GÉANT
Networks • Services • People

CONNECT

THE MAGAZINE FROM THE GÉANT COMMUNITY

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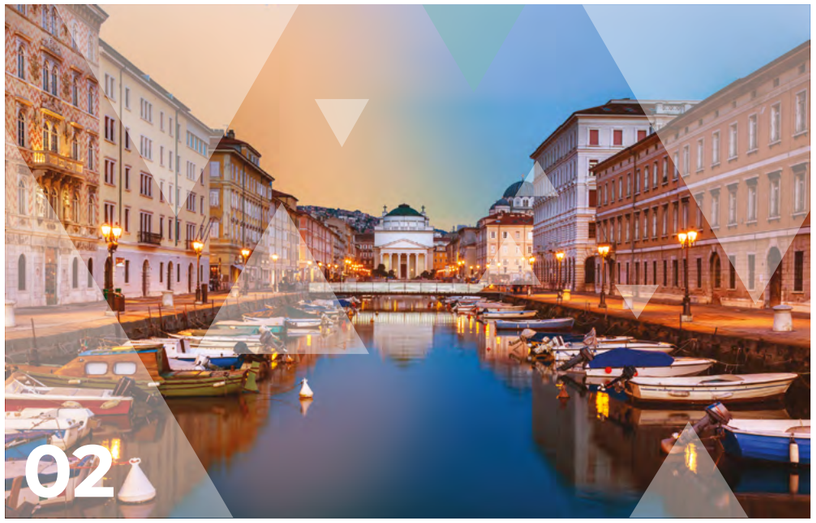

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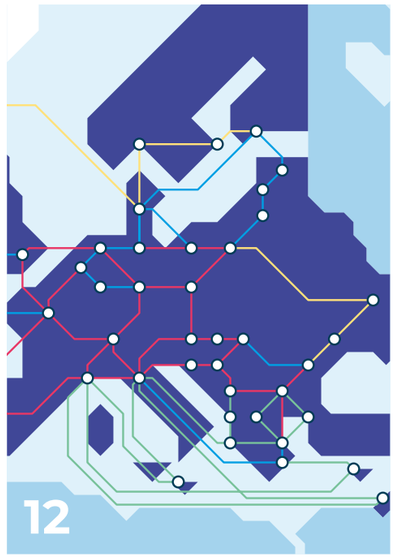

Welcome from Cathrin Stöver

Welcome to this issue of CONNECT, and welcome to our first #Face2FaceTNC in three years! I am so excited for this week and for the community to come together in real-life again. This time last year I welcomed you all to our virtual TNC21 and whilst that was a roaring success, nothing quite takes the place of meeting each other in person and soaking up the unique TNC atmosphere. And for those unable to travel, we hope we can bring you a flavour of the conference via our live streaming.

So, as is customary in our TNC issue, we go a little behind the scenes to bring you the background on various topics in the programme.

Therefore, I direct you first to the Community Award article, where I hope you can join me in a huge congratulations to our winners Tryfon Chiotis of GÉANT, and Paul Dekker of SURF. We also congratulate Natalia Manola who is this year's recipient of the Vietsch Foundation Medal of Honour. Together with the nominees, all three illustrate the passion and the 'going-the-extra-mile' mentality of our community.

We also have interviews with some of the people you may see this week, including keynote speaker Dr Gihan Kamel of SESAME, and session presenter Sebastiano Buscaglione of GÉANT. And we shine the light on the Emerging NREN Programme and the biggest Future Talent Programme group so far.

We see also an extremely eloquent thought leadership article from my respected friend and colleague Federico Ruggieri, of TNC22 host GARR, highlighting the challenge of digital sovereignty within national cloud strategies. And GÉANT's Alf Moens takes us through the recent EU directives on cybersecurity and their implications for the NREN community. Required reading for all of us!

Finally, I would draw your attention to the amazing article from Brazilian NREN RNP, and their inspiring journey to make Brazil now one of the largest eduroam networks in the world.

All of these diverse topics and people make up the many lively conversations we love to hear at TNC. So do make sure that if you are in Trieste you drop by the GÉANT booth, meet the teams, and join the conversation.

Enjoy the issue, and the conference!

Cathrin Stöver, GÉANT

CONNECT is the magazine from the GÉANT community; highlighting the activities of Europe's leading collaboration on e-infrastructure and services for Research and Education.

The Team Behind CONNECT

Reflecting the breadth of our community, the articles you read in CONNECT are contributed by a wide range of people from the GÉANT Association, the GN4-3 project, and from our NREN and regional partners. The planning, production and editing is performed by a small team highlighted below.

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Regular contributors:
Cathrin Stöver, Paul Maurice, Rosanna Norman, Silvia Fiore, Karl Meyer, Leonardo Marino (GÉANT)

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tnc22
Trieste, Italy | 13-17 June 2022

Consortium GARR

GÉANT

WELCOME TO **TNC22**

After three long years, the international R&E community meets in person once again in one of the most beautiful European cities: GÉANT and GARR welcome you all to Trieste!

Words: Rosanna Norman, GÉANT

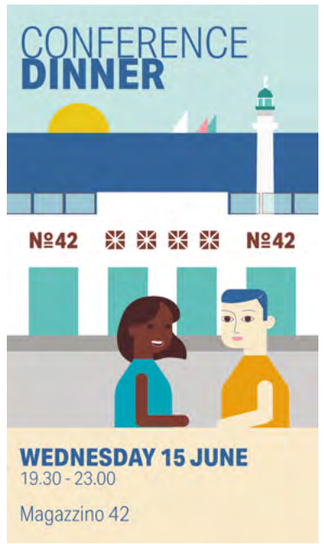
Are you ready to enjoy the buzz of a real-life conference, the excitement of the opening plenary, the happy sound of people chatting during coffee breaks, and the inspiring keynotes? Are you looking forward to catching up with old friends, meeting new ones, listening, discussing, sharing, and learning?

The TNC22 team has been hard at work to ensure that this year's programme makes of TNC22 another memorable conference. Anna Wilson, Chair of the TNC22 Programme Committee said, "So excited to be with everybody again, I hope all participants will feel enriched by the conference's content, inspired by the brilliant keynotes, and I would also like to encourage everybody to make the most of this year's riveting social programme too."

Here's what is in store for all at TNC22:

KICK OFF PARTY – TUESDAY 14 JUNE

An informal after-dinner social event will take place in three different bars in the area of Piazza Giuseppe Verdi, a beautiful square in the very heart of Trieste. Come and enjoy a spritz (or two), a typical local drink, at Citybar Tergesteo, Caffè degli Specchi and Caffè Tommaseo, mingle with old friends and colleagues and create new connections in the magical atmosphere of an Italian piazza on a warm summer night. There will be music (at the Citybar) and dancing! The TNC22 kick-off party is proudly sponsored by GARR.



CONFERENCE DINNER – WEDNESDAY 15 JUNE

Magazzino 42 is located on the pier of Trieste Maritime Station, currently a cruise ship terminal, and it used to be the terminal for transatlantic ocean liners. From its spectacular terrace, a panoramic view over the Gulf of Trieste at sunset will welcome you to the long-awaited TNC22 conference dinner. GARR is the proud sponsor of the TNC22 Conference Dinner.

CURIOUS FACTS ABOUT TRIESTE

James Joyce lived in Trieste for over a decade and here completed The Dubliners, A Portrait of the Artist as a Young Man and began to write his most famous novel, Ulysses

Locals consume twice the annual amount of coffee of the average Italian: 10kg/person a year!

The Ellis Island pictured in the movie The Godfather II was filmed in Trieste, at the former Fish Market on the waterfront.

WHAT DO YOU KNOW ABOUT TRIESTE?

Trieste is the capital city of the Friuli Venezia Giulia region in the northeast of Italy, it occupies a thin strip of land between the Adriatic coast and Slovenia's border. A combination of geographical and historical factors make this city a unique and fascinating place. It is culturally very diverse, embracing its Roman, Balkanic, Venetian, Austrian, Greek, and Jewish origins. For centuries Trieste was considered one of the most prosperous Mediterranean seaports as well as a capital of literature and music. After decline caused by WWII, in the 70s the city went through an economic revival which saw many industries flourish. In 2020 Trieste was named the European Capital of Science, today it's an important research hub and its international research centres such as the International Centre for Theoretical Physics (ICTP) or the Elettra Sincrotrone attract scientists from all over the world.

WOULD YOU LIKE TO FIND OUT MORE ABOUT TCC, THE TNC22 VENUE?

The TCC is the new city hub for international congresses, events, and tradeshows. Built in the Old Port of Trieste over an area of 10,000m2, the TCC offers a sustainable and green conference venue comprising two pavilions, a large auditorium (seating over 1,800) and five smaller halls.

Access the TNC22 programme

SCIENCE FOR **PEACE**

CONNECT Magazine met Dr Gihan Kamel, Principal Scientist at the Synchrotron-light for Experimental Science and Applications in the Middle East (SESAME), whose keynote will close TNC22 in Trieste on Thursday 16 June 2022. Dr Kamel talked to us about the role of SESAME not only as a pioneer research centre, but also as a bridge for peace and a vehicle for economic growth, and how scientific research can bring people from diverse backgrounds together to achieve a common goal.

Words: Rosanna Norman, GÉANT

Dr Kamel had you ever come across GÉANT and our flagship conference TNC?

Yes, indeed. There are some collaboration schemes between GÉANT and SESAME concerning connectivity and scientific computing projects which comprise various iterations of EUMEDCONNECT and AfricaConnect projects.

In your TNC22 keynote you talk about what makes SESAME an exceptional scientific facility, explore the human side of scientific collaboration and how research can help overcome differences. Could you share with our audience some highlights of your talk?

Understanding the Middle East diversity is very puzzling to many, with the coexistence of several cultures, common traditions, in addition to belief systems. All these mentioned are sculpted by history, geography, nationality, and religion, among other aspects. In reality, economic and political crossroads do emerge due to the vast geographical features. But fundamentally, there are still many debates and scepticism regarding the science and technological advances in the Middle East – being such a boiling region on the threshold of war most of the time, the key player is peace. Currently, SESAME brings together eight members: Cyprus, Egypt, Iran, Israel, Jordan, Pakistan, Palestine, and Turkey.

SESAME has had a huge impact on the scientific community and social economic development in the Middle East. It is modelled on the European Organisation for Nuclear Research, which was established at the end of the Second World War to unite European scientists. I think that collaborative science is about resources and complementarities. The way that we help and support each other depends mainly on our perspectives. Officially launched in 2017 under the auspices of UNESCO, it is based in Jordan. Being the only synchrotron facility in the Middle East and neighbouring regions, it was conceived with two main objectives: to foster the scientific excellence and interdisciplinary research laboratories and to serve as a bridge for peace and co-existence in a region long characterised by tension. For instance, the countries of the region have common links in developmental health challenges and a wealth of archaeological and cultural heritage. Thus, it seemed rational to bring together scientists to simply follow the conceptual approach of "science for peace".

In addition, the large-scale emigration of skills and knowledge of what is well known as the human capital flight or the brain drain challenge which imposes a dramatic influence on both people and countries as it has a socio-economic impact, as well as the women in science one and how to overcome it, both remain two major challenges for the entire region.

Therefore, SESAME is considered to have a great responsibility to conduct intense awareness and promoting within the Middle East to scientists, leaders, policymakers, and the general public. I believe that it is of paramount importance to emphasise SESAME as a model for "science for peace" – and how does science serve as a neutral power, complementing political diplomacy.

Thursday 16 June, 16:00 - 17.30 CEST

In a TEDxCERN talk, you say that you have an interest in breaking through science (and other types) borders and explain that these are defined by labels. Could you give us some examples?

Labels are so many, including nationalities, languages, religions, and genders - this in turn, impose different considerations and ideological behaviours which sometimes are intolerable and biased. We share 99.9% of our genes with each other, which means that we share almost the same diseases, pollution, energy, and climate change problems that impose different impacts on our economies, food security, and disaster management.

I believe that labelling is quite toxic and unfair, and to overcome such a labelling system, we need to avoid narrow-mindedness and prejudices. Science, in my opinion, is such a tool that never fails to stand as a very efficient language that we can all use to overcome all our differences and labels. Science is labels-free, neutral, and fair.

For example, it is really inspiring to see many politically conflicting groups of people gathering in one place, sharing scientific ideas and future plans, sharing hopes and optimism for the mutual benefit relying only on scientific collaboration – putting aside –even if for a short time- the conflicts, the wars, and the differences.

Another label - that unfortunately still dominate many scientific societies even in the developed countries - is the women in "discipline" terminology – be it women in science, women in engineering, etc. I believe that such a concept would not be that public unless it represents a real and persisting challenge.

You were the first woman scientist to join SESAME. What did it mean to you? What advice would you give to young women who aspire to work in your field?

I was alerted at an early age to the discrimination imposed by the wider society and some of the male teachers and professors I encountered, that women do not belong in science which should be left for men. In a way, my scientific ambition was quite a rebellion in addition of being merely a choice of specialisation. Our culture ideals impose rigid obstacles on the role and capacity of women in the society. When I joined SESAME, I was – and still am – the only woman scientist in the place. It meant a huge challenge and a remarkable experience, one of a kind to me. I knew that I would have to work extremely hard, firstly to become as expert as possible in the field and, of equal importance, to rise above the biased as well as the flawed prejudgements.

To date, many women Arab scientists are still constrained. Many are only able to travel to other Arab countries, and not internationally. Thus, SESAME hands an opportunity to the women scientists in the Middle East to simultaneously maintain their ambition and tradition, and to break the unacceptable rules. And this is my mere advice to the young women, to break the unacceptable rules. To rise above all the differences and to compete without hate. Accompanied by patience, persistence, strength of will and self-discipline.

What's around the corner for Dr Gihan Kamel?

Challenges. Further scientific challenges, and societal barriers to overcome, and more rules to break despite success and progress. We, scientists, are always looking for more problems to solve or experiments to play with.

Another emerging experiment is my new endeavour with the foundation with the African Light Source. No one can argue that Africa is facing many challenges. In this context, a synchrotron light source for Africa can play a crucial role in the region, for the African community and elsewhere, as SESAME did and is currently doing where the impact will robustly go beyond any "national" science, again with no borders and with no personal labels.

On the positive side, as women are trying, pushing, and applying to conduct research, training, or short fellowships at SESAME. I feel obliged to fully assist and support. So, along the queue, there are many scientific collaborations awaiting to be fulfilled.

Thus, I also consider it a personal mission to highlight and engage more African women in international collaborations and projects. More broadly, I urge young female students interested in science, technology, engineering to explore their horizons and not to be afraid to break societal rules that stand in the way of their scientific ambition.

Picture
Dr Gihan Kamel, Principal Scientist at SESAME

2022 GÉANT COMMUNITY AWARD – **CELEBRATING OUR COMMUNITY'S SILENT HEROES**

This year's GÉANT Community Award was presented to two winners in the category 'impactful contributors to the GÉANT project or wider community activities over a sustained period of time': Tryfon Chiotis from GÉANT and Paul Dekkers from SURF. The award ceremony, presented by Claudio Allocchio, Chair of the GÉANT Community Programme, took place on Tuesday 14 June, during TNC22's opening plenary, in Trieste, Italy.

Words: Rosanna Norman, GÉANT

The recent changes to the voting process enabled the community to submit their nominations via an online form and subsequently select one candidate, at the click of a button on the new community website, from a published shortlist selected by the award committee. And the hundreds of votes received confirm not only the success of this new process, but also the eagerness and generosity of this enthusiastic community to celebrate its deserving fellow members.

TRYFON CHIOTIS, HEAD OF THE GÉANT PROJECT MANAGEMENT OFFICE

Here's the beautiful testimonial chosen for Tryfon's laudation: "When Tryfon joined the GÉANT Project Management Office it changed the tone of the GÉANT Projects. Activity Leaders felt supported by someone who really understood their topics. NRENs knew they were dealing with someone who knows both sides of the equation. He's an assiduous, friendly, supportive Project Manager who is admired and appreciated by all those who know him. He has been the essence of the GN project for the last 10 years, and by extension the spirit of the GÉANT community. Tryfon's integrity, hard work, and quiet humility mean he is a real silent community hero."

Tryfon reacted, "I am privileged and excited to receive this award. For the last thirty years, from campus level at NTUA, to national level at GRNET and to international level at GÉANT, working with the GÉANT community is my passion. Together with more than 600 colleagues from 44 countries and driven by a strong sense of community, we deliver the infrastructures and services that enable research and education to excel. This award also goes to all the friends from the GÉANT PMO. Making our GÉANT project a success is teamwork. My heartfelt thanks to all of them."

