised and has the mandate and potential to strongly promote unhindered participation in knowledge production. Making scientific processes and results more transparent and accessible in the Open Science paradigm allows others to evaluate, use, and analyse them in new ways, which speed up scientific discoveries, reduce redundancy of experiments, and provides a mechanism for innovation, social justice and economic growth. LIBSENSE aims to increase capacity to support, maintain, deploy and reconfigure digital scholarship services which directly benefit researchers.

What is next for LIBSENSE?

The LIBSENSE initiative has drafted templates for data exchange model agreements that cover the data acquisition policy for aggregators and data usage policy. Draft metadata guidelines to ensure interoperability across African repositories have also been released for public comments. The next step will be to continue the advocacy and community building around strategic development of Open Access publishing and e-research infrastructure. This will be complemented with training programs targeting digital skills needed by the librarians and researchers as well as workshops targeting senior university management who make decisions regarding investment in these digital services to raise awareness of the importance of the Open Access and Open Science.

CONNECT Interview: Dr. Matthews Mtumbuka

Dr. Matthews Mtumbuka has recently been announced as CEO of the UbuntuNet Alliance. He spoke with CONNECT about his background and his plans.

What is your background and what led you to the UbuntuNet Alliance?

My background is in engineering and information technology. For the past eight years, I worked for a major mobile operator, Airtel Africa, where I was in charge of information technology in Malawi, then Rwanda and, over the last three years, coordinated IT Operations and Governance across the 14 countries in Africa where Airtel operates. My first job was with Shell Oil Europe, based in Aberdeen in Scotland, and my educational background includes an undergraduate qualification from the University of Malawi and a PhD from the University of Oxford, where I was a Rhodes Scholar from 2002 to 2005 – all in engineering. I have enjoyed a progressively expanding career. It has always been my desire to lead large scale engineering/technical organisations that have an impact in Africa. In this way, I can make a major contribution to Africa. That is why once I had learnt enough in Europe, during my seven years in the UK at Oxford and Shell, I resigned to come back to Malawi, to Africa. So, when this opportunity came up, I was very excited to go for it. I am also very passionate about academia so this sounded like the perfect match.

What is your highest priority for the coming six months?

We have a major project coming up with one of our main development partners. My number one focus area for the next six months is to ensure that we complete the actions that enable us to satisfy the prerequisites for this project. This will put us on a good footing to expand our network and make it robust and resilient with good redundancy on many of the links. Secondly, we have some governance matters to refine including a review of our constitution among others. A third area is community which, as we operate in a membership-based organisation, is a big feature of what we do. I will ensure that over the next six months our community values are well embedded because that will help us work more effectively and efficiently with the NRENs who are both owners and our customers. And, of course, our focus on driving actions that in the long term give us sustainability will also remain an ongoing priority during this period.

Where do you see NRENs from the UA region in 2025?

I see them as being much bigger than they are now. At least half of our NRENs are still in the formative stages. I expect them all to have matured and have achieved a stable performance by then. As of now, most of them provide broadband to end users as their primary and main product. I envision that by 2025, at least 40% of their products and services will be Value-Added Services (VASs) leveraging the existing broadband offering. VASs will thus be a key thrust for us going forward. We will create VASs as a strategic building block for the sustainability of the Alliance.

Is there a leadership methodology that you believe will be most suitable for the UA?

Participatory leadership will be the central methodology. Of course, given the large scope of our work in terms of geographical reach, range of projects and scale of operations, we would use a range of leadership methodologies but all gravitating towards and reverting to the participatory approach. A participatory approach is the default methodology because of our nature as a membership organisation. We have to start with the needs and requirements of the end user via engagement with the NRENs. If we can accurately manage that process, the bottom-up approach, then sustainability of the Alliance is automatically secured and guaranteed.

Any final inspiring words?

I am very excited to join the NREN community. The scope of what we can do to impact the education and research community is nearly limitless. It is gratifying to see many keen partners eager to work with us. I see a very bright future ahead of us and with the great teamwork that I already see at the secretariat and from the NRENs, as experienced at the recent Annual General Meeting in Entebbe in Uganda, I have no doubt that we will digitise and greatly transform the education and research sector in the medium to long-term period.

Google

Google Cloud and GÉANT strengthen support for global research community

Google Cloud Platform helps GÉANT NREN members accelerate their research and scale data processing, fueling new insights and discoveries.

Today's research computing demands lightning-fast speed, vast data storage, and intensive processing power in order to advance discoveries across disciplines, from genomics to climate change. Google's facilitation agreement with GÉANT expands our support for academic researchers in EMEA, enabling them to leverage the benefits of Google Cloud Platform (GCP), our suite of cloud computing solutions for storage, compute, big data, and machine learning.

