



2012  
ANNUAL REPORT CESNET

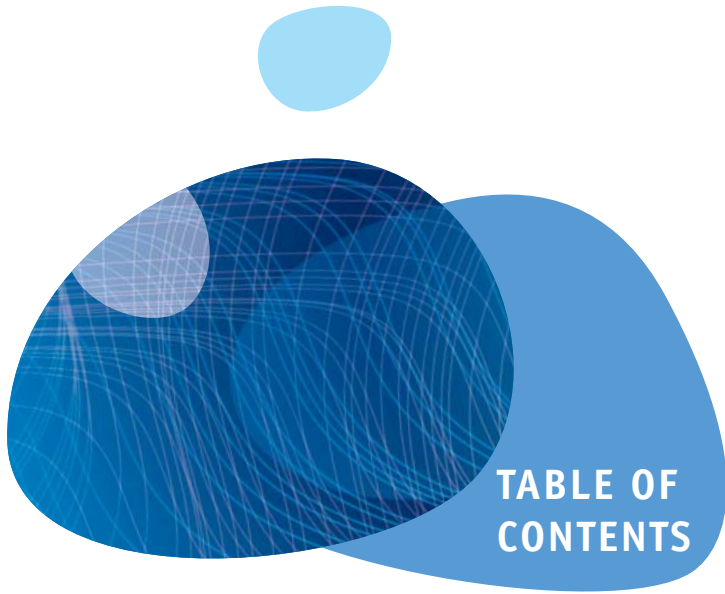
Inter alia, the Annual Report  
provides a detailed overview  
of our progress in  
building the **CESNET**  
**e-infrastructure**  
in 2012.



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director  
**Jan Gruntorád**



## A MESSAGE FROM THE DIRECTOR

In your hands, you have the CESNET Association Annual Report for 2012. This was a year when we worked intensely on two strategic projects entrusted to us by the Ministry of Education, Youth and Sports: *CESNET Large Infrastructure* and *Extension of the National R&D Information Infrastructure in Regions* (abbreviated to *eIGeR*). You can find details about them on the following pages.

The Annual Report provides a detailed overview of our progress in 2012, within both projects, in building the CESNET e-infrastructure; a complex environment involving a national high throughput communications infrastructure, a national grid infrastructure and data repository infrastructure, complemented by various other sophisticated tools and services.

You will also learn about the major international projects in which our staff were involved during 2012. Undoubtedly, the most important one is the building and development of the GÉANT pan-European communications infrastructure, which makes networking services available to approximately forty million users in over 3,500 research and scientific institutions in 38 European countries.

The Annual Report also offers an overview of our most important research activities that we pursued in 2012: they were highly specialised activities in the areas of e-infrastructure security, monitoring, grid middleware, optical transmission systems, accurate time transmissions over optical networks, and high definition video transmission.



In this context, I would like to highlight our success at both domestic and global professional forums. For example, our *UltraGrid* technology, that enables on standard workstations a transmission of both compressed and uncompressed full HD video via IP networks, with a delay of a mere 90 ms, won *the Best Open-Source Software Award* at the prestigious ACM Multimedia conference in Japan.


On the home scene, inter alia, we made a major progress in practical utilisation of the latest networks and technologies in medicine. We performed live webcasts of surgeries during the *Modern Operating Oncourology course*, a webcast of a robotic operation from the University Hospital in Olomouc to the 21st Gynaecological Endoscopy Congress of the Czech Medical Society of J. E. Purkyně, held in Poděbrady, a live webcast of operations as part of the 20th Annual Congress of the Czech Society of Cardiology in Brno, a live stereoscopic (3D) video transmission in cooperation with our colleagues from the Slovak academic network SANET from a robotic gynaecological operation at the 19th Congress of the Slovak Gynaecology and Obstetrics Society, and the list goes on and on.

I emphasise the medical domain on purpose: it is perhaps the best proof of how much the challenging network research and development can contribute to improving the quality of our lives. CESNET staff also contribute to developing human capacities and knowledge in other disciplines, including particle physics, cosmic research, environmental sciences etc.

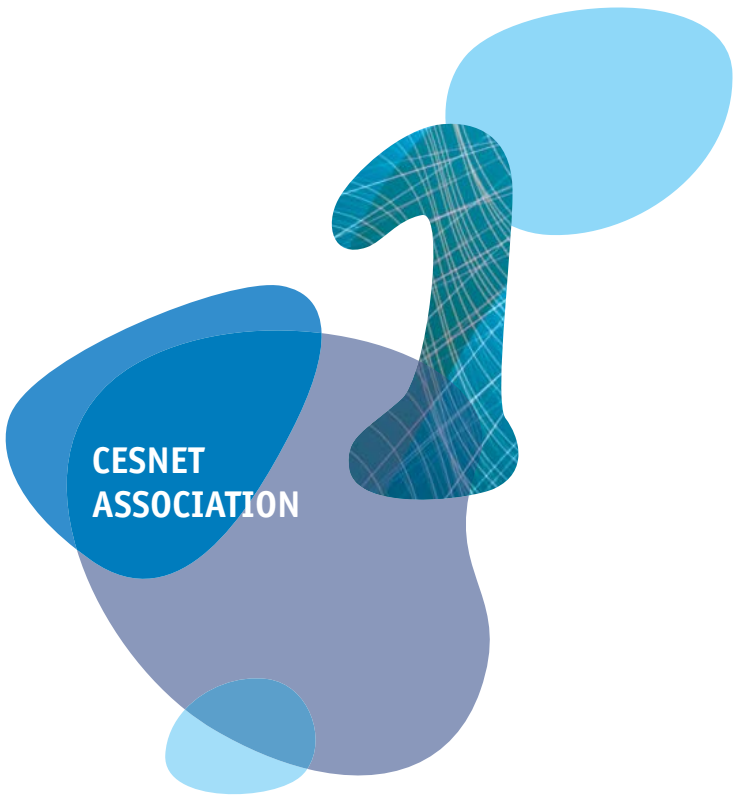
We were very active in public presentations of our work in 2012. This was also linked to the twentieth anniversary of the official connection of Czechoslovakia to the Internet, which took place on 13 February 1992. On the occasion of the anniversary, we organised a ceremonial meeting in Prague, featuring prominent personalities of both the present and past Internet research and development. It was an ideal opportunity to evaluate what a giant leap our discipline and alongside the whole humankind has managed over the past two decades. Concerning Internet connection as such, it has shifted to totally different technological dimensions. Whereas the bitrate of the first connection in 1992 was 19.2 kbps, today the capacity of our backbone national infrastructure counts to tens of gigabits per second: a million times more. By the end of 2013 we would like to increase the capacity to 100 Gbps. The world may expect to beat the 1,000 Gbps limit by 2015: one terabit per second. These are fascinating figures. They ideally prove the dynamic Internet research and development. We are honoured to be a part of it. It would be impossible without the institutional and funding support from the Ministry of Education, Youth and Sports of the Czech Republic, as well as the helpful attitude of all the CESNET Association members and, of course, the determination and skills of all the CESNET employees and colleagues. All of these institutions and individuals deserve sincere thanks.



**Jan Gruntorád**  
Director and Member of the Board of Directors, CESNET

The background features a large, abstract blue shape on the left side, filled with a fine grid pattern. This shape has several white, organic cutouts. The rest of the background is white, with several other blue shapes: a large light blue shape at the bottom right, a smaller dark blue shape overlapping it, and a medium blue shape at the top right. The overall aesthetic is clean and modern, with a focus on blue tones and geometric patterns.

The Association provides **CESNET** e-infrastructure services not only to its members, but also to selected entities that comply with the *rules for accessing the e-infrastructure.*



**CESNET  
ASSOCIATION**

# CESNET ASSOCIATION

## History

The Association was founded in 1996 by universities in the Czech Republic, together with the Academy of Sciences of the Czech Republic (hereinafter referred to as ASCR). In the same year, thanks to the grant for the *TEN-34 CZ Network Deployment* project from the Ministry of Youth, Education and Sports of the Czech Republic, the Association started to develop the academic backbone network across the Czech Republic with an entirely new quality level. At the same time, the academic and the commercial sectors became gradually separated, and all the members moved towards the academic network. From 1997, the Association had operated two independent networks. The first network, TEN-34 CZ (later TEN-155 CZ), served the needs of science, research and education, and members of the Association and some other institutions complying with the Acceptable Use Policy were connected. The second network was for historical reasons called CESNET and served commercial customers. Both the networks were separated in technological, economic, and largely also personnel way. In 2000, the Association ceased its operation as a commercial Internet provider, chiefly due to economic and legislative reasons. Since then, the Association has been engaged exclusively in the development and operation of the backbone network for science, research and education (NREN, National Research and Education Network of the Czech Republic) and related activities. The NREN is called CESNET2. During the years 2004 to 2010 the Association was subsidized in the form of an institutional support for its *Optical National Research Network and Its New Applications* research plan, the draft of which was presented in 2003. The year 2010 was the seventh and final year of the research plan. The final expert review of the research plan took place in 2011, concluding that the objectives of the research plan were successfully achieved. The Association obtained two crucial decisions by the Ministry of Youth, Education and Sports of the Czech Republic in 2011, based on which it was promised funding for two large projects. The first of them is for *CESNET Large Infrastructure*, with the implementation planned for 2011–2015. The other project, crucial for the Association's activities, is the *Extension of the National R&D Information Infrastructure in Regions* (abbreviated to *eIGeR*).