ABOUT TRYFON
Tryfon is the Head of the GÉANT Project Management Office (PMO) responsible for the day-to-day management and administration of the various iterations of the GÉANT project. Prior to joining GÉANT, he was the CTO for GRNET, the Greek National Research and Education Network, developing research networking and cloud infrastructure and services for the Greek community whilst already working with the GÉANT community. Tryfon has been a member of the NRENPC, the TERENA GA, and the Future Internet Forum, served as a delegate for Greece to ESA and to the e-IRG and also had a role in the EGI and the PRACE councils. Tryfon has a PhD in Quality of Service in High-Speed Networks from the National Technical University of Athens.

PAUL DEKKERS, WIRELESS SERVICES SPECIALIST, SURF

Here's an extract from Paul's laudation: "Paul started at SURF two decades ago, with an internship assignment working on a brief on the use of WiFi technology to enable secure guest use of WiFi networks. That project led to eduroam: today students, researchers, and lecturers in over 30,000 locations in more than 100 countries can connect to the internet safely and easily! Over time Paul has been dedicated and committed not only to the technical development of eduroam, but also to the service's future developments, international governance, and standards. He is now the Service Owner for eduroam and Chairman of the Global eduroam Governance Committee."

Paul commented, "I was so thrilled to be nominated for the GÉANT Community Award together with outstanding members of our community: such an honour to be part of this group! The voting procedure turned out to be a very nice experience, seeing people within and outside our community showing enthusiasm for the work we do. Winning the award is of course fantastic; I'm so happy that this career and the amazing people I work with in the eduroam community appeared on my path! I am grateful to SURF and the GÉANT community for what we are able to achieve working together."

ABOUT PAUL
Paul Dekkers is a wireless services specialist at SURF working on the innovation and operation of a variety of services, and his main area is international eduroam. Paul is a member of the eduroam Operational and Development Team and is currently the chair of the Global eduroam Governance Committee (GeGC) which coordinates eduroam globally. He is also eduroam Service Owner in the GÉANT Project. Paul is member of the geteduroam board and involved in OpenRoaming. At SURF, Paul is also responsible for national services such as eduroam visitor access, geteduroam, and for the development of IoT related services such as LoRaWAN and iotroam and has worked on the development and support of govroam. Previously he worked on 3G and 4G networking as well as scalable, secure and cloud infrastructures.

Claudio Allocchio, Chair of the GÉANT Community Programme closed by adding, "Our community is unique in many ways: there is no 'you' and 'me', there is no 'supplier' and 'customer', there is just 'us'! Some among us are often in the spotlight, on stage, helping us to progress, achieve new goals, some others just stay behind the scenes, but provide a tremendous service to all of us, with dedicated commitment, knowledge, passion and the human touch that makes 'us' unique. And our Community Award is the way we recognise our heroes. This year the winners are two of our best hidden gems: Paul, our hero behind the eduroam services, and Tryfon, our hero behind the GÉANT project. Last but not least, the new way we now run the award process now also brings the community contribution even more to the centre stage. Well deserved, Paul and Tryfon!"

vietsch foundation

VIETSCH FOUNDATION, MEDAL OF HONOUR 2022

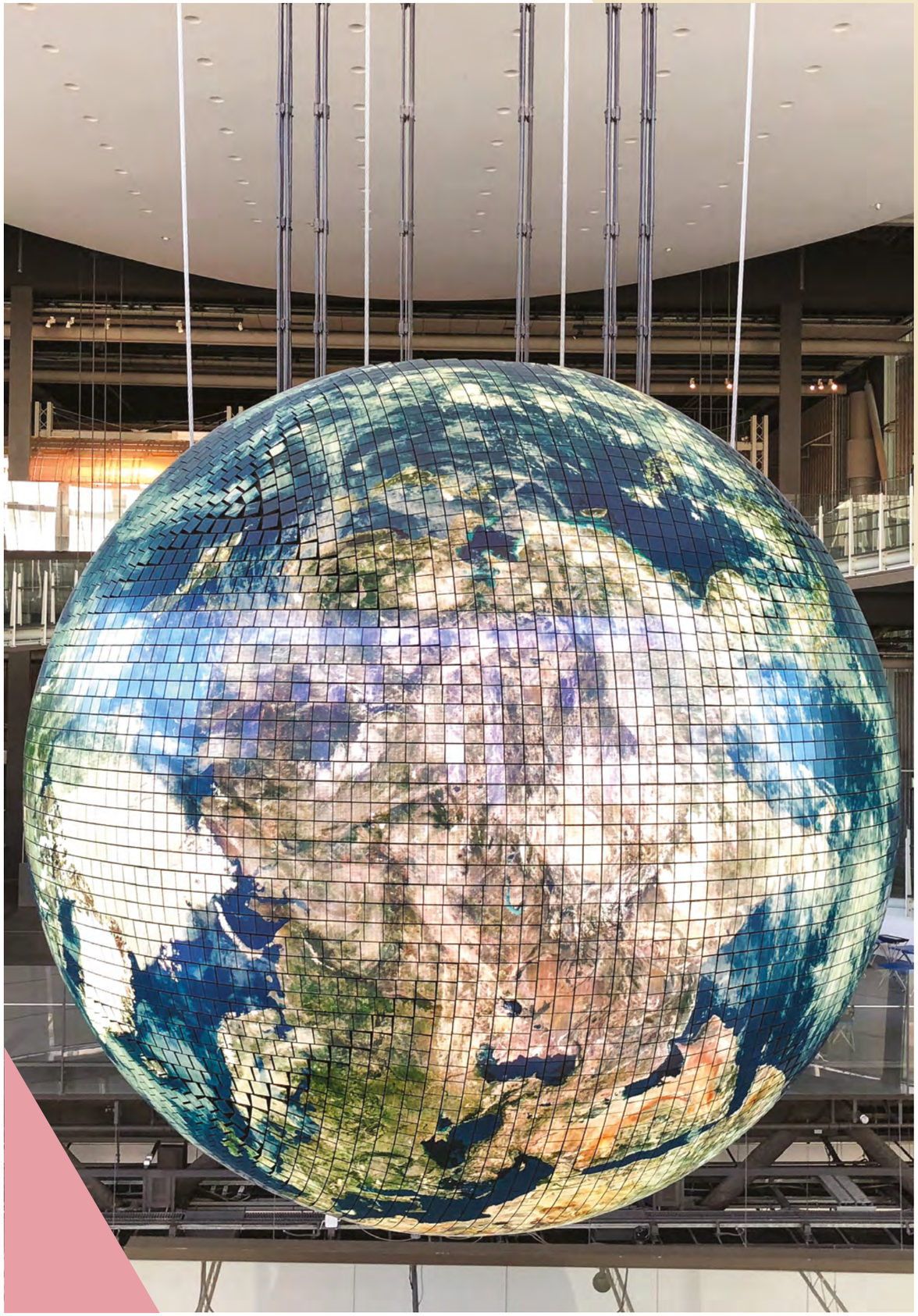
The TNC22 stage also hosted the ceremony for the 2022 Medal of Honour by the Vietsch Foundation. The award was presented to Natalia Manola, CEO of OpenAIRE, by Antoinette Vietsch, treasurer of the Board of Trustees of the Vietsch Foundation and sister of the late Karel Vietsch.

"The Board of Trustees of the Vietsch Foundation chose to award the 2022 Medal of Honour to Natalia, as a recognition of her continuous and successful dedication to management of OpenAIRE across many years of project activity, making it now an independent, stable, and sustainable legal entity," said Valentino Cavalli, Chair of the Board of Trustees of the Vietsch Foundation, explaining the rationale for the choice.

ABOUT NATALIA MANOLA
Natalia is a research associate at "Athena" Research and Innovation Center and the University of Athens, Department of Informatics & Telecommunications, with several years of experience as a Software Engineer and Architect in the Bioinformatics commercial sector. Natalia is the managing director of OpenAIRE (www.openaire.eu) since 2009, a pan European e-Infrastructure supporting open access in all scientific results, the coordinator of OpenMinTeD (www.openminted.eu) an infrastructure on text and data mining, and is now involved in the implementation of HELIX, the Greek e-Infrastructure for research. She has expertise in Open Science policies and implementation, and she currently serves in the EOSC Executive Board and the Open Science Policy Platform, an EC High Level Advisory Group to Commissioner Moedas to provide advice about the development and implementation of open science policy in Europe.

Vietsch Foundation
The Vietsch Foundation was officially established on 28 February 2014 by the will of the late Karel Willem Vietsch, former Secretary General of TERENA. As a charity (ANBI) 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. The Board of Trustees of the Vietsch Foundation are the custodians of the foundation assets and core values and implement them by funding initiatives and projects that have the greatest potential impact with minimal cost.

To learn more, visit **http://www.vietsch-foundation.org/**



GÉANT EMERGING NREN PROGRAMME - **ENRICHING AND STRENGTHENING THE NREN COMMUNITY**

The GÉANT Emerging NREN Programme (ENP) has been taking place alongside TNC since 2018. The programme has aimed to integrate individuals from emerging NRENs from around the globe into the TNC community and create further synergies and connections at different organisational levels between European and international NRENs.

Words: Rosanna Norman, GÉANT

Picture
Photo by Romain Tordo on Unsplash

The purpose of the programme is to bring to TNC individuals from NRENs that would not be able to participate otherwise, focusing particularly on engineering and technical personnel. In just three editions the programme has reached 54 participants from 32 different countries and territories.

This year the GÉANT ENP will be held physically alongside TNC22 from Monday 13 June to Friday 17 June 2022 in Trieste and supported by GARR, host of TNC22.

Regional and National R&E Networks are encouraged to nominate representatives to take part in the programme, in particular young engineers, NREN staff members, or researchers who are part of the community, but are not usually able to attend conferences and would benefit from the knowledge exchange. Diversity is also strongly supported by encouraging applications from women wherever possible.

This year the ENP welcomes participants from 19 countries and territories:

- Albania
- Bangladesh
- Benin
- Bosnia and Herzegovina
- Burundi
- Cape Verde
- Jordan
- *Kosovo
- Morocco
- Pakistan
- Palestine
- Panama
- Peru
- Sri Lanka
- Tajikistan
- The Kyrgyz Republic
- Tunisia
- Uganda
- Zimbabwe

*This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence

Each participant will attend TNC22 and take advantage of a tailor-made programme that includes dedicated sessions with GARR. Participants will be paired with GÉANT community members based on common professional backgrounds, in order to facilitate informal dialogue between individuals sharing the same interests.

The objective of this pairing experience is to make TNC participation more relevant and impactful by providing the opportunity to strengthen and enrich the NREN community and build new relationships. Representatives of the GÉANT community also benefit from the exchange as it enhances their understanding of NRENs around the world by listening to different perspectives on needs and challenges.

Leila Dekkar, International Relations Project Manager for GÉANT commented: "We are delighted to finally meet again face to face with our international colleagues and bring together the ENP participants with the GÉANT community! I am really grateful to GARR for organising a dedicated programmme and I am confident that this week will create wonderful connections and foster future collaboration between countries."

For further information about the GÉANT ENP contact Leila Dekkar **leila.dekkar@geant.org**

RECORD NUMBER OF GÉANT FUTURE TALENT STUDENTS **IN SPOTLIGHT AT TNC22**

The GÉANT Future Talent Programme (FTP) equips students and young professionals with presentation skills and gives them the opportunity to share their ideas, projects or research with the global research and education networking community at TNC. Supported by the GÉANT Learning And Development (GLAD) team and part of GLAD's outreach to the wider GÉANT community, the programme builds a talent "pipeline" for NRENs and generates innovative research ideas and contributes to the GÉANT Community's objective of supporting European Research and Education through knowledge sharing.

Words: Leonardo Marino, GÉANT

This year, eight Future Talents nominated by six European NRENs were selected to take to the stage at TNC22 and inspire the audience during their 5-minute Lightning Talks.

Additionally, all eighteen talents accepted on the Future Talent Programme received high quality professional training, to help them master presentation skills and prepare for an impactful presentation.

Public speaking Masterclasses with coach Michael Koenka of Koenka and Partners – reconfirmed for a second year – were held in April and May.

And it's not a surprise that this record edition of the Future Talent Programme takes place in 2022, a year that has been designated as the **European Year of Youth** by the European Commission. In the same spirit of the EC Initiative, GÉANT's Future Talent Programme wants to put young people in the spotlight, empower them with new skills, competence, and knowledge, involve them and let their voices be heard. Don't miss these inspiring presentations! The TNC22 Lightning Talk sessions will take place on 14 and 15 June, at 14:00 CEST. Recordings of students' presentations will be available on GLAD's Wiki page after TNC22.

"The Future Talent Programme is a highlight of GLAD's training calendar. We are delighted that a record number of students and young professionals from the GÉANT community have been selected to give Lightning Talks at TNC22."

Sarah Hughes, Senior Learning & Development Manager at GÉANT.

FIRST **STRIKE!**

Tuesday 14 June 2022, 14:00 CEST

Idio Guarino
University of Naples Federico II, GARR, Italy

Traffic analysis of communication and collaboration apps bloomed with Covid-19 via advanced Deep Learning approaches

Ana Rita Carneiro
University of Porto, FCCN, Portugal

AI for Heritage - SOS digital collections: classifying and characterizing

Bruno Vaz
FCCN, Portugal

Fake News Detection Models — Introducing GAN Generated Synthetic Samples to Improve Performance

Marion Dübendorfer
University of Zurich, SWITCH, Switzerland

Why we need a collaborative DDoS protection architecture in Europe

SECOND **STRIKE!**

Wednesday 15 June 2022, 14:00 CEST

Witold Taisner
Poznan University of Technology, Poznan Supercomputing and Networking Center (PSNC), Poland

Challenges in processing and knowledge discovery in specifications of scientific resources

Ashley Catherina Sheil
HEAnet, Ireland

Guessing PINs, One Partial PIN at a Time

Hilco de Lathouder
University of Amsterdam, SURF, Netherlands.

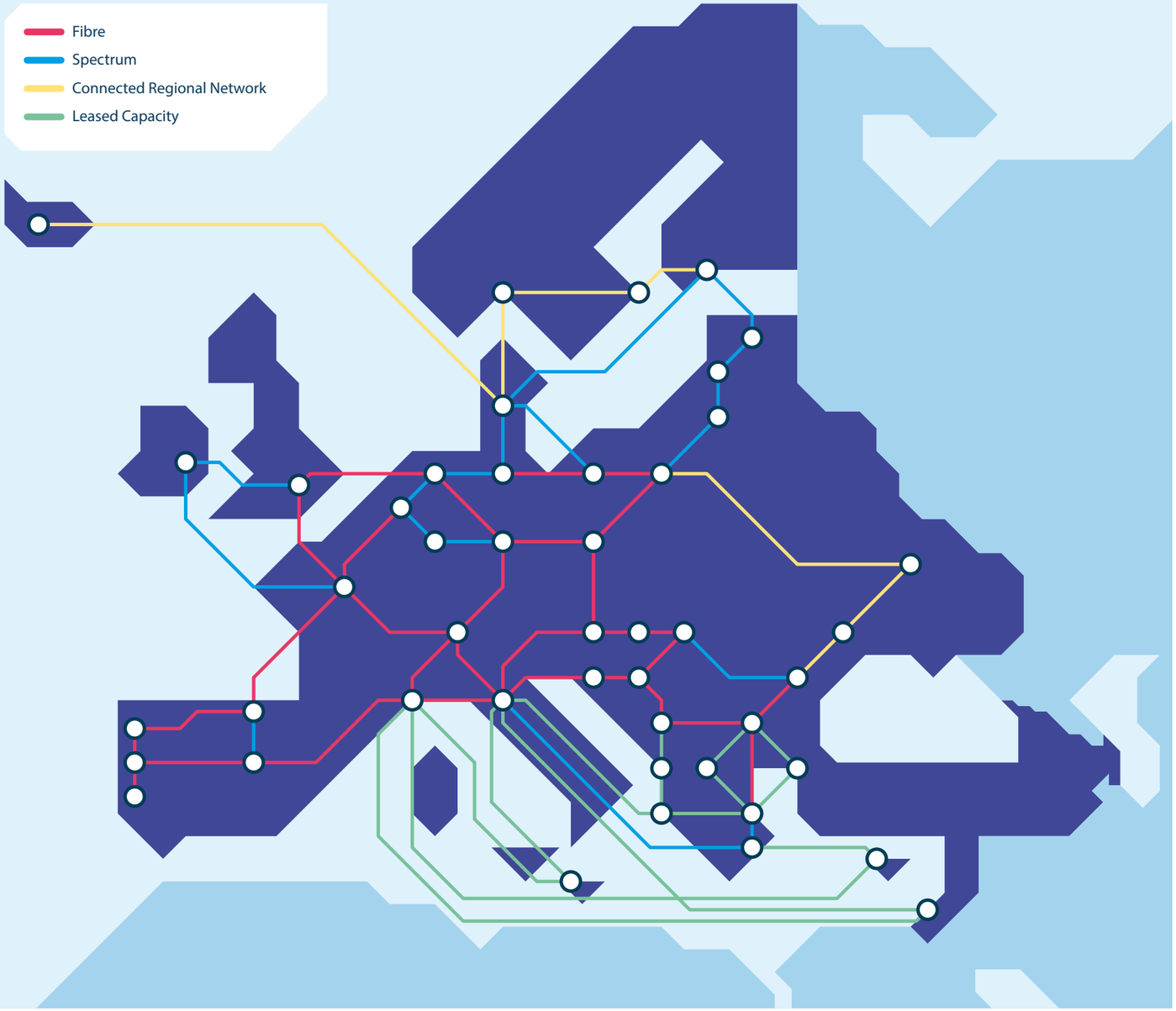
Multi-factor authentication support between eduGAIN federations

Frédéric Gerber
EPFL Lausanne, SWITCH, Switzerland

Self-Sovereign Identity (SSI) for Future-Proof Digital Wallets

Further details about the 2022 Future Talent Programme and promotion materials are available on the GLAD wiki: **https://wiki.geant.org/pages/viewpage.action?pageId=202801312**

Coach: Michael Koenka of Koenka and Partners
Organiser: GÉANT Learning & Development (GLAD)
NRENs: ASNET-AM, CESNET, FCCN, GARR, GÉANT, HEAnet, PSNC, SURF, SWITCH.