Giving European researchers easy access to GCP

Google offers GÉANT's 50 million users across Europe special educational discounts to access GCP. Together, the scientists, educators, IT leaders, and the 38 National Research and Education Networks (NRENs) in GÉANT can make direct Google connections at reduced cost to put their data to work to discover meaningful insights with the potential for global impact. Andres Steijaert, Project Leader for Cloud Services at GÉANT, says that "we are delighted that Google Cloud Platform can now be used easily via a ready-to-use agreement, through GÉANT. The machine learning and AI features open up a wide range of exciting opportunities for education and research." Other benefits include data egress waivers, unique pricing for GÉANT member campuses, single sign-on support through SAML2, and a

negotiated terms of service, as well as access to GCP training. As Team Lead Cloud Services, Michel Wets is pleased with how GCP and GÉANT help SURF, the Dutch NREN, drive innovation: "we're very happy to see GCP compliment the cloud services available to Dutch R&E. SURF is currently testing GCP services and will support institutions in GCP pilot projects later this year. So far, it looks very promising!"

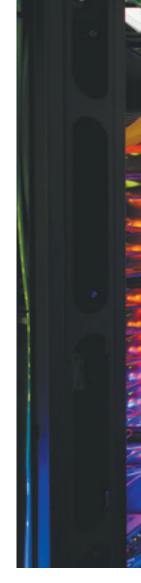## Providing a secure and private infrastructure that meets EU data protection standards

Cloud computing enables faster, more efficient data processing, which means researchers can analyze more data, try out more hypotheses, and ask more questions. The Institute for Molecular Medicine Finland (FIMM) at the University of Helsinki, for example, uses GCP to fuel an ambitious project called FinnGen, which integrates genomic data with clinical health records for 500,000 Finnish citizens. Mari Kaunisto, Communications Director and geneticist at FinnGen, explains the importance of their project: "The combination of genotype information and health data enables genetic discoveries that improve our understanding of disease mechanisms, creating medical breakthroughs. We hope that FinnGen will reveal new

biological or molecular mechanisms behind a number of diseases."

The project has already processed 100,000 individual records, generating three terabytes of raw data and adding 50,000 participants every six months. FinnGen researchers turned to GCP because they needed a technological infrastructure that could scale to manage an estimated 1.5 petabytes of genomic data over the next three years. They also needed vigorous security and privacy controls to meet donor, institutional, and European Union requirements. By building on Google's Compute Engine and Cloud Storage and integrating other Google tools like DataProc, AppEngine, Identity and Access Management (IAM), BigQuery, and CloudSQL, the FinnGen team designed a seamless infrastructure for scaling data while keeping it secure and private. New datasets will be made available to FinnGen's international research team every six months, fueling more collaboration and potential discoveries.

Accelerating research—at scale

Similar to FinnGen, researchers at the University of York faced challenges scaling storage and processing for massive amounts of data. Microbiologist James Chong studies microorganisms to understand how to make the anaerobic digestion of biosolids more efficient. Water processing plants use this process to convert sewage into renewable

energy, reducing greenhouse gases that harm the environment. Working with Yorkshire Water, Chong's group collected sixty gigabases (or sixty billion base pairs) of microbial DNA sequence and asked their colleagues at York's Bioscience Technology Facility (BTF) for help in analyzing the data on high performance computing (HPC) clusters.

Once sequenced into "long reads," all that genetic data need to be re-assembled again, generating huge datasets with heavy computational demands, especially large amounts of disk space. So the York team turned to Cloud Technology Solutions (CTS), a Google Cloud Premier Partner based in the UK and offering cloud migration, transformation, Big Data and support services, to pilot their workflow on Google Compute Engine's virtual machines (VMs).

Working with CTS, the York team started running the genome assembly with 3TB of disk space but found they needed even more storage. Within five days they solved the problem: completing their pipeline for the first time and on a single Google Compute VM. Dr. Peter Ashton, Head of the Genomics and Bioinformatics Laboratory in BTF, marvels that "we hadn't been able to run this workflow at all but using Google VMs makes this genome assembly possible, accessible to more researchers, and more affordable."

Getting started with GCP

These examples from Finland to the United Kingdom are just a few of the many innovative projects in EMEA that build on Google tools and infrastructure. To get started on your own, we offer research credits to academics using GCP for qualifying projects in eligible countries. You can find our application form at **www.cloud.google.com/edu**. GCP is now available to GÉANT member institutions wishing to leverage the facilitation agreement through Cloud Technology Solutions (CTS), one of the world's largest cloud infrastructure experts. For more information, email H.Ed@cloudsolutions.co.uk.

COME VISIT US AT TNC19

Find out more about our products and tell us how you use Google tools in your work!

