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tnc21
Making Waves
21-25 June 2021

ALSO IN THIS ISSUE

CONNECT INTERVIEW:
PROFESSOR SUE BLACK, TNC21 KEYNOTE SPEAKER

Africa Connect 3
AFRICACONNECT:
CELEBRATING 10 YEARS OF AFRICAN EUROPEAN COLLABORATION

CONNECT INTERVIEW:
ANDREAS DUDLER, CHAIR OF THE GÉANT BOARD

GÉANT STRATEGY:
PRESENTING THE STRATEGY FOR 2021-2026
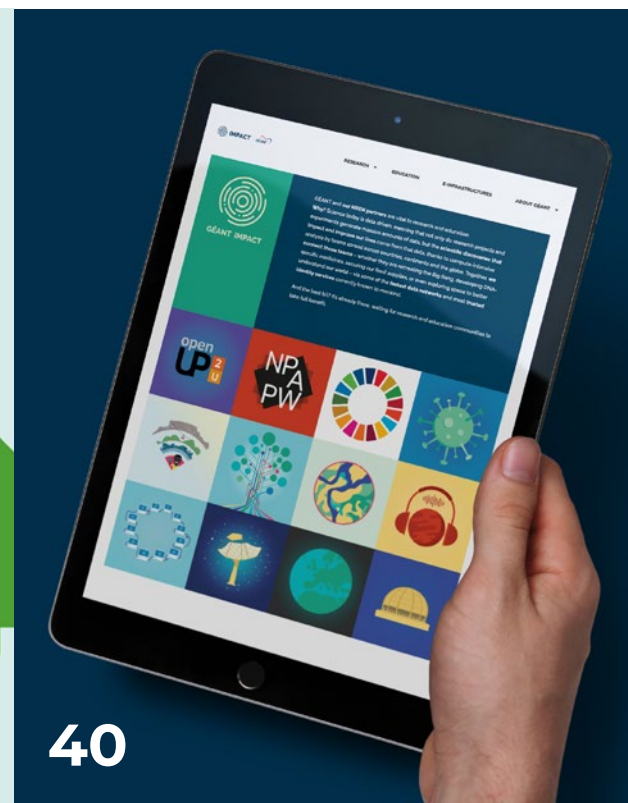
tnc21
Making Waves
21-25 June 2021

02

05

06

07

12

14

27

BELLA
Building the Europe Link to Latin America

29

40

Contents

Welcome from Cathrin Stöver

Welcome to CONNECT 37 and TNC21! When we release this magazine, TNC21 will be in full swing and I very much hope that you enjoy our virtual platform, the studio hosts, the networking possibilities, and most of all of course our programme full of great key notes and content. Having had to pause TNC for one year – we feel we are back with a bang, making waves and creating yet another memorable event for our global community!

As CONNECT 37 is the magazine accompanying TNC21, we aim to provide background to the conference and interviews with people, who will be presenting their work, activities, and passions during TNC21 week. We hope you will enjoy the many interviews in this edition, they give excellent insights into the thinking and direction of our global community.

And 'community' is the word here: almost every single article includes the word community – whether this is the interview with Kees Neggers looking back to the establishment of RARE, with Andreas Dudler looking forward to the next seven years, with Claudio Allocchio about today's Community Programme, and it certainly comes out in our new GÉANT Association strategy. Community is at the Heart of what we all do, every single day. Our community is what makes us strong and sets us apart.

And that is why I am so pleased that one of our most successful and committed community players is the winner of the 2021 GÉANT Community Award – my congratulations to Maria Isabel Gandía. *Enhorabuena* and very much deserved! (I am also really interested to learn that the GN4-3 Work Package on Orchestration, Automation and Virtualisation competes as one of the most cat-loving ones!)

However, my favourite article in this edition is that which highlights the work of the Future Talent Programme, and I am really looking forward to the participants' Lightning Talks on Friday 25 June! We all grow, when we make space for new talent.

Enjoy the read, and even more: enjoy TNC21 – Virtual, but real.

Cathrin Stöver, GÉANT

tnc21
Making Waves
21-25 June 2021

TNC21
Virtual but real

Making Waves, the theme chosen for TNC21, is about the similarly transformative and disruptive capabilities that digital technologies across networking, Trust & Identity and cloud services can deliver for Research & Education.

Over the course of five days the conference programme features live and on-demand content, four internationally acclaimed keynote speakers who bring a global perspective across a variety of fields, demonstrations, and Lightning Talks – providing a snapshot of the global R&E community.

Words: Rosanna Norman, GÉANT

A new virtual platform

The TNC21 team has worked round the clock to ensure that attendees have an exciting and memorable experience. Central to this is a virtual platform, through which attendees join live sessions, create their own schedule, network with other attendees, view on-demand content and are connected through the day by live lobby hosts.

Based at studios in Amsterdam (GÉANT) and Poznan (PSNC), the live lobby hosts will keep attendees informed during breaks, highlight sessions for each day, and ensure virtual feels real!

On top of that, attendees can see how much CO2 they've saved by joining the conference online, create their own personalised schedule by selecting sessions in advance, and have the choice to meet other attendees via direct chat or video.

And with all sessions viewable on-demand 90 minutes after their live presentation, deciding between parallel sessions is made much easier!

Networking Carousel

One of the most collaborative features of the virtual platform is the Networking Carousel where attendees can meet each other in four-minute chat sessions, helping to recreate those 'coffee-break' moments where we all love to catch up with old friends and make new connections!

'The TNC21 team has worked wonders to create a virtual environment that comes close to a real conference experience. You will be able to tailor-make your programme and even more importantly: the platform offers excellent networking opportunities, almost as good as real coffee breaks!', adds Cathrin Stöver, GÉANT.

Get social at TNC21!

Following on from the success of #road2TNC in 2019 and #MissingTNC in 2020, TNC21 launches two brand new social media campaigns: #myTNC and #TNC21MorningRun.

#MyTNC

From where will you join TNC21? In your home office and in the company of your pets? In your garden or veranda? In a coffee shop or a park? Do let us know. How?

All TNC21 participants are invited to share their experience of the conference with captions and photos of their locations and set up.

#TNC21 MorningRun

Continuing with the tradition of the TNC Morning Run the aim is to encourage participants to share their activity and create additional buzz around the conference.

Join runners, joggers and walkers in the traditional TNC21 morning runs, wherever in the world you are - it doesn't really need to be morning. Tell us about you, where you live and share the views you enjoy during your runs, jogs or walks.

With our social media campaigns, in the absence of physical contact and 'in real life' connections, we hope to encourage TNC regulars and novices to join in, connect, interact, fill that virtual void and feel part of the global TNC family.

Keynotes

Sue Black, Professor of Computer Science and Technology at Durham University in the UK in her keynote '*If I can do it, so can you*' will talk to us about her inspiring autobiographical story of one woman's determination, motivation and passion to succeed and how, against all odds, she became one of the top 50 women in tech in Europe.

Adam Lewis, Managing Director of the Digital Earth Africa Establishment Team from Australia, in his keynote '*Digital Earth Africa: Transformation powered by networks*' will present on how earth observation data can be used to inform crucial decision-making to improve lives and contribute towards a more sustainable future for the African continent.

Paulo Artaxo, Professor of Atmospheric Physics from the University of São Paulo in Brazil, in his keynote '*Climate Change research and policies: the urgency of international interdisciplinary collaboration*' will explain, through his experience as a member of the Intergovernmental Panel on Climate Change group, how international scientific cooperation is the only possible way to deal with the climate emergency.

Serge Fdida, Professor of Computer Science from the Sorbonne University in Paris in his keynote '*Digital transformation of research-intensive universities*' will highlight how crucial the digital transformation has become for academia across the world, and will analyse some of the most significant challenges and changes that universities should embrace in order to survive and thrive in the years to come.

Leila Dekkar · Rosanna Norman · Bouchra Rahim · Ena Ahmetbegovic · mayra corado · mgaya · Meeting Room 2 · hadia yaseen · Tom Fryer · Erik Huizer · Jumagul KTMU · Jamilur Rahman · Sara Halahleh · Mohamed Ali Ahmed (SomaliREN) · Besart Hajrizi · AUGUSTIN KANYIMBU · Deepthi Gunasekara · Audace Manirabona · Lensa Abera

News from the Emerging NREN Programme

The Emerging NREN Programme (ENP) aims to bring professionals from emerging NRENs to TNC and integrate them into the vibrant global R&E community.

Words: Rosanna Norman, GÉANT

Early in 2021 Emerging NRENs from around the world were invited to nominate representatives to take part in the programme and this year we are excited to welcome 19 participants from 17 different countries and territories.

All participants will take part in TNC21, supported by dedicated check-in coffee sessions, and morning sessions scheduled for each day of the conference to introduce the programme for that day. In addition, this year two of the participants have been selected for the Lightning Talk session that will take place on Friday 25 June.

Leila Dekkar, International Relations Project Manager for GÉANT, reminds us of the salient elements of this initiative: "The programme's objectives are simple and straightforward: to integrate emerging NRENs into the global R&E community by bringing them to TNC,

to encourage involvement from field operatives in preference to senior management and, in particular, to stimulate new synergies and stronger connections between individuals across different organisations and organisational levels."

Leila adds, "We are particularly pleased with the uptake of this initiative, hope that the community will keep reaping the benefits of this collaborative work, and are grateful to Jisc for their valuable contribution to this year's programme of events."

Pictures
Top: Emerging NREN Programme 2021 - Kick-off meeting

Bottom:
Leila Dekkar, International Relations Project Manager for GÉANT

Future Talent Programme – what's new?

The Future Talent Programme (FTP) gives the opportunity to students and young professionals from the R&E community to present their brilliant ideas in an engaging way, and provide them with the necessary skills to convey ideas and concepts confidently to a wide audience, such as that of TNC.

Words: Nadia Sluer and Rosanna Norman, GÉANT

Selected students for the Lightning Talks part of the FTP will be able to share their idea on this year's TNC virtual stage! Conrad Ekisa (HEAnet) will share an ingenious idea about combatting cyber-attacks on critical infrastructures, while Hanna Karpenka (BASNET) will take us on a journey to what may lead us to eternal life.

Conrad Ekisa said: "My supervisor introduced me to the FTP earlier this year and thought that this would be a great challenge for me. I had never heard about GÉANT, TNC or the FTP, so after some research I was soon convinced that this would be a good opportunity to showcase my work, but also to give some exposure to my research. It has been exciting to be part of an NREN community supporting academic research and I am very grateful for the opportunity offered by this programme."

Hanna, a brilliant young scientist from Belarus learned about the FTP when she participated in the EaPEC (Eastern Europe Partnership) Conference in Armenia in 2019. Then and there she decided to take part

because, as she explained: "As a young scientist I need to know how to introduce my work in the right way."

"The problem is that a lot of schools, especially engineering and technical schools, focus more on the content and not as much on its delivery. Being able to translate highly technical insights into language that everyone can understand and really get behind is paramount," FTP coach Michael Koenka explains.

Nadia Sluer, FTP coordinator from GÉANT adds: "This programme focuses on the appropriate type of training. We worked in a safe collaborative environment with the students and the coach. This helped the students to come up with better ideas for their presentations and help them to overcome doubts, shyness and fear." FTP participant Federico Mason (GARR) confirms: "The best thing about the training was the opportunity to interact with other participants with similar goals. It was very useful to give and receive advice on how to prepare and give a better presentation."

Picture
Top right:
Michael Koenka,
Koenka &
Partners

Future Talent showcases

All of the students' video presentations can be viewed on **https://learning.geant.org/future-talent-programme/**

Conrad Ekisa, Institute of Technology Carlow, HEAnet. A testbed to bridge the cybersecurity skills gap in industrial control systems

Hanna Karpenka, UIIP NASB, BASNET. Telomerase - eternal life or a panacea for all cancers?

Federico Mason, University of Padova, GARR. Ensuring High Reliability in Public Safety

Sara Raggiunto, Polytechnic University of Marche, GARR. Indoor Localisation service based on beacons: a system to save your life!

Anna Valeria Guglielmi, University of Padova, GARR. Biometrics-based scheme for public key agreement protocol in wireless body area networks

Coach: Michael Koenka, Koenka & Partners

Organiser: GÉANT Learning & Development (GLAD)

NRENs: HEAnet, UIIP NASB, BASNET, GARR

Let's hear it from the coach

How did you get involved with the FTP and what is your background?

I was approached by a dear friend of mine and of GÉANT's, Barbara Rogosky. Barbara and I worked quite closely in several international TED talks where our job was to help presenters deliver amazing groundbreaking ideas to wider audiences.

Building on my background in technology and working with some high-tech firms where I helped technology leaders to pitch and present their ideas to a larger audience was for me a natural fit with the FTP.

And as we can see, the students' output has been phenomenal. And not only that, I've had a brilliant time working with them. Whether it's framing the way they present their information, shaping the visual identity of their presentations, or even just giving them the confidence and rehearsal skills to be able to articulate their ideas in a way that's seamless and at the same time very true to who they really are as individuals.

Why do you think it's important to work with technical professionals from the R&E community?

Explaining technical information to a wider audience isn't always easy. Engineers and high performing individuals, such as those from the R&E world aren't really trained for this, nor are these kinds of opportunities on offer in higher education and universities.

At the same time, some of these ideas are so out there, so incredible and so dense in terms of the amount of specific knowledge they demand and their technical nature, that just giving a synopsis is enough to confuse anybody. Coming into the FTP allows us to assist young scientists and engineers on how to shape their content, share their vision on where they think the future lies, and empower them to share their ideas in a more engaging way.

What's your aim for the future talent students and how do you plan to achieve it?

Having fun is the first thing that I like to focus on. Secondly, creating a peer-to-peer feedback system where we get to share and collaborate and grow with each other. My main goal is to help my students move from a very engineering and fact-based heavy presentation to something that connects with people. In my experience what connects ideas with people the most is telling great stories.

Whether it's through helping them come up with stories, brainstorming ideas, refining and sharpening analogies and metaphors that we use, finding a real fun, engaging collaborative co-creating space is something that I love doing, and that's what I've sought to structure together with Nadia Sluer and the rest of the GÉANT Learning and Development team. I think we've created a beautiful system where we can encourage the creation and development of great stories that can take future technical leaders and experts to a podium that resounds with a wider audience. I think that's fun and quite beautiful really.

What would you say to students in this year's FTP programme?

It's a profound honour to work with some of these ideas, such as helping make it safer to leave emergency situations fast and efficiently to the discovery of unlocking the fountain of youth and empowering us to be able to live longer, healthier and more fulfilling lives. It's mindboggling! To be able to give the programme participants the skills to present these amazing ideas in a way that people really get behind, is profoundly moving for me. And so the first thing I would say to my students is 'thank you', thank you for letting me share what I know to help you share what you know. The second thing I would say is, 'ad Astra'. Keep reaching for the stars. Keep pushing yourself to come up with better and bigger ideas, pushing the limits of technology and making sure that other people like you have the skills, talents and capabilities to move the human endeavor even further in the future.

2021
GÉANT
Community
Award

2021 GÉANT Community Award – A constant force for good

This year's GÉANT Community Award panel unanimously chose the successful nominee in the category 'impactful contributors to the GÉANT project or wider community activities over a sustained period of time': Maria Isabel GandÍa from CSUC.

Words: Rosanna Norman, GÉANT

The award was presented as part of TNC21 by Klaas Wierenga, GÉANT Chief Information & Technology Officer who commented: "Maria Isabel has been a constant force for good in the GÉANT community for many years. Through her work in the Special Interest Group-Network Operation Centres (SIG-NOC) she has been a remarkable facilitator, educator, and community builder; she is one of the main reasons why this group remains one of the most active in the GÉANT Community Programme. She has also worked tirelessly to promote NREN interests in the RIPE community."

Claudio Allocchio, Chair of the GÉANT Community Committee added: "Let me add that Maria Isabel is also a very accomplished and experienced engineer whose involvement in the use of advanced networks in performing arts, such as net:art, has enabled revolutionary multi-site performance events. All the people who know her and work with her will agree that she is dedicated, modest, welcoming and very open, a great ambassador for the CSUC, RedIRIS and the GÉANT communities."

Accepting the award Maria Isabel said, "I feel so honoured and delighted because this recognition comes from the community, and I want to share it with the community. This award also

belongs to all the friends from the SIG-NOC, to its present and past steering committee members and to the GÉANT community at large. This community, through dedication, commitment, and creativity – often thinking outside the box – helps to improve people's lives by facilitating research, education and collaboration. This award also goes to the scientists, researchers and enthusiasts in the network and performing arts field, a subject so close to my heart. Being part of this wonderful community is such a privilege, let's keep working together! And lastly, I would like to share it with my family for their continuous and relentless support."

Watch Maria Isabel's acceptance video **here**.

About Maria Isabel

Maria Isabel is a network engineer who loves both the human and the technical side of networking. She has been collaborating with the SIG-NOC, since its inception, helping to make the community stronger through knowledge-sharing. Maria Isabel currently leads the Networking Department at CSUC and with her team she manages the Research and Education Network in Catalonia, Anella Científica, and the internet exchange, CATNIX. In the GÉANT (GN4-3) project she works, on behalf of RedIRIS, to foster the use of Orchestration, Automation and Virtualisation on the network (sharing the love of cats with one of the most cat-loving teams in the project!). As she believes that the engagement of women in technology has to start from childhood, she has mentored several teams of girls to enable them to present their technology projects.

More about the Community Award

With the Community Award, GÉANT honours people who have contributed significant ideas, time, and expertise to the development of the research and education networking community's collaborative achievements. This year's panel of judges comprised Andreas Dudler, Chair of the GÉANT Board, Claudio Allocchio, Chair of the GÉANT Community Committee, Sabine Jaume-Rajaonia Chair of TNC21 Programme Committee and Erik Huizer, CEO of GÉANT.