Next-generation GÉANT network comes to life

GÉANT's exciting next-generation network – planned, procured, and being built under the EC-funded GN4-3N Project – is very much coming to life in 2022. Driven and guided by the community throughout thanks to the Network Infrastructure Advisory Committee (NIAC), the new network is set to benefit all of Europe's research and education networking community.

Words: Paul Maurice and Karl Meyer, GÉANT

With 28 routes deployed (and 14 of those now in operation) two routes in deployment, 12 routes in the connectivity delivery phase, seven routes in the response evaluation or contract finalisation stage, and two routes in the active tendering phase, it's easy to see how quickly this complex project is moving.

Despite the challenges of the pandemic and its impact on travel, and despite a global semiconductor shortage affecting the delivery of new equipment, everybody involved in this project is continuing to dig deep and push this ambitious and complex project forward.

At the time of writing (early May) 18 countries are now connected to the new network, there are 209 physical spans, with 294 new Infinera nodes built, and over 14,500km of dark fibre has been lit.

In parallel to this work, the focus over the summer will be on the decommissioning of legacy equipment and the migration of new routes, ensuring operational savings are realised and the project budget optimised.

Ahead of its showcase at TNC22, CONNECT spoke to several of the people involved in this project to understand the background and the technical side of the project, but also to see how far we've come, what's coming next, and what the community can expect from the next-generation GÉANT network.

Karl Meyer spoke with Sebastiano Buscaglione, GÉANT's Senior Network Architect, to understand the process and the technology behind the GN4-3N Project.

Sebastiano, I know this plan has been underway for a long time but how long have you been working on GN4-3N?

Well, the initial pre-planning and design studies started in 2017, so over four years ago. As with all plans of this size there is a huge amount of work done before a project is approved and this included developing reference topologies, project scoping, and budget developments even before seeking formal approval. This phase took around 18 months and involved large numbers of people from across both GÉANT and the wider community even before we could start work in 2019 on procurement and supplier selection.

What is the reason behind such a large project as GN4-3N?

One of the key drivers behind the project was the aim to equalise the cost per bit of data access across Europe – to make the cost of a 100Gbps connection comparable for all NRENs and, most importantly, to reduce the variable costs for any upgrades.

It is these two factors that have until now worked to constrain distributed research activities and to reinforce the digital divide across Europe. With the new model for GN4-3N, costs are far more equitable, and therefore the costs of future upgrades in capacity can be a more marginal increase, making the future expansion of the network capacity more affordable and predictable.

So, what is the key change in the networking concept for GN4-3N that makes it so different to previous updates?

GN4-3N has a completely different design concept to previous network iterations. It is a combination of both technology developments and changes in the funding model for the network.

At a technical level, the recent developments in Data Centre Interconnect (DCI) equipment provide DWDM optical transmission at a much lower cost point than traditional telco equipment. As an example, the Facebook Voyager optical switch launched in 2016 was a pathfinder for this type of equipment. It provided a much more targeted feature set and was designed to be installed in data centre type environments rather than having to support the less controlled telco implementations. This reduced both the unit cost of the devices and the running costs. GÉANT was one of the first organisations to test the Voyager equipment and these

experiments greatly helped in the development of the technical concepts for GN4-3N.

DCI devices are increasingly used within cloud service providers and major distributed systems such as Facebook and YouTube and Content Delivery Network providers and are a significant step towards much more efficient disaggregated design. As a result, GÉANT and the European NRENs have taken a major step forward in networking provisioning.

At a financial level, the willingness of the EU to provide a funding structure which allows GÉANT to procure dark fibre using 15-year IRU (Irrevocable Rights of Use) has provided not only cost stability for the new network and improved capacity scalability but also helped "pump prime" the networking capacity for the wider EU community.

How has GN4-3N helped the commercial sector?

For the most part, telcos in Europe have been very national in their outlook and development. Even with the huge growth in mobile and data networking, cross-border interconnects are still very limited with routing between countries still constrained to a very small number of locations. This meant that some cross-border connections (for example Poznan to Prague) had to be routed via much more complex and therefore more expensive waypoints. This increased the costs of these connections which then suppressed demand and so made it uneconomic for suppliers to offer them.

GN4-3N broke this vicious circle by providing both the demand and the funding for these routes. It enabled providers to implement new connectivity and capacity with an assured customer and enabling them to offer additional capacity to commercial providers at much more attractive costs – helping to support and generate demand for international networking across Europe and further breaking down the digital divide.

So, in essence, GN4-3N is not only a revolution for R&E networking but also for business across Europe?

Absolutely! And to be able to play a part in this really demonstrates the power of GÉANT, the EU, and the NRENs working together for the benefit of everyone.

Paul Maurice spoke to Paul Shelswell, GÉANT's Programme Manager for GN4-3N, to get a snapshot of where we are in the project timescale.

Paul, you're responsible for keeping this project firmly on schedule and overseeing every detail. Where do we sit on the project timeline now?

We are at a very interesting point in the overall project, where we have built a significant part of the new network and are now using a large section of the new GN4-3N infrastructure in the GÉANT IP backbone network.

This has allowed a number of existing fibre routes and leased services to be ceased and the related equipment decommissioned. This means that the planned operating expense (OPEX) savings are now starting to be realised based on the longer-term funding structure that Sebastiano noted earlier.

The project has also been granted a 12-month extension by the EC to allow the extended project scope to be completed. This extended scope will provide upgraded connectivity services to more NRENs as part of the GÉANT backbone expansion and is possible based on the procurement savings achieved to date. We are now working through the market engagement and procurement activities and I'm expecting that these final routes will move into the build phase during Q2 2023.

What have been the most challenging aspects of the project so far, and how were they overcome?

It's fair to say that we have had a number of challenges over the 40 months of the project so far. The biggest challenge has been the COVID-19 pandemic that started just before the first deployment activities got underway in the Iberian Peninsula.

The widespread lockdowns and restrictions added complexity to build planning and activities, but we were fortunate to work with the Infinera project team and their very flexible deployment partners to minimise any impacts.

Deployment engineers were faced with last minute travel changes and multiple isolation periods but due to the large pool of highly experienced engineers, we were able to work with the Infinera team to minimise delays by using a larger engineering team. On cross border routes, we also used multiple teams working from each end of the route to avoid having engineers travel across land borders which was not always possible.

Another challenge been the extended hardware lead times for Infinera hardware due to the global semiconductor shortage – a knock-on impact of COVID-19. We have seen lead times more than double since the first hardware was ordered in 2020 and we are currently looking at a 26-week lead time. To minimise the impact of extended lead times, we are ordering hardware earlier in the process than we normally would – this introduces an element of risk as we do not always have the full fibre data available when the Infinera order is placed, but we have added hardware return clauses in the supply contracts to mitigate the risk of ordering so far in advance.

And what have been the highlights so far?

One of the highlights has been to use the new Infinera Network Management System to visually see how quickly the new network build has progressed across Europe, from the start in the Iberian Peninsula in Q3 2020 to the more than 14,000km of lit fibre that we now have.

At the same time, it's been very pleasing to see the network topology map display on the existing Network Management System shrink in size as services have been migrated to the new network and existing services have been decommissioned from the network.

Another challenge has been the interaction and cooperation between GÉANT and the NREN community in many areas of the project. This starts with the NIAC where network design options are reviewed and endorsed, through to the innovative solutions deployed in the network using NREN infrastructure.

A good example of this has been in the Iberian Peninsula where we were able to deliver fibre connectivity between Portugal and Spain using a mixture of NREN infrastructure and commercial connectivity solutions. We are now also starting to work on the first leased spectrum solutions in the network using NREN managed optical DWDM systems. This work will continue over the next 12 months.

How has the project evolved since its start? Have we been able to extend the scope of it?

The project has evolved in size and complexity since the first reference design was produced back in 2017 to support early design and market engagement activates. With the GN4-3N extended scope, we are now looking to provide the minimum 100G connectivity offering in more countries. This has been made possible by the procurement savings achieved via the procurement process compared to the original GN4-3N network design and associated budget.

The project has been extended to the end of 2023 and I expect that the final deployment and integration activities will be completed during Q3 2023.

What do you see as most important over the next 12-18 months to ensure we deliver on time?

The most important tasks over the next 12-18 months are to ensure that we continue to maintain good progress in moving new GN4-3N routes into the GÉANT production network which will then allow the existing routes, typically with higher OPEX costs, to be ceased.
I'm confident that based on the good teamwork, well defined processes and experience gained since the start of GN4-3N deployments in 2020, the build out of the remaining new roues should go reasonable smoothly, but the focus must be on moving the new infrastructure into production service as soon as possible but in a well-controlled manner.

How do you manage the build of one of the largest fibre networks across Europe, managing and delivering change on network sites and equipment in dozens of locations across the continent, when COVID rules prevent your team travelling to the office let alone to different countries?

This is the challenge the Network Implementation team faced in 2020 when the world locked down just as the installation of the GN4-3N was starting.

Before COVID, the Network Implementation team were some of the most prolific travellers in GÉANT. Flying out, often at a few days' notice, to deliver user requested services, install new equipment and replace or upgrade existing optical and IP equipment within the GÉANT network, so their way of working was most affected by the lock-down. It was quickly apparent that the operation of the team needed to be radically changed – for the better.

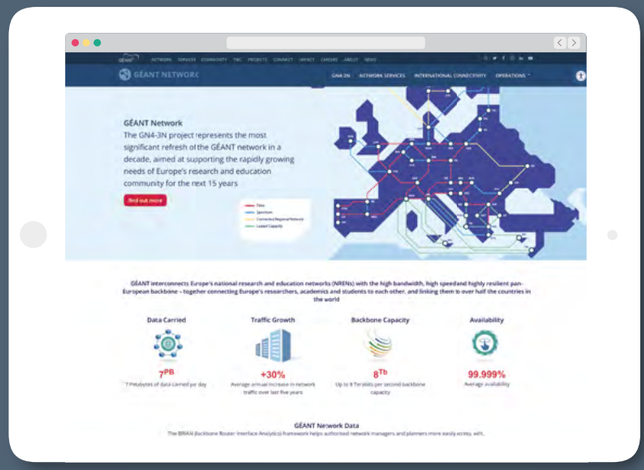
The lock-down was an opportunity to re-think the way the team worked. The concept of the team travelling to every location was clearly no-longer viable so as much on-site work as possible was quickly outsourced to in-country engineers with the internal team re-focusing on analysis, planning, design, and configuration activities.

This has allowed the team for focus on the value-added components of their role. Before, team members would often travel hundreds of miles, spending hours in airport lounges and on planes in order to perform a couple of hours work in a POP. This not only required many days away from home but also generated huge CO2 emissions.

"The changes enforced by BREXIT and the COVID pandemic gave us the opportunity to reflect on our established working practices and define and implement a new and more efficient working method, which not only allowed us to continue supporting the community and the GN4-3N project but better leveraged the high level of competence in the team and directed our time and effort where it was most valuable – increasing efficiency whilst maintaining the quality of our service delivery."

Michael Sharp, Head of Implementation, GÉANT

As Europe comes out of the COVID restrictions there is no plan to return to the old ways of operation, indeed procurement is underway to put in place local arrangements in each country so that the GÉANT team can work much smarter, and greener in the future.



To learn more about GN4-3N and see live network traffic data, visit **https://network.geant.org/**

CONNECT Interview: Sabine Jaume-Rajaonia, Strategy and International Relations Director, RENATER

Sabine has built an exceptional career within RENATER, starting in 1995 with the role of External Relations Officer to her current role as Strategy and International Relations Director.

Interview by: Silvia Fiore, GÉANT

Picture
Sabine Jaume-Rajaonia, Strategy and International Relations Director, RENATER

Sabine, how did you first become interested in promoting connectivity, a (still) predominantly male-dominated field – and what kept you motivated to stay?

I started with RENATER after a few months as a consultant in the telecommunications field. When I saw an offer to join the French NREN I thought that this was the 'future! Indeed, that was back in 1995 at the beginning of the internet and I immediately felt that having a dedicated network for R&E would create big impact and create value!

That's how I started, first in charge of contracting with our own users and then quickly taking part in building the pan-European network at the project governance level. And you know the story: we started with TEN-34, TEN-155, and then several generations of the GÉANT network, with more and more services and a growing Community… We were pioneers and we are at the heart of a fascinating digital transformation for R&E! That's a motivation!

You have over 25 years of invaluable experience in the R&E community not only in Europe but, through your collaboration with African partners, also globally. Can you tell us what you value the most in your work with the Community and the end users?

We all have the same needs for excellence in R&E, on all continents. Moreover, R&E is global and we have created over the years a unique incredible network of people who trust in each other. I often used to say that "we are stronger together" as I very much value teamwork, exchange of experience and expertise as we learn from each other. And to succeed in this global community it's key to listen and be able to understand different "cultures" in order to examine issues from a different perspective. As for my involvement towards our African partners, we must support development of NRENs on this continent as they are facing many challenges, and we need to improve end-to-end connection for users taking part in education or scientific international collaborations.

How did your many years serving on the GÉANT Board of Directors influence you and your career?

It has been a great honour to be elected to serve on the GÉANT Board. Being on a board means taking key decisions on budget, HR, strategy, projects… it's definitely complex but it makes you learn and think differently, in other words from a governance point of view. It was also a rich human experience at many levels, based on trust.

What can you tell us about the main challenges and obstacles that you have experienced as a woman building your way up in a STEM field? How did you overcome them?

Well, when I started, we were only two women attending the so called "NREN Policy Committee" gathering of 20+ NREN CEOs/Exec levels, and I could feel that some of the meeting attendees were really wondering what my job was at RENATER to be there. But working hard and showing empathy facilitated my integration and within a few months I really found nice and cooperative colleagues. Some of them even became my mentors in a sense.

Last year, the GCP launched the GÉANT Innovation Programme and awarded funds to ten international projects. During the showcase in March 2022, a point was raised that all the project coordinators were men. What do you think that the GCP can do to ensure that more women apply to future Calls for Proposals, and are more generally taking leading roles in the Community working groups?

I have never been in favour of quotas as I consider that Excellence is not a matter of gender!

To start with, it might be worth focusing on educating our community to prevent some attitudes or comments which could be embarrassing or hurting.

Then we should find a way to make our opportunities more visible to women in our community, either via dedicated professional networks or using own connections. We could also imagine showcasing success stories in universities or labs and disseminating around our global network.

We need to encourage young women to participate in projects and even take the lead wherever they feel they can do it!

To conclude, what would you say to an aspiring woman in STEM interested in building a career in the R&E community who is held back by the expected challenges?

Simply, "go for it!" I am sure there are plenty of young women who can enrich our community and I would enjoy meeting them. We definitely have to boost diversity!

Howard Davies: a true British gentleman at the service of research networks

It is often said that research networks stand on the shoulders of giants – and surely one of those giants was Howard Davies.

