Welcome to TERENA:
The Trans-European Research and Education Networking Association

Today’s students, teachers and researchers rely on electronic media and computer networks more than ever before: for simple email communication; for remote learning, teaching and conferencing; for transferring and analysing large and complex data sets; and for experimenting with network technologies and applications.

Dedicated research and education networking organisations provide the necessary networking infrastructure and services to research institutes and educational establishments.

TERENA is the association in which Europe’s research networking organisations, research institutes, equipment vendors and telecommunications operators can meet, exchange information and experience, and collaborate on a range of activities.

Those activities - projects, task forces and events - are open to any organisation or individual who can offer appropriate expertise, manpower, or other resources.

www.terena.org
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Foreword
In many ways, 2008 has been ‘business as usual’ for the TERENA community. The annual conference once again attracted around 500 participants from different research networking sectors in Europe and elsewhere. Ideas, experience and expertise were also shared through a number of other meetings and workshops, often hosted by TERENA member organisations.

However, the past year did see some changes too, of course. The EARNEST foresight study that was completed in 2007 highlighted the challenges ahead for the research networking community, and the results were presented to Members of the European Parliament in April 2008. These challenges and recommendations helped prompt several new directions.

The GN3 project that succeeds GN2 in 2009 will have a similarly significant impact on the organisations that collaborate on project-funded activities.

Putting the GN3 proposal together was a major activity for many of these organisations in 2008, and there was an effort to respond to EARNEST’s findings. One result is that TERENA will play a larger and more diverse role in GN3 than in GN2.

Within TERENA, activities have also been influenced by EARNEST. December’s end-to-end provisioning workshop sought to involve people ‘on the ground’ in universities and research institutes more than ever before. This reflects a growing recognition that these people are a vital component of the research networking community, and that TERENA looks to them as well as to research networkers at the national and European level. The research networking community recognises that there is a need for a more businesslike approach to building relationships with users and to developing and promoting relevant services. The TERENA Task Force on Management of Service Portfolios (TF-MSP) was established in 2008 to address these needs, building on the work of its predecessor TF-LCPM.

TF-Storage is another task force newly launched in 2008, in response to a growing interest in issues relating to the storage of data. At the other end of its lifespan was the Task Force on Enhanced Communication Services (TF-ECS), which concluded its activities in September. With a new software package, handbook and service resulting from its two years of collaborative effort, TF-ECS is a very successful demonstration of what can be achieved by and for the research networking community.

The concept of a community pulling together is fundamental to TERENA’s values. The staff in the TERENA Secretariat are aware that they serve this community’s needs, and that the members of this community are the very heart of the association. This year’s annual report intends to focus more on the contributions and achievements of you, who work together through Europe’s national research and education networking organisations and other bodies to form this community.

It has been my privilege and pleasure to serve as TERENA’s president for the past six years. I would like to thank you for your contributions to our shared activities. Having continued my presidency for an additional year beyond two full terms of office, the time is now definitely right for me to step down in June 2009. But I still very much look forward to continuing my participation in the TERENA community thereafter, and to seeing what the coming years will bring to European research and education networking.

Dorte Olesen, President
Policy and Outlook

TERENA activities are all undertaken under the guidance and responsibility of the TERENA Executive Committee and the ultimate authority of the TERENA membership as represented by the TERENA General Assembly.

TERENA Executive Committee

President
Dorte Olesen

Vice President
Miroslav Milinović

Vice President
Technical Programme
Christoph Graf

Treasurer
Lajos Bálint

Members
Alberto Pérez
Marko Bonač
Agathoclis Stylianou

meetings in 2008
20 February, 14 April, 17 June, 18 September, 18 December, TERENA Secretariat offices

We need a shift in emphasis to meet challenges ahead

The main results of the EARNEST foresight study were published in 2008. These identified three main kinds of challenges for research and education networking in Europe in coming years:

Economic challenges
Models for paying the costs of networks and services – both nationally and at the European level – continue to be an area of discussion. Disparities in the price of network infrastructure in different parts of Europe remain: the digital divide has not gone away. In addition, in the world of ‘dark fibre’ networks a new divide is opening up that is related to geographic distance.

Technical challenges
A few years ago, the GN2 consortium and many national research networking organisations took control of their own fibre infrastructures and deployed hybrid IP-optical networks. This paradigm shift brought new technical challenges, for example, related to monitoring of networks at the lower layers, and to automated provisioning of optical paths. At the same time, the increasing mobility of researchers and students, and their growing use of facilities outside their own institution create challenges for authentication and authorisation systems, which need more development, standardised policies and more structured collaboration across Europe.

Wider roll-out and uptake of services
EARNEST found that beneficial services are deployed and used to a much smaller extent than one might expect. It is a major challenge to ensure that services and tools that in theory are available to researchers, teachers and students, are actually available to them in practice, and are being used efficiently and effectively. It is also important to consider the needs of potential new users outside the traditional user communities in research and higher education.

The third challenge should receive much more attention than in recent years, when efforts tended to focus on the networking needs of the most technically
In May, Dorte Olesen (UNI•C) was re-elected as TERENA's president. Agathoclis Stylianou (CYNET) replaced Marko Bonač (ARNES) as Member at Large of the TERENA Executive Committee for a three-year term. The General Assembly received the 2007 annual report of the TERENA Executive Committee and approved that year's financial accounts. UIIP NASB from Belarus was admitted as a national member of TERENA and Nortel Networks was welcomed as an associate member. The assembly heard a report about a TERENA-organised workshop on regulatory issues that affect national research networking organisations.

The General Assembly had an intensive discussion about preparations of the GN3 project proposal. There was broad support for the importance of human networking activities and joint research activities, and participants agreed that TERENA should have more responsibilities in the new project than it had in GN2.

During the autumn meeting the assembly adopted the TERENA budget for 2009 and raised the membership fees by 1.6% in order to compensate for ongoing inflation. The Executive Committee presented its Activity Plan for the coming year. This focused on the start of the GN3 project. One task to be led by TERENA is ‘Partner Services Promotion’: in a lively two-hour brainstorming session, the representatives of the TERENA members discussed which of their services were most in need of promotion to achieve wider deployment and use.

TERENA’S ROLES IN THE GN3 PROJECT

The GN3 project, which is part of the 7th Framework Programme of the European Union, will start on 1 April 2009. All of TERENA’s roles in GN2 will continue in GN3, except the European videoconferencing service. The foresight study will have more limited scope. In addition, TERENA will take on six new work items.

A new service, led by TERENA, will be European PKI (Public Key Infrastructure) coordination. This will include TERENA’s TACAR service, which will be expanded and upgraded. As part of the service, one national research networking organisation will provide a PKI for users whose own national research networking organisations do not operate a PKI service. TERENA will also make a small contribution to the eduGAIN (education GÉANT Authorisation Infrastructure) service that will be started as part of the GN3 project.

Two GN3 Activities will be led by TERENA Secretariat staff members. One of those will cover research in the areas of roaming developments, identity federations and composable network services. The other will include a study of the environmental impact of GÉANT and national research networks, and an action to promote best practices in network and service provision on campus. TERENA will lead the Partner Services Promotion task, which will assist national research networking organisations with promoting the deployment and uptake of services at a local level. Finally, the TERENA Secretariat will handle the logistics of regular GN3 project management conventions and annual project symposia.
TERENA Membership in 2008 (as at 31 December)

ASSOCIATE MEMBERS

ADVA
OPTICAL NETWORKING
Thomas Schneider

Cisco
Systems
Klaas Wierenga

DANTE
Dai Davies

EMBL
Peter Stoehr

Extreme Networks
Gerrie de Jongh

IBM
David Martin

Juniper Networks
Jean-Marc Uzé

Level 3 Communications
Bart van Aanholt

NORDUnet
René Buch

Nortel Networks
Jan Willem Elion

Tata Communications
Yves Poppe

UNITED KINGDOM
JANET(UK)
Shirley Wood

IRELAND
HEAnet
Mike Norris

NETHERLANDS
SURFnet
Kees Néggars

BELGIUM
BELNET
Pierre Bruyère

FRANCE
RENATER
Dany Vandromme

PORTUGAL
FCCN
Pedro Veiga

SPAIN
RED.ES
Tomás de Miguel

NORWAY
UNINETT
Petter Kongshaug

DENMARK
UNiC
Ole Kjørgaard

GERMANY
DFN
Klaus Ullmann

LUXEMBOURG
RESTENA
Antoine Barthel

SWITZERLAND
SWITCH
Christoph Graf

ITALY
GARR
Enzo Valente
Outreach

As a trusted body of the European research and education networking community, TERENA plays a role in exchanging information through various means: welcoming visitors to the Secretariat offices, presenting TERENA activities at external events, issuing printed materials and publishing relevant news and events announcements online.

COMMUNITY INFORMATION ONLINE

In 2008, TERENA’s online calendar listed around 150 events of relevance to the research networking community. The news column carried 120 reports and announcements, 60 percent of which were published directly by staff from national research and education networking organisations.

Information Dissemination

Presenting TERENA activities to the wider community

An overview of findings of the EARNEST foresight study was presented by Karel Vietsch via videoconference at the opening plenary session of an APAN (Asia-Pacific Advanced Network) conference. Kevin Meynell presented the study on technical issues. He presented this topic in person at the annual conferences of UNIC, LITNET and JANET(UK). At a meeting of OIC-CERT he discussed the activities of TF-CSIRT.

Licia Florio gave a presentation about middleware activities in TERENA and in Europe at the January APAN meeting. She also gave a poster presentation overview of TERENA and its involvement in the GN2 project at the eResearch Australasia event in September. An overview of TERENA activities was also presented at the WDM & Next Generation Optical Networking conference in June in Cannes, France, by Péter Szegedi.

The Compendium was the subject of presentations by John Dyer at UbuntuNet-Connect 2008 in Lilongwe, Malawi, and by Bert van Pinxteren at the Spanish national research networking conference that celebrated the 20th anniversary of RedIRIS in November. Karel Vietsch participated in a panel session at the Internet2 Fall Member Meeting in October, which was devoted to the TERENA Compendium and similar data gathering initiatives in the United States and the Asia-Pacific region. Materials from the Compendium were used in a number of other presentations, including a keynote speech by the president of TERENA at the PIONIER anniversary conference in Poznan in November.

The ‘Case for NRENs’, which was developed during the year, was presented by John Dyer to Open Access 2008 in November in Lilongwe, and by Valentino Cavalli at the Internet2 Fall Member Meeting in New Orleans.

Visits to TERENA members

TERENA Secretariat staff members visited JANET(UK) in June 2008 as the first in a series of visits to member organisations to gain a better understanding of their policies and expectations of TERENA. John Dyer introduced the TERENA organisation, governance and mission, Valentino Cavalli provided more detailed information about the TERENA technical programme and Licia Florio expanded on middleware activities. There was also discussion about the TERENA Compendium.

www.terena.org/news
www.terena.org/events
FEAST

FEAST is a feasibility study whose major objective is to work with key stakeholders to provide the European Commission with a ‘roadmap’ to implement the AfricaConnect initiative.

That initiative, co-funded by the Africa-EU Partnership Agreement, will support the establishment of sustainable and extensible regional backbone networks dedicated to the connection of African national research networks to each other and to the world via GÉANT.

In mid-December 2008, the European Commission awarded a contract to the Swedish Royal Institute of Technology, KTH, and its partners TERENA and DANTE to carry out the FEAST feasibility study. The ten-month study will run until October 2009.

www.feast-project.org

TERENA Compendium

Review Panel 2008

Claudio Allocchio (GARR)
Tryfon Chiotis (GRNET)
Mike Norris (HEAnet)
Esther Robles (RedIRIS)
Shirley Wood (JANET)(UK)

More analysis and interpretation

The 2008 edition of the TERENA Compendium of National Research and Education Networks in Europe revealed a few surprising results alongside the more expected trends. It was published in October and included data from more than 40 countries across Europe and surrounding regions, with information about more, non-European, countries also available online.

This edition gave a more in-depth analysis and interpretation of figures than in previous years. The data demonstrated that at the GÉANT2 boundaries, the proportion of IPv6 (Internet Protocol version 6) traffic has actually been falling relative to IPv4, while the total IP traffic continues to double year on year. One might have expected the IPv6 traffic to have increased, given concerns that IPv4 address space is all but exhausted. The explanation is probably that the European research and education community has a sufficiently large pool of address space to accommodate its immediate needs. It will be interesting to follow the trend of IPv6 use over the coming five-year period.

Meanwhile, there has been a continuation of the trend that levels of service increase while funding levels remain stable. From 2004 to 2008, the overall network size of European national research networks more than tripled. This was achieved with a budget increase of around 10% over the same period.

As always, Compendium data were collected using a questionnaire developed with the welcome help of a review panel. Panel member Mike Norris (HEAnet) worked closely with TERENA Secretariat staff in developing the questionnaire and analysing its results. Further stimulation came from participants in TF-MSP, who worked on a taxonomy of services that had been developed previously by TF-LCPM (Task Force on Life Cycle and Portfolio Management). Thanks to the more interpretive approach adopted in 2008, the Compendium is developing into an even more effective tool for understanding emerging issues in the development of national research and education networks.

www.terena.org/compendium

WHAT IS THE COMPENDIUM?