Vietsch Foundation awards the 2021 Medal of Honour to Laurel Haak

Laurel L. Haak, Founding Executive Director of ORCID, is the recipient of the 2021 Medal of Honour of the Vietsch Foundation.

Words: Rosanna Norman, GÉANT

The medal is awarded annually, with an award ceremony at TNC, to people who have made a contribution of lasting value to the research and development of advanced Internet technology aimed to support science, research and higher education.

In the spirit of the award, which recognises individuals who have proved their organisational skills and whose efforts have led to the creation of institutions or services of long-term value, the choice fell on Laurel as the best in a range of very qualified nominees. "Laurel led the development of ORCID from a concept to a global, community-led, non-profit service used by more than ten million researchers. ORCID IDs are now the essential foundation for research processes in and between institutions, funders, and publishers: enabling the creation,

testing, sharing, and finding of new knowledge," said Andrew Cormack, Member of the Board of Trustees of the Vietsch Foundation, explaining the rationale for the award.

Laurel currently is the Founder and CEO of Mighty Red Barn where her work centers on trust-building to foster communities, through practice areas of digital infrastructure and identity, governance and decision frameworks, product strategy and practice. She also serves as a volunteer mentor for the SCORE small business start-up programme.

Wikipedia page: **https://en.wikipedia.org/wiki/Laurel_Haak**

Watch Laurel's acceptance video **here**

About the Vietsch Foundation

The mission of the Vietsch Foundation is to promote research and development of advanced Internet technology for scientific research and higher education. The Vietsch Foundation fulfils its goals in two ways: First, it contributes funding to specific research and development projects that demonstrate potential value to progress European and global research and education networking. And second, each year it awards a medal of honour to people who have contributed to the development of services or technologies of lasting value that are used by the networking community and its users in research, development and education. The Foundation was created through the last will and testament of Willem Karel Vietsch (1952–2014), a Dutch expert, a leader of the international Internet community, and also the Secretary-General of TERENA, a former association of European national research and education networks. For details visit: **http://www.vietsch-foundation.org**

CONNECT Interview
Andreas Dudler

Andreas Dudler was elected Chair of the GÉANT Board in November 2020, after joining the Board for the first time in 2017. As he is welcoming the community to TNC21, CONNECT took the opportunity to get his views on the past four years, as well as what is next for our community.

Interview by: Laura Durnford, GÉANT

Why was the time right for you and for SWITCH in 2017 and 2020 for you to take on roles in the GÉANT Board?

GÉANT is important for higher education and research in Europe, and therefore for Switzerland too. In 2017, GÉANT was recently formed from the merger of DANTE and TERENA; there were important challenges for the future. That motivated me. By 2020, as a community, we already achieved a lot. We are now preparing a new EU framework agreement, which will integrate the strategic goals of GÉANT - an important foundation for our future work. And last, but not least: working in the GÉANT Board is an honour!

In 2017 you said our community should "be unafraid to change". Have we been unafraid enough?

The formation of GÉANT pursued the important goal of being stronger together. It was foreseeable that digitalisation of teaching and research would bring great challenges; the idea of approaching new things with courage but without fear referred to this. I think

we have done this. For example, the brand new GN4-3N project is building a new research network for Europe. We are tackling this with courage, and 100% EU funding shows that our community has built up a lot of trust there.

You said our community should become less dependent on EC funding and emphasised that Trust and Identity, Security and seamless access are key to providing true value to users, meaning that GÉANT and NRENs need integrated support with each other and other e-infrastructure projects. How has this been going?

Financial dependence on the EU is still there. But GÉANT has achieved a strong trust by the EU in our work and our importance for teaching and research. I experience this in every conversation with EU officials.

Trust and Identity, Security, seamless access for users, and

collaboration with other European e-Infrastructures are increasingly important. These elements are well positioned in the new GÉANT Association strategy. And strong support for the EOSC executive committee plus the ongoing EOSC association board contribution is a concrete success in e-infrastructure collaboration.

The 2021-2026 GÉANT Association strategy included input from NRENs and other stakeholders. What do you see as its most important elements and impacts?

We have succeeded in developing a common vision for the future of the GÉANT community. I am very pleased that we adopted the strategy unanimously, despite very different starting points of the various members. This consensus is, for me, of particular importance, as is the clear commitment "to collaborate and share knowledge to enable NRENs to improve their performance, both individually and collectively." This collaboration will impact every member and the GÉANT Association.

How do you see the community and GÉANT tackling challenges related to an ever-increasing demand for involvement in relatively new or expanding areas – for example with EuroHPC, Quantum, and international initiatives? How can NRENs balance being part of a strong and unified NREN community that meets these international challenges together and ensuring that they meet their local and cultural needs?

More requests are being made and this relates to the trust already mentioned. That is why it's important to tackle such challenges together and make the results available to all NRENs. Not that all NRENs have to be involved in all activities. We must not overestimate the possibilities of GÉANT. Concrete national implementation will generally remain the task of NRENs; GÉANT is committed to help NRENs to fulfil this role.

A major challenge facing us all is environmental change. What do you see as our responsibilities and opportunities for 'greening' our activities?

Part of GÉANT's innovation strategy is to "make ecological and climate sustainability a priority for all of its work, striving to be carbon neutral." This clear statement shows our responsibility in this matter. Operational implementation will have to be defined. Already clear is, the new network will substantially reduce electricity consumption. Our travel footprint will be another part. The past 12 months has shown what is possible in that sense.

If you could complete just one achievement with GÉANT in the rest of this year, what would you prioritise?

Completion of the new framework agreement with the EU. This will set the boundary conditions for the next seven years.

Reflecting on your career and time in our community, what makes you most proud?

My work in the GÉANT community started in 2012, when I took responsibility for SWITCH, the Swiss NREN. I joined the group that prepared the merger to create the GÉANT Association and I am proud that we foresaw upcoming challenges and worked towards new, well-functioning structures.

Andreas Dudler and the GÉANT Association strategy feature in the TNC21 Conference Opening (09:30-09:55 CEST) on Monday 21 June.

SWITCH: **www.switch.ch**

A closer look at the GÉANT Community Programme

CONNECT Magazine meets Claudio Allocchio, who chairs the GÉANT Community Committee (GCC), to talk about the Community Programme and how it benefits the wider R&E Community.

Interview by: Silvia Fiore, GÉANT

The GÉANT Community Programme (GCP) is a grassroots, voluntary initiative built by world experts from NRENs and beyond. Claudio, can you tell us in a nutshell who these experts are and how their work benefits the wider R&E community?

The R&E community is behind the very existence of NRENs and GÉANT. They live and thrive to help the community grow, bring together its members to experiment new cross-disciplinary solutions, and ultimately to deliver services. Indeed, this can only happen through a bottom-up, or grassroots, approach where experts from the NRENs and the community work closely together, exploring new ideas, going past the provider vs consumer mentality.

In the GCP, we gather technical experts, advanced users and researchers in Task Forces, Special Interest Groups, workshops, research initiatives, and forums, regardless of whether they come from an NREN, a university, or any other research or education institute. Not only do they work for their own institutions but, recognising the value of knowledge-sharing within the community, they are appointed as voluntary champions of their specific interest area and liaise with the rest of the community.

The GCP gives room to international collaborations across different disciplines, and also allows the community to steer the direction of their research.

Thinking of the GCP's biggest achievements, which project sticks in your mind and why?

eduroam is obviously the first that comes to mind. It perfectly explains how the Community Programme works nowadays: there is a problem to solve (roaming access to our networks), a tentative solution is brought up, a few experts from the community deploy a testbed, which then turns into a worldwide success!

But we have many more hidden gems. For example, our AAI (Authentication and Authorisation Infrastructure) system, which followed the same development process of eduroam, is now a must-have our institutions cannot survive without, as it helps us to have secure and privacy-compliant networks.

These may seem inventions for a niche market, but the GCP's achievements spread across numerous other fields. For example, the members of the Network Performing Arts Production Workshops (NPAPW) invented the most advanced multimedia real-time interaction services, making the case that NRENs are fundamental also outside the more scientific areas, and can have a leading role in the humanities as well. Similarly, the TF-EDU, the Task Force on Educational Technologies, has been playing a key role in the survival of educational systems during the COVID-19 pandemic! And the list goes on!

On the other hand, what do you see as the biggest challenges to bring the community together?

Our community is very large, and therefore not everyone is always aware of the activities that GÉANT and the NRENs carry out and what services they offer. Unfortunately, the community does not always realise that joining forces is the solution! The GCP has been trying to solve this visibility challenge by familiarising with the community's needs and involving all kinds of experts.

However, very often these experts have busy schedules and getting them to contribute on a voluntary basis can be tricky. And when collaboration is achieved, it is important to find a common language and ground, given the variety of the fields of expertise.

Funding is a challenge too. The GCP can sometimes help with funds – see for example the recent Innovation Programme, but the majority of the activities remain unfunded. In a short-sighted, but understandable, approach, management from NRENs and institutions often tends to prefer areas where funds are available. I think if more scientists played a managerial role in such institutions there would probably be a better understanding of the value of investing in activities for the community.

In February 2021, the GCC launched the Innovation Programme calling for innovative ideas from the GÉANT Community in need of funding. Could you give us a sneak preview of the brilliant ideas received so far?

Now that the first round of evaluations has just been finalised, we have seen that the community is very lively in different cross-disciplinary areas. It was really a challenge to select only a few out of the 20+ proposals received. Proposals range from multimedia-mediated new ways of interaction, adaptive security enhancements, improvements in using cloud services, to new ways to run a backbone network.

The second round of evaluations has started earlier this month and soon all the selected ideas will be displayed on the Innovation Programme webpage. We are positively impressed by, and so thankful for, the level of engagement from the Community!

Claudio, you are one of the founders of the Italian NREN GARR and have more than 35 years of experience working with NRENs. What keeps you motivated to serve this community every day?

When I started, most of today's NRENs were not even born yet. Instead, we had groups of users in need of network and services struggling to address their communities' needs. This is exactly why we needed the GCP! The community speaks to that much-needed feeling of mutual support and, in my opinion, is one of the few places where we still work to find solutions to real problems, and often succeed!

We do not invent a product and then look for customers to sell it. Instead, we create where there is a need, and seeing our users' productivity increase because we delivered exactly what they needed, makes my day, every day!

There is no boring routine at the GCP, even when you play a managerial role with more paper-based tasks. I feel very lucky to enjoy my job and be challenged every day, and this is for me one of the best rewards.

Read more about the GÉANT Community Programme and its activities **here**

35 years of European Research & Education Networking

On 13 June 2021 we celebrated the 35th anniversary since the establishment of RARE (later TERENA and then merged with DANTE to form the GÉANT Association) and the start of formal collaboration among European NRENs. On the occasion, we interviewed Dutch internet pioneer Kees Neggers, who was at the heart of the initiative since its beginning.

Interview by: Leonardo Marino, GÉANT

Kees, you played a key role in the birth of European Research and Education Networking. How did it all start?

In the early 80's, there was a growing need for international networking and the research communities of several disciplines already started their own network (HEPnet for the high-energy physics, SPAN for astronomy, etc.).

The first international network in Europe was EUnet[1], which was founded in 1982 and connected Unix computers. Then in 1984 IBM started to sponsor a project called EARN (European Academic and Research Network). That was my first international networking experience. Back then I worked at University of Nijmegen, which became the EARN node in the Netherlands and I was appointed Netherlands' member of the EARN Board of Directors.

To build the EARN network, IBM managed to convince national PTT (Postal, Telegraph, and Telephone service) authorities in Europe that researchers needed leased lines, rather than the dial-up lines in use, with the promise to give lines back within three years and upgrade to X.25.

Very rapidly EARN became a big success: it was proven technology, it worked instantly, and people could not do without it anymore. At the same time, no one in Europe wanted to rely on IBM or IBM protocols for either national or international networking. A different solution was needed, and governments and PTTs were quite keen to support activities towards an open infrastructure.

How did RARE originate and what was its purpose? What was your role in it throughout its history?

You could say RARE (Réseaux Associés pour la Recherche Européenne) started as a reaction to EARN, which was IBM-dominated. Additionally, computers were already connecting to each other, both nationally and internationally, but only the same-model computers could talk with each other.

We wanted to have an environment where everybody could speak to everybody via open standards. Even the big companies and PTTs supported it, because they realised that - in the end - they had to provide connectivity to all. The idea initially took shape in May 1985 at an informal workshop in Luxembourg.

At the time, in the Netherlands we were lagging behind. Particularly Germany, UK and the Nordics already had well established networking organisations. We wanted to step in and established the SURF project to provide plans for national networking.

To kick-start more international cooperation, I then received 100,000 ECU [*European Currency Unit, predecessor of Euro], from the SURF-project, soon matched by the European Commission. Within a year and thanks to those funds RARE was officially established, on 13 June 1986.

I was in the RARE executive for most of the first 15 years, then for the next 10 years still represented SURFnet in the General Assembly, and finally - after my retirement at SURFnet in 2012 - I became more of an interested observer.

RARE was also decisive in the "Protocol Wars" between OSI and IP standards. How did we end up with the current IP-based network?

The European governments strongly supported OSI over IP and – through the Eureka[1] organisation – had asked RARE in 1986 to start the COSINE project to define and design an OSI-based network, and then to start its implementation.

As part of COSINE, RARE had started a joint working group with EUnet, EARN and HEPnet to define a better transport infrastructure. This led to an agreement between the Commission and PTTs to deliver the International X.25 Interconnect (IXI), a pan-European private X.25 network based on 64Kbps leased lines to support the research community in Europe. Unfortunately, even before its start, we ran into infrastructural limits: we definitely needed more and different capacity! In May 1990 RARE, while still executing the COSINE Implementation Phase, expressed the need for support of a multiprotocol backbone service and NORDUnet had already decided to implement one.

Meanwhile, at SURFnet, together with the national PTT, we had started a 2Mbps multiprotocol pilot in 1991, which demonstrated that X.25 could not support more than 360 Kbps and showed that embedded X.25 was no longer a solution. As a result, we introduced a 2Mbps multiprotocol network in the Netherlands and initiated and sponsored a task force to plan for a European multiprotocol backbone. This resulted in Ebone, the first pan-European IP backbone which became operational in 1992. RARE provided administrative support and became the Ebone clearing house.

Although PTTs and governments formally only supported OSI initiatives, they understood the need and did not forbid Ebone, which we had presented as an interim multi-protocol activity that also included a pilot connectionless OSI service. Ebone was a major success and within a year COSINE and the Commission formally approved the next generation of European backbones to be multi-protocol.

Finally, in 1992 the predominance of IP led RARE to host the Réseaux IP Européens Network Coordination Centre (RIPE NCC), which later became a separate entity.

What would you say were RARE's main achievements?

RARE made the difference by being pragmatic, by listening to the users and involving them, by discovering and predicting their needs and matching them with our knowledge about technical possibilities. This was demonstrated again in 2001 by TERENA's support of GLIF, the Global Lambda Integrated Facility, when the Internet alone was no longer capable to support all the researchers needs.

Clearly the main achievements of RARE, then TERENA, and following the merger with DANTE now the GÉANT Association, are that they built and supported a community, established a close liaison with users, and that they were always open to users' input and to following up on users' initiatives.

A nice example of that is eduroam. At SURFnet, when Klaas Wierenga came to me and proposed the idea we immediately recognised that international scale was essential to make it a success, so I suggested him to first get support from TERENA. He did and today the whole world is using it!

Ebone, RIPE NCC, GLIF and eduroam were all bottom-up activities. This spirit was essential for RARE and for TERENA and it should remain the main spirit of GÉANT.

In 1994 RARE finally merged with EARN to form TERENA. What led to that decision?

In 1993 RARE had established DANTE as a professional organisation to secure the provisioning of pan-European services, so far provided by its CPMU (COSINE Project Management Unit), after the end of the COSINE implementation phase.

IP becoming dominant, EARN services were no longer needed and it became obvious that DANTE would take the role as pan-European NREN service provider. EARN and RARE so far had played several important and complementary roles, but it was useless to have them continuing as separate entities more or less providing the same services to the same community.

I was a linking pin between the two worlds, as the only person present from the beginning in both the RARE Board and the EARN General Assembly. This was helpful but also quite difficult, especially due to tensions during the Protocol Wars. Sometimes there were hostile environments, which were completely unneeded and unnecessary, as we had the same ultimate goals! The challenge was to find the cooperation and collaboration to do what was needed.

What were the main challenges and obstacles you encountered and how did you overcome them?

In the beginning there was a lack of infrastructure and a lack of support from PTTs and industry, all with their own private protocols. Then, due to the mismatch in needs and possibilities, it was very challenging to find consensus on what was possible internationally. Furthermore, there were too many discrepancies in the different governance structures. The TERENA General Assembly, the NREN PC (Project Committee for EC sponsored projects) and the DANTE Shareholders were – all in parallel – trying to control the European scene.

At my last TERENA assembly meeting in Reykjavik in 2012, a group was formed to solve these governance problems. Ultimately, the proposals from the Reykjavik Group led to the merger of TERENA and DANTE to create the GÉANT Association, in October 2014.

To summarise, the main challenges and obstacles were both external (Government policies and the monopoly of PTTs) and internal (the governance structures). My impression is that currently they are overcome, so in principle GÉANT's future now looks bright.

To conclude, how do you imagine the future of research and education networks?

Throughout the years, our organisations and NRENs were able to address the demand of our community, by developing services that were not yet available on the market. To do that, you need to be agile, adapt to the changing circumstances and grab opportunities. GÉANT needs to keep service provision at the front of what is possible, because that's what researchers will always need.