Words: Maddalena Vario, GARR

From the first international research network HEPNET to the association of European research networks RARE, up to the creation of DANTE, now GÉANT, Howard Davies has always played a leading role, making the history of the research network.

We would like to honour him, through the memories of Fernando Liello and Claudio Allocchio, two network experts who made GARR history and were lucky enough to work side by side with Howard.

Fernando Liello, member of the Technical and Scientific Committee, GARR

"I was part of the committee that selected Howard Davies to be the first executive director, along with Dai Davies, of DANTE, the organisation that created and managed the pan-European research network and that would later become GÉANT. We worked together on all the different versions of the network: our meetings were held in DANTE's offices in Cambridge and sometimes we also met in Amsterdam or Brussels.

We had both worked at CERN as researchers, so the mindset that was leading each and every choice we made was to always see the network at the service of users. For him it was essential to identify what users needed and to be able to interpret their needs, even when they were not clearly expressed, and then move on to the technical part. He was open-minded, and a man of culture. I remember that the name DANTE was chosen when he showed up one day at a meeting with a bottle of Dante olive oil. He was a perfect British gentleman and, as such, he had a habit of speaking softly. I once told him as a joke: "Howard, I realise that speaking softly is a sign of education in the UK, but the problem is that we don't hear you!" At one point they even had to give him a portable battery-operated speaker that could stand in front of him when speaking.

He was a great diplomat and mediator. He got along well with people, he liked to talk with them. He had a great ability to listen, and he really listened, even when his interlocutors had different points of view. He was able to understand their needs beyond the specific solution they sought, and his great ability was to satisfy those needs, even though a different solution. In a way I was his complement, I agreed with this strategy and as chairman of the Committee I took the risk of having things approved. Then there was the other executive director, Dai Davies, who had a more commercial mentality. He was selected because the two were different but complementary: this choice of personalities proved to be strategic and in fact made possible the creation of precious synergies and mutual reinforcements.

It was also important for him that young people knew the history of things and in fact he was chief editor of one of the first books written on the history of research networks: "A History of International Research Networking: The People who Made it Happen". He started writing the book when he was still working and then it was published when he retired.

For sure I can say that Howard, with his pioneering vision of research networks and his ability to keep everything in balance, has left a great void."

Claudio Allocchio, Senior Technical Officer, GARR

"Howard was first of all a scientist, who understood what networks were made for. I met him in the 1980s at CERN, I was just starting out my career and he already knew exactly that the network was a tool for doing research. I remember he was working with Enzo Valente (the founder of the Italian Research and Education Network, GARR) who was involved in physics experiments; with Peter Villemoes, who was head of the Nordunet research network for many years; and with Francois Flukinger, from CERN, who was in charge of the computer centre. They were mainly physicists, who needed to exchange data and consequently they were building the first international research network HEPnet. At some point, Howard and many others realised that they needed to team up to get the European Commission to fund the construction of a pan-European network backbone. Since 1986 there was already RARE, the first association of the European research networks, which later became TERENA and finally the GÉANT Association, but it was necessary to create something specific, a detached division, in order to have the right structure to create and manage a large and international backbone: that's how DANTE was born. He became executive director of DANTE along with Dai Davies and I remember we used to call them "the Davies twins" as a joke. In reality they were very different but absolutely complementary and together they formed an excellent team. One was a great diplomat, the other a great manager and a skilled salesman and, working side by side, they knew how to make DANTE work. Perhaps Howard was a little bit embarrassed by this juxtaposition, I would say bizarre, with his namesake Dai, since they had a completely different mentality, but he didn't show it.

He had a great sense of humour and knew how to laugh at himself too, a quality I would say rare to meet. I remember that he was always wearing tweed, with a sweater without any tie, even in the most formal meetings. He was a true British gentleman, and a gentleman agreement had the same value as a signed one with him. He was a curious person, even if he didn't show it, he always wanted to know what was happening, and behind his discreet questions, you could guess his constructive need to understand what a person was doing and why. He knew how to lead people in the right direction and make sure, at the same time, that people could bring out their resources.

He always tried to keep everyone in balance and, when dealing with a lot of money to manage, I would say that it is not an easy thing to do. He also knew how to maintain the balance between the real needs of the network and what the European Commission was asking for and his focus was on spending the funds in the best possible way. I remember, in this regard, that the Commission wanted everything to be achieved with the OSI protocol and the birth of the COSINE project was the clear proof of this. I worked with him on this project and I will never forget his perfect ability to interface with the European Commission, even when his ideas were different.

GARR and all the European research networks owe a lot to Howard, without him we wouldn't have many of the things we take for granted today."

Biography

Howard Davies (1939 – 2020) was one of the founding fathers of today's pan-European GÉANT network for research and education. From 1989 to 1991 he was Director of the COSINE interim Project Management Unit and from 1992 to 1994 he was Vice President of RARE.

As co-managing director of DANTE, Howard has played a leading role in implementing an increasingly powerful network infrastructure to support network services for research and education. Before Howard retired in late 2001, he witnessed the launch of the GÉANT network. During his retirement, he worked with Beatrice Bressan from CERN on the editing of the book "A History of International Research Networking – The People who Made it Happen". Howard was involved in building the research network community, being one of the founding fathers of DANTE, which became GÉANT. Today GÉANT interconnects over 110 countries around the world, with millions of scientists and students using its services every day.

National cloud strategies, digital sovereignty, and community: a vision

The recently published Italian Cloud Strategy has once again put digital sovereignty in the spotlight in our country. But this is not an Italian-only problem. Digital sovereignty means having control over national critical and strategic data, as well as secure and reliable data management services, especially those used by the Public Administration.

Words: Federico Ruggieri, GARR

As you can imagine, this is one of the key challenges that any cloud strategy is called to tackle, in Italy as elsewhere. Despite its promising beginnings, Italy (as so many other countries) has over time offshored not only servers, but also competences. The way the digital technology supply chain has evolved has in fact centralised the provision of large-scale clouds in the hands of comparatively few players, most of which are not based in Italy, nor in Europe. Somewhat belatedly, individual countries such as Italy, France, or Germany, and more generally Europe started to realise that total dependence on these external players is not acceptable anymore, as it raises the vendor lock-in from an industrial problem to a potential blackmail weapon, much like Putin's threats of turning off the gas tap. Let's ask ourselves: what if the OTT decided to "turn off the Cloud"?

Bringing back the cloud in Europe is no easy task. No policy alone can bring back the ecosystem needed to ensure the independence from US (and Chinese) big players. However, policies can create the right conditions to nurture such an environment, not just through targeted fundings, but also by stimulating the offer of high-end services, the transfer of competences, as well as by encouraging public and private investments. Appropriate policies, especially at the EU level, are also a key to offer better conditions and safeguards to Europeans with regards to the control over their own data, whenever the use of third-country service providers can't be helped.

What is our role in all of this, as NRENs and as part of the research and education community? From time to time, ICT and e-Infrastructure experts call for the national research and education networks to lead national public clouds. Such testimonies of the high esteem in which the NRENs are held cannot fail to please us. However, this kind of endeavour goes well beyond the mission of any NREN, with our focus relying on serving the R&E community. Also, despite the competence and the expertise of our staff, as NRENs we do not have the right forces to compete with players of the standing of Google or Amazon and their virtually unlimited resources. Most of all, this is not a one-organisation job.

Digital sovereignty is a goal that can only be reached by working together in the long run and many seeds need to be planted in order for this very complex ecosystem to grow back, with fruits that will ripen not in one or three years, but in the next decades. This may sound discouraging but it should not stop us: we need to regain the lost ground and get policy makers involved right now.

And while NRENs should not be charged with the mission of building national clouds, we can bring unique expertise in what should be a common goal, by leveraging our privileged role as the aggregators of a wide and multidisciplinary community of innovators. Our community needs tailored telecommunication and application services, and our commitment has always been to create a technological and human platform where the competences needed to build them can grow.

With this vision in mind, we can help implementing and testing new solutions as well as propose a model of the cloud – encompassing both services and data – based on shared and federated computing resources. This is not by any means a lesser role; on the contrary it means to be at the forefront of a very ambitious project. And after all, we know just how many times solutions coming from the R&E environment landed in everyone's life.

After all, isn't this what happened with the Internet and the WWW?

e-Universities: digital transformation of higher education in Croatia

e-Universities project will contribute to the digital transformation of at least 90 per cent of public higher education institutions. It includes improving computer networks, equipping classrooms, educating teaching staff, and increasing the cyber security of the higher education system.

Words: CARNET

The Croatian Academic and Research Network – CARNET – will implement the e-Universities project aiming at the digital transformation of higher education in Croatia by improving digital infrastructure, introducing digital teaching tools, and strengthening the digital competence of teachers. It is the largest project in higher education in Croatia, with a total value of more than €83 million (HRK 633 million), financed by the National Recovery and Resilience Plan 2021-2026.

"It is a challenge to plan large-scale investments in times of growing uncertainties and predict future users' requirements, but this is a capacity that we are rapidly building. At the same time, we have to move away from emergency remote teaching, which was a temporary shift and not designed to respond to the overnight closing of schools and lecture halls," said CARNET CEO Hrvoje Puljiz, adding that "CARNET also needs support from the European and national administrations in funding and educational policies, and a more flexible and agile planning, less determined by the present challenges and more open to emerging ones."

The aim is to develop a project that supports more stable but flexible mid-term investments. In doing this, CARNET is designing Digital Maturity as a Service (DMaaS) that will support reflection and action planning of specific Higher Education Institutions. It will help CARNET member institutions make the most of the investments in digital infrastructure and use the investments to serve student needs in developing their skills for future jobs and labour markets.

To achieve that, there is a whole scale of various hybrid learning scenarios to support with teaching/learning equipment based on audio and video solutions, including A/V studios, platforms and audio and video repositories.

The e-Universities project will, by 2026, improve at least 90 per cent of public higher education institutions' digital infrastructure. For the project beneficiaries - public universities, polytechnic schools and colleges, and student campuses, this means improving the network infrastructure and/or equipping them with the adequate technology. All this with an approach that matches the needs of each of the higher education institution.

In CARNET, projects have a strong education and community perspective. Thus, the digital infrastructure investments will be fully supported by investments in developing the digital competence of decision-makers and university teachers, who will be the ones to design their teaching and learning activities using project results.

Special focus will be given to improving the cyber security of users, computers, and network infrastructure in higher education, as well as strengthening the educational and scientific research community in the field of cyber security.

Picture
Right: Hrvoje Puljiz, CARNET CEO

The eHealth Task Force: one year on

Interview by: Silvia Fiore, GÉANT

Why eHealth?

Interest in the field of eHealth has been growing quickly in recent years, due to its impact in improving citizens' healthcare and advancing scientific medical research. Since the outbreak of the COVID-19 pandemic in 2020, teleconsulting and telemedicine have, in fact, proved crucial in granting ubiquitous access to medical care. Hence, the relevance not only of the integration of medical devices and patient health records with data analysis tools, but also of secure storage for medical data and computational resources enabled by network infrastructures became evident.

For example, according to National Health Insurance figures, the number of remote consultations in France in March 2020 exceeded 600,000, compared with only 40,000 the previous month. Telemedicine quickly became a key enabler for curing patients during the pandemic, when physical contact had to be minimised.

A Task Force for eHealth

The creation of the eHealth Task Force (TF-eHealth) followed two successful community events in 2021 - a baselining meeting in January, and a Community eHealth BoF in June - which clearly showed that the community of NRENs supported the idea of a working group on eHealth. Both events facilitated tracking the developments in the domain of eHealth and getting an updated overview of the rapidly changing landscape.

As part of the GÉANT Community Programme, TF-eHealth aims at assessing the existing gaps in the support NRENs are providing to the eHealth community, identifying possibilities for collaboration and synergies for the NRENs on specific topics related to the eHealth community, and implementing the work plan.

TF-eHealth covers a wide variety of topics, from data management, interoperability, access, as well as security and privacy, eHealth applications in Cloud, AAI infrastructure, and information sharing on communications from the European Institutions.

CONNECT spoke with Mario Reale, Senior Research Engagement Officer at GÉANT, and internal coordinator of TF-eHealth, to understand more about its activities and goals.

Mario, why was TF-eHealth created and how did the idea become a reality?

The TF was officially established last year in July building on the outcomes of the two main community events on eHealth organised before. A first community baselining event on eHealth had shown that the community of NRENs considers it important to implement synergies and share best practices in support of the eHealth institutions. The second community event - the eHealth BoF at TNC21, gathered the community around a proposed work plan for a possible TF on the topic of eHealth, and eventually recommended its creation.

The primary goal of the TF is to stimulate discussion, sharing of experiences and best practices across the NRENs on supporting the eHealth community. An additional goal is to showcase eHealth use cases to the community, highlighting how eHealth projects and collaborations are addressing their needs within the existing multi-domain network and services infrastructure. The TF plans in this way, in the longer term, to support the process of designing and implementing scalable, privacy-preserving, GDPR-compliant and resilient services by identifying the current bottlenecks and issues NRENs are facing in supporting their eHealth User Communities.

Can you highlight the key outcomes achieved so far?

The first deliverable of the TF was a detailed gap analysis report about the needs identified by NRENs providing support to eHealth, and potential areas for collaboration. In July 2022, we plan to host a Security and Privacy training for the eHealth domain. The meeting will be open for any interested Community member to join.

Why should the community of NRENs be interested in eHealth, and what role can it play for the benefit of the eHealth User Community?

Supporting eHealth has implications at all layers of the service stack, from the network to the cloud, including the AAI components and security. Sensitive data and medical research records require data handling management at the highest level of security and confidentiality. Plus, policies, regulations and best practices are ever-evolving, as the EC wants to ensure that the Health data lakes and eHealth research and medical e-Infrastructures allow for interoperation and cross-border provisioning of medical services to EU citizens.

In this context, the TF-eHealth can – by mandate of the NREN community - play a fundamental role as a liaison between our user communities and the EC on the forthcoming regulations on the allowed usage of primary and secondary Health data.

The European Health Data Space is a good example of an initiative targeting interoperability of health data and infrastructure, regulatory aspects on medical data sharing, and the provisioning of cross-border medical services in the EU. New user-centric medical services are also being created, and each of them will require some work and consideration about data sharing and privacy. As you can see, it is a dynamic field and NRENs will have to carefully consider where to invest their resources due to the limited manpower available for TF-eHealth.

Picture
Right: Mario Reale, Senior Research Engagement Officer at GÉANT

Since you mentioned it, how can TF-eHealth, with limited manpower currently available, make a real difference in eHealth?

A first step could be to improve information sharing practices across the NRENs. It is important to connect eHealth institutions with the relevant bodies within the ECand to propose to the NRENs relevant collaboration options, for example by highlighting available calls and project opportunities from the EC, the new Multi Country Projects, and the EU4Health Programme.

Also, TF-eHealth can closely follow what other initiatives on eHealth are doing and signal and report about relevant information for NRENs' eHealth User Communities.

What's in store for TF-eHealth in the upcoming months?

The next steps will be to produce a final report on the first year of activities for the GÉANT Community Committee (who oversee the Community Programme). In general, there will be a discussion on how the future of the TF will look like. This conversation will be led by a soon-to-be-drafted community white paper on the topic, which will provide an overview of the existing community services relevant for the eHealth community, and recommendation on what possible new services and initiatives NRENs could be working on.

Learn more about the activities and the objectives of TF-eHealth on **https://community.geant.org/tf-ehealth/**

Brazil now has one of the largest eduroam networks in the world

This year, for the first time, Brazil became the country with the largest eduroam network in the world in terms of number of different locations. This means that more than 3,000 spaces spread across the country offer secure Wi-Fi to connect students, researchers, professors, employees, and other members of the Brazilian academic community, and which currently has 178 teaching and research institutions that use the service.

Words: Karine Rodrigues, RNP

Also present in around 100 other countries, eduroam has been managed and operated in Brazil by the National Education and Research Network (RNP) since 2012.

In addition to expanding the indoor service to more Brazilian teaching and research institutions, RNP is also working to bring the wireless network to public environments with a large circulation of people, such as airports, shopping malls, squares, restaurants, and cafés. To achieve this, different initiatives are being developed:

- In 2014, Porto Alegre became the first city in Latin America to offer access to eduroam in public places. There are now 15 connection points distributed throughout the city, between squares, parks, and public buildings, in a cooperative action with the city hall;
- the wireless network was also made available at Salvador International Airport, in Bahia, thanks to a partnership with the company Linktel;
- also in collaboration with Linktel, the eduroam signal is now accessible in more than fifteen cafés spread across the cities of Brasilia, Rio de Janeiro and Campinas;
- RNP is also implementing eduroam at public Wi-Fi points in 40 squares across 20 cities in the northeast region of the country through the Nordeste Conectado project, with support from the Ministry of Communications (MCom);
- within the Federal Government's Wi-Fi Brasil program, eduroam will be available in 67 locations in Rio Grande do Norte and another 67 spaces in the state of Alagoas, such as squares, schools, Social Assistance Centers and Health Units.