TERENA gathers information about national research and education networking organisations (NRENs) and the issues they face. An annual Compendium documents the work, budgets and users of these networks in Europe and beyond. Basic data and information about the organisation, staffing, finances, user base, capacity, services and developments are available online. The more important information, with interpretation, is available online and in print.

The TERENA Compendium provides an authoritative reference source for anyone with an interest in the development of research and education networking and it has prompted similar publications in other world regions.

Production of the TERENA Compendium of National Research and Education Networks in Europe was financially supported by the European Union through the GN2 project.
Networking Development Support

Advisory Panel 2008

Antoine Barthel (RESTENA) (until 2 February)
Artur Binczewski (PSNC)
Sabine Jaume-Rajaonia (RENATER)
Baiba Kaškina (IMCS UL, SigmaNet)
Agathoclis Stylianou (CYNET)

Work to diminish the digital divide is ongoing

In 2008 there was follow-up to Networking Development Support activities from previous years, plus new efforts to assess individual country needs and to raise awareness of the need for computer security incident response teams.

EU-Med Event 2

The event was collaboratively organised by TERENA, DANTE, GARR and JUNet with financial support from the GN2, EUMEDCONNECT2 and LINKSCEEM projects.

Media coverage

The event attracted wide media interest which resulted in 19 newspaper and 23 online articles plus reports on satellite and Jordanian national television.

Actions to follow-up on previous work:

Europe and the Mediterranean – EU-Med Event 2

4 November, Amman, Jordan

Following the success of the 2007 EU-Med Event in Brussels, EU-Med Event 2 brought together high-ranking public officials and specialists from 20 countries in Europe and the Mediterranean regions of North Africa and the Middle East. The event highlighted projects that have benefits for people living in the Mediterranean region.

Human networking and a spirit of cooperation were emphasised. Alongside government ministers from Jordan, Palestine and Morocco and other high-level participants, researchers and policy makers from around the region used the opportunity to gather ideas and contacts for future collaborative projects.

A panel discussion about the role of the European Union (EU), governments and the private sector in sustaining e-infrastructures in the Mediterranean region further highlighted human networking. Several speakers suggested that raising awareness about networks and services, among researchers and politicians, would increase demand for their long-term provision.

EU-Med Event 2 culminated in the launch of EUMEDCONNECT2 – the high-capacity data communications network that links the research and education communities of the Mediterranean region with those in Europe. The launch celebrated the confirmation of two further years of EU funding for the network.

Progress in southeast Europe

As part of an ongoing dialogue with MARNet, Valentino Cavalli of TERENA was invited to participate in a conference session on research networking, in Skopje in December 2008. This was an opportunity to present ‘The Case For NRENs’ to conference attendees, and to meet informally with MARNet Board members and representatives from the Macedonian Ministry of Information Society.

In 2007, participants in a TERENA-organised Round Table on research and education networking in Bosnia and Herzegovina discussed a number of resolutions, mainly to interconnect universities in the Federation of Bosnia and Herzegovina via a network called FARNET, and to revitalise BIHARNET, Bosnia and Herzegovina’s official national research networking organisation. By September 2008, the FARNET network was almost completely implemented and talks about BIHARNET were still ongoing; this progress was presented at the final review meeting of the SEEREN2 (South-Eastern European Research & Education Network) project.

New assessments of country needs

Ukraine

Ukraine is a large country in terms of both area and population, and has a well-developed research and education community. Two organisations currently provide networking services there, URAN and UARNet. An assessment of the country’s needs concluded with a visit in April by Kevin Meynell and Valentino Cavalli (TERENA Secretariat) and Jacek
Gajewski (CEEnet). The team met key representatives of URAN, UARNet and the National Academy of Sciences, managers and directors of research and education institutions and representatives of the Ministry of Education and Science. In July the result of the study was reported in a confidential document that was distributed to key stakeholders in Ukraine and to the European Commission.

Montenegro
In summer 2008 the research networking needs of Montenegro were assessed. With one public university and a small user community, its chief challenges are limited international bandwidth and limited network capacity outside Podgorica. During a visit in September, Kevin Meynell met technical managers and members of the board of MREN, as well as the Minister for Education and Science and the Deputy Director of the Computer Centre for Primary and Secondary Schools. Shortly after these meetings MREN obtained a financially attractive arrangement for increasing its network capacity. The assessment report was sent to the European Commission and to local stakeholders in October.

Belarus
An assessment of the country needs of Belarus began at the end of 2008 and is to be completed in 2009.

Other support actions
Raising awareness about computer security incident response
The GN2 project encourages all participating national research and education networking organisations to establish a computer security incident response team (CSIRT). As BREN (Bulgaria) and RoEduNet (Romania) had no formally established CSIRTS, meetings were held in 2008 between their management and representatives of GN2’s security research and networking development support activities. In July Kevin Meynell went with Claudio Allocchio (GARR) to BREN and in August he accompanied Christoph Graf (SWITCH) to meet RoEduNet representatives. Action plans were agreed in both cases. In Romania this was swiftly implemented and a CSIRT was established within a few months.

www.terena.org/development-support

TOPICS AND GOALS OF EARNEST
EARNEST started in March 2006. From July 2006 to June 2007, seven parallel sub-studies explored the expected development of research and education networking in Europe over the next 5-10 years. These covered:
- campus issues
- geographic issues
- organisation and governance issues
- technical issues
- economic issues
- researchers’ requirements
- requirements of users in schools, the healthcare sector and the arts, humanities and social sciences.

In addition a report on regulatory issues was commissioned and a summary report was produced. Reports are available online and in print.

The goal of EARNEST, led by TERENA, was to provide input for initiatives that could keep European research networking at the forefront of worldwide developments and enhance the competitiveness of the European Research Area. EARNEST was funded by the European Union through the GN2 project.

STOA workshop
The “Computer networks for research and education: A European success story - new challenges for policy makers” workshop was organised by STOA, the Science and Technology Options Assessment unit of the European Parliament, in cooperation with TERENA. The event was chaired by MEPs and STOA panellists Jorgo Chatzimarkakis (Germany) and Joel Hasse Ferreira (Portugal).

Jorge-A. Sanchez-P. (JPPartners & Co.) presents EARNEST Geographic Issues sub-study findings during the STOA workshop.

www.terena.org/earnest

EARNEST Education And Research Networking Evolution Study
workshop in 2008
2 April, hosted by the European Parliament in Brussels, Belgium

EARNEST goes to Parliament
Members of the research and education networking community presented key findings of the EARNEST foresight study to Members of the European Parliament.

Around 45 participants heard overviews of EARNEST and the GN2 project, as well as accounts of how geographic and economic disparities contribute to the ‘digital divide’. The challenges faced by research networking organisations in new European Union member countries were also highlighted, while a presentation about research networking in Portugal mentioned how bureaucratic difficulties were overcome when trying to obtain European Structural Funds.

The impact that networking has had on researchers from all disciplines was one aspect investigated in EARNEST. Presentations about developments in radio astronomy, digital libraries and in biomedical and social sciences emphasised the growing dependence of research and academic communities in all disciplines on computer network technologies and services. Discussions focused on the potential for research networking organisations to collaborate with small and medium-sized enterprises and with the European Institute of Innovation and Technology.

www.terena.org/earnest

Outreach
TF-MSP was launched on 1 March 2008 after approval by the TERENA Executive Committee. It continues work that was started in the Task Force on Life-Cycle and Portfolio Management (TF-LCPM), which concluded in December 2007 after completing its main deliverables. However, TF-MSP has a wider scope - to explore issues at the boundary between technical and management aspects of NREN services.

TF-MSP will examine the common organisational concerns of finding, developing and introducing new services, and supporting them during their production phase and eventual withdrawal. TF-MSP provides a forum in which national research networking organisations can explore new areas for inter-NREN cooperation. Its deliverables will include tools and information to assist NREN managers and staff at all levels to manage their portfolio of services.

The continued existence of a forum to discuss such matters is felt to be very important by task force participants: there are many relevant non-technical, managerial issues that affect research networking organisations and their portfolios of services, and the opportunity to share experiences and perhaps reach cooperation agreements is highly valued.

Key work areas of TF-MSP
A large number of deliverables have been defined in the areas of the requirements for services, their development, deployment and operation, and how to handle the end of their life. Another area of work relates to strategy regarding tariff models, non-technical factors that could affect the development of NREN activities (like defining new user groups), and making the case for NRENs.

TF-MSP
Management of Service Portfolios
Chair: Alberto Pérez (RedIRIS)

meetings in 2008
18 May, Bruges, Belgium
29-30 September, hosted by SWITCH in Zürich, Switzerland

New task force makes a swift impact
After the initial process of making the transition from TF-LCPM to TF-MSP, the number of task force participants and the level of activity increased significantly during the course of 2008. The task force liaised with other bodies on areas of common interest and saw several concrete benefits arising from its work.

From among the many issues discussed, several led to practical developments within participants’ NRENs. For example, Alberto Pérez mentioned that, as a result of information gathered in the task force, RedIRIS created a new service (a ‘reputation block list’), got very useful ideas about how to improve other services, used other NRENs’ strategic plans as a model for the definition of its five-year strategic plan, and significantly improved its service portfolio management.

Making The Case for NRENs
The task force also contributed to the development of a document that received interest from NRENs all around the world: ‘The Case for NRENs’ provides arguments for the ongoing existence of research and education networking organisations. John Dyer (TERENA Secretariat) presented the work in various settings during the year.

Other significant topics included media delivery services, with the TF-MSP discussion leading to the organisation of a TERENA workshop at the start of 2009. Similarly, a 2009 workshop on the improvement of mail quality is anticipated as a follow-up to TF-MSP activities.

In addition to open meetings to exchange information about topics identified in the TF-MSP terms of reference, task force participants decided that in future there would also be smaller meetings to discuss specific subjects.

www.terena.org/tf-msp
TF-PR and TF-MSP share areas of common interest

TF-PR and TF-MSP held a joint meeting in May 2008 and a joint session on 30 September. They discussed areas of common interest, including the marketing of NREN and GÉANT services, assistance and support to new or developing NREns and ‘The Case for NREns’. Questions were raised about gathering data for the TERENA Compendium and some technical issues such as low uptake of IPv6 and ENUM (E.164 Number Mapping). The task forces considered the possibility of working on joint deliverables, but concluded that, even if no shared deliverables are produced, it is still desirable to have further joint meetings in future.

Outreach

TF-PR
Public Relations and Information Dissemination

Chair: Maria Ristikok (EENet)

Meetings in 2008
21-22 February, hosted by CARNet in Zagreb, Croatia
18 May, Bruges, Belgium
29-30 September, hosted by SWITCH in Zürich, Switzerland

TF-PR makes new contacts, anticipating change

In 2008 TF-PR took advantage of a meeting in Switzerland to forge links with CERN (European Laboratory for Particle Physics), one of TERENA’s international member organisations. It also had joint meetings with TF-MSP, as well as the customary back-to-back meetings with the GN2 PR Network. Plans for changes under GN3 were presented for the first time, as well as information about PR and marketing related topics.

An ongoing exchange of experience

Although changes in staff led to a smaller number of active TF-PR participants in 2008 and a reduced input to the task force’s deliverables, the group maintained commitment to the community news agency ‘PeaR’ and gathered data for the annual PR Compendium. Samples of brochures, annual reports and other materials were exchanged as well as experience and best practice on their production, with information sheets on how to make an annual report and a corporate brochure being added to the ‘PR Tool Kit’. Several task force participants presented overviews of PR and marketing activities within their organisations, and compared plans to celebrate a spate of significant NREN anniversaries. Round table sessions were also used to enlighten participants about other forthcoming events, competitions, branding strategies, the development of new websites and NREN services. The SWITCHcast video management system that was showcased by Roland Eugster (SWITCH) particularly caught the interest of participants.

PR-related activities at CERN

James Gillies (CERN) gave a frank and entertaining presentation about the planning and implementation work needed for communicating the LHC; which began several years before the Large Hadron Collider launch event on 10 September 2008. The talk focused mainly on building press relations and dealing with sometimes adverse public perceptions of the project, as well as training technical staff to be interviewed by journalists. There was discussion about cooperation between CERN and TF-PR participants in the sharing of information for press releases.

PR planning for GN3

As a prelude to a GN2 PR Network meeting back-to-back with the September TF-PR meeting, an overview of the initial plans for the GN3 project’s PR-related activities was presented by Laura Durnford (TERENA Secretariat). This had a particular focus on the new TERENA-led task, ‘Partner Services Promotion’. The ensuing discussion revealed that task force participants present at the meeting had previously heard nothing about GN3 through their own organisations. This led to plans for TF-PR to discuss in 2009 the issue of internal NREN communications.

www.terena.org/tf-pr
Technical Programme

Through its projects and task forces, the TERENA Technical Programme supports European collaboration in developing, testing and evaluating innovative networking technologies, applications and services. It brings together technical specialists in the research networking community with their colleagues from other countries. Two TERENA bodies assist the management of the Technical Programme: the Technical Advisory Council and the TERENA Technical Committee.