"The combination of comprehensive genomic information from the Finnish founder population and national health register data enables genetic discoveries that improve our understanding of disease mechanisms and benefit global healthcare systems long into the future."
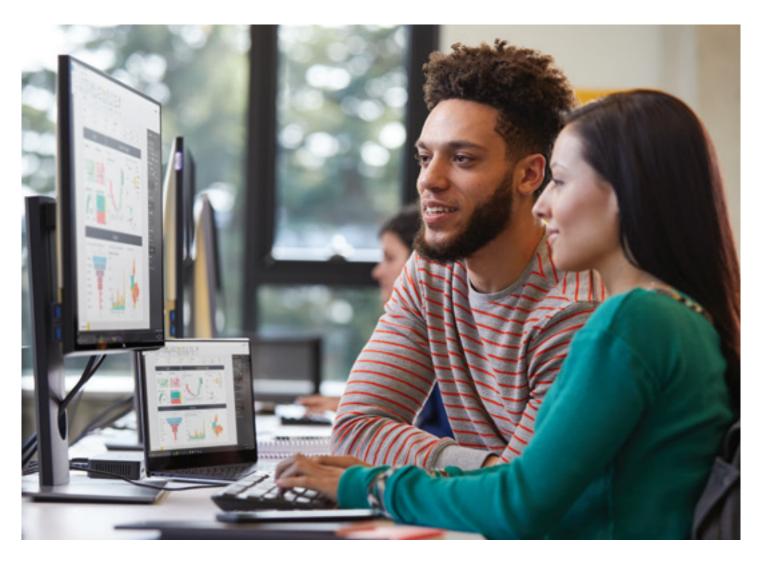
Mari Kaunisto, Communications Director and Senior Researcher, FinnGen

"We are delighted that Google Cloud Platform can now be used easily via a ready-to-use agreement, through GÉANT. The machine learning and AI features open up a wide range of exciting opportunities for education and research."

Andres Steijaert, Project Leader for Cloud Services, GÉANT

"We hadn't been able to run this workflow at all but using Google VMs makes this gene assembly possible, accessible to more researchers, and more affordable."

Dr. Peter Ashton, Head of the Genomics and Bioinformatics Laboratory, University of York

![Microsoft]

Microsoft Azure: Solutions for Education

Nowadays, latest technology and education often go hand-in-hand in. As a result, many institutions in the education field use the power of Microsoft Azure to provide the right resources for students and researchers to succeed, to empower educators and to increase value and efficiency in the campus environment. Wanting to remain focused on three core values - relevance, reputation and revenue, universities face many challenges as they evolve to meet the expectations of a growing population of students.

By incorporating the technology skills of tomorrow into the classrooms of today Microsoft Azure will help bridge the knowledge gap for future employability. For students, technology literacy is more important than ever, as most careers now come with computer-based job duties.
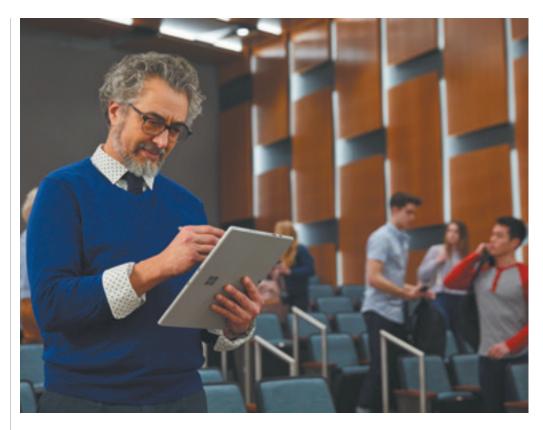
Serving students & researchers

The rapid evolution of technology and the growing demand for answers has significantly increased the pressure on academic researchers to accelerate innovation. They need technology that gives them unlimited compute and data capabilities, allows them to quickly scale up and down, and helps them install whatever services they need at any time. Microsoft Azure provides an open, flexible, global platform that supports multiple programming languages, tools, and frameworks allowing researchers to achieve faster results and achieve more by using the cloud.

Real-world success: Do epic research!

At Australian National University (ANU), one of the top-ranked universities in Australia, researchers teams at The John Curtin School of Medical Research use Microsoft Azure to conduct studies in using genome-scale data. Dr. Sebastian Kurscheid's work has shown how cloud computing can be harnessed to tackle genome analysis, simulations, and visualizations, potentially opening the door for widespread clinical application. Dr. Kurscheid and fellow researchers gain two monumental capabilities with Azure:

- They can now store and process data in a more flexible way than they could with their previous technology. Exploring correlations between the billions of data points within the structures of the human genome is a highly demanding computational task. Azure provides the elastic computing power and analytical tools needed to power those processes, discover connections, and power new discoveries. It's a valuable facilitator on the discovery path.
- Also, Azure provides a safe and secure way to share these discoveries and collaborate with fellow researchers anywhere in the world before the research is published, accelerating research faster than ever before.