For the future I suggest keeping a close connection with the user base, looking for opportunities, understanding that what you provide today is not the ultimate solution and consistently reviewing the current system to improve it.

Finally, we have to be aware that the internet we have today has severe limits, as it was an interim solution from the start. The problems at its core need to be solved and the GÉANT community, which successfully introduced the current internet in Europe, should now take responsibility for providing its community with a better network, suited for the next 35 years.

1. EUnet provided communication between Unix systems on an operating system specific basis
2. Intergovernmental organisation for research and development funding and coordination http://www.eurekanetwork.org/

South Eastern Europe (SEE): perspective, opportunities, and challenges

Professor Anastas Mishev, Member of the Board of MARNET, talks about the opportunities and challenges that Research and Education Network (REN) organisations are currently facing in the SEE region. Anastas analyses the steps being undertaken to bridge the digital divide between SEE and the rest of Europe and shares his hopes for the future of R&E in this part of the world.

Interview by: Rosanna Norman, GÉANT

Anastas, could you give our readers a brief overview of the RENs that make up the SEE region? Which major R&E projects and funding initiatives are benefitting SEE?

In the last several years GÉANT has been strongly engaged with RENs in the SEE region. Through its SEE Forum, a platform gathering representatives from the RENs in Albania, Greece, North Macedonia, Serbia, Montenegro, Kosovo*, Cyprus, Turkey, Bulgaria, and Hungary, it facilitates discussion and collaboration on the common challenges shared by these organisations.

The heterogeneous nature of these RENs makes this forum even more useful, since the more developed organisations, such as GRNET, KIFU, or ULAKBIM are able to share their valuable experience with the smaller

ones, such as CYNET, MARNET, RASH, BREN, or MREN, or with those that are at embryo stage like the Kosovo* Research & Education Network, KREN.

For instance, Bosnia and Herzegovina, the only European country that has not yet established an REN, has been very active in the SEE Forum drawing experience and receiving support toward the establishment of a national network.

principal one. Through projects such as NI4OS-Europe, most of the SEE countries are trying to identify their relevant EOSC services and offer them to the wider research community, as well as to develop policies that will strengthen the role of Open Science at a domestic level.

To support their development, some of the RENs, like KREN most recently, use alternative funding mechanisms such as the World Bank. KREN was established and equipped through the KODE project, with the objective to improve access to better quality and high-speed broadband services in Kosovo*. Similar steps are being taken by RASH with the Western Balkan Investment Fund, aiming to build a national and regional networking infrastructure capable of connecting the regional HPC centres.

What are the major opportunities for SEE on the horizon?

The GÉANT SEE Forum has become a valuable platform for the exchange of ideas and mutual support for RENs in the region. The more developed RENs keep sharing their experience and offer practical help to the developing and smaller RENs in the region, building and strengthening the human connections on top of the data network.

GÉANT-led projects are among the most vital sources of additional funding for all RENs in the SEE region, since all of these RENs use state-funding models and face huge challenges in personnel retention and the overall recruitment process.

The RENs and their constituents are also collaborating on other important matters for the academic community, with Open Science currently being the

There are high expectations that the GN4-3N project will strengthen the academic networking infrastructure in the SEE region, especially for the smaller and less developed RENs as this will enable a further step in the effort to close the digital divide that exists not only within SEE, but also between the region and the rest of Europe.

What are the main challenges and obstacles faced by RENs in this part of Europe?

RENs in the SEE region, although different in size and development, share a great deal of challenges. Most of the SEE countries experience strong political influences at REN management level, with governments either directly appointing directors or exercising strong influence through the elected board. This can be considered a very limiting factor for the development of RENs as crucial providers laying the foundation not only for the digitalisation of R&E, but of society in general.

Another limiting factor for the further development of the SEE RENs is their position withing the state administration. Most of the RENs are state agencies, with their employees being public servants. This affects the remuneration, especially of the highly trained technical staff earning salaries considerably lower

than those offered by the private sector for the same qualifications. On the other side, very few of the SEE RENs are actively involved in the national research and innovation development processes. A contrasting example is GRNET, which thanks to recent legislative changes, has become a leading institution driving the Greek e-Government advancements.

Could you tell us about your plans for the forthcoming 2021 SEE User Forum and your objectives for this first conference?

Due to the COVID-19 pandemic, plans for a big SEE regional event had to be postponed. I am delighted to announce that a GÉANT-organised 2021 SEE User Forum will take place on 3-4 November 2021, from 10:00 -13:00 CET, and it will be a virtual event. The forum, which will be supported by regional and pan-European EOSC-related projects such as NI4OS-Europe and EOSC Future, has the goal to showcase Open Science services and user engagement along with users' technical challenges, their needs for these services, and how GÉANT can help address such needs through the SEE Forum. I strongly believe that this will further emphasise the important role of RENs as key EOSC enablers and supporters.

*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

CONNECT Interview:
Professor Sue Black

CONNECT meets Professor Sue Black, one of the top 50 women in tech in Europe and TNC21's first keynote speaker. Professor Black talked us through her inspiring personal story, about her passion for technology, and the importance to fill the gender gap for women in STEM.

Interview by: Rosanna Norman, GÉANT

Professor Black, what did you know about GÉANT and were you familiar with our flagship conference TNC?

I was not familiar with GÉANT, and I had never heard about your conference, but I am now very intrigued by the Research & Education community and the areas in which GÉANT operates. I am always excited to meet and talk to new audiences and look forward to presenting at TNC21.

In your TNC21 keynote "If I can do it, so can you" you tell the inspiring and motivating autobiographical story of one woman's determination to succeed. Could you share the highlights of your talk?

I come from an average family, but life changed drastically for me after losing my mum when I was a child. My family transitioned from functional to dysfunctional, I left school at 16 and ended up getting married quite young. Unfortunately, my circumstances became worse when, in my early twenties, I had to move to a women's refuge with my three children.

Most of my talk is indeed about the time after these events because gradually, whilst trying to create a better life for my children, I ended up creating a better life for myself. I went back into education and enrolled at a local college, my studies led to a degree in computing, and as my passion for technology grew, I completed a PhD in software engineering and stayed in academia. In my keynote I also talk about how 23 years ago, during my PhD, I set up the first UK online network for women in technology.

Why? Most of the academic conferences in computer science I attended had a 90% male participation, I often felt isolated and excluded until I took part in a brilliant conference for women in science in Brussels. To be surrounded by dozens of like-minded women passionate about science and technology felt like a party: when you are in the majority life is undeniably easier! That event was a turning point as it made me realise the power of women's networks. In our society girls are brought up to give priority to the needs of those around them, and I am convinced that this approach has detrimental effects on our understanding of how to behave in the workplace and ultimately on our mental health.

As a technology evangelist, based on your experience and knowledge, what do you think can be done to fill the gender gap for women in STEM?

Not just one thing. Lots of different things. It is linked to the way in which our society sees women. It's about what we can do as individuals and organisations to embrace a more inclusive culture. Our history shows how women haven't been treated as equals and this is accepted and ingrained in our society and our way of thinking, but events such as the #metoo movement started to help us all to see more clearly. It is not about a gender war, women vs men, it's beyond that, it's about equality and equity which are fundamental human rights.

For instance, at Durham University academic applicants are required to write a diversity and inclusion statement which is a decisive factor in the recruitment process. A small but significant step in the right direction. And I can say that I have witnessed some changes in the last twenty years and the existence of hundreds of active women in tech groups are the living proof.

What tips would you give to a girl who is unsure about pursuing a career in STEM when self-belief and self-determination are in need of a boost?

Find other girls who feel the same way as you, find other people who understand your viewpoint and are ready to support you. Work together, support each other, find mentors and people who are ahead of you on the path you have chosen and can guide you along the way. It is not always easy to find your path, but the availability of people who are ready to support you will put you in a much stronger position. Social media and the internet are also great enablers of support networks, mentorships and collaborations.

What's around the corner for Sue Black?

In 2019 at Durham University, we launched the TechUPWomen programme which aims to create pathways in tech careers for women with degrees, from minority groups.

For years companies have been asking us for advice on how to employ more women in technical roles, sharing with us their struggle in the search for the right candidates. TechUPWomen aims to be that link to fill that gap, whilst supporting women graduates who have the ambition and the potential, but just don't know how to get into tech.

Working with 15 industry partners to create a training programme tailored to industry needs we identified four target roles: software developer, agile project manager, business analyst and data scientist. The TechUPWomen participants (with degrees in any subject area including music, medieval literature, and geography) go through a six-month online programme at the end of which they are able to apply for one of these four roles.

Our most recent programme took 100 women from underrepresented communities in North England, retrained them, gave them the opportunity to interview with a company, and over 50 of them now have jobs in tech.

I am currently looking for funding and partners to scale TechUPWomen as I would like to run it internationally in Kenya, India, Nigeria and Pakistan. We know that the programme works, this is why we are very keen to scale it. These are the challenges I enjoy, I love solving problems that haven't yet been addressed, and thrive in the solution-finding process.

CONNECT Interview:
Gitte Kudsk

On 1 January 2021, Gitte Julin Kudsk became CEO of DeiC (Danish e-infrastructure Cooperation). She has worked with digital infrastructure since 2000, when she started as a project manager in UNI-C, which became part of DeiC in its establishment in 2012. As the head of secretariat and communications, Gitte was very active in NORDUnet and GÉANT activities and well versed in the Danish ministerial and political landscape. Half a year into her new role, we asked about her goals for DeiC and its relationship with the GÉANT community.

Interview by: Laura Durnford, GÉANT

What qualities and experiences do you bring to the role of DeiC CEO, and to DeiC's national and international activities?

Internationally it's my network; I've been around for many years, and I know a lot of people. Nationally, I've spent a long time talking with universities and know how they organise themselves in the e-infrastructure area. As head of secretariat, I had an important role in the strategic planning towards the new DeiC, which will be the 'place' where the universities actively collaborate. I really appreciate collaboration. My ability to involve people and organise this is very important.

"The new DeiC" - what is the plan?

Today DeiC is a virtual organisation, with everybody employed at the Technical University in Lyngby. We are going to be a company owned by the universities. The DeiC name will stay, but the 'C' will become 'Consortium'. Operation of the network will stay at the TU, but the networking, data management, and high-performance computing services will be offered through DeiC. We will need our own staff to follow international developments, as well as have knowledge of the infrastructures, but we will be no more than 20 people. It's now my responsibility to create this new company.

What will this change mean for DeiC's international relationships?

The strategy stated that Denmark would be more active internationally and this is in DeiC's mandate. As DeiC will be small, we will need the Danish universities to be more active also, which is quite new. The relationship between DeiC and the TU will remain close and we will be able to represent each other internationally, but DeiC will stay as the official Danish representative in GÉANT.

What are your top three priorities for the coming year?

Of course, one is to get the new organisation established and acting according to the national strategy. COVID-19 hasn't been helping and a lot of people have been anxious about the future.

We will ensure we have synergies between national and international developments, with DeiC being active where possible and keeping the universities involved.

We will also get more involved in EOSC and EuroHPC activities. That doesn't mean we forget about GÉANT - we are quite involved in GÉANT already and that will continue.

You have participated in GÉANT Community Programme working groups over the years. What do you see as the benefits of those?

I have been both a long-term member and a chair of the marketing communications group SIG-Marcomms. I was also in the NORDUnet communications team. The main benefits are getting to know people, and understanding the differing ways that people and NRENs in different countries view infrastructures and how to use them. But also, that we mainly have the same challenges and goals. And that the same kind of diversity exists among the universities within each country too. These are the important lessons I can use now in DeiC's national and international relationships.

More broadly, what are your views about the benefits of GÉANT membership?

Collaboration inside GÉANT is very important - the way we work together to achieve common goals. Having all the countries represented means that decisions are based on a broad range of views, cultures, and backgrounds. Any country negotiating alone at EU level would have only its own perspective to rely on, but being part of this community opens your eyes to other perspectives, which can make you stronger. And sometimes it's good to look not only at what seems important for you, but also for a majority of countries. Through NORDUnet we have one Nordic voice in GÉANT, and GÉANT does the same in having a European R&E networking community voice towards the EU. Collaboration is very important and GÉANT is the place to do that.

What would you like readers to know about you more personally? Surprise us!

I think I'm not a very surprising person! What might surprise some though, is I have a very strong heart in the Scout community and spend a lot of spare time in that world. In the Scouts, collaboration is very important; you are not just yourself, but are part of a team. A lot of the way I do things as a manager comes from the tools I've learned in the Scouting movement.

Learn more about DeiC at
https://deic.dk/

2021-2026
GÉANT Association Strategy

The GÉANT Association is the collaboration of European National Research and Education Networks (NRENs).

Together, we deliver an information ecosystem of infrastructures and services to advance research, education, and innovation on a global scale.

Vision
To collaborate to deliver the infrastructures and services that enable the R&E community to excel.

Mission
To empower R&E with an open, innovative, and trusted information ecosystem.

Ambition
To address and anticipate the needs of the R&E community by offering sustainable, open, innovative and trusted infrastructures and services.

To be a trusted and preferred-choice partner to the benefit of the European R&E community.

To collaborate and share knowledge to enable NRENs to improve their performance, both individually and collectively.

GÉANT Association publishes strategy for 2021-2026

Following extensive consultation and discussion with GÉANT Association members, and subsequent approval by the GÉANT General Assembly (GA) the GÉANT Association strategy for 2021-2026 has been published. The strategy is based around eight key strategic goals and aims to frame the activities undertaken under the umbrella of the GÉANT Association collaboration.

On Monday 21 June, at the TNC21 Conference Opening (09:30-09:55 CEST), GÉANT's Erik Huizer and Cathrin Stöver discuss the strategy and what it means for the community.

The strategy documents are **available here**.

The GÉANT Association is driven by Eight Strategic Goals

Network
We are the trusted partner for pan-European and global advanced R&E networking.

Security
We provide a safe and secure information ecosystem for researchers, educators, and students.

Innovation
We continually evolve key infrastructures, innovate, and develop new services in order to fulfil the needs of the R&E community in a sustainable way.

Community
We are acknowledged worldwide as a leader for developing and supporting R&E networking communities, and global REN development.

European Union
We are seen by the EU as an indispensable partner for their vision.

Stakeholders
We forge relationships with other e-infrastructure providers, research infrastructures (RIs), and other stakeholders, to benefit the R&E community.

Governance
We have a governance structure that is agile and benefits from the diversity of our membership.

Funding
We will ensure financial sustainability to benefit our members.

T&I @ TNC21

Supporting global collaboration for Research and Education

The past 18 months have demonstrated both the need for global collaboration and also the power that it can bring to both distributed learning and advanced research. From federated access to online courses and classes, to the ability of researchers to access genome data from around the world, AAI services are a vital tool for R&E.

At TNC21, Trust and Identity services will be covered in-depth across a number of sessions including:

Words: Karl Meyer, GÉANT

Connecting services, building trust and empowering students on mobility

(Monday 21 June, 10-10:40 CEST)

The procedures that allow European higher education institutions to exchange student mobility data remain largely paper-based, making students dependent on a number of accounts and documents to apply for mobility. As more students go abroad and with an increasingly interconnected world, Erasmus needs to evolve to align with the European leaders' vision of a European Education Area by 2025 - no borders to student mobility.

MyAcademicID delivered an Identity and Access Management Platform and defined an eID scheme for higher education that allows students to consistently and reliably authenticate to online Erasmus services and are an important step forward towards the digital transformation of Erasmus programmes.

eduTEAMS turns 3: from demo to solution

(Tuesday 22 June, 10-10:40 CEST)

eduTEAMS was first presented at TNC18. Three years later, eduTEAMS is enabling thousands of researchers and students to access R&E services across Europe. In this session, we recount a journey that started at TNC18: a journey in delivering large-scale, production Identity and Access

How changing the IdP discovery process impacts remote access to scholarly content

(Tuesday 22 June, 15-15:40 CEST)

SeamlessAccess started its rollout just as COVID-19 began to impact our world. What was anticipated as a soft launch suddenly saw a new level of urgency to enable federated identity to access scholarly content. Dependency on Federated Identity Management (FIM) is creating a demand from all stakeholders to improve online access in a way that's intuitive to the end-user and still protects their privacy.

This session looks at how FIM access models have significantly changed in 2020, from the SP, Library, and Federation Operator perspectives.

Running a cloud identity provider platform — technology is the easy part

(Wednesday 23 June, 10-10:40 CEST)

The Australian Access Federation (AAF) began building a cloud identity provider (IdP) platform in 2016. This followed repeated requests from Australian universities as they adopted cloud infrastructure strategies.

The resulting platform, Rapid Identity Provider, now has significant adoption across AAF's subscribers. This session provides an overview of the architecture and covers the major product and commercial challenges we've faced in making the service sustainable.

Establishment of new identity federations in Africa: the AfricaConnect3 perspective

(Wednesday 23 June, 15-15:40 CEST)

Establishing new Identity Federations in Africa presents challenges the African RRENs – ASREN, Ubuntunet and WACREN – have decided to tackle. To support the NRENs and their communities, they are focusing on actions aimed at boosting new identity federations. This presentation provides a view of the current situation, the goals and ongoing activities driven by AfricaConnect3 in the process of establishing of new identity federations.

The evolution of eduroam

(Thursday 24 June, 15-15:40 CEST)

eduroam is deployed across thousands of R&E organisations in over 100 countries and serves billions of roaming end-user authentications each year.

The session provides an overview of the major milestones in eduroam's development over time, along with a deeper look at recent enhancements.

For more information visit
tnc21.geant.org

Welcome BRIAN: (Backbone Router Interface ANalytics)

To help network managers and planners more easily access, edit, and share traffic data from the GÉANT network, a new solution has been architected by GÉANT's software development team based on a suite of mostly open-source applications.