"Since the launch of eduroam in Brazil in 2012, we have sought partnerships that would enable its expansion, both in Higher Education Institutions and in public environments that would allow access to secure Wi-Fi service for the academic community. In recent years, we have expanded its reach, and with the establishment of new partnerships more recently, we are taking eduroam outside institutional walls, and expanding to other public places with wide access. The recognition as the largest eduroam network in the world reinforces RNP's effort to expand, in a country with continental dimensions, the service coverage for the benefit of the mobility of the academic community, at a time of a gradual hybrid return of the academic community," explained the director of Services and Solutions at RNP, Antonio Carlos Fernandes Nunes.

To lear more about the Brazilian R&E network and their activities, visit **https://www.rnp.br/en**

2021 Compendium Report Published

The 2021 GÉANT Compendium of National Research and Education Networks in Europe Report will be published on Monday 13 June, with hard copies provided to the General Assembly members and the digital version released on the GÉANT website.

Words: Jennifer Ross, GÉANT

The annually published Compendium Report brings together and contextualises data collected from Europe's NRENs each year about their network, equipment, and users. 40 NRENs generously gave their time to respond to the Compendium Survey, which forms the basis of the Report, with extra information included from the results of surveys and studies carried out by different teams within GÉANT and the NREN community.

The 2021 Compendium Report is further enriched by findings from TF-EDU, OCRE, REFEDS, and the Partner Relations team.

Because the 2021 GÉANT Compendium Report is based on data collected in the Autumn/Winter of 2021, it quantifies some of the impact of the COVID-19 pandemic on the work of NRENs. The Report will show that the volume of external traffic dropped, which traffic within NREN networks was stable, or even increasing, and which reflects the reduced presence of students and researchers on site.

Unsurprisingly, there has also been an increase in the services NRENs provide their users to support remote teaching, including, but not limited to, video-conferencing services.

Long term trends continued, despite the pandemic, with budgets and staff numbers on the whole increasing. Very positively, the involvement of NRENs in European Commission projects continues to increase, as does the capacity of the NREN networks.

The Compendium Report is a great example of the GÉANT Community working together, with a team of 19 people from the GÉANT Association and eight different NRENs coming together to write and compile the Report. To ensure that the Compendium stays relevant and useful to NRENs, it is steered and supported by the work of the Compendium Advisory Board, with important contributions from János Mohács (KIFÜ), Hank Nussbacher (IUCC), and Nataša Glavor (CARNET) gratefully received throughout the year.

canarie

Think Local, Act Global

Even with the effects of the COVID-19 pandemic affecting travel, TNC22 will see strong Canadian participation – not just from CANARIE, which acts as the NREN backbone, but also from our provincial and territorial NREN Partners. Some may wonder why international engagement is so important to Canada's NREN. But participation in the Global Research and Education Network (GREN) is vital to everything we do at CANARIE, right down to the institutional level. That's why even when we are thinking locally, we tend to act globally.

Words: Alex Bushell, Director, Strategic Policy and Analysis, CANARIE

Connectivity

As important as it is for researchers in Canada to be able to connect with one another, most of the world's most significant challenges – COVID-19, climate change, etc. – can only be solved through international collaboration. Analysis by Nature suggests close to 25% of research papers in 2020 featured international collaborations, and as such, it is little surprise that over 40% of traffic on the CANARIE Network is international.

Thanks to CANARIE's international relationships and the costs savings that can be achieved by working together on initiatives such as the Advanced North Atlantic (ANA) project, we are able to offer increasingly robust, reliable, and resilient connectivity to our communities.

In summer 2021, significant flooding and mudslides cut off Vancouver and surrounding areas from the NREN – even with three redundant links in place! Fortunately, our partnership with Internet2 allowed us to rapidly create a temporary route for that traffic via the US. Without it, researchers and students could have been disconnected for weeks.

Cybersecurity and Identity Services

Similarly, the true value of eduroam and Federated Identity Management (FIM) comes from their international reach – as research collaborations become increasingly international, the requirement to access global datasets and services via eduGAIN is indispensable to Canadian researchers. CANARIE also benefits from international innovations in these services, such as eduroam Visitor Access (eVA), that was first developed and rolled out by SURF.

Moreover, these identity services are becoming ever more important to institutions' cybersecurity portfolios, an area that NRENs are being more heavily involved in each year. While the R&E sector faces many unique challenges in cybersecurity, these challenges are not unique to any single country. By leveraging our global relationships, we are able to evolve CANARIE's services, such as sharing threat intelligence with related organizations in the US, Australia, and the UK, to prevent and mitigate cyberattacks.

External Relations

We often say that the GREN is the most important piece of global infrastructure that people haven't heard of. But we think everyone – researchers, institutional leaders, and governments – should know about the GREN and its value to the world. Whether it is In the Field Stories or producing an annualised spend on R&E networking, the story we tell the world only makes sense when you understand that Canada is part of the GREN community.

Coupled with the soon-to-be launched GREN Map, which will help show the true reach and extent of the GREN, we are able to tell this story together much more than we can individually.

It is for all these reasons and many more that you will likely see an even more sizable Canadian contingent at TNC23!

NPAPW: Where performers and techies mingle over the network

Remote musical workshops, educational contaminations, successes, and failures: welcome to the Network Performing Arts Production Workshop (NPAPW), where art and technology meet and become pure innovation.

Words: Maddalena Vario, GARR

The NPAPW is the annual workshop organised jointly by GÉANT and Internet2 (who take responsibility on alternate years) to discuss the possibilities and challenges that high-performance networks offer in the field of performing arts, together with the most advanced technologies. We spoke with Claudio Allocchio, Chair of the GCC, member of the workshop program committee, and GARR senior manager and chief advisor.

Claudio, we know that you are a pianist, as well as a technology lover and network expert. Yours is certainly a privileged point of view to tell us more about this interesting workshop.

Performing arts are very demanding when it comes to IT requirements. This is why the workshop has been conceived as a training opportunity for artists, teachers and technicians. In particular, artists and teachers have the opportunity to clearly understand their own needs and to better interact with the technicians in the IT Department in order to address them.

At the same time, technicians can participate in specific training sessions, for example to learn how to configure network devices based on different network needs. We mainly try to teach IT technicians, dealing with networks and network services, to be open-minded when they work in universities and to avoid the all-purpose standardised processes and commercial solutions, which are often considered to be valid for all kind of users, as if universities only needed "office automation" services.

As a matter of fact, technology requirements of the performing arts are very advanced and need cutting-edge solutions, something very different from the "common internet".

Pictures
Credits to New World Symphony Miami

What are the concrete opportunities that the research networks have opened up to the world of performing arts?

Let's take an example, LoLa (LOw LAtency audio visual streaming system): this is an experience that made remote performing and teaching activities a reality. This opportunity, that today is commonly used in many music institutions, was the result of a very high-quality videoconferencing system combined with a cutting-edge network: a technology developed more than 10 years ago.

What is the main reason, today, for the world of performing arts to use the network?

The participation in European projects, such as Erasmus+, now requiring the use of LoLa for remote activities as an integral part of the curriculum, has been often essential.

For many institutions the restrictions imposed by the pandemic were the occasion to discover the opportunities provided by the network. For others, the main reason was the necessity to save resources, as the network makes it possible to virtualise activities that otherwise could only be done on site.

This aspect has a direct impact also on the quality of the education: thanks to online masterclasses, it is possible to have a more attractive educational offer for students while admission exams can be done remotely, thus eliminating all the problems involved with a recorded audition.

Where will the next workshop be held and how will it be organised?

The next workshop will be held in Tallinn, in Estonia, from 12 to 14 September. A specific part of the workshop will be dedicated to engaging with online participants. In fact, we have planned a wrap-up session at the end of each day in which everyone (both on site and online) can interact with each other.

Furthermore, we have decided to dedicate a section to "failures", which means the projects that, despite having started with a good idea, failed for various reasons. In general, workshops tend to give visibility only to success stories, but failures can also be a valuable learning opportunity which perfectly fits the main objective of our workshops: to encourage discussion and growth within the community.

Find out about NPAPW activities and upcoming events at **https://npapws.org/**.

More information about the LoLa project can be found at **https://lola.conts.it/**.

Consortium GARR

CONNECT Interview: Cybersecurity doesn't stop at national borders

CONNECT meets with Alf Moens, GÉANT's Senior Security Information Officer, to talk about the recent EU directives on cybersecurity and their implications for the international NREN community.

Interview by: Rosanna Norman, GÉANT

Alf, you recently attended the Science|Business Experts Roundtable on cybersecurity in Brussels. What are your main takeaway points of this event?

In the EU legislation space a number of directives and 'acts' for cybersecurity are receiving a great deal of attention. I am going to highlight two of them: the Cyber Resilience Act and the NIS-2 directive. DG CONNECT, the DirectorateGeneral for Communications Networks, Content and Technology, has rolled out a consultation regarding their upcoming Cyber Resilience Act. This initiative aims to address market needs and protect consumers from insecure products by introducing common cybersecurity rules for manufacturers and vendors of tangible and intangible digital products and ancillary services. Though this is primarily aimed at protecting consumers, there will be parts of this act that touch on R&E networking and services. We are also currently waiting for the finalisation of the NIS-2 directive proposal whose text is currently being discussed in an EU trialogue.

In the discussions on cybersecurity in which I took part, one of the subjects of interest is the balance between national requirements and European collaborations. For instance, for the NIS-2 directive it is expected that a national body in each member state determines and assigns organisations to a specific directive. This body will also enforce the security standard that should be adopted by that specific member state.

How will these directives affect the international NREN community?

GÉANT's intention and aim is to prevent the risk of being faced with too much diversity in the European cybersecurity legislation landscape. In fact, the number of differences in the role played by each NREN in their country is already quite high.

Small versus large

It's the traditional divide between smaller and larger NRENs, where the smaller NRENs have less resources to dedicate to security and security collaborations. The extremes are considerable, from NRENs with a 100+ security headcount to NRENs with a security headcount of less than 1.

Different roles

The role that NRENs play in security varies depending on non-R&E activities they are involved in, such as being responsible for the national Top Level Domain-registry, running a national Internet exchange, or also supplying network services. These roles may require different responsibilities in terms of compliancy needs.

Different governance

Most NRENs are independent not-for-profit organisations, some are government agencies, and others are virtual entities operated by university employees. This has implications on maneuverability and compliancy demands.

Can you also talk to us about your participation in the high-level roundtable on cybersecurity organised by the STOA, the Scientific Foresight Unit of the European Parliament?

Discussions mostly focused on the considerable increase in the number of threats deriving from the cyberwar between Russia and Ukraine. The general opinion was that these cyberthreats will not stay within the Ukrainian and Russian territories but will be reaching the rest of Europe. This risk illustrates the need to exchange relevant threat information on a European scale and, as far as GÉANT is concerned, there is a strong plea to share threat intelligence across borders within Europe.

A great deal of the upcoming security legislation is aimed at implementation at a national level, but security troubles do not stop at national borders, we need collaboration at European level, we need information sharing whilst taking into account all national specifics and sensitivities.

What does this mean for GÉANT and the NRENs' security priorities?

We must be very alert and vigilant. One of the priorities in the coming years will be to build a European R&E Security Intelligence Hub, with a joint workforce from security analysis and operation teams from all NRENs. Starting with a European intelligence exchange point we will work together to analyse and distribute security intelligence from different multiple sources. Together with our R&E partners we can establish a global early warning system that enables us to prepare and be ready to mitigate threats.

Picture
Alf Moens, Senior Security Information Officer, GÉANT

CONNECT Interview: Prof. Madara Ogot, CEO of the UbuntuNet Alliance

Interview by: Silvia Fiore, GÉANT

Prof. Ogot, you have an impressive portfolio of experience of almost 30 years in the African academic world, but also more globally in the advisory boards of several international academic institutions. Over these years, how have you seen African NRENs evolve and bring benefit to the continent's institutions and learners?

Coming from a background in academics, I have seen first-hand that faculty and staff at universities very often have no idea that regional and national R&E networks exist. They are familiar with the services that are provided within the institutions but do not know where they are coming from. Let me give you an example: one of the difficulties that universities have had throughout the years is in the area of journals.

Going back to a few years ago, most African universities were still ordering print journals, libraries were running out of space to put those journals, and the journals themselves were expensive. Now, articles and papers are all available and downloadable online and hence very few people still buy printed journals. What universities and students do not know is this is only possible because the NRENs exist, and they are the reason they can access online resources relatively easily. So, I would argue that the existence and development of the NRENs are contributing to a tremendous transformation of R&E institutions by substantially helping university students and staff enrich their research and their teaching and learning experience.

Picture
Madara Ogot, UbuntuNet Alliance CEO

Working at the University of Nairobi as well as at other African academic institutions, you have always been in contact with students. Can you share with us an example of how tangibly African NRENs have impacted the institutions and the students you have engaged and worked with?

Let's start by making a distinction between postgraduate and undergraduate students, as their needs are fundamentally different within the academic setting. Most of postgraduate students are now able to access educational resources and research anywhere thanks to the NRENs and their work towards the digitalisation of libraries. When I was doing my PhD, I had to go physically to the library to look up books and I did not always find what I was looking for! Now, you can read research from anywhere, on campus or at home!

For undergraduate students the most significant change that NRENs have brought is the administration of their universities. In most institutions, students are able to login on their university's portal, register for their courses, see their grades, and do a lot more! All of this was not possible just a few years ago. You had to walk to the admin office and line up to get what you wanted.

These are just two simple examples of what the NRENs have made possible across the African continent, starting with enabling universities to get more affordable connectivity, and user-dedicated engineering assistance for their networks.

Earlier this year, you were appointed Chief Executive Officer of the UbuntuNet Alliance, the regional R&E network for Eastern and Southern Africa. How do you see your new role in the region?

When I joined the UbuntuNet Alliance in 2022, I was not new to the community. I am coming from the consumer world, a university. One of the elements that have been advocated in the region is that R&E networks need to start off by having the needs of the consumer in mind. We know that providing affordable, high-speed and reliable connectivity is a given, so we must focus on what more we can do: what applications and services will we make available on the network we provide?

I am very passionate about the idea that with the outbreak of the COVID-19 pandemic, the value of the regional and national networks become ever more evident. For the past two years, around 95% of our network traffic was incoming. This means that there was not a lot of content created and shared within the continent, but our students and leaners were seeking it from outside Africa. We have made this a priority at the UbuntuNet Alliance, to help institutions regionally and locally to create more content that can be provided on the network that we built.

From your point of view, what does it mean for the UbuntuNet Alliance to be part of the global R&E community?

To us, it means being able to access and work with researchers from around the world. And by work, I mean co-create, co-develop, co-author, co-everything! To some extent, regional R&E networks have been glorified data collectors in the continent, using the network to collect and move large volumes of data, but then the data analysis happens outside the continent because we lack the tools to do so. The hardware and the network are present across the continent, so why can't we have the tools too? We need to advocate for global collaborations more than unilateral work.

Can you tell us in a nutshell what your region, but also the wider African R&E community, should expect from your upcoming work? What are your priorities for the near future?

Our number one priority this year is to upgrade our network to 10Gbps minimum and potentially to 20Gbps in the next few years. At the moment, our network is at maximum capacity, which is insufficient to the needs of the region, and we have not even connected all the countries!

We also want to create content in collaboration with our partners and members. We are already working on Utafiti Africa, a project which is up and running and aims at providing funding opportunities, free of charge, and relevant to research on the continent. We are also partnering with the Association of African Universities to change the way journals are published and papers are presented. Now, if you are a researcher and have sent your paper to a publishing platform, you will need to pay to access it or make it freely available. Instead, our concept will distribute the costs among universities and access to papers will be completely free to the authors, the students, and the researchers. Finally, we are also looking to set up a Kindle-like platform for available African textbooks. The UA will pay for the licenses upfront and then make them freely accessible to students, while the institutions will pay a nominal subscription. This will be game-changing as now African universities fully rely on the lecturers due to the lack of accessible and affordable textbooks for the students.

The roles and scope of NRENs are constantly expanding across the African continent, where the community's needs and the technological trends are ever evolving. How do you imagine African NRENs progressing in 10 years from now?