The main work of the TERENA Technical Committee is to monitor the progress of the Technical Programme activities, to consider proposals for new TERENA task forces and projects, and to discuss technical issues related to TERENA’s activities.
Technical Advisory Council

meeting in 2008
19 May, Bruges, Belgium

The Technical Advisory Council is composed of nominated senior technical managers of the TERENA members. During its annual meeting, the council discussed TERENA’s middleware-related task forces and the impact of ‘free’ services, it redefined the special interest areas that form the focus of the technical programme and, for the first time, considered environmental matters.

‘Green computing’ issues relating to cost, policy, responsibility, opportunity and efficient use of research networks were introduced by Lars Fischer (NORDUnet). A significant number of research networking organisations are already involved in such matters and the council agreed that the community should more formally address the issues, in part through the GN3 project.

Christoph Graf (SWITCH) raised the question of how research networking organisations should best respond to the growing use of ‘free’ services such as gmail and skype by institutes and researchers.

Participants leaned towards the opinion that it is in the interest of research networking organisations to be aware of potential impacts on their relationships with users and providers of commodity services. For the time being, TERENA should remain vigilant.

The council discussed and endorsed a shift in emphasis in the middleware-related task forces TF-EMC2 and TF-Mobility. It also reviewed the special interest areas at the heart of TERENA’s technical activities. Based on the consensus reached in this meeting, the TERENA Executive Committee decided in June to adopt the following list:

- Lower-layer technologies (layers 1 - 4 of the OSI (Open Systems Interconnection) reference model)
- Security
- Middleware
- Mobility
- Voice and Video Collaboration
- Virtualisation

In addition, campus networking and end-to-end issues are challenges that have an impact across all special interest areas, while Grid collaborations span many of the areas.

www.terena.org/about/tac
www.terena.org/about/tech

TERENA Technical Committee in 2008

Christoph Graf (chair)
Andrew Cormack
David Kelsey
Diego López
Ligia Ribeiro
Afrodite Sevasti
Karel Vietsch (ex officio)
Valentino Cavalli (secretary, ex officio)
TF-CSIRT
Collaboration of Security Incident Response Teams

Chair: Gorazd Božič (ARNES) until 14 May, Lionel Ferette (BELNET) from 15 May

meetings in 2008
28-29 January, hosted by Sun Microsystems in Prague, Czech Republic
13-14 May, hosted by UiO CERT and UNINETT CERT in Oslo, Norway
25-26 September, hosted by CERT.at, AConet CERT and the Austrian Academy of Sciences in Vienna, Austria

A year of change and extending contacts

In 2008, TF-CSIRT got its first new chair since the task force was created. Two new work items were included in the revised terms of reference, which came into force in May, granting a further two-year mandate to the task force.

The evaluation of tools is one new work item for the task force. The idea is that at each TF-CSIRT meeting a software tool for incident handling could be presented and discussed, perhaps with in-depth teaching sessions on how to use it. Drill exercises are another new feature. Practical security exercises could be a good way for security teams to identify any problems and weaknesses, while helping them improve their incident handling techniques.

Drill exercises were mentioned during a meeting of the Asia Pacific Computer Emergency Response Team (APCERT), which was attended by TF-CSIRT participants as part of an exchange of representatives at meetings in the course of the year. There was also a meeting in Tunisia with the OIC-CERT Task Force, which had been established under the auspices of the Organisation of the Islamic Conference (OIC). In November a TF-CSIRT delegation visited Russia, to meet with RU-CERT, RU-CENTER and the Federal Security Service. The programme covered incident response in Russia, e-commerce issues, country code top-level domain regulation and RU-CERT plans for the future. The TF-CSIRT delegation provided overviews of specific topics based on their own experiences, and encouraged future collaboration between Russia and the wider CSIRT community.

The 25th TF-CSIRT meeting, in September, was the first to be chaired by Lionel Ferette (BELNET), who had taken over the chairmanship from Gorazd Božič (ARNES) in May. Gorazd Božič had led the task force since its creation eight years before. In this meeting, an overview was given of the cyber-attacks on Georgia that coincided with, and partly preceded, the South Ossetia war in August. There were similarities between these and the attacks directed against Estonia in 2007 and against Lithuania earlier in 2008.

Spin-off activities of TF-CSIRT, such as the Trusted Introducer service, CSIRT training workshops and the Request Tracker for Incident Response project are reported on elsewhere in this annual report.

www.terena.org/tf-csirt

Gorazd Božič and Lionel Ferette
TF-Storage

Chair: Jan Meijer (UNINETT)

meetings in 2008
8 April, hosted by CSC in Espoo, Finland
12 September, hosted by IMCS UL, SigmaNet in Riga, Latvia

A positive start for a new task force

The first meeting of TF-Storage was co-located with the NORDUnet 2008 conference and attracted around 30 participants. After an initial round of introductions and overviews of national storage experiences, investments and research works, discussion focused on the work items listed in the task force’s terms of reference.

The topics that drew the greatest interest were a taxonomy of storage technology and middleware, backup and / or disaster recovery services, and a 'Poste Restante' or large file transfer service that would be more advanced than a traditional FTP (File Transfer Protocol) service by virtue of including content security, federated access and user-friendly web interfaces.

Existing implementations of such services were presented during the autumn meeting by representatives of UNINETT, CSC/FUNET, the University of Basel / SWITCH and HEAnet. They demonstrated how their systems work and highlighted the technical features. Those national research networking organisations interested in establishing a Poste Restante service decided to combine their efforts in pursuing it.

During the same meeting, several vendors were invited to present their storage products and solutions so that the task force would be better informed about commercial trends. This approach proved valuable as it stimulated interesting discussion about possible storage architectures and services. The task force decided to keep vendor presentations as a recurring agenda item in future meetings.

www.terena.org/activities/tf-storage

GOALS OF TF-_STORAGE

TF-Storage is the new task force that was approved by the TERENA Technical Committee in February 2008, following the success of meetings on storage issues the previous year. Under a two-year mandate TF-Storage will coordinate the development of open and interoperable data storage and management infrastructures and services among national research networking organisations, and academic and research institutions.

The task force will identify and promote the use of common standards, techniques, technologies and procedures in the field of data storage that are relevant to the education and research community. It will focus its activities on the TERENA constituency. Since there are many activities already underway related to Grids that have a storage component, the task force will coordinate with these activities to avoid unnecessary duplication of effort.
TF-EMC2
European Middleware Coordination and Collaboration

Chair: Diego López (RediRIS)

Meetings in 2008
4-5 February, hosted by CRU in Marseille, France
9-10 July, hosted by Umeå University in Umeå, Sweden
3-5 December, hosted by SURFnet in Utrecht, Netherlands

A new focus and ongoing activities for TF-EMC2

In July the task force considered refocusing and re-balancing its portfolio and that of the other middleware task force TF-Mobility. By September the terms of reference were re-formulated and the TERENA Technical Committee approved the task force’s third two-year mandate.

TF-EMC2 will focus on identity infrastructures and application-oriented middleware. Several work items continue from the previous period, but the following new work items have been added:

- Community PKI Initiatives: concentrates on overseeing patterns of use and emerging technologies that may be relevant for Public Key Infrastructure services; proposes how to make the services evolve and continues promoting the services through projects and groups such as EGEE and the International Grid Trust Federation. It will interact with the PKI-related activities proposed within the GN3 project and will follow the development of TACAR and the Server Certificate Service.
  - Reputation Systems: addresses the propagation of trust in highly distributed environments, such as wikis, social networks etc. The main goal is to establish a service-oriented pilot to provide reputation ratings for various systems.
  - Identity Services beyond Web Single Sign-On: follows on from discussion at the TERENA Networking Conference 2008 and will be strongly connected to identity-related activities in GN3. The European academic community has found many use cases for federated digital identity in applications other than those accessible through a web browser (e.g. SIP). Going beyond the browser is fundamental to fulfilling the potential of identity management to simplify the task of service administrators and to enhance user experiences.

Recognised as a source of expertise

In 2008 the large digital library project EUROPEANA enquired about support on authentication and authorisation technologies. Also, a representative of the CLARIN (Common Language Resources and technology Infrastructure) project presented its authentication and authorisation needs. It was agreed that CLARIN would be a good candidate for using eduGAIN.

The TF-EMC2 community is engaged in ensuring that middleware technologies do not compromise the privacy of individuals. Research networking organisations are becoming much more privacy conscious: the latest trend to raise awareness is to seek users’ agreement before sending their information to services they want to access.

www.terena.org/tf-emc2
SCHAC

The SCHAC directory schema is wholly or partially used in Finland, Spain, Norway, Poland, Slovenia and Australia, by perfSONAR and by the GidP (GÉANT Identity Provider).

The SCHAC directory schema defines a set of attributes to describe individuals in academic and research institutes. A mature version having been released in 2006, some attributes were tested on an experimental branch of SCHAC during 2008.

In June, Victoriano Giralt (University of Málaga) spoke at the annual EUNIS conference about the potential for SCHAC to help codify information about students moving between institutions under the Bologna process. The aim is to get as many people using the schema as possible.

To increase visibility of SCHAC, a plan was discussed in 2008 to change the namespace registry to urn:schac and to issue a Request for Comments. To support SCHAC, TERENA currently operates the namespace registry urn:mace:terena.org.

www.terena.org/registry
www.terena.org/schac

REFEDs

During 2008 much work was done to update contents of the REFEDs wiki.

This has become a valuable tool for sharing information among identity federation operators, even including commercial companies willing to connect their systems to existing federations. Discussions about legal issues, security practices and outreach to other sectors proved valuable, with interest in REFEDs activities from communities such as the Liberty Alliance.

The key topic of discussion in 2008 was whether REFEDs should separate from TF-EMC2 and become a distinct activity such as a project. In December it was agreed that REFEDs should have its own identity; a ‘roadmap’ was drawn up, describing the work required to provide best practices, guidelines and recommendations to address issues facing research and education federations in Europe, America and Asia. This roadmap will be completed in 2009.

www.terena.org/refeds

ECAM

ECAM is the European Committee for Academic Middleware, the joint steering committee of TF-EMC2 and TF-Mobility. ECAM promotes innovative and open middleware infrastructures and technologies, gives feedback on planned topics for EuroCAMP and NRENs and Grids workshops, and advises TERENA on its middleware activities and other relevant initiatives. Through common members, ECAM liaises with MACE, the Middleware Architecture Committee for Education, which operates under the umbrella of Internet2.

In 2008, ECAM members discussed the objectives of TF-EMC2 and TF-Mobility and how best to fit TERENA’s middleware activities into these two task forces. This contributed to a revision and restructuring of their terms of reference. In turn this affected the membership of ECAM, because only current work item leaders from these task forces and invited members are allowed to participate.

New documents about privacy and data protection were added to the ‘Suggested by ECAM’ section of the website, where members collate documents and software that might be of general interest to the research networking community engaged in middleware development.

www.terena.org/ecam
TF-Mobility
Mobility and Roaming

Chair: klaas Wierenga (Cisco Systems)

meetings in 2008
6 February, hosted by CRU in Manéville, France
8 July, hosted by Umeå University in Umeå, Sweden
2 December, hosted by SURFnet in Utrecht, Netherlands

A new name and a new focus

2008 was a year of change for the task force, which is reflected in its new official name: Task Force Mobility and Network Middleware. Having focused on exploring roaming technologies and security issues that may affect roaming services, largely related to eduroam (education roaming), TF-Mobility was able to broaden its scope after eduroam developed from a pilot into a service in recent years. This shift in emphasis continued in 2008.

The need arose to redefine the focus of the middleware-oriented task forces TF-Mobility and TF-EMC2. Consequently, the new TF-Mobility terms of reference, which came into force in September, include work areas related to network middleware, besides a number of continuing activities. The new work items are:

- Location awareness: explores the use of mobile devices to deliver relevant, timely and personalised content to users depending on their location.
- DNSSEC: investigates models for rolling out a secure Domain Name System in the research networking community from the perspective of technology and policy.
- Integration with other operators: focuses on collaboration with (commercial) WiFi, GPRS and UMTS operators, explores integration from a technical and business model viewpoint including the possibility for the research networking community to become a (virtual) wide area wireless operator.
- Liaison with other GN2 and GN3 activities: provides a communication channel between participants in the GN2 and GN3 projects and other research groups and networking communities in Europe, North America and the Asia-Pacific region to exchange knowledge and experience and to identify possible collaboration.

Ongoing eduroam-related activities

The eduroam-related activities that remain in the remit of the task force are the furthering of eduroam beyond Europe, the relation of eduroam with other technologies and liaison with standards bodies, and new technical developments that may constitute a future eduroam. During 2008, TF-Mobility engaged in discussions that resulted in eduroam being deployed in Canadian higher education institutes and in a rekindled interest in eduroam in the United States.

