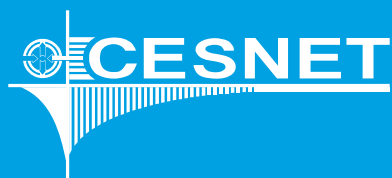


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# A Message from the Director



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## Jan Gruntorád

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

Thanks to the CESNET e-infrastructure academic and scientific research institutes all over the Czech Republic have become part of all the important activities currently occurring in European and global science

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The Annual Report that you are reading recapitulates the achievements of the CESNET Association in 2013.

It was a year in which a major part of our work dealt with tasks related to the two strategic projects that the Ministry of Education, Youth and Sports of the Czech Republic entrusted to us: CESNET Large Infrastructure and Extension of the National R&D Information Infrastructure in Regions (abbreviated to eIGeR). The central focus of our effort was to keep the Czech Republic at the forefront in computer network communications, and thus provide our scientists, researchers and academic professionals with such infrastructural facilities that would guarantee them a reliable and fast data transfer within the country and, above all, a close contact with the world's leading institutes.

The objective of the CESNET Large Infrastructure project is the gradual upgrade of the National Research and Education Network (NREN) to a modern comprehensive national e-infrastructure for research,

experimental development and innovation. Its core components are a national high throughput communications infrastructure, national grid infrastructure (NGI), and data storage infrastructure, enhanced with tools and services for controlling access to resources, tools for ensuring communication security and data protection, as well as tools for effective collaboration of distributed users and teams. In 2013, we made considerable progress in all these areas; the following pages will provide you with more details about it. At the end of October, the implementation phase of the eIGeR project was concluded. It was complementary to the CESNET Large Infrastructure project and was funded under the Operational Programme Research and Development for Innovation, priority axis 3, call 2.3. It was an investment project whose main objective was to build a regional foundation for the comprehensive national research and development e-infrastructure in the Czech Republic, which includes all the integral components necessary for provision

of services with a high added value. Above all, the implementation of the elGeR project resulted in an increased capacity of the communications infrastructure and expansion of its functions and properties by deploying more powerful network elements. In addition, the project involved increasing the capacity of the access interfaces, expanding the foundation of the national grid infrastructure (NGI) by boosting the computing capacity of the MetaCentrum (a computational grid under the auspices of our Association), building three high-capacity data repositories enabling the storing and sharing of large quantities of data, including their mid-term and long-term archiving, and increasing the capacity and enhancing the infrastructure for videoconferencing. In accordance with the grant decision, we will now ensure sustainability of the elGeR project till at least the end of 2018.

The chapters of the Annual Report will inform you about the specific tasks that we implemented in 2013 in relation to both the projects. All of them focused on developing

the CESNET national information e-infrastructure and its innovative use. In mid 2013, we proudly announced that the whole e-infrastructure network core began to provide a bitrate of 100 Gbps on all the optical DWDM routes. This ranked our national research and education network among the few optical infrastructures in the world capable of such bitrates. Upgrading the optical network to the capacity of 100 Gbps also meant a global primacy thanks to the first simultaneous utilization of production 100 Gbps data transfer and photonic services on a shared optical fibre on the Prague-Brno line. This was an important, though not the only, achievement on which we can pride ourselves when looking back at 2013. For example, our experts fascinated several global forums with the UltraGrid technology, enabling standard workstations to transfer both compressed and uncompressed audio and video at up to 8K resolution over IP networks. With respect to our current and past achievements, we were invited to actively participate in the most important pan-European

projects in the area of network infrastructure and its services such as the GÉANT and the follow-up GÉANT3plus, ORIENTplus, GLIF and others.

Thanks to the CESNET e-infrastructure academic and scientific research institutes all over the Czech Republic have become part of all the important activities currently occurring in European and global science, across various research and development domains. Without the CESNET e-infrastructure and the related services, our specialists would have no possibility to get involved in solving the greatest current scientific challenges.

However, our high-quality projects would not suffice by themselves. I would therefore like to conclude by expressing gratitude for the institutional and funding support that we have received from the Ministry of Education, Youth and Sports of the Czech Republic, as well as the dedication and professionalism of all our colleagues in CESNET and our partner organisations that helped us to accomplish our demanding tasks. ☒

The Association  
deals primarily  
with developing  
and operating  
the CESNET  
e-infrastructure,  
designed for science,  
research and  
education, and with  
related activities.



01

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CESNET  
Association



# The Association's history and current tasks

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**The Association was founded in 1996 by public universities and the Academy of Sciences of the Czech Republic (ASCR). Its main objectives are:**

- operation and development of the backbone network that connects its members' networks
- research and development of advanced network technologies and applications and dissemination of this knowledge
- development of the CESNET e-infrastructure designed for research and education

After its establishment, the Association also operated as a commercial Internet provider, with the aim of gaining sufficient resources from these activities for its main activity. It succeeded in gaining the position of one of the most important entities on the Internet access market in the Czech Republic. The Association discontinued that activity in 2000,

mainly for economic and legislative reasons. Since then, the Association has been engaged exclusively in the development and operation of the science, research and education backbone network (NREN, National Research and Education Network of the Czech Republic) and related activities.

In 2011, the Association received two crucial decisions of the Ministry of Education, Youth and Sports of the Czech Republic on funding for two large projects. The first of them is the CESNET Large Infrastructure project, with the implementation period of 2011-2015. The objective of the project is to reconstruct the CESNET2 national research network into a large infrastructure that will comprise all the information and communications e-infrastructures necessary for the Czech Republic involvement in the European Research Area and will allow, among other things, the connection to other e-infrastructures described in the ESFRI Roadmap.

The other project, cardinal for the Association's work, was the Extension of the National R&D Information Infrastructure in Regions (abbreviated as eIGeR), with the main objective to create a regional foundation for the comprehensive national research and development e-infrastructure in the Czech Republic. The project was implemented during the period from May 2011 to October 2013. In accordance with the grant decision, the Association is bound to provide sustainability of the project till at least the end of 2018.

