GÉANT
Networks · Services · People

CONNECT

GÉANT: POSITIVELY IMPACTING RESEARCH

GÉANT IMPACT

CONTENTS

REGULAR CONTRIBUTORS

Paul Maurice, GÉANT Head of Marketing and Communications: leads on project communications for the GÉANT Project and supports marketing and communications activities for the GÉANT Association. These include overall responsibility for CONNECT magazine, messaging, PR and content creation.

Helga Spitaler, GÉANT Senior International Engagement Officer: drives and oversees the development and implementation of innovative stakeholder engagement and support activities within the international community to effectively promote R&E networking and to highlight GÉANT's global reach and role therein.

Karl Meyer, GÉANT Product Marketing and Management Officer: supports the development, roll-out and marketing of the GÉANT service portfolio. Karl has a background in IP network design and cloud service development.

Laura Durnford, GÉANT Senior Communications Officer: supports SIG-Marcomms and the GÉANT Community Programme as well as communications activities for the AARC and EaPConnect projects. With a background in biology and radio production, Laura holds a MSc in science communication.

Rosanna Norman, GÉANT Communications Officer: provides PR and marketing support to the communications and outreach activities within the GÉANT Project, the GÉANT Community Programme and the GÉANT Association. Rosanna is a B2B marcomms specialist with experience in technology organisations and academia.

WELCOME FROM CATHRIN STÖVER

Welcome to CONNECT 31 – the focus of this edition is on Impact! How do we as the GÉANT community impact science, change the world or even people's lives? Can we actually explain this in non-technical language? There is a new approach to this out there and you can find it on impact.geant.org. Finally, we have a place that explains how Copernicus and French fries go hand in hand.

Another area where the GÉANT community is making a noticeable impact is in our Trust and Identity activities. In this edition of CONNECT, we look at the results of the AARC project, we interview Klaas Wierenga about the Trust and Identity plans for 2019 and follow up with highlights of new services such as eduTEAMS and InAcademia. Also, we celebrate the impact of our community's Women in Trust and Identity and the fact that our community can #love2eduroam in 101 countries now! eduroam is having a major impact on student mobility around the world.

The world cried when "Oppy" died on 13 February this year, having roamed Mars for the last 15 years. Before its battery ran low and the world around was getting dark, the Opportunity rover collected the images of 5,000 Mars sunrises, which were sonified pixel by pixel into a quiet, slow harmony that you can listen to – the Mars soundscapes are also available on our Impact site. Enjoy!

Cathrin Stöver, GÉANT

tnc19

Tallinn, Estonia 16-20 June 2019

TNC19 – FORGING DIGITAL SOCIETIES IN THE E-CAPITAL OF EUROPE

TALLINN, ESTONIA, 16–20 JUNE 2019

The global Research and Education networking community is already gearing up for TNC19, GÉANT's flagship event. This year's programme promises to be thought-provoking, enriching and inspiring and expectations within the community are already very high.

TNC19's theme, Forging Digital Societies, is inspired by two main concepts: the idea that computer networks, by supporting human interactions, help to create and forge digital societies, is combined with the innovative model of Estonia's e-residency programme. TNC is the place where our community gathers to shape the future of research and education forging the society of the future with digital 'fire' and passion for innovation and progress. The programme will also focus on sub-themes and areas of interest such as Network, Trust & Identity, Security, Supporting Research & Education, and Communities & Collaboration.

The word of the host

Kristina Lillemets, Director of Infrastructure for EENet of HITSA:

"I believe that the programme will be not only thought-provoking and challenging, but practical too. With the e-Estonia model in mind, we'll be pulling all the stops to provide our conference guests a truly memorable experience. We look forward to launching the event and can't wait to introduce this year's prestigious keynote speakers, who will also enlighten us on some of the key factors behind e-Estonia's success. With 21 sessions covering multiple themes and more lightning talks than ever, TNC19 will inform, inspire and stimulate the community."

Inside the Programme Committee

The TNC19 Programme Committee is an international group of experts in Research and Education networking dedicated to providing a forum for our community to collaborate and advance science for the benefit of all. The committee - made up of 19 members representing 11 nationalities across 4 continents - had the difficult task of structuring the conference programme and designing sessions and parallel tracks after co-reviewing the submitted papers online.

Every year the selection process grows in difficulty due to the consistent high standard of the submitted proposals.

Here are some interesting facts and figures:

- 40 Side meeting requests submitted
- 12 Demonstrations submitted
- 73 Proposals for sessions / presentations submitted
- 4 Confirmed keynote speakers
- 21 Sessions created

The power of human disruption, network automation and orchestration, creating and supporting digital communities are just some of the subject areas included in TNC19's sessions. Such a wealth of themes and talent promises to generate stimulating debates, create new international collaborations, strengthen the networking community and enhance the prestige of GÉANT's annual flagship conference as a result.

Josva Kleist, CSEIO (Chief Software Engineering & Integration Officer) for NORDUnet, Chair of TNC19 Programme Committee:

"TNC has become THE conference for the Research and Education Networking community, not only on a European scale, but globally. It has been an honour chairing the programme committee, working with highly skilled colleagues to build TNC19's programme. Due to the high calibre of the submissions received, the proposal selection has been a challenge, and the plenary speakers' selection generated great discussions within the committee: in my view, this is what makes TNC a great conference. I am personally looking forward to TNC19, its plenaries, sessions and lightning talks, but meeting with colleagues and friends from around the world will be one the real highlights of this event".

Keynote speakers

Through keynote speeches TNC19 presents participants with a unique overview of the latest developments in Research and Education networking, both in the technical field and in the area of application management. Ranging from security strategies, national ICT policies and the role of community, TNC19 covers a wide variety of inspiring topics by renowned experts in their fields.

This year's keynote speakers are:

Siim Sikkut

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

John Womersley

John Womersley is Director General of the European Spallation Source (ESS), a European intergovernmental laboratory that will start user science operation in 2023. Before moving to ESS, Prof. Womersley held the position of Chief Executive of the Science and Technology Facilities Council (STFC), the United Kingdom's funding agency for large scale science facilities and national laboratories, particle physics, nuclear physics and astronomy. He has also served on the council of CERN and has chaired the European Strategy Forum on Research Infrastructures (ESFRI).

Merike Kaeo

Merike Kaeo is CEO and founder of Double Shot Security. She has over 25 years of experience in pioneering Internet technology deployments and developing strategic security initiatives. In 2007, she was instrumental in fostering cooperation and trust among the global operational security community and the Estonian National CERT during the cyber-attacks against Estonia. In 2014 Merike was part of the EU Network and Information Security (NIS) Working Group 2 that created guidelines and recommendations to promote the sharing of cyber threat information and incident coordination in both the public and private sectors in the EU.

Tusu Tusubira

Tusu Tusubira is the Founding CEO of the UbuntuNet Alliance and managing partner of Knowledge Consulting Ltd. He received the 2015 continental African Network Information and Infrastructure Award and served on the boards of RENU and TENET, the Research and Education Networks of Uganda and South Africa. Tusu worked for Makerere University for 32 years (Head of Electrical Engineering, Associate Dean of the Faculty of Technology, and Director, ICT Support) and continues to participate actively in research with more than 60 papers and books as author or co-author.

2019 GÉANT COMMUNITY AWARD

Nominations are now open for the 2019 GÉANT Community Award. The winner will be selected by a panel of judges from within the GÉANT community and will be announced at TNC19.

AWARD CATEGORIES

- Initiators of significant new ideas or improvements which have had lasting impact on the organisation, project or community.
- Impactful contributors to the GÉANT project or wider community activities over a sustained period of time.
- Outstanding contributions to the project or community which have immediately led to significant and recognisable new ideas, developments or improvements over the last 12 months.

HOW TO NOMINATE

A maximum of two submissions per person will be accepted; if more nominations are submitted, only the first two complete forms will be taken into account. The nomination form is available online: **https://www.surveymonkey.co.uk/r/GEANTCommunityAward2019**.

Deadline for nominations is midnight CET on Friday 22 March, take this opportunity to nominate a colleague or a member of your community that you think deserves recognition for their contributions to Research and Education networking in Europe and further afield.

Best Lightning Talk Award

We are delighted to announce that TNC19 will be the stage of the brand new Best Lightning Talk Award. Lightning Talks are popular plenary sessions that galvanise the TNC audience, their importance has grown year after year and expectations within the community are already very high. We invite our readers to keep en eye on the forthcoming regular TNC19 communications and social media announcements to learn more about this new and exciting award. Stay tuned!

What is a Lightning Talk?

Lightning Talks focus on one key point. This can be an idea, a successful project, a cautionary story, a collaboration invitation, a quick tip or demonstration. It is an opportunity for ideas to get the attention they deserve, within a maximum of 5 minutes. The clock will be ticking, so get prepared!

POSITIVELY IMPACTING RESEARCH

Ever wondered why GÉANT and the NRENs do what they do? Ever wanted to explain this to friends or family members who don't get – or don't really care about – the more technical aspects of connectivity, or federated identities?
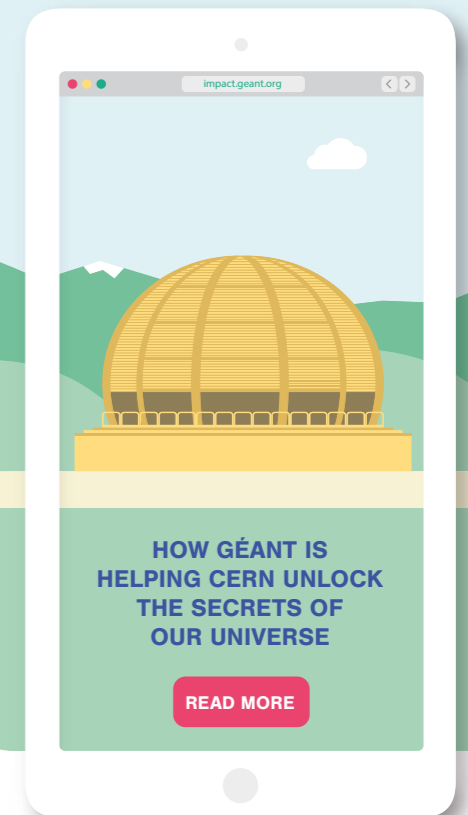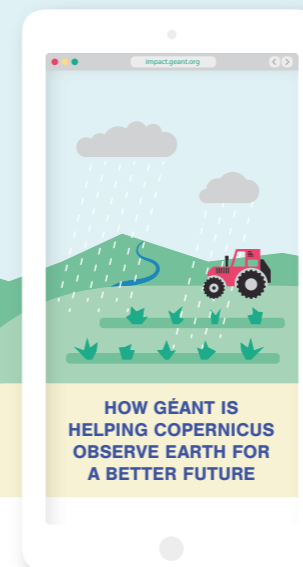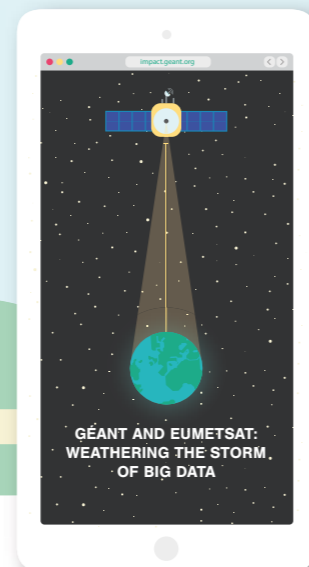
You're not the only one!

To help, GÉANT has launched **impact.geant.org**, a new way to see how GÉANT and the NRENs support amazing projects within research communities such as Earth Sciences, Social Sciences and Physical Science. Below is just a snapshot of some of the initial projects featured – visit impact.geant.org to read more!

> **"It is thanks to the GÉANT community that world class science collaborations can continue to push the limits of knowledge."**
>
> David Foster, Head of Data Privacy Protection, CERN

GÉANT IMPACT

GÉANT AND THE SKA – AN ASTRONOMICAL COLLABORATION

READ MORE

GÉANT AND EUMETSAT: WEATHERING THE STORM OF BIG DATA

HOW GÉANT IS HELPING COPERNICUS OBSERVE EARTH FOR A BETTER FUTURE

HOW GÉANT IS HELPING CERN UNLOCK THE SECRETS OF OUR UNIVERSE

READ MORE

MORE DATA IN A DAY THAN THE ENTIRE INTERNET

The Square Kilometre Array, known as the SKA, will become the world's biggest radio telescope, surveying the sky ten thousand times faster than ever before. You might be imagining a vast, single telescope. But the reality is more like thousands of antennas, all dotted across remote areas of South Africa and Australia.

When linked together, they form the equivalent of a single dish with a surface area of, you guessed it, a square kilometre. The SKA is expected to generate more data in a day than the entire internet's daily output – tenfold. Processing that lot will be a job for exaflop-capable supercomputers and high capacity advanced networks to move all that data around.

This $780 million, multi-year project, is a collaboration between 100 organisations across 20 countries.

See **impact.geant.org/SKA** for more.

DELIVERING WEATHER AND CLIMATE MONITORING DATA

The European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) is a global operational satellite agency at the heart of Europe that delivers weather and climate monitoring data to partners and users all over the world.

A vital collaboration between 30 Member States; EUMETSAT exists to protect human life, property and the economy, by monitoring weather, climate and the environment.

Real-time data transfer is critical to accurate weather forecasting, nowcasting and other weather and climate related applications. And weather agencies all over the world rely on this data.

Yet making it simultaneously accessible, 24-hours a day, is a huge challenge.

Add to this: constantly evolving satellite technologies and changing user needs; and it's clear the seamless observation of atmosphere, ocean and land surfaces is a big data challenge of epic proportions.

It all requires flexibility, continuity, IT security, and constant monitoring. Challenges that need a coordinated response and cutting-edge infrastructures.

See **impact.geant.org/EUMETSAT** for more.

CONSTANTLY MONITORING OUR PLANET'S HEALTH

Copernicus is the EU's Earth Observation Programme, looking at our planet and its environment for the benefit of all European citizens. The project is a partnership between the Member States, and eight participating organisations, including the European Space Agency (ESA).

If we are to tackle global warming, prepare ourselves for man-made and natural disasters, and protect our environment, we constantly need to monitor our planet.

Copernicus helps us achieve this by observing our environment, atmosphere, living organisms, rivers, oceans and ice sheets—and collecting, storing and analysing that data.

This data comes from a set of dedicated satellites,—the Sentinels—plus dozens of contributing missions that ensure a whole range of observational requirements are met.

Every year, Copernicus disseminates a whopping 40 petabytes of data. And the number of users is doubling, year on year. As of May 2018, Copernicus had 170,000 users. In fact, every citizen has full, free and open access to Copernicus data; opening up potential for innovators and start-ups to improve our well-being and the long-term sustainability of our planet.

Coping with this surge in data and high volume of users requires a robust, hard-working infrastructure.

See **impact.geant.org/Copernicus** for more.

HELPING TO UNDERSTAND THE UNIVERSE

When the Large Hadron Collider (LHC) at CERN began smashing protons together, the world held its breath. As scientists prepared to recreate the big bang in a 17-mile tunnel beneath the French-Swiss border – it was the stuff of science fiction.

Yet the world's largest and most powerful particle accelerator is a very real attempt to understand the universe. And its home to some of the most important physics experiments of our time.

As you might imagine, the computational, storage and networking challenges involved in a project like this are colossal. Processing the data generated by 100-200 events each second relies not only on a community of 13,000 scientists – at 170 computing centres in 100 countries – but also vast storage for permanent archiving of this valuable data.

With 80% of the LHC data processed outside of CERN, a rather special computing solution was needed: the Worldwide LHC Computing Grid (WLCG), an enormous collaborative effort shared between GÉANT and its European NREN and international partners.

See **impact.geant.org/CERN** for more.

160+ FTEs
500+ contributors

50M users

tnc TNC18 had over **700 participants** from 73 countries

eduroam
4.3 BILLION NATIONAL AUTHENTICATIONS
Now in 101 countries

eduGAIN
AVAILABLE IN 59 COUNTRIES

eduTEAMS

INTRODUCING THE GÉANT GN4-3 AND GN4-3N PROJECTS

1 January 2019 saw the start of the GN4-3 and GN4-3N projects, the final stage in the existing Framework Partnership Agreement that began with GN4-1 in May 2015.

The new projects follow on from successful GN4-2 (May 2016 to December 2018) and GN4-1 projects, and share the ongoing vision to ensure all researchers across Europe have equal high performance network access to the research infrastructures and e-infrastructure resources available to them.

What is GN4-3?

GN4-3's vision is to become the unified European Communications Commons – driving knowledge creation as the global hub for research networking excellence. Its mission is to deliver world-class services with the highest levels of operational excellence.
Throughout GN4-3:

- GÉANT will maintain the operational excellence of the established GÉANT services, while still achieving economies on the costs of the backbone network. The reliable, secure and state-of-the-art, high-speed network services offered to researchers and other network users across Europe will remain exceptional.

- Massive data transfer capacities required by extreme-scale instruments, both existing (e.g. Large Hadron Collider (LHC) and under development (e.g. Square Kilometre Array (SKA), and by the penetration of big data in many areas of science will be prototyped with due consideration to specific security and deployment challenges.
- Exascale computing will be installed in some countries and accessed from most, making user requirements for very high network speeds with the guarantee of no packet loss even more important.
- GN4-3's developments are guided by the vision of a future where a set of coherent and integrated European e-infrastructure services will offer convenient, seamless access for the end users.
- Trust & Identity is key to the security, privacy and trust of the end users of e-infrastructure services. Federated access and national identity federations have enabled NRENs to explore new models for service delivery. The services in this area of GN4-3 are operated and developed in accordance with user requirements as they need to adapt to the increasingly integrated
- e-infrastructure environment necessary for supporting the European research community.

What has changed from GN4-2?

GN4-3 has introduced several changes, some administrative and some more substantial.

The whole lifecycle of a service is now within one Work Package. This integrated approach ensures service developments are closely matched to operational support.

Other new areas include a new Work Package for Security (WP8), recognising the vital nature of this area in ICT; consensus building in Network Technologies and Services (WP6), to discover new network infrastructures and network services innovation; and an Incubator Task in the Trust & Identity Work Package (WP5) to support new ideas or potentially disruptive technologies that are considered sufficiently mature for the project environment. WP5 will not only consider technical ideas, but also policy, business and trust model aspects that may have an impact on the existing Trust and Identity service models or that may lead to new services.

What is GN4-3N?

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

The GN4-3N project will greatly improve the underlying infrastructure of the fibre and optical system, with the fibre network extended well beyond its current reach. This will involve restructuring the GÉANT backbone network through exploration and procurement of long-term Indefeasible Rights of Use (IRUs), leased lines and associated equipment, serving the GÉANT partner NRENs and providing interconnectivity to the global research and education community.

GN4-3N's mission is to deliver unconstrained access at higher minimum capacity thresholds, highest levels of security across the network, and equal access to clouds and other services in the European research area and beyond. It will also increase network footprint, future proof connection speeds and stimulate the market in cross-border communications infrastructure while decreasing the digital divide.

CONNECT will provide regular insight into the progress of both GN4-3 and GN4-3N, with focus on the key people and partners involved.

GN4-3 Project Structure

There are three sets of Work Packages in GN4-3:

Support Work Packages
WP1: Project Management
WP2: Marketing Communications and Events
WP3: User and Stakeholder

Service DevOps Work Packages
WP4: Online Services Development and Delivery
WP5: Trust and Identity
WP6: Network Technologies and Services Development
WP7: Network Core Infrastructure and Core Service Evolution and Operations
WP8: Security

Operations Work Packages
WP9: Operations Support

GN4-3N Project Structure

WP1: Project Management

WP2: Infrastructure Implementation

Start date	1 January 2019
Duration	48 months
Total budget	€119M
EC contribution	€77.5M
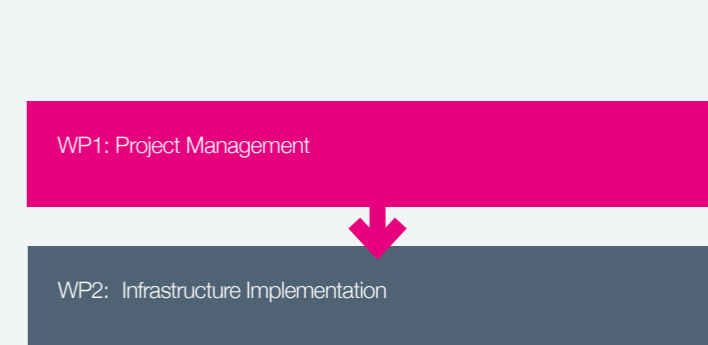
Start date	1 January
Duration	48 months
Total budget	€63.125M
EC contribution	€50.5M

GN4-3 and GN4-3N have over 500 participants and 39 Project Partners, 37 NRENs, NORDUnet (representing 5 Nordic countries) and GÉANT Association

In both projects, the Project Management Board (PMB), comprising the Work Package Leaders and relevant subject matter expert (SME) coordinators, meets monthly with the Project Management Office to exchange information, coordinate common work and ensure that interdependencies are maintained between Work Packages, and any issues resolved in a timely fashion. The GÉANT GA, the GÉANT Board and the Oversight Committee oversee the implementation of the projects.