Words: Erik Reid, GÉANT

BRIAN (Backbone Router Interface Analytics) is a framework that aims to help the whole community by reproducing the functionalities of Cacti (the classic network monitoring and visualisation programme) while providing convenient and direct access for a wider range of data consumers such as Grafana, Tableau or external parties. BRIAN decouples data collection, storage and visualisation, using modern off-the-shelf technologies wherever possible, allowing network managers and planners to use the data in new ways as they see fit.

InfluxDB, which is supported almost universally by programming languages and data rendering frameworks, was selected as the back-end data storage technology. This is in stark contrast to the inconvenient and lossy RRD-based (Round Robin Database) storage format used with Cacti.

The visualisation experience, also previously provided by Cacti, is being mostly replaced by a Grafana front-end. Grafana is a widely used tool, familiar to networking and IT experts and benefits from regular development and active support.

> **"We've been relying on bespoke, complex tools for many years. BRIAN brings together a suite of tools that fully automates our network analytics."**
>
> Keith Slater, GÉANT Service Manager and BRIAN product owner

Do not miss the presentation on the Life of BRIAN at TNC21 on June 22: **https://tnc21.geant. org/presentations/#s474**

To learn more about BRIAN and see the real-time data on the GÉANT network, visit **brian.geant.org**

While BRIAN was being developed in 2020 and in the early months of 2021, GÉANT Operations has been simultaneously migrating from OpsDB to a new inventory system: VC4's IMS. While this added an element of risk to an already complex task, it also gave the opportunity to leverage this migration and further decouple the new reporting framework from low-level network access. The result is a data-driven system, automatically reflecting and visualising as far as possible the current network topology, rather than being maintained manually and being at risk from user error.

While the GÉANT network backbone is now fully monitored by BRIAN, there remain a few services that are still monitored only by custom configurations in Cacti. Following BRIAN's launch to the community in April 2021, the priority is now to address this and fully decommission Cacti.

Picture
BRIAN screenshot: aggregate GWS ingress as of June 3rd 12.20pm

New GN4-3N network rollout continues

Fibre
Fibre or Spectrum
Connected Regional Network
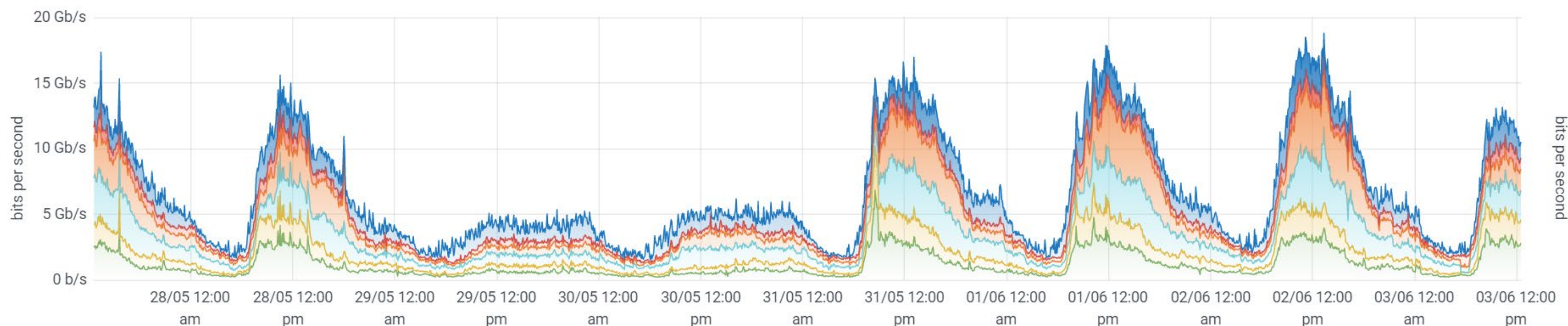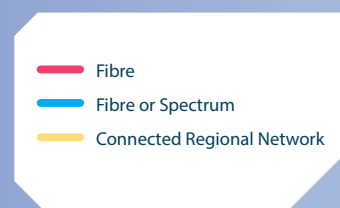
The EC-funded GÉANT (GN4-3N) network rollout continues apace, despite ongoing challenges including a global pandemic (see last issue) and more recently a global semiconductor shortage threatening equipment deliveries worldwide! However, the unwavering efforts and commitment of the GN4-3N project team, GÉANT's network implementation team, our NREN partners, and our close partner suppliers, means disruption to the project schedule has been minimised.

Words: Paul Maurice, GÉANT

At the time of writing in June 2021:

- Seven routes fully deployed with end-to-end testing completed.
- Eight routes currently being deployed.
- Six routes are currently in the connectivity delivery phase.
- Nine routes are in the response evaluation or contract finalisation stage.
- Five routes are in the active tendering phase.

To date over 140 nodes have been deployed, and over 8,000km of dark fibre lit, with the longest route so far (Madrid to Marseille) measuring 1,387km!

At the most recent NIAC (Network Infrastructure Advisory Committee) meeting, discussions centred on the final stages of the project and the potential to make further improvements and network extensions outside of the original project scope. Watch for updates in future CONNECT issues.

And the GN4-3N project team now look forward to the first service migrations onto the new network, expected in the Iberian Peninsula in June.

Less power, bigger network

A key factor in the design and procurement stages was how to ensure the new network could play its part in supporting the European Green Deal. Thanks to extensive analysis and continuous modelling, the project is continuing to invest in the most efficient technologies, which will lead to significantly reduced power consumption across the network.

We will report on this in the next issue of CONNECT.

Picture
Illustrative map showing planned fibre

How NRENs are keeping musicians and artists connected

The COVID-19 pandemic has drastically changed music performance as we know it, with musicians and artists having to adjust to performing arts through a screen. In this context, NRENs have had a vital role in strengthening the community despite the difficulties posed by the switch to online learning and performing. Together, they have successfully been responding to the various lockdowns with new and innovative services for artists, musicians, and students.

On 27-28 April, the community gathered online for the 2021 edition of the Network for Performing Arts Production Workshop (NPAPW), a free event where experts exchanged experiences and lessons learned after more than a year without live concerts. Attendees from NRENs and other institutions from Europe and beyond met online to discuss and assess new ways for musicians to rehearse and perform collaboratively online. We asked several attendees to describe their experiences, and how they have contributed to the success of the global arts & humanities community in what has been a very challenging time.

Picture
One of the online "Quarantine Sessions" organised by the Center for Computer Research in Music and Acoustics at Stanford University. The concerts were broadcasted live with artists performing from around the world.

Domenico Vicinanza, Coordinator for the Arts and Humanities for GÉANT

"GÉANT and Internet2 have a long tradition of working with the arts & humanities community, introducing, supporting, and coordinating the development and adoption of advanced network technologies in this fascinating field. NPAPW is an annual gathering of technologists, network experts, performing artists, faculty members and students. Historically it has focused on innovative technologies in the performing arts that utilise advanced networks provisioned by Internet2, GÉANT, and partners across the globe. This year's workshop explored emerging solutions and lessons learned during 2020, including the transition to substantial reliance on home broadband connections. It was presented in a virtual, condensed format, with interactive demonstrations, tutorials, and panels, and will be followed by a series of webinars offered throughout 2021 focusing on advanced networked technologies enabling master classes, remote auditions, and multisite performances."

Bartlomiej Idzikowski, Poznan Supercomputing and Networking Center (PSNC)

"PSNC started supporting artistic communities already at the very beginning of the pandemic, thanks to the available equipment and our team's broadcasting experience. A spectacle at Teatr Nowy, one of the most famous Polish theatres, was transmitted in less than 32 hours after the official closure of theatres was announced. It was the very first time, since the outbreak, that an event was live streamed in alternative to a regular performance, here in Poland. After that, tens of other performances were prepared and delivered via Internet both live and pre-recorded: theatre productions, live concerts, video clips, festivals, and films. eduMEET played an important role in many of these events, as an easy and reliable tool for remote participation and artistic collaborations. Other dedicated tools were also developed, such as Concert Machine - an open web instrument intended to inspire composers and listeners, as well as to provide a telematic experience to the audience."

Maria Isabel Gandia, Consorci de Serveis Universitaris de Catalunya (CSUC)

"Organising remote performances through advanced networks during the pandemic has been complicated, to say the least. The network was already in place, but almost everybody was at home using their own internet connections. Despite the difficulties, artists reinvented themselves and countless amazing initiatives, colorful performances and home concerts have been carried out in these last months. Before COVID-19, we used to receive queries about remote collaborations from time to time and we helped with some of them. In the last few months, the questions have increased considerably, not only for big productions, but also for small collaborations of musicians who miss playing together live. As a Research and Education Network, we are here to support them and strive to provide them with the best tools and collaboration options."

Claudio Allocchio, Consortium GARR

"GARR, together with Internet2, has been pioneering the support for the arts and humanities users for more than 20 years now. So, when in 2020 everything suddenly moved online, we were the immediate reference for a vast community of worldwide users seeking help. Queries about online teaching tools flooded our support services, both for LoLa and for the SWING projects, which were already in place before the pandemic. Our support teams became a worldwide 'helpdesk' for the community. We also started to work with eduMEET to create a profile for music education (now ready to be released as "HiFimode") and accelerated the development of 'how to' resources in the SWING project, making them more versatile and user friendly. We teamed up with many educators to help them experiment different ways of teaching music and arts online. We are proud of the feedback received from the users, and always work to improve our services. Many more in the community are now aware that networks have also a key role in arts and humanities education!"

Mårten Frojdo, Remote North – Nordic Centre for Digital Presence (NCDP)

"Remote North NCDP is a network which has developed a method for low latency two-way communication. The network consists of around a hundred culture schools, theaters, universities, organisations in the performing arts and the creative industries in the Nordics. The active network stretches from Tammerfors, Helsinki and Åbo in Finland (incl. the autonomous Aland islands) to Stockholm, Hallunda, Norsborg, Falun in Sweden and the cities of Lillehammer and Hamar in Norway. Recently, Coventry University in the UK has joined the network as well. In 2021 our goal is to include six new regions between Norway, Sweden and Finland on the 62-63 latitudes to the culture network. Thanks to the NRENs and the regional networks we have been able to share music and performing arts experiences during the pandemic despite tough travel restrictions. This shows how extremely important the networks are in supporting the new normal where artists, audiences and researchers need to congregate in this hybrid of physical and virtual presence."

Sven Ubik, Czech National Research and Education Network (CESNET)

"The objectives of the work in the NPAPW community, supporting distance collaboration in live culture, are not directly related to the COVID-19 pandemic. However, due to the pandemic situation, the interest in distance learning and collaboration in live culture has naturally increased. CESNET has supported several online music events. We used a combination of low-latency MVTP technology and several other technologies according to local conditions and latency requirements. An example is a concert against totalism, organised traditionally on the anniversary of the Velvet Revolution in the Czech Republic on November 17. In 2020, the concert took place online. Another example is a series of online concerts Music Without Borders, organised by the Bohuslav Martinů Foundation, aimed to support Doctors Without Borders, which helped in the epicenters of the COVID-19 outbreaks, and to bring the music of leading musicians to listeners in this difficult time."

Miloš Liška, Czech National Research and Education Network (CESNET)

"The pandemic and consequent lockdowns isolated artists all around the world and forced them to rehearse and perform at home. The shift towards home networks led to new and non-traditional tools for networked performing, such as eduMEET. At CESNET we have supported a couple of local jazz bands using the proven combination of JackTrip and UltraGrid. The expected obstacle was actually using these tools in connection with home networks. Their bandwidth was sufficient for the deployment of both technologies, but the users were struggling with Native Address Translation (NAT) and Firewalls. The pandemic has provided an unexpected extra motivation to develop new technologies to overcome the obstacles of relying on home broadband connections. UltraGrid is no exception in this sense. Its next version will bring a new NAT traversal functionality, a new mode for multipoint audiovisual transmissions and hopefully even better resiliency under adverse networking conditions."

For more information about the NPAPW21 and to watch the recordings of the tutorials, visit **https://npapws.org/virtual-npapw21/**

Trusted communities for greater cybersecurity

Trusted communities are the lifeblood of cybersecurity, even when they work in the background, and they are vital to effectively keeping attackers at bay.

Words: Frank Herberg, Head of SWITCH-CERT Commercial Sectors

SWITCH

In 1988, one of the first pieces of computer malware – named the Morris worm after its developer – incapacitated a large share of the internet. This development gave birth to the idea of responding to future online security incidents with Computer Emergency Response Teams (CERTs). These teams of computer experts would be deployed whenever someone caused trouble on the internet and the resulting damage needed to be contained as quickly as possible.

But the teams of IT security experts soon realised that there was often a limit to what they could do on their own. The CERTs had to network with one another so they could coordinate countermeasures to attacks that crossed national borders. Another key factor was also that each team of specialists needed to learn about new security incidents from other groups as quickly as possible so it could efficiently protect its own infrastructure. The global Forum of Incident Response and Security Teams (FIRST) was established in 1990 for this very purpose. Its goal was to enable and encourage exchange between CERTs around the world through networking, communication, building trust and cooperation.

Now, over three decades later, the threat situation has fundamentally changed. The damage caused by cybercrime is growing every year, with global damage estimated at $1 trillion for 2020 alone. What might be a lucrative business field for attackers is a growing challenge for IT security experts, which is why the issue of trusted communities has become all the more important. The reasons are the same as they were 30 years ago: CERTs need to learn from one another quickly and work together efficiently whenever an incident occurs.

A few examples of trusted communities:

- Sector-specific CERTs: SWITCH operates sector-specific CERTs with trusted communities for Swiss universities, banks, industry and logistics, as well as the energy sector. The parties involved have known one another for many years and openly exchange detailed information about the latest security incidents in the sector in regular teleconferences and meetings.
- Security researchers: Modern malware and the infrastructure behind it have become very complex. No individual working alone could ever capture all the active families of malware. Today's experts can only succeed by working closely together on a global scale in confidential, closed 'lists'. This requires them to maintain an excellent reputation and an active presence over the years.

- CERT forums: CERTs often organise themselves into geographical and sector-specific forums. Here, too, the focus is on exchanging information about – and cooperating during – acute security incidents. During FIRST conferences, CERTs with the same sector-specific problems arrange themselves into smaller groups, facilitating closer exchange. Clear rules and active involvement are vital here too.

As different as trusted communities are, the basic rules for success always remain the same: participants need to make themselves personally known and get involved in the group. And information must only be used under the agreed conditions. What's more, many of these communities aren't open to the public, and admission is often by invitation only following a security check. And just like anything else in life, trust is something that takes time to build up, but it can be destroyed in an instant.

Frank Herberg has been working for SWITCH since 2012 and, as Head of SWITCH-CERT (Commercial Sectors), he is responsible for the Banking, Industry & Logistics and Energy customer sectors.
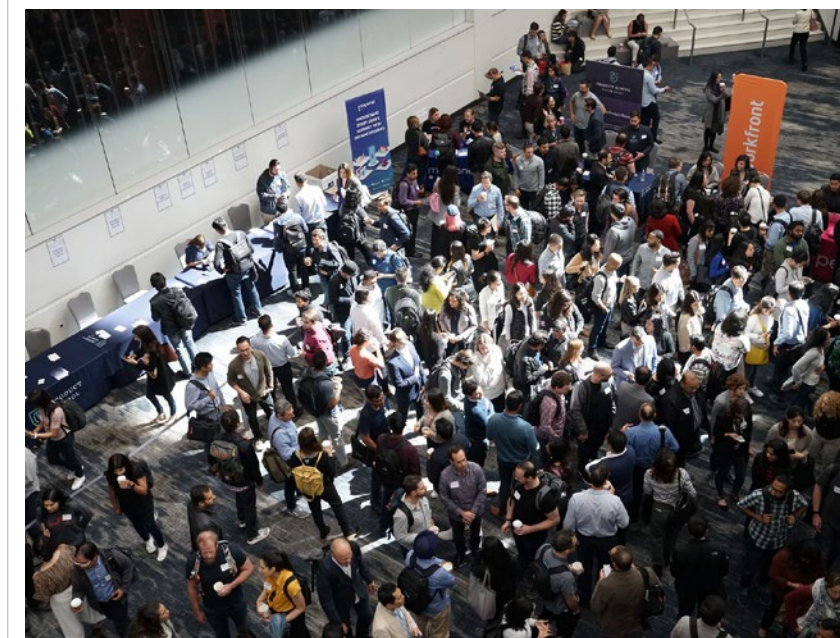
An audio-only social network for the educational & research community.

Audioroam:
A Clubhouse & Twitter Spaces for Educators and Academia

Grassroots Approach and Authenticity Guaranteed

CARNET, the Croatian Academic and Research Network, is developing a new audio social media platform, Audioroam, aimed specifically at the global academic & research community. Audio social media networks represent the latest trend in social media networking as voice seems to contribute to greater intimacy, focus & the development of collective intelligence. Many big players have taken a seat in this new trend: in addition to the already developed Clubhouse, Twitter Spaces is in the early phase, while Facebook & Reddit are developing their own versions.

Words: CARNET

The new audio-only based platform that CARNET is developing will enable its users - the educational & research community - to disseminate their ideas and form networks. After the piloting phase, the platform model, if proven successful, will be extended to the global community. Similar to the existing cutting-edge platforms (the Clubhouse and Twitter Spaces), the Audioroam platform will have a built-in regulation system as to who can speak and who can listen - the organising hosts will be able to manage these features according to their preferences. These "audiosnaps" will be provided in the form of speech acts typical of the educational & research community: classroom dialogue, panel & lecture etc. All events will be listed and searchable via key words directly in the search engine.