# The Association Objectives and Scope of Activities

10/11

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## 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 organize the provision of education services of research and development type, using the high-speed national research and education network;
  3. to ensure for its members and their established allowance organizations the development and operation of a computer network interconnecting their networks with metropolitan networks; the development 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 ensure 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 other 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 quality improvement of the network by involving additional participants and procuring of 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 is settled by the end of each fiscal year; otherwise, the Association will abandon 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 involved in coordinating international telecommunication activities of Central and Eastern Europe countries.

**GLIF** (Global Lambda Integrated Facility) – global experimental network activities focusing on the support for

development of the most demanding scientific and research applications; their 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 all 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 on 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, enabling mutual connectivity among its members' networks; the association had 72 members as of 31 December 2013.

**CZ.NIC** - the Association is also a founding member of the CZ.NIC Interest Association of Legal Entities, dealing with domain registrations and support of Internet-related publicly beneficial projects and activities; the association had 111 members as of 31 December 2013.

# Association Members / Internal Organisational Structure

12/13

## Association Members

The following institutions were members of the Association in 2013:

- 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 in 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 Pilsen
- Academy of Sciences of the Czech Republic
- Tomáš Baťa University in Zlín
- University of Defence
- Police Academy of the Czech Republic in Prague

## Internal Organisational Structure

CESNET has the following bodies:


- General Meeting
- Board of Directors
- Supervisory Board

Based on the elections conducted at the 33rd General Meeting on 12 July 2012, the Association's Board of Directors had the following structure in 2013:

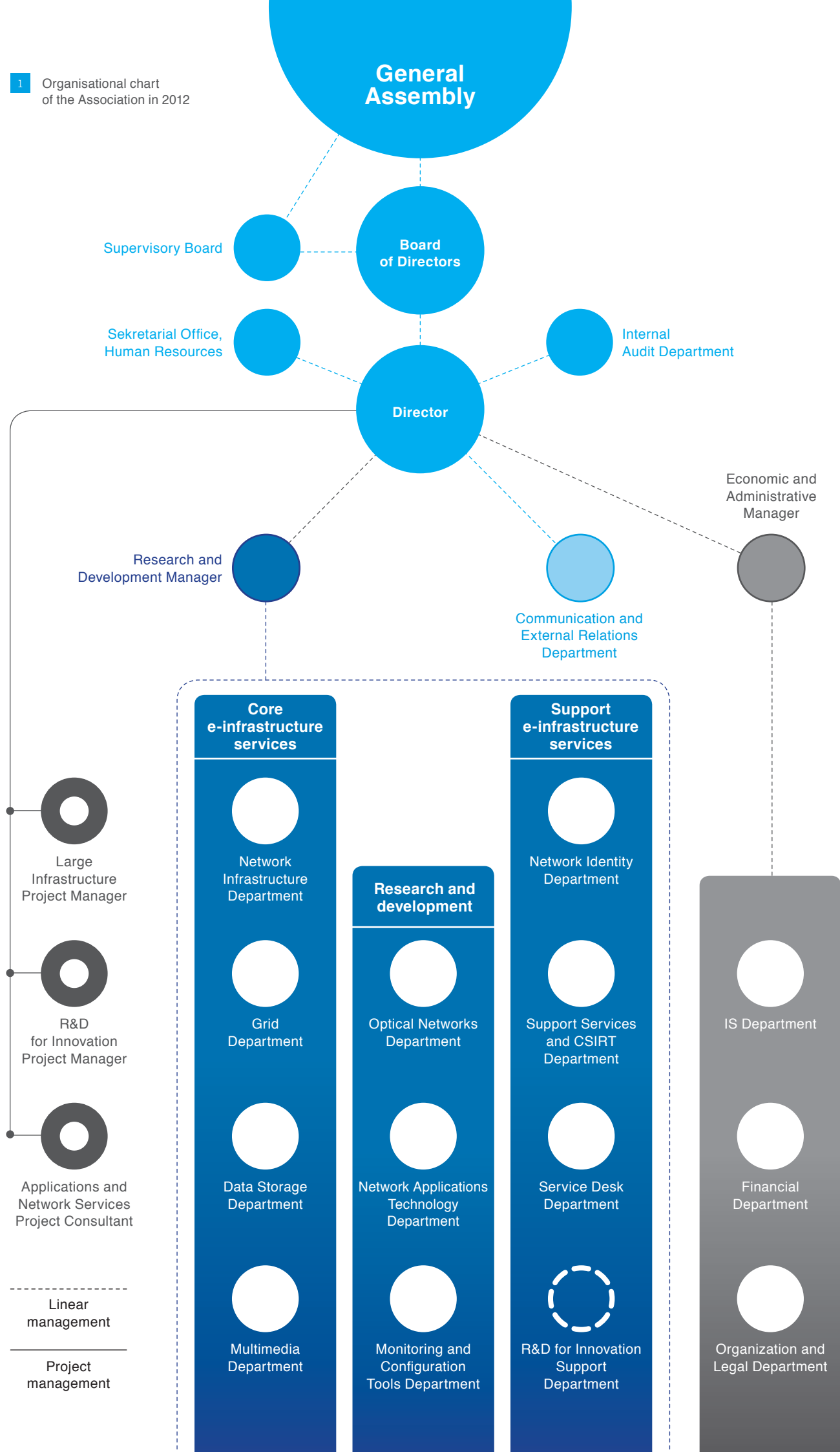
- Prof. Ing. Jiří BÍLA, DrSc.
- RNDr. Alexander ČERNÝ
- Ing. Jan GRUNTORÁD, CSc.
- Ing. Josef KUBÍČEK
- doc. RNDr. Václav RAČANSKÝ, CSc.
- doc. RNDr. Pavel SATRAPA, Ph. D.
- prof. Ing. Miroslav TŮMA, CSc.

Ing. Josef Kubíček held the office of the **Chairman**, and RNDr. Václav Račanský, CSc., and Prof. Ing. Miroslav Tůma, CSc., were **Vice-Chairmen**.