VOICE OF THE GÉANT BOARD

Continuing our series of Board member interviews, CONNECT spoke with CEO of Jisc, Paul Feldman, who joined the GÉANT Board in November 2017. Jisc runs the United Kingdom's National Research and Education Network, Janet.

How does the Board reflect the wishes of the GÉANT Membership?

We listen very carefully to the General Assembly (GA) and ensure that our decisions meet the needs of the multiple constituencies that it represents. The NREN member base comprises a variety of country-specific communities with different sizes, history, backgrounds, levels of maturity and very diverse requirements. By adopting an umbrella approach we always endeavour to listen, be attentive and focus on such a multiplicity of needs.

What do you see as the main successes of the Board?

GÉANT is continuously evolving to adapt to the ever-changing European landscape. The Board is following the same process in order to be better positioned to fulfil its mandate, provide strategic direction and foster a successful relationship with the GA. I believe that we are creating the right conditions and balance for all the parties involved to be successful. Our objective is also to provide the right financial parameters to empower and guide the GÉANT executives, so as to enable them to carry out their responsibilities and tasks in the smoothest way possible.

How would you like to see the Board develop in the future?

The Board has a vital part to play to ensure NRENs' needs are understood and met by GÉANT. I believe we should aim to spend less time, resources and energy on minutiae and use our valuable GÉANT time to refine the strategy, develop risk prevention measures, and define objectives and priorities. We need to keep monitoring the macro environment, act as critical friends, coaches and mentors, create the right challenges, and occasionally play the devil's advocate role.

How do you see Jisc's role in Europe developing, and Jisc's interaction with EU partners and EU science and education?

Jisc's vision is for the UK to be a digitally advanced lifelong learning nation, transformed by technology. Due to the current uncertain times, we cannot predict the role of the UK within the Horizon 2020 programme, but I do expect my country will still be a very strong and reliable partner for research and education in Europe. My intent for Jisc is to continue playing its current role in the European and global NREN community, but the present situation is unfortunately outside our control and we are faced with a considerable number of unknowns. Our focus is on data in teaching, research data management and we also hope to continue participating actively in EOSC open scholarship programmes as a strong and reliable link between UK and EU programmes. There are few NRENs in the world similar to Jisc. We are not just a network, but have a much wider scope: we have become a very broad digital body for higher education and research in the UK. We are developing exciting visions for teaching driven by the industrial revolution 4.0 technologies (which we label Education 4.0), stimulating radical thinking within our member organisations. We will keep developing new services for R&E

and providing advice, guidance and thought leadership to our prestigious universities.

How do you see Jisc's position in the world developing?

We need to share and facilitate the adoption of best practice in universities from around the globe whilst helping to embrace new ways of thinking. Our universities are some of the most advanced in the world, and some of them are starting to expand geographically across borders into other countries and continents. Jisc needs to support them in the successful setting up of new campuses, working with telecom providers, local NRENs and suppliers. For instance, we need to continue providing unmatched connectivity and superlative levels of support to enable them to carry out a growing number of regular virtual sessions with remote campuses and ensure that all students, independently of their location, feel part of a university's global community.

Tell us about yourself

Achieving a good work-life balance has always been one of my objectives. I like to keep myself active playing golf and cycling, I enjoy reading international crime fiction and I am also a self-confessed cinema lover. Travelling is one of my passions too. My latest holiday was probably one of the most memorable of my life; my wife and I went gorilla watching in the Republic of Congo at a camp run by Odzala, a charity that looks to protect the area and reinvest in it. As well as tramping through impenetrable jungle and 'glooping' through waist deep swamp, seeing these amazing creatures and other rare forest animals was an experience second to none.

TRUST & IDENTITY PROGRAMME GOING STRONG IN 2019

2019 promises to be an exciting year for the Trust & Identity Programme of GÉANT. Chief Community Support Officer Klaas Wierenga explains.

Over the past few years, Trust & Identity (T&I) has become a significant part of not only the GÉANT project but also research and education in general and it is not hard to see why. Students, staff and researchers are becoming more mobile; visiting, working and collaborating around the world, but are also accessing information, and services from a huge range of global providers and systems.

In order to be able to work globally, users need to be able to identify themselves with a huge number of systems and rely on their identity being protected. The rise of distributed cloud services will only increase this need for user identities to be both shareable and secure. Already millions of R&E staff and students every day are using services such as eduroam and eduGAIN to get online and connect to services to help them work and study, and 2019 promises even more opportunities to help them.

The Trust & Identity Work Package in GN4-3 is bigger than ever. The main T&I services in the GÉANT community - eduroam and eduGAIN - remain the core of the programme, and they will be more secure, robust, better supported, and easier to use. For example eduroam Managed IdP service will enable smaller institutions to offer eduroam services to their staff and students using a simple, hosted service.

In addition, new and exciting services like InAcademia and eduTEAMS are being introduced, building on the foundation of eduGAIN interfederation and supporting research teams and students.

AARC – moving forward

The AARC project that addresses the needs of research collaborations will finish in April, but its results will carry on. Support for researchers is now an integral part of T&I in GN4-3, and the AARC Blueprint Architecture (BPA) is being adopted by most research collaborations worldwide and GÉANT's own implementation of it, eduTEAMS is gaining traction both among NRENs and research groups.

https://aarc-project.eu/
https://eduteams.org/

Other Trust & Identity projects that GÉANT will be contributing to in 2019 include:

MyAcademicID

The MyAcademicID project that GÉANT and a number of NRENs participate in looks at integrating student cards and government issued electronic identifiers (eID) with eduGAIN to provide a consistent identity for students across on and offline activities.

NGI_Trust

The NGI_Trust project is an activity involving GÉANT, EFIS and a number of other research institutions and NRENs. It will launch a range of open calls for innovation projects aimed at exploring new and exciting ideas in the field of privacy enhancing technologies. This project will support the development of technologies at early Technology Readiness Levels (TRLs) which could later feed into GÉANT service development.

LifeSciences AAI

In 2019 the LifeSciences AAI pilot work is planned to develop into a robust production AAI service for the Life Sciences cluster of projects. This field of research is heavily dependent on cross-institution and international collaborations and the nature of the data shared requires the most stringent management and control of access.

Effective AAI solutions will support the flexible yet controllable access to data and services which are an essential foundation for research.

EOSC-hub, EOSC and R&E e-infrastructures

As a major infrastructure provider for the R&E communities, GÉANT will be highly active in supporting the EOSC, EOSC-hub and other initiatives throughout 2019 both at a practical level with existing services but also in helping to develop the future frameworks that will support EOSC delivery.

And finally, GÉANT will continue with its global coordination activities under the aegis of REFEDS, the Global eduroam Governance Committee and the eduGAIN Steering Group to help support existing federations and to develop an even wider take-up of identity federation and interfederation across research and education.

All in all, 2019 looks set to be an exciting and very busy year for the Trust & Identity team across GÉANT.

What is AARC and how does it help R&E?

AARC has developed a Blueprint Architecture (BPA) to implement federated access management solutions for international research collaborations. The BPA lets software architects and technical decision-makers mix and match tried and tested components to build customised solutions for their requirements.

These components help support:

- User Identities: services which provide electronic identities that can be used by users participating in international research collaborations.
- Identity Access Management: defines an administrative, policy and technical boundary between the internal/external services and resources.
- Authorisation: contains elements to control the many ways users can access services and resources.
- End-services: where the external services interact with the other elements of the AAI.

EDUTEAMS - "MANAGING VIRTUAL TEAMS MADE EASY"

eduTEAMS enables researchers, students and other members of the research and education community to create and manage virtual teams, and securely access and share common resources and services - using federated identities from eduGAIN and other trusted Identity Providers

Introduction

International collaboration has always been at the heart of academic research. During the last decade, eduGAIN has enabled millions of researchers to access participating services with the same accounts that they use at their home organisations. The success of eduGAIN has led many groups to investigate how researchers can use their federated identities and eduGAIN as a foundation to enhance their digital collaborative environments across organisational and national boundaries.

AARC produced a Blueprint Architecture (BPA), to enable federated access in distributed research collaborations. The BPA captures and streamlines a design pattern that has emerged as the best practice for implementing interoperable authentication and authorisation solutions for accessing and sharing resources in international research collaborations and infrastructures. GÉANT, being one of the core contributors in the design of the AARC BPA, has fully embraced it and has developed the eduTEAMS service for the benefits of its community.

eduTEAMS

eduTEAMS enables research communities to securely access and share common resources and services. Leveraging the ubiquitous presence of eduGAIN federated identities, eduTEAMS enables communities to securely authenticate and identify their users, organise them in groups, assign them roles and centrally manage access rights for their resources.

As research is not confined only to the research institutes and universities, eduTEAMS caters also for users coming from industry as well as for citizen scientists who may not have access to eduGAIN. It does so by supporting a wide range of non-eduGAIN identity providers, such as social networks, community identity providers, corporate federated identity management systems and other platforms that can provide federated user identities.

eduTEAMS is comprised of four components:

1. eduTEAMS Proxy & Identity Hub

The Proxy is an SP-IdP Proxy with first-class support for the OIDC and SAML protocols. It can connect SAML Identity Providers, OIDC Providers, SAML Service Providers, OIDC Resource Providers thus enabling teams to use their preferred identity sources and services regardless of the authentication protocol. The Proxy is responsible for aggregating the user attributes from various identity sources, enforcing community and platform wide policies and providing one persistent user identifier and a harmonised set of attributes to the connected services.

2. eduTEAMS Discovery Service (DS)

The Discovery service provides a web interface for users to search and select their preferred identity provider. The Discovery Service is integrated with the eduTEAMS Proxy and Identity Hub which enables it to operate with all identity providers supported by eduTEAMS in the same way.

3. eduTEAMS Metadata Service (MDS)

The Metadata Service aggregates the metadata of all the SAML Identity and Service Providers that are connected to the platform. It does so by aggregating the metadata feed of eduGAIN, while allowing the platform administrators to configure also other local or remote metadata sources. The MDS is an essential component of the platform directly connected to the eduTEAMS Proxy.

4. eduTEAMS Membership Management Services (MMS)

The MMS allows users to create virtual organisations (VOs), manage these VOs, invite users to collaborate, manage registration flows, organise users into groups, and assign them roles and resource entitlements as needed within the collaborations. Currently, users can choose between three options for their VO: COmanage, HEXAA and Perun. Communities can pick the one which fits best to the organisational and operational models. All three are fully integrated and available on the eduTEAMS platform.

The eduTEAMS Offerings

There are three eduTEAMS offerings:

1. eduTEAMS Service

The eduTEAMS Service is provided by GÉANT to small and medium sized communities. The eduTEAMS Service supports multiple communities on the same platform and is ideal for communities that want to get started with their collaborations, taking full advantage of the federated access without having to deal with the complexity of operating and supporting their own AAI. The eduTEAMS Service provides everything required in order to securely collaborate and use services such as those available to the GÉANT community and the European Open Science Cloud.

2. eduTEAMS Dedicated

For communities requiring full control of their AAI, GÉANT can host and operate their own, dedicated AAI service powered by the eduTEAMS technology. Communities using eduTEAMS Dedicated can rely on the operational capabilities and expertise of GÉANT, while they are in full control of the policies, configuration and branding of their AAI.

3. eduTEAMS Bespoke

There are communities that have requirements that do not align with, or, go beyond what the eduTEAMS service and eduTEAMS Dedicated packaged offerings can provide. For those communities that require tailor-made functionality, such as integration with custom back-office and front-office systems, new capabilities or complementing their existing AAIs with new functionality available in eduTEAMS, GÉANT can provide bespoke solutions based on the eduTEAMS technology, which can include a combination of consultancy, development and hosting of the service.

Are you interested to find out more about eduTEAMS? Visit the eduTEAMS website at **https://www.eduteams.org** or contact us at **support@eduteams.org**

FOLLOW IN OUR FOOTSTEPS

AARC RESEARCH COMMUNITIES SHARE EXPERIENCES AT FIM4R

AARC has proved a useful forum for research communities and e-infrastructures to make contact and address the increasing need for federated access to their online services and resources. They could also 'safely' try out specific authentication and authorisation infrastructure (AAI) solutions for their infrastructures.

All of the solutions that have been tried in AARC use the AARC Blueprint Architecture (BPA) and could provide useful shortcuts to future research communities. But with AARC coming to an end in April, leaving a trail that can be followed is now one of the project's goals.

Research communities participating in AARC pilots presented their work to the FIM4R (Federated Identity Management for Research) community at a workshop on 11 February. FIM4R and AARC have a close relationship, with many participants in common.

Representatives from the Worldwide LHC Computing Grid, LIGO, LifeWatch, DARIAH and EGI, and EISCAT 3D showed their solutions, based on the AARC BPA and policy guidelines.

As an example of the challenges, David Hübner of DAASI International describes his AARC work on behalf of DARIAH: "We basically invented our own infrastructure, which worked for us but then we faced some scaling issues. There were more and more services in the DARIAH community that all needed to connect to the various Identity Providers in the federations and we had no possibility to centrally manage policy issues, for example. With the AARC BPA you have a central component, the proxy, which makes it very easy for the service operators in the community to connect to the AAI, so that's one of the things we wanted to achieve. The second point was interoperability with other communities and infrastructures." At FIM4R, David presented the solution that allows interoperability between DARIAH and EGI, so their researchers can access a wider range of resources, tools and data.

AARC is documenting the pilots work in case studies detailing the initial requirements, relevant policies and training materials as well as the technical solutions. These can be found on the 'AARC in action' webpage alongside other useful materials: https://aarc-project.eu/aarc-in-action/

The FIM4R workshop also covered developments in working groups led by REFEDS (Research and Education Federations), WISE (Wise Information Security for Collaborating e-Infrastructures) and InCommon, which all tackle aspects of the federated identity management challenge. Another focus was to track the adoption of recommendations in the FIM4R version 2.0 white paper, which was published in June 2018 and expresses common requirements of research communities.

Hannah Short of CERN and the WLCG AARC pilot says that FIM4R will continue to be a key place for research communities to go to for information and expert support. "Even after AARC has stopped, it's somewhere where the same people will be able to keep sharing best practices."

Fim4r.org

FIM4R White paper: **https://doi.org/10.5281/zenodo.1296031**

Aarc-project.eu

AARC ACHIEVEMENTS BENEFIT RESEARCH COLLABORATIONS

The AARC project answers an increasing need among research collaborations and e-infrastructures for authentication and authorisation mechanisms and for federated access to their online services and resources. AARC has two main pillars, the Blueprint Architecture (BPA) and the policy framework, that promise benefits for the research community at large. AARC ends in April, but its impact will remain visible for years to come.

Architecture

The BPA is a reference architecture that provides 'building blocks' for an AAI that supports federated access. Research and e-infrastructures adopting the BPA can take advantage of the Identity Federations and eduGAIN and enable federated access to resources in a way that was not possible before.

A new version of the BPA will shortly be released, which focuses on allowing the AAIs of different research- and e-infrastructures to inter-operate. This functionality is needed by research communities requiring access to resources that are offered by other infrastructure providers.

The new BPA promotes a 'community first' approach, introducing the Community AAI. This element streamlines how researchers can access services - either by using their credentials managed by an institution participating in eduGAIN, or by using credentials issued by other parties.

The BPA has been adopted by EGI, EUDAT and GÉANT, and provides a cornerstone AAI in the European Open Science Cloud. Several research infrastructures have adopted or are adopting BPA-based AAI solutions, including DARIAH, LIGO, PaNOSC and Life Sciences - 13 research communities from the Life Sciences domain.
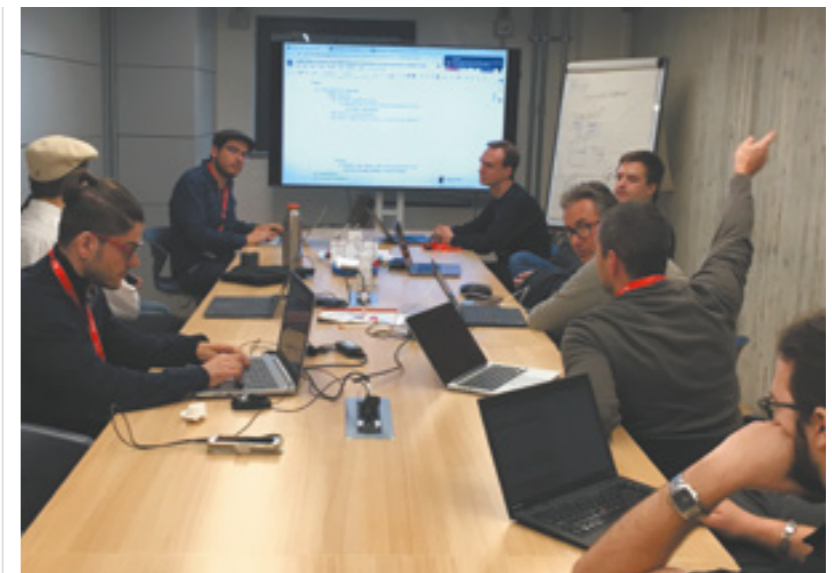
Policy

A large number of policy guidelines documents have been published, and a 'Policy Development Kit' has recently been released. The PDK includes a self-paced training course, a complete handbook and templates on the best ways to ensure high levels of trust for users, resource providers, and infrastructures.

AARC has invested significant effort on policy, as "more often than not it's the trust and governance issues that prove more complicated [than the technology] and that's where policy comes in," says Hannah Short of CERN, one of the lead authors of the PDK. "If we have hundreds of organisations working together, we need to ensure that each is conforming to a baseline of operational security, that they're respecting the privacy rights of their users and that everybody is doing this in a consistent way."

All these developments are part of the AARC legacy that will keep supporting research collaborations to securely access a wider range of resources and work better together, even after the project ends.

Further info:

See more detailed news reports about the BPA: **bit.ly/2svzyTH** and the Policy Development Kit: **bit.ly/2CIb5VJ.**

Guidelines in full: **aarc-project.eu/guidelines/**

AARC project overview article: **bit.ly/2sqFld7**

DEVELOPMENTS ON OPENID CONNECT IN THE R&E COMMUNITY

Introduction

OpenID Connect (OIDC) is a simple identity layer on top of the OAuth 2.0 protocol, which acts in a similar way like SAML2 as a protocol for identification and authentication.

Current identity federations in the academic area are, with almost no exception, SAML2 based. There is however a strong and rising interest for using OpenID Connect as a protocol for identification and authentication.

The OpenID Connect protocol is being perceived as a simpler, JSON/REST based protocol, and is being designed, besides web-based applications, to also support native apps and mobile applications. OpenID Connect is an open standad and it is adopted by the large players in the industry, like Amazon, Google and Microsoft. Furthermore a recent REFEDS survey showed great interest from federations for supporting OpenID Connect.

The GN4-2 team working on Next Generation Trust and Identity Technology Development successfully deployed several activities targeted at the use of OpenID Connect in the R&E world.

OpenID Connect Federations

There is no default support for building federations in the basic standards of OpenID Connect, not for the multi-lateral identity federations that are employed in the academic area. Roland Hedberg et al., have written a specification at the OpenID Foundation for creating an identity federation using OpenID Connect, hereby taking into account some lessons learned from the identity federations as we know them now.

During the course of the project the specification has been further developed, implemented for both mobile and desktop applications and had a major rewrite. At the same time a deployment profile targeted to R&E identity federations was drafted. The work on the specification consisted of both supporting the main editor, Roland Hedberg, and engaging with multiple R&E communities in order to collect needs, feedback and suggestions.

OIDC Support in Shibboleth

Shibboleth is an open-source project that provides a Single Sign-On software suite. Shibboleth Identity Provider and Service Provider support the SAML 2.0 standard and the R&E multi-lateral identity federations. The Shibboleth suite is among the world's most widely deployed federated identity solutions in the R&E environment, which is why the Shibboleth Identity Provider was chosen as the target platform for an OpenID Connect plugin (named Shibboleth OIDC Extension).

The extension fully supports the main OIDC specifications. With the plugin, institutions can use both SAML2 and OIDC at the same time as authentication mechanism. The code was built in agreement and collaboration with the Shibboleth developers, and reached beta status. The development will continue in GN4-3 in order to reach a stable release during 2019.

OpenID Foundation R&E Working Group

From supporting the development of an identity federation standard for OpenID Connect, the GN4-2 project participants advocated the creation of a working group dedicate to R&E in the OpenID Foundation. The initiative was very successful and after a positive vote from the OpenID Foundation Board, the OpenID Connect R&E Working Group was founded in October 2018. In order to get a broader base for the use of OpenID Connect in within R&E, the working group is focusing on developing:

- a profile for OpenID Connect with specific requirements for security, multi-lateral trust and interoperability in the R&E sector.
- a profile for the use of a specific set of claims and scopes related to the R&E sector.
- a profile for extending the OpenID Connect entity's metadata to support policy frameworks used in the R&E sector.

Moreover, many of the working group participants are also engaged in the REFEDS OpenID Connect for Research and Education (oidcre) working group and the InCommn OIDC-OAuth Deployment Working Group.