By focusing more on the research and less on the technology, and by leveraging the best of Azure cloud computing, researchers like Dr. Kurscheid will pioneer the next generation of genomics breakthroughs. And thanks to on-demand cloud computing, we may see that next breakthrough faster than expected.

Microsoft Azure is the perfect choice for research and education. It allows quick and easy access to very powerful computing environments where complex data can be analysed, stored and shared easily and securely. It also gives researchers access to amazing tools that can turn data into insights and enable them to collaborate with others quickly and securely to accelerate discovery.

Meet security and privacy compliance requirements

Microsoft believes privacy is a fundamental human right. We are committed to providing you with products, information, and controls that allow you to choose how data is collected and used. We live in a time where digital technology is profoundly impacting our lives, from the way we connect with each other to how we interpret our world. To thrive in this privacy-focused era, one needs a trusting partner who can help not only to overcome the challenges, but also to make the most of the opportunities that lie ahead. Microsoft's principled

approach to privacy, security, compliance and transparency means you can trust Azure. The Azure portfolio addresses rigorous security and privacy demands and our cloud services are GDPR compliant, supporting you in ensuring your own.

Take advantage of Microsoft Azure benefits

Microsoft Azure makes it easy to move around and work inside the cloud and that means students can spend more time learning and exploring. Educational institutions can spend more time teaching and challenging students to overcome boundaries and IT department will have the luxury of more time to innovate and add new tools to support those efforts. Choose Azure and stay up to date with the latest technology and security, while increasing value and efficiency for your campus environment!

Get more information here: **bit.ly/AzureHIE**.

And come visit us at our booth @TNC19, we will answer all your questions about Microsoft Azure Solutions for Education!

Huawei Optical Network Solution
—— OptiX@Education
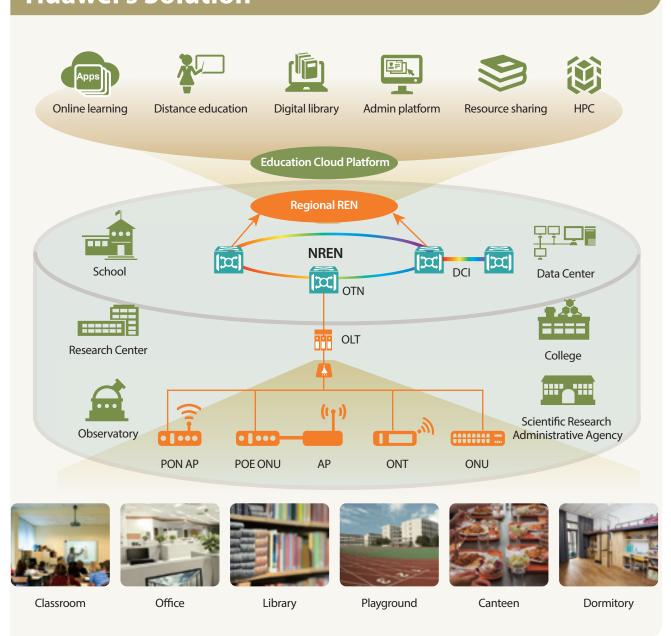
Trends and Challenges

- Campus network raises higher requirements on service convergence, high bandwidth, and low latency.

- Multi-functional REN is expected to achieve efficient deployment as well as simple and eco-friendly O&M.

- Based on education informatization, network openness, innovation, and smooth evolution become essential.

Huawei's Solution

Online learning　　Distance education　　Digital library　　Admin platform　　Resource sharing　　HPC

Education Cloud Platform

Regional REN

NREN

School

OTN

DCI

Data Center

Research Center

OLT

College

Observatory

PON AP　　POE ONU　　AP　　ONT　　ONU

Scientific Research Administrative Agency

Classroom　　Office　　Library　　Playground　　Canteen　　Dormitory

Solution Highlights

Huawei's PremiumON solution performs all-optical network to enable unified, multi-scenario, and all-service bearing, achieving E2E ultra-large bandwidth, all-optical simplified architecture, and continual smooth evolution.

Research & Education Network (REN)

Ultra-broadband High-performance 200G/400G+, Super C-band, increasing 50% in spectrum width.

Agile OTN+OXC O&E synergy switching, covering all service granularities, E2E flexible grooming.

Openness SDN ready, quantum keys injection, NETCONF/SNMP/etc. interfaces, continual evolution.

Data Center Interconnect (DCI)

Ultra-broadband Industry's 1st 600G/λ, single-fiber capacity 48T, reducing the cost per bit.

Simplicity OXC all-optical switching, '0' fiber connection, reducing 80% in room space.