A number of TF-Mobility participants are active in the IETF (Internet Engineering Task Force). There is involvement in its nea (Network Endpoint Assessment) working group to ensure that standards will be compatible with eduroam, the emu (EAP method update) group defining requirements for EAP (Extensible Authentication Protocol) methods and the capwap (control and provisioning of wireless access points) working group for the management of access points. However, the main attention focuses on the radext (RADIUS extensions) working group, in which Stefan Winter (RESTENA) on behalf of GN2 drives the effort to standardise RadSec, which will allow for a more robust, scalable and secure eduroam infrastructure.

The task force gave feedback on a RadSec proxy that was developed in the GN2 framework by Stig Venås (UNINETT). The proxy allows institutions with non-RadSec-capable RADIUS (Remote Authentication Dial-in User Service) servers to participate in a RadSec-based eduroam. TF-Mobility is also monitoring work by the University of Alcalá de Henares in Spain to implement a prototype for InfoCard-SAML-RADIUS integration.

www.terena.org/tf-mobility
TF-ECS
Enhanced Communication Services

Co-chairs: Erik Dobbelsteijn (TWiYO) and Fabio Vena (SWiTCh)

meetings in 2008
16 January, videoconference
22 February, hosted by SWiTCh in Zürich, Switzerland
16 May, Bruges, Belgium
30 September, videoconference

Task force ends with triple achievement

A new software package, handbook and service are the results of the Enhanced Communication Services task force, which completed its two-year mandate in September 2008.

Previously available open-source software components were packaged by the task force as ‘N-ECS’ (NREN-Enhanced Communications Server) images. These allow easy installation - either on a physical server or a virtual machine - of a fundamental back-end SIP server infrastructure, which is pre-configured to allow a quick start.

Some basic calling functions of the server software were put to the test during the May meeting of the task force. A demonstration server had been installed on the CESNET network and participants used test accounts to make voice and video calls among SIP clients and among H.323 clients respectively.

A handbook describing how to install and configure the N-ECS images was begun by TF-ECS, but was completed as a TERENA project (mentioned elsewhere in this annual report). It describes VoIP (Voice over IP) and videoconferencing technologies, and how to set them up and test them using the N-ECS software.

The TERENA SIP Handbook is targeted at NREN administrators and university campus network administrators. It provides a single source of all relevant information set in a wide context, in contrast with the many fragmented and narrowly focused sources currently available on the Internet. This is the first time that a feature-rich system combining the most powerful roles of various open-source systems has been set up and put into context, taking into account multi-domain scenarios. Both the N-ECS software images and the SIP handbook are available for download.

The third focus and achievement of TF-ECS was to ensure the continuation of the NRENum.net service, which complements the other products of the task force. This service is reported upon elsewhere in this document.

In addition to developing its deliverables, in 2008 the task force liaised with the European videoconferencing service activity of the GN2 project, also known as ‘educonf’. They explored potential synergies in their work and concluded that educonf could use the N-ECS software images for echo server and monitoring purposes, and that this knowledge would help refine work on the software.

www.terena.org/tf-ecs
www.terena.org/n-ecs

TF-ECS explored collaboration tools and technologies that go beyond simple voice- and videoconferencing. During its lifetime, eleven national research and education networking organisations contributed to the task force’s work.
TERENA PROJECTS

TERENA projects are regulated by contractual relationships between TERENA and a subcontractor. Often they are pieces of work that originate from TERENA task force activities but cannot be completed by volunteer effort alone. Sources of funding vary depending on the size and scope of the project. Very small projects can be funded by TERENA from its own resources, but larger projects require financial contributions from TERENA members and possibly other interested organisations.

Request Tracker for Incident Response

The Request Tracker for Incident Response project ended on 4 February 2008, when a final batch of software was approved by the RTiR working group of TF-CSIRT.

What is RTiR?
The Request Tracker for Incident Response software is a tool supporting Computer Security Incident Response Teams in their daily work, registering incidents and keeping track of the workflow in handling an incident.

In September 2005, TERENA signed a contract with Best Practical Solutions, LLC, to upgrade and expand the software. The project costs of approximately 95,000 US dollars were carried by nine CSIRTs: ACONet CERT (Austria), CERT Polska (Poland), CERT.PT (Portugal), GOVCERT.NL (Netherlands), IRIS-CERT (Spain), JANET CSIRT (United Kingdom), LITNET CERT (Lithuania), SUNet CERT (Sweden) and SWITCH-CERT (Switzerland).

www.terena.org/tf-csirt/rtir.html

TERENA SIP Handbook

The TERENA SIP Handbook originated in the Task Force on Enhanced Communication Services. It was completed as a TERENA-funded project in 2008. TERENA contracted Erik Dobbelsteijn (TWiyo) as the main writer and editor, with contributions from TF-ECS.

From ‘Cookbook’ to ‘Handbook’
In contrast to the IP Telephony Cookbook that TERENA produced in 2004, which contained ‘recipes’ for setting up various IP-based telephony solutions at university campuses and NRENs, the new handbook contains just one recipe. This TERENA SIP Handbook is ‘A practical guide to setting up a safe VoIP and videoconferencing server: the NREN-Enhanced Communications Server or N-ECS’. The contents and use of the handbook are described in this annual report in the section on TF-ECS.

www.terena.org/n-ecs

EXTERNAL PROJECTS

TERENA Secretariat staff undertake work that is (fully or partially) funded from external sources. Often such work is part of a Framework Programme project that is co-funded by the European Union and in which TERENA is a partner.

FEDERICA
Federated E-infrastructure Dedicated to European Researchers Innovating in Computing network Architectures

TERENA’s contributions to FEDERICA activities

The objectives of the TERENA-led networking activities are the development and involvement of the user community as well as disseminating information and organising training events related to use of the infrastructure. The main purpose of the joint research activity led by TERENA is to work on novel architectural paradigms for virtualised infrastructures facilitating user control.

www.terena.org/federica
Early in 2008, the first networking activity explored user needs, with a survey of potential user groups that had been identified in various European countries. The project also determined the basic user policy, defining the terms and conditions of use of the FEDERICA facilities.

Conference sessions were arranged at the TERENA Networking Conference 2008 in May and the Internet2 Fall Member Meeting. The focus was on raising awareness of the project and encouraging contact with potential collaborators.

The TERENA-led research activity reviewed existing and planned frameworks, infrastructure projects and architectural visions in the field of network virtualisation to see what concepts and implementation options they have in common and what functional parts could be added in FEDERICA. In particular the IPsphere framework initiated by Juniper and the IaaS (Infrastructure as a Service) framework promoted by i2CAT were both found to be relevant to developing FEDERICA’s virtualisation services. Work began on an interoperability prototype to provide a bridge between the business layer defined by IPsphere and the FEDERICA virtualisation platform following the IaaS approach. This work will continue in 2009.

**FEDERICA IN 2008**

The FEDERICA project started in January 2008 and will run for 30 months. In its first phase, the project is focusing on creating a Europe-wide infrastructure and developing and testing mechanisms that achieve virtualisation or ‘slicing’ of network resources, as well as mechanisms to control these processes.

By the end of 2008, the project team succeeded in defining the network architecture and had installed the necessary equipment at the points of presence. The topology comprises four fully-meshed core nodes and eight other nodes connected via 1 Gb/s Ethernet or MPLS links provisioned over the GÉANT2 network.

An official launch event took place in November 2008, co-located with the ICT 2008 conference and the 6th e-Infrastructure Concertation Meeting in Lyon, France. It featured speakers from the project and from the EC and highlighted developments that had been made since the project began.

FEDERICA also liaised with other relevant activities, including the PlanetLab, OneLab, MANTICORE and PHOSPHORUS projects, as well as the EU-funded FIRE and the USA’s National Science Foundation-funded GENI initiatives.

**WHAT IS FEDERICA?**

The FEDERICA project is building an infrastructure that allows ‘slices’ of network resources to be allocated to researchers for potentially disruptive experiments. These slices will provide a flexible but safe ‘environment’ for testing new technologies and architectures that will help shape the future Internet.

Network researchers from across academia, European projects and the private sector do not need to be connected physically, but can access their allocated slices from anywhere on the Internet. Their research has to use the network not only as a tool, but as the subject of their work. The FEDERICA infrastructure allows multiple research groups to trial new ideas in complete isolation but using the same physical resources. Each allocated slice contains the virtual resources and topology requested.

FEDERICA depends on global cooperation between researchers, vendors, NRENs and the GÉANT2 network. FEDERICA is coordinated by GARR and involves CESNET, DANTE, DFN, FCCN, GRNET, HEAnet, HUNGARNET, Fundació i2CAT, ICCS, Juniper Networks, KTH, Martel Consulting, NORDUnet, Politecnico di Torino, PSNC, RedIRIS, SWITCH, TERENA and UPC. TERENA is leading the project’s activities to build and consolidate the user community, for information dissemination and training, and for research on novel paradigms and user control.

FEDERICA is co-funded by the European Union as part of its 7th Framework Programme.
The practical applications of these and other previously developed software components were demonstrated in the pilot NoAH test bed. Statistics of cyber-attacks detected by the test bed sensors are publicly available at https://demonstrator.fp6-noah.org/

NoAH attracts attention
On 20 May, the second NoAH workshop was held in Bruges, Belgium, as two sessions within the TERENA Network Conference. More than 60 people heard about project activities and other relevant work related to honeypots. This included talks on Argos, on signature generation and analysis, and on honey@home.

NoAH also had a booth at the conference, where several demonstrations of the working project prototype showed real-time attacks being captured by the NoAH honeypots. Many conference participants visited the booth and several expressed their interest in collaborating with the project partners.


www.fp6-noah.org

WHAT IS NOAH

The NoAH project created an experimental infrastructure to gather and analyse information about the nature of Internet cyber-attacks, and to allow appropriate countermeasures.

Honeypots are hosts that are set up on a network to appear to offer useful resources, but have no production value and can therefore be used to lure attackers in order to analyse their methods and behaviour. Information about such attacks can be distributed at an early stage, allowing defensive steps to be taken and possibly preventing attacks from becoming systematic or widespread.

NoAH was a 42-month project co-funded by the European Union as part of its 6th Framework Programme. It was coordinated by ICS-FORTH and involved Alcatel-Lucent, DFN-CERT, ETH Zürich, FORTHnet, Virtual Trip and the Vrije Universiteit Amsterdam as well as TERENA. TERENA was responsible for the project’s dissemination activities, including running the website, organising workshops, and liaising between NoAH and other relevant activities such as TF-CSIRT.

KEY ELEMENTS OF THE NOAH SYSTEM:

- **Honey@home** is a software client that can be installed on a Windows or Linux PC in order to identify harmful traffic and redirect it towards the NoAH servers. It allows the scope and reach of the honeypot infrastructure to be greatly extended.

- **Low interaction honeypots** filter out known or uninteresting attack traffic and pass on the rest to the next part of the system.

- A more intelligent honeypot runs the **Argos** secure system emulator that provides a virtual environment for detecting incoming attacks. If harmful activity is detected, the virtual machine terminates and passes on details of the attack to a NoAH server.

- The **NoAH servers** record the identifying signatures of cyber-attacks, which can be used to identify the same attacks elsewhere in the network.
SEEREN
South-Eastern European Research & Education Network

In March 2008 the SEEREN2 project officially ended, but residual funds allowed the network’s connectivity to continue until August. A final review in September deemed the project a success. However, no further generations of SEEREN will be necessary, because several key research networking organisations in this area of southeast Europe will become full members of the GN3 project consortium.

TERENA led the training, dissemination and communication work of SEEREN2, which provided a regional network that connected countries in southeast Europe to the pan-European backbone research network GÉANT2. SEEREN2 also made leading-edge technologies and services available to the research and education community in this region.

Thanks to SEEREN2, three beneficiary countries will join the GN3 Consortium: Montenegro, Serbia and the Former Yugoslav Republic of Macedonia.

The project was coordinated by GRNET and the project consortium consisted of partners from Albania (ASA/INIMA), Bosnia and Herzegovina (BiHARNET), Bulgaria (BREN), the Former Yugoslav Republic of Macedonia (UKIM/MARNET), Hungary (NIIF/HUNGARNET), Montenegro (UoM/MREN), Romania (RoEduNet) and Serbia (UoB/AMRES), as well as DANTE and TERENA.

www.seeren.org

GLIF
Global Lambda Integrated Facility

GLIF events in 2008
19-20 January, working group meetings, Honolulu, United States
1-2 October, 8th Annual Global LambdaGrid Workshop, hosted by Pacific Northwest Gigapop, Pacific Wave and the University of Washington, Seattle, United States

GLIF’s development work illustrated

Technical issues under discussion
In January the technical issues working group focused on dynamic lightpath management, in particular the need to assign globally unique identifiers, how to undertake end-to-end monitoring and improve the ticketing system. The control plane group discussed developments related to the GNI (Generic Network Interface) and the Inter-Domain Control protocol. In October their joint discussions covered next generation Ethernet technology, and efforts to standardise automated circuit routing, set-up and tear-down, which had been augmented by work on the task forces on GNI specifications, service level agreement and global identifiers.

e-Science projects and applications
Presentations on high-definition video transmission initiatives, on the SCARie project’s correlation of radio telescope data, and on a supercomputer Grid between Japan and the Netherlands for cosmological simulations (CosmoGrid) featured in the research and applications working group meeting in Seattle. Research to set up and control lightpaths to enable these and other applications over multiple domains was also described. Several of the projects and applications discussed here were also demonstrated at the University of Washington.