Words

Maarten Kremers, SURFnet (pictured left)

Davide Vaghetti, GARR

OpenID Connect training

New technology requires new training. Three successful instances of the Roland Hedberg's OJOU (OAuth2, JW*, OpenID Connect and UMA) course were held, training NREN personnel on the fundamental basics of OpenID Connect and it's underlying protocols. The course material is available to anyone through Github, and it already inspired other training events organised by the Authentication and Authorisation for Research Collaboration (AARC) project.

A specific training course on the Shibboleth OIDC Extension was also run twice, one at Internet2's Technical Exchange 2018 and one hosted by GÉANT. Both events were very successful, and testament to the great interest in the use of OpenID Connect with the Shibboleth Identity Provider.

A final word

OpenID Connect is a relatively new standard, being finalised only in 2014, but it has already won many developers to its side for its solid roots in the OAuth2 framework, its use of modern technologies like JSON and REST-like APIs and finally for it being suited for the web as well as for mobile platforms and desktop applications.

In order to pair SAML 2.0 as an authentication technology the promising work on extending OpenID Connect to fully support the sophisticated use cases of the R&E world must continue. The journey of OpenID Connect in the R&E world has just begun, but it already coalesced an army of identity professionals that are eager to use it and participate in its further development.

INACADEMIA BEGINS ITS ROLL-OUT

Picture
Above: Detail of the Atlas of Ortelius (pub. 1571) from the Koninklijke Bibliotheek collection

Being a student has many perks, not least among them the availability of services that are designed for those in academia or offer a discount. For students, though, this can mean a tiresome process of presenting a valid student card to an online service to identify themselves, which is also undesirable for privacy reasons. For the services, it is critical to know if someone requesting access or a discount is indeed entitled to it – are they affiliated with an institution, and how can that be validated?

InAcademia is a simple, one-button online service that allows online merchants to validate if a customer is a student or affiliated to an education institute in another way. It's a low cost, easy-to-implement service providing fast, entirely secure validation.

InAcademia has now moved into its pilot phase and is actively recruiting organisations, both educational institutes and commercial organisations.

National Library of the Netherlands Joins InAcademia

The Koninklijke Bibliotheek (KB) is the national library of the Netherlands. Driven by the power of the written word they further intellectual development, proficiency and creativity in the Netherlands. The KB promotes the visibility, usability and longevity of the Dutch Library Collection, including collective holdings of all publicly funded libraries in the Netherlands. Unhindered access to these collections furthers the development of new ideas and allows researchers to build upon the ideas of their predecessors.

A key focus centres around digital resources on cultural sciences. For example;

- E-book Central: More than 400.000 scholarly ebooks on a variety of subjects in the humanities and social sciences.
- Databases: A large amount of databases with publications about history, politics, environment, arts, religion and sports.
- (Inter)national newspapers: A Worldwide selection of recent newspapers and magazines from the last three months.

As part of this goal the KB offers discounts to members of a wide range of educational institutes across the Netherlands. In order to process these discounts it is necessary to validate the credentials of these applicants without the costs, complexity and delay of receiving and checking copies of student cards or other physical identity processes.

By using InAcademia, the Koninklijke Bibliotheek can rapidly and automatically validate credentials. This improves the experience of the users and reduces the workload of the KB.

> "We were previously using a SURFconext validation service which was reaching end-of-life and so we needed to switch to something new. We were pleased to find InAcademia, a very light-weighted validation service, that exactly meets our needs. Implementation was simple and quick. From now-on our student customers can prove they are a student just by authenticating like they are used to do in their own institution. We love the service."
>
> Johanneke van Dorp, Koninklijke Bibliotheek

> "The Koninklijke Bibliotheek had been connected to a legacy platform for over 5 years, this was now being phased out.
>
> The advantage for SURFnet of using InAcademia is that once institutions are connected to InAcademia - like the Koninklijke Bibliotheek is now - we are also able to connect other merchants and research institutions to the students of these institutions. There is no need for every institution to take any further action on a new connection.
>
> Because InAcademia works via eduGAIN, by connecting the Koninklijke Bibliotheek to InAcademia, lots of new institutions have now connected to eduGAIN. That's a perfect enhancer for eduGAIN as well. The use of eduGAIN has become more accessible for them. Great news for everybody."
>
> Thijs Kinkhorst - Technical Product Manager Trust & Identity - SURFnet

Over the next few months, the InAcademia team will be signing up a range of academic and commercial service providers. For more information on InAcademia and the range of services available, visit **https://inacademia.org**

- Two pan-European tenders, for IaaS and video conferencing.
- 29 service offerings for IaaS, video conferencing, file storage and real-time communications services.
- Closed special terms and conditions to suit the needs of research and education institutions, including SAML2 support, private peering with GÉANT to reduce data transport charges, special discounts and more.
- Development of an open standard WebRTC web conferencing.

In addition, development teams completed two underlying cloud technology components with Integrations that allow OpenStack users to authenticate to Kubernetes and move data to AWS.

Delivery, Deployment and Promotion

The key markers for the success of this cloud activity is how these cloud services are being adopted by the community. To this end, delivery frameworks reached an all-time high, with actual systems deployed in operational production environments:

- IaaS services consumed by 294 institutions in 18 countries throughout Europe.
- 140 specialists in 34 NRENs are supporting application service delivery.
- Over 6,600 attendees at 135 activity-organised events.
- 47 weekly VC forums for NREN cloud managers in 2018.
- 40 institutional representatives attended a two-day cloud deployment workshop in September 2018 on AWS and Microsoft Azure.
- 50 attendees at a machine learning and Artificial Intelligence workshop by Google at TNC18.
- 19 participants attended a cloud adoption workshop at EaPEC2018 for the NREN and R&E community in Eastern Europe.

Toward Pan-European Open Science

One of the most exciting developments to emerge alongside the Cloud Team's achievements is the complementary OCRE (Open Clouds for Research Environments) consortium. OCRE combines the expertise of four partners: CERN, GÉANT, RHEA and Trust-IT. The consortium is led by GÉANT and charged with the task of facilitating access to commercial digital services and drive the adoption and use of these services. Essential for interdisciplinary research, these services include:

- Commodity type commercial digital services, such as: Infrastructure as a Service (IaaS) and Platform as a Service (PaaS), providing compute, storage, network and related services
- Software as a Service (SaaS), such as file storage (sync and share), online collaboration, simulation and virtualisation tools
- Secure Earth Observation commercial services, which make use of the Copernicus Data and Information Access Services (DIAS).

OCRE will run for three years: 2019 – 2021.

Next Steps

These achievements are due to the hard work and teamwork of many people from many countries. And while the achievements do speak for themselves, fitting recognition was granted when Activity Leader Andres Steijaert was awarded the 2018 GÉANT Community Award for his impactful contribution to the GÉANT project and wider community activities over a sustained period of time. Working with limitless optimism and energy, but also great organisational and negotiating skills, Andres drove the cloud project from the initial concept to its current active state, and will continue as Work Package leader for GN4-3. Ambitious plans include tendering education-specific services, scaling up national community clouds from individual NRENs to a pan-European GÉANT level and accelerating delivery and adoption.

We encourage you to stay tuned to the exciting developments in this area, as the R&E community continues to soar into the clouds to accelerate and fuel outstanding research and education.

Words
Maria Ristkok,
EENet

To find out more information about the GÉANT Clouds activities visit:
https://clouds.geant.org

REACHING FOR THE CLOUDS

BUILDING A DIGITAL SINGLE MARKET FOR CLOUD SERVICES

As the GN4-2 project came to a close in December 2018, it is a good time to reflect on the accomplishments the GÉANT Cloud Team has achieved to date, and anticipate many more great things coming up in GN4-3.

It is sometimes hard to believe that in just a few short years, GÉANT succeeded in creating Europe's very first Digital Single Market for cloud services. Considering the myriad of national regulations, tender policies, supplier and reseller networks and all the native spoken languages involved – this is no small feat. Under the management of Andres Steijaert from SURFnet, the Cloud Team built a strong foundation, positioning GÉANT and the NRENs as trusted delivery gateways to this ecosystem and supporting widespread adoption of cloud services in a predictable, affordable and transparent manner.

Agreements and Developments

These efforts, which are well aligned with the goals of the overall European Open Science Cloud, bore fruit to an impressive mass of deployments. Below are just some of the facts and figures:

WOMEN IN TRUST & IDENTITY

In honour of Women & Girls in Science Day and International Women's Day, two important days marked by the United Nations and celebrated across the globe, we are celebrating the women in our community – yes ladies, all of YOU!

As our wonder women are involved in many fields, we decided this year to focus on a specific field and to highlight the women in Trust & Identity! As with everything in the world of GÉANT, our Trust & Identity team is a strong collaboration between women (and men!) all over the globe.

Since the two universally celebrated days are about a month apart (Women & Girls in Science Day on February 11 and International Women's Day on March 8) our campaign spanned the month and introduced you to the profiles,

contributions and inspirations of the women who are working day in and day out to make sure that the development of effective Trust & Identity systems is maximised for students, researchers, institutions and even governments. Think of the women involved in eduGAIN, eduroam, eduTEAMS, InAcademia, and more federated identity and advanced technology tools.

Have a look at the full profiles on the GÉANT Community Blog on the GÉANT women in STEM category. We have also published teasers to the profiles on our social media channels (Twitter, Facebook, LinkedIn and Instagram) under #GEANTwomeninSTEM.

From all the men and women at GÉANT, we would like to show our gratitude to the female career tigers, young professionals, researchers, students, mothers, experts, in short all the hard working women contributing to not only Trust & Identity, but all the work we are doing in R&E networking.

EDUROAM REACHES INCREDIBLE MILESTONE

At the latest Global eduroam Governance Committee (GeGC) seven new territories joined eduroam, the worldwide WiFi roaming service.

These new countries now bring eduroam access to 101 territories giving users even more free WiFi roaming access and supporting research and education collaboration around the world.
Since its inception, eduroam has been an amazing example of NRENs working together around the world to support millions of users and we look forward to welcoming even more territories to the eduroam family.

The latest 7 territories to join eduroam are:

- Benin (BeninRER)
- Ethiopia (EthERNet)
- Madagascar (iRENALA)
- Nigeria (NgREN)
- Oman (OMREN)
- Tanzania (TERNET)
- Togo (TogoRER)

With an estimated 4.3 billion authentications in the 2017-18 academic year across Europe alone, it is safe to say that eduroam is a huge and growing success.

Klaas Wierenga, GÉANT's Chief Community Support Officer and one of the founders of the eduroam initiative comments, "Everyone at GÉANT and the research and education networking community is delighted at the success of eduroam. With more and more countries taking part, the benefits to both existing users and new users are growing – making it easier for staff, students and researchers to work and collaborate globally."

To find out where in the world you can eduroam visit: **https://eduroam.org/where**

eduroam Companion App launched

To help users find and use eduroam hotspots when travelling worldwide, Jisc, the UK's national research and education networking charity, has just released a completely rewritten version of the eduroam companion app for Android and iOS.
This new version offers the same functionality as its predecessor, documenting the global eduroam estate and helping end users discover more about and navigate to venues that offer eduroam connectivity in all 101 countries. However, it is now much more efficient and future proof.
Jisc is able to offer this refresh to the eduroam apps and keep them free to use by reusing the work that's gone into the companion app for the UK govroam service, which has just passed 3,000 locations across the UK (many of which also offer eduroam access).
The apps are free to download from Google and Apple stores.
To find out more visit: **https://eduroam.org/companionapp** or search for "eduroam companion app" on the App Store or Google Play.

CESNET announces eduroam access for railways stations across the Czech Republic

In December 2018. CESNET (the National Research and Education Network for the Czech Republic) announced that twelve Czech railway stations are now covered by eduroam, providing students, teachers and scientists with free WiFi internet access whilst travelling.

As part of this initiative, the number of connected railway stations has grown considerably, namely the main railway station in Brno, České Budějovice, Pilsen, Olomouc and Ostrava, as well as Ostrava-Svinov station. The service was available earlier in Prague, both at the main railway station and Masaryk train station and at the main railway stations in Hradec Králové, Pardubice, Ústí nad Labem as well as at the railway station Zlin-center.

CESNET has been very active in motivating organisations to provide eduroam access and by being able to offer the benefits of eduroam on the rail network this will strengthen the case for institutions to join eduroam.

https://www.cesnet.cz/sluzby/eduroam/

WOMEN & GIRLS IN STEM DAY & INTERNATIONAL WOMEN'S DAY

WHAT DOES A MARS SUNRISE SOUND LIKE?

Astronomy is a discipline that is instinctively associated with vision. Since Galileo invented it in 1610, we have been using the telescope to look at stars and planets – one was even launched into space almost thirty years ago (NASA's Hubble Space Telescope), to gain the best possible pictures of galaxies and nebulas.

Pictures, however, are not just for the eyes. Scientists are increasingly using alternative techniques to investigate images and to detect patterns and anomalies, explore singularities and hidden structures.

Picture
Dr Domenico Vicinanza on the NASA booth at SC18

Turning pictures into music using R&E networking

Dr Domenico Vicinanza of Anglia Ruskin University, and Dr Genevieve Williams from the University of Exeter, are using a technique called data sonification to analyse scientific data in their labs. They stress that listening to data through sound and music is an entirely natural way for us to experience pictures as melodies and rhythms, and in fact we are naturally better at picking out patterns and anomalies with our ears than with our eyes!

Through sound, we can also perceive multiple streams of data at one time, providing a multidimensional representation of a data set. Image sonification allows certain properties of the picture, for example the existence and shape of clusters, the abundance of a specific colour, the recurrence of a particular brightness pattern, to be portrayed as sound and melodies.

As an example of how sonification can be used to communicate and explore science from a different perspective, the two scientists used this technique to create a very special piece of music that was premiered at NASA's booth at Supercomputing 2018 (SC18).

Mars rover records its 5,000th sunrise on the red planet

Opportunity is a robotic exploration rover that has been providing photographic data on Mars for NASA since 2004. On February 16 2018, Opportunity captured the 5,000th sunrise witnessed on Mars – marking the equivalent of 5,137 Earth days' continuous operation of the rover*.

To create their piece of music, Dr Williams and Dr Vicinanza analysed this picture – pixel by pixel – looking at brightness and colour information and combining this with terrain elevation, assigning to each element a specific pitch and rhythm.
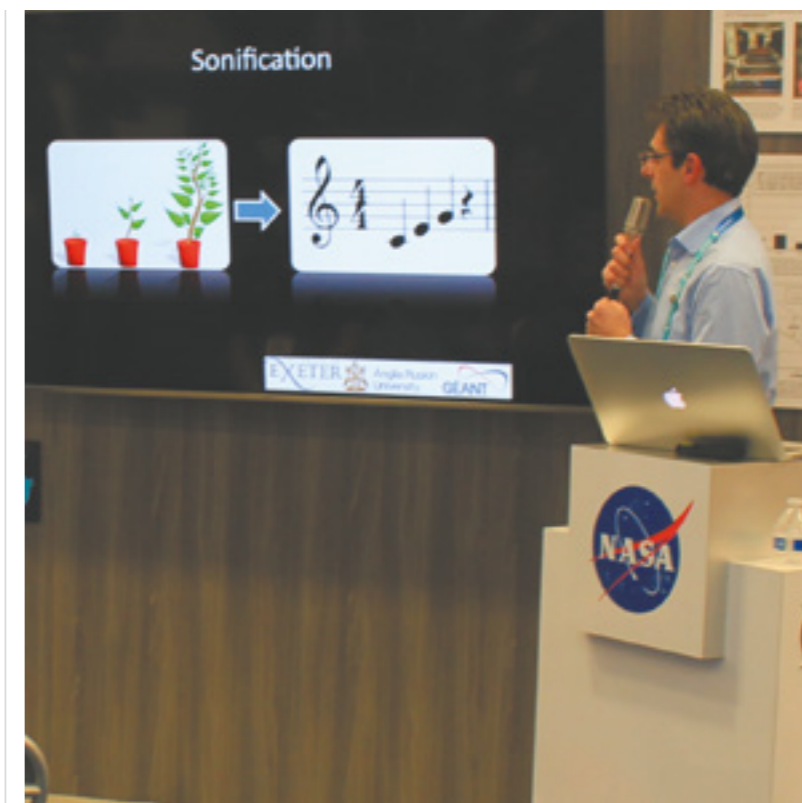
Within the piece, the quiet, slow harmonies are a consequence of the dark background and the brighter, higher pitched sounds towards the middle of the piece are created by the sonification of the bright sun disk.

This special piece of music was presented using both conventional speakers and vibrational transducers so the audience could feel the vibrations with their hands, thus enjoying a first-person experience of a sunrise on Mars.

Dr Vicinanza, who is also a Senior Research Engagement Officer for GÉANT said: "We were absolutely thrilled to present this work about such a fascinating planet. Image sonification is such a flexible technique to explore science and it can be used in several domains, from studying certain characteristics of planet surfaces and atmospheres, to analysing weather changes or detecting volcanic eruptions."

Dr Williams added: "The process of sonification is relevant for science because it gives us a different medium through which to explore data. In health science, for example, it can provide scientists with new methods to analyse the occurrence of certain shapes and colours, which is particularly useful in image diagnostics."

The sonification process used the EGI (**www.egi.eu**) computing infrastructure, connected through the GÉANT network (**www.geant.org**) and its European NREN partners. This created a mesh of computers working together seamlessly. Only distributed grid computing like this can provide the high-bandwidth needed to turn millions of pixels into sound waves. These collaborative computing networks can be used to accelerate scientific discovery across many domains.

To learn more, visit **impact.geant.org/Mars**

GÉANT TRIALS DIAMOND KEY SECURITY™ HSM TECHNOLOGY

DIAMOND KEY SECURITY™

Digital encryption is a fundamental Internet technology. Without digital cryptography and encryption, commerce on the Internet never would have been possible, and the 'Internet-isation' of the world would never have happened. In the wrong hands, private information, personal messages, and confidential data can be compromised and used for nefarious purposes, but when data is effectively and confidently encrypted, it cannot be retrieved and exploited by unauthorised parties. Digital cryptography technologies provide a base-level of security and trust that enables the secure transferal of funds and information. However, if the encryption solutions are proprietary, or have been implemented by private entities, the resulting security and trust are built upon a leap of faith, rather than a rock-solid foundation.

For these reasons, the development of dedicated, Hardware Security Modules (HSMs) has been at the forefront of cryptographic technology. However, how easy is it to put your trust in a 'black box' HSM where you have no way of checking the integrity of the hardware or the software?

Diamond Key Security™ (DKS), headquartered in Chicago, Illinois, USA, is a leading not-for-profit innovator and provider of transparent, auditable, and open-source cryptographic solutions that face these threats head-on. With substantial seed funding from the Internet Society (ISOC), an industry-leading Internet policy organisation founded at the dawn of the web, DKS was established to make open and assured security available to users across the globe.

Diamond Key Security and the CrypTech Project

The Diamond-HSM™ from DKS is the first ever open-source Hardware Security Module, and it is based on open technology from the CrypTech Project. The CrypTech Project was formed initially in response to the Snowden revelations of mass surveillance. The goal of CrypTech is to create an open source design for a hardware cryptographic engine for HSMs and an associated reference implementation that allows anyone to deploy and audit a secure, low-cost cryptographic engine in their environments. HSMs provide critical key management functions while maintaining secure cryptography. Key management includes generation of good keys for cryptographic operations, an essential component of good security, and secure storage of those keys. Essential cryptographic operations, such as signing data, are performed within the device so that the keys are never exposed outside the device.

GÉANT and Diamond Key Security

The Diamond-HSM supports digital signing and key management which enables use-cases such as DNSSEC, RPKI, TOR Consensus, PGP, Root and Intermediate Certificate Authority Storage; so that these applications can be implemented without depending on closed or proprietary components that cannot be audited or are possibly distrusted for their functionality. The Diamond-HSM can also function as a digital signer for Federated Identity Management.

GÉANT has recently acquired prototype Diamond-HSM devices from Diamond Key and is beginning the research into their usage and applicability within the R&E environment for Federated Identity Management and other uses. This study aims to provide use cases and best practice configurations suitable for NREN and Institutional use to allow R&E to secure and manage our data and resources in the new post-Snowden world.

For more information visit Diamond Key at **https://dkey.org** and CrypTech at **https://cryptech.is**

GÉANT IMPLEMENTS A 300GBIT/S IP LINK USING THE LATEST DCI EQUIPMENT

REDUCING COSTS AND INCREASING CAPACITY WITH ALIEN WAVE TECHNOLOGY

GÉANT has in December implemented a 300Gbit/s POP to POP link on the backbone network using Infinera G30 Groove DCI equipment. This link, between the two London POPs, is the first step in upgrading the GÉANT "Western Ring" (London – Brussels – Amsterdam – Frankfurt – Geneva – Paris - London) to provide a 300Gbit/s DCI loop. This will reduce the overall costs of the network, increase capacity and free up valuable equipment to extend the life of the Infinera switching fabric in advance of the GN4-3N project.