## The Association Objectives and Scope of Activities

The main scope of activities of the Association is as follows:

1. to conduct research and development in the area of information and communication technologies and their applications;
2. to provide and arrange the provision of education services of research and development type, using the high-speed national research and education network;
3. to ensure and perform for its members and their established allowance organizations the development and operation of a computer network interconnecting their networks and metropolitan networks; the creation of collectively used technical, communication and software resources and information services; the testing of new applications; the cooperation and complementarity of the members' activities at a level comparable to leading education and research networks abroad (including Internet access);
4. to secure and provide, in cooperation with its members, the long-term development, acquisition and deployment of high quality communication and information technologies based on the Internet and similar advanced systems;
5. to support, against the reimbursement of related expenses, propagation of erudition, culture and knowledge, cooperation of members with industry, expansion of the latest information technologies deployment, and network quality improvement by recruiting additional participants, information sources and services.

The Association performs and provides its activities within the scope of received subsidies and partial compensation of expenses related to these activities. It is not the Association's objective to generate any profit on these activities.



In addition to its main activities, the Association also pursues economic/business activities; however, solely with the purpose of making more efficient use of its property and without any negative impact on research activities. The services are not provided on a publicly available basis. The Association provides CESNET e-infrastructure services not only for its members, but also for selected entities that comply with the rules for accessing the e-infrastructure. Any loss incurred in connection with the Association's economic/business activities will be settled by the end of each fiscal year; otherwise, the Association will terminate the economic (business) activities in question before the beginning of the following fiscal year. After settling the obligatory reserve fund contribution, the Association uses its entire profit to support research and development.

## Membership in International and National Organizations

The CESNET Association is a member of important international and national organizations.

### International Organizations

**TERENA** (Trans-European Research and Education Network Association) – established in 1994 through the merger of EARN (European Academic and Research Network) and RARE (Réseaux Associés pour la Recherche Européenne). It is dedicated to the development of the telecommunication infrastructure of academic and scientific sites across Europe.

**CEENet** (Central and Eastern European Networking Association) – organization coordinating international telecommunication activities of Central and Eastern Europe countries.

**GLIF** (Global Lambda Integrated Facility) – global experimental network activities, focusing on the supporting the development of the most demanding scientific and research applications; its main objective is to create a network to serve applications with extreme transmission requirements.

**DANTE** (Delivery of Advanced Network Technology to Europe Ltd.) – non-profit organization aimed at the development and quality improvement of the IP connectivity for European academic institutions.

**Internet2** – consortium led by American research and education institutions endeavouring to develop and deploy new types of network technologies, services and applications; CESNET has been an associate consortium member since 1999.

**PlanetLab** – consortium of academic, commercial and governmental organizations from around the world, collectively operating a global computer network designed for developing and testing new telecommunication applications; the network currently encompasses 780 nodes in 31 countries.

**EGI.eu** – organisation aimed at co-ordinating European computing grids used for scientific calculations and supporting their sustainable development.

### National Organizations

**NIX.CZ** – CESNET is one of the founding members of NIX.CZ, Interest Association of Legal Entities. (Neutral Internet Exchange), an association of Internet service providers in the Czech Republic, providing mutual connectivity among its members' networks; the association had 79 members as of 31 December 2012.

**CZ.NIC** – the Association is also a founding member of CZ.NIC, Interest Association of Legal Entities, dealing with domain registrations, support to Internet-related generally beneficial projects and activities; the association had 107 members as of 31 December 2012.

## Association Members

The following institutions were members of the Association in 2012:

Charles University in Prague • Palacký University in Olomouc • Czech Technical University in Prague • VŠB (University of Mines) – Technical University of Ostrava • Academy of Arts, Architecture and Design in Prague • Academy of Fine Arts in Prague • Brno University of Technology • University of Veterinary and Pharmaceutical Sciences Brno • Masaryk University • Mendel University in Brno • Academy of

Performing Arts in Prague • Janáček Academy of Music and Performing Arts in Brno • University of Pardubice • The Institute of Chemical Technology in Prague • Czech University of Life Sciences in Prague • Technical University of Liberec • University of Economics, Prague • University of Hradec Králové • University of South Bohemia in České Budějovice • University of Ostrava • Silesian University in Opava • Jan Evangelista Purkyně University in Ústí nad Labem • University of West Bohemia in Plzeň • Academy of Sciences of the Czech Republic • Tomáš Baťa University in Zlín • University of Defence

The Police Academy of the Czech Republic was admitted as a regular member at the 34th CESNET General Meeting on 20 December 2012 (its membership came into effect on 1 January 2013).

## Internal Organisational Structure

CESNET has the following bodies:

- General Meeting
- Board of Directors
- Supervisory Board

The **Board of Directors** consisted of the following members until 12 July 2012:

Jiří BÍLA  
Alexander ČERNÝ  
Jan GRUNTORÁD  
Josef KUBÍČEK  
Václav RAČANSKÝ  
Pavel SATRAPA  
Miroslav TŮMA

Josef Kubíček held the office of the Chairman, and Václav Račanský, and Miroslav Tůma were Vice-Chairmen.

For the electoral term 2012–2014, the 33rd General Assembly elected the Board of Directors with the following members during its meeting held on 12 July 2012:

Jiří BÍLA  
Alexander ČERNÝ  
Jan GRUNTORÁD  
Josef KUBÍČEK  
Václav RAČANSKÝ  
Pavel SATRAPA  
Miroslav TŮMA

Josef Kubíček was elected Chairman of the Board of Directors, and Václav Račanský, and Miroslav Tůma were elected Vice-Chairmen.

The **Supervisory Board** consisted of the following members in 2012:

Jaromír MARUŠINEC  
František POTUŽNÍK  
Eva ŠMÍDOVÁ  
Ivo VONDRÁK  
František ZEDNÍK

Jaromír Marušinec was the Chairman of the Supervisory Board.

Jan Gruntorád was the **Director** of the Association again in 2012.

## Development Fund Board

The **Development Fund Board** operated with the following structure in 2012:

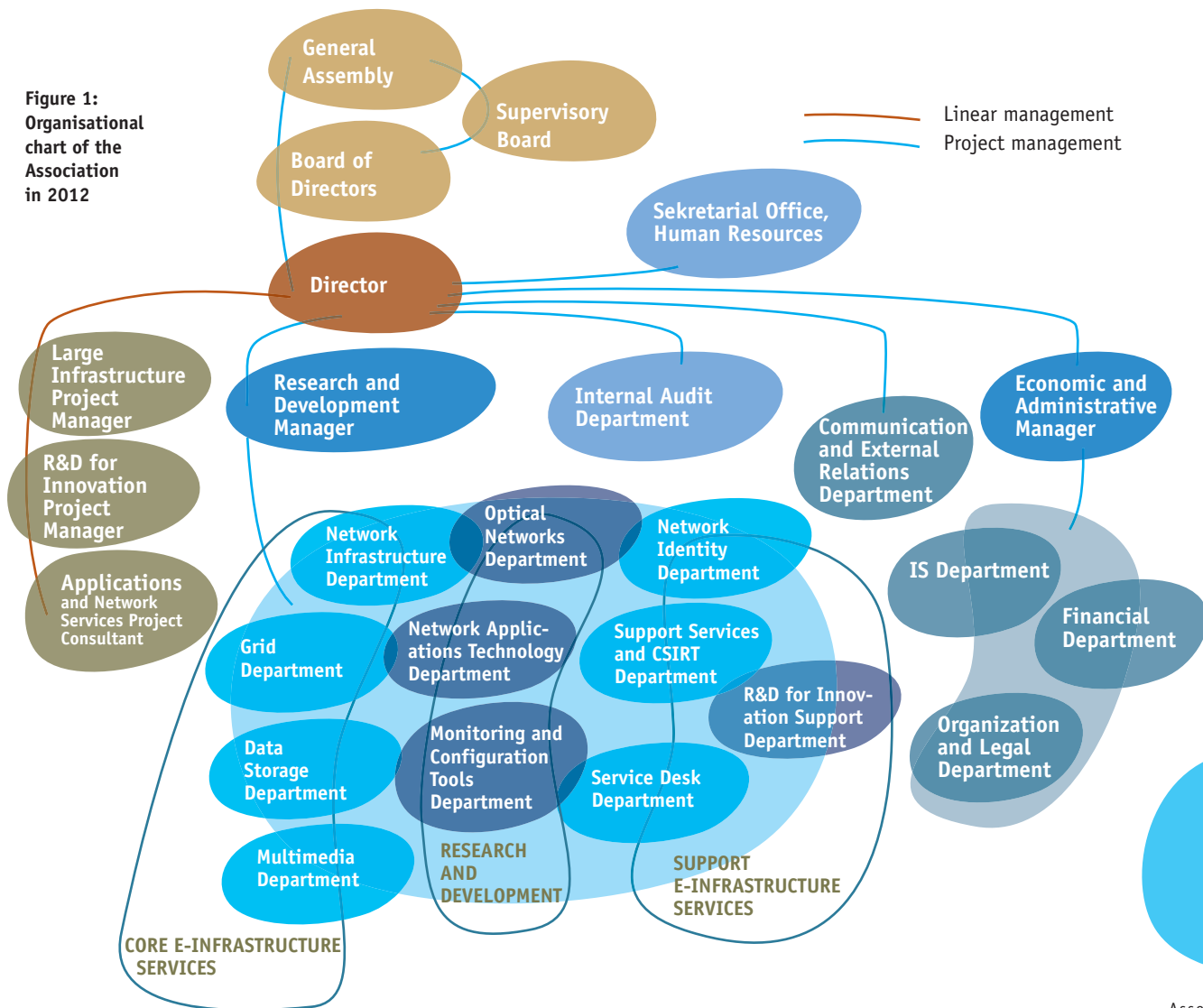
Igor ČERMÁK  
 Miroslav INDRA  
 Pavel JURA  
 Olga KLÁPŠŤOVÁ  
 Antonín KUČERA  
 Zdeněk KŮS  
 Jan SLOVÁK

Igor Čermák was the **Chairman of the Development Fund Board**.

## Organisational Chart

Following negotiations with the Board of Directors, the Organizational Chart (see Figure 1) was approved by the Director of the Association on 22 November 2012 and came into force on 1 December 2012. The Association involved 135.6 converted full-time jobs in 2012. The Association's basic organisational structure comprises departments, which may be aggregated into sections. Management within this structure is performed by so-called line managers.

Figure 1:  
 Organisational  
 chart of the  
 Association  
 in 2012



The CESNET e-infrastructure  
is built within two  
complementary projects:

***CESNET Large Infrastructure***

*and Extension of the National R&D*

***Information  
Infrastructure***

***in Regions***

*(eIGeR).*



CESNET  
E-INFRASTRUCTURE



## CESNET E-INFRASTRUCTURE

CESNET's fundamental activity is the development, constructing and operation of the CESNET e-infrastructure, which is part of the *Roadmap for Large Research, Experimental Development and Innovation Infrastructures in the Czech Republic*, approved by Government Resolution No. 2072 of 15 March 2010. The purpose of the CESNET e-infrastructure within the national roadmap for large infrastructures is to provide a transparent common communication environment for the cooperation of entities dealing with research, experimental development and innovation across all sectors in the Czech Republic. Of course the e-infrastructure is integrated into the relevant international infrastructures, particularly those described in the *European Research Infrastructures Roadmap (ESFRI Roadmap)*, on which the national roadmap is based. The CESNET e-infrastructure is also used as a testing and development environment for new technologies and applications in the area of information and communication technologies.

The CESNET e-infrastructure is a complex environment, comprising a high capacity national communications infrastructure, a national grid infrastructure (NGI) and a data repository infrastructure, complemented with tools and services for managing access to the e-infrastructure resources, tools for communication security and data protection, and tools for effective cooperation of the distributed users and teams.

The CESNET Association has been developing this infrastructure with substantial support from public budgets under two mutually complementary projects, *CESNET Large Infrastructure and Extension of the National R&D Information Infrastructure in Regions (eIGeR)*.

### Special-purpose support to developing and operating CESNET e-infrastructure

#### CESNET Large Infrastructure

The *CESNET Large Infrastructure* project determines the basic orientation and goals of the Association's work for the period 2011–2015. The special-purpose support to this project is the most important source of funding for operating and developing the services of this e-infrastructure.

The objective of the project *CESNET Large Infrastructure* is the gradual upgrading of the e-infrastructure to a modern comprehensive national e-infrastructure for research, experimental development and innovation. The e-infrastructure will comprise all the general components that are needed to link the Czech Republic to the European Research Area and, among other things, will enable connecting with other e-infrastructures described in the *ESFRI Roadmap*. The chief components will be a national high-throughput communications infrastructure, national grid infrastructure (NGI), and data storage infrastructure, enhanced with tools and services for controlling access to e-infrastructure sources, tools for ensuring communication security and data protection, as well as tools for effective collaboration of distributed users and teams. The project work was under way in accordance with the timetable during 2012.

#### eIGeR project

The project called *Extension of the National R&D Information Infrastructure in Regions (eIGeR)*, funded from the EU structural funds under the operational programme *Research and Development for Innovation*, is designed as part of the building of the *CESNET Large Infrastructure*, and its pivotal benefit is a substantial initial strengthening of installed technology in the regions outside Prague.

The main objective of the project is to build a regional foundation of the CESNET e-infrastructure encompassing all its components, involving in particular the following:

- increasing communications infrastructure capacity
- boosting the computational capacity of the MetaCentrum as the foundation of the NGI
- building three high-capacity repositories
- increasing the capacity and enhancing the infrastructure for video conferences

The project implementation stage is scheduled for a period from May 2011 to October 2013.

## Communications infrastructure

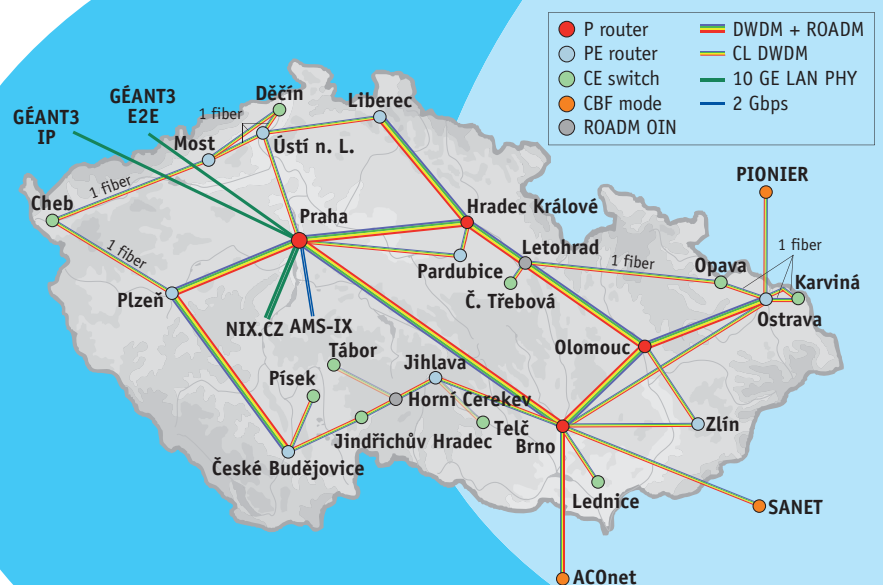
The CESNET2 backbone communications infrastructure is the precondition for the other parts of the national information e-infrastructure and is designed as a multiple-layer system connected at individual layers with research project and user networks as well as research networks abroad, the European GÉANT network, and the global experimental GLIF infrastructure. The new communications infrastructure offers concurrent support for the IPv4 and IPv6 protocols with optional advanced functionalities and features, provision of dedicated services at different network layers, especially lambda services and remote real-time access to user research equipment.

The core topology of the optical backbone network is based on leased optical fibres conforming to the ITU-T G.652 standard (see Figure 2). Some routes outside the network core make use of only single fiber for data transfer.