The October event’s opening plenary revealed how lambdagrids have enabled e-science around the world. This was complemented by presentations from different world regions. The closing plenary included presentations on Atlantic Wave, the MoscowLight GOLE (GLIF Open Lightpath Exchange) and on the NorthernLight optical network that serves the Nordic countries.

www.glif.is

WHAT IS GLIF?

GLIF is an international virtual organisation that promotes the paradigm of lambda networking - using interconnected wavelengths of light (lambdas) over optical fibres - to support demanding scientific applications. GLIF makes lambdas available for use by scientists involved in data-intensive research. GLIF brings together leading network engineers from across the world, to enable the development, testing and implementation of new lambda networking technologies, middleware and applications.

TERENA provides the GLIF secretariat, which is funded through voluntary sponsorship by a number of GLIF participants. In 2008, 21 organisations provided sponsorship amounting to almost 70,000 euro, which was more than sufficient to cover the direct cost of the secretariat functions. Currently 50 organisations are registered as GLIF participants. The TERENA Secretariat maintains the GLIF website and organises GLIF meetings.

GLIF’s collaborative activities are organised in working groups:
In January 2008 the control plane issues group merged into the technical issues working group, which is now led by Erik-Jan Bos (SURFnet) and Gigi Karmous-Edwards (MCNC). New task forces were created to work on GOLE service level agreement definition, global lightpath identification, and GNI specifications. Maxine Brown (UIC) and Larry Smarr (UCSD) lead the research & applications working group. The governance working group is led by Kees Neggers (SURFnet).
Training workshops promote the uptake of eduroam.
TERENA’s Trusted Introducer (TI)
service is an accreditation scheme that
helps build a web of trust between
Computer Security Incident Response
Teams. Many organisations have a
CSIRT to deal with security incidents
and it is important that they collaborate
because, in many cases, incidents
originate from outside the network
that is affected. Collaboration requires
trust between the security teams. The TI
fosters trust by accrediting CSIRTs that
meet certain criteria and publishing
information about them on a regularly
updated website.

Accredited CSIRTs can participate
in closed meetings that are organised
back-to-back with TF-CSIRT meetings.
Representatives hear sensitive and
confidential information about recent
large-scale incidents and security
threats. Other benefits the TI provides
to accredited CSIRTs include statistics
gathering and dissemination, a
re-encrypting secure mail gateway
and out-of-band alerting.

The Trusted Introducer service
is provided by S-CURE BV and
PRESECURE GmbH, under contract to
TERENA, which collects the fees from
the accredited teams.

Review Board changes and new plans
In recent years CSIRTs have
increasingly expressed the wish for the
Trusted Introducer service to offer more
than the current accreditation scheme
and establish ‘enhanced accreditation’
or even certification of CSIRTs, which
would involve inspection of their
quality and performance. Development
of a model for the necessary mandatory
and desirable criteria began in 2008.

The TI Review Board assesses the
operations of the Trusted Introducer and
addresses all special issues that might
arise. In September 2008 a number of
new board members were elected. Lionel
Ferette (BELNET) replaced Gorazd Božič
(ARNES) as the chair of TF-CSIRT and
therefore also as ex-officio member of
the board. Kevin Meynell succeeded Karel
Vieten as TERENA’s representative on the
board. Przemek Jaroszewski (CERT Polska)
was appointed a member in place of
Jacques Schuurman (SURFcert) who had
completed his second three-year term of
office and could not be re-elected. Jimmy
Arvidsson (Telia-Sonera CERT) succeeded
Jacques Schuurman as chairman. The fifth
TI Review Board member in 2008 was
Chelo Malagón (RedIRIS).

Since its launch in 2003, TACAR has
become a trusted online store of
trust anchor certificates, related
certificate policies and certificate
practice statements registered by the
Certification Authorities of organisations
in the academic community.

From 2005 TACAR grew significantly,
serving as a single source for all
relying parties to validate their trust
infrastructure for the iGTF (International
Grid Trust Federation) and for many
other academic identity providers.
By the end of 2008, new Certification
Authorities from Argentina, Brazil and
the Caribbean had joined, taking the
total to 46 certificates stored in TACAR.
Server Certificate Service

Call for proposals for a new tender

The Server Certificate Service is currently provided through a contract between TERENA and GlobalSign NV/SA of Leuven (Belgium), which will expire in January 2010. In the years since the service began, the number of participating countries increased and the market changed. Therefore, in 2008, the organisations participating in the service asked TERENA to publish a call for proposals for a new tender.

Volunteers from the participating organisations, assisted by TERENA Secretariat staff members, prepared the technical descriptions that needed to be included in the call for proposals. This was published in September 2008 and the process of selecting a preferred supplier was still ongoing at the start of 2009.

WHAT DOES THE SERVER CERTIFICATE SERVICE DO?

TERENA’s Server Certificate Service was launched at the start of 2006 at the initiative of a number of national TERENA member organisations. They were witnessing an increasing demand for SSL (Secure Sockets Layer) server certificates. Through their combined buying power, with TERENA as a financial clearing house and contracting partner, they can obtain such certificates at a significantly reduced price from a commercial Certification Authority (CA) whose root is recognised by the major browsers.

Although some organisations in the research community have set up their own CA, in practice their roots are not listed as being trusted by popular Web browsers. Consequently, users need to manually import the relevant root certificates into their browsers. While TERENA’s TACAR service provides an easy way to collect the various roots and make them available for download via a user-friendly interface, manually importing root certificates remains a major obstacle.

The Server Certificate Service avoids these problems by obtaining server certificates from a major commercial provider.

The service has attracted interest from the academic community in Europe and beyond – both for addressing the important topic of server certificates and for defining a new business model. More than 25,000 certificates were issued between the start of the service and the end of 2008.

www.terena.org/scs

Number of TERENA national member organisations participating in the Server Certificate Service
WHAT IS THE EUROPEAN EDUROAM SERVICE?

‘Open your laptop and be online’ is the experience eduroam (education roaming) seeks to provide, allowing any eduroam-enabled user to obtain wireless network access at any institution connected to eduroam.

eduroam started in 2003 as a pilot service under the TERENA task force TF-Mobility, with six countries taking part. From September 2004, additional research work was done in the GN2 project. Part of that work was to define and agree the policy for eduroam in Europe. Most of the actual work of providing the eduroam service is done by technicians in eduroam-enabled institutions, which are assembled in federations at the national level. These federations are usually run by the national research networking organisation, and are interlinked in ‘confederations’. The policy specifies the service level agreement for national research networking organisations that are part of the European eduroam confederation. The final eduroam policy was agreed at the end of 2007.

Since September 2007, the setting up and maintenance of the European eduroam service has been funded by the GN2 project. NRENs formally joined the confederation from January 2008. The European eduroam service has been in regular operation from the end of August 2008, when a number of supporting services were also in place.

The TERENA Secretariat provides staff to the operational team, which is responsible for daily operation of the European eduroam service. The other team members are staff from SURFnet, UNiC and Srce, led by Miroslav Milinović.

European eduroam® Service

Improved eduroam website launched

A newly improved eduroam website was launched in March 2008. It includes an interactive map showing where eduroam is available, plus a ‘cookbook’ explaining how to install the system. It hosts all information related to the European eduroam confederation, and links to the counterpart eduroam website for the Asia-Pacific region. It also provides links to monitoring tools, which assess the working status of the eduroam service. TERENA is responsible for running the website.

TERENA staff also collaborated in the organisation of eduroam training workshops that were held in 2008 as part of GN2 training efforts (detailed elsewhere in this report).

* eduroam is a registered trademark of TERENA.

www.eduroam.org
European Videoconferencing Service - ‘educonf’

educonf online

The educonf service website is a central access point for educonf services, such as directory, monitoring, and support coordination tools. It hosts services for both administrators and end users:

- Directory Services: a database, a query interface and geographical view of NREN and institutional videoconference and VoIP deployments
- Troubleshooting tools (e.g. trouble ticketing system, support mailing list, etc.)
- Monitoring views of current status of infrastructure (GDS for H.323, and ENUM / NRENum.net for SIP)
- Knowledge base (wiki)
- Other educonf activity information (news, contact points, etc.)

The educonf service website has been operational since May 2008. The hypertext pre-processor and cascading style sheet-based website framework was developed by TERENA. The design was created by DANTE and TERENA. The site is hosted by HEAnet.

http://educonf.geant2.net

WHAT IS EDUCONF?

The European research and education videoconferencing service, educonf, became a service activity within the GN2 project as a result of the past TERENA Task Forces on Voice and Video Collaboration (TF-VVC) and on Videoconference Service Studies (TF-VSS). They provided a comprehensive list of problems with international higher education and research videoconferencing and VoIP services, and a set of proposed actions to rectify those problems.

educonf has created coordination and support tools for European videoconference and Voice-over-IP (VoIP) services for higher education and research establishments. The main focus is to support VoIP and videoconferencing services at international level by coordinating between NREN real-time service groups. At the same time the service is aimed at education and research networkers throughout Europe in universities, research institutions and higher education organisations.

Three main educonf milestones in 2008

16 May: the educonf service website is launched.
18 October: GDS reachability world map is published, showing Global Dialling Scheme-connected countries of the world and basic information of maintainer organisations.
27 October: educonf directory service pilot online, with useful VoIP and videoconference service information provided by NRENs and their customers.
NRENum.net

Continuation of a service that fills a gap in videoconferencing dialling

In 2008 TERENA ensured the continuation of the NRENum.net service, following a proposal by the Task Force on Enhanced Communications Services. TF-ECS found that this pre-existing service is useful to the research and education community, and arranged for TERENA to oversee the service, which is technically hosted by SWITCH.

Ten European countries are currently participating in NRENum.net, which encourages its members to actively experience ENUM, even if they do not have access to the ‘golden tree’. National research networking organisations can take the role of a national Tier-1 Registry and sub-delegate zones to universities and research institutes. As soon as the golden ENUM tree becomes available in a country, e164.arpa shall be used and the delegation in NRENum.net will be revoked.

The NRENum.net service complements the other products delivered by TF-ECS, which are described elsewhere in this report.

www.nrenum.net

WHAT DOES NRENUM.NET DO?

NRENum.net facilitates videoconferencing by translating the IP (Internet Protocol) addresses of videoconferencing resources to a code that uses the same format as telephone numbers. In this way it is similar to ENUM (E.164 Number Mapping), which provides seamless dialling interconnection between all technologies with one single number for multiple voice, video and data services. The ‘golden ENUM tree’ is standardised by the IETF (as e164.arpa), but is not available everywhere. NRENum.net provides an intermediary solution for countries where the golden tree is not available.
NEW at TNC 2008

For the first time, TERENA offered students the opportunity to attend the conference free of charge. Eight applicants met the criteria and attended the Bruges event.
The 2008 TERENA Networking Conference attracted almost 520 participants from 30 European and 15 non-European countries. Sponsorship was provided by Belgacom, Juniper Networks, Global Crossing, TransTec, Alcatel-Lucent, Cisco Systems, Extreme Networks, Force10 Networks, GlobalSign, Nortel Networks, ADVA Optical Networking, Ciena, BELNET and the municipality of Bruges.

Journal publication of TNC papers
For the third year in succession, the peer-reviewed journal 'Campus-Wide Information Systems' published a special edition focusing on the TERENA Networking Conference. Ten papers were selected from more than a hundred that were presented at the conference.

How will research and education networking organisations go 'beyond connectivity'?

There was an air of introspection at the TERENA Networking Conference 2008, with several speakers applying the conference theme to research and education networking organisations as a 'species' to examine how they must evolve 'beyond connectivity' in the near future.

In an amusing and personal talk, Professor Paul Van Binst (Free University of Brussels, ULB) opened the conference with a plenary speech that raised a mirror to the research networking world and invited it to consider where it is going. Do research networking organisations need to develop more functionality, or a new business plan? Should they remain separate from other (public) services? If they do, will they die, be superseded by the more rapidly developing commercial sector, or continue alongside as a niche market?

Similar questions were posed by plenary speakers Tim Robinson of Net North West (United Kingdom) and Richard Katz of EDUCAUSE (United States). Both considered social, demographic, political and economic factors that could have an impact on education and, indirectly, research networking. Although the 'Internet boom generation' is now entering university equipped with powerful laptops and a range of technology skills, there is a low level of information technology 'literacy' and critical thinking skills, they agreed. The challenge they presented was for research networkers to lift their gaze from the networks and see that the world has changed. One suggestion was to integrate more people from different disciplines, ethnic groups and cultures into the discussion. Their audience included participants in Malawi, China, Spain, Italy, Indonesia and the Czech Republic, who were linked by live-stream videoconferencing via satellite, as part of the GLOBAL project’s pioneering Virtual Conference Centre initiative.