Previously IP connectivity between the London POPs was managed through a 200Gbit/s connection via the Infinera DTNx. This connection used multiple interfaces on the DTNx chassis which were reaching capacity. This service now operates using a pair of Infinera G30 Groove DCI (Data Centre Interconnect) devices running at 300Gbit/s and directly connected to the Juniper MX routers. The outputs of the DCIs are then inserted into the existing fibre connection using Alien Wave technology (a parallel light channel using a different frequency to separate it from the existing DTNx interconnect)

Implementation of DCI interconnection using alien wave services

This update has three major benefits:

1. It releases up to 200Gbit/s of extra capacity on the current 500Gbit/s London to London2 link for other services.
2. It frees up 100Gbit/s Infinera interfaces that can be reused in other parts of the network.
3. It avoids the need to upgrade the Infinera DTNx switches which are reaching capacity.

This work also helps GÉANT and the wider R&E community gain experience in these innovative techniques and technologies to assist in the planning and implementation of the next generation of Research and Education networking worldwide.

Moving forward to GN4-3N

The innovative use of DCI equipment and alien wave technology is a pathfinder for the future implementations of these solutions within the GN4-3N project. GN4-3N will involve restructuring the GÉANT backbone network through exploration and procurement of long-term Indefeasible Rights of Use (IRUs), leased lines and associated equipment, serving the GÉANT partner NRENs and providing interconnectivity to the global research and education community.

This new way of thinking will enhance the ability of GÉANT to offer a range of IP and Layer 2 services in cost-effective and flexible ways. It will be an essential approach to ensuring the long-term success of this major re-development of the GÉANT network and will support the growing demands of research and education.

For more information on GN4-3N visit **https://www.geant.org/gn4-3N**

NETWORK VIRTUALISATION, ORCHESTRATION, AUTOMATION AND WHITE-BOXING FOR THE EVOLUTION OF NETWORK SERVICES IN THE GÉANT AND NREN COMMUNITIES – WE NEED YOUR INPUT

With the start of GN4-3, the Work Package on Network Technologies and Services Development (WP6) is seeking to establish and build community consensus and use cases around certain technologies, towards the enhancement of existing – or the establishment of future – GÉANT and NREN services.

New Opportunities, New Challenges

New and advanced applications in the areas of IoT, cloud services, big data and cellular mobile services require a continuous evolution of the underlying network service elements. In order to meet these new demands static network services must be redesigned and must move from fixed transport services to a new way of providing flexibility, scalability and the efficient use of network resources.

To meet these goals and fulfil such requirements, network services must be able to re-use the existing network infrastructure in different ways, to allow for the use of network resources in a hardware-agnostic and agile manner and based on network functions that define the desired network behavior for different user applications.

Virtualisation and Disaggregation – Delivering lower costs and higher flexibility

Virtualisation, which has become relatively well-established, allows the definition of service components abstracted from their physical implementation, but to make potentially complex virtual network systems manageable, the adoption of network orchestration and automation platforms and tools are required to most effectively enable the programmatic configuration and provisioning of network connections and services.

In parallel, there is also an emerging trend of network technology disaggregation. The white box or "non-branded box" concept allows a range of commercial or open source Network Operating Systems (NOS) to be run on supporting hardware. White boxing offers the network operator independence from the hardware or the NOS platform, and the potential to rapidly innovate new services. Many white boxes are programmable through the P4 language, potentially allowing NRENs and campuses lower cost, more flexible platforms upon which to run their services.

WP6 Needs You

In WP6 we would like to investigate these concepts further over the coming months. There are some existing approaches in this space, either built within previous GÉANT projects or deployed and in use within NRENs, but there is an open question as to what consensus exists within, and importantly between, those communities in terms of their use. We are therefore seeking to find out how virtualisation, orchestration, automation and white boxing are currently being used and applied within different NRENs, and if there is a consensus on common use cases that could be identified and developed further.

Please help us in this investigation and support us in our upcoming surveys! We would like to work with you to foster standardisation and multi-domain interoperability for such new technologies and for hardware-agnostic and programmable service platforms for single and multi-domain environments.

Picture
Ivana Golub,
Joint WP6
Leader

Please also save the dates for upcoming presentations and workshops where we will be driving discussions of these issues, including:

- SIG-MSP, 5 March, Nicosia, Cyprus
- SIG-NGN meeting, 4-5 April, Stockholm, Sweden
- SIG-NOC meeting, 8-9 April, Ljubljana, Slovenia

We will also be contacting all NREN representatives to ensure members of the community have a chance to give their input. You are also welcome to contact the WP6 leaders Ivana Golub and Tim Chown at **gn4-3-wp6-wpls@lists.geant.org**

ENSURING BEST PRACTICE FOR GÉANT SOFTWARE DEVELOPMENT

GN4-3's work on software governance (Work Package 9 Task 2) is designed to support the software development (SWD) teams in harmonisation of software management (SWM) and development practices, as well as to help them in adopting consistent SWM practices. Additionally, the task performs code reviews of services and organises annual trainings (School of Software Engineering, Secure Code Training) for the GÉANT software community.

Motivation

The road towards extracting best practices and the definition of the GÉANT Software Maturity Model (SMM) was paved by GÉANT SWD community efforts in harmonising development processes and sharing the experiences among the teams. The idea started in GN4-2 with the Deliverable D5.3 "Analysis of Requirements for Software Management", which showed that SWD teams are using diverse development processes. That in turn may hinder proper management of the projects and the exchange of good practices elaborated in teams. Moreover, a GN4-2 Symposium side-meeting in 2017, organised with the representatives of the GÉANT SWD community, showed that SWD teams face similar problems, caused by geographical distribution of team members and their partial availability, low manpower percentage or involvement in other high priority projects.

Vision

In order to address the described issues, a custom SMM was designed specifically for GÉANT SWD teams. It is expected to provide guidance for the teams in their efforts related to SWD process improvements, considering the GÉANT structure and specific constraints. With a continuous representation and its prescriptive purpose, SMM enables measurement of the SWD team's maturity in relevant areas without giving a single, overall score of maturity, thus avoiding unnecessary benchmarking and rather focusing on the improvement.

The software governance task is aiming at addressing these issues and keeping up with the quality standards, while maintaining a large number of software projects developed in a distributed environment with the effort and expertise of skilled staff coming from all member NRENs and GÉANT.

The SMM was described in a TELFOR 2018 conference paper, which received significant attention from the audience. During 2018, pilot implementation was performed with the following eams: inAcademia, NMaaS, and GTS. The results are shared with the team representatives and also used for a revised version of the proposed SMM.

Activities and Plans

The SMM will officially be published in 2019 along with an invitation for teams interested to participate in the evaluation. WP9 T2 is going to determine the maturity of their applications, and help develop Best Common Practice.

The final outcome will be published in a project document comprising the agreed common practices for GN4-3 SWD teams.

About the authors:

- Andrijana Todosijevic, Milan Tosic, Branko Marovic of the Academic Network of Republic of Serbia – AMRES, University of Belgrade - UoB
- Bartosz Walter, Maciej Labedzki, Marcin Wolski, of the Poznan Supercomputing and Networking Center – PSNC
- Ivan Garnizov, of the Friedrich-Alexander-University of Erlangen-Nürnberg – FAU/DFN

Contact us

The WP9 T2 team members are waiting for your comments and questions regarding the harmonisation of software development process in GÉANT community. Please send any message to Task Leader Marcin Wolski at **marcin.wolski@man.poznan.pl**

FOCUS ON SPECIAL INTEREST GROUPS AND TASK FORCES

CONNECT meets Alf Moens and Tim Chown, respectively chairs of SIG-Information Security Management and SIG-Managed Services Portfolio to talk about their roles within the NREN community and their involvement in GN4-3.

Alf Moens, Corporate Security Officer for SURFNet, the Netherlands National Research and Education Network, is a passionate all round adviser specialised in information security, with a deep understanding of stakeholders' information management needs, information processing and process management.

What does your involvement with SIG-ISM mean to you?

The role of a security officer can be lonely at times, therefore I value collaborating, sharing experiences and being in regular contact with colleagues in similar roles across the NREN community. Working with my security counterparts is always very inspiring, I try to make the most of our group sessions by using these as a sounding board to test the choices I make for my own organisation. In particular, I really enjoy advising colleagues on improving security for their organisations and helping to make the NREN world a much more secure space.

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

In my view SIG-ISM's major achievement is to create a space that brings together community members and colleagues who face similar professional challenges and enables them to share experiences and expertise. Another success of this group is the launch of WISE, the information security collaboration community for e-infrastructures

where GÉANT, jointly with large ICT computer infrastructures - such as EGI, PRACE, EUDAT - and their American counterparts - such as CSTC, XSEDE and more - work on common security challenges. In addition, the successful transformation of some shared good practices into white papers, which are very valued by NRENs, is undoubtedly another great accomplishment of this group

What are the benefits that SIGs and TFs bring to the R&E community?

SIGs and TFs help to fill some expertise gaps across NRENs. They identify common challenges and evaluate possible solutions, always learning from each other's practices, bring together experts from the R&E world through discussions and exchanges and enable them to join forces in areas and fields of common interest to a large number of NRENs.

With the SIGs and TFs the R&E community has access to a unique cooperative model that also acts as an example for other sectors. Through SIGs and TFs we overcome boundaries by sharing our experts and their knowledge across the NREN community. A level playing field of opportunities is created for all NRENs where experience is shared and learning opportunities develop not only at European level, but also globally.

SIG-ISM will play an important role in the GN4-3 security work. The project will have regular and direct access to the group's participants who will be consulted to provide input on security matters and act as a reviewing board for relevant procedures and policies.

SIG-PMV: WORKING TOGETHER ON NETWORK PERFORMANCE MONITORING AND VERIFICATION

GÉANT Special Interest Groups (SIGs) offer an excellent vehicle for members of the GÉANT and NREN communities to get together and discuss a wide range of topics. Membership is generally open further to campus operators, university researchers, international collaborators as well as industry participants. The SIGs provide a collegiate, collaborative environment in which to discuss technologies, use cases, requirements, and consensus on best practises. While the focus is face-to-face meetings, many interesting discussions happen on the SIG mail lists, and increasingly in their Slack groups.

SIG-PMV focuses on performance monitoring and verification (PMV) topics from both a research and operations perspective, and in identifying and establishing best practises for wired/wireless (campus) networks, and the multi-domain GÉANT and National Research and Education Networks (NRENs) that connect them.

At present there is a wide range of PMV tools available, and their usage varies between communities, based on requirements, levels of knowledge, and other factors. Examples include open source tools such as iperf, commercial tools integrated into vendor platforms, bespoke packages such as perfSONAR, and "lightweight" community measurement initiatives such as the RIPE

Atlas project (**https://atlas.ripe.net/**).

Much of the SIG's work is built around identifying scenarios for performance monitoring, and subsequent discussion of the tools best-suited to address those scenarios or, where appropriate tools may be lacking, the identification of potential new tools or approaches that are needed.

As an example, with the growth in data-intensive science, and with it the need to transfer ever larger data sets across multiple network domains for compute, storage and visualisation, it has become increasingly important to have persistent measurements of network characteristics between the endpoints involved. The perfSONAR toolkit (**https://www.perfsonar.net/**), which has been used extensively within the Worldwide Large Hadron Collider Computing Grid (WLCG) community, is an open source platform for measuring loss, latency, traffic paths and throughput. The toolkit continues to be developed within GN4-3 as part of an international collaboration and is recommended by the SIG for research collaborations moving large volumes of data between multiple (inter-domain) sites.

Other scenarios considered by the SIG include wireless networks, layer 2 links, links under multi-hop VPN paths, virtual network environments, multicast

networks, high-speed links (where for example full sampling at 100G becomes more challenging) and autonomous networks.

The SIG also acts as an input to GN4-3 in Work Package 6 where network management and monitoring tools are developed or enhanced. Currently WP6 is continuing development of perfSONAR and NetMon and is exploring a hybrid wireless network monitoring approach combining crowd-sourced WiFiMon measurements with those from network infrastructure elements.

The SIG-PMV steering committee would very much like to hear from people interested in presenting at our meetings; the broader the constituency and the contributions to the SIG, the better its discussions and recommendations will be.

LIFE AT GÉANT

GÉANT is a unique organisation that plays a pivotal role for research and education worldwide. Life at GÉANT is an initiative launched to bring the community closer to the people inside the organisation and share what excites them about their working lives. CONNECT has chosen to feature GÉANT's Licia Florio and Helga Spitaler's employee stories to give you a flavour of this popular initiative and takes the opportunity to celebrate two relevant annual events: the International Day of Women and Girls in Science (11 February) and the International Women's Day (8 March). For more information on Life at GÉANT, visit **www.geant.org**

Licia Florio, Senior Trust & Identity Manager, Amsterdam

'Flexibility and trust'

What do you enjoy most about working at GÉANT?

I have always worked in the area of T&I and my job has never been monotonous. Through the years, collaborations with different groups have certainly helped me and my colleagues, gain, understand and benefit from different perspectives. I have worked on a wide range of projects - all very different, but equally exciting – that have undoubtedly added elements of variety and challenge to my job.

I work in an international and diverse environment where the different interactions between colleagues create enriching experiences. I really appreciate the high degree of trust and flexibility with which we are all enabled to carry out our job; it makes us all work harder, empowers us to do what we believe in and generates high levels of job satisfaction. I truly enjoy what I do and I am always motivated to do my very best.

About Licia

Licia was born in Italy and holds a Computer Science degree from the University of Bologna. In 2001 she moved to the Netherlands – where she had only intended to spend one year – to work for GÉANT (TERENA at the time). Licia was part of the Task Force that produced the eduroam (federated access to wireless networks) pilot - a service that now counts tens of thousands of hotspots in 101 countries across the world - and has led the AARC project to help research organisations deploy federated access. In 2018 Licia was awarded the prestigious Medal of Honour by the Vietsch Foundation that supports research and development of advanced internet technology for scientific research and higher education.

Tell us about your role at GÉANT

During my career at GÉANT I have been privileged to take part in a large number of initiatives that make up the current European and global Authentication and Authorisation Infrastructure for Research & Education. Specifically, I work in the area of Trust and Identity (T&I), to support the adoption of federated access in large scale international research collaborations operating in areas such as life science, earth observation, particle physics, astronomy and arts & humanities. We help users across multiple organisations and countries to access resources, collect research data and handle a variety of access issues specific to each field with one log in identity. Our work on federated access for such collaborations focuses on specific technical aspects, but also requires a certain degree of familiarity with the fields in which these operate, their constraints and how they interact.

Helga Spitaler, Senior International Engagement Officer, Cambridge

'Making a difference'

What do you do at GÉANT?

As part of the International Relations team, for over 10 years I have been involved in adapting the GÉANT model to other parts of the world in the context of EU-funded regional networking projects. Specifically, I drive and coordinate the visibility efforts for these projects, including mentoring colleagues to build up PR capacity locally.

I always want to understand the WHY that is behind what we do. I am therefore very keen to demonstrate our impact through the eyes of the actual network users, and in particular the less traditional ones who have a huge societal benefit potential. And I am proud to be involved in the In The Field blog project which depicts such a powerful picture of the difference NRENs make around the world.

Why GÉANT?

Again, it's about making a difference. Like the caretaker at NASA who replied when asked' What do you do' with 'I am helping put a man on the moon' we should proudly say 'We are helping advance scientific research and make education more accessible'. And it's about the people. I really value the multi-cultural atmosphere here at GÉANT. I work with and learn from amazing colleagues, both in this organisation and in the wider community and have made real friends along the way.

I joined GÉANT (at the time DANTE) in 2004, and I am still stimulated by the diversity and the need to think outside the box, as each region has its own challenges and opportunities. GÉANT also gives me the opportunity to grow. Working with the most experienced project managers has given me invaluable insight into aspects beyond my core activities and I am confident that my journey here at GÉANT is not quite finished yet.

About Helga

Before joining the Research & Education networking world, Helga was an Executive Education Programme Manager at the Judge Business School in Cambridge, following a stint in event management in San Francisco, US, and after 'escaping' the isolation of soundproof simultaneous interpreting booths. Helga hails from Bolzano in Italy and occasionally misses the Dolomite mountains landscapes, but feels very privileged to call Cambridge home.

QUANTUM COMPUTING AND ENCRYPTION: HOW WORRIED SHOULD WE BE?

ROBIN WILTON FROM THE INTERNET SOCIETY EXPLAINS
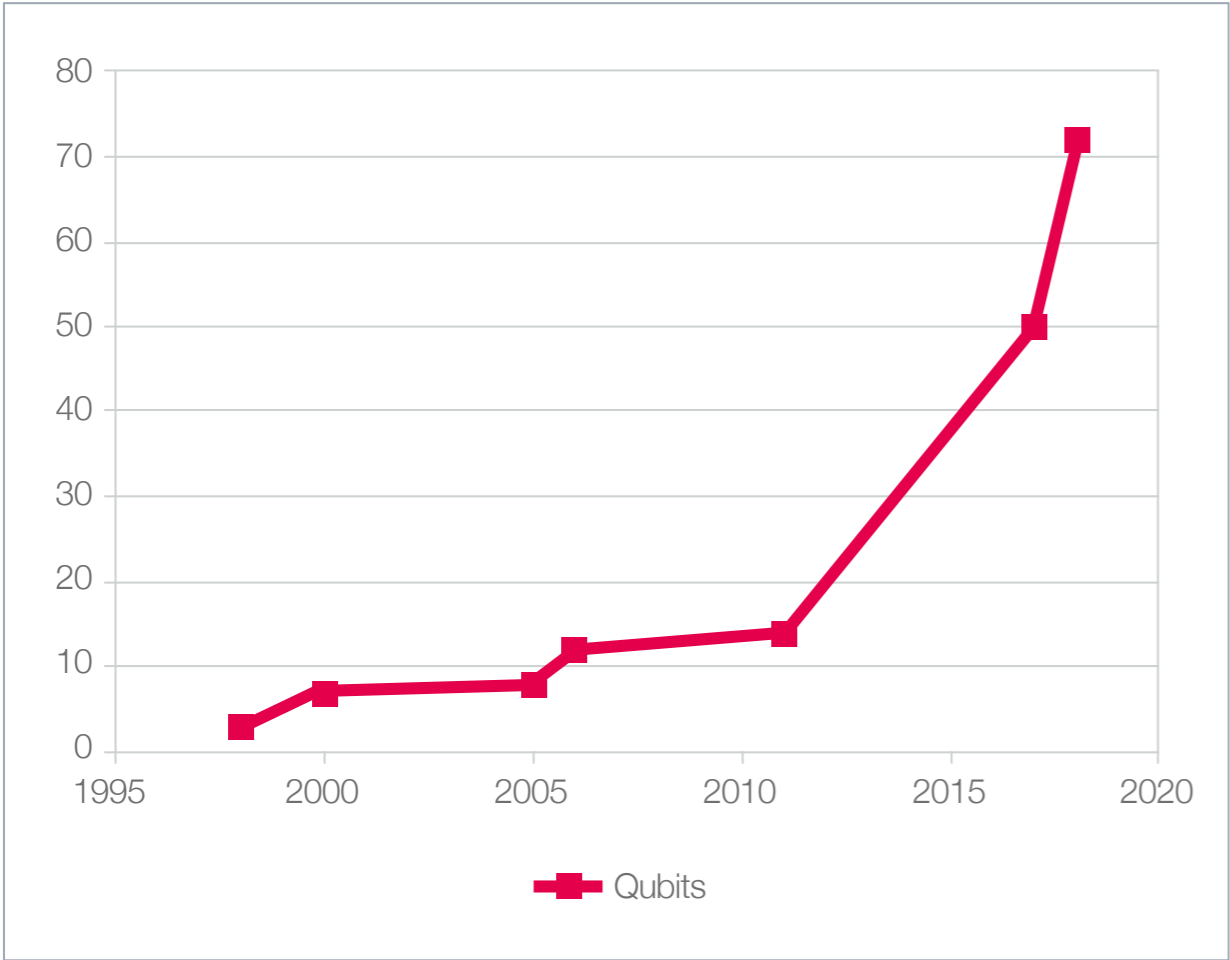
Picture
Left: Number of usable qubits assembled

Quantum Physics and Computing

Classical physics cannot explain some of the things we observe in the universe, like how light can apparently act as both a wave and a particle simultaneously. However, quantum physics can explain these phenomena at the sub-atomic level. To over-simplify: sub-atomic particles can maintain (or "superpose") different states at the same time. In the case of light, each photon is superposing wave-like and particle-like states.

The computers we use today are based on binary values - "bits". Since bits are binary, they must represent one of two values, either 0 or 1. Quantum computers use a quantum bit ("qubit") which is non-binary, allowing it to represent both 0 and 1 at the same time. By using qubits to represent both 0 and 1 simultaneously, a quantum computer can store and compute multiple values at the same time, whereas a classical computer cannot. This increases the speed of computation, potentially undermining the methods of encryption

on which much of our digital life depends.

This may give quantum computers a problem-solving advantage over classical computers. For instance, when trying to solve problems with multiple possible answers, picking the correct one will, statistically, take a classical computer many tries. However, if a quantum computer can try all the possible solutions simultaneously, the time it takes to find the right one may be drastically reduced.

Quantum Computers and Encryption

This principle can be applied to break encryption, of which the two dominant forms used today are symmetric and asymmetric.

Symmetric encryption uses a key to "lock" the data, and an identical key to "unlock" it: just like a petty cash box. One method of breaking symmetric encryption is called "exhaustive attack": the attacker tries every possible decryption key until they find the correct one. Good symmetric encryption algorithms are designed to make this approach impractical for a classical computer by making the number of possible keys unfeasibly large.