The network core consists of a complex optical transport system with a common management system and enables establishment of end-to-end optical transmission channels without the need for any interconnection or reconfiguration of the intermediate ROADM nodes. The system also enables concurrent operation of up to 80 channels spaced at 50 GHz and planned; transmission channel capacity of 1–100 Gbps.

The remaining routes deploy *CzechLight DWDM* technology, developed by the Association itself as part of in-house research activities. The technology is currently based on *CzechLight* optical amplifiers with passive Mux/Demux or ROADM installed. It is deployed on some of the double-fiber and all of the single-fiber routes.

Figure 2: Basic optical topology of the CESNET2 backbone network



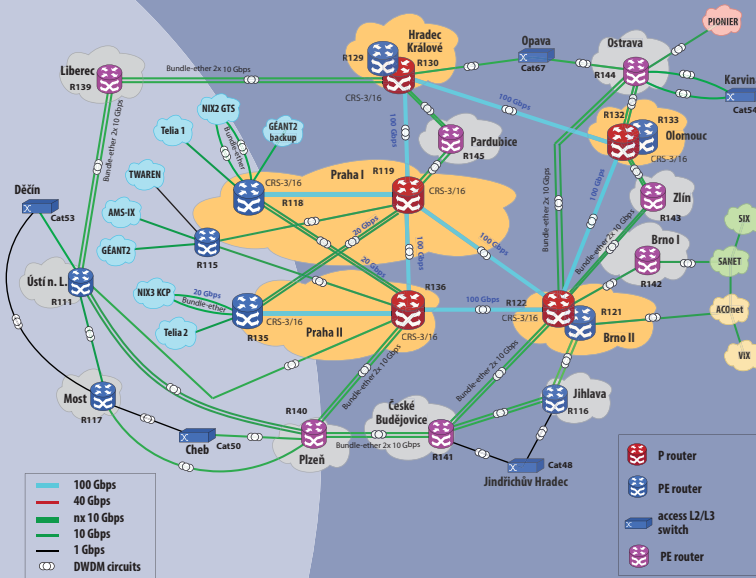


Figure 3: Topology of the IP/MPLS infrastructure at 2012 end

The IP/MPLS layer of the communications infrastructure was boosted during 2012 by extension of the terabit routers at the Prague I and Brno nodes and the main backbone ring Prague–Brno–Olomouc–Prague was fitted with equipment enabling data transfer at 100 Gbps. The current topology of the communications infrastructure is shown in Figure 3.

The worksites of the *IT4Innovations* and *CERIT* projects, and the VTP Rostoky u Prahy site were connected to the CESNET e-infrastructure in 2012. In addition, the Association has been gradually improving the connection of existing major CESNET2 network users' sites by increasing the connection capacity, shifting to dark fibre connection, or providing an independent secondary route, chiefly supporting their participation in international research projects. The quality and reliability of the network is also improved by removing the first mile parallels on intercity routes to the CESNET2 network nodes.

## Grids

The Association's long-term goal in the area of distributed computing is the operation and development of the *MetaCentrum National Grid Infrastructure (NGI)* and integration of its activities into the corresponding international projects and infrastructures. The CESNET Association performs the role of the national coordinator in the NGI.

The National Grid comprises two basic types of computing clusters: conventional computing clusters with a lower number of high-performance processors, and high-performance SMP servers with more processors in shared memory. Along with these computing servers, the *MetaCentrum* also operates extensive data capacities, used for storing large experimental data processed in the grid. The grid infrastructure is part of the national e-infrastructure developed within the projects *CESNET Large Infrastructure*, *CERIT-SC* and *IT4Innovations*.

The computational capacity of the *MetaCentrum* clusters was boosted again in 2012, both due to CESNET projects as well as with resources of collaborating projects. At the end of 2012, the *MetaCentrum* provided access to more than 6500 CPUs and 800 TB of storage capacity in a semi-permanent data repository.

The main hubs of the *MetaCentrum* are the Masaryk University (CERIT-SC Centre and Faculty of Science), Charles University in Prague (CU Supercomputer Centre), the University of West Bohemia in Plzeň (Faculty of Applied Sciences), the University of South Bohemia in České Budějovice (Faculty of Science cluster), the Technical University in Brno (Faculty of Electrical Engineering and Communication), the Department of Wood Science of Mendel University in Brno (Supercomputer Centre), the Academy of Sciences of the Czech Republic (Institute of Physics), and CESNET.

## Data repositories

The main objective of the project in the area of data repository is to create an integrated data storage infrastructure consisting of interconnected data centres distributed across the Czech Republic. The system will be based on three CESNET's own high-capacity data centres with a planned total capacity of 15–20 PB.



From a technical point of view, the repository is organized hierarchically (HSM – Hierarchical Storage Management). Its basic principle is that less frequently utilized data is shifted to cheaper and slower-access high-capacity media, typically tapes, which also considerably reduces the operating costs, and enables to achieve a much higher capacity with the given investment and operating costs compared to a disk-only repository. The only user limitation of this system is that the query will take somewhat longer to process once accessing long-unused data, involving the data move from the slower storage layer to the fastest one.

Additional data repository in Plzeň, acquired at the end of 2011, was put into operation in the course of 2012; it offers 500 TB of disk space and 3.3 PB on tapes. It operates repository access mechanisms such as NFSv4, FTPS, rsync, scp, and SFTP. The system was also connected to authentication and authorisation mechanisms as part of the eduID.cz federation. The Plzeň repository is currently accessed by approximately fifteen usergroups, who have stored over 240 TB of archived data on tapes and 24 TB on disks. The repository also stores backups of part of the MetaCentrum disk arrays, backups of CESNET's internal information systems, and systems for sharing the Association's multimedia data. The portfolio of services provided by the data repositories includes also FileSender for handling large files among the users. Over 1,100 files have been handled since the system was launched in 2012. The CESNET Association is also a member of the consortium developing related software.

Public tenders for the two remaining components of the system – repositories in Jihlava and Brno – were announced and evaluated in 2012. The installation will take place in early 2013.

## Infrastructure for collaboration and user support

### IP telephony, video and web conferencing and streaming multimedia

The IP telephony network connects 46 gateways connected to institution exchanges, several CCM IP telephone exchanges, and several SIP domains (complete SIP infrastructures within institutions). The Association cleared 904 thousand calls totalling 48.5 thousand hours during 2012.

Above all, the video conferencing infrastructure offers client registration options, use of virtual rooms on HD MCU, relation recording and streaming in the Windows Media and Flash formats. Registration of video conferencing devices brings easier availability of both units and services thanks to telephone numbers allocated by the Association. About seventy hardware units in eighteen institutions have made use of this option. The HD MCU itself hosted 3,451 hours of connections (67% more than in the previous year) in dozens of virtual rooms in the course of the last year. Nine new hardware units are registered from seven connected institutions.

The Association operates a web conferencing system built on the Adobe Connect platform, employing Adobe Flash technology. The system registers more than 500 users who authenticate themselves using the *eduID.cz* federation of identities, and together with visitors have 65 virtual rooms available. The Adobe Connect system users performed 2,033 hours of connections in 2012; an increase by about 70% compared to 2011.

The collaboration infrastructure also includes means for live and recorded streaming in Windows Media, Adobe Flash and MPEG-4 formats. The infrastructure is utilised by over ten institutions, which have stored over 8.5 TB of multimedia data in the repository; this represents approximately 1,500 hours of recording.

The Association has supported a number of conferences and seminars in 2012 by providing multi-point video conferencing and streaming.