A panel discussion about the 'successes and shortcomings' of the GN2 project and the GÉANT2 network continued the self-examination. Topics with the most impact were those relating to the management and marketing of research and education networks and services. In order to know what users want, NRENs should do some serious market research, several participants recommended.

'Fewer and smarter' protocols
A plenary lecture by Josh Howlett of JANET(UK) drew upon wide-ranging inspirations in considering the problem of establishing trust in people’s identities as they move around their own ‘universe’ within the network in non-obvious ways. He showed that today’s identity protocols are so numerous and specific to certain layers of the network that there is no connection between them. Like builders installing foundations to bind different strata of rock and prevent slippage, networkers need to ‘dig down’ and tap into layers of identity information in order to build a stronger system of trust. He suggested that a little policy can go a long way and is a better approach than seeking technical solutions. The quest for ‘fewer and smarter’ protocols and policies has begun, he concluded, inviting participants to join a discussion during a later birds-of-a-feather session.
GROUND-BREAKING LIVE DEMONSTRATIONS

- For the first time to a Europe-wide audience of networkers there was a live demonstration of high definition videoconferencing between surgeons in Belgium, Japan, Singapore and Italy.

- The GN2 project’s bandwidth-on-demand system AutoBAHN (Automated Bandwidth Allocation across Heterogeneous Networks) was demonstrated, allowing potential users to give feedback on its capabilities.

- The conference witnessed a ‘first’ in radio astronomy. The EXPReS project (Express Production Real-time e-VLBI Service) linked telescopes in Africa, Europe, North America and South America to a central data correlator in the Netherlands, simulating a telescope almost 11,000 kilometres in diameter. Data were correlated in real time and results were transmitted live to Bruges. This was the first live connection between four continents offering detection of signals that radio astronomers could work with. The details and challenges were explained during the closing plenary session.

and related technologies in another plenary presentation. He discussed approaches to controlling which devices can be connected, under what circumstances, and to fixing ‘unhealthy’ machines. In considering “where next beyond NAC?”, he said that distrust of the Internet and connected devices is well founded with around 50% of PCs infected or controlled by botnets. He presented IF-MAP, a new standard published three weeks earlier, which should achieve stronger linkage of security systems.

An astronomical achievement
The closing plenary showcased an astronomical ‘first’. Huib Jan van Langevelde of JIVE explained the details and the challenges involved in that day’s live demonstration of the EXPReS project’s real-time collection and correlation of radio astronomy data across four continents. He said developments in connectivity have put Europe far ahead of other world regions in this field of research. Among other benefits, it means increased sensitivity and reduced response times of the e-VLBI (Very Long Baseline Interferometry) system. Immediate feedback now allows problems with the telescopes to be spotted within minutes rather than months, and the time to publication of results is significantly reduced. Close collaboration with national research networking organisations and GÉANT must be continued, he said.

Sessions highlights
A session on ‘the general picture of identity management’ featured talks on a wide range of topics, including some aspects of IT law and a suggestion that non-commercial companies could create ‘Facebook-like’ sites run on open protocols, offering the same service but allowing users to know what is inside.

A consistent message emerged from a session about malicious traffic; the bad news is that there is a lot of it around – the good news is that a significant amount of it can be dealt with using existing tools such as filtering, IPsec (Internet Protocol Security) and analysis of flows.

A concurrent session on medical applications included a presentation about an initiative to improve connectivity between the United Kingdom’s National Health Service network N3 and the research and education network, JANET. The aim is to better integrate these sectors through improved authorisation and...
International Federation Peering Workshop

18 May, Bruges, Belgium

Working towards smoother interactions between federations

The way in which federations coexist and interact within a country and internationally was discussed in the workshop, which was organised by REFEDs. Several models are possible, which reflects in different types of agreements that can exist. The discussion moved on to how attributes should be managed within and among federations. Use-cases for inter-federation collaboration were reviewed.

Policy documents that different federations draw up currently follow very different formats and structures; the reasons for this were investigated by JISC (Joint Information Systems Committee) in 2008, revealing that this is the result of randomness rather than legal or other requirements. The workshop participants discussed options for standardising these documents once JISC's recommendations are finalised.

The rest of the meeting focused on how to make REFEDs successful and how to market the initiative. It was agreed to liaise with the Liberty Alliance's eGovernment special interest group and to give more visibility to REFEDs in general.

www.terena.org/refeds/meetings/may08

The second one-day workshop to explore international federation peering brought together more than 40 technical and policy experts from around the world. They agreed on the importance of a neutral forum for discussing inter-federation issues and considered the best way forward for REFEDs.

Conferences and Workshops

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As lower-layer networking technologies evolve, it is important to keep members of the research networking community updated on these developments. TERENA organised a workshop on Next Generation Networking towards the end of 2007, to improve knowledge and awareness of recent developments in technologies, such as optical networking and network virtualisation, and how they might be applicable in research and education networks. Deemed a success by the attendees from universities, research institutes, government agencies, commercial vendors and regional and national research networking organisations, it was agreed to follow up in 2008 with a second interactive workshop.

The expected exhaustion of IPv4 address space and the economic advantages of DWDM (Dense Wavelength Division Multiplexing) dominated the topics at the second Next Generation Networking Workshop.

Workshop participants heard that the regional Internet registries are discussing measures to conserve IPv4 address space plus the possible introduction of an exchange where IPv4 addresses can be traded.

Several presentations showed the cost reduction benefits of DWDM solutions. Ongoing migration from traditional network architectures to pure IP-over-WDM transport architectures results in economic advantages, but it also allows structural changes in companies so that IP and optical (transport) network staff can work more closely, improving staff compatibility and reducing pressure to increase staff numbers as traffic demands grow.

Participants also heard about advances in multi-degree ROADM (Reconfigurable Optical Add-Drop Multiplexer) technology that allows fully reconfigurable, meshed optical networks to be built. A high-performance optical network represents a future-proof foundation for research and education networks. It provides lowest-cost-per-bit transport for any layer-2 or -3 device and keeps the network open for new applications and vendors.

Luca Deri (University of Pisa) gave a presentation on the advances in chipsets that will allow monitoring of IP networks at speeds greater than 10 Gb/s. He also proposed the ‘n2n’ concept, which would allow the establishment of peer-to-peer VPNs (Virtual Private Networks) at layer 2 of the networking stack, instead of at application level. These would be able to cross network address translators and firewalls from inside to outside, so that n2n nodes are reachable even on a private network.

www.terena.org/ngn-ws
Towards virtualisation, and supporting end user access to infrastructures

There was a renaissance of interest in lower-layer topics, with stimulating discussion about virtualisation projects. Middleware continued to be significant though, with a move from software development towards supporting end user access to infrastructure.

Grid and NREN infrastructures are maturing: facilitating the use of existing infrastructure and identity federations is becoming increasingly significant, and several examples of this were presented. There was also consideration of the different ways in which authorisation is implemented in the Grid and NREN environments. The Virtual Organisation Management System used by Grids can now generate SAML assertions, the standard used in NRENs’ identity federation. This is an important step towards interoperability.

In a discussion about a ‘push model’ versus a ‘pull model’ for the retrieval of attributes (about users or resources) it was agreed that more work is needed on the attribute side. TERENA was invited to play a coordinating role in this area.

The lower-layer discussion in the workshop focused on the emerging relationship between Grids and resource virtualisation. There was an overview of Grids that use virtualised resources and a summary of the results of a survey that showed a large uptake of virtualisation (more than 70%) in production Grids. The EGEE-III, PHOSPHORUS and FEDERICA projects also featured, as well as the IaaS (Infrastructure as a Service) framework, which provides an enabling technology for upcoming virtualised / shared infrastructures.

This was the first time in this forum that there had been discussion about virtualisation and its potential to optimise virtual components, tailoring them for specific tasks in Grid computing problems. As a topic area it was well received: representatives of the EGEE-III project were interested in the general concept and in FEDERICA in particular. This shift from ‘traditional’ lower-layer topics to virtualisation will continue in 2009.

www.terena.org/nrens-n-grids
CSIRT Training Workshops

24-25 April, co-organised and sponsored by ENISA and GOVCERT.NL, in Egmond aan Zee, Netherlands
23-24 October, co-organised and sponsored by ENISA, CESNET and CSIRT.CZ, in Roztoky u Prahy, Czech Republic

CSIRT training promotes preparedness for security incidents

In 2008, almost 60 trainees completed TERENA-organised workshops that equipped them to respond to network and information security threats, and that connected them to an international network of security experts. These CSIRT (Computer Security Incident Response Team) training workshops have been made increasingly interactive in response to participant feedback about the course materials.

Trainees from 13 countries attended the first workshop of 2008. The trainers were Don Stikvoort (S-CURE, Netherlands), Serge Droz (SWITCH-CERT, Switzerland), Wim Biemolt (SURFcert, Netherlands) and Andrew Cormack (JANET(UK)). Don Stikvoort and Andrew Cormack also taught at the second training workshop, joined by Lionel Ferette (BELNET CERT) and Jaap van Ginkel (University of Amsterdam). The latter presented a modified technical module, which contained new material about forensics. Trainees completed exercises, heard presentations and joined in discussions about the legal, technical, operational and organisational aspects of CSIRTs, as well as the role of CSIRTs in working with vulnerabilities.

Trainees from South Africa and Japan attended for the first time

The October workshop attracted trainees from the commercial and non-commercial sectors in 14 countries, including South Africa and Japan. This was the first time that people from these two countries took part.

www.terena.org/activities/csirt-training

COURSE MATERIALS

For several years TERENA has been training people to be able to respond to network and information security threats, and connecting them to an international network of security experts. Training materials originally developed by volunteers from TF-CSIRT and expanded later in the EU-funded TRANSITS (Training of Network Security Incident Teams Staff) project continue to be updated and delivered in workshops in and around Europe.

The course covers the organisational, operational, technical and legal issues involved in running a CSIRT. The lecturers are experienced members of the CSIRT community and a high tutor:trainee ratio allows for intensive interaction.

In early 2007, TERENA signed a contract with S-CURE to maintain the TRANSITS materials. Don Stikvoort of S-CURE enlists the assistance of volunteer experts from the international CSIRT community to provide updates.

Non-TERENA training workshops

FIRST, the global Forum of Incident Response and Security Teams, regularly organises CSIRT training workshops with a continental scope in Latin America and in the Asia-Pacific region, using the TRANSITS materials. In 2008, one such training workshop took place, in Seoul on 1-5 September.

In addition, TERENA frequently gives permission to other experienced members of the CSIRT community to use the TRANSITS materials for training workshops. In 2008, these included:

- four workshops in the Netherlands organised by SURFnet for its connected institutions;
- a workshop in Kiev on 21-23 April that was funded by NATO and aimed at participants from Armenia, Azerbaijan, Georgia, Kyrgyzstan, Moldova, Tajikistan and the Ukraine;
- a workshop in Espoo on 1-2 October organised by the Finnish national research networking organisation CSC for its connected institutions;
- a small internal workshop of NTT-CERT in Tokyo on 4 August;
- two workshops in Vienna, on 17-18 September and 22-23 September, funded by Wiener Krankenanstalten Verbund, BundesKanzlerAmt, ENISA, CERT.at and ACONet.
EuroCAMP Workshops

7-8 May, hosted by Stockholm University, Sweden
5-6 November, hosted by the National Technical University of Athens, Greece

EuroCAMP Programme Committee
Victoriano Giralt (University of Málaga)
Jasmina Hodžić (University of Oslo)
Ken Klingenstein (Internet2)
Diego López (RedIRIS)
Miroslav Milinović (Srce)
Oliver Salaün (CRU)
Klaas Wierenga (Cisco Systems)
Licia Florio (TERENA Secretariat)

From advanced to basic topics - EuroCAMP covers the bases

EuroCAMP went ‘back to basics’ at the end of 2008, following a very advanced workshop earlier in the year. As a way of spreading information about middleware-related technology, these events have become appreciated in the research networking community, but the challenge is to keep them fresh. The EuroCAMP programme committee decided that in future there will be more ‘basic’ events tailored to local needs and focusing on particular technologies.

During the May EuroCAMP, participants agreed that students should learn about the implications of sharing personal data, as part of their general education. Which data are ‘owned’ by the user, which are ‘private’ and which are public was one topic of discussion that centred around how an identity provider collects user consent for giving data to a service provider, and the problem of formulating a question that makes sense to the user so that he or she can give consent in an informed way.

Identity management and federated applications
Among other topics were identity management and federated applications. In theory this allows a user to access multiple applications with a single set of credentials, saving the need for multiple passwords stored in various places. Paul Caskey (University of Texas) demonstrated a novel use, accessing the management interface of a router using Shibboleth, showing that a federated login can be used to access non-web applications. There was also discussion about which data are needed by applications and about translation between ‘machine readable’ codification and ‘human readable’ text. As most of the Identity Federations use SAML (Security Assertion Markup Language), it could be possible to use some SAML features to codify attributes in both formats.