However, quantum computing means many possible keys can be tried simultaneously, and - combined with new ways of sorting through the results - greatly reduces the time needed to find the correct key. In fact, the reduction is so great that it's as if you had halved the length of the key used. A viable quantum exhaustive attack would threaten symmetric encryption. On the other hand, simply doubling the length of the keys used should restore a symmetric algorithm to its former strength, even against a quantum computer.

Asymmetric encryption uses one key to "lock" the data and a different key to "unlock" it: rather like putting a letter into a postbox. Anyone can put a letter in, but only the person with the key to the box can get them out again. Many communication protocols rely on asymmetric encryption, particularly to secure an initial exchange of symmetric keys between communicating partners.

Asymmetric encryption is based on mathematical operations which are easy to do in one direction, but harder to reverse. By analogy: it is much easier to work out what 1303×1307 is, than to work out the prime factors of $1,703,021$. In the case of asymmetric encryption, effective attacks are based on trying to solve these mathematical problems, rather than exhaustively searching for a key but - as in the case of symmetric encryption - a combination of quantum computing and techniques for sorting the results can significantly reduce the time and effort needed for an attack.

Algorithm type	Length of "reasonably strong" key	Number of qubits required per key bit	Total qubits required
Symmetric (e.g. AES)	128 bits	1	128
Elliptic Curve	256	~9	2304
RSA	3072	2 (plus 2 more)	6146

Quantum computing is not fatal for encryption... yet

Quantum computing faces some practical challenges. While the number of qubits in a working quantum computer has been increasing as technology improves, it is still (at around 80 qubits) short of the number needed to attack a 128-bit symmetric key, let alone a 4096-bit asymmetric one.

Based on a rule of thumb for what are currently considered "reasonably strong"[1] keys for each algorithm type, the following table illustrates the number of qubits needed.

Given enough usable qubits, quantum computing halves the effective key length for a symmetric algorithm. The obvious countermeasure is to double the length of the keys used, and for symmetric algorithms, that is the suggested approach.

The number of qubits is only part of the problem: qubits tend to "decay", especially at room temperature, so they need a lot of cooling, and are easily disrupted by electrical or environmental effects, and indeed each other. Stable usability is still an issue.

While quantum computing potentially weakens currently-deployed asymmetric algorithms (such as RSA and Elliptic Curve), research is identifying a number of quantum-resistant alternatives based on other mathematically hard problems.

However, technology can evolve unpredictably fast, and replacing obsolete or unsafe encryption throughout the enterprise and network infrastructure is known to be a slow process.

What can stakeholders do?

As consumers, we probably can't do much directly, but we should understand the issues and express an informed view, given the opportunity, to decision-makers and service providers.

Decision-makers should ensure that encryption technology is treated as critical infrastructure, with corresponding investment in governance, risk assessment, and planning. Their strategy should:

- monitor developments in quantum computing and quantum-resistant encryption;
- maximize algorithm agility if a change of algorithms/technology is needed, especially at short notice[2];
- cultivate the organisation's ability to refresh and deploy security technology in step with best practice[3];
- take care that superseded security technology is not able to persist in the infrastructure beyond its "safe use" period.

Robin Wilton is a specialist in digital identity, privacy, IT security and public policy, at the Internet Society. He has a background over 30 years in systems engineering, consulting and industry analyst roles, in organisations including IBM, Sun Microsystems and Gartner Group.

Robin has developed a reputation for 'translating' complex topics between technologists, business-people and policy-makers. His particular interest is in how social constructs such as identity, privacy and trust are mediated through technology. He also contributes to technology policy work with bodies such as the Council of Europe and the OECD.

[1]"BlueKrypt" key length comparison tool: https://www.keylength.com/en/4/
[2]IETF guidance on algorithm agility: https://datatracker.ietf.org/doc/rfc7696/
[3]Internet Society paper on "Cryptography for CxOs": https://www.internetsociety.org/resources/doc/2018/cryptography-ceo-questions-ctos/

Auckland, New Zealand 5-9 August 2018

CSIRT CAPACITY BUILDING IN ASIA

PROVIDING SECURITY TRAINING AND FACILITATING CREATION OF A TRUSTED INFORMATION SHARING PLATFORM

Do we wait for another large cyber-attack to be a wake-up call for NRENs worldwide or should we rather be proactive and invest in global collaboration and talent in the regions where it is needed most?

The wider deployment of eduroam and eduGAIN services throughout the global Research & Education community assumes that the NREN (or similar organisation) supporting these services was also responsible for the operation of a Computer Security Incident Response Team (CSIRT). While this is the case in Europe, where TF-CSIRT (task force promoting collaboration and coordination between CSIRTs) supports over 70 CSIRTs from the R&E community, the situation in the Asia Pacific region is very different. Most of the NRENs in the region do not have a CSIRT team, and the collaboration between those who do, could be strengthened and improved.

To bridge the gap, the Asi@Connect project has committed to fund the CSIRT Capacity Building in Asia project, aiming to facilitate CSIRT co-ordination, development, training and information sharing within the Asia-Pacific region with the organisation of a series of CSIRT Capacity Building in Asia events, to be held in 2018 and 2019. This project is led by GÉANT, in cooperation with experienced trainers from APNIC and the TF-CSIRT Community.

CSIRT Capacity Building in Asia events happen in conjunction with APAN conferences and include two parts – meetings and training sessions. The meetings' agendas include participants' presentations, information, experiences, knowledge sharing, discussions and demos. The training programme

is modelled after TRANSITS I and comprises 4 modules: Operational, Organisational, Technical and Legal.

Project in Numbers

In 2018 (Year 1 of the project):

- 2 events (APAN45 Singapore & APAN46 New Zealand)
- 4 CSIRT in Asia knowledge and experience sharing sessions
- 35 participants (24 funded + 11 unfunded)
- 4 trainers
- 14 economies represented

Bangladesh, Bhutan, Cambodia, Hong Kong, India, Indonesia, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Taiwan, Thailand

Year 1 Results

Asi@Connect funding of the CSIRT Capacity Building in Asia has been crucial in attracting the participations from the partner organisations from the developing countries and giving the opportunity not only to learn from the experienced trainers from Europe and Australia, but also from each others' experiences, which can sometimes be region-specific. Some noteworthy results that go beyond the expectations of the first year of the project are listed below:

- PERN (Pakistan) established a CSIRT team to support its higher education institutions. They initiated the process by becoming members of FIRST & APCERT, a very important achievement in the region as it places Pakistan Academic Network cyber security efforts on the world map.

- CSIRT team created at LEARN (Sri Lanka). LEARN organised a remote training session for its constituents, led by APNIC trainers, on the importance of CERT activities, further to attending the CSIRT Capacity Building in Asia events. This topic will now become a part of all NREN training, and was shared as a best practice at the CSIRT Capacity Building in Asia event in August 2018.
- BdREN (Bangladesh) and MYREN (Malaysia) are in the process of creating an NREN CERT, which will be supported by the CSIRT Capacity Building in Asia and other Asi@Connect activities.
- After attending TRANSITS at APAN45, the Universitas Islam Indonesia created a CERT team and is working on reviving Indonesia ACAD-CSIRT. This successful national collaboration of the CERT teams is the first step towards working together with the other teams in the region and worldwide.

What Next?

In 2019, at least two more CSIRT Capacity Building in Asia will be organised, in parallel with APAN conferences, inviting around 30 more funded participants from the Asia-Pacific region. Some of the initially identified beneficiary countries, such as Mongolia, Laos and Vietnam, have not yet nominated attendees for these events, so more effort will be put into getting the partner organisations from these countries involved and networked in the region.

Another focus area, in the second part of the project, will be to encourage further collaboration sharing between those organisations whose members took part in the events in 2018. Dedicated communications platforms for past and future attendees of the CSIRT Capacity Building in Asia have been set up to facilitate information sharing and to help strengthen the active NREN CSIRT network in the Asia-Pacific region.

![GLAD — GÉANT LEARNING AND DEVELOPMENT]

GÉANT E-ACADEMY HOSTS NEW LEARNING CONTENT FOR RESEARCH COMMUNITIES

GLAD TEAM CAN NOW SUPPORT REQUESTS FOR NEW COURSE CREATION

Collaboration between the GÉANT Learning and Development (GLAD) team and the AARC project delivers new materials for the GÉANT e-Academy online learning platform: the 'Policy Development Kit' (PDK). The PDK, whose creation proved a valuable learning experience for the AARC team, will benefit users from research communities.

Picture
From left to right:
Uros Stevanovic,
Irina Mikhailava,
Hannah Short

Irina Mikhailava, who heads the GLAD team says: 'The GÉANT e-Academy gives our community the unique benefit of a common space for accessible online training products. Our ambition is to create an online learning platform available 24x7 with quality training material. It also aims to be a platform that enables the community to disseminate its e-learning products. Research and education communities are set to benefit and, at the same time, contribute to this digital learning platform whose training modules cover a range of topics within and beyond the networking landscape.

The e-Academy was chosen by the AARC project as the vehicle for securing the PDK knowledge developed in recent years. The PDK focuses on capturing knowledge around policy aspects and has been designed to increase policy writing capability within research infrastructures. "It provides template policies to help infrastructures get started or implement their own policy layer" explains Hannah Short of CERN, who is AARC's Operational Security Task Leader. "The PDK's key benefit is that the policies are all ready and available and aim to facilitate interoperability between the infrastructures that adopt them". The opportunity to capture knowledge through e-Academy offers the AARC project team a degree of comfort in knowing that users will be able to access AARC knowledge even after the end of the project.

A cross disciplinary team was set up to make the PDK happen: the AARC project provided materials and experts whilst the GLAD team offered technical and didactic support.

For each e-Academy project, GLAD offers support in packaging content knowledge into engaging and interactive e-learning products. This process can be at times challenging as content owners need to look at the ideas from the learner's point of view. Every piece of knowledge within a course needs to have a clear purpose and play a direct role in developing the learner's skills and competencies. If it doesn't serve that purpose, then it should not be there. In the words of the PDK expert, Uros Stevanovic: "This is fundamental when trying to produce something for others to learn from … as this could influence how well the information is regarded and absorbed in the future."

The creation of e-learning materials is an experience of growth and development for content owners too.

The AARC experts were particularly challenged when it came to creating the content's video elements. Uros adds: "Working with GLAD during video creation gave me a different perspective on how to produce visual information and made me appreciate more the work of visual experts. It was challenging!"

GLAD will be collaborating with community experts who help monitor content and evaluate the level of relevance of any given course. In fact, e-content in this dynamic field can easily become obsolete.

PDK creation is indeed the outcome of the extensive work carried out by many AARC project members. "AARC project participants were very excited about the prospect of their knowledge and skills being used to help others" concludes Hannah Short.

The release of this latest online course is for GLAD a positive experience and another step forward in adding content variety to the e-Academy. The team looks forward to working with other projects, content owners, teams and initiatives to harness their knowledge and output and translate them into engaging, accessible and useful learning for others. Get in touch with GLAD if you want to learn more!

Policy Development Kit on the eAcademy: **bit.ly/2FoKsDl**

GÉANT Learning and Development: **https://learning.geant.org/**

EDUPERSON MOVES TO REFEDS

spherical cow group

The eduPerson scheme started nearly twenty years ago, "before there was a mechanism for moving attributes around" according to Ken Klingenstein of Internet2. With its transition to REFEDS, the focus will be on improving the internationalisation of the schema and continued support for its adoption around the world.

Words
Laura Paglione (right) and Heather Flanagan (far right) of Spherical Cow Group

Why is this a big deal?

In order for services to interoperate and tools to develop along commonly supported lines, having a common attribute schema is critical. Most federations within eduGAIN support and

> "eduPerson is a Lightweight Directory Access Protocol (LDAP) schema designed to include widely-used person and organisational attributes in higher education. The eduPerson object class provides a common list of attributes and definitions, drawing on the existing standards in higher education."
>
> https://wiki.refeds.org/display/STAN/eduPerson

use several of the key attributes within eduPerson, helping to set a baseline for interoperability between the entities within the federations.

A little Directory Services history

Directory services play an important role in developing intranet and internet applications by enabling information sharing about resources such as users, systems, networks, services, and applications throughout the network. Each resource is considered an object by the directory server that includes a collection of attributes associated with that resource. By 1997, LDAP (Lightweight Directory Access Protocol) was a well-established standard from IETF for accessing and maintaining directory information services over an IP network.

The 'un-standard' standard – "It's a person Jim, but not as we know it"

In late 1998, Internet2 launched the Middleware Initiative to promote the standardisation and interoperability of, and to support deployment of, middleware services. Their work included identification, authentication, authorisation, security services and directories.

Universities started making use of LDAP and the related directories middleware services being developed and refined. However, it soon became clear that the lack of established patterns for building general-purpose institutional directories meant that each institution had to start from scratch when building out their directories – despite very similar use cases. As a result, no two directories looked alike. It wasn't possible to share resources, exchange information, or even query resources even though the institutions were using the same LDAP standard.

By early 2000, Keith Hazelton and others were advocating for the formation of the eduPerson Working Group that would work on an eduPerson object class. This object class would draw on the standards work done in higher education to provide a common list of attributes and definitions and provide a common LDAP representation for each of them. Early adopters included the "Middleware Directory of Directories" led by Michael Gettes, a project to enable "anonymous access to library resources" led by David Wasley, and an effort to provide "digitally signed financial aid applications" led by the Net@Edu PKI Working Group.

This new working group which eventually evolved to be the MACE-DIR group had the ambitious goals to quickly complete the initial version of the eduPerson object class, including a definition of the object class along with documentation, a process for maintaining and updating the class definition, and a process for promoting this new object via schema registration bodies and IETF channels.

A new standard is born

The eduPerson 1.0 Specification was published in February 2001 by the Internet2/Educause eduPerson Working Group. The group also prepared files that enabled direct import of the new object class and its attributes into an LDAP server, enabling straight forward adoption.

This release marked the possibility of several inter-institutional applications that today are commonplace, for example;

- Web pages related to a course at one campus could be easily and securely opened to students in another class at another institution with just a simple configuration.
- An institution could agree to license a database for only business students, using eduPerson attributes to implement the access controls.
- Scientific researchers could reserve specialised computing resources at distant locations using local services.
- A directory of directories could enable a user to search multiple institutional directories in parallel to find public information for a particular person.

The eduOrg Object Class quickly followed with its first specification being released in October 2002 along with an update to eduPerson. The purpose of this new object was to represent institutions of higher education. The Object Classes incrementally evolved through 2016. The small, deliberate changes made during this period were a testament to the object class adoption rate. Two additional object descriptions were included during this timeframe.

eduCourses was explored for describing courses and course enrollments. By 2007, the IMS Global Learning Consortium took on similar work as part of their portfolio of standards for student records and learning management systems. The other object description was for groups with the eduMember object, which migrated into the Grouper project in 2009, an open source toolkit for managing groups and access to resources. The migration of each of these projects led to renewed energy and innovation, and ultimately increased standardisation and utility.
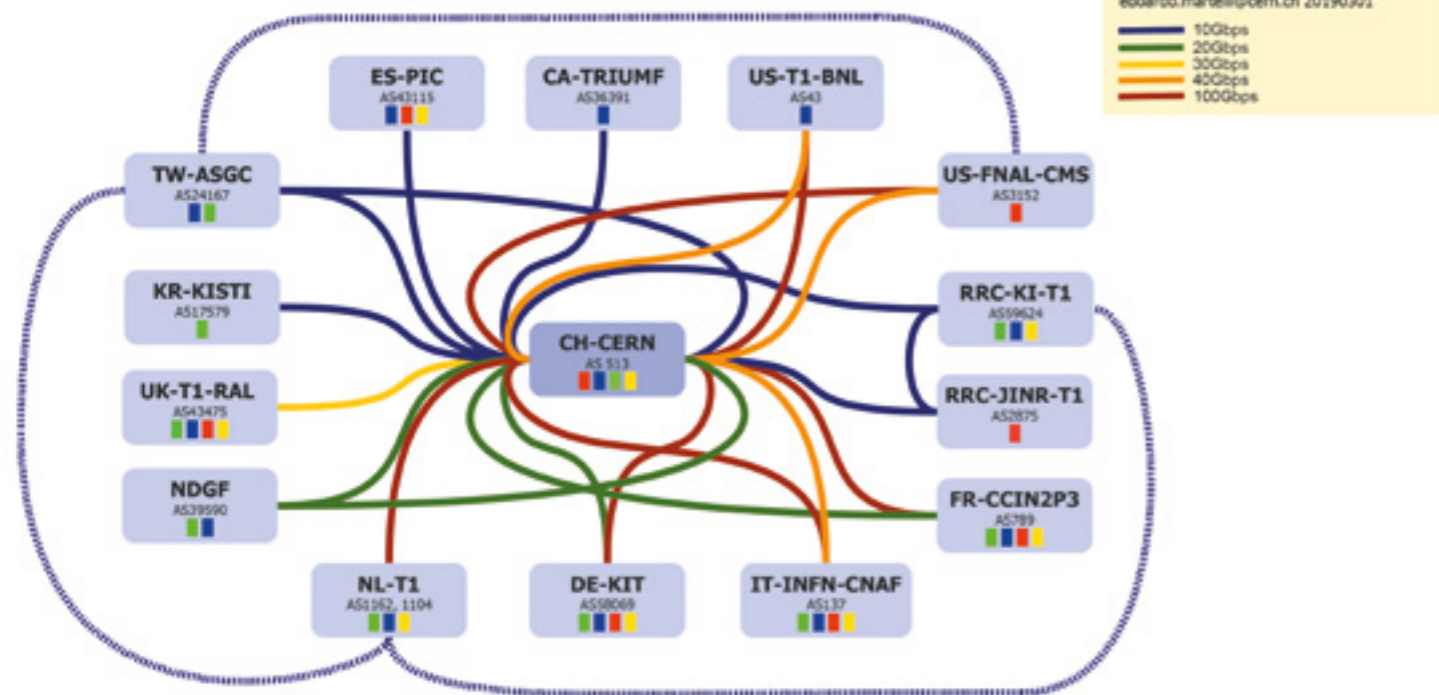
What next for eduPerson?

One of the best gifts of standards work is the plentiful documentation, not just of what was adopted, but also of what people felt were challenges, missed opportunities and huge successes. In looking back at the history of eduPerson, we were struck by how many conversations from 15-20 years ago still continue today. With this transition to REFEDS, the focus will be on improving the internationalisation of the schema and continued support for its adoption around the world. Of course, the debates will continue, though the balance point between interoperability and institutional schema use sovereignty are likely to change as considerations are made primarily for global use cases, and perhaps with a broader set of views. This transition provides an opportunity to sunset items no longer used (pager attribute, anyone?), revisit old debates from a new vantage point, and innovate to enable new uses that we can't even imagine today.

It has taken significant inspiration, vision, effort, and dedication from an amazing group of people in the MACE-DIR working group over the last 19 years to make the absolute impossibility of interoperable information exchange about people across institutions so commonplace today, that the uninitiated might casually dismiss the accomplishment. The new group will have their work cut out for them, but we're sure they will be up for the challenge.

To find out more about eduPerson visit **https://refeds.org/eduperson**.

T0-T1 and T1-T1 traffic
T1-T1 traffic only
■ = Alice ■ = Atlas ■ = CMS ■ = LHCb
edoardo.martelli@cern.ch 20190301
10Gbps
20Gbps
30Gbps
40Gbps
100Gbps

BIG SCIENCE IN ITALY: A HYPER-CONNECTION AT 200GBPS

Record capacity for CNAF, the first Italian site connected to the GARR network at 200 Gigabits per second

CNAF, the Italian national computing centre of the INFN (National Institute of Nuclear Physics) and one of LHC Tier1, is the first site in Italy to get a 200 Gbps access link, thanks to close collaboration with the GARR research network.

The brand-new high capacity link interconnects CNAF with the worldwide research networks and in particular with CERN in Geneva, where the LHC data are produced, and with the other national centres (Tier2) where these data are distributed for processing.

From the start of LHC operations, the volume of data exchanged with CERN equals to 61 PB, which made necessary an upgrade to 200 Gbps, a capacity over 200 thousand times the average Internet link capacity in Italy,

according to the DESI Report 2018.

"We are proud to announce this result - said Massimo Carboni, CTO at GARR – which is our response to the Big Data challenge that scientific experiments worldwide pose to NRENs. We didn't just build a high-capacity link, but we created a resilient, reliable and redundant infrastructure thanks to the presence of 200 Gbps links on most of our backbone."

By doubling the capacity of the backbone core links between GARR network nodes in Milan, Bologna and Rome, GARR backbone boasts a total capacity of about 3 Tbps. Meanwhile, INFN increased its overall computing capacity by providing more than 60,000 cores and about 150 PB storage for experimental data (between fast access and slow storage systems) to its scientific users, and in particular to CERN's LHC experiments.

"This is an important result for us, because the 200 Gbps link allows

CNAF to fully exploit internationally its computing and storage resources, fostering the development of distributed high-performance computing models on a global scale", explains Stefano Zani, head of the CNAF network. "This high-capacity link allows CNAF a closer integration with CERN and rivals the network connectivity of major American scientific computing centres such as Fermilab."