The Supervisory Board consisted of the following members until 11 July 2013:

- Ing. Jaromír MARUŠINEC, Ph. D., MBA
- Mgr. František POTUŽNÍK
- Mgr. Eva ŠMÍDOVÁ 

1 Organisational chart of the Association in 2012



- Prof. Ing. Ivo VONDRÁK, CSc.
- RNDr. František ZEDNÍK

Ing. Jaromír Marušinec, Ph.D, MBA, was the Chairman of the **Supervisory Board**.

**The 35<sup>th</sup> Annual Meeting elected a Supervisory Board of the same structure for the term 2013-2015. At the same time, Ing. Jaromír Marušinec, Ph.D, MBA, was again elected the Chairman of the Supervisory Board.**

Ing. Jan Gruntorád, CSc. was the **Director** of the Association in 2013.

#### Development Fund Board

**The Development Fund Board operated with the following structure until 11 July 2013:**

- RRNDr. Igor ČERMÁK, CSc.
- Ing. Miroslav INDRA, CSc.
- Prof. Ing. Pavel JURA, CSc.

- Ing. Olga KLÁPŠŤOVÁ
- doc. RNDr. Antonín KUČERA, CSc.
- Prof. Dr. Ing. Zdeněk KŮS
- Prof. RNDr. Jan SLOVÁK, DrSc.

RNDr. Igor Čermák, CSc., was the **Chairman of the Development Fund Board**.

**The 35<sup>th</sup> General Meeting, held on 11 July 2013, elected the following Development Fund Board for the term 2013-2015:**

- RNDr. Igor ČERMÁK, CSc.
- Ing. Miroslav INDRA, CSc.
- Prof. Ing. Pavel JURA, CSc.
- Ing. Olga KLÁPŠŤOVÁ
- doc. RNDr. Antonín KUČERA, CSc.
- Prof. Dr. Ing. Zdeněk KŮS
- Ing. Michal SLÁMA

RNDr. Igor Čermák, CSc., was again elected **Chairman of the Development Fund Board**.

Ing. Olga Klápšťová holds the office of the **Vice-Chairwoman**.

#### Organisational Chart

Following negotiations with the Board of Directors, the Organisational Chart (Figure 1) was approved by the Director of the Association on 22 November 2012 and came into force on 1 December 2012 and was in force throughout 2013. The Association involved 138.3 converted full-time jobs in 2013. 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. ✕

The purpose  
of the CESNET  
e-infrastructure  
is to provide  
a transparent  
common  
communication  
environment for  
the cooperation  
of entities dealing  
with research,  
experimental  
development  
and innovation.





02

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CESNET  
E-Infrastructure



# Introduction

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**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 of 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 Association has been developing the e-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 the CESNET e-infrastructure

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## CESNET Large Infrastructure

The CESNET Large Infrastructure project defines 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 comprises all the general components that are needed to link the Czech Republic to the European Research Area and, among other things, connects with other e-infrastructures described in the ESFRI Roadmap. The chief components are a national

communications infrastructure with a high throughput, 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 went in accordance with the timetable in 2013.

## eIGeR project

The project called Extension of the National Research and Development 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.

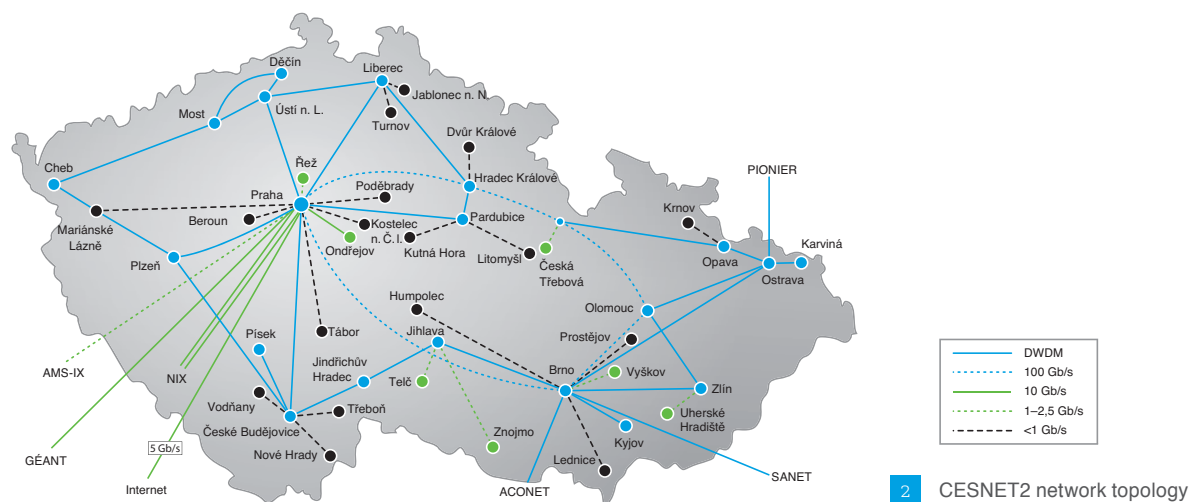
The main objective of the project implementation phase, which was concluded on 31 October 2013, was to build a regional foundation for the CESNET e-infrastructure in all its components.