The name Audioroam does not accidentally evoke eduroam, one of the most impactful services developed by the GÉANT community. eduroam's LDAP authentication system will be behind identity verification, meaning that all Audioroam users' identities would be authenticated and verified, giving it an edge over the other platforms noted above, as their anonymity and uncontrolled chatter seem to be causing a range of problems, hate speech in particular. Finally, Audioroam will offer members of the educational & research community more opportunity to connect, find interdisciplinary synergies and widen their impact, while decreasing excessive data usage.

To find out more about CARNET and its services, visit **https://www.carnet.hr/en/**

PARTAGE:
The French R&E community on-premise pooled collaborative email solution

In collaboration with various Universities and research centres, RENATER (the French Research and Education Network) has introduced an Email Collaborative Suite, called PARTAGE.

Words: Laurent Aublet-Cuvelier, RENATER

RENATER hosts and operates PARTAGE as collaborative SaaS (Software as a Service) complying with the French Government data security recommendations, including GDPR (General Data Protection Regulation). PARTAGE is a web-based suite where users can benefit from several other services, including Anti-Spam, videoconferencing by RENATER, and FileSender, and it is available both in desktop and mobile mode through standard protocols (imap, smtp, CalDav, WebDav, ActiveSync, XMPP, etc.). PARTAGE means "to share" in French. The name is inspired by one of the service's pillars: putting the community and its needs at the very centre of PARTAGE.

The collaborative suite addresses the community's needs through the following three areas:

1. Day-to-day activities, such as keeping the platform available 24/7, preparing newcomers with scalable infrastructure, and releasing the developments pushed by the community. One example is the integration in the Online Office Suite, based on Libre Office.
2. The users who help to define the future developments or even share their own open-source codes through RENATER qualifying and integrating processes.
3. The extended community who runs similar incentives which can integrate with PARTAGE. For example, FileSender operated by RENATER can be directly drawn from PARTAGE.`

Add-ons are possible through the open-source solution Zimbra and its web-based implementation with a plugin system called Zimlet. It allowed us to create a collaborative platform which includes instant messaging and videoconferencing. The platform's main functionalities are also useable both on desktops and mobile phones.

Moreover, PARTAGE has the advantage of being an outsourced platform with the administrative flexibility of an internalised one. First of all, each institution keeps its own domain name, RENATER does not provide nor impose a common "edu" domain. Then, the institution's administrators can easily connect their systems through the solution's APIs or use the dedicated interface allowing direct management and control over their environment.

The second pillar is about the constant challenge of maintaining the service availability versus the security and scalability, neither of which obviously can be compromised on. 40% growth for the last three years; more than 99.9% availability for 2020.

The worldwide growing concerns of data sovereignty have led RENATER to early on make the choice to host and operate all its infrastructures in France. Data ownership has become more and more relevant with the growth of the major commercial platforms. Therefore, it is compliant with GDPR and aims to preserve scientific and technical heritage.

In summary, PARTAGE is the premise of a growing collaborative email platform that could lead to much more to come.

To read more about PARTAGE visit **https://partage.renater.fr/** or contact the team at **offre-partage@renater.fr**

40%
growth for the last three years

More than
99.9%
availability for 2020

Portuguese internet images from the past can now be found at Arquivo.pt

Arquivo.pt is a digital preservation service provided by FCCN to the Portuguese general public. This project preserves millions of files collected from the web since 1996 and offers a public search service over this information. Though it is mainly a Portuguese project it contains information in several languages and unique content, such as the first webpage of the Smithsonian Institute, from 1996.

Words: Ana Afonso, FCCN and Fábio Rodrigues

André Mourão, from the Arquivo.pt team, explains everything about the functionality of this new feature that allows users to search for images 'from the past'.

Arquivo.pt launched the Dionisius project on 24 March. Can you tell us what this initiative consists of?

At Arquivo.pt, we have a periodic release model for new versions of our portal. In these releases, we group all the improvements made, and these are usually focused on a central goal of the release. Dionisius had a special impact as we launched the new version of the image search, the result of years of work. We went from a prototype with 22 million searchable images, to a system that provides more than 1,800 million, while maintaining response speed and our user friendly web portal.

1.8 billion images from the web have become searchable on Arquivo.pt. How do you classify this result?

This process went quite well and far exceeded our most optimistic expectations. We processed more than 8 billion pages, for a total of 520TB of archived data, corresponding to the time period from 1992 to 2019. By May 2020, we were predicted to find 18 times as many images: the end result was an 81-fold increase, in the number of searchable images.

This solution is described as "an innovative system" by Arquivo.pt. How does this version innovate in relation to what has been done by other web archives?

Apart from the scale, the greatest innovation of this Arquivo.pt search is the focus on extracting relevant information from the pages for each image. For all images on all pages, we extract a textual legend, corresponding to the portion of the page text that is closest to the image.

This is especially relevant on pages that have many images, as it allows users to find the specific image that illustrates their search.

Other functionalities to be highlighted are related to the automatic classification of potentially offensive content for users, advanced search with multiple content filters and automatic access from APIs, which allows the data collected by Arquivo.pt to be used in innovative projects (**https://arquivo.pt/apis**).

What kind of added value and potential does this new functionality represent for the Arquivo.pt user?

External studies show that around a quarter of general searches on the web are for images. In the case of Arquivo.pt, image searches represent around one fifth of the total searches performed. Searching on archived data allows us to have an insight on generalist image search engines such as Google Images. These are focused on searching images of the present, especially popular and recent content.

Arquivo.pt allows a retrospective search with a special focus on time. Old versions of images and pages are available for consultation, making it possible to see how pages and images have evolved. Our search allows greater exemption in the results returned, as we are not focused on popularity metrics. We also allow greater granularity in filtering search results (for example, filter results by date, website and file type, among others).

Arquivo.pt has already given origin to many projects with potential of positive impact in society. In the specific case of this research, a scientific article was recently published by Ricardo Campos and co-authors, where the image search API is used to find images to illustrate the results of the temporal division of a news story. Giving a personal example, I found many records of book reviews made by my great-aunt at the Calouste Gulbenkian Foundation. These records were scanned from the originals from the 1960s and 1970s, placed on the Gulbenkian website and are now available for consult and research at Arquivo.pt.

Is there anything you would like to add?

I would like to reinforce that our web portal and APIs are open source, free to access and are available for personal use or for research projects without prior registration. Finally, I would also like to mention the annual Arquivo.pt Prize, now in its 4th edition, which aims to reward innovative works based on historical information preserved by Arquivo.pt with up to €10,000. The works focus on themes from any area (e.g. Education, History, Sociology, Communication, Health and Information Technology) so stay tuned to see who wins this year. Some interesting projects based on our digital preservation service will be rewarded!

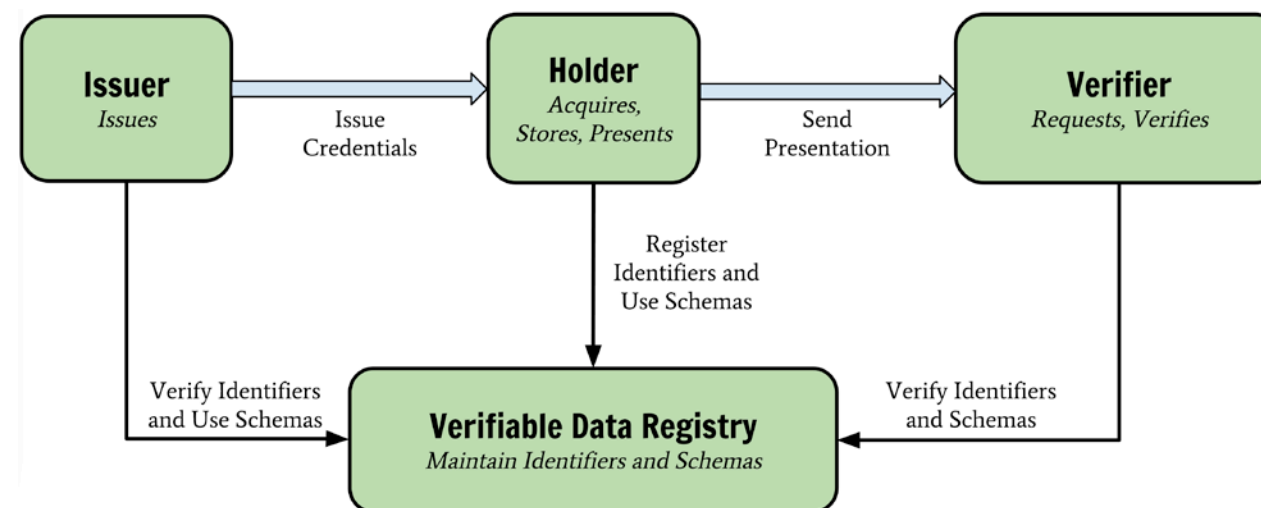**Picure**

Bottom left:
André Mourão from Arquivo.pt, FCCN

Bottom right:
Screenshot of a preserved page containing images from Arquivio.pt

SURF

SURF investigates the possibilities of self-sovereign identity

With self-sovereign identity, users - rather than, for example, the educational institutions - have direct control over the exchange of their personal data. What are the possibilities and challenges of this concept? SURF investigated it and concludes that self-sovereign identity is very promising.

Words: Jan Michielsen, SURF

Pictures
Bottom left: Niels van Dijk, SURF (Credit: Jelmer de Haas).

Top right: Schematic overview of the Verifiable Credentials ecosystem as implemented in SSI (source: w3.org)

For authentication, many NRENs use a federated ecosystem, such as the SURFconext federation in the Netherlands: students and staff have an institutional identity that gives them access to various services. This offers a lot of advantages. For example, they don't have to create a new account for each service and the credentials are managed by the institution, which improves security.

A disadvantage, however, is that the entity issuing the identity (the issuer, usually an educational institution) has control over the user's data. The issuer determines which attributes of the user are passed on, and to whom. This could be improved, for example in the light of privacy. And perhaps also in the light of flexibility, for example by making it easier to reuse and combine attributes from different sectors.

User in control

SURF therefore investigated the possibilities of self-sovereign identity (SSI). In addition to the educational institution, there are other issuers of profile data, for example a scientific collaboration, the government or healthcare organisations. In the SSI concept, users collect their data from the issuers themselves. Profile data is collected from different issuers and stored in a 'wallet', managed by the user (holder). The user determines which data is passed on to which services (verifiers), directly from their wallets. The wallet of the user is thus the central location where the collected personal data is stored.

However, how can a service that receives data directly from a user trust this data? For this purpose, the verifier queries a so-called verifiable data registry. The registry contains information about trusted parties, and also which information may be exchanged by these parties. The registry explicitly does not contain the personal data of the users.

Better control of privacy

Niels van Dijk, technical product manager for trust and identity innovation at SURF, says: "With SSI, we can better regulate the privacy around identities. In our technical exploration, we investigated, among other things, the scalability, security, privacy protection, and maturity of SSI."

As a test environment, SURF chose the open-source platform Hyperledger Indy, in which the verifiable data registry is implemented on the basis of a distributed ledger. Niels states, "Open source is important to us at SURF. We really wanted to be able to look under the hood, and understand and determine exactly what is happening. And a distributed ledger offers potential advantages, because it eliminates the need for a central component."

Self-sovereign identity aligns with public values

The conclusions of the survey are positive. Niels adds, "SSI is not fully mature yet, but its privacy-protecting nature, the fact that the user controls data sharing, and the SSI trust model tie in well with the public values that are typical for education and research. We therefore want to continue to work with this concept in the Netherlands. SSI is also attracting a great deal of attention in the international context. The GÉANT Special Interest Group Distributed Ledger Technologies was recently set up, in which NRENs can work together to explore the opportunities and challenges of this promising technology."

Learn more

Want to know more about SSI? Wondering what it can do for research and education at your NREN?
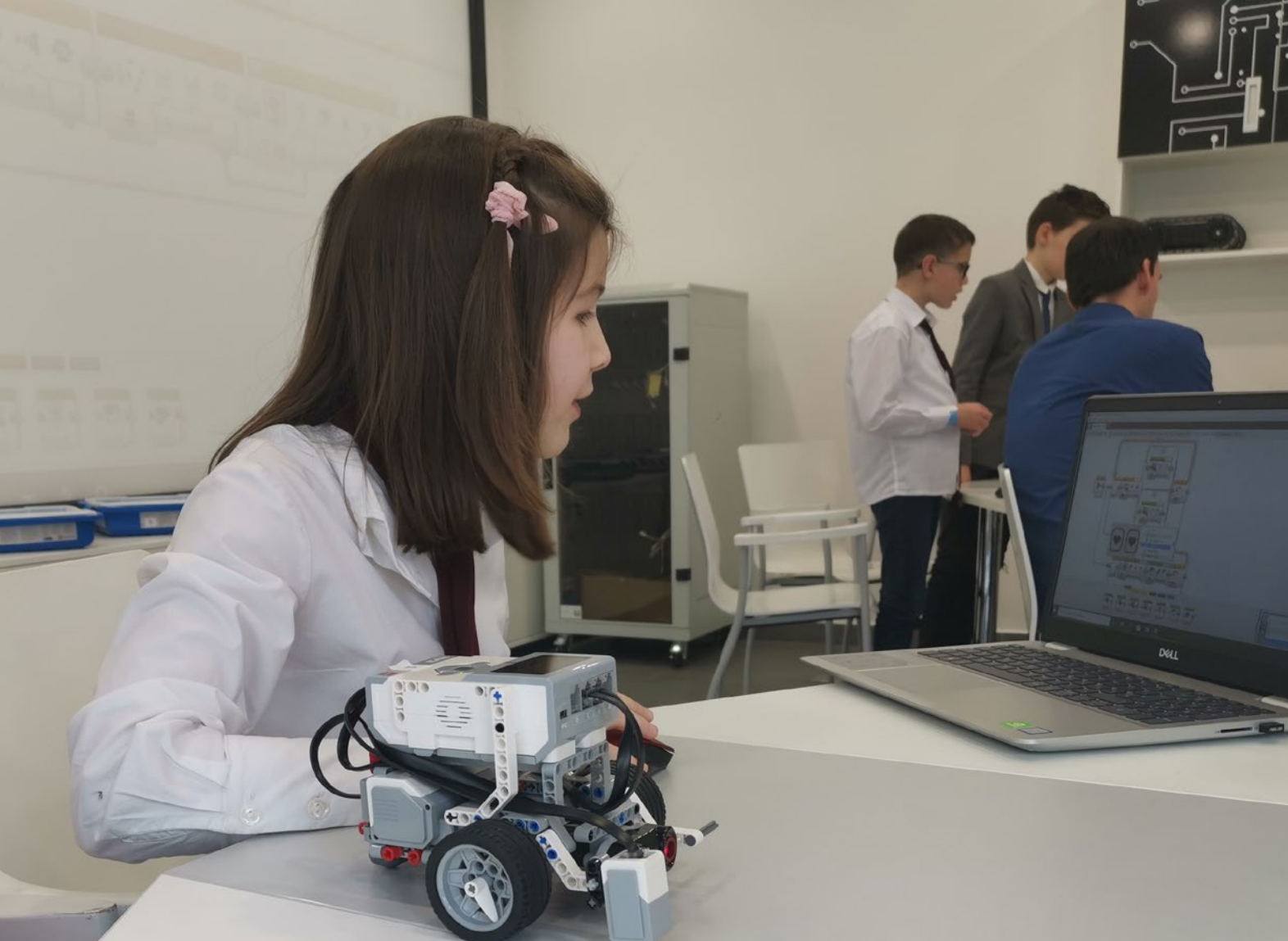
1. Read the research SURF has done, at **www.surf.nl/en/ssi**.
2. Contact Niels van Dijk, via **niels.vandijk@surf.nl**, if you have questions about the research.

Join the GÉANT Distributed Ledger Technologies SIG on **https://wiki.geant.org/spaces/viewspace.action?key=TFDLT**

Programme your future

The future is digital. As such, digital companies demand a talent pool that is equipped with the necessary IT skills and competencies. To ensure its citizens have what it takes to compete in the information age, the EU-funded 'Programme your future' project set out to promote IT courses at Hungary's leading universities, and encourage young people to pursue a career in IT.

Words: János Gombos, Project Professional Leader, GINOP 3.1.1.

The project collaborated with a number of internationally recognised IT companies to gain a better understanding of labour market needs and current best practices. Together with these partner companies, the project worked with 22 of Hungary's universities that offer IT coursework to help them create course curriculums that would provide students with skills that matched market needs.

A total of 147 lecturers were trained and 11 industry-certified courses were created. It also created a database of IT professionals willing to give guest lecturers at universities. All universities were equipped with the latest digital equipment and teaching aids.

With the courses and experience centres in place, the project next launched a promotional campaign to raise awareness about how a career in IT could prove lucrative. This included holding guest lectures and programming at local high schools. Within the framework of the project, the training packages and exam opportunities sought in the market are provided for university lecturers and students.

In addition to college courses, the project also established digital experience centres, public facilities that gave students and families an opportunity to get a hands-on look at the IT profession. Visitors can also get training in basic computer skills or learn more about such advanced technologies as virtual reality and smart home devices.

As a result of the project, Hungary is seeing an increase in the number of young people applying for education in IT. For example, in 2016, 5,166 people applied for a full-time BA university education in IT, whereas in 2021 the number was up to 8,388 applicants.

Total investment for the project "Encourage and support cooperation between educational institutions and ICT" is just short of €25M, with the EU's European Regional Development Fund contributing just over €21.5M through the "Economic Development and Innovation Operational Programme" for the 2014-2020 programming period.

Zoltán Szijártó, chairman of Governmental Information Technology Development Agency, commented:

"After the closure of the project, the values created and implemented will not be lost. The 22 cooperating universities, and the faculty members who have completed the market courses provided by the project will continue to educate new students in the modern laboratory environments. Existing IT students who have participated and passed exams in project-funded courses can easily find employment in the labour market, so the shortage of IT professionals in Hungary is expected to decrease."