### Network identity

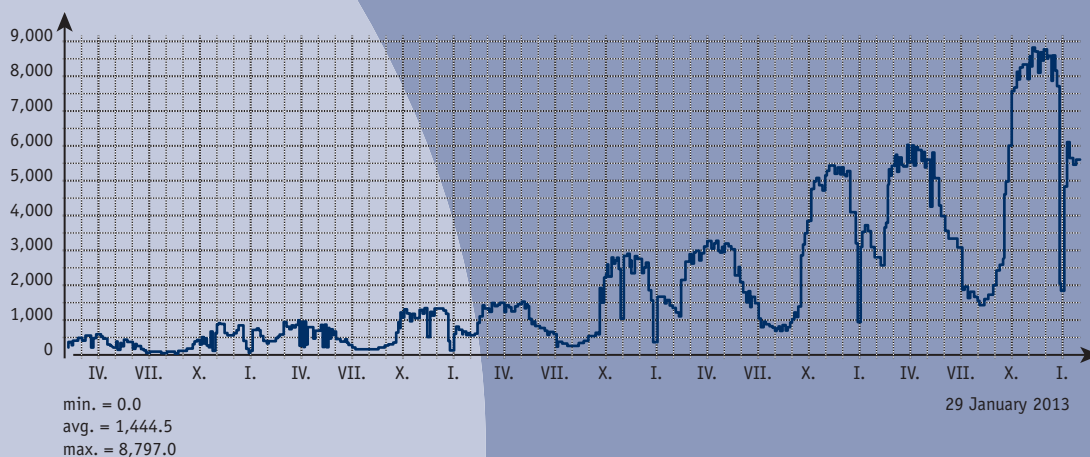
A system for user management and access control for services provided under the e-infrastructure is an integral component of the comprehensive e-infrastructure. The user management is based on the *eduID.cz* distributed federation of identities, where the initial user registration and authentication services are provided by the home organizations while the authorization information is managed at the level of the services and their administrative domains. At present, the federation comprises 31 identity providers (IdP) and 59 service providers (SP). The *eduID.cz* federation has been a member of the European *eduGAIN* academic inter-federation since 2011; the Association's users can thus make use of the services operated by the partner federations in Europe.




The Association has developed a special IdP *eduID.cz Hostel* for users who do not have an account with an IdP (identity provider) involved in *eduID.cz*. The *Hostel* enables normal self-service registration based on authenticating an e-mail address. Users registered in this way are provided with a limited scope of the large infrastructure services. For unlimited use of the services, users need to perform full registration via an *eduID.cz Hostel* registration official based on furnishing their personal documents. A fully registered users' identity is equivalent to the identities provided by *eduID.cz* member IdPs.

The best-accepted federated service so far is probably *eduroam.cz*, which enables users from various involved institutions to connect to a (typically wireless) network of any other cooperating institution, thus gaining access to the Internet or certain other services operated by the host network (roaming). Users are always authenticated by the home institution. This academic roaming system was created as a European initiative, and has gradually spread worldwide.

Figure 4: Numbers of accesses via eduroam in the last five years





To ensure secure and reliable communication, the CESNET Association operates a public key infrastructure, based on the CESNET CA certification authority which issues various types of certificates: for individuals, servers and other certification authorities.

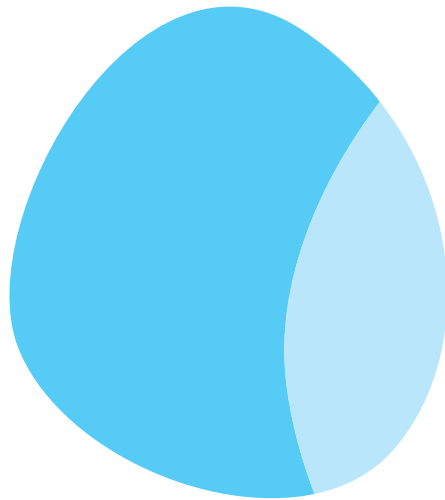
### **Security of the e-infrastructure**

The primary system for the provision of e-infrastructure security is the CESNET-CERTS security team. Its work focuses on the following issues:

- receipt of security incident notifications occurring in the CESNET2 network and incident handling;
- awareness raising: training sessions, presentations, publications;
- communication and cooperation with national security teams;
- communication and cooperation with security teams abroad within TF-CSIRT activity, run by TERENA, and other institutions;
- operation and development of IDS systems, honeypots and network operation monitoring tools;
- pilot operation of a forensic laboratory for investigation into security incidents.

The Association pays great attention to awareness raising among users and administrators of the connected computer networks.

The DNSSEC technology was deployed on the DNS servers operated by the Association in 2012. This is an extension of the domain name system (DNS) for improved security. DNSSEC assures users that the information acquired from the DNS is provided by the correct source, is complete and that integrity was not violated during transfer.



The background features several abstract blue shapes and grid patterns. At the top left, there is a large, dark blue shape with a fine grid pattern, containing a smaller, lighter blue circle with a similar grid. To its right is a solid dark blue rounded rectangle. Below these are several overlapping circles and rounded shapes in various shades of blue, from light to dark. At the bottom right, there is a large, dark blue shape with a grid pattern, similar to the one at the top left, with a white circular cutout. The overall aesthetic is clean and modern, using a monochromatic blue color palette.

In 2012,

CESNET was involved in major  
international research projects such as

**GÉANT, ORIENTplus, GLIF, PlanetLab,  
EGI-Inspire, OSIRIS**  
and more.



**INTERNATIONAL  
INFRASTRUCTURE  
PROJECTS**

## INTERNATIONAL INFRASTRUCTURE PROJECTS

### GÉANT

The *GÉANT* communications infrastructure currently makes network services available to approximately 40 million users at more than 3,500 institutions in 38 European countries. The connectivity provided includes connection of European National Research and Education Networks (NRENs) via GÉANT with similar networks such as the Internet2 and ESnet in the USA, the CANARIE in Canada and networks on other continents. The GÉANT network is being built and operated under the project GN3 (*Multi-gigabit European Research and Education Network and Associated Services*). In addition to DANTE and the TERENA association, the project involves 34 NREN operators, including CESNET. Jan Gruntorád, Director of the CESNET Association, is one of the eight members of the project's Executive Committee.

The Association staff apply their expertise primarily in the following project activities:

- examination of potential new transfer protocols and fully optical signal processing for new generation networks and, above all, for support to new applications, such as real-time signal processing;
- participation in designing the next generation of the pan-European GÉANT research network, especially concerning possible use of new photonic applications in a multi-domain environment;
- development of solutions for automated creation of virtual channels on a European scale for specialized applications;
- development and operation of AAI mechanisms as part of the GÉANT network;
- intense involvement in the task *Best Campus Practices*, whose outcomes are mostly documents describing recommended processes, focusing on, among others, IPv6 and IP telephony and traffic monitoring in university networks.

### ORIENTplus

Since July 2011, the Association has been involved in a project to connect the European (via the GÉANT) and Chinese national research networks (CSNET and CERNET), called *ORIENTplus*. Its basic objective is to maintain the existing connection and progressively increase its capacity up to 10 Gbps. The ideal goal for which the consortium is headed is a hybrid link allowing both IP packet transfer and establishment of point-to-point connections. CESNET's activities focus on supporting users of such a link and demonstrating the possibilities that the new link is going to offer.

## Global Lambda Integrated Facility – GLIF

*Global Lambda Integrated Facility (GLIF)* is a global research activity involving the most advanced institutions and consortia engaged in network research and application in Europe, North and South America, Asia and Australia. Individual *GLIF* participants enable other participants to use part of their resources so that collective experiments can be carried out. *GLIF* refers to a virtual organization composed of involved institutions as well as a research environment (facility), consisting of lambdas and nodes known as GOLE (GLIF Open Lightpath Exchanges), set up by this organisation. Such an environment also enables experiments and demonstrations that pose a risk of interference and destruction.

## PlanetLab and Related Projects

*PlanetLab* is the first laboratory that has changing the Internet as one of its objectives. It was set up in 2002 as a consortium of several American universities, and has been gradually joined by other universities from all over the world. Prominent research departments in IT companies have also become its members. Today, it is a unique network with the status of a world-wide laboratory for network applications. It has over 1,100 nodes distributed in more than 500 locations in every part of the world. At present, CESNET has four nodes (two in the original *planet-lab.org* and two in the new *planet-lab.eu*). The fifth node in the Czech Republic is a computer at the Brno University of Technology Faculty of Information Technology. However, also this computer works under a licence awarded to CESNET. The servers run special Linux-type software that supports virtualization. Thus, each physical machine can have several virtual machines running, used by users from all over the world. The virtual computers working on a shared project are combined in instances known as “slices”. At present, CESNET has the right to use ten virtual network instances in *planet-lab.org* and ten instances in *planet-lab.eu*. CESNET is responsible for the operation of local infrastructure, that is, the operation of the server and registration of domestic users, authentication of their affiliation with the organisation, and basic support activity in the area of using the system. It registers about thirty permanent users from several universities, but the number of users increases substantially temporarily during semestral teaching. For these users, CESNET has established and operated 18 active slices with different configurations, specified by the users themselves. In total, all the slices used by the Association users contain about 400 foreign nodes. This gives the users an extraordinary opportunity to test their applications in a global context.