Focusing on single sign-on systems
The second EuroCAMP of 2008 was deemed the most successful to date, according to organisers and attendees. This workshop returned to the original aim of developing middleware awareness at grassroots level, presenting some of the identity management and authentication mechanisms available with a focus on single sign-on (SSO) systems.

The first day concentrated on directories - the building blocks of SSO systems - in particular LDAP (Lightweight Directory Access Protocol) and how to use it. Participants also heard about schemas such as eduPerson and SCHAC, how to convert directory attributes into SAML assertions, and how to handle temporary users at a campus level. SAML2 and SimpleSAMLphp were compared and participants learned how to use the latter to provide federated access to applications such as wiki, foodel and moodle. The favourite subject was Google Apps: attendees learned about challenges in integrating it with existing identity management infrastructures at campus level, which can be more difficult and time consuming than expected.

Participants valued the practical, ‘how to’ presentations and would like more of these in future EuroCAMPs. The organisers agreed that the principle of focusing on well-developed topics and encouraging discussion could be applied to future events.

Www.terena.org/eurocamp

Who is EuroCAMP for?

European CAMP (Campus Architecture Middleware Planning) workshops bring together people involved in the development and deployment of middleware in campuses around Europe. They are aimed at Internet technology architects and information technology managers from universities and research centres, at representatives of national research and education networking organisations who are involved in designing campus-wide digital identification systems, and at whoever is interested in the development of identity management systems on campuses.

Licia Florio (TERENA Secretariat) closes the Athens EuroCAMP.
GN2 Training Workshops

TERENA and DANTE continued a close cooperative effort to develop and organise training courses as part of the Knowledge Transfer Activity of the GN2 project. This collaborative work will continue under GN3.

Course tutors came from various TERENA member organisations. Logistic arrangements, including registration and production of course materials, were handled by the TERENA Secretariat, while overall coordination was done by DANTE.
Security Toolset Training
18-19 March, hosted by SWITCH in Zürich, Switzerland

Thirteen people from eleven European countries achieved the title of ‘Security Toolset Approved Trainer’ after completing this one-and-a-half day training course.

This was the first pilot for a planned series of training sessions across Europe. It provided an introduction to the ‘Security Toolset’ - a suite of network monitoring and data retrieval tools to aid incident handling. The course explained how to use the tools, and what their uses are. It also gave an introduction to training techniques, communication and presentation skills, with the goal of creating a trusted base of approved trainers who could help to deliver the course in subsequent rounds of training.

The course materials were developed by SWITCH, DANTE and CESNET. These materials are copyrighted to the original authors and TERENA must be asked to grant permission, under certain terms and conditions, each time the course is delivered.

www.terena.org/training/sectoolset/

eduroam Administrator Training
12-13 June, hosted by TERENA in Amsterdam, Netherlands
29-30 September, hosted by Srce in Zagreb, Croatia

Almost 30 eduroam administrators from 17 countries across Europe were trained in the two eduroam workshops in 2008.

The ultimate goal is to facilitate the pan-European installation of a reliable eduroam Service Provider in campuses and other end user locations. The course gave eduroam administrators from key institutions throughout the European eduroam confederation an overview plus hands-on modules on how to set an organisation up as an eduroam Service Provider. There was a step-by-step approach to setting up as an eduroam Identity Provider, including installation and configuration of necessary software and an overview of hardware requirements. The second part of the course was designed to give participants the skills and knowledge to successfully train other systems administrators, preferably in their local languages.

The course materials were developed by Stefan Winter (RESTENA), Jürgen Rauschenbach (DFN), Miroslav Milinović (Srce) and Peter Webster (DANTE).

www.terena.org/training/eduroamadmin/

PERT Training
27-28 November, hosted by SWITCH in Zürich, Switzerland

Seventeen network engineers trained in Performance Enhancement and Response Team (PERT) skills during this 2008 course, which followed an initial pilot in 2007.

The training equips staff to establish and operate national and local PERTs within the new eduPERT structure of federated PERTs. Courses involve both hands-on and theoretical exercises in various aspects of network performance monitoring and analysis, including the installation, setting up and use of various software tools available to carry out these tasks. It also gives an overview of PERT history and explains what steps to take in order to set up an accredited PERT.

The eduPERT training course was jointly developed by TERENA, DANTE and SWITCH.

www.terena.org/training/pert/
Memberships and Liaisons

WHAT IS THE ENPG?

The European Networking Policy Group is the forum where civil servants from national governments in Europe meet to exchange information and coordinate their policies for (the funding of) research and education networking. TERENA has the status of a permanent observer in the ENPG. The TERENA Secretariat has also been sub-contracted to host the ENPG website and mailing lists.
ENPG and European Commission

ENPG meetings in 2008
10-11 March, hosted by FCCN in Lisbon, Portugal
9-10 June, hosted by SUNET in Umeå, Sweden
22-23 September, hosted by the Polish Ministry of Science and Higher Education in Krakow, Poland

A new reflection on policy coordination in Europe

In the March meeting, Lajos Bálint of NIIF, Hungary, was elected as the new chairman of the ENPG. Setting the agenda for the activities of the policy group in coming years was the main focus of attention in the 2008 meetings.

In addition, ENPG members heard presentations about research networking in the hosting countries, and received updates on the GN2 project and the preparations for the GN3 project, as well as about new policy developments with the European Commission.

Outside the ENPG meetings, TERENA Executive Committee members and the TERENA Secretariat staff have, mostly informal, contacts with the European Commission services. Thanks to the venue being close to Brussels, more Commission representatives than usual were able to attend the 2008 TERENA Networking Conference.

www.enpg.org

DANTE

How TERENA and DANTE collaborated in 2008

Organisation of events
TERENA Secretariat and DANTE staff worked closely on the development and delivery of GN2 workshops for Security Toolset training, PERT training and training for eduroam administrators.
There was also collaboration on the organisation of the second EU-Med Event, as part of the GN2-funded Networking Development Support activities.

The DANTE-led GN2 PR Network and the TERENA Task Force on Public Relations held back-to-back meetings twice during 2008, with staff from each organisation participating in the other’s meeting.

Partnership in projects
Both organisations signed up as partners in the FEDERICA project, which started in January 2008, and the feasibility study FEAST, which commenced in mid-December. They were also partners in the SEEREN2 project, which ended in March.

TNC and GN2 / GN3
DANTE was represented on the Programme Committee for the TERENA Networking Conference, which included a ‘distributed workshop’ of topics relating to the GN2 project.

TERENA contributed to the management of the GN2 project through participation in its Executive Committee, and to preparations for the successor project GN3.

www.dante.net

TERENA and DANTE (Delivery of Advanced Network Technology to Europe Ltd.) are sister organisations which collaborate intensively. This manifests itself particularly in the GN2 project, which DANTE coordinates, and where each of the organisations is responsible for a number of activities. TERENA’s President and Secretary General are members of the Executive Committee of the GN2 project, and the latter is also an observer in the DANTE Board of Directors.

Memberships and Liasons
Intercontinental Collaboration

CCIRN meeting in 2008
17-18 May, Bruges, Belgium

Challenges and strategies at the CCIRN annual meeting

The challenges confronting research networking and strategies to face these challenges were the key topics at the 2008 CCIRN meeting.

Rapid network innovation makes it increasingly difficult – and imperative – for research networks to stay ahead of developments. At the same time, research networks must serve the needs of their very diverse users. Where both advanced and ordinary user communities must be served and are represented on the governing bodies of research networking organisations, important managerial decisions must be made and potentially conflicting interests become apparent.

Different aspects of strategic issues to deal with the challenges were debated. The main recommendations from the EARNEST study were presented, as was a new Strategic Plan for Internet2, based on inclusiveness and bringing together effort from research networkers at federal, regional and campus level. The structure and services of the GÉANT2 network and the strategy behind the plan for the successor project GN3 were explained. Debates followed on service portfolios and the importance of operations in the networking environment, and on meeting the current and future needs of demanding scientific applications.

Participants at the CCIRN meeting also heard updates about GLIF, the Asia Future Internet Initiative and the deployment of IPv6, the status of continental research networking in Latin America, the US Federal Plan for Advanced Networking Research and Development, the status of research networking in Canada, and about support to international health sciences communities.

www.ccirn.org

Internet Society

The Internet Society provides leadership in addressing issues that confront the future of the Internet. It is the organisational home for groups responsible for Internet standards, including the Internet Engineering Task Force and the Internet Architecture Board.

TERENA was one of the original charter members of the Internet Society. It remains a supportive member, especially because of the society’s role in the standards area, which TERENA considers to be the Internet Society’s reason for existence.

www.isoc.org
The balance sheet, statement of income and expenditure, and summary cash-flow statement for TERENA for the year 2008 that are presented below are extracted from the draft accounts of the association. A full understanding of the association's financial position and results can be obtained only from the final version of the annual accounts as adopted by the General Assembly in its meeting of 11 and 12 June 2009 and the accompanying auditor's report. These documents are available from the TERENA Secretariat upon request. All figures are in euros.

### Balance sheet as at 31 December 2008

<table>
<thead>
<tr>
<th>Assets</th>
<th>31 December 2008</th>
<th>31 December 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed assets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tangible fixed assets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer equipment</td>
<td>22,421</td>
<td>36,773</td>
</tr>
<tr>
<td>Other fixed assets</td>
<td>39,383</td>
<td>43,972</td>
</tr>
<tr>
<td></td>
<td><strong>61,804</strong></td>
<td><strong>80,745</strong></td>
</tr>
<tr>
<td><strong>Current assets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accounts receivable</td>
<td>663,726</td>
<td>997,812</td>
</tr>
<tr>
<td></td>
<td><strong>663,726</strong></td>
<td><strong>997,812</strong></td>
</tr>
<tr>
<td>Cash at bank and on hand</td>
<td>2,365,927</td>
<td>1,926,181</td>
</tr>
<tr>
<td></td>
<td><strong>3,091,457</strong></td>
<td><strong>3,004,738</strong></td>
</tr>
</tbody>
</table>
## Liabilities

<table>
<thead>
<tr>
<th></th>
<th>31 December 2008</th>
<th>31 December 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Equity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General reserves</td>
<td>1,449,009</td>
<td>1,412,944</td>
</tr>
<tr>
<td>Deferred income (long-term)</td>
<td>0</td>
<td>12,000</td>
</tr>
<tr>
<td><strong>Current liabilities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creditors</td>
<td>14,031</td>
<td>44,944</td>
</tr>
<tr>
<td>Taxes and social premiums</td>
<td>48,540</td>
<td>39,017</td>
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<tr>
<td>Deferred income TERENA projects</td>
<td>359,016</td>
<td>374,071</td>
</tr>
<tr>
<td>Pre-issued invoices</td>
<td>1,056,890</td>
<td>1,020,230</td>
</tr>
<tr>
<td>Other payables and deferred income</td>
<td>163,971</td>
<td>101,532</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,642,448</td>
<td>1,579,794</td>
</tr>
<tr>
<td><strong>Total liabilities</strong></td>
<td>3,091,457</td>
<td>3,004,738</td>
</tr>
</tbody>
</table>
### Statement of Income and Expenditure 2008

<table>
<thead>
<tr>
<th></th>
<th>Budget 2008</th>
<th>2008</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Income</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contributions</td>
<td>1,020,000</td>
<td>1,025,759</td>
<td>993,914</td>
</tr>
<tr>
<td>Projects, workshops and conferences</td>
<td>1,153,000</td>
<td>1,249,343</td>
<td>1,481,245</td>
</tr>
<tr>
<td>Interest received</td>
<td>55,000</td>
<td>89,738</td>
<td>74,564</td>
</tr>
<tr>
<td>Late payment charges</td>
<td>0</td>
<td>521</td>
<td>1,578</td>
</tr>
<tr>
<td>Other income</td>
<td>1,000</td>
<td>1,745</td>
<td>450</td>
</tr>
<tr>
<td><strong>Total income</strong></td>
<td>2,229,000</td>
<td>2,367,106</td>
<td>2,551,751</td>
</tr>
<tr>
<td><strong>Expenditure</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personnel costs</td>
<td>735,000</td>
<td>395,275</td>
<td>526,487</td>
</tr>
<tr>
<td>Projects, workshops and conferences</td>
<td>1,274,000</td>
<td>1,680,669</td>
<td>1,463,983</td>
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<tr>
<td>Technical Programme</td>
<td>52,000</td>
<td>47,961</td>
<td>45,717</td>
</tr>
<tr>
<td>Other administrative costs</td>
<td>306,000</td>
<td>169,083</td>
<td>226,353</td>
</tr>
<tr>
<td>Bad debts written off</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Financial expenses</td>
<td>22,000</td>
<td>18,065</td>
<td>21,359</td>
</tr>
<tr>
<td>Project results from earlier years</td>
<td>0</td>
<td>19,989</td>
<td>2,363</td>
</tr>
<tr>
<td><strong>Total expenditure</strong></td>
<td>2,389,000</td>
<td>2,331,042</td>
<td>2,286,262</td>
</tr>
<tr>
<td><strong>Result</strong></td>
<td>-160,000</td>
<td>36,064</td>
<td>265,489</td>
</tr>
<tr>
<td><strong>Destination of the result</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General reserves</td>
<td>-160,000</td>
<td>36,064</td>
<td>265,489</td>
</tr>
</tbody>
</table>
### Cash Flow Statement

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NET RESULT</strong></td>
<td>36,064</td>
<td>265,489</td>
</tr>
<tr>
<td>Depreciation charges</td>
<td>18,941</td>
<td>8,196</td>
</tr>
<tr>
<td>Investments in tangible assets</td>
<td>0</td>
<td>-88,941</td>
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<tr>
<td>(Increase)/Decrease in accounts receivable</td>
<td>334,085</td>
<td>-525,962</td>
</tr>
<tr>
<td>Increase/(Decrease) in current liabilities</td>
<td>62,656</td>
<td>-326,904</td>
</tr>
<tr>
<td>Increase/(Decrease) in long-term liabilities</td>
<td>-12,000</td>
<td>0</td>
</tr>
<tr>
<td><strong>NET CASH FLOW</strong></td>
<td>439,746</td>
<td>-688,122</td>
</tr>
</tbody>
</table>

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash in bank and on hand, 1 January</td>
<td>1,926,181</td>
<td>2,594,303</td>
</tr>
<tr>
<td>Cash in bank and on hand, 31 December</td>
<td>2,365,927</td>
<td>1,926,181</td>
</tr>
</tbody>
</table>

### Membership Fees

The annual membership fees for National Members are in eight categories, depending on the gross national income of the countries that they represent. A National Member pays the unit fee multiplied by the number of units linked to its category. The membership fees for National Members in categories 1 and 2 are further differentiated according to the gross national income per capita of their countries. National Members in categories 1 and 2 from countries that are classified by the World Bank as an ‘upper-middle-income economy’ receive a reduction in the fee and in the number of votes of 20%. That reduction is 40% if their country is classified as a ‘lower-middle-income economy’ and 60% if their country is classified as a ‘low-income economy’.