From obstacles to opportunities

When Covid struck in March 2020, UK universities took swift action, supporting their home students' access to remote teaching and learning. But what about international students?

Words: Dr Esther Wilkinson, Head of international, Jisc

Around 20% of the UK's student population are from overseas. Those who could not stay in the UK during the pandemic needed reliable, secure connectivity in their home territories for access to UK learning materials, support and peer networks, as well as online exams, assessments and pre-sessional courses. And they needed this connectivity to their own homes, which is far more challenging than the traditional campus-to-campus connections that NRENs support.

At Jisc we responded to this clear need from our community – more than half of UK universities contacted us asking for help – and set up the Global Education Access Framework (GEAF). We offer a series of solutions to provide secure, high-performance connectivity for learners to access UK virtual learning environments from overseas. The framework is available worldwide through preferred suppliers and initial demand was for access from China, which we provided via Alibaba Cloud.

The preferred solution for China that we have been working with can be deployed in a matter of days and is flexible to upscale and downscale as requirements alter, whether through the term or as student numbers change.

One of the institutions we supported was the University of Birmingham, as its network development manager Renyk de'Vandre explains:

"The solution isn't about providing unfettered access to the internet, or a way to bypass China's firewalls, but about giving learners as much of a guarantee as possible that they will be able to access services they need for educational purposes.

"A large part of that project involved making sure the right services were available via the solution, provided by Alibaba Cloud, and then using data analytics to understand how those services are being used, which will help us model for the future. Although it's been an essential part of maintaining services through lockdown, it has also opened up opportunities beyond the pandemic, such as increased possibilities for transnational education."

Such future opportunities opened up through the GEAF are particularly exciting. Although, with Alibaba Cloud and other solutions on the framework, these are non-NREN solutions, a group of global NRENs has been working on this project, including Jisc, through the GREN Offshore Students Working Group (a sub-group of the GNA-G, Global Network Advancement Group), to investigate how NREN infrastructure and services such as eduroam and eduVPN could support off-site learning.

As the UK moves from a Covid emergency response to a more steady state with potentially new and innovative modes of delivery, the UK higher education sector expects to see an increase in transnational education – in particular online and blended learning – both in the short term, due to borders remaining closed and lower levels of global vaccinations, and in the longer-term, through the critical interplay between climate change, digital transformation and internationalisation of education.

We expect solutions such as GEAF to hold the key to this new delivery of global education for a more sustainable future.
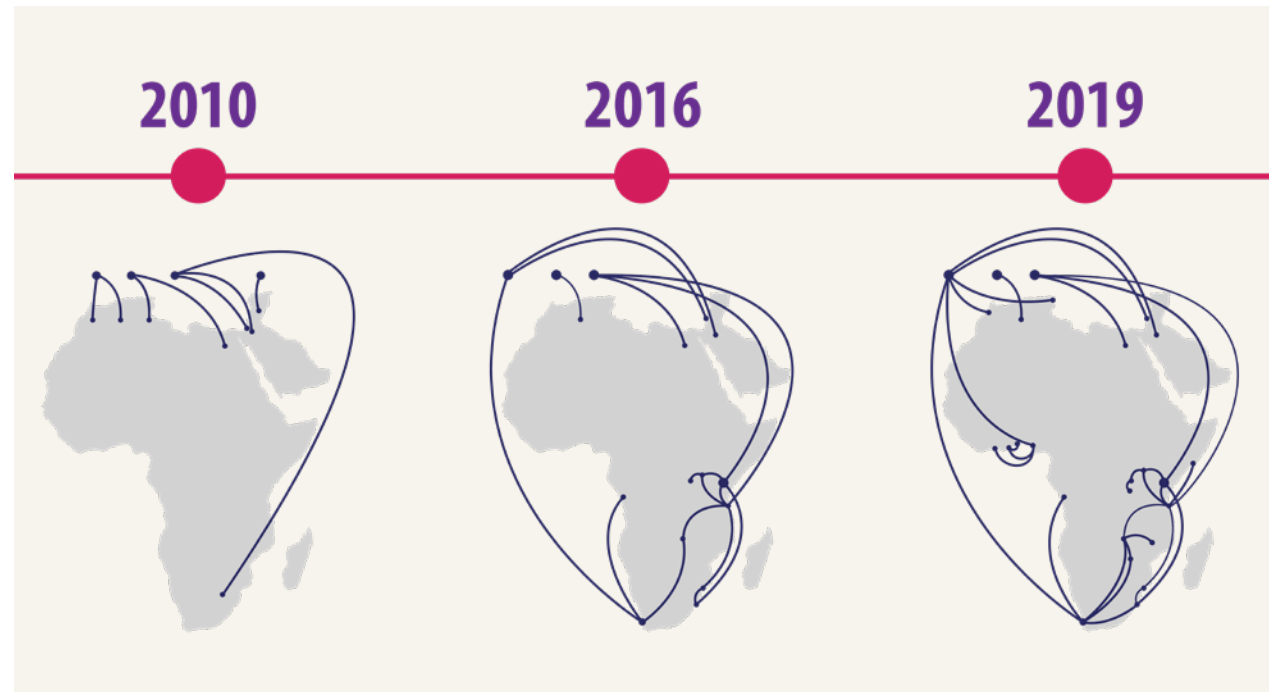
AfricaConnect:
Celebrating 10 years of African European collaboration

Picture
The Research and Education Network of Uganda (RENU) providing Direct Assistance Engineering to Nsambya Hospital in Kampala, Uganda

On 11 May 2021, the AfricaConnect project celebrated its 10th anniversary, looking back and reflecting on its achievements and valuable partnerships while preparing for the next step ahead!

Words: Silvia Fiore, GÉANT

To date, over 5 million users in 1,600+ institutions benefit from AfricaConnect's dedicated, high-capacity and affordable internet connectivity and services. Thanks to their bulk purchasing power, African NRENs were able to increase the network capacity up to 60% in Zambia and to reduce internet prices by 97% in Algeria to the great advantage of local researchers and students.

Great attention has also been paid to strengthening human resources capacities and expertise at different levels across the R&E communities to retain local talents and curb brain drain. African NRENs are running **women empowerment initiatives**, virtual hackathons and, throughout the years, have also partnered up with European NRENs and leading

network organisation, such as the Network Startup Resource Centre (NSRC), to offer engineering assistance and technical training on Network Management, Cloud and Trust & Identity services.

More recently, with the COVID-19 pandemic outbreak, the African NRENs have once again proved how vital they are to the very survival of higher education institutions. Their services have been supporting institutions all across Africa in the switch to online education with a vast service offer, including online video-conferencing tools, e-learning management platforms, discounted data bundles for university students, and university wi-fi outside of campuses (see **eduroam story** and **other examples**).
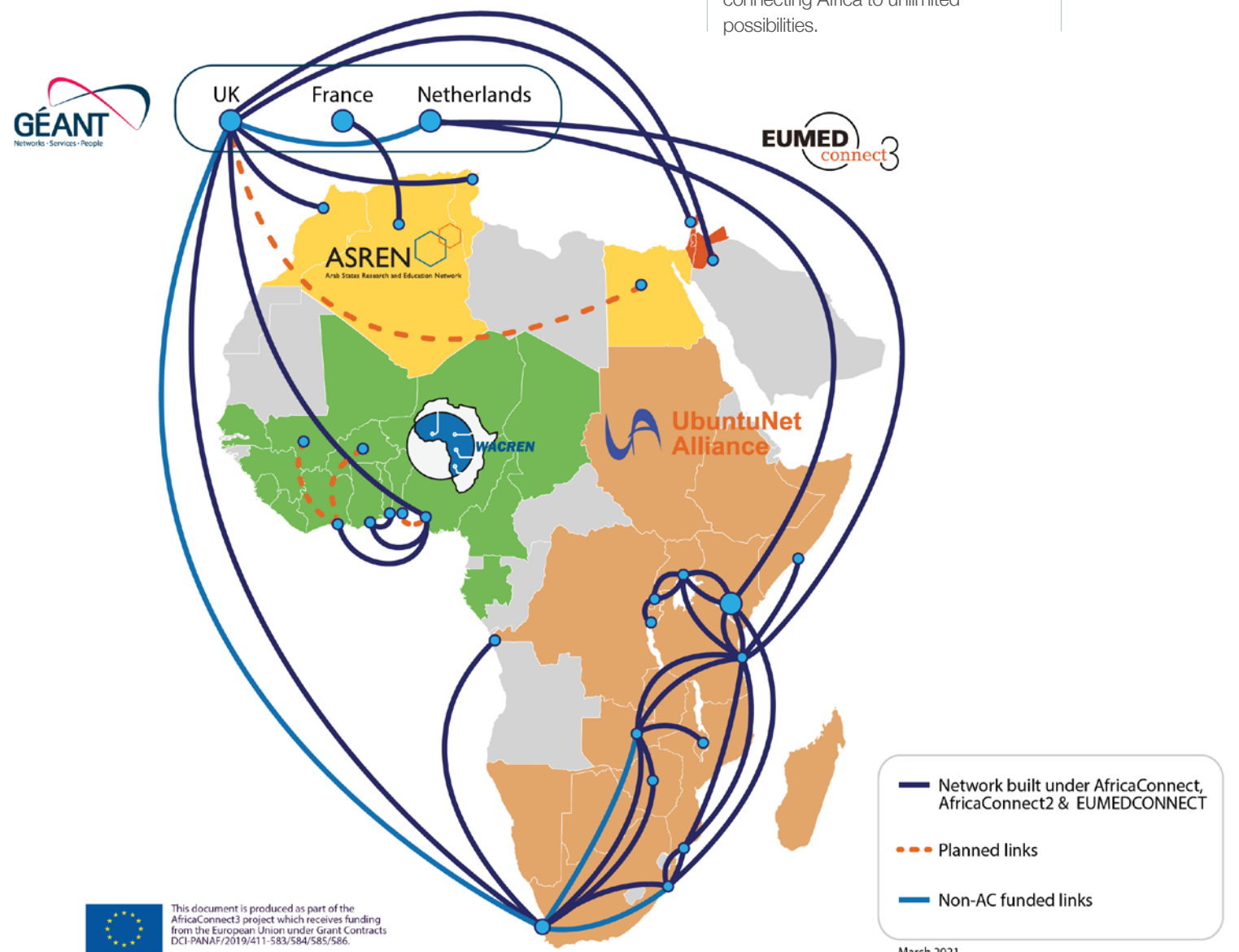
Where are we at now?

The current phase, AfricaConnect3 (2019-2023), is continuing to accelerate Africa's scientific and educational breakthrough at a global scale, reinforcing relationships with Europe and beyond. It will continue to develop new direct connections, especially from West and Central Africa. AfricaConnect3 is a renewed commitment with local African partners and the European Commission's Directorate-General for International Partnerships (DG INTPA), aiming at further extending the reach of the regional R&E networks, greatly improving access for researchers, students and institutions to digital infrastructures and technologies, connecting Africa to unlimited possibilities.

Pictures
Top left: Maps of connected countries

Bottom right: Map of AfricaConnect member NRENs and international links as of May 2021

In 2010, representatives from the European Union, African Ministries, the African-Caribbean-Pacific Secretariat, the African Union, as well as African and European NRENs met in Brussels for the Feasibility Study on the AfricaConnect Initiative (FEAST) workshop.

The FEAST Study had explored the modernisation and development of research and education (R&E) in Sub-Saharan countries by providing access to the global research and education network infrastructure. It laid out the foundations of the EU co-funded AfricaConnect project.

Who was involved?

AfricaConnect set out to plan, procure, build, operate and maintain a dedicated high-capacity data-communications network for R&E communities across Southern and Eastern Africa. By connecting to the pan-European GÉANT network, African NRENs were able to offer direct high-speed intercontinental connectivity for their users, as well as the shortest and fastest possible network routes for their data traffic within Africa, as well as to and from Europe.

The project kicked off with 20 Partners: the UbuntuNet Alliance, the Association of African Universities (AAU) as well as various African and European NRENs. As the activities unfolded, the funds also increased.

Based on a proven model of building and interconnecting NRENs in regional networks, in 2015 the second phase of the project, AfricaConnect2, opened a new chapter in this African success story by extending the scope of its predecessor to a pan-African level. More partners joined, including more African NRENs in Southern and Eastern Africa, and two more regional networks: the West and Central African Research and Education Network (WACREN), and the Arab States Research and Education Network (ASREN) for Northern Africa. Now in its third phase, AfricaConnect3, the project counts 35 member countries with a total of 40 R&E organisations enrolled.

Why AfricaConnect?

AfricaConnect was created to respond to the need of providing African research and higher education institutions with access to the global R&E network infrastructure so that they could jointly tackle universal challenges to humanity with their peers in Europe and other parts of the world.

The project acted as an accelerator to the development of African NRENs and a catalyst for global R&E cooperation. Key to ignite this momentous evolution for African NRENs have been the joint financial contributions coming both from the European Union - for a total of €61.8M, and the African partners – for €17M ,

over the course of the last 10 years. African NRENs are now at the forefront of ICT development in the continent by contributing to narrow the digital divide and making a meaningful contribution to the fulfilment of the United Nations' Sustainable Development Goals (SDGs). More specifically, NRENs are able to guarantee quality education (SDG 4) to African researchers and learners, boost industry and catalyse innovation in novel sectors (SDG 9), create new decent jobs (SDG 8) and narrow the gender gap in science, technology, education and mathematics (SDG 5).

African NRENs do not only establish high-speed networks to interconnect universities, colleges, and research centres across Africa, but also deploy a wide range of services that allow instructors, scientists and students to seamlessly access a wealth of invaluable R&E resources and services, such as eduroam and eduGAIN.

What have African NRENs achieved so far?

The successful performance of surgical operations in remote hospital facilities with online support from overseas (see **RENU surgery story**) and the inclusive initiatives for new African voices to be take part in the scholarly communication landscape (see **the LIBSENSE initiative**) are only a few of the many examples of AfricaConnect's societal impact.

Network built under AfricaConnect, AfricaConnect2 & EUMEDCONNECT

Planned links

Non-AC funded links

March 2021

BELLA celebrates EllaLink cable inauguration at EC's Leading the Digital Decade event

At the recent Leading the Digital Decade, a two-day online event focused on Europe's digital transformation towards 2030, the BELLA Programme welcomed on the first day the inauguration of the new 6,000km EllaLink submarine cable connection that directly links Europe and Latin America.

Words: Paul Maurice, GÉANT

Marking a major milestone for BELLA, the EllaLink cable was inaugurated in a dedicated session in Sines, Portugal with speeches from Portugal's Minister of Economy and Digital Transition Pedro Siza Vieira, Brazil's Minister for Science Technology and Innovation Marcos Pontes, EllaLink President Philippe Dumont, and Nokia President and CEO Pekka Lundmark. As part of the session, EllaLink showed a new video describing the journey taken to get to this point.

Later in the day, a plenary session on 'International Partnerships for the Digital Decade' saw a welcome address from the EC's Roberto Viola, Director General of the Directorate-General for Communications Networks, Content and Technology. In the panel session that followed, the BELLA Consortium was represented by RedCLARA Executive Director Luis Cadenas and GÉANT CEO Erik Huizer.

Commenting on the inauguration, Luis said,

"Today is a day of celebration. With the inauguration of the EllaLink cable, we realise this dream of having a direct digital connection between Europe and Latin America. Taking advantage of the capacity that we inaugurated today will give us an even greater opportunity to collaborate, to engage more than ever before, and will greatly support economic and social growth."

Commenting further, Erik added:

"As a member of the BELLA Consortium, GÉANT warmly welcomes the EllaLink Inauguration in Sines, Portugal as part of the wider BELLA Programme. We look forward to an era of unprecedented research collaboration in many important areas. Enabling optimal data exchange between researchers in Europe and Latin America, BELLA will, for example, enable the data of the European Copernicus program – Earth Observation data – created by European researchers, to be accessed by researchers in Chile. These researchers can then use the data on the Atacama Desert, and combine it with local measurements to study the impact of Iodine mining. The results of that research will help the Chilean government to get insight in the effects of pollution, economic development and resource production estimation. This is just one example of the enormous benefits the BELLA Programme will bring, thanks to the EllaLink cable inaugurated today."

With the submarine cable now complete and officially inaugurated, the next milestone for the BELLA Programme will see connectivity come online in the coming weeks, to provide the high capacity and low latency necessary for data-intensive research and education use.

To learn more, visit the **BELLA website**.

Omren Technology Summit:
Enabling collaborations for the OMREN Research & Education Community

The OTS (OMREN Technology Summit) which took place online on 31 May, is an annual gathering of OMREN and Global Research & Education Community to share their knowledge, success stories, identify solutions, explore business opportunities, discuss current challenges and needs to improve services and achieve the objectives of Connect, Collaborate and Innovate. For 2021 the event took place online and attracted over 300 attendees.

The event proved an ideal meeting place with power packed networking opportunities with diverse global and regional Stakeholders, NRENs, Researchers, solution providers, leading Industry Experts, Decision Makers, Policy Makers and Government Officials from across the value chain.

The summit featured an expansive line-up of stellar speakers (including GÉANT's Helga Spitaler), case studies, panel discussions, engaging discussions, unique presentations providing access to a wealth of industry-leading knowledge, sharing best practices & experiences, spotlighting trends, information exchange, cutting-edge insights and outlooks with actionable takeaways.

The comprehensive expo showcased avant-garde solutions, specific transverse and latest technologies, cutting edge innovations, cost-effective products and services to meet the requirements.

The Summit intended to enable a technically, financially manageable and sustainable national Information and Communication Technology infrastructure and services that shall effectively contribute to the development of innovation, research, education, strategic and international e-collaboration with the research and education community and improve the provision of world class e-infrastructure and services continuously meeting the sector needs.