Smart AI+ O&M, automatic service provisioning, health prediction, active visible maintenance.
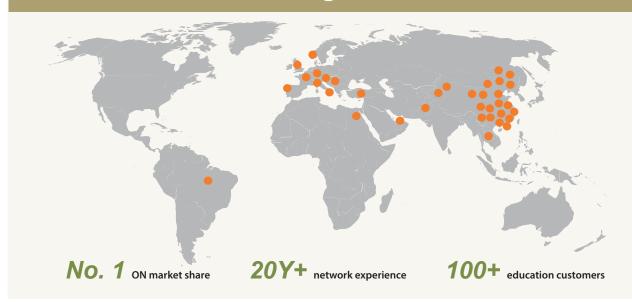
All-Optical Campus Network

Simple architecture All-optical network, flat layer 2 architecture, passive without power supplies and rooms.

Easy evolution One fiber for multi-services, easy service expansion without cabling.

Smart O&M Plug and play, passive ODN, commissioning free, easy for maintenance work.

Global Success Stories@Education

No. 1 ON market share   **20Y+** network experience   **100+** education customers

HUAWEI

IDEA
Information Digitalization and Experience Assurance Dept

MORE INFORMATION http://support.huawei.com

Enterprise Transmission & Access

Best Practices to Support a Transition to Cloud-First Environment

The world's leading digital governments rely on the cloud's flexibility, innovation, and scale to empower officials with the insight they need to deliver top-tier public services. Amazon Web Services (AWS) helps governments become digital organizations, which enables them to focus on their core mission – serving citizens.

Modern governments work on the front lines of service delivery and face a challenging fiscal environment. With no room for administrative waste, governments increasingly need rapid access to technologies that simplify their processes, deliver massive reductions in administrative costs, and enable innovation to create efficient and effective citizen services.

Commercial cloud computing has become the default pathway for governments to transform themselves into innovative citizen-centric service delivery organizations — just as it has become the default for innovation in the banking, insurance, and professional services market. Cloud Service Providers (CSPs) such as AWS offer a range of on-demand services from compute, storage, networking, and databases to powerful analytics including artificial intelligence and machine learning functions that make service delivery more accurate and more effective. Throughout the service sector, the cloud has become the industry standard as organizations recognize the cost-savings potential relative to on-premises data centers, the cloud's embedded high level of security, and its data science capabilities (in addition to a myriad of other benefits the cloud offers).

Cloud-First

A Cloud-First policy directs or requires government agencies to use commercial cloud services as the primary enabler for IT modernization. CSPs now make it easy for government customers to move away from the capital expenditure (CapEx) model of buying and owning physical IT assets that depreciate.

Instead, agencies can allocate their IT budgets toward operating expenditures (OpEx) to cover only the services they use, while also avoiding traditional CapEx-related 'tech debt' through having on-demand access to leading-edge IT products and services. A well-crafted Cloud-First policy leads to cost savings, provides greater security than on-premises solutions, allows the flexibility for government entities to adjust usage, and augments efforts for workforce development and transparency.

Key Policy Considerations

Federal governments from Argentina to Australia, Bahrain, Canada, Chile, the Philippines, Singapore, the United Kingdom, and the United States have adopted smart cloud policies to modernize their IT infrastructure. Drawing on these experiences, AWS has identified a set of best practices to support a transition to cloud-first environment.

1. **Promoting Cloud-First Policies**: Governments issue a policy statement with an actionable directive – including timetables—that creates a framework for the implementation of cloud technologies, clarifies the roles and responsibilities of government entities and CSPs, and establishes a procurement vehicle that is designed to gain the full benefits of cloud technologies. Once governments have established cloud-first policies and infrastructure in place, their IT professionals can engineer 'born-in-the-cloud' or 'cloud-native' solutions.

2. **Cloud Accreditation, Compliance, and Security**: Governments use existing domestic and international cloud-centric accreditation systems to evaluate CSPs (rather than create their own unique certification programs) and leverage the shared responsibility model for cloud security.

3. **Data Classification**: Governments categorize their data based on its level of sensitivity, and then manage each segment in a manner congruent with its level of sensitivity.

4. **Data Privacy and Control**: Governments establish and/or adopt complementary security and data processing and privacy policies to support a successful transition to the cloud.

5. **Cloud Contracting and Procurement**: Governments design and institute a cloud-contracting vehicle that agencies can use to gain the full benefits of cloud, with cloud-centric terms and conditions, pricing, governance, and security. Contract vehicles and procurement guidelines recognize the pay-as-you-go model of commercial cloud computing, and the role of CSP partners and resellers in the cloud delivery model.

As governments transition to cloud-first policies, CSPs have identified a few potential policy pitfalls. To optimize the cloud journey, government leaders need to (1) fully commit to the cloud, (2) formalize the budgeting and procurement processes, (3) establish timelines for cloud migration, (4) take steps to avoid traditional hardware and licensing-based vendor lock-in, and (5) take the time to build and then follow a cloud migration roadmap.