## EGI.eu and International Cooperation Projects on Grids

The *EGI.eu* initiative was founded in 2009 based on results and recommendations of an EU-supported project titled *EGI\_DS (European Grid Initiative – Design Study)* with the objective to coordinate national activities in the area of implementation of grid technologies as an important e-infrastructure component at the European level. CESNET is one of the founding members of this initiative. The main objectives of *EGI.eu* include the following:

- provision of long-term sustainability of the European grid infrastructure;
- its operation, including interconnection of NGIs; and
- coordination of middleware development.

The cooperation under *EGI.eu* continued in 2012 by conducting the *EGI-Inspire* project, which further develops the concept of a multi-discipline pan-European grid infrastructure. CESNET is involved in all the primary operational activities within the project, ensures the operation of the national EGI grid node, and provides computational resources, comprising not only the association's own computing capacities but also those of the Institute of Physics of the Academy of Sciences of the Czech Republic. The capacities involved are also part of *MetaCentrum* and use its virtualized infrastructure. Providing the operation of the pan-European grid infrastructure also involves so-called global activities, common throughout the infrastructure. The project coordinator is in charge of their operation, but in fact more than half of them are performed by the partners. In this context, CESNET is in charge of operating the support services and also continues to support virtual organizations *Auger* and *VOCE*, as well as directly supporting user groups in the Czech Republic interested in utilizing the pan-European grid.

The last of the projects related to developing international grid infrastructures in which CESNET staff are involved is the *CHAIN* project dealing with coordination of cooperation of European grid infrastructures with similar infrastructures in other regions. The project ended in 2012, but a new EU-funded project, *CHAIN-REDS*, follows up on it immediately.

## OSIRIS

Together with the Academy of Sciences of the Czech Republic, CESNET has become involved in the *OSIRIS* project under the 7th EU Framework Programme, which aimed at establishing a European platform for coordinating the development of research infrastructures in the area of information and communications technologies. The project ended in 2012, resulting in a set of documents containing analyses and recommendations related to funding and sustainability of e-infrastructures in Europe.



## Cooperation Under the TERENA Association Activities

Task Forces (TFs) within the TERENA Association form a very important European platform for cooperation; they are set up based on current common needs of European academic infrastructures and bring together experts from NRENs interested in the issues. In 2012, CESNET was involved in the work of the following task forces:

- **TF-CSIRT (Computer Security Incident Response Team):** coordinating network security incident resolution and prevention;
- **TF-EMC2 (European Middleware Coordination and Collaboration):** coordination and collaboration in identity management and development of middleware for applications and services;
- **TF-Mobility and Network Middleware:** development and deployment of mobile technologies and utilization of network middleware for supporting interoperable roaming services within academic networks;
- **TF-CPR (Communications and Public Relations):** exchange of information and coordination of procedures associated with presenting national research network activities and results to the public;
- **TF-Media (Media Management and Distribution):** collection and exchange of ideas, knowledge and creation, its management as well as distribution of related work procedures in the European area;
- **TF-Storage:** issues of implementation of data repositories in the academic network environment;
- **TF-NOC (Network Operation Centre):** issues of supervision centres of National Research and Education Networks.

Besides building and operating  
e-infrastructure, CESNET also deals with  
research and development  
in the area of information  
and communications technologies.





THE ASSOCIATION'S  
RESEARCH  
ACTIVITIES

## THE ASSOCIATION'S RESEARCH ACTIVITIES

Development of e-infrastructure for R&D requires an innovative approach, which is why CESNET, in addition to building and operating the e-infrastructure, also deals with research and development in the area of information and communications technologies, notably in the following areas:

### E-infrastructure security

CESNET has dedicated long-term care to network security. In addition to developing tools for providing user privacy protection and security for their data and tools for sharing information on security incidents, we have been intensively developing tools for network monitoring and detection of operating anomalies as potential sources of attack. One of the activities in the area of monitoring is the development of specialised hardware equipment, based on programmable gate arrays for monitoring data flows.

### Grid middleware

In connection with development of grid infrastructure, CESNET is involved in the international *EMI* project supported under the 7th EU Framework Programme, developing grid middleware, specifically the *Logging and Bookkeeping* service, as well as further development of some components related to operation security. The purpose of this project is to create and further advance a consolidated set of middleware components designed for the EGI grid, PRACE and possibly other distributed computing infrastructures (DCI).

### Optical transmission systems

CESNET has been researching and developing optical technologies for a long time. We have developed the *CzechLight* series of original fully optical transmission systems, the openness of which is their greatest advantage. This means that any software adjustments can be done by the device owner or administrator directly without approaching CESNET or the manufacturer. This makes the owner independent in terms of decisions on the further network development. The *CzechLight* series components have found practical application: specialist companies manufacture and market them under a CESNET licence.

### Accurate time transmission via optical network

The transmission of accurate time (deviation under 100 ps) and frequency (accuracy of  $10^{-17}$ ) via optical networks seems to be a promising application. These issues are the subject of the international research project *NEAT-FT* pursued as part of the *EMRP* (*European Metrology Research Programme*). CESNET is the only project partner representing national research and education networks; the other nine partners represent national laboratories dealing with time and frequency metrology.

## High definition video transmissions

CESNET is developing two platforms in the area of very high definition real-time video transmission. The first of them is the *MVTP (Modular Video Transfer Platform)* for low-latency duplex transmission of high definition video signals for specialised applications. The completion of the development of this prototype, requalifying it as a product and marketing it is the subject of a joint project of CESNET, Visual Unity, a. s., and ACE, a. s., called *POVROS*, supported by the Technology Agency of the Czech Republic as part of the *ALFA* programme. The project is scheduled for the period 2011–2013. The other platform is the *UltraGrid* software tool, enabling in standard workstations a transmission of both compressed and uncompressed full HD video over IP networks with a delay of 90 ms. CESNET has successfully demonstrated the capacities of this platform at several international conferences. At the ACM Multimedia prestigious world conference on work with multimedia content and data processing, held in Japan at the turn of October and November, *UltraGrid* won the award *ACM Multimedia 2012: The Best Open-Source Software Award*.

## CESNET Development Fund

In 2012, the Development Fund Council announced a tender for new projects in the following thematic areas:

- utilization of services of the CESNET2 network and modern information and communications technologies within the tuition and education process, creative and scientific research activities and management of public universities and the Academy of Sciences of the Czech Republic;
- advanced applications utilizing the high-speed backbone network;
- support of network service and application research;
- support of utilisation of CESNET data repository services;
- support to training for Association employees/members in order to obtain a globally recognized certificate in IS/IT.

A total of 39 projects were registered; 25 were admitted for co-funding, including 12 that were admitted after having been revised.

In 2012 there were two rounds of review procedure for completed projects: 40 projects were successfully completed in total, including two that were presented within the actual review. Completion or revision of final documentation was requested for several projects. Final reports for project within the CESNET Development Fund are available on the Association's website. In the course of 2012, the Development Fund Council dealt with suggestions of reviewers communicated to the Council in relation to project evaluation.

The results of some projects were presented at seminars for *Large Infrastructure* and *eIGeR* project executors, seminars for CESNET members and the professional public, as well as international conferences. Project outcomes were also presented in the form of publications in professional journals.

<b>Project Number</b>	<b>Project Executor</b>	<b>Project title</b>
438R1/2012	TUL	Network protocol for data sharing among graphic and web applications
440/2012	SBU	Extension of data backup and archiving of the basic services at the SBU
441/2012	MU	Visual tools for monitoring safety of computer networks
442/2012	University of West Bohemia in Plzeň	Automatic installer for Orion end stations
445/2012	University of West Bohemia in Plzeň	Development of ISD with IPv6 support
446/2012	University of West Bohemia in Plzeň	System for chip card certificate management
447/2012	University of West Bohemia in Plzeň	Integration of the Access System into the UWB AAA infrastructure
448R1/2012	University of West Bohemia in Plzeň	System for monitoring and archiving of application logs
449R1/2012	University of West Bohemia in Plzeň	Acquisition of partial test 70-640 Windows Server 2008 Active Directory, Configuring for the Server Administrator certificate under the scheme Microsoft Certified IT Professional (MCITP)
451/2012	University of Jan Evangelista Purkyně	Infrastructure for transmission of medical operations
454/2012	ICT Prague	Training for professionals at the ICT Prague computer centre aimed at acquisition of CCNP certification
455R1/2012	UP	Integration of CESNET remote data repository into the IBM TSM backup system
458/2012	UTB	Development of the Shibboleth federal authentication and authorisation infrastructure, remote and SSO access to library services
459R1/2012	TUL	Acquisition of the Oracle Database 11g Administrator Certified Professional
460/2012	University of Hradec Králové	Support to education, provision of work and study stays of Association members' staff at the world's leading workplaces in the areas of the Association's activity
461R1/2012	University of Pardubice	Increasing qualifications of teaching staff at the University of Pardubice Faculty of Electrical Engineering and Informatics concerning programming and programming technology
464/2012	Czech Technical University in Prague	Network visualisation environment for remote collaboration
465R1/2012	Academy of Performing Arts in Prague	Interactive research and education psychoacoustic analyses focusing on voice
466R1/2012	Academy of Fine Arts in Prague	Artyčok. TV information channel
467R1/2012	AS CR	Distributed computing environment for the application of statistical assimilation methods to pollutant dispersion in the atmosphere
468R1/2012	Academy of Performing Arts in Prague	Optimisation of APA network application and equipment management
469/2012	Academy of Performing Arts in Prague	Increasing qualifications of APA staff in IS/IT with a focus on CISCO technologies
470R1/2012	Charles University	Streaming and distribution of educational videos for universities
473R1/2012	SBU	Establishment of a joint local node of the SBU and the Biology Centre of the Academy of Sciences and its integration into the national infrastructure for biological data ELIXIR_CZ
474/2012	Silesian University	Increasing qualification of staff in charge of IT system management at the Silesian University in Opava