My take has always been that, at the academic level, the African continent is still trying to address very basic needs, in comparison to the Western world. In this context, I see the regional and national networks as crucial actors committed to addressing their needs and a lot of this is being done through content-based collaboration. Without innovative content solutions and applications, an NREN is just another ISP providing connectivity, hence the urgent need to help institutions create content by providing them with platforms which enable them to do just that.

Let's think outside the box for a moment: imagine for example that for every student around the world it is an academic requirement to take a basic course in economics and these courses are all taught face-to-face. Why not develop this together and offer it in a blended format? RENs and NRENs can create platforms where these courses can be freely accessible to their members. This would enable institutions to free up resources to invest in other projects. This is what I envision NRENs doing in 10 years from now. Today, we are stuck with the model of universities that has been there for centuries, and nobody says it cannot be shifted a little bit to make room for improvement.

If you are interested in learning more about the UbuntuNet Alliance's activities in Eastern and Southern Africa, visit their website **https://ubuntunet.net/**

The SEE Forum welcomes three new directors

Three new directors recently joined the South East Europe Forum: Tomi Bozhinovski from MARNet in North Macedonia, Aleksandar Popovic from MREN in Montenegro and Hrvoje Puljiz from CARNET, the Croatian NREN.

Words: Rosanna Norman, GÉANT

SEE NRENs work together to address the requirements of the region, in an effort to overcome Europe's digital divide, by bringing the region closer to the whole GÉANT community and fostering opportunities for collaboration to ensure the optimal use of GÉANT's infrastructure and services.

The Forum has been steadily working since 2018 with the aim to provide a dedicated point of reference within the GÉANT community where participating NRENs can gather information and exchange practices in order to overcome regional challenges and ultimately make the most of local connectivity.

Via the SEE Forum, the SEE NRENs have been working together and meeting regularly to strengthen their role and R&E in the region. In 2021 the SEE NRENs witnessed the first SEE User Forum in the region where researchers from all economies took part and had a glimpse of the state-of-art disciplines and areas of research across the region.

The SEE directors will finally come together again at TNC22 in Trieste this June after over two years of remote meetings, where some of them will meet in person for the first time.

We approached the recently appointed three new directors who are now part of the SEE Forum and asked them to share with us their views about their role within the forum and the implications for their NREN and country.

Tomi Bozhinovski, MARNet told us: "Being part of the SEE Forum has been incredibly beneficial to MARnet, but also personally to me as a recently appointed director. MARnet is a small NREN in a non-EU country, hence meeting other directors facing and addressing similar issues gives us a strong sense of belonging to this forum. We learn from each other whilst supporting each other and with GÉANT's help we not only grow as a group but are also able to transfer this experience to our local communities."

Aleksandar Popovic, MREN, added: "We are privileged to be part of the GÉANT family. Apart from using a wide range of services, cooperation with other members of the global R&E community is very important to us."

Hrvoje Puljiz, CARNET commented: "CARNET has been very active in the vibrant pan-European NREN community for nearly 30 years. As the largest NREN in Southern Europe, CARNET participates in the GÉANT project and many other international activities and projects. Over the years, our personnel gained expertise in almost every ICT-related field, and we have done so by cooperating and learning from the NREN community. Excellent collaboration with neighbouring NRENs is enabling our organisation to give back to the R&E community. The SEE Forum is the right place to do so. We have the opportunity to support the emerging NRENs in the SEE region and in general to cooperate on a variety of projects and ultimately provide, while always learning from each other, cutting edge services to our users."

Marina De Giorgi from the GÉANT Partner Relations team concluded: "We welcome Hrvoje, Tomi and Aleksandar in the SEE Forum, and we are excited to meet each other in person and look forward to more fruitful exchanges and active collaboration in the future."

Pictures
From left to right: Tomi Bozhinovski, MARNet, Aleksandar Popovic, MREN and Hrvoje Puljiz, CARNET.

For further information on the SEE Directors Forum, contact Marina De Giorgi from GÉANT Partner Relations marina. **degiorgi@geant.org**

EaPConnect2 Project - Resilience and collaboration

Words: Rosanna Norman, GÉANT

The last six months have been productive and eventful for the EU-funded project EaPConnect. This brief article provides an overview of the most salient developments and initiatives involving the EapConnect partners in the last quarter of 2021 and the first quarter of 2022.

The Russian military aggression in Ukraine and the consequent termination, decided by the EC Directorate General Neighbourhood and Enlargement Negotiations (DG NEAR), of the Belarusian NREN's partnership (BASNET) in EaPConnect2, understandably, had unavoidable effects on the entire project and its teams. All partners are now collaborating even more closely to support colleagues from URAN in these tragic and adverse times: the Ukrainian NREN has been showing incredible resilience in its efforts to provide stable services to the research and education community whilst also ensuring the physical and financial safety of its employees. Whilst accepting BASNET's (one of the original six partners) departure from the project, there is recognition for the Belarusian NREN's enthusiastic participation and contributions to EaPConnect since its start in 2015.

Picture
Baku, Azerbaijan

GRENA, the Georgian NREN, has been busy with the development of its cloud infrastructure and has welcomed five new cloud user organisations from a variety of sectors: the National Cybersecurity Association, the Supreme Court of Georgia, Kutaisi City Hall, Euroins Insurance Company and the Georgian Medical Programmes.

Also, following the results of a tender, GRENA signed a contract with Orient Logic for the provision of two new powerful servers which will contribute to the NREN's own infrastructure. ASNET-AM, the Armenian NREN, with a growing focus on Open Science and access to scientific journals, is continuously providing maintenance and online consultations for operators of the Pan-Armenian

Digital Library (arar.sci.am) whilst also ensuring the regular upload of additional datasets into noad.sci.am based on dLibra software. In addition, ASNET-AM specialists keep providing maintenance and support for the new web page for IIAP's scientific journal (Mathematical Problems of Computer Science) and carried out the customisation and support of new websites for nine scientific journals using the Open Journal System.

An ongoing NREN collaboration between RENAM from Modova and RoEduNet from Romania is being developed further and we hope to be able to provide further information and details in the coming weeks.

In the first months of 2022 international training security events were delivered online and attended by partners of the EaP region and beyond, LoLa technology enabled remote master classes and concerts respectively in Azerbaijan and Armenia and more recently national Open Science events took place in Georgia and Moldova.

Preparations are progressing for EaPEC 2022, the fifth Eastern Partnership E-infrastructures Conference that will take place in Baku, Azerbaijan on 28-29 September 2022 under the theme 'Building Connections'. It will be proudly hosted by AZScienceNet. The conference programme committee is hard at work to finalise the preliminary programme which will be published in the coming weeks. The host is busy preparing for their first face to face international event after a pause of three long years due to the COVID pandemic.

Registration for EaPEC 2022 is already **open**.

For further information about the Conference visit: **https://conferences.eapconnect.eu/** and contact **info@eapconnect.com**.

"This has been a challenging time, challenging for organisations and people. This has also been the time to re-connect and to demonstrate the resilience, the strength of the community spirit and the determination to rally around to support the education, science and research communities for the continuing benefits to societies".

Irina Matthews, EaPConnect2 Project Manager, GÉANT

EU4Digital

The 'EU4Digital: Connecting Research and Education Communities (EaPConnect)' project is now in its second 5-year phase. The first EaPConnect project launched in July 2015 and the second project began on 1 July 2020. EaPConnect is funded under the EU4Digital initiative of the European Union.

Keeping intellectual control of data in the Digital Age:

Sustainable FAIR ARCHIVER solutions ready for the research community

Data is immensely complicated. Digital preservation involves a series of activities necessary to ensure continued access to research data for as long as necessary, while keeping its intellectual control. This regards not only the creation or ingest action to a certified archival repository, but how FAIR principles (Findability, Accessibility, Interoperability, Reusability) are preserved in the outset, how it extends to associated products (e.g. software) and how clearly delineated the responsibilities of data stewards and service providers are.

Words: Sara Pittonet, Trust-IT Services and João Fernandes, CERN

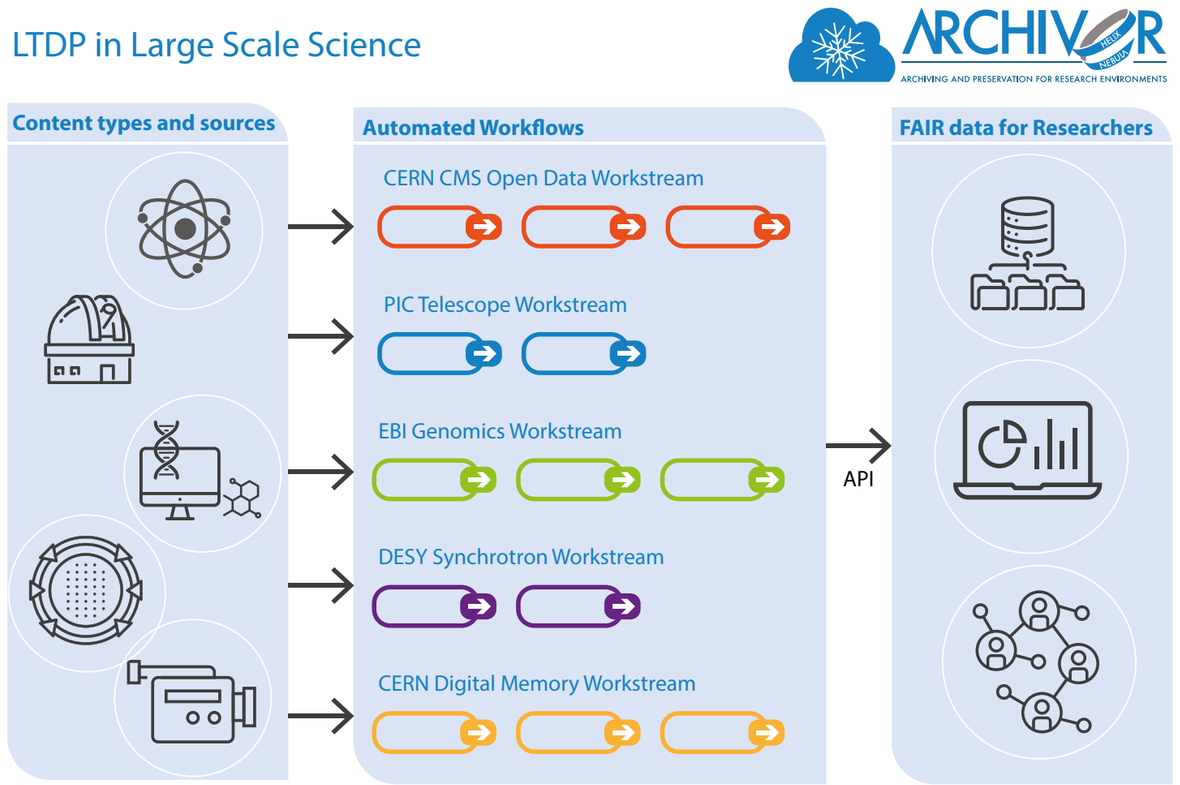
There is not enough emphasis on the long-term curation and stewardship of data, i.e. ensuring that data is interoperable and re-usable over very long timescales in a sustainable manner.

ARCHIVER Pre-Commercial Procurement is a unique initiative currently running in the context of the European Open Science Cloud (EOSC) framework that spent three years designing, prototyping, and piloting innovative services for the Long Term Digital Preservation (LTDP) of scientific datasets.

During the project, R&D was performed competitively by commercial suppliers, over three phases resulting in the selection of two consortia (led by Arkivum and LIBNOVA) providing pilot services for scientific data archiving and preservation. Thanks to the improved efficiency of the preservation processes to more affordable technologies, and a sensible reduction of the resources needed to archive and preserve larger amounts of data, the two solutions are also boosting research organisations towards much more environmentally sustainable digital preservation, by providing the means to analyse and reduce the carbon footprint. These service providers can support in the effort towards carbon neutrality, by aligning with initiatives such as the Code of Conduct for Data Centres and the more recent Green Public Procurement criteria within the European Green Deal.

This R&D work was driven by the needs of a diverse range of stakeholders including CERN, which operates the Large Hadron Collider, DESY (the Deutsches Elektronen-Synchrotron), EMBL-EBI (the European Bioinformatics Institute), and PIC (Port d'Informació Científica), all contributing high-value datasets to the EOSC.

The work accomplished in ARCHIVER is a game-changer for the approach taken to long-term research data management both from a mindset and technological perspective, i.e. what data do researchers retain, how to keep intellectual control of it, and what data stewards organisations must do to ensure long-term value can be realised from it.



To maximise the project's impact, ARCHIVER has started an onboarding process to make the resulting services available to Early Adopters organisations, giving them the possibility to assess the innovative services, trial them, evaluate their functionalities, and eventually purchase them with a clear costing model.

"I remember in 2004 our PhD student Clea spent an entire year getting the forecasts data she needed for her research by mailing USB sticks from Vienna to Reading, packed in envelopes. She had less time for her exciting science, less time to do forecasts and make a difference in her PhD," says Florian Pappenberger, Director of Forecasts at ECMWF (European Centre for Medium-Range Weather Forecasts), one of the research organisations who is having the opportunity to test the long-term data preservation solutions developed within ARCHIVER.

These solutions are supplementing a lack in the current European Open Science research panorama of ready-to-use, scalable long-term data preservation services.

"We wanted all scientists to make a difference using ECMWF data, which are coming from the biggest meteorological archives of the world," continues Florian Pappenberger. "We needed a common platform allowing users to link up with other data sources, together with other organisations following the same FAIR data guiding principles and with a special focus on interoperability. ARCHIVER was an essential cornerstone of that dream".

Picture
Long Term Data Preservation in Large Scale Science

How to learn and test the platform - join the upcoming public sessions:

- 13-17 June 2022: public review of the ARCHIVER solutions
- 23-24 June 2022: training webinar on the use of the ARCHIVER Pilot Platforms

Dates and details will be soon announced on the ARCHIVER website **https://www.archiver-project.eu**

SPARKLE

Sparkle:

Accelerating digitalization and cloud adoption in the European Research and Education community

A year and a half after the launch of the OCRE cloud framework, Sparkle takes stock of the pan European project

Cloud offers powerful tools to researchers and students, improving data processing speed and collaboration, through shared tools and data storage. For example, remote learning, further accelerated by the lockdowns, requires a range of cloud-based applications and tools to deliver online lessons, set assignments, share educational resources, score assessments, and communicate with students.
In addition, the scalability, flexibility and cost-effectiveness offered by public cloud services relieve universities and research institutes of the operational and economic burden of managing self-hosted hardware and infrastructure, thus allowing them to focus on their core activities: high quality research and education.

However, purchasing cloud services can be a complex and time-consuming process for many institutions which usually have to compare multiple solutions, choose the provider themselves and manage all the legal and contractual aspects associated with the procurement process.

In Europe, R&E institutions can benefit from OCRE, a European project created to facilitate cloud adoption in the research community. Through ready-to-use service agreements with qualified cloud service providers, the OCRE Cloud Framework offers a standardized contractual vehicle to ease the purchase of these solutions and assure the best value for money.

Sparkle - already GÉANT IaaS Cloud Framework provider since 2016 and OCRE Cloud Framework provider and Google Cloud integrator in 27 countries since 2020 - provides the R&E community with Google-based solutions ranging from High-Performance Computing (HPC), infrastructure modernization, collaboration and productivity tools, genomic and clinical research, healthcare and medical imaging. In this cloud journey, interaction with end users (students, researchers and professors) is crucial to understand the needs of the organization and then design the cloud solution that best support its goals.

Thanks to its team of experts, synergies with sister company Noovle - TIM Group's center of excellence for cloud and edge computing - and an ecosystem of specialized local partners, Sparkle is able to converse with customers on their respective fields, a decisive added value that results in more effective design and faster deployment of the cloud infrastructure to support their specific needs and goals.

Thanks to GÉANT's daily activity and to projects such as OCRE, Sparkle accelerated digitalization and cloud adoption, thus enabling education and research centers to develop new projects that benefit society and the economy in all aspects of real and modern life, from weather forecasting to air transport safety, from medical imaging to smart energy systems, from communication networks to internet security.

This possibility is granted even to smaller organizations with limited budgets, which can thus gain access to advanced IT infrastructure, applications, and tools.

Especially at this challenging time for the world, Sparkle believes deeply in the need and importance of developing, providing and promoting advanced network and digital capabilities, accelerating research and education activities that are vital for the future development of our society.

For more information visit
www.ocre.cloud.tisparkle.com

Research and Education networks face shifting frontiers

Research and education networks have long been the proving ground for innovation. Collaboration between educational institutions, public and private research centers, including Nokia Bell Labs, has resulted in significant advances. Our shared experience of the pandemic has drawn attention to the need for network resilience and flexibility in the face of dramatic shifts. Shifts in capacity. Shifts in security. Shifts in when, how and where we collaborate. The R&E community again is navigating these shifts.