### **This mainly concerned:**

- 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 objectives were fulfilled in accordance with the plan. ▶

# Communications infrastructure



2 CESNET2 network topology

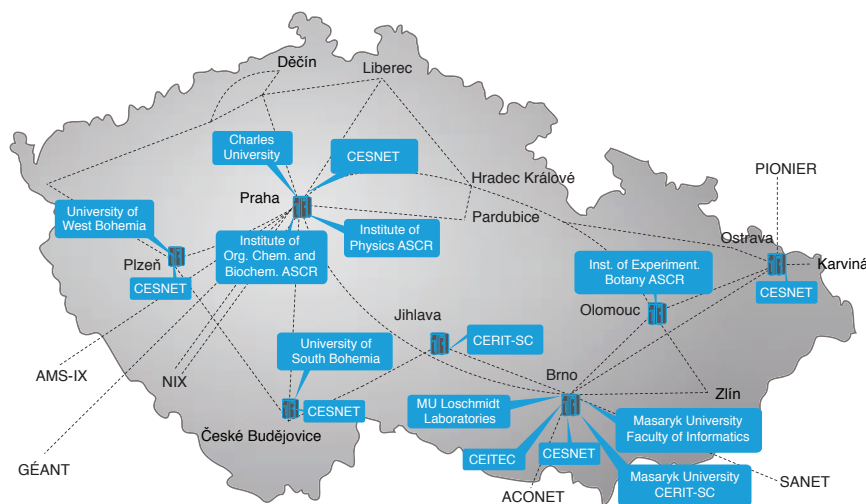
The CESNET2 backbone communications infrastructure is the precondition for the other parts of the national information e-infrastructure and is designed as a multiple-layer system connected in its layers with research project and user networks as well as research networks abroad, the European GÉANT network, and the global experimental GLIF infrastructure. The newly constructed 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 foundation of the CESNET2 network is infrastructure of leased

optical fibres conforming to the ITU-T G.652 standard. The core of the infrastructure comprises an integrated optical transport system with a uniform control system, which makes it possible to establish optical transmission channels without the need for any connection or reconfiguration of intermediate ROADMs (Reconfigurable Optical Add-Drop Multiplexer) 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 are equipped with CzechLight DWDM (Dense Wavelength Division Multiplexing) technology, developed by the Association as part of its in-house research activity. The technology is currently based on CzechLight optical amplifiers and equipped with

passive Mux/Demux or ROADMs. The IP/MPLS layer of the communications infrastructure was enhanced in 2013 by deploying terabit routers in the nodes Liberec, Ostrava, Plzeň, České Budějovice, Pardubice, Zlín, Brno, Jihlava, and Ústí nad Labem. The transmission capacity of the main circuit Prague–Brno–Olomouc–Hradec Králové–Prague was upgraded to 100 Gbps. The topology of the backbone network as of the end of 2013 is shown in Figure 2.



3 MetaCentrum infrastructure

The Association's long-term goal in the area of distributed computing is the operation and development of the MetaCentrum National Grid Infrastructure (NGI; the distribution of clusters within the Czech Republic shown in Fig. 3) and integration of these activities into the corresponding international projects and infrastructures. The grid environment is part of the national e-infrastructure built as part of the projects CESNET Large Infrastructure, CERIT-SC and IT4 Innovations, where it complements conventional supercomputer resources and extensive data repositories oriented on long-term data storage, and is also involved in integrating new types of computing power resources (cloud environment). At the same time, it is part of the European Grid Infrastructure, EGI.eu. The National Grid comprises two

main 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 experimental data being processed in the grid. The Association plays the role of the national coordinator within the NGI, interconnecting the individual clusters provided by other organisations or projects into a single national grid and providing its resources primarily for balancing the blast demands of the individual groups and for faster launch of application projects that are only in phase of planning the acquisition of their own computing resources. The integration activities include the development and management

of grid middleware, coordination of procurement of application software, and user support. In the area of application software, new versions of some applications have been installed and support to bioinformatics software has been enhanced. In 2013, the national grid infrastructure has been augmented by a cluster with nodes mounted with high-performance graphics cards. The MetaCentrum and the cloud services made available approximately 9,000 CPU cores at the end of the year (of which 3,400 were provided by CESNET), registered 757 users with valid accounts in the national grids (19% increase from 2012) and 220 in international virtual organisations (45% increase). These users entered more than 1.3 million tasks in the system (18% increase), which used 3,900 CPU years of machine time (56% increase). 2

# Data repositories

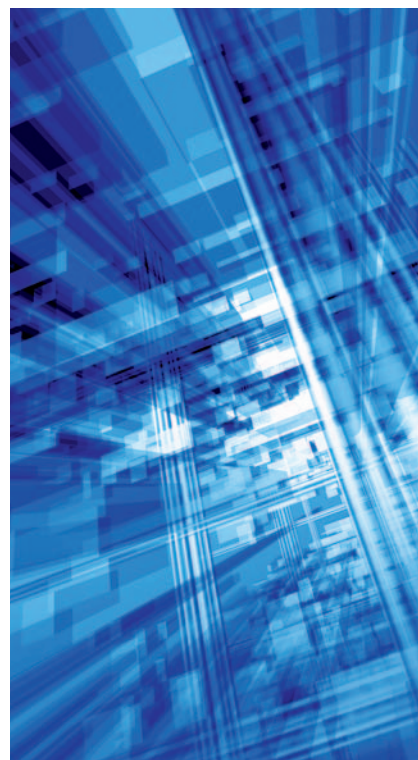
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The Association began building the distributed data repository as a constituent part of the e-infrastructure in 2011 with the aim of establishing an integrated data storage infrastructure composed of interconnected data centres distributed all over the Czech Republic. The foundation of this system comprises the Association's three high-capacity data centres with a combined capacity of 20 PB located in Plzeň, Jihlava and Brno.

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 considerably reduces the operating costs. The only user limitation of this system is that the query will take somewhat longer to process when accessing long-unused data, before the

data is moved from the slower storage layer. In 2013, we put into operation the FileSender service for transferring large files among users. The service quickly gained popularity, having been used to transfer more than 6,000 files, corresponding to approximately 7.4 TB of data.

More than 2 PB of data were stored in the data repository infrastructure at the end of 2013. The repository is used by 60 user groups (virtual organisations) via standard file-oriented interfaces, which represents 1,598 individual user accounts (people and service identities). However, the overall impact of the repositories on the community is greater, as an individual user with an account in the repository often represents a group for which the user performs backup or archiving tasks without all the group members necessarily having physical access to the repository. One group uses access via a block interface.



# Infrastructure for collaboration and user support

22/23



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

The IP telephony network interconnects 45 gateways connected to institution exchanges, several CCM IP telephone exchanges, and several SIP domains (complete SIP infrastructures within institutions). The Association cleared 810,000 calls totalling 42,500 hours during 2013.