<b>Project Number</b>	<b>Project Executor</b>	<b>Project title</b>
396R1/2011	UEP	Developing professional qualifications of UEP staff in IT management
398/2011	TUL	Building and operation of a data repository for archiving and management of teaching recordings from TUL lecture rooms
399/2011	University of West Bohemia in Plzeň	Extension of the IS/STAG system with a student evaluation module
400/2011	University of West Bohemia in Plzeň	Acquisition of the Oracle Database 11g Administrator Certified Professional
401/2011	University of West Bohemia in Plzeň	Deployment of Windows 7 in the Orion environment at the University of West Bohemia in Plzeň
403/2011	University of West Bohemia in Plzeň	Secure availability of sensitive university resources to mobile device users
404R1/2011	University of West Bohemia in Plzeň	Support to IPv6 for external work sites
405/2011	University of West Bohemia in Plzeň	Acquisition of IBM WebSphere Application Server Network Deployment V6.1
406/2011	University of West Bohemia in Plzeň	Optimisation of a mobile platform portal
408/2011	Czech Technical University in Prague	Applied research into directional strategies in IP telephony
409/2011	AS CR	Visualisation of high-capacity multispectral visual measurements
411R1/2011	University of Pardubice	Increasing qualifications of teaching staff at the University of Pardubice Faculty of Electrical Engineering and Informatics concerning operating systems
412/2011	SBU	Acquisition of a server for the Moodle teaching system at the South Bohemian University Faculty of Sciences
413R1/2011	Czech Technical University in Prague	Application of video conferencing equipment to support teaching at external work sites of the CTU FEE in Prague
414/2011	VUT	Deployment of IPv6 for end user services at the Brno University of Technology Faculty of Mechanical Engineering
415/2011	Czech Technical University in Prague	Implementation of IPv6 in the experimental and research network of the Department of Telecommunications Technology and its methodological generalisation
416R1/2011	AS CR	Institute of Physics computer centre and IPv6
418/2011	Czech Technical University in Prague	Increasing qualifications of staff of the CTU Computer and Information Centre concerning management of Linux servers
419/2011	Charles University	Increasing qualifications of staff of the CIT Network Department at the CU Faculty of Natural Science
421R1/2011	VŠB-TUO	Data centres in academic network environments
422R1/2011	VUT	Study into advanced virtualisation and cluster solutions
423/2011	Academy of Performing Arts in Prague	Remote access to voice signal analysis
424/2011	Academy of Performing Arts in Prague	Analysis of high-speed video recordings
427R1/2011	University of Pardubice	Multi-platform access to university data and applications from mobile devices
429/2011	VŠB-TUO	Multimedia services in current optical access networks and new generation optical access networks
431/2011	Charles University	Interactive identification of physiological systems in a computer cloud and on cards with CUDA
432/2011	UP	Behavioural analysis of network operation (Internet Uplink) at the UP
433/2011	VUT	ITIL V3 certification for BUT Faculty of Chemistry

The background features a large, dark blue area on the left and bottom, filled with a fine, light blue grid pattern. Overlaid on this are several organic, light blue shapes of varying sizes and opacities, creating a layered, abstract effect. The top right corner is plain white.

On the occasion

**of the twentieth anniversary**

of the connection of the Czech Republic to the Internet,  
the Association held a

**formal ceremonial meeting**

with a remote address by one of the creators of the

**“web of webs”, Vinton G. Cerf.**



A large, stylized graphic of the number '54'. The '5' is filled with a light blue grid pattern, and the '4' is filled with a darker blue grid pattern. The numbers are partially overlaid by other blue shapes.

**PUBLIC  
RELATIONS**



Figure 5: Jan Gruntorád



Figure 6: Ondřej Neff



Figure 7: Helmut Sverenyák

## PUBLIC RELATIONS

February 2012 marked twenty years since the Czech Republic (then CSFR) joined the Internet. The Association commemorated the event by holding a ceremonial *Meeting on the 20th anniversary of the Czech Republic connecting to the Internet*. On 13 February 2012, over a hundred guests had the chance to follow, among others, presentations by the Association Director Jan Gruntorád (Figure 5), Jiří Peterka, Ondřej Neff (Figure 6), and a recorded speech by Vinton G. Cerf, founder of the Internet. The next most important event in the first half of 2012 was the *CESNET National Conference 2012*, held on 11 April. Over 110 guests attended the meeting, aimed at presenting CESNET e-infrastructure for science, research and innovations, and most prominently, the services and additional application options that the infrastructure offers (Figure 7). The conference agenda included speeches by representatives of the collaborating projects *CERIT-SC* and *IT4Innovations* (Figure 8).



Figure 8: Vít Vondrák



Figure 9: Campus Network Operation Monitoring



Figure 10: Pierre Auger Observatory Analysis Meeting

Monitoring of local area network (LAN) operation was the topic of a two-day international seminar *Monitoring of Campus Network Operation* held by CESNET, in co-operation with its partners within TERENA, the association of European national networks, in Brno on 24 and 25 April 2012. The event was primarily designed for network administrators at universities and academic institutions, and attended by guests from twelve European countries (Figure 9).

On 24–26 April 2012, the Association and the Institute of Physics of the ASCR (FZU) co-organised an international meeting of computer experts participating in the project *Pierre Auger Observatory*, the task of which is to study ultra-high energy cosmic rays radioation (Figure 10). The Association and the FZU provide the project, employing more than 500 scientists in 18 countries, with key services for the computing grid.



Figure 11: CEF Networks Workshop



Figure 12: Luděk Matyska

For the seventh time in a row, the Association organised the international *Customer Empowered Fibre (CEF) Networks Workshop*. On 12–14 September 2012, fifty professionals from Africa, Asia, South and North America and Europe presented and discussed their experience with designing and managing customer optical networks, which are now regarded as indispensable for providing demanding services for the research and education community (Figure 11).

The Association became the local organiser for the *EGI TF (European Grid Initiative Technical Forum) Conference*, held by the EGI initiative in Prague on 17–21 September 2012. The main topic of the discussion at the technical forum for the *EGI InSPIRE* project pan-European grid infrastructure was to evaluate the development of the pan-European grid system so far and to initiate its more intense utilisation for the purposes of European science. Four hundred experts from all over the world attended the meeting (Figure 12).

On 11 November 2012, CESNET and CZ.NIC co-organised the *Internet and Technology 12 Conference*, focusing on current Internet technologies. CESNET was represented with speeches by Michal Krsek, Lukáš Kekely and Jiří Chudoba.

Traditionally, the Association has presented itself by providing live webcasts for major medical events. During the *Zlín Eye Festival* on 9 March 2012, we performed live webcasts of three eye surgeries in very high definition. For the *20th Annual Meeting of the Czech Society of Cardiology* in May, the Association performed unique transmissions of three surgeries on the human heart, including communication with the physicians in the operating room. On the last day of May 2012, the Association provided a live stereoscopic (3D) webcast of a gynaecological operation for the *19th Congress of the Slovak Gynaecological and Obstetrical Society*. In June, the Association provided technical support for the two-day post-graduate on-line course intended for neurosurgeons from all over the world, which took place in Prague as a part of the *7th annual Central European Neurosurgical Society Meeting 2012 (CENS; Figure 13)*. On 20 October 2012, we performed a live webcast of a four-hour robotic operation at the University Hospital in Olomouc, Obstetrics and Gynaecology Clinic.