Flexible capacity
For several decades now, the scale of growth in R&E networks as well as the wider internet, has put an emphasis on bigger numbers with 400 Gb/s now widely adopted by national or regional research and education network (NREN) organizations like GÉANT (Europe), ESnet (USA) and CANARIE (Canada). We've reached a point, however, where speeds of 800 Gbps to 1 Tbps have become reality. The foundation of resilience is often making the best use of the resources at your disposal.

One of the real-world limits to optical advances is the state of existing fiber plant. Optical reach, for instance, is highly dependent on parameters such as fiber type, fiber loss and span loss. It is not uncommon to see differences in distances covered of 4–6x or more between different networks. Thus, with shifting demand patterns, it isn't always possible to ensure optimum fiber conditions for meeting your NREN partners.

Nokia's latest generation of optical components, for instance, feature two application-optimized coherent DSPs that use fine baud rate granularity to adjust to different fiber plant. One is designed for metro applications operating up to 67 Gbaud between 100G and 400G (PSE-Vc). The other is a long-haul processor (PSE-Vs) that operates at higher baud rates such as 90 Gbaud. Because overall wavelength capacity is based on the modulation format and baud (or symbol) rate, increasing the baud rate allows use of lower order modulations formats suitable for long and ultra-long distances, while supporting high capacity 400G wavelengths.

Quantum-safe security
As the world becomes less stable geo-politically, resilience and security go hand in hand. With the advent of quantum computers, most of today's key cryptography will be rendered useless, based as they are on assumptions about the intractability of mathematical problems. Networks must consider carefully how they secure their networks so that they are quantum-safe in a cost-efficient way.

Chris Janson
Product Marketing Manager

The Nokia 1830 SMS Security Management Server generates high-quality keys deployed in a symmetric distribution architecture. When used with AES-256 encryption engines, this solution provides safety today from practical quantum computer attacks.

Partnering for sustainability
Nokia's most recent collaboration with Norway's Uninett showcases the need for resilience, deploying our optical network solutions to advance multi-disciplinary research on geophysical sensing and sustainable resource exploration — just another of the many R&E partnerships with which Nokia is proud to be involved. Discover more on our webpage: nokia.ly/TNC-education.

Learn more!

Nokia and Bell Labs have a long history of networking innovation. Join us at TNC 22 to learn more about our solutions including PSE V optical transport and quantum-safe transport during a presentation on Thursday, 16 June at 14:00.

Open, secure and efficient terascale networking

Optical networks have become key assets for our societies and economies with businesses and communities like research and education (R&E) increasingly reliant on optical transport infrastructure. At ADVA, we're committed to the development of truly open and resilient optical networks that enable national research and education networks (NRENs) to offer highly secure and resilient services.

Words: Maria Teresa Chamorro, ADVA

Trusted network infrastructure

With an open and modular design, our FSP 3000 optical transport platform helps NRENs deploy agile networks that support the most stringent connectivity demands. Incorporating the latest innovation in photonic networking, the FSP 3000 provides terascale connectivity with up to 800Gbit/s line rates from metro to long-haul distances[1]. With a truly open and disaggregated architecture our FSP 3000 provides freedom to choose the technology and the vendor of choice at any time.

The FSP 3000 open line system enables the transport of third-party vendor wavelengths without any constraints, as well as optical spectrum services. This facilitates flexible end-to-end connectivity beyond NREN network boundaries, and makes it possible to interconnect and share infrastructure with other NREN partners.

Secure services

With an open design, ultra-flexible coherent interfaces and standards-based APIs, the FSP 3000 open terminals provide high-speed connectivity over any type of network infrastructure. Customer services can be securely transported with state-of-the-art encryption that protects data in motion even against quantum computer attacks.

Powered with our ConnectGuard™ technology, the FSP 3000 is the first optical transport solution secured by post-quantum cryptography[2]. We're also pioneers in the practical use of QKD data security[3] in optical networks. Since 2014, ADVA has collaborated with partners and customers in the development of quantum-safe optical networks.

Advanced fiber monitoring

In-service advanced fiber monitoring is also key for secure and reliable optical network connectivity. Optical fibers are at risk from both accidental damage and malicious attacks. These anomalies may cause connectivity disruptions, degrade the performance of the network, or compromise the confidentiality of critical data, which could have severe economical and reputational impact.

Our ALM is an in-service fiber monitoring and remote test unit (RTU) solution that gives users real-time insight into the quality of their fiber, whether customer-owned or leased. In the event of abnormal attenuation, fiber breaks or a tapping attempt, the user is immediately notified and given the exact geographic location of the event via the ADVA Ensemble Fiber Director or third-party GIS. This avoids unsuccessful repair attempts, prevents outages, and enhances customer experience.

Join us at booth #11 for a live showcase featuring an ALM demo setup that reveals how machine-learning can help improve fault diagnosis and localization.

We're here to help

ADVA can help you design, install, and activate a next-generation open optical network. With our FSP 3000 open line system and open optical terminals, and our ALM fiber monitoring solution, you can leverage optical technology innovation and bring secure services to your customers at lowest cost and with maximum operational simplicity.

www.adva.com

[1] **FUNET and SUNET transport 400Gbit/s over record 10,000km distance with ADVA FSP 3000 TeraFlex™** (February 17, 2022). **FUNET and ADVA score industry first in 800G long-haul demo** (November 4, 2021)

[2] **ADVA launches world's first optical transport solution with post-quantum cryptography** (July 8, 2021)

[3] **ADVA plays key role in new QKD projects to accelerate commercial rollout** (May 5, 2022)

A10

Threat Report

2022 DDoS Threat Report

In the past couple of years, the world has been battling the COVID-19 pandemic. As we slowly work our way back to normalcy in the real world, the cyber world still seems to be engulfed by a new pandemic of cyber attacks with each passing day.

In the second half of 2021, we saw some interesting developments in the area of cybercrimes, including events like attackers leveraging the now notorious Log4j vulnerability, and Microsoft mitigating one of the largest DDoS attacks ever recorded. We also observed 23% YoY increase in the total number of DDoS weapons available. These could easily be exploited for use in DDoS attacks.

In addition, at the beginning of 2022, we saw the Ukraine-Russia conflict take a turn for the worse, turning into an all-out war. In conjunction with the ground war, we observed a number of cyberattacks targeting Ukraine government networks and infrastructure. The latest edition of the Global State of DDoS Weapons report contains a special highlight section detailing the use of DDoS attacks in the Ukraine-Russia conflict to disrupt critical infrastructure and communications.

The A10 security research team observed significant and sustained attacks on Ukrainian government networks and commercial internet assets, with a massive spike on the first day of the conflict. These cyber warfare tactics didn't stop on the first day though and have continued.

In addition, the report includes a spotlight section featuring the Apache Log4j vulnerability, what that means for DDoS attacks, and how organizations can protect themselves against this vulnerability by incorporating principles of Zero Trust into their security strategies and by taking solid preventive measures.

Heat map shows DDoS attacks on multiple targets in Ukraine carried out on February 24, 2022

The report also provides detailed insights into specific DDoS weapons and DDoS attack activities observed around the globe including the use of malware in the recruitment of botnets.

Key insights from the report:

- China hosts the highest number of DDoS weapons, including both amplification weapons and botnet agents
- 100% YoY growth of obscure weapons like Apple Remote Desktop (ARD)
- Twice as many DDoS weapons hosted in North America per person compared to Asia
- More than 75% Log4j scanners originated from Russia

To learn more about the current state of cybersecurity and how you can protect your organization dowload the report here:

www.a10networks.com/resources/reports/2022-ddos-threat-report

aws

Over 14,000 educational institutions of all sizes use the Amazon Web Services (AWS) Cloud to:

- Modernise and secure their institutions
- Improve the student experience
- Turn data into wisdom
- Empower researchers and accelerate research

The AWS Cloud can be procured through the Open Clouds for Research Environments (OCRE) framework using our Partners:

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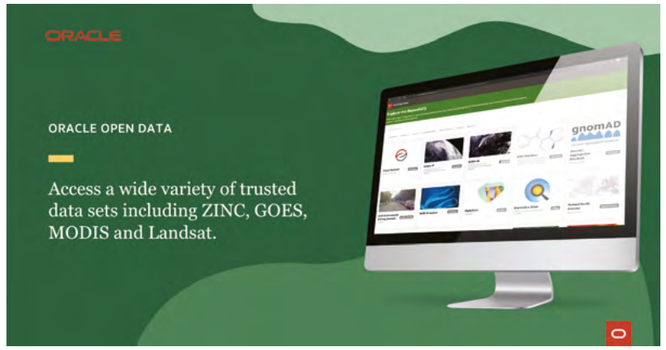
ORACLE

Oracle Open Data: Download trusted data sets and contribute your own

We've made it easier than ever for developers, educators, researchers and data scientists to find and consume the data they need so that they can keep making the discoveries that matter. **Oracle Open Data** is a new data set repository made for the people that create, use and manipulate data sets each day. Data sets are freely available, with no need for login nor payment. Plus, Oracle fully covers the cost of any data download egress fees.



Connect with information from data producers like NASA, NOAA, and NIH, and access a wide variety of data sets including **ZINC**, **GOES**, **MODIS** and **Landsat**. Get code snippets, data set search functionality and data that isn't available anywhere else. Researchers, developers and educators can use these data sets to explore and test hypotheses, teach and learn about data use, train AI and ML models, and develop new computational solutions.

Host your large data sets with us

Oracle is also now accepting data set contributions from researchers and institutions interested in sharing their data with a wide range of users. **Become an Open Data Contributor** and upload your own data sets. Host and share your large, petabyte-scale data sets for free so that our community can start using and citing your information.
Make a mark on your research domain - simply fill out and submit **our online form** and we'll contact you with next steps within two weeks of submission.

Get free, easy access to trusted data sources

Oracle Open Data's main focus is on the data user experience. Our purpose-built tools enable users to concentrate on using large data sets and metadata to achieve the results they need. Advanced filters let users drill down into data subsets, locating relevant information for analysis or visualization. Users no longer need to download entire data sets and then sort through them, saving precious time and storage.

"Many researchers in the interactive computing community like me are looking for services that remove burdens associated with data hosting and that also encourage communities to keep these valuable resources available," said Dr. Hyeokhyen Kwon, Georgia Tech Ph.D. graduate and Oracle for Research recipient.

"Platforms like Oracle Open Data can be a big help in this, and an additional benefit of these types of open data platforms is that they allow researchers to gain exposure to research problems in other disciplines. This type of collaboration across disciplines may bring new research opportunities."

Oracle Open Data offers free access to domain-specific data sets from some of the most trusted institutions in the world. Or host your large data sets with us and make your mark by enabling future research. It all starts **here**.

Join the Oracle for Research Community

Oracle for Research is on a mission to partner with academic, educational, and institutional researchers in all aspects of discovery. At our core, we believe researchers shouldn't be held back by tech, which is why we've made it simple for them to host, store and analyse their data with our cloud infrastructure solutions. Our research customers are changing the world: we just provide the tech that helps them do it.

Read about research projects that used Oracle Cloud.

Oracle is proud to be part of **the OCRE Framework**. All Oracle cloud technology services – Oracle Cloud Infrastructure (OCI) – are available in the 40 countries under the OCRE framework, via 6 value-added reseller partners.

Learn more about Oracle Cloud.

Words: Andrew Bell, Content and Community Manager, Oracle for Research

Ensuring consistent, accurate network inventory management for NRENs

When you change network and service tech, you can't lose sight of the big picture – consistency matters, so that national and international research networks can deliver to their users. Effective inventory management is critical to delivering agile services across complex, multi-site networks.

Continual network evolution requires effective inventory management

As specialist providers of internet and connectivity facilities, National Research and Education Networks (NRENs) have demanding needs, with strict obligations to deliver. Their customers and users can have diverse requirements and may need dedicated and often very different services – connecting, for example, globally distributed research teams undertaking markedly different projects. Moreover, the logical and physical service connections may span multiple NRENs, as well as pan-continental networks, such as GÉANT

NRENs are also often early adopters of new solutions and need to ensure that the introduction and management of each new technology proceeds as smoothly as possible. Each, such as WDM/OTN, MPLS or SDN/SD-WAN, adds a new dimension to consider. Comprehensive inventory management is the key to handling successive waves of technology, delivering a consolidated view of your network, assets, and the logical / physical relationships between them – end-to-end. Some legacy platforms are unable to support new technologies as they are introduced, which inhibits performance and agility.

Inventory is integral to business and process management

New services bring new possibilities, resulting in an increasingly diverse portfolio that can be delivered between research partners, or even to specific teams in different sites. These must be provisioned and assured correctly. And, the services delivered end-to-end may traverse a series of interconnecting paths – nationally leased dark fiber, as well as international leased lines. If you establish a new project, or forge a new relationship, you need these services and the connectivity they require to be allocated, dynamically – and to be accounted for.

That applies equally to existing services and connections. What if a leased line that had been heavily utilized becomes redundant, due to the conclusion of a project? It needs to be shut down or redeployed so that costs can be managed – an effective inventory solution can identify usage and correlate it to payments, so that optimization steps can be flagged.

Updating and accuracy – reconciliation is essential

Inventory management solutions should be able to present operational data correlated with a real-time view of physical locations and resources, as well as the virtual services enabled for all generations of technology. It's essential for this view to be maintained, updated daily to take account of any changes, so this can be mapped to organizational requirements – regardless of the evolution of the network. So, when you transition from one generation to another, you need a tool that can maintain this view – for WDM/OTN, MPLS, SDN/SD-WAN and more.

VC4-IMS – a complete inventory management solution for NRENs

VC4-IMS is a complete, intelligent inventory management system that brings data together, eliminating silos and providing a consolidated record of your network assets – physical, virtual, logical, and service – giving you clarity and supporting operational automation and transformation. It is compatible with every generation of technology you adopt – and supports a unique reconciliation process, so that it is automatically updated – providing the flexibility you need to meet the demands of your customers. In other words, it boosts your capability to deliver high-performance networks to researchers – nationally and internationally.

"SURF has been using the VC4 IMS since 2014. The coverage of all network layers makes this a fundamental part of our network administration and NOC activities."

SURF:

"RedIRIS-NOVA marked a milestone in our infrastructure, services and procedures: 15.000 km of dark fiber and more than 180 points of presence. But files became uncontrollable, and information was misaligned. After looking into the market and sharing information with other NREN colleagues, we came to a set of requirements - and VC4 was the company that best met them in terms of quality and price. The VC4 platform adds extraordinary value for handling operational tasks. Based on our past experiences, I foresee a long future for IMS in RedIRIS. "

RedIris

NETWORK AUTOMATION TO THE RESCUE

Gartner named NetYCE 'Cool Vendor' because the platform dramatically simplifies network automation.

Wim Gerrits: "You can imagine I'm really proud, but I dare to say you need a lot more than a tool to be successful with network automation."

WIM GERRITS - CEO NETYCE

Wim Gerrits, CEO of NetYCE: "With more than 20 years under our belt we can safely say that the biggest challenge with network automation is the lack of resources, experience and time. We often see organisations dragged into long and expensive vendor implementations or busy managing a jungle of custom scripts and tools.

We do it differently. Instead of focusing on a tool or platform we focus on the end goal. How? We bundle the tool with implementation by world-class DevNet engineers. Combined with the proven methodology we guarantee results in just a matter of weeks.

The methodology is simple: we help organisations unleash of the power of network automation in three steps:

1. Automatically find out the current state of a network and identify any risk or issue that impacts its stability, security and agility
2. Then, automatically fix these issues and drive efficiency for day-to-day changes through network automation
3. And last but not least, ensure the network is configured according to your intent. This will prevent misconfigurations from happening ever again.

The result: a stable and agile network that supports your business.

I'm happy to invite you to see it for yourself and try it out. Our subscriptions are tailored to get the results you need without any risk or long-term commitment.

Simply book a meeting at: meetings.hubspot.com/wim-gerrits

Happy automating,

Wim Gerrits

P.S. We are fully agnostic to the vendors you have or the approach you prefer (e.g. CLI, Ansible, Python, API, Netconf, etc.) so no worries there ;-)

About NetYCE

NetYCE enables organizations to easily build network automation solutions that are manageable, scalable and secure. Its full-stack platform and unique implementation approach ensure fast results without risk. NetYCE has been recognised by Gartner as Cool Vendor for Enterprise Networking.