The video conferencing infrastructure interconnected with the IP telephony, primarily offers client registration options, use of virtual rooms on HD MCU, session recording and streaming in the Windows Media and MPEG4 formats. The infrastructure registers ninety hardware units in twenty institutions, which provides easier access to both units and services via telephone numbers allocated by the Association. An

institution's infrastructure can also be connected with the Association's infrastructure, as is the case of the Masaryk University with nearly thirty units and additional systems. Our Multiple Conferencing Units (MCU) provided 4,500 hours of meetings in 2013 (almost a 40% increase compared to the previous year) in dozens of virtual rooms. Twenty new hardware units have been registered.

The Association operates a web conferencing system built on the Adobe Connect platform, employing Adobe Flash technology. The system registers more than 1,300 users who authenticate themselves using the eduID.cz federation of identities and who have 120 virtual rooms available alongside visitors. The Adobe Connect system users performed almost 4,000 hours of meetings in 2013 (80% increase). The collaboration infrastructure also includes means for live transmission (streaming) and recorded broadcast

in Windows Media, Adobe Flash and MPEG-4 formats. The infrastructure is used by over ten institutions, which have stored over 12 TB of multimedia data in the repository.

## 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 38 identity providers (IdP) and 70 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 partnership 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 this way are provided with a limited scope of the large infrastructure services. For unlimited use of the services, users need to undergo a full registration via an **eduID.cz Hostel** registration officer 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 enabled 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 since spread all over the world.

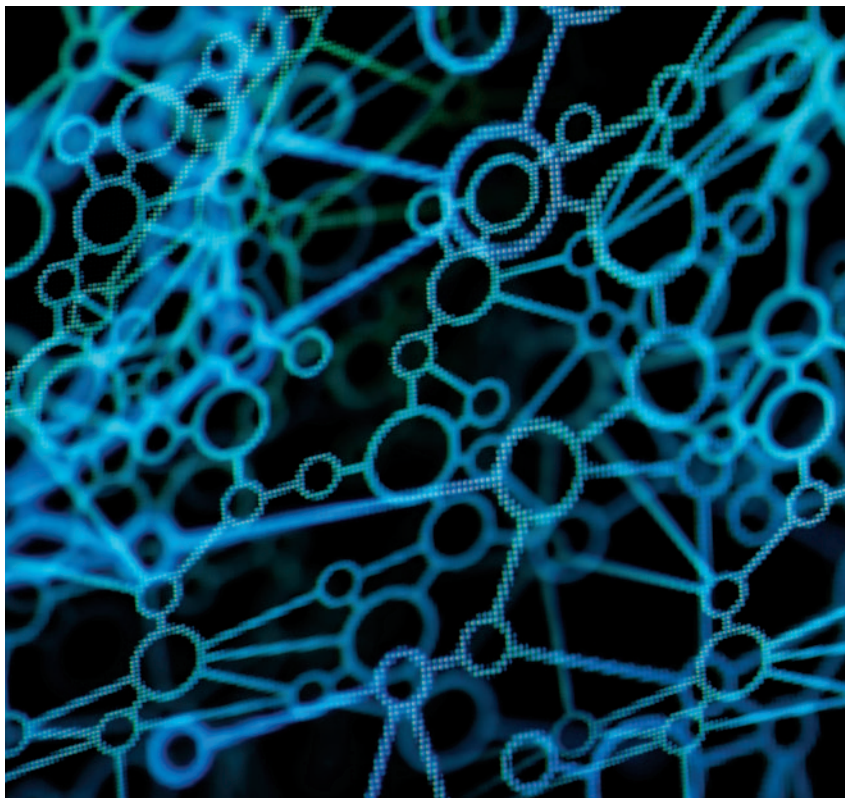
To ensure secure and reliable communication, the CESNET Association operates a public key infrastructure, based on the CESNET CA certification authority which issues various types of certificates: for individuals, servers and other certification authorities. The Association has been developing its own system, Perun, for controlling access to the

e-infrastructure resources; it enables management of the whole ecosystem comprising user identities, user groups, resources and services.

### Security of the e-infrastructure

The primary system for the provision of e-infrastructure security is the **CESNET-CERTS** security team. The core of its activity is the incident handling involving receipt of security incident notifications occurring in the CESNET2 network, its solving and related coordination. The Association pays great attention to awareness raising among users and administrators of the connected computer networks. It organises training, presents itself at numerous events and via publications focusing on security. It cooperates with other security teams and relevant organisations at both the national and international levels, including





under the TF-CSIRT activity, sponsored by TERENA. As part of its activities related to network security, the Association operates its own detection systems, which provide the information on attacks in progress. In 2013 it established its forensic laboratory FLAB, offering help in investigating security incidents. Its staff are able to examine computers and use electronic traces left to answer questions related to the incident. In the second half of 2013, the Association started preparations for elevating the status of the laboratory to an expert institute.

### Cooperation with national research and development infrastructures

The Association has been continuously in touch with representatives of other large infrastructures listed in the Road

Map of the Czech Republic for Large Research, Experimental Development and Innovation Infrastructures, and other infrastructural projects. It strives to identify their needs from the point of view of the services provided by the Association and to start cooperation in the area.

It maintains very close cooperation with the large infrastructures CERIT-SC and IT4Innovations with the aim of establishing a framework for future cooperation and promotion of these e-infrastructures as a united national ICT e-infrastructure.

Along with the Institute of Organic Chemistry and Biochemistry of the ASCR, Institute of Molecular Genetics of the ASCR, Global Change Research Centre of the ASCR, the Masaryk University, and the University of South Bohemia, CESNET is the founding member of the national node of the ELIXIR European Infrastructure for Biological Information.

The objective of the Czech national node ELIXIR.CZ is to provide an advanced computing environment, data resources and unique tools for the biological information scientific community in the Czech Republic and in Europe. ☒



In 2013, CESNET  
was involved in  
major international  
research projects:  
GÉANT and  
GÉANTplus,  
ORIENTplus,  
GLIF, PlanetLab,  
EGI\_DS and more.