This result was possible thanks to the R&D activity carried out by GARR on Alien Wavelengths, a technique to transport signals on a different optical platform from the one generating them, thus allowing an optimal reuse of existing devices and cutting down the time and costs of upgrading the network.

The next step will be doubling CNAF's international link to CERN in order to realize the "Data Lake", a geographically-distributed data storage, from where data can be 'fished' regardless of where they are processed.

Words
Carlo Volpe and Maddalena Vario, GARR

RAISING AWARENESS OF CYBER-SECURITY IN LUXEMBOURG

In the framework of the European CyberSecurity Month (ECSM) initiative and the national cybersecurityweek* in Luxembourg, the University of Luxembourg and the RESTENA Foundation invited to a half-day security awareness conference targeted at students, researchers and general public.

In a fully booked conference room and exhibition hall, participants were informed about recent attacks, new tools, general risks in IT but also privacy issues by national partners from the IT security community. The topics ranging from technical presentations about incidents targeting the Government and the University to fancy hardware tools for initiating attacks and stealing data were presented by securitymadein.lu, the University of Luxembourg and Govcert Luxembourg. Additional focus was put on data privacy, especially on how users can protect their data, and

attendants were informed about the actions that should be taken in case of a data breach.

To spread the word to a broader audience, BEE-SECURE, the national initiative for awareness raising by the Luxembourgish ministries of economy, family, youth and education, presented its new awareness campaign, called Love Stories 4.0. This year's campaign is about online dating apps and especially love on social networks and the associated risks.

In addition to this full agenda, participants were informed about various

topics in the exhibition area, such as how to detox from social networks, or how to protect against data leakage. Participants bringing their old hard-drives had the opportunity to safely erase remaining data in an on-site degaussing machine.

More information about the conference and the related talks can be found on: **www.cyberday.lu**

On January 28th 2019, the University of Luxembourg and the RESTENA Foundation has organized a 2nd edition of their Data Privacy Day conference: **www.dataprivacyday.lu**.

Words
Dr Cynthia Wagner – RESTENA Foundation – RESTENA operates the high speed network for education and research in Luxembourg and is the national partner in the worldwide research and education network community.

SURF

BUILD YOUR OWN SERVICE FOR TWO-FACTOR AUTHENTICATION BASED ON THE DUTCH MODEL

Using SURFnet's open source software OpenConext-Stepup, anyone can set up a service for two-factor authentication. Institutions and (research) groups that take this step together avoid a great deal of work and enable their users to log in to various services and collaborate with one another, all using just a single token. The service can be used in combination with federated login via the SAML 2.0 protocol, but also separately.

Classified research data, student results and even medical information: education and research institutions frequently work with data that is so confidential that it has to be protected using two-factor authentication. This is why the Dutch NREN SURFnet has developed Step-up authentication as a service, Stepup for short. Institutions affiliated with SURFnet can activate this service for each connected service provider (SP). When the institution's users login to a SP, they complete the first step of the login procedure as usual (typically: entering user name and password in the own identity provider (IdP)). Then they are forwarded to the Stepup server, where their second factor is verified. This is usually a code received via text message or a special app or a hardware security token such as a Yubikey. When this token is verified, the user gains access to the service.

Words
Jitse Schipper

Pictures
Merlin Daleman

A single shared service

Every institution or SP can request a second factor independently of others. However, this means a lot of work is performed twice and users have to juggle a handful of tokens. It is more efficient to work together with other parties instead. The Netherlands has even set up a single central Stepup service for all institutions and services.

For example, it's possible to set up this service from within a collaborative organisation. A group of researchers from a range of backgrounds conducting joint research can set up the Stepup service, which is then linked to all SPs they need for their work. The researchers require just a single token to gain access to all the services they require within the collaborative network. Such an arrangement is already used within the GÉANT network: following an evaluation of the available products, the eduTEAMS project team opted to set up OpenConext Stepup for a pilot project within eduTEAMS.

High level of identity assurance

In the Netherlands, identity vetting – checking a person's identity and activating their token – is the responsibility of each institution, so users just go to their own service desk. There is, however, an NREN-wide protocol: users have to present themselves at the desk in person with a valid form of identity before the token is activated. This means the same level of identity assurance applies to every user within the federation, meaning that institutions can trust each others' users. Institutions do not have to make any technical modifications to their infrastructure.

However, SURFnet is also developing a feature for self-service vetting. As part of this feature, users can scan the contactless chip in an ICAO identity document using a smartphone or use authentication supplied by Dutch banks (iDIN) to confirm their identity. This allows users to validate their token themselves, which reduces the institution's workload while ensuring that the level of identity assurance remains high.

Second factor on demand

Stepup can be used as a proxy (from a SPs perspective). The service takes care of the entire authentication process: the first authentication phase with the institution's own IdP followed by second-factor authentication, depending on the policy in place.

However, Stepup can also just be used to authenticate only the second factor. In the Netherlands, this is the case at institutions running their own internal services that are not connected to the federation, e.g. accounting software. When the user logs in, the institution's authentication system completes the first authentication step itself. After that, the IdP communicates with the external Stepup servic to verify the second factor.

To do so, the authentication system needs a connection to Stepup. Stepup has already been integrated into the commercial access control systems by Citrix and F5. SURFnet has developed an AD FS MFA extension for Microsoft AD FS. A module is available for SimpleSAMLphp for authentication with Stepup. This method of using the Stepup service is referred to as Second Factor Only.

By following this integration method, SPs generally do not have to be modified. There are also SPs that require more flexibility of their authentication process. For example software for managing students' results that provide users with read-only rights after initial login, but require second factor authentication before allowing the user to change grades. These SPs will have to be modified.

Get started!

Stepup is based on open standards. SAML 2.0 is used for integration with IdPs and SPs. Stepup is developed as open-source software. SURFnet hopes other users will use it and contribute to it. Interested? Get started with the source code at **https://openconext.org/stepup** or get in contact via **openconext@googlegroups.com**.

SURF

EDUBADGES IN DUTCH HIGHER EDUCATION

BADGE PROCESS

VERIFY

BADGE ISSUER (EDUCATIONAL INSTITUTION)

ISSUE

BADGE

BADGE CONSUMER (EMPLOYER OR OTHER EDUCATIONAL INSTITUTION)

BADGE EARNER (STUDENT)

PUBLISH

BADGE

Badges are digital indicators (images) that prove the recipient possesses certain knowledge or skills. The image contains digital information about the issuer and value of the badge. This information cannot be copied or amended.

Digital badges are a new phenomenon in higher education. Badges are digital insignia that proves a student possesses certain knowledge or skills. The badge contains digital information about the issuer, such as a higher educational institution and the value of the reward (e.g. a specific skill). If higher education institutions can award badges for small educational components, to their students, this will contribute to more flexibility in the education system and to more transparency of a student's profile. Together with Dutch higher educational institutions, SURF is experimenting with an infrastructure for awarding digital edubadges to students.

SURF and edubadges

In 2015, SURF published a white paper 'Open badges and micro-credentials'. It explains the basic principles of micro-credentials, the breakdown of accredited education into units smaller than diplomas. SURF then developed a proof of concept (PoC) from September 2017 to May 2018. In this PoC nine institutions of higher education tested an infrastructure developed by SURF to create and award edubadges. It helped institutions to gain an overview of how the introduction of badges could work in practice. The conclusions of the PoC were published in a report.

Currently, SURF is running a pilot project with 13 institutions. This project uses an upgraded version of the – fully GDPR compliant – edubadges infrastructure containing new features requested by the institutions.

Experiences from pilot-participant Rotterdam School of Management

From the very beginning, Rotterdam School of Management (RSM), part of Erasmus University Rotterdam, has been involved in this project. Project leader Marijn van den Doel: "Sometimes an employer is looking for someone who possesses specific skills or certain knowledge. If the university is able to offer education in small components, certify those components separately and in a standardised manner, the student can make these visible in their profile when looking for a job. In this way, badges could lead to a better match between graduate and labour market."

In the medium term, Van den Doel expects that full-time higher education will become more flexible. "Ultimately, we may move towards a situation in which different institutions 'accept' each other's educational components, so that students can follow a few subjects here and a few subjects at other institutions in order to eventually receive their degree."

A great deal of coordination required

But there is still a long way to go. In the proof of concept, RSM discovered that even a small project with badges takes a lot of pioneering. Fifty students not only received their final degree, but were also awarded a digital badge for completing a Master of Science programme. "It turned out to be a challenge," says Van den Doel. "Partly because we already wanted to comply with the GDPR in 2017, a great deal of coordination was necessary: with the programme director and managers, the legal and privacy officers of the university and the faculty, the examination committee, the marketing and communications department and with SURF."

A second lesson learned is that the awareness of badges among students is still small. RSM set up a web page where participants in the proof of concept gave explicit consent for the use of their private data. There was also a need for a video tutorial about adding badges to a LinkedIn profile. "In the pilot we will inform students in an earlier stage," says Van den Doel. "And we will benefit from the fact that the framework of internal coordination we set up during the PoC is in place."

Accessible road

In the pilot, a new batch of students will receive badges for completing the Master's programme. Participants in a private RSM educational programme will receive badges for individual learning components, plus an additional badge for obtaining the entire programme. At other faculties of the Erasmus University Rotterdam, the interest in edubadges is growing. "Our society is more visually oriented than before," notes Van den Doel. "A website is no longer a piece of text these days. Badges do the same for learning. It is a visualisation of your skills, which you can easily share and which others can verify. In the future, we might get a lot less calls from employers asking if an applicant really studied with us.

Added value of edubadges

Edubadges provide added value as they enable the institutions to indicate a student's skill (whether as part of or outside the curriculum) in a more transparent manner. Edubadges make it possible to accurately describe exactly which learning objectives the student achieved and the skills they acquired as part of formal, informal and non-formal education. The information displayed on a Bachelor's or Master's certificate does not go into this much detail. Edubadges thus contribute added value to a student's profile.

More information
www.surf.nl/en/edubadges

SWITCH

SWITCH EDU-ID IN THE DIGITAL IDENTITY LANDSCAPE

Digital identities are tools that help users to access services. Why are SWITCH and the SWITCH edu-ID the right choice for the Swiss academic research and education sector? And how does it fit into the digital identity landscape, which has many other similar services – nationally and internationally?

Digital identities greatly simplify our digital lives. A single registration with new credentials is all it takes to access many services– no need to register again.

A word of caution: since these digital identities transport user information between data suppliers and services, they inevitably create profiling information as a by-product, e.g. which users accessed which services and at which time. This requires care when selecting a service partner. 'Free' services, where you 'pay with your data', might not be the best choice. The governance structure of the SWITCH foundation guarantees that it is and will stay bound to the rules set by the Swiss universities themselves.

An interuniversity working group defined new identity management principles to address important trends in the academic community: life-long learning, increasing mobility and collaboration. The service SWITCH edu-ID is implementing this concept on top of the successful SWITCHaai platform to form the core of the identity management solution for Switzerland's academic sector.

The key benefit is a single persistent identity that allows users to access services relevant to Swiss higher education organisations. When returning to the university for continuing education, the existing SWITCH edu-ID will speed up the sign-up process. Universities themselves also benefit with the ability to simplify their administrative processes. Furthermore, new service elements added to the centrally provided SWITCH edu-ID identity platform immediately become available to universities, which require minimal effort to implement and offer further advantages over time.

To take full advantage of the SWITCH edu-ID, universities need to undertake adoption planning and implementation with the help of SWITCH. This links the university identity management system to the centrally hosted SWITCH edu-ID and ensures that all users can access a SWITCH edu-ID identity. This adoption takes place on a university by university basis for which SWITCH secured grants from swissuniversities[1] until 2020. Universities may define the timing individually to align with other projects.

Research does not stop at national borders; for many years already, the 'interfederation' service of GÉANT, eduGAIN, has been supporting international research and education collaboration on a global scale. SWITCH edu-ID is fully compatible with this service.

An active identity management ecosystem also exists outside of academia in Switzerland, and SWITCH is exploring opportunities to collaborate with other emerging services, of which the national E-ID is a prominent one. It is foreseen that private sector players get the option to issue officially recognised E-IDs, and SWITCH is considering to participate. To settle open issues and to promote the establishment of a national E-ID, SWITCH participates in a working group of government authorities and other potential issuers of E-IDs from the private sector.

Another important project is one led by educa.ch with the goal of building an identity federation for Swiss schools. SWITCH is represented on the project board and collaborates on a technical level to coordinate the two identity federations as closely as possible.

SWITCH edu-ID, the identity solution for Switzerland's research and education sector, enabled by eduGAIN of GÉANT for global collaboration.

Words
Christoph Graf, Programme Leader SWITCH edu-ID, SWITCH

Picture
Regardless of whether you share your data among Swiss universities or with a worldwide community, the SWITCH edu-ID is internationally compatible thanks to a collaboration with GÉANT.

GREEK RESEARCH AND TECHNOLOGY NETWORK

ADVANCED EINFRASTRUCTURES AND SERVICES FOR EDUCATION, RESEARCH, CULTURE AND HEALTH ORGANISATIONS

10,000 km Optical fiber

50 Cities

151 Connected Institutions

500K Users

Networking Research, Education, Health and Culture

GRNET, the Greek Research and Technology Network, established in 1998, is the national provider of high-quality e-Infrastructures, network services, Internet connectivity, cloud computing and digital application services to the national Education and Research community.

GRNET daily supports more than **500,000 demanding users**: students, academics, researchers, managers and administrators. It interconnects Education, Research, Health and Culture organizations, in total **151 institutions**, over **50 cities**: Academic Institutions/Universities, Research centers, **31 Public hospitals,** the Pan-Hellenic School Network, Museums, Libraries and other Cultural Institutions.

GRNET infrastructure and services include:

- A nation-wide 10,000km fiber optic network
- 6 large-scale Data Centers. GRNET has adopted innovative green technologies for its infrastructure, implementing an innovative green Data Center at Louros, using river water for cooling.
- A high-performance computing system HPC–ARIS, integrated in PRACE, the pan-European supercomputing infrastructure, provides state-of-the-art supercomputing capabilities for large-scale scientific applications.

The GRNET user community benefits from advanced connectivity services, specialised compute, storage and scientific data processing facilities and offerings. GRNET operates its large-scale infrastructures, incorporating authentication & authorisation mechanisms for secure processing, storage and data retrieval.

GRNET has pioneered in designing and developing ~okeanos, an innovative open-source cloud solution. It is also an early adopter of network infrastructure and service delivery automation and software-controlled management practices. GRNET has been transforming its operations and service delivery capabilities to meet on-demand and self-service provisioning at scale. It is coordinating the upgrade of all campus networks nationally. Currently, it is deploying a new, dedicated ultra-high capacity network and compute infrastructure overlay to serve national Research Infrastructures.

Furthermore, GRNET offers large-scale end-user services in the areas of Education (e.g. "EUDOXUS" for the circulation of academic textbooks, "ATLAS" for matching work placement opportunities between students and employers), Health (e.g. hosting of the "National Blood Donor Registry") as well as the broader Public Sector (e.g. offering the trusted digital elections system "Zeus").

Prof. Panayiotis Tsanakas, President and CEO: "GRNET facilitates the evolution and proliferation of research and technology, by offering opportunities to all its users to develop their academic and scientific activities. Our teams of professionals will continue to develop and collaborate with key partners, through national, European and international partnerships, to adopt and advance state-of-the-art digital technologies with the aim to support continuous growth and excellence for the benefit of the Greek society."

Stay connected or Follow us:

Web: **www.grnet.gr**
Email: **info@grnet.gr**
LinkedIn: **GRNET**
Facebook: **@grnet.gr**
Twitter: **@grnet_gr**
Youtube: **GRNET EDET**
#GRNET #GRNETsymposium
GRNET corporate video:
http://bit.ly/2DsezHF

Words
Artemis Psarianou, GRNET

Pictures
Above: GRNET Fiber Optic Footprint
Below: GRNET High Performance Computing System 'ARIS'

HPC

GRNET DIGITAL TECHNOLOGY SYMPOSIUM: NEW DIMENSIONS FOR RESEARCH AND EDUCATION

20 YEARS GRNET

GRNET celebrated the 20th year of continuous provision of ICT infrastructures and services to the Research, Education, Culture and Health sectors in Greece, by organising a two-day Digital Technology Symposium on November 5-6, 2018. Key audiences were invited to attend: academics, scientists, researchers, post-doctoral students, executives, management, IT and NOC professionals, from Universities, Research Centers, Hospitals, partners from public government bodies and key executives from private companies who collaborate and are connected with the GRNET network.

The Symposium's main purpose was to bring the key users, influencers and policy makers, all major key sector community members together, in order to present and discuss topics of mutual interest for all and create the basis for further cooperation in finding solutions to key technological challenges the communities are facing. Modernisation and continuous development are essential for the above sectors and GRNET is a key enabler contributing to growth and prosperity with the use of ICT for these user communities. The GRNET Digital Technology Symposium is an event intended to be organised every 2 years, aspiring to become the focal meeting point, bringing together and connecting digital innovation audiences.

Symposium Highlights:

380 attendees, including the Minister of Education, state officials, representatives of the research and academic community, executives of public organisations and health industry and electronic infrastructure providers were present at the Symposium and participated in 60 presentations delivered by 53 speakers from academic and research institutions across Greece, in 9 thematic areas. The two-day presentations were broadcasted live via the 'GRNET DIAVLOS' livestreaming service, gathering a total of 1585 concurrent views, and the material remains available on demand here: **https://diavlos.grnet.gr/event/e1166**

During the two-day event, a variety of open discussions took place, focusing on the recent developments in digital infrastructures and services, best practices and ideas shared, focusing on covering the needs of students, researchers, academics, public administration officials, and citizens. The modernisation of network infrastructures in 56 academic and research institutions through the national project "Hephaestus" was presented, as well as the development of a new, simplified way of accessing the network, computing and storage resources for all users, using automated, transparent and secure procedures; best use cases for research of the ARIS national supercomputing infrastructure and the corresponding European infrastructures; GRNET also presented the services it offers in support of the National Health Interoperability Framework.

Relevant links:

GRNET Digital Technology Symposium

EN: **https://grnet.gr/en/symposium2018/**
GR: **grnet.gr/symposium**

DIAVLOS Livestreaming on demand: **https://diavlos.grnet.gr/event/e1166**

#GRNETsymposium

GRNET Contact:

Artemis Psarianou, Head of Marketing & Communications Service

Email: **marcoms@grnet.gr**

GROWING CYBERSECURITY SKILLS IN THE EASTERN PARTNERSHIP

Security of digital information is a major societal challenge. R&E networking organisations in Eastern Partnership (EaP) countries have increased efforts to tackle the issue, working with a variety of partners to raise visibility, provide training and overcome potential threats.

The Georgian research and educational networking association GRENA has been leading the charge. Its cybersecurity activities include working with a significant list of partners and supporting the annual national cyber Olympiad 'Cyber Cube'. Any enthusiast under age 25 can participate in this event, which promotes promising students and popularises the development of skills and knowledge. 450 people have participated in the three Olympiads to date.

GRENA also recently launched a cyber exercise portal, Cyber-Lab Tech. IT students – and professionals working in public and private sectors – can deepen their skills with exercises in cryptography, cyber and network analytics and reverse engineering, among others. In the first two weeks after its launch, the portal had been tried by around 120 people.

GRENA's own cybersecurity team, CERT-GE, participates in the international computer security and incident response community through GÉANT's TF-CSIRT and Trusted Introducer activities. It also competes in 'Cyber-EXE' – where representatives of public and private organisations complete cyber exercises. Around 280 people have participated in the five events to date; in December 2018, CERT-GE ranked top among 20 teams.

This growing expertise was shared with EaPConnect project partners during a project workshop last June. Key issues for EaP cybersecurity teams were identified and cybersecurity strategies were compared, with 30 participants from 12 EaP and EU organisations.

Information security was the focus of a conference at the Institute of Information Technology of the Azerbaijan National Academy of Sciences (ANAS) in December. IT researchers and experts from the country's relevant government agencies, universities, research institutes and media took part. Highlighting the strategic importance of information security in national security, the event covered a wide range of topics including digital heritage, the protection of electronic resources, and child protection in the Internet environment.

A workshop to inform leading Ukrainian universities about the Penetration Test service offered by the Ukrainian research and academic network URAN was held in August. This allows users of local networks to conduct basic security checks using targeted attack simulations. It helps to assess the information system's resistance to unauthorised influence and to identify the main vulnerabilities, the most successful models of attack and the possible size of any damage. A follow-up workshop is now being planned.

www.eapconnect.eu

EAPEC BRINGS BENEFITS TO HOSTS AND PARTICIPANTS

The 2018 Eastern Partnership E-infrastructures Conference, EaPEC 2018, was a great success for host organisation RENAM, the Research and Educational Networking Association of Moldova.

One important outcome was the signing of a contract between RENAM and the university 'Perspectiva-INT', which specialises in studies related to business and international relations. The university's rector attended EaPEC 2018 and learned about the services and connectivity that RENAM offers and how it interconnects the Moldovan research and education community with peers in Europe and other world regions via the pan-European GÉANT network under the auspices of EaPConnect. The signed agreement means one more university in the Republic of Moldova will benefit from the opportunities for connectivity and services offered by RENAM and GÉANT.