The event anticipates to be an ongoing catalyst to foster more collaborations between organizations and countries in Research & Education Network and Innovation.

For more information, see:
https://www.ots.om/

EU4Digital

EaPConnect brings eHealth into focus

With health and online living becoming top concerns in the past year, the topic of 'eHealth' and how NRENs can work together to support it has also been gaining visibility. For partners in the EU-funded EaPConnect project this builds on activities of the past few years, which now find resonances with GÉANT and with the EU's EU4Digital initiative.

Words: Laura Durnford, GÉANT

The first exploration of challenges and solutions for NRENs in supporting biomedical research communities was in 2018. Representatives from the six Eastern Partnership (EaP) countries - Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine – met peers from Denmark, Israel, Italy, and Poland in a workshop organised with EaPConnect by the Italian NREN GARR, which was already active in eHealth support. The event highlighted the diversity of situations in different countries and of needs among relevant research communities, infrastructures and projects.

The complexity of legal, ethical, security and computational resource challenges in supporting biomedical research were evident. A presentation from Belarus showed work to develop Artificial Intelligence tools to improve image analysis for medical research, training, and practice, in which such challenges are particularly pressing.

Medical images' generation, storage and usage have been a focus in Moldova. NREN support for the standard 'DICOM' (Digital Imaging and Communications in Medicine) system and its integration with administration systems intensified during the COVID-19 pandemic and has extended from one to five hospitals in the capital, Chisinau.

These examples were shared in two events in early 2021:

- A virtual event in March, on advanced analytics usage in medical images, was the first in a series of eHealth collaboration events organised by EU4Digital - the initiative through which the EU supports the development of harmonised national frameworks for eHealth among EaP and EU countries. The EU4Digital 'eHealth Network' audience of representatives from EaP health ministries and other relevant institutions heard presentations from RENAM (Moldova) and UIIP NASB (Belarus).

- An 'eHealth Baselining Meeting' organised by EaPConnect and the EU-funded GÉANT (GN4-3) project in January drew 70+ participants from NRENs and other organisations around the world. Experiences from EaP, EU and Brazilian NRENs broadened the discussion to include telemedicine, SME collaboration, and the potential role for Clouds. A warning that technological developments could mean NREN computing and data handling services become bypassed raised the question whether NRENs should widen their focus if they are to play a meaningful role in the changing eHealth landscape.

These discussions continue in a 'Birds of a Feather' (BoF) meeting at TNC21, where a new GÉANT eHealth task force will be presented.

Google

Google Cloud drives student success and accelerates research

A Q&A with Google's Head of Strategy for Higher Education in Europe describes the present and future of the cloud for faculty, students, researchers, and IT professionals in EMEA.

We recently joined the OCRE framework to expand access to Google Cloud through four resellers in EMEA. We asked Felix Manoharan, Google's Head of Strategy for Higher Education in Europe, to explain how cloud computing impacts key stakeholders.

Words: Nicole DeSantis, Google

How does Google serve EMEA customers?

Google Cloud is helping students and faculty, researchers, and higher education institutions across EMEA better access our cloud platform through our free credits programs and our participation in the OCRE procurement framework. Our goals are to address the skill gap in cloud computing, greatly reduce cost and time to research, and bring flexibility, security, and collaboration to higher education institutions. The OCRE framework, for example, offers a streamlined procurement process with ready-made agreements that can be tailored to each institution's needs; up-to-date compliance requirements and built-in data protections; and special discount pricing, data egress waivers, and funding opportunities. It's win, win, win.

How does this benefit users?

First, we are helping students and faculty acquire cloud skills, some of the most valued and in-demand skills on the labour market today. By signing up for our Teaching and Learning program, they can explore the Google Cloud curriculum online and receive free credits to use and experiment on Google Cloud.

Second, we are offering researchers access to powerful tools and services that allow them to innovate and accelerate their research projects while reducing their costs at the same time. They can request a grant to support their projects through our Research Credits Program.

And finally, we strive to help higher education institutions digitally transform their campus to offer services and tools for student success. Learn more about these programs at **https://cloud. google.com/edu**

Why is this important, especially for students?

The shift to remote learning at all levels of education has highlighted the challenges of ensuring student success and maintaining a good student experience. We have recently launched Google Cloud's Student Success Services to help meet these challenges. It is a set of tools that aims at supporting students with personalized assistants, real-time insights, and collaboration tools. Our goal is to benefit both institutions and students by improving remote and in-person learning, which together create a modern, fulfilling student experience. We believe that digital tools can support students' engagement, retention, and success rates.

Why now?

The world is changing more rapidly than ever, so it's important to equip the higher education and research community with the right set of tools and skills to allow them to continue to innovate. As more and more people access data through their smartphones or on the cloud, we all need the skills to adapt to new ways of learning, working, and living. We want to address that gap by offering cloud skills programs for free, for everyone. One great advantage of the cloud is it works anywhere, and across all fields. We want to prepare the next generation for the job market that's already here.

## Getting started with Google Cloud

Faculty, researchers, and institutions can procure Google Cloud through one of our four resellers on the OCRE framework, depending on their country.

Students, faculty and researchers can sign up for our free credits programs at **edu. google.com/programs**.

Securely connecting research networks in the quantum age

Research networks and data centers depend on reliable and secure connectivity. The security controls applied today – such as AES-256 encryption or Diffie-Hellman key exchange protocols – are considered to be extremely robust. They can resist attacks from even the most powerful super computers. This situation, however, is set to change with the emergence of quantum computers.

Words: Ulrich Kohn, Helmut Griesser, ADVA
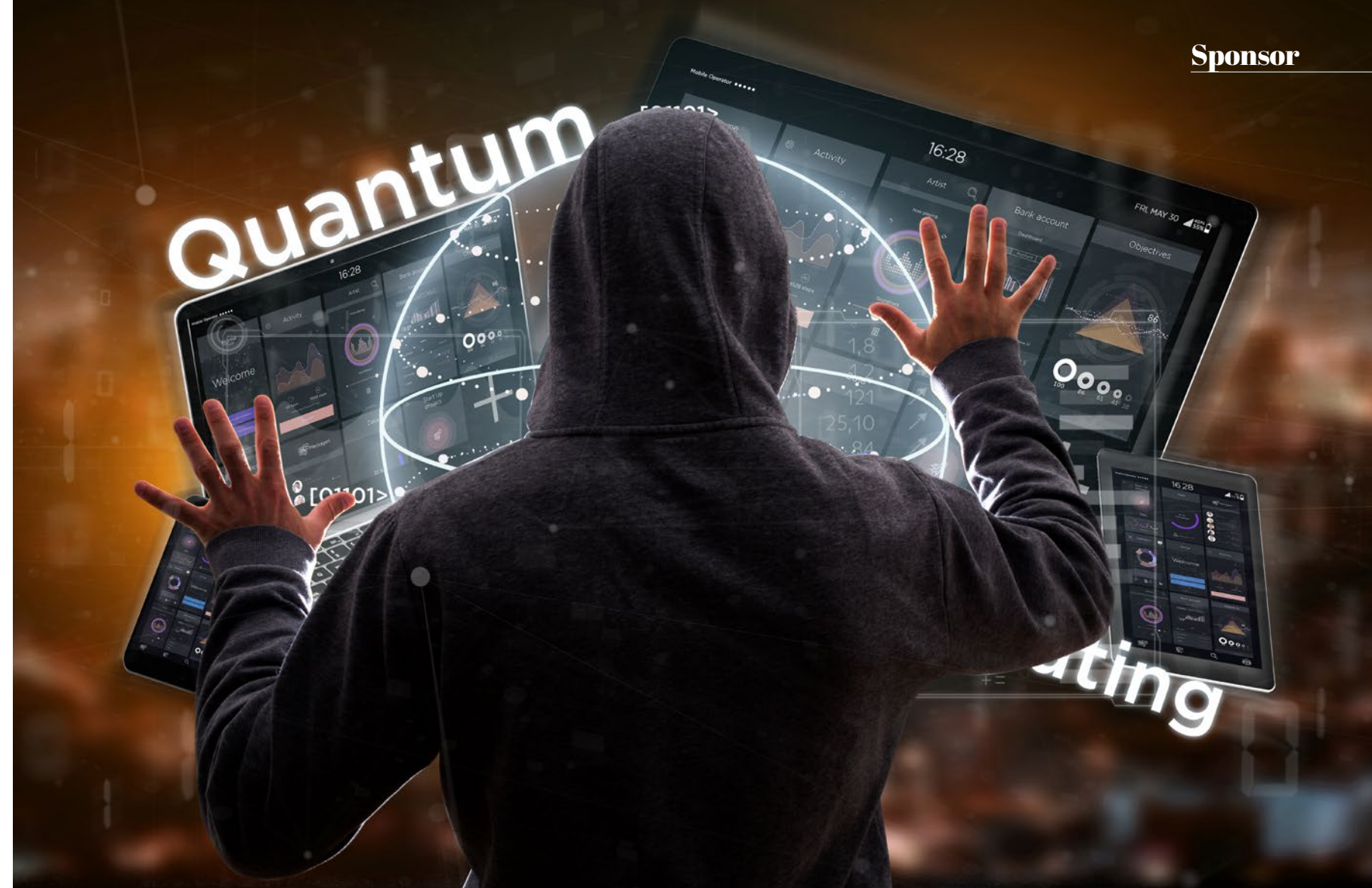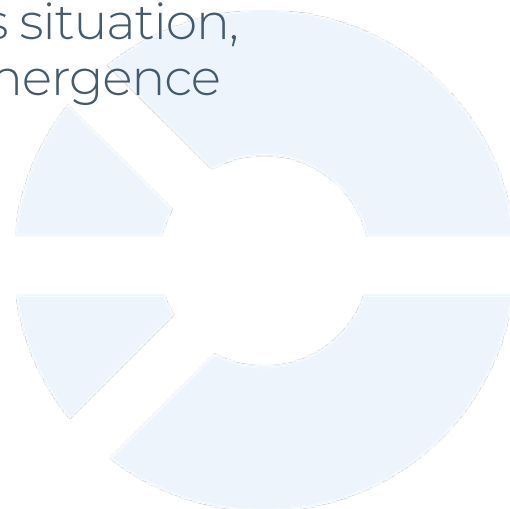
Public key cryptography is an essential component of today's protective controls. These security algorithms are, among other things, used for the authentication, creation and exchange of session keys. Mathematical operations that are difficult to invert are at the core of such algorithms. The most famous example is the RSA algorithm. Its security relies on the computational difficulty of factorizing large integers into their prime factors.

In 1994, Peter Shor published two algorithms that employ quantum properties to allow prime factorization and enable the calculation of discrete logarithms in polynomial time. A large quantum computer would be able to solve these problems in hours and break today's public key protocols. Using bigger numbers is only a short-term remedy. Recent progress demonstrated by companies like IBM, Google and Intel suggests that the emergence of sufficiently powerful quantum computers is likely within the next decade.

Interestingly, quantum technologies – or more specifically quantum key distribution (QKD) – can be applied to counteract the code-breaking capabilities of quantum computers. The security of QKD does not depend on progress in computing power and mathematical algorithms, thereby enabling so-called long-term security. On the downside, QKD is limited by attenuation, keeping the practical reach well below 100km.

Another option is protocols based on problems that are also difficult for quantum computers. Known as post-quantum cryptography (PQC), these are still susceptible to progress in classical or quantum algorithms and computing power. Led by the US National Institute of Standards and Technology (NIST), corresponding standards will be defined within the next few years.

Since 2014, ADVA has been investigating quantum-safe cryptography. World-record demonstrations of QKD and PQC were showcased in recent years and quantum-resistant solutions are now available. ADVA is the first company to release optical transport solutions with a standardized key exchange interface to efficiently implement QKD solutions as well as pre-standard PQC algorithms.

400G ZR+ Revolutionizes How to Fulfill the Need for Speed

Words: Jonathan Homa, Senior Director Solutions Marketing, Ribbon

Need for Speed in 400G Lanes

Research and educations networks have a need for speed to support applications such as immersive learning, real-time collaboration, distributed high performance computing, massive data sharing, and synchronous data replication. To meet this need, RENs, along with most network operators, have begun embracing 400G lanes as the desired link speed to transport ubiquitous 100GbE client and growing 400GbE client traffic.

Until recently, the only way to achieve 400G transmission was to build an optical transport solution using proprietary embedded transceiver modules. These modules, which are hard-integrated onto a line card, have an ability to transmit up to 800G on a single wavelength, depending on distance and fiber conditions. Their downside is that they are expensive. Moreover, as proprietary technologies they cannot interwork with similar solutions from another supplier, adding a roadblock to achieving a disaggregated network where that is desired.

The 400G ZR+ Alternative

The good news is that an alternative approach is now starting to be available using 400G ZR+ transceiver technologies, packaged in two types of pluggable form factor (see table). These pluggables will have a significantly lower cost than the embedded modules for two reasons – they are much simpler, and they have many more competing suppliers. Moreover, the pluggables will also support multi-service agreement (MSA) standard configurations enabling optical interoperability between different suppliers.

The smaller QSFP-DD pluggable targets direct incorporation in routers. Its very small size and low signal launch power constrains its use to point-to-point links and simple ROADM networks. We do not look further at this pluggable in this article.

Our focus is the larger CFP2 DCO pluggable that has the same 1mW launch power as proprietary embedded modules, and can compete in the same application space of providing optical transport over sophisticated mesh CD/C ROADM networks.

In fact, CFP2 DCO pluggables implementing 400G ZR+ can deliver superior performance to embedded modules at an equivalent cost, for both metro and long haul applications. By superior performance, we mean an ability to transmit for a longer distance given the same fiber conditions and amplification.

Proving the 400G ZR+ in CFP2 DCO Pluggable Advantage

This bold claim is based on two factors, modulation efficiency and cost. If you compare two transceivers at the same line rate, then the one with a "less dense" modulation scheme will always transmit further. The reason for this is that the symbol elements (made up of different phases and amplitudes) will smear less into each other as they propagate along the fiber, making it easier to distinguish them at the receiver. For example, a 400G line using 8QAM (3 bits/symbol) will transmit further than a 400G line requiring 16QAM (4 bits/symbol).

We use this insight to compare 400G ZR+ in CFP2 DCO pluggables against embedded 800G transceiver solutions. The math for interested parties is that Modulation (bits/symbol) = Line Rate (bits/second) divided by (all in brackets) the Baud Rate (symbols/second) times 2 Polarizations times 80% for FEC overhead.

For metro applications, we compare two CFP2 DCO pluggable 400G wavelengths against a single embedded 800G wavelength. At 64Gbaud, the pluggable 400G wavelengths require a modulation density of 3.9 bits/symbol, versus 5.3 bits/symbol for the 800G embedded wavelength operating at 95GBaud. In fact, the 400G wavelengths can propagate twice as far! Moreover, since two 400G wavelengths are the same cost as a single 800G wavelength (and likely even lower) it delivers far superior cost-performance.

The same approach holds true for long haul applications, where line rates are by necessity lower. Here we compare two combined CFP2 DCO pluggable 200G wavelengths (specifically, 400G ZR+ technology operating at 200G) against a single embedded 400G wavelength. In this case, the two pluggable 200G wavelengths require 1.9 bits/symbol, versus 2.6 bits/symbol for the 400G embedded transceiver. The same argument applies as above, so that the pluggable 400G ZR+ solution provides superior cost-performance.
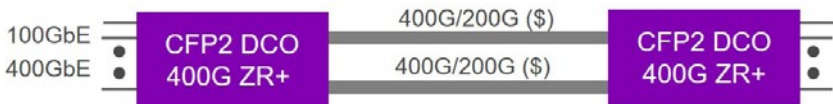
GOAL: 400G Lanes on a 75GHz Grid

Another advantage of 400G ZR+ is that each wavelength uses a regular 75GHz channel width, or 150GHz when two wavelengths are combined for long haul. This compares to the strange 112.5GHz channel width used by embedded 800G wavelengths, which can lead to wasted spectrum. The 75/150GHz scheme is also consistent with the coming (late 2022) generation of embedded technology that will use 130Gbaud in a 150GHz channel width. This next generation embedded will provide a single 1200G wavelength for metro applications, and a single 400G wavelength using gold standard QPSK modulation for long haul appli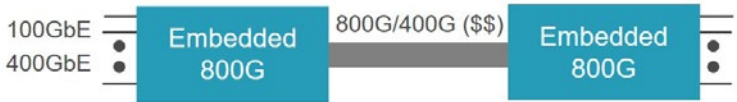cations. This will produce a situation where 400G ZR+ pluggables provide a power-cost optimized solution, and next gen embedded provides a performance optimized solution. Together these will deliver 400G optical transport lanes for all applications on a grid based on multiples of 75GHz.

Ribbon is pursuing precisely this approach. Our just announced TM400_2 line card for our Apollo optical networking system is available today. It incorporates two CFP2 DCO pluggables implementing 400G ZR+ technology, which can be used in either independent or combined modes, providing a superior 400G solution for both metro and long haul applications. Along with our roadmap 130Gbaud transceiver, we are ready to revolutionize how to fulfill REN's need for speed. To learn more please contact the author at **jonathan.homa@rbbn.com**.