03

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International  
Infrastructure  
Projects

# International Infrastructure Projects

## **GÉANT and GÉANTplus**

The GÉANT communications infrastructure currently provides access to network services to approximately 40 million users in more than 3,500 institutions in 38 European countries and ensures connection of European national research and education networks with similar networks, such as the Internet2 and ESnet in the USA, CANARIE in Canada, and networks in other continents. Starting from April 2013, the funding for this infrastructure and the related activities for the next 24 months is covered through support of the European Commission to the GN3plus project, a follow-up on the previous GN3.

The consortium members are 34 NREN operators, including CESNET, and the TERENA association and the DANTE society, which coordinates the project. The involvement in the project provides

the Association with access to the GÉANT infrastructure and an opportunity to participate in developing the infrastructure. It makes an important contribution to activities related to photonic services, testbeds, clouds, end network support, and AAI. Since the project is a two-year one, the Association is currently involved in planning the future of the GÉANT network – Ing. Stanislav Šíma of CESNET is a member of the seven-member international board tasked with defining a strategy for the pan-European infrastructure by 2020.

## **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 main 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. The Association's activities focus on supporting users of the 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 enables also experiments and demonstrations that pose a risk of interference and destruction.

### PlanetLab and Related Projects

CESNET has been a member of the PlanetLab consortia since 2006 and permanently maintains four machines in the PlanetLab (.org and .eu) networks. The popularity of PlanetLab among university users has been at a stable level. The Association 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 the system usage . It registers about thirty permanent users from several universities, but their number substantially increases temporarily during semestral tuition. For these users, the Association has established and operates twenty active virtual networks with various configurations specified by the users themselves. In total, all the virtual networks used by the CESNET users contain about 400 foreign nodes. This gives the users an excellent opportunity to test their applications within 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. The CESNET Association 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 connections among national grid infrastructures;
- coordination of middleware development.

he cooperation under EGI.eu continued in 2013 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 them, but in fact more than half of them are performed by the partners. In this context, CESNET is responsible for the operation of support services – a web server, a document server, a wiki, a request monitoring system, a conferencing system, mailing lists, jabber, etc. The last of the projects related to developing international grid infrastructures in which CESNET

staff are involved is the CHAIN-RED project dealing with coordination of cooperation of European grid infrastructures with similar infrastructures in other regions.

### 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 area.

**In 2013, 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-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 experience concerning technical, administrative as well as legal aspects of Internet multimedia outputs, their management as well as distribution of related work procedures in the European area;
- **TF-Storage**: issues related to implementation of data repositories in the academic network environment;
- **TF-NOC** (Network Operation Centre): issues related to supervision centres of National Research and Education Networks. ✕







In 2013,  
the Association  
was also active in  
the field of research  
and development  
of information and  
communications  
technologies.



04

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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 e-infrastructure, also deals with research and development in the area of information and communications technologies, notably in the areas discussed below.**

## E-infrastructure security

CESNET has paid close attention to network security in a long term. In addition to developing tools for ensuring user privacy protection and data security, and tools for sharing information on security incidents, the Association has been intensively developing tools for network monitoring and detection of traffic 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. Part of this development is funded under a joint project of CESNET

and INVEA-TECH, a.s., with a title the Distributed System for Comprehensive Monitoring of High-speed Networks (DMON100), supported by the Technology Agency of the Czech Republic under its ALFA programme. The project's objective is to complete the development of a HW probe enabling traffic monitoring on lines with a capacity of up to 100 Gbps. The probe has a great potential in the area of high-speed data network security.

## Grid middleware

Grid middleware development took place until the end of March 2013 mainly under the EMI international project under the 7th EU Framework Programme, in which the Association was involved in developing the Logging and Bookkeeping service as well as some components related to grid infrastructure operating security. The goal of the project as a whole was to create and further advance a consolidated set of middleware components designed for the EGI grid, PRACE and possibly other

distributed computing infrastructures. After the project completion, the cooperation with former EMI partners continues under EGI.eu, where the Association is involved in further development of selected components.

## Optical transmission systems

CESNET has long been researching and developing optical technologies. 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 requesting CESNET or the manufacturer. This makes them 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 partner to this project representing national research and education networks; the other nine partners represent national laboratories dealing with time and frequency metrology.

### High-definition video transmissions

The Association is developing two platforms in the area of very high-definition real-time video transmission.

**The first** is the 4K Gateway device 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 was successfully completed in December 2013.

**The second** platform is the UltraGrid software tool, enabling transmission of both compressed and uncompressed audio and video up to 8K in standard workstations over IP networks. UltraGrid is also part of the SAGE system (control and communication with large composite video walls).

The Association regularly presents the capabilities of the above platforms with great success at prestigious conferences abroad as well as events at home, and both solutions are permanently deployed at top-class medical facilities (MNUL and University Hospital Brno).

### Establishment of spin-off Comprimato Systems, s. r. o.

As part of its activities related to developing cooperation environments, the Association has been dealing with video compression since 2010 and constructed a unique compression design based on existing ordinary and computational graphics cards, which comprises video using the JPEG 2000 codec at up to ten times the speed of existing software options, at a fragment of the price of single-purpose customer hardware solutions. Several commercial organisations expressed preliminary interest in the work in early 2013, but they required a standard commercial approach, which is not the Association's primary focus. Having considered all the options, a spin-off financed by venture capital was selected as a suitable model; the link to the Association is expressed by transferring the execution of copyright for a charge. >



## Research and Development Outcomes

In 2013, the Industrial Property Office granted CESNET a patent for Circuits for fast analysis of headers of packets transmitted along a data bus, and a utility model Device for reception of video signals transmitted over a packet computer network. The Association appreciates very much the international patent Device for multicast of optical signals in the internet and other networks, granted by the United States Patent and Trademark Office (USPTO). Based on the research activities in 2013, 13 papers were published in professional journals, 24 papers in conference proceedings among others, and 11 software-type outcomes achieved.