Figure 13: On-line course for neurosurgeons



Figure 14: Interview with J. Gruntorád for the TV

In November 2012, the Association again became one of the co-organisers of the eleventh year of the *Science and Technology Week*, taking part in broadcasting of selected expert lectures.


The Association published the results of its activities in print and electronic professional journals. We made 29 press releases in 2012. The quality of their content is confirmed by the fact that all of them were adopted by at least one print or electronic professional journal.

Two issues of the *Datagram* journal were published during the year; and, in addition, a special issue was dedicated to announcing the call for project proposals under the Development Fund of the CESNET Association. *Datagram* was distributed in print form, and it is also downloadable in electronic form from the Association's website.

At least once every year since 2005, CESNET has made it into the biggest mass medium, television. At present, the television stations have made it a tradition to associate Internet topics personally with CESNET Director Jan Gruntorád (Figure 14). He appeared in Czech Television programmes *Události*, *Hyde Park*, and *Retro*, and the *Night Television News* on TV Nova in 2012.

Internationally, the Association continued its active participation in the TF-CPR working group of TERENA and GÉANT2 PR Network working group of DANTE.

The Association makes use of feedback in the form of regular media monitoring and its monthly analyses of these outputs have confirmed a steady increase in activities presenting the Association's work in a positive light.

An abstract graphic on the left side of the page, featuring a dark blue background with a fine, light blue grid pattern. Overlaid on this are several organic, flowing shapes in various shades of blue, including a large light blue shape at the bottom and several darker blue shapes above it. There are also three white, irregularly shaped cutouts within the blue area.

The Association properly  
managed the entrusted financial resources in 2012,  
meeting all of its obligations resulting from  
the legislation, decisions of the  
**Ministry of Youth, Education  
and Sport of the Czech Republic**  
and running contracts.



## ECONOMIC RESULTS

### 2012 Economic Results

Activities of the CESNET Association are divided into two categories in accordance with its statutes: Principal Activity and Economic Activity.

#### Principal Activity

Two large projects continued in 2012: the five-year project *CESNET Large Infrastructure*, primarily with an investment focus, and *Extension of the National R&D Information Infrastructure in Regions (eIGeR)*, lasting for 30 months, also with a major investment focus.

As part of its principal activity, the Association continued building an e-infrastructure of a new quality to provide Association members and other entities eligible for connection to the CESNET2 network with a comprehensive set of services. In addition, the Association was involved in executing international research projects under the EU's 7th Framework Programme, a grant from the Technology Agency of the Czech Republic, and projects of the Development Fund Board.

The Association's principal activity ended 2012 with a book profit of CZK 2,221 thousand. Revenues from the Association's principal activity amounted to CZK 518,371 thousand; the expenditures reached CZK 516,150 thousand.

The income tax base from the yields of the Association's principal activity in 2012 was positive, amounting to CZK 1,018 thousand.

#### Economic activity

The Association's economic activity in 2012 mainly involved management of the largely bond-based portfolio of the Development Fund comprising financial resources obtained by sale of the commercial part of the CESNET network in 2000 and management of financial resources in other funds.

The Association's economic activity ended 2012 with a book profit of CZK 24,143 thousand. Revenues from the Association's economic activity in 2012 amounted to CZK 106,880 thousand; expenditures on the economic activity were CZK 82,737 thousand.

The income tax base from the yields of the Association's economic activity in 2012 was positive, amounting to CZK 24,605 thousand.

#### Total Book and Tax Economic Result

The total book economic result of the CESNET Association prior to taxation reported in 2012 was a profit amounting to CZK 26,364 thousand.

The total income tax base after deducting the items lowering the tax base was CZK 24,623 thousand.

The Association will pay income tax of CZK 4,678 thousand for 2012, resulting in a net profit of CZK 21,686 thousand.

#### Conclusion

The Association properly managed the entrusted resources in 2012, meeting all its obligations resulting from the legislation, decisions of the Ministry of Youth, Education and Sport of the Czech Republic and concluded contracts. The financial statement for 2012 was verified by the auditor without any remarks.



## BALANCE SHEET IN THOUSANDS OF CZK

	2012	2011	2010	2009
<b>Assets total</b>	<b>1,145,473</b>	<b>973,454</b>	<b>649,539</b>	<b>754,621</b>
Fixed Assets	676,126	627,664	459,849	524,013
Intangible fixed assets	7,800	3,615	3,623	3,064
Tangible fixed assets	345,263	306,765	137,150	206,780
Financial Investments	323,063	317,284	319,076	314,169
Current assets	469,347	345,790	189,690	230,608
Supplies	1,406	243	0	0
Receivables	52,862	70,176	19,042	25,879
Current liquid assets	397,617	252,428	144,003	160,692
Other assets	17,462	22,943	26,645	44,037
<b>Liabilities total</b>	<b>1,145,473</b>	<b>973,454</b>	<b>649,539</b>	<b>754,621</b>
Own resources	985,784	797,542	605,710	681,001
Funds	839,660	665,136	474,303	538,976
Economic result	21,686	9,125	-2,047	3,915
Undivided profit from last years	124,438	123,281	133,454	138,110
External resources	159,689	175,912	43,829	73,620
Obligations	157,015	173,658	41,321	70,980
Loans	0	0	0	0
Other liabilities	2,674	2,254	2,508	2,640

## PROFIT AND LOSS STATEMENT IN THOUSANDS OF CZK

	2012	2011	2010	2009
Earnings for the sale of goods	748	21	20	23
Earnings of own product and services	98,697	100,933	102,050	105,437
Current liquid assets revenues	89,755	26,039	78,960	19,603
Other revenues	187,818	107,775	63,425	54,505
Received membership fees	0	0	0	0
Operation subsidies	248,233	229,675	139,771	186,688
<b>Revenue total</b>	<b>625,251</b>	<b>464,443</b>	<b>384,226</b>	<b>366,256</b>
Purchase price of sold goods	263	16	15	19
Material and energy consumption	19,656	21,958	15,274	17,416
Purchased services	230,517	197,130	149,385	191,555
Personnel costs	133,844	129,133	100,852	104,878
Depreciation and amortization of intangible and tangible fixed assets	132,057	74,905	24,926	30,902
Other costs	82,550	27,810	93,576	14,261
Income tax – assesment for the current year	4,678	4,366	2,245	3,310
<b>Costs total</b>	<b>603,565</b>	<b>455,318</b>	<b>386,273</b>	<b>362,341</b>
<b>Economic result (revenue - costs)</b>	<b>21,686</b>	<b>9,125</b>	<b>-2,047</b>	<b>3,915</b>

## ***R – audit, s. r. o.***

150 00 Praha 5, Ostrovského 253/3

Tel.: 266 315 971, 604 824 760; fax: 257 003 291; e-mail: info@r-audit.cz

entered in the Commercial Register kept at the Municipal Court in Prague under Section C, Entry 20496 from 31 May 1993, auditor's certificate number 124

### **REPORT OF THE INDEPENDENT AUDITOR**

**Auditor's report for the members of the association of CESNET, Association of Legal Entities with its registered office at: Praha 6 – Dejvice, Zikova 4, Company Registration Number: 63 83 91 72**

We have audited the accompanying financial statements of association CESNET, Association of Legal Entities which comprise the balance sheet as at 31 December 2012, a profit and loss statement and the appendix to these financial statements, including a description of the significant accounting policies used. Information about CESNET, Association of Legal Entities is specified in point 1 of the appendix to these financial statements.

#### ***Statutory Body's Responsibility for the Financial Statements***

The statutory body of CESNET, Association of Legal Entities is responsible for the preparation of financial statements that give a true and fair view in accordance with Czech accounting regulations and for such internal control as statutory body determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

#### ***Auditor's Responsibility***

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with Act No. 93/2009 Coll., the Act on Auditors and International Standards on Auditing and the related application guidelines issued by the Chamber of Auditors of the Czech Republic. Those laws and regulations require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation of the financial statements that give a true and fair view in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

#### ***Opinion***

**In our opinion, the financial statements give a true and fair view of the financial position of CESNET, Association of Legal Entities as of 31 December 2012, and of its financial performance for the year then ended in accordance with Czech accounting regulations.**

Date of issue of report:

In Prague on 18 June 2013

**Auditing company: R – audit, s. r. o.**

Chamber of Auditors of the Czech Republic certificate number 124

Company head office: Praha 5, Ostrovského 253/3

**Responsible auditor: Ing. Radmila Špišková**

Chamber of Auditors of the Czech Republic certificate number 1326