The AWS team is at the disposal of government leaders to help develop and implement smart cloud-first policies.

Read the whitepaper
https://pages.awscloud. com/public_sector_aws- smart-cloud-native-policy- whitepaper.html

Taking Advantage of a Programmable and Open Optical Network

OPTICAL NETWORKS	UNTIL NOW	GOING FORWARD		BENEFIT
Openness	Alien wavelengths	Open interfaces (e.g. OpenROADM MSA)	→	Modularity, disaggregation
Control Monitoring	NMS (procedural, manual) Alarms, events	SDN (abstract, automated) Continuous telemetry	→	Programmable control
ROADMs OTN switching	Fixed grid, colorless, directionless Medium/high capacity	Flexible grid, contentionless Access-to-core scalability	→	Programmable routing
Client side Line side	Multiservice (Ethernet,storage,etc) OTUk, ODUflex	400GE, FlexE OTUCn, FlexO	→	Programmable transport mapping
Line rates Spectrum	Coarse (100/200G) Fixed	Fine (50G steps to 600G) Flexible	→	Programmable throughput

Optical networks are shaking off their cocoons. They are transforming from handcrafted static configurations into programmatically reconfigurable entities. They aggregate multiple services like Gigabit Ethernet and Fibre Channel effortlessly onto wavelengths. Then they employ advanced continuous modulation and flexible spectrum techniques to create the fastest possible optical highways for each wavelength. Innovative switching technologies allow reconfiguring the paths of these highways in real time. SDN automation brings everything together, orchestrating this symphony of light to produce novel and beneficial optical networking applications. We examine some of these here.

Words: Jonathan Homa, Director Portfolio Marketing, ECI

Maximizing Throughput

Lighting wavelengths with transponders is the most expensive part of optical networking. With a programmable network, it is possible to extract the maximum bandwidth-carrying throughput from each wavelength, reducing the total amount of wavelengths needed. For example, imagine a three-node network, with one terabit (1Tbps) traffic running between each node. In the current environment, the choices for filling this need are limited essentially to 100G and 200G line rates, operating over a fixed grid. Let's assume this translates into 5x200G links between two of the nodes, and 10x100G links (having a longer distance to traverse) connecting other two-node pairs, for a total of 25 links. A programmable optical network with continuous modulation uses granular selection of the line rate and spectral grid for each path, making it possible to find the "sweet spot", maximizing the throughput right up to the edge of the non-linear Shannon limit. These links might now translate to 3x350G, 5x200G, and 7x150G. This totals only 15 links, providing significant savings, with capacity to spare.

MAXIMIZING THROUGHPUT

OLD APPROACH

5 x 200G link
10 x 100G link
Traffic
1T   1T
1T
10 x 100G link
25 links

PROGRAMMABLE NETWORK

3 x 350G link
5 x 200G link
Traffic
1T   1T
1T
7 x 150G link
15 links with capacity to spare

Customer-controlled Bandwidth on Demand

Platforms like Amazon Web Services let business customers order computing resources on-demand, raising their expectations for similar telecom offerings. For example, a data center operator normally requires a 100G link between two locations, but on occasion, to perform large backups, wants to increase this to 300G. A programmable optical network enables this as follows: The customer pays a fixed fee for a package of 3 x 100GE physical interfaces to serve each data center, and a 100G transport service. Through a portal, the customer then 'dials up' additional bandwidth to 200G or 300G whenever needed, and the network allocates resources to accommodate the request, or makes the best effort to do so. Pricing would vary depending on time of day, and the customer just pays for the additional bandwidth during the temporary usage period.

Dynamic Restoration

Let's start with a specific example. A 200G wavelength using a 50GHz wide channel transports a 200GE service. The fiber fails and there is no pre-assigned automatic backup link. An SDN restoration application searches for an alternative path for the wavelength, but can only find a longer path that requires an 87.5GHz channel width to achieve the 200G line rate. This is a straightforward task for a programmable optical network, which re-routes and restores the link.

When SDN control extends to the service layer, schemes that are more sophisticated are possible. If multiple services fail, as would almost certainly be the case with a fiber cut, the restoration application can prioritize which ones to restore first. When the service layer uses interfaces like FlexE, there is also the possibility for partial service restoration. For instance, if the restoration application only finds a maximum 150G link to re-route the 200GE service, it can then signal the service layer to sub-rate the service to 150GE.