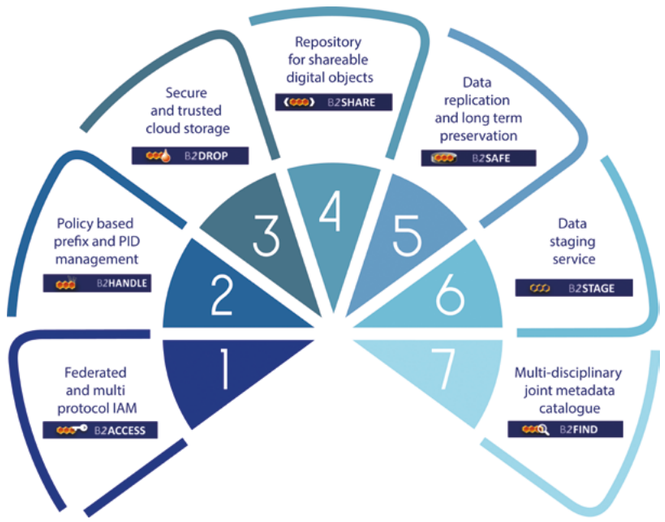
A Solution for the full Research Data Lifecycle

Data proliferation in Europe's scientific and research communities is a huge challenge facing the scientific community today! The EUDAT Collaborative Data Infrastructure (CDI) is providing a strategic solution, addressing the full lifecycle of research data and enjoys an ongoing collaboration between Service Providers and Research Communities working as part of a common framework for developing and operating an interoperable layer of common data services.

With a network of more than 25 European research organisations, data and computing centres in 14 countries, the EUDAT Collaborative Data Infrastructure (CDI) is one of the largest infrastructures of integrated data services and resources supporting research in Europe.

EUDAT has developed a service stack that forms the Collaborative Data Infrastructure (CDI):

- B2SAFE, Replicate Research Data Safely
- B2FIND, Find Research Data
- B2SHARE, Store, Share and Publish Research Data
- B2DROP, Sync and Exchange Research Data
- B2ACCESS (identity and authorisation), easy-to-use and secure Authentication and Authorisation platform
- B2HANDLE (persistent identification management), a service to register persistent identifiers called Handles to data objects and retrieve data objects via these identifiers, serving a purpose similar to DOIs for papers



EUDAT supports research by providing a trustworthy, collaborative and interoperable data infrastructure and assists researchers and research organisations with essential training and consultancy on Research Data Management.

Are you an NREN or Research or Academic Institution looking for a Research Data Management infrastructure for your community? Get in touch with us today at **eudat.eu/** contact to find out how we can help or visit our service catalogue at **eudat.eu/catalogue**!

New Key Innovation in Optical Networking

Words: Antonio Napoli, Sr. Manager Hardware Development, Infinera and Christian Uremovic, Director Solution Marketing, Infinera

Today, major upgrades are taking place in optical transport networks yet again. Back in the year 2000, state-of-the-art wavelength division multiplexing (WDM) optical transport systems could provide up to 400 Gb/s of capacity per fiber pair. Two decades later, the same fiber pairs can carry up to 80 Tb/s – a 200× increase – by transmitting over the C- and L-band. Core networks – including long-haul and subsea – are leveraging transponders with 7-nm CMOS technology and 800 Gb/s per wavelength to reduce cost per bit per km and number of cards and simultaneously improve spectral efficiency. 7-nm CMOS technology is also empowering metro and data centers, where 400 Gb/s is emerging and becoming the main optical interconnection interface. In this scenario, the main benefits are reducing cost per bit, minimizing footprint, reducing the number of interfaces and associated cabling, and supporting capacity growth. This technology evolution has also led to a significant reduction in power consumption. For example, a 100 Gb/s WDM module in the year 2011 operated at 60 W per 100 Gb/s, which translates to 0.6 W/G. A 400 Gb/s coherent pluggable today operates at 20 W per 400 Gb/s, or 0.05 W/G.

Reductions in cost per bit have been accomplished by jointly introducing coherent detection, polarization multiplexing, and high-order modulation formats, together with the continuous increase of the symbol rate. This has led to the current situation where the Shannon capacity limit is being approached, generation after generation, as illustrated in Fig. 2 of [1]. In consequence, incremental improvements in spectral efficiency are slowly coming to an end. Today, Infinera's ICE6 optical engine supports 42.4T in the extended C-band, which translates into 8.833 bits per second per Hz[1]. Further, with the implementation of probabilistic constellation shaping (PCS) and flexible symbol rates in ICE6 transponders, operators can "tune" capacity much more granularly and support different link distances and network setups more efficiently [2].

One additional innovation that is enabling better-performing transponders – and consequently lowering cost per bit per km – is the Nyquist shaping of wavelengths. Having pioneered the use of Nyquist subcarriers with ICE4, Infinera's ICE6 optical engines introduced second-generation Nyquist subcarriers, doubling the number of subcarriers per wavelength to eight. The usage of Nyquist subcarriers helps simplify the compensation of accumulated dispersion as compared to single-carrier wavelengths. For example, in the case of an 800G transponder with eight Nyquist subcarriers, a complexity savings of 0.68× versus single carrier is achieved, which leads to power savings – see Sec. IV-A of [2]. This is obtained thanks to the squared relationship between symbol rate and dispersion, and the compensation of this effect is simplified when it is realized with Nyquist subcarriers. Even more relevant is the lowered impact of enhanced equalization phase noise, as described in Fig. 2 of [2]. A further benefit of Nyquist shaping is that it also contributes to tight channel spacing with minimized wavelength roll-off, and better fiber utilization respective to improved spectral efficiency is the result.

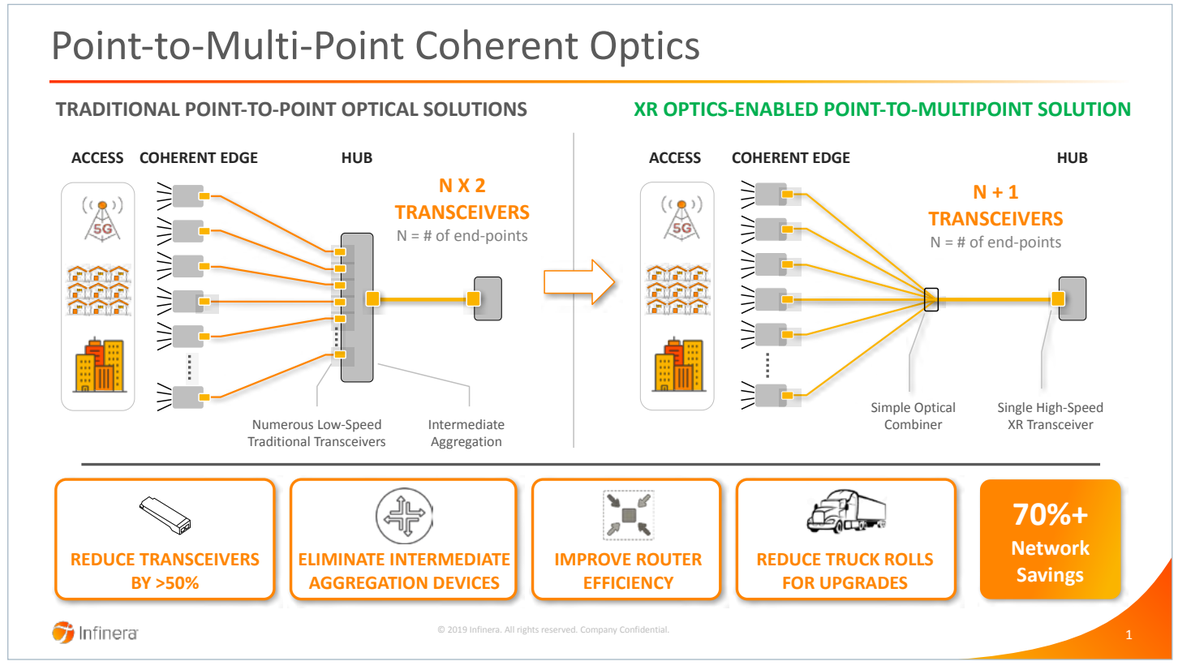
However, these improvements are incremental and typically provide 20-30% savings in total cost of ownership. As innovation is the prime driver to reduce the costs of building an operating network, relying solely on manufacturing scale might not be enough. As an industry, we must continue to innovate to improve and simplify network architectures, to consider sustainability aspects, and to enable operators to flexibly allocate capacity to traffic hot spots, avoiding wasted electricity on empty bits.

In our recent work with digital subcarriers and 7-nm CMOS technology, we have evolved to the third generation of Nyquist subcarriers [1]. Here, we are introducing – in the case of a 400G coherent transceiver – 16 Nyquist subcarriers, each transmitting at 25G and within a 4 GHz spectrum per subcarrier. Contrary to the previous two generations, now the subcarriers can be managed independently and sent to different destinations, thus acting as virtual channels, with the additional capability of realizing high-speed coherent point-to-point (P2P) and point-to-multipoint (P2MP) transceivers. This feature greatly enhances system flexibility and achieves network simplification. Fig. 1 illustrates this technology, where a multitude of low-speed end users – e.g., 5G antennas, businesses, campuses – can simultaneously communicate with a single high-speed transceiver located at, for example, a hub site. This is an important scenario for metro/access aggregation, where traffic patterns are primarily hub and spoke. Today, these networks are designed with P2P, but they can be enormously simplified with P2MP enabled by Nyquist subcarriers, where the individual subcarriers are managed at the network level like any other channel and provide the required simplicity. This approach halves the number of needed transceivers thanks to the replacement of the aggregation layer with a passive optical component.

XR optics is available in standard form factor pluggables such as QSFP-DD and CFP2, and later in QSFP28 formats. To create the necessary ecosystem to enable such a paradigm shift in the way networks are deployed, the Open XR Forum (**https://www.openxrforum.org/**) has been established. The Open XR Forum is a multi-source agreement (MSA) working group for XR optics that will: (i) foster collaboration to advance the development of P2P and P2MP products and services; (ii) accelerate adoption of intelligent coherent point-to-point and point-to-multipoint network architectures, and (iii) drive standardization of networking interfaces to ensure ease of multi-vendor interoperability and an open, multi-source solution ecosystem.

In [1,3] we showed how the proposed P2MP solution leads to a significant reduction in components and footprint and allows operators to reconfigure capacity remotely with a mouse click. This solution also includes the important benefit of being multi-generational as long as the defined granularity of 25 Gb/s is preserved. In the study presented in [3], we investigated the case of a filterless network designed with P2P and P2MP transceivers. Here, we demonstrated a 76% savings obtained by a network deployed with P2MP with respect to the one with P2P. In further studies, we also reported on the advantages that this technology provides in terms of routing bypass [4] and aggregation of horseshoes in metro networks [5].

In summary, P2MP transceivers offer an innovation vector that enables a significant step function in network savings to be maintained.



Picture
XR optics innovations significantly simplify network architectures

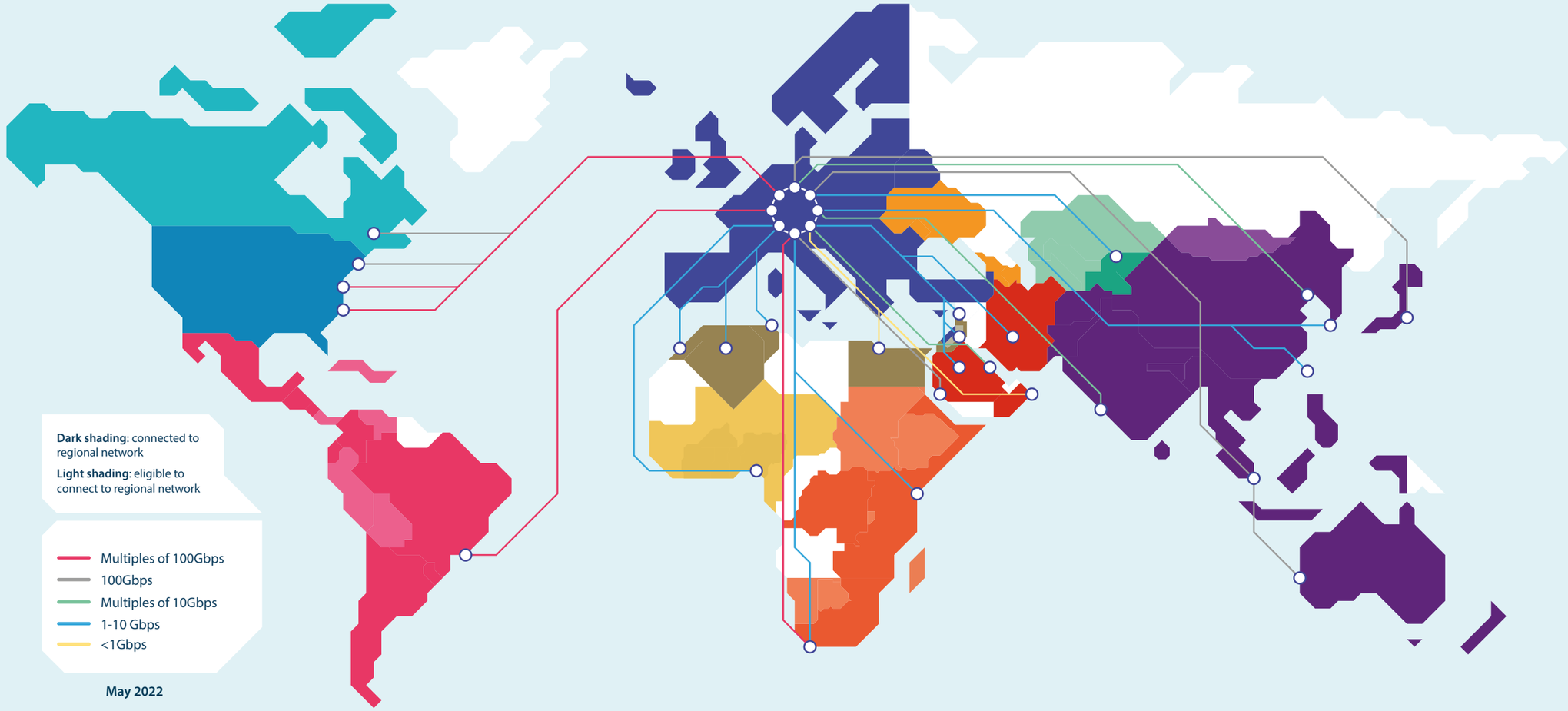
[1] D. Welch et al., "Point-to-multipoint optical networks using coherent digital subcarriers," Journal of Lightwave Technology, vol. 39, no. 16, pp. 5232–5247, 2021.
[2] H. Sun et al., "800G DSP ASIC Design Using Probabilistic Shaping and Digital Sub-Carrier Multiplexing," in Journal of Lightwave Technology, vol. 38, no. 17, pp. 4744-4756, 1 Sept., 2020
[3] J. Back¨ et al., "CAPEX savings enabled by point-to-multipoint coherent pluggable optics using digital subcarrier multiplexing in metro aggregation networks," in 2020 European Conference on Optical Communications (ECOC), IEEE, 2020, pp. 1–4.
[4] A. Napoli, et al. "Enabling Router Bypass and Saving Cost using Point-to-Multipoint Transceivers for Traffic Aggregation." Optical Fiber Communication Conference. Optica Publishing Group, 2022.
[5] J. Bäck et al., "A Filterless Design with Point-to-multipoint Transceivers for Cost-Effective and Challenging Metro/Regional Aggregation Topologies", accepted for publication, ONDM, 2022

[1]This assumes a C-band of 4.8 THz.

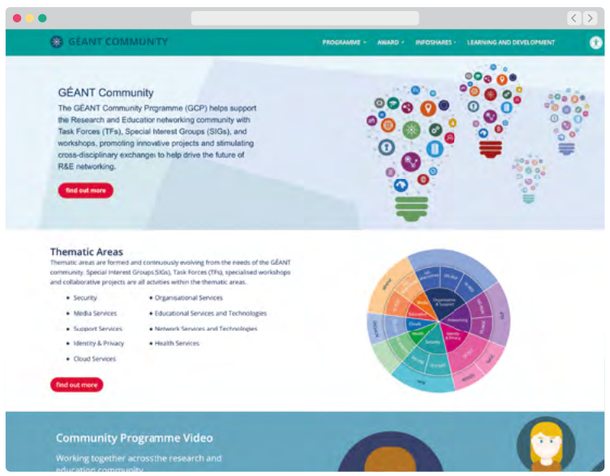
GÉANT at a Glance

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 CONNECT is online (connect.geant.org) and you can sign up to our weekly newsletter. You can also get involved on social media – see you online!

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.



May 2022



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Xantaro SERVICE INTEGRATION

netYCE

Infinera

A10

orange Business Services

ORACLE

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