Module Type	Proprietary Embedded	400G ZR+ in CFP2 DCO Pluggable	400G ZR+ in QSFP-DD Pluggable
Relative cost	$$	$	$-
Size	200cm^3	55cm3	14cm3
Maximum line rate	800G	400G	400G
Signal power	1mW	1mW	0.1mW
Baud rate	95Gbaud	64Gbaud	64Baud
Channel width	112.5GHz	75GHz	75GHz
Main application	CD/C ROADM networks	CD/C ROADM networks	Point to Point
Interoperable	No	OpenROADM MSA	OpenZR+ MSA

Longer distances for the same fiber conditions

100GbE / 400GbE — CFP2 DCO 400G ZR+ — 400G/200G ($) / 400G/200G ($) — CFP2 DCO 400G ZR+

Current approach

100GbE / 400GbE — Embedded 800G — 800G/400G ($$) — Embedded 800G

orange™ **Business Services**

ModelArts:
A truly accessible way to deploy AI models in the cloud

Artificial Intelligence (AI) has a substantial influence in the academic world and is a tool your internal users are actively seeking out. The technology enables data scientists and researchers across all disciplines to handle giant data sets at unprecedented speed to harvest valuable insight.

AI drives data-driven scientific hypotheses and allows scientists to understand better complex interactions between our environment, human, social, and economic systems. AI also supports open-source science platforms, allowing scientists to collaborate globally in unparalleled ways.

AI offers enormous opportunities but also challenges. Development can be highly complex, time-consuming, and require large amounts of computing power, which is expensive and sometimes difficult to source.

You don't want your users searching out their own AI solutions on shadow IT, either. For security reasons, above all else, you want to keep them on the same applications on the same public cloud platform.

One-stop AI platform

Orange Business Services offers the AI development tool ModelArts on its powerful Flexible Engine public cloud platform to meet these needs. Accessed via the OCRE framework,

ModelArts is available to GÉANT members and combines high-performance cloud infrastructure as a service and computing power together with integrated services. In addition, as a European cloud provider, Orange ensures that you meet all data sovereignty and data protection requirements.

ModelArts is an ideal solution for those with or without AI expertise. The out-of-the-box, full-lifecycle AI development platform is unrivaled in its speed and ease of use without compromising on the quality of your models. It delivers end-to-end AI application development, including data labeling and reparation, model training, optimization, and deployment.

ModelArts includes raw data collection, data labeling, training job creation, algorithm selection, and model creation to manage the AI development lifecycle. It is easily accessible through the user console of Flexible Engine, allowing users to create and deploy their models directly into the cloud. AI models can quickly and easily be made for all your use cases, including image, video, voice, object detection, scoring, recommendations, and exception detection.

ModelArts making a difference

The ModelArts platform is already making a difference. Medical research teams in Asia are using ModelArts with cloud computing and big data to build an AI solution in the fight against COVID-19. Medical imaging plays a key role in diagnosis and treatment. Starting with an algorithm, medical teams collected data in real-time using precise labeling from a panel of doctors to train the system. The detection and accuracy rate of pinpointing pneumonia lesions has reached 96% accuracy using the solution.

In another use case, scientists are using ModelArts with high-performance computing, AI and cloud to explore the universe in many different ways. The aim is to find answers to enduring questions about the universe, such as its development. The program is part of a project to explore new applications for AI in astronomical research, such as star classification.

Adaptable to all levels of user from complete novice to advanced

The inclusive platform has been designed to adapt to all levels of expertise. It ranges from pre-integrated models for beginners to

no-code models using graphic user interfaces, up to full-blown end-to-end development utilizing open-source web applications such as Jupyter notebook. Developers will appreciate how fast ModelArts can start, train and deploy models.

Data labeling and preparation, for example, is an arduous, labor-intensive task. But it is essential if you want to get the most out of your AI tools. ModelArts has a built-in data governance framework for data labeling and preparing during AI development that speeds the process up by reducing the amount of data that needs to be manually labeled. ModelArts allows AI developers to share AI data, models, and APIs to accelerate innovation.

The development platform dramatically reduces the training time required for models and incorporates many capabilities, including automated learning and model design.

AI: transforming the world of research

AI makes academia more connected, accessible, and collaborative, enabling exciting discoveries about us and the world we live in. Don't let your users get left behind in the race for an AI tool to deliver the insight academic data science projects need.

The ModelArts workshop "Straight out of the box AI development with ModelArts" takes place on Monday 21 June (12:00-13:00 CEST). To register, visit **tnc21.geant.org**

Pass Logic

Passlogy is very happy and excited to exhibit PassLogic to the European NREN community at TNC21, PassLogic is a pattern based authentication platform that provides tokenless one time passwords using only a Web browser

PassLogic is a leading solution for major corporations and government agencies in Japan. In the education sector, PassLogic has been adopted by leading Japanese universities, governmental education boards and world renowned research facilities. Every day, over one million people use PassLogic to access their computer systems both locally and remotely. PassLogic is an easy to use solution that is both lightweight and highly scalable; PassLogic utilizes only standard Web technologies.

■ How Tokenless One-Time Passwords Work

STEP 1 - Create and register a pattern by selecting a sequence of cells from a grid.
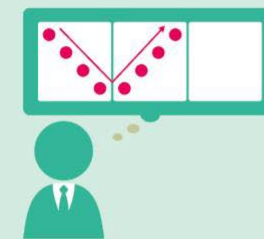
Any sequence of cells can be selected by the user.

The same cell can be selected multiple times.

STEP 2 - The password is the sequence of numbers in the Random Number Table that matches the pattern.

1st Time — 6 1 4 7 5 2 9 8

2nd Time — 0 3 6 4 9 6 1 2

The Random Number Table changes at each login.

The user has a new password each time they log in.

● No need for specialized hardware - deployment and operational costs can be significantly reduced.
● Can be used on any device that supports a standard web browser.

PassLogic enables organisations to:

- **Increase security** by providing tokenless one time passwords, along with two factor authentication and device authentication options
- **Improve operational efficiency** by creating a comprehensive single sign on environment for a wide range of cloud and on prem services and applications
- **Reduce deployment and operational costs** by removing the need for specialized authentication devices and reducing the administrator workload through automated user support
- **Protect access to Windows desktops** with tokenless one time passwords for Windows Logon.

PASSLOGY

www.passlogy.com/en/

Technology for Education

Education is built on Amazon Web Services

Hundreds of millions of students, educators, and researchers in over 200 countries and territories have access to education technologies and online curricula on AWS.
Let's dive deeper!

11,000 academic institutions use AWS

96% of R1 Research Institutes are using AWS

5,000 Arizona State University students are learning cloud technology with AWS

Improve Learning with Analytics
Build, deploy, and operate student data initiatives that support predictive analytics, recruitment and retention efforts, personalized learning, student engagement, and behavioral analysis.

Build Tomorrow's Workforce, Today
Prepare students of all ages for competitive technology careers using cloud computing. AWS offers AWS Promotional Credits and other programs at no cost to schools or teachers.

Secure Student and Patient Information
Institutions, health sciences schools, and researchers can process, maintain, and store student education records and patient information in a secure AWS environment.

Increase Access to Learning Resources
Give students a hands-on, practical learning experience using laptops, tablets, and Chromebooks at home or in the classroom with cloud-based, desktop-as-a-service technology and application streaming.

Innovation with Artificial Intelligence and Machine Learning
Use machine learning to predict patterns for student success, identify financial aid or application fraud, and reduce time spent manipulating data for research projects.

aws.amazon.com/education

Programs for Education

AWS Educate
Provides students and educators with the resources needed to accelerate cloud-related learning with several programs to help educators teach cloud curricula and students skill-up for the workforce. With AWS Educate, Employers have direct access to hundreds of thousands of students looking for cloud careers through the AWS Educate Job Board. Visit us at aws.educate.com.

AWS Academy
Accredited post-secondary institutions can use AWS Academy to receive instructor training and an AWS-maintained curriculum that prepares students for AWS Certification. Visit us at aws.amazon.com/ education/awsacademy.

AWS EdStart
AWS EdStart is a startup accelerator that helps entrepreneurs build online learning, analytics, and campus management solutions on AWS. Visit us at aws.amazon.com/awsedstart for a program application.

AWS Cloud Credits for Research
Researchers and principal investigators can apply for AWS Cloud Credits for Research, which provides AWS Promotional Credits for science-as-a-service applications. Apply at aws.amazon.com/research-credits.

AWS Institute
Engage with global leaders who share the desire to use technology to help solve issues affecting education and workforce development. Visit us at aws.amazon.com/institute.

"We cut the IT expense of digitization by **~60% with AWS.**"

Anjanesh Babu
Systems Architect and Network Manager for Oxford University's Garden's, Libraries, and Museums

"**Using AWS allows us to focus on key business outcomes** without dealing with infrastructure pressure. We cut almost 60% of expenses thanks to this AWS Enterprise Support contract as well as our purchasing of reserved instances."

Bon-jun Koo
CTO, ST. Unitas

"The evaluated setup can cut our research time by **~50% because of the automation with AWS Batch.**"

Alex Peltzer
Senior Bioinformatics Research Scientist, Quantitative Biology Center, University of Tubingen

aws.amazon.com/education

Microsoft

European academic research and science is at the forefront of solving global challenges at a rapidly increasing rate.

To delve into complex questions and power scientific enquiry across huge datasets, research teams are scaling from desktops to supercomputers, requiring big data storage, processing and analysis. Many are now using cloud computing to help them meet the challenges of scale and collaboration in a cost-effective way.

"We are delighted to bring many benefits to the research and education community through the OCRE framework agreement, which builds on our strong partnership with GÉANT, NRENs and Microsoft partners across Europe. The OCRE framework provides a tremendous opportunity for research organisations to benefit from unmatched time to insight, scale, and price-performance on the cloud built for high performance computing, data, and analytics," says Brian Gibson, EMEA Higher Education & Research Director, Microsoft.

The benefits brought by Azure Cloud

Microsoft Azure provides an open, flexible, global platform that supports multiple programming languages, tools, and frameworks to enable faster results.

By joining the OCRE framework, Microsoft Azure comes with key benefits for universities and research institutions:

- Discounted Azure prices across 40 European countries.
- Ready-to-use contracts, designed to satisfy national and European public sector procurement regulations and requirements

How Azure benefits research teams:

- **Faster discoveries.** They can work easily with huge datasets and use AI, HPC and Azure discipline-specific tools to arrive at new insight faster
- **Virtual research teams.** They can share and manage code across research communities using GitHub repositories, integrate IoT for remote sensing data and enable hybrid working for the team in a crisis.
- **Best practice code.** Software engineers and researchers can use Azure's best practice coding toolsets to create custom research software to solve new scientific challenges.
- **Quality control.** Students can view project data, upload results and run analytics workloads with role-based access protecting data integrity.
- **Cost control.** Universities pay for computing resources only when needed, plus they can use Azure tools to optimise cloud workload costs, reducing total cost of ownership.
- **Data management and governance.** They can make research discoverable, apply data policy and protect university IP with a best practice platform automating governance.

By using Azure, researchers harness one of the world's most powerful public clouds for research:

- Infinitely scalable compute resources based all over the world
- 99.95% monthly availability with 24/7/365 support
- Secure, on-demand access to vast storage and supercomputing resources

- No additional investment in capital assets or IT infrastructure, freeing research funding
- Sustainable zero emissions technology

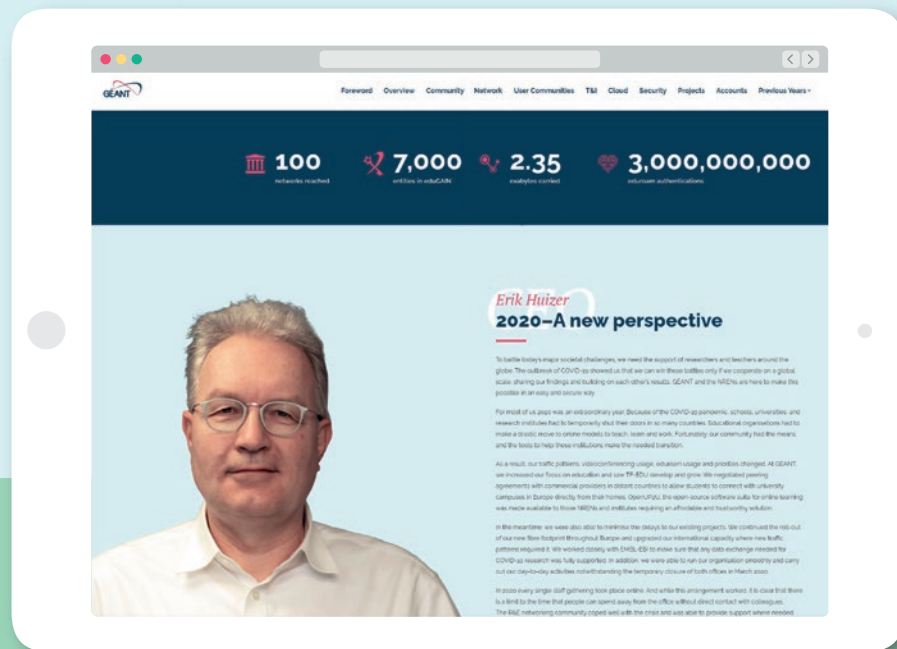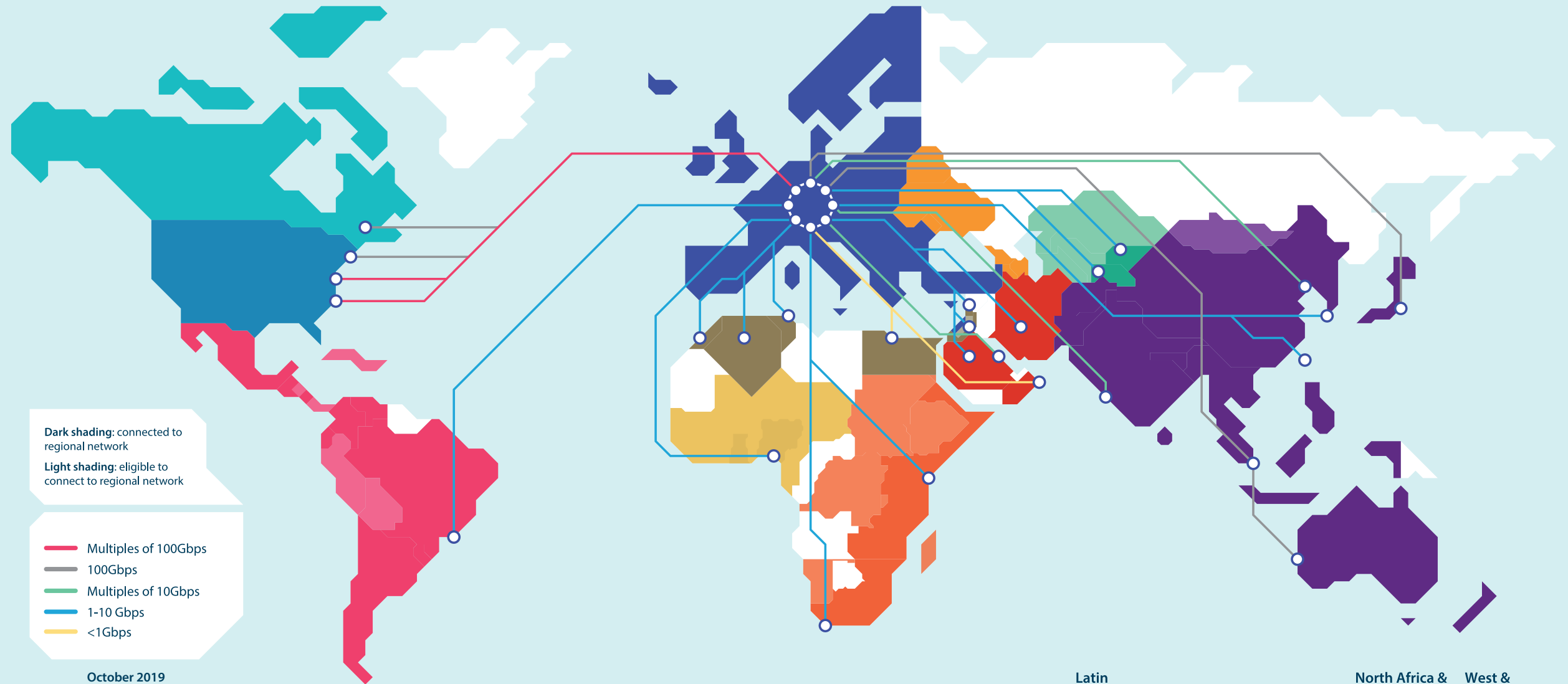## Azure at work in research, accelerating scientific breakthroughs

John Hefele, PhD candidate at Leiden University, used Azure Batch to spin up to 200 virtual machines in about 15 minutes. He ultimately scaled to 500 VMs. He was able to generate a million asteroid trajectories in just nine hours – a task requiring at least three weeks on the university's supercomputer, a shared resource that's hard to access. He used the data to train a neural network that identified 11 asteroids that could impact Earth and weren't yet flagged as a threat.

A team of engineers at the Politecnico di Milano provided archaeologists surveying a restricted underground site in Rome with the smart-sensor technology they needed to determine the impact of environmental factors on the sculptures and frescoes. The team used azure to create a simplified IoT-based system that could deliver the collected data in customizable, easy-to-use graphs, with different tabs for different sensors and filters. "When the archaeologists were shown they could simply select the metric and a time window to see the data readings, it was fantastic for them. The Azure solution provided the data they needed in a way that made it valuable", says Luca Mottola, Associate Professor at Politecnico di Milano, Italy.

Microsoft Azure joins the OCRE framework to empower over 10,000 European Research & Education institutions to take their research projects to new heights

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 now CONNECT is online with a new website (connect.geant.org) and weekly newsletter. You can also get involved on social media – see you online!

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Dark shading: connected to regional network

Light shading: eligible to connect to regional network

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

October 2019

🏛 **100** networks reached   🏃 **7,000** entities in total   📊 **2.35** examples correct   💡 **3,000,000,000** eduroam authentications

Erik Huizer
2020–A new perspective

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