Conference participation by senior representatives of Moldovan ministries and institutions helped to attract coverage by national TV, radio and press, and brought a high level of visibility to RENAM and to the research and education networking and e-infrastructures community.

EaPEC 2018 was held in Chisinau, Moldova, on 17-18 October, organised by the Eastern Partnership Connect (EaPConnect) project, which is led by GÉANT.

Around 180 people from a diverse range of fields from 80 organisations and 20 countries gathered at the event. They learned about research and education networks, other e-infrastructures, and services that can benefit Eastern Partnership research and education communities and bring them collaboration opportunities.

Highlights of the conference included a keynote presentation by Erik-Jan Bos of NORDUnet, introducing the 'Global Network Architecture'. In a session on EC-funded research, Igor Serotila of the Academy of Sciences of Moldova explained how EaP countries can contribute to Horizon Europe. An e-infrastructures session provided overviews of GÉANT, the European Open Science Cloud, PRACE, EGI and EOSC-Hub.

Pictures
Left: Anatol Goncearuc, Executive Director of RENAM, and Dr. Arina Kraijdan, Rector of University 'Perspectiva-INT. Right: Peter Bogatencov, Executive Vice-Director of RENAM being interviewed for TV at EaPEC 2018.

In other sessions, activities in Poland to digitise cultural objects were described, an explanation was given why the library community needs NRENs, the value of the music community to NRENs was discussed, and reasons were presented why every country needs an NREN. Lightning talks introduced the Open Source Geospatial foundation, blockchain for fraud-proof video, and the 'DICOM Network' for medical imagery. Panel discussions about women in IT and about the sustainability of NRENs engendered lively debate with the audience.

The conference closed with an invitation to attend EaPEC 2019, which will be hosted in Yerevan, Armenia, by ASNET-AM on 25-26 September 2019.

For EaPConnect information, news and links to the EaPEC 2018 agenda, slides and videos, visit https://www.eapconnect.eu

ARAB R&E COMMUNITY GATHERS AT E-AGE2018

Held under the patronage of the Minister of Higher Education and Scientific Research in Jordan and in conjunction with 10th Annual Conference on Quality and Accreditation in Education (AROQA), the event attracted over 150 delegates from 35 countries and offered a high-quality programme with captivating speakers and ample opportunity for debate with an engaged audience.

During the opening session, ministers and senior officials stressed the need for the Arab region to secure its place on the global research and education map. Ambassador Andrea Fontana, Head of the European Union to Jordan, highlighted the importance of technological literacy and R&E connectivity as key factors for socio-economic and scientific progress and recognised the role of EU-funded programmes, such as EUMEDCONNECT3, in catalysing it by supporting a virtual environment in which ideas can be freely exchanged.

Adapting to the 4th industrial revolution

One of the recurring conference themes was the need to adapt to the 4th industrial revolution. Artificial intelligence. Automation. Ubiquitous supercomputing. Self-driving cars. Exciting opportunities, but at the same time also the potential for technological unemployment. NRENs have a role to play – that was one of the core messages in the keynote of GÉANT's CEO Erik Huizer. NRENs can provide the tools and act as the enabler for governments, educators and students to tackle challenges in the educational systems and thus to cater for the individual rather than the mass brain.

Ensuring access to knowledge

NRENs were called upon also by representatives of library consortia in Africa and the Middle East to help ensure open access to knowledge. Diana Naser, Library Director at Birzeit University in Palestine spelled it out: "Libraries need good connectivity, and we need your

The Arab States Research and Education Network (ASREN), GÉANT's partner in the Arab region, hosted the 8th edition of its flagship event – eAGE18 – on 2-3 December 2018 in Jordan's capital Amman. As in previous years, e-AGE18 provided an ideal platform for the Arab R&E networking community to take stock of achievements and developments across the region and to explore opportunities for international cooperation.

help". The AfricaConnect2-funded LIBSENSE project sets out to provide this very support: improving the capabilities of the African HE libraries through workshops, organised by the AfricaConnect2 regional partners ASREN, WACREN and UbuntuNet Alliance, so that they can leverage network services and become effective curators of knowledge.

The voice of demanding users

Attendees also heard first-hand accounts of data communications requirements from scientists involved in SESAME – the synchrotron radiation facility officially opened in Allan, 50km north of Amman, in 2017. Based on the CERN model, it is the largest scientific project in the Middle East, bringing together physicists from several countries that rarely talk to one another – Cyprus, Egypt, Iran, Israel, Jordan, Turkey, Pakistan and Palestine – but whose scientists are determined to collaborate. Their enthusiasm about the fact that two beamlines are now operational was catching and their

endorsement for the need of international connectivity for such massive data generators (a single experiment generates 2–3 TB of raw data!) was undoubtedly music to many (networking) people in the room.

Positive developments

e-AGE18 offered the opportunity to spread the word about R&E networking across the Arab and African world. There was a positive vibe also during the combined project meetings for EUMEDCONNECT3 and the North African cluster of AfricaConnect2 which took place jointly with Internet2's Middle East SIG the day prior to the conference with representatives from across North Africa, the Eastern Mediterranean and the Gulf States.

Admittedly, the picture that emerged was complex and uneven. Some partners plan multi-gigabit upgrades, whilst others continue to be challenged by prohibitive tariffs in unfavourable market conditions.

Pictures
Clockwise: Ambassador Andrea Fontana, Head of EU Delegation to Jordan; Panel discussion on synergies between regional R&E initiatives; Diana Naser, Library Director at Birzeit University, Palestine; Participants at joint EUMEDCONNECT3, AfricaConnect2 North Africa cluster and Internet2 Middle East SIG meeting

Yet, there were achievements to celebrate, such as the agreement with the European Union on a further AfricaConnect phase, the fact that all North African AfricaConnect2 partner countries now have access to international R&E connectivity, the nascent Lebanese NREN TechCARE, the explicit endorsement of the role of NRENs by the earth observation and high energy physics communities, and the willingness to share best practice and learn from each other, be it in human capacity building, roll-out of services such as eduroam and eduGAIN, promotion or user engagement strategies.

There are challenges ahead in the Arab R&E networking world – but there is a willingness among the partners to tackle them together!

Many thanks again to ASREN for a productive week in Amman!

For further information on e-AGE18, including presentations, please visit **http://asrenorg.net/eage18/**

ASI@CONNECT PROJECT ON A ROADSHOW

Catalyzing the support of national stakeholders is crucial for the success of a regional networking project. That is why networking organisation TEIN*CC, who manages the EU-funded Asi@Connect project, has teamed up with partner NRENs across Asia to stage a series of national project launch events in participating beneficiary countries. Building on the impact of similar events during a previous project phase (TEIN2), national project launches provide a unique opportunity to help secure buy-in from local key stakeholders, such as high-level government officials, funding bodies, NREN member institutions, current and prospective network users as well as opinion formers. The overall objective is to introduce the project,

showcase relevance and benefits to the national user communities and society at large and encourage project involvement through participation in call for proposals and in global collaborative R&E projects.

A customised local approach

The event is generally in two parts: a ceremonial session followed by application-based seminars. During the ceremonial part, ministers and local EU Delegation officials deliver congratulatory messages to officially inaugurate the Asi@Connect project at country level. This often amounts to an explicit validation of the role of the NREN in support of R&E communities which is

further stressed by the intervention of a TEIN*CC representative who provides the regional picture and stresses the importance for the country and its researchers to have access to the global R&E network infrastructure.

The subsequent seminar session provides an overview of the national R&E scene and looks more closely on ways the NREN can stimulate user engagement and R&E activities through Asi@Connect.

To maximise its impact, each event focuses on NREN priorities and applications in a given country. Whilst benefiting from Asi@Connect funding support to stage the launch, partners are not expected to follow a set event model; the format, timing and content are therefore likely to reflect national preferences, resulting in unique local events.

Between June 2017 and November 2018 four national launch events took place:

Sri Lanka

On 20 June 2017, LEARN, the national research and education network of Sri Lanka, opened their national launch event in Colombo with a dance performance and a traditional oil lamp lighting ceremony intended to bring good fortune to Asi@Connect.

Following the ceremonial part, LEARN members took stock of their activities in the fields of medicine, agriculture, engineering and other scientific areas with the aim of developing a more integrated approach.

Pictures
Right (clockwise from top):
Participants in launch event in Bangladesh; Panel discussion during Thai launch event; Group picture for launch event in the Philippines.
Left: Traditional oil lamp lighting during Sri Lankan launch.

Bangladesh

BdREN, the national research and education network of Bangladesh, hosted the Asi@Connect national event on 1 November 2017 in Dhaka. The International Seminar on "Strategies for Sustainable R&E Networks" set out to articulate BdREN's development strategies, including increased engagement of its members in regional and global programmes. Global partners from NORDUnet (Northern European countries), ThaiREN (Thailand), ASTI (Philippines) and Academia Sinica Grid Computing Center (Chinese Taipei) joined in to share their own key activities, experiences and strategies.

Philippines

The Philippine partner ASTI (Advanced Science and Technology Institute), collocated the national Asi@Connect launch with celebrations for its 30th Anniversary in the first week of December 2017. The event focused primarily on telemedicine and e-learning with user champions, such as Dr. Jefferey Jeromino Domino, pioneer of telemedicine in the Philippines, stressing the importance of ICT and the need for more collaboration.

Thailand

The most recent event was held by the Thai partner, ThaiREN, on 27 November 2018, with high-level dignitaries in attendance.

The programme focused on experiences and lessons learned in R&E networks, recent research developments, new application ideas and collaborations with Asi@Connect participating institutions. From the neighbouring partner countries, NREN representatives and experts from Laos, Bangladesh and Japan joined in the discussions around Asi@Connect collaborative activities.

A regional project with local impact

Following the success of the first 'roadshow', during the course of 2019 further national launches are planned to take place in Vietnam, Pakistan, Bhutan, Cambodia and Myanmar.

It is fair to say that national Asi@Connect launch events, tailored to the R&E priorities, circumstances and aspirations of an individual country, offer a powerful platform to not only promote a regional project and lobby for funding and active participation in it, but to also remind local policy makers, funders and users of the unequivocal role an NREN can play in facilitating collaborative research and education and in contributing to societal and economic development in a country.

Find out more on Asi@Connect at
www.tein.asia

"Asi@Connect is an excellent example of regional integration, with the R&E communities of 21 Asia-Pacific countries inter-connected by powerful high-capacity, high quality Internet links. There are unlimited fields of world-class research which can profit from the powerful links we have created together. Sharing data and working together on astronomy, meteorology, climate change monitoring, or early warning in case of natural disasters, are just a few examples."

Ambassador Tuang-Lai Margue, Head of EU Delegation to Sri Lanka and the Maldives

"Today knowledge is not local, whatever knowledge we produce, it is instantly accessible from anywhere in the world. Asi@Connect enables us to jointly produce knowledge in collaboration with other people. Just as a joint perspective, multiple perspectives are required for research."

Prof. Dr. Gowher Rizvi, International Affairs Adviser to the Prime Minister of Bangladesh

"We had a very engaging session and our stakeholders are now aware of the project and are waiting for the next call for proposals to apply. Therefore, we would encourage all Asi@Connect partners to follow suit and stage a national launch event."

Dr Roshan Ragel, CEO of LEARN

SCIENTIFIC COMMUNITIES IN EUROPE AND CHINA TO BENEFIT FROM ADDITIONAL HIGH-SPEED INTERCONTINENTAL LINK

Collaborative scientific research between Europe and China is set to be further boosted by an additional 10G of inter-regional connectivity which has just entered service.

LONDON

FRANKFURT

BEIJING

China Science & Technology Network
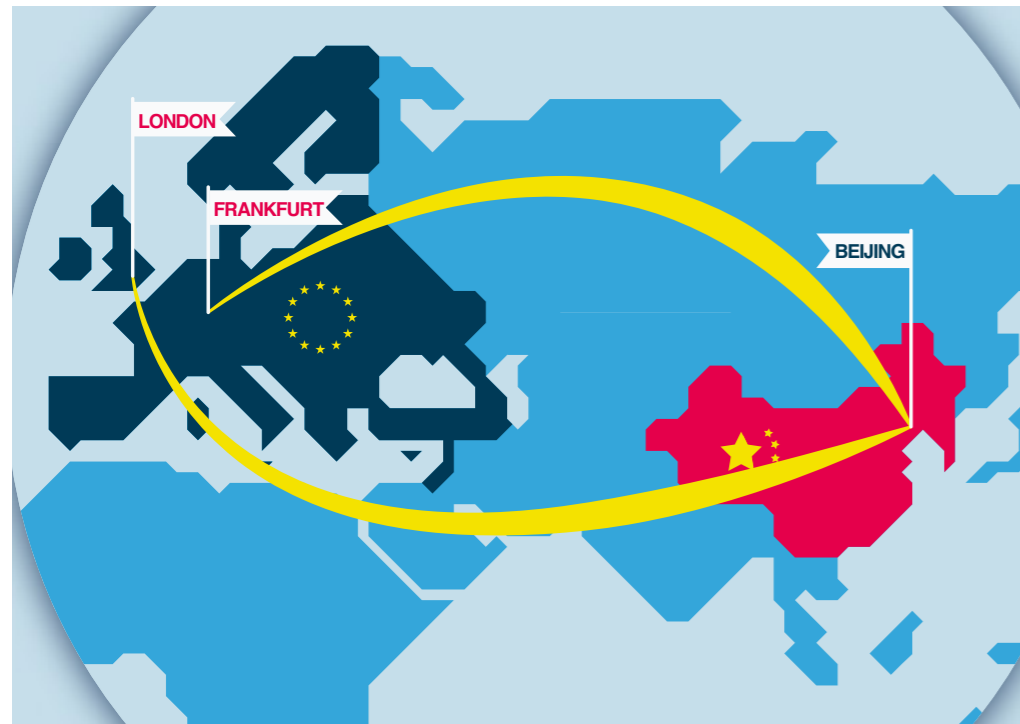
Jointly tendered and contracted by GÉANT and CSTNET, the Chinese science network, the new circuit directly links CSTNET's national network and GÉANT's pan-European research and education backbone over a low latency terrestrial fibre optic cable. Funding is shared between Europe and China: the European share is provided by the GÉANT project which is co-funded by the EU's Horizon 2020 programme whilst the Chinese part is contributed by the Chinese government.

The capacity boost comes in response to the increasing data transfer requirements of collaborative research between Europe and China on projects such as the ITER energy fusion reactor, the Large Hadron Collider (LHC) experiments, the meteorological TIGGE ensemble forecasts, EUMETSAT, the EBI-BGI genomics collaboration and the worldwide e-VLBI radio-astronomy network, to name but a few.

The new circuit complements the existing 10G London-Beijing link jointly contracted by GÉANT and the Chinese NREN CERNET since 2015 following the successful completion of the ORIENTplus project which had established the first direct connection between Europe and China with CERNET and CSTNET.

> **"The growing number of research programmes and academic collaborations between Europe and China showed an increase in data exchanged and clearly highlighted the need for additional and resilient high-capacity connectivity. For many applications with significant economic impact in the long term, such as the ITER global energy fusion programme and the Jiangmen Underground Neutrino Observatory (JUNO) experiment, good connectivity will be the only viable solution. We are pleased to be able to provide this solution jointly with our Chinese partners and we welcome this new link which will give an additional boost to scientific collaborations between our regions."**
>
> Erik Huizer, CEO, GÉANT

> **"We are very proud of this result which will meet the needs of Chinese researchers for a low-latency connectivity solution not only for increased capacity but also time-critical data traffic, such as for meteorological applications. And we have agreed with our colleagues at CERNET mutual back-up for the two EU-China links to optimize resilience so that we can give our users the best service possible."**
>
> Fangyu Liao, General Director, Computer Network Information Center (CNIC), Chinese Academy of Sciences, CSTNET

WITH ELLALINK'S CABLE BELLA BECOMES REALITY

EllaLink

In the beginning of January, GÉANT and RedCLARA announced the finalisation of the agreement by EllaLink and Alcatel Submarine Networks (ASN) for the construction of the first submarine fibre optic cable system that will provide direct connectivity between Europe and Latin America. CONNECT caught up with **EllaLink Group's CEO, Philippe Dumont**, to learn about EllaLink's views on the wider impact of this cable system and share with our readers some elements of the cable construction process.

Can you tell us about your professional background. How did you come to join EllaLink?

Prior to becoming CEO of the EllaLink Group I was working as an advisor to the infrastructure investment fund Marguerite. One of the opportunities that we looked into was the EllaLink cable system, joining Europe and Latin America. Subsequently Marguerite became the major equity owner of EllaLink and in the period that followed I moved from an advisory role into the management team of EllaLink, turning the project from a design on paper into a contracted system that has now commenced construction.

Before this I was the President & CEO of ASN (Alcatel Lucent Submarine Networks) and I've been involved in the international telecoms industry for over 20 years. I am pleased to be joined in the EllaLink management team by a number of other highly experienced subsea professionals.

What are EllaLink's views and expectations of the wider impact of the cable on both regions?

The whole ethos of the EllaLink system is to provide a direct connection between Europe and Latin America. Currently traffic on this path is routed via North America and hence the latency is high. EllaLink's design will allow for savings of around 60ms on the Round Trip Delay between Sines and Fortaleza which makes a huge difference to the end users, particularly in the banking and high frequency trading sector. Another benefit of the route we selected was its diversity from all the other transatlantic systems. With many cables landing in the same locations both in North America and Europe, EllaLink offers a truly unique solution for anyone looking to improve redundancy in their network.

EllaLink also lands in Cabo Verde providing interconnections with the rest of Africa, and Madeira, where it adds variety to the existing infrastructure and the element of competition in the regional market place.

Can you give us more details about the logistics of the cable system construction from start to finish? Which challenges are you expecting to face?

The first step when starting any new subsea build is to set up the project team and together with our system supplier, Alcatel Submarine Networks, we will be allocating groups of experts to look at the specific marine route details and making the cable selection, the implementation process and the end-to-end equipment design. There are a variety of challenges faced in every project like EllaLink; obviously survey and marine installation operations face the challenges posed by mother nature, and backhaul implementation can face infrastructure and timing constraints. Our network offers a PoP (Point of Presence) to PoP solution meaning that alongside the subsea system there will be a number of secure terrestrial routes put in place to connect our end users. We plan to commence the survey in Q2 this year with the cable manufacture and marine installation to follow. The final stage is system commissioning and then EllaLink will be Ready for Provisional Acceptance in Q4 2020.

BELLA will be using spectrum from Sines in Portugal to Fortaleza in Brazil. Can you tell us about the plans for other sections of the cable?

Alongside the BELLA consortium, EllaLink has a number of strategic partners who will take capacity and/or spectrum on the cable system. EMACOM for example will own a fibre pair between Madeira and Lisbon, and Telebras spectrum on the end-to-end transatlantic network. Cabo Verde Telecom has procured spectrum between Cabo Verde and Brazil and Cabo Verde and Portugal. The remainder of the capacity will be sold on an open access carrier-neutral basis.

UBUNTUNET-CONNECT 2018 TOWARDS AFRICAN SMART UNIVERSITIES – SERVICES THAT MATTER

The 11th UbuntuNet-Connect conference couldn't deny one of the hottest topics on the continent: digital transformation. Therefore, this year's conference, held in the beautiful Zanzibar, focused on the concept of SMART education and research. This topic was not just exploited during the two-day conference, but also during co-located events days before.

UbuntuNet Alliance

"We are aware that despite the progress the global world is making Tanzania continues to lag behind in the uptake of ICT and innovation and this is mainly due to the prohibitive cost of bandwidth as well as slow speed internet. We are happy that organisations like UbuntuNet Alliance are helping local entities like TERNET to help us solve this problem. As government we are committed to helping TERNET have the required resources to reach the acceptable levels of ICT advancement that can allow the

country participate in global agendas as we cannot afford to continue to lag behind." - Prof. Joyce Ndalichako, Minister of Education, Science and Technology for Tanzania who officially opened the conference

With these powerful and promising words, the conference contained an energised vibe, sustained by the speakers who shared their challenges, results of studies, and perhaps most importantly, solutions and recommendations. These aim to help not only Tanzania, but the entire region to develop even better in terms of innovation, and decrease the digital divide of Africa with the rest of the world.

Co-located meetings and workshops

An important meeting around the conference theme was the Vice Chancellor's ICT Forum, where several universities from the Eastern and Southern part of Africa gathered to discuss and brainstorm all things digital in today's research and education environment. Sessions covered topics ranging from challenges of emerging digital transformation, learning and teaching innovation in a digital university, the future of ICT in African higher education, a SMART university administration concluding with a roundtable discussion on how to tackle these topics.

Pictures
Clockwise from top: Attendees of UbuntuNet-Connect 2018.

Attendees of the VC ICT Forum.

Attendees of the Networking workshop.

Attendees of the Communications workshop.

Furthermore, librarians gathered for the LIBSENSE workshop to convene library and NREN stakeholders to explore how repositories can operate embedded in NREN e-infrastructure and provide a foundation for an innovative, open, distributed and networked resource for scholarly communication and open science in Africa.