Just in Time Power Margin

Many industries operate on the principle of "just-in-time inventory". A car manufacturer receives the parts it needs for the day's production, perhaps only the previous day. This eliminates idle capital. However, today we typically overbuild optical routes by a 3dB to 5dB margin, to compensate for the future degradation of the fiber. These margins translate to about 100G and 200G of lost bandwidth, per route. In effect, up to half the capacity of capital investment in the network is lost to margin!
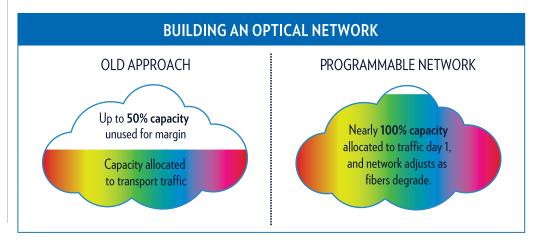
With "just-in-time margin", the network operator provisions routes right up to their feasible limits, maximizing their traffic carrying capacity and associated

capital investment. When the fiber does eventually deteriorate, we can maintain the desired line rate in variety of ways, such as by increasing the channel width, or by provisioning a brand new route and releasing the existing facilities for other services. In other words, the network continually optimizes itself. When no amount of reshuffling can accommodate all desired links, then the network optimization algorithm, perhaps based on machine learning by this point, simply orders new facilities.

Changes in Philosophy Needed

While all these applications are technologically possible, most require a philosophical change on the part of the network operator to implement them. The modus operandi until now has been to carefully craft predominantly static optical networks to transport all traffic in a fully deterministic fashion. The first step to a dynamic optical network is to start defining transport services with a range of availability SLAs from fully-guaranteed to best-effort. Then we can start transforming optical networks into an elastic pool of resources, which balances between dedicated and shared support for the traffic.

Another key to success is being able to construct Programmable Optical Networks in a modular fashion, piecing together major sub-systems from different vendors. This promotes beneficial competition and best-of-breed solutions for the various transmission, ROADM, OTN switching, and control sub-systems. Fortunately, the industry is moving to support disaggregated solutions by defining open, standard functionality models and control interfaces in initiatives like the OpenROADM MSA.

Find out how ECI can help you construct a Programmable Open Optical Network at our booth at TNC19 in Tallinn.

BUILDING AN OPTICAL NETWORK

OLD APPROACH

Up to **50% capacity** unused for margin

Capacity allocated to transport traffic

PROGRAMMABLE NETWORK

Nearly **100% capacity** allocated to traffic day 1, and network adjusts as fibers degrade.

Dropbox

Fuel cross-campus learning and innovative research with Dropbox Education's secure collaboration platform.

Universities use Dropbox to supercharge their existing workflows, boost productivity and enhance information security.

"We recently deployed Office 365 and Dropbox has perfectly complemented the package. We now offer a choice of tools to aid collaboration for all staff and students at the university. Its scalability and ease of use are key factors in us making Dropbox available to everyone at the University. We want to offer the best choice of collaboration tools for our staff and students so they can focus on their important work, and Dropbox fits perfectly into this."

Dr. Mark Ferrar, University Information Systems, University of Cambridge

"We knew we had to deliver a consistent experience for users on all devices, anywhere in the world. We needed to provide everyone access to teaching and resources. We recognised the importance of enabling a more collaborative culture to create genuinely global research projects. To help deliver on our objectives we migrated to Dropbox Business."

Kathy McCabe, CIO, Heriot Watt University

"We're about to have a saying here – 'no upload, no evaluation'. Now, in order to graduate, students have to place their final work in Dropbox so that they can be evaluated. Taking everything digital has been better for lecturers, and helps immensely with our audits. Because of all this, we seem to grow more grateful for and excited about Dropbox every day."

Manon Thiemann, Maastricht Academy of Media Design and Technology, Zuyd Hogeschool

→ **6k+** global universities
→ **94k+** shared folder invites per week
→ **64%** growth in university users in the last three years
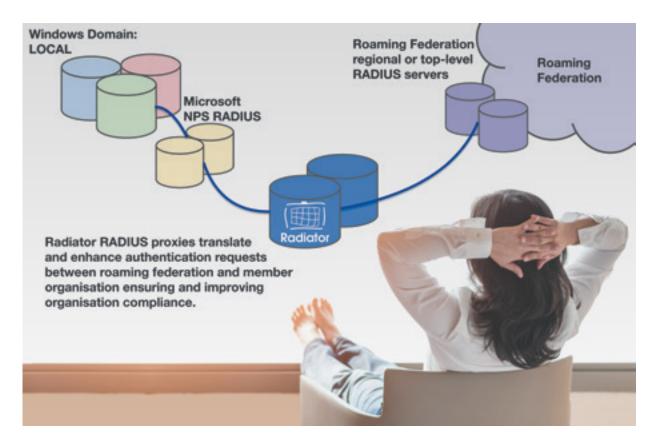→ **80** universities with **10k+** users

Dropbox streamlines workflows and elevates collaboration by addressing the unique needs of university IT teams, staff, professors, and researchers.