## CESNET Development Fund

**In 2013, the Development Fund Council announced a selection procedure 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 27 projects were registered; 19 were admitted for co-funding, including 5 that were admitted after being reworked. In 2013, there were two rounds of opposition procedures for completed projects. 19 projects were successfully completed in total; one was presented within an opposition procedure. Completion or revision of final documentation was requested for several projects.

Final project reports within the CESNET Development Fund are available on the Association's website.

In the course of 2013, the Development Fund Council dealt with suggestions of examiners communicated to the Council in connection with project evaluation. It then selected topics for a new tender for projects in cooperation with the Association towards the end of the year. The topics focused on support to projects of the Association members making use the data repositories and services developed under the eIGeR project and infrastructure under the CESNET Large Infrastructure project.

The results of some projects were presented within the seminars for CESNET 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. ✕

Project Number	Project Executor	Project title
475/2013	University of West Bohemia in Plzeň	Increasing webhosting security
477/2013	University of West Bohemia in Plzeň	Acquisition of the Oracle Database 11g Security Certified Implementation Specialist certificate
478R1/2013	University of West Bohemia in Plzeň	IPv6 support in the DNS and DHCP management system
479R1/2013	University of West Bohemia in Plzeň	Mobile connection management at the UWB
482/2013	ASCR	Use of IPv6 protocol in the grid centre
483/2013	Charles University	Increase in qualification of workers of the CIT network department at the Faculty of Natural Science IV
484/2013	Charles University	Use of the CESNET disk repository in OU backup processes
486/2013	ICT Prague	Increase of qualification for an employee of the Computer and Control Equipment Institute of the Institute of Chemical Technology Prague by acquiring a CCNP certificate
487R1/2013	Academy of Performing Arts in Prague	High-capacity data network infrastructure for audiovisual transmission (follow-up on 424/2011)
488/2013	MENDELU	Central infrastructure administrator education and certification process for the MENDELU in Brno
489/2013	SLU	Increasing qualification of staff in charge of IT system management at the Silesian University in Opava
490R1/2013	VŠB-TUO	Hybrid optical networks with fibre/optical amplifiers connected en route
491/2013	Czech University of Life Sciences in Prague	Download server for the Czech University of Life Sciences in Prague
493R1/2013	Czech Technical University in Prague	Consolidation of data backup, archiving and sharing
494/2013	ASCR	User identification by means of computer key pressure dynamics
495/2013	Academy of Performing Arts in Prague	Integration of CESNET data repositories into the backup processes at the Academy of Performing Arts in Prague
496/2013	Czech Technical University in Prague	Filtering and anonymising of SIP traffic
497/2013	Czech Technical University in Prague	Measurement and analysis of latency in order to optimise cloud computing networks
500/2013	ASCR	National photonic network of the CR for transmission of stable frequencies, stage I: construction of a backbone link ISI Brno – CESNET Zikova, Prague

In 2013, CESNET  
presented itself  
at numerous  
international  
and domestic  
events, and  
organised many  
of them.







05

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External  
Relations

# External Relations


**In 2013, the Association continued profiling itself as a large infrastructure for research, development and innovations and intensified the presentation of the whole portfolio of its services, including their benefits to users.**

Early in the year, a new website was launched with a well-arranged structure, focusing among other things on a more pronounced presentation of the e-infrastructure services. The Association began to inform representatives of members and user institutions as well as numerous individual users about current events and news in the area of services by means of an e-mail newsletter. In 2013, CESNET focused on more intensive use of social media, primarily Facebook and Twitter, in its communication with users and the professional public. Member institutions showed great interest in the CESNET Days in 2013: an informal meeting of the Association's experts with users from the member organisations.

The meetings focused on specific areas and problems of the different universities or institutes of the Academy of Sciences based on specific wishes and requirements (Figures 4, 5, 6, 7 and 8).

Since 2005, the Association's representatives have made regular appearances in the biggest mass media – television, where they present expert opinions on the Internet, computer networks, and security. In 2013, the Association's Director Ing. Jan Gruntorád, CSc., appeared in the Czech Television show *Rub a líc* dealing with the Internet. Ing. Karel Nykles explained the appropriate password configurations for various on-line identities in a TV Nova news report. The Czech Television news department was fascinated by our successful transcontinental music and dance performance at the APAN 36 conference: Ing. Jiří Navrátil, CSc., appeared in the news report. Experts and researchers of the CESNET Association have

presented the outcomes of their work at numerous major events and conferences abroad. For example, the UltraGrid software developed by the Association was deployed at the annual summit of US Ignite for transmitting 3D films at a 4K resolution between Poznan, Poland, and Chicago, USA. The Association presented two examples at the TIP2013 international conference: a three-dimensional (3D) transmission of a concert from the Music and Dance Faculty of the Academy of Performing Arts in Prague in HD and long-distance interactive work with the 3D model of Prague.

Naturally, CESNET also presents itself at a range of domestic events. A full-day seminar was dedicated to a detailed presentation of the novelties in the sum of CESNET e-infrastructure services; the Association's experts focused on opportunities for practical utilisation of the services and their integration into existing IT solutions on the user institutions' side (Fig. 9). 

University of Pardubice, 15 February 4

Masaryk University, 26 February 5

Technical University of Ostrava, 20 March 6

University of South Bohemia, České Budějovice, 17 June 7

Academy of Sciences of the CR (Lanna Villa), 23 October 8

Seminar on the sum of CESNET e-infrastructure services, 21 October 9







IPv6 seminar in Olomouc, 6 December	10
3D Film Festival – booth, 26–28 April	11
3D Film Festival – 3D concert transmission	12
MEFANET, 26–27 November	13
Inovace 2013, 3–6 December	14
TF-CPR (Communications and Public Relations), 5–6 February, Utrecht	15

The grid computing seminar held in Brno on 21 November presented a regular overview of information of the Czech MetaCentrum national grid environment. The Association organised a seminar on practical aspects of operating networks with the IPv6 protocol at the Palacký University in Olomouc (Fig. 10).