Next to that, there were workshops on identity, networking and one on communications. The identity workshop covered the concepts and practical implementations of identity, authentication & authorisation using a federated approach. Participants of the technical networking workshop developed skills in Interior Gateway Protocol (IGP) and Border Gateway Protocol (BGP) required for the configuration and operation of the large scale networks that make up the internet according to current industry best practices. The skills learned during this course will help improve the performance of the NREN and the campus networks connected to them.

During the communications workshop attendees were stimulated to view communication activities as important ways to inform stakeholders about the importance of having an NREN and not to shy away from it.

"How can I even think about communicating when I'm insecure about being considered a Research and Education Network or not, as I am not connected yet?" An important question raised during the communications and visibility workshop on the 23rd of November co-located at the 11th UbuntuNet-Connect conference held in Zanzibar.

Being part of a community that strives to support students and researchers to have the best toolkit for their studies and careers, shouldn't demotivate members on sharing content, albeit stories that show challenges rather than successes. A response that quickly came up, which lead to a stimulating discussion where all participants of the workshop shared their views on these topics. This was exactly, what this first workshop was intended for: African NRENs empowering each other, brainstorming on how to go about communication activities, and identify the needs of communications support.

Just before wrapping up, GÉANT CEO Erik Huizer managed to attend, as the first ever GÉANT CEO to attend an UbuntuNet-Connect conference. His attendance sparked great enthusiasm across the room, as GÉANT is one of the main partners of the AfricaConnect2 project that supports the UbuntuNet Alliance in the Eastern and Southern African region with high-capacity internet networks. By collaborating with AfricaConnect2, the pan-European GÉANT network strengthens Europe's links with the African continent and provides African research and education communities with a gateway for global collaborations.

Curious to learn more about the Tanzanian Research and Education Network or the regional UbuntuNet Alliance? Read more on their respective websites:

**https://www.ternet.or.tz/
https://ubuntunet.net/**

STUDENT INTERNS DEVELOP CAMPUS SECURITY SYSTEMS IN NIGERIA

The Campus Technology Internship Program (CTIP) is an Eko-Konnect student internship initiative to bridge the gap between today's advanced computing and networking technologies and knowledge shared in Nigeria's higher education community. The program brings together students from diverse tribal, cultural and religious backgrounds to work on common interests and exposes students to real-life digital technology trends in a wide range of disciplines, including robotics, virtual and augmented reality and the Internet of Things, to identify creative solutions and solve societal challenges.

The transformational impact of NRENs

Eko-Konnect is a cluster of the Nigerian Research and Education Network (NgREN); it is proud to be running the campus technology internship program at university campuses across all regions of Nigeria. This is part of wider efforts to establish a functional and sustainable National Research and Education Network (NREN). CTIP interns, and their work on the security system are raising awareness of the transformational effects NRENs can have as an enabler of learning and knowledge in emerging economies.

Words
Owen Iyoha,
Eko Konnect

"The internship program with Eko-Konnect has broadened my scope on new and emerging technologies. I have learned how to use python programming for physical computing. I have gained access to resources, participated in projects and events which I otherwise would not have engaged in, had I not been involved in this internship. It has helped to further develop my technical skills and knowledge beyond what is available to me from my university curriculum. I have learned a whole lot more about NRENs and the importance of developing communities within my NREN."

Tomisin Awosika, Eko-Konnect
Intern and Computer Engineering
Student of the University of Lagos

Enabling the institutions of the future

Creating a partnership to help digital transformation have real impact in your institution.

Dropbox has been creating a collaborative workspace since day one, and has been helping researchers, faculties, staff and students share work both internally and externally while keeping their content safe. Our platform is easy to use, regardless of device choices—integrates and syncs easily across all application workflows, and already conforms both to EU data protection regulations and the highest possible security standards.

And we know that GÉANT is always on the lookout for new technological solutions that benefit its members and all the users within them—whether they're administrators, researchers, or students.

We've come together to help achieve our goals of more effective and complete connectivity.

We're excited to announce that Dropbox and GÉANT are now partnering to help you develop a mature collaboration and data sharing capability that matches the true requirements of your users.

We've developed a solution especially suited to the unique, growing needs of educational institutions.

But why Dropbox?

We've been paying close attention to the way that NRENs and users are responding to the need for ever more effective data sharing tools.

We weren't surprised to see that institution-specific proprietary solutions were often seen as incapable of meeting demand. Especially as files and datasets increase exponentially.

And we weren't surprised to discover that many institutions were seeing great success using Dropbox as their officially sanctioned platform.

We also noticed that even when Dropbox wasn't the platform of choice for the institution, it was for the users. With many taking advantage of their own personal accounts to create workarounds for inadequate sanctioned solutions.

We want to help you and your users take advantage of a tool perfectly suited to the job of global education and research sharing and collaboration. One that you're likely already using in some capacity.

So Dropbox and GÉANT have worked together to create a great pricing plan for all member NRENs and the institutions they represent. With automatic, stepped discounts based on user numbers and scope, starting at just 250 seats. This deal is open to every institution—even existing Dropbox Education and Dropbox Advanced customers. All you need to do is contact Dropbox when your current contract is up for renewal and request migration onto the GÉANT deal.

What's in it for you?

We've agreed to a customized contract that was evaluated by the legal council of GÈANT, and should meet the needs of all NRENs and European educational institutions.

With competitive pricing for both Dropbox Education and Dropbox Advanced, GÈANT are already seeing many institutions take advantage of this new procurement route.

The deal starts for 250 users with further discounts based on more users, contract duration, and more.

All plans include EU data storage to help ensure GDPR compliance. All terms of service are compliant with GDPR, and offer the choice of London, Dublin, or Amsterdam as court of law for regulatory purposes.

Dropbox already has over 300,000 integrations available. Including Blackboard, Shibboleth, Active Directory, Canvas, and Office 365. These partnerships along with many other relevant teaching and research suites mean you'll be able to run it seamlessly alongside all your existing technological assets.

And to help you smoothly manage the project and get the most out of Dropbox, we've included guaranteed specialist support and training.

Our Dropbox Education team will be on hand to guide you through every part of the product right from the moment of purchase. If you ever need them, they're only an email away.

We're very proud to be able to partner in this way. To continue to develop a global network that empowers researchers and institutions to share and collaborate securely worldwide.

For more information on Dropbox, our plans, and how to take advantage of this fantastic opportunity, see overleaf. Or email **geant@dropbox.com** and one of us will be in touch to answer all your questions and draw up a plan that's right for your institution.

GÉANT   **Dropbox**

Dropbox.com/education

The GÉANT-Dropbox partnership

How to take advantage of this fantastic deal

1. You get in touch

Contact geant@dropbox.com, and one of us will get back to you to help you choose the right product. We're offering two plans under this agreement:

Dropbox Education
which offers 15GB of storage per user (in a data pool). Ideal for departments with lower data requirements.

Dropbox Advanced
which offers as much data as you need. Ideal for those dealing with large datasets and specialised file types.

2. We get in touch

Send an email to us at **geant@dropbox.com**, with a note highlighting your interest (maybe include user and data requirement estimates). You can take advantage of this deal whether you're a completely new customer, or you already use Dropbox in your institution and it's time to renew your contract.

3. Determine your scope

How many users will you need to serve?
Does your plan include staff, students, or administrative personnel? Or all three?

Would you prefer an agreement for the whole institution, or per-department? Your scope determines your discounts. The more users you equip and the longer the contract term, the greater the discount.

4. Agree deployment plan and scope integrations

Deployment can be customised to suit your needs, internal timelines, and procurement policies.

We offer over 300,000 integrations with solutions like Shibboleth, Blackboard, Office 365, Active Directory, Canvas, and more. And if you're already with us, you can switch to a GÉANT plan as soon as your current plan ends.

5. Agree contract length...

... and pass it to your legal teams and executive committees for review and signature.

6. We start working together

As soon as the agreement is active, our teams start working with yours. Including training your admins, setup of the Dropbox environment, integration support, and new feature deployments.

We offer full-lifecycle care for all customers, so whenever you need a hand, you'll have access to the specialist Dropbox Customer Success Management team, who are all experienced in the unique challenges institutions face in handling digital technologies.

MAKING THE MOST OF CLOUD INVESTMENTS IN THE RESEARCH AND EDUCATION SECTOR

We're now at the point where there is widespread cloud implementation within many research and education sector organisations, with cloud computing in the education sector already valued at $8.13 billion in 2016, and it is expected to grow to $25.36 billion by 2021. From student email systems, to MOOCs and online distance learning platforms, to employee collaboration platforms – cloud has become essential. The flipside of greater adoption, however, is we may start to see the 'cracks' appearing.

For research and education (R&E) organisations to make the most of their investments in the cloud, challenges such as outages, poor performance of non-cloud native applications, or differing levels of service from vendors with individual service level agreements (SLAs), must be addressed. Ultimately, the many moving parts associated with cloud environments need to be effectively monitored and controlled.

Minimising complexity

Cloud optimisation means reducing expenditure and improving performance, whilst ensuring a secure IT environment is maintained. It is not necessarily an easily-achievable feat, as digitalisation changes the way we work, think and live. Cloud, for all the benefits it delivers – from hosting virtual learning environments to supporting international collaboration – has also added a whole new layer of complexity.

Additionally, by using multiple clouds from different vendors, many R&E organisations could unknowingly lose control over their infrastructure, meaning performance can suffer. Cloud sprawl, insecure storage of sensitive data, and malware infiltrating the network are just some of the risks of uncontrolled cloud. Not to mention the hidden costs that can soon mount up.

Words
Chris Bartlett, Business Unit Director – Public Sector, COMPAREX UK

Visibility and monitoring

To combat these issues and ensure their cloud is running at peak efficiency, IT departments in R&E institutions need a holistic view of their entire infrastructure supported by continual monitoring. Real-time visibility into what software and applications are procured, and where they are deployed is essential. To achieve this understanding, organisations need an overarching layer of control that can deliver this intelligence to a central location.

Once the IT department has the full picture, it can make informed decisions to manage and optimise the cloud environment; for example, ensuring controlled purchasing through closing loopholes in governance. This could take the form of an approved application whitelist – minimising the potential for downloading malware or viruses when employees purchase new applications.

No more 'bill shock'

Greater control of cloud also reduces unplanned spend, which can quickly spiral as consumption grows. Given the amount of data R&E organisations handle, and the diverse and geographically dispersed pool of users – including students, employees, and third-party partners – this is particularly important. A vital aspect of cloud optimisation is managing and predicting cloud consumption; requiring deep visibility into the entire infrastructure.

Though the ease with which cloud can be adopted is a huge benefit for R&E organisations, management of it shouldn't stop post-adoption. While in the on-premise world, it was relatively easy for organisations to keep track of the software being used, where, and by whom, cloud has turned this model on its head. Structured, controlled purchasing, and comprehensive management and reporting, will help IT departments in R&E institutions ensure their cloud journey is one that delivers real value.

To find out how COMPAREX has been helping organisations succeed in the cloud, visit **https://www.comparex-group.com/web/uk/en/products-and-services/cloud/cloud-services.htm**
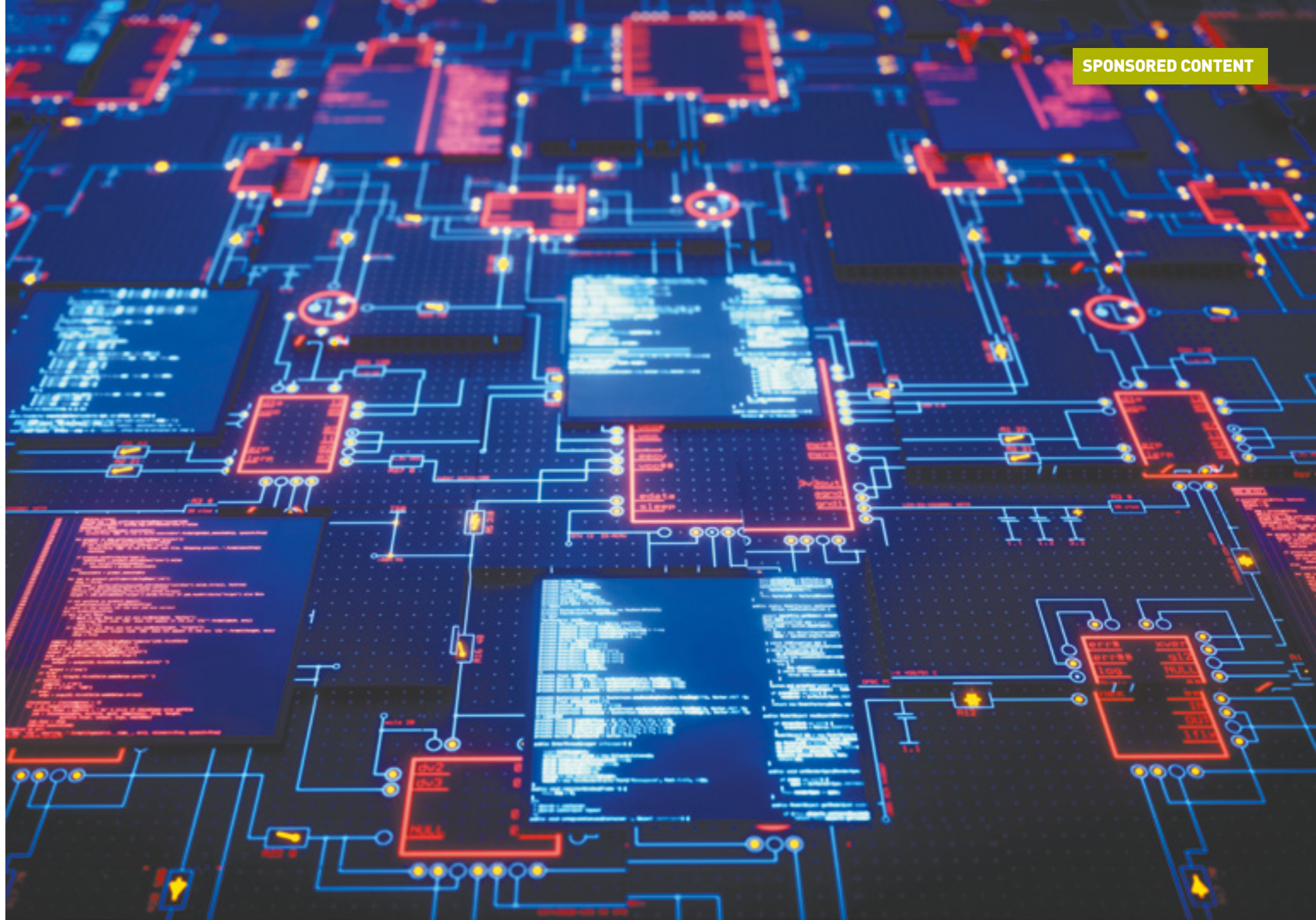
GÉANT AT A GLANCE

GÉANT is the leading collaboration on network and related infrastructure and services for the benefit of Research and Education, contributing to Europe's economic growth and competitiveness.

GÉANT has 41 member countries and is owned by its core NREN membership, and also has Associate members including commercial organisations and multi-national research infrastructures and projects.

Networks

GÉANT interconnects research, education and innovation communities worldwide, with secure, high-capacity networks. We plan, procure and build the large-scale, high-speed networks that are essential for sharing, accessing and processing the high data volumes generated by Research and Education communities, and for testing innovative technologies and applications. GÉANT also provides network and collaboration services that facilitate international cooperation between researchers and educators, and brings people together for the human networking that drives innovation.

Services

GÉANT develops the services its members need to support researchers, educators and innovators - at national, European and international levels.

Our portfolio of advanced services covers connectivity and network management, trust identity and security, real-time communications, storage and clouds and professional services.
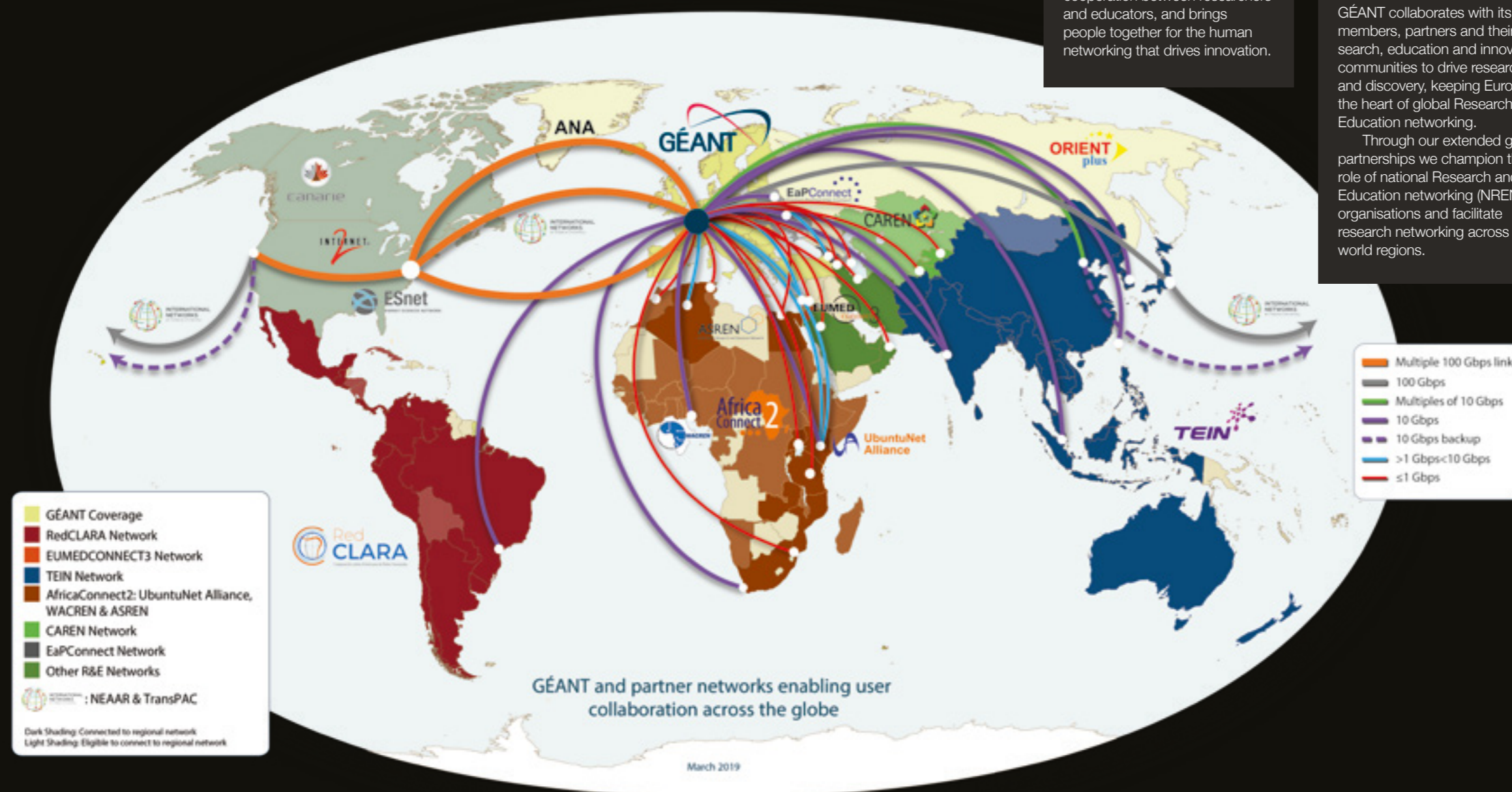
People

GÉANT collaborates with its members, partners and their research, education and innovation communities to drive research and discovery, keeping Europe at the heart of global Research and Education networking.

Through our extended global partnerships we champion the role of national Research and Education networking (NREN) organisations and facilitate research networking across all world regions.

Innovation

GÉANT invests in the research and development of network architectures, technologies and paradigms to develop into the services, processes, tools and network capabilities of tomorrow.

GÉANT facilitates community collaboration that pushes the boundaries of networking possibilities. Fresh ideas from task forces, special interest groups and open calls are applied through specific research activities and initiatives, informed by foresight studies and future user needs to achieve and promote innovation.

Projects

GÉANT is a trusted European Commission (EC) partner in many global collaboration projects and initiatives through our special relationship with the European Union.

We have built up our depth of network expertise and leadership over two decades, and excel in managing and participating in highly successful projects, delivering Research and Education networks and services, and coordinating innovation.

Learn more at
www.geant.org

GÉANT and partner networks enabling user collaboration across the globe

March 2019

Legend:
- Multiple 100 Gbps links
- 100 Gbps
- Multiples of 10 Gbps
- 10 Gbps
- 10 Gbps backup
- >1 Gbps<10 Gbps
- ≤1 Gbps

- GÉANT Coverage
- RedCLARA Network
- EUMEDCONNECT3 Network
- TEIN Network
- AfricaConnect2: UbuntuNet Alliance, WACREN & ASREN
- CARÉN Network
- EaPConnect Network
- Other R&E Networks
- : NEAAR & TransPAC

Dark Shading: Connected to regional network
Light Shading: Eligible to connect to regional network

Join the conversation

www.geant.org
www.facebook.com/GEANTcommunity
www.twitter.com/GEANTnews
www.linkedin.com/company/18128
www.youtube.com/GEANTtv

GÉANT

Networks · Services · People

www.geant.org

CONNECT/0319