International Members have 10 votes and pay the unit fee. Associate Members pay half the unit fee.

The unit fee for 2008 was set at 5,027 euro.

<table>
<thead>
<tr>
<th>Category</th>
<th>Units</th>
<th>Votes</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.2</td>
<td>2</td>
<td>FYRoMacedonia</td>
</tr>
<tr>
<td>1</td>
<td>0.3</td>
<td>3</td>
<td>Montenegro</td>
</tr>
<tr>
<td>1</td>
<td>0.4</td>
<td>4</td>
<td>Malta</td>
</tr>
<tr>
<td>2</td>
<td>0.5</td>
<td>5</td>
<td>Belarus</td>
</tr>
<tr>
<td>2</td>
<td>0.6</td>
<td>6</td>
<td>Bulgaria, Latvia, Lithuania, Serbia</td>
</tr>
<tr>
<td>2</td>
<td>0.8</td>
<td>8</td>
<td>Cyprus, Estonia, Iceland</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>10</td>
<td>Croatia, Luxembourg, Slovakia, Slovenia</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>20</td>
<td>Czech Republic, Hungary, Israel, Romania</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>40</td>
<td>Denmark, Finland, Greece, Ireland, Norway, Poland, Portugal</td>
</tr>
<tr>
<td>6</td>
<td>8</td>
<td>50</td>
<td>Austria, Belgium, Netherlands, Sweden, Switzerland, Turkey</td>
</tr>
<tr>
<td>7</td>
<td>12</td>
<td>60</td>
<td>Spain</td>
</tr>
<tr>
<td>8</td>
<td>16</td>
<td>70</td>
<td>France, Germany, Italy, United Kingdom</td>
</tr>
</tbody>
</table>
### TERENA Secretariat Staff in 2008

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secretary General</td>
<td>Karel Vietsch</td>
</tr>
<tr>
<td>Business and Technology Strategist</td>
<td>John Dyer</td>
</tr>
<tr>
<td>Chief Technical Officer</td>
<td>Valentino Cavalli</td>
</tr>
<tr>
<td>Project Development Officers</td>
<td>Kevin Meynell, Licia Florio, Péter Szegedi</td>
</tr>
<tr>
<td>Senior IT Support Officer</td>
<td>Dick Visser</td>
</tr>
<tr>
<td>Senior Webmaster</td>
<td>Christian Gijtenbeek</td>
</tr>
<tr>
<td>Webmaster</td>
<td>Gijsbert Sliedrecht</td>
</tr>
<tr>
<td>Chief Administrative Officer</td>
<td>Bert van Pinxteren</td>
</tr>
<tr>
<td>Financial Administrator</td>
<td>Wilma Overdevest</td>
</tr>
<tr>
<td>Assistant Bookkeeper</td>
<td>Harriëtte Raaymakers</td>
</tr>
<tr>
<td>Public Relations Officer</td>
<td>Laura Durnford</td>
</tr>
<tr>
<td>PR and Conference Officer</td>
<td>Carol de Groot-Crone (until 1 February)</td>
</tr>
<tr>
<td>Conference and Workshop Organiser</td>
<td>Gyöngyi Horváth</td>
</tr>
<tr>
<td>Workshop Organiser</td>
<td>Jim Buddin</td>
</tr>
<tr>
<td>Secretary</td>
<td>Hanna Cherigui</td>
</tr>
<tr>
<td>Data Analyst</td>
<td>Anikó Nagy (from 1 April until 30 September)</td>
</tr>
</tbody>
</table>

**Retired**

Carol de Groot-Crone retired on 2 February 2008 after ten years of service with TERENA. She considers her greatest contributions during this time to have been her part in establishing the Task Force on Public Relations, and in developing ‘CORE’, the back-end system used for organising the annual TERENA Networking Conferences and displaying content online. Carol is now spending much of her time as a freelance desktop publisher and editor. She would be delighted to stay in touch with the TERENA community and welcomes contact via her email carol-freelance@casema.nl.
## Acronyms and Abbreviations

<table>
<thead>
<tr>
<th>A</th>
<th>Acronyms and Abbreviations</th>
</tr>
</thead>
<tbody>
<tr>
<td>APAN</td>
<td>Asia-Pacific Advanced Network</td>
</tr>
<tr>
<td>APCERT</td>
<td>Asia Pacific CERT</td>
</tr>
<tr>
<td>AutoBAHN</td>
<td>Automated Bandwidth Allocation across Heterogeneous Networks</td>
</tr>
<tr>
<td>B</td>
<td>BoF</td>
</tr>
<tr>
<td>C</td>
<td>CA</td>
</tr>
<tr>
<td>CAMP</td>
<td>Campus Architecture and Middleware Planning</td>
</tr>
<tr>
<td>CANARIE</td>
<td>Canadian Network for the Advancement of Research, Industry and Education</td>
</tr>
<tr>
<td>capwap</td>
<td>Control And Provisioning of Wireless Access Points</td>
</tr>
<tr>
<td>CCIRN</td>
<td>Co-ordinating Committee for Intercontinental Research Networking</td>
</tr>
<tr>
<td>CEENet</td>
<td>Central and Eastern European Networking Association</td>
</tr>
<tr>
<td>CERN</td>
<td>European Laboratory for Particle Physics</td>
</tr>
<tr>
<td>CERT</td>
<td>Computer Emergency Response Team</td>
</tr>
<tr>
<td>CLARA</td>
<td>Cooperación Latino Americana de Redes Avanzadas</td>
</tr>
<tr>
<td>CLARIN</td>
<td>Common Language Resources technology Infrastructure</td>
</tr>
<tr>
<td>CosmoGrid</td>
<td>Grid-enabled Computational Physics of Natural Phenomena</td>
</tr>
<tr>
<td>CRU</td>
<td>Comité Réseau des Universités</td>
</tr>
<tr>
<td>CSIRT</td>
<td>Computer Security Incident Response Team</td>
</tr>
<tr>
<td>D</td>
<td>DANTE</td>
</tr>
<tr>
<td>DNSSEC</td>
<td>Domain Name System Security Extensions</td>
</tr>
<tr>
<td>DWDM</td>
<td>Dense Wavelength Division Multiplexing</td>
</tr>
<tr>
<td>E</td>
<td>EAP</td>
</tr>
<tr>
<td>EARNEST</td>
<td>Education And Research Networking Evolution Study</td>
</tr>
<tr>
<td>EC</td>
<td>European Commission</td>
</tr>
<tr>
<td>ECAM</td>
<td>European Committee for Academic Middleware</td>
</tr>
<tr>
<td>educonf</td>
<td>Education Conferencing</td>
</tr>
<tr>
<td>eduGAIN</td>
<td>Education GÉANT Authorisation Infrastructure</td>
</tr>
<tr>
<td>eduroam</td>
<td>Education Roaming</td>
</tr>
<tr>
<td>EGEE</td>
<td>Enabling Grids for E-sciencE</td>
</tr>
<tr>
<td>emu</td>
<td>EAP Method Update</td>
</tr>
<tr>
<td>ENISA</td>
<td>European Network and Information Security Agency</td>
</tr>
<tr>
<td>ENPG</td>
<td>European Networking Policy Group</td>
</tr>
<tr>
<td>ENUM</td>
<td>E.164 Number Mapping</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>EUNIS</td>
<td>European University Information Systems</td>
</tr>
<tr>
<td>EuroCAMP</td>
<td>European CAMP</td>
</tr>
<tr>
<td>EXPreS</td>
<td>Express Production Real-time e-VLBI Service</td>
</tr>
</tbody>
</table>

---

## Acronyms and Abbreviations

<p>| F | FEAST | Feasibility Study for African–European Research and Education Network Interconnection |
|---|FEDERICA|Federated E-infrastructure Dedicated to European Researchers Innovating in Computing Network Architectures |
| FIRE | Future Internet Research and Experimentation |
| FIRST | Forum of Incident Response and Security Teams |
| FORTH | Foundation for Research and Technology - Hellas |
| FTP | File Transfer Protocol |</p>
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GA</td>
<td>General Assembly</td>
</tr>
<tr>
<td>Gb/s</td>
<td>Gigabits per second</td>
</tr>
<tr>
<td>GDS</td>
<td>Global Dialling Scheme</td>
</tr>
<tr>
<td>GÉANT</td>
<td>Gigabit European Academic Network Technology</td>
</tr>
<tr>
<td>GENI</td>
<td>Global Environment for Network Innovations</td>
</tr>
<tr>
<td>GIdP</td>
<td>GÉANT Identity Provider</td>
</tr>
<tr>
<td>GLIF</td>
<td>Global Lambda Integrated Facility</td>
</tr>
<tr>
<td>GLOBAL</td>
<td>Global Linkage Over Broadband Links</td>
</tr>
<tr>
<td>GN2</td>
<td>Multi-Gigabit European Academic Network</td>
</tr>
<tr>
<td>GN3</td>
<td>Multi-Gigabit European Research and Education Network and Associated Services</td>
</tr>
<tr>
<td>GNI</td>
<td>Generic Network Interface</td>
</tr>
<tr>
<td>GOLE</td>
<td>GLIF Open Lightpath Exchange</td>
</tr>
<tr>
<td>GPRS</td>
<td>General Packet Radio Service</td>
</tr>
<tr>
<td>IaaS</td>
<td>Infrastructure as a Service</td>
</tr>
<tr>
<td>ICCS</td>
<td>Institute of Communication and Computer Systems</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communication Technologies</td>
</tr>
<tr>
<td>IETF</td>
<td>Internet Engineering Task Force</td>
</tr>
<tr>
<td>IF-MAP</td>
<td>Interface for Metadata Access Point</td>
</tr>
<tr>
<td>IGTF</td>
<td>International Grid Trust Federation</td>
</tr>
<tr>
<td>IP</td>
<td>Internet Protocol</td>
</tr>
<tr>
<td>IPsec</td>
<td>IP Security</td>
</tr>
<tr>
<td>IPv4</td>
<td>IP version 4</td>
</tr>
<tr>
<td>IPv6</td>
<td>IP version 6</td>
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<tr>
<td>ISOC</td>
<td>Internet Society</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>JISC</td>
<td>Joint Information Systems Committee</td>
</tr>
<tr>
<td>JIVE</td>
<td>Joint Institute for VLBI in Europe</td>
</tr>
<tr>
<td>KTH</td>
<td>Kungliga Tekniska Högskolan</td>
</tr>
<tr>
<td>LDAP</td>
<td>Lightweight Directory Access Protocol</td>
</tr>
<tr>
<td>LHC</td>
<td>Large Hadron Collider</td>
</tr>
<tr>
<td>MACE</td>
<td>Middleware Architecture Committee for Education</td>
</tr>
<tr>
<td>MANTICORE</td>
<td>Making APN Network Topologies on Internet Cores</td>
</tr>
<tr>
<td>MCNC</td>
<td>Microelectronics Center of North Carolina</td>
</tr>
<tr>
<td>MEP</td>
<td>Member of the European Parliament</td>
</tr>
<tr>
<td>MPLS</td>
<td>Multi Protocol Label Switching</td>
</tr>
<tr>
<td>N</td>
<td>NAC</td>
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<td>N</td>
<td>NATO</td>
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