As traditionally, the Association has presented itself by providing live webcasts at major medical events. For example, in 2013, these included the Zlín Ophthalmology Festival and the 21st Annual Congress of the Czech Society of Cardiology. The Association also presented itself at the 3D Film Festival at the Lucerna cinema in Prague, where it organised a unique transmission of a live concert using the 3D technology (Fig. 11 and 12).

The Association also presented itself in the form of information booths at the MEFANET (Medical

Faculties NETWORK) conference (Fig. 13) and during the Research, Development and Innovation Week (Inovace 2013 – Fig. 14).

In November, the Association provided transmission of selected lectures of the 12th Science and Technology Week and contributed to it with a lecture called Safely Through the Internet World. In the form of partnership, CESNET promoted itself at additional conferences on information technologies, such as the Internet and Technology 13 and OpenSource Network Solutions.

The Association presents the outcomes of its work in its own publications (Datagram) as well as conventional and electronic professional journals, which also adopt press releases issued by the Association (28 issued in 2013). In 2013, the Association hosted several meetings of representatives of European national research

networks. In June, shareholders of DANTE and the GN3 project met in Prague, as did national research network administrators at the TF-NOC Meeting and the TERENA Network Architects Workshop in November.

In the international domain, the active collaboration of the Communications and Public Relations Department continued under the TF-CPR working groups of the TERENA Association and DANTE's GÉANT PR Network (Fig. 15).

The Association regularly monitors media output, and analyses the visit rates of its web site and the CESNET profiles in social media. The analyses of this output confirm a steady increase in the media presence and other activities connected with the Association's communication. ✕



10



11



12



14



13



15

## The Association

properly managed  
the entrusted  
financial resources  
in 2013, 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.

06

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Economic  
results



# Economic results

## 2013 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 2013: the five-year project CESNET Large Infrastructure, with a primarily investment focus, and Extension of the National R&D Information Infrastructure in Regions (eIGeR), which was completed on 31 October 2013, 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, grants from the Technology Agency of the

Czech Republic, and projects of the Development Fund Board.

The Main Activities of the Association ended in 2013 with a book loss of CZK 4,189,000.

Revenues from the Association's principal activity amounted to CZK 561,072,000; the expenditures were CZK 565,261,000.

The basis of the income tax on the Association's main activities in 2013 was negative, amounting to CZK 9,374,000.

### Economic activity

The Association's economic activity in 2013 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 2013 with a book profit of CZK 5,045,000. Revenues from the Association's economic activity in 2013 amounted to CZK 156,731,000; expenditures on the economic activity were CZK 151,686,000.

The income tax base from the yields of the Association's economic activity in 2013 was positive, amounting to CZK 5,420,000.

## Total Book and Tax Economic Result

The total book economic result of the CESNET Association prior to taxation reported in 2013 was a profit amounting to CZK 856,000.

The total income tax base after deducting the items lowering the tax base was CZK 4,420,000. The Association paid income tax of CZK 840,000 for 2013, resulting in a net profit of CZK 16,000.

## Conclusion

The Association properly managed the entrusted resources in 2013, 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 2013 was verified by the auditor without any remarks.

<b>BALANCE SHEET IN THOUSANDS OF CZK</b>				
	<b>2013</b>	<b>2012</b>	<b>2011</b>	<b>2010</b>
<b>Assets total</b>	<b>1,020,221</b>	<b>1,145,473</b>	<b>973,454</b>	<b>649,539</b>
<b>Fixed Assets</b>	814,654	676,126	627,664	459,849
<b>Intangible fixed assets</b>	10,044	7,800	3,615	3,623
<b>Tangible fixed assets</b>	475,675	345,263	306,765	137,150
<b>Financial Investments</b>	328,935	323,063	317,284	319,076
<b>Current assets</b>	205,567	469,347	345,790	189,690
<b>Supplies</b>	92	1,406	243	0
<b>Receivables</b>	46,879	52,862	70,176	19,042
<b>Current liquid assets</b>	135,918	397,617	252,428	144,003
<b>Other assets</b>	22,678	17,462	22,943	26,645
<b>Liabilities total</b>	<b>1,020,221</b>	<b>1,145,473</b>	<b>973,454</b>	<b>649,539</b>
<b>Own resources</b>	907,022	985,784	797,542	605,710
<b>Funds</b>	768,320	839,660	665,136	474,303
<b>Economic result</b>	16	21,686	9,125	-2,047
<b>Undivided profit from last years</b>	138,686	124,438	123,281	133,454
<b>External resources</b>	113,199	159,689	175,912	43,829
<b>Obligations</b>	109,676	157,015	173,658	41,321
<b>Loans</b>	0	0	0	0
<b>Other liabilities</b>	3,523	2,674	2,254	2,508





PROFIT AND LOSS STATEMENT IN THOUSANDS OF CZK				
Indicator	2013	2012	2011	2010
Earnings for the sale of goods	193	748	21	20
Earnings of own product and services	99,276	98,697	100,933	102,050
Current liquid assets revenues	151,325	89,755	26,039	78,960
Other revenues	229,200	187,818	107,775	63,425
Received membership fees	0	0	0	0
Operation subsidies	237,810	248,233	229,675	139,771
<b>Revenue total</b>	<b>717,804</b>	<b>625,251</b>	<b>464,443</b>	<b>384,226</b>
Purchase price of sold goods	4	263	16	15
Material and energy consumption	22,473	19,656	21,958	15,274
Purchased services	222,073	230,517	197,130	149,385
Personnel costs	137,480	133,844	129,133	100,852
Depreciation and amortization of intangible and tangible fixed assets	181,783	132,057	74,905	24,926
Other costs	153,135	82,550	27,810	93,576
Income tax – assessment for the current year	840	4,678	4,366	2,245
<b>Costs total</b>	<b>717,788</b>	<b>603,565</b>	<b>455,318</b>	<b>386,273</b>
<b>Economic result (revenue – costs)</b>	<b>16</b>	<b>21,686</b>	<b>9,125</b>	<b>-2,047</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 2013, 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 2013, and of its financial performance for the year then ended in accordance with Czech accounting regulations.**

Date of issue of report:

In Prague on 13 June 2014

**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