With **300,000** integrations available, including Blackboard, Turnitin, Notability, Office 365 and Active Directory, connecting and aligning partners, funders, students, and innovators, as well as those studying and researching, is simple.

GÉANT

Dropbox and GÉANT - Partnering to help universities work better together

For more information on the plans, and how to take advantage of this fantastic opportunity, email geant@dropbox.com or click on dropbox.com/education.

Windows Domain: LOCAL

Microsoft NPS RADIUS

Roaming Federation regional or top-level RADIUS servers

Roaming Federation

Radiator

Radiator RADIUS proxies translate and enhance authentication requests between roaming federation and member organisation ensuring and improving organisation compliance.

Easy Roaming with Radiator

Radiator is used across eduroam/govroam/*roam federations. You can find Radiator everywhere where there is a RADIUS server, from the national top-level server level to the service and identity provider level. There is a good reason: Radiator provides most, if not all, of the features the organisations, operators, and service providers request. Combined with the Radiator technical support, handled by Radiator developers themselves, it is no wonder that the organisations globally choose Radiator when they just want to make things work.

Radiator

True, it may be challenging to deploy eduroam/govroam/*roam if your organisation does not have expertise in AAA servers or RADIUS-based roaming infrastructures. With Radiator, it is not a problem. It provides a simple, field-tested, easily deployed configurations that will connect your AAA servers and identity databases to the roaming federations. Radiator also supports various operating systems from Linux to Unix and Windows servers. This makes Radiator a great choice when you just want to get connected and not to worry about software and configuration compliance, diagnostics, or connection problems with other products. What is more, Radiator is also ready for the future with support for the technologies such as RadSec and DNS roaming.

One of these challenges, that Radiator solves, is illustrated above. An organisation wants to roam but it has deployed among other organisations Windows domains with common domain name LOCAL. When Radiator is deployed in front of the Microsoft NPS RADIUS server, Radiator makes it possible for this organisation to be able to join to the roaming federation. The organisation does not have to restructure its Active Directory infrastructure and this solution is much more compliant and fault-tolerant than using the original NPS servers.

Learn in detail how we solved this challenge with Radiator in our Radiator technical workshop in TNC19 on Thursday, 20 June 2019, from 9.00am to 12.30pm, or book a one-to-one meeting with us at **https://radiatorsoftware. com/meet-us/**

GÉANT at a Glance

We're bringing you greater content across a wider range of channels: from our Annual Report to showcasing the amazing research projects the GÉANT community supports. And coming soon, CONNECT will be online 24/7 through a new website and weekly newsletter. You can also get involved on social media – see you online!

GÉANT ANNUAL REPORT

ar2018.geant.org

Dark shading: connected to regional network

Light shading: eligible to connect to regional network

— Multiples of 100Gbps
— 100Gbps
— Multiples of 10Gbps
— 1-10 Gbps
— <1Gbps

June 2019

GÉANT IMPACT

impact.geant.org
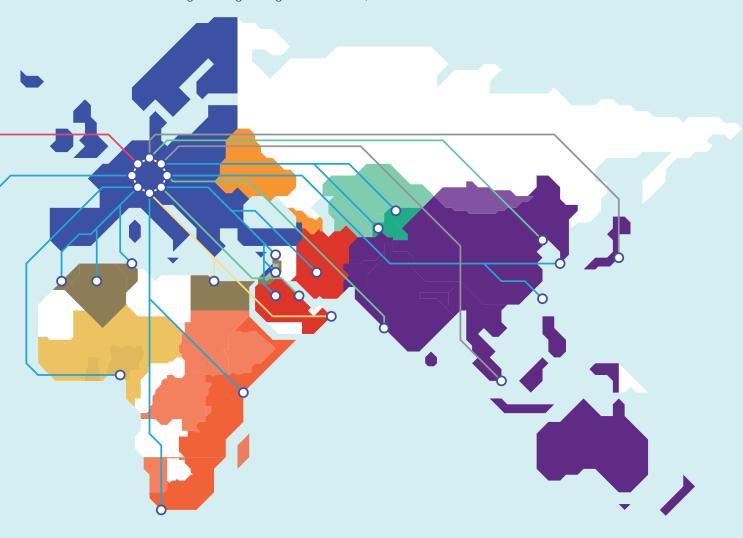
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COMING SOON!

GÉANT is Europe's leading collaboration on network and related infrastructure and services for the benefit of research and education, contributing to Europe's economic growth and competitiveness. We develop, deliver and promote advanced network and associated e-infrastructure services, and support innovation and knowledge-sharing amongst our members, partners and the wider research and education networking community. Together with our NREN partners, we interconnect 50 million users at 10,000 research and education institutions; and via extensive global partnerships and GÉANT-managed networking projects, reach over 100 countries worldwide.

COMING SOON!

CONNECT NEWSLETTER

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